Mercury TMDL Response to Comments Cover Letter

The draft mercury TMDL was placed on formal public notice from July 18 to October 18, 2005. In addition, eight public informational meetings were held throughout the state between July 14 and July 25, 2005. During the formal 90-day public comment period, we received 981 comments, by letter, e-mail, postcard, or petition. The Agency separated the comments received into 92 issues. Each Issue was given an Issue Code [from E to CR, in no specific order].

The very large majority of the issues are related to the implementation planning that will occur after the TMDL is approved by US EPA. EPA will not review implementation comments, or our responses, but they are going to be a key component as the Agency and its partners develop approaches to implementation during the year following approval of the TMDL study.

A number of changes will be made to the Mercury TMDL to clarify and improve the accuracy of some statements. For example, a paragraph will be added that describes the process for calculating the standard size fish mercury concentration and mercury discharges from coal-fired power plants will be added to the wasteload calculations. For the most part, the Agency does not consider these changes significant because they do not change the final TMDL components of wasteload allocation, load allocation, margin of safety, or the mercury emissions reduction goal of 93%.

The one change, however, that is considered significant is the removal of waters from coverage under the mercury TMDL because the Agency cannot be certain they will meet the water quality standards when the reduction goals are achieved. Consequently, the mercury impaired waters listed in Appendix A of the Mercury TMDL will now only include a subset of all mercury impaired waters.

Significant Modification to the Draft Mercury TMDL

Context: Several commenters raised the issue that we included waterbodies in the mercury TMDL Appendix A that would not meet water quality standards after the 93% reduction in mercury emissions was met. The following criterion was given by the commenters for removing impaired waters from coverage under the draft Mercury TMDL: a water body has a fish size class mean mercury concentration that exceeds 0.572 ppm.

Action: The Agency has decided to follow this recommendation and assess waterbodies on a reach-specific & lake basis rather than the regional approach of the previous draft Mercury TMDL.

We accept that the list of river reaches and lakes included in Appendix A in the mercury TMDL can only include those that meet that requirement and Appendix A has be shortened accordingly. The revised Appendix A only has impaired waters that meet the following criteria: (1) fish samples were collected since 1990, (2) size class means contain more than one fish, (3) size classes are less than 30 inches for northern pike and less than 20 inches for walleye; no muskellunge are evaluated [MnDNR regulations do not allow these fish to be eaten], and (4) maximum mercury concentration for a size class mean is less than 0.572 ppm. The resulting list of waters meeting these criteria

includes 329 lakes and 18 rivers; previously Appendix A contained 824 lakes and 43 rivers. Those lakes and rivers not contained in Appendix A will remain on the Agency's 2006 list of impaired waters.

The regional approach remains a tenet of the Mercury TMDL, despite the reduction in impaired waters covered, and the regional mercury reduction goals have not changed. The Agency has considered mercury impairments to be a regional problem for many years because mercury has been known as an atmospheric deposition problem, airborne deposition is relatively uniform across the state, and a major proportion of deposited mercury originates outside the state. When the Agency first listed mercury impaired waters in 1998, it included the following footnote: "Impacts of mercury are mainly regional in expression, so the initial approach will be to complete regional mercury TMDLs. This approach could change based on basin planning activities." Because mercury was understood as a regional problem—that is, all waters were affected by the atmospheric deposition of mercury—data requirements for assessment of mercury impairments are less stringent than the criteria for individual reach assessments for most other pollutants. The U.S. district court judge's ruling on Minnesota's Southwest Fecal Coliform TMDL in 2005 necessitates a more constrained and rigorous assessment of what constitutes impaired waters. The judge's narrow interpretation of the Clean Water Act requirements for TMDLs does not allow for an adaptive management approach, as espoused in the draft Mercury TMDL. Consequently, this Mercury TMDL has a narrower coverage of waters and MPCA's guidance manual for listing impaired waters will be revised during the 2008 impairment listing cycle to reflect these changes.

Responsiveness Summary

Following is the Responsiveness Summary by issue. The issue codes in brackets connect the issues to the commenters by way of an Issue letter codes by person matrix. Very closely linked Issues may be provided with a linked response, e.g. issues [E], [W], [AH], and [AT] on page 3 below.

The matrix file, named "Issue letter codes by person.xls", is located on the Agency Mercury TMDL web site at http://www.pca.state.mn.us/publications/wq-iw4-01j.pdf. This Responsiveness Summary will also be located at this same web site.

Responses to Mercury TMDL Issues

[E] Act now
[W] Minnesota should lead, not follow
[AH] Progress is too slow
[AT] Measures should be serious

Minnesota has taken serious actions and will continue to act to reduce mercury emissions in Minnesota. Since 1990, we have achieved a 70% reduction in mercury emissions in Minnesota, primarily in the products sector. In February 2006, Governor Pawlenty requested the Minnesota Pollution Control Agency (MPCA) initiate legislation which would reduce mercury emissions from the states largest power plants in Minnesota faster than those proposed by the Federal government. In May, this legislation, the Mercury reduction act of 2006 became law. By 2014, the states three largest plants will be required to reduce emissions by 90 percent. This legislation is among the strongest in the nation and will result in annual reductions of about 1200 pounds per year.

[F] Reducing mercury in fish will improve health and is good for the economy in the long run as the associated benefits outweigh the costs

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. During the development of the implementation plan, the MPCA, in consultation with stakeholders, will attempt to evaluate the economic benefits of improved health due to reduced mercury contamination of fish.

[G] Ottertail Power Company's plans to construct another power generating unit at its Big Stone plant are a problem.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. While the MPCA is not the permitting authority for Ottertail Power's proposed new 500 MW unit at its Big Stone generating station in South Dakota, staff are following the facility proposal and permitting process. Ottertail Power Company representatives have visited with MPCA staff to describe the Big Stone II project. The information provided, while not at the same detail as a permit application will contain, shows that in addition to including state of the art air pollution controls for the new unit, control equipment will be upgraded for the existing unit. The current staff understanding is that air pollutant emissions for the expanded project will be at or below current emission rates. Mercury emissions from the entire facility will be far below the existing unit's current emissions.

[H] Cap & trade concern

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is

approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Cap and trade programs are of interest by regulators and industries when there are widely varying costs in controls, and the precise location of the reduction is of lesser importance. Key to the success of such programs is establishing a cap that is low enough to change emission profiles. The MPCA has viewed cap and trade programs as potentially useful to address mercury emissions within Minnesota, and looks forward to a discussion about the merits and shortcomings of such a regulatory effort.

[I] Reduce coal-plant emissions
[BE] Coal plant regulations / cleanup

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process.

Recently adopted federal rules are lowering power plant emissions in general; both Xcel and Minnesota Power have undertaken or announced changes to some of their generating stations that lower air pollutant emissions. Additionally, the Minnesota Mercury Reduction Act of 2006, which became law in May 2006, will reduce annual mercury emissions from the state's largest power plants by about 1200 pounds per year by 2014.

[J] Contamination of land;
[AC] Proportionality principle challenged;
[AE] Re-release from sediments;
[AJ] Stormwater issues

The proportionality principle is described in Section 5.2 of the draft Mercury TMDL. The Agency has adopted the principle as a tenet of the TMDL because it is the best available science on the relationship between atmospheric deposition and mercury bioaccumulation in fish. We are not aware of any published studies that contradict the proportionality principle and the commenters have not provided any additional information to contradict it. There were several comments related to the proportionality principle that challenged the draft Mercury TMDL's focus on atmospheric deposition mercury reductions as the way to achieve the target mercury concentration in fish and the commenters proposed other issues that should be addressed as part of the TMDL.

The issues include water management, contamination of land, re-release from sediments, and stormwater. These inter-related issues are not included in the TMDL because they are not mercury sources for TMDL allocation; rather they are processes that influence the fate and transport of mercury and for that reason they will be addressed in the TMDL implementation. They should not be included as sources of mercury that need to be reduced as part of the allocation process.

An analogy would be phosphorus that originated from a wastewater treatment plant and was then absorbed by algae. When the algae die, the phosphorus is released. It would be inappropriate to claim that algae are the 'source' of phosphorus; they are just way stations as the phosphorus moves downstream.

That said, the Agency is aware that these areas can be intermediary sources and should be an important part of implementation planning. Erosion management and stormwater quality must be considerations for implementation planning.

Stormwater is included in the LA and WLA, but is zero in the latter because the mercury in stormwater is essentially all from atmospheric deposition and not from sources on the land cover per se.

The Agency is not aware of any land resources pollution by excess mercury in Minnesota; mercury in the environment must be significantly bioaccumulated before it becomes a hazard to humans and wildlife.

The Agency agrees with a comment that water management could be useful for reducing mercury methylation on a local scale; however, the draft Mercury TMDL is intent on addressing the sources of mercury. Water management can be considered in the implementation phase of the TMDL as a means to mitigate mercury loading on a local scale. It is important to note that controlling methylation is not the same as controlling the source of mercury. Wetlands, for example, are known as primary mercury methylation sites, but wetlands are not the source of the problem. They are a concern because of the mercury that enters the wetlands, not the wetlands themselves.

A commenter asserted the draft Mercury TMDL, Section 5.4, has contradictory statements by saying the plan assumes methylation is constant yet it is likely that the proportion methylated has increased relative to natural levels because of anthropogenic changes. This point was made in the TMDL to show the assumptions about methylation were conservative.

[K] Mercury TMDL requested

The document was mailed out within two business days.

[L] Dissatisfied with staff performance
[Q] FOIA request
[R] MPCA should be investigated
[AA] There were problems with the process
[AF] Return to original draft
[AG] Either re-write or start over
[AO] Agency too cozy with industry

Several comments were concerned that the process the MPCA followed to bring the mercury TMDL to the final draft version placed on public notice was flawed. Some were dissatisfied with staff performance; others raised concerns that the Agency granted too much access to industrial groups and not enough access and information to environmental groups.

To insure that all parties had all available information upon which to base and provide comments, the public comment period was extended two times. A normal 30 day comment period was extended to 90 days. In addition the MPCA staff, met twice with environmental groups to first discuss the mercury TMDL process and secondly to fully provide all technical information and basis for the TMDL decisions.

Minnesota Statutes 116.07 subd. 6 calls for the Agency to give due consideration to the establishment, maintenance, operation, and expansion of business, commerce, trade, industry, and traffic, and other factors in proposing any actions. MPCA staff met with industry to understand the potential effects of the draft mercury TMDL.

[M] Environmental justice
[T] Limits not strict enough
[V] Mercury levels too high
[BM] Must acknowledge cultural practices

One concern of some who commented was mercury limits being too high. Minnesota's mercury water quality standard is 0.2 mg/kg mercury in fish tissue. EPA's criterion is 0.3 mg/kg mercury in fish tissue. Minnesota's is more restrictive. Waters are listed when mercury levels in fish are such that the Minnesota Department of Health advises no more than one fish meal per week be consumed by the most sensitive individuals in the population including but not limited to, children, pregnant women, and their fetuses. Hypersensitive members of the population and those who do not follow consumption advice are not protected. The 93% reduction called for in the mercury TMDL will decrease the levels of mercury in fish in Minnesota and will reduce the risk of mercury toxic effects in all Minnesota populations (pregnant women, children, subsistence anglers and ethnic minorities) that consume fish. If all mercury emissions in Minnesota were eliminated now we still would not be able to have unlimited consumption of fish by all population segments due to global sources and existing natural and background conditions. Consumption advice continues to be needed and followed. This mercury TMDL will be the just the first step in controlling mercury.

[N] EPA modeling issues
[BS] TMDL needs modeling

A commenter states that the TMDL claims uniform state-wide atmospheric deposition of mercury, based on fish tissue levels, core sampling, and deposition sampling. Further, the commentator states that in the absence of a statistically valid sampling, the TMDL should rely to some extent on a model of atmospheric deposition.

