HUDBAY

May 4, 2012

Ms. Tracey Braun, M.Sc.
Director, Environmental Assessment & Licensing Branch
Manitoba Conservation and Water Stewardship
123 Main Street, Suite 160
Winnipeg, Manitoba
R3C 1A5

Dear Ms Braun,

We write to apply for a Class 2 *Environment Act* license for the construction and operation of the Lalor Mine. A cheque for the application fee in the amount of $5000.00 is enclosed along with an *Environment Act* Proposal Form and Report (the "Proposal"), prepared by AECOM on behalf of Hudson Bay Mining and Smelting Co., Limited (HBMS).

The Lalor Mine will be comprised primarily of the facilities which have been approved and are being constructed for the Lalor Advanced Exploration Project (AEP) and Lalor Ramp projects. Lalor Mine will consist primarily of operation of the Lalor main shaft, developed for advanced exploration purposes and converted to use for production, together with the supporting infrastructure on the Lalor AEP site. The proposed Lalor Mine also will link operation of the Lalor main shaft with the underground ramp and three ventilation raises constructed as part of the previously approved Lalor Ramp Project.

The site of the proposed Lalor Mine lies entirely within the footprint occupied by the previously approved Lalor projects, including the Lalor AEP and Lalor Ramp. The Lalor Mine also will be supported by other HBMS existing licensed operations in the Snow Lake region. As outlined in this report, the proposed Lalor Mine has been planned, to the maximum extent possible, to avoid adverse environmental effects by taking advantage of available existing licensed support facilities and by keeping the footprint of the development as small as possible.

The Lalor AEP Closure Plan, which was approved by the Director of Mines on April 9, 2010, will be updated to account for operation of the proposed Lalor Mine and will be submitted to the Director of Mines for approval, along with any increase/decrease in financial assurance that may be required. In accordance with HBMS experience with mine closure, it is expected that closure activities will, in time post-closure, result in substantial return of the site to pre-project conditions.

Along with the Proposal, we include in this submission a copy of each of the reports used by AECOM in completing the Proposal.

We provide 7 hard copies and 22 electronic copies of this submission. In order to facilitate public review, each set contains both the Proposal and all of the additional above-mentioned reports.

P.O. Box 1500
1 Company Road
Flin Flon, Manitoba
Canada R8A 1N9
hudbayminerals.com

As well, we can advise that we are providing both electronic and hard copies of the submission to Mathias Colomb Cree Nation, as they have expressed an interest in receiving information about the project.

We look forward to hearing from you with your instructions concerning the assessment process and schedule to be followed.

We would be pleased to provide any other information that you may require. Thank you very much for your kind attention to this application.

Sincerely,

Stephen West, P. Eng.
Superintendent, Environmental Control

cc: Sheryl Rosenberg
Tom Goodman
Brad Lantz

Environment

Hudson Bay Mining and Smelting Co., Limited

Lalor Mine Environment Act Proposal Report

Prepared by:

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www.aecom.com

Project Number:

60212403 (402.19)

Date:

May, 2012

Statement of Qualifications and Limitations

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- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
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AECOM: 2012-01-06

Distribution List

# of Hard Copies	PDF Required	Association / Company Name
7	22	Manitoba Conservation
5	5	Hudson Bay Mining and Smelting Co., Limited
2	2	Thompson Dorfman Sweatman LLP
4	4	Mathias Colomb Cree Nation

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	A. Weiss	May 3, 2012	Final

AECOM Signatures

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MAY 3, 2012
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APEGM
Certificate of Authorization
AECOM Canada Ltd. (MB)
No. 4671 Date: 2012/05/03

Executive Summary

This Environment Act Proposal (EAP) report contains the information described in Manitoba Conservation's Information Bulletin, "Environment Act Proposal Report Guidelines." It has been prepared and is submitted to assist in the consideration of the HBMS application for an *Environment Act* license for the Lalor Mine.

The Lalor Mine will be composed primarily of the facilities which have been approved and are being constructed for the Lalor Advanced Exploration Project (AEP) and Lalor Ramp projects. These two projects will intersect near the Lalor deposit. The Lalor AEP and Lalor Ramp will have been completed and used for their exploration purposes prior to commencement of the proposed Lalor Mine project. The proposed Lalor Mine will involve conversion of these two existing projects from exploration to production purposes.

The proposed Lalor Mine Development will consist primarily of operation of the Lalor main shaft, developed for advanced exploration purposes and converted to use for production, together with the supporting infrastructure on the Lalor AEP site. The proposed Lalor Mine also will link operation of the Lalor main shaft with the underground ramp and three ventilation raises constructed as part of the previously approved Lalor Ramp Project.

The site of the proposed Lalor Mine project lies entirely within the footprint occupied by the previously approved Lalor projects, including the Lalor AEP and Lalor Ramp. The Lalor Mine will also be supported by other HBMS existing licensed operations in the Snow Lake region. As outlined in this report, the proposed Lalor Mine has been planned, to the maximum extent possible, to avoid adverse environmental effects by taking advantage of available existing licensed support facilities and by keeping the footprint of the development as small as possible.

The Lalor AEP Closure Plan, which was approved by the Director of Mines on April 9, 2010, will be updated to account for operation of the proposed Lalor Mine and will be submitted to the Director of Mines for approval, along with any increase/decrease in financial assurance that may be required. In accordance with HBMS experience with mine closure, it is expected that closure activities will, in time, result in substantial return of the site to pre-project conditions.

Topography

Construction and operation of the proposed Lalor Mine will not affect the topography of the site. The Project Site has been previously cleared and levelled during construction of the Lalor AEP. The closure phase will include restoration of the topography of the site to match the surrounding area to the extent that is practical.

Soil

As the plan for operation of Lalor Mine eliminates the potential to generate ARD on-site, no effect on soil quality as a result of ARD is anticipated. Construction and operation phases will not include any activity that is likely to result in soil erosion, and operation and closure activities will include assessment of any potential contamination caused by the development, followed by any remediation that may be required to eliminate risk to human health, safety or the environment.

Air

The dense nature of the vegetation immediately surrounding the Project Site is expected to mitigate wind effects and overall potential dust migration, limiting its effects to the Project Site and the immediate Project Area. Although dust generation is anticipated on Provincial Road 395 and the Lalor Mine access road from traffic as they are unpaved roads, substantial dust generation is not anticipated on Provincial Road 392 as it is a paved road. With the implementation of standard mitigation measures, the effect of dust on air quality will be negligible under normal weather conditions.

Although the increase in traffic associated with the Lalor Mine is considered major, the increase in emissions due to the 160 vehicle per day increase in vehicles is anticipated to have a negligible effect on air quality. With the implementation of standard mitigation measures during the operation phase, the potential residual effect on air quality is anticipated to be negligible in the Project Area.

Noise

All practices performed on the Lalor Mine site will be carried out in accordance with the *Workplace Safety and Health Act* and HBMS' OHSAS 18000 certified management system, which will minimize potential effects on health and safety. With the implementation of standard engineering controls (such as silencers) on equipment where possible, noise levels are anticipated to subside to ambient levels prior to reaching the closest residential receptor (cottage on Cook Lake). Further, noise levels associated with mine-related traffic on Provincial Road 395 are anticipated to return to ambient levels prior to reaching the closest residential area in the Town of Snow Lake. As such, there will be no adverse effects from noise in the Town of Snow Lake or cottages located at Cook Lake.

Climate

Although climate change effects due to greenhouse gas emissions are considered irreversible; the overall quantity of greenhouse gas emissions generated during construction, operation and closure of the Lalor Mine is considered to have a negligible effect on climate change.

Groundwater

For the purposes of this environmental assessment, a distinction has been made between shallow and deep groundwater resources. Any effects on shallow groundwater quality are anticipated to be limited in spatial extent to the Project Site and immediate Project Area.

No registered groundwater users have been identified within 5 km of the Lalor AEP site, which includes the subsurface area that will be affected by the proposed mine. As a practical matter, the deep groundwater is not available for use as the low hydraulic conductivity of the rock formation in the Lalor Zone provides very slow recharge; and the great depth of the groundwater that may be affected by the mine restricts accessibility for users. Deep groundwater collected in the mine potentially affected by blast chemicals will be pumped to surface for treatment at the Chisel North WTP, removing the potential for additional groundwater to be affected; therefore it is anticipated that residual effects on deep groundwater quality due to the use of explosives will be negligible.

Based on the amount of groundwater seepage expected and the absence of users of the deep groundwater, no significant effects on deep groundwater are anticipated to result from mine dewatering.

No effects from ARD or waste management are expected.

Surface Water

As the need for fresh water is accommodated within existing approved limits, surface waterbodies are not anticipated to be substantially affected as a result of fresh water supply to the Lalor Mine. Wastewater generated during the operation phase of the Lalor Mine will be managed using existing licensed treatment facilities, and sanitary sewage generated at the Lalor Mine will be treated in an on-site sewage treatment plant.

Protected and Other Flora Species

Although the Lalor development resulted in a loss of vegetation on the Project Site, no unique vegetation communities were lost and the species lost to the development footprint are common in the Project Area and Region. No additional loss of vegetation will be caused by construction or operation of the Lalor Mine. For these reasons, the loss of vegetation to the Lalor development footprint is not considered significant.

Protected and Other Fauna Species

No habitat of specific or critical value to wildlife was observed at the Project Site (such as calving or over-wintering areas) and, based on site conditions and field observations, there is no critical wildlife value in the Project Area. Although the Lalor Mine Development has resulted in a loss of wildlife habitat at the Project Site, the type of habitat that was lost is common in the Project Area and Region. No additional loss of wildlife habitat will be caused by construction or operation of the Lalor Mine. Noise effects on wildlife will be limited to portions of the Project Area with no noise effects anticipated beyond the Project Area. Species present in the Project Area are anticipated to be accustomed to some level of noise due to the presence of existing Provincial Roads and existing developments. For these reasons, the Lalor Mine Development will not result in adverse effects on wildlife.

Aquatic Resources and Protected Species

The mitigation measures planned for surface water are anticipated to sufficiently mitigate potential surface water effects. There are no protected species known to occur in the Nelson River watershed including the waterbodies surrounding the Lalor Mine or where discharges from support infrastructure will occur. The mitigation measures proposed for surface water will prevent adverse effects on aquatic resources.

Land Use

As residual environmental effects on aquatic and terrestrial resources have been determined to be minor to negligible in magnitude, it is anticipated that the Lalor Mine will not adversely impact the availability of plants, wildlife or fish for resource harvesting in the Project Region. As a result, no change in land use is anticipated outside the Lalor Mine Development.

Heritage Resources

There are no historic or heritage resources anticipated at the Lalor Mine site or in the immediate surrounding area. Land disturbance during construction of Lalor Mine will be limited to the existing cleared and levelled Lalor AEP site, and no further disturbance beyond the existing Project Site will occur during operation or closure activities. Therefore, no effects on heritage resources are anticipated during construction, operation or closure of the Lalor Mine.

Aesthetics

Based on the mine's remote location and surrounding vegetation, aesthetic effects during the construction and operation phase are anticipated to be negligible.

It is recommended that the mitigation measures and monitoring programs described in this report be implemented to ensure potential environmental effects are minimized and/or are identified early so that appropriate action can be undertaken. Monitoring programs that have been recommended include continued Environmental Effects Monitoring (EEM) and monitoring requirements under *Environment Act* licenses as well as monitoring the success of re-vegetation efforts.

In summary, the residual environmental effects will be negligible to minor in magnitude with the implementation of the mitigation measures identified and monitoring programs proposed. It is our opinion that based on the available information and documented assumptions, the proposed project is not likely to cause significant adverse environmental effects.

Glossary

Item	Explanation
AADT	Annual Average Daily Traffic.
AEP	Advanced Exploration Project.
Ambient	Surrounding, encircling - pertaining to any local non-point source conditions such as temperature, air quality or noise levels.
ANFO	Ammonium nitrate/fuel oil.
Aquifer	A geological formation of permeable rock, sand, or gravel that conducts groundwater and yields useable quantities of water to springs and wells.
Archaeology	The scientific study of past human cultures by analyzing the material remains.
ARD	Acid Rock Drainage
Bedrock	Solid rock that underlies soil, sand, clay, gravel, and loose materials on the Earth's surface.
Berm	A sloped wall or embankment used to prevent the inflow or outflow of material into/from an area.
Biota	Living organisms.
CCME	Canadian Council of Ministers of the Environment.
Clay	A fine-textured, sedimentary or residual deposit consisting of hydrated silicates of aluminum mixed with various impurities.
Conductivity	The ability of an aqueous solution to carry electrical current.
CSQG	*Canadian Soil Quality Guidelines.*
CWQG	*Canadian Water Quality Guidelines.*
Deposition	The geological process by which material is added to a landform or land mass.
DFO	Fisheries and Oceans Canada.
Dissolved oxygen	DO; the amount of oxygen dissolved in water.
DO	Dissolved oxygen.
EAP	*Environment Act* Proposal.
Ecoregion	Large unit of land characterized by various items including distinctive climate, ecological features and terrestrial communities.
Ecozone	The largest scale biogeographic division of the earth's surface based on the historic and evolutionary distribution patterns of plants and animals.
EEM	Environmental Effects Monitoring.
Emergent plant	A plant rooted in shallow water with most of the stem and leaves above water.
Ephemeral	A stream that flows during, and for short periods, following a precipitation event. The stream may or may not have a well-defined channel.
Erosion	The removal of solids (sediment, soil, rock and other particles) in the natural environment. It usually occurs due to transport by wind, water, or ice; by down-slope creep of soil and other material under the force of gravity; or by living organisms, such as burrowing animals.
Erosion control techniques	Methods used to prevent or reduce the risk or erosion from disturbed sites. Methods include re-vegetation, riprap and silt fences.
Eutrophic	The trophic status of a waterbody; whereby the waterbody has relatively high primary productivity, based on total phosphorus concentrations between 35µg/L and 100µg/L (CCME, 1999).
Evaporation	The transition from a liquid state into a gaseous state.
Fauna	All animal life in a particular region.

Item	Explanation
FFB	Flin Flon Belt.
Flood plain	Area of land adjacent to a watercourse that is covered by water during a flood.
Flora	All plant life and vegetation in a particular region.
Fluvial	Of, pertaining to, inhabiting, or produced by the action of a river or stream.
FMU	Forest Management Units
Glacial	Relating to or derived from a glacier; "glacial deposit".
Gravel	Gravel is rock that is of a specific particle size range. Specifically, it is any loose rock that is larger than two millimeters (2 mm/0.079 in) in its smallest dimension (about 1/12 of an inch) and no more than 64 mm (2.5 in).
Groundwater	Water that exists beneath the earth's surface in underground streams and aquifers.
HBMS	Hudson Bay Mining and Smelting Co., Limited.
Hydrogeology	The study of the distribution of groundwater.
Hydrology	The study of the distribution and movement of water.
Hydrometric station	An active water level and streamflow station that collects surface water quality and sediment data.
Infiltration	Infiltration is the process by which water on the ground surface enters the soil.
Lacustrine	Sediment deposits related to a lake.
LHD	Load haul dumps.
Loam	A loose mixture of clay, sand, and silt.
masl	Metres Above Sea Level.
MESA	*Manitoba Endangered Species Act.*
Mesotrophic	The trophic status of a waterbody; whereby the waterbody has relatively moderate primary productivity, based on total phosphorus concentrations between 10µg/L and 20µg/L (CCME, 1999).
Meso-eutrophic	The trophic status of a waterbody; whereby the waterbody has moderate to high primary productivity, based on total phosphorus concentrations between 20µg/L and 35µg/L (CCME, 1999).
Mitigation	Actions taken to reduce effects by limiting, reducing or controlling hazards and contamination sources.
MMER	Federal *Metal Mining Effluent Regulations*.
Moraine	Accumulated earth and stones deposited by a glacier.
MPN	Most Probable Number
MSQG	*Manitoba Sediment Quality Guidelines.*
NAG	Non acid generating.
OHSAS	Occupational Health and Safety Assessment Series
Oligotrophic	The trophic status of a waterbody; whereby the waterbody has relatively low primary productivity, based on total phosphorus concentrations between 4µg/L and 10µg/L (CCME, 1999).
PAG	Potentially acid generating.
Permeability	The facility with which a porous mass permits passage of a fluid. Soil permeability can be determined using the 'constant head' method or the 'falling head' method.
pH	A measure of the activity of hydrogen ions (H+) in a solution and, therefore, its acidity, a number between 0 and 14, that indicates whether a solution is acidic (pH <7).

Item	Explanation
Potable Water	Water safe for human consumption.
PM	Particulate matter.
Ppb	Parts per billion.
Proponent	A person or organization seeking approval to conduct a business or activity that impacts on the environment.
RCMP	Royal Canadian Mounted Police.
Renewable Resources	A resource that is capable of being naturally restored or replenished over time.
Residual Effects	Effects that remain after mitigation has been applied.
R.M.	Rural Municipality.
RTLs	Registered trap lines.
Sand	Material containing loose, unconsolidated accumulations of sediment.
SARA	*Species at Risk Act.*
Saturated	A condition in which all voids between soil particles are temporarily or permanently filled with water.
SCAT	Self-contained aboveground tank.
Sediment	Any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid.
Sewage	Wastewater produced in showers, toilets, sinks, laundry facilities sent for treatment at an onsite Sewage Treatment Facility
Shale	A consolidated clay rock which possesses closely-spaced well defined laminates.
Silt	Material of an earthy character intermediate in grain-size between sand and clay, with greater than 50% passing through a No. 200 sieve.
Silt Fences / Silt Curtain	A temporary barrier used to intercept sediment-laden runoff from small areas.
Sinking	Refers to excavating a vertical (or near vertical) shaft from the top down.
Soil series	A grouping of soils that have similar soil profiles and are developed from a particular kind of parent material.
Spawning	The production or depositing of large quantities of eggs in water.
STP	Sewage Treatment Plant.
Subsurface	The geological zone beneath the surface of the Earth.
Surface Water	Water that sits or flows above the earth, including lakes, oceans, rivers, and streams.
TDGA	*Transportation of Dangerous Goods Act.*
TDS	Total dissolved solids.
Terrestrial	Existing on land.
TIA	Tailings Impoundment Area.
Till	Dominantly unsorted and unstratified drift, generally deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders.
Tonne	Unit of mass equal to 1,000 kg or 2,204.6 pounds. Also referred to as “metric tons”.
Topography	The physical features of the land.
Tributary	A stream or river which flows into a mainstem (or parent) river.
TSS	Total Suspended Solids.

Item	Explanation
Turbidity	A measure of water clarity.
Unemployment Rate	Number of unemployed persons expressed as a percentage of the labour force.
Ungulate	Hoofed animal such as deer.
USgpm	US gallons per minute.
VMS	Volcanic-hosted massive sulphide.
Wastewater	Water containing waste products requiring treatment. In the context of the Lalor Mine, wastewater may consist of water from the mine (groundwater seepage and process water) and sewage.
Waterfowl	Birds that swim and live near water, including ducks, geese, pelicans and swans.
Watershed	The entire geographical area drained by a river and its tributaries; an area characterized by all runoff being conveyed to the same outlet.
WMA	Wildlife Management Area.
WMO	World Meteorological Organization.
WTP	Water Treatment Plant. In the context of the Lalor Mine, the Chisel North WTP provides treatment of wastewater.

Table of Contents

List of Tables

Appendices

1. Introduction and Background

1.1 Project Overview

As presented in **Figure 1,** the site of the Lalor Advanced Exploration Project ("Lalor AEP") lies approximately eight kilometers (km) west of the Town of Snow Lake in the Snow Lake region of northern Manitoba. Hudson Bay Mining and Smelting Co., Limited (HBMS) proposes to operate an underground copper-zinc-gold mine on the site of the existing Lalor AEP, primarily by converting the use of the Lalor AEP facilities from exploration to production purposes (the "Lalor Mine").

The proposed Lalor Mine Development will consist primarily of operation of the Lalor main shaft, developed for advanced exploration purposes and converted to use for production, together with the supporting infrastructure on the Lalor AEP site. The proposed Lalor Mine also will link operation of the Lalor main shaft with the underground ramp and three ventilation raises constructed as part of the Lalor Ramp Project.

This Environment Act Proposal (EAP) report contains the information described in Manitoba Conservation's Information Bulletin, "Environment Act Proposal Report Guidelines." It has been prepared and is submitted to assist in the consideration of the HBMS application for an *Environment Act* license for the Lalor Mine. A copy of the *Environment Act Proposal Form* is attached as **Appendix A**.

It is our opinion that, based on the available information and documented assumptions, the proposed project is not likely to cause significant adverse environmental effects. As outlined in this report, the proposed Lalor Mine has been planned, to the maximum extent possible, to avoid adverse environmental effects by using existing licensed support facilities and by keeping the footprint of the development as small as possible. Residual environmental effects of the proposed Lalor Mine will be negligible to minor in magnitude with the implementation of the mitigation measures identified and the monitoring programs proposed.

It is anticipated that the Lalor Mine may continue in operation until 2031, operating at a rate of approximately 3,500 to 4,500 tonnes per day. Upon completion of mining, the Lalor Mine will be closed in accordance with the requirements of the *Mine Closure Regulation*, including building removal, capping of all shafts, removal and remediation of contaminated soil, site contouring and re-vegetation of the site. The Lalor AEP Closure Plan, which was approved by the Director of Mines on April 9, 2010, will be updated to account for operation of the proposed Lalor Mine and will be submitted to the Director of Mines for approval, along with any increase/decrease in financial assurance that may be required. In accordance with HBMS experience with mine closure, it is expected that closure activities will, in time, result in substantial return of the site to pre-project conditions.

The proposed Lalor Mine will employ up to approximately 350 people during operation, with most workers expected to live in the Town of Snow Lake. Operation of the proposed Lalor Mine also will entail continued use of infrastructure on existing sites in the Snow Lake/Chisel Mine area. HBMS residential facilities located in the Town of Snow Lake are being used by Lalor AEP construction workers. These residences are serviced by a camp sewage treatment facility licensed to HBMS. HBMS is also supporting the improvement of the Town of Snow Lake's licensed sewage treatment facility. The camp sewage treatment facility and the Town of Snow Lake sewage treatment facility are existing licensed developments and are not proposed as part of this EAP report. It is anticipated that the Lalor Mine project will generate economic benefit in the region, with no significant adverse environmental effects.

1.2 Company Profile

The proponent of the Lalor Mine is HBMS, which is a wholly owned subsidiary of Hudbay Minerals Inc. (Hudbay). HBMS operates the 777 and Trout Lake Mines in Flin Flon, Manitoba, and the Chisel North Mine in Snow Lake, Manitoba. The Trout Lake Mine will close on June 30, 2012. An Advanced Exploration Project is underway on the Reed Property, located in Grass River Provincial Park, Manitoba.

Copper and zinc ore from the 777 Mine and Trout Lake Mine is concentrated in the Flin Flon Metallurgical Complex, while zinc ore from the Chisel North Mine is concentrated at the Stall Lake Concentrator. Zinc concentrates from both Flin Flon and Snow Lake are processed to produce refined zinc in the zinc pressure leach plant (cellhouse and zinc casting plant) located in the Flin Flon Metallurgical Complex. Since closure of the Flin Flon copper smelter in June of 2010, copper concentrate has been shipped out of Manitoba for further processing.

As of 2010, HBMS supported 1,286 direct jobs with an annual payroll of $186.4 million, contributed $6.6 million in municipal taxes and grants, and paid $38.5 million in income, mining and capital taxes in Canada.

1.3 History of Economic Development in the Snow Lake Region

The Snow Lake area has had an active mining history ever since gold was first discovered on the eastern shore of Wekusko Lake in 1913 (Snow Lake, 2011). There have been 37 mining operations within a 50 km radius of the Lalor deposit (Table 1.1). Only the Chisel North and Snow Lake (formerly known as New Britannia) Mines are currently operational.

Table 1.1: Mines and Shafts within 50 km of Snow Lake, Manitoba

Mine Name	Dates of Operation	UTM (NAD83, 14U)	
		Easting	Northing
Ballast-Moosehorn Shaft [N. Manitoba Shaft]	1917-31	449349	6069522
Laguna (Rex) Mine	1918-40	450575	6071394
Laguna Main Shaft	1918-40	450574	6071397
Apex Shaft	1918-55	447992	6075577
Bingo Shaft	1923-32	451293	6071876
Moss 1 (Ferguson Mine)	1927-73	445253	6090396
Ferro-Rainbow Mine	1932-74	454497	6072585
Nemo Shaft	1935	454655	6074673
Jupiter Shaft #2 #3	1938-58	400331	6075692
North Star Shaft	1938-58	400118	6077397
Gold Shower Shaft	1938-58	400369	6078784
Pocahontas Shaft	1945-46	454469	6072371
K.K. Syndicate Shaft	1941-53	449224	6073229
Kiskoba-Kiski Shaft	1941-53	448613	6068137
Snow Lake Mine	1946	433884	6079699

Mine Name	Dates of Operation	UTM (NAD83, 14U)	
		Easting	Northing
Nor-Acme Mine [Howe Sound]	1949-58	434714	6081164
McCafferty Shaft #2	1950	456128	6076371
McCafferty Shaft #1	1950	456051	6076311
Reed Lake Shaft	closed 1961	397468	6051679
Wekusko	closed 1961	450960	6045909
Chisel Lake Service Shaft	1961-87; 1989-94	428200	6076820
Rod #1	1962-64	440855	6079126
Silver Lead Shaft	closed 1963	453578	6087418
Stall Lake Mine	1964-94	439585	6079327
Osborne Lake Shaft	1967-84	453348	6090712
Dickstone Shaft	1970-75	404347	6079673
Anderson Lake Mine	1970-88	436191	6079741
Ghost Lake [Lost Lake]	1971-88	430616	6076535
Spruce Point	1982-92	409341	6048489
Rod #2	1984-95	440215	6076944
Chisel Pit Mine	1988-94	427900	6076850
Chisel North Production Shaft	1989-present	428352	6077865
Photo Lake Mine	1995-98	428457	6082712
New Britannia Mine [former Nor-Acme Mine]	1995-2005	431596	6083497
Winnipeg Jupiter Shaft #3	Unknown	399893	6075508
Gold Rock	Unknown	400584	6078569
Snow Lake Mine [former New Britannia Mine]	2010-present	431596	6083497

Source: Manitoba Innovation, Energy and Mines; Mineral Resources Division, 2012

HBMS started aggressively exploring the area around Snow Lake in 1951. In 1958, HBMS purchased a number of Howe Sound Mining Company support facilities (owners of the Nor-Acme Mine site), including mining infrastructure and a power transmission line. These facilities were used as the Snow Lake Service Centre, which supported HBMS mining and exploration activities in the Snow Lake district.

The Town of Snow Lake developed around the Nor-Acme Mine site and a store, school, curling rink, community hall, residences and a hospital opened in 1947. In two years, another 57 residences, additional stores, a bank, hotel, and café were built. The population reached 654 in 1954. Today there are nearly 70 businesses located in the Snow Lake area. (Snow Lake, 2011)

In 1947, construction began on the Snow Lake mining road from Wekusko and on the Hudson Bay Railway line to the Town of Snow Lake. In 1960, a rail line from Chisel Lake to Optic Lake (65 km west of Chisel Lake) was completed. (Government of Manitoba, 2012) Provincial Road 392, connecting the Town of Snow Lake to Provincial Trunk Highway #10 was paved in 1960 (Snow Lake, 2011).

A rail line connecting Osborne Lake Mine, Stall Lake Mine and Chisel Lake Mine was completed in 1967 (Government of Manitoba, 2012). These rail lines have since been decommissioned and there is currently no rail access to Snow Lake. The nearest active rail access to the Town of Snow Lake is at Wekusko siding, approximately 45 km south-east of the Town of Snow Lake.

In 1973, Manitoba Hydro assumed responsibility for the northern communities of Flin Flon and Snow Lake by acquiring the distribution facilities of the Northern Manitoba Power Company Limited, a subsidiary of HBMS. Another subsidiary of HBMS, the Churchill River Power Company Limited, continued to supply power to the company's mines, mill, and smelter from its Island Falls Generating Station in Saskatchewan (Manitoba Hydro, 2010). SaskPower assumed operation of the generating station in 1985, four years after purchasing it from the Churchill River Power Company Limited (SaskPower, 2012).

Manitoba Hydro services the Lalor AEP and Chisel North Mine area with a transmission line running approximately parallel to Provincial Road 395. Two HBMS-owned substations are located in the area. Electrical power for mining operations in Flin Flon and Snow Lake are supplied from the Manitoba Hydro and Saskatchewan Power Corporation (Flin Flon only) power grids. (HudBay Minerals, 2011; Manitoba Hydro, 2012)

Tolko Industries Ltd. (Manitoba Solid Wood Division, Woodlands), located in The Pas, Manitoba has three Forest Sections in Manitoba (Highrock, Nelson River and Saskatchewan River) where wood is harvested. These Forest Sections include areas surrounding Snow Lake, Flin Flon and Grass River Provincial Park. (Tolko Industries Ltd., 2011)

Wild rice is harvested for commercial purposes from companies based in Cranberry Portage (Naosap Harvest, 2012), Flin Flon (Far North Wild Rice, 2012), and The Pas (Wild Man Ricing Wild Rice, 2012). There is no evidence of commercial harvest of wild rice in the Snow Lake area.

HBMS has played an integral part in Snow Lake's active mining history since the late 1950's by operating nine mines in the area, including Photo Lake, Rod, Chisel Lake, Stall Lake, Osborne Lake, Spruce Point, Ghost Lake, Anderson Lake, and the current operation at Chisel North Mine. **Figure 2** displays a general overview of some of the historic HBMS mine locations relative to the site of the proposed Lalor Mine. The mines at Rod, Osborne Lake, Spruce Point, Ghost Lake, and Anderson Lake have been fully decommissioned, and partial decommissioning has been performed at the Chisel Lake and Stall Lake Mine sites.

The Chisel Lake Mine, located 16 km southwest of Snow Lake, was opened in 1958, and was the first copper-zinc mine in the Snow Lake area. This was followed two years later with the opening of the Stall Lake Mine, located seven km east of Snow Lake, and in 1968, a third mine at Osborne Lake was opened. In 1979, an ore concentrator was commissioned near the Stall Lake Mine, when five mines were in operation near Snow Lake. In 1988, the Chisel Lake Mine site was expanded with the development of an open pit mine. This open pit mine produced extremely high-grade zinc ore, mixed with small quantities of lead, silver, and gold. Ore was taken from the pit by truck and transported to the Stall Lake Concentrator for processing.

The Chisel Open Pit Mine was closed in 1994, and was followed by the opening of the Photo Lake Mine, located approximately three km east of the Chisel Open Pit Mine. The Photo Lake Mine was operational from 1994 to 1998. Between 1998 and 2000, a decline ramp was driven from the bottom of the Photo Lake Mine to the current Chisel North Mine, located just north of the former Chisel Lake Mine. The Chisel North Mine has been operational since 2000 and has a production of approximately 14,515 tonnes (16,000 tons) of zinc per year. Based on current mineable reserves and inferred resources, the Chisel North Mine is expected to be depleted in 2012.

The Stall Lake Concentrator was commissioned in 1979 and operated continuously until shutdown in early 1993, following ore depletion at the Chisel Open Pit Mine and Stall Lake Mine. The concentrator was reopened in 1994 to process ore from the Photo Lake Mine and later to process ore from the Chisel North Mine. The Chisel North Mine and Stall Lake Concentrator suspended operations in 2009, but both facilities resumed operation in early 2010. The Stall Lake Concentrator has two separate crushing/grinding/flotation circuits. One of the circuits is currently being used to mill Chisel North zinc ore at a present rate of 313,000 tonnes per year. The other circuit is being refurbished to handle early copper production from the Lalor Mine. As well, the Anderson Tailings Impoundment Area (TIA) has been operated throughout the decades since 1979.

The history of exploration and mining in Manitoba also has included sites in the Grass River Provincial Park. HBMS operated the Spruce Point Mine on the south shore of Reed Lake from 1981 to 1992 and is currently engaged in advanced exploration at the Reed Property located in the Reed Lake area.

In spite of the mining, rail development and forestry activity in the Snow Lake Region, the area also supports a variety of resource use and recreational activities. Five lodges are located in the Snow Lake region with opportunities for camping, hiking, fishing, hunting, snowmobiling and all terrain vehicle use. The region also supports several registered trap lines, cottages and remote residences.

1.4 History of the Lalor Development

1.4.1 Exploration History

The Lalor Mine site, as shown in **Figure 2,** is located approximately 3 km northwest of the existing Chisel North Mine. The Chisel Basin area is also the host of the Lalor deposit. Hudbay has been performing exploration work within the Lalor/Chisel area for over 57 years. Drilling in the area surrounding Lalor has essentially been continuous from May 1, 1955 to the present time. Overall, within the Lalor/Chisel area a total of 1,500 drill holes have been completed from 1955 to present date. **Figure 3** provides an overview of the exploratory drill holes within 10 km of the Lalor Mine site.

Since the 2007 Lalor deposit discovery, drilling has been continuous with over 216 drill holes and nearly 200,000 meters (m) drilled to date targeted at the Lalor deposit. The initial discovery hole intersected a zinc-rich base metal horizon. Subsequent drilling confirmed the occurrence of several base metal horizons, two of which were very extensive in size. Diamond drilling has been successful in outlining these horizons and delineating to approximately 50 m to 70 m spacing. These base metal horizons are composed primarily of zinc, with lesser amounts of copper, silver, gold and lead, which is very similar to the mineralization encountered at the operating Chisel North Mine.

In the latter part of 2008, exploration drilling encountered a gold-bearing horizon at a much deeper depth than the base metal horizons. Since the initial gold intersection, exploration drilling has been successful in intersecting additional gold-bearing horizons, all at greater depths from surface than the base metal horizons. Some of the gold-bearing horizons are located at depths greater than 1,200 m below the ground surface. Due to the great depths and complex shape of these horizons, exploration drilling from surface was limited in its ability to accurately define the shape and grade distribution. In the fall of 2009, an exploration drill hole intersected a high-grade copper-gold zone located approximately 1,300 m below surface. Following this discovery, there was additional diamond drilling, but exploration by this method was met with limited success. The depths at which the gold-copper zones are encountered results in the deviation of drill holes from the target zones, resulting in difficulty in accurately defining the target zones.

The information about the size and grade of the even deeper copper-gold zone is too limited to qualify it as mineral resource or declare reserves in accordance with regulatory requirements. Further diamond drilling is required from an Exploration Platform located at depth to define the gold and copper-gold zones. This will be accomplished with the Lalor AEP.

1.4.2 Lalor Ramp Project

The mineral leases and claims containing the Lalor deposits are located directly north of the Chisel Mineral Leases, where mining has occurred for decades. One early approach to continued exploration of the Lalor deposits was to create a link from the workings of the Chisel North Mine to the Lalor deposits. The Lalor Ramp Project also may facilitate early production of the zinc resource, as the Chisel North deposit is depleted.

The Lalor Ramp Project was approved on December 3, 2009 as a minor alteration to existing licenses. Nearing completion at this time, the project primarily comprises the underground ramp and three ventilation raises. It relies primarily on continued use of existing surface infrastructure, with construction of some new surface infrastructure. The new construction occurred with minimal disturbance to the environment on properties already associated with the existing Chisel facilities.

Even though the Lalor Ramp is licensed in connection with existing facilities, we include it in this description of the proposed Lalor Mine Development, because, as described in detail in Section 1.5.3, the Lalor Ramp facilities will continue to be required for operation of the Lalor Mine.

1.4.3 Advanced Exploration Project (AEP)

On April 9, 2010, HBMS was granted approval from the Manitoba Mines Branch to conduct advanced exploration for the Lalor Project. The Lalor AEP included the construction of a deep shaft driven vertically from the surface ("the Exploration Shaft"), with supporting infrastructure, to link with the ventilation shafts constructed in the Lalor Ramp Project. The Lalor AEP will provide access for development of an Exploration Platform at the depths required to define the gold and copper/gold zones, while safely providing ventilation for exploration workers. This Exploration Platform will support diamond drilling of the deep gold zone and subsequent exploration drilling of the deeper copper-gold zone.

A maximum 10,000 tonne bulk metallurgical sample will be collected from the gold zone, with the goal of determining whether sufficient gold potential can be upgraded to "reserve," identifying the required infrastructure needed to mine the ore, and assessing the feasibility of investment in the upgrades and further infrastructure that would be required to mine and process the gold.

Key project tasks approved under the Lalor AEP include:

- Upgrading the existing exploration road running 4 km west from Provincial Road 395 to the Lalor AEP site to facilitate the trucking and hauling needs of advanced exploration.
- Constructing the Exploration Shaft and related facilities at the Lalor AEP site.

- Developing an Exploration Platform to allow definition drilling of the gold and copper-gold deposits to permit confirmation of the ore widths, grades and the condition of the footwall and hanging wall in the gold and copper-gold ore zones.

- Extracting a maximum 10,000 tonne ore sample from the gold and copper-gold ore bodies located within the Lalor deposit and testing the extracted ore samples in the Stall Lake Concentrator and/or Flin Flon Metallurgical Complex to determine the recovery percentage of metals from the ore.

Construction of the Lalor AEP infrastructure is currently underway with the Exploration Shaft anticipated to be in operation by mid 2013.

1.5 Regulatory Framework

1.5.1 Mineral Rights

The proposed Lalor Mine Development is supported by the Mineral Claims and Leases shown in the maps attached as **Figure 4** and **Figure 5.** These mineral rights permit use and occupation of the land for the purpose of prospecting, exploring for, developing, mining or production of minerals on, in, or under the land. These claims and leases have been held by the company from as early as 1960.

