Diavik Diamond Mines (2012) Inc.
P.O. Box 2498
300 - 5102 – 50th Avenue
Yellowknife, NT X1A 2P8
Canada
T (867) 669 6500
F (867) 669 9058

DISTRIBUTION LIST

30 June 2015

Subject: 2014 Environmental Agreement Annual Report for the Diavik Diamond Mine

Attached please find for review the Diavik Diamond Mines (2012) Inc. (DDMI) Environmental Agreement Annual Report (EAAR) for 2014. This document is intended to meet the commitments outlined in Section 12.1(c) of the Environmental Agreement.

On 4 September 2014, DDMI received a letter from the Government of the Northwest Territories (GNWT) indicating that the content of the 2013 EAAR was satisfactory, and requested that the 2014 report be issued at higher resolution. In order to keep the file size of the report small enough to be distributed by e-mail, the attached report remains at a lower resolution. However, a high resolution version will soon be uploaded to the DDMI website (http://www.riotinto.com/diamondsandminerals/documents-12127.aspx), and a copy can be provided directly to any Party, upon request.

Please note that the translations of the Executive Summary had not all been received at the time of distribution. These will be distributed to each of the Parties to the Environmental Agreement upon receipt.

Please contact the undersigned should you have any questions or wish to discuss the report.

Yours sincerely,

For:

Gord Macdonald
Principal Advisor, Sustainable Development

Attach.

cc: Monica Wendt, GNWT

DISTRIBUTION LIST

Sean Richardson
Chair
Environmental Monitoring Advisory Board
seanrichardson@tlicho.com

Ernie Campbell
Deputy Minister, Environment and Natural Resources
Government of the Northwest Territories
Ernie_Campbell@gov.nt.ca

Steve Pinksen
Assistant Deputy Minister, Department of Environment
Government of Nunavut
spinksen@gov.nu.ca

Grand Chief Eddie Erasmus
Tłı̨chǫ Government
grandchiefediiwa@tlicho.com

Chief Edward Sangris
Yellowknives Dene First Nation (Dettah)
esangris@ykdene.com

Chief Ernest Betsina
Yellowknives Dene First Nation (N'dilo)
ebetsina@ykdene.com

Chief Felix Lockhart
Lutsel K'e Dene Band
chief.lkdfn@gmail.com

Stanley Anablak
President
Kitikmeot Inuit Association
kiapresident@qiniq.com

Bill Enge
President
North Slave Metis Alliance
billenge@nsma.net

2014 Environmental Agreement Annual Report

Diavik Diamond Mines (2012) Inc.

Document #: ENVI-470-0615 R0

Published: 30 June 2015

RioTinto

DOMINION DIAMOND CORPORATION

Diavik Diamond Mine

Table of Contents

Executive Summary

The Diavik diamond mine is located on the East Island of Lac de Gras, in Canada's Northwest Territories, approximately 300 kilometers northeast of the capital city of Yellowknife. There are a lot of different types of wildlife in the area. The environment is considered pristine and sacred for the communities who have used this area in the past, which is why Diavik carried out a comprehensive Environmental Assessment before beginning mining.

Diavik signed an Environmental Agreement ("the Agreement" or EA) with 5 Aboriginal organizations and the federal and territorial governments in 2000. The Agreement says what Diavik is to do to protect the environment while operating the mine. There was also an Advisory Board formed as part of the Agreement; the Board is a public watchdog of the regulatory process and the implementation of the EA. The Diavik diamond mine was in its twelfth year of operations during 20143, and all mining was done underground this year.

This report summarizes the results of Diavik's environmental monitoring and management programs during 2014. Copies of the reports listed can be found on-line in the EMAB library (http://www.emab.ca/Library.aspx) or Wek'èezhìi Land and Water Board public registry (http://www.mvlwb.ca/Boards/WLWB/SitePages/search.aspx?app=W2007L2-0003).

Environmental Monitoring and Management

Many companies, including Diavik, have an Environmental Management System (EMS) that provides a structure to identify, control, measure and improve the environmental performance of day-to-day operations at the mine. Diavik's EMS is checked against the ISO14001 criteria each year by people who work for a company specializing in this. Diavik passed the review in 2014 and maintained our EMS certification. The EMS includes procedures for operational controls, environmental monitoring, communication plans and the recording of information.

The EA says that Diavik's environmental plans and programs are to be 'adaptable', or able to change in response to results. A company that conducts adaptive management would consider possible changes to decrease proven impacts, as necessary.

Diavik's management plans and monitoring programs follow the EMS improvement cycle, where changes have been made based on the results received. Examples include: installation of equipment and buildings that reduce and monitor emissions, building on lessons learned from past re-vegetation research and several changes to the lake-wide water sampling program.

Re-vegetation

It takes a long time for grasses and plants to grow in the sub-arctic. For this reason, Diavik started doing research in 2004 that looks at the best types of native plants, soil and additives that could be

used for plant growth at the mine site after closure. Diavik also wanted to research how best to grow native plants and if surface features such as boulders affect plant development.

This research continued in 2014, and is currently planned through to 2016 with the goals of determining: how best to grow plants from seed, how effective different planting methods are on plant growth and the type of conditions that improve plant growth over time. The research will look at how effective it is to use different planting techniques in patches around the mine site at closure, as this is something that has worked well for other large sites. This work will also include more monitoring of the research plots from 2004, to see how well they are doing over time.

To date, research has indicated that soils can be constructed from many different materials salvaged from mine operations (e.g. gravel, till from the bottom of the lake, treated sewage sludge) and used effectively for re-vegetation. Seed loss (erosion) is an issue and use of erosion control techniques, such as erosion control blankets (straw mats) and the addition of some protective mounds, bumps and rocks on the ground, are showing some success for increasing plant growth. Lastly, the regrowth process at reclamation sites is faster than for natural recovery but it still takes a long time, with soil and plant development taking 2 to 3 years.

Monitoring Program Activities

Caribou

Various methods are used to monitor caribou and the results of these programs are summarized below.

- Caribou aerial surveys were not required in 2014.
- Movement patterns predicted in the Environmental Assessment have shown to be correct—to the west of Diavik in spring and to the east in fall.
- A total of 9 behavioural scans (watching caribou to study their reaction to mining or other activities) were done in 2014.
- There were no caribou deaths due to mining activities in 2014. Caribou were herded once in 2014, in order to avoid having the animals enter a possibly hazardous area.