The TMDL does not rely on fish tissue levels as a measure of atmospheric deposition, but rather notes that mercury concentrations in fish vary much more than atmospheric deposition does, for a variety of reasons that are described section 4.1. The MPCA considers core sampling and wet deposition sampling to be valid representations of atmospheric deposition because the atmosphere is well-mixed and, except immediately adjacent to a low-elevation significant source of divalent mercury to the atmosphere, a measurement of deposition will characterize a broad area. MPCA staff are not aware of any significant low-elevation (from a short stack) emissions of divalent mercury. When empirical measurements of mercury deposition (from cores and MDNR measurements) are available, it is difficult to identify any additional benefit to modeling atmospheric deposition—models are usually verified by comparing to empirical data, which already indicate uniformity across Minnesota. In addition, the predictions of mercury models are very dependent on the quality of input data, especially the relative amounts of elemental and divalent mercury, which are not consistently reliable for emission sources. The

MPCA acknowledges that data and models are improving, and that at some point the output from these models can be trusted to accurately characterize the environment. The main utility of such a model at this time is to generate patterns of deposition, which, if the inputs are correct, indicate where one would expect unusually elevated deposition, or a "depositional hot spot." The results of a modeling effort by Dr. Atkinson of the EPA are available. The one depositional hot spot predicted by Dr. Atkinson's modeling in Goodhue County was the result of two incinerators that are now closed, as described in section 5.1 of the TMDL.

[O] Equation Discussions

A commenter suggested revised calculations in Table ES-1 of the draft Mercury TMDL; however, the suggestions were based on the December 2004 preliminary draft mercury TMDL rather than the May 2005 draft. One suggestion was to apply the 70% factor (for anthropogenic fraction) in Section 4 of Table ES-1 to remove the natural component of atmospheric deposition, rather than in Section 5 of Table ES-1. While this might make more sense to the commenter, it is not the way EPA expects natural sources to be treated. The TMDL is divided in WLA and LA, plus the MOS, but does not separate out the natural source component. The natural, or background, loading is included in the LA.

The commenter states that it is not clear how the 512.9 kg/y reduction goal for NE MN is equal to the total currently shown in Section 5. After presenting alternative calculations for Section 5 of Table ES-1, the commenter states, "These are actually deposition reduction goals and not based upon in-state emissions." This implies that the draft Mercury TMDL reduction goals are based on in-state emissions, which is not the case. The emission reduction goals are simply the 65% reduction goal divided by the 70% anthropogenic sources, which results in a 93% reduction goal for all anthropogenic emissions, in-state and out-of-state emissions.

The commenter noted that if the reduction factor was 90% rather than 65%, a reduction of 128% in emissions from anthropogenic sources would be required and this is not possible. Indeed, that is correct. The maximum reduction that we can expect is 70%, which is equal to the 70% from anthropogenic sources, because we cannot expect to get any reductions from natural sources.

The commenter suggested emission reduction goals for taconite and power generation. Table ES-1 does not include source specific reduction goals, because those specific goals will be decided in the implementation plan. We do, however, present proposed goals for the three source sectors in Section 11.4.2. of the draft Mercury TMDL.

[P] Set standards and fine industries that don't meet them.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. If rules or permits set emission limits for mercury, then exceeding the limit will result in enforcement action by the MPCA. The MPCA will seek monetary penalties, depending on the magnitude, harm and frequency of such a violation.

[S] The implementation plan in the TMDL is not strong enough

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. As described in Section 11 the implementation plan will be developed following the approval of the TMDL. The implementation ideas presented in this document are not the implementation plan but rather a proposed starting point. The MPCA plans to intensively involve stakeholders in developing the final implementation plan.

[U] Mandatory dates and timelines
[CE] Need date certain triggers

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Within the draft TMDL, a plan showing reasonable progress towards the TMDL was presented. Future implementation planning will need to take into account whether there are means of achieving permanent emission reductions, and if so, under what time frame. Setting up a schedule for achieving reductions, and reviewing progress made towards the TMDL goal is a critical issue of an implementation plan.

[X] The TMDL's margin of safety is inadequate for many lakes
[BT] The TMDL's margin of safety is inadequate for many lakes, especially in the northeast

The discussion of margin of safety (MOS) is found on pages 39 & 40 in the mercury TMDL. Several commenters challenged the adequacy of the MOS, because it is implicit instead of explicit and because of the characterization of what the Agency considers to be adequate justification. This is a draft document until US EPA reviews and approves it. They will use their guidelines to determine if the mercury TMDL MOS is adequate.

On May 20, 2002, EPA released a memorandum to its Regions titled "Guideline for Reviewing TMDLs under Existing Regulations issued in 1992." Page 4 of that document discusses MOS. "If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified." The mercury TMDL has described the 'conservative assumptions' used, meeting the federal requirements.

This was further clarified in 2001 in Natural Resources Defense Council, et al. v. Muszunski, et al., No. 00-6232 (2nd Cir.). Under the Discussion, III. Margin of Safety, "In approving the TMDLs, EPA noted that in lieu of any 'standard' or guideline for choosing a specific margin of safety, best professional judgment and the available information are used in setting a margin of safety." We believe the mercury TMDL meets this guideline.

Several commenters suggested that the northeastern lakes should have a different MOS than the rest of the state and that it should be larger. We do not concur. The allocations very clearly show our explicit recognition for the unique differences between the northeast and the rest of the state; the statewide reduction goal was based on reductions required in the northeast. To extend that into the MOS would pile safety factor on top of safety factor excessively.

A comment letter called for a greater margin of safety, which could be interpreted as using a higher percentile from the standard size walleye data. The 90th percentile was chosen rather than 100th percentile because of uncertainty. Without any variability or uncertainty, achieving the target level in 90th percentile of standard size walleye would mean 9 out of 10 water bodies will achieve the target; however, many factors, in addition to mercury load, affects fish tissue mercury levels, and those factors can change over time in ways that we cannot predict. Even if all those factors remained constant, we know from scientific studies in Minnesota and elsewhere that mercury deposition has declined from a peak around the 1970s. Mercury concentrations in fish accumulate over the lifetime of the fish and as mercury deposition continues to decline we expect fish to be exposed to lower mercury loads over their lifetime.

A commenter noted that there are safety factors other than what is discussed in the Margin of Safety (MOS) discussion and suggested the TMDL should identify all safety factors and assumptions built into the fish consumption advisories and criteria and into the TMDL plan and its goals. We did attempt to identify the assumptions we used throughout our decision making to arrive at a mercury TMDL and mercury reduction goals. One of the factors listed by the commenter—analyzing skin-on fillets—is not considered an assumption of our calculations, but merely the tissue type that is used for determining fish consumption advisories, as recommended by USEPA. Having the skin on the fillet actually reduces the mercury concentration (by less than 10%) because the mercury is bound to the muscle tissue and relatively little mercury is associated with the fatty tissue of the skin.

The discussion of ‘critical conditions’ is found on page 40 in the mercury TMDL. Several commenters noted that several other critical conditions exist that were not discussed, including acidic soil, dissolved oxygen, temperature, soil type, erosion, dissolved organic matter, length of the food chain, sulfates, and total organic carbon.

On May 20, 2002, EPA released a memorandum to its Regions titled “Guideline for Reviewing TMDLs under Existing Regulations issued in 1992.” Page 3 of that document discusses critical conditions as follows:

“TMDLs must take into account critical conditions for stream flow, loading, and water quality parameters as part of the analysis of loading capacity. (40CFR130.7c(1)). TMDLs should define applicable critical conditions and describe their approach to estimating both point and nonpoint source loadings under such critical conditions. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g. meteorological conditions and land use distribution.”

The other factors noted by the commenter are facets of all TMDLs and are some of the reasons why the state was explicitly broken out into two regions. We believe that is sufficient to cover these factors.

[Y] New/future source concerns
[BF] Reserve capacity issues

The mercury TMDL implementation plan which will be developed after the TMDL is approved by EPA will determine if and how new sources of mercury will be handled and how any reserve capacity is allotted to new sources.

[Z] Services offered during implementation

The commenter offered her company's services during implementation. If the Agency needs to contract for services, the Agency will follow guidelines as mandated by statute and the Minnesota Department of Administration.

[AB] Past emission reductions associated with product use should not be used to offset current reductions from current predominant sources.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Reductions from product-related emission sources in the past 15 years have been substantial and have resulted in Minnesota sources achieving a 70% reduction. Going forward, the MPCA expects that all mercury emission sources will have to significantly reduce from current levels in order to reach the final emission reduction target. The relative amounts of reductions from each sector will be determined during the implementation planning process. A new law will require the power generation sector to reduce their emissions substantially.

[AD] Recycling of products that contain mercury has been effective at reducing environmental releases but barriers to recycling remain.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Minnesota is a leader in recycling of mercury-containing products with some of the strongest public and private recycling infrastructure and programs in the country. Continued reductions in the release of mercury from products will certainly involve increased recycling. Strategies to remove barriers and enhance incentives to recycling will be explored during implementation planning.

[AI] Speciation.

The commenter notes that the TMDL does not address the speciation of mercury from emission sources, and that omission is a failing because an atmospheric model from Dwight Atkinson of the EPA that does utilize speciation information predicts that "states with the highest mercury levels get more than half of their mercury from local sources." In addition, the commenter states that Mark Cohen, a NOAA modeler, has output that shows 50% of divalent mercury is deposited within 500 km of the source.

Regarding the assertion that "states with the highest mercury levels get more than half of their mercury from local sources," the commenter is apparently misinterpreting

PowerPoint slides from Dr. Atkinson, in which there is a pie chart labeled, for instance: "Contributions to Hg at site of maximum MN Hg deposition." In Minnesota's case, the in-state proportion is modeled as 58%, which refers to the modeled 6 by 6 km cell, not the state as a whole. As stated above, the incinerators responsible for that modeled result are no longer operating.

The commenter apparently thinks that the TMDL should have considered the speciation of mercury emissions in Minnesota because deposition of divalent mercury would be elevated near sources, causing a depositional hot spot that contradicts the assumption of uniform deposition across the state. A major reason that the TMDL does not consider a depositional hot spot a likely phenomenon is that there no longer are any low-elevation concentrated sources of divalent mercury in Minnesota. As the commenter notes, the results of a modeling effort by Dr. Atkinson of the EPA are available. The one depositional hot spot predicted by Dr. Atkinson's modeling in Goodhue County was the result of two incinerators that are now closed, as described in section 5.1 of the TMDL.

The mercury emissions from all taconite facilities and major coal facilities in Minnesota emit less than ten percent divalent mercury, so significant local deposition is not expected adjacent to any one of those emission sources. The concern that Cohen predicts that 50% of divalent mercury is deposited within 500 km (300 miles) of a tall (250 m) emission source does not in itself predict significantly elevated deposition near the source, since deposition over 500 km would greatly dilute the mercury. The commenter is correct that deposition of divalent mercury emitted from short stacks would be greater than that predicted by Cohen, but to receive significantly elevated mercury deposition, a lake would have to be adjacent to such an emission source. The MPCA has not been able to document a depositional hot spot, despite having cored lakes near the Northshore taconite plant, the Clay Boswell coal-fired power plant, and the Flint Hills Resources oil refinery. By design or not, most mercury emission sources in Minnesota are not adjacent to a lake, and so are not likely to significantly elevate the mercury content of fish even if the source has a relatively short stack. There are a number of emission sources adjacent to rivers, but the hydraulic residence time is too short in rivers for locally elevated deposition, even if it were to occur, to have a significant affect on mercury concentrations in fish.

[AK] Taconite regulations

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. As the taconite industry ramps up to meet global steel demands, mercury emissions are likely to increase. Mercury control at taconite-production and iron producing facilities has not (yet) been the beneficiary of the intense research that has recently resulted in cost-effective controls for coal-based power plants. Implementation planning will need to consider the current state of knowledge about the ability to control mercury emissions. A likely key discussion of this TMDL's implementation plan will be whether there is active research or not, and if not, what would be useful mechanisms to drive research.

If there appear to be technically feasible controls, the next step will be to determine how to achieve reductions, including whether the MPCA should impose stack control requirements.

[AL] Tax Utilities

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Taxing generators of a pollutant based on the amount of pollutant emitted (utilities, but also solid waste generators or taconite production facilities) may or may not be useful in lowering overall emissions. This means of securing reductions can be considered in the development of a detailed implementation plan.

[AM] Thank you; good job

This was a letter thanking the Agency for going out to the regional offices during the mercury TMDL public informational meetings in the summer of 2005 and discussing this issue with them.