Applications have been filed to convert each of the Mineral Claims to Mineral Leases and obtain concomitant surface leases.

Five continuous claims held by HBMS encompass most of the Lalor deposit. The five claims, which cover a total area of 765 hectares and are in good standing, are as follows:

Table 1.2: Lalor Mineral Claims

Holder	Disposition No	Disposition Name	Hectares	Recording Date	Year of Expiry
HBMS	CB10605	DUB 10605	195	AUG-20-1979	2020
HBMS	CB10606	DUB 10606	182	AUG-20-1979	2020
HBMS	CB10607	DUB 10607	107	AUG-20-1979	2012
HBMS	CB10608	DUB 10608	100	AUG-20-1979	2020
HBMS	CB5361		181	MAY-9-1977	2012
Total			**765**		

Eight HBMS Mineral Leases encompass the up-plunge extension of the mineralization. The leases, totalling 152 hectares, are as follows:

Table 1.3: Lalor Mineral Leases

Holder	Disposition No	Disposition Name	Hectares	Recording Date	Anniversary Date
HBMS	M 5778	OX NO. 153	16	APR-8-1960	APR-8-2012
HBMS	M 5779	OX NO. 154	18	APR-8-1960	APR-8-2012
HBMS	M 5780	OX NO. 155	18	APR-8-1960	APR-8-2012
HBMS	M 5781	OX NO. 156	20	APR-8-1960	APR-8-2012
HBMS	M 7278	OX NO. 143	22	SEP-6-1960	SEP-6-2012
HBMS	M 7279	OX NO. 144	21	SEP-6-1960	SEP-6-2012
HBMS	M 7280	OX NO. 145	22	SEP-6-1960	SEP-6-2012
HBMS	M 7281	OX NO. 146	15	SEP-6-1960	SEP-6-2012
Total			**152**		

The surface components of the proposed Lalor Mine Development are located within Mineral Claims and Mineral Leases shown in Table 1.4 and on **Figures 5** and **5A**.

Table 1.4: Mineral Claims and Leases Associated with Lalor Mine Surface Components

Mineral Claims	Mineral Leases
CB 10605	M5779
CB 10607	M5780
CB 10608	M5730
CB 5361	M5731
	M7307
	M5732
	M5726
	M7276
	M7266
	M5725
	M5724
	M7309
	M5776
	M7237
	M7236
	M7222
	M7223
	M7212
	M7211
	M7200
	M7345
	M7201
	M7192
	M7199

Copies of the applicable Mineral Claims and Leases are included in **Appendix A**.

1.5.2 Crown Land General Permits

The exploration road constructed to the Lalor AEP site was authorized by General Permit GP59093. HBMS also holds a Quarry Lease for a quarry which was used as a source of roadbed material during the development of the access road. The quarry may continue to be used for other purposes (QL-1928). The quarry is located along the exploration road route between the Chisel North Mine and Lalor AEP site.

Construction of the Lalor AEP infrastructure is being carried out under General Land Permit GP63483. General Land Permit GP63483 was extended to also include the area needed for explosives magazines, with a short access road connecting the magazines to the Lalor access road.

The existing General Permits are as follows:

Table 1.5: Lalor General Permits

Permit Number	Work
GP59093 - General Permit for Lalor access road	All clearing, leveling and construction
QL-1928 Quarry Lease	Extraction of material
GP63483 – General Permit for Lalor AEP site and explosives magazine	All site clearing, leveling and construction

All clearing, leveling and construction activities have been and are being carried out in accordance with these general permits and any specific work permits required from time to time.

Copies of these general permits are included in **Appendix A**.

1.5.3 Related Environmental and Water Rights Licenses

The proposed Lalor Mine Development will be operated in conjunction with existing facilities, such as the Chisel Open Pit, Chisel North Mine, Chisel Pumphouse, Chisel North Water Treatment Plant (WTP), Anderson TIA and Stall Lake Concentrator, which are all approved and operating under existing *Environment Act* or Water Rights licenses, as summarized below.

The Stall Lake Concentrator and Anderson TIA are operated in accordance with *Clean Environment Commission Orders* 765 and 766.

The Lalor Ramp Project is currently under construction in accordance with an application for minor alteration made on November 13, 2009 and approval granted by the Director of the Environmental Assessment and Licensing Branch on December 3, 2009 to *Environment Act* Licenses No. 1919 S2 RR and 1501 RR, which apply to continued operation of the Chisel Open Pit used for waste rock and water storage, Chisel North WTP and Chisel North Mine. HBMS has filed two progress reports, dated July 21, 2010 and February 4, 2011 with Manitoba Conservation, detailing the progress of the Lalor Ramp Project. Copies of each of these documents are included in **Appendix A.**

Water withdrawal from Ghost Lake and Chisel Lake for use at the Chisel North Mine and the Lalor AEP site is authorized under the *License to Use Water for Industrial and Domestic Purposes* 94-18 and *Environment Act* License No. 2648.

Copies of these *Environment Act* and Water Rights licences are included in **Appendix A**.

1.5.4 Sewage and Wastewater Disposal

Sewage generated during operation of the proposed Lalor Mine will be managed on-site in a containerized sewage treatment plant (STP). The Biodisk Portable Wastewater Treatment Plant ("Lalor STP") which is approved for operation in accordance with the *Onsite Wastewater Management System Regulation* and the Director's Approval dated November 29, 2010 will continue in operation at a higher rate of flow than currently is approved pursuant to the *Regulation*. Approval therefore is required pursuant to section 11 of *The Environment Act*. Included in **Appendix B** is a copy of the Director's Approval together with the material submitted in support of the application for this approval. The location of the Lalor STP within the Lalor Mine site is shown on **Figure 6**.

The operation of the Lalor STP will be reviewed on an as needed basis over the life of the mine and, if additional sewage treatment capacity is required, further information will be provided to Manitoba Conservation at that time.

Wastewater generated during construction and operation of the proposed Lalor Mine Development will continue to be managed in the same manner as during construction and operation of the Lalor AEP. It will continue to be piped from the Lalor site to the Chisel Open Pit and Chisel North WTP, which are operated in accordance with *Environment Act* Licenses No. 1501 RR and 1919 S2 RR.

1.5.5 Other Approvals

The Lalor AEP Closure Plan will be updated in accordance with the *Mine Closure Regulation, Manitoba Regulation 67/99*, to account for operation of the proposed Lalor Mine and will be submitted to the Director of Mines for approval, along with any increase/decrease in financial assurance that may be required.

No Federal permits are required or will be sought for the proposed Lalor Mine.

1.6 Planning for Future Developments

It is anticipated that, by the summer of 2012, final planning decisions will have been made in relation to the processing of ore produced from the proposed Lalor Mine and that a proposal will be filed for environmental review and licensing of a new concentrator to be located on the same site as the Lalor Mine. It is anticipated that the new concentrator and associated aboveground tailings lines will be constructed primarily within disturbed areas associated with previously approved developments.

In addition, a further application may be made in the future for expansion of the capacity of the existing Anderson TIA.

2. Lalor Mine Project Description

2.1 Overview

The Lalor Mine will be composed primarily of the facilities, described below, which have been approved and are being constructed for the Lalor AEP and Lalor Ramp projects. These two projects will intersect near the Lalor deposit. The Lalor AEP and Lalor Ramp will have been completed and used for their exploration purposes prior to commencement of the proposed Lalor Mine project. The proposed Lalor Mine will involve conversion of these two existing projects from exploration to production purposes.

This Section 2 identifies the components of the existing Lalor projects that will continue in operation during the life of the Lalor Mine, describes the steps required to convert the approved Lalor projects from exploration to production purposes, sets out the additional (minor) facilities which will be constructed for the purpose of the proposed Lalor Mine, and describes operational practices for the proposed Lalor Mine. **Figure 7** displays a conceptual, chronological overview of the steps in development of the Lalor exploration and mine projects.

The site of the proposed Lalor Mine project lies entirely within the footprint occupied by the Lalor projects, including the Lalor AEP and Lalor Ramp. **Figure 8** displays the plan view of the areas comprising the Lalor AEP and Lalor Ramp projects in relation to each other. **Figure 5** displays the total footprint of the proposed Lalor Mine Development, including the location of the existing Lalor AEP site, together with the components of the Lalor Ramp Project which will continue in operation (the proposed "Lalor Mine Site"). **Figure 5** also shows the boundaries of HBMS' mineral and surface rights, which underlie the proposed development.

This Section 2 also includes a description of other HBMS existing licensed operations which will continue in operation and support operation of the proposed Lalor Mine.

2.2 Previously Approved and Constructed Facilities

2.2.1 Overview of Lalor Ramp

The Lalor Ramp was proposed by HBMS letter to Manitoba Conservation dated November 13, 2009 and approved by the Director of the Environmental Assessment and Licensing Branch by her letter dated December 3, 2009, as a minor alteration to *Environment Act* Licenses 1919 S2 RR and 1501 RR. HBMS has filed two progress reports, dated July 21, 2010 and February 4, 2011, detailing the progress of the Lalor Ramp Project. As shown in **Figure 7,** construction of the Lalor Ramp, including ventilation raises, is in progress, with completion expected in July 2012.

The Lalor Ramp runs from one underground point to another. It extends a distance of 2,828 m, from the existing Chisel North production ramp into the area around the Lalor deposits at a target depth of 835 m below the ground surface. The Lalor Ramp Project commenced with conversion of an existing Chisel North exhaust raise to a downcast raise, to permit the ventilation required for construction of the Lalor Ramp (the "Downcast"). Then, a new exhaust raise was installed that tied into the Lalor Ramp at a depth of 435 m below the ground surface (the "435 m Raise").

Thirdly, an additional exhaust raise (the "Lalor Ramp Ventilation Shaft") is being excavated near the Lalor deposit to a depth of 840 m below the ground surface.

Once the Lalor Ramp Ventilation Shaft is completed and connected to the Exploration Platform, the first phase of the complete ventilation system will be in place with the capability of exhausting 200 m^3/s (425,000 cfm) of air. The headframe and hoist on the top of the Lalor Ramp Ventilation Shaft will remain in place until the Production Shaft is commissioned. The ventilation infrastructure allows up to 1,500 tonne per day hoisting capacity, plus is a second means of egress until the Production Shaft is commissioned. Once the Production Shaft is commissioned, the headframe and hoist will be removed to allow for the installation of two fans to exhaust air permanently from underground.

The components of the Lalor Ramp are shown on **Figure 8** and detailed in the section below. All the surface components of the Lalor Ramp are located on HBMS leases associated with mining of the Chisel deposits as displayed in Table 1.4 and as shown on **Figure 5** and **5A**.

2.2.1.1 Lalor Ramp Surface Components

In summary, the Lalor Ramp Project, though primarily underground, includes the following surface facilities which will be converted and/or continued in use during operation of the proposed Lalor Mine:

- Portable propane tank and fan that provides heat at the (converted) Downcast near the start of the Lalor Ramp.
- Electrical substation (13.6 kV) near the Downcast.
- 435 m Raise.
- Lalor Ramp Ventilation Shaft, equipped with two - 2.61 m diameter fans powered by 938 kW motors to exhaust 425 m^3/s of air.

2.2.1.2 Lalor Ramp Subsurface Components

The following Lalor Ramp subsurface facilities will be operated as part of the proposed Lalor Mine.

- 2,828 m Lalor Ramp.

2.2.2 Overview of Lalor AEP

The Lalor AEP consists mainly of the Exploration Shaft, which is a 985 m deep shaft driven vertically from a surface site in the area adjacent to the Lalor deposits and connecting with the Lalor Ramp at the 835 m level. Use of the shaft will be converted from exploration to production purposes (the main “Production Shaft”) for the proposed Lalor Mine.

HBMS submitted to the Director of Mines the Lalor Zone Advanced Exploration Project Plan and Lalor AEP Closure Plan (“Lalor AEP Closure Plan”), dated March 2010, prepared by AECOM on behalf of HBMS. By letter dated April 9, 2010, the Director of Mines approved the Lalor AEP Closure Plan and accepted financial assurance in the amount of $1.5 million to secure closure in accordance with the Lalor AEP Closure Plan.

The surface components of the Lalor AEP are shown on **Figures 6** and **8** and detailed in the section below.

2.2.2.1 Lalor AEP Surface Components

The Lalor AEP includes the following surface facilities which will be converted and/or continued in use during operation of the proposed Lalor Mine:

- An access road from Provincial Road 395 at the Chisel North Mine to the Lalor AEP site.

- A fresh water pipeline to supply the Lalor AEP site with water obtained from Chisel Lake and/or Ghost Lake. The pipeline is heat traced and installed aboveground with sand mounded overtop to provide protection.

- A discharge water pipeline (for polishing pond discharge and STP treated effluent) installed parallel to the fresh water pipeline. The pipeline is heat traced, and installed aboveground with sand mounded overtop to provide protection.

- An aboveground electrical power line to provide power to the Lalor AEP site and the Lalor Ramp Ventilation Shaft site. A packaged diesel generator provides an emergency site power supply at the Lalor AEP site.

- A Water Treatment Plant Building. Below the floor of the Water Treatment Plant Building are six storage cells. These cells provide storage for treated sewage/mine discharge (two cells), fire/fresh process water (two cells) and domestic use water (two cells). Fresh water from the pipeline is pumped into the two domestic use water cells or the two fire/fresh process water cells intermittently and then distributed by pump across the site and to underground operations. The Water Treatment Plant Building houses a microfiltration water treatment unit that is part of the proposed project as described in Section 2.4.

- Water distribution lines located throughout the AEP site and heat traced as required for domestic use, fire suppression and shaft sinking.

- A containerized STP sized to handle the peak manpower expected on-site during the AEP stage and expandable to meet the treatment requirements during the mine production stage. The STP is located on-site and will be operated under the *On-site Wastewater Management Systems Regulation* pursuant to Director's Approval dated November 29, 2010. The treated STP effluent is pumped to the treated sewage/mine discharge cells beneath the Water Treatment Plant Building and is then pumped via pipeline to a booster station. The booster station pumps the treated sewage/mine discharge via pipeline to the Chisel Open Pit for subsequent further treatment at the Chisel North WTP. This proposal includes an application for licensing of the Lalor STP under *The Environment Act*.

- A concrete storage pad for one 30,000 L self-contained aboveground tank (SCAT) used for diesel fuel storage and distribution.

- A concrete storage pad for housing two 70,000 L propane tanks and gas trains. Propane is used to heat the air used for ventilation and for heating buildings within the site.

- A parking lot constructed from non acid generating (NAG) waste rock. A security gate may be installed on the main access road entrance to restrict access to the parking area.

- A communication tower in the area of the parking lot provides wireless phone services and internet access at the site.

- A pre-engineered steel building used as a surface warehouse and maintenance shop for servicing surface mobile equipment. A bermed concrete pad located outside the surface warehouse is used for storing oil, lubricants and hydraulic fluid.

- An Administration facility and Dry Complex, designed to accommodate ten workers. This will be replaced by a permanent facility as part of the proposed project as described in Section 2.4.

- An electrical substation, located in the vicinity of the main Production Shaft.

- Two - 2.87 m diameter low-pressure horizontal ventilation intake fans, complete with 225 kW motors and propane-fired air heating units located in the vicinity of the main Production Shaft.
- A steel headframe, including a pre-engineered collar house approximately 10 m x 16 m in size with a height of approximately 53 m.
- One waste rock bin and one ore bin. The bins have a live storage capacity of approximately 880 tonnes and 400 tonnes respectively and discharge to highway-style trucks.
- A hoist house consisting of a pre-engineered steel structure, sized to permit the installation of two double-drum hoists (a production (skip) hoist and a service (cage) hoist), and a small single-drum (auxiliary cage) hoist. The hoist house also houses a compressor plant including five compressor units and two – 15,000 L air receivers.
- A mobile aboveground service utilidor to allow compressed air pipelines and electrical/communication lines to be safely routed between the headframe, hoist house and compressor plant.
- A 2,000 m^2 polishing pond consisting of two adjacent geo-synthetic-lined dugouts, with a depth ranging from 1 m to 3 m for the collection and clarification of mine discharge water.
- A booster pump station located adjacent to the intersection of the Lalor Access Road and Provincial Road 395 as shown in **Figure 8**. This booster pump station is used to pump mine discharge and treated sewage (from two cells located beneath the Water Treatment Plant Building) via pipeline to the Chisel Open Pit, a total distance of approximately 8 km. This booster pump station also pumps fresh process water from Chisel Lake or Ghost Lake to the reservoirs cells located beneath the Water Treatment Plant Building.
- Explosive (detonator, powder and emulsion) magazines, a transformer tied into the 25 kV aboveground power line along the Lalor access road, an underground power line and a 628 m long access road were approved as an extension to General Permit GP63483 and were constructed as shown on **Figure 8**. These explosive magazines are owned by independent contractor Dyno Nobel Inc. They may continue in operation during operation of the mine but more likely will be relocated underground.

2.2.2.2 Lalor AEP Subsurface Components

The use of the following Lalor AEP subsurface facilities will be converted to production during operation of the proposed Lalor Mine:

- The Exploration Shaft will become the main Production Shaft for the Lalor Mine. It will connect to the 835 m mine level to complete the ventilation circuit for the Lalor Mine, as displayed in **Figure 9**. The main Production Shaft will extend to an anticipated depth of 985 m. The cage, auxiliary cage, and two 16 tonne skips, installed for the purpose of exploration within the shaft, will continue to be operated for production purposes during the life of the mine.
- The 835 m and/or the 910 m levels will be used as the main haulage routes. The 835 m level will be used as part of the ventilation circuit and as an additional point of egress (by access to the Lalor Ramp).

2.3 Overview of Construction and Operation of Proposed Lalor Mine

Transition from exploration to production will require the following additional infrastructure on the Lalor Mine Site:

- Construction of a permanent Administration and Dry Complex (the “Dry Complex”).

- Operation of a microfiltration water treatment unit within the Water Treatment Plant Building.

The production phase also will entail a significant increase in underground development. It is estimated that approximately 3,500 to 4,500 tonnes per day will be hoisted to the surface from the Production Shaft.

No employee housing will be provided at the Lalor Mine site. Employees will reside in the Town of Snow Lake or surrounding area. The Lalor Mine will be operated seven days per week 24 hours/day.

The Lalor Mine will continue to be supported by existing licensed facilities as shown in **Figures 8, 10** and **11**. Fresh water will continue to be supplied by Chisel Lake and/or Ghost Lake under existing licenses. Sewage will be treated in the on-site Lalor STP and will be pumped along with mine discharge and polishing pond discharge to the Chisel Open Pit for treatment at the Chisel North WTP.

Once in the production stage, waste rock will not be characterized as NAG or potentially acid generating (PAG) waste rock due to the turnaround time associated with this analysis. As a result, all waste rock generated during the production stage will be handled as PAG. The waste rock will be used as mine backfill at the Lalor Mine or Chisel North Mine or hauled to the Chisel Open Pit. No temporary storage of waste rock outside of the waste rock bin will be provided at the Lalor Mine site.

A portion of the ore may be processed at the Flin Flon Metallurgical Complex with tailings resulting from the processing managed in existing licensed facilities, but it is anticipated that most of the ore initially will be processed at the Stall Lake Concentrator. Both the Flin Flon Metallurgical Complex and the Stall Lake Concentrator have sufficient capacity available to handle the ore.

The surface components of the proposed Lalor Mine development are shown in **Figures 5** and **6**.

The process flow diagram for the proposed Lalor Mine is provided in **Figure 10**.

Figure 10 also indicates the existing regulatory approvals for support facilities for the Lalor Mine and outlines the Lalor Mine project components described in this EAP.

Figure 11 provides a spatial overview of the input and output pathways for the planned Lalor Mine.

2.3.1 Mining Methods

Drift and fill, post pillar and longhole mining methods have been determined to be the most appropriate mining methods based on the dimensions and configuration of the Lalor ore lenses. Underground definition diamond drilling will confirm the widths/dips which in turn will determine the mining method best suited.

The ore body will be subdivided into four mining horizons including the 985-910 m level, 910-835 m level, 835-760 m level and 760-685 m level. No mining above the 685 m level is anticipated at this time.

2.3.2 Mine Production Capacity

Preliminary estimates indicate that the accessible areas of the Lalor Zone ore could produce up to 26 million tonnes of ore over a 19 year period (ending in 2031). The mine production grade will be 6.79% zinc, 0.59% copper and 0.15% lead with 1.98 g/tonne gold and 20.99 g/tonne silver. Inferred gold and copper/gold zones exist outside of the resource estimate and will be further defined by underground drilling. These mineralizations represent an opportunity to extend the life of the mine and will require the underground definition drilling conducted as part of advanced exploration to determine their impact on the life of the mine.

2.4 Lalor Mine Surface Components

The Lalor Mine will consist primarily of the components described above in Section 2.2.2 and shown in **Figures 5** and **6**. No additional clearing will be required beyond the 15 ha previously approved for clearing for the Lalor AEP infrastructure. The new Dry Complex and microfiltration water treatment unit will be installed within the footprint of the previously disturbed site. The new Dry Complex will replace the temporary Administration and Dry Complex installed as part of the Lalor AEP. There may be a surface mobile utilidor which connects the office complex to the hoist house/headframe complex.

Dry Complex

The new Dry Complex will be constructed with a design capacity to accommodate 300 people (considering the rotation of crews). Its location within the Lalor Mine site is shown in **Figure 6.** The new Dry Complex will include:

- Dry facilities including individual lockers for clean clothes and hanging baskets for work clothes.
- Showers and washroom facilities.
- Space and facilities for:
    - First aid, safety and training.
    - Mine rescue including a secure area for storage of mine rescue equipment.
    - Mine lamp storage and recharge areas.
    - Laundry facilities.
- Offices for foremen, shift bosses, and site management.
- Lunchroom and conference rooms.
- Offices and work areas for mine management, maintenance management, mine engineering, mine planning, survey, geology, procurement, mine administration and other site office personnel. Open work areas with cubicles will also be utilized where practical.

The new Dry Complex will be equipped with a storage area for mine rescue equipment and first aid equipment. Mine rescue teams will be trained as appropriate with HBMS call out procedures implemented. HBMS has an agreement in place with other mine rescue teams in the area to provide backup as required.

Microfiltration Water Treatment Unit

A new microfiltration water treatment unit was installed within the Water Treatment Plant Building as shown in **Figure 6**. The facility entails microfiltration of the water supplied from Chisel Lake or Ghost Lake to near potable standards for use in showers and for hand washing. This water treatment facility unit has the ability to be upgraded to a nano-filtration unit in the future should it be required. Design drawings for the microfiltration water treatment unit are included in **Appendix C**.

Now that the microfiltration water treatment unit has been installed, fresh water from Chisel Lake or Ghost Lake will no longer be pumped to the cells beneath the floor of the Water Treatment Plant Building but will be pumped to a skid mounted tank within the Water Treatment Plant Building (265 L capacity). Potassium permanganate will be added to the raw water and will be pumped through a strainer to remove large particulates with water subsequently pumped through the system's microfiltration membranes. System filtrate (filtered water) will be chlorinated and stored in the two cells located under the floor of the Water Treatment Plant Building to allow for disinfection contact time and storage of treated water (to continue to meet site demands) during system maintenance (total treated water storage capacity of 219 m^3).

Membrane regeneration will be undertaken on a regular basis and will include an air scrub cycle followed by a flush of feed water or reverse filtration where water will pass back through the membrane. Solids from the strainer and backwash water will be directed to a drain that will discharge to the treated sewage/mine discharge cells located under the Water Treatment Plant Building. Raw water containing acid or caustic used in chemical cleaning of the membrane will be directed to the treated sewage/mine discharge cells located under the Water Treatment Plant Building.

The microfiltration unit will provide a total of 123,000 L of treated water per day (1.4 L/s) with a peak hour demand of 3.4 L/s.

Although the microfiltration unit will provide treatment of water to near potable standards, HBMS will provide bottled water for staff for drinking.

Sewage Treatment Plant

The on-site Lalor STP is a Model BJ-166 rotating biological contactor (RBC) manufactured by Biodisk with a manufacturer recommended average day flow capability of 15,700 L/day (0.18 L/s) for high strength influent (characterized in Table 2.1).

Table 2.1: High Strength Influent Wastewater Characteristics

Constituent	Concentration
BOD_5	500 mg/L
TSS	500 mg/L
Total Phosphorus	12 mg/L
Total Ammonia (as N)	75 mg/L
COD	800 mg/L
Total Nitrogen	75 mg/L

The Lalor STP uses a primary settling tank, denitrification tank, three stage rotating biological contactor, and final clarifier to reduce wastewater constituent concentrations. The Lalor STP has the ability to accommodate wastewater having a low biochemical oxygen demand (BOD) concentration relative to ammonia concentration through the addition of sodium acetate to the denitrification tank as a source of carbon and sodium bicarbonate to the second stage of the RBC for pH adjustment. Chemicals used at the Lalor STP are stored in granular form on a chemical storage skid in the control room area of the STP. A UV disinfection system is used to provide reduction of total and fecal coliforms. The Lalor STP will discharge treated wastewater to the treated sewage/mine discharge cells beneath the Water Treatment Plant Building for pumping via pipeline and booster station to the Chisel Open Pit.

Sludge is removed from the final clarifier using a vacuum truck. Sludge from the Lalor STP will be disposed of at a licensed waste disposal facility.

The design basis for the Lalor STP used published guideline values to estimate the per capita average day wastewater flows at 95 L per capita per day (based on an eight hour shift). Due to water conservation measures proposed for the Lalor Mine, it was assumed that the wastewater at the site would be high strength and similar in quality to the high strength wastewater characterized in Table 2.1. Using the estimated water usage and manufacturer's capacity information, it is estimated that the Lalor STP has the capacity to accommodate the needs of approximately 165 workers. The STP will meet the effluent limits outlined in Table 2.2.

Table 2.2: Proposed STP Effluent Limits

Parameter	Limit	Note
Five-day carbonaceous biochemical oxygen demand ($CBOD_5$)	<25 mg/L	
Fecal coliform content	<200 per 100 mL of sample, indicated by the MPN index	As determined by the monthly geometric mean of three grab samples collected at equal time intervals, once each week
Total coliform content	<1500 per 100 mL of sample, indicated by the MPN index	As determined by the monthly geometric mean of three grab samples collected at equal time intervals, once each week
Total suspended solids	<25 mg/L	
Unionized ammonia	<1.25 mg/L, expressed as nitrogen (N)	At 15°C ±1°C

Note: MPN = Most Probable Number

The Lalor STP has an average day hydraulic capacity of up to 45,000 L/day (0.52 L/s) according to the manufacturer. For average strength influent wastewater (characterized in Table 2.3) and favourable operating conditions, the plant could approach the maximum hydraulic limit and still treat to the anticipated effluent limits in Table 2.2. Once site collected data for influent and effluent parameters are available, it will be possible to evaluate the actual loading and plant capacity for the Lalor STP to be used in determining when modifications to the system would be required to provide sewage treatment for additional workers. It is estimated that up to 1.6 L/s of sanitary sewage (26 USgpm) may be generated when the mine is in full production.

Table 2.3: Average Strength Influent Wastewater Characteristics

Constituent	Concentration
BOD_5	190 mg/L
TSS	210 mg/L
Total Phosphorus	7 mg/L
Total Ammonia (as N)	25 mg/L
COD	430 mg/L
Total Nitrogen	40 mg/L

Source: Wastewater Engineering Treatment and Reuse, Metcalf and Eddy, Fourth Edition (2003) – Table 3-15

The operation of the Lalor STP will be reviewed on an as needed basis over the life of the mine and, when additional sewage treatment capacity is required, further information along with any necessary applications will be provided to Manitoba Conservation at that time. **Appendix B** includes relevant design information for the Lalor STP.

2.5 Lalor Mine Subsurface Components

A conceptual mine schematic is provided in **Figure 12**. Underground development will commence with the components described in Section 2.2.2.2 and will include the following:

- Internal mine ramp development, level development and ventilation raise extensions throughout the mine.

- Installation of five refuge stations/sanitary facilities.
- Construction of a main maintenance shop and satellite maintenance shops.
- Construction of two explosive magazines and two detonator magazines.
- Installation of three main level electrical substations and four portable substations.
- Installation of two fuelling stations with lubricant storage.
- Installation of ore and waste rock handling facilities.
- Installation of water management facilities.

Mine development will be based in part on the underground definition drilling conducted as part of the Lalor AEP and as such the conceptual mine schematic may be refined as more information is gathered regarding the deeper mineralizations.

Drifts and ramps will be developed using drill jumbos, roof bolters, load haul dumps (LHD), and trucks. Charging rounds will be charged with explosives using a scissor lift equipped truck with a 450 kg ammonium nitrate/fuel oil (ANFO) loading pot. If emulsion explosives are required, the truck will be equipped to handle a 1 m^3 emulsion cube. Explosives and detonators will be stored in two designated areas underground. Explosives will be provided in "just-in-time" deliveries. Size of charges will be minimized to the smallest extent possible. Underground mobile equipment consisting of forklifts, scissor lifts, trucks, mancarriers and graders will also be used for development. Support within the mine will include resin bars and plates installed in patterns along the walls and ceilings of openings. Cement grouting will be used in conjunction with cable bolts as required to provide support.

Five refuge stations will be provided underground located at each main level and at the 835 m level maintenance shop. Each refuge station will be equipped with two fire rated bulkheads, lighting, communication, first aid and emergency equipment, air and water lines and potable water (in 19 L containers).

An underground maintenance shop will be constructed near the 835 m level. The shop will include a welding bay, material storage area, lube and fuel bays, refuge station and a wash bay. A satellite maintenance shop will be constructed along the Lalor Ramp near the 835 m level.

Fuels and lubricants will be transported underground via the cage in the Production Shaft in bladders. Two fuel and lubricant stations will be located underground and will be used to store these products. A fire suppression system and fire resistant doors will be provided for each station.

The permanent ore/waste circuit will consist of an ore and waste pass from the 835 m level to the 955 m level near the Production Shaft. A rockbreaker will be installed at the 910 m level. Ore and waste below the 910 m level and above the 835 m level will be hauled by truck to passes near the Production Shaft.

Compressed air will be supplied underground via the compressor plant installed as part of the Lalor AEP. Pipelines will be used to transport compressed air underground down the Production Shaft. Power will be supplied underground via the Production Shaft. Substations will be installed underground as required. Sinks will be provided for hand washing. Chemical toilets will be available at each mine refuge station and at the maintenance shop.

Supplies will be transported underground via the Production Shaft. Personnel will be transported underground via the cage in the Production Shaft. Mancarriers will be used to transport people within the mine to work areas.

Hydrogeological testing of the Lalor Zone was conducted in 2009, which resulted in a calculation of bulk hydraulic conductivity of 8.3×10^{-10} m/s (Golder Associates Ltd., 2009). HBMS therefore has provided for design capacity of pumps and pipelines to take account of a maximum potential groundwater inflow of 37 L/s (585 USgpm) in total for the mine. However, based on HBMS experience in the construction of the Lalor AEP and the Lalor Ramp and also based on HBMS experience in the region, it is anticipated that groundwater seepage into the mine will be much less than the design inflow rate.

The mine dewatering system will consist of sump pits equipped with submersible pumps that will pump to settling cones. Liquid from the settling cones will discharge to a dewatering station at the 955 m level which will pump to surface. Mine water pumped to the surface will be discharged directly to the treated sewage/mine discharge cells located beneath the Water Treatment Plant Building. Solids from the settling cones will be settled with the aid of a flocculent, drawn off as slimes, and filtered in a storage/agitator tank. Filter cake will be deposited in the ore circuit for processing. The liquid from the filter cake will be diverted to the sump pit on the 955 m level.

Water from the sewage/mine discharge cells is pumped to the Chisel Open Pit for subsequent treatment at the Chisel North WTP as shown in **Figures 10** and **11**.

Once the mine dewatering system is in place, the polishing pond will no longer be required however it will be maintained on-site. The polishing pond will be maintained to provide water storage for emergency fire fighting purposes, to provide surge capacity in the event that water pumped from underground cannot be accommodated at the discharge cells and may be used for the future Lalor Concentrator as a source of process water.

2.6 Communications System

The Lalor Mine will use the leaky feeder radio communication system installed as part of the Lalor AEP for communication around the site and from surface to underground. The communications tower to be installed as part of the Lalor AEP will provide wireless phone services and internet access for the Lalor Mine.

2.7 Emergency Warning System

An underground emergency warning system was installed as part of the AEP and includes a system for injecting ethyl mercaptan (stench gas) into the ventilation intake. This system will continue to be used for the Lalor Mine. An emergency response plan will be prepared by HBMS and submitted to the mines inspection branch.

2.8 Project Inputs

2.8.1 Fresh Water

Potable water will be delivered for on-site use in containers. Fresh water will be supplied to the Lalor Mine site via the existing fresh water pipelines from existing licensed facilities (Chisel Lake and Ghost Lake) installed along the site access road approved under the Lalor AEP as shown in **Figures 5, 10** and **11**. It is estimated that up to 14 L/s (222 USgpm) or 441.5 dam^3/year of fresh water will be required at the Lalor Mine for use in surface facilities (showers, washrooms etc.) and for use in underground equipment.

It is estimated that, on average, 12 L/s (196 USgpm) of fresh water will be required for drills and washing the rock face. The water required for drills and washing the rock face is included in the total anticipated water demand of 14 L/s (222 USgpm).

2.8.2 Fresh Air

During production, the ventilation circuit will include the Production Shaft, the Lalor Ramp and the ventilation raises. An estimated 425 m^3/s of fresh air will be required in the mine during steady state production. Fresh air will be forced down the Production Shaft at a rate of 307 m^3/s. The Lalor Ramp will provide 118 m^3/s of fresh air. The Lalor Mine ventilation circuit conceptual overview is provided in **Figure 9**.

The ventilation requirements will be met using infrastructure developed as part of the Lalor Ramp and Lalor AEP and no additional ventilation construction will be required. As mine development progresses, regular adjustment of the internal air distribution system will be required as new areas are accessed and mined areas are backfilled.

2.8.3 Power

Electrical power will be supplied to the Lalor Mine site via the power lines installed as part of the Lalor AEP.

2.8.4 Employees

It is estimated that on average up to 280 employees will be working on-site during any one time over a 24 hour period. A maximum of up to 350 employees could be expected to access the site per day and includes suppliers, ore truck haulers, site visitors etc. A bus service will be provided by HBMS. Shifts will be divided into a Day Shift and Night Shift.

2.8.5 Raw Materials

Raw materials used at the Lalor Mine will include diesel fuel, propane, rebar, pipe, screen, rockbolts, explosives and other operating supplies. Raw materials will be delivered on a regular basis to the Lalor Mine site via truck.

2.9 Project Outputs

2.9.1 Discharge Water

The on-site STP can treat up to 0.52 L/s (8.2 USgpm) of sanitary sewage. At full production in 2014, the STP will require expansion to treat the 1.6 L/s of sanitary sewage (26 USpgm) that will be generated. At some time prior to expansion, details on the expansion will be provided to Manitoba Conservation for review. The on-site STP will discharge treated sewage to the treated sewage/mine discharge cells beneath the Water Treatment Plant Building for transfer to the Chisel Open Pit as shown in **Figure 10**. In the event that peak sewage flows exceed the hydraulic capacity of the STP, the overflow will be routed to a buffer tank which will discharge to the STP once peak flows have subsided. Sludge from the STP will be disposed of at a licensed waste disposal facility.

The polishing pond will receive water from underground (process water and groundwater seepage) only during the Lalor AEP stage. Once in the mine production stage, process water and groundwater seepage will be directed to the treated sanitary sewage/mine discharge cells as described previously and will not be discharged to the polishing pond.

It is estimated that up to 49 L/s (783 USgpm) of process water, groundwater inflow and precipitation from the polishing pond will be pumped from the Lalor Mine to the Chisel Open Pit for treatment at the Chisel North WTP as shown in **Figure 10**.

2.9.2 Exhaust Air

The Lalor Mine Ventilation Shaft will exhaust 425 m^3/s of air from the mine. The Lalor Mine ventilation circuit conceptual overview is provided in **Figure 9**.

2.9.3 Solid Waste and Hazardous Materials Management

Garbage collection bins will be maintained at surface at specific locations throughout the Lalor Mine site. Bins will be emptied on a regular basis with materials removed for disposal at a licensed waste disposal facility or other permitted disposal site.

Hazardous materials including waste oil, lubricants, and other petroleum products will be removed by a licensed hazardous material handler for recycling or approved disposal. Waste oils and other hazardous materials will be returned to the surface using fuel drums or other containers specifically designed for this purpose.

2.9.4 Ore Management

The Lalor deposit is a multi lens deposit with 29.4M tonnes of mineral resources ranging in confidence from indicated to inferred. From these resources, and mineral reserves have been estimated at 14.4M tonnes within the probable category. The resources and reserves are as of March 2012.

The Lalor Mine will operate at an approximate rate of 3,500 to 4,500 tonnes ore per day. The Lalor ore will be initially processed at the licensed Stall Lake Concentrator as shown in **Figures 10** and **11**.

It is anticipated that, by the summer of 2012, final planning decisions will have been made in relation to the processing of ore produced from the proposed Lalor Mine and that a proposal will be filed for environmental review and licensing of a new Lalor Concentrator to be located on the same site as the Lalor Mine. It is anticipated that such new concentrator and associated aboveground tailings lines will be constructed primarily within disturbed areas associated with previously approved developments.

