THE MESABA ENERGY PROJECT

APPLICATION TO THE MINNESOTA POLLUTION CONTROL AGENCY FOR A NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT

Prepared by

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June 18, 2006

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ACRONYMS

BACT	Best Available Control Technology
BMP	Best Management Practices
CCPI	Clean Coal Power Initiative
C.F.R.	Code of Federal Regulations
DOE	Department of Energy
EIS	Environmental Impact Statement
EIV	Environmental Information Volume
Excelsior	Excelsior Energy, Incorporated
HVTL	High Voltage Transmission Line
IGCC	Integrated Gasification Combined Cycle
kV	kilovolt
MDNR	Minnesota Department of Natural Recourses
MEQB	Minnesota Environmental Quality Board
MW	megawatts
NPDES	National Pollutant Discharge Elimination System
Project	Mesaba Energy Project
POI	regional high voltage electric transmission grid
PSD	Prevention of Significant Deterioration
SCR	Selective Catalytic Reduction
URS/Barr	URS Corporation and Barr Engineering

1.0 INTRODUCTION

1.1 PURPOSE

Excelsior Energy Inc. ("Excelsior"), on behalf of its two wholly-owned project companies, MEP-I LLC and MEP-II LLC (MEP-I LLC and MEP-II LLC, together, the "Applicant" or "Company") submits and respectfully applies to the Minnesota Pollution Control Agency (MPCA) for a National Pollution Discharge Elimination (NPDES) Permit pursuant to Section 402 of the Clean Water Act and Minnesota Rules Chapters 7001 and 7050. Such Permit is a necessary preconstruction approval for the electric power generating station described herein. All forms required by the Minnesota Pollution Control Agency ("MPCA") in support of this filing are provided in Appendix A. These forms, the narrative text provided in Sections 1 – 5, and supplemental information presented in Appendices B – G of this document comprise the entirety of the Applicant's NPDES Permit Application (the "Application").

1.2 PROJECT PROPONENT

Excelsior is an energy development company based in Minnetonka, Minnesota that has created the two wholly-owned project companies, MEP-I LLC and MEP-II LLC to construct, own and operate at a site in Northeastern Minnesota a 1,212 megawatt$_{(net)}$ integrated gasification combined cycle ("IGCC") steam electric power generating station (hereafter, the "IGCC Power Station") fueled by coal and other solid, petroleum-based feedstocks. Applicant's offices are located at 11100 Wayzata Boulevard, Suite 305, Minnetonka, Minnesota 55305. Applicant's contact with respect to all elements of the Application is:

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1.3 PROJECT OVERVIEW

1.3.1 Nomenclature

In this Application, the terms "Project" or "Mesaba One" will be used synonymously with the phrases "Phase I IGCC Power Station" and "Phase I Development." The term "Mesaba Two" will be used synonymously with the phrases "Phase II IGCC Power Station" and "Phase II Development." The combined Phase I and Phase II Developments will be used synonymously with the term "Mesaba One and Mesaba Two" and the phrase "Phase I and II IGCC Power Station." The phrases "IGCC Power Station", "Power Station", or "Station" will be used where the context with respect to Mesaba One, Mesaba Two, or both, is obvious. The term "IGCC Power Station Footprint" or "Station Footprint" means the fenced area within which the IGCC Power Station is located. "Buffer Land" means the land area contiguous with or adjacent to the IGCC Power Station Footprint, extending to the boundary of the property eventually to be controlled by the Applicant and upon which limited Station-related activity occurs. The phrase "Station Footprint" will refer to the area serving the IGCC Power Station that includes all buildings, parking areas, stormwater controls, material handling/storage areas, rail loop and the interconnecting roadways between such features. Water Resources" refers to water supplies and

receiving waters required to support construction and operation of Mesaba One and Mesaba Two.

1.3.2 Location of IGCC Power Station

Excelsior acquired an option to purchase approximately 1,260 acres of industrially zoned property located within the city limits of Taconite, Minnesota. The optioned property is also located within the Taconite Tax Relief Area ("TTRA") of Northeastern Minnesota in conformance with Minn. Stat. § 216B.1694. Figure 1.3-1 shows the boundary of the TTRA and the general location of the IGCC Power Station. A general location map showing the IGCC Power Station Footprint and Buffer Land is provided as Figure 1.3-2. Currently, the land upon which Excelsior has secured its option is completely contained within the boundaries shown for the Buffer Land. The optioned property is currently undeveloped, unoccupied land located in the immediate vicinity of former iron mining operations and contiguous with or in immediate proximity to transportation, transmission and other infrastructure, and is near critical Water Resources. The property outlined on Figure 1.3-2 is located completely within Iron Range Township (4th Principal Meridian, T56N, R24W).

Figure 1.3-1
Minnesota Taconite Tax Relief Area and General Site Location

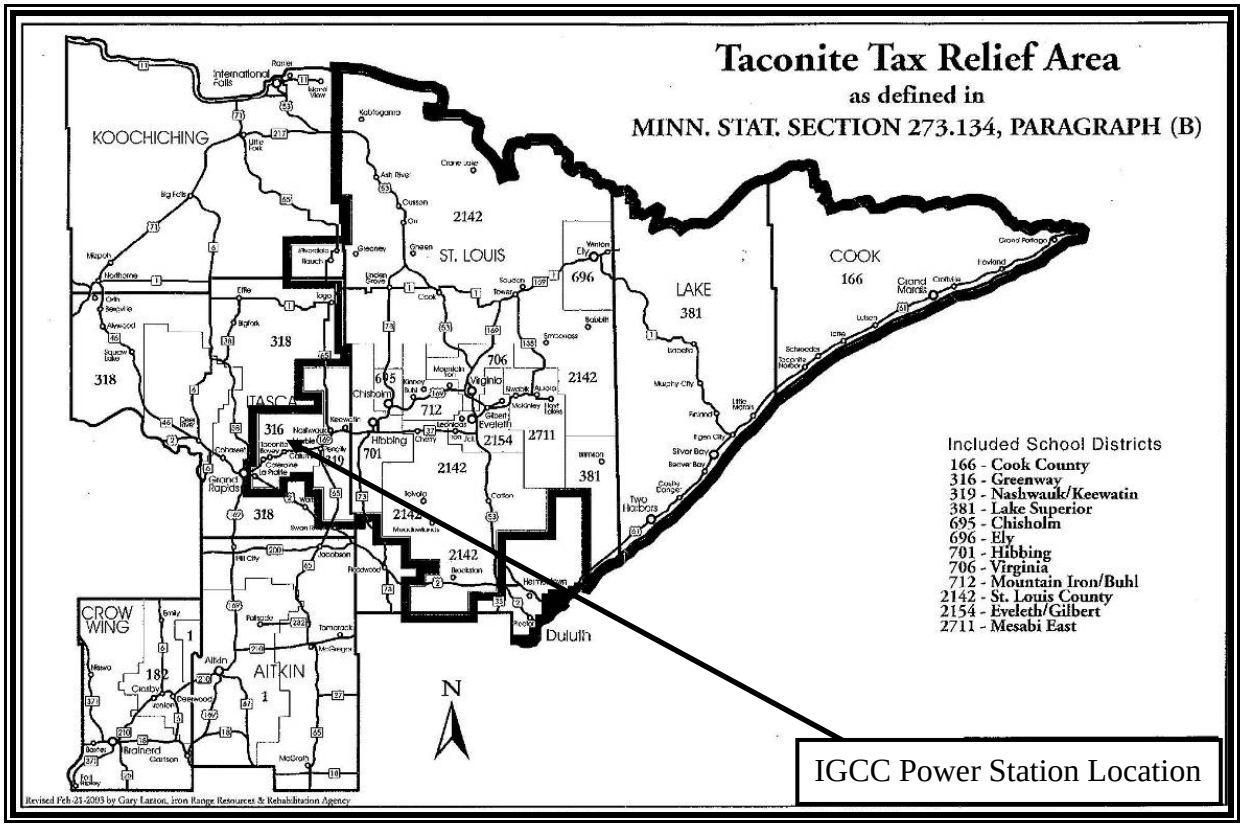


Figure 1.3-3 is an aerial photograph showing the outline of the IGCC Power Station Footprint and Buffer Land, infrastructure relevant to this Application, and the location of both relative to nearby residential receptors.

Figure 1.3-2 IGCC Power Station Footprint and Buffer Land

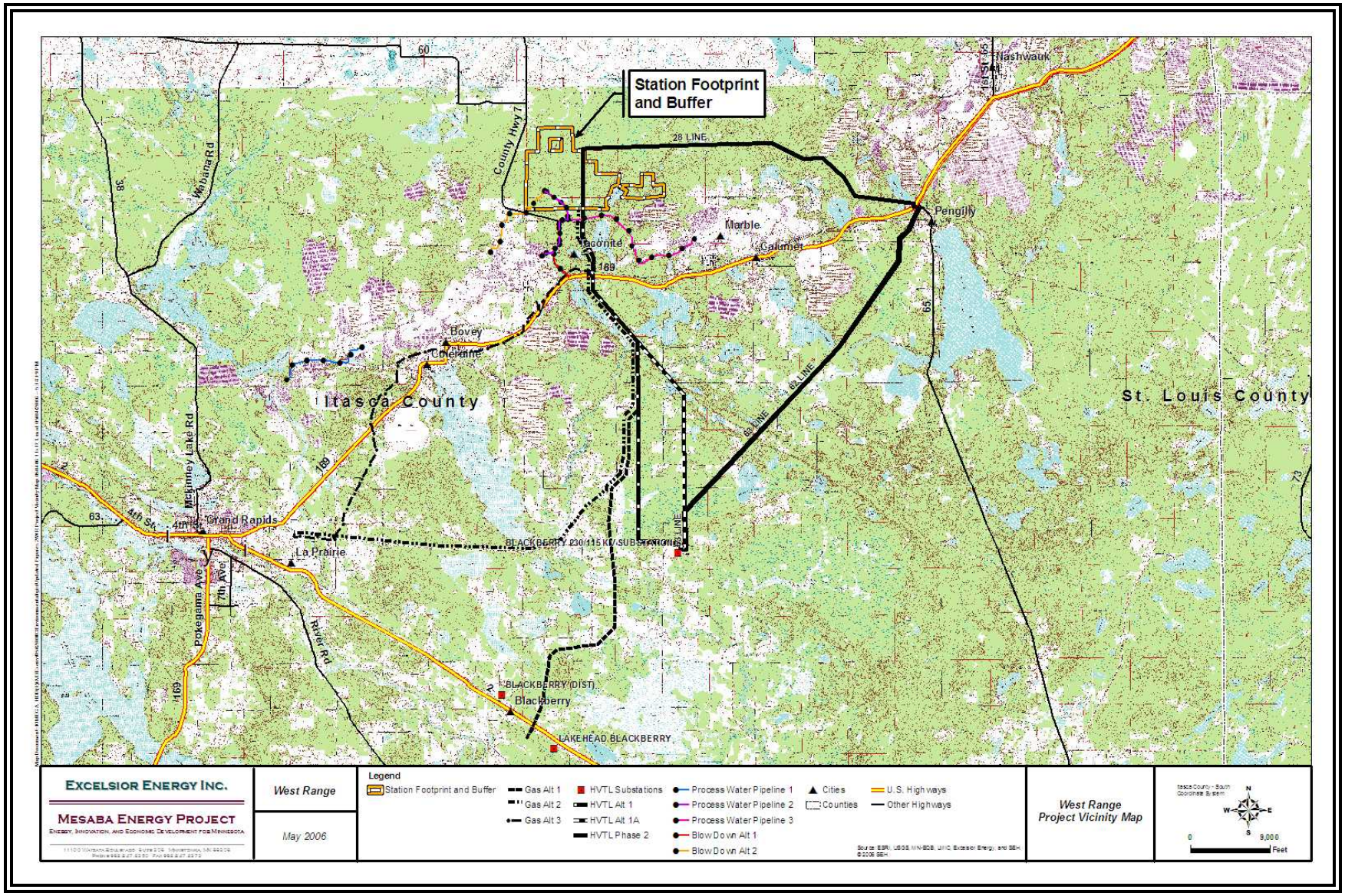
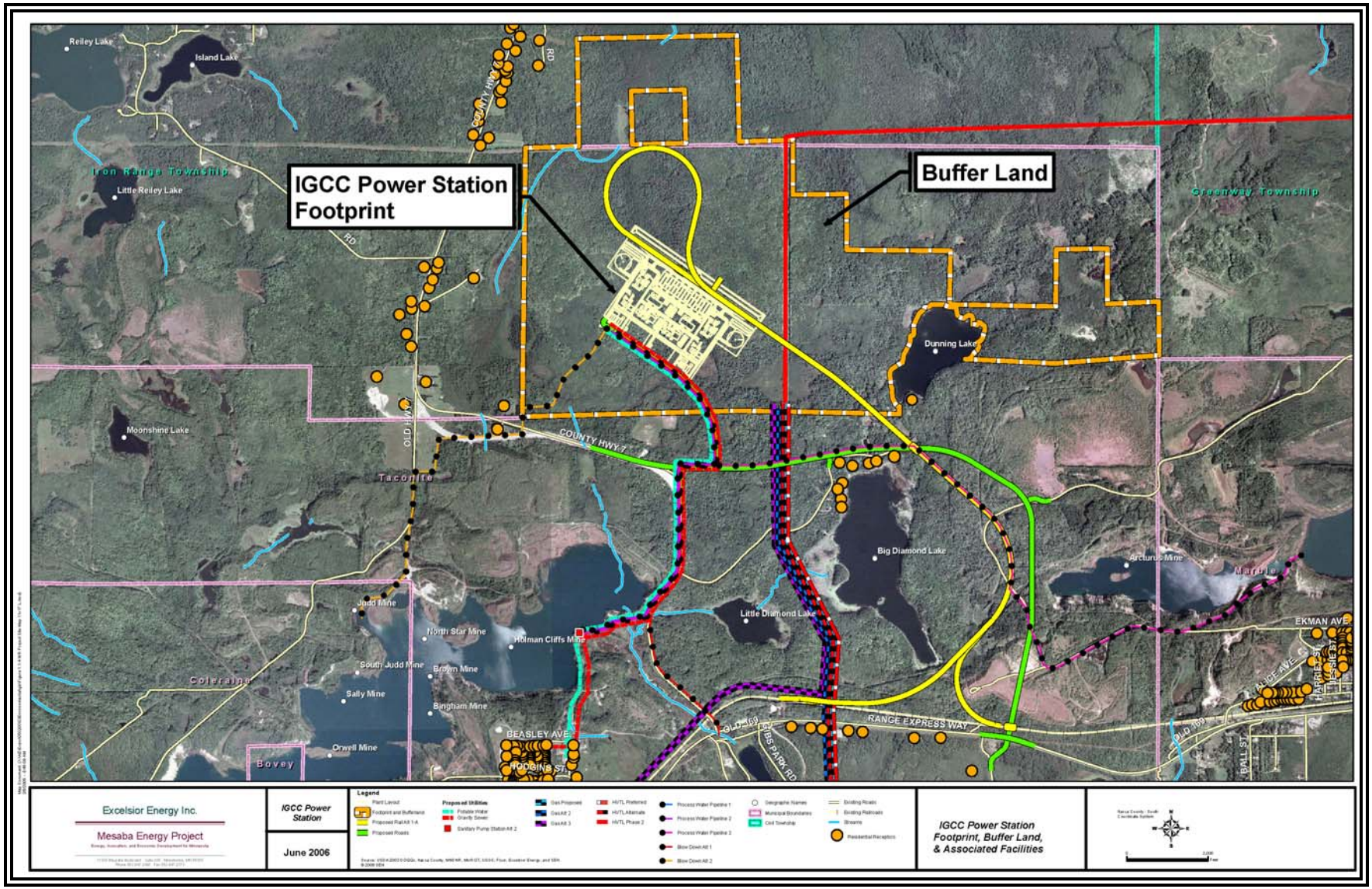


Figure 1.3-3 Optioned Property, Station Footprint and Relevant Infrastructure in Site Vicinity



1.3.3 Process/Project Description

The gasification process that Applicant has selected to supply fuel to the IGCC Power Station is the ConocoPhillips E-Gas™ gasification technology. In the E-Gas™ process, coal, petroleum coke, or blends of coal and petroleum coke are crushed, slurried with water, and pumped into a pressurized vessel (the gasifier) along with sub-stoichiometric amounts of purified oxygen. In the gasifier, controlled reactions take place, thermally converting feedstock materials into a gaseous fuel known as synthesis gas, or syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a combustion turbine, which is directly connected to an electric generator. The assembly of the combustion turbine and generator is known as a combustion turbine generator ("CTG"). The expansion of hot combustion gases inside the combustion turbine creates rotational energy that spins the generator and produces electricity. The hot exhaust gases exiting the CTG pass through a heat recovery steam generator ("HRSG"), a type of boiler, where steam is produced. The resulting steam is piped to a steam turbine that is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity. When a CTG and a steam turbine generator ("STG") are operated in tandem at one location to produce electricity in a highly efficient manner, the combination of equipment is referred to as a combined cycle electric power plant. Combining the gasification process with the combined cycle power plant is known as IGCC, an inherently lower polluting technology to produce electricity from solid feedstocks.

The Applicant is proposing to construct and operate a fuel flexible IGCC Power Station that can interchangeably use the following feedstocks:

- Coal (including, but not limited to, Powder River Basin sub-bituminous and Illinois No. 6 bituminous)
- Petroleum coke
- Blends of coals and petroleum coke.

1.4 NPDES PERMIT REQUEST SUMMARY

The purpose of this Application is to obtain necessary State and Federal preconstruction approvals for Mesaba One and Mesaba Two. The Application provides information to support approvals for the following:

- Use of two water intakes for the Phase I Development. One structure would be used for withdrawing water from the Canisteo Mine Pit ("CMP") and a second for withdrawing water from the Hill-Annex Mine Pit Complex ("HAMP Complex") a pit water complex which includes the Hill-Annex, Gross Marble, and Arcturus Mine Pits.
- Use of a water intake to allow withdrawal of water from the Lind Mine Pit ("LMP").
- Use of the following three outfalls for the Project Development: Outfall 001 into CMP from the IGCC Power Station; Outfall 002 into Holman Lake from the IGCC Power Station and the CMP; and Outfall 003 into the CMP from the HAMP Complex.

- Use of Outfall 004 into the CMP from the LMP.
- Discharge of non-contact cooling water after several cycles of concentration in cooling towers and small volumes of boiler water blowdown, such waters containing minor quantities of residual chemical conditioners (see Section 4.2).
- Discharge of other minor wastewater streams from the demineralizers.
- Discharge of stormwater that is covered either as part of the NPDES permit or under the state general NPDES stormwater permit for industrial activity (Outfall 005 and 006).
- The continued use of an existing permitted outfall from the HAMP Complex into Panasa Lake (NPDES Permit No. MN0030198) to maintain the desired water level in the HAMP Complex.

The major features of the water supply and wastewater discharge systems for the combined Phase I and II Developments are shown schematically in Figure 1.4-1 and on an aerial photograph of the project in Figure 1.4-2.

Figure 1.4-1
Water Supply and Wastewater Discharge System Schematic

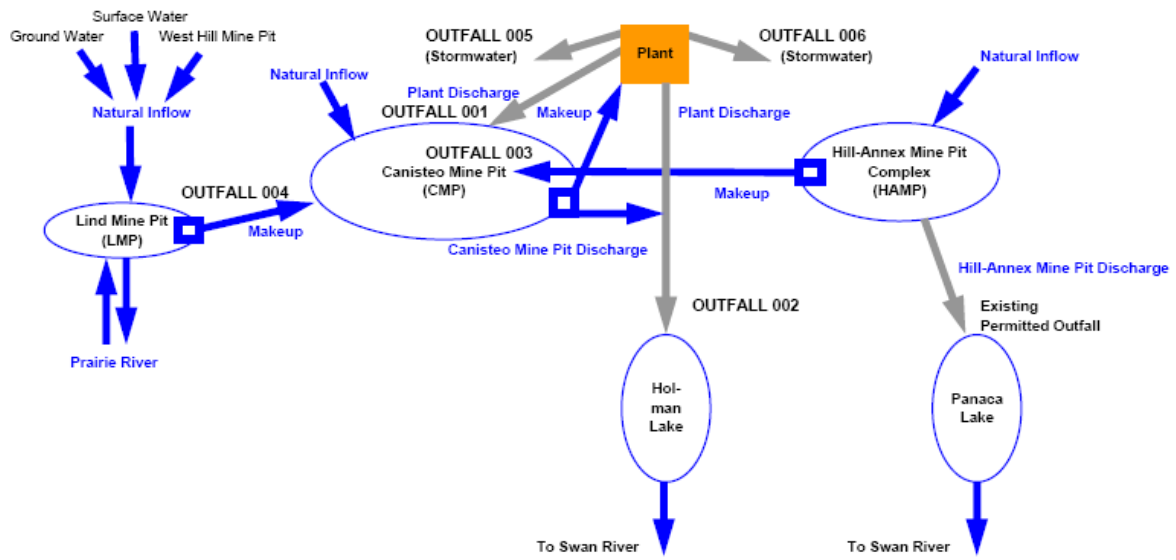
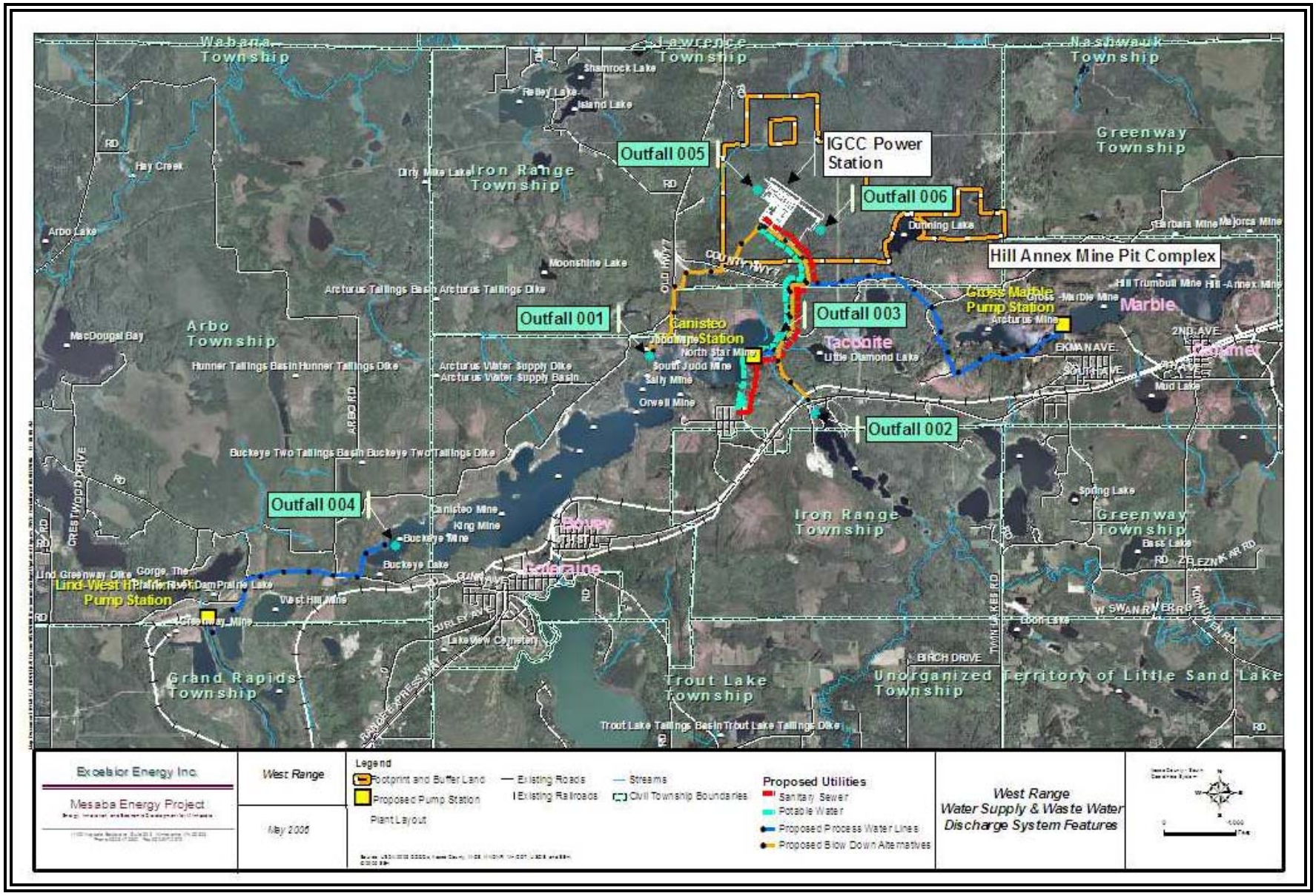


Figure 1.4-2 Water Supply and Wastewater Discharge System Features



1.5 PROJECT SCHEDULE

An overview of the schedule associated with the development and implementation of Mesaba One is provided in Figure 1.5-1. The detailed implementation schedule for Mesaba Two will be similar to that shown for Mesaba One, but some construction synergies are expected.

Mesaba One and Mesaba Two will be constructed in two phases. Electric power for each project phase will be produced in two CTGs (about 220 $MW_{(gross)}$ each) and in a STG (up to 300 $MW_{(gross)}$). Power generated from the project would be conveyed to the regional electrical grid by a HVTL. Each phase of the Project would nominally provide 606 $MW_{(net)}$ of electricity at peak to the bus bar of the high voltage switchyard located within the Station Footprint.

Applicant expects to commence construction of Mesaba One in the first quarter of 2008 and commence commercial operations in the third or fourth quarter of 2011. Construction of Mesaba Two is planned to begin in 2010 and commercial operations are planned for 2013.

Figure 1.5-1. Project Schedule (Page 1 of 3)

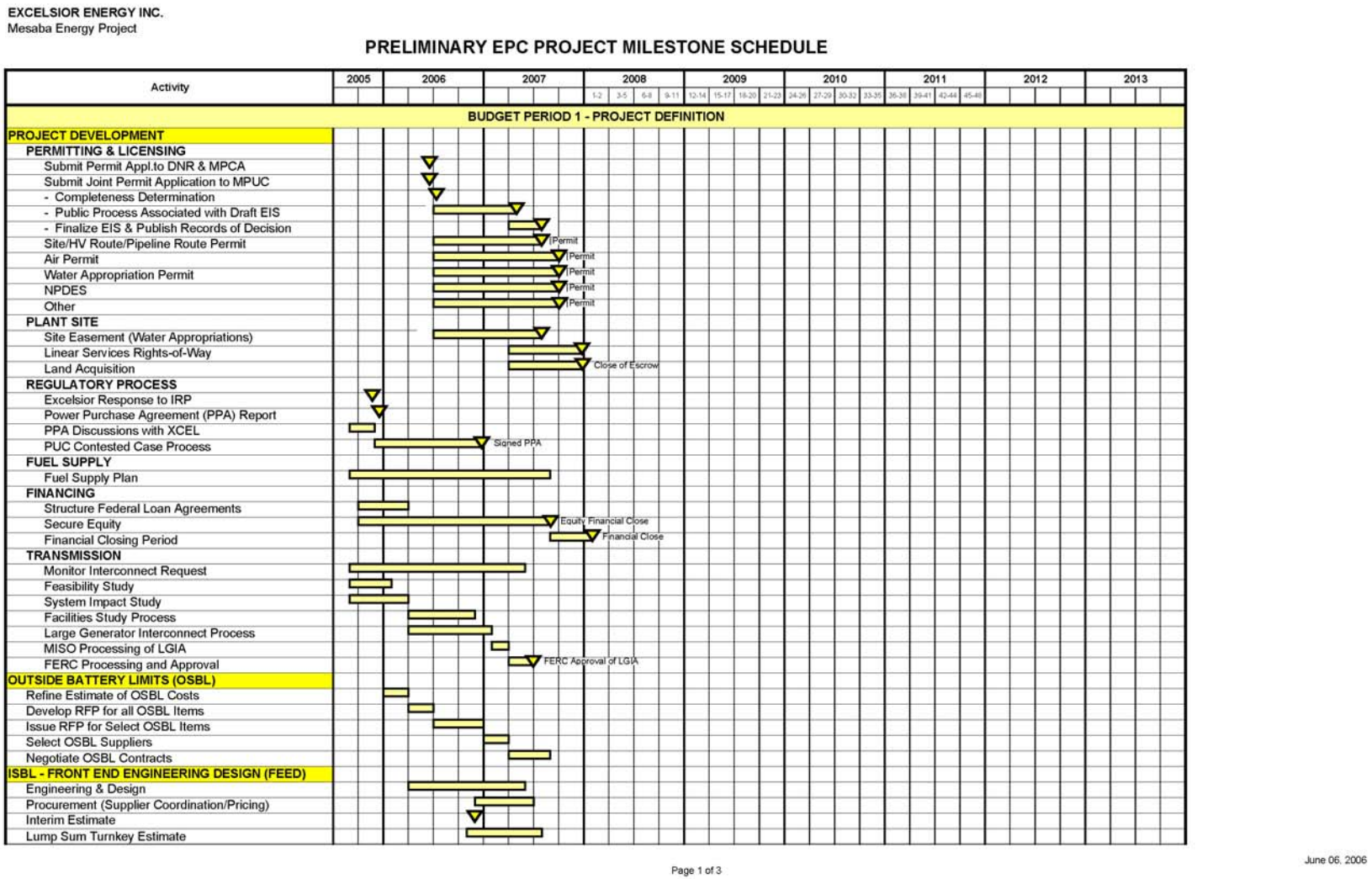


Figure 1.5-1. Project Schedule (Page 2 of 3)

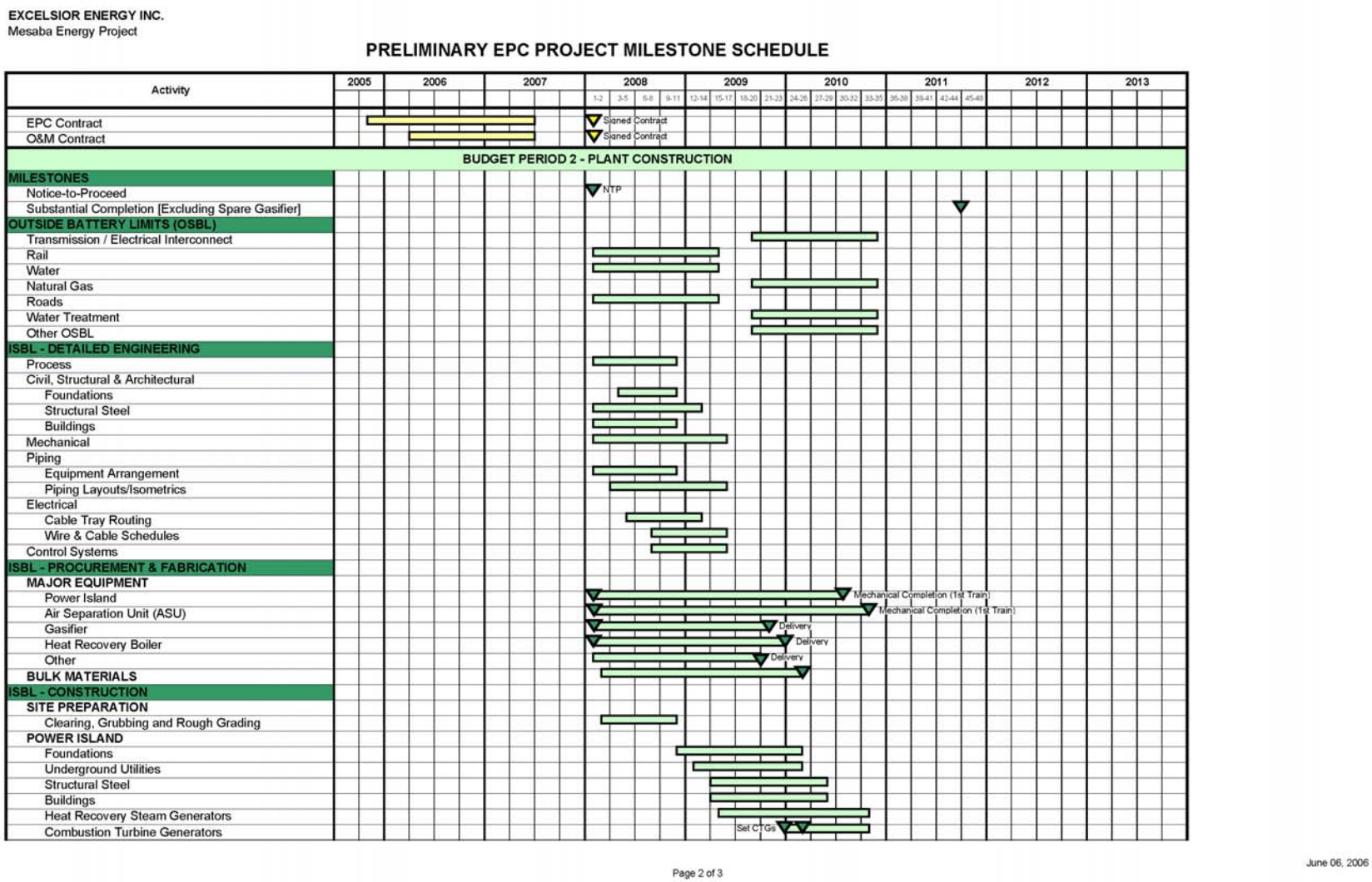
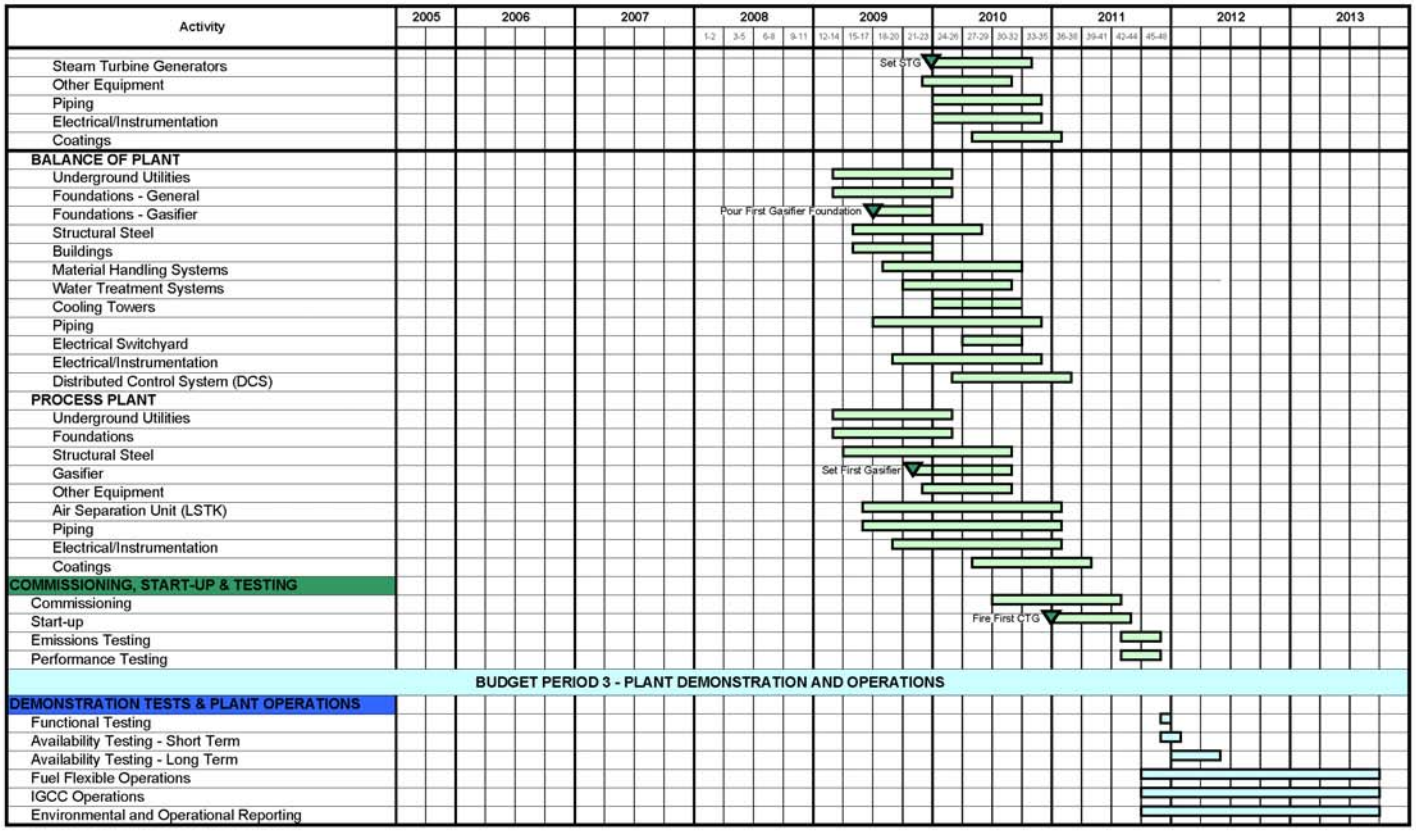


Figure 1.5-1. Project Schedule (Page 3 of 3)

EXCELSIOR ENERGY INC.
Mesaba Energy Project

PRELIMINARY EPC PROJECT MILESTONE SCHEDULE



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2.0 STORMWATER MANAGEMENT

2.1 CONSTRUCTION

Few environmentally sensitive areas exist within the Optioned Property. Those that do exist in the vicinity of the Station Footprint and in corridors along which associated facilities will traverse will be identified prior to initiating construction. Such areas will be clearly flagged and remain undisturbed during site preparation activities. Best Management Practices ("BMP") for stormwater runoff will be identified, adopted and implemented during this time period.

Initial activities on the Optioned Property and in corridors along which associated facilities will traverse involve preparing such areas for major construction work. Major initial work will consist of constructing access roads, clearing brush and trees, leveling and grading areas, bringing in necessary utilities, and undertaking dewatering activities that may be required. Such activities will involve the use of earthmoving and logging equipment. In the Optioned Property, large equipment will be required to clear and grade the area for construction of facilities in the vicinity of the Station Footprint. Construction parking, temporary offices and material storage locations will be constructed on the Optioned Property early in the site development process. . During this time, trucks will haul fill material for roadways and the plant, removing harvested timber, removing debris from the Optioned Property, and stockpiling fill material. Gravel and road base will be utilized for temporary roads, material storage, and parking areas.

In accordance with 40 C.F.R. Part 122.26(b)(14)(x), The Applicant will develop and submit to the MPCA a Storm Water Pollution Prevention Plan (SWPPP) that identifies erosion prevention and sediment BMPs. The SWPPP will be a combination of narrative and plan sheets that address foreseeable conditions at any stage in construction or post construction timeframes. The SWPPP will include a description of the nature of the construction activity and address the following:

- Potential for discharging sediment and/or other potential pollutants from the Optioned Property.
- Location and type of all temporary and permanent erosion prevention and sediment control BMPs along with procedures to be used to establish additional temporary BMPs as necessary for Site conditions during construction.
- Site map with existing and final grades, including dividing lines and direction of flow for all pre and post-construction stormwater runoff drainage areas located within the project limits. The site map will also identify impervious surfaces and soil types.
- Location of areas that are to remain undisturbed.
- Location of areas where construction will be phased to minimize duration of exposed soil areas.
- All surface waters and existing wetlands, which can be identified on maps such as United States Geological Survey 7.5 minute quadrangle maps or equivalent maps, located within one-half mile from the construction site and which, during or after construction, will receive stormwater runoff.
- Methods to be used for final stabilization of all exposed soil areas.

2.2 OPERATION

Stormwater generated during operation of the IGCC Power Station will be managed in three ways:

1. Stormwater with the potential to become impacted with process solids will be segregated from process equipment by curbs, elevated drain funnels and other means and returned as makeup to the feedstock slurrying system or for other process water use.

2. Stormwater that could become impacted with oil (such as runoff from parking lots) will be routed through an oil/water separator to the cooling tower blowdown sump prior to being discharged off-site through Outfall 001.

3. Stormwater from other areas not associated with industrial activity will be routed to the stormwater detention ponds where settling can occur and initial rainfall ("first flush") can be contained, checked, and released in a controlled manner to Outfall 005 and Outfall 006.

3.0 WATER USE

3.1 WATER REQUIREMENTS

Preliminary estimates for water appropriation requirements are presented in Table 3.1-1. This information is provided for background purposes to assist with understanding the overall water requirements of the Project. Complete and detailed information regarding water appropriations is provided in Applicant's Water Appropriation Permit application filed with the Minnesota Department of Natural Resources.

Table 3.1-1
Water Appropriation Requirements for the IGCC Power Station

Phase	Average Annual Appropriation (gpm)	Peak Appropriation (gpm)
Mesaba One	4,000[a]-4,400[b]	6,500
Mesaba One and Mesaba Two	8,800[b]-10,300[c]	15,200

[a]Based on 8 cycles of concentration in the gasification island and the power block cooling towers
[b]Based on 5 cycles of concentration in the gasification island and the power block cooling towers
[c]Based on 3 cycles of concentration in the gasification island and the power block cooling towers

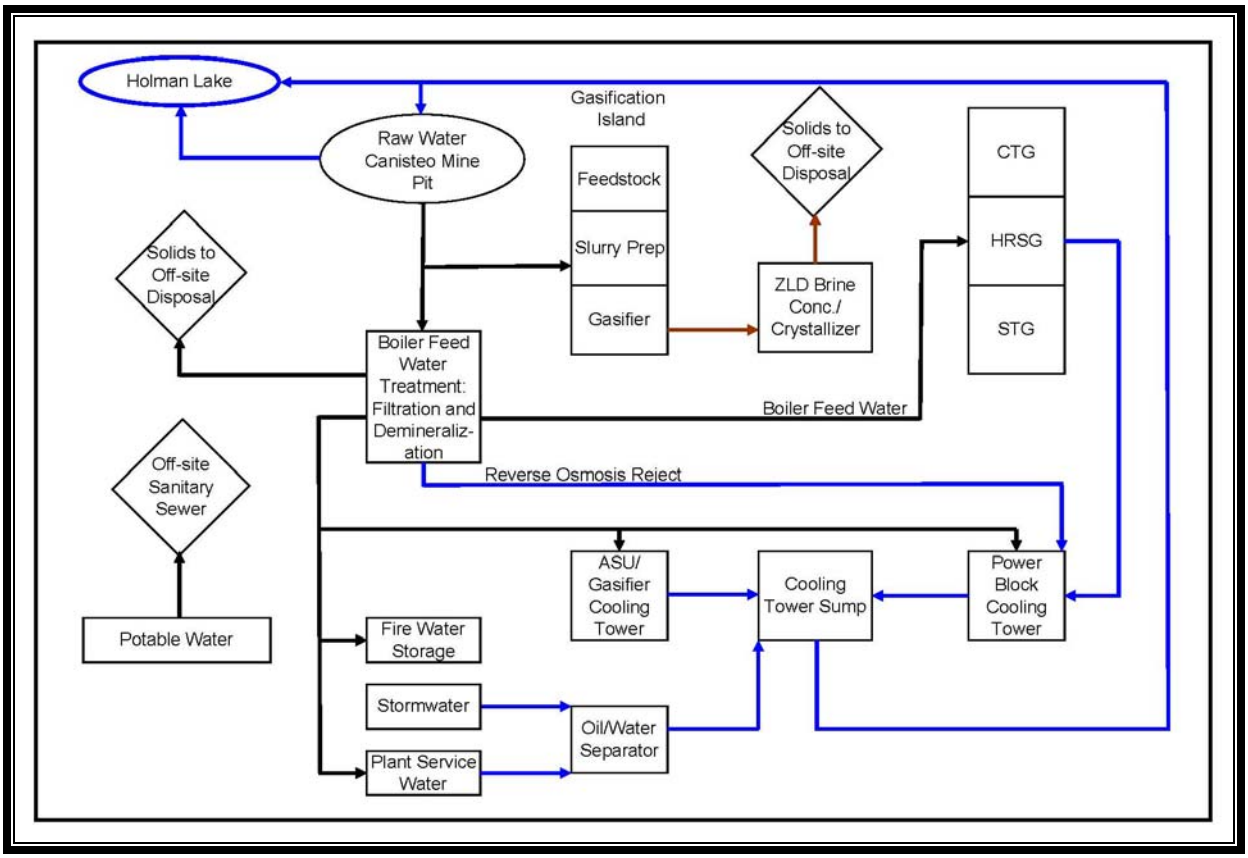
A water use flow diagram for the IGCC Power Station is presented in Figure 3.1-1. Estimated average annual consumptive and non-consumptive uses and flows contributing discharge to the CMP during operation of Mesaba One, based on five cycles of concentration ("COC") in the gasification island and power block cooling towers, are shown in Figure 3.1-2a. Flows depicting operation of Mesaba One and Mesaba Two assuming three cycles of concentration in the cooling towers are shown in Figure 3.1-2b. Wastewater discharges for three sets of COCs are shown in Table 3.1-2. The specific water uses related to the gasification island and the power block are described below in Sections 3.1.1 and 3.1.2, respectively.

Table 3.1-2
Wastewater Discharges From Systems in the Phase I IGCC Power Station

Wastewater Component	COC	Expected Discharge (GPM)	
		Ann. Avg.	Peak
Power Block Cooling Tower Blowdown	8	335	498
HRSG Demineralizer /RO Reject Water*	8	15	15
HRSG Blowdown*	8	17	17
Gasifier/ASU Cooling Tower Blowdown	8	140	209
Plant Service Water	8	45	45
Mixed Bed Polisher Regen./Backwash	8	15	15
Power Block Cooling Tower Blowdown	5	585	873
HRSG Demineralizer /RO Reject Water*	5	15	15
HRSG Blowdown*	5	17	17
Gasifier/ASU Cooling Tower Blowdown	5	245	366
Plant Service Water	5	45	45
Mixed Bed Polisher Regen./Backwash	5	15	15

Wastewater Component	COC	Expected Discharge (GPM)	
		Ann. Avg.	Peak
Power Block Cooling Tower Blowdown	3	1,180	1,750
HRSG Demineralizer /RO Reject Water*	3	15	15
HRSG Blowdown*	3	17	17
Gasifier/ASU Cooling Tower Blowdown	3	494	732
Plant Service Water	3	45	45
Mixed Bed Polisher Regen./Backwash	3	15	15

Figure 3.1-1
IGCC Power Station Water Use Flow Diagram*



*Red lines represent contact process waters; blue lines non-contact water.

