Minnesota Pollution Control Agency

National Pollutant Discharge Elimination System (NPDES)/

State Disposal System (SDS) Permit Program Fact Sheet

Permit Reissuance

MN0057207

Permittee:	U.S. Steel Corp 600 Grant St Pittsburgh, Pennsylvania 15219
Facility name:	U.S. Steel Corp - Minntac Tailings Basin Area County Road 102 Mountain Iron, Minnesota 55768
Current permit expiration date:	July 31, 1992
Public comment period begins:	November 15, 2016
Public comment period ends:	December 23, 2016
Receiving water:	**Timber Creek – Class 2Bg, 3C, 4A, 4B, 5, 6 water;** Dark River – 2Bg, 3C, 4A & B, 5, 6 (1B, 2A, 3B downstream); Unnamed wetlands north of the basin – 2D, 3D, 4C, 5, 6; Unnamed wetlands tributary to the Dark River and Timber Creek – 2D, 3D, 4C, 5, 6
Permitting contact:	Erik Smith Minnesota Pollution Control Agency 520 Lafayette Rd N St. Paul, MN 55155-4194 651-757-2719 erik.smith@state.mn.us

Table of Contents

Purpose and Participation 4
Applicable Statutes 4
Purpose 4
Public Participation 4
Summary of conditions in the draft permit 5
Facility Description 6
Background Information 6
Facility History and Existing SOC 6
Distinction Between State and Federal Discharges 7
Facility Location Legal Description 9
Facility Operations Description 9
Stormwater 10
Site Geology and Hydrology 11
NPDES Outfall Monitoring Station Legal Description 12
Permitted Facility Map 13
Surface Water Monitoring Locations 14
Groundwater Monitoring Locations 18
Tailings Basin Process Water Monitoring and Limits 18
Components and Treatment Technology 18
Current Information 18
Changes to Facility or Operation 19
Make-up Water 19
Recent Compliance History 20
Inspection Summary 20
Recent Monitoring History 25
Receiving Water(s) 26
Use Classification 26
Use Classification Descriptions 26
Impairments 27
Biological Assessment 28
Existing Permit Effluent Limits 29
Technology Based Effluent Limits (TBELs) 30
Water Quality Based Effluent Limits (WQBELs) 30
Proposed Permit Limits and Monitoring 30
Technology Based Effluent Limits 30
Water Quality Based Limits 30
Dark River – Trout Reach Concentration Analysis 32
Flow Calculations and Dilution Ratios 32
Concentration Analysis 33
Salty Discharge Monitoring 35
Iron and Manganese Monitoring 36
Compliance Limits in Surface Waters 36
Sulfate Limits – Wild Rice 37
Additional Requirements 37
SDS Compliance Schedule 37
NPDES Compliance Schedule 39
NPDES and SDS Compliance Schedule (permit excerpt) 40
Total Facility Requirements (TFR) 45
Nondegradation and Anti-Backsliding 46
Table of Recent Monitoring 47

Figures

Figure 1 – Map of permitted facility 13
Figure 2 – Minntac Tailings Basin aerial photo 14
Figure 3 – Monitoring locations new to this permit 15
Figure 4 – The Class 1B Reach of the Dark River 33

Tables

Table 1 – Dark River monitoring results 16
Table 2 – Downstream receiving waters impairments 27
Table 3 – Monitored parameters under existing permit 29
Table 4 – SD001 reasonable potential analysis 31
Table 5 – Trout reach concentration analysis 34
Table 6 – Salty discharge monitoring parameters 36
Table 7 – DMR summary report - 2015 47

Purpose and participation

Applicable statutes

This fact sheet has been prepared according to the 40 CFR § 124.8 and 124.56 and Minn R. 7001.0100, subp. 3 in regards to a draft National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit to construct and/or operate wastewater treatment facilities and to discharge into waters of the State of Minnesota.

Purpose

This fact sheet outlines the principal issues related to the preparation of this draft permit and documents the decisions that were made in the determination of the effluent limitations and conditions of this permit.

Public participation

You may submit written comments on the terms of the draft permit or on the Commissioner's preliminary determination. Your written comments must include the following:

1. A statement of your interest in the permit application or the draft permit.
2. A statement of the action you wish the Minnesota Pollution Control Agency (MPCA) to take, including specific references to sections of the draft permit that you believe should be changed.
3. The reasons supporting your position, stated with sufficient specificity as to allow the Commissioner to investigate the merits of your position.

You may also request that the MPCA Commissioner hold a public informational meeting. A public informational meeting is an informal meeting which the MPCA may hold to help clarify and resolve issues.

In accordance with Minn. R. 7000.0650 and Minn. R. 7001.0110, your petition requesting a public informational meeting must identify the matter of concern and must include the following: items one through three identified above; a statement of the reasons the MPCA should hold the meeting; and the issues you would like the MPCA to address at the meeting.

In addition, you may submit a petition for a contested case hearing. A contested case hearing is a formal hearing before an administrative law judge. Your petition requesting a contested case hearing must include a statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing pursuant to the criteria identified in Minn. R. 7000.1900, subp. 1 and a statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested. To the extent known, your petition should include a proposed list of witnesses to be presented at the hearing, a proposed list of publications, references or studies to be introduced at the hearing, and an estimate of time required for you to present the matter at hearing.

You must submit all comments, requests, and petitions during the public comment period identified on page one of this notice. All written comments, requests, and petitions received during the public comment period will be considered in the final decisions regarding the permit. If the MPCA does not receive any written comments, requests, or petitions during the public comment period, the Commissioner or other MPCA staff as authorized by the Commissioner will make the final decision concerning the draft permit.

Comments, petitions, and/or requests must be submitted by the last day of the public comment period to:

Erik Smith
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

The permit will be reissued if the MPCA determines that the proposed Permittee or Permittees will, with respect to the facility or activity to be permitted, comply or undertake a schedule to achieve compliance with all applicable state and federal pollution control statutes and rules administered by the MPCA and the conditions of the permit and that all applicable requirements of Minn. Stat. ch. 116D and the rules promulgated thereunder have been fulfilled.

More detail on all requirements placed on the facility may be found in the Permit document.

Summary of conditions in the final permit

- Requirement to achieve a sulfate concentration in the tailings basin pool water of 357 mg/L in 10 years (or an alternative, approved concentration based on new research), and to determine what pollutant concentrations in the basin will result in downstream surface waters and groundwater meeting applicable water quality standards

- Compliance schedule for deep seepage discharges under State rules requiring:
    - Investigation of pollutant sources and flowpaths
    - Determination of achievable compliance dates for final surface water and groundwater standards
    - Begin construction of basin pool treatment/mitigation system within 54 months of issuance

- Compliance schedule for surface seep discharges under Federal rules requiring that the Dark River Seepage Collection and Return System (SCRS) be operational by 18 months after permit issuance

- Additional monitoring wells near the property boundary

- New surface water monitoring in the Dark River, Timber Creek, Admiral Lake, and Little Sandy Lake

- Toxicity testing to protect the Dark River

- New stormwater monitoring location (SD005) at the southwest corner of the basin

- New discharge monitoring location (SD006) for surface flow to wetlands on the north of the basin

- The goal of the investigations and monitoring is to determine where limits would best be applied, what those limits would be to protect all applicable uses of surface and groundwater, and when they could be met. The intent is to set limits in a modified or reissued permit.

Facility description

Background Information

Facility History and Existing Schedule of Compliance

The Minntac Tailings Basin has been in operation since approximately 1967, before passage of the Clean Water Act (CWA). Construction and early operations were authorized under permits from the former Department of Conservation. U.S. Steel Corp. (U.S. STEEL) was first issued an NPDES/SDS permit to govern its discharges on September 30, 1987. This permit expired on July 31, 1992. U.S. Steel continues to operate the Facility under the expired permit according to Minn. R.7001.0160.

There has been a long-standing issue with increasing concentrations of pollutants in the tailings basin (notably sulfate, specific conductance, and hardness), and the impact this has had on groundwater and surface water. The MPCA and the Permittee have entered into several agreements to conduct studies and perform mitigation measures to reduce concentrations of sulfate and other pollutants in the tailings basin and surrounding waters. The mitigation efforts and investigations conducted at the basin have shown that there is significant seepage escaping the basin over its 8000+ acre footprint and that this seepage is causing exceedances of water quality standards in surface water and groundwater in a broad area surrounding the basin. The focus of the draft permit is on reducing the pollutant concentration at the basin as measured in the process water that is cycled through the taconite plant and basin. Not only does this water contribute to the total seepage from the basin, as it leaks out, but it also is "buried" as pore water within the fine tailings in the basin tailings disposal cells. Reducing the initial pollution concentration of this water at the time of its disposal in the basin will significantly reduce the mass of sulfate and other pollutants within the basin that will leak from it long-term. Final closure of the basin will require that ponded water within the basin be released for dam safety reasons, which would necessitate that there not be on-going active remedial measures, such as seepage pump-backs into the basin. Reducing the pollutant concentration in the water stored in the basin ponds and as tailings pore water (groundwater) would help to facilitate these closure conditions. This permit proposes basin concentration limits for sulfate to be met within ten years.

Awareness of these issues has resulted in recent proposals by U.S. Steel to address basin water quality, but U.S. Steel has not yet completed any of the proposals. In March 2009 U.S. Steel submitted an NPDES Permit Application that included plans to construct a 7000 gallon per minute Process Water Treatment System (PWTS), in part to satisfy a 2008 Stipulation Agreement for line 3 hardness issues. U.S. Steel predicted the PWTS would lower the basin sulfate concentration from 900 to 350 mg/L in one permit cycle. U.S. Steel then requested MPCA not act on the application while it investigated refinements to the proposed PWTS. Instead, U.S. Steel proposed replacement of wet emissions scrubbers on the pelletizing furnaces with dry controls. This would remove a significant source of pollutants to the basin (as well as reduce air emissions) and was forecast to lower the basin sulfate concentration to 476 mg/L within 20 years. The phased installation of dry controls, beginning with line 6, was included in a June 9, 2011, Schedule of Compliance (SOC). In 2015, U.S. Steel informed MPCA it did not intend to install dry controls.

Actions already completed under the SOC include the use of alternate make-up water with a lower sulfate concentration to mitigate the increased loading of sulfate to the basin water. Remaining actions from the SOC that are incorporated in this permit include constructing a Seepage Collection and Return System (SCRS) in the Dark River Watershed, meeting the sulfate standard in groundwater at the property boundary, and reducing tailings basin sulfate concentrations. These components of the SOC will be removed from the SOC with their inclusion in the reissued permit.

Distinction between discharges subject to regulation under state law and those subject to regulation under state and federal law

Within this fact sheet, the term "discharge" can have several meanings. The intended meaning will be denoted as follows:

- Discharge(H) – (Hydrologic definition): The flow of water, including any suspended solids, dissolved chemicals, and or biological materials from one water body or aquifer to another, or through a given cross-sectional area. This includes movement as **both surface water and ground water**.
- Discharge(NPDES) – (NPDES - CWA definition): Federal law requires a permit for any addition of a pollutant to **navigable waters** from any point source. Navigable waters means waters of the United States, including the territorial seas. State law applies the permit requirement to **surface waters** of the state under Minn. R. 7001.1030.
- Discharge(SDS) – (Minn. Stat. § 115.01 definition): The addition of any pollutant to the **waters of the state** or to any disposal system. This includes discharge to groundwater as described below.
    - "Waters of the state" means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, **aquifers**, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or **underground**, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof. [Disposal systems or treatment works operated under permit or certificate of compliance of the agency are not "waters of the state" for purposes of water quality standards - Minn. R. 7050.0130(2)]

This permit contains conditions and limits on the management and discharge(H) of the facility's industrial process wastewater, stormwater, and onsite domestic wastewater effluent. The conditions and limits are derived from both state and federal authority. Those derived from state authority govern discharge(SDS) of wastewater from the tailings basin to groundwater, which is a water of the state but not a water of the United States (navigable water). Additionally, any impacts to surface waters from pollutants that were transported from the tailings basin via groundwater are addressed under state statute based on the reasoning discussed below. MPCA has regulated under NPDES permits all seepage that emerges either from the side of the basin dam, or within the vicinity of the toe of the dam, that creates surface flow or ponded features that would not exist in the absence of the tailings basin. That practice will continue under this permit. The differentiation between this seepage and discharge(H & SDS) to groundwater is discussed below.

Discharge(H) from the tailings basin may occur as surface seepage points along the exterior toe of the outer basin dam. These features are similar to base of hillslope springs. Some are small and flow intermittently, while some of the larger seeps create ponded features with measureable flows of several hundred gallons per minute (gpm) into the adjacent wetlands and streams. The source of this water, particularly at the larger, persistent seeps, is primarily flow from the tailings basin traveling through or immediately under the basin dam.

Historically, MPCA has issued an NPDES permit establishing effluent limits and other conditions to regulate these near-basin seeps and intends to do so under this permit. NPDES permitting guidelines can be applied because flow from the large seeps is often observable, and with installation of a berm and outlet weir the flow can be measured, similar to flow from a ditch or channel. This allows quantification of flow volume and pollutant load, such that the reasonable potential to cause or contribute to exceedance of a water quality standard can be evaluated and, if necessary, effluent limits can be determined and applied. Although this seepage will be regulated under the NPDES portion of this permit, one requirement of this permit is to intercept/eliminate these seepage discharges(NPDES). This will reduce the loading of pollutants to surrounding surface waters, and elimination of this seepage is the fastest way to achieve compliance with NPDES requirements, rather than traditional effluent limits.

MPCA uses the term "deep seepage" to refer to wastewater that enters the underlying surficial aquifer throughout the area of the basin and does not discharge(H) to the ground surface adjacent to its source. The deep seepage travels as groundwater, which may emerge into the surrounding wetlands, lakes or stream channels as baseflow, or may remain in the subsurface within the regional groundwater flow system. The surficial aquifer beneath and surrounding the tailings basin consists of unconsolidated glacial sediments and as such, the movement of water through it is consistent with the physics of porous media flow. Within the aquifer, which at this facility extends laterally for several miles, water can move in any direction depending on the hydraulic head (water table) conditions, which vary spatially and over time. This flow system is neither confined nor discrete and is not consistent with the examples of underground conveyances explicitly mentioned in the CWA definition of a point source (i.e., is not a tunnel or discrete fissure). Flow through porous media is also subject to lateral dispersion, which is the mixing and spreading of the pollutant perpendicular to the path of fluid flow. There is a scaling factor to this phenomenon, whereby the degree of dispersion often increases at a greater rate as the flow path lengthens. Consequently, the area over which impacted groundwater may discharge(H) to surface water features can be thousands of feet in length, covering hundreds or thousands of acres, particularly when discharging(H) to wetlands. Although deep seepage may eventually commingle with surface water, the flow path that the pollutants travel from the basin to surface water is not a discernible, confined, and discrete conveyance, nor is there typically a discrete, discernible and measureable discharge(H) from groundwater to surface water from deepseepage. Precipitation that has infiltrated, along with other groundwater not directly impacted by the basin, may interact with the basin-affected water to alter its interaction with surface water. Therefore, in this permit the MPCA finds the transfer of pollutants via deep groundwater from the tailings basin to distant surface water (not adjacent to the basin) does not meet the CWA definition of a point source. Consequently, it is not a discharge(NPDES) under the CWA.

State law gives MPCA authority to require permits for the operation of disposal systems discharging(S & H) to waters of the state. Minn. Stat. § 115.03, subd. 1(e). A person operating a disposal system is required to have a permit under Minn. Stat. §
115.07. The Minntac tailings basin meets the definition of disposal system in Minn. Stat. § 115.01, subd. 5. Waters of the state include all accumulations of water, surface or underground (Minn. Stat. § 115.01, subd. 23). Consequently, MPCA intends to regulate basin seepage to groundwater and deep seepage expected to eventually impact surface water as discharges(SDS) to a water of the state in accordance with State Disposal System Permit guidelines.

Facility Location Legal Description

The U.S. Steel - Minntac Tailings Basin Area facility (facility) is located in multiple Sections of Township 59 North, Ranges 18 and 19 West, Mountain Iron, St. Louis County, Minnesota.

The facility covers approximately 8700 acres (13.6 square miles) and consists of the Minntac tailings basin, the drainage area contributing surface runoff to the basin, all wastewater disposal systems within the area designated on the map on page 13, as well as part of the Minntac plant area. That portion of the plant area which drains to the basin includes the concentrator, the agglomerator, the sewage treatment plant, the lube storage area, a substation, the plant area reservoir, and part of the crushing facilities. The contributing drainage area was thought to include part of an overburden/rock stockpile area to the southwest of the basin, however U.S. Steel now asserts that stormwater runoff from this area does not enter the basin, but instead constitutes the flowage near the southwest corner of the basin that was previously identified in seepage surveys as "seep C".

Facility Operations Description

The principal activity at this facility is taconite processing. At the maximum operating rate, the facility can produce 15 million long tons of taconite pellets per year. The Minntac plant consists of a series of crushers and screens, a crusher thickener, a concentrator, an agglomerator, and various auxiliary facilities. The concentrator utilizes a series of mills, magnetic separators, classifiers, hydroclones, hydroseparators, screens and thickeners, as well as a flotation process. Chemical additives include flocculants and various flotation reagents. The flocculants include Anderson WE-A3P, added to the crushing plant dust collector slurry at a concentration of 2 ppm, and NeoSolutions NS6800 and NS3455 or equivalent cationic homopolymers, added to the concentrator tailings slurry prior to the thickening stage at a rate of 300 lb/hr. The flotation reagents include: (a) an alkyl ether primary amine acetate or alkyl ether diamine acetate collector, Arosurf MG- 83, Arosurf MG-83A, Tomah DA-17-5% Acetate, or equivalent (alkyl chain R no greater than C_{14}), added at a maximum rate of 295 lb/hr; (b) an alcohol frother, methyl isobutyl carbinol, Arosurf 2057, Nalflote 8848, or equivalent (mixed C_4 to C_9 aliphatic alcohols only), added at a maximum rate of 101 lb/hr; and (c) anti-foaming agents NeoSolutions NS9548, Nalco 8638, or ChemTreat FO922, added at a maximum rate of 1260 gal/day.

