



Barr Engineering Company  
4700 West 77th Street • Minneapolis, MN 55435-4803  
Phone: 952-832-2600 • Fax: 952-832-2601 • www.barr.com *An EEO Employer*

Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

## Memorandum

**To:** Brian Timerson, MPCA  
**From:** Lori L. Stegink  
**Subject:** Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
**Date:** July 31, 2009  
**Project:** 23/31-035-EA01  
**c:** Anne Jackson, MPCA  
Ann Foss, MPCA  
Mike Rhoads, USS  
Chrissy Bartovich, USS  
Tishie Woodwell, USS  
Peder Larson, Larkin Hoffman

The purpose of this memo is to summarize the measures that U. S. Steel (USS) has taken to adhere to the MPCA's Mercury TMDL Guidance for New and Expanding Sources for the proposed expansion at the Keetac facility near Keewatin, MN. This project is currently undergoing environmental review by the DNR, along with the USACE and MPCA, as they develop an Environmental Impact Statement (EIS) for the project. Parallel with the EIS development USS has been working with the MPCA to develop an Air Emission Permit Application for the project. As such, several studies have already been completed to evaluate the environmental impacts of mercury emissions from the existing facility as well as the proposed expansion and these are summarized later in this memo. In September of 2008, USS presented a proposed strategy for adhering to MPCA's guidance to the MPCA and other stakeholders. This serves as the basis for the USS plan for adhering to this guidance. In this plan USS proposed installation of mercury control technology on the new indurating furnace, to conduct testing of control technologies on existing lines at its Minntac facility, and to install mercury controls on existing lines at Minntac and Keetac to the extent necessary to offset the increase in mercury emissions from the proposed project and meet its portion of the TMDL mercury reduction goal for the taconite industry.

The MPCA Mercury TMDL Guidance for New and Expanding Sources requires proposers of a project with the controlled potential to emit more than 3 lbs/yr of mercury to provide the following:

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009

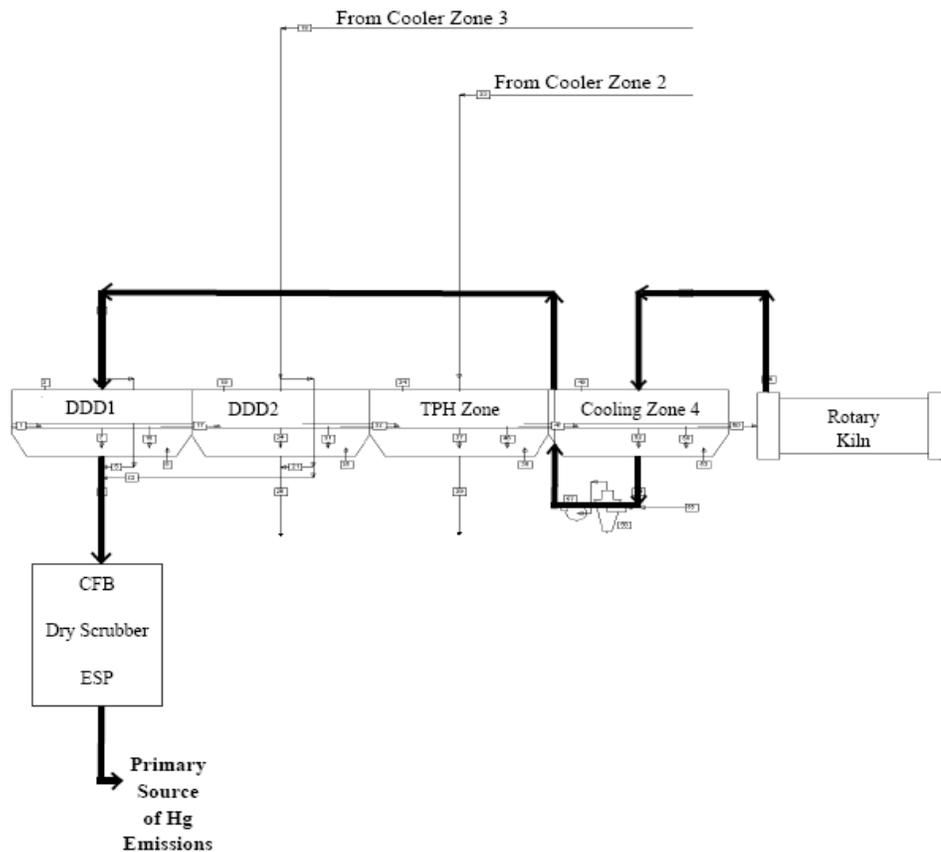
1. Employ the best mercury control available.
2. Complete environmental review, as applicable, including evaluation of local and cumulative mercury impacts per MPCA guidelines.
3. During permitting, assess the impact of added emissions towards attaining the sector's lbs Hg/yr air emission goal.
4. Arrange for a reduction equal to the new emissions from the existing sources in the state.
5. If equivalent mercury reductions from another facility in Minnesota can not be identified propose alternative mitigative strategies.
6. During permitting, submit a plan to the MPCA describing the facilities specific plan for reductions in 1 – 5 above.