Figure 3.1-2a
Phase I - Water Uses Contributing to IGCC Power Station Discharge

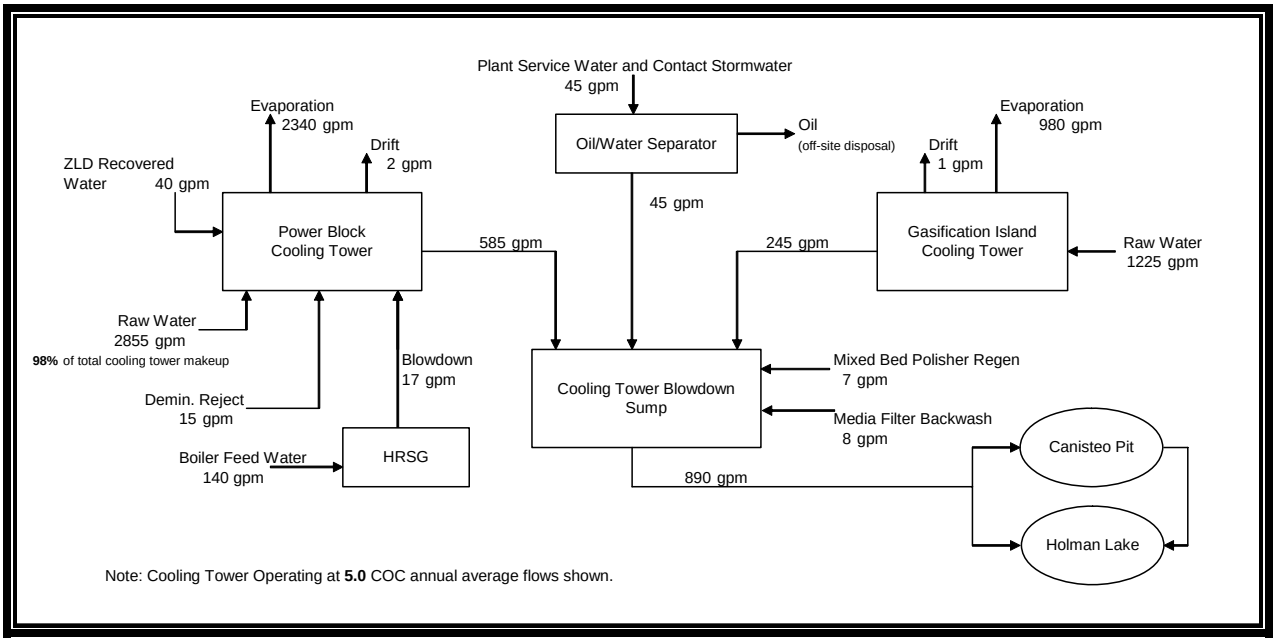
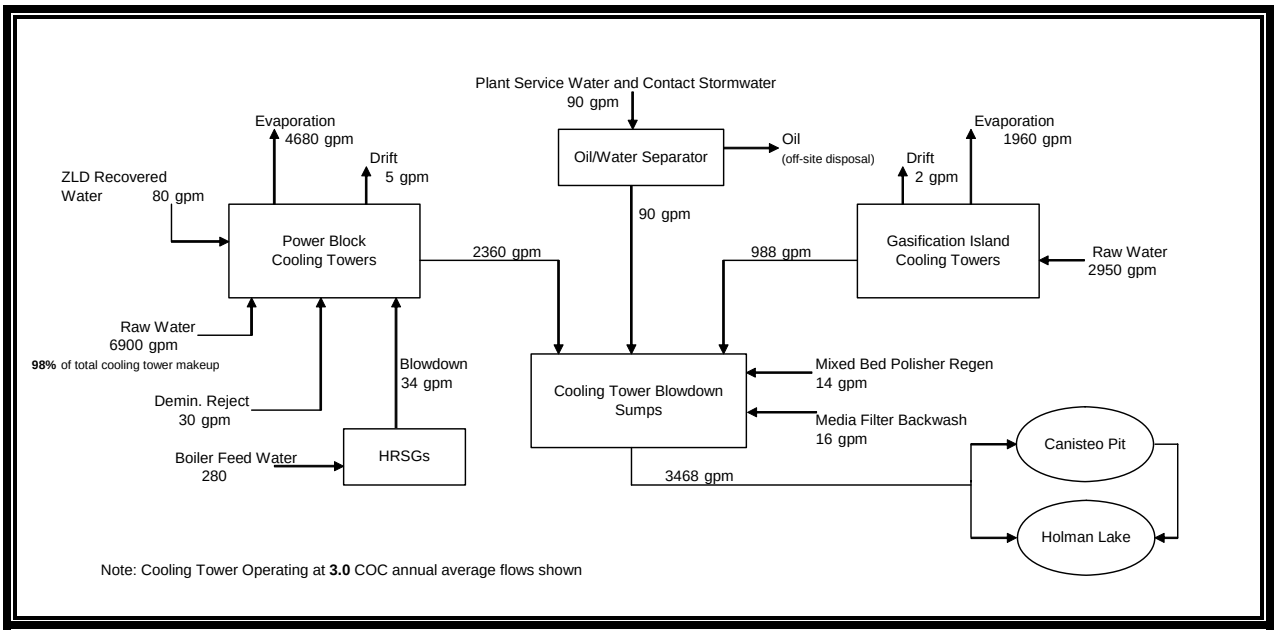


Figure 3.1-2b
Phase I and II - Water Uses Contributing to IGCC Power Station Discharge



3.1.1 Gasification Island

The major water use in the gasification island is for makeup water for the air separation unit cooling tower. Minor uses include watering for feedstock dust suppression and slurry preparation.

3.1.2 Power Block

Cooling water is the primary water need of the power block operation. Heat must be rejected from the IGCC Power Station's condenser in order to maintain proper steam cycle characteristics. Generally, a large volume of water is required for this purpose (for example, a 600 MW pulverized coal power plant would require approximately 300,000 gallons of water per minute for a once-through cooling system)[1]. The Phase I and Phase II IGCC Power Station will use cooling towers to reduce – relative to a once-through cooling system – the amount of water required to be withdrawn from the area's water resources.

In a cooling tower, warmed cooling water from the power plant condenser is cooled by the evaporation of a portion of the water as it passes through the cooling tower. In addition to evaporation, a very small amount of entrained water, called drift (water droplets that are entrained in the exhaust air stream carrying heat away from the towers), is also lost. As evaporation continues, salts dissolved in the remaining cooling liquid become more concentrated. When the concentrations of dissolved salts near their solubility limit, scale formation may occur on the condenser tubes and hinder heat transfer. Although addition of certain chemicals can inhibit scale formation, a portion of the cooling water, called cooling tower blowdown, must be removed. The quantity of cooling tower blowdown is calculated as follows[2]:

$$\text{Blowdown} = \frac{\text{Evaporation}}{\text{Cycles} - 1} - \text{Drift}$$

The cycles, or cycles of concentration, relate to the degree that the dissolved solids are allowed to concentrate in the cooling water system. For example, at peak evaporation rates (a hot summer day), approximately 3,500 gpm of water will be lost through evaporation for each phase. Assuming that the plant is operating at between three and five cycles of concentration, the amount of blowdown discharged to the receiving water will be between 500 and 1,750 gpm for each project phase. Drift is generally insignificant from a water use perspective, constituting approximately 0.001% of the water being recirculated in the cooling towers (about 3 gpm for a single phase).

Other minor water needs are for boiler feed water (for the HRSG) and general plant service water.

[1] From Black & Veatch, 1996. Power Plant Engineering, Kluwer Academic Publishers, Boston, page 525-6.
[2] Ibid, page 526.

3.2 WATER RESOURCES

The water needs of Mesaba One and Mesaba Two will be met by appropriating water from nearby abandoned mine pits and the Prairie River. The CMP, the HAMP Complex and the LMP are the identified sources that will meet most of the IGCC Power Station's water needs. Additional water will also be obtained from the Prairie River. The following sections describe how the Water Resources will be managed to meet the needs of the IGCC Power Station and other required uses, and summarize the available water quality data for each such Resource.

3.2.1 Water Management Plan

The applicant will attempt to maintain water levels in the identified mine pits within a specified range. Given this consideration, no one pit water resource will be capable of supplying all of the water requirements for Mesaba One and Mesaba Two. In aggregate, however, the three mine pit resources and the Prairie River will support the full load operation of the Phase I and II Developments. Applicant has developed a water management plan utilizing these water resources which are all within close proximity to the site.

3.2.1.1 Overview

The water delivery system consists of three pumping stations located on three abandoned mine pits, and an engineered weir to draw water from the Prairie River. The overall plan is as follows:

3.2.1.1.1 Mesaba One

- Water from the HAMP Complex will be pumped via a pump station to the CMP.
- A pump station on the CMP will pump water to the IGCC Power Station for makeup water or to Holman Lake for mine pit water level control and/or mine pit water quality management.
- Excess water in the HAMP Complex will continue to be pumped to Panasa Lake to maintain that pit's desired water level, as is currently taking place.
- Cooling tower blowdown from the IGCC Power Station will be discharged to the CMP and/or Holman Lake.

3.2.1.1.2 Mesaba One and Mesaba Two

- Water from the HAMP Complex will be pumped via a pump station to the CMP.
- A pump station on the CMP will pump water to the IGCC Power Station for makeup water or to Holman Lake for mine pit water level control and mine pit water quality management.
- Excess water in the HAMP Complex will be pumped to Panasa Lake to maintain the desired water level.
- Water from the LMP will be pumped via a pump station to the CMP.
- The engineered intake structure installed on the Prairie River will direct by gravity water above certain river flows to the LMP.

- Cooling tower blowdown from the IGCC Power Station will be discharged to the CMP and/or Holman Lake.

Current water surface elevations, water surface areas and estimated water volumes in the mine pit sources is summarized in Table 3.2-1.

Table 3.2-1
Abandoned Mine Pit Water Sources

Water Source	Water Surface Elevation (feet) (November 2005)	Surface Area (acres) (November 2005)	Estimated Volume (acre-feet) (November 2005)
CMP	1,309	1,400	150,000
HAMP Complex			
Hill-Annex Mine Pit	1249	216	20,600
Arcturus Mine Pit	1269	105	4,490
Gross/Marble Mine Pit	1249	141	11,100
LMP	1265	82	8,310

3.2.1.2 System Capabilities

The sustainable supply capability for each water source was estimated using information supplied by the MDNR, previous engineering studies, and information supplied by local government units. The actual sustainable rates that will be realized are dependent on several factors, including: precipitation, evaporation, pit water level and hydrogeological conditions. Estimated water source supply capabilities are presented Table 3.2-2:

Table 3.2-2
Water Source Supply Capability

Water Source	Est. Range of Flow (gpm)	Assumed Sustainable Flow for Water Balance Modeling (gpm)
CMP	810-4,190	2,800
HAMP Complex	1,590-4,030	2,000[a] 3,500[b]
LMP	Not yet quantified	1,800[c]
Prairie River	0-2,470[d]	0[e]
Discharge from IGCC Power Station	0-3,500	Varies

[a]At an operating elevation of 1,230 ft.
[b]At minimum operating elevation
[c]Based on a single observation and flow estimate
[d]Maximum available flow assumed to be 25% of the 7Q10 flow of the Prairie River
[e]For modeling purposes, the Prairie River contributions determined to be unnecessary provided LMP flow rate is sustained a 1,800 gpm.

Preliminary estimates of the required pumping station capabilities are presented in Table 3.2-3. Pump station peak flow capability will provide redundancy to supply daily peak and average needs in the event of a failure of a major pump station.

Table 3.2-3
Pumping Station Capability (Phase I and II)

Pump Station Location	Ave Annual Flow (gpm)	Peak Flow (gpm)
CMP	Up to 10,300	15,200
HAMP Complex	Up to 3,500	7,000
LMP	Up to 2,000	7,000

The estimated pumping rates for the CMP pump station to the IGCC Power Station are summarized in Table 3.2-4.

Table 3.2-4
CMP Pump Station – Expected Operation

	Mesaba One	Mesaba One and Mesaba Two
Annual Average Flow	4,400 gpm	10,300 gpm
Peak Operating Day (80 °F)	6,500 gpm	15,200 gpm

Mine pits will receive excess water in wet years and provide additional supply to cover shortfalls in dry years.

3.2.1.3 Operating Plan

The water management system will be designed and operated to provide the following:

- Pumping of water from the CMP to Holman Lake for mine pit water level control and mine pit water quality management.
- Continued pumping of the HAMP Complex for water level control and water quality management in the CMP.
- Adequate redundancy to supply daily peak and average needs despite catastrophic failure of a major pump station.
- Retention of water in years of excess precipitation.
- Provision of retained water in years of low precipitation.
- Emergency discharge of water from mine pits in cases of extreme precipitation.

The following describes in greater detail how each water source will be used.

3.2.1.3.1 CMP

The CMP's role in the water management system is as follows:

- Host the main water pumping station on the east end of the pit.
- Provide the primary supply of cooling and process makeup water to the IGCC Power Station for routine operation.
- Receive water from cooling tower blowdown from the IGCC Power Station.
- Accept the discharge from the LMP pumping station in the western edge of the pit.
- Accept the discharge from the HAMP Complex pumping station in the eastern edge of the pit.
- Provide for pumping from the CMP into Holman Lake through a discharge pipe to Holman Lake.
- Maintain water within a sufficiently wide operating range of pit elevations to accommodate wet and dry years.

3.2.1.3.2 HAMP Complex

The HAMP Complex is comprised of three connected mine pits: Arcturus, Gross-Marble, and Hill-Annex. The MDNR is currently pumping seasonally out of the Hill-Annex Mine Pit to preserve historically significant mining structures in the State Park. Use of the HAMP Complex water will be somewhat dependent upon the MDNR needs to control Hill-Annex Mine Pit levels. Applicant will establish an agreement with the MDNR to control pumping from the HAMP Complex, with such agreement to be finalized as part of the permitting process.

A pumping station will be installed on the Gross Marble Mine Pit and will pump directly to the CMP. The existing Hill-Annex Mine Pit pumping system will be maintained and operated in accordance with the above-referenced agreement to allow pumping to its current discharge point, Panasa Lake, and if necessary, modified to pump water into the Gross-Marble Mine Pit.

3.2.1.3.3 LMP

A pumping station will be required on the LMP to transport water to the CMP. The pumping station will pump a combination of pit inflows (surface water, ground water and inflow from the West Hill Mine Pit) and water from the Prairie River.

<u>Prairie River</u>

Overflow from the Prairie River during high flow periods will be directed to the LMP via an engineered intake structure. Surface water levels in the LMP will be maintained at a low enough elevation to accommodate gravity feed of flows from the Prairie River.

3.2.2 Water Source Quality

The current quality of each water source is summarized in Table 3.2-5. In general, the current concentration of each constituent is based on the median concentration of available qualified water quality analyses. The available source water quality data is provided in Appendix B.

Table 3.2-5
Current Source Water Quality Constituent

Current Source Water QualityConstituent	Water Source				
	Units	CMP	HAMP Complex	LMP	Prairie River
Hardness	mg/l	308	229	--[b]	--[b]
Alkalinity	mg/l	180	163	178	76
Calcium	mg/l	55.3	58.6	73.2	50
Magnesium	mg/l	40.8	20.5	--	22
Iron	mg/l	<0.05	<0.05	--	--
Manganese	mg/l	<0.02	<0.02	--	--
Chloride	mg/l	5.15	5.2	4.9	1.3
Sulfate	mg/l	103.5	59.5	--	<5
TDS	mg/l	337	254	402	--
pH	mg/l	8.4	8.3	7.7	7.4
Aluminum	ug/l	<25	<25	--	91
Barium	ug/l	28.6	29.7	--	--
Cadmium	ug/l	<10	<10	--	--
Chromium (6+)	ug/l	<5	<5	--	--
Copper	ug/l	<10	<10	--	--
Fluoride	mg/l	--	--	--	--
Mercury	ng/l	0.9	0.9	0.8[a]	0.59
Nickel	ug/l	<5	<5	--	--
Selenium	ug/l	<2	<2	--	--
Sodium	mg/l	6.6	6.2	5.0	2.5
Specific Conductivity	umhos/cm	476	418	--	171
Zinc (3)	ug/l	<10	<10	--	--
BOD	mg/l	<2	<2	--	--
COD	mg/l	<2	<2	--	--
TOC	mg/l	1.9	1.9	--	--
TSS	mg/l	1.5	1.5	--	--
Ammonia (as N)	mg/l	<0.1	<0.1	0.1	0.018
Phosphorus	mg/l	<0.1	<0.1	0.01	0.029

[a] For the mass balance computations presented in Section 5, it was conservatively assumed that the mercury concentration in the LMP is identical to that in the HAMP Complex and the CMP.
[b] --Indicates that no data was collected.

4.0 WASTEWATER GENERATION AND DISCHARGE OUTFALLS

4.1 WASTEWATER GENERATION

4.1.1 Zero Liquid Discharge System

The IGCC Power Station gasification island will incorporate a significant environmental feature to protect the quality of local streams and lakes. Significantly, wastewater generated from the gasification and slag processing operations, containing certain levels of heavy metals and other contaminants from the feedstocks, will be treated in a Zero Liquid Discharge ("ZLD") process that will recover distilled water for reuse in the power plant, (reducing fresh water consumption) and, more importantly, concentrate heavy metals and other contaminants of concern into a solid waste stream. This solid waste will be disposed in a solid waste management facility operating in accordance with all applicable rules and regulations governing such facilities. No wastewater streams from this system will be discharged or require disposal(see Figure 3.1-1).

4.1.2 Discharges From the IGCC Power Station

As shown in Table 3.1-2, wastewater from the power block will consist primarily of cooling tower blowdown blended with relatively low-flow additional wastewater streams from other plant systems (including HRSG blowdown, boiler feed water demineralizers and intermittent treated water from the oil/water separator serving the plant drainage system). Estimated average annual flow rates of the waste streams contributing to discharge to CMP and/or Holman Lake during IGCC Power Station operation are shown in Figure 3.1-2a (for Mesaba One) and Figure 3.1-2b (for Mesaba One and Mesaba Two). Calculated total wastewater discharge rates to the CMP vary for the range of expected coals and petroleum coke feedstocks to be processed in the plant and the COC in the cooling towers. The discharge to the CMP may also vary due to the discharge of a portion of the IGCC Power Station effluent directly to Holman Lake. The expected range of wastewater discharge rates is summarized in Table 4.1-1 (see also Figures 3.1-2a and 3.1-2b and Table 3.1-2).

Table 4.1-1
Wastewater Discharge Rates

Phase	Peak Discharge (gpm)	Average Annual Discharge	
		(gpm)	(MGD)
Mesaba One (5 COC)	1,300	890	1.3
Mesaba One and Mesaba Two (3 COC)	5,140	3,500	5.0

Because almost all of the wastewater discharged from the IGCC Power Station operations is due to the need to remove a portion of the condenser cooling water for control of dissolved solids, the constituents in the discharge are essentially the same materials present in the background water supply delivered to the plant, but more concentrated. Based on the IGCC Power Station

equipment operating requirements and expected water source quality, the plant cooling towers are expected to be limited to between approximately three to five COC. Therefore, the contaminants in the cooling water blowdown are expected to be concentrated (due to evaporation in the cooling tower) by about three to five times the concentration in the water supply. Information regarding discharges associated with eight COC is presented in Table 3.1-2 given the potential to operate at that level.

4.1.3 Sanitary Discharges

The sanitary wastewater produced during operation of the Phase I and II IGCC Power Station will be relatively small (about 30 gallons per day per person) and will be discharged to the City of Taconite's sanitary sewer system. As an alternative, the sanitary wastewater could be treated in an on-site septic system. In either case, this wastewater stream is not included under this NPDES permit application.

4.2 CHEMICAL ADDITIVES

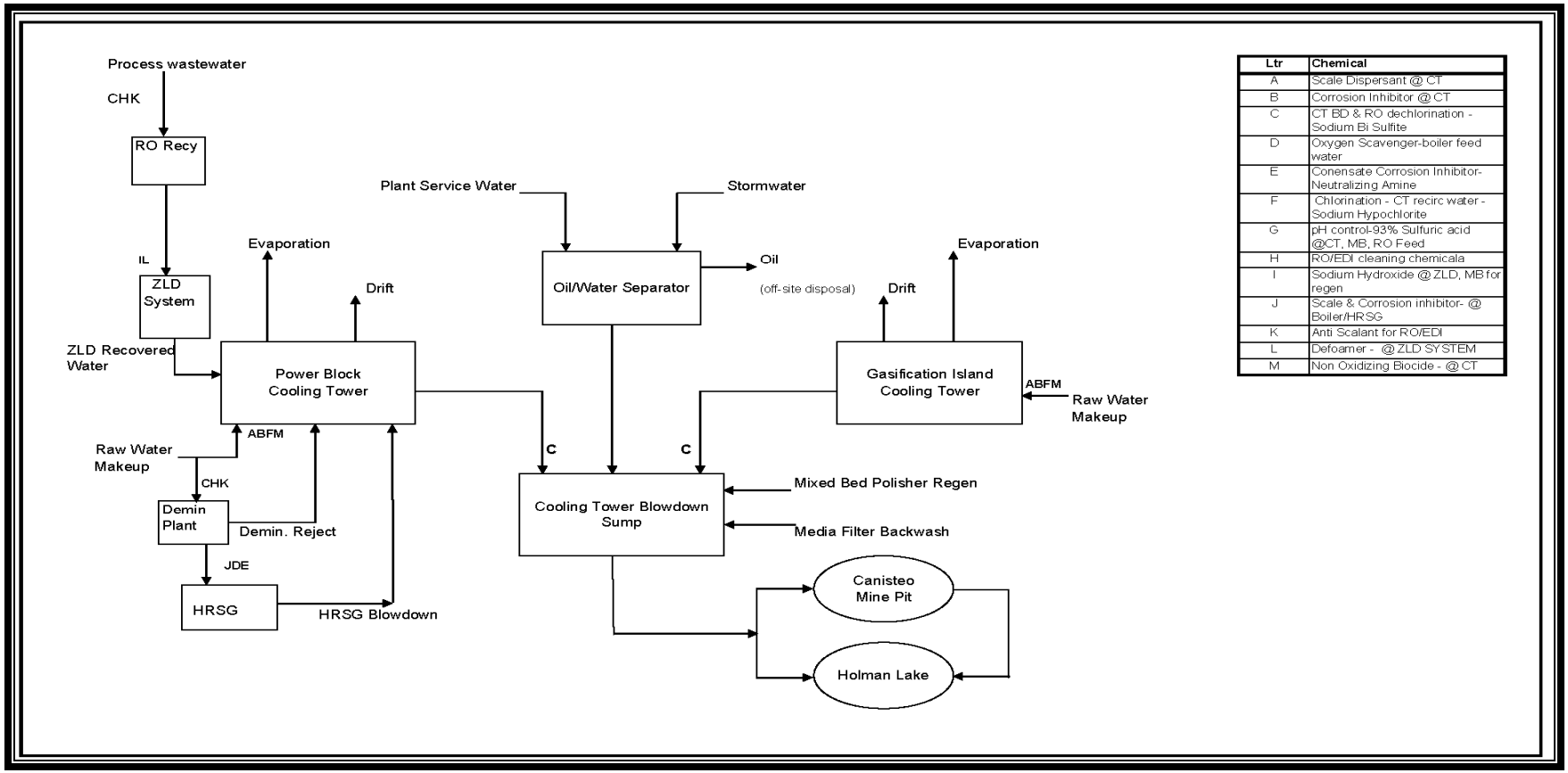
Typical chemicals that are expected to be added to the water stream that ultimately will be discharged from the IGCC Power Station to the CMP and/or Holman Lake are listed in Table 4.2-1. These chemicals are primarily needed to control cooling water corrosion and fouling and to neutralize certain undesirable constituents in the plant discharge stream. The point of introduction for each of the chemicals is also indicated in the table and shown in Figure 4.2-1. Material Safety Data Sheets (MSDS) representative of the chemical additives are provided in Appendix C. The estimated usage for Mesaba One and Mesaba Two are listed (half the indicated amount will be used for Mesaba One only). To be noted is that the majority of these chemicals will be consumed in the plant processes and only residual amounts are expected to be present in the water ultimately discharged. These quantities are preliminary estimates only and are subject to revision when the specific water chemistry program for the facility is developed.

Table 4.2-1
Chemical Additives

Chemical	Point(s) of Introduction	Estimated Usage (lbs/year)	Estimated Residual in Discharge	Basis, % in Discharge
Dechlorination - Sodium Bisulfite	Cooling Tower Blowdown Sump, Reverse Osmosis System	15,000 7500	150 75	1%
Oxygen Scavenger	Boiler Feed Water	6,600	66	1%
Condensate Corrosion Inhibitor-Neutralizing Amine/ammonia	Boiler Feed Water	2,200	22	1%
Chlorination - Sodium Hypochlorite	Cooling Towers	300,000	1,500	0.5%
pH control-93% Sulfuric acid	Cooling Towers, Reverse Osmosis, Mixed Bed	18,000 3,000 11,000	36 6 22	0.2%
Sodium Hydroxide	Mixed Bed regeneration	11,000	0	(totally neutralized)

Chemical	Point(s) of Introduction	Estimated Usage (lbs/year)	Estimated Residual in Discharge	Basis, % in Discharge
Anti-Scalant	Reverse Osmosis, Deionizer	150 200	2 2	1%
Cleaning chemicals (intermittent), hydrochloric acid, caustic, surfactant	Reverse Osmosis	1000 lb/yr	10	1%
Non-Oxidizing Biocide	Cooling Towers	11,000	22	0.2%

Figure 4.2-1. Points of Chemical Addition in IGCC Power Station Circulating Water System



Ltr	Chemical
A	Scale Dispersant @ CT
B	Corrosion Inhibitor @ CT
C	CT BD & RO dechlorination - Sodium Bi Sulfite
D	Oxygen Scavenger-boiler feed water
E	Conensate Corrosion Inhibitor-Neutralizing Amine
F	Chlorination - CT recirc water - Sodium Hypochlorite
G	pH control-93% Sulfuric acid @CT, MB, RO Feed
H	RO/EDI cleaning chemicala
I	Sodium Hydroxide @ ZLD, MB for regen
J	Scale & Corrosion inhibitor- @ Boiler/HRSG
K	Anti Scalant for RO/EDI
L	Defoamer - @ ZLD SYSTEM
M	Non Oxidizing Biocide - @ CT

4.3 DISCHARGE OUTFALLS

Proposed permitted outfall locations for the IGCC Power Station are shown on Figure 1.4-2 and are described below.

4.3.1 CMP – Outfalls 001, 003 and 004

Outfall 001 into the east end of the CMP is one of two alternative points of discharge for wastewater generated from the power block and gasification island cooling towers of Mesaba One and Mesaba Two.

Outfall 003 into the east end of the CMP is necessary for the transfer of HAMP Complex waters to the CMP for IGCC Power Station makeup water and management of CMP water quality during operation of Mesaba One and Mesaba One and Mesaba Two.

Outfall 004 into the west end of the CMP is required for the transfer of LMP water to the CMP for IGCC Power Station makeup water.

4.3.2 Holman Lake - Outfall 002

Outfall 002 into the north end of the Holman Lake will be available for the discharge of water from two sources: (1) water from the CMP to control the mine pit water level and to manage the water quality in the mine pit during plant operation, and (2) wastewater generated from the cooling towers serving the power block and gasification island of Mesaba One and Mesaba Two to control water quality in the CMP.

4.3.3 Stormwater Outfalls 005 and 006

Stormwater from areas of IGCC Power Station that is not associated with industrial activity will be routed to stormwater detention ponds and then released to Outfalls 005 and 006. Outfall 005 will discharge west of the IGCC Power Station site to a natural watercourse that eventually drains to the CMP. Outfall 006 will discharge east of the IGCC Power Station site to a natural watercourse that eventually drains to the CMP or to Holman Lake.

4.3.4 Existing Panasa Lake Outfall

The IGCC Power Station water appropriation from the HAMP Complex during Phase I operation may not be sufficient to maintain the desired water level in the HAMP. The existing outfall into Panasa Lake will be maintained and operated in accordance with the previously referenced agreement (between Applicant and MDNR) to discharge a portion of the HAMP Complex water to maintain the desired water level in the HAMP. The MDNR currently holds an existing NPDES permit (No. MN0030198) to discharge water pumped from the HAMP Complex to Panasa Lake (see Table 5.2-3). This outfall will be maintained for discharges as needed to maintain desired pit water levels in the HAMP Complex .

5.0 NPDES PERMIT APPLICATION CONSIDERATIONS

The IGCC Power Station operating plan described and analyzed in this section was developed to provide a worst-case analysis of discharges from Mesaba One and Mesaba Two that would meet all applicable water quality standards and the requirements of 40 C.F.R. 122.4 (that no new or expanded discharge will "cause or contribute" to violations of water quality standards in impaired waters).

5.1 WATER BALANCE SUMMARY

Makeup water needs of the IGCC Power Station, primarily for cooling water needs (see Section 3), will be met by withdrawals from the CMP. Makeup water needs in excess of that otherwise available from the CMP will first be addressed by pumping water from the HAMP Complex into the CMP (at Outfall 003). Additional makeup water needs will next be met by transferring water from the LMP (and the Prairie River) into CMP (at Outfall 004). Natural inflows to all these pits occur from direct precipitation, surface water runoff and groundwater infiltration. IGCC Power Station discharges, primarily consisting of cooling tower blowdown, will be discharged into CMP (at Outfall 001) and/or into Holman Lake (at Outfall 002). Water will be discharged from the CMP to Holman Lake (at Outfall 002) to control water levels in the CMP and to manage pit water quality. Water levels will be maintained in the HAMP Complex by discharging water as necessary to Panasa Lake under the existing NPDES permitted outfall. Water use and discharge scenarios have been developed for Mesaba One and Mesaba One and Mesaba Two operations based on the expected water availability and water quality from each of the mine pit and river water sources described in earlier sections of this report, and the water quality considerations discussed later in this section.

The expected average annual flow rates for each water stream for operation of Mesaba One are shown in Figure 5.1-1a. The illustrated water balance for such operation is based on five COC in the cooling towers and assumes a portion of the plant effluent is discharged to the CMP (Outfall 001) and a portion is discharged to Holman Lake (Outfall 002). The volume of water discharged to Holman Lake is based on the currently permitted mass of mercury and phosphorus now allowed from the HAMP Complex. The exact flow rate and volume discharged to Holman Lake will be dependent upon the water quality discharged from the IGCC Power Station. In addition, provisions will be made for direct discharge from the CMP to Holman Lake if required to control water levels in the CMP.

The expected average annual flow rates for each water stream for operation of Mesaba One and Mesaba Two is shown in Figure 5.1-1b. The illustrated water balance for such operation is based on three COC in the cooling towers and assumes that a portion of the plant discharge is discharged through Outfall 001 to the CMP and a portion of the plant discharge is directed to Holman Lake through Outfall 002. Normally, during operation of Mesaba One and Mesaba One and Mesaba Two, no discharge is expected occur from the CMP to Holman Lake. As with operation of Mesaba One, the ability to discharge through Outfall 002 from the CMP during operation of Mesaba One and Mesaba Two is desired to provide operational flexibility.

Figure 5.1-1a
Mesaba One Water Operations Flow Rates

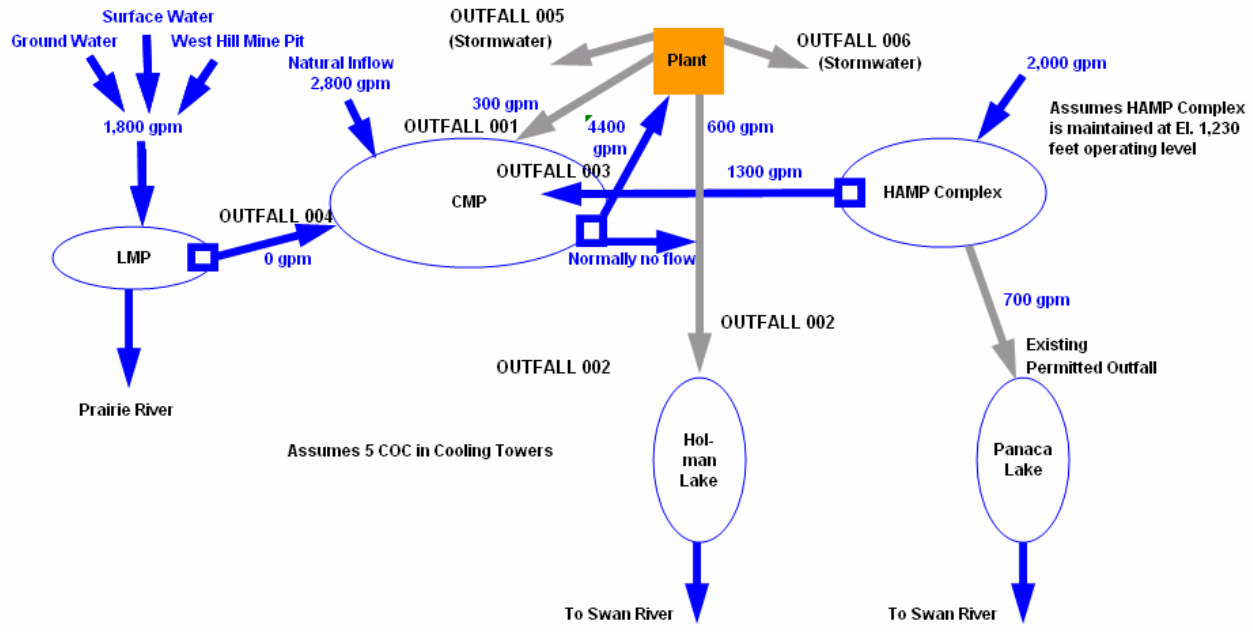
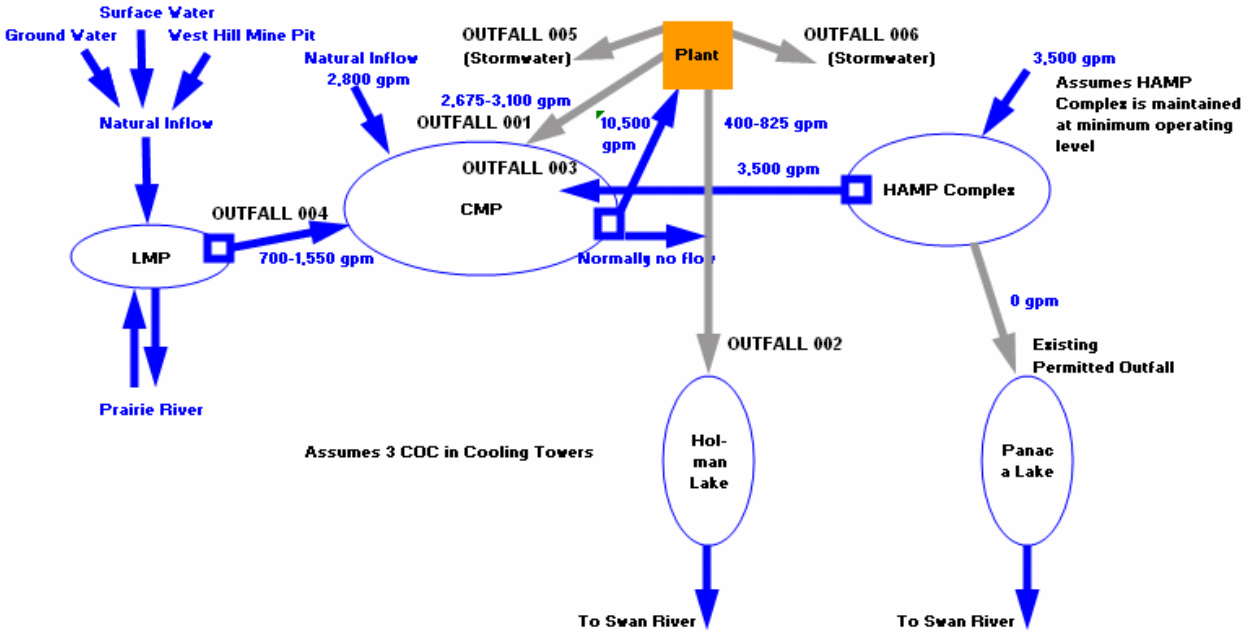


Figure 5.1-1b
Mesaba One and Mesaba Two Water Operations Flow Rates



The expected average annual flow rate and proposed permitted peak flow rate for each outfall for Phase I and Phase I and II operation are summarized in Table 5.1-1. The expected average annual discharge rates are based on the water balances presented above. The proposed peak discharge rates are typically based on modeled peak rates plus some additional capacity to provide operational flexibility.

Table 5.1-1
Discharge Flow Rates

Outfall	Mesaba One		Mesaba One and Mesaba Two	
	Average (gpm/MGD)	Peak (gpm/MGD)	Average (gpm/MGD)	Peak (gpm/MGD)
001	300/.43	3,000/4.3	3,500/5.0	6,000/8.6
002	600/0.9[a]	3,000/4.3	825/1.2[a]	6,000/8.6
003	1,300/1.9	7,000/10.1	3,500/5.0	7,000/10.1
004	0	0	1,500/2.2	7,000/10.1
005	To be determined	To be determined	To be determined	To be determined
[a] Limited by mercury mass discharge, see Section 5.2.1				

5.2 WATER QUALITY

As demonstrated in this Application, the IGCC Power Station's proposed operation will be in compliance with the Minnesota water quality requirements set forth in Minn. R. ch. 7050.

The water discharged from Mesaba One through Outfall 001 and Outfall 002 will essentially be CMP water concentrated up to several times the background concentration found in the pit water sources. The relatively minor amounts of other water streams and chemical additives will not significantly alter the water quality of the concentrated mine pit water (cooling tower blowdown). Beyond a reasonable mixing zone, the discharge from the IGCC Power Station mixed with mine pit water will be below applicable water quality criteria. CMP water will, over time, have limited increases in both the mass and concentration of the current constituents as a result of receiving Outfall 001 discharges

Outfalls 003 and 004 will be discharge points for the transfer of water from the HAMP Complex and LMP to the CMP without intervening treatment or use. The water quality of the source and receiving mine pits is similar, so adverse impacts from such transfers will not occur.

5.2.1 Existing Water Quality

The existing water quality data for the two proposed receiving waters (the CMP and Holman Lake) are presented in Table 5.2-1. As noted above, there will be a limited increase in the concentration of the various constituents in the CMP over time as a result of receiving Outfall 001 discharges.

Table 5.2-1
Current Water Quality of Receiving Waters

Constituent	Units	CMP	Holman Lake
Hardness	mg/l	308	--[a]
Alkalinity	mg/l	180	186
Calcium	mg/l	55.3	50.2
Magnesium	mg/l	40.8	--
Iron	mg/l	<0.05	0.75
Manganese	mg/l	<0.02	0.04
Chloride	mg/l	5.15	8.4
Sulfate	mg/l	103.5	10.1
TDS	mg/l	337	236
pH	mg/l	8.4	7.9
Aluminum	ug/l	<25	--
Barium	ug/l	28.6	--
Cadmium	ug/l	<10	--
Chromium (6+)	ug/l	<5	--
Copper	ug/l	<10	--
Fluoride	mg/l	n/a	--
Mercury	ng/l	0.9	<4.0
Nickel	ug/l	<5	--
Selenium	ug/l	<2	--
Sodium	mg/l	6.6	7.4
Specific Conductivity	umhos/cm	476	--
Zinc (3)	ug/l	<10	--
BOD	mg/l	<2	--
COD	mg/l	<2	--
TOC	mg/l	1.9	--
TSS	mg/l	1.5	--
Ammonia (as N)	mg/l	<0.1	<0.1
Phosphorus	mg/l	<0.1	0.01
[a] – Indicates that no data was collected.			

5.2.2 Numerical Water Quality Standards

A comparison of expected IGCC Power Station discharges and applicable state numerical water quality standards (Minn. Rules 7050.0222) is summarized in 5.2-2 and discussed below. All IGCC Power Station outfalls discharge to Class 2 waters. This is the case since none of the abandoned mine pits are listed on the Public Waters Inventory ("PWI") or listed in the published rules. Applicant believes that the Class 2B water standards are thus applicable (Minn. R. 7050.0430) to mine pit waters, and also with respect to Holman Lake as while it is listed on the PWI, it is not included in Minnesota Rules (so Class 2B water standards therefore apply).

Table 5.2-2
Expected IGCC Power Station Discharges and Applicable State Numerical Water Quality Standards

Constituent	Units	Class 2 WQ Standard	Anticipated Effluent Water Quality – Phase I (5 COC)	Anticipated Effluent Water Quality – Phase II (3 COC)
Hardness	mg/l	250	0 .07	0.03
Alkalinity	mg/l	n/a	4	--
Calcium	mg/l	n/a	--	--
Magnesium	mg/l	n/a	--	--
Iron	mg/l	n/a	--	--
Manganese	mg/l	n/a	--	--
Chloride	mg/l	230	38	16
Sulfate	mg/l	n/a	470	280
TDS	mg/l	700	2,317	1,039
pH	mg/l	6 - 9	6 – 9	6 - 9
Aluminum	ug/l	125	73	31
Arsenic	ug/l	53	--	--
Barium	ug/l	n/a	--	--
Cadmium	ug/l	2.0[1]	Note 3	Note 3
Chromium (6+)	ug/l	32[1]	Note 3	Note 3
Copper	ug/l	15[1]	Note 3	Note 3
Fluoride	mg/l	n/a	--	--
Mercury	ng/l	6.9	6.6	2.8
Nickel	ug/l	283[1]	37	16
Selenium	ug/l	5	Note 3	Note 3
Sodium	mg/l	n/a	--	--
Specific Conductivity	umhos/cm	1,000	12,380	1,400
Zinc (3)	ug/l	191[1]	Note 3	Note 3
Phosphorus	mg/l	1[2]	0.07	0.03

[1] indicates a hardness based standard. It is assumed hardness in the receiving water is >200 mg/L based on available data.
[2] phosphorus standard is an effluent limit and not a water quality standard.
[3] results below detection limit.
[4] not analyzed.

5.2.2.1 Modeled Discharge Water Quality-Outfalls 001 and 002

A mass balance model was created to estimate the IGCC Power Station effluent water quality over various periods of operation of the IGCC Power Station and under various operating scenarios. The model is described and detailed study results are presented in Appendix D. The model calculates the anticipated water quality from the IGCC Power Station discharge and that anticipated in the CMP as a result of various inflows from the HAMP Complex and the LMP, and discharges from the IGCC Power Station.

The modeling results indicate that key water quality constituents associated with Outfall 001 and 002 discharges will be mercury, total dissolved solids (TDS), and hardness. As shown below, mercury discharges will be addressed by operating the IGCC Power Station such that the concentration of mercury in its effluent discharges will not exceed the water quality standard of 6.9 ng/L. In addition, operation of the system will be such that the mass of mercury discharged to Holman Lake through Outfall 002, combined with the mass of mercury discharged to Panasa Lake from the continued pumping of the HAMP Complex, will not exceed the mass of mercury currently permitted to be discharged to Panasa Lake under existing NPDES Permit No. MN0030198. Both Holman Lake and Panasa Lake are tributary to the Swan River. In this way, this system will not contribute additional pollutants to the Swan River watershed. TDS and hardness discharge concentrations will be acceptable with the inclusion of a mixing zone as discussed below.

Based on the results of the mass balance modeling, the following operating scenario was selected: The IGCC Power Station will operate at five COC during operation of Mesaba One and at three cycles of concentration for Mesaba One and Mesaba Two. A portion of the IGCC Power Station effluent will be discharged to the CMP and a portion will be discharged to Holman Lake. The volume of water discharged directly to Holman Lake from the IGCC Power Station will be controlled such that the total mass of mercury discharged to the Swan River watershed (the sum of any future discharge from the HAMP Complex to Panasa Lake and the IGCC Power Station discharge directed to Holman Lake) is less than the mass currently permitted to be discharged to the watershed from the HAMP Complex. The outcome of this operating scenario is no net increase in the mass of mercury permitted to be discharged to the Swan River watershed under the existing NPDES Permit. The volume of water discharged directly to Holman Lake will be adjusted approximately every five years, or as needed during Phase I and II operation, to limit the mass of mercury discharged to Holman Lake.

Figure 5.1-1a and Figure 5.1-1b present the water balance results of the modeling for Phase I and Phase I and II, respectively. The results for mercury, hardness and TDS are presented below.

5.2.2.1.1 Mercury

The mercury water quality standard for Class 2B waters outside of the Lake Superior Basin is 6.9 ng/L[3]. Twice monthly sampling, testing and sampling variability give rise to permit limits of 10 ng/L on a monthly average basis, 17 ng/L on a per sample basis[4].

The median mercury concentration in the 2005 samples of CMP water is 0.9 ng/L; the median mercury concentration in the Hill-Annex Mine Pit water is also 0.9 ng/L. With limited analytical data available for the LMP, the applicant has assumed in the mass balance model that all water sources have a mercury concentration of 0.9 ng/L. The mass balance model described in Appendix D was used to model mercury concentrations assuming the Phase I water balance presented in Figure 5.1-1a and the Phase I and II water balance presented in Figure 5.1-1b. In this case, the majority of the Phase I and II 3,500 gpm of IGCC Power Station discharge is directed through Outfall 001 to the CMP. A portion of the total volume, starting at approximately 825 gpm (annual average) in the first year and decreasing to approximately 400 gpm in year 30, is directed through Outfall 002 to Holman Lake (the volume discharged through Outfall 002 is limited by the concentration of mercury which, in the model, is gradually increasing in the CMP source water, and thus requires a gradual reduction in the discharge rate. See Section 5.2.3).

The estimated mercury concentration in the IGCC Power Station discharge water and in the CMP over 30 years of IGCC Power Station operation is depicted in Figure 5.2-1. The results demonstrate that the IGCC Power Station can operate for more than 30 years before the mercury water quality standard of 6.9 ng/L would be exceeded in the IGCC Power Station discharge. Beyond 30 years of operation the water quality standards for mercury will be met by either mercury removal, treatment of the IGCC Power Station's effluent, a reduction in the COC, or establishing a total mass daily load for the chemical species for which the Swan River is impaired. Figure 5.2-1 also shows that the concentration of mercury in the CMP increases slightly, from 0.9 ng/L to about 2.2 ng/L, over that same time period.

Similarly, it is anticipated that the concentration of sulfate in the IGCC Power Station discharge water will also increase over time and concern has been raised regarding the link between sulfate and methyl mercury. While it has been demonstrated that the addition of sulfate may stimulate the formation of methyl mercury in peatlands (Branfireun et al. 1999; 2001)[5], the relationship may depend on several variables in addition to sulfate. These include organic carbon, the fraction of bioavailable mercury, and the microbial community structure (not all sulfate reducing bacteria methylate mercury) (Porvari and Verta 1995; Branfireun et al. 1999; Macalady et al.

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[3] *See* Minn. R. 7050.0222, subp. 4.

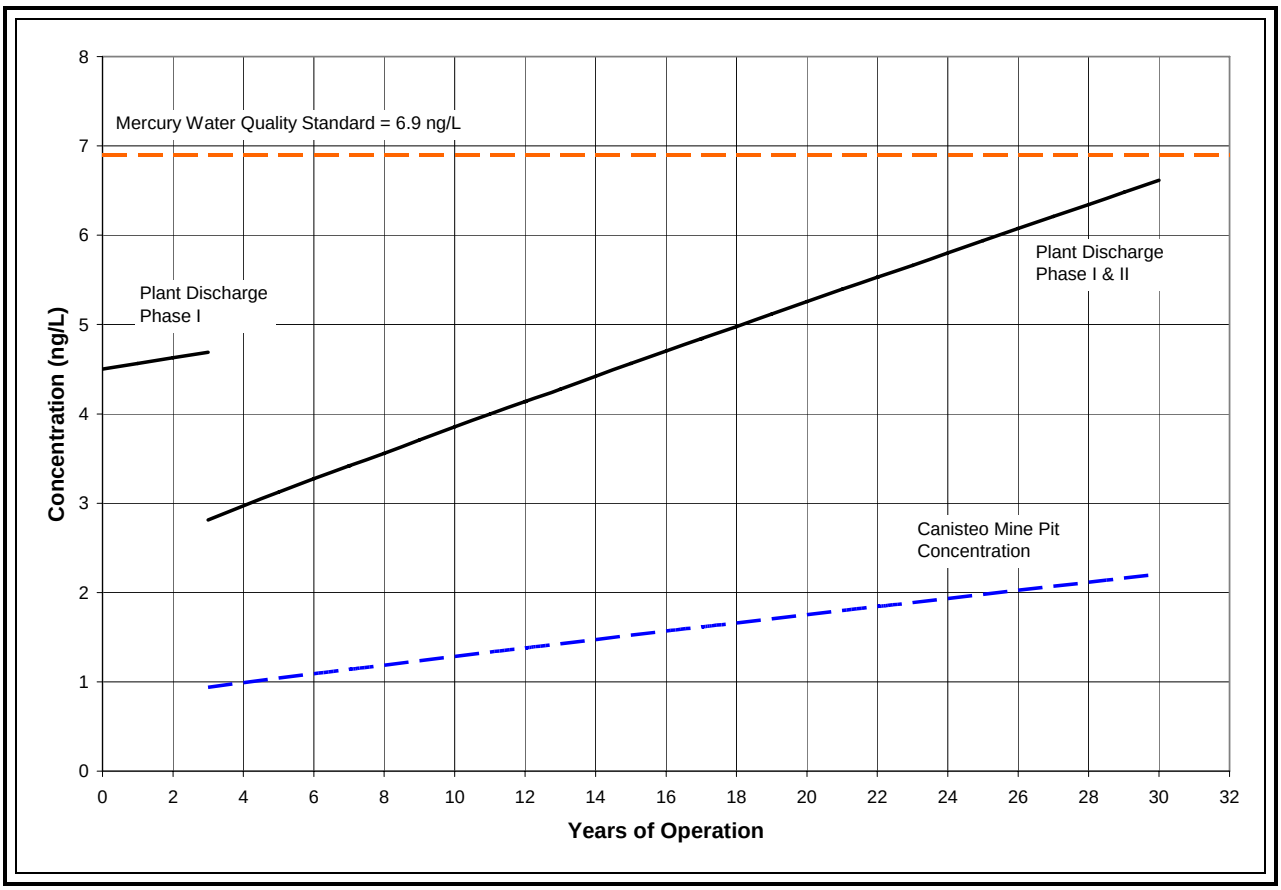
[4] Correspondence with Richard Clark & Gary Kimble, MPCA

[5] Branfireun BA, Roulet NT, Kelly CA & Rudd JWM (1999) In situ sulphate stimulation of mercury methylation in a boreal peatland: toward a link between acid rain and methylmercury contamination in remote environments. Global Geochemical Cycles 13: 743-750.