2.9.5 Waste Rock Management

Management principles applied successfully during the Lalor AEP and Lalor Ramp will be continued during operation of the proposed Lalor Mine. With the exception of the waste rock bin, no temporary storage of waste rock will be provided at the Lalor Mine. Preferentially, waste rock will remain underground to be used within the Lalor Mine. Any waste rock brought to the surface will be treated as if it were PAG rock and hauled to the Chisel Open Pit for disposal.

Backfill requirements for the mine are anticipated to be approximately 6.4 million tonnes of rockfill, assuming 100% of the voids are filled. Unconsolidated backfill will be used in the pre-production stage (2012-2014) until such time a paste fill backfill process is commissioned at the Lalor Concentrator.

When a backfill deficiency is encountered, the shortage will be made up by taking material from the Chisel Open Pit and returning it underground.

2.9.6 Traffic

Traffic volumes will vary as the project ramps up to production. Employee buses, delivery vehicles, waste rock and ore trucks will all access the site on a daily basis. Table 2.4 provides an estimate of the number of vehicles accessing the site in 2013, once construction of the Dry Complex commences, and in 2014 during mine operation. These traffic projections assume that ore will be hauled to the Stall Lake Concentrator. Once the Lalor Concentrator is constructed, truck traffic will be reduced as ore will no longer be hauled to the Stall Lake Concentrator.

Table 2.4: Estimated Lalor Mine Daily Traffic Volumes

Traffic Source	2013			2014			
	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter
Trucks - haul waste rock to Chisel Open Pit	50	30	30	30	50	75	75
Trucks – site deliveries	5	5	5	7	7	7	8
Trucks – concrete	16	15	0	2	2	2	0
Cars, pick-up trucks	40	40	25	25	50	50	50
Employee shuttle bus	1	1	1	2	2	2	2
Trucks – ore transport to Stall Lake Concentrator	24	24	24	24	24	24	0
TOTAL one way trips per day	136	115	85	90	135	160	135

As shown in the table, the peak traffic is anticipated in the 3rd quarter of 2014, during mine operation with ore hauled to the Stall Lake Concentrator. For the purposes of this assessment, the peak traffic volumes have been used to assess potential traffic effects.

2.10 Support Facilities

The Lalor Ramp, Lalor AEP and the proposed Lalor Mine will be supported by existing licensed facilities as described in the following sections. The locations of the existing licensed facilities are shown in **Figure 8**. The licenses for the existing facilities are shown in **Figure 10**.

2.10.1 Chisel Lake and Ghost Lake Pump Houses

Fresh water to be used at the AEP site/Lalor Mine will be supplied by Chisel Lake and/or Ghost Lake. The Chisel Lake pump house is operated under *Environment Act* License No. 2648. Under this license, HBMS is permitted to withdraw 600 dam^3/year of water from Chisel Lake.

The Ghost Lake pump house is operated under the existing *License to Use Water for Industrial and Domestic Purposes* 94-18. Under this license, HBMS is permitted to withdraw 1,600 dam^3/year of water from Ghost Lake at a rate not exceeding 20 L/s.

2.10.2 Chisel North Water Treatment Plant

2.10.2.1 Chisel Open Pit

Waste rock from the Lalor Mine and discharge water from the Lalor Mine will be managed in the Chisel Open Pit. The Chisel Lake Mine was opened in 1958 and was the first copper and zinc mine in the Snow Lake area. In 1988, the Chisel Lake Mine site was expanded with the development of an open pit mine, the Chisel Open Pit. The Chisel Open Pit produced extremely high grade zinc ore, mixed with small quantities of lead, silver and gold. Within two years of operating, the pit had reached a depth of nearly 76 m. Mining of the Chisel Open Pit was terminated in 1994. The location of the Chisel Open Pit is shown in **Figure 8**.

During active mining, groundwater seepage, rainfall and surface runoff were continuously removed from the pit. When mining and dewatering stopped, water from these sources gradually accumulated in the inactive pit resulting in the formation of a pit lake. Currently mine discharge from the Chisel North Mine is directed to the Chisel Open Pit. Water in the Chisel Open Pit is directed to the Chisel North WTP for treatment prior to release to the environment.

Following the termination of mining, it was estimated that the Chisel Open Pit had a storage capacity of 4,390,000 m^3. HBMS has used the Chisel Open Pit to store waste rock from several mining operations in the Snow Lake area. HBMS will undertake a bathymetric survey of the pit in 2012 to confirm the capacity remaining in the pit. It is anticipated that sufficient capacity exists within the pit to manage the excess waste rock from the Lalor Mine over the life of the project.

2.10.2.2 Original Water Treatment Plant

The original WTP located to the east of the Chisel Open Pit was built in 1984. A small overflow pond and reservoir are located between the Chisel Open Pit and the WTP. The plant was originally designed to treat process water from the former Chisel Lake Mine and had a water treatment capacity of 25 L/s (400 USgpm). Upon closure of the Chisel Lake Mine, the WTP was used to treat process water from the Chisel North Mine, Chisel Open Pit, surface water runoff and groundwater.

In the years leading up to 2006, the WTP was found to be unable to keep up with inflows from the Chisel North Mine, the Chisel Open Pit and surface runoff into the Chisel Open Pit. As a result, the water level in the Chisel Open Pit was slowly rising. In order to prevent overflow of the Chisel Open Pit, it was concluded that the optimal solution for maintaining and potentially reducing water levels in the Chisel Open Pit was to commission a new WTP in conjunction with improved water management practices. The original WTP remains on-site, but it is no longer in use.

2.10.2.3 Upgraded Chisel North Water Treatment Plant

In 2008, HBMS commissioned a new 126 L/s (2,000 USgpm) WTP adjacent to the original WTP. The upgraded WTP treats discharge from the Chisel North Mine and natural water inflows to Chisel Open Pit and is currently being operated at an average rate of 63 L/s (1,000 USgpm) and a peak rate of 101 L/s (1,600 USgpm). The WTP draws water from the Chisel Open Pit and discharges treated water into a ditch which drains into Woosey Creek and Morgan Lake. Sludge from the WTP is pumped underground to the former Chisel Lake Mine workings for disposal. The WTP reduces elevated suspended and dissolved metals and adjusts pH of the wastewater. The upgraded WTP is operated under *Environment Act* License 1501 RR and the effluent from the Chisel North WTP is treated to meet the requirements of the Federal *Metal Mining Effluent Regulations* (MMER).

2.10.3 Stall Lake Concentrator

The Stall Lake Concentrator was commissioned in 1979 and operated continuously until shutdown in early 1993, following ore depletion at the Chisel Open Pit and Stall Lake Mines. The concentrator was reopened in 1994 to process ore from the Photo Lake Mine and later to process ore from the Chisel North Mine. The Chisel North Mine and Stall Lake Concentrator suspended operations in 2009, but both facilities resumed operation in early 2010.

The Stall Lake Concentrator consists of two circuits: a 1,200 tonne per day zinc circuit used for ore from the Chisel North Mine and a 2,500 tonne per day copper circuit that was decommissioned in 1994 but is currently being refurbished. The concentrator was originally designed to produce concentrates from ores containing copper, lead and zinc. Today the concentrator produces only zinc concentrate, which is then trucked to the Flin Flon Metallurgical Complex but refurbishing of the copper circuit at the Stall Lake Concentrator will allow for copper and zinc concentrate production. Tailings and process water from the concentrator are pumped to the Anderson TIA. Water from the Anderson TIA is recycled for use at the concentrator. The Stall Lake Concentrator operates under *Clean Environment Commission Order* 765.

In the early production stages, ore from the Lalor Mine will be processed at the Stall Lake Concentrator, with the exception of sample amounts which are expected to be processed at the Flin Flon Metallurgical Complex for design purposes in planning for the Lalor Concentrator. It is anticipated that, by the summer of 2012, final planning decisions will have been made in relation to the processing of ore produced from the proposed Lalor Mine and that a proposal will be filed for environmental review and licensing of a new Lalor Concentrator to be located on the same site as the Lalor Mine.

2.10.4 Anderson Tailings Impoundment Area

The Anderson TIA is used to manage tailings generated at the Stall Lake Concentrator. Since commissioning of the Stall Lake Concentrator in 1979, tailings and concentrator process water have been pumped via a buried pipeline to the TIA. Effluent from the Anderson TIA is discharged to Anderson Creek via the regulated final discharge point in accordance with *Clean Environment Commission Order* 766 and the requirements of the Federal MMER. The Anderson TIA also supplies approximately 70% of the process water used in the Stall Lake Concentrator.

A survey of the Anderson TIA in 2009 indicated capacity is available for the storage of tailings from the Chisel North Mine and Lalor Mine until approximately 2017 (BGC Engineering Inc., 2012). Before 2017, HBMS will need to examine options for tailings management including the construction of new dams for the TIA. Any changes to the Anderson TIA or tailings management are expected to be subject to a subsequent *Environment Act* licensing process, once sufficient project information has been developed.

2.11 Project Schedule

Construction of infrastructure approved under the Lalor Ramp and the Lalor AEP is currently underway. The following summarizes key development milestones for the planned Lalor Mine. A project schedule is provided in **Figure 13**. **Figure 7** displays a conceptual, chronological overview of the steps in development of the Lalor exploration and mine projects.

<u>*2012*</u>

- Construction of support surface infrastructure at the AEP site.
- Begin to advance the Exploration Shaft/future Lalor Mine Production Shaft in March 2012.
- Lalor Ventilation Shaft to reach 835 m level by July 2012.
- Advance 835 m level from Lalor Ramp towards Exploration Shaft.
- Waste and limited ore production up Lalor Ramp/Lalor Ramp Ventilation Shaft at a rate of 1,000 to 1,500 tonnes per day.

<u>*2013*</u>

- Exploration Shaft/Lalor Mine Production Shaft completed to the 985 m level.
- Diamond drilling from the current planned workings as warranted.

2014-2015

- Off shaft infrastructure installations – ventilation raises, ore/pass raises, conveyors, sumps, etc.
- Commissioning of the Production Shaft.
- Continuing internal ramps and lateral development on various levels in order to establish sustaining production.
- Production from zinc and gold zones.
- Exploration platform development for the copper/gold zone and gold zones.

2015-2031

- Underground diamond drilling of copper/gold zone and gold zones
- Production mining.
- Steady state production of 3,500 to 4,500 tonnes per day.

2.12 Closure Plan

The Lalor AEP Closure Plan will be updated for the planned Lalor Mine following the procedures outlined in the Manitoba *Mine Closure Regulation 67/99.* HBMS will submit the updated closure plan when it is available. HBMS has successfully completed reclamation on many mining operations across Canada with several of these sites located in the Snow Lake region.

2.12.1 Site Decommissioning

The decommissioning of the Lalor Mine will be conducted in accordance with the updated Closure Plan and will generally consist of:

- Removal of all buildings and foundations.
- Removal and appropriate disposal of any stockpiled NAG and PAG rock.
- Removal and appropriate disposal of miscellaneous infrastructure such as power lines, generators, transformers, pipelines, pumps, water storage tanks etc.
- Removal and appropriate disposal of site refuse.
- Scarifying the access road.
- Removal of surface and underground mining equipment.
- Removal of all fuel storage tanks.
- Testing, removal and/or remediation of any contaminated soils.
- Full decommissioning of all underground operations, including disposal of waste rock in the underground workings and capping of all shafts and raises.
- Re-grading and contouring of stockpile pads (if any exist), polishing pond, site roads and parking area.
- Re-vegetation of disturbed areas in order to restore the landscapes as much as possible to their native appearance.

2.12.2 End-Use

Following the decommissioning of the Lalor Mine site, the site will be returned to the greatest extent possible to its natural state. It is anticipated that the end-use of the Lalor Mine site will be a natural space with no planned residential, commercial or industrial development at the site.

Based on HBMS closure experience in the Snow Lake region, the growth of grasses and mosses is apparent within the first few years following closure, whereas trees and shrubs take longer to establish through natural succession and may be evident within a five to ten year period following closure.

2.13 Funding

Funding for the proposed project will be provided solely by HBMS.

3. Scope of the Assessment

To assess the potential environmental effects of the project, clearly defined temporal and geographic boundaries were utilized as presented in the following sections.

3.1 Temporal Boundaries

The temporal boundaries of the assessment were divided into the following phases:

- Construction Phase – limited surface infrastructure to be installed at the Lalor Mine site in 2013.
- Operation Phase – production mining from 2013 to 2031.
- Closure Phase – anticipated to occur from 2031 into the future.

3.2 Geographic Boundaries

The following are the spatial boundaries defined for this report. However, where specifically noted, these boundaries are adjusted to suit the Environmental Component (EC) affected.

- The **Project Site** is composed of the area that is likely to be directly disturbed by project activities, including the Lalor Mine Development as shown in **Figure 5,** as well as Provincial Road 395 from the Lalor Mine access road to the intersection with Provincial Road 392, Provincial Road 395 from the Lalor Mine access road to the Chisel Open Pit and Provincial Road 392 from the intersection with Provincial Road 395 to the Stall Lake Concentrator.
- The **Project Area** includes the area, up to 2,000 m beyond the Project Site, which possibly could be disturbed by project effects. This includes effects due to noise, vehicle emissions, traffic, etc.
- The **Project Region** includes the area up to 10 km beyond the Project Site which possibly could be disturbed by project effects. Effects that may be seen outside of the Project Area may include items, such as increased traffic and aesthetic effects.

The Project Site, Project Area and Project Region are shown in **Figures 14** and **15**.

The Project Region is located within a broader environmental setting described in Section 4. The terrestrial setting is comprised of:

- **Reed Lake Ecodistrict**, located within the
- **Churchill River Upland Ecoregion,** located within the
- **Boreal Shield Ecozone**

Figure 16 shows the location of the Reed Lake Ecodistrict, Churchill River Upland Ecoregion and Boreal Shield Ecozone.

The Project Region is located within the **Grass River sub basin** of the **Nelson River watershed** as shown in **Figure 17.**

3.3 Environmental and Social Components

This EAP report considers changes to the environment caused by the project, as well as any resultant effects on the socio-economic environment. Environmental Components (ECs) and Social Components (SC) were selected following the guidance provided in Manitoba Conservation's Information Bulletin, "*Environment Act Proposal Report Guidelines*". SCs include components of the socio-economic environment that may be affected by a change in the environment caused by the project.

The potential interaction between project components and ECs and SCs are identified in **Table 3.1**. Potential interactions were identified based on the professional judgement of the assessor combined with assumed implementation of standard environmentally responsible construction techniques and operating procedures in the course of the project construction, operation and closure. The potential interactions identified in Table 3.1 are assessed in Section 5. Mitigation measures and residual effects are also described in Section 5.

Table 3.1. Identification of Potential EC/SC Interactions with Project

	Environmental Components										Social Components[2]			
	Topography	Soil	Air	Climate	Groundwater	Surface Water	Flora	Fauna	Aquatic Resources	Protected Species	Protected Areas	Resource Use	Heritage Resources	Aesthetics
Construction Phase														
Construction at Lalor Mine site (Dry Complex and microfiltration water treatment unit within Water Treament Plant Building)			X	X			X	X		X		X		
Operation Phase														
Underground Development (including fresh water and wastewater supply/management and below ground and above ground ore management)		X	X	X	X	X	X	X	X	X		X		
Waste Rock Management			X	X			X	X		X		X		
Closure Phase														
Closure Activities (building removal, contouring, revegetation, remediation of hydrocarbon impacts, etc.)	X	X	X	X	X	X	X	X	X	X		X		
Accidents and Malfunctions														
Spills		X	X		X	X	X		X			X		
Fire/Explosions		X	X		X	X	X	X	X	X		X		X
Transportation Accidents		X	X		X	X	X	X	X	X		X		
Polishing Pond/Discharge Cells/Pipeline Leaks, Overflows, or Failures		X			X	X	X	X	X	X		X		
Power Failure					X									

Notes

1. x = identified potential interaction

2. only indirect interactions with SCs as a result of a direct potential project/EC interaction were considered

4. Environmental Setting

This section describes the environmental setting of the proposed Lalor Mine and introduces the Environmental Components (ECs) that have the potential to interact with the proposed Lalor Mine.

4.1 Environmental Baseline Studies

In 2007, baseline terrestrial and aquatic investigations were commenced in anticipation that discoveries in the Lalor Zone could lead to future development. The investigations dealt broadly with the scope of aquatic and terrestrial resources that could be affected by future development, including a review of local geology, soil, vegetation and wildlife, and 12 waterbodies that were initially identified as being located within the potential area of influence of the Lalor discovery.

As planning of the Lalor AEP and Lalor Mine proceeded in subsequent years, additional focused investigations were undertaken, including a small waterbody identified by AECOM as Tern Ditch Pond. The baseline investigations carried out in 2007, 2008, 2010 and 2011 are reported on in the *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012). This baseline report is the primary source for the information summarized in this Section 4.

4.2 Physical Environment

The physiographic setting for the proposed Lalor Mine is defined using the ecological land classification system. This hierarchical system of ecozones, ecoregions, and ecodistricts represents subdivisions of increasing ecological detail. The proposed Lalor Mine is located within the:

- **Boreal Shield Ecozone**, which contains the
- **Churchill River Upland Ecoregion**, which contains the
- **Reed Lake Ecodistrict**

The Boreal Shield Ecozone, the largest ecozone in Canada, extends from northern Saskatchewan east to Newfoundland, north and east of Lake Winnipeg and finally north of the Great Lakes and St. Lawrence River. The Churchill River Upland Ecoregion extends from the sparsely forested regions to the north, the southern edge of the Precambrian Shield to the south, and extends westward from the Grass River to the Saskatchewan border. The Reed Lake Ecodistrict extends west from Wekusko Lake to just over the Saskatchewan border as shown in **Figure 16**.

4.3 Topography

The elevations in the Reed Lake Ecodistrict range from approximately 255 metres above sea level (masl) to 335 masl. Slope lengths in the ecodistrict range from approximately less than 50 m to more than 150 m in length. Rocky cliffs can rise from 35 m to 40 m above the lakes and peat-filled depressions. (Smith, *et al.*, 1998)

The Project Region is characterized by broken, hilly to rolling bedrock, which controls relief of the area. The bedrock is partially covered by unconsolidated mineral and organic materials. Areas to the east of Lalor Lake contain extensive lacustrine deposits, while the remainder contains a mixture of lacustrine sediments, till deposits and peatlands.

Elevations within the region of the proposed Lalor Mine site vary from more than 312 masl for the highest bedrock outcrops to the west to approximately 256 masl near Wekusko Lake, located to the east (Department of Energy, Mines and Resources, 1985 and 1995).

4.4 Geology

The Project Region is part of the Flin Flon Belt (FFB). According to the Manitoba Geological Survey, the FFB is in the juvenile internal zone of the Trans-Hudson Orogen and consists of Paleoproterozoic volcanic, plutonic and minor sedimentary rocks. According to Manitoba's Mineral Resources Geological Survey, *"the Flin Flon greenstone belt extends hundreds of kilometres to the south-southwest beneath a thin, geophysically transparent Phanerozoic cover. To the north the FFB is tectonically overthrust by younger metasedimentary rocks of the Kisseynew domain and by nappes of metavolcanic rocks that are the same age as those in the FFB."* (Government of Manitoba, 2011)

The tectonostratigraphic architecture of the FFB is of vital economic significance. The FFB is one of the largest Proterozoic volcanic-hosted massive sulphide (VMS) districts in the world, containing 27 copper – zinc (gold) deposits. Of these deposits, more than 162 million tonnes of sulphide have already been mined. (Government of Manitoba, 2011)

The Snow Lake arc assemblage that hosts the Lalor deposit is a 20 km wide by 6 km thick section that records the transition from primitive to mature arc. The mature arc Chisel Sequence that hosts the Lalor deposit typically contains thin and discontinuous volcanoclastic deposits and intermediate to felsic flow-dome complexes. Rock units in the hanging walls of the deposit typically include mafic and felsic volcanic and volcanoclastic units, mafic wacke, fragmental and crystal tuff units. The footwall rocks have extensive hydrothermal alteration and metamorphic recrystalization which has produced exotic aluminous mineral assemblages including; chloritic and seracitic schist; and cordierite-anthophylite gneisses. (Bailes and Galley, 2007)

4.5 Soil

As noted above, the Reed Lake Ecodistrict extends west from Wekusko Lake to just over the Saskatchewan border. Acidic granitoid bedrock in the form of sloping uplands and lowlands can be found in this ecodistrict. Bedrock areas are subdominant and widely distributed areas of permafrost can occur in peatlands.

Dystric Brunisols are the dominant soils in the ecodistrict. These soils have developed over glacial till overlying bedrock and consist of shallow, sandy and stoney veneers. Peat-filled depressions with very poorly drained Typic and Terric Fibrisolic and Mesisolic Organic soils can be found throughout the ecodistrict. These soils are overly loamy to clayey glaciolacustrine sediments. Eutric Brunisols and Gray Luvisols can be found on sandy bars, beaches, and exposed clayey deposits. (Smith, *et al.*, 1998)

4.6 Air

Specific measurements of air quality in the Project Region are not available. However, air quality in this area is considered very good compared with larger cities and commercial and industrial areas found in other parts of Manitoba. There are no industrial operations with significant releases to the atmosphere within 10 km of the proposed Lalor Mine site, and the closest significant industrial activity is in the City of Flin Flon and the Town of The Pas, located approximately 109 km and 135 km west of the proposed Lalor Mine site, respectively. Occasional regional impediments to air quality, although uncommon, may occur in the Project Region. This could include smoke from forest fires and wood-burning stoves, emissions from fuel storage tanks and vehicle emissions.

4.6.1 Noise

A baseline noise assessment was undertaken by AECOM between July 12-14, 2011. Noise baseline data was collected at two Points of Reception (POR) within the Town of Snow Lake. The measured background levels were determined to be typical of a suburban area where the dominant sources of ambient noise and vibration are vehicular traffic. The equivalent day/night sound levels were calculated to be 53 dBA at POR 1 and 49 dBA at POR 2. Average root mean square vibration velocities ranged from 0.045 to 0.426 mm/s at POR 1 and POR 2 over a 24 hour period.

4.7 Climate

The weather station nearest to the Project Site is located at the Flin Flon airport near Baker's Narrows, approximately 100 km west of the Project Site. The Flin Flon airport is located at an elevation of 304 masl and in our opinion is considered to be climatically representative of the Project Site. The mean annual air temperature at the Flin Flon airport is -0.2°C. The daily mean temperature ranges between 18°C in July and -21°C in January. Total annual precipitation at the Flin Flon airport is composed of 339 mm of rain and 141 cm of snow. July has the highest average rainfall (77 mm), whereas November and December have the highest average snowfall (25 cm and 24 cm, respectively). (Environment Canada, 2012)

The average temperature, precipitation and wind conditions measured at the Flin Flon airport each month are provided in Table 4.1.

Table 4.1: Climate Data for the Flin Flon A Meterological Station (1971-2000)

Latitude 54° 41' N Longitude 101° 41' W Elevation 303.90 m

	Month													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**	**Code**
Temperature (°C)														
Daily Average	-21.4	-16.7	-9.3	0.7	8.8	14.9	17.8	16.6	9.8	2.7	-8.4	-18.4	-0.2	A
Extreme Maximum	9.5	10	15	27	32.5	**35**	35	33.9	30	24	17.5	8.3		
Extreme Minimum	-44.5	-45.6	-41	-31	-13	-2	4.4	-1.5	-6.7	-16.5	-35	-44		
Precipitation														
Rainfall (mm)	0.1	0.3	0.9	8.6	36.9	66.6	76.5	66.6	55.3	25.6	1.4	0.4	339.2	A
Snowfall (cm)	19.6	14.6	19.1	20	3.7	0	0	0	2	13	25.4	23.9	141.3	A
Wind Conditions (km/h)														
Speed	9.4	9.7	10	10.9	11.1	11.2	10.9	10.7	12.1	12.2	11.1	9.3	10.7	A
Most Frequent Direction	NW	NW	S	S	NE	S	NW	S	NW	NW	NW	NW	NW	A

Notes:

Data obtained from Environment Canada Flin Flon A meteorological station (2012)

"A": World Meteorological Organization (WMO) "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation) between 1971 and 2000.

4.8 Groundwater

There is no comprehensive report describing the regional groundwater flow system. However, based on conditions in similar environments, the regional shallow groundwater flow, in particular in the overburden, is likely controlled by the topography and bedrock surface in the region. Recharge of shallow groundwater can be expected to occur in elevated areas. From there, shallow groundwater flow will generally follow the topography and drain to the low-lying areas where it will discharge to surface waterbodies and wetlands. Shallow groundwater tables are high in most peat lands and in low areas bordering the peat lands. Shallow groundwater levels in the area are generally at or near surface in the spring and early summer and drop as the year progresses. Locally, the topography of the buried bedrock surface can have a significant effect on groundwater flow direction. Bedrock groundwater wells, when present, are likely connected to fractures or discontinuities that are connected to the local water table and are not likely regionally interconnected.

The Manitoba Water Stewardship water well records indicate little groundwater utilization near the Project Site. There are no registered groundwater wells in use within a distance of at least 5 km from the Lalor AEP site.

Hydrogeological testing of the bedrock in the vicinity of the Lalor deposit determined the bulk hydraulic conductivity of the fractured rock to be within the upper range for unfractured metamorphic or igneous rocks and the lower range for fractured metamorphic or igneous rocks ($K_{BULK} = 8.3 \times 10^{-10}$ m/s). Groundwater and seepage expected in the proposed Lalor Mine underground workings during development and operation are described in Section 2.5. (Golder Associates Ltd., 2009)

4.9 Surface Water

4.9.1 Hydrology

The Reed Lake Ecodistrict lies within the glacial Lake Agassiz basin and is part of the Nelson River drainage system. The area drains generally eastward through Wekusko Lake, other medium sized lakes in the general region, and an irregular bedrock-controlled network of streams that are all part of the Grass River watershed. (Smith *et al.*, 1998) The Nelson River watershed and Grass River sub basin are shown in **Figure 17**.

The closest waterbody to the proposed Lalor Mine is Lalor Lake. Lalor Lake is a small (0.4 km^2) headwater lake located to the west of the proposed Lalor Mine site. It drains north for approximately 300 m through a creek and marsh into Maw Lake (0.16 km^2). Maw Lake then continues to drain northward for nearly 4 km via Unnamed Creek 1 into Varnson Lake (0.7 km^2). Varnson Lake continues to drain east via a creek into Squall Lake, a relatively large and deep lake. Squall Lake then drains south via Snow Creek and eventually into Snow Lake Narrows, which makes up the west arm of Snow Lake. Snow Lake also receives water from the south via Tern Creek and Tern Lake, a small lake with a total surface area of approximately 0.15 km^2.

Cook Lake, a relatively large and deep lake, is located west of Lalor Lake. Cook Lake is isolated from Lalor Lake by at least a 300 m wide band of elevated forest underlain by bedrock. Another small and shallow lake, Unnamed Lake 1, is located southwest of Lalor Lake and drains northwest into Cook Lake. Cook Lake drains to the south whereas Lalor Lake drains north as shown in **Figure 18**. Area waterbodies and watershed boundaries in the area of the proposed Lalor Mine are presented in **Figures 19** and **18**, respectively.

As a result of varying topography created by hummocky bedrock surfaces, the drainage conditions vary considerably over short distances. Terrain falls at about 0.6 m to 1.0 m per km. Regionally, runoff from bedrock and upland areas collects in peat filled lows (bogs), which slowly release excess water to surrounding lakes and creeks. Groundwater tables are high in most bogs and in low areas bordering the bogs. Similar to much of the Boreal Shield Ecozone, contiguous and isolated bogs cover between 20% and 40% of the Project Region. Bogs are widespread and stagnant in the Project Region. Prior to clearing and leveling, the site of the existing Lalor AEP was a large rocky outcrop in a large stand of dense black spruce surrounded by wet bog. The rock outcrop has been leveled and a bog/wet area exists to the north of the existing AEP footprint, within an area that has been previously cleared of vegetation.

4.9.2 Lake Bathymetry

Lake bathymetry was assessed as part of the baseline aquatic work and will function as a benchmark for future monitoring in the lakes and other waterbodies, within the potential area of influence of the proposed Lalor Mine. In September 2007, the bathymetry of Lalor Lake, Varnson Lake and Tern Lake was assessed using a boat mounted sonar unit. Maw Lake, which was too shallow to use a boat mounted sonar unit, was manually surveyed. In September 2008 and 2010, bathymetry in Cook Lake and Tern Ditch Pond was assessed, respectively. The locations of the area waterbodies are shown in **Figure 19**. At the time of the bathymetric assessment, baseline information was recorded, and the results are presented in Table 4.2.

Table 4.2: Summary of Bathymetric Surveys Conducted in Project Region

Waterbody	Year	Surface Area (m²)	Volume (m³)	Mean Depth (m)	Maximum Depth (m)
Lalor Lake	2007	413,650	477,823	1.2	2.1
Maw Lake	2007	163,675	120,918	0.7	1.4
Varnson Lake	2007	711,350	1,229,410	1.7	2.6
Tern Lake	2007	153,150	246,701	1.6	2.2
Cook Lake	2008	2,284,027	11,533,364	5.0	9.5
Tern Ditch Pond	2010	75,125	39,750	0.5	1.0

Lalor Lake

Lalor Lake was found to be a relatively shallow lake with a mean depth of 1.2 m and a maximum depth of 2.1 m. The total surface area of Lalor Lake was 413,650 m² and the total calculated volume was 477,823 m³.

Maw Lake

Similar to Lalor Lake, Maw Lake is a relatively shallow lake. Maw Lake was determined to have a mean depth of 0.7 m and a maximum depth of 1.4 m. The total surface area of Maw Lake was 163,675 m² and the total calculated volume was 120,918 m³.

Varnson Lake

Varnson Lake had a mean depth of 1.7 m and a maximum depth of 2.6 m. The total surface area of Varnson Lake was 711,350 m² and the total calculated volume was 1,229,410 m³.

Tern Lake

Tern Lake is a small lake with a total surface area of 153,150 m². Tern Lake had a mean depth of 1.6 m and a maximum depth of 2.2 m. The total calculated volume of Tern Lake was 246,701 m³.

Cook Lake

Cook Lake had a modeled volume of 11,533,364 m³ and total surface area of 2,284,027 m². The bathymetric contours indicated that the lake is characterized by a north/south trench of more than 6 m in depth. The majority of the storage was along the eastern shore of the lake with the deepest portion of the lake reaching greater than 9 m in depth. The far north and south ends of the lake were significantly shallower, likely due to a combination of shallower slopes and the effects of sedimentation from the long term deposition resulting from the lake's inflows and outflows. Cook Lake was the longest and deepest of the lakes investigated.

Tern Ditch Pond

Tern Ditch Pond had a modeled area of 75,125 m^2, a volume of 39,750 m^3, and the mean depth was 0.5 m. Depth was homogenous over the majority of the pond except for one northeast-southwest trending trench of up to 1.0 m in depth. The average grade of the lake bottom was 1.9% which is characteristic of a shallow gently sloping headwater lake. The shallow bottom allows for significant vegetation to grow within the pond itself. Only one small rock island with associated small rocky ridges was observed in the east end of the pond. Sediment was highly organic with limited distribution of cobble or mineral soils. Leaf matter was also present in near-shore areas, particularly on the south-eastern shore of Tern Ditch Pond.

4.9.3 Surface Water Quality

In 2007, North/South Consultants was retained by AECOM to collect water samples from 12 waterbodies located in the Project Area and Region as part of an aquatic assessment study. Waterbodies included in the 2007 and 2010 studies are indicated in Table 4.3. In 2010, AECOM sampled surface water from seven waterbodies in the Project Area and Region as part of a supplemental aquatic assessment (Table 4.3). The water quality values were used to establish the baseline water chemistry of the tested waterbodies and will function as a benchmark for future water quality monitoring in the lakes and other waterbodies, within the potential area of influence of the proposed Lalor Mine.

Table 4.3: Waterbodies Sampled in the Project Region

Waterbody	Year		
	2007	2008	2010
Lalor Lake	X		X
Maw Lake	X		X
Cook Lake	X	X	
Varnson Lake	X		X
Squall Lake	X		
Unnamed Lake 1	X		
Unnamed Creek 1	X		
Snow Creek	X		
Snow Lake	X		
Tern Creek	X		X
Tern Ditch	X		X
Tern Lake	X		X
Tern Ditch Pond			X

4.9.3.1 Water Quality Results

In situ water quality parameters such as pH, temperature, specific conductance, turbidity, and dissolved oxygen (DO) were collected. Secchi disk depth was also measured at the approximate centre of each lake.

Samples were analyzed for the following parameters:

- Routine parameters (e.g., physical and nutrients);
- Major Ions (i.e., chloride, sulphate, bromide and silicate);

- Total and Dissolved Metals;
- Total and Dissolved Mercury; and,
- Biological parameters (i.e., chlorophyll *a* and pheophytin).

The following is a summary of the water quality data collected in the 2007 and 2010 baseline sampling events. Additional details are provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012). Water quality data was compared to Provincial and Federal guidelines and objectives that have been generated for various water quality parameters, with the purpose of protecting aquatic life and human health (*i.e*., drinking water or protection of fresh water aquatic life). The guidelines applied to the water quality data collected during the two aquatic assessments are indicated in Table 4.4.

Table 4.4: Applicable Water Quality Guidelines, 2007 and 2010

Baseline Survey	Water Quality Guideline
2007 (North-South)	• Canadian Council of Ministers of the Environment Phosphorus and Lake Trophic Status (CCME, 2004) • Manitoba Water Quality Standards, Objectives and Guidelines (Williamson, 2002)
2010 (AECOM)	• Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011)

<u>Lalor Lake</u>

Lalor Lake was not thermally stratified in 2007 or 2010. At all sample depths in Lalor Lake, the average temperature was 13.4°C in September 2007 and 19.7°C in July 2010. In both aquatic assessments, the water was well-oxygenated, with dissolved oxygen concentrations of 9.5 mg/L in 2007 and 12.2 mg/L in 2010. In both aquatic assessments, Lalor Lake was neutral to slightly alkaline, relatively nutrient poor, clear and moderately hard. According to the CCME classification scheme for lake trophic status based on total phosphorus concentrations, Lalor Lake was considered *oligotrophic* in 2007 and *mesotrophic* in 2010. Overall, there were no differences in limnological parameters between 2007 and 2010.

Concentrations of several metals were below the detection limit during both sampling events (*i.e.*, antimony, beryllium, cadmium, cobalt, mercury, silver, tellurium, and zinc). There were no exceedances of applicable water quality guidelines in water samples collected from Lalor Lake in both 2007 and 2010 aquatic assessments, with the exception of field pH in 2010 (average of 9.02 and guideline range of 6.5 to 9.0).

<u>Maw Lake</u>

Maw Lake had high dissolved oxygen concentrations (average of 10.1 mg/L in 2007 and 8.3 mg/L in 2010) and consistent temperature (average temperature of 12.6°C in 2007 and 20.5°C in 2010) at all sample depths. Maw Lake was neutral to slightly alkaline, nutrient poor to moderately nutrient rich, clear with soft water in both aquatic assessments. Maw Lake was considered to be *oligotrophic* in 2007 and *mesotrophic* in 2010, according to the CCME classification scheme based on total phosphorus concentrations. Overall, there were no differences in limnological parameters between 2007 and 2010.

Concentrations of several metals were at or below the detection limit during both sampling events (*i.e.*, antimony, beryllium, bismuth, cadmium, cesium, chromium, cobalt, selenium, silver, tellurium, thallium, tin, uranium, vanadium, zinc, and zirconium). All concentrations of metals and metalloids in Maw Lake in both 2007 and 2010 were below the applicable guidelines in water samples collected as part of both aquatic assessments, with one exception. In 2010, two of the three field pH values (9.02 and 9.03) were outside of the guideline range (6.5 to 9.0).

Unnamed Creek 1

Unnamed Creek 1 was sampled only during the 2007 aquatics assessment. The dissolved oxygen concentration of 5.1 mg/L was below the applicable water quality guideline for the protection of cool water species and early life stages of cold water species (6.0 mg/L). However, it is not clear if any cool water species or early life stages inhabit Unnamed Creek 1. Unnamed Creek 1 was considered to be a soft, nutrient poor, clear stream with a slightly alkaline pH. Based on the concentration of total phosphorus, Unnamed Creek 1 was considered to be *mesotrophic* in 2007.

None of the metal and metalloid concentrations exceeded applicable water quality guidelines in Unnamed Creek 1 in 2007.

Varnson Lake

Varnson Lake had high dissolved oxygen concentrations (average of 9.7 mg/L in 2007 and 8.2 mg/L in 2010) with a consistent temperature at all sample depths (average temperature of 12.9°C in 2007 and 20.3°C in 2010). Varnson Lake had a neutral pH, was moderately nutrient rich, with soft, clear water. Varnson Lake was considered to be *mesotrophic* according to total phosphorus concentrations in water samples collected in both 2007 and 2010. Overall, there were no differences in limnological parameters between 2007 and 2010.

Concentrations of all metals and metalloids were at or below the applicable water quality guideline in Varnson Lake in both 2007 and 2010. Several (i.e., 17) metal concentrations were below the detection limit in both 2007 and 2010 samples collected from Varnson Lake.

Cook Lake

Cook Lake was sampled only during the 2007 aquatics assessment. At the time of assessment, Cook Lake had a high dissolved oxygen content (average of 9.7 mg/L). Despite the greater depths in Cook Lake, there was no evidence of thermal stratification at any station. Similar to Varnson Lake, Cook Lake had a neutral pH, moderately rich in nutrients with moderately hard, clear water. Based on total phosphorus concentrations in Cook Lake in 2007, it was considered *meso-eutrophic* according to the CCME classification scheme.

Several metal concentrations in Cook Lake in 2007 were below detection limit and none exceeded the applicable water quality guideline.