The agglomerator receives the concentrate, which is then dewatered by disc filters. The filter cake is then mixed with bentonite and formed into pellets in balling drums. The pellets are dried, heated, and fired in a grate kiln, and then loaded for rail transport.

Wastewater inputs to the tailings basin consist of the following, with their estimated average rates:

- Fine tailings slurry/concentrator process water — 22,000 gpm
- Agglomerator process water — 14,800 gpm
- Sewage plant discharge, formerly covered under NPDES/SDS Permit MN0050504 — 40 gpm
- Laboratory wastewater (neutralized) — 3,650 gal/yr
- Plant non-process water (wet scrubber discharge, floor wash, roof runoff, non-contact cooling water — Unknown
- Runoff from plant area, stockpile areas and adjacent upland areas — Unknown

The agglomerator process water, sewage plant discharge, laboratory wastewater, plant non-process water and surface runoff from the plant area enter the south side of the basin through a series of pipes and ditches to the north of the concentrator and agglomerator buildings, in Section 28. Surface runoff from the upland area to the southeast of the basin enters through a series of four culverts through the perimeter dam.

An average of 21 million long tons of dry fine tailings and 14 million long tons of dry coarse tailings are disposed of each year in the tailings basin. The coarse tailings are generated from the classifier, following the first stage of milling and magnetic separation. The fine tailings are generated from the crusher thickener overflow and the tailings thickener underflow. The fine tailings slurry and concentrator process water is directed by gravity flow through pipes from the Step I, II, and III thickeners to a fine tailings pump house, which lifts the slurry for disposal through a series of open ditches to the Minntac tailings basin. The flow from the flotation process is restricted to Step I thickeners, but is mixed with discharge from Steps II and III in the pump house. The basin is segmented into several cells, and the fine tailings spigot point is periodically moved from one cell to another. A permanent pumping station located within the basin returns water to the plant site reservoir. The station is located on the east side of Cell 1 (SE ¼, Section 15). Calcium chloride is occasionally used as a chemical dust suppressant on the basin and haul-roads in the facility. Some coarse tailings are used for sanding on roads in the facility during the winter, and others are sold as aggregate product.

The various basin cells are separated by dams, each constructed of a single berm of coarse tailings placed by truck and various pieces of auxiliary equipment. Most of the perimeter dam for the tailings basin was constructed by spigotting a fine tailings slurry into the core between parallel inner and outer coarse tailings dams; that part of the perimeter dam on the southwest side of the basin was constructed in the same manner as the interior basin dams. The coarse tailings dams were constructed by truck in ten foot lifts. The perimeter dam spigot lines are located on the dry side (outer) of the core; this created a surface slope from the dry side down to the wet (inner) side, thus causing the water from the slurry to pond on the wet side of the core and seep through the wet side dam to the retained water within the disposal facility. Peat was removed from the original ground area to be occupied by the perimeter dam, and a ten-foot-deep key-way was dug in the glacial drift prior to spigotting fine tailings into the core portion of this area.

A demolition debris landfill (Solid Waste Permit SW-240) is located on the southeast corner of Cell A-2, but was closed per MPCA guidelines in 2013. The abandoned Minntac dump site (Agency Landfill Inventory Number SL-183) is located in the southwest corner of Cell 1 (SW ¼, SE ¼, Section 21 and NW ¼, NE ¼, Section 28). Paper, lunch wastes, wood scraps, scrap metal, mill grease, and waste oil were disposed of at this dump during its period of operation.

A minor permit modification was done in 2010 to allow for the construction of a Seep Collection and Return System (SCRS) as evaluated through a Schedule of compliance originally entered into by the Company and the MPCA on November 14, 2007, and as amended by Amendment No. 1 on February 25, 2010.A domestic wastewater treatment plant (WWTP) for the facility was previously covered under SDS permit number MN0050504, but will be incorporated into this permit. The plant consists of a lift station which discharges to bar screens followed by an activated sludge package plant. The package plant is an extended aeration Infilco Accelo-BIOX Type "C" Plant. It provides continual aeration, mixing, recirculation, settling, and clarification within a single circular unit. Raw domestic wastewater is introduced at the bottom, outer zone of the unit; aeration and mixing is provided by a sparge ring at the bottom of this outer zone. Mixed liquor from the outer zone overflows into an inner cone that provides settling; the settling sludge is returned by gravity to the outer zone as return activated sludge (RAS). A cylindrical clarification zone within the inner cone then discharges through a peripheral launder. The effluent is disinfected using sodium hypochlorite prior to routing from the system to the tailings basin. Monitoring of the effluent to the basin will occur at WS008. Waste activated sludge is periodically pumped directly from the outer zone as needed and transported to the Mt. Iron WWTP. The Minntac WWTP was designed for an average flow of 0.06 million gallons per day (MGD) and a maximum flow of 0.09 (MGD). The WWTP is a Class C facility.

Stormwater

Facilities that discharge stormwater associated with industrial activity as defined at 40 CFR § 122.26(b)(14) are required to either apply for an NPDES stormwater permit or include in their permit application information pertaining to stormwater sufficient to allow the permitting authority to include stormwater requirements in the facility's NPDES/SDS permit.

Stormwater permits typically require the Permittee to monitor for benchmark parameters, develop a stormwater pollution prevention plan that contains descriptions of the measures and controls the Permittee will implement, and to perform monitoring and inspection.

Stormwater effluent limitations can be numeric or in the form of best management practices, which are control measures used by the Permittee to eliminate or reduce the exposure of pollutants to rain, snow, snowmelt, and the runoff generated from these events. A stormwater pollution prevention plan typically requires the organization of a pollutant prevention team, development of a site map, including the location of potential pollutant sources and drainage patterns, and the description of the measures used to limit the exposure of pollutants to stormwater or to treat polluted stormwater prior to discharging it to local waterways.

The Permittee will manage stormwater by utilizing best management practices and a pollution prevention plan. In addition, the Permittee has stated that flow on the southwest corner of the basin that was previously attributed to basin seepage (seep C) is instead, stormwater runoff from stockpiles to the south of this area. A discharge point (SD005) has been added to the permit to monitor stormwater in this area.

Site Geology and Hydrology

Geology at the site consists of a thin layer of heterogeneous glacial outwash sediments comprised of variably interbedded and intergraded silty sands, gravels and thin clay units with occasional cobbles and boulders. The glacial deposits range in thickness from 0 to 100 feet, although most of the area has 10 to 20 feet. The sediments are overlain by a thin layer of organic rich soils, including peat deposits in the lowest-lying areas. The glacial sediments are generally thinnest at the southern part of the site along the Laurentian Divide and deepen to the north. The underlying bedrock is granitic and is not known to serve as an aquifer in the area. The bedrock surface is irregular and generally mimics the surface topography in that local highlands are underlain by elevated bedrock knobs and wetlands and surface water features are generally situated over bedrock depressions.

The tailings basin also straddles a north-south trending watershed divide and has buried the headwaters of the major streams in those watersheds, the Dark River to the west and the Sand River to the east. The headwaters for both streams are now adjacent to the basin dam. Each stream is situated over a roughly U-shaped bedrock depression that is up to approximately 100 feet deep. The western half of the northern dam is also on the southern boundary of the Johnson Creek watershed which extends north from the tailings basin. There is no identifiable channelized surface flow leading away from the basin to surface water features in this watershed.

Given the position of the tailings basin on the edge of the Laurentian Divide, and the greatly elevated hydraulic head (30+ feet) that has been created within it, the general groundwater flow is away from the basin, primarily to the east and west, and to a lesser degree to the north. After more than 40 years of operation, essentially all groundwater in the surficial aquifer beneath the basin is likely to be tailings-impacted. Due to the extreme head gradient (water table slope) across the dams (~0.05), and the relatively shallow gradient in the surrounding wetlands (~0.001 to 0.003), considerable emergent flow at and near the base of the dams is expected, and has been observed. This is supported by monitoring and modeling results in the vicinity of monitoring well GW012 which show the presence of an upwards vertical gradient near the basin that diminishes with distance from the basin. Emergent groundwater seepage at the toe of the basin dam flows into the Dark River and Sand River. It has been permitted under the existing permit at compliance/monitoring locations SD001 and SD002, respectively. These sites measure flows from specific seepage points along the basin.

Average flows over the past decade have been approximately 0.14 million gallons per day (MGD) at SD001 and 0.28 MGD at SD002 (prior to seep collection). Air photos and seepage surveys by U.S. Steel indicate that there are other areas of shallow seepage that do not report to the monitoring stations. Projects to collect seepage have been completed on the east side of the basin. The permittee is in the final stages of wetlands permitting for a similar system on the west side to collect seepage along the Dark River.

In 2010, the permittee installed a seep collection and return system (SCRS) along roughly 1 ¾ miles of the east side of

the basin including SD002. The SCRS system consists of catch basins located in each of the 13 identified seepage locations, hydraulically connected by subsurface high-density polyethylene piping to pump stations. Each of the seepage areas has been shaped and graded to promote seepage flow to the catch basins. Sheet pile cut-off walls were installed downgradient of each catch basin, connecting areas of higher elevation on either side of each discrete seepage location, to a depth of approximately 15 feet below existing ground level to ensure that surrounding wetlands are minimally impacted. The SCRS system consists of two subsystems, one collecting seepage from the northern section and the other from the southern section. Each subsystem terminates in a pump station consisting of a concrete vault containing a duplex pump system capable of returning the collected seepage back to the tailings basin. This system collected an average of 0.78 MGD in October of 2010. The system captures 0.5 MGD more flow than the Permittee previously reported for SD002, as this was only one of several known seeps in this area. Construction of a similar system on the west and northwest sides of the basin is required under the June 9, 2011, SOC and is incorporated into this permit. The Dark River SCRS design is currently being revised to minimize wetland impacts and it is anticipated to be installed and operational during the term of this permit.

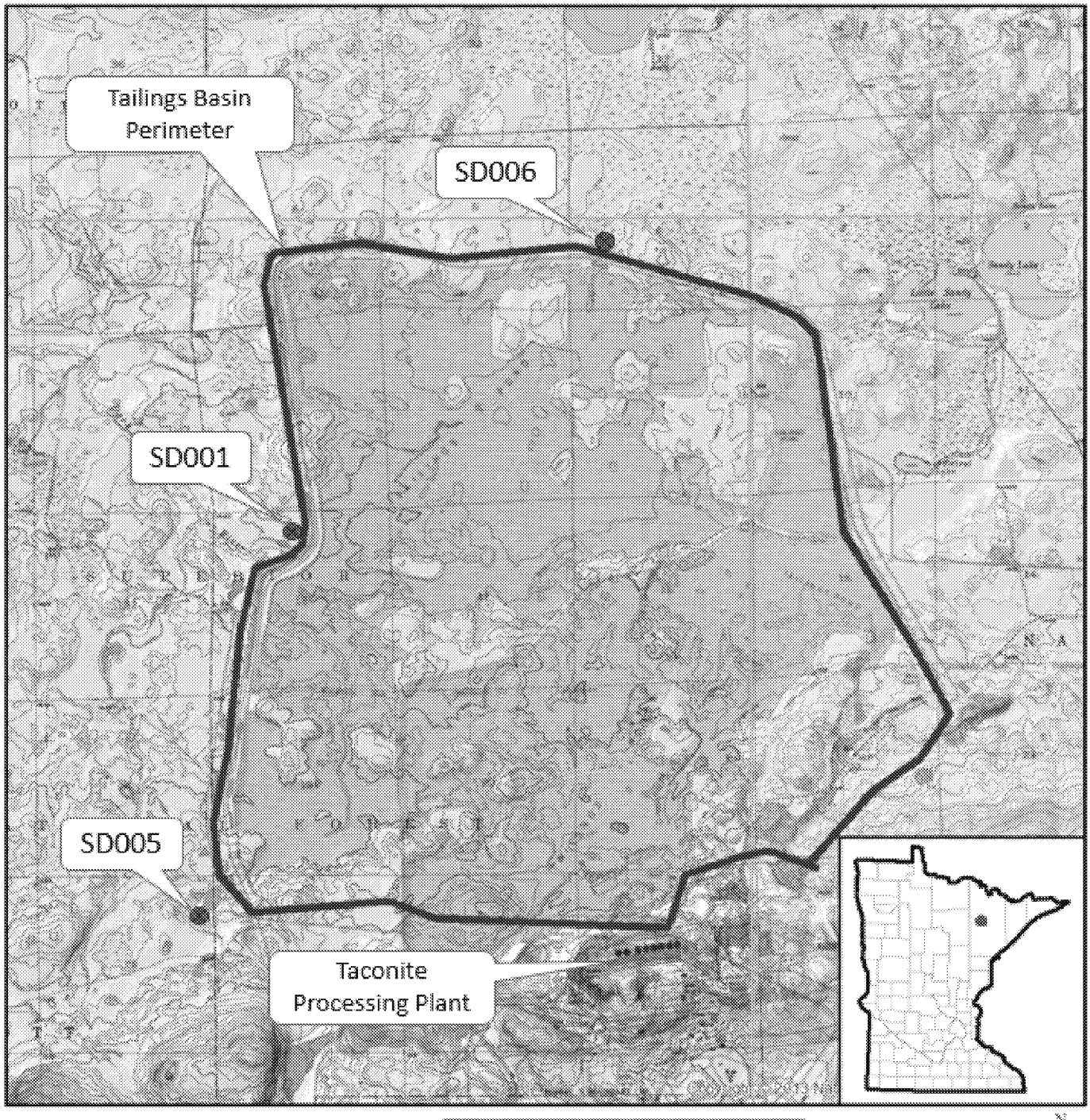
NPDES Outfall Monitoring Station Legal Description

SD001 (formerly SD020) on the west toe in the SE ¼, NE ¼, NW ¼, Section 18, is the only monitored outfall subject to compliance with NPDES guidelines under the CWA in this joint NPDES/SDS permit. Monitoring has been conducted at the SD001 sampling station due to its position at the headwaters of the Dark River, and because it is thought to be representative of the multiple dam seeps existing on the west and northwest perimeter of the tailings basin.

Figure 1 - Map of permitted facility

Topographic Map of Permitted Facility

MN0057207: U.S. Steel Minntac Tailings Basin
T59N, R18W, Sections 3-10, 14-23, and 27-30
Mt. Iron, St. Louis County, Minnesota