Wolverine, Grizzly Bear and Falcons

- Wolverine snow track surveys were done in 2014 with the help of a community assistant. A total of 25 tracks were spotted over 150 km surveyed.
- The wolverine hair snagging DNA study is only done in certain years and was done in 2014, in collaboration with the GNWT and other mining companies; results from this program are not yet complete.
- There were 7 wolverines on East Island in 2014, and no wolverine deaths or injuries.
- The grizzly bear DNA sampling program was conducted for 2 years in 2012 and 2013. There was no DNA sampling conducted in 2014, and a long-term schedule for this program still needs to be determined.
- There were 69 incidental sightings of grizzly bear around the mine area in 2014, with no bear

injuries or deaths.

- In 2014 there was 1 peregrine falcon nest and 2 rough-legged hawk nests found on the mine site.
- There were no falcon deaths or injuries at the mine site in 2014.

Vegetation, Dust and Air Quality

Snow samples are taken every spring and they are melted to test for water quality and the amount of dust. Dust particles are also captured in collectors and checked to see if there are patterns in the amount and location of dust from the mine. During 2014:

- Dust and snow samples were taken and tested.
- The Air Quality Monitoring Program continued.
- Total diesel use decreased by 3% compared to 2013, which meant 40 less fuel loads travelling on the winter road.
- A total of 64.7 million litres of diesel were used to operate the mine site.
- The amount of greenhouse gasses generated from fuel use equalled 182,427 tonnes of carbon dioxide (CO_2e), down a further 10,117 tonnes CO_2e when compared to 2013.

Two new incinerators began operating at the mine site in October 2012. Testing of the emissions that are produced when the garbage is burned was done over a 10 day period by an external lab. The results indicated that dioxin and furan emissions (chemical side effects of incineration) were higher than expected. An action plan to address operational issues and reduce these emissions was developed in 2014.

Water

Diavik continued to do the Aquatic Effects Monitoring Program (AEMP) in 2014. The AEMP studies different parts of the lake in different years in order to identify possible effects to Lac de Gras from mining activities. The following parts of the lake were monitored in 2014:

- Water chemistry (quality);
- Sediment (lake bottom) chemistry (quality);
- Plankton (tiny plants and animals in the water - amount and type); and,
- Benthic invertebrates (small bugs that live on the lake bottom - amount and type).

Changes to the lake are mostly caused by an increase in nutrients from the groundwater and blasting. Diavik tries to reduce the amount of nutrients that reach Lac de Gras by using blasting controls, careful selection of blasting materials as well as water management and treatment. The Environmental Assessment predicted that approximately 20% of Lac de Gras would be impacted by nutrient enrichment and the multi-year summary report submitted in October 2014 supports this prediction.

Community Engagement

Diavik values opportunities to share updates on environmental monitoring and closure planning progress with community members. Diavik works with each PA organization to try and determine a suitable method and time to carry out such events. Community meetings, open houses and school visits are some of the methods used to achieve this over the years. The following table summarizes planned and completed engagements relating to the environment that Diavik conducted in partnership with the Participation Agreement (PA) organizations during 2014.

Diavik also tries to bring community members to the mine site so that they can see the mine and observe the surrounding environment with their own eyes. While it is impossible to bring everyone to site, the hope is that those who have been involved share their experience with others back home in the community.

Diavik has a Traditional Knowledge (TK) Panel that was transferred from EMAB to Diavik during the summer of 2013. The TK Panel's primary focus is the consideration and incorporation of Traditional Knowledge into mine closure planning. The TK Panel's focus in 2014 was where and how to encourage plant growth at the mine site after closure.

Table A: Planned and Completed Community Engagements Relating to Environment During 2014

Organization	Methods	Dates	Topics
KIA Implementation Committee	Conference Call Conference Call Conference Call	2014-04-04 2014-05-27 2014-08-22	Site Visit Planning, SEMA performance update, liaison role, **Environmental Performance, TK Panel overview, A21**
KIA Board of Directors	Annual Update	Unable to schedule	SEMA update, **Environment Update**, Water Licence Renewal, **ICRP**, A21
Community Kugluktuk	Annual Update	Unable to schedule	SEMA update, **Environment Update**, Water Licence Renewal, **ICRP**, A21
Lutsel K'e - Community	Community Event Annual Update	2014-04-10 Unable to schedule	PA Renewal SEMA update, **Environment Update**, Water Licence Renewal, **ICRP**, A21
LKDFN Chief/Council/L&W Committee	Annual Update	Unable to schedule	SEMA update, **Environment Update**, Water Licence Renewal, **ICRP**, A21
LKDFN Implementation	Conference Call	2014-07-16	Implementation Workplan, Summer Student, Liaison Role
NSMA President	Meeting	2014-08-26	A21
NSMA President & Board	Annual Update	Unable to schedule	SEMA update, **Environment update**, Water Licence Renewal, **ICRP**, A21
TG Kwe Beh Working Group	Meeting Annual Update	2014-09-12 2014-11-13	A21, SEMA SEMA update, **Environmental Performance, TK Panel overview**, Water Licence Renewal, **ICRP**, A21

Organization	Methods	Dates	Topics
TG – Chief Executive Committee	Site Visit / Meeting Site Visit / Meeting	2014-03-11 2014-10-28	SEMA, A21, **Environmental Performance, TK Panel overview**
TG Communities	Annual Update	Unable to schedule	SEMA update, **Environmental Performance, TK Panel overview**, Water Licence Renewal, **ICRP**, A21
Tlicho Investment Corporation	Meeting Site Visit / Meeting	2014-07-08 2014-10-28	SEMA, **Environmental Performance, TK Panel overview**, A21
YKDFN - Implementation	Meeting Meeting Meeting Meeting	2014-05-06 2014-09-09 2014-07-17 2014-10-31	SEMA, **Environmental Performance, TK Panel overview,** Liaison/ Representative Roles
YKDFN Chiefs	Meeting (informal) Meeting Site Visit / WR Tour	2014-02-10 2014-02-19 2014-03-17	SEMA, **Environmental Performance, TK Panel overview**, Winter Road
YKDFN Communities	Career Fair	2014-05-15	HR Job Opportunities, Recruitment

New Technologies & Energy Efficiency

There are four wind turbines that operate at the Diavik mine, and staff continued to increase the efficiency of these turbines throughout the year. The wind turbines offset 4.9 million litres of diesel fuel use, which was a 29% improvement from 2013. The turbines have flashing lights to help deter wildlife and bird mortality from the rotating blades.