Unnamed Lake 1

Unnamed Lake 1 was sampled only during the 2007 program. At the time of the assessment, Unnamed Lake 1 had high dissolved oxygen concentrations (average of 11.3 mg/L) and consistent temperature at all sample depths (average of 7.7°C). Unnamed Lake 1 had a neutral pH, was relatively nutrient deficient, with soft clear water. Unnamed Lake 1 was classified as *oligotrophic* according to the CCME classification scheme using total phosphorus concentrations.

Concentrations of all metals and metalloids were low in Unnamed Lake 1 in 2007 and were below applicable water quality guidelines.

Squall Lake

Squall Lake was sampled only during the 2007 program. At the time of assessment, Squall Lake had a high dissolved oxygen concentration (average of 10.4 mg/L) and consistent temperature at all sample depths (average of 12.4°C). Squall Lake had a neutral pH and was moderately nutrient rich, with soft clear water. Based on total phosphorus concentrations in 2007, Squall Lake was classified as *mesotrophic*.

Concentrations of most metals and metalloids were low in Squall Lake in 2007 and none exceeded the applicable guidelines, with two exceptions. A single sample from Squall Lake in 2007, SL-1 (out of four samples) had total aluminum concentration of 0.11 mg/L) and total selenium concentration of 0.002 mg/L which exceeded the applicable guidelines of 0.1 mg/L and 0.001 mg/L, respectively.

Snow Creek

Snow Creek was sampled only during the 2007 program. Snow Creek had a high dissolved oxygen concentration (average of 9.7 mg/L). Water temperature was relatively consistent with a slight decrease in temperature with depth at SC-2 (maximum depth of 1.5 m). Snow Creek had a neutral pH and moderately hard water. Nutrient richness was described as moderate to rich and based on total phosphorus concentrations, Snow Creek was classified as *meso-eutrophic*.

Concentrations of most metals and metalloids were low and below the applicable water quality guidelines with the exception of total aluminum and total iron. For both samples collected from Snow Creek in 2007, total aluminum concentrations (0.5 mg/L and 0.13 mg/L) and total iron concentrations (0.8 mg/L and 0.4 mg/L) exceeded the applicable guideline concentrations of 0.1 mg/L and 0.3 mg/L, respectively.

Snow Lake Narrows

Snow Lake Narrows was sampled only during the 2007 program. At the time of assessment, there was evidence of thermal stratification in Snow Lake Narrows, with a small gradual decrease in water temperature and dissolved oxygen with increasing depth. Snow Lake Narrows had neutral pH, soft water and was moderately clear and nutrient rich. Snow Lake Narrows was classified as *meso-eutrophic* based on total phosphorus concentrations.

Concentrations of most metals and metalloids in Snow Lake Narrows were relatively low with the concentration of total iron in one sample, SLN-1 (0.3 mg/L) equal to the applicable water quality guideline concentration of 0.3 mg/L in 2007.

Tern Creek

At the time of assessment, Tern Creek was well oxygenated, with dissolved oxygen concentrations of 6.9 mg/L in 2007 and 9.5 mg/L in 2010. Tern Creek had a relatively neutral pH, was clear and moderately hard. Based on total phosphorus concentrations, Tern Creek was classified as *oligotrophic* in 2007 and *mesotrophic* in 2010. Overall, there were no differences in limnological parameters between 2007 and 2010.

Concentrations of all metals and metalloids in Tern Creek were below the applicable water quality guidelines in 2007. In a sample collected from Tern Creek in 2010, concentrations of total aluminum (0.28 mg/L) and total iron (1.6 mg/L) exceeded the applicable water quality guideline concentrations of 0.1 mg/L an 0.3 mg/L, respectively.

Tern Ditch

At the time assessment, Tern Ditch had high dissolved oxygen concentrations (8.0 mg/L in 2007 and 9.6 mg/L in 2010). Tern Ditch had hard water, a neutral pH, was highly coloured and nutrient rich. According to the CCME classification scheme, Tern Ditch was classified as *eutrophic* based on total phosphorus concentrations in both 2007 and 2010. Overall, there were no differences in limnological parameters between 2007 and 2010.

In 2007, concentrations of total aluminum (0.6 mg/L) and total iron (1.7 mg/L) in Tern Ditch exceeded the applicable water quality guideline concentrations of 0.1 mg/L an 0.3 mg/L, respectively. In 2010, concentrations of total aluminum (0.40 mg/L), total arsenic (0.009 mg/L) and total iron (1.1 mg/L) in Tern Ditch exceeded the applicable water quality guideline concentrations of 0.1 mg/L, 0.005 mg/L, and 0.3 mg/L, respectively. In general, concentrations of most metals in Tern Ditch were higher than those measured in other waterbodies in both aquatic assessments.

Tern Lake

At the time of assessment, Tern Lake had high average dissolved oxygen concentrations of 10.3 mg/L in 2007 and 12.4 mg/L in 2010. Water temperatures were consistent across depth (average of 11.3°C in 2007 and 19.5°C in 2010). Tern Lake was moderately hard with clear water with a neutral pH. Tern Lake was classified as *mesotrophic* according to the CCME classification scheme in both 2007 and 2010. Overall, there were no differences in limnological parameters between 2007 and 2010.

In Tern Lake, concentrations of most metals were generally low and none exceeded the applicable water quality guidelines in 2007 and 2010.

Tern Ditch Pond

Tern Ditch Pond was sampled only in 2010. Tern Ditch Pond is a shallow headwater lake that, at the time of assessment, was well oxygenated and showed no thermal stratification. Tern Ditch Pond had moderately hard water that was coloured and had a neutral pH. Based on total phosphorus concentrations, Tern Ditch Pond was classified as *mesotrophic*.

Concentrations of all metals and metalloids in Tern Ditch Pond were below the applicable water quality guideline in 2010.

4.9.3.2 Water Quality Summary

In September 2007, the majority of waterbodies were alkaline, clear and well-oxygenated at the time of sampling. Unnamed Creek 1, however, had dissolved oxygen concentration (5.1 mg/L) below the most conservative guideline (6.0 mg/L). No thermal or oxygen stratification was observed in any waterbody during the 2007 survey. In July 2010, all waterbodies were well-oxygenated with no evidence of thermal stratification. Several conventional parameters measured (*e.g.,* carbonate, total dissolved solids and pH) were highest in Lalor Lake.

Tern Ditch had the highest total phosphorus concentration in 2007 and 2010 was classified as eutrophic. Trophic status changed from oligotrophic to mesotrophic for Lalor Lake, Maw Lake, and Tern Creek between 2007 and 2010.

Overall, water quality in the waterbodies surrounding the proposed Project Site were of good quality in 2007, exceeding the applicable water quality guidelines in only nine instances for three total metals (aluminum, iron, and selenium). The exceedances were also small, with the exception of concentrations of total aluminum and total iron in Tern Ditch, which were each nearly six times greater than the guideline.

Overall, water quality in the waterbodies surrounding the proposed Lalor Mine site were of good quality in 2010: less than 5% of the concentrations that were screened exceeded the water quality guideline for three total metals (aluminum, arsenic and iron) and pH. The exceedances were also small, with the exception of concentrations of total aluminum and total iron in Tern Ditch and Tern Creek.

4.9.4 Sediment Quality

In 2007, North/South Consultants was retained by AECOM to collect sediment samples from 12 waterbodies in the Project Area and Region as part of an aquatic assessment study. Waterbodies included in the 2007 and 2010 studies are indicated in Table 4.3. In 2010, AECOM sampled sediments from seven waterbodies in the Project Area and Region as part of a supplemental aquatic assessment (Table 4.3). The sediment quality values were used to establish the baseline sediment chemistry of the tested waterbodies and will function as a benchmark for future sediment quality monitoring in the lakes and other waterbodies, within the potential area of influence of the proposed Lalor Mine.

Due to the utilization of different analytical methodologies employed by the testing laboratory, concentrations in sediment samples collected in 2007 were reported as micrograms per gram dry weight (µg/g) while in 2010 they were reported as milligrams per kilogram dry weight (mg/kg).

4.9.4.1 Sediment Quality Results

The following is a summary of the sediment quality data collected in the 2007 and 2010 baseline sampling events. Additional details are provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012). Sediment quality data was compared to Provincial and Federal guidelines and objectives that have been generated for various sediment quality parameters, with the purpose of protecting aquatic life and various human uses (*e.g.*, protection of fresh water aquatic life). The guidelines applied are described in Table 4.5.

Table 4.5: Applicable Sediment Quality Guidelines, 2007 and 2010

Baseline Survey	Sediment Quality Guideline
2007 (North-South)	• Manitoba Sediment Quality Guidelines (Williamson, 2002) • Ontario Sediment Quality Guidelines (Persaud et al., 1993)
2010 (AECOM)	• Canadian Soil Quality Guidelines for Residential/Parkland Use (CCME, 2007) • Manitoba Water Quality Standards, Objectives and Guidelines (Williamson, 2002)

<u>Lalor Lake</u>

At least four of five samples collected from Lalor Lake in 2007 had concentrations of arsenic (average of 10 µg/g), copper (average of 41 µg/g), nickel (average of 24 µg/g), total nitrogen (average of 2.9 µg/g) and total organic carbon (average of 31%) exceeding the lowest applicable sediment quality guidelines of 5.9 µg/g, 35.7 µg/g, 16 µg/g, 0.055 µg/g, and 1 µg/g, respectively. Total phosphorus concentrations in three of five samples collected from Lalor Lake in 2007 exceeded the lowest applicable sediment quality guideline. In addition, one of the five samples collected from Lalor Lake in 2007 had concentrations of cadmium and chromium exceeding the lowest applicable sediment quality guideline.

In 2010, concentrations of copper (average of 44.5 mg/kg) and selenium (average of 1.4 mg/kg) exceeded applicable sediment quality guidelines (35.7 mg/kg and 1 mg/kg, respectively) in all four samples collected from Lalor Lake. The concentration of lead (35.3 mg/kg) in one of four samples collected from Lalor Lake in 2010 exceeded applicable sediment quality guidelines (35.0 mg/kg).

<u>Maw Lake</u>

Concentrations of arsenic, cadmium, copper, total nitrogen, total phosphorus and total organic carbon in at least two of the three samples collected from Maw Lake in 2007 exceeded the lowest applicable sediment quality guideline.

All samples collected from Maw Lake in 2010 had concentrations of copper (average 57.7 mg/kg) and selenium (average of 1.5 mg/kg) that exceeded applicable sediment quality guidelines of 35.7 mg/kg and 1 mg/kg, respectively. In two of three samples collected from Maw Lake in 2010, concentrations of arsenic (6.8 mg/kg and 7.7 mg/kg) and cadmium (0.85 mg/kg and 0.98 mg/kg) exceeded applicable sediment quality guidelines of 5.9 mg/kg and 0.6 mg/kg, respectively.

Unnamed Creek 1

In 2007, concentrations of cadmium, copper, total nitrogen, total phosphorus and total organic carbon exceeded the lowest applicable sediment quality guideline in the sample collected from Unnamed Creek 1. The copper concentration in Unnamed Creek 1 in 2007 was the highest concentration compared to all other waterbodies sampled in 2007.

Unnamed Creek 1 was not sampled in 2010.

Varnson Lake

In the sample collected from Varnson Lake in 2007, the concentration of nickel (18.7 µg/g), total nitrogen (2.7 µg/g), total phosphorus (850 µg/g) and total organic carbon (30.5%) exceeded the lowest applicable sediment quality guideline of 16 µg/g, 0.055 µg/g, 600 µg/g, and 1%, respectively.

Of the three samples collected from Varnson Lake in 2010, one sample had a concentration of cadmium (0.67 mg/kg) that exceeded an applicable sediment quality guideline (0.6 mg/kg) and two samples had concentrations of selenium (1.2 mg/kg, each) that exceeded an applicable sediment quality guideline (1 mg/kg).

Cook Lake

In 2007, all three samples from Cook Lake had concentrations of nickel (22 µg/g to 37.4 µg/g), total nitrogen (1.3 µg/g to 1.8 µg/g), total phosphorus (920 µg/g) and total organic carbon (28% to 32%) that exceeded the lowest applicable sediment quality guideline of 16 µg/g, 0.055 µg/g, 600 µg/g, and 1%, respectively. One of the three sediment samples collected from Cook Lake in 2007 (CL-2) had concentrations of chromium (49.8 µg/g), copper (47.6 µg/g), and iron (24,600 µg/g) that exceeded the lowest applicable sediment quality guideline of 37.3 µg/g, 35.7 µg/g, and 20,000 µg/g, respectively.

Cook Lake was not sampled in 2010.

Unnamed Lake 1

Concentration of manganese (651 µg/g), total nitrogen (2.1 µg/g), total phosphorus (1,040 µg/g) and total organic carbon (32.8%) exceeded the lowest applicable sediment quality guideline of 460 µg/g, 0.055 µg/g, 600 µg/g, and 1%, respectively in the sample collected from Unnamed Lake 1 in 2007.

Unnamed Lake 1 was not sampled in 2010.

Squall Lake

At least three of the four samples collected from Squall Lake in 2007 had concentrations of chromium, iron, manganese, nickel, total nitrogen, total phosphorus and total organic carbon that exceeded the lowest applicable sediment quality guideline. The average iron concentration in Squall Lake in 2007 (31,400 µg/g) was the highest of all samples analyzed in 2007.

Squall Lake was not sampled in 2010.

Snow Creek

In one of the two samples collected from Snow Creek in 2007 (SC-2), the concentration of manganese (482 µg/g), nickel (21 µg/g), and total phosphorus (730 µg/g) exceeded the lowest applicable sediment quality guideline of 460 µg/g, 16 µg/g, and 600 µg/g, respectively.

Snow Creek was not sampled in 2010.

Snow Lake Narrows

In general, there was a spatial trend in the concentrations of metals in samples collected from Snow Lake Narrows in 2007, where concentrations decreased from west to east. In at least one of three samples collected from Snow Lake Narrows in 2007, concentrations of arsenic, chromium, copper, iron, manganese, nickel, total nitrogen, total phosphorus and total organic carbon exceeded the lowest applicable sediment quality guideline. The samples collected from Snow Lake Narrows had among the highest frequency of exceedances compared to other samples collected in 2007.

Snow Lake Narrows was not sampled in 2010.

Tern Creek

Arsenic, cadmium, nickel, zinc, total nitrogen, total phosphorus and total organic carbon concentrations exceeded the lowest applicable sediment quality guidelines in the sample collected from Tern Creek in 2007. The concentration of zinc (157 µg/g) in the sample collected from Tern Creek was the only zinc concentration to exceeded the applicable sediment quality guideline (123 µg/g) across all other samples collected in 2007.

In the one sample collected from Tern Creek in 2010, only the concentration of selenium (1.1 mg/kg) exceeded the applicable sediment quality guideline of 1 mg/kg.

Tern Ditch

In the sample collected from Tern Ditch in 2007, concentrations of arsenic (24.7 µg/g), total nitrogen (1.3 µg/g), and total organic carbon (31%) exceeded the lowest applicable sediment quality guidelines of 5.9 µg/g, 0.055 µg/g, and 1%, respectively.

In the one sample collected from Tern Ditch in 2010, the concentrations of arsenic (24.8 mg/kg), chromium (45 mg/kg), copper (39 mg/kg) and zinc (140 mg/kg) exceeded at least one applicable sediment quality guideline. Arsenic and zinc concentrations in Tern Ditch and Tern Creek were similar and higher than other waterbodies in 2010.

Tern Lake

In the sample collected from Tern Lake in 2007, the concentrations were among the lowest of all samples collected in 2007. Only total nitrogen (0.9 µg/g) and total organic carbon (15.6 µg/g) concentrations exceeded the lowest applicable sediment quality guidelines of 0.055 µg/g and 1%, respectively, in the sample collected from Tern Lake in 2007.

In the one sample collected from Tern Lake in 2010, concentrations of arsenic (29.7 mg/kg), cadmium (0.67 mg/kg), selenium (1.1 mg/kg), and zinc (190 mg/kg) at least one applicable sediment quality guideline. Arsenic and zinc concentrations in Tern Ditch and Tern Creek were similar and higher than other waterbodies in 2010.

Tern Ditch Pond

Tern Ditch Pond was not sampled in 2007.

None of the metals concentrations measured in the one sample collected from Tern Ditch Pond 2010 exceeded applicable sediment quality guidelines.

4.9.4.2 Sediment Quality Summary

Of the thirteen parameters for which there was an applicable sediment quality guideline, only lead and mercury were not exceeded in any sample in 2007. In total, there were 135 instances of exceedances over applicable sediment quality guidelines (i.e., nearly 40% of concentrations that were screened exceeded at least one sediment quality guideline). In 2007, Snow Lake Narrows had metals concentrations that exceeded six applicable sediment quality guidelines. In contrast, Tern Lake had no metal exceedances in 2007. Overall, sediment quality was impacted in each waterbody, with the exception of Tern Lake in 2007. Arsenic, chromium, copper, manganese, nickel, total nitrogen and total organic carbon guidelines were exceeded most frequently in 2007.

None of the concentrations in Tern Ditch Pond exceeded applicable sediment quality guidelines in 2010. Out of 182 concentrations that were screened, 33 concentrations exceeded at least one sediment quality guideline in 2010. In 2010, concentrations of barium, mercury, nickel, thallium, uranium, and vanadium did not exceed applicable sediment quality guidelines. Overall, sediment quality in the waterbodies examined in 2010 was fair. Although there were exceedances, these were generally of small magnitude, with the exception of arsenic concentrations in Tern Ditch and Tern Lake in 2010. Several guidelines were not exceeded in 2010. Concentrations of selenium and copper most frequently exceeded the applicable sediment quality guideline in 2010. These metals are likely high naturally in this region. Concentrations of arsenic in Tern Ditch and Tern Lake in 2010 had the highest magnitude of exceedance, suggesting potential contamination (given the limited geographic extent of this magnitude of exceedance).

In general, concentrations of most metals were higher in 2007 as compared to 2010 and overall, there were more exceedances of applicable sediment quality guidelines in 2007 than in 2010. Sediment heterogeneity is the likely source of these observed differences. Overall, the sediment quality can be considered as slightly impacted from elevated metals concentrations, possibly due to the natural composition of soils in the region and/or from historical industrial operations (mining, forestry, etc) and other anthropogenic influences within the Snow Lake region. Congruent with water quality, Tern Ditch sediments in 2010 were considered to be impacted.

4.10 Terrestrial Environment

4.10.1 Flora

Vegetation in the Reed Lake Ecodistrict is typical of the northern Boreal forest region with black spruce, jack pine, trembling aspen and white spruce as the dominant species. The bog peat-lands have stunted black spruce, moss, and ericaceous shrub vegetation, while fens have sedge, shrub and tamarack vegetation in varying mixtures. Forest composition is reflective of a forest fire history. (Smith *et al.*, 1998)

4.10.1.1 Terrestrial Field Surveys

AECOM’s baseline terrestrial surveys carried out in September 2007, July 2010 and May/June 2011 included a review of the geology, soil, vegetation and wildlife located on the Project Site, targeted sections of the Project Area, and an area within approximately 1 km of the shoreline of twelve waterbodies located in the Project Region. The field survey consisted of a random meander survey by AECOM biologists.

The Project Region is a boreal forest biome typical of the rock outcrop and bog landscape. Rock outcrops are primarily igneous and common, forming open lichen woodlands of white spruce and jack pine. Black spruce bog has developed in the areas between rocky outcrops and created deep deposits of sphagnum moss that restrict drainage. The bog is fairly mature with large areas of even-aged black spruce stands. One indication of tree stand density is the relative lack of understory shrubs. Alder dominates the shrub layer in openings created by watercourses. There were no hazel, saskatoon, chokecherry, or other typical understory shrubs noted during the survey. Ground cover is moss with typical boreal ground plants such as bunchberry and Solomon's seal. Soil development has occurred in pockets between rock outcrops with good drainage. Jack pine grows in sporadic open sandy areas.

Historical disturbance in the Project Area had opened the canopy prior to AECOM's first visit in 2007. Most of this activity was composed of narrow cut lines and drag roads that grow in rapidly. Regrowth in such areas consists largely of hardwoods but these areas also offer some growth opportunity for shrubs that were largely lacking in other parts of the forest stand. Although the historical regrowth in this area is a minor part of the forest canopy, it is extensive and likely important in terms of offering linear features that present more diversity than the surrounding forest and providing openings in an otherwise dense canopy.

A list of confirmed vegetation (based on desktop review and supported by field observation in 2007, 2010 and 2011) is provided in Table 4.6. It should be noted that the spring 2011 survey did not reveal any species not previously observed in the 2010 work.

Table 4.6: Vegetation observed during site visits of the general Project Area in 2007, 2010 and 2011

Awned Hair Cap Moss (*Polytrichum piliferum)*	Lily of the Valley (*Maianthemum canadense*)
Balsam Fir (*Abies balsamea*)	Marsh Cinquefoil (*Potentilla palustris*)
Bearberry (*Arctostaphylos uva-ursi*)	Mountain Cranberry (*Vaccinium visit-idaea)*
Black Spruce (*Picea mariana*)	Northern Reindeer Lichen (*Cladina stellaris)*
Bog Cranberry (*Vaccinium vitis-idaea*)	Paper Birch (*Betula papyrifera*)
Bunchberry (*Cornus canadensis*)	Perennial Sow Thistle (*Sonchus arvensis*)*
Canada Anemone (*Anemone canadensis*)	Reed Canary Grass (*Phalaris arundinacea*)
Canada Bluejoint (*Calamagrostis canadensis)*	Rough Cinquefoil (*Potentilla norvegica*)
Canada Buffaloberry (*Sheperdia canadensis*)	Sedge (*Carex sp.*)
Canada Thistle (*Cirsium arvense*)*	Shore-Growing Peat Moss (*Sphagnum riparium*)
Cladonia (*Cladonia sp.*)	Snowberry (*Symphoricarpos albus*)
Common Reed Grass (*Phragmites australis*)	Speckled Alder (*Alder rugosa)*
Common Cattail (*Typha latifolia*)	Sphagnum Moss (*Sphagnum sp.*)
Drooping Wood-Reed (*Cinna latifolia)*	Squarrose Peat Moss (*Sphagnum squarrosum*)
Dwarf Billberry (*Vaccinium caespitosum)*	Stiff Club Moss (*Lycopodium annotinum)*
Early Blue Violet (*Viola adunca)*	Stinging Nettle (*Urtica dioica*)*
Fern (*Matteuccia sp.*)	Tall Cotton-Grass (*Eriophorum angustifolium*)
Finger Felt Lichen (*Peltigera neopolydactyla)*	Trembling Leaf Aspen (*Populus tremuloides*)
Girgensohn's Peat Moss (*Sphagnum girgensohnii)*	Tufted Moss (*Aulacomium palustre)*
Ground Cedar (*Lycopodium complanatum*)	Velvet Leaf Blueberry (*Vaccinium myrtilloides*)
Ground Pine (*Lycopodium obscurum*)	Wavy Dicranum (*Dicranum undulatum)*
Jack Pine (*Pinus banksiana*)	Wax Paper Lichen (*Parmelia sulcata*)
Labrador Tea (*Ledum groenlandicum*)	Wild Mint (*Mentha arvensis*);
Large Cranberry (*Vaccinium macrocarpon)*	Wintergreen (*Pyrola asarifolia*)
Leatherleaf (*Chamaedaphne calyculata*)	

** Invasive species*

Overall, the Project Region is naturally a dense boreal forest, primarily black spruce interspersed with jack pine and hardwoods. Dense forest canopy has limited understory growth in all areas within the Project Region. Sphagnum forms the dominant ground cover. In general, the proposed Lalor Mine site is typical for this region. No rare or endangered plant species were encountered at the Project Site. There are no indications that this area contains unique opportunities for plant growth outside of that present in the general region.

Currently there is no central source of information to describe plants that are of cultural significance to the First Nation Communities near the proposed Lalor Mine. AECOM consulted Manitoba Hydro's Environmental Impact Statement for their Bipole III Project and conducted an internet search to determine if any of the plant species identified during the field surveys may have cultural significance to Aboriginal People in Manitoba. Table 4.7 includes a list of plants that were found during the terrestrial surveys that may be of importance to Aboriginal People.

Table 4.7: Plants found during the Lalor Baseline Terrestrial Surveys that may be of importance to Aboriginal People

Common Name	Scientific Name
Labrador Tea	*Ledum groenlandicum*
Cedar (cedar vines, ground cedar)	*Juniperus horizontalis/ Lycopodium tristachyum*
Cranberry	*Vaccinium macrocarpon*
Bearberry	*Arctostaphylos uva-ursi*
Birch Tree Leaves	*Betula papyrifera*
Lowbush Blueberry/Velvet-Leaved Blueberry	*Vaccinium myrtilloides*
Mint	*Mentha arvensis*
Bunchberry	*Cornus canadensis*
Stinging Nettle	*Urtica dioica*

Stinging nettle is an invasive weed, and would likely be encountered in road ditches and cleared areas within the Project Area and Region. The other species identified in Table 4.7 are very common boreal species and are expected to be encountered throughout the Project Area and Region. None of the identified species are considered unique to the Lalor Project Site.

4.10.1.2 Regional Analysis

Field surveys were undertaken to characterize the vegetation at the Project Site. The vegetation lost as a result of the Lalor Mine Development (including the Lalor AEP site, access road, explosives magazines and access road, and Lalor Ramp Ventilation Shaft site and access road) was also characterized using the Forestry Branch of Manitoba Conservation Forest Management Units (FMU) to determine if the vegetation was unique in the Project Area or Region and to determine the availability of similar vegetation within the Project Area and Region. A calculation was made to compare the vegetation communities lost to the Lalor Mine Development to the abundance of those communities in the Project Area and Region. The calculation of the actual vegetation communities lost to the Lalor Mine Development was performed using the FMU as defined by the Forestry Branch of Manitoba Conservation.

The Forestry Branch of Manitoba Conservation creates forest inventory maps that are developed from interpretation of 1:15,840 aerial photography. Each forest inventory map covers one township (36 square miles). For purposes of indexing and assembling the data, multiple townships of data are packaged into a FMU. Within each FMU package, the individual townships are maintained as separate files along with their associated attributes. Each FMU identifies the vegetation cover class of the FMU and identifies the species composition based a hierarchical series of attributes (i.e. land cover, productivity, tree type, and species composition). This cover class identifies a unique area of tree canopy that combines a series of attributes and species composition that can be interpolated into a general habitat classification. The FMU is the most detailed vegetation identification information available for the undeveloped portions of the province.

To determine the vegetative cover disturbed as a result of activities related to the Lalor Mine Development, the area disturbed by the Lalor AEP site, access road, explosives magazines and access road and Lalor Ramp Ventilation Shaft site and access road was calculated. The cover classes present at the Lalor Mine Development were determined by clipping the footprint of the Lalor Mine Development (55.4 ha) from the FMU that covers the Project Region and surrounding area. The Lalor Mine Development includes five different vegetated cover classes, one class of disturbed area, and one class of water area as shown in Table 4.8.

To determine the availability of the classes of vegetation at the Lalor Mine Development within the Project Site, Area and Region, the remaining undisturbed areas of these five vegetated cover classes were calculated as above and the percentage within the Project Site, Area and Region were determined. Other cover classes exist within the Project Site, Area and Project Region that were not found within the Lalor Mine Development, these other combined cover classes have an area of 18.0 ha, 1,073.9 ha and 11,345.6 ha within the Project Site, Area and Region respectively.

Table 4.8: Cover Classes and Areas

Cover Class	Species Composition or Subtype	Area (ha) of Cover Class				Lalor Mine Development area as a % of		
		Lalor development	Site	Area	Region	Site	Area	Region
Black Spruce	71-100%	4.6	20.6	1003.4	5329.0	22.1%	0.5%	0.1%
Black Spruce	40-70%, with Jack Pine	13.7	21.3	1173.2	7814.8	64.0%	1.2%	0.2%
Jack Pine	71-100%	0.4	5.5	394.5	3169.3	7.6%	0.1%	0.0%
Jack Pine	40-70%, with Spruce	6.4	24.3	1032.9	6557.0	26.4%	0.6%	0.1%
Treed Muskeg	with Black Spruce	28.7	49.3	2061.0	11059.9	58.3%	1.4%	0.3%
Disturbed		0.8	39.2	475.3	1075.0	2.1%	0.2%	0.1%
Water		0.8	1.2	1429.3	17237.6	63.9%	0.1%	0.0%
Classes not found within Lalor Mine Development		-	18.0	1073.9	11345.6	-	-	-
Total		**55.4**	**179.4**	**8643.5**	**63588.1**	**30.9%**	**0.6%**	**0.1%**

Of the five different vegetated cover classes, the largest area within the footprint of the Lalor Mine Development was *Treed Muskeg with Black Spruce* (28.7 ha); the smallest cover class disturbed was *Jack Pine, 71-100%* (0.4 ha). The majority (77%) of the Lalor Mine Development was composed of two classes:

- *Treed Muskeg with Black Spruce* (28.7 ha); and
- *Black Spruce 40-70%, with Jack Pine* (13.7 ha)

To determine if the vegetation lost to the Lalor Mine Development was considered unique or rare within the Project Site, Area or Region, the vegetation cover of the Lalor Mine Development footprint was compared with Project Site, Area and Region vegetation to determine what percentage of the vegetation fell within the Lalor Mine Development footprint. The resulting percentages are the amount of area within the Lalor Mine Development footprint of that cover class compared to the total area of that cover class within the Project Site, Area and Region. This is an estimate of the amount of that cover class lost to the Lalor Mine Development footprint.

The cover class that was present in the Lalor Mine Development that was the least common throughout the Project Site, Area and Region was *Jack Pine, 71-100%* (0.4 ha). This vegetation class represented approximately 7.6%, 0.1% and 0.01% of total area available in the Project Site, Area and Region respectively. It should be noted that the loss of this cover class to the Lalor Mine Development leaves a significant amount of this cover class remaining within the Project Site, Area and Region (5.5-0.4 = 5.1 ha in the Project Site, 394.5-0.4 = 394.1 ha in the Project

Area, and 3169.3-0.4 = 3168.9 ha in the Project Region). Furthermore, as shown on **Figure 20**, this cover class is common to the area surrounding the Project Region.

The Lalor Mine Development footprint covered five vegetated cover classes of 30 total classes found within the Project Region for a total disturbed vegetated area of 53.8 ha. None of the cover classes disturbed were unique to the Project Site, Area or Region, and the most significant disturbance calculated by percentage of area disturbed of total area available did not substantially affect the availability of this cover class to the Project Site, Area or Region. **Figure 20** provides a spatial overview of the vegetation cover classes lost to the Lalor Mine Development and their distribution though the Project Site, Area and Region.

4.10.2 Fauna

The Churchill River Upland Ecoregion provides habitat for moose, woodland caribou, black bear, lynx, wolf, beaver, muskrat and snow-shoe hares. This ecoregion is also a winter range for barren-ground caribou. Various bird species including sandhill crane, grouse, waterfowl (ducks, geese and pelicans) along with many other birds are found in this ecoregion. (Smith *et al.*, 1998)

During the field studies conducted in September 2007, signs of bear and moose in the Project Area were apparent and wildlife observed included a coyote, fox, white tail deer, timberwolf, otter, beaver, eagles, pelicans, crane, loons, and frogs. With the exception of a variety of waterfowl, there were no signs of wildlife observed within approximately 1 km of the Project Site at the time of the field investigation in 2010. In 2010, ravens were seen in the area, however terrestrial wildlife was largely absent during the survey. The densely forested black spruce bog offers little in the way of nesting habitat for birds and very few were seen or heard in the area during the 2011 survey. No species were observed in the spring 2011 survey that were not previously recorded in the 2010 survey.

The density of the forest canopy and poor diversity of plant life under the trees make this a poor area in terms of wildlife diversity in general. This is especially true for nesting birds, which benefit from the edge effects of different tree stands and open areas. Warblers and other insectivorous birds benefit from open areas that promote insect flight. The general Project Region has some variation in terms of upland rocky outcrops that promote hardwood growth and open areas in lichen outcrops.

Wildlife populations have open access to a large area of natural woodland in the Project Region that provides river and lake shore edge habitat and many burned areas in various stages of regrowth. Such areas provide a large diversity of habitats that favours wildlife populations and adjoin the immediate Project Area. Wildlife species can make use of the Project Area to the extent that it benefits them, but are not restricted to it. There is no restriction on wildlife species in terms of moving to more favourable areas within the general region.

There was no specific critical wildlife value observed at the Project Site (such as calving or over-wintering areas) and based on site conditions and limited field observations, it is expected that there is no critical wildlife value in the Project Area. The absence of suitable waterbodies for waterfowl in the general area makes it unlikely that they are nesting anywhere within the general area surrounding the Project Site.

4.11 Aquatic Resources

Lake bathymetry, water quality, sediment quality, phytoplankton community, zooplankton community, benthic invertebrate community, and fish and fish habitat were assessed in the area of the proposed Lalor Mine site as part of aquatic assessment studies. In 2007, North/South Consultants Ltd., on behalf of AECOM, conducted an aquatic assessment of 12 waterbodies in the area and in 2008 and 2010, AECOM conducted supplemental aquatic studies in eight waterbodies in the area (Table 4.3). Additional details are provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012).

4.11.1 Aquatic Non-Fish Community

As part of the baseline environmental aquatic assessments, phytoplankton, zooplankton and benthic invertebrate community data was collected. The results of the phytoplankton, zooplankton and benthic invertebrate community study have been used to establish the baseline biological content of the sampled waterbodies and will function as a benchmark for environmental monitoring in the lakes and other waterbodies potentially influenced by the proposed Lalor Mine. Detailed information on the phytoplankton, zooplankton and benthic community is provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012).

The aquatic baseline studies confirmed several aquatic non-fish species within the study area. Phytoplankton communities include *Dictyosphaerium* (chlorophyte), *Coelosphaerium* sp. and *Microsystis* sp. (cyanophytes). In 2007, Varnson Lake had the highest total biomass (451 mg/m^3) while Tern Lake had the lowest total biomass (125 mg/m^3). In 2010, species diversity ranged from 24 (Lalor Lake) to 37 (Tern Lake and Tern Ditch Pond) and biovolume ranged from 0.8 mm^3/L (Maw Lake) to 4.1 mm^3/L (varnson Lake). Similar species were found in both 2007 and 2010 phytoplankton communities. It should be noted that the difference in reporting units from 2007 (biomass mg/m^3) and 2010 (biovolume mm^3/L) is due to the fact that analysis and volumes were completed at two different laboratories.

Zooplankton communities include *Diaptomus oregonensis*, *Diaphanosoma leuchtenbergianum* and *Diaptomus* copepods. The zooplankton communities were dominated by Copepoda in 2007 in all the waterbodies examined, with Lalor Lake having the lowest species diversity and lowest total abundance. In 2010, Maw Lake had the highest abundance and highest species diversity. There were differences in the diversity of species identified in the samples in 2007 and 2010. This variability could be due to seasonal differences at the time of sample collection, differences in analytical reporting, sorting procedures, and/or taxonomic identification. Abundance will be evaluated in the fall of 2012 to evaluate variability observed in the two studies and confirm abundance in each waterbody.

Benthic invertebrates were collected only in 2007 and the communities consisted of larval diptera, chironomids, amphipods, molluscs and oligochaetes. Varnson Lake had the highest species diversity with 21 species, while Unnamed Lake 1 had the lowest species diversity with six species.

4.11.2 Fish Community

The fish community was assessed as part of the baseline aquatic assessments conducted in 2007 and 2010. Fishing effort included Standard Gang and Swedish gang index gill nets, seine nets and minnow traps. In 2007, Lalor Lake, Maw Lake, Varnson Lake, Tern Lake and Unnnamed Lake 1 were fished. In 2008, large-bodied species were targeted with trawling from the boat and angling from shore as fishing methods in Cook Lake. In 2010, only Tern Ditch Pond was fished using Swedish gang gill nets, seine nets and minnow traps. Detailed results for fish community sampling are provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012).

Fish species known to be present in the Nelson River watershed are listed in Table 4.9.

Table 4.9: List of Expected Aquatic Species in the area of the proposed Lalor Mine site

Family Name	Common Name	Species Name	Distribution
Petromyzontidae	Silver Lamprey	*Ichthyomyzon unicuspis*	N
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	N
Hiodontidae	Mooneye	*Hiodon tergisus*	N
Cyprinidae	Lake Chub	*Couesius plumbeus*	N
	Carp	*Cyprinus carpio*	I
	Pearl Dace	*Margariscus margarita*	N
	Emerald Shiner	*Notrophis atherinoides*	N
	Blacknose Shiner	*Notropis heterolepis*	N
	Spottail Shiner	*Notropis hudsonius*	N
	Fathead Minnow	*Pimephales promelas*	N
	Longnose Dace	*Rhinichthys cataractae*	N
Catostomidae	Longnose Sucker	*Catostomus catostomus*	N
	White Sucker	*Catostomus commersoni*	N
	Shorthead Redhorse	*Moxostoma erythurum*	N
Ictaluridae	Channel Catfish	*Ictalurus punctatus*	R
Esocidae	Northern Pike	*Esox lucius*	N
Umbridae	Central Mudminnow	*Umbra limi*	0
Osmeridae	Rainbow Smelt	*Osmerus mordax*	I
Salmonidae	Cisco	*Coregonus artedi*	N
	Lake Whitefish	*Coregonus clupeaformis*	N
	Rainbow Trout	*Oncorhynchus mykiss*	I
	Brook Trout	*Salvelinus fontinalis*	N
	Lake Trout	*Salvelinus namaycush*	N
Percopsidae	Trout-perch	*Percopsis omiscomaycus*	N
Gadidae	Burbot	*Lota lota*	N
Gasterosteidae	Brook Stickleback	*Culaea inconstans*	N
	Ninespine Stickleback	*Pungitius pungitius*	N
Cottidae	Slimy Sculpin	*Cottus cognatus*	N
Percidae	Johnny Darter	*Etheostoma nigrum*	N
	Yellow Perch	*Perca flavescens*	N
	River Darter	*Percina shumardi*	N
	Sauger	*Sander canadensis*	N
	Walleye	*Sander vitreus*	N
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	N

Source: Stewart and Watkinson, 2004,
Notes: Estuarine species are excluded from this list. N = native; I = introduced; 0 = not previously captured in this watershed.