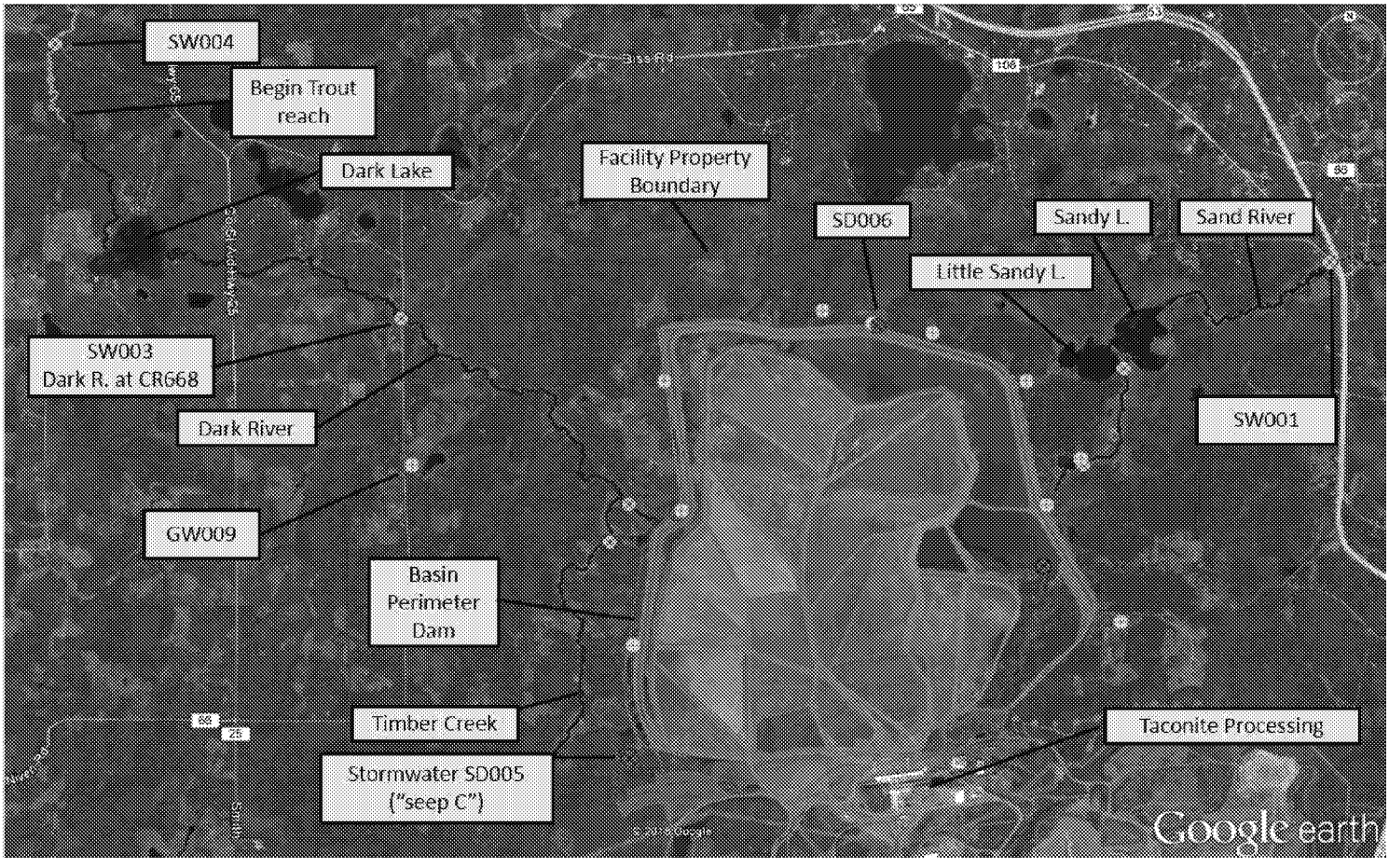


Map produced by: MPCA Staff, 7/31/2018
Source: USGS Quad
Scale: 1:50,000

0 0.5 1 2Miles

N

Figure 2 – Minntac Tailings Basin aerial photo

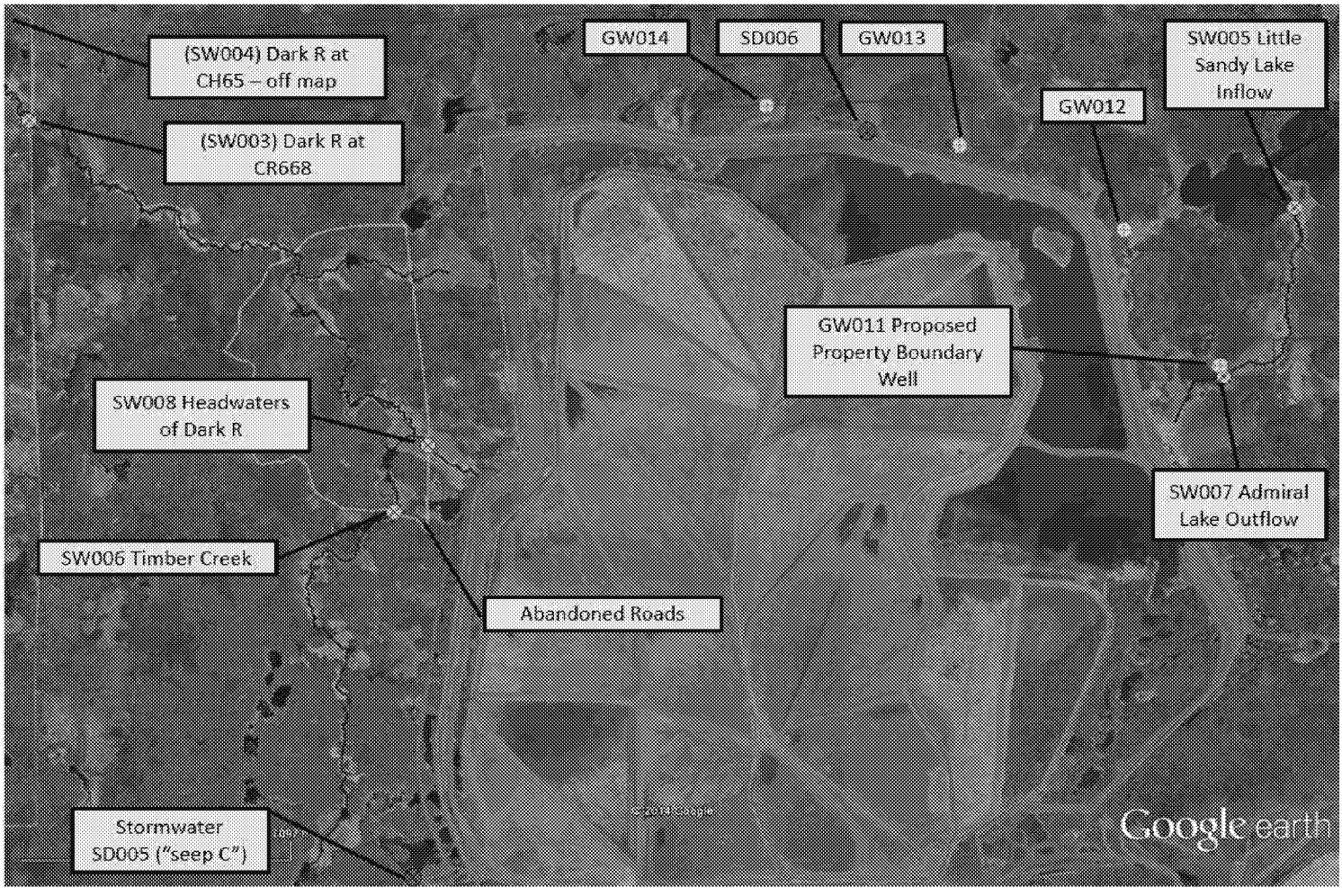


Surface Water Monitoring Locations

Under this permit, the Permittee will be required to establish sampling stations (described below) for monitoring of surface water quality in surface water downgradient of the tailings basin (consistent with Minn. R. 7050.0150, subp. 8).

Surface water monitoring for ultimate compliance with numeric water quality standards and narrative criteria is proposed in streams and lakes that are, or have the potential to be, affected by discharge(H) from the tailings basin. On the west side, this includes the Dark River and Timber Creek. On the east side this includes the Sand River which originates near the basin and passes through Admiral Lake, Little Sandy Lake, and Sandy Lake. To the north, there are no surface water features known or suspected of receiving discharge(H) from the basin. There is a lesser hydraulic gradient to the north than to either the east or west and monitoring has not shown any impact to Sand Lake from the basin. Sampling conducted there in 2010 and 2011 indicated an average sulfate concentration of 3.2 mg/L and specific conductance of approximately 100 uS/cm, which are in the anticipated range of background concentrations for these parameters in this region. Therefore, no monitoring of Sand Lake is proposed at this time.

Figure 3 – Monitoring locations new to this permit



Timber Creek (Class 2B, 3C, 4A, 4B, 5 and 6) originates on the north flank of the Laurentian Divide and flows to the north, generally parallel to the west side of the basin and at an average distance of about ½ mile from it. With a total length of about 4.4 miles, Timber Creek flows north into the Dark River approximately 2000 feet downstream from the Dark River's headwaters at the toe of the basin. There is no known flow or analytical information for Timber Creek. Air photo analysis shows the creek to be roughly 10 feet wide, where channelized. However, the stream passes through many shallow, flooded wetlands and would be difficult to follow on the ground. Compliance monitoring is proposed for Timber Creek because seeps on the southwest corner of the basin appear in air photos to be tributary to it, and it likely receives emergent groundwater that originated at the tailings basin as a portion of its baseflow. A surface water sampling station for compliance monitoring is proposed where the creek crosses an abandoned roadway, roughly one-half mile upstream from Timber Creek's confluence with the Dark River (Figure 3). This location was chosen because it would allow for assessment of impacts from possible groundwater and surface water contamination that could occur along almost the full length of the stream and because the abandoned roadway may provide a means of access from a basin perimeter road roughly one-third of a mile away.

The Dark River (Class 2B, 3C, 4A, 4B, 5, and 6) originates just outside of the tailings basin near current monitoring station SD001 and flows approximately 7.5 miles before entering Dark Lake (Class 2B, 3C, 4A, 4B, 5 and 6). It continues flowing north out of Dark Lake for 1.59 miles where its designation changes to a trout stream (Class 1B, 2A, 3B, 4A, 4B, 5, and 6) for the next 7.91 miles. After the trout stream reach, the river continues for 1.36 miles before entering the Sturgeon River, which flows north for 28.27 miles before entering the Little Fork River. Sampling has been conducted for a limited set of parameters at two downstream locations on the Dark River under the SOC. Sample location D-1 is where the Dark River crosses County Road 668 (~4 river miles from the basin) and location D-1a is where the river crosses County Road

65, which is within the trout stream reach (Class 1B, 2A, 3B, 4A, 4B, 5, and 6), roughly 1 ¼ miles downstream from where the designation starts. These locations are shown on Figure 2. Elevated concentrations of sulfate, total dissolved solids ,bicarbonate, hardness, and specific conductance have been observed at locations D-1 and D-1A, with periodic exceedances of applicable surface water standards for these pollutants (see Table 1). Information on biological assessments in the Dark River is included in the section on Receiving Waters later in this document.

Table 1 – Dark River monitoring results

Dark River at CR-668 (D-1)	Bicarbonate (HCO3 as CaCO3)	Total Dissolved Solids	Total Sulfate	Hardness (Ca + Mg, as CaCO3)	Specific Conductance
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(microSiemens/cm)
Relevant Standard	*250*	*700*		*N/A*	*1000*
Date of Measurement					
11/8/2011	**417**	**1658**	741	1220	NM
1/6/2012	**505**	**1950**	909	1430	**2367**
6/5/2012	209	**749**	298	555	988
9/19/2012	**463**	**1600**	763	1320	**2164**
11/27/2012	**432**	**1650**	750	1200	**2103**
1/10/2013	**682**	**1880**	920	1550	**2422**
5/17/2013	244	**744**	335	590	**1091**
9/12/2013	**476**	**1620**	689	1100	**2026**
11/25/2013	**479**	**1610**	767	1220	**2137**
1/24/2014	**547**	**1920**	814	1420	**2424**
5/23/2014	187	548	238	430	826
Dark River at CH65 (D-1A)	**Bicarbonate (HCO3 as CaCO3)**	**Total Dissolved Solids**	**Total Sulfate**	**Hardness (Ca + Mg, as CaCO3)**	**Specific Conductance**
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(microSiemens/cm)
Relevant Standard	*250*	*500*	*250*	*250*	*1000*
Date of Measurement					
11/8/2011	**288**	**986**	**426**	**764**	NM
1/6/2012	**308**	**1040**	**489**	**788**	**1412**
6/5/2012	119	460	167	**311**	587
9/19/2012	206	**576**	244	**496**	877
11/27/2012	**252**	**829**	**361**	**636**	**1161**
1/10/2013	**251**	**796**	**399**	**702**	**1178**
5/17/2013	126	416	164	**306**	602
9/12/2013	208	**605**	236	**437**	823
11/25/2013	**287**	**865**	**392**	**678**	**1239**
1/24/2014	**312**	**920**	**390**	**710**	**1319**
5/23/2014	101	348	125	236	488
NM indicates parameter not measured					
Bold values indicates exceedance of standard					

Monitoring results and the configuration of the local water table indicate that pollutants enter the Dark River from the tailings basin via surface flow, which originates at seeps such as SD001, and groundwater flow that enters the Dark River as baseflow both near the basin and at unknown distances downgradient from the basin. The SCRS along the western basin margin is designed to capture the current surface flow from SD001 as well as shallow groundwater flow. This will likely result in a change in the observable location of the headwaters of the Dark River, as well as a significant decrease in concentrations of parameters in this area, particularly during times of high meteoric water input (i.e., snow melt). Due to this, the possibility exists that under some hydrologic conditions, downstream tailings-impacted baseflow contributions could cause an increase in the concentrations of some parameters from what is observed at the headwaters. To assess this, and to ensure that the Permittee does not cause or contribute to an excursion above water quality standards, the permit proposes monitoring for compliance in the Dark River at two locations: a headwaters location and a downstream location where it is likely that most or all of the tailings-impacted baseflow has emerged (Figure 2). The proposed headwaters location is just upstream from where Timber Creek joins the Dark River. MPCA selected this location because it should still have measureable flow after the SCRS is operational due to its distance from the basin. The exact location of both the Timber Creek and Dark River headwaters sampling stations will be determined by field conditions.

Insufficient information exists regarding the groundwater flow patterns and groundwater-surface water interactions along the Dark River to know at what point the river has ceased receiving tailings-impacted baseflow. Determining this would likely require a significant study in terms of time and expenditure. The existing SOC sampling point D-1 at the County Road 668 (CR668) crossing is 4.4 river miles downstream from its origin at the basin and 2.3 miles linearly distant from the nearest portion of the basin. It is very likely that this location is far enough from the basin that there is not any significant loading to the river downstream of this point, and it is the first downstream point on the river that has existing maintained access. For these reasons, the permit lists this location (CR668 crossing) as a downstream sampling point on the Dark River (SW003). Compliance monitoring requirements are also required in the draft permit at the CH-65 crossing location (SW004) to ensure and evaluate compliance with water quality standards unique to the downstream portion of the Dark River designated as a trout stream.

The Sand River (Class 2B, 3C, 4A, 4B, 5, and 6) originates just outside of the tailings basin near former monitoring station SD-002 and flows approximately 1/4 mile before entering Admiral Lake. It exits the east side of the lake and flows roughly 1 ¼ miles to Little Sandy Lake, which flows directly into Sandy Lake through an opening approximately 60 feet wide in a peninsula that otherwise separates the two lakes. The lakes are also known as the Twin Lakes (Class 2B, 3C, 4A, 4B, 5, and 6). The river exits the east end of Sandy Lake and flows east 11.84 miles where it joins the Pike River. Under the existing permit, monitoring was done for sulfate and flow at SW001 which is where the Sand River crosses Highway 53, approximately 2 ½ miles downstream from Sandy Lake (Figure 2). Additionally, under an agreement between the Bois Forte Band of Chippewa and U.S. Steel, monitoring has been conducted since 2010 by the 1854 Treaty Authority at four locations: the inlet to Little Sandy Lake, the middle of Little Sandy Lake, the middle of Sandy Lake, and the outlet of Sandy Lake, identified as Twin 1, 2, 3, and 4, respectively. Monitoring at these locations as well as SW001 has shown elevated concentrations of sulfate, total dissolved solids, bicarbonate, and specific conductance with some concentrations exceeding applicable water quality standards. Not all parameters for which there are applicable water quality standards have been monitored. Information on biological assessments in the Sand River is included in the section on Receiving Waters later in this document.

Like the monitoring proposed for the Dark River and for similar hydrologic reasons, compliance monitoring is proposed along the Sand River and its associated lakes at a headwaters location and a downstream location. With operation of the SCRS on the east side of the tailings basin, there is no longer any observable flow at SD002. The segment of the Sand River between the basin and Admiral Lake is poorly channelized and hard to discern. For this reason the "headwaters" sampling station is proposed to be where the Sand River exits Admiral Lake on its east side. There is no known monitoring data for Admiral Lake, and a compliance point at the lake's outlet would be representative of the water quality in the lake resulting from both stream inflow and groundwater contributions and would possibly also allow for flow monitoring if a definable channel is present or can be established, although this is not a requirement under the current permit.. Coupled with chemical analysis, flow monitoring will allow for calculation of pollutant mass flux. This could be used to determine where contaminant mass may be entering the river system as part of the Hydrologic Investigation Work Plan.

Sampling conducted by the 1854 Treaty Authority from 2010 through 2012 showed that concentrations of water quality parameters impacted by the tailings basin are greatest at the upstream Twin 1 location and decrease at each successive downstream sampling location. Therefore, the most representative "downstream" sampling location on the Sand River is proposed to be at the inflow of the river to Little Sandy Lake, at the general location of the current Twin 1 sampling point.

Sampling at SW001 will continue under this permit so that the gross pollutant loading to the Sand River can be monitored and compared to a significant period of record to assess the ongoing impact of the tailings basin, the

effectiveness of mitigation efforts, and determine whether limits are needed to protect surface water along this portion of the Sand River.

Groundwater Monitoring Locations
Minn. R. 7060.0600, subp.6, requires all persons operating a disposal system to monitor the affected underground waters at the direction of the agency. Under this permit, the Permittee will be required to monitor groundwater quality downgradient of the tailings basin at existing and proposed monitoring wells. Where the tailings basin is causing or contributing to exceedance of groundwater quality standards at the property boundary, final compliance limits are established in this permit.

The Permittee currently conducts monitoring at ten monitoring wells, installed to depths ranging from 14.5 to 34.8 feet below the ground surface around the basin. Wells GW003, GW004, GW006, GW007, and GW008 are located roughly adjacent to the outer basin dam and all show significantly elevated pollutant concentrations. Well GW009 is about 2 ¼ miles west of the basin and does not appear to be impacted by pollutants from the basin. GW010 is located roughly 1200 feet east of the southeast corner of the basin and appears to be upgradient to cross-gradient, but monitoring results are variable and may reflect impact from overall facility operations, although not necessarily the basin. Monitoring at these wells will continue under this permit to assess ongoing impacts to groundwater; however, because they are all distant from the property boundary, limits will not be established. Wells GW012, GW013, and GW014 are located along the property boundary; therefore, compliance limits are established at these wells. Monitoring at wells, GW009 and GW010 will be required once annually in October as previous monitoring at these wells has shown limited impact from the tailings basin. The permit will require the Permittee to install an additional groundwater monitoring location (GW011) near the property boundary in the vicinity of Admiral Lake. A well nest, consisting of shallow (water table or uppermost mineral soil), intermediate and deep wells, is to be installed to monitor groundwater flow in the bedrock valley which roughly underlies the Sand River. Following installation, the permittee will be required to conduct three rounds of sampling of the intermediate and deep depth wells, the one with the highest concentration of sulfate will receive the GW011 designation and be used as the compliance monitoring location.