Branfireun BA, Bishop K, Roulet NT, Granberg G & Nilsson M (2001) Mercury cycling in boreal ecosystems: The long-term effect of acid rain constituents on peatland pore water methylmercury concentrations. Geophys. Res. Lett. 28: 1227-1230.

2000).[6] In addition, the thermal modeling presented in Section 5.3 below has demonstrated that the discharge water from the IGCC Power Station is anticipated to remain at or near the surface of the receiving water and will have limited mixing with the bottom waters.

Figure 5.2-1
Modeled Mercury Concentrations in IGCC Power Station Discharge and CMP



5.2.2.1.2 TDS and Hardness

The Class 2B water quality standards for total dissolved solids (TDS) and hardness are 700 mg/L and 250 mg/L, respectively. It is understood that the hardness standard is proposed to be increased to 500 mg/L. Current source water quality for these two constituents (based on the median of recent analytical results) is presented in Table 5.2-3.

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[6] Macalady JL, Mack EE & Scow KM (2000) Sediment Microbial Community Structure and Mercury Methylation in Mercury-Polluted Clear Lake, California. Appl. Environ. Microbiol. 66: 1479.

Porvari P & Verta M (1995) Methylmercury production In flooded soils - a laboratory study. Water, Air, and Soil Poll. 80: 765-773.

Table 5.2-3
Current Source Water Quality-TDS and Hardness

Constituent	Units	WQ Standard	Water Source		
			CMP	HAMP Complex	LMP
TDS	mg/l	700	337	252	369.5
Hardness	mg/l	250	308	229	n/a

The modeled TDS and hardness concentrations for the IGCC Power Station discharge water and in the CMP over 30 years of IGCC Power Station operation are illustrated in Figure 5.2-2 and Figure 5.2-3. The results demonstrate that a mixing zone will be necessary to comply with water quality standards for TDS and hardness. The figures also show that the concentrations of TDS and hardness in the CMP increase slightly over time, but the TDS concentration remains below the water quality standard for more than 24 years. The hardness concentration in the CMP will remain below the proposed water quality standard of 500 mg/L for more than 14 years. Beyond these time frames, the water quality standards for TDS and hardness will be met by either treating effluent from the IGCC Power Station for TDS and hardness or further reducing the COC at which the IGCC Power Station operates.

Figure 5.2-2
Modeled TDS Concentrations in IGCC Power Station Discharge and CMP

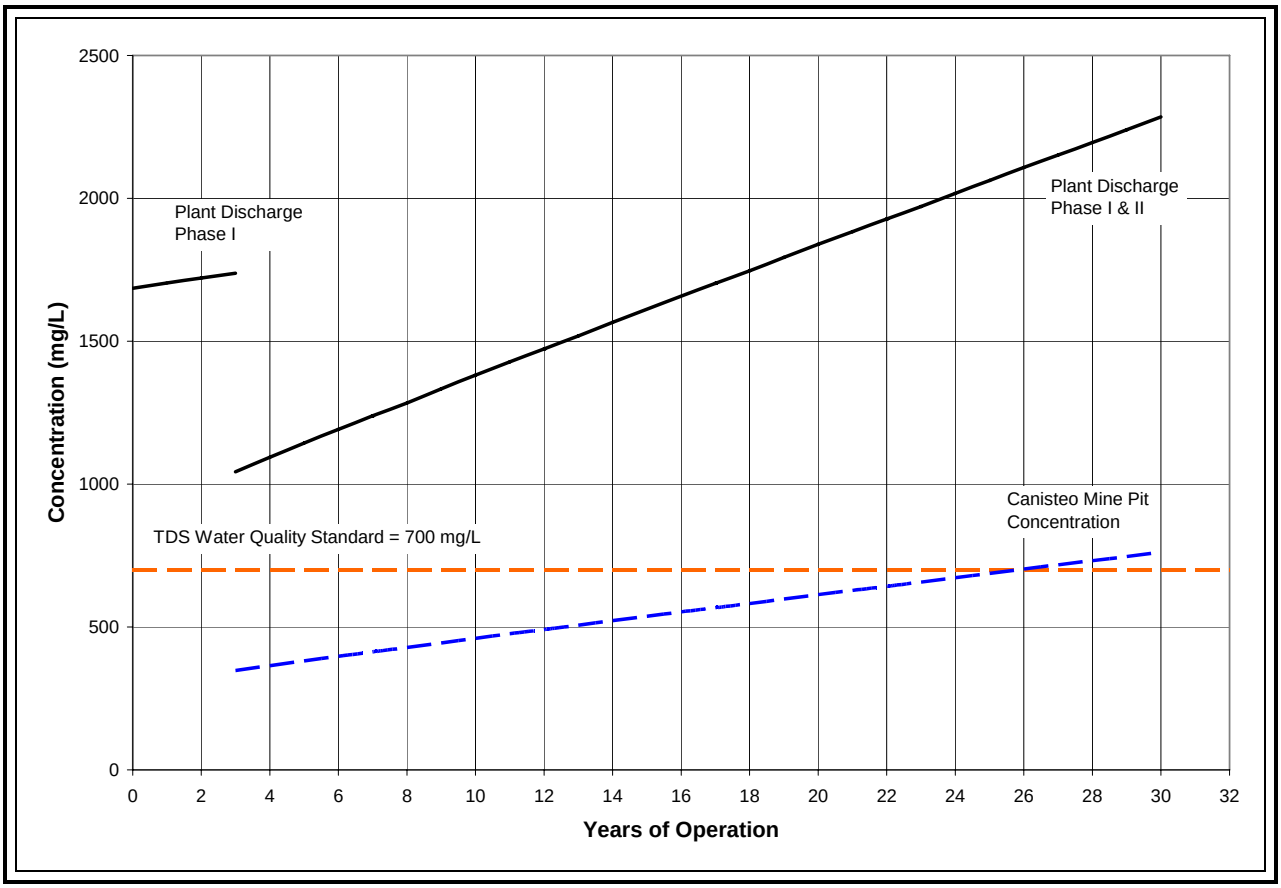
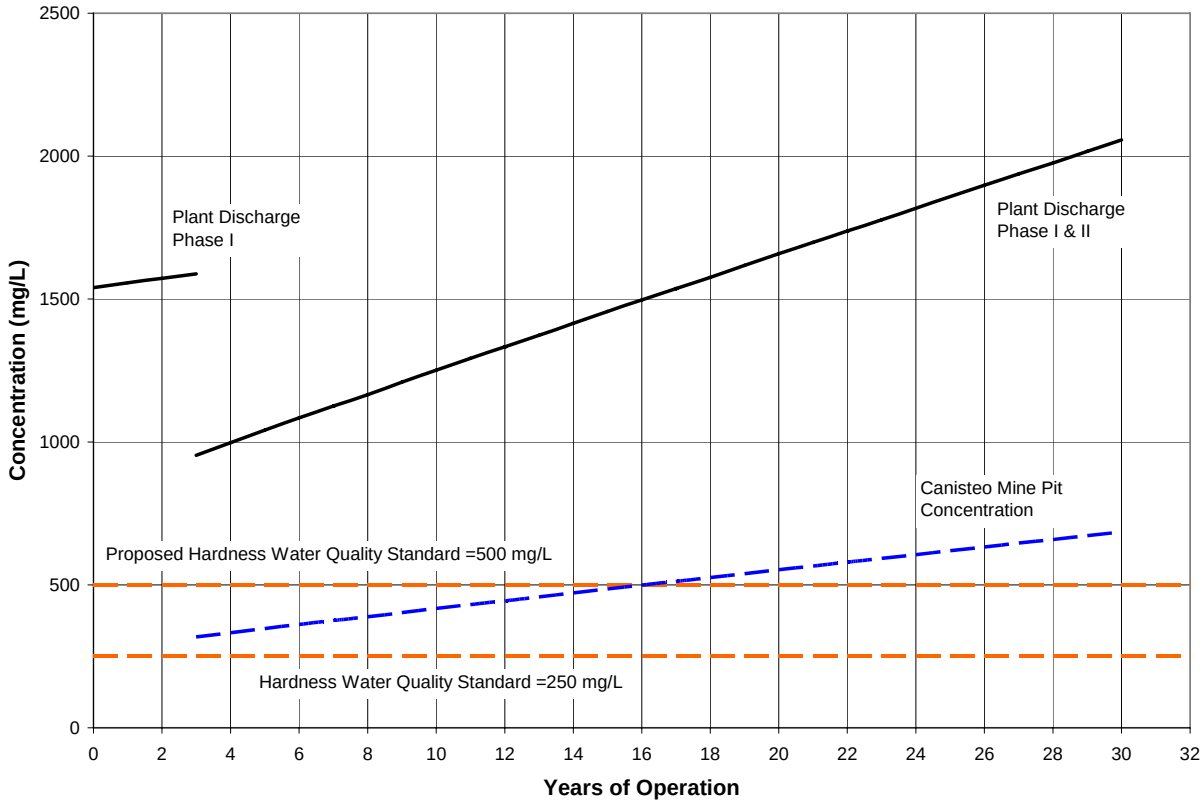


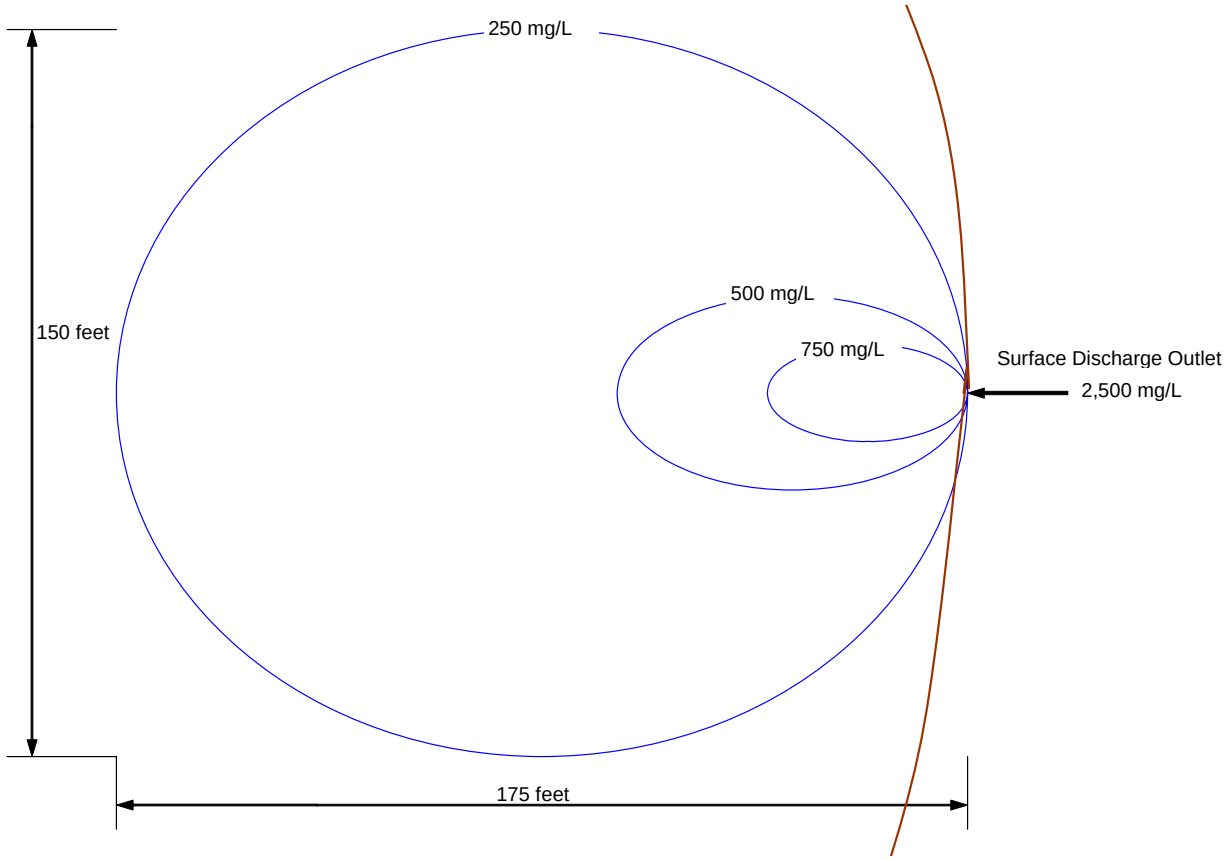
Figure 5.2-3
Modeled Hardness Concentrations in IGCC Power Station Discharge and CMP



An analysis of the constituent plumes resulting from the plant discharge into both the CMP and Holman Lake was performed using CORMIX modeling software. CORMIX is an EPA-supported mixing zone model for environmental impact assessment of regulatory mixing zones resulting from continuous point source discharges (http://www.cormix.info/). The worst case scenario, occurring at the 30th year of operation, was modeled to determine the maximum mixing zone required. A maximum discharge rate of 3,500 gpm and a TDS concentration of 2,500 mg/L into the CMP were assumed. While the concentrations discharged into Holman Lake will be identical to that discharged into the CMP, the discharge flow rate will be more than 75 percent lower. The hardness concentration in the plant effluent after 30 years of operation is estimated to be approximately 2,100 mg/L.

The evaluation demonstrated that even after 30 years of operation the applicable water quality criteria (Minn. R. 7050.0222) will be met with a reasonable mixing zone, as allowed under Minn. R. 7050.0210, subp. 5. With mixing zones extending about 175 feet beyond Outfall 001, concentrations of TDS and hardness, assuming average discharge rates, will be below the applicable water quality standards as demonstrated by discharge plume modeling. The mixing zone required for Outfall 002 into Holman Lake will be smaller given the reduced flow rates. The modeled TDS concentration plume, assuming an end-of-pipe concentration of 2,500 mg/L, as calculated by the CORMIX model, is illustrated in Figure 5.2-4.

Figure 5.2-4
Modeled IGCC Power Station TDS Discharge Plume After 30 Years of Operation at 3,500 gpm.



5.2.2.2 Expected Discharge Water Quality-Outfalls 003 and 004

The expected discharge water quality for Outfalls 003 and 004 is anticipated to be identical to the source raw water quality. Since no treatment or use of the water will occur, water will simply be transferred from one abandoned mine pit to another. No applicable water standards are expected to be exceeded in the discharges at Outfalls 003 and 004. A comparison of expected discharge water quality from Outfalls 003 and 004 and applicable state water quality standards (Minn. Rules 7050.0222) is presented in Appendix D.

5.2.2.3 Expected Discharge Water Quality-Outfalls 005 and 006

The stormwater runoff discharged at Outfalls 005 and 006 will be from areas not associated with industrial activity and will be routed to the stormwater detention ponds where settling can occur and initial rainfall ("first flush") can be contained, checked, and released in a controlled manner prior to being discharged. In addition, Applicant will develop a SWPPP that identifies erosion prevention and sediment Best Management Practices (BMPs) as outlined in Section 2. The

detention basins will reduce the potential for discharging sediment and/or other potential pollutants from the site.

Therefore, the quality of the stormwater discharged at Outfalls 005 and 006 will meet all applicable water quality standards.

5.2.3 Impaired Waters

Holman Lake, Panasa Lake, the CMP and the HAMP Complex are not impaired waters. However, the water from those water bodies, either now or in the future, will ultimately discharge into the Swan River, which is impaired for mercury and dissolved oxygen (DO) based on the Draft 2006 TMDL list. The Swan River flows into a reach of the Mississippi River between Swan River and Sandy River. That reach of the Mississippi River that is also impaired for mercury (*http://www.pca.state.mn.us/publications/wq-iw1-03.pdf*).

Other downstream reaches of the Mississippi River are impaired for:

- Mercury
- Fecal Coliform
- PCBs
- Low DO (excess nutrients, primarily phosphorus)
- Turbidity

The IGCC Power Station discharge will not contain Fecal Coliform or PCBs. Any turbidity discharged will be minimal and will meet effluent limits.

Phosphorus concentrations in recent samples collected from proposed source waters (CMP, HAMP Complex and the LMP) have been shown to be below 0.01 mg/L. While there is currently no water quality standard for phosphorus, the MPCA has established a discharge standard of 1.0 mg/L that is applied at end-of-pipe discharges. However, it is understood that while a discharge may be able to meet the discharge standard of 1 mg/L, because this discharge is upstream of an impaired body of water, the discharge cannot cause or contribute to the violation of the water quality standard of issue. The mercury standard was discussed in section 5.5.2 above. The following analysis of impaired water issues is focused on mercury and phosphorus discharged through Outfall 002 into Holman Lake and ultimately into the Swan and Mississippi Rivers.

5.2.3.1 Regulatory Background

The following paragraphs provide information on the applicable regulatory requirements related to impaired waters.

Rules published at 40 C.F.R. 122.4 address prohibitions on permitting discharges to impaired waters (emphasis added):

> ***"No permit may be issued****:*

*(i) To a **new source** or a new discharger, if the discharge from its construction or operation **will cause or contribute** to the violation of water quality standards. The owner or operator of a new source or new discharger proposing to discharge into a water segment which does not meet applicable water quality standards or is not expected to meet those standards even after the application of the effluent limitations required by sections 301(b)(1)(A) and 301(b)(1)(B) of CWA, and for which the State or interstate agency has performed a pollutants load allocation for the pollutant to be discharged, must demonstrate, before the close of the public comment period, that:*

(1) There are sufficient remaining pollutant load allocations to allow for the discharge; and

(2) The existing dischargers into that segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards. The Director may waive the submission of information by the new source or new discharger required by paragraph (i) of this section if the Director determines that the Director already has adequate information to evaluate the request. An explanation of the development of limitations to meet the criteria of this paragraph (i)(2) is to be included in the fact sheet to the permit under §124.56(b)(1) of this chapter."

Information provided in this section demonstrates that the proposed IGCC Power Station discharge will not cause or contribute to the impairment of the water bodies downstream of the proposed discharge, and is therefore allowed under the Clean Water Act.

5.2.3.2 No Mercury or Phosphorus will be added to Water Discharged from the IGCC Power Station

The operation of the IGCC Power Station will not add mercury, phosphorus or other pollutants that are associated with the impairment concerns and therefore will not add these constituents to the receiving waters. There will be no added mercury or phosphorus to the proposed Outfall 002 discharge into Holman Lake. Waste streams that will be discharged from the IGCC Power Station will consist mostly of cooling tower blowdown, blended with relatively low-flow additional wastewater streams from other plant systems, including HRSG blowdown, boiler feed water demineralizers and intermittent treated water from the oil/water separator serving the plant drainage system. All other contact process water is managed in the ZLD system. All sanitary wastewater will be sent to a nearby POTW.

5.2.3.3 Mass Discharge from IGCC Power Station will be Lower than Currently Permitted Discharges

The proposed operation of the IGCC Power Station will result in no increase in the mass of mercury or phosphorus over that currently permitted from the HAMP Complex under NPDES Discharge Permit MN0030198. The MDNR also holds a water use permit, No. 510144, for appropriating water from the Hill-Annex Mine Pit. General permit information is summarized in Table 5.2-4. The MDNR has been pumping water out of the Hill-Annex Mine Pit since 1989 to

control water levels in the pit and has discharged the water into Panasa Lake and ultimately to the Swan River[7]. Prior to 1989, the HAMP Complex was pumped to allow mining activities.

Table 5.2-4
Summary of Hill-Annex Mine Pit NPDES and Appropriations Permits

Permit Number	Date Issued	Expiration Date	Permit Holder	Average Discharge Rate (MGD/ gpm)	Maximum Discharge Rate (MGD/ gpm)	Annual Average Discharge Volume (acre-feet)	Receiving Water Body
NPDES Permit							
0030198	June 3, 2003	May 31, 2008	MDNR	4.5/3,125	9.0/6,250	--	Panasa Lake
Appropriations Permit							
510144	Not available	NA	MDNR	10.08/7,000	--.	10,485	--

Based on the permitted average discharge rate from the NPDES permit, assumed mine pit water concentration based on the analytical results from the HAMP Complex, and concentrations monitored in other regional water bodies, the mass of a constituent permitted to be discharged to the Swan River watershed under the existing HAMP Complex pumping permit was estimated. [Limited low-level phosphorus analyses are available for the region and none is available for the HAMP. The actual concentration of phosphorus in the HAMP is believed to be on the order of 0.01 to 0.05 mg/L and with one exception, has not been detected in samples analyzed with a 0.1 mg/L reporting limit. Therefore, the permitted mass discharge of phosphorus is conservatively based on a 0.01 mg/L concentration in the HAMP]. The estimated mass of mercury and phosphorus permitted annually is shown in Table 5.2-5.

Table 5.2-5
Estimated Annual Mass Permitted to the Swan River Watershed From the Hill-Annex Mine Pit

Constituent	Estimated Concentration	Permitted Average Annual Discharge Rate	Permitted Annual Mass Discharge
Mercury	0.9 ng/L	3,125 gpm	5.6 g
Phosphorus	0.01 mg/L		62 kg

Applicant will operate Mesaba One and Mesaba One and Mesaba Two such that the actual mass of mercury and phosphorus discharged to the Swan River will be less than or equal to that currently allowed under the existing NPDES permit. The mass discharged will be the sum of each constituent associated with:

[7] Discharges of Canisteo Mine Pit water to the Swan River watershed has also occurred during past mining operations. NPDES permits for those discharges are available in MPCA files but detailed records of actual pumping activities are limited.

1. Water discharged into Holman Lake at Outfall 002 from the IGCC Power Station or the CMP. (Mercury and phosphorus contained in the minor volume water streams that ultimately flow to the ZLD system is expected to be small and need not be considered in the water discharge mass balance calculations. Similarly, mercury volatization in the cooling towers and elsewhere in the process is expected to be negligible and is not considered in this calculation.).

2. Water pumped to Panasa Lake from the Hill-Annex Complex Mine Pits for water level control permitted under existing NPDES Permit MN0030198.

Mass balance calculations, based on expected source water quality (Table 3.2-5), expected IGCC Power Station operation, and assumed HAMP Complex water level management pumping rates are illustrated in Figure 5.2-6 (mercury) and Figure 5.2-7 (phosphorus). The mass balance calculation shows that mercury and phosphorus discharged from Outfall 002 and the existing Panasa Lake outfall will be maintained at annual quantities less than that allowed under the current permit.

Figure 5.2-5
Annual Mass of Mercury Discharged to Holman Lake

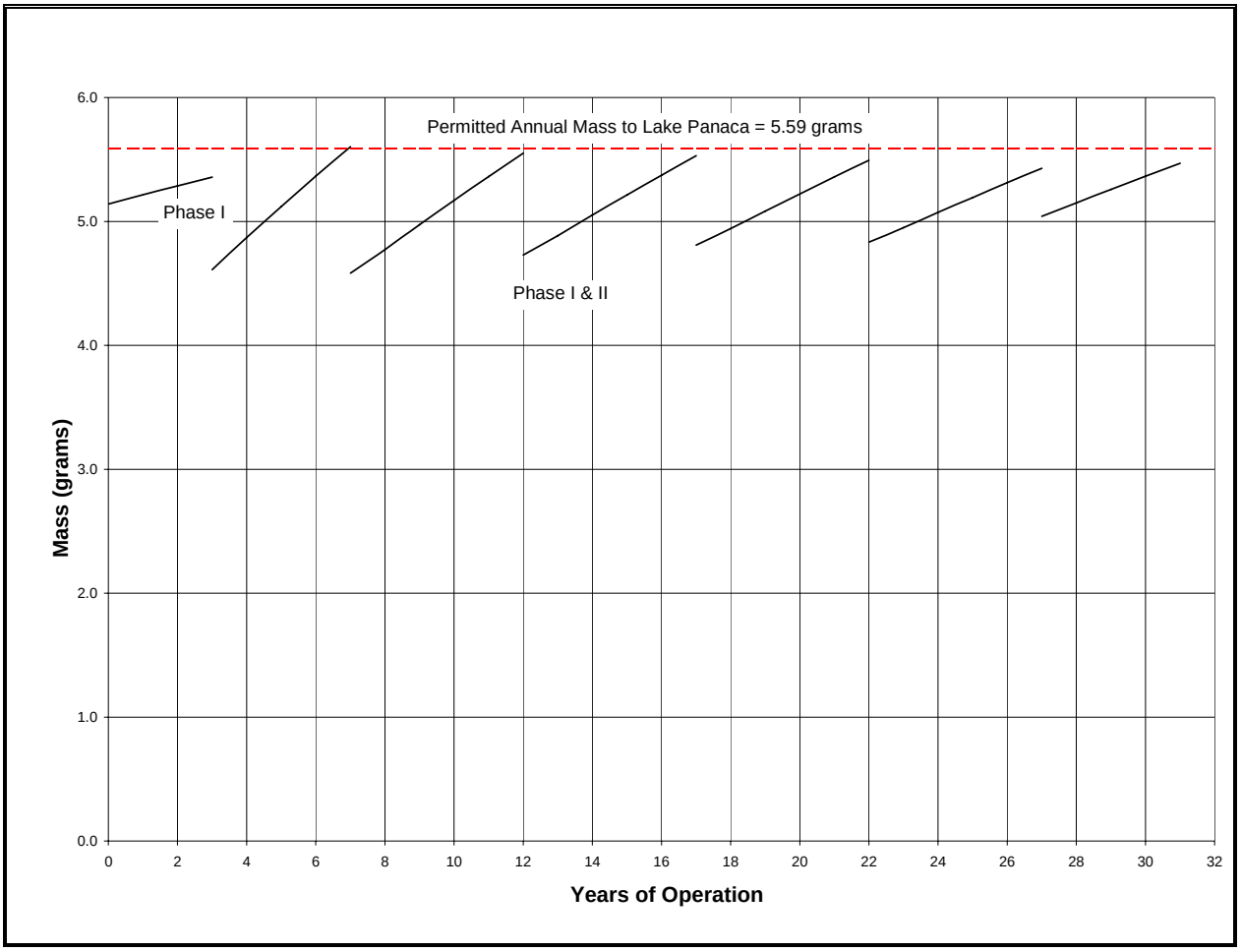
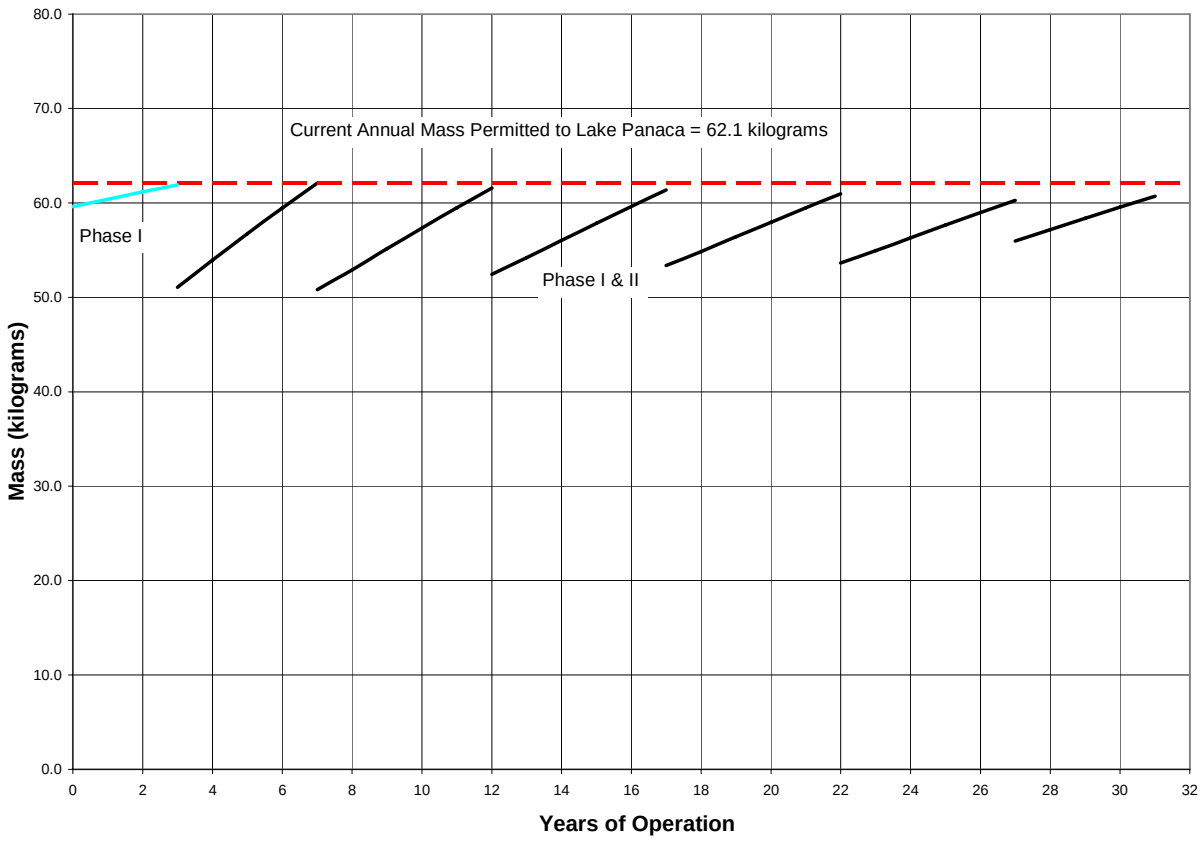


Figure 5.2-6
Annual Mass of Phosphorus Discharged to Holman Lake



In addition to no increase in the total mass of phosphorus discharged to the Swan River, the point of discharge will be moved downstream. This will result in a decrease in mass loading of phosphorus (as well as mercury) in that reach of the Swan River between the outfall from Lake Panasa and the outfall from Holman Lake.

5.3 THERMAL DISCHARGES (CLEAN WATER ACT SECTION 316(A))

The IGCC Power Station will discharge cooling tower blowdown directly to the CMP and Holman Lake. This section presents an assessment of the thermal impacts of the IGCC Power Station cooling tower blowdown discharge (from both Mesaba One and Mesaba One and Mesaba Two) that demonstrates that the applicable temperature water quality criteria in Minn. R. ch. 7050 and the Clean Water Act (CWA) Section 316(a) will be met with a reasonable mixing zone as allowed under Minn. R. 7050.0210, subp. 5.

5.3.1 Thermal Modeling

Thermal modeling of the IGCC Power Station discharge into the CMP and Holman Lake was conducted. A detailed description of the modeling procedure and results are presented in

Appendix E. Seasonal water temperatures of the surface layer after the addition of the cooling tower blowdown are shown in Figure 5.3-1 for the CMP and Figure 5.3-2 for Holman Lake. The temperature rise in the CMP due to the addition of the cooling tower blowdown is relatively small, in the vicinity of 1 to 2 °F.

Figure 5.3-1
Water Temperature of Surface Layers of CMP

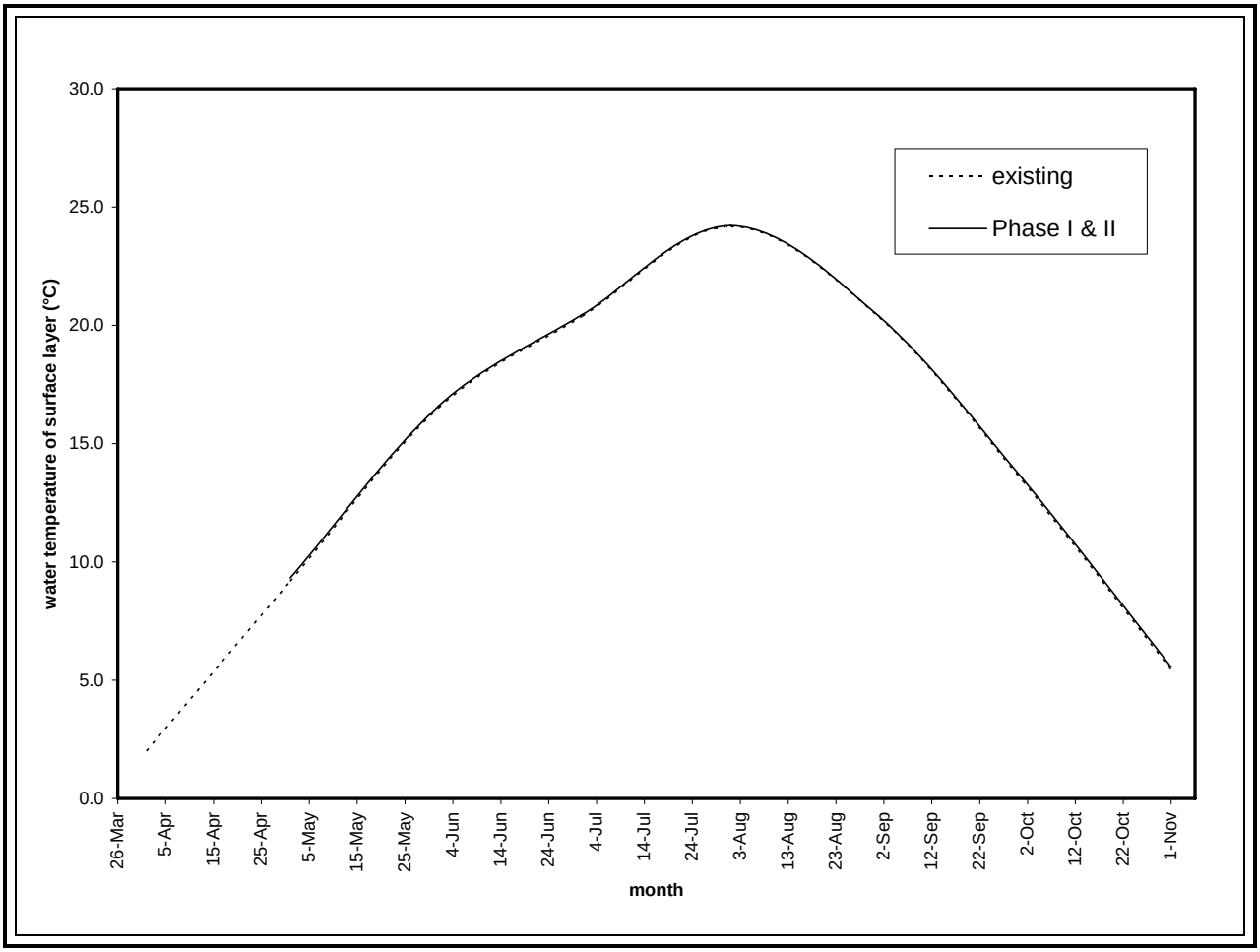
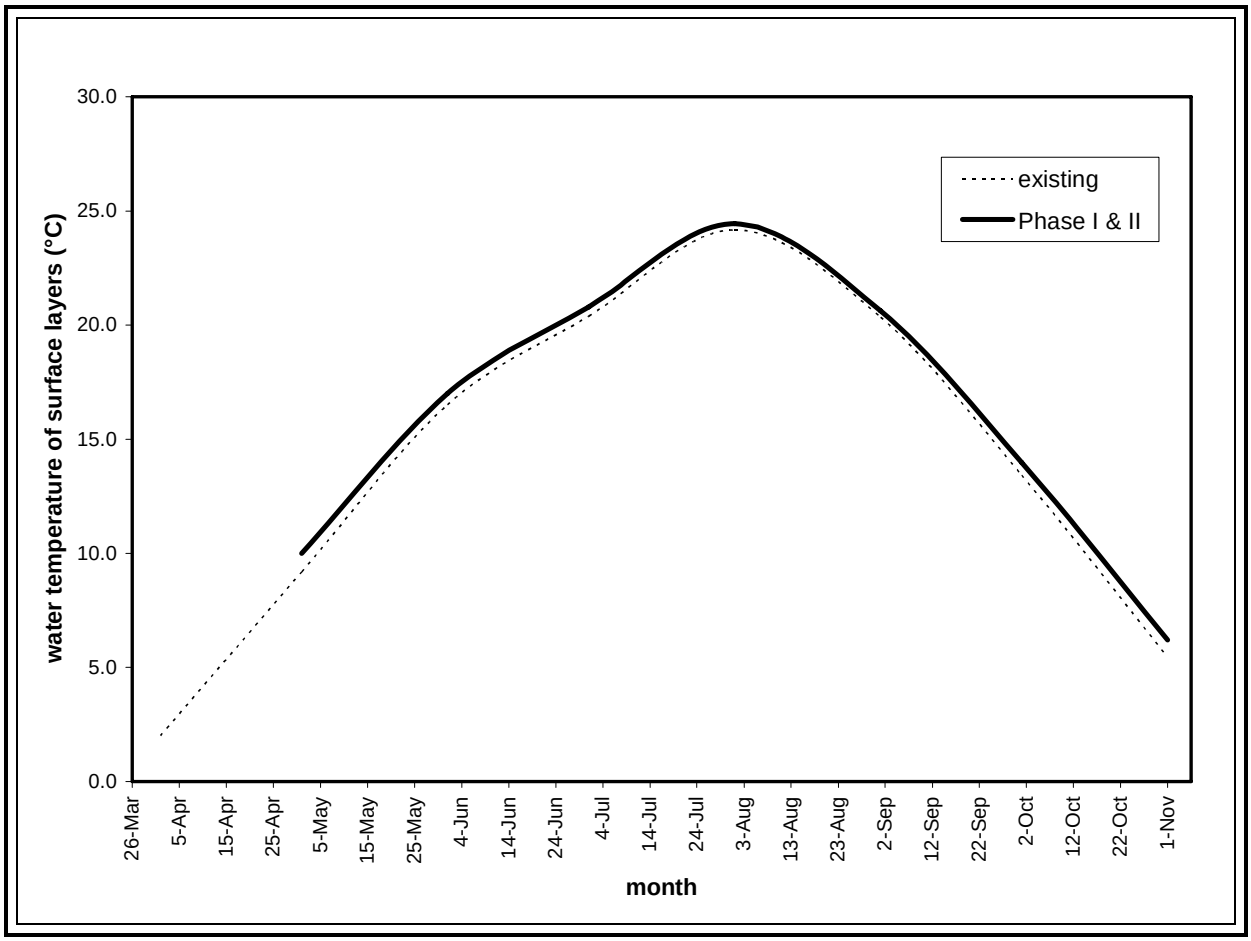


Figure 5.3-2
Water Temperature of Surface Layers of Holman Lake



The temperature rise in the CMP and Holman Lake due to the addition of the cooling tower blowdown is also relatively small for several reasons:

1. The mine pit has a relatively large surface area over which to dissipate the additional heat back to the atmosphere.

2. The discharge flow volume is small relative to the volume of the receiving water bodies, and the small heated flow is easily diluted in the large receiving water body.

3. The cooling tower blowdown is only 10 to 15 °F warmer than the summertime temperature of the receiving water body. In contrast, once-through cooling operations often have discharge temperatures 25 to 30 °F or more above ambient.

This heat balance analysis is intended to provide general information on the effect of the cooling tower discharges on the overall temperature of surface layers of the receiving water body. It assumes a well-mixed uniform temperature throughout the surface layers. In reality, the cooling

tower discharge will have a greater effect on water temperatures closer to the point of discharge, and a lesser effect far from the point of discharge. The thermal effects in the proximity of the point of discharge are discussed in the following section on plume modeling.

5.3.2 Thermal Plume Modeling

CMP and Holman Lake are Class 2B waters (Minn. Rules 7050.0430). State water quality standards (Minn. Rules 7050.0220, Subp. 5a) limit the temperature of heated discharges to Class 2B waters to 3°F above ambient water temperature (based on monthly average of maximum daily temperature), and in no case can the discharge daily average temperature exceed 86°F. If the temperature at the point of discharge exceeds these standards, mixing zones can be granted by the MPCA on a case-by-case basis (Minn. Rules 7050.0210, Subp. 5). Thermal water quality standards must then be met at the edge of the mixing zone.

To determine the extent of the mixing zone required, an analysis of the thermal plumes resulting from the cooling tower blowdown discharge into the CMP and Holman Lake was performed using CORMIX modeling software (see Appendix E). The modeling indicates a mixing zone of approximately 100 feet in length will be necessary for a surface discharge. Discharges at deeper depths (10 ft and 40 ft) would be diluted more quickly and require a smaller mixing zone.

5.3.3 Thermal Assessment Conclusions

Cooling tower blowdown discharged to the CMP will have a minimal effect on the overall temperature of the surface water. Surface layers of the water body will rise less than 2 °F with the addition of Mesaba One and Mesaba Two cooling tower blowdown. Temperatures in the immediate proximity of the discharge will need to utilize a mixing zone to comply with thermal standards.

The dimensions of the required mixing zones are relatively small in comparison to other permitted power plants throughout the state. This is primarily due to the low flow rate and low temperature of the cooling tower blowdown from the IGCC Power Station compared to typical once-through cooling operations which can require mixing zone lengths on large rivers of thousands of feet .

5.4 WATER INTAKE (CLEAN WATER ACT SECTION 316(B))

This section provides background on Clean Water Act Section 316(b) requirements and their applicability to the IGCC Power Station mine pit water pumping stations. This section further describes how compliance with Section 316(b) requirements will be met.

The applicant has assumed that the water intakes proposed for the Canisteo, Hill-Annex Complex, and LMP are subject to the requirements of Section 316(b) of the Clean Water Act (CWA) and 40 C.F.R. 125 for cooling water intake structures. Since this is a new facility, the intakes are subject to the Phase I regulations published in the December 18, 2001 Federal Register. Section 316(b) requires that cooling water intake structures reflect the best technology available (BTA) to protect aquatic organisms from impingement or entrainment. The section addresses the following issues:

- Section 316(b) and BTA: BTA for the proposed pumping stations and Section 316(b) requirements to ensure the conceptual intake plan is consistent with federal and state requirements.

- Conceptual Cooling Water Intake: the conceptual designs of inlet structures, including preliminary sizing of pipes and requirements for intake screens. These design concepts will apply to all the mine pit intakes.

5.4.1 Section 316(b) and BTA

5.4.1.1 Background

Section 316(b) of the Clean Water Act (CWA) requires that cooling water intake structures reflect the best technology available to protect aquatic organisms. The rule aims at reducing mortality of aquatic life due to entrainment and impingement. Entrainment occurs when aquatic life is drawn into the intake and passes through the heat exchange system. Impingement occurs when aquatic life is trapped on screens and cannot readily escape. The rule applies to new facilities that use cooling water intake structures to withdraw water from waters of the U.S. and that have or require a National Pollutant Discharge Elimination System (NPDES) permit. New facilities subject to this regulation include those that have a design intake flow of greater than two (2) million gallons per day (MGD) and that use at least twenty-five (25) percent of water withdrawn for cooling purposes. Phase I rules (for new facilities) were implemented in December 2001. Section 316(b) Phase I is a performance-based rule that establishes national performance standards for the reduction of impingement and entrainment of aquatic organisms.

5.4.1.2 Two-Track Approach

The Section 316(b) rule establishes a two-track approach for regulating cooling water intake structures. The intent of the rule is to minimize adverse environmental impacts by implementing best technology available (BTA). Track I establishes uniform requirements based on cooling water intake capacity. Track I is the “fast track” approach that typically utilizes accepted technologies to meet the requirement. Track II provides the opportunity to utilize alternative requirements that will achieve similar results as the Track I approach. Track II provides flexibility to operators who believe alternative or emerging technologies will be similarly effective at reducing impingement and entrainment. Track II requires performance of a costly Comprehensive Demonstration Study to confirm that comparable Track I results are obtained.

Track I

Under Track I, new facilities with a design intake flow equal to or greater than 10 MGD, must meet the following requirements:

(1) Cooling water intake flow must be at a level commensurate with that achievable with a closed-cycle, recirculating cooling system.
(2) Through-screen intake velocity must be less than or equal to 0.5 feet per second.
(3) Location- and capacity-based limits on proportional intake flow must be met:

- for fresh water rivers or streams, intake flow must be less than or equal to 5 percent of the mean annual flow.
- for lakes or reservoirs, intake flow may not disrupt natural thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies).

(4) Design and construction technologies for minimizing impingement mortality and entrainment must be selected and implemented if certain conditions exist where the cooling water intake structure is located.

Track II

Under Track II, new facilities must meet the following requirements:

(1) Employ technologies that will reduce the level of adverse environmental impact to a comparable level to that which will be achieved under the Track I requirements (as demonstrated in a Comprehensive Demonstration Study).

(2) The same proportional intake flow limitations as in Track I, based on the intake source water, must be met.

5.4.1.3 Project Compliance

The IGCC Power Station will pursue compliance under Track I. Since the proposed cooling water system meets the definition of a closed-cycle recirculating cooling system (see 40 C.F.R. 125.83), the requirement that the cooling water intake flow be at a level commensurate with that achievable with a closed-cycle recirculating cooling system will be met. The proposed cooling water intake structures will be located at abandoned mine pits. Since these pits are similar to the definition of a lake or reservoir, the cooling water intakes should primarily address impingement requirements. The basic impingement requirement for intake design is to maintain velocities through the screen openings at 0.5 feet per second or lower (40 C.F.R. 125.84 (b) (2)). Use of Johnson well screens or other wedgewire screen technology that meet these velocity requirements is accepted BTA in accordance with Section 316(b).

According to MDNR Lakefinder website (www.dnr.state.mn.us/lakefind), Lake Trout and other fish have been identified in the CMP. Compliance with Track I design intake velocities will be protective of those populations by reducing the potential for impingement mortality. In addition, rainbow smelt have been found in CMP. To avoid the threat of transferring rainbow smelt to the waters of Holman Lake, water will be withdrawn from depths below the typical range for this species.

Intake design will ensure natural thermal stratification or turnover patterns will be maintained to the extent necessary to ensure compliance (40 C.F.R. 125.84(b)(3)). Temperature profiles for several northern Minnesota mine pits were studied and presented in the report “Limnological Assessment of Mine Pit Lakes for Aquaculture Use” (Center for Water and the Environment Natural Resources Research Institute, September 1992). Specifically, the following pits located near Chisholm, MN were studied: Twin City-South, Twin City-North, Sherman, Fraser, Grant and Hartley pits. The report indicates the thermocline ranged between depths of 16 to 49 feet.

The depths of the pits studied ranged from 100 feet to greater than 300 feet. It is expected that the thermocline will be similar at the Canisteo, Lind and Hill Annex pits. In addition, mine pit lakes typically experience a meromictic mixing regime, that is, they never totally mix because of stagnant or oxygen devoid bottom layers. The proposed intake at the Canisteo pit will be at least 50 feet below the water surface, which is below the anticipated thermocline. Operating at depths below the thermocline is expected to avoid the inadvertent transfer of rainbow smelt into Holman Lake.

Proposed intakes at the other pits are similar to floating systems already in place at the Hill-Annex pit. Due to the intake location and the size, depth and volume of the source water bodies, the proposed intake design is expected to have negligible effects on the natural thermal stratification or turnover pattern.