The most abundant species captured during the fish community assessment was the Brook Stickleback. No large-bodied fish were captured in either the 2007 or the 2010 baseline surveys. Northern Pike and Walleye were captured in 2008 in Cook Lake.

Lalor Lake

Fish collections were conducted in Lalor Lake between September 7 and 8, 2007. The most abundant species captured in Lalor Lake in 2007 was Brook Stickleback; only a single Central Mudminnow was collected. Three fish species were collected in Lalor Lake: Brook Stickleback, Fathead Minnow and Central Mudminnow.

Maw Lake

Fish collections were conducted in Maw Lake on September 9, 2007. Three forage fish species were captured: Brook Stickleback, Fathead Minnow and Central Mudminnow. Fathead Minnow was the most abundant fish captured in Maw Lake in 2007, while only a single Central Mudminnow was captured.

Varnson Lake

Fishing effort in Varnson Lake occurred from September 10-11, 2007. Simliar to Maw Lake and Lalor Lake, only three species of forage fish were captured from Varnson Lake in 2007: Brook Stickleback, Fathead Minnow and Central Mudminnow.

Tern Lake

Fish collections were conducted on September 11, 2007. Only Brook Stickleback were captured in Tern Lake in 2007.

Cook Lake

Walleye and Northern Pike were captured from Cook Lake September 10-11, 2008. Once the first predator species of fish was caught, it was assumed sufficient prey species were present and no attempt was made to capture minnows or other fry. A total of six Northern Pike and four Walleye (three adult and one fry) were caught in Cook Lake in 2007.

Tern Ditch Pond

Only Brook Stickleback were captured in Tern Ditch Pond between July 8-10, 2010.

4.11.3 Metal Residues in Fish

Fish from Lalor Lake, Maw Lake, Varnson Lake and Tern Lake were submitted for metals analysis in fish tissue during the 2007 study. Fish from Tern Ditch Pond, were submitted for metals analysis in fish tissue in the 2010 study. Detailed information on the fish tissue analysis is provided in the AECOM report *Proposed Lalor Mine Environmental Baseline Assessment* (AECOM, 2012).

In total, 140 fish were submitted from Lalor Lake, Maw Lake, Varnson Lake and Tern Lake in 2007. With one exception, concentrations of arsenic, lead and mercury were below the *MWQSOG* (Williamson, 2002) for all fish analyzed and the majority of metal concentrations were at or below the detection limit. The mercury concentration in a single Fathead Minnow from Varnson Lake equalled the guideline with a concentration of 0.5 µg/g wet weight in 2007.

A total of 20 Brook Stickleback (sex unidentified) captured in Tern Ditch Pond were submitted for analysis of whole-body metal concentrations in 2010. Concentrations of most analytes were low or below detection limit and none exceeded the *MWQSOG* aquatic life residue guidelines for human consumption for arsenic, lead or mercury.

4.11.4 Aquatic Habitat

Based on the results of the aquatic study, it is not likely that Unnamed Creek 1, Lalor Lake, Maw Lake, Varnson Lake and Tern Lake could support any significant populations of large-bodied fish. The shallow depth, limited suitable habitat types and lack of connectivity limit these waterbodies to support only small-bodied (*i.e*., forage) fish species. The forage fish species that were found in the waterbodies closest to the location of the proposed Lalor Mine were the Brook Stickleback, Fathead Minnow and Central Mudminnow. These three species are often associated with one another, particularly in bog and headwater habitats (Stewart and Watkinson, 2004).

A number of other lakes, streams, creeks, ponds, and wetlands may also support small-bodied fish species. Large-bodied fish populations are supported in the larger lakes, such as Cook Lake, Squall Lake, and Snow Lake. These lakes are well-connected with other waterbodies, have greater depths and abundant fish habitat types available.

Lalor Lake, Maw Lake and Varnson Lake are small lakes within the Project Region. Iverach Lake, Erzinger Lake and Gutray Lake are moderately sized lakes within the Project Region but were not part of the baseline studies (**Figure 19**). Although these lakes are relatively shallow, each are likely to support small-bodied fish throughout the majority of the year. Larger lakes in the Project Region include Squall Lake, Cook Lake and Snow Lake. Squall Lake is north of Snow Lake and is likely able to support a variety of fish species. Snow Lake is known to support a variety of fish species throughout the year.

4.12 Protected Species

Protected species are species that are endangered, threatened or are of special interest as defined by either Federal or Provincial legislation. In the Province of Manitoba, endangered, threatened or special interest species are protected by the *Manitoba Endangered Species Act* (MESA) which may have species that overlap with the Federal *Species at Risk Act* (SARA). The woodland caribou is classified as threatened under MESA and may be found in the Churchill River Upland Ecoregion. No other provincially listed species are known to occur in the Project Region. A search of the *Species at Risk Public Registry* revealed occurrences within the Project Region of species listed as endangered, threatened or of special concern under SARA.

The following table displays a list of protected species which have the potential to occur in the Project Region.

Table 4.10: List of Protected Species with Potential to Occur in the Project Region

Common Name	Scientific Name	SARA Status	MB Status
Boreal Woodland Caribou	*Rangifer tarandus caribou*	Threatened	Threatened
Yellow Rail	*Coturnicops noveboracensis*	Special Concern	Not Ranked
Shortjaw Cisco	*Coregonus zenithicus*	Threatened	Not Ranked
Monarch	*Danaus plexippus*	Special Concern	Not Ranked
Flooded Jellyskin	*Leptogium rivulare*	Threatened	Not Ranked

Source: Manitoba Conservation, 2011a and Government of Canada, 2011a

According to Manitoba Conservation Fact Sheets, Manitoba recognizes three varieties of caribou: coastal, barren ground and boreal woodland. The boreal woodland caribou was designated as threatened under *MESA* in June 2006. (Manitoba Conservation, 2011a) Such factors as habitat destruction, hunting, disturbance by humans (including construction of roads and pipelines), and predation (by wolves, coyotes, and bears) have all contributed to the decline of caribou. In many parts of their range, forestry practices and the expansion of agriculture and mining have resulted in the loss and alteration of important caribou habitat. Other factors such as weather and climate change are also influential however are more difficult to control. One of the current challenges in caribou management is to learn more about how these factors interact and how to decrease their threat to caribou populations. (Government of Canada, 2011a)

The Manitoba Conservation Data Centre provides a ranking of species of conservation concern for the Churchill River Upland Ecoregion. The term “species of concern” includes species that are rare, distinct, or at risk throughout their range or in Manitoba and need further research. Species are evaluated and ranked on the basis of their range-wide (global) status, and their province-wide (sub-national) status according to a standardized procedure used by all Conservation Centres and Natural Heritage Programs. Fungi, plants and vertebrate animals of special concern and their ranking have been listed for the Churchill River Upland Ecoregion in Table 4.11.

Table 4.11: List of Species of Special Concern

Common Name	Scientific Name	Rank
Fungi		
Flooded Jellyskin	*Leptogium rivulare*	Globally and provincially the species is not ranked; a rank has not yet been assigned or the species has not been evaluated.
Vascular Plants		
Few-Flowered Sedge	*Carex pauciflora*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon in the province.
Few-Fruited Sedge	*Carex oligosperma*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon in the province, but status is uncertain.
Fragrant Shield Fern	*Dryopteris fragrans*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon to widespread, abundant and apparently secure throughout the province.
Limestone Oak Fern	*Gymnocarpium robertianum*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked very rare throughout the province.
Long-Fruited Sedge	*Carex michauxiana*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked rare throughout the province.
Moor Rush	*Juncus stygius ssp. americanus*	Globally ranked demonstrably widespread, abundant and secure throughout its range including its subspecies and provincially ranked very rare in the province, but status is uncertain.
Northern Oak Fern	*Gymnocarpium jessoense*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon to widespread, abundant and apparently secure throughout the province.
Northern Woodsia	*Woodsia alpina*	Globally ranked widespread, abundant and apparently secure throughout its range and provincially ranked very rare in the province.
Round-Leaved Bog Orchid	*Platanthera orbiculata*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon in the province.
Small Water-Lily	*Nymphaea tetragona*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked rare throughout the province.
White Beakrush	*Rhynchospora alba*	Globally ranked demonstrably widespread, abundant and secure throughout its range and provincially ranked uncommon in the province, but status is uncertain.

Common Name	Scientific Name	Rank
Vertebrate Animal		
Caribou	*Rangifer tarandus caribou*	Globally ranked demonstrably widespread, abundant and secure throughout its range while its subspecies is widespread, abundant and apparently secure throughout its range and provincially ranked widespread, abundant and apparently secure throughout the province.
Shortjaw Cisco	*Coregonus zenithicus*	Globally ranked uncommon throughout its range and provincially ranked uncommon in the province.

Source: Manitoba Conservation Data Centre – Churchill River Upland (Manitoba Conservation, 2011b)

As confirmed through field observations conducted in 2007, 2010 and 2011, the wildlife habitats within the Project Area are considered to be typical for the region, with no unique or rare habitats encountered.

4.13 Socio-Economic Environment

4.13.1 Protected Areas

Grass River Provincial Park is located approximately 25 km southwest of the proposed Lalor Mine site and covers an area of 2,279 km^2. This Provincial Park is also classified as a Natural Park as its purpose is to preserve natural areas that represent the Churchill River Upland portion of the Precambrian Boreal Forest. Woodland caribou can be found throughout the park year round, and are usually found in areas with mature forest and treed muskeg. (Manitoba Conservation, 2011c)

Cormorant Provincial Forest, the most northern Provincial Forest in Manitoba, is located approximately 80 km southwest of the proposed Lalor Mine site. This Provincial forest was established in 1947 and covers an area of 1,479 km^2 including Clearwater Lake Provincial Park. Provincial forests are Crown Lands managed by Manitoba Natural Resources. (Manitoba Conservation, 2011d)

Clearwater Lake Provincial Park is located approximately 105 km southwest of the proposed Lalor Mine site and covers an area of 593 km^2. This Provincial Park is classified as a Natural Park as its purpose is to preserve natural areas that represent the Mid-Boreal portion of the Manitoba Lowlands. (Manitoba Conservation, 2011e)

The Saskeram Wildlife Management Area (WMA) is located approximately 130 km southwest of the proposed Lalor Mine site and occupies an area of 958 km^2. The Tom Lamb WMA is located approximately 85 km south-southwest of the proposed Lalor Mine site and occupies an area of 2,083 km^2. Both of these WMAs encompass a large portion of the Saskatchewan River Delta. These areas provide breeding and staging areas for waterfowl and habitat for moose, wolves, black bears and furbearers. (Manitoba Conservation, 2011f)

4.13.2 Heritage Resources

Information from the Historic Resources Branch of Manitoba Culture, Heritage and Tourism does not indicate any historic or heritage resources on the Project Site or within the Project Area. The closest heritage resource of significance is located approximately 20 km south of the Project Site at Tramping Lake, the site of one of Manitoba's largest known concentrations of aboriginal petrographs. At the narrows of Tramping Lake, in the southeastern part of the Grass River waterway, ancient artwork appears on a series of 14 rock faces, on a granite outcropping that dominates the shore. The paintings of deer, bison, moose, birds, fish, snakes and humans are thought to have been created 1,500 to 3,000 years ago by the Algonkian-speaking ancestors of the Cree and Ojibway First Nations.

Further, as the Project Site was a bedrock outcrop and treed muskeg prior to development, it is unlikely that graves or other buried artifacts would be encountered.

4.13.3 Economy

4.13.3.1 Town of Snow Lake

The main community in Project Region is the Town of Snow Lake, an important mining and service centre for the surrounding area. According to the 2006 census data from Statistics Canada, Snow Lake has a population of 837 with the majority of these residents employed at, or supported by, the mines located throughout the area. Many other Snow Lake residents are employed in the industries and services that support the region's mining operations. The proposed Lalor Mine is located within the municipal boundary of the Town of Snow Lake as shown in **Figure 21**. (Statistics Canada, 2010a)

The Snow Lake area has had an active mining history for more than 50 years. HBMS has played an integral part in this history since the late 1950's by operating nine mines in the area including Photo Lake, Rod, Chisel Lake, Stall Lake, Osborne Lake, Spruce Point, Ghost Lake, Anderson Lake and in current production at Chisel North Mine.

In addition to mining activities, extensive forestry operations have occurred within the region and surrounding area, with wood sent to the pulp and paper mill operation in The Pas, Manitoba. Trapping and hunting are also popular activities in this region.

4.13.3.2 City of Flin Flon

According to the 2006 census data from Statistics Canada, the City of Flin Flon has an approximate population of 5,594 people (Statistics Canada, 2010b). The City of Flin Flon is the main mining community in north-western Manitoba and north-eastern Saskatchewan. Flin Flon is located just over 800 km north-northwest of Winnipeg, Manitoba, and 120 km west of the Town of Snow Lake. The community occupies portions of both Manitoba and Saskatchewan.

In addition to mining, Flin Flon is the location of a number of other thriving industries including: forestry and primary retail. Flin Flon has a strong tourism industry which includes hunting, fishing, camping, and boating.

4.13.4 Community Infrastructure

4.13.4.1 Town of Snow Lake

The Town of Snow Lake is situated mid-way between Thompson, Flin Flon and The Pas. Year-round road access is provided to Snow Lake by Provincial Road 392. The community is serviced directly by Manitoba Hydro transmission lines and has telephone access through Manitoba Telecom Services Inc. Potable water is obtained from Snow Lake, and is treated in a WTP located in the Town of Snow Lake.

4.13.4.1.1 Traffic

Highways and major roads in the vicinity of the proposed Lalor Mine are shown in **Figure 22**. According to Manitoba Infrastructure and Transportation, the 2009 annual average daily traffic (AADT) flow for Provincial Road 392 north of Provincial Trunk Highway 39 and south of the Provincial Road 395 junction is 520 vehicles per day. The average daily traffic flow for Provincial Road 395 west of the Provincial Road 392 junction is 80 vehicles per day. (Manitoba Infrastructure and Transportation, 2009)

4.13.4.2 City of Flin Flon

Access to Flin Flon is along paved Provincial Trunk Highway 10 from The Pas and Southern Manitoba, Provincial Trunk Highway 39 from Snow Lake and Thompson, and Highway 106 from Saskatchewan. Flin Flon is serviced directly by Manitoba Hydro transmission lines and has telephone and cellular access through Manitoba Telecom Services Inc.

4.13.5 Community Services

4.13.5.1 Town of Snow Lake

The Town of Snow Lake has various community services including: a health facility that is staffed by two doctors, a grocery store, two hotels/motels, two service stations, a hockey arena, a curling rink and a nine-hole golf course. There is an un-serviced gravel municipal airstrip located approximately 20 km east of the proposed Lalor Mine site, along Provincial Road 393, that is designed to accommodate air ambulances for medical evacuations. There is also a tailings strip north of the Town of Snow Lake that is located approximately 9 km from the proposed Lalor Mine site. Other services include an RCMP station and a volunteer fire department. There are also numerous recreational opportunities including camping, hiking trails, fishing, hunting, snowmobiling and all terrain vehicle trails. (Snow Lake, 2011)

4.13.5.2 City of Flin Flon

The City of Flin Flon operates an airport located 20 km southeast of the city near Baker’s Narrows. Other services such as a hospital, a fire hall and a police/RCMP station are located in Flin Flon along with a hockey arena, curling rinks, a golf course, a public swimming pool and numerous sports fields for recreational opportunities. (City of Flin Flon, 2008)

4.13.6 Personal/Family/Community Life

4.13.6.1 Town of Snow Lake

Some of the larger community events held in Snow Lake include the Winter Whoot Festival and the Sno-Drifters Radar Runs. Other events include Bingo and Texas Hold’em that are held at The Royal Canadian Legion #241. (Snow Lake, 2011)

4.13.6.2 City of Flin Flon

Various community events are held in Flin Flon during the year. Some of these events include: The Friendship Center Sled Dog Races, Baker’s Narrows Day, Phantom Lake Father’s Day Picnic and the Trout Festival. Other smaller events include a Spring Breakout Program, Canada Health Day Event, Terry Fox Run and the Christmas Family Event. (City of Flin Flon, 2008)

4.13.7 Regional Resource Use

4.13.7.1 Trappers

The Manitoba Conservation office in Snow Lake has confirmed that there are two registered trap lines (RTLs) in the area of Cook Lake and Lalor Lake. These lines include RTL 23 and RTL 14 which are owned by Martin McLaughlin and Jim Schollie, respectively. Manitoba Conservation has confirmed that the area of Anderson Creek and Wekusko Bay, located within the Project Area, is registered as RTL 13. This trap line is owned by Russell Bartlett (assisted by Greg Foord).

4.13.7.2 Cottages or Remote Residences

During AECOM's Cook Lake bathymetry field investigation conducted in September 2008, five cabins were observed on Cook Lake. All five cabins were unoccupied on the first day of the investigation. On the second day of the investigation, one resident was present at Cabin 5. In a brief interview with the resident, it was indicated that cabins have only been on the lake in the last 15 years and that five cabins is the maximum allotted to Cook Lake by Manitoba Conservation. Boats and all terrain vehicles were observed during the September 2007 field study.

4.13.7.3 Lodge Owners

There are no lodges in the area immediately surrounding the proposed Lalor Mine, however there are five lodges located in the Snow Lake region. The Diamond Willow Inn & Willow House is located in the Town of Snow Lake at 200 Lakeshore Drive and is approximately 9 km east of the Lalor AEP site. Wekusko Falls Lodge and Tawow Lodge Ltd. (Herb Lake Landing) are located approximately 18 km and 35 km southeast of the Lalor AEP site, respectively. Burntwood Lodge is a fly in fishing lodge located on Burntwood Lake and is estimated to be approximately 60 km northwest of the Lalor AEP site. Grass River Lodge is located on Reed Lake and is approximately 23 km southwest of the Lalor AEP site with outpost cabins on Dolomite Lake (50 km southwest of the proposed Lalor Mine site) and Moody Lakes (40 km northwest of the Lalor AEP site).

4.13.7.4 Snowmobilers

The Snow Lake area is home to the Snow Lake Sno-Drifters snowmobiling club. A map of snowmobile trails in the Snow Lake area is included in **Figure 22**.

4.13.7.5 Forestry

As indicated in Section 4.13.1, the Cormorant Provincial Forest is located approximately 80 km southwest of the proposed Lalor Mine site and covers an area of 1,479 km^2. Provincial forests are Crown lands managed by Manitoba Natural Resources on a sustainable yield basis. A license or permit allows harvesting of trees on Crown lands and also indicates the quantity of each type of trees that can be harvested. Large companies must regenerate forest lands that they have harvested according to their Forest Management License. A forest renewal fee is paid by individuals or small companies for reforestations. (Manitoba Conservation, 2011d)

Tolko Industries Ltd. (Manitoba Solid Wood Division, Woodlands), located in The Pas, Manitoba has three Forest Sections in the region (Highrock, Nelson River and Saskatchewan River) where wood is harvested. These Forest Sections include areas surrounding Snow Lake, Flin Flon and Grass River Provincial Park. (Tolko Industries Ltd., 2011)

4.13.8 First Nations

The Mathias Colomb Cree Nation, located approximately 122 km northwest of Snow Lake at the community of Pukatawagan, is the closest First Nation community to the Project Site. According to the 2006 census data from Statistics Canada, Pukatawagan had a population of 1,478 people in 2006 (Statistics Canada, 2010c). Mathias Colomb had a band population of 1,576 people in 2006 (Statistics Canada, 2007).

Other First Nations that are within a similar distance to the proposed Lalor Mine site include:

- Nisichawayasihk Cree Nation at Nelson House (129 km)
- Mosakahiken Cree Nation at Moose Lake (131 km)
- Opaskwayak Cree Nation at Opaskwayak (137 km)
- Cross Lake First Nation at Cross Lake (155 km)
- Norway House Cree Nation at Norway House (182 km)

Figure 23 shows the locations of these First Nations relative to the proposed Lalor Mine Development.

5. Assessment of Environmental Effects and Mitigation Measures

5.1 Effects Assessment Methodology

Applying professional judgment and a thorough understanding of the components of the proposed project (set out in Section 2 of this report), AECOM determined the potential for each component of the proposed project to interact with each Environmental Component. Table 3.1 (in Section 3 of this report) displays these potential interactions, which are the subject of the analyses set out in the sections below. Mitigation measures that have been incorporated into the proponent's proposed plan are taken into account, as well as the environmental protection practices and procedures included in the proponent's standard of operation (such as compliance with ISO certified safety and environmental management systems). Where required, recommendations for additional mitigation measures have been provided in addition to those proposed by the proponent.

Environmental effects that may be caused by malfunctions or accidents are discussed separately in Section 5.12.

Technical terms used in the analysis are defined in the following table.

Table 5.1: Explanation of Terms Used in Effects Assessment

Project Phase:	Refers to the phase of the project as construction, operation or closure.
Potential Effect:	Classification of the type of effects possible during a specific project phase.
Magnitude of Effect:	Refers to the estimated percentage of population or resource that may be affected by activities associated with the construction, operation and closure of the Lalor Mine. Where possible and practical, the population or resource base has been defined in quantitative or ordinal terms (e.g., hectares of soil types, units of habitat). Magnitude of effect has been classified as either less than (<) 1%, 1% to 10%, or greater than (>) 10% of the population or resource base. Where the magnitude of an effect has been defined as virtually immeasurable and represents a non-significant change from background in the population or resource, the effect is considered negligible. An exception to this is in terms of potential human health effects where, for example health issues due to water-borne diseases amounting to 1% of the population being affected would still be considered major.
Direction of Effect:	Refers to whether an effect on a population or a resource is considered to have a positive, adverse or neutral effect.
Duration of Effect:	Refers to the time it takes a population or resource to recover from the effect. If quantitative information was lacking, duration was identified as short-term (<1 year), moderate term (1 to 10 years) and long term (>10 years).
Frequency of Effect:	Refers to the number of times an activity occurs over the project phase, and is identified as once, rare, intermittent, or continuous.
Scope of Effect:	Refers to the geographical area potentially affected by the effect and was rated as Project Site, Project Area or Project Region as defined in Section 3. Where possible, quantitative estimates of the resource affected by the effect were provided.
Degree of Reversibility:	Refers to the extent an adverse effect is reversible or irreversible over a 10-year period.
Residual Effect:	A qualitative assessment of the residual effect remaining after employing mitigation measures in reducing the magnitude and/or the duration of the identified effect on the environment.

Magnitude of Effect	Direction of Effect	Duration of Effect	Frequency of Effect	Scope of Effect	Degree of Reversibility of Effect
Negligible (immeasurable)	Positive	Short term (< 1 year)	Once	Project Site	Reversible
Minor (<1%)	Adverse	Moderate (1 to 10 years)	Rare	Project Area	Irreversible
Moderate (1 to 10%)	Neutral	Long term (>10 years)	Intermittent	Project Region	
Major (>10%)			Continuous		

The following sections assess the potential interactions between Environmental Components and the proposed construction, operation and closure activities for the proposed Lalor Mine, taking mitigation measures into account and identifying residual adverse effects. The analysis also includes any effects on Social Components that may result from significant residual adverse effects. AECOM assessed the significance of any residual adverse effect, based on the magnitude, scope, duration/frequency and reversibility of that effect.

A summary table of the potential effects, mitigation measures and residual effects is included in Table 5.2.

5.2 Topography

5.2.1 Levelling and Stockpiling

Changes to site topography can result from clearing, levelling, blasting or stockpiling of rock. Construction and operation of the proposed Lalor Mine will not affect the topography of the site. The Project Site has been cleared and levelled during construction of the Lalor AEP. The construction activities planned for the Lalor Mine, including the construction of a Dry Complex will be limited to the existing Lalor AEP site. The operation phase will not entail any surface blasting or stockpiling of waste rock.

The closure phase will include restoration of the topography of the site to match the surrounding area to the extent that is practical. Rehabilitation of the topography will include removal of all buildings and foundations, followed by re-grading and contouring of the Lalor Mine site and access road.

5.3 Soil

5.3.1 Acid Rock Drainage

PAG waste rock has the potential, when exposed to air and water, to create acid rock drainage (ARD). ARD can adversely affect soil quality (pH change) as well as local vegetation, groundwater and surface water. ARD also has the potential to liberate metals from the waste rock or dust which can increase metal concentrations in soil, groundwater and surface water.

All waste rock produced during operation of the mine will be treated as if it were PAG waste rock, as follows: no waste rock will be stored at the Project Site; waste rock will be used as mine backfill at the Lalor Mine and Chisel North Mine; and, if backfilling is not possible, the waste rock will be disposed of in the Chisel Open Pit. Water from the Chisel Open Pit is treated at the Chisel North WTP before discharge to the environment. As the plan for operation of Lalor Mine eliminates the potential to generate ARD on-site, no effect on soil quality as a result of ARD is anticipated.

5.3.2 Waste Management

Wastes such as STP sludge, used oils, rags, drums and miscellaneous garbage have the potential to cause adverse effects on soil and surface water quality, with potential consequent exposure to flora and groundwater. To prevent any potential adverse effects on soil quality that could be caused by wastes, the following standard HBMS waste management practices will be undertaken:

- All wastes will be disposed of appropriately at a licensed waste disposal facility.
- Wastes generated at surface will be disposed of in garbage collection bins maintained at specific locations throughout the Lalor Mine site. These bins will be emptied on a regular basis for disposal at a licensed waste disposal facility or other permitted disposal site.
- Waste oils and other hazardous materials generated underground will be returned to the surface using fuel drums or other containers specifically designed for this purpose.
- Hazardous materials including waste oil, lubricants and other petroleum products will be removed by a licensed hazardous materials handler for recycling or appropriate disposal.

5.3.3 Remediation

The proposed Lalor Mine, like any operation which uses fuel or other potential contaminants, has the potential to deposit contaminants in soil, which may be transported into groundwater, surface water or air (dust). If during mine operation the surface explosive magazines are relocated underground, assessment of contamination (if any) at the magazine locations and remediation as required will be undertaken as part of the relocation process. Closure activities will include assessment of any contamination caused by the development, followed by any remediation that may be required to eliminate risk to human health, safety or the environment.

5.3.4 Erosion

Wind and precipitation can cause erosion of soil which, in turn, has the potential to cause subsequent effects on air (dust generation), flora (decreased growth due to dust deposition) and surface water (turbidity).

As described in Section 4, prior to development of the Lalor AEP site, the site consisted of a bedrock outcrop with minimal soil. During construction of the Lalor AEP, the site was cleared and levelled and now is composed primarily of crushed rock. The construction and operation phases will not include any activity that is likely to result in soil erosion.

The final phase of closure activities will include the application of soil to disturbed areas (except for the access road), with re-seeding of appropriate species and other mitigation measures that are likely to prevent erosion that could be caused by wind and precipitation, including the following:

- A buffer of mature forest will be maintained around the Lalor Mine site to mitigate soil erosion due to wind.
- The site will be contoured to match the surrounding topography as much as possible.
- Re-vegetation will occur as soon as practical following the application of soil.
- The success of re-vegetation efforts will be monitored until vegetation has re-established with additional re-vegetation activities to occur on an as needed basis.

Thus, at the completion of site rehabilitation, there should be no residual adverse erosive effect on the quantity of soil on the site.

5.4 Air

5.4.1 Dust Generation

Dust and particulate matter have the potential to adversely affect air quality with consequent effects on human health (respiratory concerns and potential transportation safety concerns due to impaired visibility on roads), vegetation (decreased growth due to deposition) and soil quality (deposition of contaminants). It is expected that dust generation will primarily occur during the summer and fall.

Construction and closure activities have the potential to adversely affect air quality by generating dust. No vegetation clearing or soil disturbance will be required during construction; however limited excavation in the crushed rock pad may be required for building foundations, which will contribute to the potential generation of dust. During closure activities, excavations to remove site buildings and infrastructure, re-grading the site, and soil placement for re-vegetation will contribute to the potential generation of dust.

The dense nature of the vegetation immediately surrounding the Project Site is expected to mitigate wind effects and overall potential dust migration, limiting its effects to the Project Site and the immediate Project Area.

To mitigate potential air quality effects during construction and closure, the following mitigation measures will be undertaken:

- Material stockpile heights will be limited where practical. No waste rock stockpiles will be located at the Lalor Mine site.
- Disturbed/exposed areas will be kept to a minimum.
- If required, dust suppression activities, such as use of an approved dust control agent, will be completed.
- Re-vegetation of disturbed areas will occur as part of site closure activities and will provide long term mitigation of dust effects upon the completion of closure activities.

With these mitigation methods employed as necessary during construction and closure, the residual effect of dust generation on air quality is anticipated to be negligible.

During the operation phase of the project, dust will be generated by vehicle movements. Employee buses, ore trucks, waste rock trucks and material delivery trucks/vehicles will travel to and from the site on a regular basis. As indicated in Section 2, up to 160 vehicle trips to the site will occur on a daily basis. The vehicles will access the site via Provincial Road 392, Provincial Road 395 and the Lalor Mine access road. As most vehicles will not remain on the site, the increase in traffic on Provincial Road 395 is anticipated to be approximately 320 vehicles per day (160, two-way trips).

Dust generation is anticipated on Provincial Road 395 and the Lalor Mine access road as they are unpaved roads. Dust generation is not anticipated on Provincial Road 392 as it is a paved road. Potential dust effects will be mitigated by the implementation of the following measures:

- Waste rock will be used as much as possible as backfill within the Lalor Mine to minimize the amount of material hauled from site.
- If required, dust suppression activities, such as the use of an approved dust control agent, will be undertaken for the Lalor Mine access road. Dust suppression on Provincial Road 395 is the responsibility of Manitoba Infrastructure and Transportation.
- Speed limits at the Lalor Mine site and along the access road will be imposed.
- Waste rock and ore truck loads will be covered to minimize dust coming off loads.

The above mitigation measures are judged to be sufficient to prevent residual adverse effects of a significant nature. During (worst case) dry, high wind conditions, the residual effect of dust on air quality is anticipated to be minor on the Project Site and in the most immediate sections of the Project Area. During normal weather conditions, the residual effect of dust on air quality will be negligible.

5.4.2 Emissions

Exhaust emissions from vehicles and equipment have the potential to adversely affect air quality. During construction, emissions will be generated during delivery of material to the site and the use of a maximum of five pieces of equipment required for the construction of the Dry Complex.

During the closure phase, emissions will be generated during excavating, hauling, grading and material placement. It is anticipated that five pieces of equipment will be used to carry out closure activities. This equipment will travel to/from the site from time to time. At least four haulage trucks will access the site on a regular basis during working hours to haul materials to/from the site.

The residual effect on air quality of emissions generated during the construction and closure phases is likely to be negligible, for the following reasons. Emissions will be relatively contained to the Project Site due to the vegetated nature of the surrounding Project Area. Emission sources will be limited to five pieces of equipment and haulage trucks. To mitigate potential air quality effects during construction and closure, the following mitigation measures will be followed:

- Vehicles and equipment will be well maintained.
- Vehicle idling will be kept to a minimum.

During operation of the Lalor Mine, vehicles accessing the site, underground vehicles and equipment, and the heating of supply air will generate emissions. As indicated in Section 2, up to 160 vehicles may access the site on a daily basis, including waste rock and ore trucks, material deliveries and employee shuttle bus service. According to Manitoba Infrastructure and Transportation, the 2009 annual average daily traffic (AADT) flow for Provincial Road 392 north of Provincial Highway 39 and south of the Provincial Road 395 junction is 520 vehicles per day. The average daily traffic flow for Provincial Road 395 west of the Provincial Road 392 junction is 80 vehicles per day. The additional traffic is therefore considered to be a major increase in traffic on both Provincial Road 392 and Provincial Road 395.

Although the increase in traffic is considered major, the increase in emissions due to the increase in vehicles is not anticipated to have a major effect on air quality. Trucks and vehicles used for the Lalor Mine will comply with Environment Canada's *On-Road Vehicle and Engine Emission Regulations* as required.

Exhaust emissions will also be generated by vehicles and mining equipment used underground. The number of vehicles and pieces of equipment used underground will vary according to the stage of mine development and level of production. However, it is anticipated that the exhaust sources underground will be far fewer than the sources at the surface (160 vehicles accessing the site per day). The mine ventilation system has been designed to provide fresh air for workers underground, taking into account equipment and vehicle emissions. Work areas are equipped with fans to help circulate fresh air and exhaust air. Further, underground workers and site supervisors will be equipped with handheld carbon monoxide monitors that alarm when levels exceed regulated limits.

Emissions will also be generated during the combustion of propane to heat supply air for the underground operations. The combustion of propane will generate pollutants including nitrogen oxides (NO_x), carbon monoxide, sulphur dioxide and particulate matter. Greenhouse gas emissions will also be generated by the combustion of propane and are discussed in Section 5.5.1. Emissions may also be generated in the event of a power failure when diesel fueled generators will be used.

To mitigate potential air quality effects, the following mitigation measure is proposed in addition to those proposed for construction and closure:

- Propane heaters will be equipped with low NO_x burners if possible.

Based on implementation of all of the above-noted mitigation measures during the operation phase, the potential residual effect on air quality is anticipated to be negligible in the Project Area.

As the air quality is expected to return to pre-existing conditions following the cessation of mining activities, potential residual effects are considered reversible. Overall, the potential residual adverse effect is anticipated to be not significant.

5.4.3 Noise

An increase in the noise level at the Project Site during construction and closure activities has the potential to influence people and wildlife in the surrounding area. Potential effects on wildlife are discussed in Section 5.9. Noise will be generated to varying degrees during construction and closure activities, with most of the noise expected to be typical of heavy equipment such as trucks, graders, loaders and excavators. No surface blasting during construction or closure activities will be required.

Construction activities for the Lalor Mine will occur over a six month period. Closure activities are anticipated to occur over a year at some point in the future. During the construction and closure period, traffic will access the site on a periodic basis. During the closure phase, at least four haulage trucks will access the site on a regular basis during working hours to haul materials to/from the site.

All practices performed on the Lalor Mine site will be carried out in accordance with the *Workplace Safety and Health Act* and HBMS' OHSAS 18000 certified management system, which will minimize potential effects on health and safety. HBMS will provide hearing protection as required to ensure site workers are protected from noise during construction and closure activities.

The closest human receptors (outside of HBMS site workers) to the existing Lalor AEP site/Lalor Mine site are the cottages on Cook Lake, located 1.7 km to the west of the Lalor Mine site. The closest residential area to the Project Site is the southern portion of the Town of Snow Lake located 8.5 km from the Lalor AEP site and 0.3 km to the north of Provincial Road 395.

Based on the distance from the Lalor Mine site to the cottages on Cook Lake, the vegetated nature of the land between the Lalor Mine site and the cottages, and the intermittent nature of the construction and closure noise, it is not anticipated that construction and closure activities will contribute to noise effects at the cottages on Cook Lake.

The distance from the Lalor Mine site to the closest residential portion of the Town of Snow Lake (8.5 km) is anticipated to be sufficient to mitigate any noise effects that may be caused by site construction or closure activities at the Lalor Mine site on the Town of Snow Lake residents. It is not anticipated that traffic associated with construction or closure activities will contribute to noise effects in the residential areas due to the separation distance from Provincial Road 395 to the residences (0.3 km), vegetation separating the road from the residential area and the intermittent nature of the noise. If noise complaints related to HBMS activities are received by HBMS during the construction or closure phase, HBMS will work with residents to design and implement appropriate mitigation.

During the operation phase of the project, noise will be generated at the Lalor Mine site including noise from fans, compressors, pumps, emergency generators and loading rock/ore trucks. Noise will also be generated from the ventilation fans at the raise sites, the booster pump station and from vehicle movements. Blasting and crushing will also occur underground throughout the life of the mine. However, the depths at which underground blasting and crushing will occur (no mining above 685 m level) are anticipated to eliminate the potential for surface noise and vibration effects due to underground operations.

All underground and surface operations will comply with the requirements of applicable legislation and as such no effects on workers due to noise are anticipated.

AECOM has carried out background (baseline) noise measurements at Points of Reception in the residential areas of the Town of Snow Lake and source measurements at Chisel North Mine and the 777 Mine in Flin Flon. Assuming that the engineering controls are similar to those employed at 777 Mine, it is expected that the effects of noise will be limited to the Project Site and non-residential areas of the Project Area. With the implementation of standard engineering design and controls, such as those currently in place at the 777 Mine in Flin Flon, noise levels are anticipated to subside to ambient levels prior to reaching the closest cottage on Cook Lake. Further, noise levels associated with mine-related traffic on Provincial Road 395 are anticipated to return to ambient levels prior to reaching the closest residential area in the Town of Snow Lake. Therefore, there will be no adverse effects from noise in the Town of Snow Lake or existing cottages located at Cook Lake.

5.5 Climate

5.5.1 Greenhouse Gas Emissions

During construction and closure activities, greenhouse gas emissions typical of worker vehicles and diesel construction equipment exhausts will be generated, including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) which can contribute to climate change effects. Emissions are expected to be generated during vehicle and equipment movement at the Lalor Mine site, including excavating, grading and material placement.