Tailings Basin Process Water Monitoring and Limits
Monitoring of the concentration of sulfate (as the pollutant of greatest concern and as a preliminary indicator for other dissolved solids) in the active tailings basin pond will be required in the permit to assess compliance with a final limit of 357 mg/L within 10 years from permit issuance. One goal of the investigation into the sources and flowpaths of contaminants from the basin is to determine a basin sulfate concentration that would lead to compliance with all applicable surface water and groundwater quality standards during operation and closure. If this concentration should differ from the 357 mg/L limit and PCA agrees with this finding, then the permit will be modified to reflect that change.

Components and Treatment Technology
Current Information
The facility uses a wastewater treatment system for the blowdown from the Agglomerator Line wet scrubber. The wastewater treatment system includes: a scrubber water recirculation tank, an equalization/precipitation tank, lime slurry make-up and feed system, 1st stage thickener, polymer make-up and feed system, scrubber solids settling/storage pond, and all related piping and equipment.

Scrubber blowdown water from the recirculation tank is sent to the equalization/precipitation tank at an average rate of 50 gallons per minute (gpm). Lime is added to the equalization/precipitation tank to increase calcium concentrations and promote calcium sulfate (gypsum) precipitation. Settling of the precipitated solids occurs in the 1st StageThickener.

Polymer may be added to the 1st Stage Thickener to enhance solids settling. The solids are sent to a 25 acre-foot, composite lined settling/storage pond located on-site for the dewatering, and possible ultimate disposal, of the solids generated from the treatment system. The overflow from the 1st Stage Thickener is sent to either the Concentrate Thickener or Slurry Mix Tank. Available alkalinity in the concentrate slurry converts from bicarbonate to carbonate and allows calcium carbonate precipitation. The calcium carbonate precipitate is then removed in the disc filters along with the concentrate and made into pellets. The filtrate from the disc filters is then used as process water and eventually sent to the tailings basin. The treatment system is specifically designed to achieve a "no net increase" in mass loading of sulfate and calcium to the tailings basin. Fluoride removal also occurs due to the reactive nature of fluoride with excess calcium.

Changes to Facility or Operation

Make-up Water

The operation currently imports approximately 4.64 MGD of water from the Mt. Iron pit at the mining area to make up for losses that occur during taconite processing and recirculation of the water through the tailings basin ponds. Under Part 7.ppp of the June 9, 2011, SOC, the MPCA identified the use of alternate make up water with a lower sulfate concentration than Mt. Iron pit water as a means to mitigate the increased loading of sulfate to the basin water, and required a study to evaluate alternative water sources. To fulfill this requirement, the permittee identified Sump 6 at the mining area as a suitable source, a pipeline was constructed, and the permittee began to utilize a minimum of 2000 gpm (monthly average) of Sump 6 water on January 26, 2015.

To enable possible further reductions in loading of sulfate and hardness to the basin, this permit authorizes the Permittee to manage its intake water supply source(s), without modification to this permit, when the following conditions are met:

1. The proposed water source is of an equivalent or better water quality, with respect to concentrations of total sulfate, hardness (Ca + Mg), total dissolved solids and bicarbonate, than the water source (sole or composite) being utilized at the time of the requested change, and of any Mt. Iron pit or Sump 6 water source that may be available but is not being utilized at that time.
2. The appropriation has received an applicable permit from the Department of Natural Resources (DNR), if required.
3. The appropriation has received other applicable permits (401/404 permits), if required.
4. Utilization of the water source complies with all applicable dam safety regulations.
5. The appropriation has completed the environmental review process, if required.
6. The water has been analyzed in accordance with the guidelines described in Total Facility – General Requirements - Sampling subsection of the permit for the following primary parameters: alkalinity (bicarbonate as CaCO3), total sulfate, hardness (Ca+Mg as CaCO3), total dissolved solids; and secondary parameters: aluminum (total), ammonia, antimony (total), arsenic (total), barium (total), boron (total), cadmium, chloride, cobalt, (total), copper, fluoride, iron (total), lead, manganese (total), mercury, molybdenum, pH, phosphorous, salinity, selenium, silver, sodium, specific conductance, strontium, total dissolved solids, temperature, thallium, turbidity, TSS, and zinc; and,
7. If concentrations of any secondary parameters identified in subheading 6 in the proposed source water exceed that of the existing make up water, U.S. Steel must submit documentation for MPCA approval that utilization of the water source is not likely to cause or contribute to exceedances of applicable water quality standards in waters of the State downgradient and downstream of the Facility.

Recent Compliance History

The most recent compliance inspection occurred on September 25, 2018. Identified concerns and corrective actions are summarized below.

Inspection Summary

A Compliance Evaluation Inspection was conducted on September 25, 2018, by John Thomas of the Minnesota Pollution Control Agency (MPCA) to determine the facility's compliance with the terms and conditions of its National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit. The following is a summary of the findings and comments resulting from that inspection. The facility was previously inspected by MPCA for NPDES/SDS permit compliance on November 15, 2011. This inspection reviews compliance for the period October 2011 – July 2018.

Areas of concern or general comments:
During the inspection SD001 was viewed as well as the pilot scale treatment area located around monitoring well MW12. The entire perimeter of the tailings basin was driven and the Sandy River seep collection and return system was inspected. The lime solids basin associated with the line 3 scrubber wastewater treatment system was also viewed though the treatment system itself was not.

Sampling methods/lab certification
With the exception of flow monitoring at SW001, all monitoring is conducted by Permittee staff (union employees).

Groundwater monitoring:

- samples that are collected are conveyed that same day, by iced cooler, to Pace Environmental Laboratory located in Virginia, Minnesota, a Minnesota Department of Health certified laboratory.
- pH is measure with a YSI G3 meter which is calibrated prior to each day's use using pH buffers 7 & 9. This meter is used for other monitoring stations for pH measurement.
- specific conductance is also measured with a YSI G3 meter which was calibrated once with a standard since its last factory calibration, which was September 2017. This meter is used at other monitoring stations for conductivity measurement.

SD001:

- flow is measured with a "V" notch weir. During the inspection the weir appeared to be in good working condition, with adequate downstream drop to ensure accuracy.
- pH and conductivity are measured with the same meters used for groundwater monitoring with the same calibration schedule.

SW001 (Sandy River)
Flow (instantaneous) is measured with a velocity meter at a gauging station transecting the stream. Flow is monitored by Northeast Technical Service employees.

WS002 (Plant water line to Line 3 scrubber)
Flow (continuous measurement) is measured with an in-line flow (mag) meter.

WS003 (1st stage thickener overflow)
pH is measured with the same meter used for groundwater monitoring and is calibrated on the same schedule.

WS004, WS005 (Concentrate slurry/Step 1 reclaim thickener influent, respectively)
pH is measured with the same meter used for groundwater monitoring and is calibrated on the same schedule. Samples that are taken for laboratory analysis are transported in an iced cooler by facility personnel to Pace Environmental laboratory located in Virginia, MN, a Minnesota Department of Health Certified Laboratory.

DMRs/sample values/annual reports

- During the period of review there were no reported effluent limit violations.

- Late DMR submittals – during the period of review the DMRs for WS006 and WS007 for the December 2013 monitoring period (due January 21, 2014) were received May 16, 2014 – 115 days late. See Violation section.

Sample Values reporting as a new reporting requirement began January 2015. As of that date, MPCA required reporting of all values that are obtained for purposes of completing DMRs. Sample value reporting is not required for WS005, WS006 and WS007. For all other monitoring stations, in general, sample values have not been reported. See Violations section, below.

Enforcement actions over the review period

- An Administrative Penalty Order was issued to the Permittee on March 1, 2016 for violations associated with a discharge at SD002 during June 2015. The enforcement action was closed May 5, 2016.

- A Schedule of Compliance (Agreement) was executed between MPCA and the Permittee on June 9, 2011. The Agreement contained the following key requirements:

    1. Selection and implementation of a Water Management Alternative to offset the net increase of total sulfate and hardness to the tailings basin from operation of the Line 3 scrubber blowdown treatment system. On January 26, 2015, the Permittee switched its makeup water source from the Mt. Iron Pit to Sump #6, which contains lower concentrations of sulfate and hardness.

    2. Installation of monitoring wells at the property boundary. Monitoring wells have been installed and monitoring results are reported on monthly DMRs.

    3. Installation of a Dark River Seep Collection and Return System. This requirement has not been completed. Compliance with this enforcement document requirement is maintained separately from this CEI report.

    4. Replacement of pellet furnace air emission control wet scrubbers with dry controls. This requirement has not been completed. Compliance with this enforcement document requirement is maintained separately from this CEI report.

- Amendment Number 1 to the June 9, 2011, Agreement was executed between the MPCA and the Permittee on February 12, 2013. The Amendment required implementation of a Groundwater Sulfate Reduction Plan (GWSRP) to address elevated groundwater sulfate concentrations at monitoring well MW12. MW12 was installed as required by the Agreement. Measures to further reduce tailings basin sulfate concentrations beyond what the Agreement already required or to reduce the sulfate concentration in groundwater before it migrates beyond the Facility's current property boundary were to be identified.

On February 25, 2014, MPCA approved a Revised GWSRP that had been submitted by the Permittee on January 31, 2014. The Revised GWSRP identified attainment of a total sulfate concentration at the property line in proximity to MW12 in 2025.

On March 26, 2015, the Permittee submitted an Addendum #1 (Addendum) to the Revised GWSRP. The Addendum was submitted to address exceedances of the 250 mg/l groundwater sulfate standard at MW13 which is a second monitoring well that was required to be installed as part of the Schedule of Compliance. By letter dated April 3, 2015, MPCA rejected the Addendum.

The most recent 6-month update provided by the Permittee, as required by the Revised GWSRP indicates the Permittee is implementing a Permeable Reactive Barrier (PRB) using zero valent iron (ZVI) and/or additional organic

substrates, as a means to reach compliance with groundwater standards at the property boundary in proximity to MW12. The pilot test consists of one large-diameter (6 foot) boring and seven small-diameter (8-inch) borings filled with ZVI and sand. Nested monitoring wells were installed downgradient of the large and small diameter borings and one monitoring well was installed in the center of the large diameter boring. After approximately a year and a half of performance monitoring, sulfate reduction trends have moderated or have reversed. Based on bench scale testing of a carbon injection system, the Permittee has determined to implement carbon injection in the pilot test and received MPCA approval on July 12, 2017. Two 4-inch diameter injection wells were drilled during July 2018, and carbon injection was conducted at one well at a time, beginning in August 2018. Only one injection per well is currently planned. Per MPCA's July 12, 2017, letter, low level mercury and methyl mercury monitoring were added to the analytical suite collected from the monitoring well cluster located downgradient from the carbon injection wells. A Revised GWSRP dated June 2018 was submitted with the June 2018 6-month update. The schedule for achievement of the groundwater sulfate standard in proximity to MW12 remained unchanged in the June 2018 update of the Revised GWSRP. Compliance with this enforcement document requirement is maintained separately from this CEI report. The pilot testing site at MW12 was visited as part of the inspection.

Monitoring at MW-12 and MW-13 is required by the SOC. The following table indicates total sulfate monitoring results at these two wells since installation and monitoring began at MW-13:

Month/Year	**MW-12 (mg/l)**	**MW-13 (mg/l)**
May 2014	370	297
July 2014	429	308
October 2014	435	308
April 2015	239	265
July 2015	417	285
October 2015	433	311
May 2016	357	311
July 2016	471	394
October 2016	461	293
April 2017	293	276
July 2017	406	316
October 2017	469	306
May 2018	320	282
July 2018	376	306

Compliance schedule progress – Chapter 2 of the current permit contains special requirements per the June 9, 2011 Schedule of Compliance between the Permittee and MPCA. The yet-to-be completed requirement is installation of a seep collection and return system for the Dark River watershed. Chapter 2 Part 4.4 requires submittal of plans and specifications for the system by May 10, 2012.

Chapter 2 Part 4.5 requires the permittee to submit a notice of completion of construction of the Dark River Seepage Collection and Return System. The Permittee has not yet initiated construction of the system, pending all necessary permit issuances and approvals.

Annual Pollution Control Report (Annual Report) required by Chapter 6 Part 1.3 of the Permit requires submittal by February 14 each year. Annual Reports for the past three years were reviewed and were received in a timely manner.

The Annual Report for 2017 (Received February 9, 2018) indicated chemical usage that appeared to be above MPCA approved usage quantities for the following chemicals:

Acute Whole Effluent Toxicity (WET) testing required by the Permit is described in the Limits and Monitoring Requirements (page 12 of the Permit) as well as Chapter 4 of the Permit. Limits and Monitoring Requirements indicates that Acute WET testing shall be completed at SW002 (McNiven Creek) twice/year and shall be completed at WS006/WS007 (fine tailings slurry) once/year. The "notes" column of the Limits and Monitoring Requirements Acute WET testing for these stations refers to Chapter 4 of the Permit for details. Chapter 4 requires that Acute WET testing with fathead minnows be conducted at least twice/year at either WS006 or WS007, depending upon which station fine tailings are being discharged to at the time of monitoring and that the control water used for Acute WET testing be taken from SW002.

The Permittee has been monitoring for Acute WET at WS006/WS007 twice/year using water from SW002 as control water, which meets the requirements of Chapter 4. Since the Permittee is complying with the more restrictive (twice/year monitoring vs. once/year monitoring) of the conflicting permit requirements, MPCA considers the Permittee in compliance with the frequency of Acute WET testing required by the Permit

Chapter 4 Part 3.7 (5) indicates that submittal of toxicity testing results shall include the date of sample collection, date of the toxicity tests, enumeration of mortality in samples, and the raw date used in making the calculations. The Permit does not indicate where and when results are to be sent. A review of monitoring results received from the Permittee indicates that not all of the required information has been submitted and results for many tests have not been received.

Within 30-days of receipt of this CEI report, provide acute WET testing reports since 2015 and include a completed Acute Whole Effluent Toxicity Test Report form with each report (see attached form). Reports and forms should be directed to the MPCA, Attn: WQ Submittal Center, 520 Lafayette Road North, St. Paul, Minnesota 55155-4194.

Sulfate and Hardness Mass Balance: Chapter 4 of the Permit requires the Permittee to calculate, on an annual basis, the mass of sulfate and hardness leaving the Line 3 scrubber system and requires that the mass of each be less than or equal to the mass entering the scrubber system. Submittal of an Annual Pollution Control Report by February 14 that includes a summary of the Line 3 scrubber wastewater treatment system monitoring activities and calculations of the preceding calendar year is required.

Each year this sulfate and hardness mass balance permit requirement has been violated. This violation was included in the 2011 Schedule of Compliance (SOC) described above. In response to requirements of the SOC the Permittee installed an alternate plant make-up water system that draws upon water that has reduced sulfate and hardness concentrations to offset the contributions of the Line 3 scrubber wastewater treatment system. Since activation of the alternate make-up water source, the Permittee has met compliance requirements of the SOC for this violation.

On January 26, 2015, as required by the 2011 Agreement, the Permittee completed the Sump #6 makeup water project. Lower sulfate and hardness concentration makeup water from Sump #6 replaces Mt. Iron Pit makeup water during non-freezing conditions (April – December). During 2017 the average sulfate and hardness concentrations within Sump #6 was 158 mg/l and 536 mg/l, respectively. During this same period the Mt. Iron pit water was 432 mg/l and 752 mg/l, respectively. During threat of freezing, the Mt. Iron pit is the makeup water source. The following is a summary of the annual mass calculations contained in the Annual Pollution Control Reports:

Operating Year	Sulfate Net Increase (lb/year)	Date of Sulfate Offset With Sump #6	Hardness Net Increase (lb/year)	Date of Hardness Offset With Sump #6
2011	81,094	NA	673,695	NA
2012	173,713	NA	352,737	NA
2013	146,910	NA	365,179	NA
2014	225,607	NA	336,689	NA
2015	223,400	Approx. Feb 26	302,990	March 1
2016	402,639	April 7	491,931	May 6
2017	337,282	May 17	366,815	May 18

Alleged violations/description of non-compliance table:

1. **NPDES/SDS Permit No. MN0057207 Chapter 2 Part 4.3**, states:

As required by the Schedule of Compliance issued on November 14, 2007 and as amended by Amendment No. 1 on February 25, 2010, U. S. Steel will implement a system of year-round collection and return of tailings basin surface seepage currently reporting to the Sandy River Watershed from the toe of Minntac's tailings basin perimeter dike.

The Permittee began operation of the Sandy River seep collection and return system in July 2010. During the inspection, surface seepage from the toe of the tailings basin perimeter dike was observed to be discharging through a hole in the sheet piling at one of the seepage collection areas to a wetland on the opposite side of the sheet piling from the tailings basin dike, in violation of the above permit requirement. The hole in the sheet piling was used for lifting the piling during installation of the piling.

2. **NPDES/SDS Permit No. MN0057207 Chapter 5 Part 4.5** states:

WS006: Submit an annual DMR annually by February 14 of each year following permit issuance

Late DMR submittals – during the period of review the DMRs for WS006 for the January – December 2013 monitoring period (due February 14, 2014) were received May 16, 2014 – 91 days late.

NPDES/SDS Permit No. MN0057207 Chapter 5 Part 4.6 states:

Late DMR submittals – during the period of review the DMRs for WS007 for the January - December 2013 monitoring period (due February 14, 2014) were received May 16, 2014 – 91 days late.