[AN] Plan does not go far enough
[AS] WWTF issues
[BN] Need more details on individual permits
[BP] No backsliding
[BV] No WWTF expansions

Our cities and towns continue to grow as Minnesota's population grows. Municipal wastewater plants will also grow to provide basic sanitation services and industries will provide people livelihoods. Point source dischargers of mercury will have to meet all applicable water quality standards to receive an NPDES permit; there will be no backsliding. The amount of mercury loading from point sources is very, very small when compared to air sources no matter how you calculate it and controlled WWTP expansions will have virtually no impact on Minnesota's mercury problem. We have not identified any water point source hotspots in streams or lakes with our past monitoring and do not expect to find any in the future. The impact of the mercury TMDL allocations to point sources and the implementation activities which will be required of point sources will be determined during the implementation plan phase which will occur after EPA approval of the TMDL. Details on the impacts to individual permits will not be available until after the implementation plan has been developed.

[AP] Uniform deposition

Sources of atmospheric mercury deposition to Minnesota were discussed in Section 5.1 of the draft TMDL, including an explanation that 40% is from regional emissions. The regional contribution was determined by subtracting the 30% natural sources and 30% anthropogenic global sources from the total deposition. A commenter requested that the TMDL include the effect of reductions in nearby states. We have estimated Minnesota's emissions contributed 10% and the rest of the Midwest contributed 15%, but we cannot be more specific and define the contribution from individual states.

[AQ] Voluntary doesn't work

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is

approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process.

While there were significant numbers of commenters complaining that voluntary reduction programs are ineffective, Minnesotans are enjoying a number of substantial, permanent reductions in mercury emissions that were achieved through voluntary initiatives.

The MPCA will continue to include voluntary initiatives, undertaken for whatever reason or purpose, as a useful and appropriate tool for securing pollutant reductions, including mercury. During implementation plan development, the role of voluntary reductions will be discussed, particularly for those economic sectors where "end of pipe" controls are not yet available but where voluntary reductions—encouragement of changes without mandating them—may make big differences. The MPCA will also continue to use regulatory and administrative tools in furthering progress toward the mercury TMDL goal.

[AR] The cost of electricity should not be issue

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. When the MPCA conducts rulemaking, it is required by state statute to estimate both the costs and benefits of a rule's actions. Costs are viewed within the context of the rulemaking.

[AU] A ten year plan is needed

Minnesota's legislation calling for 90%reduction of mercury emissions in our largest power plants contains a seven years window. This is substantially shorter than the 10-year plan suggested by the commenter.

[AV] Point source discharges are not de minimis for some receiving waters [CQ] Point source loading underestimated and nonpoint source data overestimated

Note: The correct spelling is *de minimis* and will be corrected in the final draft of the TMDL.

The wasteload allocation in the second (May 05) draft was significantly changed from the first (Dec 04) draft, making concerns about use of a *de minimis* term moot. The proposed wasteload allocation for water point sources is less than one percent of the total load allowed—the total statewide allocation is 1191 kg/year and the statewide wasteload allocation is 11 kg/year, or 0.92%. The Agency is not aware of any biological 'hotspots' from water point sources and we are not aware of any watershed exceeding the 1% wasteload allocation goal.

The Dec 2004 draft Mercury TMDL had used the term *de minimis* to indicate wastewater point sources were insignificant mercury loads to the two regions of the state compared to atmospheric mercury loading. As described in the draft Mercury TMDL, the assessment of point sources as insignificant followed the reasoning used in US EPA's Mercury Maps report (www.epa.gov/waterscience/maps/report.pdf) where POTW mercury loads were considered significant "If the sum of POTW mercury loads is greater

than 5% of the air deposition load, as delivered to waterbodies..." In Mercury Maps the "as delivered to waterbodies" was interpreted as 20% of the atmospheric deposition.

Assigning the significance level for wastewater point sources as 5% of 20% of the air deposition load is mathematically the same as using 1% of 100% of the air deposition load. Therefore, we opted to simplify the assessment of significance (i.e., *de minimis* level) by removing the 20% delivery factor as an explicit variable in our calculations. We realize now from comments that this was not properly explained in the draft Mercury TMDL and resulted in confusion as to why we described the delivery factor in Equation 2 of the draft Mercury TMDL but then did not use it later in comparing air deposition and wastewater discharges. Rather than use the 20% delivery factor and define the *de minimis* level as 5% of the total load, we prefer to clarify in the TMDL report why we used 1% of 100% rather than 5% of 20%.

According to one comment, the TMDL should apply the one percent to each water body. In the draft Mercury TMDL, the wasteload allocation was set to one percent of the total mercury load for each region. Applying the one percent on an individual water body basis is counter to a tenet of the Mercury TMDL that mercury contamination is a regional problem and cannot be addressed on an individual water body basis. The one percent wasteload allocation for each region will be interpreted in the implementation plan and could result in its strict application to each point source, but that is a decision appropriate for implementation and is not necessary or beneficial to establishing the regional TMDLs for mercury.

The draft Mercury TMDL labels the one percent wasteload allocation as *de minimis* to indicate changes in loads below one percent of the total load are considered insignificant because they will have no measurable affect on statewide fish tissue mercury concentrations. This does not mean that draft Mercury TMDL exempts dischargers from the Clean Water Act requirements. The following excerpt was taken from the draft Mercury TMDL (Section 11.3 Implementation for Wasteload Allocation):

> Despite the relatively very minor contribution of point sources to the total mercury load, the Agency will continue to strive to reduce mercury from all sources inside the state, including point source water discharges. To do so, the permitted facilities will establish mercury minimization plans (
>
> **Table 1**). In receiving water segments that are discharge-dominated, the dischargers will be subject to permit conditions that address ambient fish tissue monitoring. This monitoring will determine the relationship of the *de minimus* assumption with actual fish tissue conditions on a more localized basis and could result in mercury limitations in NPDES permits.

Table 1 WWTP Mercury Reduction Plan

WWTP Average Wet Weather Flow (g/d)	Sampling per Year	Mercury Minimization Plan (MMP) Required
Less than 200,000	0	NO
200,000 – 500,000	1	YES
Greater than 500,000	4	YES

The sum of municipal WWTP, stormwater & industrial WWTP WLA loads shall remain *de minimus*, i.e. less than 1% of the atmospheric deposition load or 11 kg per year. This includes both existing WLA facilities, expanding facilities, and new facilities. Mercury minimization plans (MMPs) and monitoring will be required for those facilities with a wet weather design flow of 0.2 mgd or greater. MMPs will include minimization of mercury in solids as well as in discharge.

Additional restrictions will be required if the *de minimus* is exceeded. For new/growth permits in the SW region, the focus will be trading, either with [1] NPS sediment reductions (the ratio must be agreed upon), [2] stormwater sediment reductions in the areas that are growing (the ratio must be agreed upon), and/or [3] trade-up in treatment to Bio-P or Chem-P, either of which will reduce the effluent mercury to below the new WQS after out-of-state reduction goals are met. Bio-P seems to reduce mercury to about one-half to one-third of the previous average effluent concentration.

For the NE region, new/growth permits will focus on trading, either with [1] air sources for sulfur reductions and/or mercury reductions, [2] stormwater sediment reductions, and/or [3] inflow/infiltration (I/I) reductions. Bio-P is also an important option.

The exception to the *de minimus* provisions for the WLA portion of this TMDL originates with the water quality rules for the Lake Superior Basin, Chapter 7052, and the GLI Guidance from which it was derived. Provisions for the phase-out of mixing zones for existing dischargers by March 23, 2007, and for not allowing mixing zones for new or expanded dischargers at commencement of discharge are specific to GLI and Chapter 7052. These provisions apply when establishing a TMDL. Therefore, all dischargers in the Basin will initially or eventually need to meet the 1.3 ng/L mercury water quality standard and mass caps as a waste load allocation for their discharge.

In response to a comment that the point source loading is significantly higher than the *de minimis* in many waters, we evaluated the mercury loads on each of the 84 minor watersheds in the state (see Attachment A). For each watershed, the percentage of mercury load from point sources (PSL%) was determined in two ways: (1) dividing the PSL by total load (NPSL + PSL) and (2) dividing PSL by (0.25 x NPSL) + PSL. The second approach [applying a 25% delivery factor to the total nonpoint source load (NPSL)] was considered the "true" mercury load by the commenter. As discussed above, applying a delivery factor raises the *de minimis* level. When a 20% delivery factor is used, the *de minimis* was defined as 5% of the total load; for a 25% delivery factor, the *de minimis* would be 4% (i.e., 0.04 x 0.25 = 0.01 or 1%). Using either calculation method, the PSL% was less than the *de minimis* for all 84 watersheds. When all watersheds in the state are summed, the second approach, using a delivery factor of 25%, results in a statewide point source contribution of one percent.

The draft Mercury TMDL gives a best estimate of mercury loading based on the latest scientific information, but the "true" mercury loading cannot be stated with certainty, as one commenter claimed. Uncertainty remains because of environmental variability and our incomplete knowledge of the ecosystem processes controlling mercury fate and transport. As discussed in the Mercury TMDL, we cannot directly measure dry deposition and instead rely on a surrogate measure of total deposition based on statistical evaluation of lake sediment core samples.

A commenter asserted that the Agency had not used the appropriate calculation for estimating nonpoint source load and in so doing underestimated the relative loading of wastewater point sources. The commenter acknowledged that the annual atmospheric mercury deposition rate goal for the Northeast regions (4.4 g/km^2) should remain as is, but the loading goal should be weighted by multiplying 4.4 by 100% of the surface water area but only 25% of the land surface area. The commenter argued that a 25% delivery factor should be applied to the nonpoint source load from atmospheric deposition to the terrestrial watershed because only 20-25% of the mercury deposited on the watershed gets to the water bodies. The 20-25% delivery factor comes from the Swain *et al.* (1992) reference, which is the basis for the 12.5 g km^{-2} yr^{-1} total mercury deposition value. The delivery factor was derived from relatively undisturbed headwater lakes. It is easy to imagine delivery factors to some streams and lakes as much higher, especially in watersheds disturbed by agriculture, urban development, or forestry. For example, Lawson et al. (2001) reported delivery factors ranging from 6.9% to 85.4% for large Chesapeake Bay tributaries.

There are multiple reasons to not adopt a delivery factor of less than 100% for mercury that is deposited to the "terrestrial" portion of watersheds surrounding fishable surface water. First, as noted above, true delivery factors probably vary from less than ten percent to more than ninety percent, with the potential of 100 percent. Secondly, 43% of the "terrestrial" portion of watersheds in the Northeast region is classified as wetlands. Wetlands are significant not only because they drain to fishable waters, but also because wetlands can be the major site of mercury methylation, as the draft TMDL discusses. Mercury does not accumulate in fish unless it has been converted to methylmercury, so it does not make sense to imply that deposition to a lake's watershed is any less important than deposition to the lake. Even if one assumes a low delivery factor of 20%, any lake with a watershed to lake ratio of greater than 5 is receiving most of its mercury from the watershed—and the majority of lakes and rives probably do have a ratio greater than 5.

Given variability in the fate of mercury deposited to watersheds, it did not seem reasonable to us to apply a 75-80% discount to air sources as recommended by the commenter. Rather than assign a fixed sub-100% delivery factor to all watersheds in the state, as proposed by the commenter, we decided the best approach to addressing the environmental fate of mercury is to assume that all of the atmospheric mercury load to terrestrial systems can potentially reach a water body. This assumption is in fact the only practical decision, in that the sources of mercury to the atmosphere can not reduce atmospheric loading to just surface water—any reduction in emissions reduces loading to both fishable water and its surrounding watershed. And since the magnitude of mercury contamination of fish can be largely determined by mercury loading to the watershed, there should be no discount to the importance of terrestrial mercury loading.

The issue of dischargers to effluent-dominated streams, such as the example given of the Hibbing WWTP, will be addressed on a case-by-case basis for each NPDES permit, as it was with Hibbing. Hibbing WWTP is required by Minnesota Chapter 7052 to meet the mercury water quality standard in the receiving water (1.3 ng/L) regardless of the mercury TMDL wasteload allocation. Although the facility was given a temporary variance because they could not meet the mercury water quality standard, they are required to conduct a mercury minimization program and must eventually meet the water quality standard.