To mitigate potential climate effects due to greenhouse gas emissions, the following mitigation measures are proposed:

- Number of vehicles in operation at the site will be minimized to the maximum extent practical.
- Vehicle idling will be kept to a minimum.

With the implementation of the mitigation measures, the potential residual effect on climate change is anticipated to be negligible in the construction and closure phase. Climate change effects due to greenhouse gas emissions are considered irreversible; however due to the limited number of vehicles and amount of equipment at the site during construction and closure activities, the overall potential residual effect is not anticipated to be significant.

During the operation phase, the Lalor Mine will require the combustion of propane to heat mine supply air and the combustion of diesel and gasoline in vehicles and equipment. The combustion of propane, diesel and gasoline will result in the release of CO_2, CH_4 and N_2O emissions which are greenhouse gasses that have the potential to contribute to climate change effects.

Manitoba Conservation's *Environment Act Proposal Report Guidelines* provide for climate change implications, including a greenhouse gas inventory, to be included in an assessment of the anticipated environmental effects of a development. The Guidelines indicate that the inventory should be calculated according to guidelines developed by Environment Canada and the United Nations Framework Convention on Climate Change. According to Environment Canada's technical guidance document, reported emissions are to include direct emissions associated with the operation of a contiguous facility. (Government of Canada, 2011b)

Hudbay calculates greenhouse gas emissions for its operations as part of its annual sustainability reports. Calculated emissions data was provided to AECOM for the Chisel North Mine from 2003 to 2010. Direct emissions were calculated and included the combustion of propane, diesel and gasoline.

Between 2003 and 2008, the Chisel North Mine operated at an approximate rate of 1,200 tonnes per day which is approximately one third of the proposed operation rate of the Lalor Mine (3,500 to 4,500 tonnes per day). From 2009 to 2010, the Chisel North Mine suspended and resumed operations and as such, the greenhouse gas emissions generated during this period are not considered representative of the mine in full production. The annual direct emissions from the years 2003 to 2008 were used to represent the mine under full production. The annual average direct emissions calculated for the Chisel North Mine were 6,566 tonnes of carbon dioxide equivalent (CO_2e) from 2003 to 2008. If it is assumed that the Lalor Mine will produce approximately three times as much CO_2e

as the Chisel North Mine based on the increased mining rate, the Lalor Mine will produce an estimated 19,699 tonnes of CO_2e on an annual basis.

HBMS' reported greenhouse gas emissions for the 777 Mine in Flin Flon were also examined to verify the greenhouse gas emissions estimate for the Lalor Mine. The 777 Mine was reported to generate an average of 20,500 tonnes of CO_2e on an annual basis from 2004-2011. In 2009, the 777 Mine operated at an approximate rate of 4,200 tonnes per day. As the Lalor Mine will operate at an approximate rate of 3,500 to 4,500 tonnes per day and as emissions for the Lalor Mine are similar to the 777 Mine, the emissions estimate for the Lalor Mine is considered appropriate. Environment Canada's mandatory reporting threshold for greenhouse gas emissions is 50,000 tonnes of CO_2e on an annual basis. As the Lalor Mine is not anticipated to generate even half of the reporting threshold, it is not considered a significant contributor of greenhouse gas emissions in the Province.

To determine the magnitude of this increase in greenhouse gas emissions at the Provincial level, the greenhouse gas emissions reported for the Province of Manitoba in 2009 in Canada's National Inventory Report 1990-2009 were examined. According to the report, the Province of Manitoba emitted a total of 20,300,000 tonnes of CO_2e in 2009 (Environment Canada, 2011). The increase of 19,699 tonnes annually of CO_2e from the operation of the Lalor Mine is considered to be a negligible increase (approximately 0.09%) in greenhouse gas emissions at the Provincial level.

Greenhouse gas emissions will be reduced where possible by ensuring vehicles are regularly serviced and are in good working order and minimizing unnecessary vehicle idling. The residual effect of greenhouse gas emissions on climate change during operation, although irreversible, is considered to be negligible.

5.6 Groundwater

For the purposes of this environmental assessment, a distinction has been made between shallow and deep groundwater resources. Shallow groundwater is considered to be water encountered below the ground surface within the overburden materials. Shallow groundwater is most likely to be influenced by mine surface activities. Deep groundwater is considered to be the water encountered below the ground surface within the bedrock. Deep groundwater is most likely to be influenced by underground development for the mine.

The Lalor Mine site is a large bedrock outcrop surrounded by bogs. Due to the bedrock outcrop and peat bog nature of the Project Region, shallow groundwater is at or near the ground surface. Local runoff from bedrock and upland areas collects in peat filled lows (bogs), which slowly release excess water to surrounding lakes and creeks as described in Section 4. Groundwater tables are high in most bogs and in low areas bordering the bogs. Bogs are widespread and stagnant in the area of the Lalor Mine, indicating that shallow groundwater movement is likely somewhat limited. As such, any effects on shallow groundwater quality are anticipated to be limited in spatial extent to the Project Site and immediate Project Area.

No groundwater users have been identified within 5 km of the Lalor AEP site which includes the subsurface area that will be affected by the mine. As a practical matter, the deep groundwater is not available for use as the low hydraulic conductivity of the rock formation in the Lalor Zone provides very slow recharge; and the great depth of the groundwater that may be affected by the mine (no mining above the 685 m level) restricts accessibility for users.

5.6.1 Use of Explosives

Explosives used during underground development and ore extraction have the potential to introduce contaminants underground, which could result in adverse effects on deep groundwater quality. Ammonium nitrate/fuel oil (ANFO) will be used in blasting and will be stored underground in two designated areas. Ammonium nitrate is water soluble and as such, blast residuals or spills and leaks from storage areas have the potential to affect groundwater quality.

Mine dewatering, which is required in order to operate underground, will eliminate the potential for blast residuals to come into contact with deep groundwater surrounding the mine. The mine dewatering methods proposed to be used by HBMS were described in Section 2.5. Groundwater removed from the mine will be pumped to the surface for treatment at the Chisel North WTP before discharge to Woosey Creek, thus preventing any groundwater that has been contaminated from re-entering the deep bedrock. Potential surface water effects associated with wastewater treatment facilities are discussed in Section 5.7.2.

Even if groundwater is exposed to blast residuals during the flooding of the mine in closure, the low hydraulic conductivity of the rock formation would restrict the migration of blast residuals in groundwater to the immediate area of underground development.

In accordance with HBMS standard practice, the following mitigation measures also will be applied:

- Storage of explosives will include spill containment measures.
- Spill containment and clean up will be undertaken as soon as possible after a spill has occurred.
- Charges will be designed to be as small as possible to minimize the volume of potential blast residuals.
- Emulsion type explosives will be used in wet areas to minimize the potential for ammonium nitrate to dissolve in groundwater.

The implementation of these measures will minimize the concentration of any blast residuals in mine water discharge. As noted above, potentially affected groundwater will be pumped to surface for treatment at the Chisel North WTP, removing the potential for additional groundwater to be affected. With the implementation of the above mitigation measures, it is anticipated that residual effects on groundwater quality due to the use of explosives will be negligible.

5.6.2 Mine Dewatering

HBMS provided for design capacity of pumps and pipelines to take account of a maximum potential groundwater inflow of 37 L/s (585 USgpm) in total for the mine. Based on HBMS experience in the construction of the Lalor AEP and the Lalor Ramp, and also based on HBMS experience in the region, it is anticipated that groundwater seepage into the mine will be much less than the design inflow rate.

Mine dewatering has the potential to create a groundwater depression zone in the area of a mine, which could affect the availability of deep groundwater for use. However, the low hydraulic conductivity of the rock presents little potential for movement of any groundwater that could be affected by the dewatering of the mine. Further, the mining methods used to minimize water infiltration in development of the mine (e.g. grouting shafts during shaft sinking) will minimize any potential influence on level or movement of deep groundwater. In addition, the depth at which dewatering will occur (no mining above the 685 m level) means that this groundwater is not available for practical use.

Recovery of the bedrock groundwater would likely occur over the moderate term if mine dewatering were to cease and as such is considered a reversible effect. No additional mitigation measures are proposed as there are no other groundwater users affected and mine dewatering is required to safely operate the mine. Based on the amount of groundwater seepage expected and the lack of users of the deep groundwater, no significant effects are anticipated.

5.6.3 Acid Rock Drainage

As described in Section 5.3.1, ARD has the potential to affect groundwater quality. As the waste rock management practices outlined in Section 5.3.1 will be undertaken to prevent the generation of ARD at the site, no effect on groundwater quality as a result of ARD is anticipated.

Post closure, the Lalor Mine will be allowed to flood, with the underground mine workings acting as a groundwater sink. The flooding of the mine will prevent the potential generation of ARD underground as oxygen will be limited and waste rock will be submerged. The residual effect on groundwater quality is anticipated to be negligible.

5.6.4 Waste Management

As described in Section 5.3.2, inappropriate waste disposal has the potential to affect groundwater quality. The waste management practices outlined in Section 5.3.2 will be implemented to prevent potential groundwater quality effects. The residual effect on groundwater quality is anticipated to be negligible.

5.6.5 Remediation

Closure activities will include the remediation of contaminated soils as described in Section 5.3.3. The removal of contaminated soils will eliminate the potential exposure pathway for contaminants to affect groundwater quality. In the event that soil contamination has resulted in groundwater contamination, remediation or monitoring of groundwater will be undertaken as appropriate under the direction of regulatory authorities. The residual effect on groundwater is anticipated to be negligible with the implementation of these mitigation measures.

5.7 Surface Water

5.7.1 Water Withdrawal

The withdrawal of water from waterbodies to supply fresh water to the Lalor Mine has the potential to adversely affect surface waterbodies by reducing water levels. It is estimated that up to 441.5 dam^3/year of water at a withdrawal rate of 14 L/s will be required at the Lalor Mine during the operation phase. HBMS is presently permitted to withdraw 1,600 dam^3/year of water from Ghost Lake at a rate not exceeding 20 L/s, and 600 dam^3/year of water from Chisel Lake. As the need for fresh water is accommodated within existing approved limits, surface waterbodies are not anticipated to be substantially affected as a result of fresh water supply to the Lalor Mine.

5.7.2 Wastewater Management

Wastewater generated during the operation phase of the Lalor Mine will be managed using existing licensed treatment facilities. The existing facilities will continue to operate in accordance with their *Environment Act* licenses/Clean Environment Commission Orders. Environmental Effects Monitoring (EEM) conducted under the *Metal Mining Effluent Regulations* (MMER) for the Chisel North WTP will continue to occur throughout the operation of the Lalor Mine.

Sanitary sewage generated at the Lalor Mine will be treated on-site as described in Section 2.4 and effluent quality will be monitored in accordance with the limits proposed in Table 2.2. The operation of the STP in accordance with these limits will acceptably mitigate potential effects on surface water quality that may be caused by the discharge of sanitary sewage.

Wastewater from underground mining operations has the potential to adversely affect surface waters if not managed and treated appropriately. Suspended solids, dissolved metals and residual blast chemicals (ammonia) can reduce water and sediment quality with subsequent effects on aquatic life if discharged to surface waterbodies. Water pumped from the mine to the surface (groundwater seepage and process water) will go through a solids separation system underground prior to pumping to the surface as described in Section 2.5. Once pumped to surface, the mine discharge will be directed to the discharge cells located beneath the Water Treatment Plant Building or to the polishing pond. This mine discharge will be pumped along with the STP treated effluent to the Chisel Open Pit for subsequent treatment at the Chisel North WTP.

The Chisel North WTP will reduce suspended solids and dissolved metal concentrations, and will adjust the pH of the wastewater prior to discharge to Woosey Creek. The Chisel North WTP currently treats discharge from the Chisel North Mine and natural water inflows to Chisel Open Pit and is operated at an average rate of 63 L/s (1,000 USgpm) and a peak rate of 101 L/s (1,600 USgpm). The treatment capacity of the Chisel North WTP is 126 L/s (2,000 USgpm).

When the Lalor Mine is in full production, approximately 51 L/s (809 USgpm) of wastewater from the Lalor Mine (including mine discharge and treated sewage) and 22 L/s (350 USgpm) from groundwater inflow from the Chisel North Mine will be directed to the Chisel Open Pit. Mining operations at the Chisel North Mine are scheduled to cease in 2012, at which time process water will no longer be generated at the Chisel North Mine. Only groundwater inflows from the Chisel North Mine will require treatment. Thus, the volume of total discharge to the Chisel Open Pit from the Lalor Mine and Chisel North Mine groundwater inflows will be 73 L/s (1,159 USgpm), which is greater than the volume generated at present, but well within the treatment capacity of the Chisel North WTP.

As well, it is anticipated that the quality of discharge into Woosey Creek will be maintained to comply with existing Provincial and Federal requirements. Concentrations of suspended solids, dissolved metals, and residual blast chemicals in the wastewater from the Lalor Mine are anticipated to be similar to the wastewater currently encountered at the Chisel North Mine.

Blast residuals will be minimized by employing the management practices outlined in Section 5.6.1. To account for residual blasting chemicals in wastewater, the Chisel North *Environment Act* license includes a monitoring requirement for total ammonia and calculated un-ionized ammonia concentrations in Woosey Creek, in addition to other parameters, including total metals, suspended solids and pH. This monitoring will continue when the Lalor Mine wastewater is treated at the Chisel North WTP. As well, discharge into Woosey Creek is subject to monitoring and controls under the Federal MMER, which includes provisions for additional monitoring and investigation if warranted. Accordingly, residual effects are considered sufficiently mitigated and are not considered significant.

5.7.3 Acid Rock Drainage

As described in Section 5.3.1, ARD has the potential to affect surface water quality. As the waste rock management practices outlined in Section 5.3.1 will prevent the generation of ARD at the site, no effect on surface water quality as a result of ARD is anticipated.

5.7.4 Waste Management

As described in Section 5.3.2, inappropriate waste disposal has the potential to affect surface water quality. To prevent potential effects due to inappropriate waste disposal, the mitigation measures described in Section 5.3.2 will be implemented. The residual effect on surface water quality is anticipated to be negligible.

5.7.5 Remediation

Effects associated with malfunctions and accidents including potential accidental discharges to surface waters are discussed in Section 5.12.

Closure activities will include the remediation of contaminated soils as described in Section 5.3.3. The removal of contaminated soils will eliminate the potential exposure pathway for contaminants to affect surface water quality. The residual effect on surface water is anticipated to be negligible with the implementation of these mitigation measures.

5.7.6 Erosion

As indicated in Section 5.3.4, closure activities will include the placement of topsoil, which has the potential to erode and affect surface water quality. The mitigation measures outlined in Section 5.3.4 will be undertaken to mitigate potential surface water quality effects that could be caused by the erosion of placed soil.

Closure activities will also include the removal of all culverts along the site access road. This process also has the potential to reduce surface water quality by introducing sediment into surrounding waterbodies either by erosion or if road bed material is placed in the waterbodies during the culvert removal. To minimize potential effects that could be caused during culvert removal, the removed road bed material will not be placed in the surface water and silt fences will be used as required to minimize sediment transport. The residual effect is anticipated to be negligible.

5.8 Protected and Other Flora Species

As described in Section 4.12, the Federally protected flooded jellyskin (lichen species) may occur in the Project Region. This lichen species was not observed in the terrestrial surveys conducted for the project. As such, no effects on flooded jellyskin are anticipated during the construction, operation and closure of the Lalor Mine.

5.8.1 Dust Deposition

Dust will be generated during construction and closure activities as described in Section 5.4.1. Dust deposition has the potential to affect vegetation growth and species diversity.

To mitigate potential dust deposition effects, the mitigation measures described in Section 5.4.1 will be implemented during construction and closure. With these mitigation measures employed as necessary, potential residual effects on flora due to dust deposition during construction and closure are anticipated to be negligible and not significant.

During the operational phase of the project, dust will be generated by vehicle movement on-site and by traffic on the site access road and Provincial Road 395 (unpaved roads), as described in Section 5.4.1.

Potential dust deposition effects will be mitigated as described in Section 5.4.1. Dust will be predominantly contained within the immediate Project Site due to the dense nature of the vegetation surrounding the Project Site. With the mitigation measures described in Section 5.4.1 employed as necessary, potential residual effects due to dust deposition are anticipated to be negligible in the Project Area. Overall the residual effect of dust deposition on vegetation is not anticipated to be significant.

5.8.2 Re-vegetation

As part of the closure of the Lalor Mine, the Lalor Mine site will be returned to native conditions to the maximum extent possible. Once site infrastructure has been removed and the site has been re-graded, the disturbed areas will be re-vegetated with appropriate vegetation species as applicable. The scarification of the access road will prevent site access and promote the growth of natural vegetation in the area.

Based on HBMS mine closure experience in the Snow Lake region, the growth of grasses and mosses is apparent within the first few years following closure, whereas trees and shrubs take longer to establish through natural succession and may be evident within a five to ten year period following closure.

To ensure the success of re-vegetation efforts, monitoring will occur regularly with subsequent re-vegetation occurring, if required. Once it has been determined that re-vegetation efforts have been successful, monitoring will be scaled back or suspended.

It is anticipated that re-vegetation as well as natural succession will substantially return the mine site to the conditions that existed before mineral exploration activity, with the exception of the areas that will be covered by permanent caps. These caps, which are required to safely decommission the raises and shaft, will prevent vegetation growth at these locations. The residual effect on flora is anticipated to be negligible.

5.8.3 Disturbance of Vegetation

Mathias Colomb Cree Nation has expressed concern regarding the loss of vegetation caused by advanced exploration activities for the Lalor Project in combination with other historic and future developments. The following analysis considers the disturbance/loss of vegetation at the Lalor Mine Development in the context of vegetation in the Project Area and Project Region.

Section 4 contains a detailed description of the vegetation communities found in the Project Site, Project Area and Project Region, as described in the *Proposed Lalor Mine Environmental Baseline Assessment*. The following sections describe the existing and reasonably foreseeable future level of development in the Project Area and Region. The assessment assumes the complete loss of vegetation at the Lalor Mine Development for the period of operation of the Lalor Mine and the period of time post-closure required for vegetation to re-establish (approximately 30 years in total) and assesses the significance of that loss in the context of the Project Area and Project Region.

5.8.3.1 Existing Developed Areas

The footprint of the Lalor Mine Development, shown in **Figure 5** is approximately 55.4 ha, which has been disturbed in the development of the Lalor AEP site, access roads, explosives magazines and the Lalor Ramp Ventilation Shaft site. The disturbance associated with the fresh water and discharge pipelines has not been included in the calculated footprint of the Lalor Mine Development as these pipelines were installed in the shoulder of existing cleared roads. The Lalor Mine Development is a portion of the Project Site and represents 31% of the Project Site footprint.

Within the Project Site, disturbed areas include the Lalor Mine Development and Provincial Roads 395 and 392. Using the Forestry Branch of Manitoba Conservation Forest Management Units data set, the total existing previously disturbed area within the Project Site (including the Lalor Mine Development) was determined to be 94 ha out of the total Project Site footprint of 179 ha. The total disturbed footprint within the Project Site (including the Lalor Mine Development) represents approximately 52% of the total Project Site footprint.

Within the Project Area (within a 2 km radius of the Project Site), disturbed areas include the Project Site, portions of the Town of Snow Lake, the Stall Lake Concentrator, Anderson TIA, Chisel Open Pit, Chisel North WTP, Chisel North Mine, roads, former rail lines, gravel pits/mine sites, ditches, pipelines and transmission lines. Using the Forestry Branch of Manitoba Conservation Forest Management Units data set, the total disturbed area within the Project Area (including the Lalor Mine Development) was determined to be 530 ha out of the total Project Area of 8,644 ha. The total disturbed footprint within the Project Area (including the Lalor Mine Development) represents approximately 6% of the total Project Area footprint.

Within the Project Region (within a 10 km radius of the Project Site), the disturbed areas located within the Project Site and Project Area include the Town of Snow Lake, cottage development, Provincial Park and services development, roads, former rail lines, gravel pits/mine sites, ditches, pipelines and transmission lines. Using the Forestry Branch of Manitoba Conservation Forest Management Units data set, the total disturbed footprint of development within the Project Region (including the Lalor Mine Development) represents 1,130 ha or 2% of the total footprint of the 63,588 ha Project Region.

5.8.3.2 Foreseeable Future HBMS Developments

The minimal surface construction required for the proposed Lalor Mine will be contained entirely within the existing footprint of the Lalor AEP/Project Site. No additional site clearing is anticipated.

It is anticipated that, by the summer of 2012, final planning decisions will have been made in relation to the processing of ore produced from the proposed Lalor Mine and that a proposal will be filed for environmental review and licensing of a new Lalor Concentrator to be located on the same site as the Lalor Mine. It is anticipated that the new concentrator and associated aboveground tailings lines will be constructed primarily within disturbed areas associated with previously approved developments, although some clearing will likely be required for a portion of the aboveground tailings line.

In addition, a further application may be made in the future to increase the capacity of the existing Anderson TIA. Although planning is in the initial stages for the Anderson TIA, it is reasonable to assume that some footprint expansion may be required for this facility. At this point, it is unknown what the extent of the footprint expansion may be.

5.8.3.3 Foreseeable Future Non-HBMS Developments

Based on our review of development in the Snow Lake Area as presented in Section 1, Tolko Industries Ltd. was identified as having forest sections in the area surrounding Snow Lake and as such, future harvest plans were examined to determine what activities were planned for the Snow Lake area. According to Tolko Industries Ltd.'s 2012/2013 consultation map, forest sections in the area surrounding the Town of Snow Lake are included in the Highrock Forest Section harvest which is scheduled to occur between 2012 and 2016. As part of the planning process and as documented in their *Annual Harvest and Renewal Plan*, Tolko has undertaken public consultation with Pukatawagan (Mathias Colomb Cree Nation) and Snow Lake as well as other surrounding communities including Cranberry Portage, Cormorant, Flin Flon, Grand Rapids, Moose Lake, Sherridon, The Pas, Thompson and Wabowden regarding the proposed Harvest Plan. According to Tolko Industries Ltd.'s record of the public consultation events, an attendee at a meeting in Flin Flon had a question about a blueberry patch that appeared to be in a quota holder block. Tolko Industries Ltd. representatives indicated that the quota holder has been very reasonable about modifying his harvest plan to accommodate other interests. The location of the blueberry patch was not shown in the public consultation record. No other concerns regarding rare or unique vegetation areas were identified to Tolko Industries Ltd. representatives in the meetings in Pukatawagan, Snow Lake, Cranberry Portage, Cormorant, Grand Rapids, Moose Lake, Sherridon, The Pas, Thompson and Wabowden. As part of Tolko Industries

Ltd.'s *Annual Harvest and Renewal Plan*, forest regeneration will also be undertaken. Tolko Industries Ltd.'s *Annual Harvest and Renewal Plan* is subject to Manitoba Conservation approval. (Tolko Industries Ltd., 2011b)

The Canadian Environmental Assessment Registry was also examined to determine what future developments may be planned for the Snow Lake area. No projects were listed for this area on the registry. Manitoba Conservation's Environmental Assessment and Licensing Branch Proposals Open for Public Comment, Proposals in Processing, Minor License Alterations, 2011 Environment Act Licenses Issued and 2012 Environment Act Licenses Issued were also examined to determine if there are any future projects planned for the Snow Lake area. No projects were identified on Manitoba Conservation's website.

5.8.3.4 Vegetation Loss Analysis

In 2007, prior to the approval of the Lalor AEP in April 2010 and Lalor Ramp Project in December 2009, AECOM undertook terrestrial surveys of the Lalor Mine site. Follow up surveys were conducted in July 2010 and May/June 2011. The terrestrial surveys confirmed that, in general, the vegetation within the area of the proposed Lalor Mine was typical for the region. No rare or endangered plant species were encountered at the Project Site. There were no indications that the Project Site contained unique opportunities for plant growth outside of that present in the Project Region.

To characterize the potential uniqueness of the Lalor Mine Development vegetation in the Project Area and Region and to determine the availability of similar vegetation within the Project Area and Region, the vegetation within the footprint of the Lalor Mine Development was characterized using the Forestry Branch of Manitoba Conservation Forest Management Units. As described in Section 4, the footprint of the Lalor Mine Development covers five vegetated cover classes of 30 vegetated classes found within the Project Region. The total footprint of the Lalor Mine Development is 55.4 ha, 53.8 ha of which was considered to be vegetated prior to development of the Lalor projects.

Figure 20 provides a spatial overview of the vegetation cover classes found at the Lalor Mine Development and their distribution though the Project Area and Region. As shown in **Figure 20** and as described in Section 4, none of the vegetation cover classes found within the Lalor Mine Development footprint were unique and all were abundant throughout the Project Area and Region.

Disturbed areas outside of the Lalor Mine Development footprint are also shown graphically in **Figure 20**. Disturbed areas increased to approximately 6% and 2% of the land base of the Project Area and Region respectively after the disturbance to vegetation by Lalor Mine Development. Although this is a measureable percentage of the land base in the Project Area and Region, none of the vegetation communities disturbed by the Lalor Mine Development identified in the terrestrial field surveys conducted were determined to be unique to the Lalor Mine Development. This is further supported by the regional vegetation analysis that shows that the vegetation within the Lalor Mine Development footprint is not unique and is found throughout the Project Area and Region. The cover class that was present in the Lalor Mine Development that was the least common throughout the Project Site, Area and Region was *Jack Pine, 71-100%* (0.4 ha). This vegetation class represented approximately 0.01% of total area available in the Project Region. Therefore although the existing loss of vegetation associated with the Lalor Mine Development is measureable, it is not considered significant as this vegetation is common throughout the Project Area and Region. Further, as the vegetation is considered common throughout the Area and Region, it is not anticipated that previous development has resulted in the destruction of rare or unique wildlife habitats or resource harvesting areas.

Future disturbance associated with the future concentrator and associated tailings lines and Anderson TIA expansion are likely to increase the footprint of disturbance in the Project Area and Region. However, the construction of the concentrator at the existing Lalor AEP Site and development of the tailings lines within previously disturbed areas is anticipated to reduce the magnitude of additional vegetation disturbance. Further, the future concentrator and Anderson TIA expansion will be subject to a separate environmental assessment process from the Lalor Mine, and will therefore examine the potential effect of the incremental loss of land associated with the projects once additional design and routing information is available.

Tolko Industries Ltd. may be conducting forest harvesting in the Snow Lake area between 2012 and 2016. Plans for this work have been made public and have included meetings in Pukatawagan and the Town of Snow Lake as well as other surrounding communities including Cranberry Portage, Cormorant, Flin Flon, Grand Rapids, Moose Lake, Sherridon, The Pas, Thompson and Wabowden to discuss harvesting plans. As documented in Tolko's *Annual Harvest and Renewal Plan,* no concerns regarding unique vegetation communities were presented to Tolko Industries Ltd. representatives at the Snow Lake, Pukatawagan Cranberry Portage, Cormorant, Grand Rapids, Moose Lake, Sherridon, The Pas, Thompson and Wabowden meetings. One concern regarding a blueberry patch was raised at a meeting in Flin Flon although it was not indicated in the record of public consultation if this area of concern was located in the subject Project Region. Although blueberries are common in the region and are found in open areas, based on AECOM's terrestrial survey undertaken for the Lalor Mine, no blueberries were identified at the Project Site and none are expected based on the dense bog nature of the Project Site.

Although timber harvesting work may further increase the footprint of disturbance within the Project Area and Region, the effect will be minimized by conducting the work over a period of years and by conducting forest regeneration activities. Further, as no vegetation communities have been identified as unique or rare around Snow Lake, no loss of unique vegetation communities is anticipated. Tolko Industries Ltd. however has committed to working with communities to identify local issues and will work with local people to avoid these areas or mitigate effects in advance of work (Tolko Industries Ltd., 2011b).

Although the Lalor Mine Development has resulted in a loss of vegetation in the Project Area and Region, no unique vegetation communities were lost and the species lost to the Lalor Mine Development footprint are commonly found throughout the Project Area and Region and as such is not considered a significant loss. Future projects such as HBMS' plans for a concentrator and Anderson TIA expansion will be subject to a separate environmental approvals process that will include an examination of the effects of vegetation loss. HBMS is committed to working with the local communities, residents and stakeholders to mitigate loss effects to the greatest extent possible to reduce the potential magnitude of any future vegetation loss.

5.9 Protected and Other Fauna Species

As described in Section 4.12, the woodland caribou is a Provincially protected species that is found in the Churchill River Ecoregion (which includes the Project Region). The Federally protected yellow rail (bird species) and monarch (anthropod species) also may occur in the Project Region.

None of these protected species were observed in the terrestrial surveys conducted. As confirmed through field observations conducted in 2007, 2010 and 2011, the wildlife habitats within the Project Area were considered to be typical for the region, with no unique or rare habitats encountered. The habitat available in Project Site is not anticipated to support yellow rail or monarch.

Woodland caribou are present in the ecoregion but, based on information provided by the Provincial caribou biologist in The Pas, woodland caribou are not found in the Snow Lake area, including the Project Area surrounding the proposed Lalor Mine. HBMS is participating in Manitoba Conservation's ongoing large scale caribou study in Northern Manitoba (which includes the Lalor Project Region) to understand and monitor caribou migration patterns.

No habitat of specific or critical value to wildlife was observed at the Project Site during the terrestrial field surveys (such as calving or over-wintering areas) and, based on-site conditions and limited field observations, it is expected that there is no critical wildlife value in the Project Area.

5.9.1 Noise

As described in Section 5.4.3, noise will be generated during the construction, operation and closure phases of the Lalor Mine project and has the potential to affect local fauna.

During construction, noise will be generated to varying degrees as described in Section 5.4.3 with the potential to deter local fauna from the area. It is anticipated that local fauna are likely already accustomed to some level of noise based on the existing activity in the area (Lalor AEP, Provincial Road 395 and Chisel North Mine). The short term nature of the construction phase (6 month period) and the likelihood that the local fauna are accustomed to some level of noise are anticipated to reduce the potential magnitude of the construction noise effects on local fauna. No habitat of specific or critical value to wildlife was identified at the Project Site (such as calving or over-wintering areas) and, based on site conditions and limited field observations, it is expected that there is no critical wildlife value in the Project Area. Therefore if local fauna are deterred from the Project Site or portions of the Project Area, it is not anticipated that this will critically affect wildlife as similar habitats are available in the Project Area and Region as described in Section 5.8.3.

During the operation phase of the project, noise will also be generated with the potential to affect local wildlife as described in Section 5.4.3. As described in Section 5.4.3, with the implementation of engineering controls, noise effects will be limited to portions of the Project Area with no noise effects anticipated beyond the Project Area. Overall impact to wildlife will be limited, as the impacted area is not considered a critical or unique habitat area and is located within an area of existing mining and road development.

The closure activities will generate noise as described in Section 5.4.3. It is anticipated that the noise generated during the closure phase will be similar to, or less than, the noise generated during the operation of the Lalor Mine. Therefore, the noise associated with the closure activities of the Lalor Mine are not anticipated to notably affect wildlife. Following closure, no noise will be generated onsite allowing the site to return to pre-mine conditions.

Potential noise effects on wildlife also have the potential to affect trapper success (use of the wildlife resource). There is one registered trap line (RTL) in the area surrounding the Lalor AEP site/Lalor Mine site and access road, line RTL 23 which is owned by Martin McLaughlin. As indicated previously, local wildlife are likely accustomed to some level of noise based on the existing activity in the area. Further, noise effects are anticipated to be limited to the Project Site and portions of the Project Area with the implementation of engineering controls. Therefore, it is not anticipated that the Lalor Mine will have significant effects on the trapline. HBMS is committed to working with Mr. McLaughlin to ensure potential effects on traplines are minimized.

5.9.2 Vehicle Collisions

With the anticipated increase in vehicular traffic on local roads during the operation period, there is a potential for increased vehicular and wildlife collisions. Moose, coyotes and wolves may pass through the Project Area, including Provincial Road 395 and the site access road. The edge vegetation and open nature of the roads allow for ease of migration, making the area attractive to wildlife. However, as local wildlife populations are considered low, the potential for increased vehicular and wildlife collisions is also considered low. HBMS experience in the local area indicates wildlife collisions are rare.

To prevent vehicle/wildlife collisions, road speed limits will be implemented. Overall factors leading to increased vehicle collisions are anticipated to be negligible.

5.9.3 Light Pollution

The Lalor Mine will operate 24 hours per day and seven days per week resulting in the need for interior and exterior lighting to allow site work to proceed safely. Light pollution can adversely affect animal behaviour including navigation and biological cycles.

To prevent potential light pollution effects, consideration will be given to selecting site lighting that directs light down to the mine site only. Lights that emit light upwards towards the sky will not be selected. With the selection of appropriate lighting, residual light pollution effects would be limited to the edge habitat surrounding the Lalor Mine site. It is anticipated however, that the activity and noise associated with the operating mine would make this habitat unattractive and as such wildlife are not anticipated to be present within the potential zone of influence of the site lighting. With the selection of the appropriate lighting, the resulting effects of light pollution are considered negligible.

5.9.4 Re-vegetation

As part of the closure of the Lalor Mine, the Lalor Mine site will be returned to its natural state to the maximum extent possible with the implementation of the re-vegetation and monitoring measures as described in Section 5.8.2. The relative increase in vegetation will be a positive effect for local wildlife and will provide an increase in available local habitat compared to operating conditions. It is anticipated that the revegetation will result in the substantial return of the site to pre-mine conditions.

No habitat of specific or critical value to wildlife was observed at the Project Site (such as calving or over-wintering areas) and, based on site conditions and limited field observations, it is expected that the Project Area does not contain habitat of critical wildlife value. Although the Lalor Mine Development has resulted in a loss of wildlife habitat at the Project Site, the type of habitat that was lost is common in the Project Area and Region. No additional loss of wildlife habitat will be caused by construction or operation of the Lalor Mine. Noise effects on wildlife will be limited to portions of the Project Area with no noise effects anticipated beyond the Project Area. Species present in the Project Area are anticipated to be accustomed to some level of noise due to the presence of existing Provincial Roads and existing developments. For these reasons, the Lalor Mine Development will not result in substantial adverse effects on wildlife.

5.10 Aquatic Resources and Protected Species

For the purpose of this environmental assessment, aquatic resources refers to any living species present in a surface waterbody, including benthic invertebrates, macrophytes, fish, and fish habitat.

As indicated in Section 4.12, the Federally protected shortjaw cisco (fish species) may occur in the Churchill River Upland Ecoregion. According to the COSEWIC status report, occurrences of shortjaw cisco in Manitoba include:

- Athapapushkow Lake
- Clearwater Lake
- Reindeer Lake
- George Lake
- Lake Winnipeg
- Lake Winnipegosis (COSEWIC, 2003)

None of these waterbodies are in the Nelson River watershed and as such, shortjaw cisco are not expected in any of the waterbodies surrounding the Lalor Mine or where discharges from support infrastructure will occur. Further, no shortjaw cisco were collected in the fish community assessment as described in the *Lalor Baseline Environmental Assessment* and as part of the EEM conducted for the Chisel North WTP.

The mitigation measures outlined in Section 5.7 are anticipated to sufficiently mitigate potential surface water effects. As a result, the mitigation measures proposed in Section 5.7 are also anticipated to protect aquatic resources with no significant adverse effects on aquatic resources including the shortjaw cisco anticipated.

5.11 Socio-Economic Effects

As outlined in this environmental assessment, residual environmental effects of the proposed Lalor Mine are considered to be minor to negligible post mitigation. For this reason, no adverse socio-economic effects are expected to result from the environmental effects of the project.

5.11.1 Land Use

As indicated in Section 4.13.1, Grass River Provincial Park, located approximately 25 km southwest of the Lalor Mine, is the nearest protected area. Based on the separation distance between the Park and the Lalor Mine, no potential adverse effects on this protected area are anticipated.

As presented in this EA, residual environmental effects on aquatic and terrestrial resources have been determined to be minor to negligible in magnitude and therefore the residual effects on any natural resource harvesting in the Project Region is not anticipated to be significant.

As indicated in Section 5.4.3, the implementation of engineering controls on noise sources, combined with natural attenuation is anticipated to mitigate potential noise effects at the nearest cottages on Cook Lake as well as the closest residential areas in the Town of Snow Lake. As the closest lodge is the Diamond Willow Inn & Willow House and is located farther from the noise sources than the cottages on Cook Lake or the closest residential area, no noise effects are anticipated at the lodge or other lodges in the Project Region. No effects on land use associated with cottages, residential areas or lodges are anticipated from the Lalor Mine project.

5.11.2 Heritage Resources

Communication with the Historic Resources Branch has indicated that there are no historic or heritage resources anticipated at the Lalor Mine site or in the immediate surrounding area. The nearest recognized historic site is located approximately 20 km south of the Lalor Mine at Tramping Lake. Land disturbance during construction of Lalor Mine will be limited to the existing cleared and levelled Lalor AEP site. No further disturbance beyond the existing Project Site will occur during operation or closure activities. Therefore, no effects on heritage resources are anticipated during construction, operation or closure of the Lalor Mine.

In the unlikely event that heritage resources are identified, the following mitigation measures will be implemented:

- If artefacts, historical features or skeletal remains are encountered during closure activities, work activities will stop immediately around the affected area with the find reported to the site supervisor. A qualified archaeologist may investigate and assess the find prior to the continuation of work.
- If skeletal remains are encountered during closure activities, the find will be immediately reported to the site supervisor and the RCMP.