3. **NPDES/SDS Permit No. MN0057207 Chapter 7 Part 3.1** states:

The Permittee shall report monitoring results for the completed reporting period in the units specified by this permit on a Discharge Monitoring Report (DMR) from or other report form provided by the MPCA.

GW003, GW004, GW006 – GW010: since January 2015 sample value reporting for groundwater monitoring stations have not been received.

SD001, SW001, WS002 – WS004: since January 2015 sample value reports were (timely) submitted for the January 2015 monitoring period. Sample value reports have not been received for any other monitoring period during the period of review.

SD002: Since January 2015, no sample value reports have been submitted during the period of review. However, the only reporting period during which discharge occurred was June 2015, at which time submittal of sample value monitoring results associated with that monitoring period was required.

4. **NPDES/SDS Permit No. MN0057207 Chapter 7 Part 11.1** states:
The Permittee shall receive prior written approval from the MPCA before increasing the use of a chemical additive authorized by this permit, or using a chemical additive not authorized by this permit. "Chemical additive" includes processing reagents, water treatment products, cooling water additives, freeze conditioning agents, chemical dust suppressants, detergents and solvent cleaners used for equipment and maintenance cleaning, among other materials.

A review of the Annual Report for 2017, which included chemical usage for the year indicates several chemicals used in amounts greater than approved by the MPCA:

Reported Chemical	Reported Usage (lbs)	Approved Usage (lbs)	Ratio of Reported/Approved
CL-1469	14,099	12,551	1.12
CL-4074	16,844	16,268	1.03
CL-6030	12,600	12,000	1.05
CL-16	1,400	48	29.17

Corrective Action Section:

1. Within 30-days of receipt of this CEI report provide a written response indicating how discharge of surface seepage from within the drainage area of the Sandy River seepage collection and return system has been/will be prevented from discharging to the Sandy River watershed. The response must include a schedule for inspecting the system to ensure containment during non-frozen conditions.

2. Given the frequency of late DMR submittal, no corrective action response is required at this time.

3. Within 30-days of receipt of this CEI report provide a written response indicating how reporting of sample values shall be completed.

4. Subsequent to the inspection, the Permittee provided further information in response to the 2017 chemical usage report which indicated use of several chemicals in amounts greater than approved.

- The Permittee indicated that usage of CL-6030, CL-1469 and CL-4074 will be evaluated to determine if additional usage is needed (above the current approved amount). If it is determined that usage will exceed the current approved amount, the Permittee will apply for a new rate through the MPCA's Chemical Additives approval process.
- The Permittee indicated that, subsequent to the inspection the Permittee has received MPCA approval to increase the usage of CL-16 to 1,679 pounds/year, which is greater than the amount reported in 2017.

No further corrective action response is required at this time to address exceedances of approved chemical usage amounts.

Recent Monitoring History
A table (Table 7) with the monitoring results for 2015 is included at the end of this document.

Receiving Water(s)

Use Classification

For the SD001 outfall, the receiving water is the Dark River (Class 2B, 3C, 4A, 4B, 5, and 6, with additional 1B, 2A and 3B classification for the designated trout stream portion). These use classifications include aquatic life and recreation, industrial consumption, agriculture and wildlife, and aesthetic enjoyment and navigation, and other beneficial uses not specifically listed.

Use Classification Descriptions

Class 1 waters, domestic consumption.
Domestic consumption includes all waters of the state that are or may be used as a source of supply for drinking, culinary or food processing use, or other domestic purposes and for which quality control is or may be necessary to protect the public health, safety, or welfare.

Class 2 waters, aquatic life, and recreation.
Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes, and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats, or the public health, safety, or welfare.

Class 3 waters, industrial consumption.
Industrial consumption includes all waters of the state that are or may be used as a source of supply for industrial process or cooling water, or any other industrial or commercial purposes, and for which quality control is or may be necessary to protect the public health, safety, or welfare.

Class 4 waters, agriculture, and wildlife.
Agriculture and wildlife includes all waters of the state that are or may be used for any agricultural purposes, including stock watering and irrigation, or by waterfowl or other wildlife, and for which quality control is or may be necessary to protect terrestrial life and its habitat, or the public health, safety, or welfare.

Class 5 waters, aesthetic enjoyment, and navigation.
Aesthetic enjoyment and navigation includes all waters of the state that are or may be used for any form of water transportation or navigation or fire prevention, and for which quality control is or may be necessary to protect the public health, safety, or welfare.

Class 6 waters, other uses, and protection of border waters.
Other uses include all waters of the state that serve or may serve the uses in subparts 2 to 6, or any other beneficial uses not listed in this part, including, without limitation, any such uses in this or any other state, province, or nation of any waters flowing through or originating in this state, and for which quality control is or may be necessary for the declared purposes in this part, to conform with the requirements of the legally constituted state or national agencies having jurisdiction over such waters, or for any other considerations the MPCA may deem proper.

Impairments
The receiving water impairments downstream of the Minntac tailings basin are shown in Table 2 below.

Table 2 – Downstream receiving waters impairments

West Side Discharge (SD001/SD005)

Downstream Impairments	Number of Impairments	TMDL Status
Dark Lake	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Sturgeon River	**2**	
Mercury in Fish Tissue	2	See the WLA section below.
Little Fork River	**10**	
Mercury in Fish Tissue	7	See the WLA section below.
Turbidity	3	These impairments are located in the Little Fork River Watershed and are included in the Little Fork River Watershed TMDL, which EPA approved on May 9, 2018. A WLA is assigned to this facility. See the WLA section below.
Lake of the Woods	**2**	
Mercury in Fish Tissue	1	See the WLA section below.
Nutrients	1	This reach is located in the Lake of the Woods Watershed. The Lake of the Woods Watershed Monitoring and Assessment Report and the Stressor ID are complete; however, a TMDL has not been completed to address the impairment.
Grand Total	**15**	

East Side Discharge (SD002/SD004):

Downstream Impairments	Number of Impairments	TMDL Status
Pike River Flowage Lake	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Vermilion Lake	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Vermilion River	**3**	
Mercury in Fish Tissue	3	See the WLA section below.
Crane Lake	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Sand Point Lake	**2**	
Mercury in Fish Tissue	2	See the WLA section below.
Namakan Narrows	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Sand Point Lake	**1**	
Mercury in Fish Tissue	1	See the WLA section below.
Namakan Lake	**3**	
Mercury in Fish Tissue	3	See the WLA section below.

Rainy Lake	**2**	
Mercury in Fish Tissue	2	See the WLA section below.
Rainy River	**2**	
Mercury in Fish Tissue	2	See the WLA section below.
Lake of the Woods	**2**	
Mercury in Fish Tissue	1	See the WLA section below.
Nutrients	1	This reach is located in the Lake of the Woods Watershed. The Lake of the Woods Watershed Monitoring and Assessment Report and the Stressor ID are complete; however, a TMDL has not been completed to address the impairment.
Grand Total	**19**	

Wasteload Allocations:

Statewide Mercury TMDL - Mercury in Fish Tissue and Mercury in Water Column Impairments

- Mercury limits, monitoring, and MMP requirements in the permit should be in accordance with the Mercury Permit Writers Guidance.

Little Fork River Watershed TMDL,
Total Suspended Solids (TSS)

- TSS WLA = 36.4 kg/day (page 33, Table 9)
- The WLA is equivalent to the current permitted effluent TSS concentration limit of 30 mg/L.
- Conversion: 30 mg/L X 0.32 mgd X 3.785 = 36.3 kg/day

Biological Assessment

The Little Fork River Watershed Monitoring and Assessment Report published in September 2011 describes biological assessments undertaken on the Dark River in 2005 and 2008 for the MPCA's intensive watershed monitoring strategy. Assessments were conducted (in increasing distance from the basin) at CR668 (4.4 mi.), Hwy 25 (7 mi.), and CR688 (17.5 mi.). The Little Fork WMAR included the following discussion on the results:

> *For the Dark River, the two stations upstream of Dark Lake produced passing IBI [index of biotic integrity] scores for both fish and macroinvertebrates which coincided with high habitat scores. Station 08RN045 (Hwy 25) yielded an excellent [macroinvertebrate] IBI score of 86. The furthest downstream station on the Dark River, 99NF120 (CR688), is within a designated coldwater stream reach and thus was not assessed during the 2010 assessment cycle. The biological communities do look healthy, brook trout and high numbers of mottled sculpin were sampled during the earlier summer months, and will most likely show full support when assessment tools become available to assess coldwater streams.*

Limited field chemistry parameters were collected during each IBI assessment. Specific conductance at the CR668 location was 1083 and 1811 uS/cm during the June and August 2005 assessments, respectively. Those values are within the range of measurements from the past few years at this location (744 to 2424 uS/cm). These locations are slated to be reassessed in 2018 per the 10 year cycle of the watershed monitoring strategy.

Intensive watershed monitoring began in the Vermillion River watershed in 2015, including an assessment on the Sand River at CR303 which is roughly 11 miles downstream of the tailings basin. In July 2018, MPCA released the Vermilion River Watershed Monitoring and Assessment Report, which indicated a passing score for fish habitat (56.87 with a passing threshold being 42) at that location. Macroinvertebrate sampling was not conducted due to excessive water depth during the sampling event.

Existing Permit Effluent Limits

The existing NPDES/SDS Permit MN0057207 included technology based effluent limits for seepage discharges(NPDES) and monitoring without limits for surface water, groundwater and internal waste streams. A summary of monitored parameters is shown in Table 3 below.

Table 3 – Monitored parameters under existing permit

Parameter	Limit	Units	Limit Type	Effective Period	Frequency
GW003, 004, 006-010					
Amines		mg/L	Single Value	Apr, Jul, Oct	1 x month
Elevation of GW Relative to Mean Sea Level		ft.a.m.s.l.	Single Value	Apr, Jul, Oct	1 x month
Temperature		Deg C	Single Value	Apr, Jul, Oct	1 x month
pH		SU	Single Value	Apr, Jul, Oct	1 x month
Specific Conductance		umh/cm	Single Value	Apr, Jul, Oct	1 x month
Total Sulfate		mg/L	Single Value	Apr, Jul, Oct	1 x month
SD001 & SD002					
pH	6.0-9.0	SU	InstantMin / InstantMax	Jan-Dec	1 x month
Specific Conductance		umh/cm	CalMoMax	Jan-Dec	1 x month
Total Sulfate		mg/L	CalMoMax	Jan-Dec	1 x month
Flow		mgd	CalMoTot / CalMoAvg / Daily Max	Jan-Dec	2 x month
Oil & Grease	10 / 15	mg/L	CalMoAvg / Daily Max	Jan-Dec	2 x month
Total Susp. Solids	20 / 30	mg/L	CalMoAvg / Daily Max	Jan-Dec	2 x month
SW001					
Total Sulfate		mg/L	Single Value	Jan-Dec	1 x month
Flow		mgd	Single Value	Jan-Dec	1 x month
SW002					
Amines		mg/L	Single Value	Jan-Dec	2 x year
Toxicity, Whole Effluent (Acute)		TUa	Single Value	Jan-Dec	2 x year
WS002					
Calcium, Dissolved (as Ca)		mg/L	CalMoAvg	Jan-Dec	1 x week
Chloride, Total		mg/L	CalMoAvg	Jan-Dec	1 x week
Hardness, Ca & Mg, Calculated (as CaCO3)		mg/L	CalMoAvg	Jan-Dec	1 x week
Sulfate, Dissolved (as SO4)		ug/L	CalMoAvg	Jan-Dec	1 x week
Flow		mgd	CalMoAvg	Jan-Dec	1 x week
WS003					
Calcium, Dissolved (as Ca)		mg/L	CalMoAvg	Jan-Dec	1 x week
Chloride, Total		mg/L	CalMoAvg	Jan-Dec	1 x week
Fluoride, Total (as F)		mg/L	CalMoAvg	Jan-Dec	1 x month
Hardness, Ca & Mg, Calculated (as CaCO3)		mg/L	CalMoAvg	Jan-Dec	1 x week
pH		SU	CalMoMin	Jan-Dec	1 x week
Flow		mgd	CalMoAvg	Jan-Dec	1 x week
WS004					
pH		SU	CalMoMax	Jan-Dec	1 x week
WS005					
pH		SU	CalMoMax	Jan-Dec	1 x week
WS006 & WS007					
Amines		mg/L	Single Value	Jan-Dec	1 x year
Toxicity, Whole Effluent (Acute)		TUa	Single Value	Jan-Dec	1 x year
Evaporation, accumulated		in	CalMoTot	Jan-Dec	1 x month
Precipitation		in	CalMoTot	Jan-Dec	1 x month

Technology Based Effluent Limits (TBELs)
EPA has established TBELs for the mining industry. 40 CFR subp. A—Iron Ore Subcategory § 440.10. Federally required TBELs apply for pH (6.0-9.0 SU), TSS (30 mg/L daily max./20 mg/L mo. avg.), and dissolved iron (2.0 mg/L daily max./1.0 mg/L mo. avg.). TSS (60 mg/L daily max. / 30 mg/L mo. avg.) and pH compliance limits were instituted at SD001 and SD002.

Water Quality Based Effluent Limits (WQBELs)
There are no WQBELs in the existing permit.

Waste Stream Monitoring Stations
Stations WS002, WS003, WS004, and WS005 were added to the permit after a 2008 Stipulation Agreement to monitor for conditions related to the requirement that there be no net increase in calcium and sulfate loading to process wastewater due to the operation of the Line 3 Scrubber Blowdown System. Since these conditions have been satisfied by offsetting the loading by utilizing Sump 6 as a source of replacement water, this monitoring is no longer required, and these stations will not be included in a reissued permit.

Stations WS006 and WS007 were utilized to monitor for potential amine toxicity in the fine tailings wastestream to the basin. Since amine toxicity has not been an issue over decades of monitoring and because Whole Effluent Toxicity Testing will be conducted at the SD001 discharge station, monitoring at stations WS006 and WS007 will not be included in the reissued permit.

Proposed Permit Limits and Monitoring

Technology Based Effluent Limits
EPA regulations at 40 CFR § 440.10 establish TBELs for pH (6.0-9.0 SU), TSS (30 mg/L daily max. / 20 mg/L mo. avg.), and dissolved iron (2.0 mg/L daily max./1.0 mg/L mo. avg.). These values will be compliance limits at SD001 under this permit.

Water Quality Based Limits
Reasonable Potential for Chemical Specific Pollutants (40 CFR § 122.44 (d)(1))
Federal regulations require MPCA to evaluate the discharge to determine whether the discharge has the reasonable potential to cause or contribute to a violation of water quality standards. The MPCA must use acceptable technical procedures, accounting for variability (coefficient of variation [CV]), when determining whether the effluent causes, has the reasonable potential to cause, or contribute to an excursion of an applicable water quality standard. Projected Effluent Quality (PEQ) derived from effluent monitoring data is compared to Preliminary Effluent Limits (PELs) determined from mass balance inputs. Both determinations account for effluent variability. Where PEQ exceeds the PEL, there is reasonable potential to cause or contribute to a water quality standards excursion. When reasonable potential is indicated the permit must contain a WQBEL for that pollutant.

SD001 is the effluent monitoring station in this permit. There was sufficient DMR data to conduct reasonable potential analysis for specific conductance at this station. Specific Conductance was found to have reasonable potential to cause or contribute to a water quality standards excursion Table 4 shows the values used in the reasonable potential calculations.

The MPCA has revised the permit to remove final limits at this monitoring location because the permit prohibits discharge from SD001 after completion of the seepage collection and return system. Effluent limits are unnecessary and are not appropriate when there is no authorized discharge. Any discharge would violate the permit; any discharge causing pollution would also violate the prohibition against pollution in Minnesota Rule 7050.0210, subpart 13. Interim effluent limits are not being applied prior to the construction of the Dark River Seepage Collection and Return System since the Permittee has no control over the discharge at this location until mitigation is implemented.

Table 4 – SD001 reasonable potential analysis

Parameter	Units	Specific Conductance (mg/L)
Plant Flow	(mliters/d)	0.53
(ADW)	(mgd)	0.14
River $7Q_{10}$	(mliters/d)	0.00
(Class 2B)	(mgd)	0
River 7Q10	(cfs)	
Background Conc.		0.8
Continuous Std (cs)		1000
Maximum Std (ms)		
Final Acute Value		
Waste Ld Allocation:		
	WLAcs	1000
	WLAms	
Coeff of Variation (CV)		0.6
Variance		0.3075
Std. Dev.		0.5545
Duration (n days)		30
Long Term Ave.-LTA		
	u_4/u_{30}	6.65370692
	u	6.505921548
	LTAcs	780.29
	u_1	
	LTAms	
Use LTAcs < LTAms:		
WQBEL: Daily Max.	uS/cm	2430.1
	s^2_n	0.165523256
	s_n	0.406845494
	u_n	6.57690992
Mo.Av. (2x)		1403
Max Meas Effl Value	uS/cm	**3180**
# data points		166
PEQ factor		1
Proj Effl Qual.(PEQ)	uS/cm	**3180**
PEQ > Daily Max		TRUE
PEQ> Monthly Ave		TRUE
PEQ > FAV		NA
Reasonable Potential		Yes

Dark River – Trout Reach Concentration Analysis

The goal of this analysis is to determine whether projected surface water concentrations at the beginning of the Class 1B, 2A, 3B, 4A, 4B, 5, 6 reach of the Dark River (AUID 0903005-525) will meet water quality standards.