5.4.2 Conceptual Cooling Water Intake Structure Description

The proposed intake structures will be employed for water withdrawal from all the proposed water source mine pits. As the IGCC Power Station design proceeds, the design concept will be developed in greater detail. A conceptual design for two types of intake systems, a caisson intake system and a floating intake system, are described below and are illustrated in Appendix F. The caisson system will be employed for the CMP pumping station that will be operated year-around. The floating system will be employed for the Hill-Annex and LMP pumping stations.

5.4.2.1 Caisson Intake System

This concept includes construction of a 13–20 foot diameter vertical shaft that will generally act as a wet well. The caisson will be formed with concrete in the unconsolidated overburden but may be able to utilize the bedrock as a wall in the deeper parts of the structure depending on competence and fractures. The actual diameter of the vertical shaft will be based on equipment requirements, such as the number of pumps and the dimensions of the pumping equipment, as well as constructability issues related to connecting the shaft to the pit. The caisson will be constructed at an elevation necessary to obtain submerged pumping conditions under the lowest anticipated pit water levels, including an emergency buffer. Connecting the shaft to the pit can be accomplished by several methods. One such method includes constructing a large horizontal tunnel, approximately 10 feet diameter from the caisson to the pit, for water collection.

Water will enter the central caisson through the horizontal tunnel and rise to the normal water elevation. The horizontal tunnel will be sized to limit intake velocities to 0.5 feet per second. With this method, 316(b) screening will be accomplished in the caisson itself using either tee screens or conventional well screens. A second method to connect the caisson to the pit involves the use of horizontal directional drilling to install several smaller diameter pipes (roughly 36” in diameter). Using this method, suction piping could be fitted with tee screens that will remain in the pit to meet 316(b) requirements. Pumps in the caisson will be conventional can style pumps commonly used in wet well applications.

Using either method, a system will be installed that will allow access to the deeper cooler water if determined to be necessary and cost effective. A new supply pipe will be constructed from the caisson to deliver cooling water to the facility for cooling and other plant needs.

A section of this concept is shown in Appendix F. This design provides:

- A system that meets 316(b) requirements that reflect the best technology available (BTA) to protect aquatic organisms from impingement or entrainment.
- Reliable construction that will minimize potential maintenance and supply issues.
- Inlet tunnel that is designed to limit intake velocities to 0.5 feet per second to meet 316(b) requirements and allow fish to freely swim in and out of tunnel.
- Installation of well screens or tee screens to meet 316(b) requirements, thereby eliminating requirements for flat panel wedgewire intake screen at the entrance to the horizontal tunnel.
- Well screens, if used in the caisson, installed so that they could be removed for maintenance.
- The depth of the caisson designed to allow access to the deeper water if desired and to ensure thermal stratification is not negatively disrupted. The structure may also be modified to include some form of deeper suction piping to feed the main intake with deeper colder water.

5.4.2.2 Floating Intake System

Floating intake structures conducive to fluctuating water levels are available and commonly used by mines for pumping systems. This system includes placing pumps and intake structures on a floating platform in the mine pit. A pipe with wedgewire screen is extended to withdraw water from the desired depth. Sufficient length of screen is provided to ensure intake velocities are maintained below 0.5 feet per second and to ensure thermal stratification is not negatively disrupted. Supply pipe will be designed to convey water from the floating platform to facility.

A section of this concept is shown in Appendix F. This design will provide:

- A system that meets 316(b) requirements that reflect the best technology available (BTA) to protect aquatic organisms from impingement or entrainment.
- Consistent suction characteristics for the pumps on a fluctuating water surfaces.
- Readily accessible main components of a floating system except for the deeper intake components.
- Relatively low construction costs.
- Potential for use of off-the-shelf systems.
- Submerged pump intake easily achievable.
- Use of less expensive horizontally mounted motor is an option.
- A floating dock or other pier structure for maintenance and access to the intake structure. Bubblers or agitators may be utilized to prevent winter freeze-up.

Water Quality Transmittal

Attachment for Non-Contact Cooling Water

EPA Form 1 and Form 2D

Attachment for Industrial Surface Water Discharge Wastewater Treatment Facilities

NPDES Permit Application – Appendix A

Minnesota Pollution Control Agency

WATER QUALITY TRANSMITTAL FORM

COMPLETE APPLICATION BY PRINTING OR TYPING. PLEASE MAKE A PHOTOCOPY FOR YOUR RECORDS.

MPCA USE ONLY		
Application Number		
MN		
Date Received		
Month	Day	Year

FACILITY INFORMATION

Facility Owner ☒ and/or Operator ☒ (Public Entity, City or Business Firm legally responsible for facility operation) [see Minn. R. 7001.0050]

Permittee Name: ***MEP-I LLC and MEP-II LLC*** Phone: **(952)847-2355** FAX: ***(952)847-2373***

Mailing Address: ***11100 Wayzata Boulevard, Suite 305*** City: ***Minnetonka***

State: ***MN*** Zip: ***55305*** Type of ownership Public ☐ / Private ☒

Facility Location No Post Office Boxes allowed. Actual physical location of facility -- must use actual street or highway address (or Section/Township/Range coordinates). *If applying for a permit that can cover more than one site (e.g. aggregate and/or hot mix asphalt operations), write NA.*

Facility Name: ***Mesaba One and Mesaba Two*** Phone: ( )***N/A***

Location Address: ***IGCC Power Station Footprint and Buffer Land is mostly located within the city limits of Taconite and is generally bounded by CR7 on West and South, the Township boundary on the East, and the city limits of Taconite on the North.***

Facility is located in ***Section 10 and portions of section 3,11, & 12*** township ***Iron Range***

of ***Itasca*** county. Township # ***56N*** Range # ***24*** East ☐ West ☒

City: ***Taconite*** State: ***MN*** Zip: ***55786***

Is the facility located on tribal land? ☐ yes ☒no If yes, apply to EPA Region V, John Coletti; (312) 886-6106.

Technical Agent or Consulting Engineer ***John T Lee*** Title: ***Environmental Engineer***

Name of firm or organization: ***Barr Engineering Company***

Mailing Address: ***4700 W. 77th St.*** Phone: ***(952)832-2646***

City: ***Edina*** State: ***MN*** Zip: ***55435***

Contact Person (Operator, Plant Manager, City Official): ***Robert S. Evans, II*** Title: ***VP- Environmental Affairs***

APPLICATION INFORMATION

Reason for Application (check all that apply):

☐ Expiration of existing permit (reissue) ☐ Modification to existing permit ☐ Agency request

☒ New permit/facility ☐ Land Application Site Approval ☐ Other, please specify _____

Type of Application (check all that apply):

☐ Municipal/Domestic / ☐ Sanitary Sewer / ☐ Biosolids / ☐ Pretreatment / ☒ Industrial Process Wastewater /

☐ Industrial By-product Land Application / ☐ Land Disposal Site Approval for Wastewater /

☒ Stormwater / ☐ Water Treatment Plant / ☒ Non-contact Cooling Water / ☐ Ground Water Pump Out /

☐ Dredge / ☐ Feedlot / ☐ Aquaculture / ☐ Aggregate/Hot Mix

Have you ever applied for, or do you currently have a National Pollutant Discharge Elimination System (NPDES) or State Disposal System (SDS) permit for this facility? ☐yes ☒no

If yes, please list permit number(s) ***NA***

Name on existing permit ***NA***

List all current MPCA permits or certificates, and their numbers, which also may apply to this facility:

No current permits or certificates, Air Quality Permit application pending.

If this is a new or expanded facility, has an Environmental Impact Statement or an Environmental Assessment Worksheet been prepared?

yes ☒ no ☐ If yes, note the title and date: ***Joint federal/state EIS in progress. Estimated completion June 2007.***

Annual Permit fee invoice should be mailed to ☒ Owner/operator address ☐ Facility location address ☐ Not applicable

Discharge Monitoring Report forms should be mailed to ☐ Owner/operator address ☒ Facility location address ☐ Not applicable

APPLICATION FEES

An application fee is required under Minn. Stat. § 116.07, subd. 4d (1990) and Minn. R. ch. 7002 (Permit Fee R.).

This application fee must be submitted with the application. **The application fee is $350.**

Reminder:

✓ ***Did you sign attachment form(s)?***
✓ ***Attach your $350 application fee?***
✓ ***Enclose completed attachments*****?**

Applications that are submitted without an authorized signature, the required application fee, and attachments will be returned. Please make your check payable to the Minnesota Pollution Control Agency. Send the completed permit application, attachments (including plans and specifications, if applicable) and check to:

Minnesota Pollution Control Agency

Beckie Olson, MAR/MAJ

520 Lafayette Road North

St. Paul, Minnesota 55155-4194

For more information please contact the Customer Assistance Center at:

In Metro Area: (651) 297-2274

Outside Metro Area: (800) 646-6247

Minnesota Pollution Control Agency

ATTACHMENT FOR

NON-CONTACT COOLING WATER

MPCA USE ONLY		
Application Number		
MN		
Date Received		
Month	Day	Year

National Pollutant Discharge Elimination System (NPDES)/

State Disposal System (SDS) Permit

Please type or print in black ink pen to complete this form. If the answer will not fit in the space, attach additional sheets as needed. To expedite the permitting process, please ensure that the application form is filled out completely and accurately. Preparation of this application form does not necessarily require the assistance of an engineer, environmental consultant, attorney or certified public accountant. Please copy the completed attachment for your records before providing it to the MPCA.

PERMITTEE: *MEP-I LLC and MEP-II LLC*

This "Non-Contact Cooling Water" form must be completed along with a completed "MPCA Water Quality Transmittal Form," and submitted together with the Transmittal Form to the MPCA. If you are proposing to establish a new non-contact cooling water discharge point, you will need to provide a complete permit application to the MPCA at least six months before this planned activity.

"Non-contact cooling water" is water used to reduce temperature that does not come into contact with a raw material, intermediate product, waste product other than heat, or finished product. It includes water used in most air conditioning equipment. "Non-contact cooling water" does not include cooling water that comes into contact with cans or other food product containers at food processing facilities. If your facility includes contact cooling water or other industrial process wastewater, please call the Minnesota Pollution Control Agency (MPCA) at (651)296-7162 to obtain the appropriate permit application attachment form(s).

1. What is/are the Standard Industrial Classification (SIC) code(s) for the principal activity(ies) conducted at the facility?	***4911***
2. What is/are the average production/consumption rates at which this/these activities occur?	***4.8 billion kilowatt-hours of electrical energy annually-Phase I*** ***9.6 billion kilowatt-hours of electrical energy annually-Phase I & II***

3. What is/are the maximum production/consumption rates at which this/these activities occur?	***5.3 billion kilowatt-hours of electrical energy annually-Phase I*** ***10.6 billion kilowatt-hours of electrical energy annually-Phase I & II***

The information for questions 1-3 must be projected for the next five years, since the MPCA permit will likely cover this period. The Standard Industrial Classification (SIC) code classification was developed by the U.S. Department of Commerce to classify facilities by their economic activities. SIC codes are commonly used on federal tax forms and unemployment insurance information provided to the Minnesota Department of Jobs and Training. If you do not know the four-digit SIC code number for your facility, please consult the STANDARD INDUSTRIAL CLASSIFICATION MANUAL, which is available in most public libraries throughout the U.S.

Production/consumption rates should be expressed as, for example, "100,000 lbs/day of milk", "600 wafers/month of integrated circuits", "5100 bbls/day of fuel oil", "23,000 cans/week of canned poultry."

4. What will be the source(s) of the cooling water?	What will be the rates at which it is supplied, in gal/day?	
	Average flow	Maximum flow (for example, in mid-summer)
Municipal water supply, chlorinated	***0***	***0***
Municipal water supply, non-chlorinated	***0***	***0***
Private ground water supply well, chlorinated	***0***	***0***
Private ground water supply well, non-chlorinated	***0***	***0***
Private surface water source, chlorinated	***0***	***0***
Private surface water source, non-chlorinated	***Phase 1 – 6,336,000*** ***Phase 2 – 14,832,000***	***Phase 1 – 9,360,000*** ***Phase 2 – 21,888,000***
The flow values above are: ☐ Metered readings ☒ Estimated based on pump capacity and times of pumping		

5. If you will have a cooling water supply other than municipal water, name the surface water body or ground water aquifer where the intake will be located: ***Canisteo Mine Pit (CMP) with influent from Hill-Annex Mine Pit Complex(HAMP) and the Lind Mine Pit(LMP)***

6. Have you already obtained a Minnesota Department of Natural Resources (DNR) water appropriations permit for this non-municipal water supply?

☐ Yes ☒ No Not Applicable ☐

If "yes," what is the DNR permit number? DNR permit expiration date?

7. If this DNR water appropriations permit will expire within the next five years, please describe how your cooling system will be modified before the DNR permit expires:

If you have questions about water appropriation permitting, please contact the DNR at (651)296-4800.

8. The cooling water will be: ☐ Run once-through the cooling system before it is routed elsewhere
☒ Recirculated up to ***8*** times through the cooling system before it is routed elsewhere

9. What is the reuse potential of the cooling water before discharge to a storm sewer or surface waters? Have you considered, for example, water conservation measures, or use of the cooling water for industrial process water supply, cropland or lawn irrigation?

Water processes for the facility utilize a variety of reuse and conservation measures, including maximum recirculation of the cooling water (*see *application supporting document.)

10. The used non-contact cooling water flow will be routed to (check those that apply):

☐ Contact cooling or industrial process water use
☒ Surface waters (ditches, streams, lakes, wetlands, etc.)
☐ Storm water retention basin or pond
☐ Drain tile system
☐ Municipal storm sewer
☐ Septic tank/drainfield
☐ Municipal sanitary sewer (If so, do you have approval from the local sanitary sewer district? ☐ Yes ☐ No)
☐ On-land disposal or land application (including irrigation of croplands or lawns)
☐ Other (explain in detail):

11. Indicate the information requested below for those discharge points that include cooling water. Discharge points include, for example, pipes, culverts and spray nozzles.

Discharge Point/ Outfall Number	Discharge flow rate, million gallons per day		Flow duration and frequency				Where will the used cooling water go? What route will it take to surface receiving waters and/or land application* sites?
	Average	Maximum	Months of flow	Weeks/ year	Days/ week	Hours /day	
001-Phase I	***0.43***	***4.3***	***12***	***52***	***7***	***24***	***CMP through dedicated pipeline.***
001–Phase II	***5.0***	***8.6***	***12***	***52***	***7***	***24***	***CMP through dedicated pipeline.***
002-Phase I	***0.9***	***4.3***	***12***	***52***	***7***	***25***	***Holman Lake through dedicated pipeline.***
002-Phase II	***0.9***	***8.6***	***12***	***52***	***7***	***25***	***Holman Lake through dedicated pipeline.***

If the cooling water will be routed to a municipal sewer, please contact the sewer authority to confirm where the sewer discharges. Include this sewer route information in the right-hand box above.

*If there will be on-land disposal, complete an "Attachment for On-land Disposal Site Approval."

12. **Attach** a schematic diagram (flow chart) showing the route(s) of wastewater flow through the cooling water system from the water intake to the point(s) of discharge and/or on-land disposal. Show the supplies of intake water, as well as the wastewater collection and treatment units. Show the operations contributing to the cooling water flow, including cooling towers, compressors and heat pumps. Include the location of the discharge points on the flow chart. The diagram should show average flows, using actual measurements whenever available; otherwise use best estimates.

See *Figure 3.1-2a and 3.1-2b in application supporting document.*

Discuss below the proposed treatment for the cooling water. Explain in detail the extent to which this treatment system will reduce the levels of the potential pollutants, including those identified in questions 13, 14 and 17 below, in the cooling water flow. **For cooling water containing chlorine, dechlorination treatment is needed before discharge.** For permit reissuance or modification, note those changes to the treatment system since this permit was last issued. **Attach** plans and flow diagrams for the treatment system equipment.

The majority of the water discharged through outfall 001 and 002 will not require treatment as it is just source water cycled up. It is not anticipated that the chemicals introduced into the cooling water will impact the effluent and require treatment.* See *section 4.2 in the application supporting document. Stormwater that

could become impacted with oil (such as water runoff from parking lots) will be routed through an oil/water separator and then to the cooling tower blowdown sump prior to discharge off-site through Outfall 001. The expected discharge water quality for Outfalls 003 and 004 is anticipated to be identical to the source raw water quality since no treatment or use of the water will occur, water will simply be transferred from one abandoned mine pit to another. Stormwater from other areas not associated with industrial activity will be routed to the stormwater detention ponds where settling can occur and initial rainfall ("first flush") can be contained, checked, and released in a controlled manner to Outfall 005 and Outfall 006.

See ***Figure 3.1-1 and Table 4.2-1 in application supporting document.***

13. List below the chemical additives that are used or proposed to be used in the cooling water system. This includes the flocculants, descalants, corrosion inhibitors, biocides, fungicides, molluscicides, algaecides, refrigerants, wastewater treatment chemical additives, chlorine or other disinfectants, detergents, cleaning products, etc. **Attach** information on the **complete chemical composition**, aquatic toxicity, human health, and environmental fate for the proposed chemical additives. **Attach** Material Safety Data Sheets and complete product label and use instructions for the additives.

See ***table 4.2-1 in application supporting document.***

Material Safety Data Sheets can be found in Appendix C.

Product Name	Continuous or periodic addition? If periodic, note how often added, and for how many hours at a time	Maximum rate of use (in weight or volume) per thousand gallons of cooling water discharged
See *Table C-1 in Appendix C and Table 4.2-1 in the application supporting document.*		***Note: Values in Table 4.2-1 are given as estimated lbs/year.***
The addition of chemicals, such as biocides or descalants, to a cooling water system disqualifies that system for coverage under a general NPDES/SDS permit, and will likely result in higher water quality permit monitoring costs and fees for that system.		

14. Describe how and where the substances cleaned from the insides of the tubes/heat exchangers, and the sediments and residual solids, including scale residues, from the cooling water systems at the facility, will be removed and disposed of: ***They will not be disposed of under this NPDES, but will be disposed of in accordance with all application regulations.***

15. Indicate the name of the laboratory that will analyze your samples: ***Unknown at this time.***

16. Indicate the Minn. Department of Health (MDH) Laboratory Certification No. for this laboratory: ***N/A***

MDH rules require that those laboratories conducting wastewater tests be certified. The MPCA accepts laboratory data only from MDH-certified laboratories. Dissolved oxygen, pH, temperature and total residual chlorine analyses do not need to be done by a certified laboratory; these analyses must be conducted as soon as practicable after sample collection, and no later than one hour after collection. Information on laboratory certification is available from the MDH at (612) 623-5243.

17. Provide representative results from tests taken during the past year for **each** of the following in the projected cooling water discharge. If more than one discharge point is involved, **attach** additional copies as needed.

Temperature minimum & maximum (degrees Fahrenheit)	***Unknown at this time***
pH minimum & maximum	***Unknown at this time***
Total residual bromine maximum (mg/L)	***Unknown at this time***

Total residual chlorine maximum (mg/L)	***Unknown at this time***
Total chloride maximum (mg/L)	***Unknown at this time***
Total phosphorus maximum (mg/L)	***Unknown at this time***
Total copper maximum (mg/L)	***Unknown at this time***
Total lead maximum (mg/L)	***Unknown at this time***
Total molybdenum maximum (mg/L)	***Unknown at this time***
Other potential pollutants (for example, metals, nutrients, organic compounds)	***Unknown at this time***
The time when you sample, including for a new proposed discharge, must be representative of the projected discharge wastewater quality. Please clearly indicate with the test results the specific dates, locations and methods of sampling.	

If this is an application for reissuance of an existing permit, review your existing NPDES/SDS permit to see if it has special testing requirements for permit reissuance. If so, be sure to comply with those requirements. The existing permit also may have special requirements for reports or other submittals for the application for permit reissuance. Failure to complete the application for reissuance of a permit as required by the permit is a violation of the permit itself and is subject to enforcement action.

18. **Attach** a detailed map of the facility, treatment systems, discharge points, storm sewer outlets (if the cooling water will be routed to a storm sewer), surface and ground water sampling points, land application sites and receiving waters. This map should be based on a 7.5-minute U.S. Geological Survey quadrangle, County Soil Survey, or County Plat location map. On this map, identify the nearby surface waters.

See *Figure 1.3-3 of the NPDES Permit application.*

19. If the non-contact cooling water system is currently covered under an NPDES/SDS permit, has the system been in compliance with the permit limits during the last three years? ☐ Yes ☐ No

    If no, please elaborate: ***NA***

CERTIFICATION AND SIGNATURE

Federal regulations (Section 309(c)(2) of the Clean Water Act and State regulations (Minn. R. 7001.0070) require the authorized signer to be one of the following:

A. For corporation, a principal executive officer of at least the level of vice president;

B. For a partnership or sole proprietorship, a general partner or the proprietor, respectively; or

C. For a municipality, State, Federal, or other public facility, either a principal executive officer or ranking executive official.

D. If the operator of the facility is different than the owner, both the operator and the owner according to items A to C.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

PRINTED NAME ***Robert S. Evans, II*** TITLE ***Vice President, Environmental Affairs***

AUTHORIZED SIGNATURE_____DATE_____

STATE TAX I.D. # _____ FEDERAL TAX I.D. # _____

Reminder:

✓Did you sign this attachment?
✓Did you enclose the Transmittal Form?
✓ Attach your application fee?
✓ Enclose completed attachments?

Applications submitted without an authorized signature, the required application fee and attachments, will be returned. Please make your check payable to the Minnesota Pollution Control Agency.

Thank you for your time in filling out this water quality permit application form. If you have any questions, please contact the MPCA at (651) 296-7162.

Please print or type in the unshaded areas only
(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved. OMB No. 2040-0086.

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER: F D

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill–in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill–in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge to waters of the U.S.**? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge to waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges to waters of the U.S.** other than those described in A or B above? (FORM 2C)		X	
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge to waters of the U.S.**? (FORM 2D)	X		X
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)		X	
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	X		
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP Mesaba One and Two

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*: 2 Robert Evans - Environmental Affairs

B. PHONE *(area code & no.)*: 952 847 2355

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX: 3 11100 Wayzata Blvd, Suite 305

B. CITY OR TOWN: 4 Minnetonka

C. STATE: MN

D. ZIP CODE: 55305

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER: 5

B. COUNTY NAME: Itasca

C. CITY OR TOWN: 6 Taconite

D. STATE: MN

E. ZIP CODE: 55786

F. COUNTY CODE *(if known)*:

EPA Form 3510-1 (8-90)

CONTINUE ON REVERSE

CONTINUED FROM THE FRONT

VII. SIC CODES *(4-digit, in order of priority)*

A. FIRST	B. SECOND
7 4911 (specify) Electric Services	7 (specify)
C. THIRD	**D. FOURTH**
7 (specify)	7 (specify)

VIII. OPERATOR INFORMATION

A. NAME: 8 MEP-I LCC and MEP-II LCC

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR *(Enter the appropriate letter into the answer box; if "Other", specify.)*
F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC *(other than federal or state)*
O = OTHER *(specify)*
P (specify)

D. PHONE *(area code & no.)*: A 952 847 2355

E. STREET OR P.O. BOX: 11100 Wayzata Blvd, Suite 305

F. CITY OR TOWN: B Minnetonka

G. STATE: MN

H. ZIP CODE: 55305

IX. INDIAN LAND
Is the facility located on Indian lands? [ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES *(Discharges to Surface Water)*: 9 N	D. PSD *(Air Emissions from Proposed Sources)*: 9 P
B. UIC *(Underground Injection of Fluids)*: 9 U	E. OTHER *(specify)*: 9 (specify)
C. RCRA *(Hazardous Wastes)*: 9 R	E. OTHER *(specify)*: 9 (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS *(provide a brief description)*

MEP-I LCC and MEP-II LCC is proposing to construct and operate an Integrated Coal Gasification Combined Cycle (IGCC) electric power generating station located in Northeastern Minnesota's Iron Range. The Mesaba Energy Project would be constructed in 2 phases, and each phase would generate nominally 606 megawatts of electricity (MW).

XIII. CERTIFICATION *(see instructions)*

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE *(type or print)*	B. SIGNATURE	C. DATE SIGNED
Robert Evans, Vice President, Environmental Affairs		

COMMENTS FOR OFFICIAL USE ONLY

C

EPA Form 3510-1 (8-90)

Form Approved. OMB No. 2040-0086. Approval expires 8-31-98.

Please type or print in the unshaded areas only

EPA ID Number *(copy from Item 1 of Form 1)*

Form 2D NPDES

EPA

New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water.

Outfall Number *(list)*	Latitude			Longitude			Receiving Water *(name)*
	Deg	Min	Sec	Deg	Min	Sec	
001	47	17	56N	93	25	56W	Canisteo Mine Pit
002	47	18	20N	93	21	10W	Holman Lake
003	47	17	56N	93	25	56W	Canisteo Mine Pit
004	47	17	56N	93	25	56W	Canisteo Mine Pit
005/006	47	17	56N	93	25	56W	Canisteo Mine Pit

II. Discharge Date *(When do you expect to begin discharging?)* 1st Quarter - 2011

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

Outfall Number	1. Operations Contributing Flow *(list)*	2. Average Flow *(include units)*	3. Treatment *(Description or List Codes from Table 2D-1)*
001	Non-Contact Cooling Water + Misc. Plant Process Water	300 gpm (Phase 1)	
		3500 gpm (Phase 2)	
002	Non-Contact Cooling Water + Misc. Plant Process Water	600 gpm (Phase 1)	
		825 gpm (Phase 2)	
003	Hill-Annex water to Canisteo Mine Pit	1300 gpm (Phase 1)	
		3500 gpm (Phase 2)	
004	Lind Mine Pit to Canisteo Mine Pit	0 gpm (Phase 1)	
		1500 gpm (Phase 2)	
005	Stormwater to Canisteo Mine Pit	Unknown	
006	Stormwater to Canisteo Mine	Unknown	

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B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures. See Figure 3.1-2 of the application supporting documents

C. Except for storm runoff, leaks, or spills, will any of the discharges described in item III-A be intermittent or seasonal?

☐ Yes *(complete the following table)* ☒ No *(go to item IV)*

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week *(specify average)*	b. Months Per Year *(specify average)*	a. Maximum Daily Flow Rate *(in mgd)*	b. Maximum Total Volume *(specify with units)*	c. Duration *(in days)*

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	a. Quantity Per Day	b. Units of Measure	c. Operation, Product, Material, etc *(specify)*
			No production based effluent guidlelines

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CONTINUED FROM THE FRONT	EPA ID Number *(copy from Item 1 of Form 1)*	Outfall Number

V. Effluent Characteristics

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

General Instructions *(See table 2D-2 for Pollutants)*

Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

1. Pollutant	2. Maximum Daily Value *(include units)*	3. Average Daily Value *(include units)*	4. Source *(see instructions)*
See application supporting documents.			

CONTINUED FROM THE FRONT	EPA ID Number *(copy from Item 1 of Form 1)*	

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

1. Pollutant	2. Reason for Discharge
None	

VI. Engineering Report on Wastewater Treatment

A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below.

☐ Report Available ☒ No Report

B. Provide the name and location of any existing plant(s) which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

Name	Location

CONTINUE ON NEXT PAGE

EPA ID Number *(copy from item one of Form 1)*

VII. Other Information *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

VIII. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title *(type or print)*	B. Phone No.
Robert Evans, Vice President, Environmental Affairs	952-847-2355
C. Signature	D. Date Signed

EPA Form 3510-2D (Rev. 8-90)

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Minnesota Pollution Control Agency

ATTACHMENT FOR

Industrial Surface Water Discharge

Wastewater Treatment Facilities

National Pollutant Discharge Elimination System (NPDES) Permit

MPCA USE ONLY		
Application Number		
MN		
Date Received		
Month	Day	Year

COMPLETE APPLICATION BY PRINTING OR TYPING. PLEASE MAKE A PHOTOCOPY FOR YOUR RECORDS.

PERMITTEE: *MEP-I LLC and MEP-II LLC*

BASIC INFORMATION

1. Principal Facility Activity: ***Integrated coal gasification combined cycle (IGCC) electric power generation.***

Products Produced: ***Electricity***

Raw Material Consumed: ***Coal, petroleum coke***

Average and maximum amount per Unit Time (such as tons/year, kilograms/day) of product:

Average:

4.7 billion kilowatt-hours of electrical energy annually – Phase I

9.4 billion kilowatt-hours of electrical energy annually – Phase I & II

Maximum:

5.3 billion kilowatt-hours of electrical energy annually-Phase I

10.6 billion kilowatt-hours of electrical energy annually-Phase I & II

Average and maximum amount per Unit Time (such as tons/year, kilograms/day) of raw material:

Average:

7,570 *tons/day of coal and/or petroleum coke - Phase I & Phase II*

Maximum:

8,550 *tons/day of coal and/or petroleum coke - Phase I & Phase II*

Standard Industrial Classification (SIC) Code Number: ***4911***

STORM WATER

2. Is the facility now covered by an MPCA storm water NPDES permit? ☐ Yes ☒ No

If yes, indicate the permit number and proceed to item 6 below: MN

3. Does storm water contact ANY raw or processed materials, finished products, industrial waste, byproducts, or any other type of materials at the facility? ☒ Yes ☐ No

If yes, describe these materials: ***Stormwater may contact feedstocks, including coal and petroleum coke, and with other materials typically associated with IGCC Power Station activity or come in contact with oils (such as water run off from parking lots)***

4. Is any vehicle maintenance, transportation equipment cleaning, or airport deicing conducted at the facility?

☒ Yes ☐ No

5. Indicate where the storm water from the facility discharges to: ***Stormwater associated with industrial activities will be returned as make-up to the feedstock slurry system, or for other process water use. Stormwater that contacts oil will be routed through an oil/water separator prior to dishcharge. Stormwater from other areas will be routed to a stormwater detention pond, where it will be contained, checked, and released in a controlled manner.***

PROCESS WASTEWATER

6. Does the facility generate process wastewater? ☒ Yes ☐ No

7. If yes, the process wastewater from the facility is disposed of to: (check all that apply)

☐ Municipal storm sewer

☐ Sanitary Sewer

☐ Storm water retention basin or pond

☐ Septic tank/drain field

☒ Surface Water, Name: CMP & Holman Lake

☐ Other

WATER SUPPLY

8. What is the source of the intake water supply for the facility?		**Rate of supply (gallons/day)?**
☐ Municipal water supply, city name:		
☐ Ground water, intake location:		
☒ Surface water, name:	***Canisteo Mine Pit (CMP), Hill-Annex Mine Pit Complex (HAMP), Lind Mine Pit (LMP)***	***Phase I – 6,336,000 day*** ***Phase II – 14,832,000 gallons/day***

Is the intake water supply chlorinated or otherwise disinfected? Yes ***x*** No

WATER QUALITY TEST RESULTS

Please clearly indicate, with all test results, the specific dates, locations, types of wastewater, and methods of sampling.

9. A. <u>Attach</u> (1A) test results for total suspended solids and pH at each of the facility discharge points.

See *Appendix B in the application supporting document for all analytical results.*

B. Attach (2A) test results for all other pollutants known or reasonably believed to be present at each of the facility discharge points. Such pollutants may include biochemical oxygen demand, fecal coliform, temperature (heat), nutrients (phosphorus, ammonia, nitrate, nitrite), metals, salts, cyanide, residual chlorine, fluoride, oil and grease, polychlorinated biphenyls, phenols, polynuclear aromatic hydrocarbons, volatile organic compounds, pesticides and/or radioactivity.

See *Appendix B in the application supporting document.*

C. If this is an application for reissuance of an existing permit, review your existing NPDES/SDS permit to see if it has special testing requirements for the application for reissuance of the permit. If so, be sure to comply with those requirements. The existing permit also may have special requirements for reports or other submittals for the application for reissuance of the permit. Be sure to comply with these requirements also. Failure to complete the application for reissuance of a permit as required by the permit is a violation of the permit itself and is subject to enforcement action.

10. Are there ground water monitoring wells or lysimeters at your facility? ☒ Yes ☐ No

If yes, describe where they were installed

11. Indicate the name of the laboratory that analyzes your samples: ***NTS.***

Indicate the Minnesota Department of Health Laboratory Certification Number for this laboratory: ***N/A***

CHEMICAL ADDITIVES

12. List below all chemical additives that are used or proposed to be used at the facility. This must include all process reagents, flocculants, biocides, wastewater treatment chemical additives, chlorine or other disinfectants, detergents, cleaning products, chemical dust suppressants, freeze conditioning agents, etc.

Product Name	How often added?	Average rate of use (weight or volume per year)
See *Table 4.2-1 in the application supporting document.*		

You must attach (3A) information on chemical composition, aquatic toxicity, human health, and environmental fate for each proposed chemical additive. Attach (4A) Material Safety Data Sheets and complete product labels for each additive.

MSDS's can be found in Appendix C of the application supporting document.

NON-CONTACT COOLING WATER

13. Does the facility discharge non-contact cooling water (e.g., power generation, refrigeration, boilers, etc.)?
☒ Yes ☐ No

If yes, is this once-through ☐ or recirculating ☒ ?

Are there any chemical additives to this wastestream? ☒ Yes ☐ No

If yes, list under "Chemical Additives":

Flow Rate Average	Flow Rate Maximum	Is discharge continuous, controlled, intermittent, or periodic seasonal?	Temperature	Receiving Water
Phase I – 900 gpm	***3000 gpm***	***Continuous, controlled***	***70 – 90 ^{0} F***	***CMP and Holman Lake***
Phase II – 3500 gpm	***6000 gpm***	***Continuous, controlled***	***70 – 90 ^{0} F***	***CMP and Holman Lake***

WASTEWATER TREATMENT AND DISCHARGE

14. How do you dispose of sewage (sanitary wastewater) at the facility? ***Sanitary sewage will be discharged to the City of Taconite sanitary sewer system. As an alternative, sanitary wastewater could be treated in an on-site septic system.***

15. Give a complete description of your wastewater treatment system and note any changes made since this permit was last issued:

The majority of the water discharged through outfall 001 and 002 will not require treatment as it is just source water cycled up. It is not anticipated that the chemicals introduced into the cooling water will impact the effluent and require treatment. Stormwater that could become impacted with oil (such as water runoff from parking lots) will be routed through an oil/water separator and then to the cooling tower blowdown sump prior to discharge off-site through Outfall 001. The expected discharge water quality for Outfalls 003 and 004 is

anticipated to be identical to the source raw water quality since no treatment or use of the water will occur, water will simply be transferred from one abandoned mine pit to another. Stormwater from other areas not associated with industrial activity will be routed to the stormwater detention ponds where settling can occur and initial rainfall ("first flush") can be contained, checked, and released in a controlled manner to Outfall 005 and Outfall 006.

See *Figure 3.1-1 and Table 4.2-1 in application supporting document.*

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16. Identify the discharge rate (gallons per day) and other information for each wastewater outfall discharge point:

Outfall point number	Type of wastewater	Discharge flow rate, average	Discharge flow rate, maximum	Is discharge continuous, controlled, intermittent, or periodic seasonal?	Route to receiving waters
001 (Phase I)	*Cooling Water*	*432,000*	*4,300,000*	*Continuous*	*CMP*
001 (Phase II)	*Cooling Water*	*5,000,000*	*7,400,000*	*Continuous*	*CMP*
002 (Phase I)	*Cooling Water*	*900,000*	*4,300,000*	*Continuous*	*Holman Lake*
002 (Phase II)	*Cooling Water*	*900,000*	*7,400,000*	*Continuous*	*Holman Lake*

17. Describe how and where the sediments and sludges removed from the wastewater treatment system at the facility are disposed of:

N/A

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18. Attach a diagram chart (1F) of the flow through the facility and the wastewater treatment system to each discharge point.

See *Figure 3.1-2a and 3.1-2b of the application supporting document.*

19. Attach a detailed map (1M), either U.S. Geological Survey, County Soil Survey, or County Plat where the location of the facility, the wastewater treatment system, each of the discharge outfalls, other surface and ground water sampling points, and all receiving waters are all clearly identified.

See *Figure 1.4-2 of the application supporting document.*

21. If the system is currently covered under an NPDES/SDS permit, has the system been in compliance with the permit limits during the past five years?

☐yes ☐no If no, please explain. ***N/A***

ATTACHMENTS (Checklist)

☒ (1A) Test results for total suspended solids & pH.

☒ (2A) Test results for all other pollutants.

☒ (3A) Information on chemical composition.

☒ (4A) MSDS sheets & product.

MAPS (Checklist)

☒ (1M) U.S. Geologic Survey, Topographic map, County Soil Survey, or County Plat

See Figure 1.3-2 of the Application.

FLOW CHART (Checklist)

☒ (1F) Route of wastewater flow through all treatment processes.

CERTIFICATION

Federal regulations (Section 309(c)(2) of the Clean Water Act and State regulations (Minn. R. 7001.0070) require the authorized signer to be one of the following:

A. For corporation, a principal executive officer of at least the level of vice president;

B. For a partnership or sole proprietorship, a general partner or the proprietor, respectively; or

C. For a municipality, State, Federal, or other public facility, either a principal executive officer or ranking executive official.

D. If the operator of the facility is different than the owner, both the operator and the owner according to items A to C.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

PRINTED NAME ***Robert S. Evans, II*** TITLE ***Vice President, Environmental Affairs***

AUTHORIZED SIGNATURE _____ DATE _____

STATE TAX I.D. # _____ FEDERAL TAX I.D. # _____

Reminder:

✓ ***Did you enclose the Transmittal Form?***
✓ ***Did you enclose all necessary attachments?***

Applications submitted without an authorized signature, the required application fee and attachments, will be returned. Please make your check payable to the Minnesota Pollution Control Agency and mail to:

Minnesota Pollution Control Agency

Beckie Olson, MAR/MAJ

520 Lafayette Road North

St. Paul, Minnesota 55155-4194

Minnesota Pollution Control Agency

NPDES PERMIT APPLICATION - APPENDIX A

The 1993 Legislature revised the Minnesota Pollution Control Agency's responsibilities in Minn. Stat. § 115.03, subd. 1(e)(10) "Requiring that applicants for wastewater discharge permits evaluate in their applications the potential reuses of the discharged wastewater;"

As a result of this 1993 Law, the Minnesota Pollution Control Agency has been charged with requiring permit applicants to evaluate the reuse potential of their wastewater prior to discharge.

Therefore, please provide in narrative form in the space below, an evaluation of reuse potential of your wastewater prior to discharge to a receiving stream, lake, or storm sewer. Some ideas include water conservation measures, use of cooling tower blowdown for thermal discharges, lawn watering or irrigation of parks and public property, wetland reclamation/development/recharge.

The IGCC Power Station will incorporate a significant environmental feature to protect the quality of local streams and lakes and reduce fresh water consumption. Wastewater generated from gasification and slag processing operations, containing certain levels of heavy metals and other contaminants from the feedstocks, will be treated in a Zero Liquid Discharge (ZLD) process that recovers distilled water for reuse in the power plant. In addition, a portion of the IGCC Power station effluent will be reused by recycling cooling tower blowdown to the CMP for reuse. **See** ***application supporting document.***

This appendix contains the results of the laboratory analysis on the various waters near the proposed IGCC Power Station and presents a review of the water quality control data to assess the validity of the analytical results.

Water samples were collected from the CMP, the HAMP Complex, Holman Lake, and the LMP. All samples were collected throughout 2005. The results of the analytical data collected for Excelsior Energy, Inc. ("Excelsior") is presented in Table B-1.

A review of the quality control data was conducted to assess the validity of the analytical results for the mine pit water samples collected in 2005 for Excelsior This review was performed in accordance with the Barr Engineering Standard Operating Procedure for data validation, which is based on "The National Functional Guidelines for Inorganic Data Review" (EPA 1999). All sampling and analysis was performed by Northeast Technical Services, Inc. located in Virginia, Minnesota.

Both laboratory and field sampling procedures were examined in the review of the sampling events. Field sampling procedures were examined utilizing field blank and masked duplicate sample analysis. Laboratory procedures were evaluated using technical holding times, accuracy and precision data, and data package completeness.

Field sampling procedures

Eighteen field blanks, equipment blanks and filter blanks (pre and post filter) were collected and analyzed over the course of the sampling event. Sixteen of these blanks had a detection of mercury above the laboratory detection limit. In addition, one equipment blank (April sampling event) had a detection of turbidity above the laboratory detection limits. Based on the EPA guidance, all detections within five times the blank value were qualified as a potential false positive value.

One masked duplicate was collected and submitted to the laboratory during the June/July sampling event. Precision was evaluated by comparing the detected values in the sample and its masked duplicate, and calculating the relative percent difference (RPD) according to the equation below.

$$\text{RPD} = \frac{\text{Amount in Spike 1 - Amount in Spike 2}}{0.5(\text{Amount in Spike 1 + Amount in Spike 2})} \times 100$$

The RPDs for turbidity and total suspended solids showed poor correlation (i.e. RPDs >40%) between the sample and its masked duplicate. In addition, the masked duplicate had a detection of mercury (1.4ng/L) while the sample was non-detect (<1.0ng/L). All remaining parameters showed good correlation between the sample and its masked duplicate.

Laboratory Procedures

Technical holding times were evaluated for each sample and target parameter based on the EPA recommendations listed in 40 C.F.R. SW8-46 "Test Methods for Evaluating Hazardous Waste". The technical holding times were within these recommendations for all of the samples.

Laboratory accuracy and precision data was supplied by the laboratory for the November sampling event only, however data from the other sampling events was qualified based on failures of laboratory accuracy and precision criteria. One laboratory duplicate was above laboratory criteria for total organic carbon (RPD =17.5%), however this value does not represent a large variability issue so no data was qualified. All remaining precision and accuracy data supplied by the laboratory met all acceptance criteria.

Data completeness was evaluated by comparing the analysis requested with the data package as received. One of the laboratory reports (March/April event) was revised to indicate that the mercury values reported were artificially high due to a contamination problem in the laboratory. The samples had been rerun and the revised results were presented. The remainder of the data was complete as reported.

Conclusion

The majority of the quality assurance data presented (masked duplicates, and blanks) indicate that good quality assurance sampling and analytical practices are being followed for this project. Low level mercury data show that a majority of blanks show levels of mercury at levels similar to the values being detected in the samples. This introduces uncertainty as to whether the majority of the mercury data represent real observations or false positives. The following recommendations are presented to increase the quality of future mercury data;

- It is recommended that future mercury sampling be performed with strict adherence to EPA protocols including; Cleangaurd™ or Tyvek™ coveralls, clean hands/dirty hands techniques and field blanks for each sample.

- It is recommended that only pre-tested laboratory supplied water and filters be used for blanks and filtering samples.

- It is recommended that the mercury analysis be performed in a laboratory that has a clean room designated for low level mercury analysis only.

Outside the uncertainties provided immediately above, the data are valid as presented and qualified and should be considered usable for the purposes of this project.

Table B-1a
Analytical Data Summary
CMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Location	CMP-2-1	CMP-2-2	CMP-1-1	CMP-1-2	CMP-1-3	CMP-2-3	CMP	CMP	CMP	CMP
Date	3/30/2005	3/30/2005	3/31/2005	3/31/2005	3/31/2005	3/31/2005	6/29/2005	6/29/2005	11/10/2005	11/10/2005
Lab	NTS	NTS	NTS	NTS	NTS	NTS	NTS	NTS	NTS	NTS
Depth							2 ft.	50 ft.	2 ft.	50 ft.
General Parameters										
Alkalinity, bicarbonate as CaCO3	190	189	102	188	185	188	--	--	--	--
Alkalinity, carbonate as CaCO3	<10	<10	<10	<10	<10	<10	--	--	--	--
Alkalinity, total	--	--	--	--	--	--	174	183	181	179
Biochemical Oxygen Demand (5-day)	<2	<2	<2	<2	<2	<2	--	--	--	--
Carbon, dissolved organic	--	--	--	--	--	--	--	--	1.8	2.1
Carbon, total organic	1.9	1.9	1.9	1.9	2.1	1.9	1.8	1.8	1.7	2.5
Chemical Oxygen Demand	<2	<2	<2	<2	<2	<2	--	--	--	--
Chloride	5.2	5.2	2.8	5.2	5.1	5.2	4.9	5	5.4	4.9
Chlorophyll a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	--	--
Hardness, total	324	306	305	310	311	277	--	--	--	--
Nitrate + Nitrite	<0.1	<0.1	<0.1	<0.1	2.9	0.11	<0.1	<0.1	<0.1	<0.1
Nitrogen Nitrate	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1
Nitrogen Nitrite	--	--	--	--	--	--	0.01	<0.01	<0.02	<0.02
Nitrogen total kjeldahl	0.69	<0.5	<0.5	<0.5	<0.5	<0.5	0.69	0.78	<0.5	<0.5
Nitrogen, ammonia as N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen, Total	0.69	<1	<1	<1	2.9	0.11	--	--	--	--
Oil and Grease	<2	<2	<2	<2	<2	<2	--	--	--	--
Phosphate, Ortho	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	--	--	0.01	0.02
Phosphorus ortho dissolved	<0.03	0.06	<0.01	<0.03	0.06	<0.03	<0.01	<0.01	<0.01	0.02
Phosphorus total	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Phosphorus total dissolved	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--
Solids, total dissolved	342	337	169	337	328	340	354	341	319	318
Solids, total suspended	<1	2	<1	<1	3	<1	18.2	2	3	<1
Sulfate	105	107	56.8	106	102	102	115	111	85.1	84.1
Measurements										
Bacteria, coliform fecal, CFU	<2	3.2	<2	<2	<2	<2	--	--	--	--
Bacteria, total coliforms, P/A	--	--	--	--	--	--	>1	>1	>1	>1
E. Coli, P/A	--	--	--	--	--	--	<1	<1	<1	<1
pH, standard units	--	--	--	--	--	--	8.4	8.3	8.4	8.4
Specific Conductance umhos@ 25oC	--	--	--	--	--	--	440	468	483	486
Turbidity, NTU	0.1	0.15	0.92 b	0.56 b	1.8	1.2	8.8	0.55	0.65	0.9
Metals, ug/L										
Aluminum	<25	<25	<25	<25	<25	<25	--	--	--	--
Arsenic	<2	<2	<2	<2	<2	<2	--	--	--	--
Barium	28.9	29.9	28.5	28.6	27.5	25.6	--	--	--	--
Boron	36.7	<35	<35	<35	<35	<35	--	--	--	--
Cadmium	<10	<10	<10	<10	<10	<10	--	--	--	--
Calcium	59.6	55.4	55.2	56.2	57	50.2	53.2	57.5	51.4	52.2
Chromium	<5	<5	<5	<5	<5	<5	--	--	--	--
Chromium, hexavalent	<10	<10	<10	<10	<10	<10	--	--	--	--
Chromium, trivalent	<10	<10	<10	<10	<10	<10	--	--	--	--
Cobalt	<5	<5	<5	<5	<5	<5	--	--	--	--

Table B-1b (continued)
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Copper	<10	<10	<10	<10	<10	<10	--	--	--	--
Iron	<0.05	<0.05	<0.05	<0.05	<0.05	**0.11**	**0.26**	<0.05	--	--
Lead	<1	<1	<1	<1	<1	<1	--	--	--	--
Lithium	<20	<20	<20	<20	<20	<20	--	--	--	--
Magnesium	**42.7**	**40.9**	**40.9**	**41.4**	**41.3**	**37.1**	**38.4**	**40.7**	**38.4**	**39.2**
Manganese	**0.02**	<0.02	<0.02	<0.05	<0.02	**0.02**	**0.01**	<0.01	--	--
Mercury, ng/L	<0.5	**2.4**	<0.5	<0.5	<0.5	**0.8 b**	<1	<1	<0.5	**1 b**
Molybdenum	<5	<5	<5	<5	<5	<5	--	--	--	--
Nickel	<5	<5	<5	<5	<5	<5	--	--	--	--
Potassium	**4.3 ***	**4.1 ***	**4 ***	**4.3 ***	**4.1 ***	**3.9 ***	**3.7**	**3.9**	**4.1**	**4.2**
Selenium	<2	<2	<2	<2	<2	<2	--	--	--	--
Silica	**5.58**	**5.24**	**5.35**	**5.1**	**5.04**	**4.77 ***	--	--	--	--
Silver	<1	<1	<1	<1	<1	<1	--	--	--	--
Sodium	**6.8**	**6.9**	**6.9**	**7**	**6.7**	**6.3**	**6**	**6.4**	**6**	**6.2**
Strontium	**128**	**129**	**129**	**131**	**125**	**118**	--	--	--	--
Thallium	<2	<2	<2	<2	<2	<2	--	--	--	--
Tin	<10	<10	<10	<10	<10	<10	--	--	--	--
Titanium	<10	<10	<10	<10	<10	<10	--	--	--	--
Vanadium	<4	<4	<4	<4	<4	<4	--	--	--	--
Zinc	<10	<10	<10	<10	<10	<10	--	--	--	--
Dissolved Metals, ug/L										
Aluminum, dissolved	<25	<25	<25	<25	<25	<25	--	--	--	--
Arsenic, dissolved	<2	<2	<2	<2	<2	<2	--	--	--	--
Barium, dissolved	**28.5**	**28.2**	**27.5**	**27.4**	**25.7**	**27.2**	--	--	--	--
Boron, dissolved	<35	**44.3**	<35	<35	<35	**40.7**	--	--	--	--
Cadmium, dissolved	<10	<10	<10	<10	<10	<10	--	--	--	--
Chromium, dissolved	<5	<5	<5	<5	<5	<5	--	--	--	--
Cobalt, dissolved	<5	<5	<5	<5	<5	<5	--	--	--	--
Copper, dissolved	<5	<5	<5	<5	<5	<5	--	--	--	--
Iron, dissolved	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	--	--	--	--
Lead, dissolved	<1	<1	<1	<1	<1	<1	--	--	--	--
Lithium, filtered	<20	<20	<20	<20	<20	<20	--	--	--	--
Manganese, dissolved	**0.01**	<0.01	<0.01	<0.01	<0.01	**0.01**	--	--	--	--
Mercury, dissolved, ng/L	--	--	--	--	--	--	**1.5 b**	**1.3 b**	**1.5**	**0.7 b**
Molybdenum dissolved	<5	<5	<5	<5	<5	<5	--	--	--	--
Nickel, dissolved	**32.6**	**19.1**	<5	<5	<5	<5	--	--	--	--
Selenium, dissolved	<2	<2	<2	<2	<2	<2	--	--	--	--
Silica, filtered	**5.2**	**5.09**	**5.22**	**5.3**	**4.77**	**5.13**	--	--	--	--
Silver, dissolved	<1	<1	<1	<1	<1	<1	--	--	--	--
Strontium, dissolved	**132**	**133**	**130**	**131**	**117**	**122**	--	--	--	--
Thallium dissolved	<2	<2	<2	<2	<2	<2	--	--	--	--
Tin dissolved	<10	<10	<10	<10	<10	<10	--	--	--	--
Titanium dissolved	<10	<10	<10	<10	<10	<10	--	--	--	--
Vanadium, dissolved	<4	<4	<4	<4	<4	<4	--	--	--	--
Zinc, dissolved	<10	<10	<10	<10	<10	<10	--	--	--	--

-- Not analyzed/not measured.
b Potential false positive based on blank data validation procedure.
* Estimated value, QA/QC criteria not met.