5.11.3 Aesthetics

The aesthetics of the Lalor Mine site are not anticipated to significantly change during the project construction and operation phases. The Lalor Mine site is accessed by a 4 km long access road owned by HBMS and the site is surrounded by dense vegetation. To maintain a clean, aesthetically pleasing mine site, HBMS will undertake the following mitigation measures:

- The site will be inspected for loose waste and debris in order to maintain a clean mine site on a regular basis.
- Waste and debris will be stored in bins and removed on a regular basis from the mine site.

Based on the mine's remote location and surrounding vegetation, aesthetic effects during the construction and operation phase are anticipated to be negligible.

As part of the closure of the Lalor Mine, the Lalor Mine site will be returned to its natural state to the maximum extent possible as described in Section 5.8.2. It is anticipated that re-vegetation as well as natural succession will substantially return the mine site to pre-mine conditions. To maintain a positive aesthetic effect, vegetation growth will be monitored and if necessary, areas may have to undergo repeated efforts of re-vegetation until vegetation has been re-established as described in Section 5.8.2. Once these efforts have been completed, aesthetic conditions on the site will be substantially restored to conditions that existed before mineral exploration on the site.

5.12 Accidents and Malfunctions

To prevent accidents and malfunctions, all phases of the project will be conducted in accordance with applicable regulatory requirements. The following sections provide additional details on precautionary measures that are proposed to prevent or mitigate accidents and malfunctions.

Worker protection in Manitoba is provided through standards, procedures and training legislated under the *Workplace Safety and Health Act*. All practices performed on the Lalor Mine site will be carried out in accordance with the *Workplace Safety and Health Act* and HBMS' OHSAS 18000 certified management system, which will minimize potential effects on health and safety. Safety equipment and personal protective equipment will either be supplied to the employees or be located throughout the facility, where needed.

5.12.1 Spills

During construction, operation and closure, there is potential for environmental effects due to fuel and chemical spills. Diesel fuel, lubricants, oils, hydraulic fluids and explosives (ANFO and emulsion type) will be stored and used on-site. Environmental effects could result from the accidental release of hazardous materials and/or equipment fluids. A number of potential environmental concerns are also associated with the accidental release of chemicals and fluids resulting from improper storage and handling procedures. These include effects on air, soils, surface water, groundwater, vegetation, aquatic resources and a direct threat to human health and safety. Activities that may cause a spill will be identified and procedures in the HBMS ISO 14001 certified Environmental Management System will be employed to mitigate risks.

To prevent spills from occurring during project activities, the following procedures will be employed:

- The diesel tank used on-site will be a self-contained aboveground storage tank (SCAT) located on a concrete pad.

- Explosives will be stored in areas equipped with spill containment measures and in compliance with the *Explosives Act*.
- When servicing requires the drainage or pumping of lubricating oils or other fluids from the equipment, a groundsheet of suitable material and size shall be spread on the ground to catch all fluid in the event of a leak or spill. An adequate supply of suitable absorbent material and any other supplies and equipment necessary to immediately clean up spills will also be available.
- Storage and disposal of liquid wastes and filters from equipment maintenance, and any residual material from spill clean-up will be contained in an environmentally safe manner and in accordance with any existing regulations.
- Waste oils, fuels and hazardous wastes (if any) shall be handled in a safe manner. Staff will be required to transport, store and handle all such substances as recommended by the suppliers and/or manufacturers and in compliance with all applicable Federal, Provincial and Municipal regulations. Manitoba Conservation shall be notified immediately if a reportable spill occurs.
- Prevent spills of fuels, oils or other hazardous materials by restricting the location for the storage and transfer of these materials, ensuring that fuel handlers are trained and qualified, and ensuring that the appropriate emergency response measures, materials and equipment are in place and readily available.
- Storage sites will be inspected periodically for compliance with requirements as applicable.
- Investigation and remediation of spills if necessary will be undertaken.
- Appropriate personnel will be trained in how to deal with spills, including knowledge of how to properly deploy site spill kit materials.
- Service and repairs of equipment are only to be performed by trained personnel.
- Vehicles and equipment will be maintained to minimize leaks. Regular inspections of hydraulic and fuel systems on machinery will be completed on a routine basis; when detected, leaks will be repaired immediately.

With these mitigation measures employed as necessary and assuming the implementation of safe work practices, the risk of spills is considered to be appropriately mitigated.

5.12.2 Fire/Explosions

During construction, operation and closure activities, the presence of mechanical equipment, fuels and explosives on-site creates the potential for fires and explosions. Effects related to fires and explosions include, but are not limited to, harm to on-site personnel, equipment, and the potential release of contaminants and hazardous materials with subsequent effects on soil, surface water, groundwater, air, flora, fauna and aquatic resources and aesthetics. Potential socio-economic effects may occur if mine shut-downs are required or if the Town of Snow Lake requires evacuation.

The Lalor Mine also has the potential to be affected by off-site forest fires during the summer months. Effects could include loss of infrastructure or inability to access the site resulting in an adverse economic effect on the Lalor Mine. The Lalor Mine site has been cleared of vegetation with infrastructure constructed on a crushed rock pad. The crushed rock is anticipated to act as a fire barrier for the site.

The Lalor Mine site is equipped with fire pumps at the discharge cells under the Water Treatment Plant Building to allow on-site fire fighting to occur. The water stored in the polishing pond can also be used for fire fighting purposes if required.

In addition to on-site fire protection, the following on-site safety precautions and procedures will be employed:

- Explosives and detonators will be stored in two designated areas underground. Two fuel and lubricant stations will be located underground and will be used to store these products. A fire suppression system and fire resistant doors will be provided for each station.
- Surface explosive storage areas and underground explosive areas will comply with the requirements of the *Explosives Act*.
- Explosives will be provided in "just-in-time" deliveries.
- An underground emergency mine warning system will be installed which will introduce ethyl mercaptan (stench gas) from pressurized cylinders into the mine ventilation intake and compressed air distribution to notify workers if mine evacuation needs to occur.
- Mine rescue teams will be trained for fire and explosion response with HBMS call out procedures implemented.
- HBMS has an agreement in place with other mine rescue teams in the area to provide backup as required.
- All flammable waste will be removed on a regular basis and disposed of at an approved disposal site.
- Fire extinguishers will be available on the work site during construction, operation and closure activities. Such equipment will comply, and be maintained in accordance, with the manufacturers' standards.
- Greasy or oily rags or materials subject to spontaneous combustion will be deposited and stored in appropriate receptacles. This material will be removed from the site on a regular basis and will be disposed of at an appropriate waste disposal facility.
- Chemical storage and use will be in compliance with regulatory requirements.
- Smoking will be restricted to designated areas.

With these mitigation measures employed and assuming the implementation of typical safe work practices, the risk of fires and explosions is considered to be appropriately mitigated.

5.12.3 Transportation Accidents

An increase in traffic has the potential to increase the potential for transportation accidents including vehicular collisions and wildlife collisions. Transportation accidents can also result in the release to the environment of vehicle fluids (such as diesel, oils etc.) and the material the vehicles were transporting (such as waste rock and fuel). Effects related to spills can include air, soil, surface water, and groundwater quality effects with potential for subsequent effects on flora, fauna, aquatic resources and human health. Potential socio-economic effects may occur if mine or road shut-downs are required in the event of a large accident.

The incremental increase in equipment for the construction of the proposed surface facilities is anticipated to be a maximum of five pieces of equipment as described in Section 5.4.2. The incremental increase in Project Area traffic is anticipated to be minor to negligible as the equipment will only travel to/from the site from time to time during the construction phase. This minor to negligible increase in traffic is not anticipated to result in a measureable increase in factors leading to transportation accidents.

As indicated in Section 5.4.2, up to 160 vehicles may access the site on a daily basis including waste rock and ore trucks, material deliveries and employee shuttle bus service during the operation phase. The additional traffic is considered a major increase in traffic on both Provincial Road 392 and Provincial Road 395 during the operation phase. To prevent transportation accidents the following mitigation measures will be implemented and enforced by HBMS:

- Vehicle speed limits will be imposed on the Lalor Mine site and access road to minimize the possibility of collisions and animal strikes.
- Appropriate road signage will be provided on the Lalor Mine access road. Signage and speed limits on Provincial Road 392 and 395 is provided and maintained by the Province of Manitoba.

- Personnel retained to drive vehicles will have a valid Manitoba Driver's License with a copy provided to HBMS personnel.

The implementation of these mitigation measures is anticipated to appropriately mitigate the potential for transportation accidents during the operation phase.

It is anticipated that during closure activities, approximately five pieces of equipment will be required at the Lalor Mine site, which will travel to/from the site from time to time, and at least four haulage trucks will access the site on a continuous basis during working hours to haul materials to/from the site as described in Section 5.4.2. The haulage traffic will be considered a decrease in local traffic over the short closure period compared to the anticipated traffic during the operation phase. The mitigation measures proposed for the operation phase of the project will be applied during the closure phase of the project. It is not anticipated that the change in traffic will result in a significant increase in factors leading to transportation accidents.

5.12.4 Polishing Pond/Discharge Cells/Pipeline Leaks, Overflows or Failures

Pipeline leaks can result in the release of fresh water or discharge water to the environment. In the event of a pipeline failure, erosive effects may also occur as the pipelines will be operated under pressure. Releases of water have potential to adversely affect local soil, surface water and groundwater (and potential for subsequent effects on flora, fauna and aquatic resources). The release of fresh water to the environment in the event of a pipeline leak or failure is not anticipated to result in adverse effects on surface water or groundwater quality as the water will be from Chisel Lake or Ghost Lake and as such will be of similar quality to other local waterbodies.

A leak in the pipeline transporting discharge water to the Chisel Open Pit may result in adverse effects on soils, surface water and groundwater as the discharge water may contain dissolved metals, ammonia, suspended solids and other organic and inorganic compounds. The mine discharge water will consist of treated sanitary sewage, groundwater seepage, process water from underground, surface runoff from the Lalor Mine site and precipitation collected in the polishing pond. The underground solids separation system will be used to reduce the suspended solids concentration in the water from underground prior to pumping via pipeline. Further, the on-site STP will treat sanitary sewage to standards appropriate for discharge to the environment prior to pumping via pipeline.

To prevent pipeline leaks or failure, the pipelines will be tested prior to operation to identify any potential leaks. Further, pipelines will be heat-traced and installed aboveground with sand mounded above the pipelines. Leaks or failure of the pipeline will be apparent during operation as both fresh water and wastewater pipelines will operate under pressure and are located along roads. In the event of a leak or failure, repair of the pipeline will occur as soon as possible, with remediation to occur thereafter as required.

As described in Section 2.5, the polishing pond will not be in daily use during normal operations, but will be maintained to provide for surge capacities and water storage for emergency fire use. Leaks from the polishing pond or discharge cells below the Water Treatment Plant Building, overflow due to failure of the polishing pond berms or emergency overflow of the polishing pond or discharge cells have the potential to adversely affect soils, groundwater and surface water as seepage water or overflow may contain dissolved metals, ammonia, suspended solids and other organic and inorganic compounds.

To prevent leaks from the polishing pond, the polishing pond is lined with a geosynthetic clay liner. Leaks from the discharge cells will be prevented by designing the cells to contain the liquid volume. To prevent failure of the polishing pond dyke, the structure is designed to contain the required volume of wastewater and surface runoff. To prevent overflow of the polishing pond and discharge cells, pumps are equipped with level meters.

These design considerations and mitigation measures are anticipated to appropriately mitigate the potential risk of pipeline, discharge cells and polishing pond leaks, overflows or failures.

5.12.5 Power Failure

During construction and operation there is potential for environmental effects due to power failure. Site power may be lost due to power line failure, fire/explosion and/or severe weather. Effects on underground workers' health and safety are also possible if there is no means of mine egress, if ventilation ceases or if mine flooding occurs. Mine flooding also has the potential to flood underground hydrocarbon (fuels and lubricants) and explosive storage areas that may result in adverse effects on groundwater quality.

Ventilation equipment, dewatering pumps and the hoist all require power to operate. To prevent effects due to power failure, backup power will be supplied to the site via diesel generators to provide for the safe evacuation of the mine. HBMS will provide backup power for all critical infrastructure and equipment.

The supply of backup power is anticipated to appropriately mitigate the potential risks of a power failure during construction and operation.

During closure activities, site power will be disconnected.

Table 5.2: Summary of Potential Effects

Environmental Component	Project Phase	Potential Interaction	Mitigative Measures	Residual Effect
Topography	Closure	Leveling and Stockpiling	None.	Restoration of site to pre-development conditions to the extent practical.
Soil	Operation	Waste Management	All wastes must be disposed of appropriately.	Negligible
			Garbage collected in bins and removed on a regular basis for disposal at permitted disposal site.	
			Waste oils and other hazardous materials returned to surface in drums.	
			Hazardous material removed by licensed hazardous materials handler for recycling or appropriate disposal.	
	Closure	Erosion	Maintain vegetation buffer surrounding the Lalor Mine site.	Negligible
			Site contoured to match surrounding topography.	
			Re-vegetation to occur as soon as practical following soil placement.	
			Re-vegetation success to be monitored and additional re-vegetation to occur as required.	
Air	Construction and Closure	Dust Generation	Material stockpile heights to be limited where practical.	Negligible
			Minimize the amount of disturbed area.	
			Dust suppression to be used if required.	
			Re-vegetation to occur as part of closure activities.	
		Emissions	Vehicles/equipment will be well maintained.	Negligible
			Vehicle idling kept to a minimum.	
		Noise	Hearing protection provided as required to workers.	Negligible
			HBMS to work with residents to find a mutually acceptable solution if noise complaints arise.	
			Separation distance and vegetation anticipated to mitigate noise effects on cottagers and Town of Snow Lake residents.	
	Operation	Dust Generation	Waste rock to be used as mine backfill to minimize the amount of material hauled from the site.	Negligible to minor
			Dust suppression to be used if required.	
			Truck loads to be covered.	
			Impose site speed limits.	
		Emissions	Vehicles/equipment will be well maintained.	Negligible
			Vehicle idling kept to a minimum.	
			Low NO_X burners will be used for propane heaters if possible.	
		Noise	Hearing protection provided as required to workers.	Negligible
			Standard engineered controls to be used on equipment where applicable.	
			Engineered controls, separation distance and vegetation anticipated to mitigate noise effects on cottagers and Town of Snow Lake residents.	
Climate	Construction and Closure	Greenhouse Gas Emissions	Vehicle idling kept to a minimum.	Negligible
			Number of vehicles to be minimized where practical.	
	Operation	Greenhouse Gas Emissions	Vehicles to be serviced on a regular basis.	Negligible
			Minimize unnecessary vehicle idling.	
Groundwater	Operation	Use of Explosives	Storage of explosives underground will include spill containment measures.	Negligible
			Spills to be contained and cleaned up as soon as possible.	
			Charges will be designed to be as small as possible to minimize the potential for residuals.	
			Emulsion type explosives will be used in wet areas to minimize the potential to dissolve ammonium nitrate in groundwater.	
		Mine Dewatering	None proposed. Dewatering is required to safely operate mine. Deep groundwater is not available for practical use.	Negligible
		Waste Management	All wastes must be disposed of appropriately.	Negligible
			Garbage collected in bins and removed on a regular basis for disposal at permitted disposal site.	
			Waste oils and other hazardous materials returned to surface in drums.	
			Hazardous material removed by licensed hazardous materials handler for recycling or appropriate disposal.	
Surface Water/Aquatic Resources/Protected Aquatic Species	Operation	Waste Management	All wastes must be disposed of appropriately.	Negligible
			Garbage collected in bins and removed on a regular basis for disposal at permitted disposal site.	
			Waste oils and other hazardous materials returned to surface in drums.	
			Hazardous material removed by licensed hazardous materials handler for recycling or appropriate disposal.	
	Closure	Erosion	Maintain vegetation buffer surrounding the Lalor Mine site.	Negligible
			Site contoured to match surrounding topography.	
			Re-vegetation to occur as soon as practical following soil placement.	
			Re-vegetation success to be monitored and additional re-vegetation to occur as required.	
			Silt fences used during culvert removal.	
			No roadbed material to be placed in water during culvert removal.	
Flora/Protected Flora Species	Construction and Closure	Dust Deposition	Material stockpile heights to be limited where practical.	Negligible
			Minimize the amount of disturbed area.	
			Dust suppression to be used if required.	
			Re-vegetation to occur as part of closure activities.	
	Operation	Dust Deposition	Waste rock to be used as mine backfill to minimize the amount of material hauled from the site.	Negligible
			Dust suppression to be used if required.	
			Truck loads to be covered.	
			Impose site speed limits.	
	Closure	Re-vegetation	Monitor the success of re-vegetation.	Substantial return of site to pre-mine conditions.
			If required, subsequent re-vegetation efforts will be completed.	

Table 5.2: Summary of Potential Effects

Environmental Component	Project Phase	Potential Interaction	Mitigative Measures	Residual Effect
Fauna/Protected Fauna Species	Construction	Noise	Local wildlife accustomed to some level of noise.	Some fauna may be deterred from Project Site or portions of the Project Area. Overall impact to wildlife will be limited, as the impacted area is not considered a critical or unique habitat area and is located within an area of existing mining and road development.
	Operation	Noise	Standard engineered controls to be used on equipment where applicable.	Some fauna may be deterred from Project Site or portions of the Project Area. Overall impact to wildlife will be limited, as the impacted area is not considered a critical or unique habitat area and is located within an area of existing mining and road development.
		Vehicle Collisions	Impose site speed limits.	Negligible
		Light Pollution	Select yard lighting that directs light down not up towards the night sky.	Negligible
	Closure	Noise	Local wildlife accustomed to some level of noise. Once closure activities are complete, noise will no longer be generated at the site.	Substantial return of site to pre-mine conditions.
		Re-vegetation	Monitor the success of re-vegetation.	Substantial return of site to pre-mine conditions.
			If required, subsequent re-vegetation efforts will be completed.	
Heritage Resources	Construction, Operation and Closure	Destruction of Heritage Resources	If an artifact is encountered, work will stop and appropriate authorities will be contacted. Work will resume with appropriate approvals.	Negligible
			If skeletal remains are encountered, the find will be immediately reported to the site supervisor and the RCMP.	
Aesthetics	Construction and Operation	Aesthetic Value	The site will be inspected for loose waste and debris in order to maintain a clean mine site on a regular basis.	Negligible
			Waste and debris will be stored in bins and removed on a regular basis from the mine site.	
	Closure	Aesthetic Value	Vegetation growth to be monitored to ensure re-vegetation efforts have been effective. If necessary, areas may have to undergo repeated efforts of re-vegetation until vegetation has been re-established.	Substantial return of site to pre-mine conditions.
Accidents and Malfunctions	Construction/ Operation and Closure	Spills	Secondary containment will be provided for storage of explosives, fuel, oil, lubricants and hydraulic fluid.	Risk of spills is considered to be appropriately mitigated.
			Explosives to be stored in accordance with the *Explosives Act* .	
			An adequate supply of suitable absorbent material and any other supplies and equipment necessary to immediately clean up spills must be available.	
			Storage and disposal of liquid wastes and filters from equipment maintenance, and any residual material from spill clean-up must be contained in an environmentally safe manner and in accordance with any existing regulations.	
			Waste oils, fuels and hazardous wastes (if any) shall be handled in a safe manner. Staff will be required to transport, store and handle all such substances as recommended by the suppliers and/or manufacturers and in compliance with all applicable federal, provincial and municipal regulations. Manitoba Conservation shall be notified immediately if a reportable spill occurs.	
			Storage sites must be inspected periodically for compliance with requirements as applicable.	
			Appropriate personnel must be trained in how to deal with spills, including knowledge of how to properly deploy site spill kit materials.	
			Service and repairs of equipment are only to be performed by trained personnel.	
			Vehicles and equipment must be maintained to minimize leaks. Regular inspections of hydraulic and fuel systems on machinery must be completed on a routine basis; when detected, leaks must be repaired immediately.	
		Fires and Explosions	Explosives and detonators will be stored in two designated areas underground. A fire suppression system and fire resistant doors will be provided for each station.	Risk of fires and explosions is considered to be appropriately mitigated.
			Explosives to be stored in accordance with the *Explosives Act* .	
			Explosives will be provided in "just-in-time" deliveries.	
			An underground emergency mine warning system will be installed.	
			Mine rescue teams will be trained for fire and explosion response with HBMS call out procedures implemented.	
			HBMS has an agreement in place with other mine rescue teams in the area to provide backup as required.	
			All flammable waste shall be removed on a regular basis and disposed of at an approved disposal site.	
			Fire extinguishers shall be available on the work site during construction, operation and closure activities. Such equipment shall comply, and be maintained in accordance, with the manufacturers' standards.	
			Greasy or oily rags or materials subject to spontaneous combustion shall be deposited and stored in appropriate receptacles. This material shall be removed from the site on a regular basis and shall be disposed of at an appropriate waste disposal facility.	
			Smoking will be restricted to designated areas only.	
			Chemical storage and use will be in compliance with regulatory requirements.	
		Transportation Accidents	Vehicle speed limits will be imposed to minimize the possibility of collisions and animal strikes.	Risk of transportation accidents is considered to be appropriately mitigated.
			Appropriate road signage will be provided on the Lalor Mine access road. Signage on Provincial Road 392 and 395 is provided and maintained by the Province of Manitoba.	
			Personnel retained to drive vehicles will have a valid Manitoba Driver's License.	
	Operation	Polishing Pond/Discharge Cells/Pipeline Leaks, Overflows or Failures	Pipeline testing during commissioning.	Design considerations and mitigation measures are anticipated to appropriately mitigate the potential risk of leaks, overflows or failures.
			Pipeline repair and remediation to occur as soon as practical.	
			Polishing pond and discharge cells designed to contain the liquid volume.	
			Polishing pond lined with geosynthetic liner.	
			Polishing pond pumps are equipped with level meters to prevent pond overflow.	
		Power Failure	Backup power provided.	Negligible

6. Economic Benefit

6.1 Town of Snow Lake

The main community in the Project Region is the Town of Snow Lake, an important mining and service centre for the surrounding area. According to the 2006 census data from Statistics Canada, Snow Lake has a population of 837 with the majority of these residents employed at, or supported by, the mines located throughout the area. Many other Snow Lake residents are employed in the industries and services that support the region's mining operations.

The Town of Snow Lake is situated mid-way between Thompson, Flin Flon and The Pas. Year-round road access is provided to Snow Lake by Provincial Road 392. The community is serviced directly by Manitoba Hydro transmission lines and has telephone access through Manitoba Telecom Services Inc. Potable water is obtained from Snow Lake, and is treated in a WTP located in the Town of Snow Lake.

The Town of Snow Lake has various community services including: a health facility that is staffed by two doctors, a grocery store, two hotels/motels, two service stations, a hockey arena, a curling rink and a nine-hole golf course. There is an un-serviced gravel municipal airstrip located approximately 20 km east of the proposed Lalor Mine site, along the Provincial Road 393, that is designed to accommodate air ambulances for medical evacuations. There is also an airstrip north of the Town of Snow Lake that is located approximately 9 km from the proposed Lalor Mine site. Other services include an RCMP station and a volunteer fire department. There are also numerous recreational opportunities including camping, hiking trails, fishing, hunting, snowmobiling and all terrain vehicle trails. (Snow Lake, 2011)

The proposed Lalor Mine will provide positive economic benefits to the Town of Snow Lake. The greatest economic benefit will be the result of additional employment to the community, as up to 350 people will be directly employed at the proposed Lalor Mine. Additional employment resulting from the mine is expected to sustain or augment overall business activity throughout the community and surrounding area through the purchasing of goods and services by mine workers and their families.

The development of the Lalor Mine is anticipated to result in improvements to housing and infrastructure within the community. As there will be no permanent camps located at the Lalor Mine site, housing in Snow Lake will be required to support the project. HBMS has committed $2 million dollars in funding towards the upgrade of the Snow Lake sewage treatment plant, and proposed upgrades to existing power supply infrastructure (for example, replacement of the Chisel substation) will result in overall power distribution efficiency for future mining operations.

The successful development of the Lalor Mine and subsequent potential upgrades to supporting mining and community infrastructure will enhance the potential for further exploration and mining in the Snow Lake region. The Lalor Mine will also offset potential job losses associated with the closure of the Chisel North Mine in 2012. The development of future mines will result in enhanced economic benefit through sustained and additional employment.

6.2 City of Flin Flon

According to the 2006 census data from Statistics Canada, the City of Flin Flon has an approximate population of 5,594 people (Statistics Canada, 2010b). The City of Flin Flon is the main mining community in north-western Manitoba and north-eastern Saskatchewan. Flin Flon is located just over 800 km north-northwest of Winnipeg, Manitoba, and 120 km west of the Town of Snow Lake. The community occupies portions of both Manitoba and Saskatchewan.

As with the Town of Snow Lake, the majority of Flin Flon residents are directly or indirectly employed by the two mines located in town, the 777 Mine and the Trout Lake Mine, and the supporting Flin Flon Metallurgical Complex. Flin Flon also has a strong tourism industry which includes hunting, fishing, camping, and boating.

Access to Flin Flon is along paved Provincial Trunk Highway 10 from The Pas and Southern Manitoba, Provincial Trunk Highway 39 from Snow Lake and Thompson, and Highway 106 from Saskatchewan. Flin Flon is serviced directly by Manitoba Hydro transmission lines and has telephone and cellular access through Manitoba Telecom Services Inc. The City of Flin Flon operates an airport located 20 km southeast of the city near Baker's Narrows. Other services such as a hospital, a fire hall and a police/RCMP station are located in Flin Flon along with a hockey arena, curling rinks, a golf course, a public swimming pool and numerous sports fields for recreational opportunities. (City of Flin Flon, 2008)

As with the Town of Snow Lake, the proposed Lalor Mine will provide positive economic benefit to the City of Flin Flon. The most significant benefit will be the processing of the zinc concentrate produced in Snow Lake, most of which will be trucked to the HBMS Metallurgical Complex in Flin Flon. In addition, with the pending closure of the Trout Lake Mine in June 2012, there is the possibility of employing some of the miners living in Flin Flon at the proposed Lalor Mine, which would help offset potential job losses resulting from the closure.

The successful development of the Lalor Mine and subsequent potential upgrades to supporting mine infrastructure will enhance the potential for further exploration and mining in the Flin Flon region. The development of future mines will result in enhanced economic benefit through sustained and additional employment.

7. Monitoring and Follow-Up Programs

Follow-up programs verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate the adverse environmental effects of the project. For the proposed project, mitigation measures will be applied as described herein and a formal follow-up program is not anticipated to be required.

Monitoring programs involve the collection and analysis of data on the state a particular environment is in to identify changes or trends over time. Results from monitoring programs indicate the success of mitigation measures that are implemented to protect the environment. They are also used to ensure compliance with environmental standards/regulations and to assist in any potential project operational changes. Monitoring programs are proposed for the Lalor Mine project and are described in the following sections. Mitigation requirements identified for the project are summarized in Table 5.2.

7.1 Environmental Effects Monitoring

During the operation of the Lalor Mine, EEM conducted under the *Metal Mining Effluent Regulations* for the Chisel North WTP and the Anderson TIA will continue. Monitoring will include examining the potential effects of effluent on fish population, fish tissue and on benthic invertebrate communities in local waterbodies potentially influenced by the Lalor Mine support facilities. These monitoring activities are anticipated to continue through operation and following closure until it can be demonstrated that no adverse effects are occurring.

7.2 Environment Act License Monitoring

Monitoring requirements under existing *Environment Act* licenses/Clean Environment Commission Orders for support infrastructure (Chisel North WTP, Anderson TIA and Chisel Lake pump house) will continue to be conducted by HBMS during the operation of the Lalor Mine. It is also anticipated that the new *Environment Act* license for the Lalor Mine will include monitoring requirements for the containerized STP. HBMS will comply with the monitoring requirements outlined in the new *Environment Act* license for the Lalor Mine, which would include effluent quality monitoring for the STP.

7.3 Success of Re-vegetation Efforts

Following closure activities, once the site has been cleared of existing infrastructure and regraded, soil will be applied to disturbed areas of the Lalor Mine site. Re-vegetation will occur as soon as practical following the application of soil. To ensure the success of the re-vegetation program, a re-vegetation monitoring program will be implemented. Regular monitoring during the growing season will determine the success of the re-vegetation program, and will determine if follow up reseeding or replanting is required. The program will include quarterly monitoring during the growing season until the seedlings appear to be established. Quarterly monitoring will then follow during the growing season, for a minimum of two years, before a successful re-vegetation program can be declared. The Lalor Mine access road will be scarified to restrict site access and promote growth of local vegetation.

7.4 Boreal Woodland Caribou Monitoring

HBMS is currently participating in Manitoba Conservation's ongoing large scale caribou study in Northern Manitoba (which includes the Lalor Project Region) to understand potential impacts to boreal woodland caribou. HBMS will continue to participate in this study in cooperation with Manitoba Conservation.

7.5 Environmental Management System

HBMS has been certified to the international standard known as ISO 14001 Environmental Management Systems (EMS) since 2003. The scope of registration is "Mining and metallurgical operations related to copper and zinc production in the Flin Flon/Snow Lake area, including associated ancillary facilities". As of November 1, 2010, the Lalor Mine Project was added to HBMS's scope of certification, and as such the environmental management policies and procedures, as outlined in the EMS, have been implemented at the Lalor AEP and will continue throughout construction, operation and closure of the Lalor Mine.

8. Public Involvement

Public involvement is an integral part of the environmental assessment process. It provides the opportunity for interested stakeholders to receive information from project proponents and, in return, it allows the proponents to gain an understanding of public concerns. Public involvement can also provide an opportunity to actively involve stakeholders in the early stages of a project which, in turn, delivers a sense of transparency in the assessment and planning process.

HBMS, together with AECOM, determined that the Town of Snow Lake would be interested in participating in the public involvement process as the project will occur near the Town of Snow Lake, will directly and indirectly employ residents, provide local economic benefits and will utilize existing infrastructure in the Snow Lake area. Based on discussions that have occurred between HBMS and local First Nations, it was determined that Mathias Colomb Cree Nation and Opaskwayak Creek Nation also have an interest in the project.

In the case of the Lalor Mine Project, public involvement has included a Town Hall presentation, two informal meetings with members of Mathias Colomb Cree Nation, a meeting with Opaskwayak Cree Nation, a public Open House event in the Town of Snow Lake, and interviews with Snow Lake area residents. A summary of the public involvement that has been undertaken for the Lalor Mine Project is included in the following sections.

8.1 Proponent Lead Public Involvement

8.1.1 Town Hall Presentation in the Town of Snow Lake

On the evening of April 13, 2011, HBMS held a Town Hall presentation in the Town of Snow Lake. The Town Hall presentation was held at the Snow Lake Community Hall and was well attended, with an estimated audience of close to 100 people. The presentation covered the Lalor Mine Project in detail, including the discovery of the ore body, development to date and the development plan for the mine. HBMS representatives held a question and answer period following the presentation. Area residents had questions related to tailings, roads, trap lines, financing, training and apprenticeships. HBMS provided answers to questions and committed to hold regular Snow Lake updates for the Lalor Mine project. Overall, Town Hall attendees were interested in the project and were either neutral or positive towards the project.

A copy of the presentation is included in **Appendix D**. An article on the Town Hall presentation was featured in the April 28, 2011 edition of the *Underground Press*, the Snow Lake community newspaper. A copy of the article is included in **Appendix D.**

8.1.2 Mathias Colomb Cree Nation Meetings

8.1.2.1 Meeting #1 – May 9-10, 2011

On May 9-10, 2011, HBMS held an informal meeting in Flin Flon with members of the Mathias Colomb Cree Nation (MCCN) regarding the Lalor Mine Project. There were seven members in attendance from the First Nation, including Chief Arlen Dumas, Sherman Lewis, Floyd North, Ken Bighetty, Hanson Dumas, Gordie Bear and Jimmy Colomb and also Pam Marsden of the Mining Association of Manitoba Inc. Detailed minutes from this meeting are provided in **Appendix D**.

The visit began in the afternoon of Monday, May 9, 2011 with a safety orientation required to prepare MCCN for a tour of the underground workings of the 777 Mine in Flin Flon, to be held the following day. The safety orientation was followed by dinner in the Staff House with representatives of the Northern Manitoba Sector Council (NMSC).

Doug Lauvstad, Executive Director, gave a presentation on the Mining Academy and its relationship with the satellite sites for the University College of the North (UCN). The Mining Academy and Flin Flon UCN site were both under construction. The presentation included some of the past history around the NMSC's work with First Nation groups in all aspects of mining, forestry, exploration and related programs. Don Nisbet, Aboriginal Liaison Coordinator with NMSC, talked about the programs that have been undertaken at Wabowden with the training of First Nations workers and spoke to what worked and what didn't work. There was also discussion about the plans for the Mining Academy, including when it would be open, and how students could be enrolled.

The discussion focused on how MCCN could participate in future programs either through business opportunities or careers, and training options for band members. Exploration was discussed in general, including increased activity by Hudbay in the region of Flin Flon and Snow Lake, which MCCN consider as traditional lands. HBMS mentioned the potential for the Reed Copper Project to generate additional employment opportunities, with the potential for approximately 80 positions.

MCCN discussed work that they were doing for the Manitoba government in Sherridon, Manitoba on the rehabilitation of mine site tailings. Chief Dumas emphasized that MCCN have people and equipment who could do more work. Given their experience, MCCN leaders feel strongly that their First Nation should be considered for potential construction opportunities associated with HBMS mine development projects.

On Tuesday, May 10, 2011, the MCCN visitors toured the underground 777 Mine, Zinc Plant and Flin Flon Concentrator. The site tours were intended as an opportunity for MCCN to learn about HBMS operations and what potential job opportunities may exist. HBMS also provided a presentation on the Lalor AEP, including updates on the progress of construction and some background on its connection to older HBMS developments in the Snow Lake region. This was the same presentation that had been given in the Town of Snow Lake on April 13, 2011.

The Lalor AEP presentation included a brief review of exploration and discoveries on the site, including continuous drilling since the spring of 2007, and updates on construction of the ramp from the Chisel deposits and shaft components of the AEP. HBMS also described plans for development into 2015, including environmental assessment and permitting for the mine itself. HBMS indicated that a tradeoff study was underway to help HBMS decide whether to refurbish the existing Snow Lake Concentrator or build a new concentrator on the Lalor site.

Following the presentation, the members of MCCN indicated that the Lalor Mine Project is located approximately 22 km from a Woodland Caribou mating area. No adverse effects to caribou are anticipated as described in Section 5.9 of this report. The members also indicated that the Lalor Mine Project was located in the heart of their traditional land. Based on the findings of the environmental baseline assessments as summarized in Section 4 and the analysis carried out in Section 5.8.3, the vegetation and wildlife habitat disturbed by the Lalor exploration projects is common to the region.

Comments were also received regarding water quality from the tailings impoundment area and concerns that this facility and the concentrator operate under regulations from the 1970s. A concern regarding the potential of a breach of the tailings impoundment area dam was also expressed.

The Lalor Mine will be supported by the Stall Lake Concentrator and the Anderson TIA. As indicated in Section 2.10.4, as part of the current operation of the Anderson TIA, effluent monitoring is conducted under a Clean Environment Commission Order. In addition, Environmental Effects Monitoring (EEM) is conducted under the Federal *Metal Mining Effluent Regulations* for discharge from the Anderson TIA. EEM data to date for the Anderson TIA has indicated that there is no significant impact to water and sediment quality in the waterbodies associated with the TIA and that the differences in fish and benthic communities between near and far-field exposure sites are considered negligible. In order to ensure dam integrity, HBMS conducts weekly dam inspections and annual geotechnical assessment by a qualified consultant of the Anderson TIA, and every 5 years a dam safety audit is conducted by a second independent geotechnical consultant as per the *Canadian Dam Association Guidelines*.

8.1.2.2 Meeting #2 – January 10-12, 2012

A meeting was scheduled with MCCN on September 12, 2011, to present a project update and environmental information about the Lalor Mine to MCCN in Pukatawagan, but the meeting was cancelled on September 9, 2012. The meeting was rescheduled and held in Flin Flon on January 10-12, 2012. The purpose of the meeting was to provide members of MCCN with information on the Lalor AEP, proposed Lalor Mine and Reed Copper Project AEP. In addition to the meetings in Flin Flon on January 10, 2012 and January 12, 2012, HBMS provided a tour of the Lalor site in Snow Lake on January 11, 2012.

Chief Arlen Dumas, Elder Marcel Caribou and Councilor Jimmy Colomb arrived in Flin Flon during the evening of January 10, 2012, and participated in a planned tour of the Mining Academy and the new satellite campus of the University College of the North (UCN). Pam Marsden of the Mining Association of Manitoba also arrived later that evening. The other members of the MCCN delegation and Mr. Chris Beaumont-Smith (Manitoba Mines Branch) did not arrive in time for the evening meeting, but did arrive in time attend the site visit and follow up meetings on January 11-12, 2012. The full list of attendees is provided in the detailed meeting minutes provided in **Appendix D.**

Topics of discussion that occurred throughout the course of the visit included training and employment opportunities, Lalor project description, environmental impact assessment, and First Nation experience in the region. Detailed minutes from this meeting are provided in **Appendix D**.

Training and Employment Opportunities

The HBMS and MCCN groups were joined for dinner on January 10, 2012, by Don Nisbet, Aboriginal Liaison Coordinator for the Northern Manitoba Sector Council, and Rob Penner, Chair of the Faculty of Arts and Sciences of UCN (the Pas) and Executive Director of the Northern Manitoba Mining Academy. Following dinner, Don and Rob gave the group a tour of the UCN and Mining Academy facilities and discussed the potential benefit of the education and training opportunities that these facilities might offer to Aboriginal residents of the North. It was stated that the fundamental goal is to train northern people for northern jobs. HBMS has been instrumental in supporting these facilities, with a grant of land and cooperation with their facilities and programs.