One commenter did a rough calculation of the mercury entering the Mississippi River from headwaters to confluence with the Minnesota and arrived at the conclusion that approximately 4.75% of the true target mercury load is currently released to the river from point sources. We did a similar calculation using the same 25% delivery factor and applied it to the entire upper Mississippi watershed (not just land cover) and got a point-source contribution of 1.4% to the mercury load (see Attachment A, Number 20, Mississippi River @ Metro). Given environmental variability, it would extremely difficult to detect the 1.4% change in mercury loading.

A commenter noted that the current load from point sources should include discharges from power plants. The commenter is correct that we did not include wastewater discharge from coal-fired power plants in the draft Mercury TMDL. Most of the discharge from coal-fired power plants is non-contact cooling water which passes through the facility with the mercury it had in the source water and the facility does not add mercury. We chose to exclude the smaller discharges from the coal-fired power plants that would contribute some mercury to the receiving waters.

In response to the comment, we will add the mercury load from four coal-fired power plants where we have effluent mercury data and we are adding the mercury load from the Flint Hills refinery (see table below). Together they contribute 0.14 kg per year of mercury, which will increase the 1990 point source load estimate from 32.81 kg to 32.95 kg (0.42%).

Industry Mercury Discharges For Addition to the Draft Mercury TMDL

Facility	Avg Hg (ng/L)	Flow (mgd)	Hg Load (kg/y)
MP Boswell SD-4 (CWWTF Discharge)	4.5	2.25	0.014
MP Boswell SD-6 (U3 Fly Ash)	9.9	3.27	0.045
Flint Hills SD-1	11.4	3.91	0.062
XL-Riverside SD-7	3.3	0.004	0.000
XL-BlackDog SD-5	6.1	0.398	0.003
XL-King SD-3	8.8	1.05	0.013
Total			0.137
		1990 PSL:	32.81
		1990 PSL w/ industry:	32.95
		% change in 1990 PSL w/ industry added:	0.42%
		1990 NPSL:	2,748
		% change in 1990 TSL w/ industry added:	0.005%

[AW] Go beyond 90th percentile;
[CN] Use of standard size fish questioned
[CO] Aggregation of fish tissue data questioned

Some commenters alleged that the load reduction goals set by the TMDL will not result in meeting water quality standards in many waters because reduction goals are based on standard size top predator fish. In addition, there were criticisms of the description of how the standard size walleye or northern pike were calculated, and the use of the 90th percentile of the standard size walleye as the assessment endpoint for determining needed mercury reductions. Based on these comments we are now aware that the draft Mercury TMDL failed to adequately describe this critical aspect of the TMDL development. There are two parts that need better explanation: one is how the standard size walleye (and northern pike) is determined, and the other is what the 90th percentile represents.

The draft Mercury TMDL states that the standard size top predator was calculated, but does not explain how. The following paragraph will be added to Section 4.4.1 Standard Size Predator Fish to clarify calculation of the standard size fish mercury concentration:

> When fish are captured for mercury analysis, the number and size of fish will vary among lakes and among trips to the same lake. Because mercury concentration increases with fish age and fish increase in length with age, comparing the average mercury concentrations among lakes would not account for this

relationship to the size of the fish. A sample set from one year could have a higher average mercury concentration than another year because the average fish size was larger the first year; therefore, average concentrations would represent a change in average fish size rather than a real change in mercury concentration. To account for this size-dependency of mercury concentrations, the mercury concentration is compared for the same size fish, which we refer to as the standard size or standard length fish. One cannot simply select the standard length fish from the collection of fish each time because lengths of collected fish vary from year to year (and lake to lake). The mercury concentration in the standard length fish is calculated for each collection using a linear regression statistical procedure, which gives a mercury concentration per length of fish. The linear regression is done mathematically. It is illustrated by plotting mercury concentration (on the vertical axis) versus the fish length (on the horizontal axis) and drawing a best fit line through the points. The line represents the best estimate of mercury concentration per fish length and can be used to predict mercury concentration for any fish length under the line. In other words, this process allows one to predict the mercury concentration for a pre-determined size of fish based on the available fish data. A collection may have as few as three fish or up to fifty fish, which are used to predict the standard length fish mercury concentration. That single value for the standard length fish can then represent the mercury concentration for the fish from that collection. If the standard length fish mercury concentration decreases between sample collections (and the relationship between age and length of fish does not change), we know that mercury concentrations in that fish species from that water body has decreased and has not changed simply because the collected fish are smaller. An important aspect of the standard size fish mercury concentration is that it is based on a set of data from a water body, not a single data point; therefore, unlike a single data point, a measure of uncertainty (such as a confidence interval) can be assigned to the value. The measure of uncertainty will vary with the number of data points available and the variability of the data. For future assessments, the standard size fish mercury concentrations can be evaluated to see if there has been a statistically significant change in fish tissue mercury concentrations.

To summarize the new paragraph, the linear regression procedure provides predicted fish mercury concentrations for a given fish length, based on the best fit to the available data; and that relationship is then used to predict the mercury concentration in a standard size fish. The standard size is 40 cm for walleye and 55 cm for northern pike. The draft Mercury TMDL showed that the standard length walleye and northern pike, when compared to the fish consumption advisory size classes, fall within the highest frequency (mode) size class for each species; therefore, the standard lengths are representative of the most common class size.

The other issue under this topic of fish selection for the reduction goal is our choice of the 90th percentile of the standard size walleye and northern pike as the assessment endpoint. A commenter charged that by choosing to meet the 0.2 ppm target in the 90th percentile existing fish tissue samples, the MPCA has explicitly set the TMDL to leave 10% of the standard length walleye above the water quality standards and neither the Clean Water Act nor its implementing regulations allow for this “close enough” or “we’ll get it later” approach. Related to this comment is another comment that asserted the target will not be met in 10% of Minnesota’s lakes. The criticism that the Mercury TMDL

allows 10% of the standard size walleye to exceed the water quality standard is an overly restrictive interpretation of the CWA language and the data. As pointed out in Section 4.4.2 of the draft Mercury TMDL, EPA listing guidance allows for 10% of samples to exceed the water quality standard, because they account for environmental variability and uncertainty. The draft Mercury TMDL applies that same principle to establishing the assessment endpoint as the 90th percentile. Another example of this reasoning is in EPA's human health criteria guidance, where it states: "The drinking water and fish intake values are 90th percentile estimates. EPA believes that these assumptions will be protective of a majority of the population and recommends them for state and tribal use." (Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health. 2000. EPA-822-B-00-004. OCT 2000. p99/185).

By selecting the 90th percentile we are not saying ten percent are allowed to exceed the standard. As discussed below, larger fish may decrease by a greater percentage and there is considerable lake to lake variation. By selecting the 90th percentile we are saying that we will address the regional impact of mercury impairment, but there is considerable environmental variability and uncertainty. Even if we set the goal at 100% reduction of anthropogenic sources (i.e., a 70% rather than a 65% reduction goal), there may be waters that will not meet the water quality standard because of their efficiency in converting the natural sources of mercury to methylmercury. Lakes with standard size walleye mercury concentrations greater than the 90th percentile around 1990 could actually decrease more (and faster) than other lakes that are less than the 90th percentile. We don't know enough *a priori* to specify which lakes will not meet the target; this uncertainty would be the same if we did individual lake TMDLs, which is a reason for stressing the regional approach to the TMDL and the adaptive management approach to TMDL implementation.

A commenter argued that the MPCA's method does not protect 90% of all fish because a calculation of MPCA data for all fish tissue data shows a 90th percentile is 0.65 ppm; however, that value is for the entire data set, 1970 to 2002, whereas the standard size 90th percentile for the TMDL assessment endpoint is from data collected between 1988 and 1992. Table 4 (page 15) in the draft Mercury TMDL shows mercury concentrations for standard size northern pike and walleye from water bodies sampled between 1988 and 1992. The five years were selected to overlap with the TMDL baseline year of 1990. The number of water bodies with sufficient data to calculate a standard size walleye mercury concentration was 156 in the Northeast region (NE) and 74 in the Southwest region (SW). Medians for standard size walleye in the two regions were 0.262 ppm and 0.218 ppm, respectively. The median is the same as the 50th percentile—one-half the standard size fish mercury concentrations are less than this value. Table 4 also shows the 90th percentile—nine out of ten values (i.e., 90%) are less than this value. For the NW regions, 140 out of 156, standard length walleye mercury concentrations were less than the 90th percentile mercury concentration. The 90th percentiles for standard size walleye in the two regions (between years 1988 and 1992) was 0.572 ppm for the NE and 0.405 for the SW. The 90th percentile concentrations for the standard size top predators, northern pike and walleye, are much higher than the 90th percentile for other fish in Minnesota lakes and rivers because the top predators have higher concentrations overall. We expect the typical mercury concentration before 1990 was higher than after 1990 because of the reductions in mercury deposition since the 1970s, as documented in sediment core analysis. The draft Mercury TMDL does show the 90th percentile for standard size and most common size class for walleye and northern pike for the entire

database in Table 3 (page 13). In the NE, the 90th percentile for walleye in the 15-20 inch size class was 0.677 ppm, for the 1970-2002 periods.

The draft Mercury TMDL goal is a 65% reduction in the 90th percentile of the standard length walleye mercury concentration ($WE40_{90}$). The $WE40_{90}$ in the Northeast region, from data collected between 1988 and 1992, is 0.572 ppm. To get to the target level of 0.2 ppm, a 65% reduction is needed. The draft Mercury TMDL describes in Section 4.4 why the target level of 0.2 ppm was applied to the standard size predator fish rather than each size class of each species where mercury data is available. The top predator fish (walleye and northern pike) are the most common reason for fish consumption impairments and the standard size top predator fish is a measurable assessment endpoint. A water body is listed as impaired if any fish size class mean exceeds 0.2 ppm and there is no minimum number of fish to calculate a mean—a single fish is sufficient. Unlike the size class means used for fish consumption advisories, at least three fish are required to calculate a standard size walleye (or northern pike) mercury concentration for a given water body.

A commenter stated that MPCA should remove waterbodies from coverage under this TMDL if the largest size fish class of the most impacted species in that waterbody has a higher fish tissue concentration than 0.572 ppm. The Agency has made the policy decision based on public comments to remove from the TMDL coverage those waters with fish size class means greater than 0.572 ppm mercury (see below for description of this decision).

Nevertheless, it is reasonable to expect that waters with fish mercury levels above the 0.572 ppm will have a proportionately larger decrease in mercury concentrations. The waters with higher fish mercury concentrations receive the same mercury deposition as lakes with lower mercury concentrations; therefore, there must be a large difference in the efficiency of conversion to methylmercury and bioaccumulation. Since these waters had a proportionately greater response to *increased* mercury loading, it follows that they will have a proportionately greater response to *decreased* mercury loading.

For tracking trends in fish tissue mercury and assessing progress in mercury reductions, the Agency uses the standard size top predator fish and we believe it is an appropriate endpoint for the Mercury TMDL. The data must be standardized to make any meaningful assessment of changes. If instead we used “fish tissue concentrations of all fish of the most impacted species” the assessment endpoint would vary among water bodies and from year to year as different fish species and sizes of fish were captured for mercury analysis. Furthermore, as discussed below, the 65% reduction of the 90th percentile standard size walleye mercury concentration could result in much different reductions for other size classes.

A 65% reduction of the standard size walleye mercury concentration does not mean the same reduction will occur in other walleye. We don’t expect the small fish to change as much as large fish because of the bioaccumulative nature of methylmercury. In general, small fish have relatively low mercury concentrations and we expect little change in those low concentrations following a big reduction in mercury loading. Larger fish are older fish that were exposed to higher mercury loading during their lifetime compared to younger fish exposure and compared to larger fish in the future. We expect mercury concentrations in large size classes to drop more than in smaller size classes because

mercury bioaccumulates over the lifetime of fish and the larger fish have been exposed to higher mercury concentrations than the younger fish.

For each step up the food chain mercury concentrations increase by about a factor of ten; therefore, there is a logarithmic increase in mercury as it moves through the food web and larger fish feed on larger fish, which also increases the mercury burden. In terms of the probability distributions mercury concentration is lognormally distributed. As described above, the standard size fish mercury concentration is determined from a regression of fish length versus mercury concentration. Because the raw data are lognormal (i.e., looks more like a normal distribution when the data are log-transformed), a linear regression is performed on log length versus log mercury. If there is a substantial mercury reduction and fish tissue mercury concentrations drop, the regression line will shift down; however, the intercept will remain about the same because it is approximately zero. This makes biological sense because the intercept of the line is the point at which fish length is zero and therefore mercury concentration must be zero. Since the intercept remains essentially constant, decreased mercury in the fish must result in a lower slope of the regression line.