Diavik started an energy management strategy in 2013, in an effort to reduce fuel use and emissions. A waste oil burner was installed and approved for use by the GNWT in March 2014; it generates heat for the backfill plant. Some of the other programs include:

- Adjusting underground mine temperature set points to four degrees Celsius from five degrees Celsius;
- Installation of energy efficient engines on the underground haul truck fleet;
- Optimizing the glycol heat recovery system in powerhouse 2, which resulted in reducing boiler plant use; and,
- Completion of energy audits on various buildings around the mine.

Compliance and EMAB

Diavik has a dedicated Inspector that works for the government and visits the mine site to make sure that Diavik continues to meet the terms of the water license and land leases. During 2014, the Inspector visited the mine site 11 times and no environmental risks or concerns were noted by the

Inspector. The environmental management plans that are required under the water license were reviewed and, where necessary, updated. Copies of Diavik's monitoring and management programs, and any related correspondence, can be found on-line in the EMAB library or Wek'èezhìi Land and Water Board public registry.

There were no direct communications or letters expressing concerns from the public about the mine or its operations during 2014. The 2013 Environmental Agreement Annual Report (EAAR) was deemed to be satisfactory by the Deputy Minister of the GNWT, Environment and Natural Resources on 4 September 2013. The letter included a requirement for Diavik to respond to reviewer comments. Diavik's response was submitted on 27 October 2014, and any relevant requests for changes to the 2014 EAAR have been addressed in this report.

The Environmental Monitoring Advisory Board (EMAB) and Diavik exchanged letters relating to topics such as the budget, reviews of various environmental monitoring programs, comments on the EAAR and EMAB workshop development.

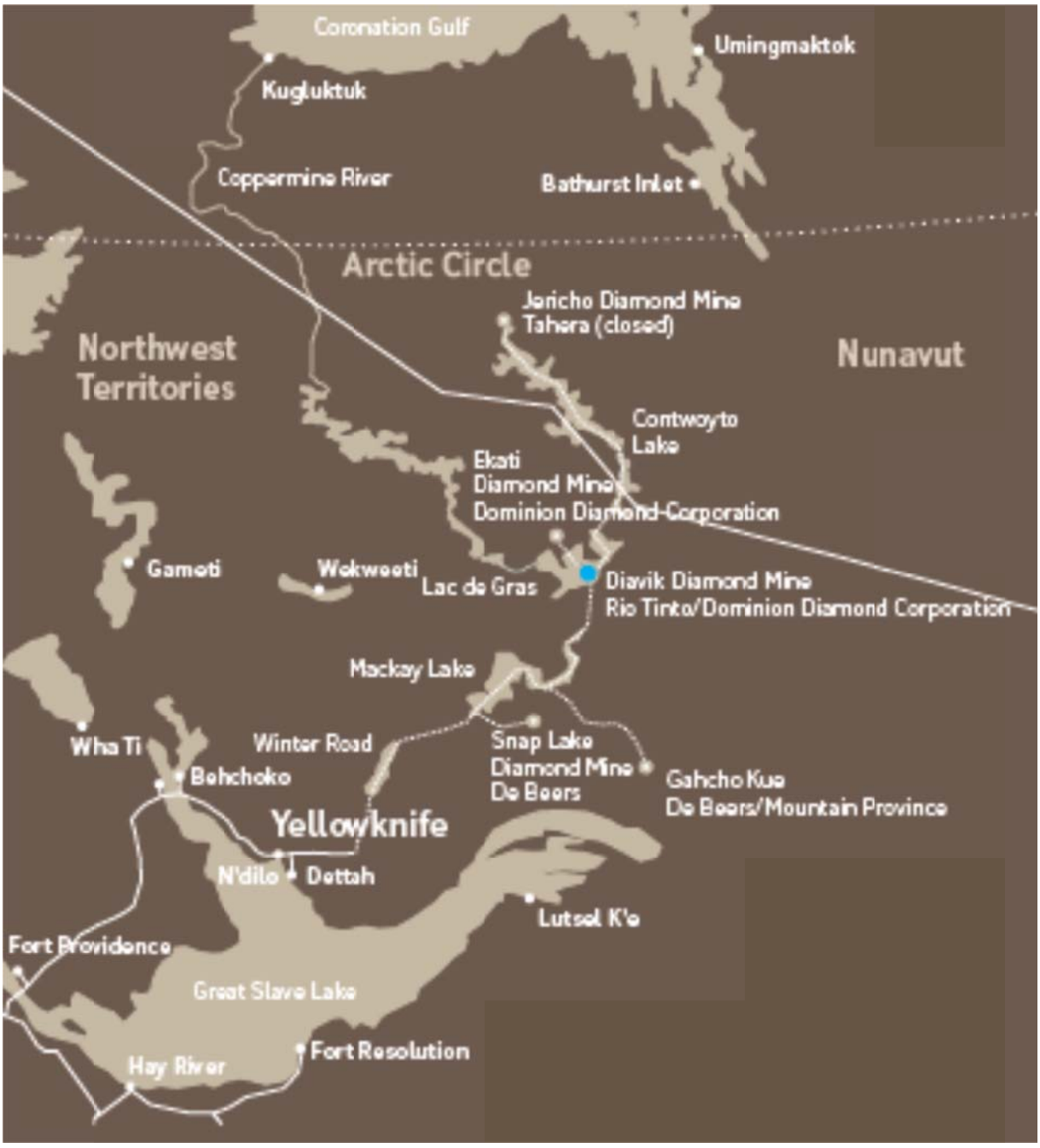
Summary

Diavik is celebrating 12 years of operations and is proud of the many positive accomplishments that have been a part of the development of this mine. Relating to the environment, the biggest successes during 2014 included:

- Successful operation of 4 wind turbines that offset fuel use by 4.9 million litres
- Closure planning recommendations founded in Traditional Knowledge through the direct administration of the TK Panel
- Continued good performance in meeting water license criteria and minimizing our environmental impacts

Thank you/Marsi Cho/Masi Cho/Quana to the Kitikmeot Inuit Association, Tlicho Government, Yellowknives Dene First Nation, Lutsel K'e Dene First Nation and the North Slave Metis Alliance for the efforts of their staff, businesses and individual members who worked with Diavik staff in 2014.