The following describes what USS's has done to address Items 1 – 4, and 6. Item 5 is not applicable to the Keetac Expansion because USS has identified reductions that will be made at facilities within Minnesota. This is described in more detail below.

## **Summary of Mercury Mass Balance**

Figure 1 shows the basic configuration of the new indurating furnace and the primary emission point of mercury emissions from the indurating furnace.

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009



**Figure 1 - Process Flow Diagram of Induration Furnace**

More information regarding emissions from the furnace is available in the *Mercury Control Alternatives Evaluation Report, March 2009*. Three factors affect the ultimate estimate of mercury emissions:

- Variability of mercury concentrations in the ore
- Fuel usage (natural gas, biomass, coal, fuel oil, or a combination can be used)
- Control efficiency of pollution control equipment

Using the 95% upper confidence interval, coal as a fuel and a control efficiency range of 50 to 80 percent, air emission of mercury from the new indurating furnace are estimated to be between 20 to 49 pounds per year.

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009

## **Employ Best Mercury Control Available**

The MPCA expects facilities to explore all pollution prevention opportunities and utilize the best control technically feasible considering environmental, energy, and economic impacts. If best controls reduce emissions by less than 90%, the new source will be subject to periodic review for opportunities for improved control efficiency.

An evaluation of mercury controls for the new indurating line was conducted and submitted to the DNR, USACE, and MPCA in the report entitled *Mercury Control Alternatives Evaluation, March 2009*. To date no mercury control technologies have been tested long term or installed on a taconite indurating furnace. The majority of the published information and research on mercury control technologies is based on coal-fired utility boilers. From this information it was determined that activated carbon injection (ACI) is commercially available and has the highest likelihood for successful technology transfer for use on an indurating furnace and was therefore determined to be the best available control technology. USS has proposed full scale installation of ACI on the Down Draft Drying Section 1 (DDD1) (see Figure 1) of the new indurating furnace as part of the expansion project.

The application of ACI is estimated to reduce mercury emissions by 50 to 80 percent. The actual reduction that will be achieved is uncertain since this technology has not been tested or installed previously on an indurating furnace. The environmental impacts therefore were evaluated for a range of mercury emissions and this is discussed in more detail below. USS proposes to perform testing after construction and installation of the new line and ACI system to determine the degree of emission reduction that can be achieved and to submit a report to the MPCA detailing the results. Based on this information the MPCA will establish permit limits, operating conditions, and testing and monitoring requirements to ensure that emission are minimized on an on-going basis.