Figure 1 shows a regression line for length (log cm) versus Hg (log Hg-ppm), which is based on walleye data for mercury. The solid line represents a likely regression line for a lake that has the 90th percentile standard size walleye mercury concentration. At the standard length, log(40 cm) = 1.60, the predicted mercury concentration is 0.57 ppm. The dashed line (below the solid line) represents a regression line with the same intercept, but a change in slope, with a predicted standard size walleye mercury concentration of 0.20 ppm. In other words, the solid line represents the baseline fish mercury concentrations and the dashed line represents the target level for the same fish population. On this log scale the two lines appear almost parallel. In Figure 2, the same lines are shown on linear scales of length and mercury concentration. Here it is much easier to see that the difference between the two lines increases as length increases. The difference between lines is 65% at the standard length (40 cm), but differences range from 51% for a 5 inch fish to 72% for a 35 inch fish. The percent difference between the two lines is plotted against length in Figure 3 and this curved line becomes a straight line if length is in log units.

This concept of changing regression slope is important for understanding that the 65 percent reduction goal is specific to standard size walleye and the reduction could be greater for larger fish and less for smaller fish. The larger top predator fish are typically the ones over the 0.2 ppm impairment threshold; therefore, when the goal is set at 65% for the standard size walleye, we can expect even greater reductions in fish larger than the standard size fish. A greater reduction in the larger size classes is good news; however, it is difficult to predict precisely what the reduction will be for all species and size classes, because the exact slope of the line in Figure 3 could vary among lakes and among fish species. Despite the uncertainty about the original slopes, the fish tissue concentrations following the 65% reduction in standard size top predators should be flatter regression slopes; that is, more similarity among fish of various lengths. Rather than compare the result of a 65 percent reduction in all fish and size classes, the draft Mercury TMDL uses the standard size fish as the assessment endpoint. As part of the monitoring and assessment for the TMDL, the Agency will evaluate what happens to other fish and size classes as the standard size fish mercury concentrations drops.

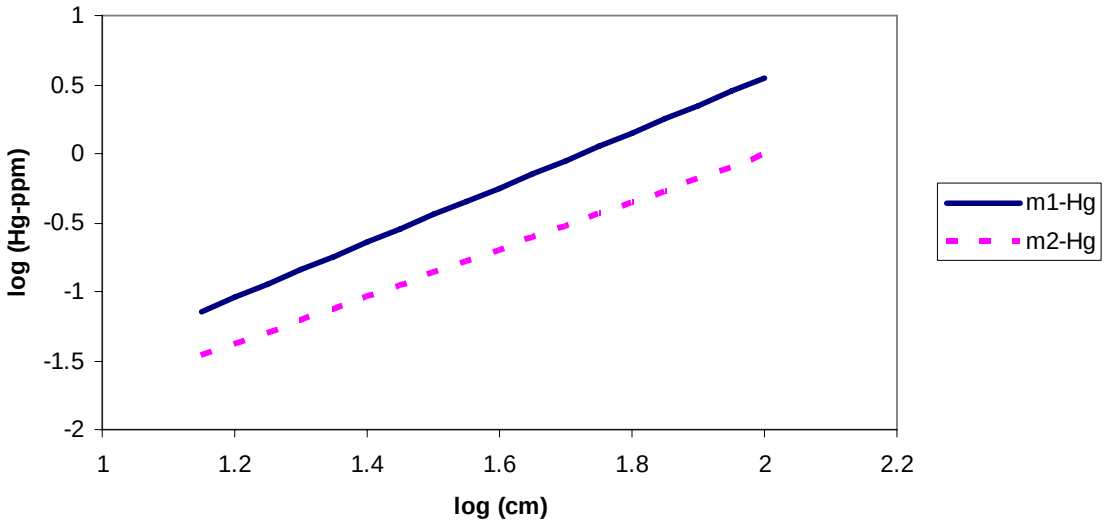

Figure 1 Mercury versus length based on walleye data: solid line gives the 90th percentile standard size walleye mercury concentration, 0.572 ppm; the dashed line is the expected same population after a 65% reduction and the standard size walleye mercury concentration is 0.2 ppm

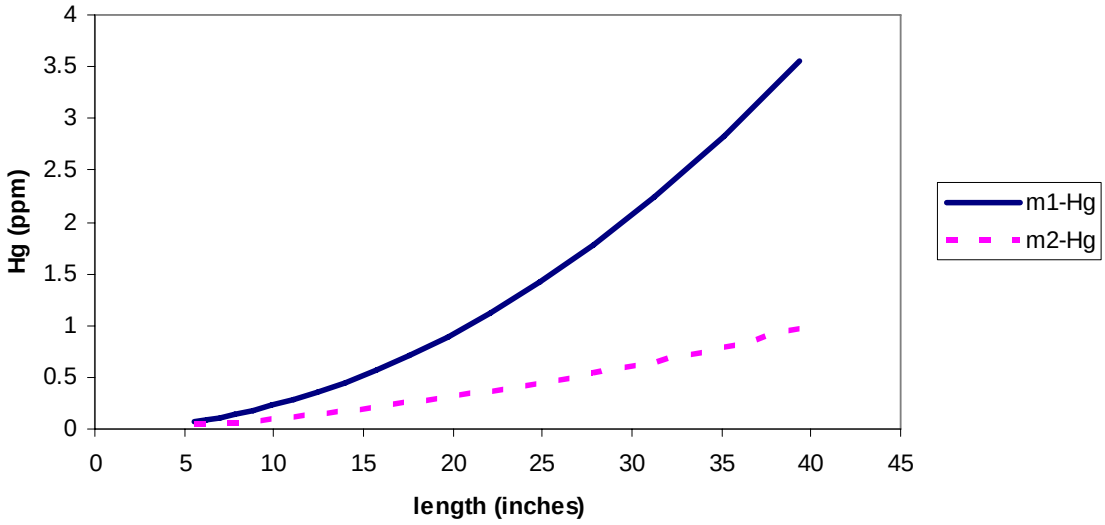

Figure 2 The same relationships as in Figure 1 except the data are on linear scales rather than logarithmic scales to better show the divergence in the curves as fish length increases

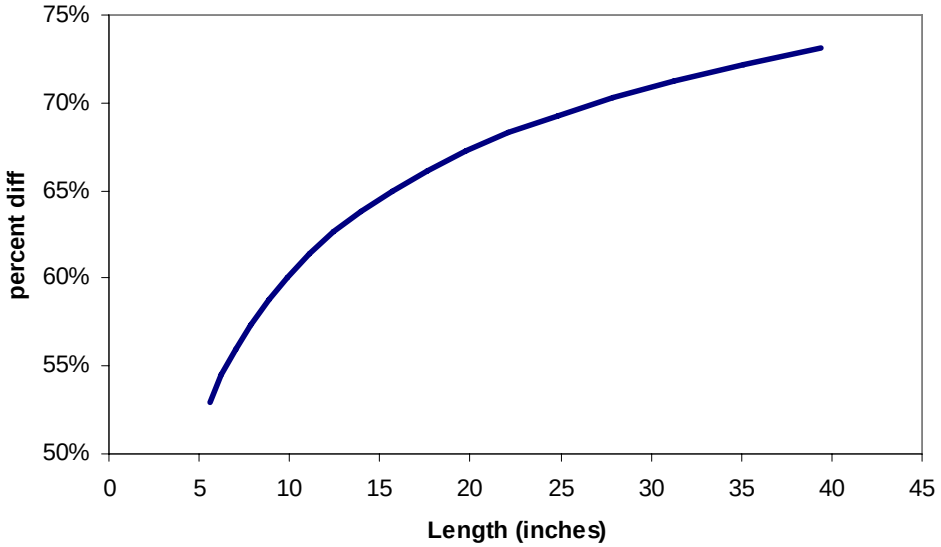

Figure 3 The percent difference between the two lines in Figure 2 (i.e., difference between baseline and target fish tissue mercury concentrations as a function of walleye fish length)

A commenter asserted that the mean value for fish size classes was inappropriate because the samples with the highest concentrations of mercury are "blunted." The commenter apparently disagreed with our presentation of the fish species size class means in Figures 3 and 4 of the draft Mercury TMDL. The size class means are presented because they are the basis for fish consumption advisories. If a size class mean exceeds 0.2 ppm mercury the fish consumption advisory recommends eating less than a meal per week for the sensitive population; and it is considered an impairment for listing. There is not minimum number of samples needed to calculate the size class means; consequently, many of the reported size class mean mercury concentrations are actually the concentration in a single fish.

Although the size class mean mercury concentrations are the basis for the fish consumption advisories, they are not the basis for the reduction factors. The reduction factors are based on standard size walleye mercury concentrations, which are based on linear regressions on individual fish lengths and mercury concentration. The linear regressions are done for each lake and sample collection year within each lake. The linear regressions are not done on the size class means [see **(AW) Go beyond 90th percentile** for description of method to calculate standard size walleye and northern pike]

Two commenters insisted that all size classes over 0.572 ppm must be removed from the draft Mercury TMDL because they will not achieve the 0.2 ppm target concentration. This assumes that a size class mean represents *the* concentration for a given size class, rather than a central tendency of a distribution of concentrations. In many cases the size class means are based on only one fish sample. The comment letters included lists of lakes with size class means that exceed 0.572 ppm. Many of these size class means are based on only one fish. For example, on one of the commenter's list of lakes that

exceed the 0.572, ten of the top dozen lakes are based on only one fish; the other two are based on two and three fish each. One fish is a very poor representation of a size class, as demonstrated by the range of mercury concentrations in size classes having more than two fish. A confidence limit cannot be calculated from one fish sample.

Figure 4 shows the minimum, mean, and maximum mercury concentrations for a set of northern pike and walleye size classes that had at least three fish in the size class and the means were near or above 0.572 ppm. This sample set shows the wide range of mercury concentrations within size classes, and it illustrates the lack of confidence one should have when the sample size is only one fish.

Another problem with using the size class means as the assessment endpoint is the data could have been collected anytime between 1970 and 2002 because the fish consumption advisories do not limit data assessment to the most recent ten years as the MPCA does for other impairment assessments. Consequently, some of the size class means are over thirty years old while others are only a few years old. These weaknesses of the size class means supports our approach of using a standard size walleye (or northern pike) rather than size class means as the assessment endpoint for the TMDL goal.

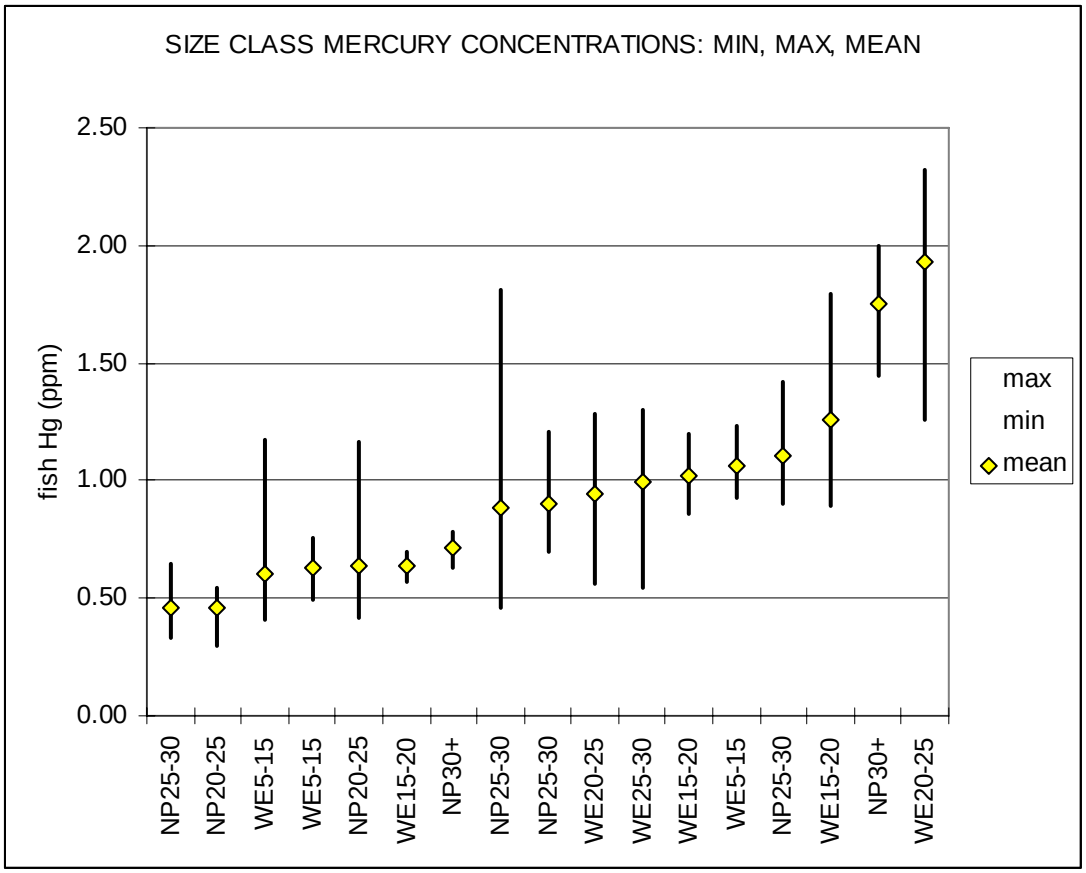

Figure 4 A sample set of size class mercury concentrations for northern pike and walleye arbitrarily selected using criteria that (1) mean was near or above 0.572 and (2) mean based on at least three individual fish filets (skin on).