The Dark River begins near the Minntac tailing basin and flows westward. Flow in the initial reaches of the Dark River is dominated by the Minntac tailing basin drainage. The Dark River flows approximately 10 miles and through Dark Lake before it reaches the Class 1B, 2A, 3B, 4C, 5, 6 designated reach. The Dark River and Dark Lake are designated as Class 2B, 3C, 4A, 4B, 5, 6 waterbodies until the Class 1B, 2A, 3B reach.

The data set is based on two sampling events in May and June of 2014 at SD001. As a result, there is a maximum of two data points for each analyte.

All limits and conclusions found in the analysis are intended to be preliminary. This document is not a replacement of a waterbody assessment.

Flow Calculations and Dilution Ratios

To adequately account for dilution, the 7Q10 flow rate at the beginning of the 1B, 2A, 3B reach was calculated.

The 7Q10 flow rate at discontinued USGS gauge #05131000 was calculated by the USGS as 2.975 cubic feet per second (cfs) using the period of record of 1943 to 1979. The drainage area of #05131000 was calculated by the USGS to be 58 square miles.

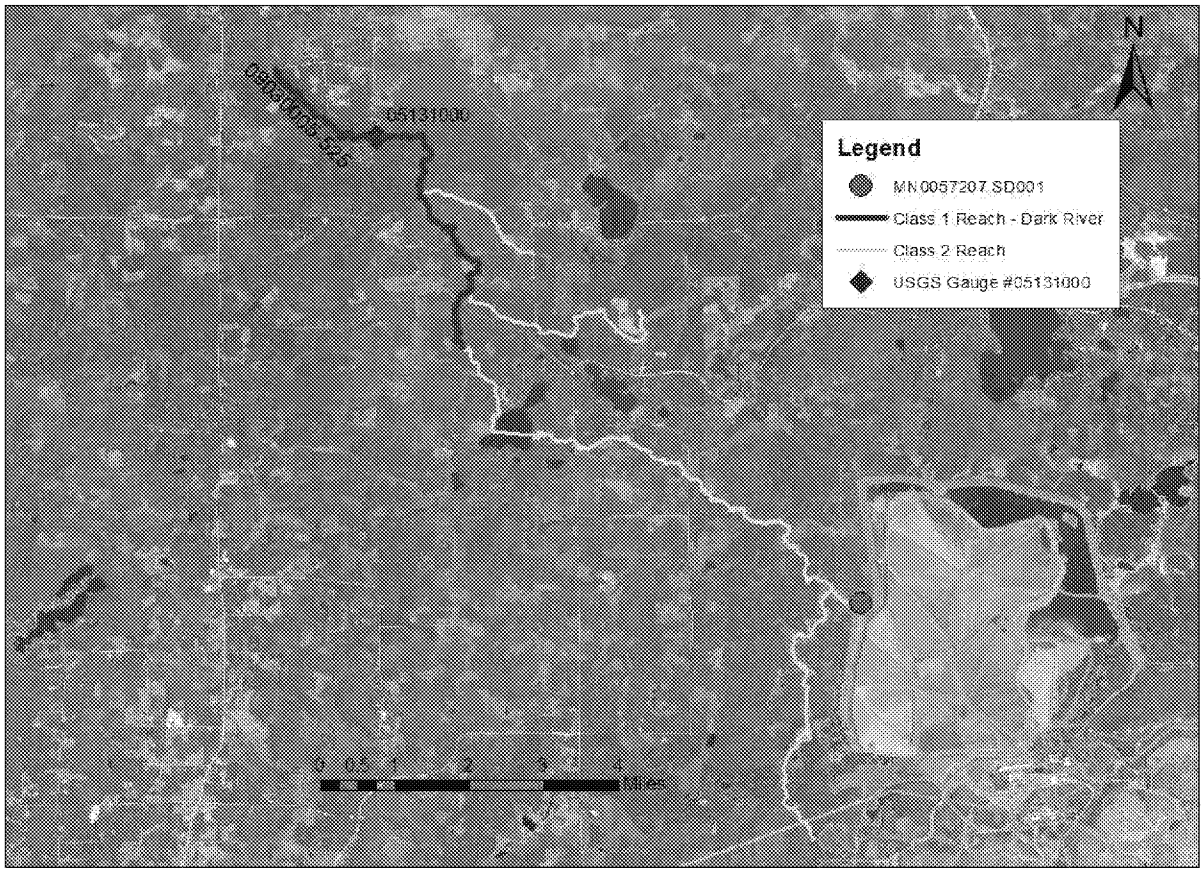
The drainage area at the beginning of the 1B, 2A, 3B was determined to be 38 square miles.

The 7Q10 flow rate at the beginning of the 1B, 2A, 3B reach was calculated as 1.95 cfs. This was calculated by multiplying 2.975 cfs by the ratio the drainage area of #5131000 to the drainage area of the 1B, 2A, 3B reach.

The flow rate exiting the Minntac tailings basin westward was assumed to be 2.63 cfs at 7Q10 conditions. The flow rate leaving SD001 was assumed to be 0.21 cfs at 7Q10 conditions.

The dilution ratio between the 7Q10 flow rate at the 1B, 2A, 3B reach and the flow exiting the Minntac tailing basin westward is 0.43. The dilution ratio between the 7Q10 flow rate at the 1B, 2A, 3B reach and SD001 is 0.043.

Figure 4. The Class 1B reach of the Dark River



Concentration Analysis

A full reasonable potential analysis cannot be performed because a minimum of ten data points is required to perform a reasonable potential analysis. The draft permit includes additional monitoring requirements to allow a full reasonable potential analysis upon reissuance.

In place of a reasonable potential analysis for the current reissuance, MPCA used the available concentration and flow data to evaluate whether discharges would exceed water quality standards. The available two data points for each parameter were averaged, adjusted for dilution and compared to applicable water quality standards. All of the parameters were assumed to be completely conservative with respect to their fate from SD001 to the beginning of the 1B, 2A, 3B reach. The stream dilution water was assumed to have a concentration of 0 mg/L for all parameters for the purpose of this analysis.

The 2A limits for Cadmium, Chromium, Copper, Lead, Nickel, and Zinc were calculated using the minimum hardness of 50 mg/L.

The dilution ratio of 0.043 was used for evaluating the Manganese concentration at the beginning of the 1B, 2A, 3B reach on the Dark River. Since manganese is highly variable and reactive, the values measured at SD001 were not extrapolated to represent the all of the seepage from the west side of the basin that is likely reporting to the Dark River via diffuse overland flow, as was done for the other pollutants. (See also the discussion regarding iron and manganese monitoring on page 31)

There were only possible exceedances of state standards for hardness, specific conductance and total dissolved solids at the beginning of the 1B, 2A, 3B reach when adjusted for dilution (See Table 5 below). Every other parameter did not have an exceedance of a state standard.

Table 5 – Trout reach concentration analysis

Parameter	WQ Standards						SD001		SD001 Average	Likely Concentration at start of 1B reach	Above or Below Applicable Standards?
	1B	2A	3B	4A	4B	404	14-May	14-Jul			
Alkalinity (Bicarbonate as CaCO3) mg/L				250			503	420	461.5	196.44	Below
Bicarbonates (HCO3)				305			613.66	512.4	563.03	239.66	Below
Ammonia (unionized ug/L)		16					0.27	0	<0.27	<0.27	Below
Fluoride (mg/L)							1.4	1.4	1.4	0.6	Below
Hardness (Ca+Mg as CaCO3)			250				1690	1574	1632.21	694.78	Yes, 3C
pH		6.5-8.5	6-9	6-8.5	6-9		7.1	7.12	7.11	NA	NA
Nitrogen (mg/L)							<1.0	<1.0	<1.0	<1.0	Below
Nitrate - Nitrite (mg/L)							3.6	4.3	3.95	1.68	Below
Phosphorous (N lakes & Forest) ug/L		30					2	11	6.5	2.77	Below
Specific Conductance (uS/cm)				1000			2670	2689	2679.5	1140.57	Yes, 4A
Sulfate***											
TDS (mg/L)				700			2200	2230	2215	942.85	Yes, 4A
TSS (mg/L)		10				20-30	<1.0	3	≤3	≤3	No
Turbidity (NTU)		25						1.9	1.9	0.81	No
Aluminum Total (ug/L)		87					<5.6	<2.8	<5.6	<5.6	No
Antimony Total (ug/L)	6	5.5					<0.25	<0.5	<0.5	<0.5	No
Arsenic Total (ug/L)	10	2					0.81	1.2	1.01	0.43	No
Barium (ug/L)	2000						51.8	51.7	51.75	22.03	No
Beryllium (ug/L)	4						<0.018	0.054	≤0.054	≤0.054	No
Boron Total (ug/L)				500			270	217	243.5	103.65	No
Bromide (mg/L)							0.85	0.91	0.88	0.37	NA
Cadmium (ug/L)	5	0.66					<0.03	<0.059	<0.03	<0.03	No
Calcium (mg/L)								177	177	75.34	No
Chloride (mg/L)		230	100				131	139	135	57.46	No
Chromium (total) ug/L	100	117					<0.26	<0.62	<0.62	<0.62	No
Cobalt, Total (ug/L)		5					1.2	0.76	0.98	0.42	No

*** See explanation in text above

Table 5 – Trout reach concentration analysis (continued)

Parameter	WQ Standards						SD001		SD001 Average	Likely Concentration at start of 1B reach	Above or Below Applicable Standards?
Copper (ug/L)	1300	6.4					3.2	<0.73	≤3.2	≤3.2	No
Iron Total (mg/L)	300					1-2	0.296	0.385	0.34	0.14	No
Lead (ug/L)	15	1.3					<0.028	<0.028	<0.028	<0.028	No
Magnesium (mg/L)								275	275	117.06	No
Manganese Total (ug/L)	50						1760	1730	1745	78.97	No
Mercury (ng/L)		6.9					0.81	0.355	0.58	0.25	No
Molybdenum (ug/L)							2.9	<2.3	≤2.9	≤2.9	No
Nickel (salts) ug/L		88					1.3	<1.1	≤1.3	≤1.3	No
Selenium (ug/L)	50	5					3.5	3.7	3.6	1.53	No
Silver (ug/L)	100	0.12					<0.1	<0.2	<0.2	<0.2	No
Thallium (ug/L)	2	0.28					0.1	<0.028	≤0.1	≤0.1	No
Tin (ug/L)							0.03	<0.053	≤0.03	≤0.03	No
Titanium (ug/L)							<10	<20	<20	<20	No
Zinc (ug/L)	5000	59					4	<0.54	≤4	≤4	No

Salty Discharge Monitoring

As a result of increased concern regarding the environmental impacts of "salty discharges," MPCA staff determined that there is a need to obtain more information from dischargers. In general, the MPCA staff will require industrial and municipal facilities with continuous, periodic/seasonal, or intermittent waste flows where the receiving water stream flow to effluent design flow dilution ratio under low flow conditions is less than 5:1 (annual climatic 7Q10: Average Dry Weather Design Flow [domestic] or Maximum Daily Design Flow [industrial]) to monitor effluent for parameters listed in Table 6. Additionally, the MPCA plans to require facilities with salty waste streams from concentrating treatment technologies (e.g., reverse osmosis, ion exchange, membrane filtration, etc.) and food processing industries using density-based (saline) sorting processes to monitor for the parameters in Table 6, regardless of the receiving water to effluent flow dilution ratio. This includes POTWs that accept salty waste streams from water treatment plants or certain sectors of industrial facilities.

As the MPCA is collecting this information to determine if limits should be applied, the MPCA will generally allow Permittees to request a reduction in monitoring if after two years of data (or 10 data points for controlled discharges at ponds), if the monitoring does not indicate a reasonable potential to exceed a water quality standard.

Table 6 - Salty discharge monitoring parameters

Analyte	Units (Jan – Dec MoMax)	WQ Standard/Justification
Chloride	mg/L	Class 2 and 3
Ca and Mg Hardness as CaCO3	mg/L	Class 3
Specific Conductance	umhos/cm	Class 4A
Total Dissolved Salts (a.k.a:solids)	mg/L	Class 4A
Sulfates as SO4	mg/L	Class 4A (where applicable),4B
Bicarbonates (HCO3)	mg/L	Class 4A
Sodium	mg/L	Class 4A
*Calcium	mg/L	Class 4A
*Magnesium	mg/L	Class 4A
*Potassium	mg/L	Class 4A
Whole Effluent Toxicity (WET)**		Use EPA Method 821-R-02-013 for chronic WET testing for fathead minnows and Ceriodaphnia dubia, if the receiving water is a Class 2 (fisheries waters) or 821-R-02-012 for acute WET testing fathead minnows Ceriodaphnia dubia and Daphnia magna, if the discharge does not impact a Class 2 water

* Analytes necessary to calculate Sodium as % total cations. The sodium water quality standard is 60% of total cations
**WET testing will be applied to permittees on a case-by-case basis.

Iron and Manganese Monitoring

The permittee will be required to monitor for iron and manganese in groundwater under this permit without limits. The geochemical behavior of these elements is such that the concentration of dissolved iron and manganese ions is controlled more by the local redox state of the groundwater than by proximity to an elevated source (J.D. Hem, Study and Interpretation of the Chemical Characteristics of Natural Water. 3rd ed., U.S. Geological Survey Water Supply Paper 2254). At this facility, as well as other facilities, there is little correlation between the concentrations discharged(H) to groundwater and those measured in the downgradient monitoring wells. Observed manganese concentrations in the tailings basin water have been roughly 280 ug/L, while monitoring well results have ranged from 102 ug/L to 4558 ug/L. Concentrations in groundwater at GW009, which is an unimpacted background well, have been 139 to 167 ug/L, which is higher than several wells that are impacted by the basin. Iron and manganese are distinguishable from other parameters in that their concentrations do not correlate with any other parameter related to tailings basin discharge. Also, most dissolved species of the ions will readily precipitate when exposed to dissolved oxygen concentrations typical of surface water or groundwater in contact with the atmosphere. Consequently, the ability of elevated concentrations to persist downgradient is generally limited. Monitoring data collected through this permit and through studies undertaken by DNR will be evaluated at the next reissuance to determine if limits are appropriate.

Compliance Limits in Surface Waters

As part of state conditions controlling discharges(SDS) to groundwater, this permit will establish surface water monitoring stations in waters that are potentially impacted by groundwater from this facility. The permit requires the Permittee to determine what concentration of sulfate and other pollutants in the recirculated tailings basin water will lead to compliance with all applicable surface water standards as well as supporting designated uses. The permit will require monthly monitoring. The MPCA has begun rulemaking to revise class 3 & 4 surface water quality standards. MPCA expects to complete this rulemaking during the period of investigation and mitigation planning outlined in the schedule of compliance. Any changes to surface water quality standards for pollutants for which there are limits specified in this permit may require modification to the permit to reflect the conclusions of the rulemaking.

Sulfate Limits – Wild Rice
In the 2015 legislative session, the Minnesota legislature prohibited MPCA from taking any actions to implement the standard that would require a permittee "to expend money for design or implementation of sulfate treatment technologies or other forms of sulfate mitigation." Minn. Laws 2015, 1st Spec. Sess., Chapter 4, Article 4, Section 136 ("2015 Wild Rice Legislation") The 2015 Wild Rice Legislation required MPCA to complete rulemaking to promulgate a new Wild Rice standard by January 15, 2018. *Id.* at (c). Legislation passed during the 2017 session extended the deadline to complete the rulemaking to January 2019. The MPCA proposed a revised water quality standard in 2017, but it was disapproved by an administrative law judge. Following disapproval, the MPCA withdrew the Wild Rice rule from the rulemaking process to allow for more work on the implementation process. The MPCA continues to support the scientific basis developed in the rulemaking and believes clarification of the rule's application is needed, such as adopting the waters to which the standard applies into rule.

The NPDES discharges authorized in the permit include SD001, which is subject to a compliance schedule eliminating the discharge, and SD006, for which MPCA found no reasonable potential to exceed water quality standards. As a result, the Clean Water Act does not require imposing a water quality-based effluent limit. *See* 40 C.F.R. § 122.44(d)(1)(i) (requiring a water quality-based effluent limit where there is reasonable potential to exceed water quality standards).
To be consistent with this legislation, the draft permit contains no sulfate limits for wild rice and does not require expenditures related to wild rice sulfate limits. MPCA anticipates that upon amendment of the rules as described above, Sandy Lake and Little Sandy Lake will be designated as wild rice waters subject to the wild rice sulfate water quality standard and that measures specifically to reduce the concentrations of sulfate in the Twin Lakes will be necessary.

The law also provides that "the agency may require sulfate minimization plans in permits." The draft permit requires specific actions be taken to lessen sulfate concentrations in groundwater that will lead to reductions in the Twin Lakes at a rate equivalent to or greater than possible sulfate minimization plan actions.

Additional Requirements

Compliance Schedules
This permit contains two compliance schedules. One addresses discharges(SDS) to groundwater that impact waters of the state, and one addresses surface discharge(NPDES) to waters of the state and waters of the United States.

As required by Minn. R. 7001.0150, subp. 2. Special conditions, this permit contains a compliance schedule to mitigate the tailings basin's discharge(SDS) to groundwater that has caused and is causing waters of the state (groundwater and surface water) to exceed applicable water quality criteria and numeric standards (hereinafter referred to as the "SDS Compliance Schedule"). A separate compliance schedule, or "schedule of compliance" as described in 40 CFR § 122.2, addresses shallow dam seepage (surface and shallow groundwater with an observable flow path to adjacent surface water) that discharges (NPDES) to the Dark River and its tributary wetlands (hereinafter referred to as the "NPDES Compliance Schedule").