Diavik Diamond Mine Location Map



List of Acronyms (abbreviations found in this report)

AEMP	Aquatic Effects Monitoring Program
ARD	Acid Rock Drainage
AANDC	Aboriginal Affairs and Northern Development Canada
BOD	Biological Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
DDMI	Diavik Diamond Mines Inc.
EA	Environmental Agreement or Environmental Assessment
EAAR	Environmental Agreement Annual Report
EMAB	Environmental Monitoring Advisory Board
EMS	Environmental Management System
ENR	Environment and Natural Resources
GNWT	Government of the Northwest Territories
ISO	International Standards Organization
ICRP	Interim Closure and Reclamation Plan
LDG	Lac de Gras
MVLWB	Mackenzie Valley Land and Water Board
NIWTP	North Inlet Water Treatment Plant
NTU	Nephelometric Turbidity Units (measurement of water turbidity)
PA	Participation Agreement
PK/PKC	Processed Kimberlite/ Processed Kimberlite Containment
PVP	Permanent Vegetation Plot
QA/QC	Quality Assurance/Quality Control
SNP	Surveillance Network Program
SOP	Standard Operating Procedure
TEK/TK/IQ	Traditional Ecological Knowledge/Traditional Knowledge/Inuit Qaujimajatuqangit
TP	Total Phosphorous
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
WLWB	Wek'èezhìi Land and Water Board
WMMP	Wildlife Monitoring and Management Plan
WTA	Waste Transfer Area
ZOI	Zone of Influence

Definitions

Abundance – a count or measurement of the amount of any one thing

Action Level - a level of environmental change which, if measured in an aquatic effects monitoring program, results in a management action well before effects that could be harmful to the lake can happen

Adaptive Management - a systematic way of learning from monitoring results or management actions with the intent to improve operating or management practices

Benthic Invertebrates – small bugs without a backbone that live in the sediments on the bottom of a lake or river; can include flies, worms, clams, etc.

Density – total amount of a given substance within a defined area

Deposition Rate – the speed at which something settles on to a surface, e.g. how slow/fast a piece of dirt falls through water to settle on the bottom of a lake

Distribution – how any one thing may be spread out over an area

Effluent – cleaned/treated water from the sewage or water treatment plant that is discharged from the plant after cleaning

Enrichment – addition of an ingredient that improves quality; if too much is added, it may then start to reduce quality

Environmental Assessment – process to review potential environmental impacts for a project that is being considered for development and decide if the project can be developed

Eutrophication – water bodies like a lake receive a lot of nutrients and then start to grow a lot of plants within the water

Habitat Compensation – replacement of natural habitat lost during construction of the mine; done using man-made features to improve areas of natural habitat

High-level Effects – change noticed between different areas that may start to be higher than an agreed-upon standard

Interim Closure & Reclamation Plan – a document that outlines ways to close a mine, including what needs to be done with water, land and wildlife. 'Interim' means that it is less detailed than a final plan, as there are still questions to answer before the final design or plan can be done.

Low-level Effect – early-warning level where little change is detected

$mg/dm^2/y$ – milligrams per decimeter squared per year, the amount of dust deposited in a given area each year

Mitigation Measures – things that are done to control or prevent a risk or hazard from happening

Moderate Effect – some change noticed between different areas that may start to be higher than an agreed-upon standard

Monitoring – a way to check on performance and compare it against an expected result, e.g. is anything changing

Parameters – chemical and physical signs that can be used to determine water or soil quality

Plume – an area in air, water or soil that is affected from a nearby source, e.g. a plume of smoke around an erupting volcano

Prediction – an educated guess of what will happen in the future, can be based on existing knowledge or experience where possible

Progressive Reclamation – starting to repair certain areas of land damage by mining activity while the rest of the mine is still operating; focus is on areas where mining activities are complete

Research – a structured way to test questions on unknown features of the environment, e.g. reasons why a change may be happening

Risk Assessment – a way to identify possible harmful effects by looking at how harmful the effect could be and how often it could occur. After risks have been identified, management actions are defined.

Sediment Chemistry – the mineral content of dirt particles that sit on the bottom of the lake

Seepage – a release of water or other liquid material that flows through or out of a containment area

Total Suspended Particulates - small particles in the air that measure 100 micrometers in size (which is slightly larger in size than the diameter of a human hair at 75 micrometers)

Trophic Status – a measure of lake productivity based on how many plants are in the lake

Water Quality – an overall characterization of the chemical (nutrients or metals), physical (temperature) and biological (algae) features of water in a lake or river

1. Environmental Agreement Annual Reporting Commitments

Section 12.1 of the EA outlines the content to be reported annually to the Parties, the Government of Nunavut, and the Advisory Board on June 30th (submission date revised from March 31st in 2003), as outlined in Table 1.

Table 1: Summary of EA Commitments in Relation to the 2014 EAAR

EA Commitment	Plain Language Interpretation (from EMAB)
Comprehensive summary of all supporting information, data and results from the Environmental Monitoring Programs and all studies and research	A full summary of all supporting information, data and results from the Environmental Monitoring Programs, plus all studies and research related to these
Rolling summary and analysis of environmental effects data over the life of the Project; compare results to predictions in environmental assessment & CSR, and illustrate any trends	A summary that adds in data of each year and an analysis of environmental effects data over the life of the Project - to show patterns over the years
Comprehensive summary of all compliance reports required by the Regulatory Instruments	A full summary of all reports on how Diavik has followed all rules and regulations in the Regulatory Instruments
Comprehensive summary of operational activities during the preceding year	A full summary of mining activities during the year up to the annual report
Actions taken or planned to address effects or compliance problems	The ways Diavik is fixing any environmental effects or problems following rules and regulations
Comprehensive summary of operational activities for the next year	A full summary of mining activities for the next year
Lists and abstracts of all Environmental Plans and Programs	Lists and summaries of all Environmental Plans and Programs
Verification of accuracy of environmental assessments	A check that environmental assessments are correct
Determination of effectiveness of mitigative measures	A report on how well steps to lessen effects are working
Comprehensive summary of all adaptive management measures taken	A full summary of all adaptive management steps taken
Comprehensive summary of public concerns and responses to public concerns	A full summary of public concerns and responses to public concerns
Comprehensive summary of the new technologies investigated	A full summary of the new technologies Diavik has looked into