Table B-1b
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Location	HAMP-1-1	HAMP-1-2	HAMP-1-3	HAMP-2-1	HAMP-2-2	HAMP-2-3	HAMP	HAMP
Date	3/31/2005	3/31/2005	3/31/2005	3/31/2005	3/31/2005	3/31/2005	6/29/2005	6/29/2005
Depth							2 ft.	50 ft.
General Parameters								
Alkalinity, bicarbonate as CaCO3	143	153	168	79.7	164	163	--	--
Alkalinity, carbonate as CaCO3	<10	<10	<10	<10	<10	<10	--	--
Alkalinity, total	--	--	--	--	--	--	149	169
Biochemical Oxygen Demand (5-day)	<2	<2	<2	<2	<2	<2	--	--
Carbon, dissolved organic	--	--	--	--	--	--	--	--
Carbon, total organic	2.1	1.9	1.8	1.9	1.8	1.9	1.4	1.7
Chemical Oxygen Demand	<2	<2	<2	<2	<2	<2	--	--
Chloride	5.1	5.2	5.7	2.8	5.4	5.2	5.5	5.6
Chlorophyll a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hardness, total	234	226	236	230	220	228	--	--
Nitrate + Nitrite	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen Nitrate	--	--	--	--	--	--	<0.1	<0.1
Nitrogen Nitrite	--	--	--	--	--	--	<0.01	0.01
Nitrogen total kjeldahl	<0.5	<0.5	<0.5	0.93	0.81	<0.5	0.56	1.4
Nitrogen, ammonia as N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen, Total	<1	<1	<1	0.93	0.8	<1	--	--
Oil and Grease	<2	<2	<2	<2	<2	<2	--	--
Phosphate, Ortho	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	--	--
Phosphorus ortho dissolved	<0.03	0.14	<0.03	<0.03	0.09	0.16	<0.01	<0.01
Phosphorus total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphorus total dissolved	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--
Solids, total dissolved	226	238	270	128	264	247	219	252
Solids, total suspended	1	3	29	3	1	17	<1	<1
Sulfate	58.1	53.1	59	25.7	54.7	27.7	56	61.9
Measurements								
Bacteria, coliform fecal, CFU	<2	<2	<2	6	<2	<2	--	--
Bacteria, total coliforms, P/A	--	--	--	--	--	--	>1	>1
E. Coli, P/A	--	--	--	--	--	--	<1	<1
pH, standard units	--	--	--	--	--	--	8.5	7.9
Specific Conductance umhos@ 25oC	--	--	--	--	--	--	331	372
Turbidity, NTU	1.1	1.5	16	3.3	0.9 b	12.8	1.2	0.4
Metals, ug/L								
Aluminum	<25	<25	159	<25	<25	25.3	--	--
Arsenic	<2	<2	<2	<2	<2	<2	--	--
Barium	29.6	29	34.9	29.7	28.3	30.2	--	--
Boron	<35	<35	<35	<35	<35	<35	--	--

Table B-1b (continued)
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Cadmium	<10	<10	<10	<10	<10	<10	--	--
Calcium	**59.6**	**54.6**	**59.6**	**58.6**	**56.1**	**57.8**	**55**	**61.5**
Chromium	<5	<5	<5	<5	<5	<5	--	--
Chromium, hexavalent	<10	<10	<10	<10	<10	<10	--	--
Chromium, trivalent	<10	<10	<10	<10	<10	<10	--	--
Cobalt	<5	<5	<5	<5	<5	<5	--	--
Copper	<10	<10	<10	<10	<10	<10	--	--
Iron	<0.05	<0.05	**0.46**	<0.05	**0.05**	**0.1**	**0.08**	<0.05
Lead	<1	<1	<1	<1	<1	<1	--	--
Lithium	<20	<20	<20	<20	<20	<20	--	--
Magnesium	**20.8**	**19.9**	**21.4**	**20.4**	**19.4**	**20.4**	**19.3**	**20.6**
Manganese	<0.02	<0.02	**0.03**	<0.02	<0.02	<0.02	**0.01**	**0.01**
Mercury, ng/L	<0.5	**1.4 b**	**1.1 b**	**2**	**0.7 b**	**0.8 b**	**7.6**	<1
Molybdenum	<5	<5	<5	<5	<5	<5	--	--
Nickel	<5	<5	<5	<5	<5	<5	--	--
Potassium	**2.7 ***	**2.6 ***	**2.9 ***	**2.7 ***	**2.5 ***	**2.7 ***	**2.6**	**2.7**
Selenium	<2	<2	<2	<2	<2	<2	--	--
Silica	**11.3**	**10.6**	**11.8**	**11.5 ***	**10.2**	**11.3**	--	--
Silver	<1	<1	<1	<1	<1	<1	--	--
Sodium	**6.1**	**6.2**	**6.6**	**6.2**	**5.7**	**6.3**	**5.7**	**5.9**
Strontium	**136**	**139**	**148**	**139**	**128**	**140**	--	--
Thallium	<2	<2	<2	<2	<2	<2	--	--
Tin	<10	<10	<10	<10	<10	<10	--	--
Titanium	<10	<10	<10	<10	<10	<10	--	--
Vanadium	<4	<4	<4	<4	<4	<4	--	--
Zinc	<10	<10	<10	<10	<10	<10	--	--
Dissolved Metals, ug/L								
Aluminum, dissolved	<25	<25	<25	<25	<25	<25	--	--
Arsenic, dissolved	<2	<2	<2	<2	<2	<2	--	--
Barium, dissolved	**23.6**	**30.1**	**29.9**	**30.2**	**29.5**	**30.2**	--	--
Boron, dissolved	<35	<35	<35	<35	<35	<35	--	--
Cadmium, dissolved	<10	<10	<10	<10	<10	<10	--	--
Chromium, dissolved	<5	<5	<5	<5	<5	<5	--	--
Cobalt, dissolved	<5	<5	<5	<5	<5	<5	--	--
Copper, dissolved	<5	<5	<5	<5	<5	<5	--	--
Iron, dissolved	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	--	--
Lead, dissolved	<1	<1	<1	<1	<1	<1	--	--
Lithium, filtered	<20	<20	<20	<20	<20	<20	--	--
Manganese, dissolved	<0.01	<0.01	**0.01**	<0.01	<0.01	<0.01	--	--
Mercury, dissolved, ng/L	--	--	--	--	--	--	<1	**1.8 b**
Molybdenum dissolved	<5	<5	<5	<5	<5	<5	--	--
Nickel, dissolved	<5	<5	<5	<5	<5	<5	--	--
Selenium, dissolved	<2	<2	<2	<2	<2	<2	--	--
Silica, filtered	**9.37**	**10.8**	**10.7**	**11.1**	**10.5**	**11.1**	--	--
Silver, dissolved	<1	<1	<1	<1	<1	<1	--	--
Strontium, dissolved	**119**	**145**	**138**	**148**	**143**	**146**	--	--
Thallium dissolved	<2	<2	<2	<2	<2	<2	--	--
Tin dissolved	<10	<10	<10	<10	<10	<10	--	--
Titanium dissolved	<10	<10	<10	<10	<10	<10	--	--
Vanadium, dissolved	<4	<4	<4	<4	<4	<4	--	--
Zinc, dissolved	<10	<10	<10	<10	<10	<10	--	--

Table B-1b (continued)
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

-- Not analyzed/not measured.								
b Potential false positive based on blank								
data validation procedure.								
* Estimated value, QA/QC criteria not met.								

Table B-1b
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Location Date Depth	HAMP-A 11/10/2005 2 ft.	HAMP-A 11/10/2005 50 ft.	HAMP-B 11/10/2005 2 ft.	HAMP-B 11/10/2005 50 ft.	HAMP-C 11/10/2005 2 ft.	HAMP-C 11/10/2005 50 ft.
General Parameters						
Alkalinity, bicarbonate as CaCO3	--	--	--	--	--	--
Alkalinity, carbonate as CaCO3	--	--	--	--	--	--
Alkalinity, total	**169**	**163**	**163**	**163**	**163**	**157**
Biochemical Oxygen Demand (5-day)	--	--	--	--	--	--
Carbon, dissolved organic	**1.3**	**1.3**	**1.2**	**1.4**	**1.4**	**1.5**
Carbon, total organic	**1.5**	**2.2**	**1.1**	**1.2**	**2.4**	**1.9**
Chemical Oxygen Demand	--	--	--	--	--	--
Chloride	**4.5**	**4.7**	**4.7**	**4.5**	**5.4**	**5.3**
Chlorophyll a	<0.001	<0.001	--	<0.001	--	--
Hardness, total	--	--	--	--	--	--
Nitrate + Nitrite	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen Nitrate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen Nitrite	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrogen total kjeldahl	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrogen, ammonia as N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen, Total	--	--	--	--	--	--
Oil and Grease	--	--	--	--	--	--
Phosphate, Ortho	**0.02**	<0.01	<0.01	<0.01	<0.01	<0.01
Phosphorus ortho dissolved	<0.01	<0.01	**0.01**	**0.01**	**0.01**	**0.02**
Phosphorus total	<0.01	<0.01	<0.01	<0.01	<0.01	**0.01**
Phosphorus total dissolved	--	--	--	--	--	--
Solids, total dissolved	**332**	**330**	**317**	**332**	**248**	**255**
Solids, total suspended	<1	<1	<1	**2**	<1	<1
Sulfate	**92.7**	**84.9**	**77.5**	**103**	**60**	**61.6**
Measurements						
Bacteria, coliform fecal, CFU	--	--	--	--	--	--
Bacteria, total coliforms, P/A	>1	>1	>1	>1	>1	>1
E. Coli, P/A	<1	<1	<1	<1	<1	<1
pH, standard units	**8.3**	**8.4**	**8.4**	**8.3**	**6.8**	**8.2**
Specific Conductance umhos@ 25oC	**465**	**467**	**466**	**464**	**366**	**387**
Turbidity, NTU	**0.5**	**0.5**	**0.6**	**0.8**	**0.7**	**1.1**
Metals, ug/L						
Aluminum	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	--	--	--
Boron	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Calcium	**62.3**	**65.3**	**60.9**	**61.8**	**55.4**	**55**
Chromium	--	--	--	--	--	--
Chromium, hexavalent	--	--	--	--	--	--
Chromium, trivalent	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Copper	--	--	--	--	--	--
Iron	--	--	--	--	--	--

Table B-1b (continued)
Analytical Data Summary
HAMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Lead	--	--	--	--	--	--
Lithium	--	--	--	--	--	--
Magnesium	**29**	**29.7**	**28.2**	**28.1**	**19.4**	**19.2**
Manganese	--	--	--	--	--	--
Mercury, ng/L	**0.9 b**	**0.9 b**	**0.9 b**	<0.5	**0.8 b**	**1 b**
Molybdenum	--	--	--	--	--	--
Nickel	--	--	--	--	--	--
Potassium	**3.3**	**3.5**	**3.2**	**3.2**	**2.9**	**2.8**
Selenium	--	--	--	--	--	--
Silica	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Sodium	**6.3**	**6.7**	**6.3**	**6.2**	**5.6**	**5.6**
Strontium	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Tin	--	--	--	--	--	--
Titanium	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--
Zinc	--	--	--	--	--	--
Dissolved Metals, ug/L						
Aluminum, dissolved	--	--	--	--	--	--
Arsenic, dissolved	--	--	--	--	--	--
Barium, dissolved	--	--	--	--	--	--
Boron, dissolved	--	--	--	--	--	--
Cadmium, dissolved	--	--	--	--	--	--
Chromium, dissolved	--	--	--	--	--	--
Cobalt, dissolved	--	--	--	--	--	--
Copper, dissolved	--	--	--	--	--	--
Iron, dissolved	--	--	--	--	--	--
Lead, dissolved	--	--	--	--	--	--
Lithium, filtered	--	--	--	--	--	--
Manganese, dissolved	--	--	--	--	--	--
Mercury, dissolved, ng/L	<0.5	<0.5	**0.8 b**	<0.5	**0.7 b**	**0.7 b**
Molybdenum dissolved	--	--	--	--	--	--
Nickel, dissolved	--	--	--	--	--	--
Selenium, dissolved	--	--	--	--	--	--
Silica, filtered	--	--	--	--	--	--
Silver, dissolved	--	--	--	--	--	--
Strontium, dissolved	--	--	--	--	--	--
Thallium dissolved	--	--	--	--	--	--
Tin dissolved	--	--	--	--	--	--
Titanium dissolved	--	--	--	--	--	--
Vanadium, dissolved	--	--	--	--	--	--
Zinc, dissolved	--	--	--	--	--	--

-- Not analyzed/not measured.
b Potential false positive based on blank data validation procedure.
* Estimated value, QA/QC criteria not met.

Table B-1c
Analytical Data Summary
LMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Location Date Depth	LMP 7/1/2005 2 ft.	LMP 7/1/2005 Below Therm	LMP 1 11/11/2005 Below Therm	LMP 2 11/11/2005 Below Therm	LMP-1 11/11/2005 2 ft.	LMP-2 11/11/2005 2 ft.
General Parameters						
Alkalinity, bicarbonate as CaCO3	--	--	--	--	--	--
Alkalinity, carbonate as CaCO3	--	--	--	--	--	--
Alkalinity, total	**126**	**139**	**261**	**178**	**243**	**175**
Biochemical Oxygen Demand (5-day)	--	--	--	--	--	--
Carbon, dissolved organic	--	--	**2**	**2.2**	**2.2**	**1.9**
Carbon, total organic	--	--	--	--	--	--
Chemical Oxygen Demand	--	--	--	--	--	--
Chloride	<0.5	**0.7**	**6**	**4.9**	**5.4**	**4.7**
Chlorophyll a	**0.004**	**0.006**	--	--	--	--
Hardness, total	--	--	--	--	--	--
Nitrate + Nitrite	<0.1	<0.1	**0.27**	**0.13**	**0.19**	**0.12**
Nitrogen Nitrate	--	--	--	--	--	--
Nitrogen Nitrite	--	--	--	--	--	--
Nitrogen total kjeldahl	**0.86**	**0.76**	**0.62**	<0.5	<0.5	<0.5
Nitrogen, ammonia as N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen, Total	--	--	--	--	--	--
Oil and Grease	--	--	--	--	--	--
Phosphate, Ortho	--	--	--	--	--	--
Phosphorus ortho dissolved	<0.01	<0.01	<0.01	<0.01	**0.01**	<0.01
Phosphorus total	**0.01**	**0.02**	<0.01	<0.01	<0.1	<0.01
Phosphorus total dissolved	--	--	--	--	--	--
Solids, total dissolved	**126**	**189**	**464**	**402**	**435**	**377**
Solids, total suspended	--	--	--	--	--	--
Sulfate	**7.9**	**7.7**	**83.4**	**98.4**	**78.4**	**78.1**
Measurements						
Bacteria, coliform fecal, CFU	--	--	--	--	--	--
Bacteria, total coliforms, P/A	--	--	--	--	--	--
E. Coli, P/A	--	--	--	--	--	--
pH, standard units	**7.8**	**7.7**	**7.4**	**8.3**	**7.7**	**8.3**
Specific Conductance umhos@ 25oC	--	--	--	--	--	--
Turbidity, NTU	--	--	--	--	--	--
Metals, ug/L						
Aluminum	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	--	--	--
Boron	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Calcium	**41.9**	**46.3**	**103**	**72.6**	**98**	**73.2**
Chromium	--	--	--	--	--	--
Chromium, hexavalent	--	--	--	--	--	--
Chromium, trivalent	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Copper	--	--	--	--	--	--

Table B-1c (continued)
Analytical Data Summary
LMP Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Iron	**0.12**	**0.11**	--	--	--	--
Lead	--	--	--	--	--	--
Lithium	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--
Manganese	**0.06**	**0.04**	--	--	--	--
Mercury, ng/L	<4	<4	**0.9 b**	**0.5 b**	**1.4 b**	**1.4 b**
Molybdenum	--	--	--	--	--	--
Nickel	--	--	--	--	--	--
Potassium	**2.2**	**2.32**	**4.5**	**4.4**	**4.8**	**4.7**
Selenium	--	--	--	--	--	--
Silica	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Sodium	<2	**2.1**	**5.3**	**5**	**5.3**	**4.9**
Strontium	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Tin	--	--	--	--	--	--
Titanium	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--
Zinc	--	--	--	--	--	--
Dissolved Metals, ug/L						
Aluminum, dissolved	--	--	--	--	--	--
Arsenic, dissolved	--	--	--	--	--	--
Barium, dissolved	--	--	--	--	--	--
Boron, dissolved	--	--	--	--	--	--
Cadmium, dissolved	--	--	--	--	--	--
Chromium, dissolved	--	--	--	--	--	--
Cobalt, dissolved	--	--	--	--	--	--
Copper, dissolved	--	--	--	--	--	--
Iron, dissolved	--	--	--	--	--	--
Lead, dissolved	--	--	--	--	--	--
Lithium, filtered	--	--	--	--	--	--
Manganese, dissolved	--	--	--	--	--	--
Mercury, dissolved, ng/L	<4	<4	**0.5 b**	**0.8 b**	**0.8 b**	**0.5 b**
Molybdenum dissolved	--	--	--	--	--	--
Nickel, dissolved	--	--	--	--	--	--
Selenium, dissolved	--	--	--	--	--	--
Silica, filtered	--	--	--	--	--	--
Silver, dissolved	--	--	--	--	--	--
Strontium, dissolved	--	--	--	--	--	--
Thallium dissolved	--	--	--	--	--	--
Tin dissolved	--	--	--	--	--	--
Titanium dissolved	--	--	--	--	--	--
Vanadium, dissolved	--	--	--	--	--	--
Zinc, dissolved	--	--	--	--	--	--

-- Not analyzed/not measured.
b Potential false positive based on blank data validation procedure.
* Estimated value, QA/QC criteria not met.

Table B-1d
Analytical Data Summary
Holman Lake Water Quality Data Summary
Excelsior Energy, Inc.
(concentrations in mg/L, unless noted otherwise)

Location Date Depth	Holman Lake 7/1/2005 Below Therm	Holman Lake 7/1/2005 2 ft.	Holman Lake 11/11/2005 2 ft.
General Parameters			
Alkalinity, bicarbonate as CaCO3	--	--	--
Alkalinity, carbonate as CaCO3	--	--	--
Alkalinity, total	186	172	189
Biochemical Oxygen Demand (5-day)	--	--	--
Carbon, dissolved organic	--	--	4.8
Carbon, total organic	--	--	--
Chemical Oxygen Demand	--	--	--
Chloride	8.4	8.5	8.2
Chlorophyll a	0.004	0.002	--
Hardness, total	--	--	--
Nitrate + Nitrite	<0.1	<0.1	<0.1
Nitrogen Nitrate	--	--	--
Nitrogen Nitrite	--	--	--
Nitrogen total kjeldahl	0.67	0.69	0.59
Nitrogen, ammonia as N	<0.1	<0.1	<0.1
Nitrogen, Total	--	--	--
Oil and Grease	--	--	--
Phosphate, Ortho	--	--	--
Phosphorus ortho dissolved	0.02	0.02	<0.01
Phosphorus total	0.02	0.01	<0.01
Phosphorus total dissolved	--	--	--
Solids, total dissolved	203	236	237
Solids, total suspended	--	--	--
Sulfate	11.1	10.1	9.2
Measurements			
Bacteria, coliform fecal, CFU	--	--	--
Bacteria, total coliforms, P/A	--	--	--
E. Coli, P/A	--	--	--
pH, standard units	7.9	8	7.9
Specific Conductance umhos@ 25oC	--	--	--
Turbidity, NTU	--	--	--
Metals, ug/L			
Aluminum	--	--	--
Arsenic	--	--	--
Barium	--	--	--
Boron	--	--	--
Cadmium	--	--	--
Calcium	54.5	49.5	50.2
Chromium	--	--	--
Chromium, hexavalent	--	--	--
Chromium, trivalent	--	--	--
Cobalt	--	--	--
Copper	--	--	--

Iron	**0.05**	**0.1**	--
Lead	--	--	--
Lithium	--	--	--
Magnesium	--	--	--
Manganese	**0.04**	**0.04**	--
Mercury, ng/L	<4	<4	**0.7 b**
Molybdenum	--	--	--
Nickel	--	--	--
Potassium	**3.13**	**3.05**	**3.6**
Selenium	--	--	--
Silica	--	--	--
Silver	--	--	--
Sodium	**7.4**	**7.4**	**7.8**
Strontium	--	--	--
Thallium	--	--	--
Tin	--	--	--
Titanium	--	--	--
Vanadium	--	--	--
Zinc	--	--	--
Dissolved Metals, ug/L			
Aluminum, dissolved	--	--	--
Arsenic, dissolved	--	--	--
Barium, dissolved	--	--	--
Boron, dissolved	--	--	--
Cadmium, dissolved	--	--	--
Chromium, dissolved	--	--	--
Cobalt, dissolved	--	--	--
Copper, dissolved	--	--	--
Iron, dissolved	--	--	--
Lead, dissolved	--	--	--
Lithium, filtered	--	--	--
Manganese, dissolved	--	--	--
Mercury, dissolved, ng/L	<4	<4	**1.1 b**
Molybdenum dissolved	--	--	--
Nickel, dissolved	--	--	--
Selenium, dissolved	--	--	--
Silica, filtered	--	--	--
Silver, dissolved	--	--	--
Strontium, dissolved	--	--	--
Thallium dissolved	--	--	--
Tin dissolved	--	--	--
Titanium dissolved	--	--	--
Vanadium, dissolved	--	--	--
Zinc, dissolved	--	--	--

-- Not analyzed/not measured.
b Potential false positive based on blank data validation procedure.
* Estimated value, QA/QC criteria not met.

This appendix contains the representative material safety data sheets (MSDS) for the IGCC Power Station. The chemicals anticipated for use in Mesaba One and Mesaba Two are listed in Table C-1 below. The specific chemicals are for preliminary representation only and subject to revision when the specific water chemistry program for the facility is developed. The MSDSs for each of the representative chemicals follows Table C-1.

Table C-1
Chemical Additives

Chemical	Representative Chemical Name	Point(s) of Introduction
Dechlorination - Sodium Bisulfite	NALCO 7408	Cooling Tower Blowdown Sump, Reverse Osmosis System
Oxygen Scavenger	NALCO ELIMIN-OX®	Boiler Feed Water
Condensate Corrosion Inhibitor-Neutralizing Amine/ammonia	NALCO 352	Boiler Feed Water
Chlorination - Sodium Hypochlorite	Sodium Hypochlorite	Cooling Towers
pH control-93% Sulfuric acid	Sulfuric Acid	Cooling Towers, Reverse Osmosis, Mixed Bed
Sodium Hydroxide	Sodium Hydroxide	Mixed Bed regeneration
Anti-Scalant	PermaTreat® PC-191	Reverse Osmosis, Deionizer
Cleaning chemicals	PermaClean® PC-33 and PermaClean® PC-67	Reverse Osmosis
Non-Oxidizing Biocide	TBD	Cooling Towers

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 7408**

APPLICATION : CHLORINE SCAVENGER

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH :	1 / 2	FLAMMABILITY :	0 / 0	REACTIVITY :	0 / 0	OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Sodium Bisulfite	7631-90-5	30.0 - 60.0

3.	HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING

Contains Sulfite. Irritating to respiratory system. May cause skin and eye irritation. Causes asthmatic signs and symptoms in hyper-reactive individuals.

Avoid breathing vapor. Use with adequate ventilation. Do not take internally. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

After contact with skin, wash immediately with plenty of water. Protect product from freezing.

Wear suitable protective clothing, gloves and eye/face protection.

May evolve oxides of sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Skin, Eye, Inhalation

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

Can cause mild irritation.

SKIN CONTACT :

Can cause mild irritation.

INGESTION :

Not a likely route of exposure. May cause asthmatic-like attack.

INHALATION :

Irritant to respiratory system. Causes asthmatic signs and symptoms in hyper-reactive individuals.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

HUMAN HEALTH HAZARDS - CHRONIC :

Ingestion of sulfite can cause a severe allergic reaction in asthmatics and some sulfite sensitive individuals. The resulting symptoms can include difficulty in breathing, flushed skin and a rash. Chronic exposure to sulfites may cause symptoms of upper respiratory disease and affect sense of taste and smell.

4.	FIRST AID MEASURES

EYE CONTACT :

Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :

Immediately flush with plenty of water for at least 15 minutes. If symptoms persist, call a physician.

INGESTION :

Induce vomiting if the patient is fully conscious. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :

Remove to fresh air, treat symptomatically. If breathing is difficult, administer oxygen. Get medical attention.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgment should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Keep containers cool by spraying with water. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ensure adequate ventilation. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7.	HANDLING AND STORAGE

HANDLING :

Avoid eye and skin contact. Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled. Keep the containers closed when not in use. Use with adequate ventilation.

STORAGE CONDITIONS :

Store the containers tightly closed. Store in suitable labelled containers. Amine and sulphite products should not be stored within close proximity or resulting vapors may form visible airborne particles.

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below. Exposure limits are listed for sulfur dioxide (SO2) since this product evolves SO2 when open to the atmosphere.

ACGIH/TLV :

Substance(s)

Sodium Bisulfite	TWA: 5 mg/m3
Sulfur Dioxide	TWA: 2 ppm , 5.2 mg/m3
	STEL: 5 ppm , 13 mg/m3

OSHA/PEL :

Substance(s)

Sodium Bisulfite	TWA: 5 mg/m3

Sulfur Dioxide	TWA: 2 ppm , 5 mg/m3
	STEL: 5 ppm , 13 mg/m3

ENGINEERING MEASURES :

General ventilation is recommended. Local exhaust ventilation may be necessary when dusts or mists are generated.

RESPIRATORY PROTECTION :

If significant mists, vapors or aerosols are generated an approved respirator is recommended. An approved respirator must be worn if the occupational exposure limit is likely to be exceeded.

HAND PROTECTION :

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available. Keep a safety shower available.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Yellow
ODOR	Sulfurous, Pungent

SPECIFIC GRAVITY	1.37 @ 77 °F / 25 °C
DENSITY	11.4 lb/gal
SOLUBILITY IN WATER	Complete
pH (1 %)	4.1
VISCOSITY	2.8 cps @ 77 °F / 25 °C
FREEZING POINT	34 °F / 1.1 °C
BOILING POINT	219 °F / 104 °C
VAPOR PRESSURE	32 mm Hg, 76 mm Hg @ 77 °F, 99.9 °F / 25 °C, 37.7 °C
VAPOR DENSITY	2.2 (Air = 1)
VOC CONTENT	0.00 %

10.	STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

MATERIALS TO AVOID :

Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. SO2 may react with vapors from neutralizing amines and may produce a visible cloud of amine salt particles.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of sulfur

11. TOXICOLOGICAL INFORMATION

The following results are for a similar product.

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	4.1 g/kg	Similar Product

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

Species	LD50	Test Descriptor
Rabbit	3 g/kg	Similar Product

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

Draize Score	Test Descriptor
1.0 / 8.0	Similar Product

Rating : Slightly irritating

PRIMARY EYE IRRITATION :

Draize Score	Test Descriptor
9.4 / 110.0	Similar Product

Rating : Minimally irritating

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product and a similar product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	> 100 mg/l	Product
Fathead Minnow	96 hrs	382 mg/l	Similar Product

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	728 mg/l		Similar Product
Daphnia magna	48 hrs	275 mg/l		Product

Rating : Essentially non-toxic

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Low

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13.	DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name :	BISULFITES, AQUEOUS SOLUTION, N.O.S.
Technical Name(s) :	SODIUM BISULFITE
UN/ID No :	UN 2693
Hazard Class - Primary :	8
Packing Group :	III
Flash Point :	None
DOT Reportable Quantity (per package) :	12,000 lbs
DOT RQ Component :	SODIUM BISULFITE

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	BISULPHITES, AQUEOUS SOLUTION, N.O.S.
Technical Name(s) :	SODIUM BISULFITE
UN/ID No :	UN 2693
Hazard Class - Primary :	8
Packing Group :	III
IATA Cargo Packing Instructions :	820
IATA Cargo Aircraft Limit :	60 L (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	BISULPHITES, AQUEOUS SOLUTION, N.O.S.
Technical Name(s) :	SODIUM BISULFITE
UN/ID No :	UN 2693
Hazard Class - Primary :	8
Packing Group :	III

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 C.F.R. 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Bisulfite : Respiratory irritant

CERCLA/SUPERFUND, 40 C.F.R. 117, 302 :

This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product.

RQ Substance	RQ
Sodium Bisulfite	12,000 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 C.F.R. 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 C.F.R. 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 C.F.R. 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 C.F.R. 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 C.F.R. 173.310 Boiler Water Additives, 21 C.F.R. 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 C.F.R. 176.180 Components of paper and paperboard in contact with dry foods.

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 C.F.R. 401.15 / formerly Sec. 307, 40 C.F.R. / formerly Sec. 311 :

This product contains the following substances listed in the regulation:

Substance(s)	Citations
Sodium Bisulfite :	Sec. 311

CLEAN AIR ACT, Sec. 111 (40 C.F.R. 60, Volatile Organic Compounds), Sec. 112 (40 C.F.R. 61, Hazardous Air Pollutants), Sec. 602 (40 C.F.R. 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Sodium Bisulfite	7631-90-5
Water	7732-18-5

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 05/16/2000

Replaces : 06/18/1999

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 352**

APPLICATION : CORROSION INHIBITOR

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH :	2 / 3	FLAMMABILITY :	1 / 1	REACTIVITY :	0 / 0	OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)

Morpholine	110-91-8	40.0 - 70.0

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

DANGER

Corrosive. May cause tissue damage. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.

Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Fire or intense heat may cause violent rupture of packages.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin, Inhalation

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

Corrosive. Will cause eye burns and permanent tissue damage. Exposure to low vapor concentrations can result in foggy or blurred vision, objects appearing bluish and appearance of a halo around lights. These symptoms are temporary.

SKIN CONTACT :

May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

INGESTION :

Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach.

INHALATION :

Irritating, in high concentrations, to the eyes, nose, throat and lungs. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4.	**FIRST AID MEASURES**

EYE CONTACT :

PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :

Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use.

INGESTION :

DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :

Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :

Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : Minimum > 200 °F / > 93.3 °C (PMCC)

EXTINGUISHING MEDIA :

Dry powder, Carbon dioxide, Foam, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material.

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Keep containers cool by spraying with water.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Fire or intense heat may cause violent rupture of packages.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7.	HANDLING AND STORAGE

HANDLING :

Do not get in eyes, on skin, on clothing. Do not take internally. Do not breathe vapors/gases/dust. Use with adequate ventilation. Avoid generating aerosols and mists. Keep away from acids and oxidizing agents. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

STORAGE CONDITIONS :

Store the containers tightly closed. Store separately from acids. Store separately from oxidizers. Amine and sulphite products should not be stored within close proximity or resulting vapors may form visible airborne particles.

UNSUITABLE CONSTRUCTION MATERIAL :

Aluminum, Brass, Nickel, Copper, and their alloys

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

Substance(s)

Morpholine	TWA: 20 ppm , 71 mg/m3 (Skin)

OSHA/PEL :

Substance(s)

Morpholine	TWA: 20 ppm , 70 mg/m3 (Skin)
	STEL: 30 ppm , 105 mg/m3 (Skin)

ENGINEERING MEASURES :

General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :

If significant mists, vapors or aerosols are generated an approved respirator is recommended. An organic vapor cartridge with dust/mist prefilter or supplied air may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :

Butyl gloves, Most glove materials are of low chemical resistance. Replace gloves regularly.

SKIN PROTECTION :

Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :

Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Light yellow
ODOR	Slight, Ammoniacal
SPECIFIC GRAVITY	1.02 - 1.04 @ 77 °F / 25 °C
DENSITY	8.5 - 8.6 lb/gal
SOLUBILITY IN WATER	Complete
pH (1 %)	9.1
(100 %)	10.5
VISCOSITY	5.5 cps @ 77 °F / 25 °C
FREEZING POINT	-8 °F / -22 °C
VAPOR PRESSURE	50 mm Hg @ 68 °F / 20 °C

VOC CONTENT 17 %

10.	STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

MATERIALS TO AVOID :

Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Avoid contact with SO2 or acidic bisulfite products, which may react to form visible airborne amine salt particles. Certain amines in contact with nitrous acid, organic or inorganic nitrites or atmospheres with high nitrous oxide concentrations may produce N-nitrosamines, many of which are cancer-causing agents to laboratory animals.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

11.	TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	3,053 mg/kg	Product

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

Species	LD50	Test Descriptor
Rabbit	> 3,083 mg/kg	Product

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

Draize Score	Test Descriptor
5.0 / 8.0	Product

Rating : Moderately irritating

PRIMARY EYE IRRITATION :

Draize Score	Test Descriptor
43.7 / 110.0	Product

Rating : Extremely irritating (Corrosive)

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

MUTAGENICITY :

Mutagenicity tests on morpholine provided the following results: A bacterial mutagenicity (Ames) bioassay was negative; sister chromatid exchange transformation was positive; mouse lymphoma was weakly positive and rat hepatocyte/DNA repair was negative.

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: High

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	384 mg/l	Product
Fathead Minnow	96 hrs	132 mg/l	Product

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs		331.2 mg/l	Product

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : 703,000 mg/l

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Moderate

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name :	AMINES, LIQUID, CORROSIVE, N.O.S.
Technical Name(s) :	MORPHOLINE
UN/ID No :	UN 2735
Hazard Class - Primary :	8
Packing Group :	II
Flash Point :	Minimum > 93.3 °C / > 200 °F

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	AMINES, LIQUID, CORROSIVE, N.O.S.
Technical Name(s) :	MORPHOLINE
UN/ID No :	UN 2735
Hazard Class - Primary :	8
Packing Group :	II
IATA Cargo Packing Instructions :	
IATA Cargo Aircraft Limit :	(Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	AMINES, LIQUID, CORROSIVE, N.O.S.
Technical Name(s) :	MORPHOLINE
UN/ID No :	UN 2735
Hazard Class - Primary :	8
Packing Group :	II

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 C.F.R. 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Morpholine : Corrosive, Flammable

CERCLA/SUPERFUND, 40 C.F.R. 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 C.F.R. 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 C.F.R. 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 C.F.R. 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 C.F.R. 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 C.F.R. 173.310 Boiler Water Additives

The following limitations apply:

Maximum dosage	Limitation
25 PPM	in the steam.

This product can not be used where the steam produced will contact milk or milk products.

U.S. DEPARTMENT OF AGRICULTURE (USDA) :

USDA Inspection and Grading Programs - Food Safety and Inspection Service:

This product is authorized by USDA for use in federally inspected meat and poultry plants. Authorized use is under category : G6

This product has been certified as KOSHER/PAREVE for year-round use EXCEPT FOR THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 C.F.R. 401.15 / formerly Sec. 307, 40 C.F.R. / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 C.F.R. 60, Volatile Organic Compounds), Sec. 112 (40 C.F.R. 61, Hazardous Air Pollutants), Sec. 602 (40 C.F.R. 82, Class I and II Ozone Depleting Substances) :

This product contains the following substances listed in the regulation:

Substance(s)	Citations
Morpholine :	Sec. 111

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Morpholine	110-91-8

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16.	OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Moderate

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 12/10/2001

Replaces : 08/15/2001

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO ELIMIN-OX®**

APPLICATION : OXYGEN SCAVENGER

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH :	0 / 1	FLAMMABILITY :	0 / 0	REACTIVITY :	0 / 0	OTHER :	0

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous.

Hazardous Substance(s)	CAS NO	% (w/w)

Carbohydrazide	497-18-7	5.0 - 10.0

3.	HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING

May cause sensitization by skin contact.

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear suitable protective clothing.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

May cause irritation with prolonged contact.

SKIN CONTACT :

Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

INGESTION :

Not a likely route of exposure. No adverse effects expected.

INHALATION :

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4.	FIRST AID MEASURES

EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7.	HANDLING AND STORAGE

HANDLING :

Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :

Store the containers tightly closed.

UNSUITABLE CONSTRUCTION MATERIAL :

Natural rubber, Neoprene, Hypalon, Buna-N, HDPE (high density polyethylene)

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended.

RESPIRATORY PROTECTION :

Where concentrations in air may exceed the limits given in this section, the use of a half face filter mask or air supplied breathing apparatus is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Particulate filter - HEPA (Purple) If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE Colorless

ODOR None

SPECIFIC GRAVITY	1.02 @ 68 °F / 20 °C
DENSITY	8.5 - 8.6 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	8.3
(1 %)	6.7
VISCOSITY	2.9 cst
FREEZING POINT	28 °F / -2 °C

VAPOR PRESSURE	12 mm Hg @ 68 °F / 20 °C
VOC CONTENT	0.17 %

10. STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions. Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

At temperatures below 4 °C (40 °F), this product loses its stability and forms precipitates. Once formed, the precipitate cannot be resolubilized and loss of product activity will occur.

MATERIALS TO AVOID :

Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with strong alkalies (e.g. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium hydroxide, calcium hydroxide (lime), cyanide, sulfide, hypochlorites, chlorites) may generate heat, splattering or boiling and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	> 5,000 mg/kg	Product

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

Species	LD50	Test Descriptor
Rabbit	2,000 mg/kg	Product

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

Draize Score	Test Descriptor
0.2 / 8.0	Product

Rating : Essentially non-irritating

PRIMARY EYE IRRITATION :

Draize Score	Test Descriptor
0.3 / 110.0	Product

Rating : Essentially non-irritating

SENSITIZATION :

Repeated or prolonged contact may cause skin sensitization.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Bluegill Sunfish	96 hrs	190 mg/l	Product
Rainbow Trout	96 hrs	360 mg/l	Product
Fathead Minnow	96 hrs	400 mg/l	Product

Rating : Slightly toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	96 mg/l		Product

Rating : Toxic

MOBILITY AND BIOACCUMULATION POTENTIAL

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM , provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages; <5% 30 - 50% 50 - 70% The portion in water is expected to be soluble or dispersible.

This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Low

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13.	DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15.	REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 C.F.R. 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Carbohydrazide : Dermal Sensitizer

CERCLA/SUPERFUND, 40 C.F.R. 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 C.F.R. 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 C.F.R. 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

-	Immediate (Acute) Health Hazard
X	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 C.F.R. 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 C.F.R. 710)

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 C.F.R. 401.15 / formerly Sec. 307, 40 C.F.R. / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 C.F.R. 60, Volatile Organic Compounds), Sec. 112 (40 C.F.R. 61, Hazardous Air Pollutants), Sec. 602 (40 C.F.R. 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

Substances known to the State of California to cause cancer are present as an impurity or residue.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

D2B - Materials Causing Other Toxic Effects - Toxic Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

AUSTRALIA

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS) and are listed on the Australian Inventory of Chemical Substances (AICS).

EUROPE

The substances in this preparation are included in or exempted from the EINECS or ELINCS inventories.

JAPAN

All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Ministry of International Trade & industry List (MITI).

KOREA

All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

THE PHILIPPINES

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

16.	OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 09/23/2002

Replaces : 07/27/2001

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **PermaClean® PC-33**

APPLICATION : REVERSE OSMOSIS CLEANER

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH :	1 / 1	FLAMMABILITY :	1 / 1	REACTIVITY :	0 / 0	OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)

Trisodium Nitrilotriacetate Monohydrate	18662-53-8	1.0 - 5.0
Sodium Hydroxide	1310-73-2	1.0 - 5.0
Tetrasodium EDTA	64-02-8	30.0 - 60.0

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING

Irritating to eyes and skin.

Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

Can cause mild irritation.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

Not a likely route of exposure. No adverse effects expected.

INHALATION :

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

HUMAN HEALTH HAZARDS - CHRONIC :

This product contains nitrilotriacetic acid, trisodium salt. The International Agency for Research on Cancer (IARC) has evaluated Nitrilotriacetic acid, trisodium salt, and found it to be a possible human carcinogen (Group 2B) based on sufficient animal data and insufficent human evidence.

Sodium nitrilotriacetate has been shown to cause kidney damage and urinary tract tumours when fed to laboratory animals at very high doses.

4.	FIRST AID MEASURES

EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice. Do not induce vomiting without medical advice.

INHALATION :

If symptoms develop, seek medical advice. Remove to fresh air, treat symptomatically.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

Use extinguishing media appropriate for surrounding fire. This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Restrict access to area as appropriate until clean-up operations are complete.

METHODS FOR CLEANING UP :

Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. SMALL SPILLS: Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7.	HANDLING AND STORAGE

HANDLING :

Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use. Avoid eye and skin contact.

STORAGE CONDITIONS :

Store the containers tightly closed.

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

Substance(s)

Sodium Hydroxide CEILING: 2 mg/m3

OSHA/PEL :

Substance(s)

Sodium Hydroxide CEILING: 2 mg/m3

ENGINEERING MEASURES :

General ventilation is recommended.

RESPIRATORY PROTECTION :

Respiratory protection is not normally needed.

HAND PROTECTION :

Nitrile gloves, Butyl gloves, PVC gloves, Neoprene gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE	Clear Yellow
ODOR	Slight, Ammoniacal
SPECIFIC GRAVITY	1.28
DENSITY	10.51 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	12.0 - 13.0
(1 %)	11.4
BOILING POINT	224.6 °F / 107 °C

10. STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

MATERIALS TO AVOID :

None known

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

11.	TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	> 2,000 mg/kg	Product

Rating : Non-Hazardous

CARCINOGENICITY :

Oral administration of large doses of nitrilotriacetic acid in the diet of mice and rats resulted in kidney tumors/cancer in mice. In the rats, there was an increase in bladder cancer in males, and induced liver and adrenal cancer in females. Oral administration of nitrilotriacetic acid, trisodium salt, monohydrate in the diet of mice and rats resulted in induced hematopoietic tumors in male mice. In rats tumors/cancers in the urinary system (kidney, ureter, and bladder) were observerd. When administered in drinking-water to male rats, the material induced cancers of the kidney.

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: High

12.	ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Bluegill Sunfish	96 hrs	1,030 mg/l	Product

Rating : Essentially non-toxic

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Moderate

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13.	DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name :	NOT REGULATED DURING TRANSPORTATION IN THE U.S., PER 49CFR 173.154(D), IF TRANSPORTED IN PACKAGE COMPATIBLE WITH THIS MATERIAL.

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S
Technical Name(s) :	TETRASODIUM SALT OF EDTA, SODIUM HYDROXIDE
UN/ID No :	UN 3267
Hazard Class - Primary :	8
Packing Group :	III
IATA Cargo Packing Instructions :	820
IATA Cargo Aircraft Limit :	60 L (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S
Technical Name(s) :	TETRASODIUM SALT OF EDTA, SODIUM HYDROXIDE
UN/ID No :	UN 3267
Hazard Class - Primary :	8
Packing Group :	III

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 C.F.R. 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Trisodium Nitrilotriacetate Monohydrate : Cancer suspect agent (refer to Section 3)

Sodium Hydroxide : Corrosive

Tetrasodium EDTA : Irritant

CERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

X	Immediate (Acute) Health Hazard
	Delayed (Chronic) Health Hazard
	Fire Hazard
	Sudden Release of Pressure Hazard
	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

NSF INTERNATIONAL :

This product has received NSF/International certification under ANSI/NSF Standard 60 in the "Other" category. The official name is "Miscellaneous Water Supply Products." Only product manufactured at NDT plant at Chagrin Falls, OH, and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications. This product is designed to be used off-line and must be flushed and drained before being placed into service. The pH of the influent and effluent water should be monitored to ensure that all traces of the product have been removed before placing into service. Membrane cleaner.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

This product contains the following substances listed in the regulation:

Substance(s)	Citations
Sodium Hydroxide :	Sec. 311

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product contains the following substances which require warning under California Proposition 65.

Substance(s)	Concentration	EFFECTS
Nitrilotriacetic Acid	<= %	Causes Cancer

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Sodium Hydroxide	1310-73-2
Trisodium Nitrilotriacetate	5064-31-3

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

D2A - Materials Causing Other Toxic Effects - Very Toxic Material, E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide

assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 09/22/2000

Replaces : 08/30/2000

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **PermaClean® PC-67**

APPLICATION : REVERSE OSMOSIS CLEANER

COMPANY IDENTIFICATION : Ondeo Nalco Company

Ondeo Nalco Center

Naperville, Illinois

60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH :	1 / 2	FLAMMABILITY :	1 / 1	REACTIVITY :	0 / 0	OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)

Sodium Dodecylbenzenesulphonate	25155-30-0	10.0 - 30.0

3.	HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING

Irritating to eyes and skin.

Do not get in eyes, on skin, on clothing. Do not take internally. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear suitable protective clothing, gloves and eye/face protection.

Low Fire Hazard; liquids may burn upon heating to temperatures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

Can cause moderate irritation.

SKIN CONTACT :

Can cause moderate irritation.

INGESTION :

Not a likely route of exposure. May cause nausea and vomiting. Can cause central nervous system depression.