SDS Compliance Schedule
The SDS Compliance Schedule for mitigation of discharge(SDS) to groundwater is intended to eliminate the exceedance of applicable water quality criteria and numeric standards for the designated uses of the waters of the state (both groundwater and surface waters) surrounding, and downstream of, the tailings basin. Monitoring and investigative activities have shown concentrations of certain parameters in surface water and groundwater that exceed applicable numeric standards. For surface water, the known parameters are bicarbonate, hardness, specific conductance, sulfate, and total dissolved salts (solids) and for groundwater they are sulfate and total dissolved solids. Exceedances for some or all of these parameters have been observed in the Dark River, Little Sandy Lake, Sandy Lake, and groundwater at the northeast property boundary and basin perimeter. Based on the area hydrology, MPCA expects similar exceedances in Timber Creek, Admiral Lake, and the Sand River from the tailings basin to Little Sandy Lake, although MPCA does not have monitoring data from those locations.

Minn. R. 7001.0150, subp. 2 states:

> Each draft and final permit must contain conditions necessary for the permittee to achieve compliance with applicable Minnesota or federal statutes or rules, including each of the applicable requirements in parts 7045.0450 to 7045.0649 and 7045.1390, and any conditions that the agency determines to be necessary to protect human health and the environment. If applicable to the circumstances, the conditions must include:
>
> A. A schedule of compliance that leads to compliance with the appropriate Minnesota or federal statute or rule. The schedule of compliance must **require compliance in the shortest reasonable period of time** or by a specified deadline if required by Minnesota or federal statute or rule. If appropriate, the schedule of compliance must include interim dates, which in no case may be separated by more than one year. A permit with a schedule of compliance must require the submission to the commissioner of progress reports. The progress reports must be submitted not later than 14 days after each interim and final date of compliance regarding the permittee's compliance or noncompliance with the schedule of compliance and they must explain any instance of noncompliance and state the actions that have been taken to correct the noncompliance.

All activities under this schedule require compliance with final limits in "the shortest reasonable period of time." During the term of this permit, the MPCA will require the permittee to better determine the fate and transport of tailings basin pollutants, and identify and select the approach for implementation methods that will work best to restore compliance. The MPCA anticipates that the next 5-year permit will contain refined dates for final compliance at applicable monitoring locations. Under this permit, initial construction of mitigation measures is required within 54 months of permit issuance, and the Dark River Watershed Seepage Collection and Return System must be operational by the end of 2017.

The SDS Compliance Schedule establishes four sequential actions that will lead to implementation of the determined final solution(s).

The first activity is a "Hydrological Investigation Work Plan," due 180 days after permit issuance. The purpose of Investigation Work Plan is to identify/refine current impacts to waters of the state, and the sources and routes of pollutants leading to those impacts. The Permittee has already conducted significant work to identify and model basin impacts over the past decade, and the MPCA has communicated to the Permittee where data gaps exist. As a result, the MPCA is requiring that the work performed under the Deep Seepage Investigation Work Plan be completed within 18 months of permit issuance (although the permittee may choose to continue some studies or monitoring past that time, the compliance schedule dates remain in effect). The permit requires the Permittee to submit a report documenting the findings of the implemented Deep Seepage Investigation Work Plan within 18 months of permit issuance.

The second activity is the submittal of a Basin Treatment Methods Study Plan within 20 months of permit issuance. The purpose of the Basin Treatment Methods Study Plan is to identify feasible technologies for non-mechanical or mechanical treatment to reduce the concentration of sulfate (as the pollutant of greatest concern and as a surrogate for other dissolved solids) within the tailings basin to 357 mg/L in the shortest reasonable period of time, not to exceed 10 years from permit issuance. Under the Basin Treatment Methods Study Plan, the Permittee will develop a plan to evaluate the treatment methods to determine which will best reduce water quality impacts from the tailings basin, taking into consideration the time that will be needed to achieve compliance, the reliability of the treatment methods, the cost to install and to operate the treatment methods, compatibility with DNR closure requirements, and the secondary environmental impacts of the treatment methods, if any. The sulfate limit of 357 mg/L in 10 years is the concentration determined in a modeling study that would allow the tailings-impacted groundwater to meet the 250 mg/L sulfate drinking water standard at the northeastern site property boundary. While the Dry Controls Effectiveness Report indicated that this target concentration could not be met with the implementation of the dry controls and sump #6 makeup water alone, the Permittee could install and operate other available treatment technologies to meet the

target concentration within 10 years of permit issuance. Additionally, because the 357 mg/L target concentration is

based on preliminary modeling, the Permittee may submit revised estimates of the tailings basin water quality that more accurately reflects the basin sulfate concentration that will lead to compliance with groundwater standards. If this concentration should differ from the interim limit of 357 mg/L and MPCA agrees with this finding, then the Permittee can seek modification of the permit to reflect that change.

The third activity brings together the results of the Investigation Work Plan and Basin Treatment Methods Study Plan. Under this activity, the permit requires the Permittee to submit a "Final Compliance Plan" within 30 months of permit issuance. This plan will identify the specific treatment systems and/or mitigation, including those measures that may be necessary in addition to the basin sulfate reduction measures that the Permittee has chosen to implement to meet final compliance limits in surface water and groundwater in the shortest reasonable period of time.

The fourth activity under the Compliance Plan, due within 48 months of permit issuance, is the submission of "Final Plans and Specification" for any construction that may be required, along with a timeline for implementing the final solution(s), including permitting and construction, if necessary, and a means to monitor progress towards compliance with final limits. The Compliance Schedule requires that the Permittee begin to implement the mitigation plan and/or initiate construction within 54 months of permit issuance.

MPCA believes that this schedule is achievable by the Permittee and that its implementation will achieve compliance in the shortest reasonable period of time, as required by law. The Compliance Schedule provides three years for the Permittee to evaluate, choose and pilot a remedy. The Permittee has already conducted significant site investigation and research into treatment and remedial technologies under a series of SOCs since 2001. It is difficult to schedule a timeframe for implementation of a remedy when the nature and scale is unknown. Therefore, it is reasonable that the timeline for those activities remains to be determined. Additionally, due to the varying time of travel between waters of the state and possible remedial locations, it is currently impossible to predict the time to compliance for a specific water body.

NPDES Compliance Schedule - for Eliminating Discharge(NPDES) to the Dark River

This compliance schedule incorporates the remaining activities from the 2011 SOC related to the construction of a Seepage Collection and Return System (SCRS) for the Dark River Watershed. As discussed above, MPCA has historically regulated seepage that emerges either from the side of the basin dam, or within the vicinity of the toe of the dam, under federal NPDES guidelines. Consequently, this NPDES Compliance Schedule is intended to meet the definition and implementing guidelines for a schedule of compliance as described in 40 CFR §§ 122.2 and 122.47. The remedy for the impacts to the Dark River from this seepage is to eliminate the discharge (NPDES). Therefore, final compliance with the conditions of the NPDES Compliance Schedule contained within this permit occurs upon implementation of the SCRS and cessation of discharge from identifiable seeps. This shall occur as soon as possible, and in no case later than 18 months after permit issuance. This date is reasonable because the SCRS is in the final stages of receiving state and federal wetlands permits.

Monitoring was required under the previous permit at the SD001 sampling station due to its position at the headwaters of the Dark River. Analysis of samples from this location has demonstrated that this discharge(NPDES) has reasonable potential to cause or contribute to exceedances of water quality standards in the Dark River for the pollutants bicarbonate, hardness, specific conductance, and total dissolved solids (TDS).

Construction of a Seepage Collection and Return System to eliminate the discharge of surface seepage to the Dark River Watershed is required under the June 9, 2011 Schedule of Compliance between MPCA and U.S. Steel. Collection of surface seepage from the west side of the Minntac tailings basin for return to the recirculating process water system would eliminate the remaining surface discharge (NPDES) to waters of the United States.

NPDES and SDS Compliance Schedules

The Compliance Schedule for the SDS and NPDES discharges, as detailed in the draft permit, is as follows:

Compliance Schedule
To mitigate impacts from the Tailings Basin discharge to groundwater (SDS Compliance Schedule), the Permittee shall meet the following limits in the shortest reasonable period of time, but in no event later than the following times, unless the Permittee establishes through the investigation required under Part 2 below (Hydrological Investigation Work Plan) and/or Part 3 below (Basin Treatment Methods Study Plan) and other reliable data that other limits will result in compliance with the applicable water quality standards at all waters shown to be affected by pollutants released from the Tailings Basin or that other deadlines are necessary, and this permit has been amended to reflect those limits and/or deadlines: a) 357 mg/L sulfate within the tailings basin pool water no later than ten years of permit issuance; and b) 250 mg/L sulfate in the groundwater at the property boundary by December 31, 2025. [Minn. R. 7001]
For the discharge of seepage to surface water along the tailings basin dam perimeter, the Permittee shall meet the terms of the NPDES compliance schedule (detailed below in part 5.28.57) as soon as possible, but not later than 18 months after permit issuance. [Minn. R. 7001]
Hydrological Investigation Work Plan. [Minn. R. 7001]
Within 180 days after permit issuance, the Permittee must submit a final plan (Hydrological Investigation Work Plan) that describes how the Permittee proposes to investigate and evaluate site conditions critical to the selection and implementation of treatment, mitigation efforts and/or other activities that could be taken to meet all applicable water quality standards and support designated uses in waters of the state that are impacted by pollutants from the Basin. submit a plan : Due by 180 days after permit issuance. [Minn. R. 7001]
The Hydrological Investigation Work Plan shall include a field data collection and analysis plan sufficient to accomplish the following: a) identify the significant surface and subsurface flow paths from the tailings basin to surrounding surface waters and groundwater under existing and foreseeable hydrologic conditions at the tailings basin; b) evaluate water quality with respect to all applicable uses potentially impacted by the tailings basin along the identified flow paths; c) determine potential aggregate acute and chronic toxic effects to aquatic organisms at compliance locations (identified in this permit) in the Sand River and Dark River watersheds; d) develop an understanding of the fate and transport of tailings basin-derived chemical constituents at a level sufficient to assess the effectiveness of considered mitigation technologies and strategies, including calculated estimates of the recirculated tailings basin pool water sulfate concentration necessary to meet applicable water quality standards and support designated uses in surface water and groundwater; e) determine sources and potential quantities of pollutants released from each source in the basin, including sources such as coarse tails, fine tails, recirculating process water, air emissions control contributions, and tailings lock-up water (pore water); and, f) identify and quantify any other pollutants the Permittee could reasonably expect to be released from the tailings basin, taking into account contributions from tailings lock-up water, continued oxidation of emplaced tails, and secondary pollutants that could be released or re-mobilized, and estimate the timeframe over which the tailings basin will continue to release pollutants. [Minn. R. 7001]
The Hydrological Investigation Work Plan shall also include a field data collection and analysis plan sufficient to develop a site conceptual flow and transport model(s) that describes the sources, fate, and transport of tailings basin pollutants sufficiently for

the purpose of estimating future hydrogeological and water quality conditions at the tailings basin and along the flowpaths identified for 5.29.32(a) during basin operation, and post closure, and which will allow the Permittee to evaluate the effectiveness of potential passive and/or active treatment technologies, mitigation alternatives or combinations of actions, with regard to meeting all applicable water quality standards and supporting designated uses in waters of the state that are impacted by pollutants from the Basin. The conceptual flow and transport model(s) shall provide a system mass balance that accounts for the transport or transformation of parameters of concern to within plus or minus ten percent of the mass calculated to be emanating from the tailings basin, as well as estimates for pollutant travel times along identified flow paths. [Minn. R. 7001]

The Permittee must also comply with the following interim requirements before submitting its final plan. Within 90 days after permit issuance, the Permittee must submit to the MPCA a status report identifying:

a) All waters of the state that are believed to be impacted by pollutants from the Basin;

b) All waters of the state within a 2 mile radius of the Basin perimeter that the Permittee contends are not impacted by pollutants from the Basin and detailing the reasons the Permittee contends those waters are not impacted by pollutants from the Basin; and

c) A preliminary list of locations where field investigation monitoring activities are planned. submit a report : Due by 90 days after permit issuance. [Minn. R. 7001]

The Permittee shall complete the actions listed in the Hydrological Investigation Work Plan within 18 months of permit issuance. [Minn. R. 7001]

Upon submittal of the Hydrological Investigation Work Plan and schedule, the Permittee shall commence work on the Plan in accordance with the schedule contained therein and provide written notice to the MPCA that it has commenced work and thereafter report to the MPCA on its progress as required by part 5.28.37 (reports). The Final Investigation Work Plan and schedule are enforceable under this permit upon submittal. The MPCA reserves the right to submit comments to the Permittee on the adequacy of the Investigation Work Plan. If the Permittee does not address comments submitted by the MPCA to the satisfaction of the MPCA, the MPCA reserves the right to determine that the results do not provide adequate scientific support for a change in the schedule of compliance limits. [Minn. R. 7001]

Following submittal of its Investigation Work Plan, the Permittee must provide a status report every 90 days identifying, at a minimum, the following:

a) The work conducted in the last 90 days;

b) Any reports prepared by the Permittee, or its consultants, related to the work performed;

c) Milestones to be met before the next 90 day status report and work the Permittee intends to perform to meet those milestones. [Minn. R. 7001]

A final report documenting the findings of the fully implemented Investigation Work Plan shall be submitted within 18 months of permit issuance. The report shall include all of the information and analyses described in Parts 5.29.32 and the site conceptual flow and transport model described in 5.29.33. submit a report : Due 548 calendar days after Permit Issuance Date. [Minn. R. 7001]

Failure to complete the Investigation Work Plan and submit the required report within 18 months of permit issuance will not extend the deadline for the Basin Treatment Methods Study Plan. [Minn. R. 7001]

Basin Treatment Methods Study Plan. [Minn. R. 7001]

Within 20 months of permit issuance, the Permittee shall submit a Basin Treatment Methods Study Plan that identifies feasible technologies (including at a minimum, nano-filtration, reverse osmosis, ion exchange, and dry emissions controls), for non-mechanical or mechanical treatment/mitigation to reduce the concentration of sulfate as required under part 5.28.28 above. submit a report : Due 610 calendar days after Permit Issuance Date. [Minn. R. 7001]

The Basin Treatment Methods Study Plan must identify how the Permittee will

evaluate the treatment methods to determine which method will reduce surface water and groundwater quality impacts from the tailings basin in the shortest reasonable period of time, considering the reliability of the treatment methods, the cost to install and to operate the treatment methods, compatibility with MDNR closure requirements, and the secondary environmental impacts of the treatment methods, if any. [Minn. R. 7001]

The Basin Treatment Methods Study Plan must include a detailed schedule that justifies the time period proposed to complete the technical feasibility analysis. [Minn. R. 7001]

The Basin Treatment Methods Study Plan must be of sufficient scope to provide for the following, which shall be detailed in the Final Compliance Plan described in Part 5.28.51:

a) a description of each possible treatment method that the Permittee has identified, an analysis of the technical feasibility of each method, and the estimated cost to install or implement each method;

b) an estimate of the length of time that each technology/treatment method would require to attain and maintain compliance with a basin sulfate concentration identified in Part 5.28.28(a);

c) an estimate of operation and maintenance costs associated with each treatment method and the reliability of that method;

d) analysis of how each identified potential passive and/or active treatment method may impact site closure in accordance with MDNR requirements, which include a dry basin;

e) identification of secondary environmental impacts and costs for each method;

f) whether mitigation adjacent to the basin will be necessary, in addition to basin water treatment, to meet all applicable water quality standards and supported designated uses for the waters of the state that are impacted by pollutants from the Basin, including any water quality standards and supported designated uses identified by the MPCA, in the shortest reasonable period of time. [Minn. R. 7001]

All tasks described under the Basin Treatment Methods Study Plan must be completed within 29 months of permit issuance. The plan provides the basis for the Permittee to submit the Final Compliance Plan described in Part 5.28.51 below. [Minn. R. 7001]

Upon submittal of the Basin Treatment Methods Study Plan and schedule, the Permittee shall initiate the plan of action identified in the Plan in accordance with the schedule contained therein, and provide written notice to the MPCA that it has done so within 14 days. [Minn. R. 7001]

The MPCA reserves the right to submit comments to the Permittee on the adequacy of the Basin Treatment Methods Study Plan and schedule. If the Permittee does not address comments submitted by the MPCA to the satisfaction of the MPCA, the MPCA reserves the right to determine that the results do not provide adequate scientific support for a change in the schedule of compliance limits. [Minn. R. 7001]

If the Permittee proposes an alternative final basin concentration, the Permittee must submit an application to modify the permit. To be approved, the Permittee must demonstrate scientific support for the ability of the alternative to meet applicable water quality standards in all water bodies identified as being affected or potentially affected by water released from the Tailings Basin as demonstrated in the Hydrological Investigation Work Plan. [Minn. R. 7001]

Final Compliance Plan. [Minn. R. 7001]

Within 30 months of permit issuance the Permittee shall submit a Final Compliance Plan. submit a compliance plan : Due by 2.5 years after permit issuance. [Minn. R. 7001]