EA Commitment	Plain Language Interpretation (from EMAB)
Minister's comments, including any Minister's Report, on the previous Annual Report	The Minister's comments on the Annual Report from the year before, including any Minister's Report
Plain language executive summary and translations into Dogrib, Chipewyan, and Innuinaqtun using appropriate media	Plain English executive summary translated into Dogrib, Chipewyan, and Innuinaqtun

2. Introduction

Diavik and the Environmental Agreement

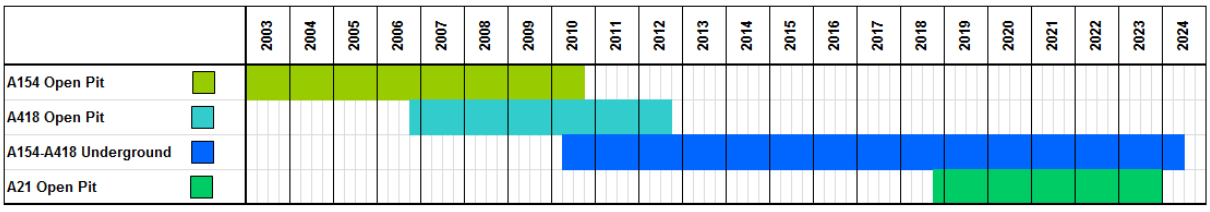
The Diavik diamond mine is located on the East Island of Lac de Gras, in Canada's Northwest Territories, approximately 300 kilometers northeast of the capital city of Yellowknife. The lake is roughly 60 kilometers long and drains into the Coppermine River all the way north to the Arctic Ocean. Diavik Diamond Mines Inc. (DDMI) undertook an Environmental Assessment that started in 1998 through the Canadian Environmental Assessment Agency. The mine has been operating since 2003, and protecting the environment around the mine continues to be important.

Diavik signed an Environmental Agreement ("the Agreement" or EA) with 5 Aboriginal organizations and the federal and territorial governments in 2000. The Agreement says what Diavik is to do to protect the environment while operating and closing the mine.

There was also an Environmental Monitoring Advisory Board (EMAB) formed as part of the Agreement; the Board is a public watchdog of the regulatory process and the implementation of the EA.

The Diavik diamond mine was in its twelfth year of operations during 2014, and operated as an all-underground mine. In October 2014, DDMI determined that construction to support mining of a third kimberlite pipe (A21) would begin in 2015. The figure below shows a timeline of Diavik's mine plan, which shows mining activities planned for the next several years.

Diavik's Planned Schedule of Operations



Notes:

- Corporate decision in Ocober 2014 to go ahead with the planned A21 dike and open pit
- Mining schedule as of July 2014 - subject to change due to market conditions, further mineral resource evaluation, ongoing mine planning updates, etc.

This report summarizes the results of Diavik's environmental monitoring and management programs during 2014. Complete copies of the numerous reports that Diavik submits each year can be found on-line in the EMAB library (http://www.emab.ca/Library.aspx), or Wek'èezhìi Land and Water Board public registry (http://www.mvlwb.ca/Boards/WLWB/SitePages/search.aspx?app=W2007L2-0003).

Figure 1: Diavik Diamond Mine Labelled Site Satellite Photo

3. Environmental Programs and Plans - 2014

Diavik's Environmental Management System (EMS) is designed to meet the internationally-recognized ISO 14001 standard. First certified in 2004, audits (reviews) are done every year by an independent, external organization that checks Diavik's performance against the standard. The EMS and the ISO 14001 standard are based on the idea of continual improvement, and this theme is the foundation for Diavik's environmental objectives, targets, plans, programs and procedures. Diavik passed this review again in 2014 and maintained our EMS certification.

This section contains an outline of the various environmental plans and programs that Diavik follows. For each plan/program, a brief outline is provided that explains why the program is being done and/or how it is completed. Many of these plans and programs are the same from one year to the next. As stated in Diavik's Water License, plans that have not changed do not require updates; those that have been updated and submitted for regulatory approval during 2014 are identified in Table 2. Additionally, Appendix I contains a list of mitigation measures and adaptive management actions that have been implemented during mine operations.

Management & Operations Plans

Management and operations plans are site-specific documents that identify potential environmental issues and outline actions to minimize possible impacts that could result from mining activities. They are to be reviewed by DDMI each year and updated as required (i.e. if something changes). Table 2 lists the management and operations plans required under DDMI's water license, provides a brief summary of the purpose of the plans and identifies which plans were updated for 2014.

Table 2: Management & Operations Plans for the Diavik Mine

Plan & Version Number	Purpose	Updated in 2014 (Y/N)	Updates/ Comments
Ammonia Management Plan, v5	To assist in achieving the lowest practical amount of ammonia from explosives that would enter the mine water and waste water streams. The plan details how ammonia management performance is evaluated, and includes details of ammonia management techniques.	No (2013)	N/A
Waste Rock Management Plan v6	Rock types that surround the kimberlite may have minerals in them that can cause water to become acidic when it runs over the rock, so methods to test, identify, separate and contain the rock are provided in order to reduce the chance of acidic runoff.	No (2011)	N/A