INHALATION :

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

4.	FIRST AID MEASURES

EYE CONTACT :

Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :

If symptoms persist, call a physician. Immediately flush with plenty of water for at least 15 minutes.

INGESTION :

If conscious, washout mouth and give water to drink. Get medical attention. Do not induce vomiting without medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

Keep containers cool by spraying with water. Use extinguishing media appropriate for surrounding fire. This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.

FIRE AND EXPLOSION HAZARD :

Low Fire Hazard; liquids may burn upon heating to temperatures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible. Ensure clean-up is

conducted by trained personnel only. Do not touch spilled material. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

7.	HANDLING AND STORAGE

HANDLING :

Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labelled. Keep the containers closed when not in use. Use with adequate ventilation. Avoid eye and skin contact.

STORAGE CONDITIONS :

Store the containers tightly closed. Store in suitable labelled containers.

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended.

RESPIRATORY PROTECTION :

Respiratory protection is not normally needed. If significant mists, vapors or aerosols are generated an approved respirator is recommended. An organic vapor cartridge with dust/mist prefilter or supplied air may be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :

Polyvinyl alcohol gloves, Viton# gloves, Nitrile

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE Amber

ODOR Mild

SPECIFIC GRAVITY	1.043
DENSITY	8.68 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	6.0 - 8.0

10.	STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

None known

MATERIALS TO AVOID :

Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with reducing agents (e.g. hydrazine, sulfites, sulfide, aluminum or magnesium dust) may generate heat, fires, explosions and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of sulfur

11.	TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Moderate

12.	ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Fathead Minnow	96 hrs	6 mg/l	Product
Bluegill Sunfish	96 hrs	1.18 - 6.5 mg/l	Product

Rating : Toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	24 hrs	6.9 mg/l		Product
Shore Crab	96 hrs	> 100 mg/l		Product

Rating : Toxic

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Moderate

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13.	DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	SODIUM DODECYLBENZENESULFONATE
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III
Flash Point :	None
DOT Reportable Quantity (per package) :	4,000 lbs

DOT RQ Component :	SODIUM DODECYLBENZENESULFONATE

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	SODIUM DODECYLBENZENESULFONATE
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III
IATA Cargo Packing Instructions :	914
IATA Cargo Aircraft Limit :	NO LIMIT (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Dodecylbenzenesulphonate : Eye irritant

CERCLA/SUPERFUND, 40 CFR 117, 302 :

This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

RQ Substance	RQ
Sodium Dodecylbenzenesulphonate	4,000 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard

- Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

NSF INTERNATIONAL :

This product has received NSF/International certification under ANSI/NSF Standard 60 in the "Other" category. The official name is "Miscellaneous Water Supply Products." Only product manufactured at NDT plant at Chagrin Falls, OH, and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications. Membrane cleaner. This product is designed to be used off-line and flushed out prior to using the system for drinking water.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

This product contains the following substances listed in the regulation:

Substance(s)	Citations
Sodium Dodecylbenzenesulphonate :	Sec. 311

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

algae

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Sodium Dodecylbenzenesulphonate	25155-30-0

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

D2B - Materials Causing Other Toxic Effects - Toxic Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16.	OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 01/23/2001

Replaces : 09/22/2000

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **PermaClean® PC-77**

APPLICATION : REVERSE OSMOSIS CLEANER

CHEMICAL DESCRIPTION : Water, Soluble salt(s)

COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER : (800)462-5378 (24 Hours) (800) I-M-ALERT

NFPA 704M/HMIS RATING

HEALTH :	0 / 1	FLAMMABILITY :	1 / 1	REACTIVITY :	0 / 0	OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

3.	HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

CAUTION

May cause irritation with prolonged contact.

Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

May cause irritation with prolonged contact.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

Not a likely route of exposure. No adverse effects expected.

INHALATION :

Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4.	FIRST AID MEASURES

EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

Use extinguishing media appropriate for surrounding fire. This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water., Do not allow material to contaminate ground water system., Prevent material from entering sewers or waterways.

7.	HANDLING AND STORAGE

HANDLING :

Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use. Avoid eye and skin contact. Keep away from acids and oxidizing agents.

STORAGE CONDITIONS :

Store the containers tightly closed.

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended. Local exhaust ventilation may be necessary when dusts or mists are generated.

RESPIRATORY PROTECTION :

If significant mists, vapors or aerosols are generated an approved respirator is recommended.

HAND PROTECTION :

Nitrile gloves, Butyl gloves, PVC gloves, Neoprene gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Straw-colored
ODOR	None
SPECIFIC GRAVITY	1.18
DENSITY	9.84 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	3.7

10. STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Extremes of temperature

MATERIALS TO AVOID :

None known.

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

11.	TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Low

12.	ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Tested Substance
Rainbow Trout	96 hrs	320 mg/l	Product

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Tested Substance
Daphnia magna	48 hrs	310 mg/l		Product

Rating : Essentially non-toxic

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Low

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13.	DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15.	REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710).

NSF INTERNATIONAL :

This product has received NSF/International certification under ANSI/NSF Standard 60 in the "Other" category. The official name is "Miscellaneous Water Supply Products." Only product manufactured at NDT plant at Chagrin Falls, OH, and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications. Membrane cleaner. This product is designed to be used off-line and flushed out prior to using the system for drinking water.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

All substances in this product are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16.	OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

Prepared By : Product Safety Department

Date issued : 10/03/2000

Replaces : 08/30/2000

1.	CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **PermaTreat® PC-191**

APPLICATION : REVERSE OSMOSIS ANTISCALANT

CHEMICAL DESCRIPTION : Water, Organic compound

COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER : (800)462-5378 (24 Hours) (800) I-M-ALERT

NFPA 704M/HMIS RATING

HEALTH :	0 / 1	FLAMMABILITY :	1 / 1	REACTIVITY :	0 / 0	OTHER :	

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2.	COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

3.	HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

CAUTION

May cause irritation with prolonged contact.

Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

May cause irritation with prolonged contact.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

May cause gastrointestinal irritation.

INHALATION :

May cause irritation of mucous membranes.

SYMPTOMS OF EXPOSURE :

Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

4.	FIRST AID MEASURES

EYE CONTACT :

Immediately flush eye with water for at least 15 minutes while holding eyelids open. If symptoms persist, call a physician.

SKIN CONTACT :

Immediately flush with plenty of water for at least 15 minutes. If symptoms persist, call a physician.

INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5.	FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :

Use extinguishing media appropriate for surrounding fire. This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.

FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6.	ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible.

METHODS FOR CLEANING UP :

SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water., Do not allow material to contaminate ground water system., Prevent material from entering sewers or waterways.

7.	HANDLING AND STORAGE

HANDLING :

Do not take internally. Ensure all containers are labelled. Avoid eye and skin contact. Keep the containers closed when not in use. Keep away from acids and oxidizing agents.

STORAGE CONDITIONS :

Store the containers tightly closed.

8.	EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :

General ventilation is recommended. Local exhaust ventilation may be necessary when dusts or mists are generated.

RESPIRATORY PROTECTION :

If significant mists, vapors or aerosols are generated an approved respirator is recommended.

HAND PROTECTION :

Nitrile gloves, Butyl gloves, PVC gloves, Neoprene gloves

SKIN PROTECTION :

Wear standard protective clothing.

EYE PROTECTION :

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :

Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available.

HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9.	PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE Yellow

ODOR Ammoniacal

SPECIFIC GRAVITY 1.36

DENSITY 11.33 lb/gal

SOLUBILITY IN WATER	Complete
pH (100 %)	10.5
OCTANOL/WATER COEFFICIENT	3.5

10. STABILITY AND REACTIVITY

STABILITY :

Stable under normal conditions.

HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

CONDITIONS TO AVOID :

Freezing temperatures.

MATERIALS TO AVOID :

Strong oxidizing agents Strong acids

HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

Species	LD50	Tested Substance
Rat	> 17,800 mg/kg	Product

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

Species	LD50	Tested Substance
Rabbit	> 15,800 mg/kg	Product

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

Draize Score	Tested Substance
0.3 / 8.0	Product

Rating : Practically non-irritating

PRIMARY EYE IRRITATION :

Draize Score	Tested Substance
3.7 / 110.0	Product

Rating : Practically non-irritating

SENSITIZATION :

This product is not expected to be a sensitizer.

CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Tested Substance
Rainbow Trout	96 hrs	> 959 mg/l	Product
Sheepshead Minnow	96 hrs	> 1,000 mg/l	Product
Bluegill Sunfish	96 hrs	> 300 mg/l	
Channel Catfish	96 hrs	1,212 mg/l	

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Tested Substance
Daphnia magna	48 hrs		863 mg/l	Product

Grass Shrimp	96 hrs	> 1,000 mg/l		Product

Rating : Essentially non-toxic

AQUATIC PLANT RESULTS :

Species	Exposure	EC50	Tested Substance
Green Algae (Selenastrum capricornutum)	96 hrs	20 mg/l	

Rating :

AVIAN RESULTS :

Species	Exposure	LC50	Tested Substance
Bobwhite Quail	14 Days	> 2,510 mg/kg	

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Low

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14.	TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15.	REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710).

NSF INTERNATIONAL :

This product has received NSF/International certification under ANSI/NSF Standard 60 in the reverse osmosis antiscalant category. The official name is "Miscellaneous Water Supply Products." Maximum product application dosage is : 5 mg/l. Only product manufactured at NDT plant at Chagrin Falls, OH, and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

All substances in this product are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16.	OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this

information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

Prepared By : Product Safety Department

Date issued : 09/13/2000

Replaces : 08/30/2000

MSDS Number: **S4037** * * * * * *Effective Date:* ***10/28/04*** * * * * * *Supercedes:* ***07/07/04***

1. Product Identification

Synonyms: Caustic soda solution; lye solution; sodium hydroxide liquid; sodium hydrate solution,Sodium Hydroxide Concentrate Solution StandARd®, Sodium Hydroxide, DILUT-IT® Analytical Concentrates, sodium hydroxide volumetric solutions
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH in water
Product Codes:
J.T. Baker: 0337, 0338, 0339, 0342, 0344, 0392, 0897, 3719, 3725, 3727, 3729, 3735, 4689, 4690, 5000, 5661, 5666, 5668, 5669, 5671, 5672, 5674, 5676
Mallinckrodt: 6290, 7701, 7702, 7703, 7705, 7706, 7775, H369, H382, H385, V038, V679

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	10 - 60%	Yes
Water	7732-18-5	40 - 90%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Hot or molten material can react violently with water.
Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.
Explosion:
May cause fire and explosions when in contact with incompatible materials.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRACIT®-2 or BuCAIM® caustic neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Store above 16C (60F) to prevent freezing. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Physical data is displayed for 10%, 30% and 50% aqueous sodium hydroxide solutions. (Merck Index).

Appearance:
Clear, colorless solution.

Odor:
Odorless.

Solubility:
Completely miscible with water.

Density:
10% solution - 1.11; 30% solution - 1.33; 50% solution - 1.53

pH:
14.0 (10%, 30% and 50% solutions)

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
For 10% solution = 105C (221F); for 30% solution = 115C (239F); for 50% solution = 140C (284F).

Melting Point:
For 10% solution = -10C (14 F); for 30% solution = 1C (34F); for 50% solution = 12C (53.6F).

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
13 @ 60C (140F) (50% solution)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Sodium hydroxide: irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe. Investigated as a mutagen.

```
  --------\Cancer Lists\-----------------------------------------------------
-
                                          ---NTP Carcinogen---
  Ingredient                              Known    Anticipated    IARC
Category
  -------------------------------------   -----    -----------    ------------
-
  Sodium Hydroxide (1310-73-2)             No          No             None
  Water (7732-18-5)                        No          No             None
```

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8
UN/NA: UN1824
Packing Group: II
Information reported for product/size: 360LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLUTION
Hazard Class: 8
UN/NA: UN1824
Packing Group: II
Information reported for product/size: 360LB

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\--------------------------------
--
  Ingredient                                          TSCA  EC   Japan
Australia
  ----------------------------------------------  ----  ---  -----  --------
-
  Sodium Hydroxide (1310-73-2)                     Yes  Yes   Yes      Yes
  Water (7732-18-5)                                Yes  Yes   Yes      Yes

  --------\Chemical Inventory Status - Part 2\--------------------------------
--
                                                          --Canada--
  Ingredient                                          Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Sodium Hydroxide (1310-73-2)                     Yes   Yes   No     Yes
  Water (7732-18-5)                                Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\--------------
--
                                              -SARA 302-    ------SARA 313----
--
  Ingredient                                  RQ    TPQ     List  Chemical
Catg.
  ----------------------------------------  ---   -----   ----  ------------
--
  Sodium Hydroxide (1310-73-2)               No    No      No         No
  Water (7732-18-5)                          No    No      No         No

  --------\Federal, State & International Regulations - Part 2\--------------
--
                                                         -RCRA-    -TSCA-
  Ingredient                                  CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Sodium Hydroxide (1310-73-2)               1000       No         No
  Water (7732-18-5)                          No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Mixture / Liquid)
```

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Revision Issued: 12/17/2003 Supercedes: 7/23/2002 First Issued: 6/17/87

Section I - Chemical Product And Company Identification

Product Name: Sodium Hypochlorite

CAS Number: 7681-52-9 HBCC MSDS No. CC17000

1675 No. Main Street, Orange, California 92867
Telephone No: 714-998-8800 | Chemtrec: 800-424-9300

Section II - Composition/Information On Ingredients

			Exposure Limits (TWAs) in Air		
Chemical Name	CAS Number	%	ACGIH TLV	OSHA PEL	STEL
Sodium Hypochlorite	7681-52-9	5-15	N/A	N/A	2mg/m³
Sodium Hydroxide	1330-73-2	< 1	N/A	N/A	2mg/m³

Section III - Hazard Identification

Routes of Exposure: Sodium hypochlorite may affect the body either through ingestion, inhalation, or contact with the eyes and/or skin.
Summary of Acute Health Hazards
Ingestion: May cause irritation of the membranes of the mouth and throat, stomach pain, and possible ulceration.
Inhalation: May cause burns, cough, pulmonary edema, up to 48 hours after exposure.
Skin: May cause moderate skin irritation and reddening of the skin. Prolonged exposure may cause burns, blistering.
Eyes: May cause severe irritation such as burns, and eye damage.
Carcinogenicity Lists: No **NTP:** No **IARC Monograph:** No **OSHA Regulated:** No
Summary of Chronic Health Hazards: Irritating effects increase with strength of solution and time of exposure.
Medical Conditions Generally Aggravated by Exposure: N/A
Note to Physician: The absence of visible signs of burns does NOT reliably exclude the presence of actual tissue damage.

Section IV - First Aid Measures

Ingestion: Do not give any liquid to an unconscious person. Drink large quantities of gelatin solution or milk. If these are not available, drink large quantities of water. Do NOT give vinegar, baking soda or acidic antidotes. GET MEDICAL ATTENTION IMMEDIATELY.
Inhalation: If adverse effects occur, remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/ Automatic Defribillator) and GET MEDICAL ATTENTION IMMEDIATELY.
Skin: Immediately flush contaminated areas with plenty of water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.
Eyes: Flush with plenty of water for 15 minutes, lifting the lower and upper lids occasionally. GET MEDICAL ATTENTION IMMEDIATELY. Contact lenses should not be worn when working with this chemical.

Section V - Fire Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Unusual Fire and Explosion Hazards: Heat and acid contamination will produce irritating and toxic fumes. May decompose, generating irritating chlorine gas.

Extinguishing Media: Use extinguishing agents appropriate for surrounding fire.

Special Firefighting Procedures: Wear NIOSH approved positive-pressure self-contained breathing apparatus. Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

Section VI - Accidental Release Measures

Spills may need to be reported to the National Response Center (800/424-8802) DOT Reportable Quantity (RQ) is 100 pounds Ventilate the area of the spill or leak. For large spills, evacuate the hazard area of unprotected personnel. Wear appropriate protective clothing. Dike and contain. Neutralize with sodium sulfite, bisulfite or thiosulfite. Remove with vacuum trucks or pump to storage vessels. Soak up residue with an absorbent such as clay, sand or other suitable material; place in non-leaking containers for proper disposal. Flush area with water to remove trace residue; dispose of flush solutions as above. For small spills, take up with an absorbent material and place in non-leaking containers; seal tightly for proper disposal. This material is alkaline and may raise the pH of surface waters with low buffering capacity.

Section VII - Handling and Storage

Store in vented, closed, clean non-corrosive containers in a cool, dry location away from direct sunlight and not adjacent to chemicals which may react with the bleach if spillage occurs. If closed containers become heated, the containers should be vented to release decomposition products (mainly oxygen under normal decomposition). Do not mix or contaminate with ammonia, hydrocarbons, acids, alcohols or ethers.

Section VIII - Exposure Controls/Personal Protection

Respiratory Protection: Not required under normal use conditions. In the case of a fire use self-contained breathing apparatus. A NIOSH approved respirator with N95 (dust, fume, mist) filters may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure.
When decomposition products exist, acid gas cartridges are also required.
A half-piece air-purifying respirator may be used in concentrations up to 10X the acceptable exposure level and a full facepiece air-purifying respirator may be used in concentrations up to 50X the acceptable exposure level.
Supplied air should be used when the level is expected to above 50X the acceptable level, or when there is a potential for uncontrolled release.
A respiratory program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.
Ventilation: No special ventilation is required unless bleach is exposed to decomposition conditions, i.e. heat or acidic conditions.
Protective Clothing: Avoid contact with the eyes. Wear chemical goggles and/or face shield if there is the likelihood of contact with the eyes. Avoid prolonged or repeated contact with the skin. Wear chemical-resistant gloves and other clothing as required to minimize contact.
Other Protective Clothing or Equipment: Safety showers and eyewash fountains should be available in storage and handling areas.
Work/Hygienic Practices: All employees who handle sodium hypochlorite should wash their hands before eating, smoking, or using the toilet facilities.

Section IX - Physical and Chemical Properties

Physical State: Liquid **pH:** 12

Freezing/Melting Point/Range: -5 to -25°C **Boiling Point/Range:** 40-76°C (104-169°F) (Decomposes)

Appearance/Color/Odor: Colorless to pale yellow watery liquid with a pungent chlorine odor

Solubility in Water: 100% **Vapor Pressure (mmHg):** 12-17 @ 20°C

Specific Gravity (Water=1): 1.07-1.26 @ 20°C

Molecular Weight: 75.45

Vapor Density (Air=1): 2.61

% Volatiles (by volume): Variable-Water plus products of Decomposition

How to detect this compound : N/A

Section X - Stability and Reactivity

Stability: Unstable above 40°C, in sunlight, or in contact with acid.

Hazardous Polymerization: Will Not Occur

Conditions to Avoid: Stability decreases with concentration, heat, light exposure, decrease in pH and contamination with heavy metals, such as nickel, cobalt, copper and iron.

Materials to Avoid: Strong acids, oxidizable materials, heavy metals (which act as catalysts), reducing agents, ammonia solutions, ether, and many organic and inorganic chemicals such as paint, kerosene, paint thinners, shellac, grease and oils.

Hazardous Decomposition Products: Chlorine. Additional decomposition products which depend upon pH, temperature and time are sodium chloride, sodium chlorate and oxygen.

Section XI - Toxicological Information

Toxicity Data: By ingestion, Grade 1: oral rat LD_{50} = 8.91 g/kg IDLH Value: Data not available

Section XII - Ecological Information

This material may be harmful to aquatic life in low concentrations.

Section XIII - Disposal Considerations

Can be neutralized with weak reducing agents such as sodium sulfite, bisulfite, or thiosulfite (DO NOT USE SULFATES OR BISULFATES). Dispose of in accordance with all applicable local, county, state and federal regulations.

Section XIV - Transport Information

DOT Proper Shipping Name: Hypochlorite Solutions
DOT Hazard Class/ I.D. No.: 8, UN1791, III

Section XV - Regulatory Information

Reportable Quantity: 100 Pounds (45.4 Kilograms)
NFPA Rating: Health - 3; Fire - 0; Reactivity - 1
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme
Carcinogenicity Lists: No **NTP:** No **IARC Monograph:** No **OSHA Regulated:** No

NSF Standard 60 Maximum Use 210 mg/L

Section XVI - Other Information

Hazardous Ingredients: Sodium hypochlorite is manufactured only in solution form. Industrial grade sodium hypochlorite contains from 10 - 15% by weight NaOCL (10 - 17.8% available chlorine) with about 0.50-1.00% excess NaOH for stability control.
Synonyms/Common Names: Liquid Bleach
Chemical Family/Type: Halogen Compound
Sections changed since last revision: II, III, IV, V, VII, VIII, IX, X, XV

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 C.F.R. 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, **Hill Brothers Chemical Company** makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.

MSDS Number: **S8237** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***05/08/03***

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.07
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 0331, 4700, 4701, 5253, 5691, 5951, 9696, S8237
Mallinckrodt: H378, H379, V011, V487, V581

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	10 - 51%	Yes
Water	7732-18-5	49 - 90%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:
1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

```
  --------\Cancer Lists\-------------------------------------------------------
-
                                          ---NTP Carcinogen---
  Ingredient                              Known    Anticipated    IARC
Category
  -------------------------------------   -----    -----------    ------------
-
  Sulfuric Acid (7664-93-9)                No          No            None
  Water (7732-18-5)                        No          No            None
```

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH NOT MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN2796
Packing Group: II
Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: SULPHURIC ACID (WITH NOT MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN2796
Packing Group: II
Information reported for product/size: 20L

International (Air, I.C.A.O.)

Proper Shipping Name: SULPHURIC ACID (WITH NOT MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN2796
Packing Group: II
Information reported for product/size: 20L

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\-------------------------------
--
  Ingredient                                          TSCA  EC   Japan
Australia
  ----------------------------------------------  ----  ---  -----  --------
-
  Sulfuric Acid (7664-93-9)                        Yes  Yes   Yes      Yes
  Water (7732-18-5)                                Yes  Yes   Yes      Yes

  --------\Chemical Inventory Status - Part 2\-------------------------------
--
                                                          --Canada--
  Ingredient                                          Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Sulfuric Acid (7664-93-9)                        Yes   Yes   No     Yes
  Water (7732-18-5)                                Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\--------------
--
                                              -SARA 302-    ------SARA 313----
--
  Ingredient                                  RQ    TPQ     List  Chemical
Catg.
  ----------------------------------------  ---   -----   ----  ------------
--
  Sulfuric Acid (7664-93-9)                 1000  1000    Yes        No
  Water (7732-18-5)                         No    No      No         No

  --------\Federal, State & International Regulations - Part 2\--------------
--
                                                        -RCRA-    -TSCA-
  Ingredient                                  CERCLA    261.33     8(d)
  ----------------------------------------  ------    ------    ------
  Sulfuric Acid (7664-93-9)                 1000      No         No
  Water (7732-18-5)                         No        No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Pure / Liquid)
```

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

This appendix describes the development and evaluation of the IGCC Power Station effluent water quality over various periods of operation and under various operating scenarios. A number of potential operating alternatives were developed and a mass balance model was used to estimate IGCC Power Station water quality. The model was also used to estimate the water quality in the receiving water bodies for each of these alternatives.

The goal of the modeling was to provide a worst-case analysis of discharge from the plant that would meet all applicable water quality standards and the requirements of 40 C.F.R. 122.4 that prohibit new or expanded wastewater discharges that could cause or contribute to the violation of water quality standards.

The nomenclature established in Section 1.3.1 of the Application is adopted for use in this Appendix.

Background

The chemistry of the effluent discharged from the IGCC Power Station will depend on equipment operating requirements, source water quality, and operational variables such as the cycles of concentration ("COC") in the power block cooling towers.

Excelsior proposes to use the Canisteo Mine Pit ("CMP") as the center of its water management plan. Water will be pumped from the CMP to supply the IGCC Power Station with its water needs. Water will also be pumped from the Hill-Annex Mine Pit Complex ("HAMP Complex") and the Lind Mine Pit ("LMP") to the CMP to assure there will be sufficient water supply to meet the needs of the IGCC Power Station. Excelsior proposes to discharge effluent from the IGCC Power Station back to the CMP and to nearby Holman Lake.

While raw water appropriation and raw water management are not the focus of this appendix, this section provides a brief description of how Excelsior proposes to manage each pit to meet the needs of the IGCC Power Station and other required uses, and summarizes the available water quality data for each of the pits for background purposes.

Water levels in the abandoned mine pits will be required to be maintained within a limited range. Given this consideration, none of the pits will be individually capable of supplying all of the water requirements for the combined Phase I and Phase I & II Developments. However, in aggregate, the three mine pits identified above are expected to support the full load operation of Mesaba One and Mesaba Two, and Excelsior has developed a water management plan around them. The CMP will function as the cornerstone of the IGCC Power Station's water needs. A permanent pumping station will be constructed in the CMP to supply the IGCC Power Station with all of its water needs. To help meet such needs, water will also be seasonally pumped from the HAMP Complex and the LMP into the CMP.

The modeling presented in this appendix provides an estimate of the anticipated effluent water quality and quantity under a number of operating scenarios. Applicable State numerical water quality standards (Minn. R. 7050.0222) are presented Table D-1 below. Station outfalls are assumed to discharge to Class 2 waters (since none of the abandoned mine pits is listed on the Public Waters Inventory ("PWI") or listed in the published rules, the Applicant has assumed the

Class 2B water standards are applicable (Minn. R. 7050.0430); Holman Lake is listed on the PWI, but not in Minnesota Rules so Class 2B water standards apply).

Table D-1
Water Quality Standards

Constituent	Class 2 WQ Standard	Units
Hardness	250	mg/l
Alkalinity	n/a	mg/l
Calcium	n/a	mg/l
Magnesium	n/a	mg/l
Iron	n/a	mg/l
Manganese	n/a	mg/l
Chloride	230	mg/l
Sulfate	n/a	mg/l
TDS	700	mg/l
pH	6-9	mg/l
Aluminum	125	ug/l
Arsenic	53	ug/L
Barium	n/a	ug/l
Cadmium	2.0[1]	ug/l
Chromium (6+)	32[1]	ug/l
Copper	15[1]	ug/l
Fluoride	n/a	mg/l
Mercury	6.9	ng/l
Nickel	283[1]	ug/l
Selenium	5	ug/l
Sodium	n/a	mg/l
Specific Conductivity	1000	umhos/cm
Zinc (3)	191[1]	ug/l
Phosphorus	1[2]	mg/l

[1] indicates a hardness based standard. It is assumed hardness in the receiving water is >200 mg/L based on available data .
[2] phosphorus standard is an effluent limit and not a water quality standard.

Initial modeling runs showed that mercury would be the main constituent of concern based on effluent concentrations. Therefore, the modeling was completed with mercury as the controlling parameter.

Alternatives Evaluation

A number of potential operating scenarios were developed in an effort to determine the optimal operating scenario, minimize the wastewater discharge from the IGCC Power Station, and meet the water quality standards under a worst-case condition. Each of the alternatives considered, the mass balance model, and the assumptions used in the model are presented in the paragraphs below. In addition, a comparison of the results of the modeling to the required water quality standards is presented.

Alternatives Description

A total of 16 alternatives were developed for each of the two phases of operation. As previously stated the quality of the water discharged from the IGCC Power Station to the receiving water will depend on a number of items, including IGCC Power Station equipment operating requirements, expected source water quality, and operational variables such as the COC in the power block cooling tower. The two main variables impacting the effluent water quality include the COC and to some degree the source water quality. There is limited control of the source water quality (CMP, HAMP Complex and LMP), but it will vary depending on the volume of water discharged into the CMP from the other mine pits and the portion of the IGCC Power Station effluent discharged directly to Holman Lake.

The water supply system was modeled assuming three, four, five and seven COC in the IGCC Power Station's cooling towers to provide results for a wide range of potential operating scenarios.

In addition to the various COC, four different discharge scenarios were also modeled:

1. All IGCC Power Station effluent will be discharged to the CMP. The volume of water pumped from the Hill-Annex Mine Pit complex and the LMP to the CMP will be just enough to meet the water requirements of the IGCC Power Station and there will be no discharge from the CMP to Holman Lake,

2. All IGCC Power Station effluent will be discharged to the CMP. The volume of water pumped from the Hill-Annex Mine Pit complex and the LMP to the CMP will be sufficient to both meet the water requirements of the IGCC Power Station and to discharge a moderate amount to Holman Lake for water quality control purposes,

3. All IGCC Power Station effluent will be discharged to the CMP. The volume of water pumped from the Hill-Annex Mine Pit complex and the LMP to the CMP is assumed to be the maximum amount available and excess water will be discharged from the CMP to Holman Lake for water quality control purposes, and

4. The IGCC Power Station effluent will be split with a fraction of it discharged directly to Holman Lake and the remaining effluent discharged to the CMP. The volume of water discharged directly to Holman Lake will be controlled by the mass of constituents (specifically mercury) in the effluent.

The four assumed COC were modeled for each of the four discharge scenarios providing a total of 16 alternatives for the Phase I and Phase I & II Developments. While the selected COC and discharge scenarios do not provide for all possible operating alternatives, they do provide a wide range of potential discharge conditions. Each of the proposed alternatives is summarized in Table D-2 below.

Table D-2
Alternative Scenarios Modeled

Alternative	COC	Discharge	
		To CMP	To Holman Lake
1A	3	Yes, All	No
1B	4	Yes, All	No
1C	5	Yes, All	No
1D	7	Yes, All	No
2A	3	Yes, Portion from CMP to Holman Lake	Yes, Portion from CMP
2B	4	Ditto	Ditto
2C	5	Ditto	Ditto
2D	7	Ditto	Ditto
3A	3	Yes, Maximum from CMP to Holman Lake	Yes, Maximum from Canisteo Allowed
3B	4	Ditto	Ditto
3C	5	Ditto	Ditto
3D	7	Ditto	Ditto
4A	3	Yes, None from CMP to Holman Lake	Yes, Directly from Station (maximum amount controlled by mass of mercury)
4B	4	Ditto	Ditto
4C	5	Ditto	Ditto
4D	7	Ditto	Ditto

Under the alternatives where all of the IGCC Power Station effluent is recycled back to the CMP (alternatives A though C), the COC do not have an impact on water consumption. However, for these three operating scenarios, the COC do impact the pumping rate required from the CMP to the IGCC Power Station. Under Alternatives 1D through 4D, the volume of IGCC Power Station effluent discharged directly to Holman Lake will have an impact on water consumption. Based on the equation provided in Section 3.1.2 of the supporting document, the blowdown discharge rate, the evaporation rate and the required flow rate for the IGCC Power Station for each of the alternatives are provided in Table D-3 below. The values appearing in the table have been rounded.

Table D-3
Water Quantities at Various Cycles of Concentrations (COC)

	COC	Evap (gpm)	Blowdown (gpm)	Source Water Required (gpm)
Alternatives 1A-1D - 3 COC				
Phase 1	3	3,500	1,750	5,250
Phase 2	3	7,000	3,500	10,500
Alternatives 2A-2D - 4 COC				
Phase 1	4	3,500	1,170	4,660
Phase 2	4	7,000	2,330	9,330
Alternatives 3A-3D - 5 COC				
Phase 1	5	3,500	900	4,400
Phase 2	5	7,000	1,800	8,800
Alternatives 4A-4D - 7 COC				
Phase 1	7	3,500	600	4,100
Phase 2	7	7,000	1,200	8,200

Alternatives B and C were developed because at times there may be more water available from the three mine pits than is needed by the IGCC Power Station. Pumping the excess water into the CMP and then into Holman will have a flushing effect on the CMP and reduce the accumulation of constituents. Table D-4 presents the assumed pumping rates into and out of the CMP for each of the alternatives.

Table D-4
Pumping Rates for the Various Operating Scenarios

	Pumping rate from Hill-Annex to Canisteo (gpm)	Pumping Rate from Lind to Canisteo (gpm)	Pumping Rate from Canisteo to Holman (gpm)
Alternatives 1A- 4A - No pumping from Canisteo to Holman			
Phase 1	700	0	0
Phase 2	3,500	700	0
Alternatives 1B- 4B – Pumping a portion of the available water into Canisteo and then to Holman			
Phase 1	1,200	0	500
Phase 2	3,500	1,200	500
Alternatives 1C –4C – Pumping the maximum possible available water into Canisteo and then to Holman			
Phase 1	2,000	0	1,300
Phase 2	3,500	1,800	1,100
Alternatives 1D –4D – Discharge IGCC Power Station effluent to Canisteo and Holman			
Phase 1	Varies	0	Varies
Phase 2	Varies	Varies	Varies

Mass Balance Model

In order to estimate the water quality over various periods of operation and under various operating scenarios as discussed in the paragraphs above, a mass balance model was constructed. The model calculates the anticipated water quality in the IGCC Power Station discharge and that anticipated in the CMP as a result of the various inflows of pit water from the HAMP Complex and the LMP, and from the IGCC Power Station.

The assumptions used in the model include:

- Mesaba One starts up and operates for 3 years prior to Mesaba Two initiating operations.
- Mesaba One and Mesaba Two operate for 30 years (Mesaba One for 30 years, Mesaba 3 for 27 years).
- The CMP is completely mixed.
- All constituents are conservative (that is, there is no removal from the system as a result of degradation, sedimentation, incorporation into biological tissue, or evaporative loss).
- Evaporation and seepage of water from the mine pits are negligible.
- Groundwater inflow into the CMP is 2,800 gpm.
- Groundwater inflow into the HAMP Complex is up to 3,500 gpm depending on the water elevation in the mine pit.
- The water quality of the groundwater inflow is equal to the current water quality of the mine pit.
- Initial water quality concentrations in the mine pits are as presented in Table 3.2-5 of the Application.
- Evaporation from cooling towers serving the gasification island and power block are 3,500 gpm for Mesaba One and 7,000 gpm for Mesaba One and Mesaba Two.
- The water elevation in the each of the mine pits is to be maintained at a relatively constant level excluding the impact of dry and wet weather. That is, the volume of water extracted from the each of the mines pits must be equal to the volume of water discharged into or inflowing by groundwater to the mine pit.
- All other flows into the cooling tower blowdown sump from sources other than the power block are negligible.

This section of the report presents the results of the mass balance model. One of the goals of this evaluation was to provide a comparison of the results of the modeled water quality to the Class 2B water standards presented in Table D-1, above. Due to the large number of tables and figures it would require to present the results for every alternative for every constituent, detailed results are not presented for all alternatives, but only the recommended alternative presented below.

In general, the results of the modeling indicated that the COC has the most significant impact on the IGCC Power Station effluent mercury concentration and this impact increases as the years of operation increase. Pumping additional water into the CMP and then discharging that excess water to Holman Lake has some improvement on both the effluent concentration from the IGCC

Power Station as well as the concentration of mercury in the CMP over time. Discharging the currently permitted mass of mercury directly to Holman Lake and the Swan River also has a significant impact on the effluent concentration of mercury from the IGCC Power Station as well as the concentration of mercury in the CMP over time.

As discussed previously, the goal of the modeling was to provide a worst-case analysis of discharge from the IGCC Power Station that would meet all applicable water quality standards and the requirements of 40 C.F.R. 122.4 that no operation will cause or contribute to the violation of water quality standards. The existing NPDES permit provides for an average flow of 4.5 MGD. Given the average mercury concentration of 0.90 ng/L in the mine pit (see Table 3.2-5), the mass of mercury currently permitted to be discharged to Panasa Lake and the Swan River watershed is calculated to be 5.6 grams per year.

Conclusions and Recommendations

The modeling results indicate that key water quality constituents associated with Outfall 001 and 002 discharges will be mercury, total dissolved solids (TDS), and hardness. One criteria of the modeling was to determine the IGCC Power Station operating scenario that would result in a mercury concentration in the Station effluent that will not exceed the water quality standard of 6.9 ng/L. Another criteria was that operation of the system will be such that the mass of mercury discharged to Holman Lake through Outfall 002 combined with the mass of mercury discharged to Panasa Lake from the continued pumping of the HAMP Complex will not exceed the mass of mercury currently permitted to be discharged under existing NPDES Permit No. MN0030198.

Based on the results of the mass balance modeling, a hybrid of the various alternatives was selected as the recommended operating scenario. This alternative is described below:

The IGCC Power Station will operate at five COC when Mesaba One is operating alone (first 3 years of operation) and at three COC during operation of Mesaba One and Mesaba Two. A portion of the IGCC Power Station effluent will be discharged directly to Holman Lake (Alternative 3D and 1D). In addition to varying the COC, the volume of water discharged directly to Holman Lake from the IGCC Power Station will be adjusted and controlled such that the total mass of mercury discharged to the Swan River watershed (the sum of any future discharge from the HAMP Complex to Panasa Lake and the IGCC Power Station discharge directly to Holman Lake) is less than the mass currently permitted to be discharged to the watershed from the HAMP Complex. For the purposes of this evaluation, the flowrate was adjusted every five years during operation of Mesaba One and Mesaba Two to limit the mass of mercury discharged. The outcome of this operating scenario is no net increase in the mass of mercury permitted to be discharged to the Swan River watershed under the existing NPDES Permit.

Figures D-1 and D-2 present the modeled mercury concentrations and mass discharged to Holman Lake, respectively. As shown in Figure D-1, the mercury concentration in the IGCC Power Station effluent remains under the water quality standard of 6.9 ng/L even after 30 years of operation. The figure also indicates that the mercury concentration in the CMP remains well below the water quality standard for greater than 30 years of operation. Figure D-2 indicates that by varying the annual volume of IGCC Power Station effluent discharged to Holman Lake, the annual mass of mercury discharged is less than that currently permitted. Figures D-3 through D-5 present process flow diagrams showing the mercury concentrations, annual mass and flow rates at years 3, 12 and 30, respectively.

Figure D-1
Modeled Mercury Concentrations in IGCC Power Station Discharge and CMP

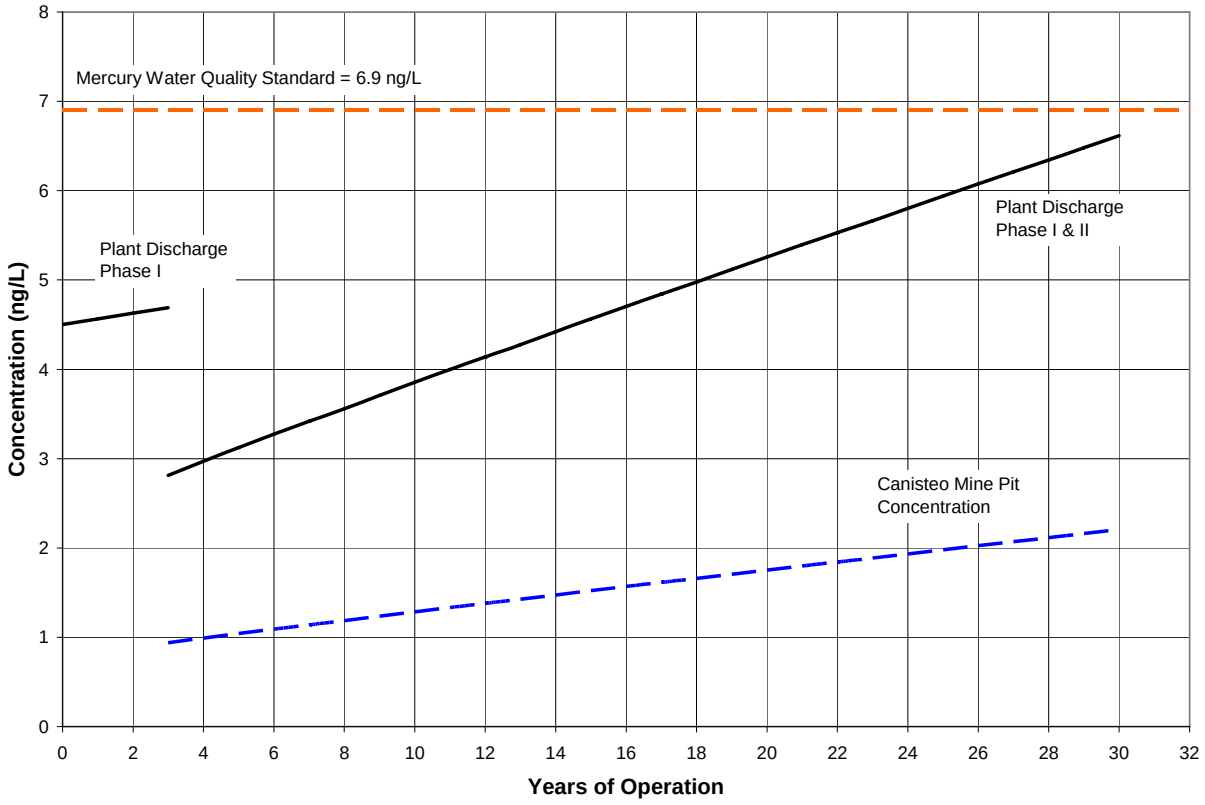


Figure D-2
Modeled Mercury Mass Discharged to Holman Lake

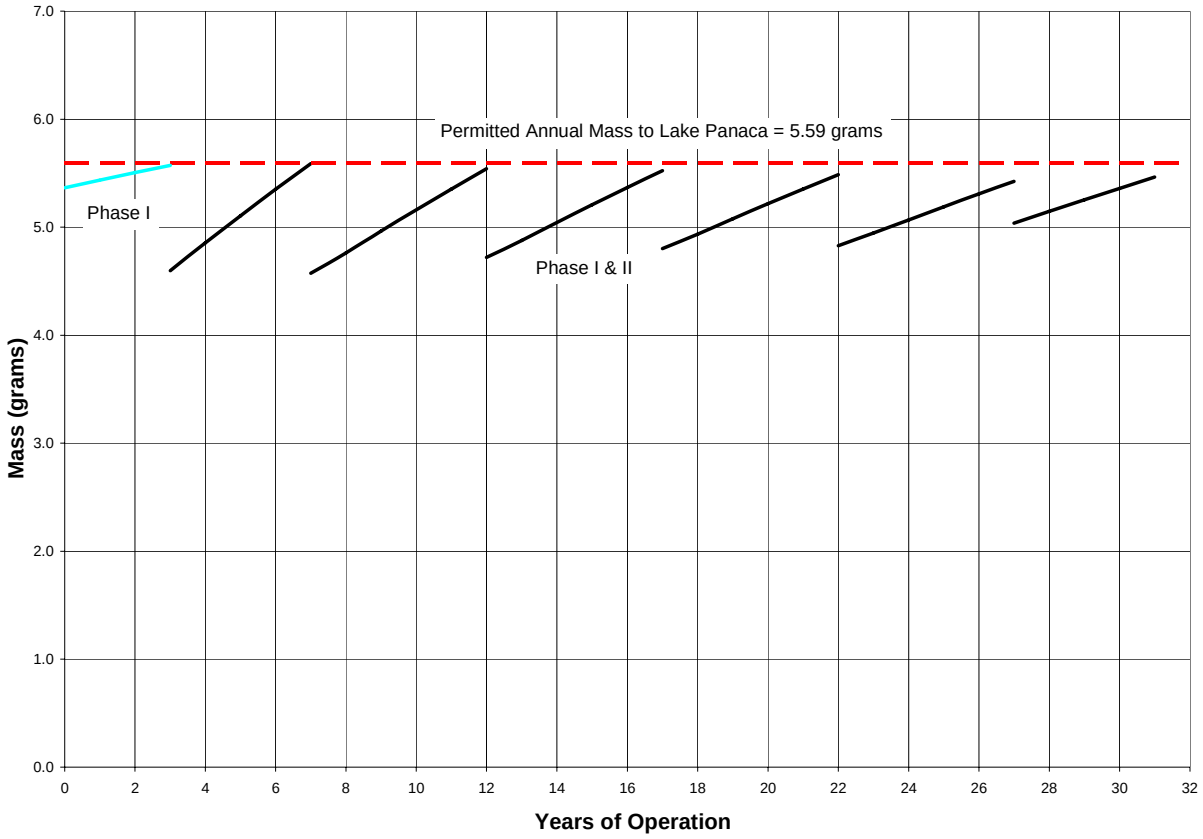


Figure D-3
Mercury Process Flow Diagram at 3 Years of Operation

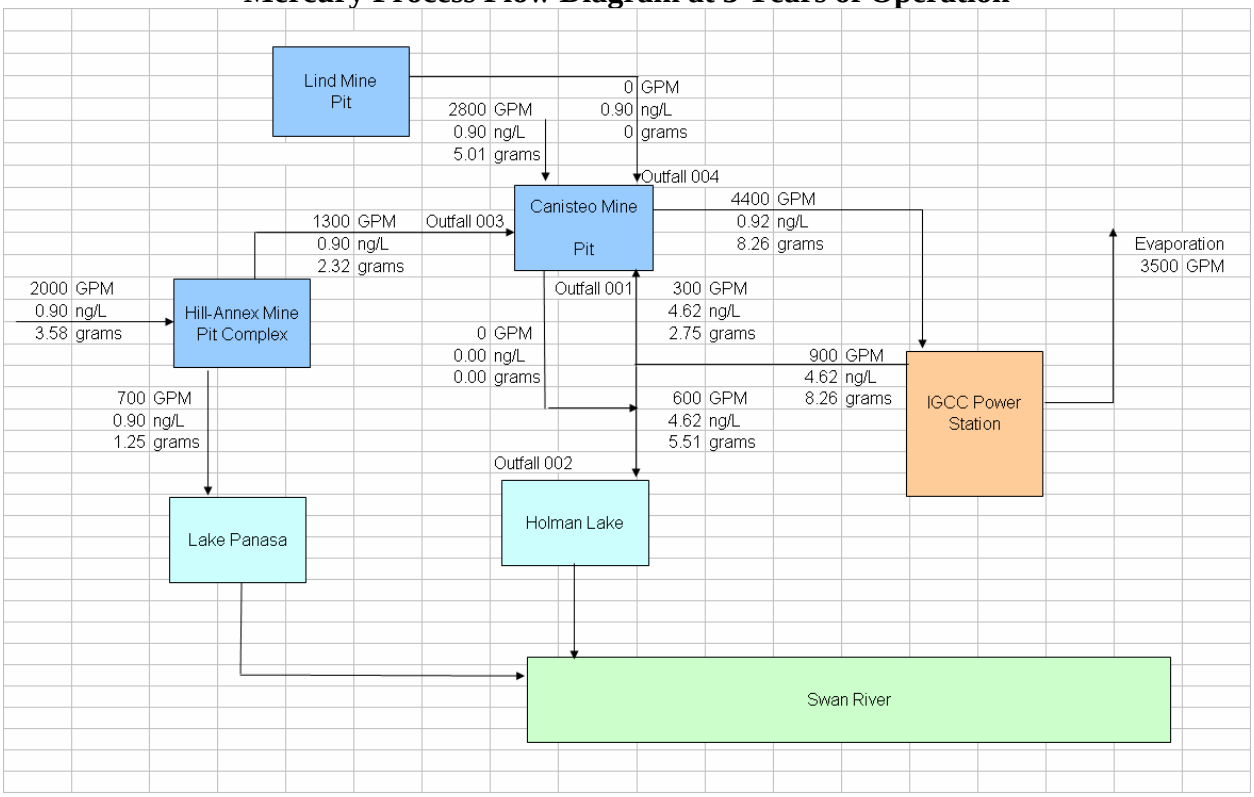


Figure D-4
Mercury Process Flow Diagram at 12 Years of Operation

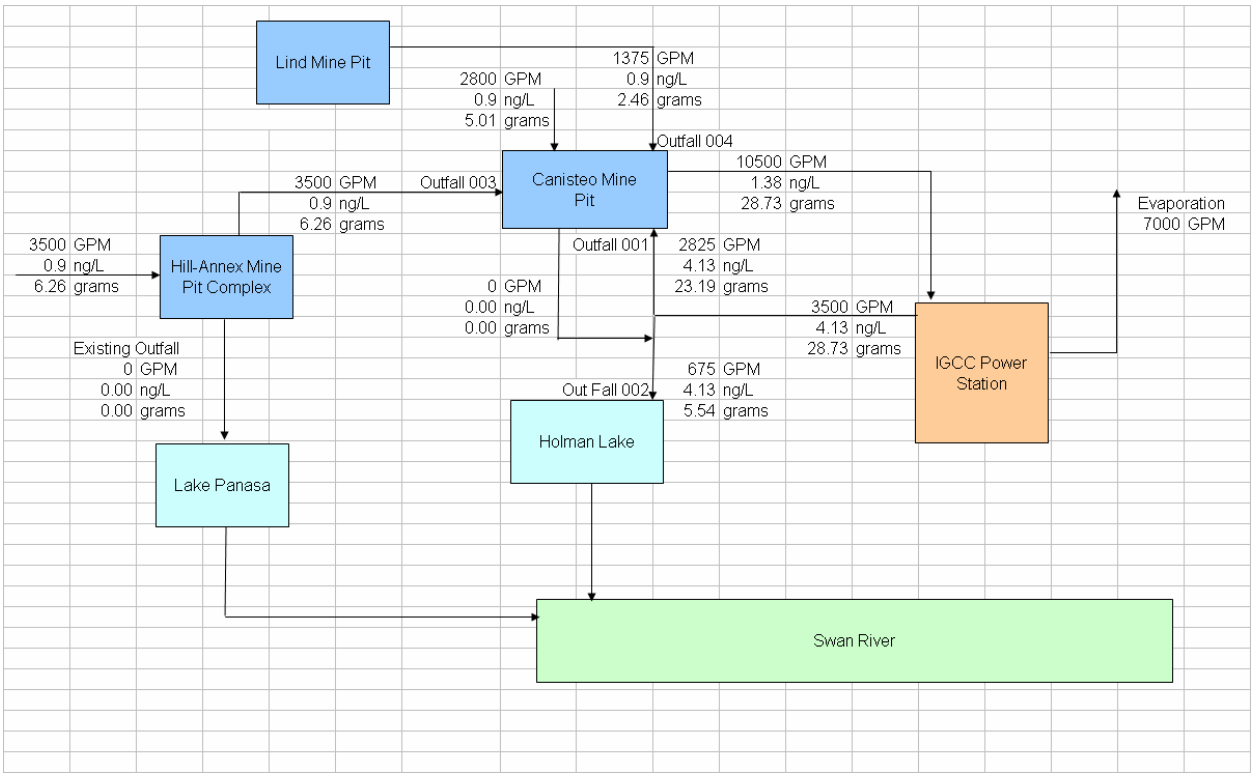
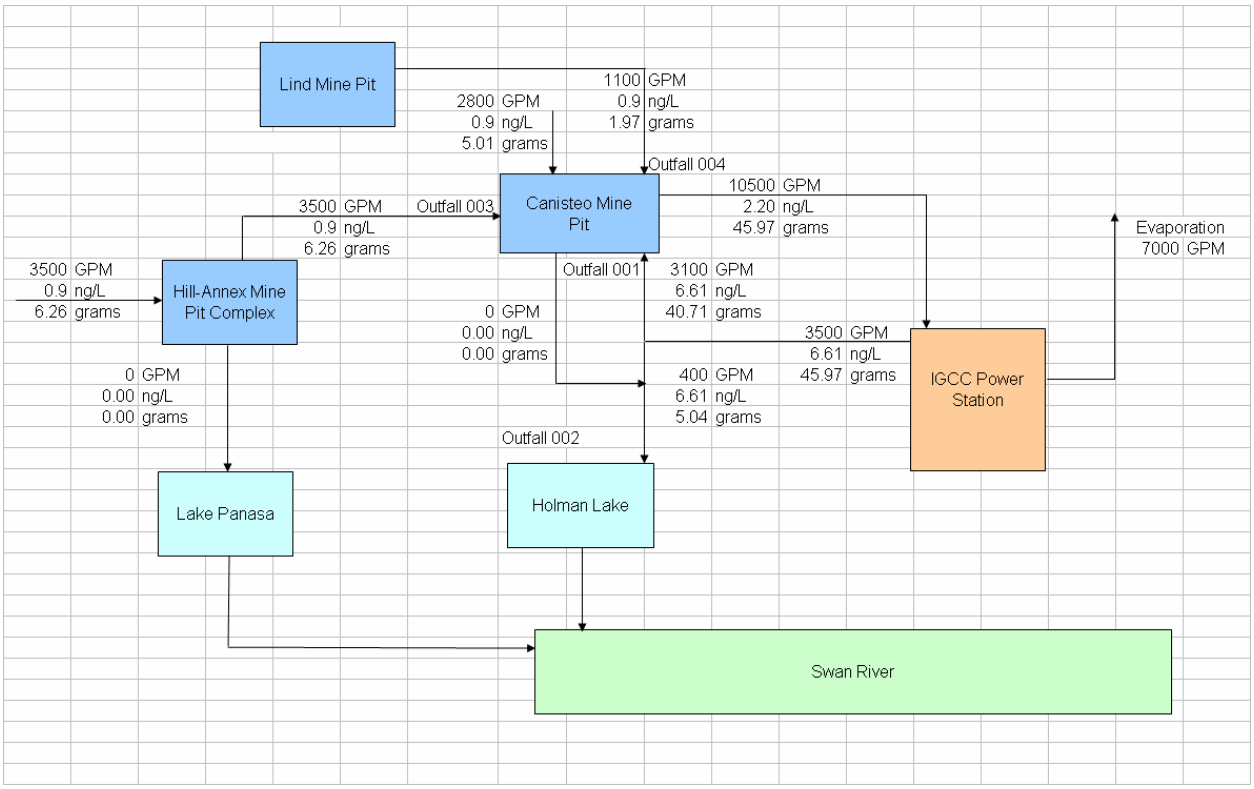


Figure D-5
Mercury Process Flow Diagram at 30 Years of Operation



The results of the concentration and mass modeling for phosphorus are presented in Figures D-6 and D-7. As shown in Figure D-6, the phosphorus concentration in the IGCC Power Station effluent remains significantly below the discharge limit of 1 mg/L even after 30 years of operation. Figure D-7 indicates that by varying the annual volume of IGCC Power Station effluent discharged to Holman Lake, the annual mass of phosphorus discharged is less than that currently permitted.