The Final Compliance Plan shall include the following:

a) the findings of the Hydrological Investigation and Basin Treatment Methods Study, including an estimate of how quickly the identified potential passive and/or active treatment technologies, mitigation alternatives or combinations of actions will reduce the basin sulfate concentration to 357 mg/L, or an alternative concentration if

the permit has been amended to include an alternative concentration.
b) an explanation of why the technology/treatment method(s) selected represent the best means of meeting final compliance limits. Factors to be considered the best technology/treatment method(s) include rate of reduction of sulfate concentration, reliability, feasibility, compatibility with the approved basin closure plan, and limitation of secondary environmental impacts that will not be mitigated;
c) an estimate of operation and maintenance costs associated with treatment/mitigation to maintain compliance with applicable water quality standards and support designated uses in surface water and groundwater;
d) an estimate of the length of time that active treatment or maintenance of passive systems would be required to maintain compliance with applicable water quality standards and support designated uses in surface water and groundwater (pre and post closure);
e) a predicted timeline, based on information collected under the Investigation Work Plan, for when the reduction of pollutant load to the watershed will be first observed at the monitoring stations;
f) analysis of how the identified potential passive and/or active treatment technologies, mitigation alternatives or combinations of actions may impact site closure in accordance with MDNR requirements, which include a dry basin;
g) a detailed proposal identifying the specific treatment systems and/or mitigation that will be implemented to achieve compliance with final permit limits, including basin sulfate concentration interim and final limits, in the shortest reasonable period of time;
h) the design, site plan, process schematic(s), preliminary design and specifications for major components of the specific treatment systems, and/or mitigation to be implemented;
i) a schedule that will incorporate any pilot testing, (which must be completed by month 42), if necessary, to finalize the design process; and
j) a schedule for attaining any necessary permits in the shortest reasonable period of time. [Minn. R. 7001]

Final Plans and Specifications. [Minn. R. 7001]

Within 48 months of permit issuance, the Permittee shall submit to MPCA:
a) a final design package, which includes plans and specifications for treatment or mitigation system components, including specifications based on any pilot testing conducted that are sufficient to submit complete and accurate applications for any permits that may be required;
b) a monitoring plan that will allow quantifiable biannual assessment of the performance of the treatment system and/or mitigation relative to its ability to achieve compliance with interim and final limits, as well as applicable surface water and groundwater water quality standards by the specified date;
c) a detailed schedule of milestones, occurring at intervals of annually or less, which include, at a minimum, start of construction, completion of construction, start-up, and initiation of operation, with adequate justification for the timeline described in the schedule meeting the shortest reasonable period of time requirement. Upon submittal, the milestone deadlines will become fully enforceable commitments of this compliance schedule, and failure to achieve these commitments will constitute a permit violation enforceable by MPCA; and
d) predictions of the dates applicable water quality standards and designated uses will be met at each surface water monitoring station as a result of proposed mitigation efforts. submit final technical documents : Due by four years after permit issuance. [Minn. R. 7001]

SDS Schedule for Deep Seepage - System Implementation or Construction. [Minn. R. 7001]

The Permittee shall initiate construction or begin implementation of the chosen treatment system and/or mitigation within the shortest reasonable period of time, but no later than 54 months after permit issuance. begin construction : Due 1644 calendar days after Permit Issuance Date. [Minn. R. 7001]

NPDES Schedule - Dark River Seepage Collection and Return System (SCRS). [Minn. R. 7001]

The Permittee shall implement a system for recapture of seepage affecting shallow groundwater and surface waters ("SCRS") on the west side of the Tailings Basin within 18 months of permit issuance. The Permittee is responsible for obtaining all necessary approvals (U.S. Army Corps of Engineers, Wetland Conservation Act) to implement the SCRS system by submitting timely and complete applications. The MPCA will not grant any extensions to this deadline if the Permittee fails to submit timely and complete applications for necessary approvals. The Permittee shall provide copies to the MPCA of all applications filed and correspondence submitted to other agencies, which must approve the SCRS system. complete construction and commence operation : Due by one year after permit issuance. [Minn. R. 7001]

Special Requirements (Applicable to NPDES and SDS Schedules of Compliance). [Minn. R. 7001]

To ensure timely submittal of complete and accurate plans fulfilling all specified requirements, the Permittee shall meet with MPCA three months prior to each plan submittal deadline. At the meeting, the Permittee must present a progress report and draft plan that includes all the components of the plan as described in this permit and that will attain compliance with permit limits in the shortest reasonable period of time. [Minn. R. 7001]

Compliance with permit limits at groundwater monitoring stations shall be deemed to have occurred when all monitoring results at that station are less than or equal to the stated limit for one year of monitoring, and remain at less than or equal to the limit thereafter. [Minn. R. 7001]

Compliance with permit limits for the basin sulfate concentration shall be deemed to have occurred when all monitoring results for that station, or other representative basin sampling location, are less than or equal to the stated limit for 6 consecutive months of monitoring, and remain at less than or equal to the limit thereafter. [Minn. R. 7001]

If any of the submitted Plan(s) described herein propose actions requiring permits and/or approvals, the Permittee shall submit complete and accurate applications in the shortest reasonable period of time and comply completely and accurately with any requests for additional information in the timeframes specified in the requests. Delays in permit issuance due to incomplete or inaccurate applications will not excuse failure to meet permit deadlines. [Minn. R. 7001]

As new information becomes available during the course of the Compliance Schedule that results in material changes to a plan that has been submitted under the Compliance Schedule, the Permittee shall submit revisions to the affected plan consistent with the requirements for plan contents under the terms of this permit. Upon submittal, such revisions shall be incorporated as enforceable provisions into the respective plans, and are enforceable under this permit. [Minn. R. 7001]

Total Facility Requirements

All NPDES/SDS permits issued in the state of Minnesota contain certain conditions that remain the same regardless of the size, location or type of discharge. The standard conditions satisfy the requirements outlined in 40 CFR § 122.41, Minn. R. 7001.0150, and Minn. R. 7001.1090. These conditions are listed in the Total Facility Requirements chapter of an NPDES/SDS permit. These requirements cover a wide range of areas, including recordkeeping, sampling, equipment calibrations, equipment maintenance, reporting, facility upsets, bypass, solids handling, and changes in operation, facility inspections and permit reissuance.

Nondegradation and Anti-Backsliding

All instances of the word discharge in this section refer to the CWA definition of a point source discharge.
In accordance with Minnesota Pollution Control Agency rules regarding nondegradation for all waters (that are not Outstanding Resource Value Waters), nondegradation review is required for any new or expanded significant discharge (Minn. R. 7050.0185). A significant discharge is: (1) a new discharge (not in existence before January 1, 1988) that is greater than 200,000 gallons per day (gpd) or (2) an expanded discharge that expands by greater than 200,000 gpd that discharges to any non-ORVW water other than a Class 7 water or (3) a new or expanded discharge containing any toxic pollutant at a mass loading rate likely to increase the concentration of the toxicant in the receiving water by greater than one percent over the baseline quality.

The discharge from the Minntac Tailings basin existed before January 1, 1988, and therefore is not a new discharge. In determining whether it is an expanded discharge, the earliest available Discharge Monitoring Reports for the facility are from 1991, so those records were used. The average discharge rates from SD001 and SD002 during the 1991 calendar year were 84,000 gpd and 365,000 gpd, respectively. Discharge from those same points over the past 3 years were 130,000 gpd and 0 gpd. There are also other seepage points along the basin perimeter, but these have not been monitored comprehensively enough to assess changes in gross discharge from the basin. There is no evidence of an increase above the threshold of 200,000 gpd. With the installation of the Sand River SCRS, the MPCA finds that the current total discharge is less than it was in 1988. Given this, and the fact that the Permittee will install a comparable SCRS for discharges to the Dark River Watershed under this permit, there is not a new or expanded discharge at the facility, therefore, a nondegradation review is not necessary.

This Permit also complies with Minn. R. 7053.0275 regarding anti-backsliding. Any point source discharger of sewage, industrial, or other wastes for which a national pollutant discharge elimination system permit has been issued by the agency that contains effluent limits more stringent than those that would be established by parts 7053.0215 to 7053.0265 shall continue to meet the effluent limits established by the permit, unless the permittee establishes that less stringent effluent limits are allowable pursuant to federal law, under section 402(o) of the Clean Water Act, United States Code, title 33, section 1342.

Table 7 – DMR summary report – 2015

Station	Parameter	Type	Limit	Units	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
GW 003	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,460.80			1,460.80			1,460.80		
	pH, Field	SingleVal		SU				6.9			6.9			6.8		
	Specific Conductance, Field	SingleVal		umhos/cm				2,075			2,098			2,109		
	Sulfate, Total (as SO4)	SingleVal		mg/L				736			763			754		
	Temperature, Water (C)	SingleVal		degrees C				7.1			9.7			11.6		
GW 004	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,469.90			1,469.40			1,469.50		
	pH, Field	SingleVal		SU				6.4			6.2			6.3		
	Specific Conductance, Field	SingleVal		umhos/cm				1,458			1,436			1,464		
	Sulfate, Total (as SO4)	SingleVal		mg/L				476			516			504		
	Temperature, Water (C)	SingleVal		degrees C				4.1			11.5			10.4		
GW 006	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,461.20			1,461.20			1,461.20		
	pH, Field	SingleVal		SU				6.7			6.6			6.6		
	Specific Conductance, Field	SingleVal		umhos/cm				2,110			2,153			2,167		
	Sulfate, Total (as SO4)	SingleVal		mg/L				862			885			858		
	Temperature, Water (C)	SingleVal		degrees C				7.2			15.8			11.9		
GW 007	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,451.40			1,451.30			1,451.40		
	pH, Field	SingleVal		SU				7			7.2			6.9		
	Specific Conductance, Field	SingleVal		umhos/cm				1,993			1,993			2,183		
	Sulfate, Total (as SO4)	SingleVal		mg/L				595			818			767		
	Temperature, Water (C)	SingleVal		degrees C				6.9			11.7			8.5		
GW 008	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,481			1,480.70			1,480.80		
	pH, Field	SingleVal		SU				6.7			7.3			6.7		
	Specific Conductance, Field	SingleVal		umhos/cm				1,582			1,411			1,813		
	Sulfate, Total (as SO4)	SingleVal		mg/L				210			440			471		
	Temperature, Water (C)	SingleVal		degrees C				5.5			20.3			11.8		
GW 009	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,431.50			1,432.10			1,432		
	pH, Field	SingleVal		SU				5.9			6.1			6		
	Specific Conductance, Field	SingleVal		umhos/cm				92			78			68		
	Sulfate, Total (as SO4)	SingleVal		mg/L				2			2			2		
	Temperature, Water (C)	SingleVal		degrees C				4.4			11.3			12		
GW 010	Amines, Organic Total	SingleVal		mg/L				0.25			0.25			0.25		
	GW Elevation	SingleVal		ft				1,529.60			1,530.70			1,529.90		
	pH, Field	SingleVal		SU				6.4			6.3			6.3		
	Specific Conductance, Field	SingleVal		umhos/cm				173			148			142		
	Sulfate, Total (as SO4)	SingleVal		mg/L				20			18.8			21.9		
	Temperature, Water (C)	SingleVal		degrees C				5.5			11.4			11.3		
GW 012	GW Elevation	SingleVal		ft				1454.5			1454.1			1454.1		
	pH, Field	SingleVal		SU				6.7			6.3			6.7		
	Specific Conductance, Field	SingleVal		umhos/cm				1400			1360			1334		
	Sulfate, Total (as SO4)	SingleVal		mg/L				239			417			433		
	Temperature, Water (C)	SingleVal		degrees C				5			8.2			8.7		
	Total Dissolved Solids	SingleVal		mg/L				576			905			1040		
	Chloride	SingleVal		mg/L				53.7			95.4			98.4		
GW 013	GW Elevation	SingleVal		ft				1462.2			1464.9			1464.8		
	pH, Field	SingleVal		SU				6.4			6.3			6.3		
	Specific Conductance, Field	SingleVal		umhos/cm				940			970			886		
	Sulfate, Total (as SO4)	SingleVal		mg/L				265			285			311		
	Temperature, Water (C)	SingleVal		degrees C				5.1			7.4			10.1		
	Total Dissolved Solids	SingleVal		mg/L				514			581			580		
	Chloride	SingleVal		mg/L				30.3			34			36.6		
GW 014	GW Elevation	SingleVal		ft					1472.9		1472.6			1472.6		
	pH, Field	SingleVal		SU					7.3		7.1			7.2		
	Specific Conductance, Field	SingleVal		umhos/cm					608		591			612		
	Sulfate, Total (as SO4)	SingleVal		mg/L					7.1		12.4			16.2		
	Temperature, Water (C)	SingleVal		degrees C					3.7		14.3			9.2		
	Total Dissolved Solids	SingleVal		mg/L					393		366			372		
	Chloride	SingleVal		mg/L					2.6		2.6			2.9		

Table 7 – DMR summary report – 2015 (Continued)

Station	Parameter	Type	Limit	Units	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
SD 001	Flow	CalMoAvg		mgd	0.15	0.18	0.17	0.18	0.19	0.19	0.16	0.18	0.17	0.19	0.19	0.19
	Flow	CalMoTot		Mgal	4.56	4.94	5.25	5.3	6	5.66	4.85	5.6	5.1	5.93	5.9	5.83
	Flow	DailyMax		mgd	0.16	0.21	0.21	0.19	0.21	0.21	0.16	0.21	0.17	0.21	0.21	0.21
	Oil & Grease, Total Recov.	CalMoAvg	10	mg/L	1	1.4	1.4	0.62	0.55	0.38	1.1	0.64	5	5	5	5
	Oil & Grease, Total Recov.	DailyMax	15	mg/L	2	1.4	1.4	1	0.6	0.38	1.3	0.9	5	5	5	5
	pH	InstantMax	9	SU	7.3	7.3	7.4	7.3	7.3	7.2	7.1	7.2	7.6	7.5	7.1	7.3
	pH	InstantMin	6	SU	7.3	7.2	7.2	7.3	7.2	7.2	7	7	7.1	7.1	7	7
	Solids, Total Suspended (TSS)	CalMoAvg	30	mg/L	2.4	1.7	2	1.6	2.6	3.6	2.6	2.8	2.3	1.9	1.9	1.7
	Solids, Total Suspended (TSS)	DailyMax	60	mg/L	2.4	2.4	2	2	3.6	3.6	3.2	4	2.8	2.8	2.8	2.4
	Specific Conductance	CalMoMax		umhos/cm	2,739	2,784	2,725	2,748	2,609	2,465	2,522	2,436	2,455	2,546	2,502	2,484
	Sulfate, Total (as SO4)	CalMoMax		mg/L	1,020	1,050	1,090	1,100	1,070	985	1,010	901	880	939	980	951
SD 002	Flow	CalMoAvg		mgd						0.19						
	Flow	CalMoTot		Mgal						0.19						
	Flow	DailyMax		mgd						0.19						
	Oil & Grease, Total Recov.	CalMoAvg	10	mg/L						0.38						
	Oil & Grease, Total Recov.	DailyMax	15	mg/L						0.38						
	pH	InstantMax	9	SU						7.4						
	pH	InstantMin	6	SU						7.4						
	Solids, Total Suspended (TSS)	CalMoAvg	30	mg/L						11.3						
	Solids, Total Suspended (TSS)	DailyMax	60	mg/L						11.3						
	Specific Conductance	CalMoMax		umhos/cm						2,265						
	Sulfate, Total (as SO4)	CalMoMax		mg/L						950						
SW 001	Flow	SingleVal		mgd	1.3	1.23	1.8	4.8	26.4	16	13.1	2.85	9.66	8.96	12.9	13.4
	Sulfate, Total (as SO4)	SingleVal		mg/L	286	393	563	38	183	118	58.9	125	51.6	121	124	131
WS 002	Amines, Organic Total	SingleVal		mg/L												0.25
	Toxicity, Whole Effluent (Acute)	SingleVal		TUa												1
	Flow	CalMoAvg		mgd	0.17	0.18	0.22	0.19				0.18	0.24	0.23	0.3	0.33
	Hardness, Ca & Mg, (as CaCO3)	CalMoAvg		mg/L	1,205	1,203	1,255	1,262				1,006	1,054	1,038	1,080	1,078
	Sulfate, Dissolved (as SO4)	CalMoAvg		ug/L	871	854	903	888				746	767	758	794	775
WS 003	Chloride, Total	CalMoAvg		mg/L	730	435	676	589				664	603	455	333	390
	Flow	CalMoAvg		mgd	0.14	0.14	0.17	0.14				0.14	0.14	0.14	0.27	0.27
	Fluoride, Total (as F)	CalMoAvg		mg/L	4.5	3.2	3.6	4.1				5.6	9.6	6.1	12.5	12
	Hardness, Ca & Mg, (as CaCO3)	CalMoAvg		mg/L	2,885	2,295	2,548	2,654				2,647	2,482	2,078	1,680	2,074
	pH	CalMoMin		SU	9.5	9.7	9.5	9.1				8.2	9.2	9.4	9.2	7.7
	Sulfate, Dissolved (as SO4)	CalMoAvg		mg/L	2,155	1,680	1,883	1,966				1,943	1,816	1,401	1,353	1,354
WS 004	pH	CalMoMax		SU	8.2	8.1	8.1	8.7				8.3	8.2	8.3	8.1	8.1
WS 005	pH	CalMoMax		SU	8.9	8.9	8.6	8.8				8.7	8.8	9	9.1	8.7
WS 006	Amines, Organic Total	SingleVal		mg/L												0.25
	Evaporation, Accumulated	CalMoTot		in												20.83
	Precipitation	CalMoTot		in												28.79
	Toxicity, Whole Effluent (Acute)	SingleVal		TUa												1
WS 007	Amines, Organic Total	SingleVal		mg/L												0.25
	Evaporation, Accumulated	CalMoTot		in												20.83
	Precipitation	CalMoTot		in												28.79
	Toxicity, Whole Effluent (Acute)	SingleVal		TUa												1