The criteria for assessing impairments based on fish mercury data have been lax compared to criteria for assessing other types of data because it was understood that mercury contamination in fish was a statewide problem and over 85% of the waters where fish data has been collected are found to be impaired. Based on public comments, the Agency has made the policy decision to remove from the TMDL coverage those waters with fish size class means greater than 0.572 ppm mercury; consequently, the data will need to be assessed in a manner consistent with other assessments. That will require minimum data sets (at least 2 fish per size class) that are no older than 1990 (or for future assessments no more than ten years old). This more restricted assessment of data will not change the fact that essentially all mercury contamination in lakes comes from atmospheric deposition and there is nothing more that can be done to ensure that these waters meet water quality standard. The only alternative is to change the designated use of these waters to some type of limited fish consumption classification. Mercury reduction must be seen as a regional problem and not a lake specific problem that can be solved on a lake specific basis.

One commenter suggested the limitations described above can be corrected in at least two ways. First, the MPCA could apply this TMDL only to those waterbodies for which a 65% reduction brings 100% of fish species in all size classes to 0.2 ppm mercury, and prepare one or more separate TMDLs for those that are still impaired. Alternatively, the MPCA could choose as it's target 100% of the standard length predator fish (both northern pike and walleye), and protect for fish in larger size classes with higher mercury

concentrations through provision of a margin of safety (MOS). The recommendations are not reasonable alternatives to the regional Mercury TMDL. All lakes exceeding the 90th percentile standard length walleye mercury concentration of 0.572 ppm receive all their mercury from the atmosphere. The draft Mercury TMDL goal is to achieve an atmospheric deposition of mercury that is 35% of what was deposited around 1990. Since natural (i.e., uncontrollable) sources contribute 30% of the deposition, there is only 5% remaining that can potentially be removed. Going from the 90th percentile to the 100% percentile results in the impossible goal of removing over 100% of anthropogenic emissions.

Contrary to a comment regarding the judge's ruling on the Southeast fecal coliform TMDL, the draft Mercury TMDL does apply to all mercury impaired waters because the primary source of mercury to all waters of the state is atmospheric deposition and the draft Mercury TMDL sets a target of 93% reduction in mercury emissions. In addition, the draft Mercury TMDL applied the target fish tissue concentration to the 90th percentile of standard size walleye, not a median fish tissue concentration, which would be comparable to the fecal coliform TMDL that was ruled on by the U.S. District court judge.

[AX] General reasonable assurance write-up
[BK] Need a national reasonable assurance plan

The discussion of reasonable assurance is found on pages 46 through 49 in the mercury TMDL. Several commenters challenged the adequacy of the reasonable assurance discussion, because of the characterization of what the Agency considers to be adequate justification. This is a draft document until US EPA reviews and approves it. They will use their guidelines to determine if the mercury TMDL reasonable assurance justification is adequate.

On May 20, 2002, EPA released a memorandum to its Regions titled "Guideline for Reviewing TMDLs under Existing Regulations issued in 1992." Page 4 of that document discusses reasonable assurance. "EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. *However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations*." The guidance goes on to say on page 5, under Implementation "Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in the TMDLs for waters *impaired solely or primarily* by nonpoint sources will in fact be achieved." {Italics added for emphasis}. When air deposition sources account for over 97% of the load, clearly and reasonably nonpoint loads are the primary source.

This was further clarified in 2001 in Natural Resources Defense Council, et al. v. Muszunski, et al., No. 00-6232 (2nd Cir.). On page 9 under I.B. "Furthermore, the EPA indicated that although 'EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources[,]' for waters such as the creek that are impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable."

The Agency has followed the intent of EPA guidance fully. The very small wasteload allocation portion of the TMDL has a robust reasonable assurance and the significantly larger load allocation portion has a general narrative reasonable assurance that meets the nonpoint source guidelines developed by EPA.

The Agency has no authority to create a national plan. That will have to be developed at the federal level.

[AY] Eliminate FCA

A commenter insisted that Minnesota must adopt a water quality standard and TMDL goal that results in elimination of fish consumption advisories. The Minnesota Department of Health (MDH) provides the fish consumption advisories so people can make wise choices in selecting which fish and how much fish to eat. For pregnant women, women who may become pregnant, and children under age 15, the fish consumption advice is unlimited consumption if the level of mercury in the fish is less than or equal to 0.05 parts per million. As discussed in Section 5.1 of the draft Mercury TMDL, 30% of the mercury being deposited in Minnesota's watersheds is from natural sources; therefore, there will always be some baseline level of mercury in fish in some lakes and some fish will exceed 0.05 ppm just because of natural mercury sources alone. As the MDH points out in their general guidance, people should eat fish for good health and the best way to avoid mercury is to not eat large (older) fish. Smaller fish have had less exposure time to mercury and feed lower on the food chain; therefore they have lower mercury concentrations.

[AZ] Hot spot issues

The draft Mercury TMDL has the following definition:

Hot spot – refers to a mercury concentration in fish or water that is obviously (1) higher than other concentrations in the area and (2) caused by a local source.

The draft Mercury TMDL discusses hot spots in Section 5.1 (p. 20). "Depositional hotspots" and "loading hotspots" are distinguished from "biological hotspots," because this is a fish tissue TMDL. The Agency discusses evidence for some depositional hotspots that occurred in Minnesota in the 1970s (p. 19) and up to 2000 in Goodhue County (p. 21) that have since been eliminated. Although mercury concentrations in fish vary greatly across Minnesota, there is no evidence that mercury concentrations in fish are correlated with past or present depositional hotspots (p. 21) or point source discharges. Variation in fish contamination is caused by differences in water chemistry, methylation efficiency, and food web dynamics.

Mercury loading to lakes is controlled by both atmospheric deposition and land use practices. The draft Mercury TMDL (p. 20) notes that mercury loading to lakes in agricultural and urbanized areas is greater than to lakes in northern Minnesota. The greater loading is likely not because atmospheric deposition is greater, but is rather because of soil erosion and, in urban areas, development of impervious surfaces. Lakes with minimally disturbed watersheds in the metro area receive loading similar to that in northern Minnesota.

As the draft Mercury TMDL notes, over centuries of atmospheric deposition, soils have accumulated relatively higher mercury concentrations (pp. 18-19). It is important to note

that the mercury in Minnesota soils is not native to Minnesota soils but originated from air emission sources; these soils are not “sources” in a TMDL sense. Erosion of soil into surface water can significantly elevate mercury loading above that from atmospheric deposition alone. If mercury associated with eroded soil were highly available for methylation, fish would be more contaminated with mercury in the SW than in the NE, but the opposite is true. Empirically, we know that fish are significantly more contaminated in the NE where atmospheric deposition is virtually the only source of mercury loading.

A concern was also expressed about the wastewater discharges causing local hotspots. This issue is also discussed under ***[AV] Point source discharges are not de minimis***.

[BA] Reductions should be mandatory

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. The MPCA seeks pollutant reductions to improve the environment and health of Minnesota citizens, but is required through state statute and insisted upon by affected parties through public comments to consider all costs—not only public health and environmental improvements, but also whether Minnesota’s economy can bear the ongoing cost of the contemplated action. If reductions can be achieved through methods other than rules, the MPCA will work to achieve that reduction.

[BB] WQS Flawed

A commenter criticized the use of 0.2 ppm mercury concentration as a water quality standard. Criticism of MPCA’s proposed methylmercury criteria for fish tissue residue is outside the boundaries of decisions made for the draft Mercury TMDL. Minnesota rules Chapter 7050 specifies that impairment will be based on the MDH fish consumption advisory more restrictive than a meal per week, and that threshold has been established by the MDH as 0.2 ppm. The MPCA has found that fish tissue residue concentration agrees with a proposed water quality standard, which is based on the US EPA’s methylmercury criteria.

The topic of mercury effects on humans is covered in detail in the EPA’s water quality criterion for methylmercury, which the TMDL references in Section 3.3.3 (page 7 of the draft Mercury TMDL); therefore, it is not necessary to repeat that information or attempt to summarize it in the Minnesota TMDL. A SONAR document is being developed for proposed new state water quality standards that include the 0.2 ppm mercury concentration in fish tissue.

[BC] 10% state share too small

In Section 5.1 of the draft Mercury TMDL (p. 23), the 10% share of mercury deposition was shown to be within in the range of 4% to 13% based on a U.S. EPA modeling study. A commenter suggested the TMDL should use a state share of 13%--the upper range of the model results. The modeling was based on estimated mercury emissions from Minnesota that included uncontrolled waste incineration, which is no longer occurring; therefore, if there is an error in any direction, it is likely that the model overestimated Minnesota’s current contribution. Given the uncertainty in data inputs and modeled

processes, it is remarkable that the 10% estimate and the model results overlap and there is no justification for using either extreme of the model results.

[BD] Use 2006 as the baseline instead of 1990

The reasons for using 1990 as the baseline for the mercury TMDL are discussed in Section 4.3 on pages 9 through 11. 1990 was the latest year for which the Agency has total mercury deposition data. There has been wet mercury deposition data collected since then, but the other equally important component, quantification of dry deposition, is not available.

[BG] Trading regimes for mercury emissions should not be applied as mercury released at any point can cause problems downwind and can also create hotspots.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Because mercury emissions have the ability to travel long distances in the atmosphere, maximizing total reductions will achieve a greater overall benefit than relying solely on local emissions. Trading programs for other pollutant have demonstrated that they are effective at achieving the greatest overall reductions for the least price. The current federal Clean Air Mercury Rule includes a provision for trading. During the implementation planning phase, the MPCA and stakeholders will explore the adequacy of the federal rule and the merits of trading schemes for mercury.

[BH] Critical condition issues

The discussion of 'critical conditions' is found on page 40 in the mercury TMDL. Several commenters noted that several other critical conditions exist that were not discussed, including acidic soil, dissolved oxygen, temperature, soil type, erosion, dissolved organic matter, length of the food chain, sulfates, and total organic carbon.

On May 20, 2002, EPA released a memorandum to its Regions titled "Guideline for Reviewing TMDLs under Existing Regulations issued in 1992." Page 3 of that document discusses critical conditions as follows:

"TMDLs must take into account *critical conditions* for stream flow, loading, and water quality parameters as part of the analysis of loading capacity. (40CFR130.7c(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g. meteorological conditions and land use distribution."

The other factors noted by the commenter are facets of all TMDLs and are some of the reasons why the state was explicitly broken out into two regions. We believe that is sufficient to cover these factors.

[BI] When considering the economic issues associated with mercury reductions, all costs to society should be considered, not just costs to industry

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. It has been long understood that toxics like mercury exact a penalty when contaminating the environment; recent studies are attempting to quantify what the "cost" of contamination might be. When the MPCA conducts rulemaking, it is required by state statute to estimate both the costs and benefits of a rule's actions. The TMDL acknowledges public health and welfare benefits from improving the environment; depending on the state of knowledge at the time, the benefit of mercury reductions may be able to be quantified.