Plan & Version Number	Purpose	Updated in 2014 (Y/N)	Updates/ Comments
Interim Closure & Reclamation Plan v3.2	Outline closure goals (overall vision for what the organization would like to achieve), objectives (steps the organization needs to take to achieve the goals – specific and measureable) and criteria (a standard against which success is measured), and includes engineering designs and research programs for closure of all the major components of the mine. Because it is a plan that evolves over time, it does not yet include final closure designs or details on specific after-closure monitoring programs.	No (2011)	- Annual progress reports are submitted to the WLWB; 2014 Progress Report was submitted on 31 October 2014
Hazardous Materials Management Plan, v18	Describe procedures for the safe and efficient transport, storage, handling and use of chemicals for mining. Prevention, detection, containment, response, and mitigation are the key elements in the management of hazardous materials. The plan also describes how hazardous materials will be removed from site during closure.	Yes	- Electronic MSDS provider & new materials request form - Legislative requirements with devolution - When to consult Inspector for hazardous material
Operational Phase Contingency Plan, v19	Describe response procedures for any accidental release (spill) of hazardous or toxic substances, as well as procedures for water management. The OPCP outlines the responsibilities of key personnel and gives guidelines for minimizing impacts to the environment, including contingencies for the underground mine.	Yes	- Organizational changes - Legislative requirements with devolution
Water Management Plan, v13	Describe how water around the site is moved, treated, monitored and controlled in different areas around the mine site. Also includes a 'water balance', which gives Diavik an idea of the amount and location of water on site at any given time, so that plans can be made for handling and treating water.	Yes	- Departmental responsibilities - A21 information - Water balance - Pond capacities & dam raise plans - Removal of open pit information
Waste Management Plans (includes Incinerator, Hydrocarbon Impacted Materials, Solid Waste & Landfill)	Identify the types of waste generated on site and outline methods for the minimization, collection, storage, transportation and disposal of wastes in a safe, efficient and environmentally compliant manner. Characterizes and segregates waste streams according to their on- and off-site disposal requirements.	Yes	- Incinerator operation requirements - Process for documenting & cleaning up spills

Plan & Version Number	Purpose	Updated in 2014 (Y/N)	Updates/ Comments
Processed Kimberlite Containment Facility Operations Plan, v2.1	Outline how to handle the water and solids within the PKC facility. Includes information on PKC design, dam construction, monitoring and characterization programs for water, ice & solids stored within the PKC. The plan also explains contingency and mitigation measures for the facility.	No (2012)	N/A
North Inlet Water Treatment Plant (NIWTP) Operation Manual, v1	Provide background information about the plant (area layout, design parameters, etc.), operational requirements of the plant (as it relates to water management both on site and within the plant) and plant maintenance requirements.	No (2012)	N/A
STP Facility Operations Plan, v3	A guide for operators of the plant that outlines the design and layout, operating guidelines and requirements, performance monitoring techniques and requirements, contingency planning, preventative maintenance and closure of the plant.	No (2011)	N/A

Monitoring Programs

Monitoring programs are designed to track changes to the environment as a project develops, and are usually linked to predictions from an Environmental Assessment. Monitoring programs required for Diavik are summarized within the water license (W2007L2-0003), Fisheries Authorization or EA.

Aquatic Effects (Lake Water Quality & Fish Health)

The Aquatic Effects Monitoring Program (AEMP) is the primary program specified in the water license for monitoring the aquatic environment of Lac de Gras.

The AEMP is designed to measure short and long-term changes in Lac de Gras, check results against predictions, measure the performance of operations and determine the effectiveness of mitigation (preventive) measures. Every year Diavik collects different types of samples in Lac de Gras. These samples may include lake water (chemistry/quality), sediment (chemistry/quality), benthic invertebrates (type and amount of bugs that live in the sediment on the bottom of the lake) and plankton (type and amount of tiny plants and animals that float in the water).

Sampling efforts focus on sampling stations in Lac de Gras that are located closer to the mine (where effects would first be expected to be measured). There are also sampling stations far away from the mine (where effects would take much longer to measure). Comparing

information from both places allows changes in the lake caused by the mine to be measured over time (temporal) and can be measured near the mine site and further away (spatial).

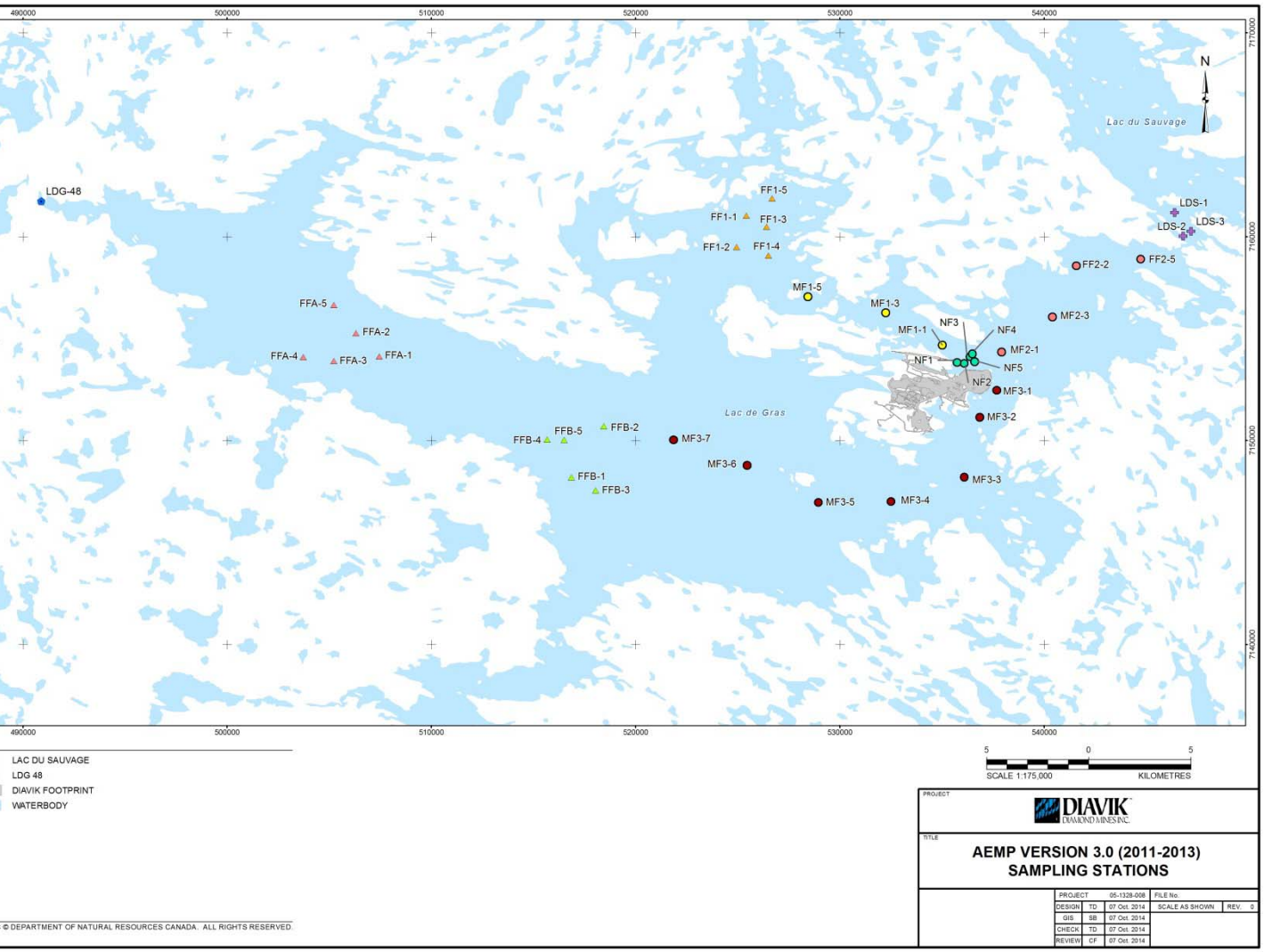
During the Environmental Assessment that was completed before the mine was built, it was predicted that the mine would cause some effects on the lake. Even the best technology cannot completely remove all chemicals from the treated mine water that is put back into the lake, so the purpose of the AEMP is to measure how good the treatment is, see if predictions were correct and make sure the effects don't harm the fish in Lac de Gras. For example, it is expected, and was predicted, that increasing nutrient levels in the lake would affect aquatic organisms because Lac de Gras is historically a nutrient-poor lake (oligotrophic), and plants and animals in the lake are used to surviving with limited nutrients. When growth-encouraging nutrients, such as phosphorus (which is naturally found in the groundwater) and nitrogen (left over from blasting chemicals), are introduced into the lake, it can potentially lead to increased plant growth that reduces the amount of oxygen available to other plants and animals in the water. To reduce such effects, Diavik has strict water management practices and a Water Treatment Plant to treat mine water before it is discharged back into Lac de Gras.