Figure D-6
Modeled Phosphorus Concentrations in IGCC Power Station Discharge and CMP

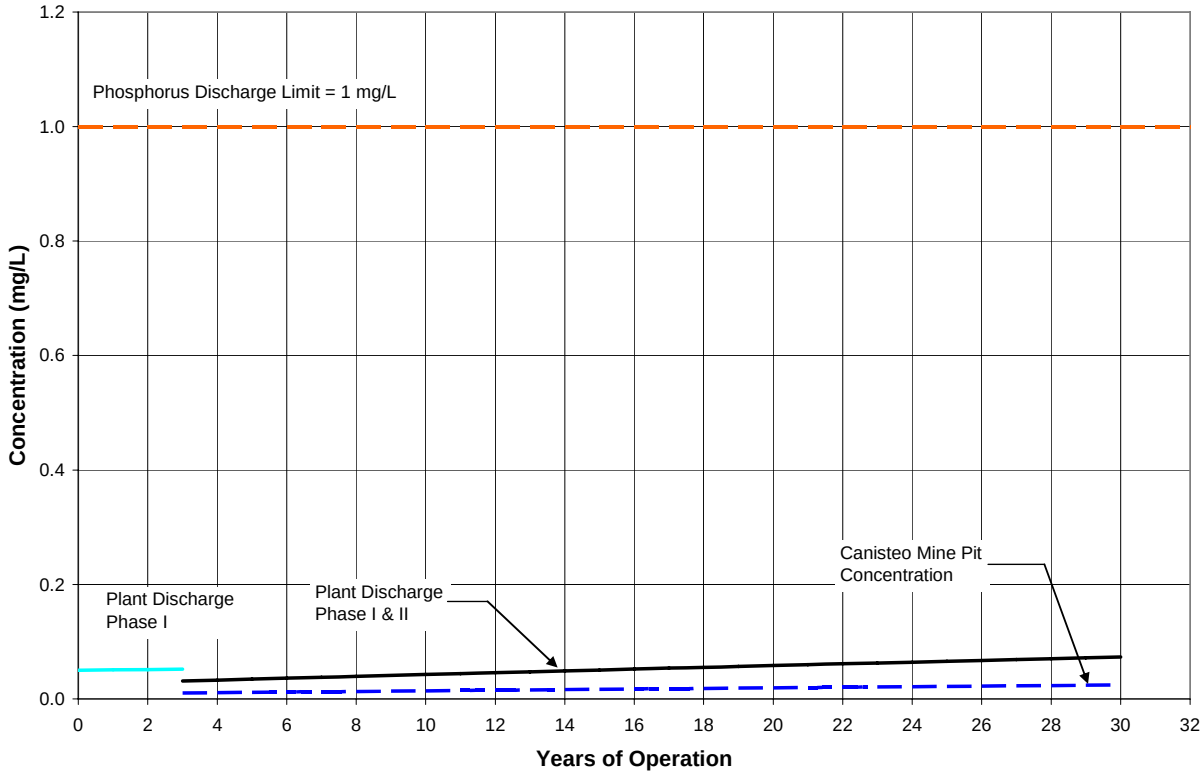
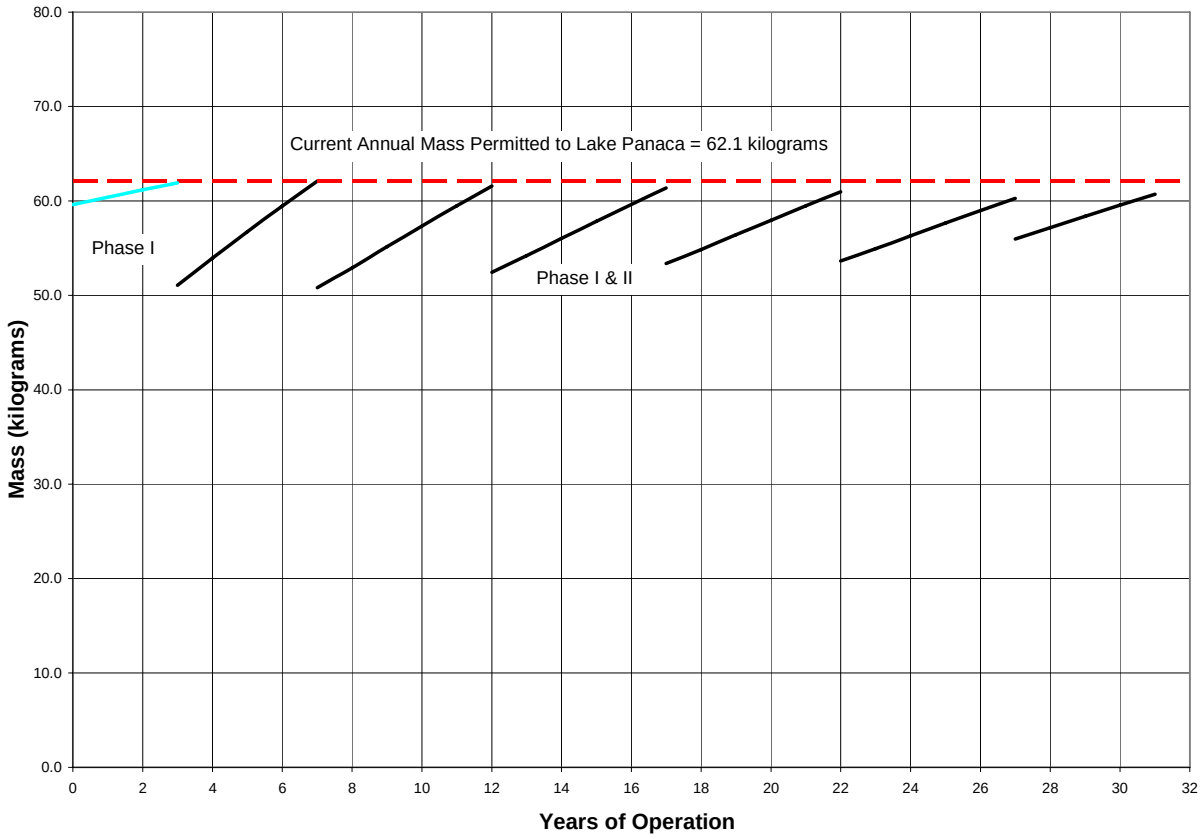


Figure D-7
Modeled Phosphorus Mass Discharged to Holman Lake



The results of the concentration and mass modeling for TDS and hardness are presented in Figures D-8 through D-11. These figures indicate that a mixing zone is required to demonstrate compliance with the water quality standards for TDS and hardness. The mixing zone established in the Application will allow compliance with these water quality standards.

Figure D-8
Modeled TDS Concentrations in IGCC Power Station Discharge and CMP

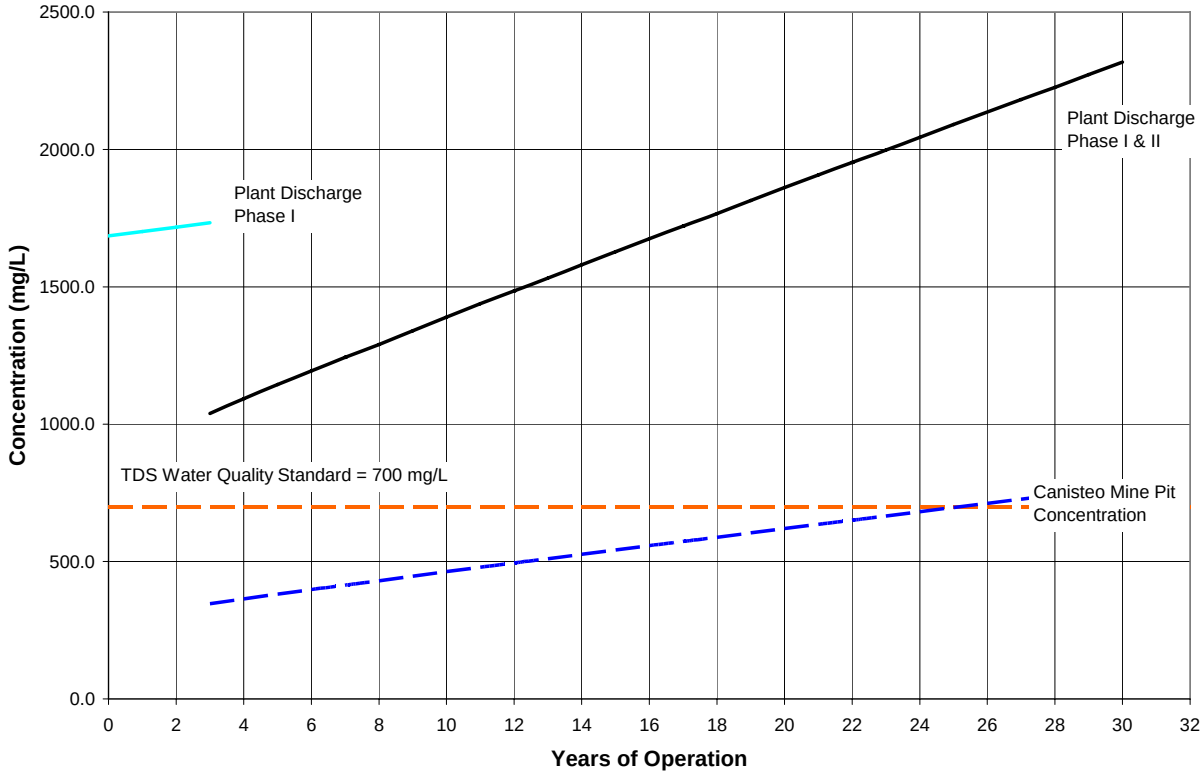


Figure D-9
Modeled TDS Mass Discharged to Holman Lake

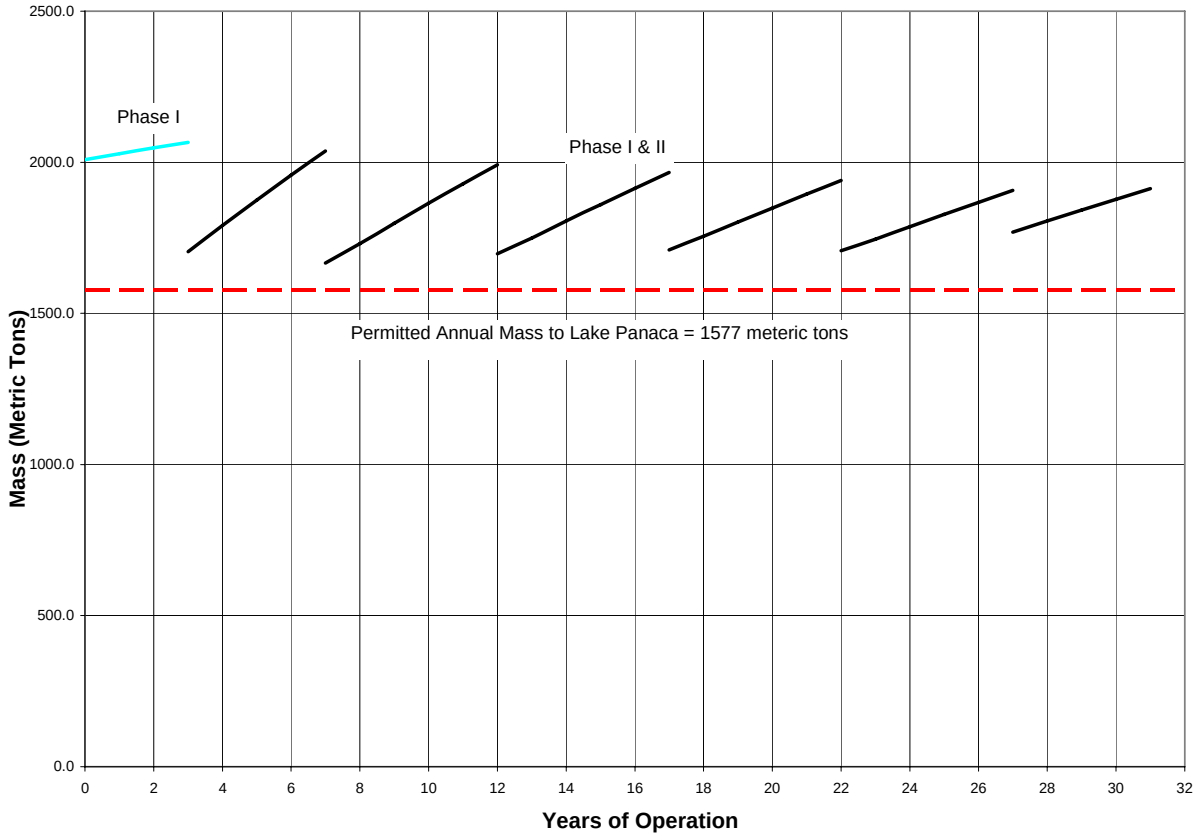


Figure D-10
Modeled Hardness Concentrations in IGCC Power Station Discharge and CMP

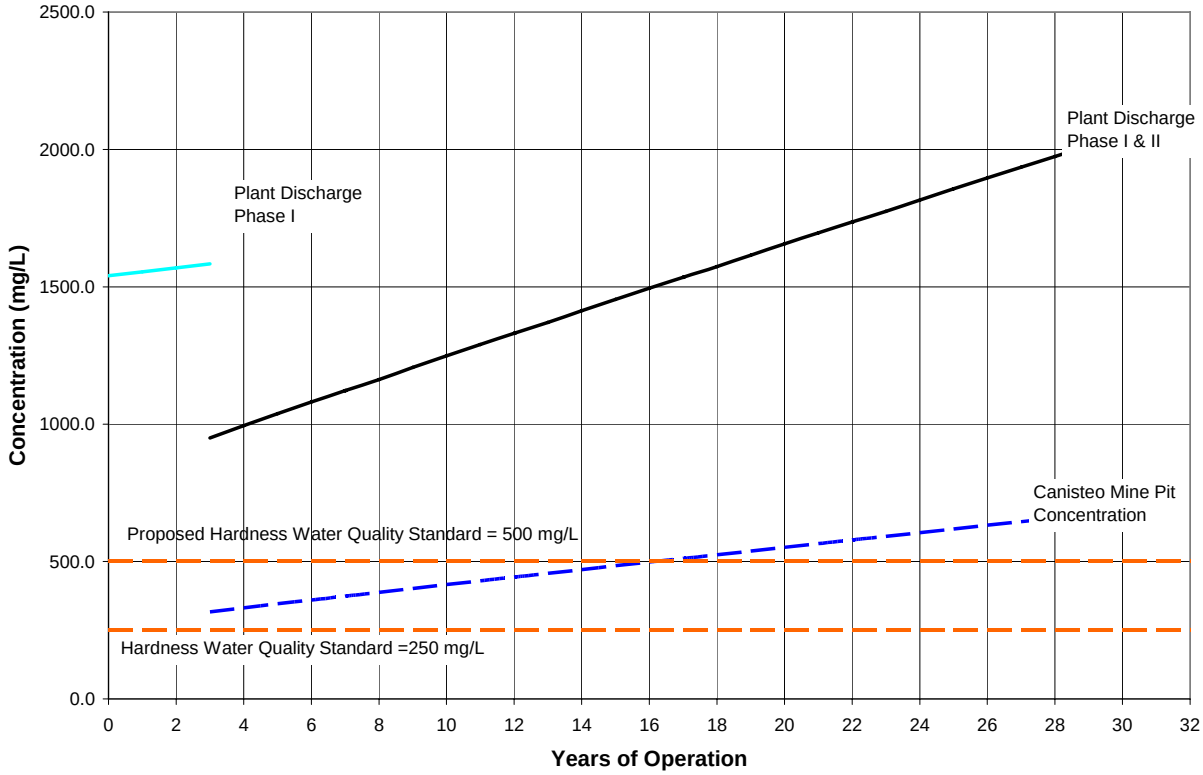
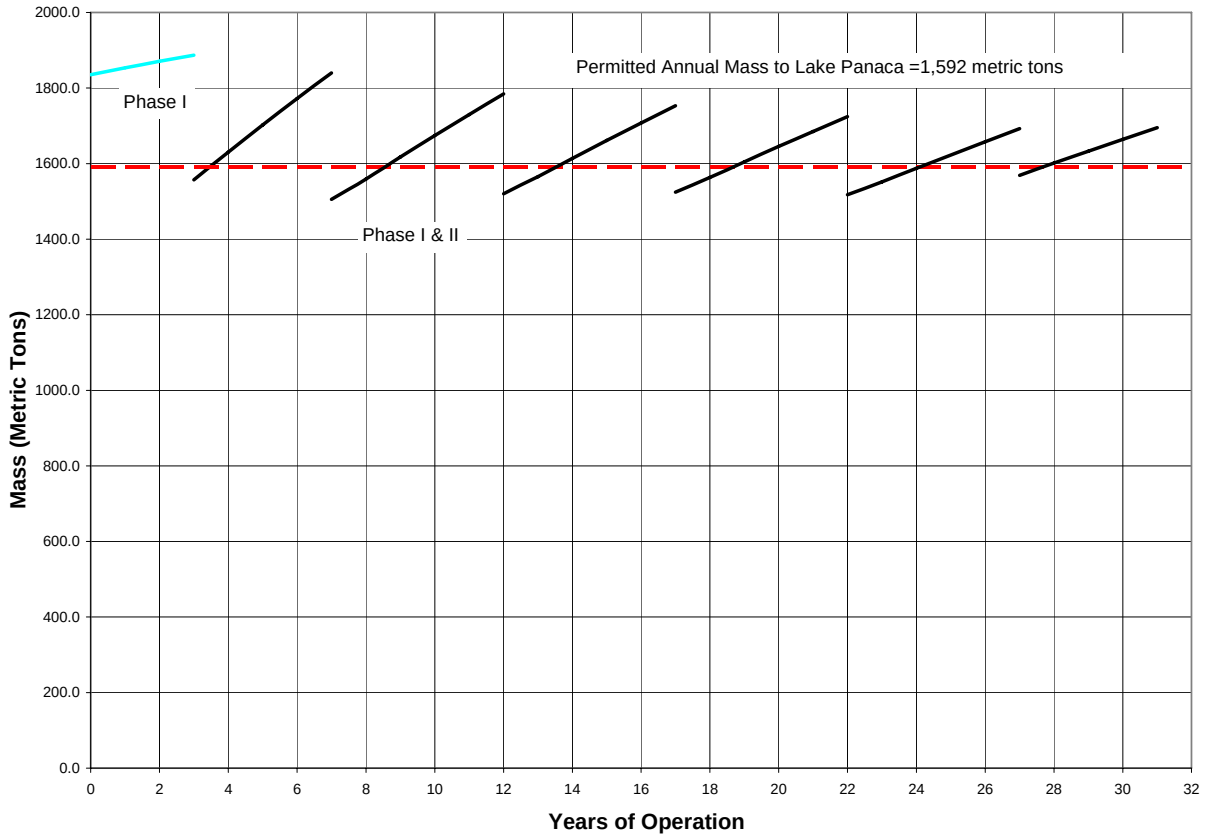


Figure D-11
Modeled Hardness Mass Discharged to Holman Lake



Figures D-12 through D-26 present the results of the modeling for phosphorus, TDS, hardness, nickel and chloride to demonstrate that the mass of these components will not exceed levels currently permitted.