During the course of the visit, there was further discussion regarding jobs and Councilor Linklater offered information about MCCN experience in constructing water and sewer lines in their community. Mr. Beaumont-Smith commented on potential support for training provided by the Province of Manitoba, as well as opportunities that may be afforded by construction of a new STP and 200 serviced lots in the Town of Snow Lake. HBMS indicated that they can assist in connecting MCCN with Jeff Precourt, Administrator of the Town of Snow Lake.

Lalor Project Description

On Wednesday morning, January 11, 2012, the group boarded a bus for the Town of Snow Lake, for a day of site tours. Along the way, Stephen West (HBMS) was able to point out the location of the Reed Copper Project AEP and some of HBMS' supporting infrastructure in Snow Lake, including the Anderson TIA and the access road to the Stall Lake Concentrator. Once in Snow Lake, the group toured the Lalor Camp, located on HBMS lots in town, including the dormitories and cafeteria. Lunch was served, after which the group proceeded on to the Chisel North Mine site, a distance of about 12 km down the highway. On the way, Mr. West pointed out some existing HBMS infrastructure supporting the Chisel North Mine which will continue in operation to support the Lalor Mine.

Once the group was settled in the Chisel North Mine conference room, Kim Proctor (HBMS) provided a power point presentation on the Lalor project description. Ms. Proctor's presentation was intended to update the presentation given to MCCN leadership during their visit to Flin Flon on May 10 and 11, 2011. She described progress in construction of the Lalor AEP and Lalor Ramp projects, projected HBMS' plans to seek environmental regulatory approval of the Lalor Mine and described plans for related future development (Lalor Concentrator). Ms. Proctor's presentation included updates on construction of the main shaft (on the Lalor site), ventilation shaft and underground ramp, and also plans to propose construction of a new concentrator on the Lalor site. In the course of Kim's presentation, there was some discussion about technical aspects of how mining wastes would be handled and technical aspects of planning for a new concentrator.

Upon conclusion of the presentation, the group re-boarded the bus for the 3 km ride to the Lalor AEP site. There, everyone received a site safety orientation and donned protective gear, prior to a tour of the hoist house, head frame, water treatment plant and warehouse. During the site tour, MCCN elders shared experiences they had had on similar sites. For example, Councilor Colomb shared memories of his work in the open pit mine in Leaf Rapids. In the hoist house, an MCCN member asked what the minimum education requirement for employment at the Lalor Mine would be. HBMS requires applicants to take its own basic skills tests in areas such as literacy and numeracy, even if they have completed Grade 12. Mr. Beamont-Smith indicated that there is an education grant program available to First Nations students to improve eligibility for such jobs by upgrading education levels.

The last stop of the tour was the ventilation raise location. HBMS explained that, once construction of the raise is complete, the existing head frame and other gear will be removed and replaced with an exhaust hood, which will be surrounded by a fence. The area surrounding the vent raise will be re-vegetated and returned to nature.

On the way back to Flin Flon, Mr. West again pointed out the site of the Reed Copper Project. He also pointed out former access to the site of the closed Spruce Point Mine, where re-vegetation has made the site nearly indistinguishable from the surrounding landscape.

Environmental Impact Assessment

On the following morning, January 12, 2012, the group met in the HBMS Staff House in Flin Flon and were joined by two additional HBMS Environmental Control Department employees, Jay Cooper and Riley Little. Cliff Samoiloff (AECOM) gave a presentation on the environmental impact assessment conducted for the Lalor AEP and Lalor Mine, outlining the background on mining in the respective areas and the baseline environmental data collected to date. The presentation included a review of public consultation undertaken to date, as well as the preliminary findings of the ongoing environmental assessment of the project. A presentation on the Reed Copper Project was conducted following the Lalor presentation.

Environmental assessment information included a description of baseline studies that had been carried out in the area of potential influence. These studies had been commenced in response to the discovery first announced in early 2007. The presentation explained how AECOM had considered each of the aspects of the environment which could be affected by the development, stated their conclusions about expected environmental effects and outlined the mitigation measures that they recommended be followed in constructing, operating and ultimately closing the Lalor Mine. The presentation outlined the environmental approval process that would apply to the Lalor Mine and also discussed planning for a future application that may be made for approval of a new concentrator on the Lalor site.

There was further discussion about the manner in which waste rock produced during shaft sinking is being managed. Mr. West explained the analytical procedures used to test the rock and reiterated that all potentially acid generating rock is being taken to the Chisel Open Pit in an existing licensed site.

Further questions dealt with requirements for the archaeological, cultural and heritage assessment performed by AECOM in accordance with Provincial standards, the continuing use of existing water rights licenses, and timing for application for *Environment Act* licenses for the Lalor Mine and concentrator. HBMS indicated that they expect to apply for the Lalor Mine *Environment Act* license in the spring of 2012. Mr. West and Ms. Proctor described the project description information that has to be finalized before the concentrator application can be prepared. The specific timing for proposal of the Lalor Concentrator has yet to be determined, with potential to submit a proposal by the summer/fall of 2012. Mine production can commence without construction of a new concentrator, but ultimately refurbishment of the existing Stall Lake Concentrator or construction of a new facility would be required.

First Nation Experience in the Region

Mr. Samoiloff described AECOM's baseline studies in the region of the Lalor deposits, including plant and animal surveys and the lakes and waterways in the region. This work was started before any specifics were known about the nature and location of potential future development of the Lalor deposits. The studies, therefore, covered a wide area. More recent studies have focused on the actual area surrounding the Project Site. The baseline work included an aquatic assessment of a number of lakes and streams in and around the Lalor deposits. One elder asked about whether the water in the lakes AECOM had studied would be suitable for drinking. While Ghost Lake and Chisel Lake might be suitable drinking water sources, some of the other lakes that were surveyed likely would not meet drinking water standards due to naturally high metals from surrounding swamps, high organics reducing water clarity and other factors.

Chief Dumas emphasized that members of MCCN had personal experience in the region: referring to the elders with him, he stated that three had grown up near Lalor Lake and that one has a cabin located a 10 minute flight north of the Lalor site. Elders Simeon Bighetty and Marcel Caribou mentioned that riverbeds viewed from the bus along Highway #395 appeared to be dry, but had been flowing in the 1970's. Elder Caribou asked about what had happened to the water. Mr. West was not sure which waterways the elder was referring to, but his recollection was that CN had constructed many drainage ditches in the Snow Lake Region which may have changed the direction of some of the water flows.

Elder Caribou asked how long it had taken DFO to permit the drainage, since his experience with DFO was that he had been refused permission for a creek crossing, after waiting a year for DFO to reply to his application. He felt that big industry might be treated more favorably than he had been in getting DFO permits. Mr. West had no knowledge of CN's permitting process, and mentioned that he thought those ditches had been constructed during the 1950's. The elders wondered if the existence of mines in the area could have contributed to dewatering. Mr. West stated that there was no connection between mines in the area and waterways, and no impact will occur on any area surface waters. The Lalor site is in a different watershed than existing operating HBMS properties. However, HBMS plans to use the existing infrastructure for water supply and wastewater treatment, so that there will not be an impact on the watershed where the Lalor site is located.

Mr. Samoiloff was asked whether, during the terrestrial review, AECOM had sought input from First Nations, particularly with respect to plants that can be used for traditional medicines. He explained that when the baseline studies commenced, the Lalor site and access road had already undergone some clearing related to exploration on the site in the year(s) prior. Baseline studies commenced in September of 2007 and were carried out over multiple years during different growing seasons. Exploration drilling was carried on continuously during that time. HBMS and AECOM were not aware of any First Nation presence on and around the Lalor site. AECOM did contact trappers with registered trap lines in the area.

Mr. West and Mr. Samoiloff mentioned that the Lalor site is a rocky knoll, with little soil cover, quite typical of many kilometers of terrain in the region. When there is soil cover, HBMS practice is to save it for use in reclamation. The team of AECOM scientists carried out a vegetation assessment within a one-kilometer buffer zone around the Lalor AEP site and access road. This survey produced a catalogue of species observed, which was compared with Provincial records concerning vegetation in the region and information about plant species that are known to have been identified as potentially having medicinal or cultural importance to Aboriginal People. As indicated in Section 4, none of the identified species that may have medicinal or cultural importance to Aboriginal People found at the Project Site are considered unique to the Lalor Project Site.

Mr. Samoiloff was asked whether there is a way to verify that the environmental review includes plants that First Nations consider to be traditional medicines. Mr. Samoiloff advised that AECOM's work to date has not identified any plant or animal that would be unique to the area that has been or potentially will be affected by the Lalor developments. AECOM and HBMS indicated during discussion that they would be grateful for any comments that MCCN elders or resource harvesters might have about the vegetation on the AECOM list or any other knowledge they may have about the area. As well, HBMS and AECOM invited MCCN elders and resource harvesters to return to the site with AECOM scientists and walk the area together, to determine if there are any environmental sensitivities that AECOM's assessment may need to include. For example, if a resource harvester or elder knows of any plant or animal or special habitat that may have been affected by the Lalor Mine Development, this information should be factored into the assessment. The environmental impact assessment report for Lalor Mine will consider both the information contained in AECOM's surveys and any comments that MCCN may be able to contribute.

At the close of the meetings, discussion returned to potential employment. Chief Dumas emphasized that tree-cutting is an activity that was completed for the project and that the First Nation should be given opportunities in that regard. HBMS agreed, but indicated that the representatives in the room that day could not address employment. HBMS promised that a follow-up contact would be made by other HBMS officials who would speak further about employment and contracting opportunities. HBMS was advised that the Councilor with the applicable portfolio is Gordie Bear.

Chief Dumas advised that MCCN was not in a position to respond at this meeting to the information presented by HBMS. HBMS invited MCCN to continue with another meeting at which there could be more discussion and information sharing by MCCN. HBMS also offered to bring the meeting to Pukatwagan to facilitate participation by elders and resource harvesters. AECOM also would like to return to the project areas with the elders who attended the meeting and any other MCCN members who might have additional knowledge that could contribute to the environmental assessment. Chief Dumas expressed appreciation for the offer and will be glad to consider it and let HBMS know. Following the meeting, Mr. West wrote to Chief Dumas to reiterate HBMS request for MCCN participation in the follow-up environmental review with AECOM. A copy of this letter is provided in **Appendix D.**

MCCN requested and HBMS agreed to provide copies of the presentations given to MCCN and copies of the applications it had filed and permits received for the Lalor project. It was agreed that we would have a follow up meeting to discuss MCCN's views on the environmental assessment information presented at this week's meetings. Mr. Sloan (MCCN counsel) suggested that HBMS consider funding a traditional knowledge study, to be carried out by a third party expert, incorporating matters of culture. MCCN now has provided a proposal for such a study and the follow up meeting has been scheduled.

Further discussion of business, education and employment are to be carried on through Councilors Gordie Bear, who attended the meeting in Flin Flon on May 9, 2011 and Kelly Linklater. Ms. Rosenberg (TDS) made a commitment that someone from HBMS would contact Councilor Bear in that regard. Further contacts have been made to follow up on these commitments. As well, HBMS personnel will help connect the administrator of the Town of Snow Lake with Councilor Gordie Bear regarding potential opportunities for Missinippi Construction to work on development sites in the town. Chief Dumas will provide contact information for each of the MCCN councilors.

Following the meeting, MCCN was provided with copies of environmental reports, licenses and permits associated with the Lalor Project. As well there has been an exchange of correspondence between counsel with a view to considering MCCN's assertion of rights and request for funding of a traditional knowledge study, HBMS's position concerning the likelihood that the Lalor site would be useful for traditional practices, and completion of HBMS's environmental information sharing process. It is expected that the information sharing process will continue with a follow-up meeting with members of MCCN.

8.1.3 Opaskwayak Cree Nation Informal Meeting

On June 6-7, 2011, HBMS, together with the Mining Association of Manitoba Inc., held a meeting and site visit in Flin Flon with the leaders of Opaskwayak Cree Nation (OCN). The delegation included Chief Michael Constant, Councillors Philip Dorion and Mike Jebb Jr., Gerald Lathlin from the Paskwayak Business Development Corporation, Stan McGillvary (Chiefs' Assistant), Community Services Manager Joan Niquanicappo, community member Larry Constant, Lori Lathlin (Treaty Land Entitlement), and Mary Head (Natural Resources Council).

The delegation arrived in Flin Flon on the evening of June 6, 2011. After dinner, there were presentations by the Northern Manitoba Sector Council (NMSC), HBMS Logistics and Hudson Bay Exploration and Development (HBED). The NMSC presented "Community Based Introduction to Industry" and "Workplace Based Introduction to Industry." The NMSC also discussed the Canadian Achievement Test (CAT). Doug Lauvstad and Don Nisbet from NMSC shared how the demographics are shifting and the need for northerners to participate in the changing workforce. The Mining Academy in Flin Flon was discussed during the presentation and a tour of the Academy occurred later that evening.

The following day, OCN were provided with a tour of the 777 Mine in Flin Flon, which included an underground and surface tour.

Following the tour, lunch was served and Kim Proctor, Lalor Project Manager, provided a presentation of the status of the Lalor Project. This presentation was the same as was provided to the Town of Snow Lake on April 13, 2011 (**Appendix D**). Following the presentation the delegation met with Garth Thompson, HBMS Contract Manager, and the tour concluded with a discussion on HBMS contract and procurement procedures.

8.2 Open House

On June 8, 2011, a public Open House was held in the Town of Snow Lake by HBMS and AECOM to provide an opportunity to convey information concerning the proposed Lalor Mine for all interested parties, including the findings of environmental baseline studies and the environmental assessment and to provide an opportunity for the public to provide the project team with feedback regarding the project. To inform the public of this event, an advertisement was placed in the May 26, 2011 edition of the *Underground Press*. A copy of the advertisement is included in **Appendix D**.

The Open House event was held at the Snow Lake Community Hall and 27 attendees participated in the Open House. A copy of the Open House attendance sheet has been provided in **Appendix D**. The Open House event consisted of a formal presentation with a question and answer period followed by informal discussions with attendees and representatives from AECOM and HBMS. No questions were received from the attendees in the question and answer period.

Large print outs of several of the presentation slides were displayed on easels around the room for attendees to examine in detail following the presentation. Questionnaires were provided to all attendees. Five questionnaires were completed by Open House attendees. Comments associated with these questionnaires are as follows:

- One questionnaire indicated that the attendee was always concerned with projects that may affect the health of the community, in particular air and water quality. The attendee commended the ongoing study of these issues and was appreciative that the information was available to the public.
- Another attendee indicated that they were concerned about unused rail bed access to fishing areas and water quality in Wekusko Lake.
    - HBMS representatives indicated to the attendee that the proposed Lalor Mine project will not affect rail bed access to fishing areas. HBMS also indicated that EEM undertaken for the Anderson TIA discharge examines potential effects on the receiving waterbody (Wekusko Lake). EEM data to date for the Anderson TIA has indicated that there is no significant impact to water and sediment quality in the waterbodies associated with the TIA and that the differences in fish and benthic communities between near and far-field exposure sites are considered negligible.
- The same attendee indicated that he used several lakes in the Snow Lake area for fishing including Rail Lake, Krug Lake, Sewell Lake and Koblun Lake.
    - HBMS representatives indicated to the attendee that the proposed Lalor Mine project will not withdraw water or discharge to these waterbodies and as such impacts are not anticipated.
- The other three completed questionnaires indicated no concerns related to the Lalor Mine.

Through discussions with Open House attendees, two cabin owners on Squall Lake, located approximately 6 km northeast of the Lalor AEP site, indicated that they wanted to ensure that appropriate controls would be in place to protect the lake from environmental damage. HBMS representatives indicated that no direct discharges or water withdrawals at Squall Lake would occur from the Lalor Mine. As such, impacts on Squall Lake were not anticipated. Another attendee indicated that she and her husband were supporters of the project as it would continue to provide employment in the area; in particular, potentially for their three adult children who want to stay in the North. AECOM and the HBMS representatives at the Open House generally observed that the attendees were interested in the project and were either neutral or positive towards the project.

An article on the Open House was featured in the June 23, 2011 edition of the *Underground Press*, the Snow Lake community newspaper. A copy of the article is included in **Appendix D**.

An online article was posted in the City of Thompson's local paper website, the *Thompson Citizen*, on July 15, 2011. It provided an overview of the Open House that was held in the Town of Snow Lake. The online article also allowed readers to post any comments regarding the article, but none were posted. A copy of the article is provided in **Appendix D**.

8.3 Interviews with Snow Lake Area Residents

Interviews with local Snow Lake residents, primarily in the commercial area of Snow Lake, were conducted by AECOM staff on June 7th, 2011. The following is a summary of the conducted interviews.

Interview #1

Owners of Wekusko Fall Lodge (Bryan and Elissa Bogdan)

Lalor Mine Work Camp:

- The work camp could be "rented" to people not working for HBMS, resulting in a loss of business for the lodge.
    - *Response:* The work camp will only be used by individuals working directly for HBMS. The work camp will not be made available to others.

- It would be more difficult to hire and retain locals to work at the lodge as the lodge can't compete with mine wages.
    - *Response:* The workforce requirements for the proposed Lalor Mine will require additional people to move to the Snow Lake area. This will result in additional people in the Snow Lake area including mine employees and their families. Some segments of the local population would not be seeking or necessarily be suited for work in the mine such as spouses and employee children. These people would be available to support other businesses in the area.

Highway Traffic:

- Heard rumours of twinning the highway and laying new road west of the lodge.
- Concerned about potential disturbance to the shoreline and recreation/tourism impacts to Tramping Lake.
    - *Response:* No highway twinning or alteration to Tramping Lake is proposed for the Lalor Mine.
- Higher traffic volume (noise and safety concerns).
    - *Response:* A noise assessment is currently underway. HBMS will impose site speed limits on the Lalor Mine Access Road. Drivers will need to follow posted speed limits on Provincial Roads 392 and 395.

Rail Line:

- Opening the rail bed could block access to the back country lakes and could limit the trappers' success in this area.
    - *Response:* There are two rail beds in the Project Region, one leading from the Anderson TIA to Provincial Road 395 and the second leading from Chisel Lake west towards Flin Flon. No alteration to either rail bed is proposed for the Lalor Mine. Any alterations required for the development of the Lalor Concentrator would be discussed with local stakeholders, but are expected to have no adverse impact on existing users.

Environment:

- Slow/no recovery of walleye stocks in Wekusko Lake. Interviewees attributed effects on walleye stocks to historic and current mining activities.
- Concerned about impacts to water quality in Wekusko Lake due to operation of TIA.
    - *Response:* EEM undertaken for the Anderson TIA discharge examines potential effects on the fish populations and habitat in the receiving waterbody (Wekusko Lake). EEM data to date for the Anderson TIA has indicated that there is no significant impact to water and sediment quality in the waterbodies associated with the TIA and that the differences in fish and benthic communities between near and far-field exposure sites are considered negligible.

Interview #2

Local Resident of Snow Lake, Trapper (Greg Foord)

- In the last ten years, the bulrushes have become denser in Anderson Creek, where it meets Anderson Bay. He suspects that the release from the TIA is causing this.
- Traps along Anderson Creek and is concerned about the TIA affecting the Creek.
  - *Response:* As stated previously, the EEM data for the Anderson TIA has indicated that there is no significant impact to water and sediment quality in the waterbodies associated with the TIA. EEM will continue through the operation of the Lalor Mine. If effects are identified as part of the EEM, the identification of cause and investigation of solutions process will be undertaken.

Interview #3

Secretary at Gogol's Airline and Outfitter (Brad Gogal)

- No concerns/comments.

Interview #4

Gardewine Representative (Connie Polh)

- Good for the community, excited for the town.

Interview #5

General Manager at Family Foods (Chris Samborski)

- No concerns/comments.

Interview #6

Canada Post employee (Mary-Ann Otto)

- No concerns/comments.

Interview #7

Manager of Home Hardware (Dave Mayer)

- Positive, excited for the town.

Interview #8

RBC Bank employee, cottage owner near Anderson Bay (Lillian Haines)

- Water quality concerns in Anderson Bay from the TIA.
- Is concerned about raw sewage discharge, under existing *Environment Act* license, from Anderson Lake through Anderson Creek to Anderson Bay. Would like to see treatment of sewage prior to release.
  - *Response:* No raw sewage is discharged to Anderson Bay. Sewage from the Stall Lake Concentrator is discharged, with concentrator tailings, to the Anderson TIA where it is passively treated. At the point of final discharge from the TIA, HBMS monitors effluent quality for total and fecal coliforms and only discharges the TIA when effluent quality meets applicable limits. The Lalor Mine will have an on-site STP to treat sewage, and only fully

treated sewage will be discharged from the Lalor Mine site into pipelines leading to the Chisel North WTP. EEM required for the Anderson TIA will continue during the operation of the Lalor Mine. As stated previously, the EEM data for the Anderson TIA has indicated that there is no significant impact to water and sediment quality in the waterbodies associated with the TIA.

8.4 Other Local Stakeholders

8.4.1 Trappers

The Manitoba Conservation office in Snow Lake has confirmed that there is one registered trap line (RTL) in the area surrounding the Lalor AEP site and access road, line RTL 23 which is owned by Martin McLaughlin. Manitoba Conservation records indicate that Mr. McLaughlin has been the owner of this trap line since at least 1968.

On June 6, 2011, AECOM staff conducted a telephone interview with Mr. McLaughlin to discuss the Lalor Project and identify any of his concerns with the project. He identified his primary trapping area is currently located around Cook Lake, but indicated that he used to trap along the east bank of Lalor Lake. Trapping consists primarily of lynx, mink and marten.

Mr. McLaughlin indicated that he had no major concerns with the project, and realizes that any impacts that could potentially occur are expected to be temporary. He indicated that previous line cutting that occurred during exploration in the Lalor area had the most significant impact on his trap lines to date, and that his only concern with the construction and operation of the mine is the possibility of restricted access to his trap lines (due to fencing associated with the Lalor Mine). He also expressed an interest in speaking with HBMS to discuss issues associated with trap line access. Mr. McLaughlin was notified of the Open House, but indicated that he was unable to attend. HBMS is committed to working with Mr. McLaughlin to ensure access to trap lines is not impacted by the Lalor Mine.

Manitoba Conservation has also confirmed that the area of Anderson Creek and Wekusko Bay is registered as RTL 13. This trap line is owned by Russell Bartlett (assisted by Greg Foord). On October 25, 2011 AECOM staff contacted Mr. Bartlett to discuss any concerns he may have about HBMS developments that may affect his trapline. Mr. Bartlett was on his trapline at the time and was not able to be interviewed at length. AECOM staff informed him that they were interested in his opinion and encouraged him to contact AECOM to discuss any concerns at his convenience. No further communication was initiated by Mr. Bartlett. HBMS is committed to working with Mr. Bartlett to ensure access to trap lines is not impacted by the Lalor Mine.

AECOM staff also conducted an interview with Greg Foord on June 7, 2011 (details are provided in Section 8.3.), and Mr. Foord was in attendance at the June 8, 2011 Open House.

8.4.2 Cottages or Remote Residences

The closest cottages to the Lalor Mine site are five cabins located on the west shore of Cook Lake, approximately 1.7 km from the Project Site. In a brief interview with one of the cabin owners during the September 2007 field study, it was indicated that these cabins have only been on the lake in the last 15 years and that five cabins is the maximum allotted to Cook Lake by Manitoba Conservation.

A few local cottage and cabin owners were in attendance at the June 8, 2011 Open House, and others were interviewed by AECOM staff on June 7, 2011. These cottage owners provided AECOM with comments regarding the development of the proposed Lalor Mine. Content of these discussions is noted in Section 8.2 and 8.3 above.

As indicated in Section 5.11.1, no adverse environmental effects are expected to affect the use of cottages in the region. Potential concerns associated with noise impacts have been addressed, and are discussed in detail in Sections 5.4.3 and 5.9.1.

8.4.3 Lodge Owners

The Diamond Willow Inn & Willow House, located in the Town of Snow Lake at 200 Lakeshore Drive approximately 9 km east of the proposed Lalor Mine site, is located within the Project Area.

Although located outside of the Project Region, there are three lodges located in the area surrounding Snow Lake. Wekusko Falls Lodge and Tawow Lodge Ltd. (Herb Lake Landing) are located approximately 18 km and 35 km southeast of the proposed Lalor Mine site, respectively. Burntwood Lodge is a fly in fishing lodge located on Burntwood Lake and is approximately 60 km northwest of the proposed Lalor Mine site.

Bryan Bogdan, owner and operator of the Wekusko Falls Lodge, was in attendance at the June 8, 2011 Open House and was interviewed by AECOM staff on June 7, 2011. Details of this interview are provided in Section 8.3.

As indicated in Section 5.11.1, no adverse environmental effects are expected to affect lodges in the region.

8.4.4 Snowmobilers

The Snow Lake area is home to the Snow Lake Sno-Drifters snowmobiling club. A map of snowmobile trails maintained by the club in the Snow Lake area is maintained online and as shown in Figure 22. The club is aware of the Lalor Project and have not expressed any concerns regarding its development.

8.4.5 Forestry

The Cormorant Provincial Forest is located approximately 80 km southwest of the proposed Lalor Mine site and covers an area of 1,479 km^2. Provincial forests are Crown lands managed by Manitoba Natural Resources on a sustainable yield basis. A licence or permit allows harvesting of trees on Crown lands and also indicates the quantity of each type of trees that can be harvested. Large companies must regenerate forest lands that they have harvested according to their Forest Management License. A forest renewal fee is paid by individuals or small companies for reforestations (Manitoba Conservation, 2011a).

Tolko Industries Ltd. (Manitoba Solid Wood Division, Woodlands), located in The Pas, Manitoba has three Forest Sections in Manitoba (Highrock, Nelson River and Saskatchewan River) where wood is harvested. These Forest Sections include areas surrounding Snow Lake, Flin Flon and Grass River Provincial Park (Tolko Industries Ltd., 2011).

As part of the planning process and as documented in their *Annual Harvest and Renewal Plan*, public consultation has been undertaken with Pukatawagan (Mathias Colomb Cree Nation) and Snow Lake as well as other surrounding communities regarding the proposed harvest plan. According to Tolko Industries Ltd.'s record of the public consultation events in Pukatawagan and Snow Lake, no concerns regarding unique vegetation areas were identified to Tolko Industries Ltd. representatives. (Tolko Industries Ltd. 2011b)

8.5 Additional Public Notification and Information Sharing

In addition to formal public consultation events, the Lalor Mine Project has been covered extensively in various forms of media since 2007, and has been presented at numerous industry events. The following listing includes a sampling of publications and industry events that have provided information regarding the Lalor project:

Winnipeg Free Press

- *HudBay Reports 'Significant' New Zinc Discovery at Lalor Lake in Manitoba*, October 24, 2007
- *HudBay Reports to Spend $43 Million this Year to Develop its Mineral Properties*, February 12, 2008
- *HudBay Reports 'Encouraging' Copper and Gold Assays at Lalor Lake in Manitoba*, March 3, 2008
- *HudBay Wild About Zinc*, March 19, 2008
- *HudBay to Add Emphasis on Exploration, Focusing on Lalor Lake*, May 29, 2008
- *HudBay's Big Lalor Strike gets Richer*, September 22, 2009
- *Snow Lake Prospects Golden*, September 23, 2009
- *Big Dig Starts Soon Up North*, October 9, 2009
- *HudBay High on Lalor Drill Results*, February 23, 2010
- *Mineral Find Boosts Manitoba Mine*, June 24, 2010
- *HudBay Optimistic Over Northern Manitoba Mine*, August 8, 2010
- *Ceremonial Kick-off Today for $560-million Lalor Job*, October 6, 2010
- *HudBay Optimistic Over Northern Manitoba Mine*, November 20, 2010
- *HudBay to Put $313M Into Province Next Year*, November 14, 2010
- *Aboriginals Flock to Northern Jobs*, January 29, 2011
- *Snow Lake Mine on Target,* May 18, 2011
- *Extra $144M for Manitoba Mine*, July 6, 2011
- *Province Mining Bright Future*, November 19, 2011
- *Snow Lake's Got it's Groove Back*, December 1st, 2011

The Globe and Mail

- *HudBay First Half 2007 Exploration Update*, October 15, 2007
- *HudBay Sees 'Most Significant New Zinc Discovery' at Lalor Lake*, October 24, 2007
- *Big Zinc Find Buys HudBay Time*, October 25, 2007
- *HudBay Plans $42.8 Million for 2008 Exploration*, December 11, 2007
- *HudBay Updates Drill Results for Lalor Lake*, March 3, 2008
- *Positive Drill Results Continue at HudBay's Lalor Lake*, May 22, 2008
- *HudBay's Lalor Exploration Yields More Precious Metal Intersections*, May 5, 2009
- *HudBay Announces Major New Copper-Gold Intersections at Lalor*, September 22, 2009
- *HudBay Announces $85 Million Production Ramp to Lalor Deposit*, October 8, 2009
- *HudBay Updates Drilling on Copper-Gold Zone at the Lalor Deposit*, December 17, 2009
- *HudBay Updates Drilling at Lalor Deposit: Copper-Gold Zone Remains Open Down Plunge to the North and West*, February 22, 2010
- *HudBay Discovers Additional Gold and Copper at Lalor*, June 23, 2010
- *HudBay Minerals Inc.: Manitoba Premier Attends Ceremonial Lalor Project Kick-Off in Snow Lake*, October 6, 2010
- *HudBay Minerals Announces Results of Lalor Optimization Study; Commitment to New 4,500 Tonne Per Day Concentrator*, July 5, 2011

Flin Flon Reminder

- *HudBay's Next Big Mine*, October 13, 2009

Thompson Citizen

- *In Snow Lake, Great Things Come in Threes*, November 6, 2009
- *HudBay's Lalor Project Gets the Go-Ahead*, August 20th, 2010

Hudson Bay Mining and Smelting Co. Limited Website

- HudBay Announces High-Grade Lalor Lake Drill Results, August 2, 2007
- Lalor Update, October 23, 2007
- Lalor Update, March 3, 2008
- Lalor NI 43-101 Technical Report, September 19, 2008
- HudBay Discovers New Gold Zone at Lalor, January 9, 2009
- Lalor Drill Results & Intersections Information, October 08, 2009
- Lalor Supplemental Disclosure, August 4, 2010
- HudBay Minerals Releases Second Quarter 2010 Results; Announces Production Decision at Lalor Project and Semi-Annual Dividend, August 11, 2010
- Lalor Project Exploration Drill Results, December 13, 2010
- Lalor Project Exploration Drill Results, March 11, 2011
- Lalor Project Exploration Drill Results, May 16, 2011

Conferences and Industry Events

- Lalor Project Update, Mines and Minerals Convention, Winnipeg, November 20, 2009
- Lalor Project Update: Building for the Future, Mines and Minerals Convention, Winnipeg, November 19, 2010
- Lalor Project Update, Mines and Minerals Convention, November 18, 2011
- Lalor Zinc-Copper-Gold Development Project, Women in Mining Presentation, Winnipeg, January 26, 2011

9. Conclusions and Recommendations

Overall the adverse residual effects of the proposed Lalor Mine were considered to be negligible to minor in magnitude and mitigable with the measures incorporated in the project and recommended herein. The results of the effects assessment can be summarized as follows:

Topography

Construction and operation of the proposed Lalor Mine will not affect the topography of the site. The Project Site has been previously cleared and levelled during construction of the Lalor AEP. The closure phase will include restoration of the topography of the site to match the surrounding area to the extent that is practical.

Soil

As the plan for operation of Lalor Mine eliminates the potential to generate ARD on-site, no effect on soil quality as a result of ARD is anticipated. Construction and operation phases will not include any activity that is likely to result in soil erosion, and operation and closure activities will include assessment of any contamination caused by the development, followed by any remediation that may be required to eliminate risk to human health, safety or the environment.

Air

The dense nature of the vegetation immediately surrounding the Project Site is expected to mitigate wind effects and overall potential dust migration, limiting its effects to the Project Site and the immediate Project Area. Although dust generation is anticipated on Provincial Road 395 and the Lalor Mine access road as they are unpaved roads, dust generation is not anticipated on Provincial Road 392 as it is a paved road. With the implementation of standard mitigation measures, the effect of dust on air quality will be negligible under normal weather conditions.

Although the increase in traffic associated with the Lalor Mine is considered major, the increase in emissions due to the increase in vehicles is not anticipated to have a major effect on air quality. With the implementation of standard mitigation measures during the operation phase, the potential residual effect on air quality is anticipated to be negligible in the Project Area.

Noise

All practices performed on the Lalor Mine site will be carried out in accordance with the *Workplace Safety and Health Act* and HBMS' OHSAS 18000 certified management system, which will minimize potential effects on health and safety. Noise levels are anticipated to return to ambient levels prior to reaching the closest cottage on Cook Lake with the implementation of standard engineering controls (such as silencers) on equipment as required. Further, noise levels associated with traffic on Provincial Road 395 are anticipated to return to existing ambient levels prior to reaching the closest residential area in the Town of Snow Lake. As such, there will be no adverse effects from noise in the Town of Snow Lake or cottages located at Cook Lake.

Climate

Although climate change effects due to greenhouse gas emissions are considered irreversible; the overall quantity of greenhouse gas emissions generated during construction, operation and closure of the Lalor Mine is considered to have a negligible effect on climate change.

Groundwater

For the purposes of this environmental assessment, a distinction has been made between shallow and deep groundwater resources. Any effects on shallow groundwater quality are anticipated to be limited in spatial extent to the Project Site and immediate Project Area.

No registered groundwater users have been identified within 5 km of the Lalor AEP site, which includes the subsurface area that will be affected by the proposed mine. As a practical matter, the deep groundwater is not available for use as the low hydraulic conductivity of the rock formation in the Lalor Zone provides very slow recharge; and the great depth of the groundwater that may be affected by the mine restricts accessibility for users. Deep groundwater potentially affected by blast chemicals will be pumped to surface for treatment at the Chisel North WTP, removing the potential for additional groundwater to be affected; therefore it is anticipated that residual effects on deep groundwater quality due to the use of explosives will be negligible.

Based on the amount of groundwater seepage expected and the lack of users of the deep groundwater, no significant effects on deep groundwater are anticipated to result from mine dewatering.

No effects from ARD or waste management are expected.

Surface Water

As the need for fresh water is accommodated within existing approved limits, surface waterbodies are not anticipated to be substantially affected as a result of fresh water supply to the Lalor Mine. Wastewater generated during the operation phase of the Lalor Mine will be managed using existing licensed treatment facilities, and sanitary sewage generated at the Lalor Mine will be treated in an on-site sewage treatment plant.

Protected and Other Flora Species

Although the Lalor development resulted in a loss of vegetation in the Project Site, no unique vegetation communities were lost and the species lost to the development footprint are common in the Project Area and Region. No additional loss of vegetation will be caused by construction or operation of the Lalor Mine. For these reasons, the loss of vegetation to the Lalor development footprint is not considered significant.

Protected and Other Fauna Species

No habitat of specific or critical value to wildlife was observed at the Project Site (such as calving or over-wintering areas) and, based on site conditions and limited field observations, it is expected that there is no critical wildlife value in the Project Area. Although the Lalor Mine Development has resulted in a loss of wildlife habitat at the Project Site, the type of habitat that has been lost is common in the Project Area and Region. No additional loss of wildlife habitat will be caused by construction or operation of the Lalor Mine. Noise effects on wildlife will be limited to portions of the Project Area with no noise effects anticipated beyond the Project Area. Species present in the Project Area are anticipated to be accustomed to some level of noise due to the presence of existing Provincial Roads and existing developments. For these reasons, the Lalor Mine Development will not result in adverse effects on wildlife.

Aquatic Resources and Protected Species

The mitigation measures planned for surface water are anticipated to sufficiently mitigate potential surface water effects. There are no protected species known to occur in the Nelson River watershed including the waterbodies surrounding the Lalor Mine or where discharges from support infrastructure will occur. The mitigation measures proposed for surface water will prevent adverse effects on aquatic resources.

Land Use

As residual environmental effects on aquatic and terrestrial resources have been determined to be minor to negligible in magnitude, it is anticipated that the Lalor Mine will not adversely impact the availability of plants, wildlife or fish for resource harvesting in the Project Region. As a result, no change in land use is anticipated outside the Lalor Mine Development.

Heritage Resources

There are no historic or heritage resources anticipated at the Lalor Mine site or in the immediate surrounding area. Land disturbance during construction of Lalor Mine will be limited to the existing cleared and levelled Lalor AEP site, and no further disturbance beyond the existing Project Site will occur during operation or closure activities. Therefore, no effects on heritage resources are anticipated during construction, operation or closure of the Lalor Mine.

Aesthetics

Based on the mine's remote location and surrounding vegetation, aesthetic effects during the construction and operation phase are anticipated to be negligible.

It is recommended that the mitigation measures and monitoring programs described in this report be implemented to ensure potential environmental effects are minimized and/or are identified early so that appropriate action can be undertaken. Monitoring programs that have been recommended include continued EEM and monitoring requirements under *Environment Act* licenses as well as monitoring the success of re-vegetation efforts.

In summary, the residual environmental effects will be negligible to minor in magnitude with the implementation of the mitigation measures identified and monitoring programs proposed. It is our opinion that based on the available information and documented assumptions, the proposed project is not likely to cause significant adverse environmental effects.

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Figures

Appendix A

EAP Form and Regulatory Approvals

Appendix B
Lalor STP Approval and Support Documentation

Appendix C

Microfiltration Unit Design Drawings

Appendix D

Record of Public Involvement