Through an inclusive process administered by the WLWB, the AEMP was updated and revised in 2014. The document, titled "Diavik Diamond Mine Aquatic Effects Monitoring Program Study Design Version 3.5", contains the final 2014 AEMP design specifications and methods (it says what Diavik will do to complete the AEMP and how it will be done).

A change in the classification of effects/action levels was completed in 2013 and described in detail in last year's EAAR. In summary, action levels for possible effects to water quality are determined in advance so that they can be followed right away, should there be an effect that is different or larger than expected. For example, fish health action level 1 would occur if there was a significant difference in a result from the near field area compared to what is normal and the action would simply be to re-sample or re-analyze to confirm the effect. If this moved beyond the near field and was seen at mid-field sample locations, action level 2 would trigger an investigation of the cause. If results continued to show a negative trend in fish health, more advanced actions would be required (i.e. action levels 3 to 5) to determine the significance of any impact to the environment.

There are 37 sample locations (Figure 2) and these may be sampled for different types of samples in different seasons, depending on the year. The types of samples taken and the methods for obtaining samples has remained largely the same, but the frequency with which samples are taken is provided in Table 3. The types of samples that were collected in 2014 included: water quality (e.g. ammonia, metals), sediments near the area where treated water is discharged back in to Lac de Gras, nutrient indicators (e.g. chlorophyll *a*), phytoplankton (tiny plants), zooplankton (tiny animals), trout flesh to test mercury levels and dust deposition and quality.

Locations



PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

AEMP VERSION 3.0 (2011-2013)
SAMPLING STATIONS

PROJECT		05-1328-008	FILE No.	
DESIGN	TD	07 Oct. 2014	SCALE AS SHOWN	REV. 0
GIS	SB	07 Oct. 2014		
CHECK	TD	07 Oct. 2014		
REVIEW	CF	07 Oct. 2014		

Table 3: AEMP Sampling Schedule

Component (a)	AEMP Version 3.5							
	2014		2015		2016		2017	
	IC	OW	IC	OW	IC	OW	IC	OW
Water Quality - Mixing Zone Boundary (b)	√	√	√	√	√	√	√	√
Sediment Quality – Mixing Zone Boundary		√		√		√		√
Effluent Plume (conductivity)	√	√	√	√	√	√	√	√
Water Quality - Routine, Nitrogens and Metals	√	√	√	√	√	√	√	√
Total Phosphorus, Total Nitrogen, Chlorophyll *a* (c)	√	√	√	√	√	√	√	√
Phytoplankton		√		√		√		√
Zooplankton		√		√		√		√
Sediment Quality						√		
Benthic Invertebrates						√		
Large Bodied Fish - Palatability and Tissue Chemistry/TEK Program				√				
Large Bodied Fish - Fish Tissue Mercury		√						√ (h)
Large Bodied Fish - Fish Health						(d)		
Small Bodied Fish - Fish Health						√		
Dust Deposition	√	√	√	√	√	√	√	√
Annual AEMP Report (e)	√		√		√		√	
AEMP Three-year Summary Report (f)		√						√
AEMP Updated Design Document (g)								√

IC = ice cover period; OW = open water period

√ - indicates a year where more sample sites are tested (i.e. comprehensive program)

a – specific information on sample locations and frequency descriptions is in Table 5.7-1 in AEMP Annual report

b – water quality sampling at the mixing zone boundary (SNP 1645-19) is conducted monthly

c - sampling for chlorophyll *a* is not conducted under ice

d – sampling to be conducted only if triggered by results from 2013 small-bodied fish survey

e – annual reports will be submitted by 31 March of the following year

f – three-year summary reports will be submitted by 15 October of the following year

g – study design documents will be submitted by 15 October of the last year covered by the present version of the program

h – sampling of mercury in lake trout will continue if previous results from large or small fish surveys show an increasing trend in mercury levels due to the mine

Air Quality (Dustfall & Emissions)

Air, wildlife and water quality concerns related to dust in the air, on the ground or in the water from mining activities were identified by all parties to the Diavik Diamond Mine EA as a concern. As part of the environmental monitoring program and commitments outlined in the Environmental Effects Assessment report and Comprehensive Study Report, Diavik has developed a program to measure dust deposition resulting from mining activities that has been ongoing since 2001. The program goal is to understand dust deposition rates caused by project activities, and the program provides data to support the Wildlife Effects and Aquatic Effects monitoring programs. The objectives of annual monitoring for dust deposition are to:

- Measure dust deposition rates at various distances from the mine, using snow core samples and dust gauges; and,
- Determine physical and chemical characteristics of dust that may be deposited from mining activities.