During the development of the implementation plan, the MPCA will work with stakeholders to evaluate all the available information on the costs and benefits associated with mercury pollution. This includes but is not limited to the costs of reducing mercury pollution, the cost of negative effects associated with human exposure to mercury in fish, and the loss tourism revenue in the state due to decreased angling.

[BJ] Need better monitoring plan

Among a list of requests from one commenter was a request for "ongoing and increased monitoring of mercury in food fish in Minnesota." Minnesota has had a fish contaminant monitoring program (FCMP) since 1970 and that program will continue. More information about the program is available as a fact sheet on the MPCA web site: http://www.pca.state.mn.us/publications/p-p2s4-05.pdf.

[BL] Duty of Candor

Some commenters believe that MPCA staff may have violated the State's Duty of Candor statutes.

MPCA staff acted in accordance with the duty of candor contained in Minn. R. 7000.300. However, staff could have communicated more clearly about external meetings and draft documents during the pre-public notice period. To address this communication issue, the MPCA has taken the following actions:

- Met with all interested environmental groups to discuss the draft mercury TMDL
- Created a new environmental liaison function within the agency to bolster communication
- Met with all interested environmental groups to identify future mercury TMDL implementation issues.

[BO] Adaptive Management Method

A number of commenters emphasized their support for an adaptive management approach or method and urged the MPCA to follow this method. As recommended by one commenter, we will add a definition of Adaptive Management Method from federal

rules (40 CFR Sec. 125.03). There will be more discussion of the details of this approach in the Mercury TMDL implementation plan.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. The MPCA intends to work with stakeholders during implementation planning to evaluate the adaptive management approach and identify the timing and circumstances associated with adaptive management reviews.

[BQ] Require industry to pay to emit mercury

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. One means of forcing mercury reductions is to place a fee on emissions. This is one mechanism among many that can be considered during implementation planning for a particular or all sectors of Minnesota's economy.

[BR] Minnesota should move away from using coal for electricity.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Minnesotans rely on coal, nuclear and hydroelectric power for its electricity needs. Moving away from coal will be a long process as we search for substitutions for coal. The MPCA and others will have to work with MPUC and Commerce to develop those alternatives.

[BU] Don't rely on federal regulations to lower mercury

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. As a delegated state, the MPCA is required to implement federal regulations within Minnesota. The MPCA believes that since national action will result in national reductions, federal activities are preferred over state-only actions, if greater mercury reductions are expected. During implementation plan development, interested parties will need to discuss when a federal regulation might result in mercury reductions, and when state action would be more promising.

[BW] Concern with fetal health

A commenter requested "more rigorous reduction to protect the fetus, based on recent studies showing that umbilical cord blood mercury is approximately 70 percent higher than maternal concentrations." This is an issue that the U.S. EPA has considered with respect to the mercury reference dose. At this point, the reference dose has been considered sufficient, even in light of this new information, because the reference dose

includes a safety factor of 10. If the reference dose is changed, it will affect the fish consumption advisories and the threshold for listing of impaired waters because of fish consumption impairment.

[BX] No new emissions

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process.

Commenters are concerned about the numerous proposals in Northern Minnesota for new or expanded industrial projects, both recently permitted as well as announced. Many of the projects have projected mercury emission rates of some consequence. Commenters listed a number of iron mining projects, as well as coal-based electricity generating plants.

The MPCA does not believe that new sources of mercury emissions would be exempted from a TMDL for mercury, but would become incorporated into the inventories as projects are developed and emissions measured.

A central issue of this TMDL implementation plan will be how to treat new mercury emission sources.

[BY] The State should oppose increased emissions from near-by states

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Mercury reductions will need to come from national and international efforts. The MPCA believes that co-operating in national efforts will result in significant, permanent reductions that benefit environmental and economic conditions for Minnesotans and citizens of other states.

[BZ] Need more data

A commenter recommended that MPCA should make an effort to resample lakes where data is more than ten years old, and there should be explicit discussion of quality assurance and data quality objectives. This included a recommendation to articulate if “minimum data threshold” is met. The MPCA agrees; the monitoring and assessment plan for implementation of the mercury TMDL will include discussion on this topic. The MPCA’s currently emphasizes re-sampling of lakes for fish tissue mercury to evaluate lake by lake changes and overall trends.

QA/QC is, of course, an important aspect of any monitoring. Details about QA/QC have not been discussed in draft Mercury TMDL because it was not necessary to present the TMDL’s technical approach. This comment is certainly relevant to the development of the implementation plan, which includes monitoring and assessment. Therefore, the Agency will attempt to say more about the QA/QC in the implementation plan, which will follow an EPA-approved final mercury TMDL.

A commenter requested that the MPCA study other known mercury sources (i.e. sediment disturbances, stormwater, soil erosion and sulfates) to examine their mercury contribution to Minnesota fish. The Agency agrees that these are important processes and we do have research projects in place to study stormwater and sulfate impacts on mercury loading. These processes are considered potentially important to mercury loading and bioaccumulation but they are not seen as primary sources of mercury; therefore, they were not included among the categories that received reduction goals. As we understand these processes better we can hopefully use that knowledge to mitigate their affects on mercury contamination.

[CA] The health of Minnesotans is a high priority

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. The MPCA agrees that the health of Minnesotans is a high priority and has established the reduction target in the TMDL to be protective of the health of Minnesotans.

[CB] Supports new source set-asides

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Implementation planning will need to focus on how to continue economic development in light of the need to seek overall reductions. Planners could consider the TMDL a mercury "budget" and set aside some amount of mercury emissions for new, but as yet unknown, mercury emitting sources. This is one means of dealing with new sources, and will likely be considered during the development of an implementation plan.

[CC] Reduction goals for only three sources

In the draft Mercury TMDL, Section 11.4.2., there is a table of proposed mercury emission reduction goals for three sectors: energy, materials processing, and products. A commenter requested MPCA study other known sources, such as sediment disturbance, stormwater, soil erosion, and sulfates. Indeed, the MPCA is studying these other factors that influence mercury cycling and uptake, but while these factors may be proximate sources of mercury the Agency does not consider these factors to be the ultimate sources of mercury. Controlling mercury release via these factors might reduce mercury loadings in specific areas, but it will not address the ultimate sources of the mercury. For more on this topic, see response to **[AC] Proportionality principle challenged** on page 4.

[CD] Mercury is a global problem

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Mercury emissions around the world contribute

to contamination of Minnesota's fish. As reported in the TMDL, reducing deposition to Minnesota and contamination of fish in Minnesota's lakes will require reductions from sources world-wide, not just sources in Minnesota and the United States. The MPCA is actively working with other states and the EPA to implement policies to reduce national emissions and to encourage the EPA to advocate for international reductions.

[CF] The MPCA should develop an implementation plan through stakeholder involvement.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. The MPCA intends for the process used to develop the implementation plan to include a high level of stakeholder involvement from all interested sectors including the citizens of the state, government, environmental advocates, and industry.

[CG] Give load allocation to both national & international sources

The MPCA has taken the lead for mercury reductions in the state, where it has jurisdiction. It will not suggest either wasteload or load allocations outside its jurisdiction in greater detail than the 93% worldwide emissions reductions required to meet state water quality standards.

[CH] Coordinate with research organizations during implementation

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. Insufficient research will impede further mercury reductions, particularly specific to controlling sources of mercury like iron mining and cremation. The MPCA looks forward to discussing how to inspire research for these critical economic activities in Minnesota.

[CI] It isn't proven that excess mercury is dangerous to fetuses and the young
[CJ] The blood mercury trend is down;
[CK] Increase WQS from 0.20 to 0.30;
[CL] Use 20 g/d rather than 30 g/d;

A commenter raised these four issues on the mercury toxicity. While these issues are certainly relevant to fish consumption advisories and the mercury ambient water quality criteria based on methylmercury in fish tissue, they are outside the scope of the mercury TMDL. The Agency has accepted the fish consumption advisories as they are developed by the Minnesota Department of Health (MDH). The Agency used 30 g/d fish consumption to develop human health based water quality standards and it is not appropriate for the TMDL to change that fish consumption rate. The commenter's contention that the MPCA uses a reference dose (RfD) for mercury that is lower than the RfD recommended and used by the US EPA is not correct. Both the MPCA and MDH use the 0.1 µg kg^{-1} day^{-1} recommended by the EPA. The proposed fish tissue

methylmercury residue concentration of 0.2 ppm proposed as a water quality standard in Minnesota uses the same RfD as the EPA, but has a higher fish consumption rate, which causes the proposed criterion to be 0.2 ppm rather than the 0.3 ppm used by the EPA. The EPA documentation of the methylmercury criteria emphasizes that each state should consider adjusting the methylmercury criterion to factors that are more appropriate for the state if the national averages are not found to reflect the state's conditions.

[CM] U.S. EPA's Clean Air Interstate Rule should be tracked before additional requirements are begun.

The MPCA considers this comment to pertain to implementation of the TMDL. The development of the plan for implementing the TMDL will commence once the TMDL is approved. This comment will help to inform TMDL implementation planning and will be more fully explored during that process. The decisions made to control emissions at Minnesota power generating units, presumably made in response to EPA's rule addressing SO_2 and NOx emissions will be considered in developing future implementation plans.

[CP] Allocations are skewed

A commenter accused the Agency of calculating the mercury loading from municipal wastewater treatment plants (WWTP) using plant design flows from 1990 because "the number of wastewater treatment plants has not changed significantly since 1990" and in doing so underestimated the WWTP load by using 1990 design flows. In fact, the draft Mercury TMDL uses current design flows rather than data for 1990. On page 34 of the draft Mercury TMDL (the same paragraph as the quote in the commenters comments) it states: "The design flow is a conservative assumption of WWTP mercury load because actual discharges are approximately 70% of design flows and very few WWTPs achieve their design flow. The current discharge information was used for the wastewater treatment plant design flow. Actual wastewater discharge has undoubtedly increased since 1990, with increasing population; however, the design flow is not considered an excessive overestimate because the number of wastewater treatment plants has not changed significantly since 1990."

[CR] Reasonable timeframe

Minn. R. 7052.0200 Subp.1A never envisioned a TMDL for which the State of Minnesota and the United States did not have control of the source of the pollutant. EPA never envisioned or developed at timeline for this situation. The mercury TMDL is just such a TMDL. The mercury TMDL states that to achieve the WQ standard of .2 mg per kg fish tissue standard in the specified waterbodies and waterways, a 93% reduction in worldwide mercury emissions must occur. Neither Minnesota nor the US EPA can project what a reasonable time period for achieving that reduction may be. If either party attempted to do so it would be merely speculation. What we can do is work toward reducing the mercury we do control. This is what we are doing. The development of the mercury implementation plan will provide this information.

Attachment A:

SF-00006-05 (4/86)

DEPARTMENT: POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE: 9 January 2006 [revised 19 April 2006]

TO: Marvin Hora
Howard Markus

FROM: Bruce Monson

PHONE: 6-7607

SUBJECT: Mercury Loads to Watersheds (HUCs)

The purpose of this memo is to describe an analysis I did of point source and nonpoint source mercury loads to the 84 watersheds in Minnesota that are described by 8-digit hydrologic unit codes (HUC)(Figure 1). The analysis was done in response to the concern that point source discharges to surface waters were greater than one percent of the mercury load when looked at on a watershed basis, rather than on the regional basis that we had done for the Mercury TMDL.

For nonpoint source loads (NPSL), the area of each HUC was multiplied by 12.5 g km^{-2} y^{-1} (same method used in the draft Mercury TMDL). An alternative approach recommended by J. Reyer (10/18/05 email) for estimating nonpoint source load is to multiply the NPSL by 25%.

For point source loads (PSL), the WWTP, Taconite, and Pulp & Paper dischargers, which are listed in Appendix B of the draft Mercury TMDL, were sorted into HUCs. Only six of the 84 HUCs had no PSL.

In the process of reviewing the point sources, I discovered that our original list of point sources that we were given from the Delta database included 67 NPDES dischargers that did not discharge to surface water and there were a few dischargers that were not included in the list. The revised point source list changed from 638 to 574 sources. The removed dischargers had very small mercury loads and had an insignificant affect on the total mercury load.