## **Assessment of Environmental Impacts of Mercury Emissions**

The MPCA Mercury TMDL guidance for new and expanding sources requires completion of environmental review, as applicable, including evaluation of local and cumulative impacts. As part of the environmental review for the proposed Keetac expansion the following studies have included an assessment of the environmental impacts of mercury emissions:

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009

- Human Health Screening Level Risk Assessment, February 2009, including the April, 2009 Addendum.
- Screening Level Ecological Risk Assessment for Chemicals Potentially Emitted to Air and Their Estimated Deposition to Nearby Ecological Receptors, May, 2009
- Cumulative Impacts Analysis, Local Mercury Deposition and Bioaccumulation in Fish, April 2009

In the first two reports the emissions of mercury from the proposed expansion as well as the existing Keetac facility were modeled to determine the amount of mercury in the air, soil and water nearby the Keetac facility and the impacts of these increases in concentrations were assessed. These reports concluded that there would be no significant adverse environmental impact to human health or ecological health from these increases.

In the third report the emissions from the Keetac expansion were assessed along with the emissions from other nearby proposed projects and existing mercury concentration in fish in the nearby water bodies to determine the cumulative impact of these projects. In addition to emissions from the Keetac expansion the following nearby projects were included in the evaluation:

- Essar Steel Minnesota, LLC (formerly known as Minnesota Steel Industries)
- Excelsior Energy – Mesaba Energy Project – West Location
- Laurentian energy Authority – Wood Fired Boiler Project

This study concluded that the four projects, at most, would increase mercury concentrations in the fish in the nearest lakes by about 2 to 5 percent.

## **Impact on Achieving Taconite Sector lb/yr Mercury TMDL Emission Reduction Goal**

During permitting, the facility is to provide an assessment of whether its added emissions will impede progress toward attaining the sector's lb/year air emission goal. The MPCA will track the sector's progress in reaching interim and final goals and may periodically request that this assessment be updated as the sector's goal approaches. As part of the MPCA's Mercury TMDL Plan an emission reduction goal

To: Brian Timerson, MPCA  
 From: Lori L. Stegink  
 Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
 Date: July 31, 2009

for the taconite industry equivalent to a 75% reduction in 2005 emissions by the year 2025 has been established.

In the *Report on the Mercury TMDL Implementation Plan Stakeholder Process, prepared for the Minnesota Pollution Control Agency by the Minnesota Environmental Initiative, July 2007* the following emissions were reported for Minntac and Keetac facilities.

<b>Facility</b>	<b>2005 Mercury Emissions (lbs/yr)</b>	<b>Future Potential Emissions (lbs/yr)</b>	<b>2025 Emission Target (75% reduction from 2005)</b>
Minntac	185.3	185.3	
Keetac Existing Line	146.9	105.8	
Keetac New Line	0	49	
Total	332.2	340.1	83.1

The mercury emission reduction between 2005 and the future potential emissions for the Keetac Existing Line resulted from the installation of a wet scrubber in October, 2005. The scrubber provides for approximately a 30 percent reduction in mercury emissions from the existing line. The 2025 emission target represents a 75 percent reduction from the 2005 baseline emissions. From the table it can also be seen that the new line at Keetac will only increase overall mercury emission by 7.9 lbs compared to 2005 levels. In order for USS to meet its portion of the target emission reduction from the 2005 baseline a 75.6 percent reduction on total future potential emissions would be necessary rather than a 75 percent reduction. This percentage is only slightly higher than the 75 percent.

As discussed in more detail in the section below USS is also proposing to install mercury controls ahead of the 2025 goal. This will lead to the same or lower mercury emissions as would occur without the expansion.