Figure D-12
Phosphorus Process Flow Diagram at 3 Years of Operation

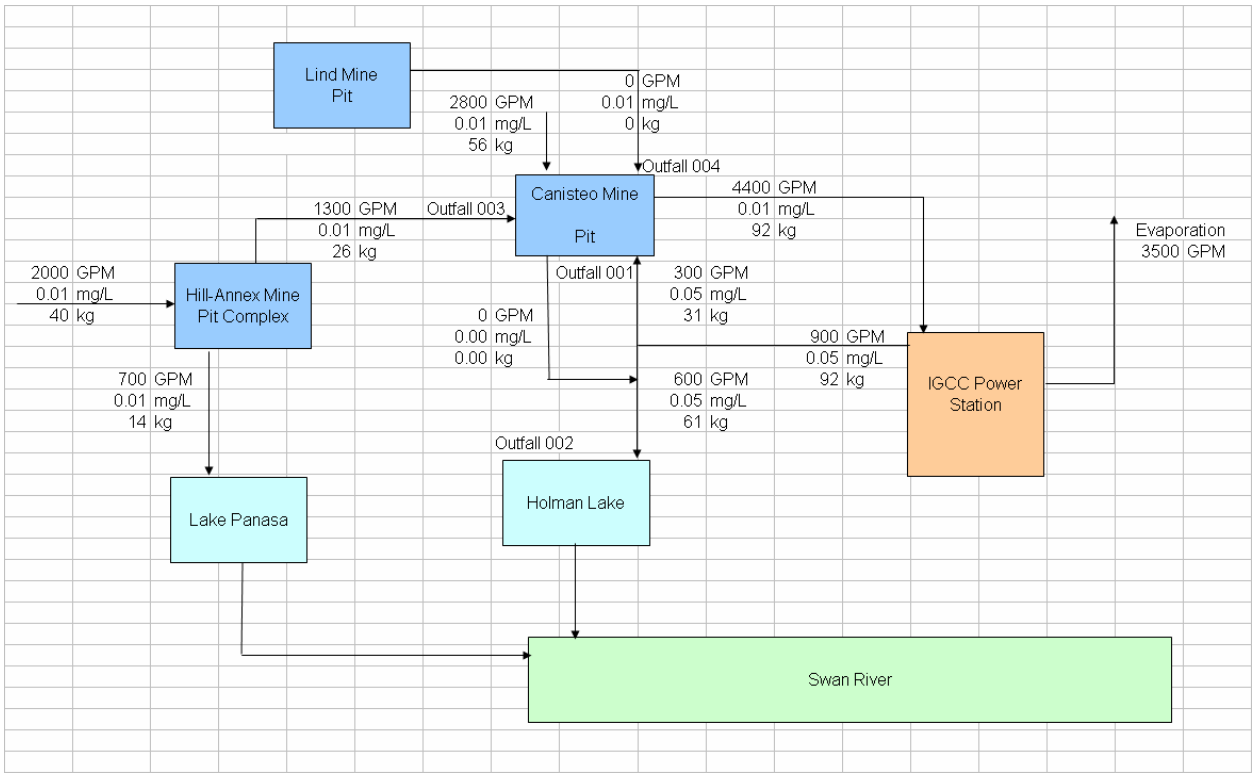


Figure D-13
Phosphorus Process Flow Diagram at 12 Years of Operation

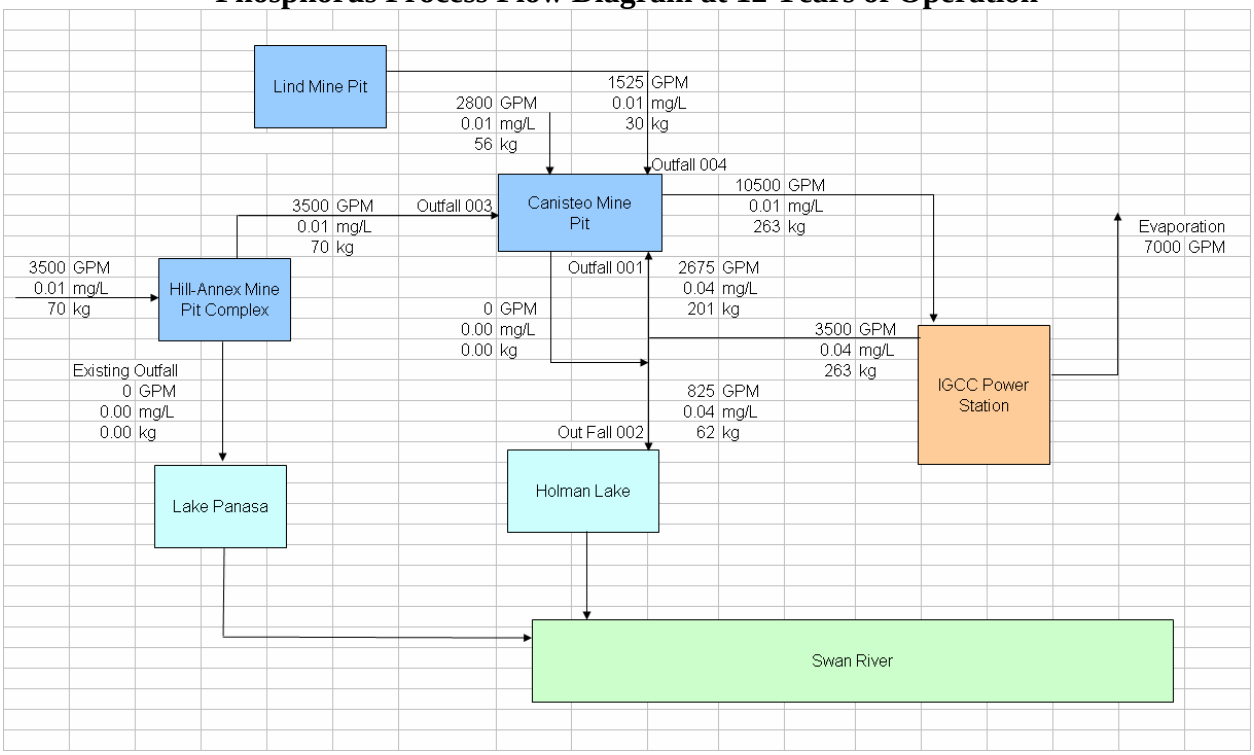


Figure D-14
Phosphorus Process Flow Diagram at 30 Years of Operation

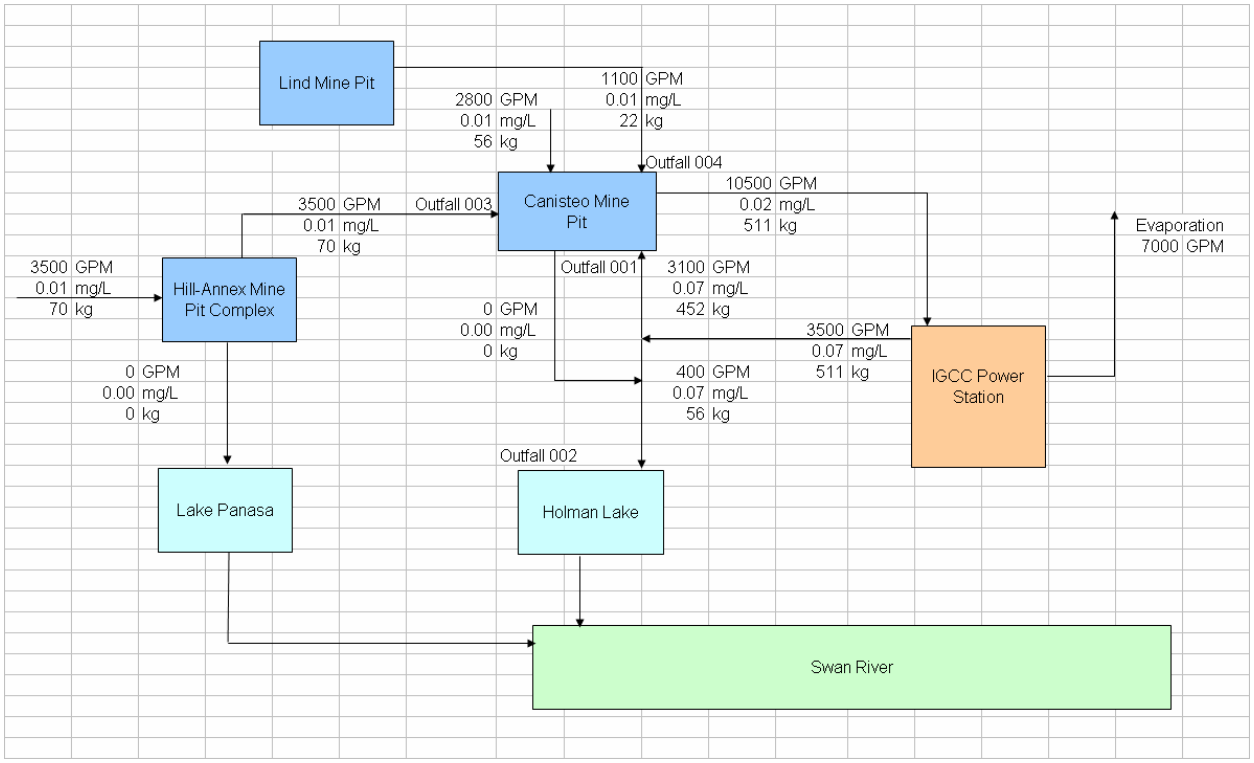


Figure D-15
TDS Process Flow Diagram at 3 Years of Operation

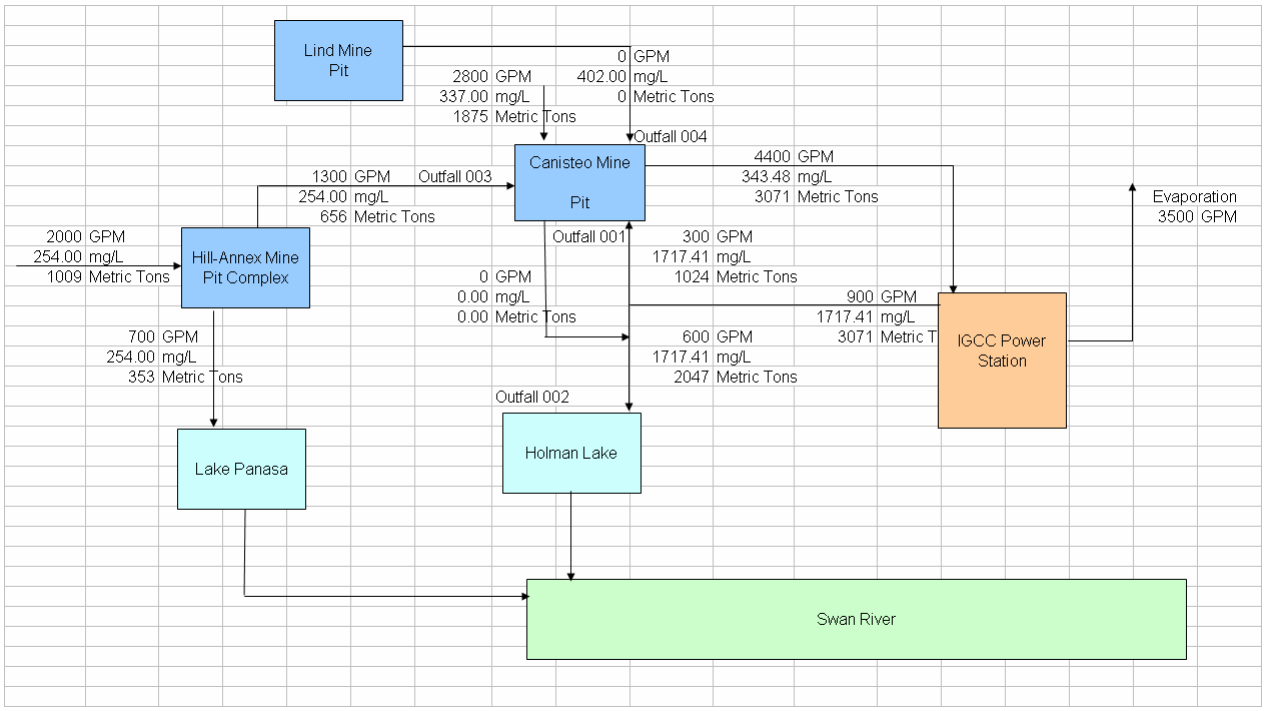


Figure D-16
TDS Process Flow Diagram at 12 Years of Operation

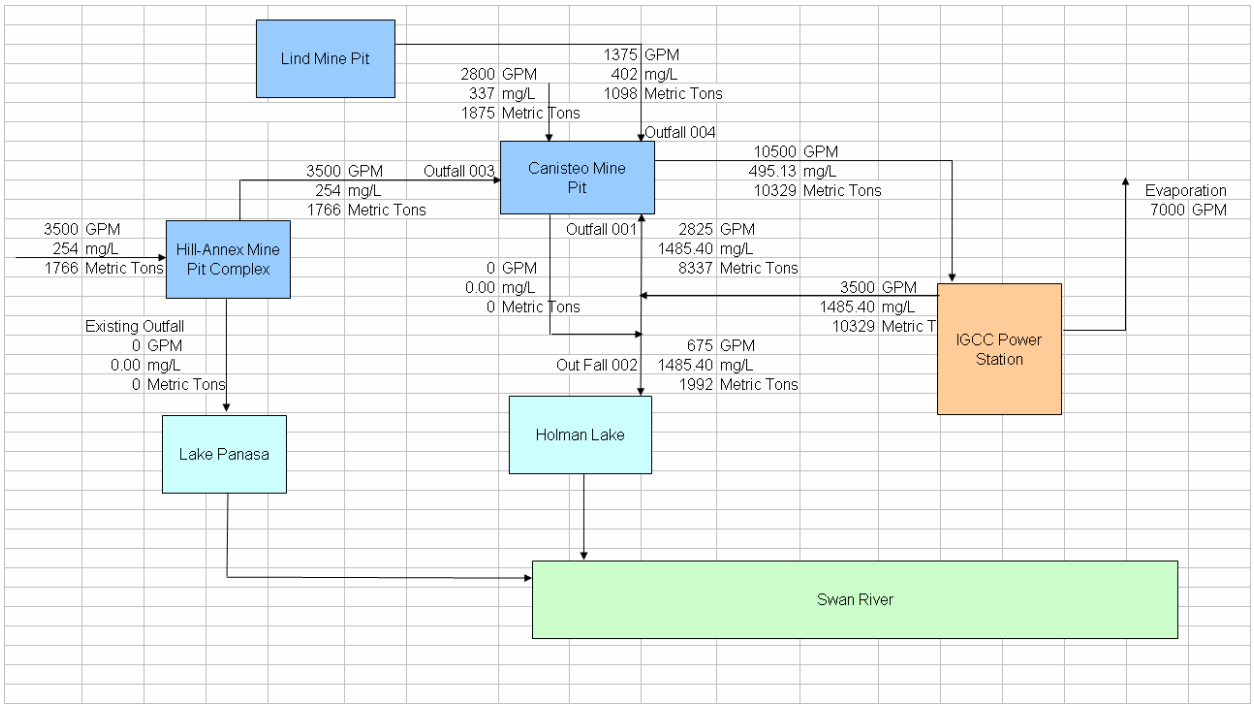


Figure D-17
TDS Process Flow Diagram at 30 Years of Operation

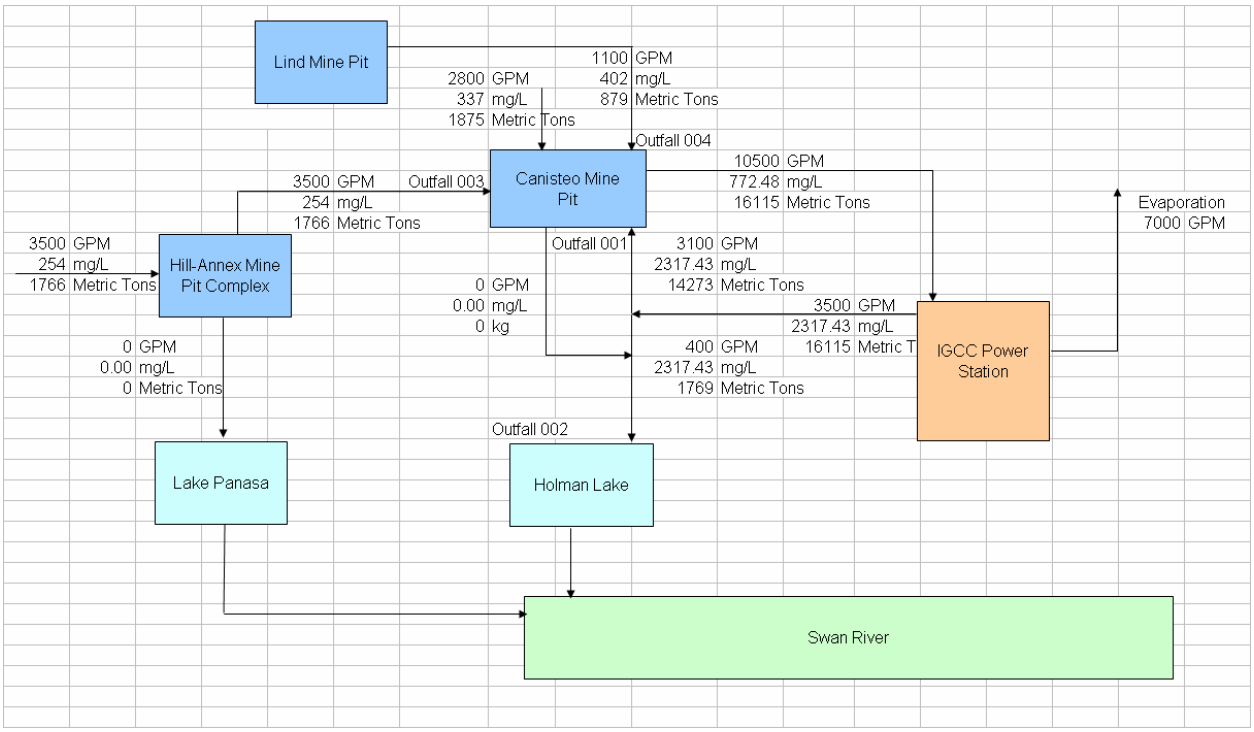


Figure D-18
Hardness Process Flow Diagram at 3 Years of Operation

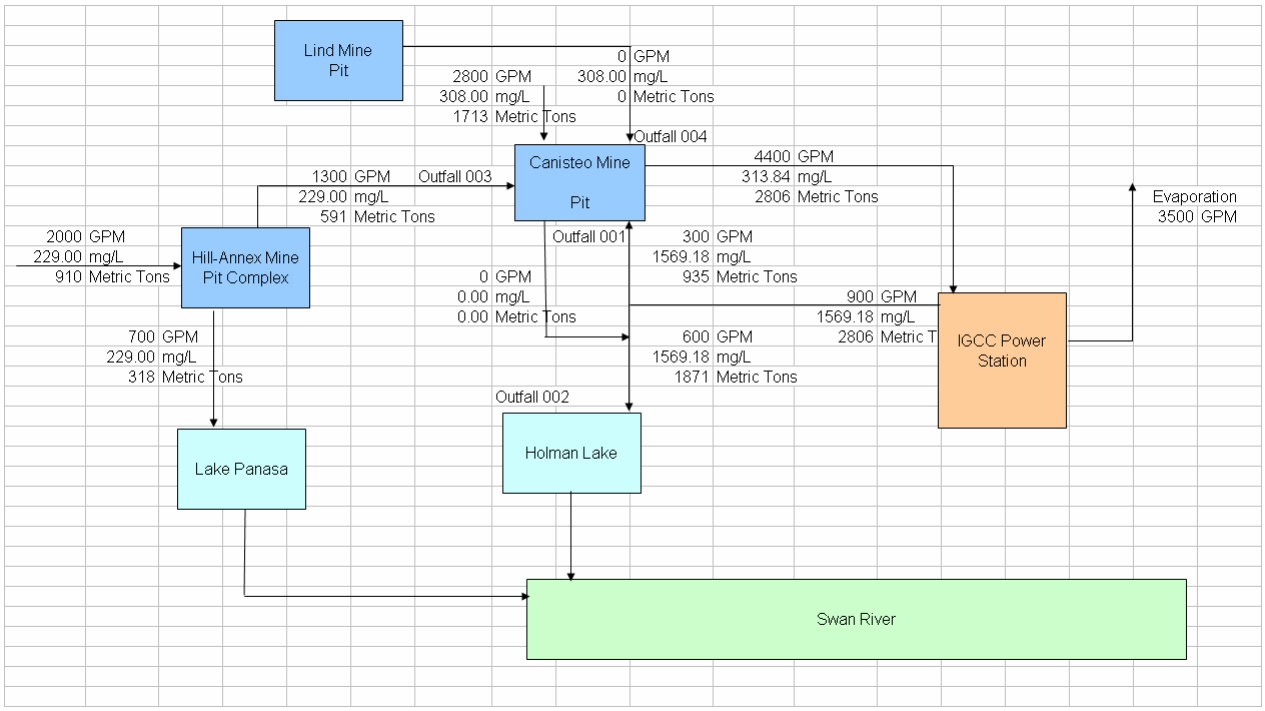


Figure D-19
Hardness Process Flow Diagram at 12 Years of Operation

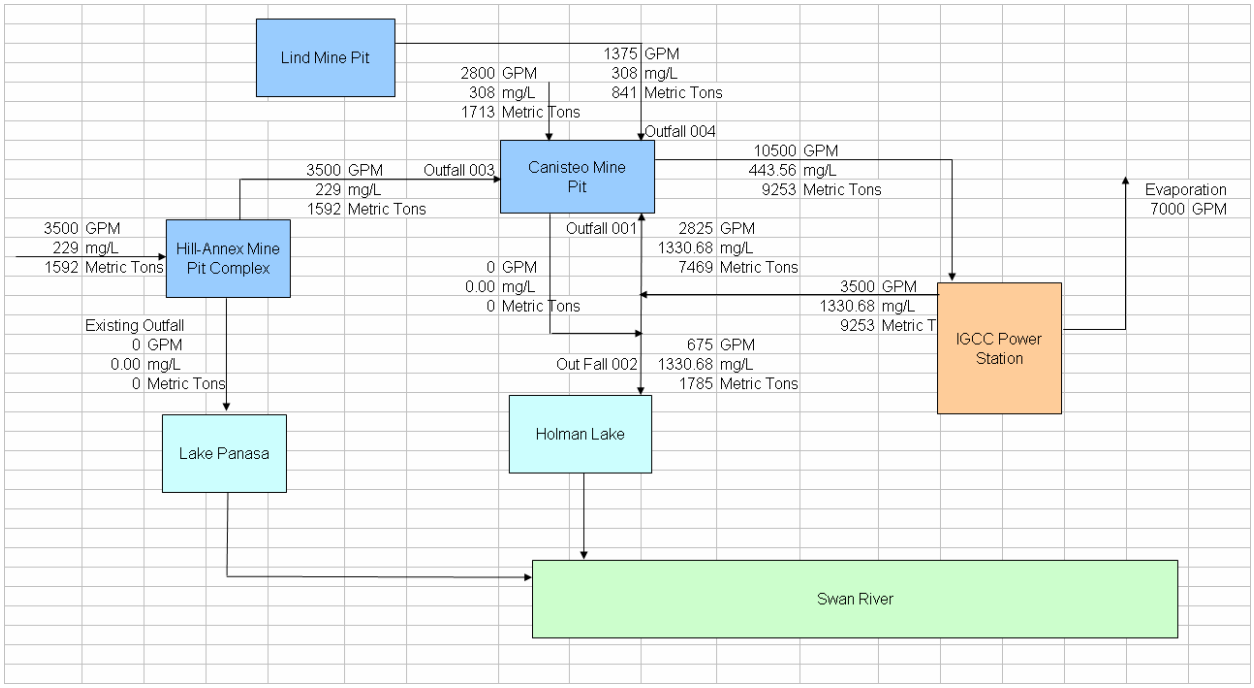


Figure D-20
Hardness Process Flow Diagram at 30 Years of Operation

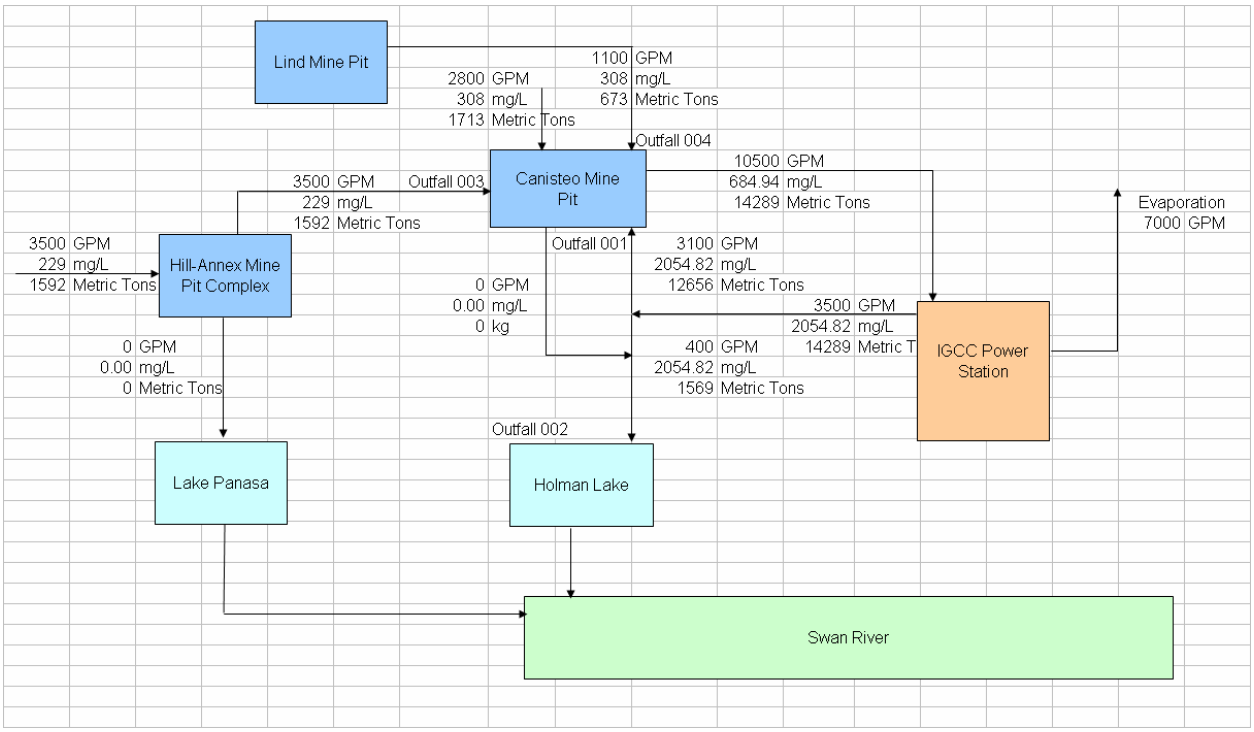


Figure D-21
Nickel Process Flow Diagram at 3 Years of Operation

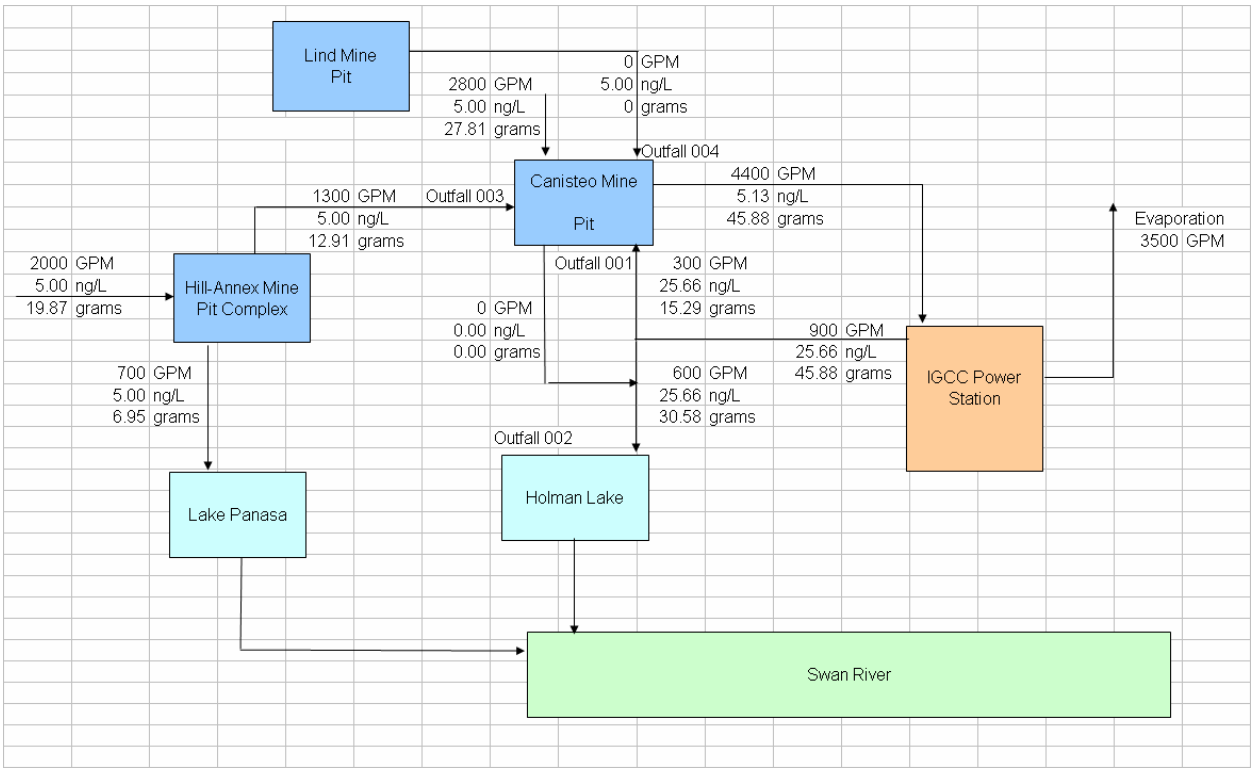


Figure D-22
Nickel Process Flow Diagram at 12 Years of Operation

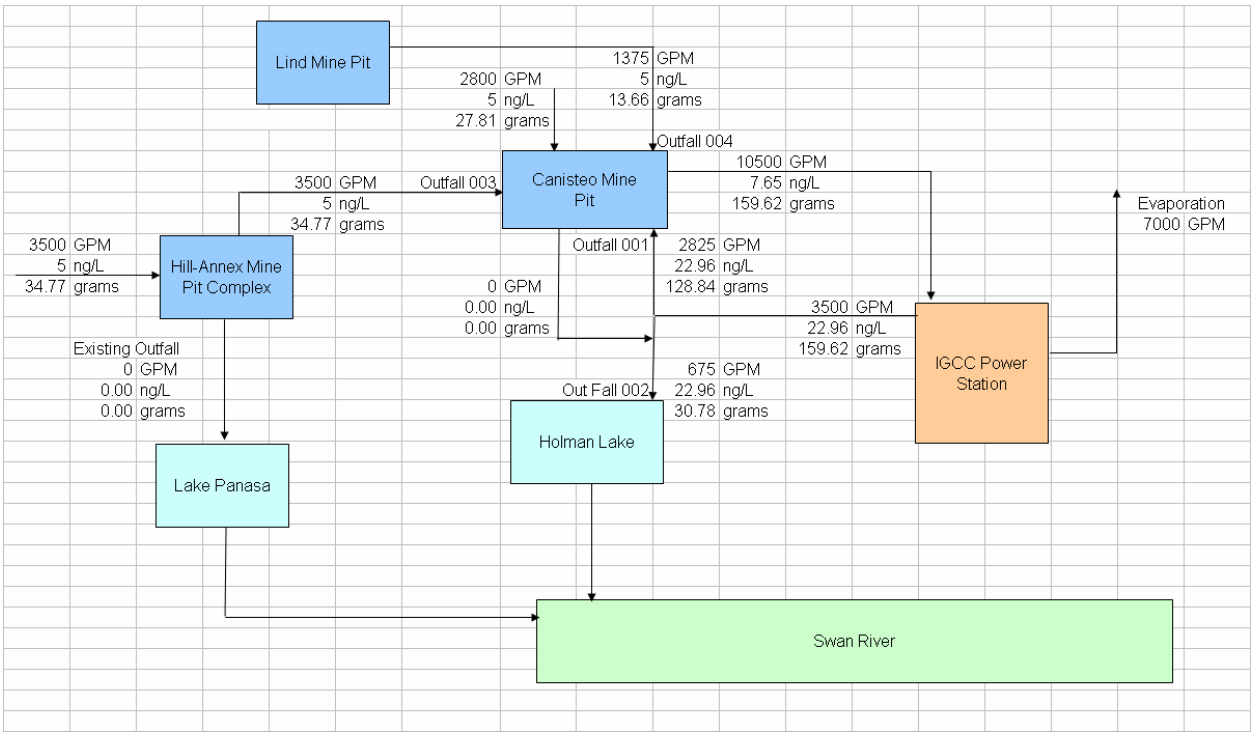


Figure D-23
Nickel Process Flow Diagram at 30 Years of Operation

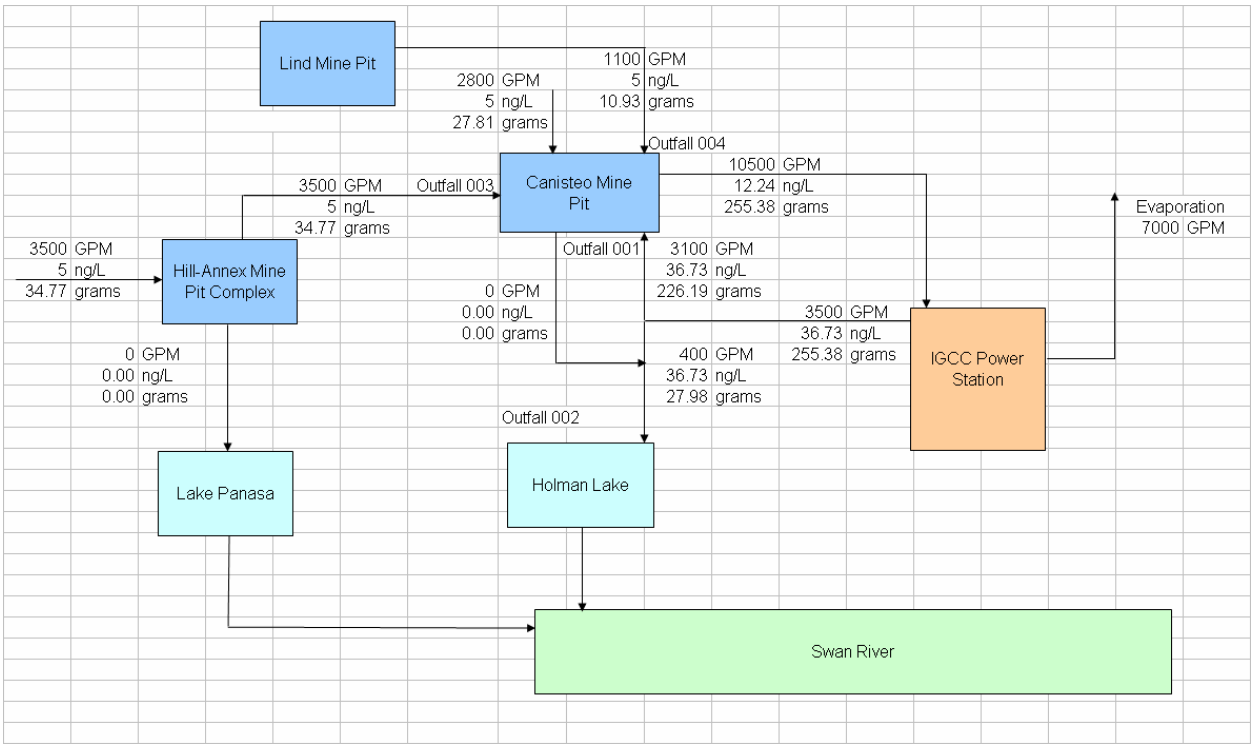


Figure D-24
Chloride Process Flow Diagram at 3 Years of Operation

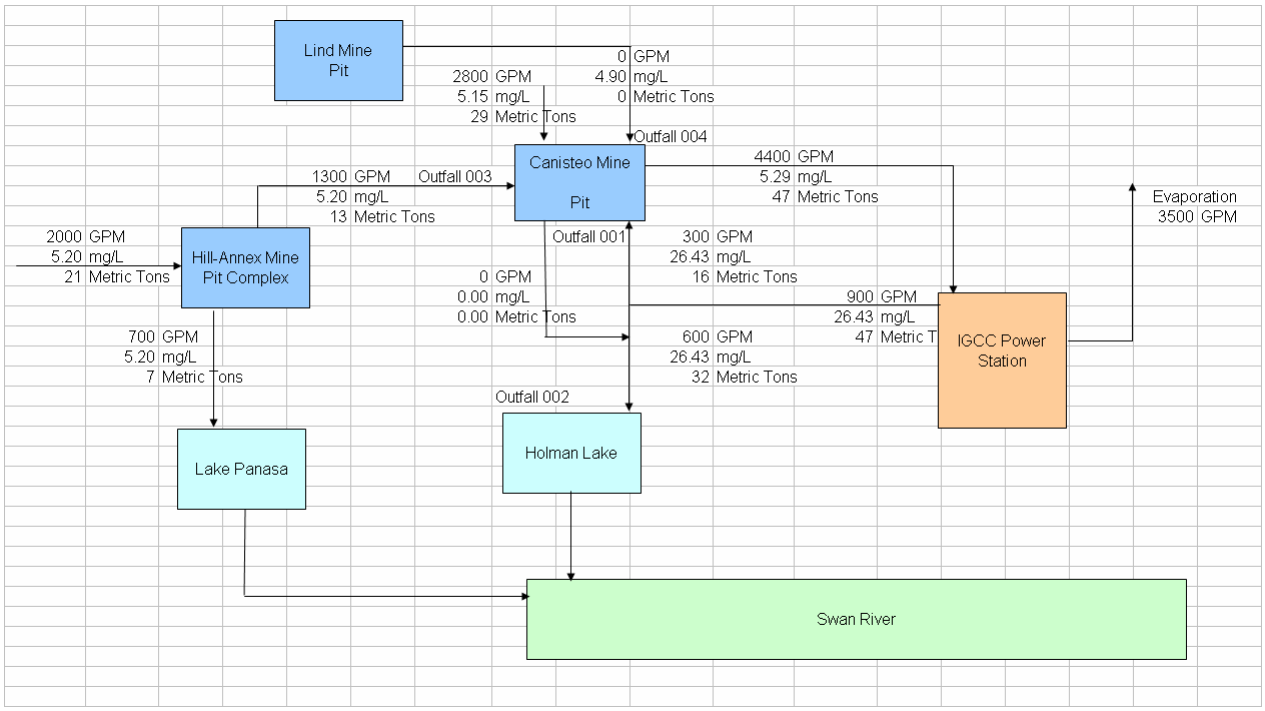


Figure D-25
Chloride Process Flow Diagram at 12 Years of Operation

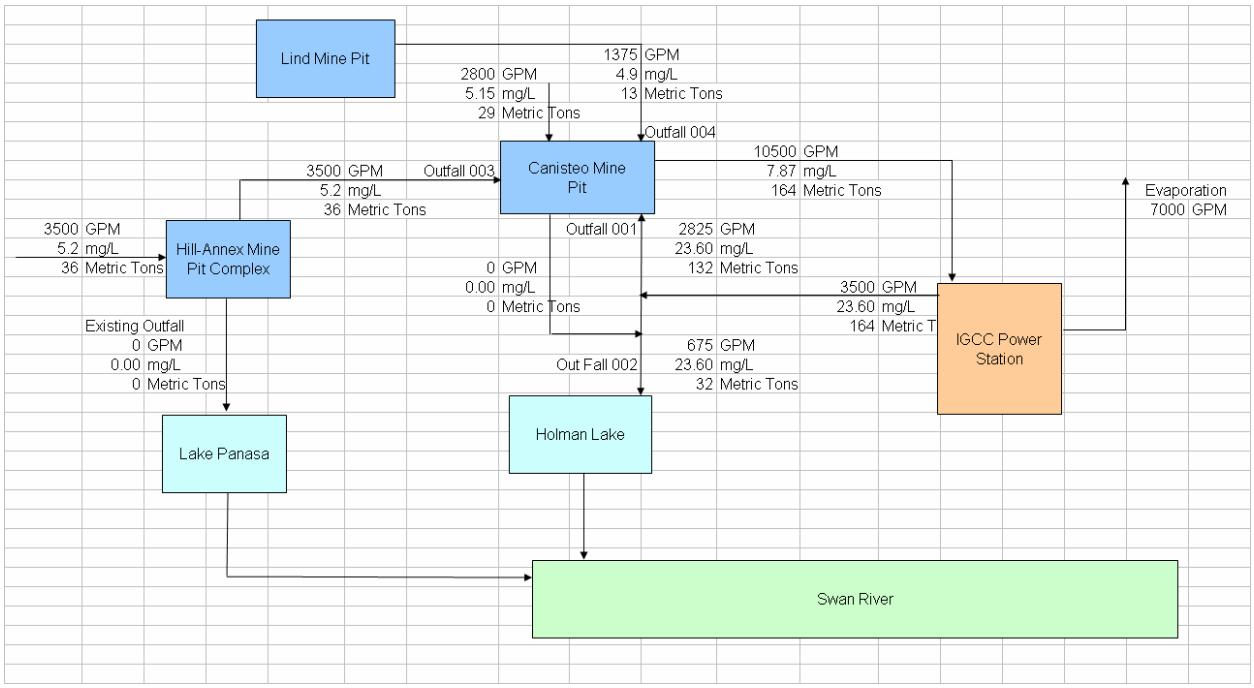
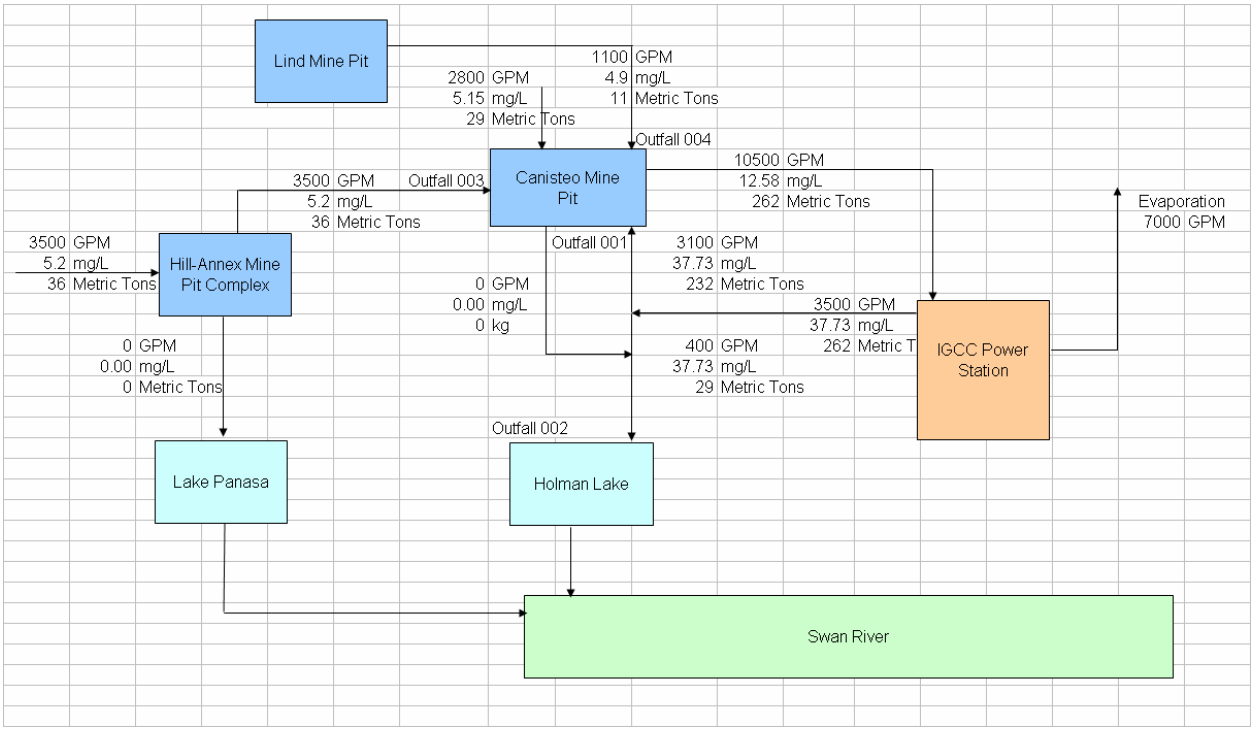


Figure D-26
Chloride Process Flow Diagram at 30 Years of Operation



The IGCC power station will discharge cooling tower blowdown water directly to the CMP or Holman Lake. This Appendix describes the methods used to complete an assessment of the thermal impacts of the IGCC Power Station cooling tower blowdown discharge (both Phase I & II). The assessment demonstrates that the applicable temperature water quality criteria in Minn. R. ch. 7050 and the Clean Water Act (CWA) Section 316(a) will be met with a reasonable mixing zone as allowed under the rules (Minn. R. 7050.0210, subp. 5).

Receiving Water Body

Limited temperature data was available for the CMP and Holman Lake. Consequently, the lakes were analyzed using seasonal temperature profiles gathered for a number of regional lakes of similar depth.

Figure F-1 shows seasonal temperature profiles for typical medium-depth lakes in northern Minnesota (similar to Holman Lake). Figure F-2 shows seasonal temperature profiles for typical deep lakes in northern Minnesota (similar to Canisteo Pit). After ice-out in April, the lakes begin warming in May. For both medium-depth and deep lakes, surface layer temperatures average 20 to 25 °C during the summer (June-August). There is a strong stratification (greater than 10 °C) in the upper 15 to 25 ft of the lakes. In deep lakes, temperatures on the bottom layers (lower 40 to 50 ft) remain near 5 °C throughout the summer. In medium-depth lakes, temperatures of the bottom layers (lower than 30 ft) remain below 10 °C throughout the summer. Lakes begin cooling in September, and complete turn-over occurs in October. Lake temperatures become a uniform 7 to 8 °C during turnover and drop to 0 to 3 °C during the winter.

Figure E-1
Water Temperature Profile-Typical Medium-Depth Lake in Northern Minnesota

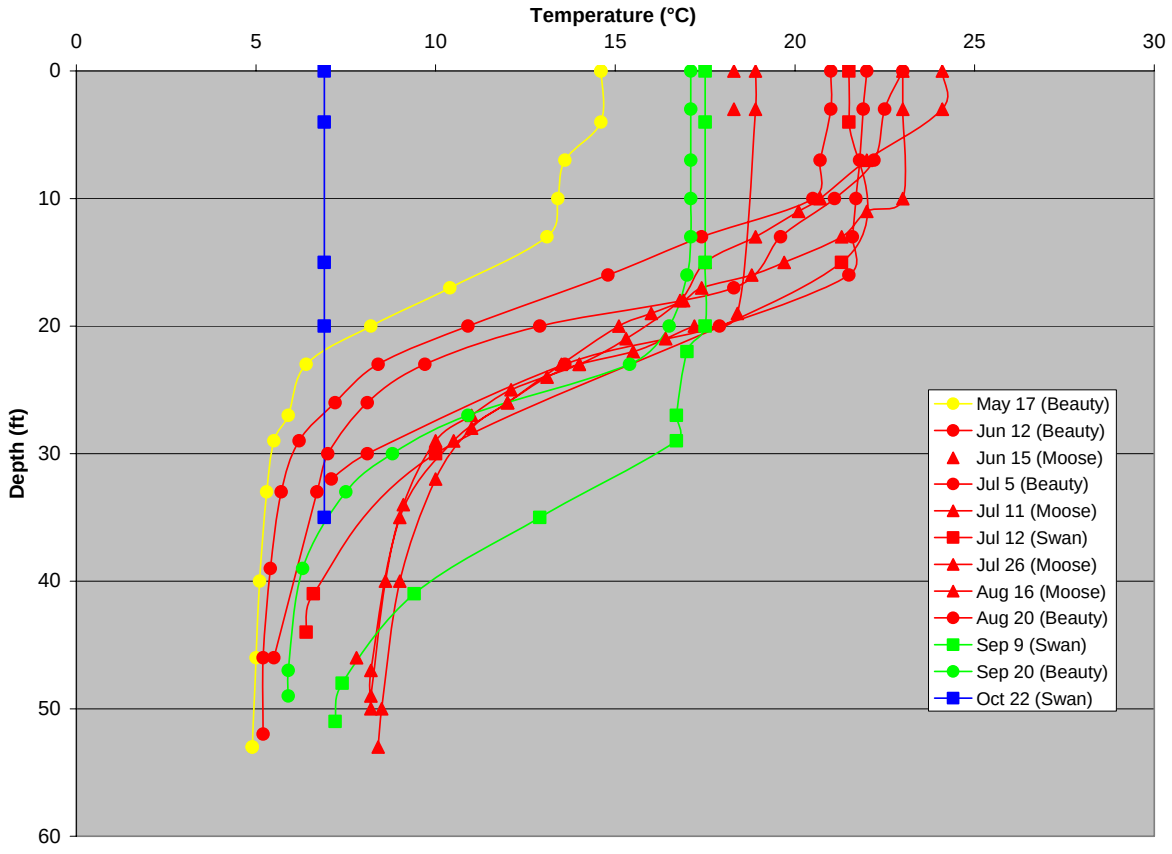
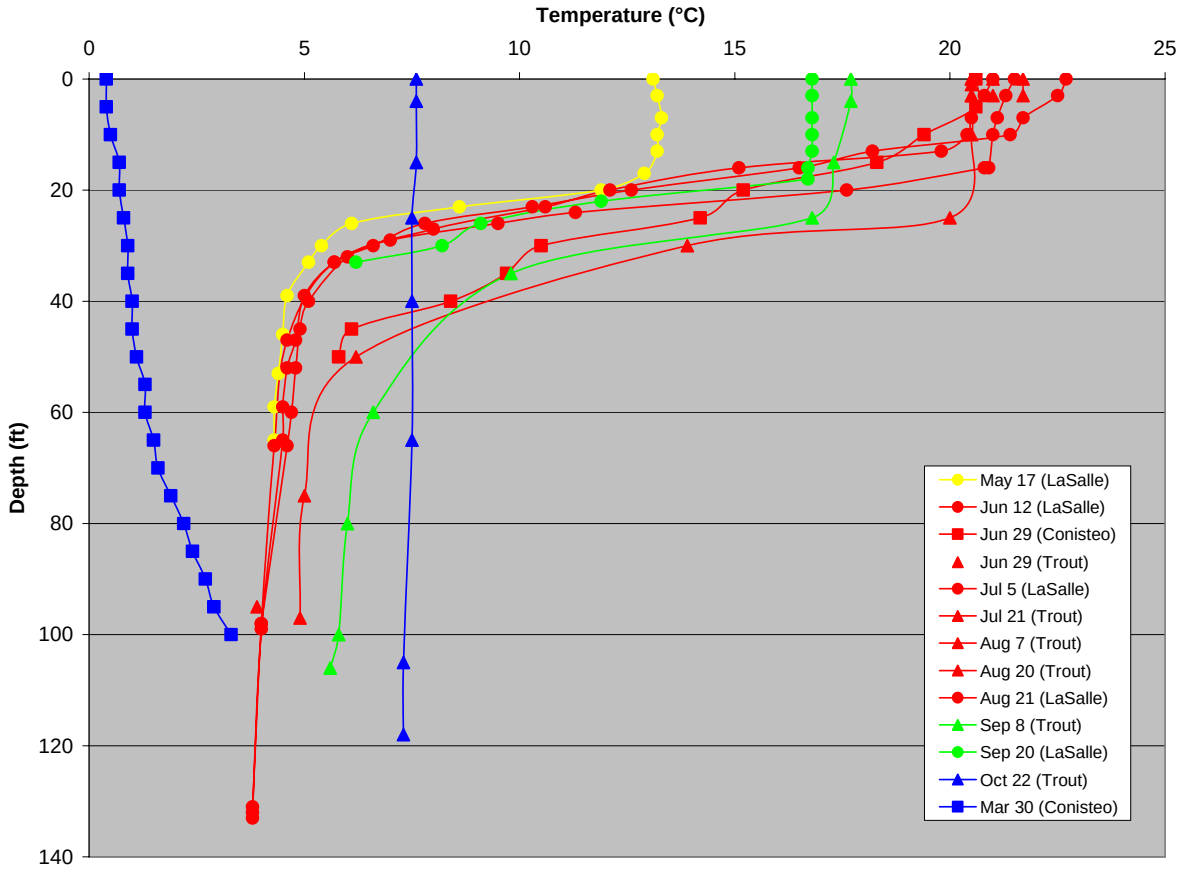


Figure E-2
Water Temperature Profile-Typical Deep Lake in Northern Minnesota



Cooling Tower Blowdown

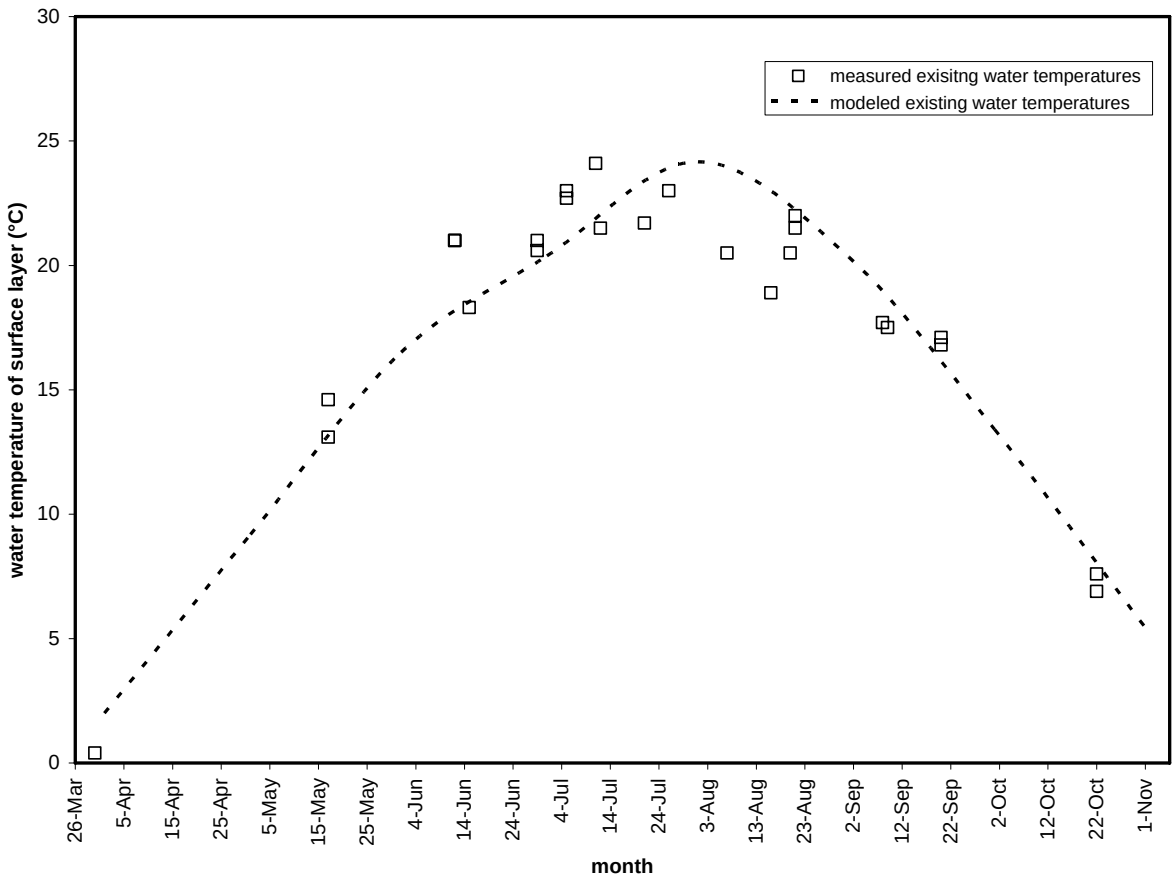
The cooling tower blowdown flow used in this analysis was 2,400 gpm (or roughly 5 cfs) for the combined flow from the Phase I and Phase II IGCC Power Station. Blowdown temperatures were estimated to be the ambient wetbulb temperature plus 15 °F during the summer months, and the ambient wetbulb temperature plus 20 °F during the spring and fall. Wetbulb temperatures used in the model described below were 5% exceedance values and were interpolated from reference isopleth maps. The 5% exceedance values were roughly 16 °F above the typical values of monthly averaged wetbulb temperatures obtained from NOAA, National Hourly Climate Data Center for the Chisholm-Hibbing Airport station. The resulting end-of-pipe blowdown temperatures used in this analysis ranged from 70 °F in April to 86 °F in July/August.

Heat Balance Model

A seasonal heat balance model on each lake was created and calibrated to existing water temperature data. The heat balance model accounted for short-wave solar radiation, long-wave atmospheric radiation, back radiation from the water, evaporative heat losses, and conductive heat losses. Since the lakes are well stratified, the heat balance modeled only the upper 18 ft of

each lake. The heat balance model computes a monthly-averaged value of water temperature based on monthly-averaged values of air temperature, short-wave solar radiation, wind speed, and relative humidity. Figure F-3 shows the modeled existing water temperature plotted against the measured temperatures of regional lakes (taken from Figures F-1 and F-2). Surface water temperatures rise from near 0 °C after ice-out in April to a maximum of nearly 25 °C during late-July/early-August. Temperatures then fall to below 5 °C before ice-over in November.

Figure E-3
Existing Water Temperature of Surface Layers in Typical Northern Minnesota Lakes



Once the heat-balance model was calibrated to the existing measured temperatures, the additional thermal loads from the cooling tower blowdown were then added to each lake model to investigate the effect that the blowdown would have on overall lake temperature.

Seasonal water temperatures of the surface layers after the addition of the cooling tower blowdown are shown in Figure F-4 for Holman Lake, and in Figure F-5 for Canisteo Pit. The temperature rise in Holman Lake is 1 to 2 °F due to the addition of the cooling tower blowdown. The temperature rise in Canisteo Pit is almost undetectable. The rise in Holman Lake is slightly larger than the rise in Canisteo Pit since the surface area of Holman Lake is smaller than Canisteo, and consequently there is less area available for the additional heat added by the blowdown to be dissipated back to the atmosphere.

Figure E-4
Water Temperature of Surface Layers of Holman Lake

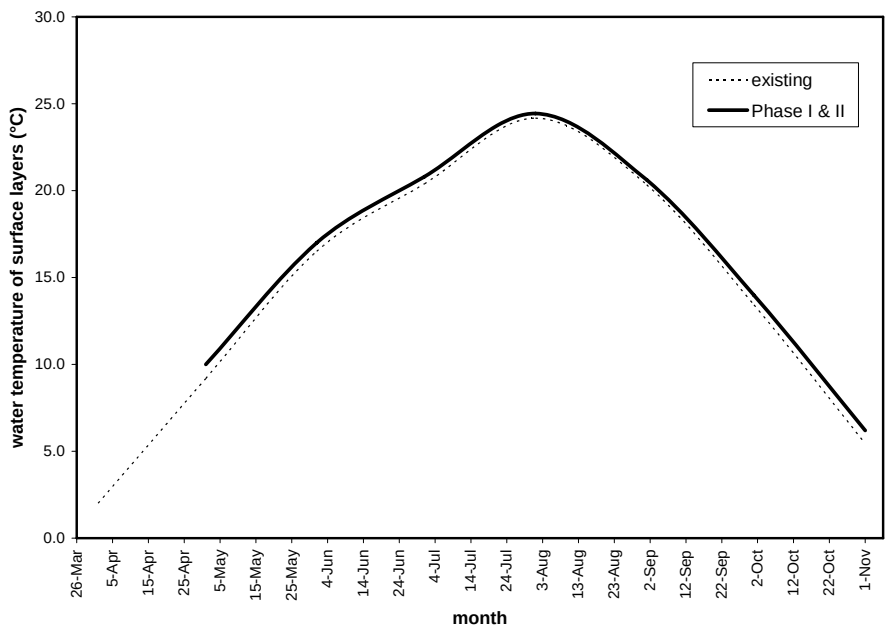
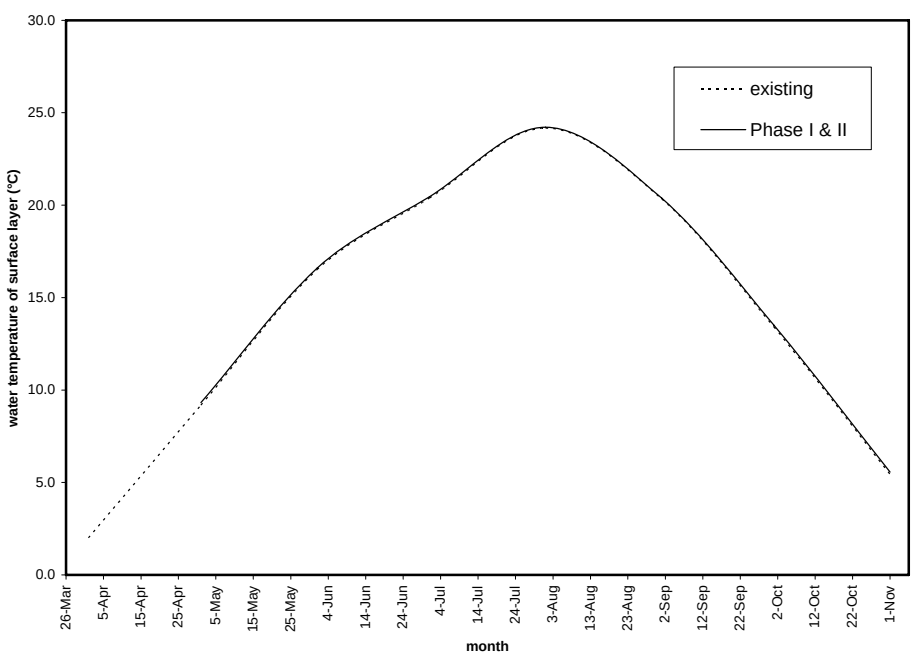


Figure E-5
Water Temperature of Surface Layers of CMP



The temperature rise at Holman Lake and Canisteo Pit due to the addition of the cooling tower blowdown is relatively small for several reasons:

1. The lakes have a relatively large surface area over which to dissipate the additional heat back to the atmosphere.

2. The discharge flow is small relative to the volume of the receiving water body. The cooling tower blowdown flow of 2,378 gpm is relatively small compared to typical once-through cooling operations. The small heated flow is easily diluted in the large receiving water body.

3. The temperature of the discharge is not significantly higher than the temperature of the receiving water body. The cooling tower blowdown flow is only 10 to 15 °F warmer than the temperature of the receiving water bodies. In contrast, once-through cooling operations often have discharge temperatures 25 to 30 °F above ambient.

This heat balance analysis is intended to provide general information on the effect of the cooling tower discharges on the overall temperature of surface layers of the receiving water bodies. It assumes a well-mixed uniform temperature throughout the surface layers. In reality, the cooling tower discharge will have a greater effect on water temperatures closer to the point of discharge, and a lesser effect far from the point of discharge. The thermal effects in the proximity of the point of discharge are discussed in the following section on plume modeling.

Plume Modeling

As noted, CMP and Holman Lake are Class 2B waters (Minn. R. 7050.0430) because they are not specifically listed. State water quality standards (Minn. R. 7050.0220, Subp. 5a) limit the temperature of heated discharges to Class 2B waters to 3°F above ambient water temperature (based on monthly average of maximum daily temperature), and in no case can the discharge daily average temperature exceed 86°F. If the temperature at the point of discharge exceeds these standards, mixing zones can be granted by the MPCA on a case-by-case basis (Minn. R. 7050.0210, Subp. 5). Thermal water quality standards must then be met at the edge of the mixing zone.

To determine the extent of the mixing zone that will be required, an analysis of the thermal plumes resulting from the cooling tower blowdown discharge into either Holman Lake or CMP was performed using CORMIX modeling software. CORMIX is an EPA-supported mixing zone model for environmental impact assessment of regulatory mixing zones resulting from continuous point source discharges (http://www.cormix.info/). Plume modeling was performed for both spring and summer conditions. Discharges to various depths in the lake and discharges of various end-of-pipe velocities were examined.

Table F-1 shows the results of the plume modeling for spring lake and discharge conditions. The surface layer of the lake was modeled at the assumed temperature of 57 °F, and the blowdown temperature was modeled at 79 °F. For discharges at the water surface (depth = 0 ft) the plume stayed at the surface and spread across the water surface as it extended out into the lake.

Discharges at depths of either 10 feet or 40 feet resulted in plumes that rapidly rose to the surface and then spread across the water surface. For a surface discharge with a velocity of 3 ft/s, the plume diluted itself down to the state water quality standard temperature at 97 feet to ambient plus 3 °F, or 60°F. Consequently, a mixing zone roughly 100 ft in length will be necessary for this discharge. Discharges at deeper depths (10 ft and 40 ft) diluted more quickly and required a smaller mixing zone.

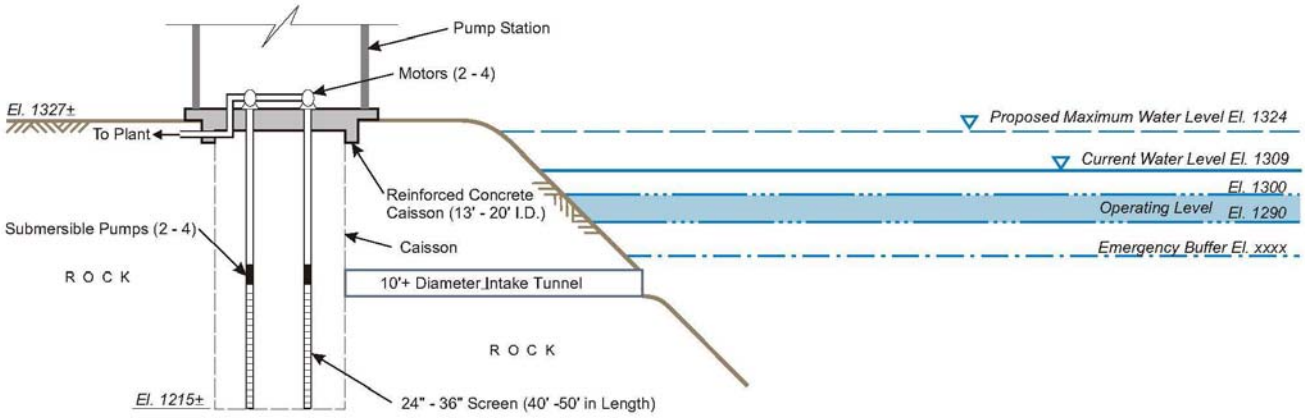
Table F-2 shows the results of the plume modeling for summer lake and discharge conditions. The surface layer of the lake was modeled at 72 °F, and blowdown temperature was modeled at 86 °F. Required mixing zone lengths for the summer conditions are smaller since the difference between discharge temperature and ambient temperature is smaller in the summer than during the spring.

Table E-1
Dimensions of Required Mixing Zones for IGCC Power Station Discharge — Spring Conditions

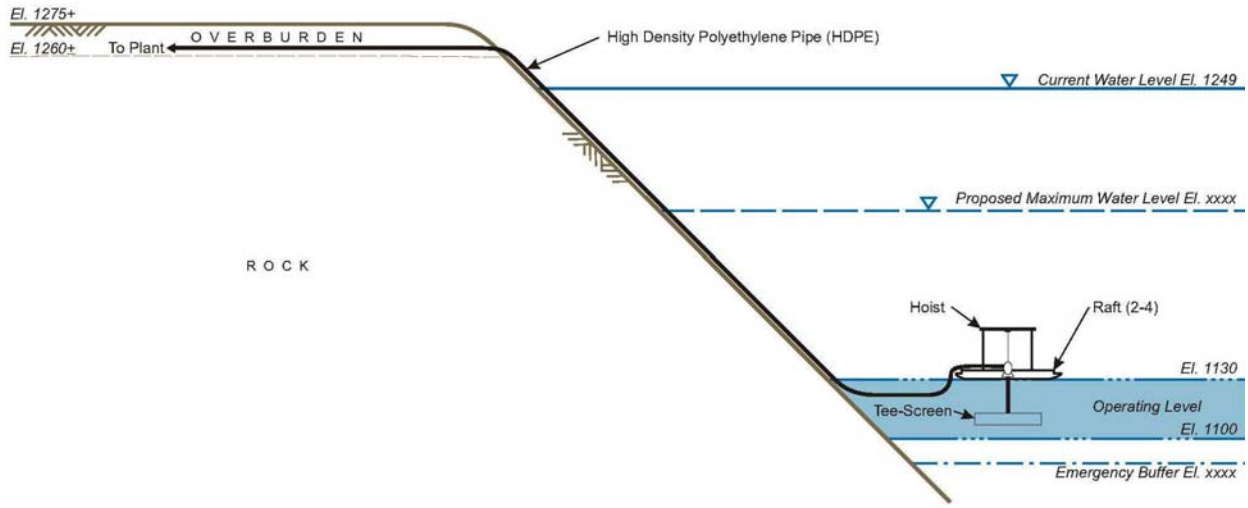
Depth of Discharge (Feet)	End-0f-Pipe Velocity (Feet/Sec)	Length Mixing Zone Required (Feet)	Comments
0	3	98	Surface plume spreads as it moves away from shore
0	6.7	75	Surface plume spreads as it moves away from shore
10	2	33	Plume rises rapidly to surface, then spreads across surface
10	6	38	Plume rises rapidly to surface, then spreads across surface
10	10	41	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
40	2	29	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
40	10	31	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
Discharge temperature = 79 °F. Ambient water temperature = 57 °F. Allowable water temperature at edge of mixing zone = 60°F.			

Table E-2
Dimensions of Required Mixing Zones for IGCC Power Station Dicharge — Summer Conditions

Depth of Discharge (Feet)	End-0f-Pipe Velocity (Feet/Sec)	Length Mixing Zone Required (Feet)	Comments
0	3	57	Plume spreads across surface as it moves away from shore
0	6.7	41	Plume spreads across surface as it moves away from shore
10	2	30	Plume rises rapidly to surface, then spreads across surface
10	10	26	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
40	2	23	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
40	10	21	Plume is diluted to allowable limits before rising to the surface. Once it reaches the surface the plume spreads across surface.
Discharge temperature = 86 °F. Ambient water temperature = 72 °F. Allowable water temperature at edge of mixing zone = 75 °F.			



Caisson Intake



Floating Intake