The percentage of mercury load from point sources was determined two ways: (1) dividing PSL by total load (NPSL + PSL) and (2) dividing PSL by 0.25 NPSL + PSL. The second approach was considered the "true" mercury load in J. Reyer's comments (10/18/05 email). A percent PSL of 4% using the second method is equivalent to a value of 1% using the first method.

Please notice that, except for the three HUCS in the Twin Cities Metro Area, the PS and NPS contributions only included the specific area of the HUC and did not include the upstream loading, and are therefore very conservative estimates of the relative impact of the point sources in rivers

with substantial upstream drainage. For the three TCMA HUCs (watersheds 20, 33, and 38), the upstream drainage was included in the load calculations.

Results of the analysis are summarized in Table 1, sorted by HUC. For the first PSL% method, none were greater than one percent. The second PSL% method is the next column, with values above one percent bolded; none of the values in the second method are above four percent.

For pulp & paper mills, I used a default mercury concentration of 13 ng/L because that was the concentration used by USEPA in the Mercury Maps calculations. However, we have measurements of mercury in Boise Cascade effluent that averaged 1.6 ng/L. For the Rainy River (HUC 0903004) the measured value is used instead of the default 13 ng/L. Recently, Gary Kimball sent me a WI-DNR analysis of mercury concentrations in Wisconsin pulp and paper mills that shows the measured value of about 2 ng/L Hg at Boise Cascade is more typical of the industry than the 13 ng/L. Therefore, we have been very conservative in using 13 ng/L for the four pulp and paper mill dischargers that are included in our Mercury TMDL.

At the end of Table 1 is the summary for the state. Based on the totals for all HUCs, statewide PSL is 7.08 kg/y and NPSL is 2731 kg/y, which gives a %PSL of 0.26% and 1.03% for the two methods. Alternatively, in terms of %NPSL, the first method gives a %NPSL of 99.7% and the second method gives 99.0%.

In conclusion, these results indicate that point sources are a relatively insignificant contributor to mercury loading even when considered on a watershed basis. Both methods for calculating %PSL indicate PSL are insignificant compared to NPSL.

Figure 4 8-digit Hydrologic Unit Code watersheds in Minnesota. Streams impaired for mercury are also shown.

Table 2 Summary of nonpoint source mercury loads (NPSL) and point source loads (PSL) by watershed (HUC)

NUM	NAME	HUC	BASIN	Area (km^2)	NPSL (kg/y)	PSL (kg/y)	PSL/ Total L	PSL/(0.25* NPSL + PSL)	Comment
1	Lake Superior (North)	04010101	LSB	4,130	51.62	0.0005	0.00%	0.00%	
2	Lake Superior (South)	04010102	LSB	1,638	20.48	0.2004	0.97%	**3.77%**	WLSSD @ 0.174 kg/y of PSL (at 2.6 ng/L Hg)
3	St. Louis River	04010201	LSB	7,389	92.36	0.8862	0.95%	**3.70%**	Hibbing N&S:0.036 kg/y; 27 dischargers to this HUC
4	Cloquet RIver	04010202	LSB	2,055	25.69		0.00%	0.00%	
5	Nemadji River	04010301	LSB	719	8.99		0.00%	0.00%	
7	Mississippi River (Headwaters)	07010101	UMB	5,126	64.08	0.0185	0.03%	0.12%	
8	Leech Lake River	07010102	UMB	3,459	43.23	0.0005	0.00%	0.00%	
9	Mississippi River (Grand Rapids)	07010103	UMB	5,326	66.58	0.1691	0.25%	**1.01%**	
10	Mississippi River (Brainerd)	07010104	UMB	4,447	55.59	0.1209	0.22%	0.86%	
11	Pine River	07010105	UMB	2,032	25.40	0.0029	0.01%	0.05%	
12	Crow Wing River	07010106	UMB	5,039	62.99	0.0177	0.03%	0.11%	
13	Redeye River (Leaf R)	07010107	UMB	2,328	29.11	0.0074	0.03%	0.10%	
14	Long Prairie River	07010108	UMB	2,232	27.90	0.0364	0.13%	0.52%	
15	Mississippi River (Sartell)	07010201	UMB	2,641	33.02	0.1989	0.60%	**2.35%**	
16	Sauk River	07010202	UMB	2,698	33.72	0.0390	0.12%	0.46%	
17	Mississippi River (St. Cloud)	07010203	UMB	2,919	36.49	0.1384	0.38%	**1.49%**	
18	North Fork Crow River	07010204	UMB	3,822	47.78	0.1118	0.23%	0.93%	
19	South Fork Crow River	07010205	UMB	3,307	41.33	0.1070	0.26%	**1.02%**	
20	Mississippi R @ Metro; HUCs 22-33	07010206	UMB+MNB	90,800	1135.00	4.0148	0.35%	**1.40%**	Includes upstream HUCs
21	Rum River	07010207	UMB	4,035	50.44	0.0284	0.06%	0.22%	
22	Minnesota River (Headwaters)	07020001	MNB	1,976	24.69	0.0065	0.03%	0.11%	
23	Pomme de Terre River	07020002	MNB	2,353	29.42	0.0123	0.04%	0.17%	
24	Lac Qui Parle River	07020003	MNB	1,940	24.24	0.0083	0.03%	0.14%	
25	Minnesota River (Granite Falls)	07020004	MNB	5,367	67.08	0.0738	0.11%	0.44%	
26	Chippewa River	07020005	MNB	5,366	67.07	0.0325	0.05%	0.19%	

NUM	NAME	HUC	BASIN	Area (km^2)	NPSL (kg/y)	PSL (kg/y)	PSL/ Total L	PSL/(0.25* NPSL + PSL)	Comment
27	Redwood River	07020006	MNB	1,853	23.17	0.0343	0.15%	0.59%	
28	Minnesota River (Mankato)	07020007	MNB	3,563	44.53	0.1634	0.37%	**1.45%**	
29	Cottonwood River	07020008	MNB	3,408	42.60	0.0202	0.05%	0.19%	
30	Blue Earth River	07020009	MNB	3,133	39.17	0.0540	0.14%	0.55%	
31	Watonwan River	07020010	MNB	2,197	27.46	0.0390	0.14%	0.57%	
32	Le Sueur River	07020011	MNB	2,858	35.72	0.0476	0.13%	0.53%	
33	Minnesota R above Metro (Shakopee); HUCs 22-33	07020012	MNB	38,730	484.12	1.3744	0.28%	**1.12%**	Includes upstream HUCs
34	St. Croix River (Upper)	07030001	SCB	1,418	17.72	0.0002	0.00%	0.00%	
35	Kettle River	07030003	SCB	2,720	34.00	0.0132	0.04%	0.16%	
36	Snake River	07030004	SCB	2,613	32.66	0.0119	0.04%	0.15%	
37	St. Croix River (Stillwater)	07030005	SCB	2,390	29.87	0.0593	0.20%	0.79%	
38	Mississippi R below Metro (Red Wing); HUCs 7-39	07040001	UMB+MNB +SCB	105,317	1316.46	4.4619	0.34%	**1.34%**	Includes upstream HUCs
39	Cannon River	07040002	LMB	3,830	47.88	0.1298	0.27%	**1.07%**	
40	Mississippi River (Winona)	07040003	LMB	1,713	21.42	0.0682	0.32%	**1.26%**	
41	Zumbro River	07040004	LMB	3,684	46.06	0.1709	0.37%	**1.46%**	
42	Mississippi River (La Crescent)	07040006	LMB	222	2.78	0.0043	0.16%	0.62%	
43	Root River	07040008	LMB	4,296	53.70	0.0277	0.05%	0.21%	
44	Mississippi River (Reno)	07060001	LMB	475	5.94	0.0044	0.07%	0.30%	
46	Upper Iowa River	07060002	LMB	564	7.05	0.0048	0.07%	0.27%	
47		07080102	CRB	32	0.41		0.00%	0.00%	
48	Cedar River	07080201	CRB	1,841	23.01	0.0712	0.31%	**1.22%**	
49	Shell Rock River	07080202	CRB	636	7.95	0.0256	0.32%	**1.27%**	Used Hg measured at Albert Lea: 0.9 ng/L
50	Winnebago River	07080203	CRB	186	2.32	0.0003	0.01%	0.06%	
51	W Fork Des Moines River (Headwaters)	07100001	DMB	3,245	40.56	0.0512	0.13%	0.50%	
52	W Fork Des Moines River (Lower)	07100002	DMB	228	2.84	0.0056	0.20%	0.78%	

NUM	NAME	HUC	BASIN	Area (km^2)	NPSL (kg/y)	PSL (kg/y)	PSL/ Total L	PSL/(0.25* NPSL + PSL)	Comment
53	E Fork Des Moines River	07100003	DMB	528	6.60	0.0022	0.03%	0.13%	
54	Bois De Sioux River	09020101	RRB	1,461	18.26	0.0005	0.00%	0.01%	
55	Mustinka River	09020102	RRB	2,275	28.43	0.0049	0.02%	0.07%	
56	Otter Tail River	09020103	RRB	5,057	63.21	0.0505	0.08%	0.32%	
57	Red River of the North (Headwaters)	09020104	RRB	1,142	14.27	0.0667	0.46%	**1.83%**	
58	Buffalo River	09020106	RRB	2,871	35.88	0.0077	0.02%	0.09%	
59	Marsh River	09020107	RRB	1,015	12.69	0.0041	0.03%	0.13%	
60	Wild Rice River	09020108	RRB	4,220	52.74	0.0046	0.01%	0.03%	
61	Sandhill River	09020301	RRB	1,462	18.28	0.0110	0.06%	0.24%	
62	Upper and Lower Red Lake	09020302	RRB	5,114	63.92	0.0003	0.00%	0.00%	
63	Red Lake River	09020303	RRB	3,417	42.71	0.0263	0.06%	0.25%	
65	Thief River	09020304	RRB	2,788	34.85	0.0002	0.00%	0.00%	
66	Clearwater River	09020305	RRB	3,588	44.85	0.0057	0.01%	0.05%	
67	Grand Marais Creek	09020306	RRB	1,554	19.42	0.0104	0.05%	0.21%	
68	Snake River	09020309	RRB	2,033	25.41	0.0028	0.01%	0.04%	
69	Tamarac River	09020311	RRB	2,328	29.10	0.0022	0.01%	0.03%	
70	Two Rivers	09020312	RRB	2,787	34.84	0.0031	0.01%	0.04%	
71	Roseau River	09020314	RRB	2,758	34.48	0.0060	0.02%	0.07%	
72	Rainy River	09030001	RAB	6,491	81.13	0.0112	0.01%	0.05%	
73	Vermilion River	09030002	RAB	2,679	33.48	0.0022	0.01%	0.03%	
74	Rainy River (Rainy Lake)	09030003	RAB	2,363	29.54		0.00%	0.00%	
75	Rainy River (Manitou)	09030004	RAB	1,357	16.96	0.1050	0.62%	**2.42%**	Used measured Hg at Boise Cascade: 1.6 ng/L
76	Little Fork River	09030005	RAB	4,774	59.67	0.0055	0.01%	0.04%	
77	Big Fork River	09030006	RAB	5,370	67.12	0.0011	0.00%	0.01%	
78	Rapid River	09030007	RAB	2,319	28.99		0.00%	0.00%	
79	Rainy River (Baudette)	09030008	RAB	790	9.87	0.0017	0.02%	0.07%	
80	Lake of the Woods	09030009	RAB	2,966	37.07	0.0030	0.01%	0.03%	
81	Big Sioux River (Medary Cr)	10170202	MOB	113	1.42		0.00%	0.00%	

NUM	NAME	HUC	BASIN	Area (km^2)	NPSL (kg/y)	PSL (kg/y)	PSL/ Total L	PSL/(0.25* NPSL + PSL)	Comment
82	Big Sioux River (Pipestone)	10170203	MOB	1,323	16.54	0.0061	0.04%	0.15%	
83	Rock River	10170204	MOB	2,366	29.57	0.0171	0.06%	0.23%	
84	Little Sioux River	10230003	MOB	807	10.09	0.0009	0.01%	0.03%	
	Entire State			**218,485**	**2731.1**	**7.08**	**0.26%**	**1.03%**	
						State-wide %NPSL:	**99.7%**	**99.0%**	