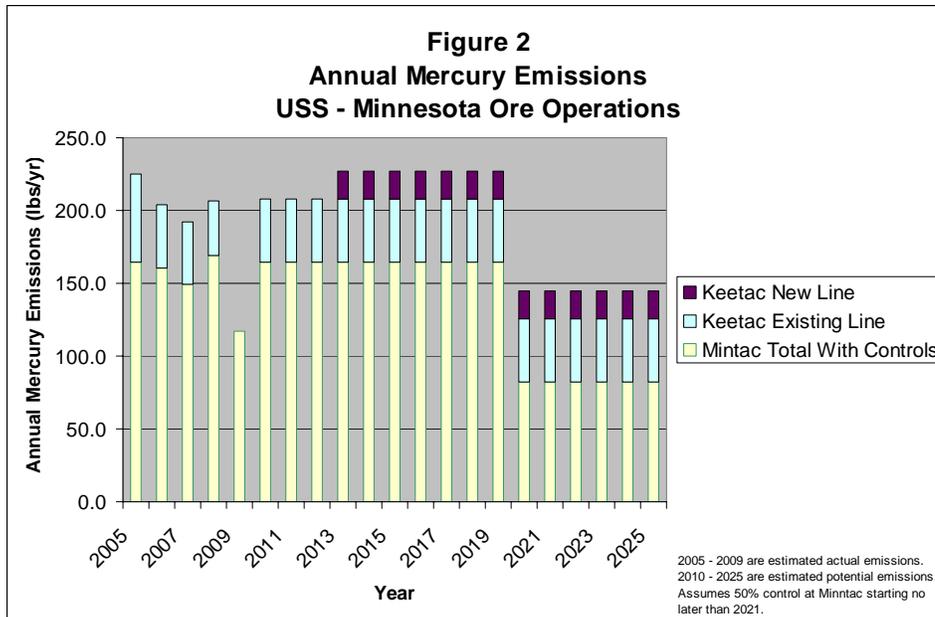
### **Equivalent Reductions at Existing Sources in the Minnesota**

Details regarding the USS proposed TMDL plan are given in the next section. In general USS proposes to install Activated Carbon Injection (ACI) on the new line to minimize mercury emission and to conduct

To: Brian Timerson, MPCA  
 From: Lori L. Stegink  
 Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
 Date: July 31, 2009

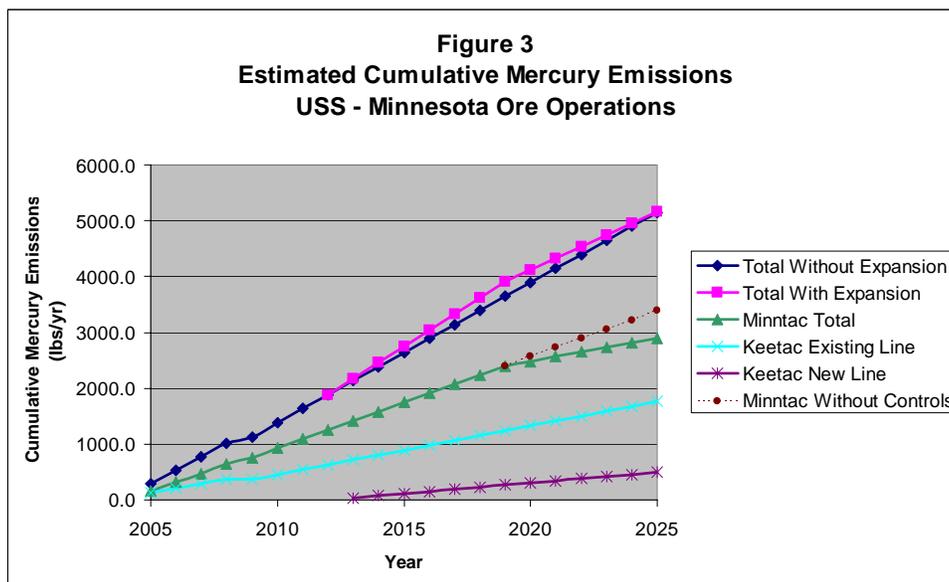
research regarding possible mercury controls that can be retrofitted to existing lines at its Minntac facility and the existing line at Keetac. The particulate and sulfur dioxide emissions from the new line at Keetac are proposed to be controlled using a dry electrostatic precipitator (ESP) and dry scrubber whereas existing lines are controlled by wet scrubbers. The dry pollution controls on the new line are key to the application of ACI. There are no known ACI installations where a wet scrubber is used for emission control.

If a feasible technology is identified from the research efforts it will be installed on the existing lines at Minntac and/or Keetac prior to the 2025 TMDL reduction date. Figure 2 illustrates how the increase associated with the Keetac Expansion and the installation of controls at Minntac would impact annual mercury emissions for 2005 to 2025. For this illustration actual mercury emissions were used for 2005 – 2008, projected emissions were used for 2009 based on projected pellet production, and potential emissions were used for 2010 – 2025. A 50 percent reduction in mercury emission starting in 2020 was assumed for Minntac. Figure 2 illustrates how potential emissions would increase with the start-up of the Keetac expansion and then drop with the installation of controls on the existing lines at Minntac.



Mercury bio-accumulates and therefore the environmental concern with it is the total mass of mercury accumulated over time. By installing the controls early the total cumulative mercury emissions from 2005 to 2025 from USS Minnesota Ore Operations, Minntac plus Keetac, including the expansion, can be

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009



maintained at the same or lower total emissions that would otherwise occur without the expansion. Figure3 illustrates this concept.

For this illustration actual mercury emissions were used for 2005 – 2008, projected emissions were used for 2009 based on projected pellet production, and potential emissions were used for 2010 – 2025. A 50 percent reduction in mercury emission starting in 2020 was assumed for Minntac. The green line on the chart shows the cumulative mercury emissions from Minntac if the controls are added prior to the 2025 TMDL timeline as part of the Keetac Expansion. The dotted brown line shows that the Minntac emissions would be without the early addition of controls as part of the Keetac Expansion. The difference between the brown and green lines offsets the increase that will occur as a result of the Keetac Expansion (i.e. purple line). As shown in Figure 3 with this level of reduction starting in 2020 the total cumulative mercury emissions in 2025, including the expansion, would be equal to the total cumulative emissions without the expansion. Therefore, the mercury emissions from the expansion will not add additional mercury to the environment and therefore will not impede achievement of the goals of the mercury TMDL. Research needs to be conducted to determine the control efficiency that can be achieved on the existing lines. If a lower control efficiency is achieved the controls would need to be installed at an earlier date in order to offset the mercury emissions from the expansion. If a higher control efficiency is achieved, the controls could be installed at a later date or if installed in 2020 additional mercury reductions would result.

To: Brian Timerson, MPCA  
From: Lori L. Stegink  
Subject: Keetac Expansion Project: Summary of Steps Taken to Adhere to MPCA Mercury TMDL Guidance for New and Expanding Sources  
Date: July 31, 2009

The results of the research that will be conducted by Minntac are likely to be applicable to other taconite operations on the Iron Range. If so, this research may actually accelerate achievement of the sector wide taconite TMDL mercury emission reduction goal. If feasible technology is identified early it is possible that it could be installed earlier than 2025 on other taconite facilities and this would lead to additional early reductions of mercury emissions.

## **USS Mercury TMDL Reduction Plan**

Detailed requirements for USS's proposed mercury TMDL reduction plan will be incorporated into the air permit requirements for the Keetac expansion project along with a Mercury TMDL Reduction Agreement. The Keetac air permit will detail requirements for installation, operation, testing, monitoring, and report for the ACI system on the new line and testing and reporting requirements for the existing line at Keetac. In addition to the permit USS will sign an agreement with the MPCA that details the requirements for conducting mercury control research, reporting results to the MPCA, and installation of feasible alternatives on existing lines at Minntac and Keetac.

The following is a summary of USS Mercury TMDL Reduction Plan.

- Install mercury controls on the New Line at Keetac and monitor and report the performance of this technology to the MPCA. Report to MPCA should be available approximately 12 months after start of operation.
- Conduct short-term trials (i.e. pilot study) of mercury control technologies at Minntac and report these results to the MPCA. The goal is to complete the short-term trials approximately 12 months following issuance of the air permit for the Keetac expansion.
- Conduct a long-term trial on one existing line of a mercury control technology selected based on the results of the short-term trial and report these results to the MPCA. The goal is to complete the long-term trial approximately 3 years following completion of the short-term trial. In this timeframe an air permit for installation of the controls needs to be applied for and issued, design and construction of the controls needs to be completed, and sufficient data on the performance of the unit needs to be collected.
- Based on the results of the long-term trial on an existing line and the performance and operating experience of the ACI system on the new line select a mercury control technology for the remaining existing lines and submit permit application(s) and schedule for installation. The goal is to have the full scale installations on all lines completed by the end of 2020.