The sampling stations for the Dust Deposition Monitoring Program (Figure 3) were established through a transect approach (series of sample locations that extend outwards on ice and land in five generally straight lines from the mine site) and include:

- 12 permanent dustfall gauges - fixed-location sampling devices that collect dustfall for analysis all year long; and,
- 24 seasonal snow survey stations - GPS locations where Diavik collects snow samples to measure the amount of dustfall deposited over the winter (24 samples) and the water quality of the snow where dust was deposited on the lake (16 samples).

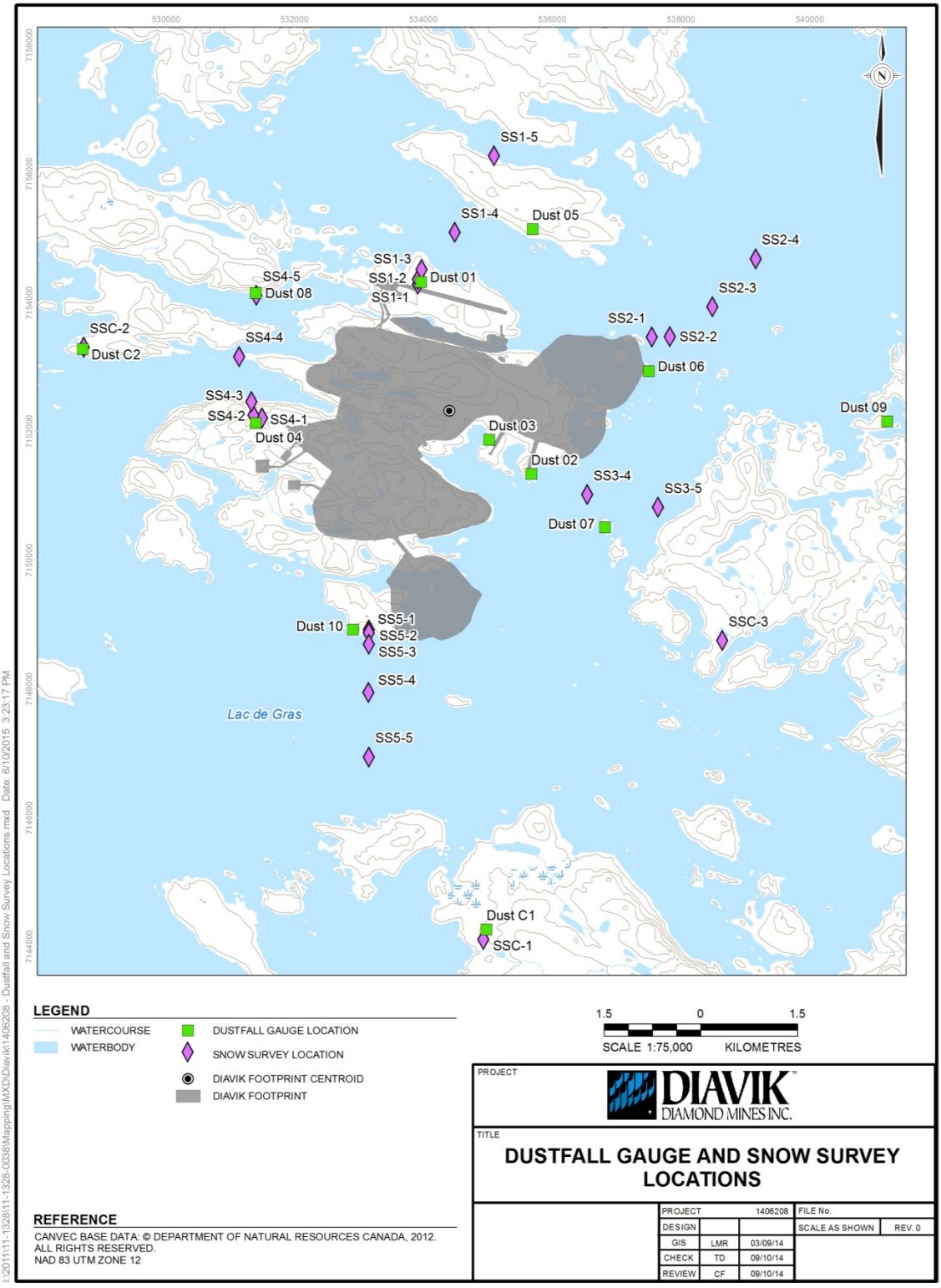
They are sampled each year and results have been compared with the British Columbia (BC) dustfall objective for the mining, smelting, and related industries. This objective is used by some mines in the Northwest Territories (NWT) for comparison purposes only, as there are no standards or objectives for the NWT. An annual report is submitted in March as an appendix to the AEMP report.

The goal of the Air Quality Monitoring Program is to assist in identifying trends in dust deposition beyond the disturbed area of the mine and includes:

- Updated dispersion model for life-of-mine emissions predictions based on current operating plans;
- Installation and operation of 2 continuous ambient air sampling stations for Total Suspended Particulates (TSP – small particles in the air that measure 100 micrometers in size, which is slightly larger in size than the diameter of a human hair at 75 micrometers).

The monitoring of TSP concentrations is continuous, and hourly concentrations are recorded.

Figure 3: Air Quality Sample Locations – Dust and Snow Surveys



Surveillance Network Program (Water Quality at the Mine Site)

Diavik monitors water quality around the mine site in accordance with the Surveillance Network Program (SNP), which is a component of Diavik's water license. The SNP outlines where Diavik collects water samples, how often samples are collected, and what parameters (metals, nutrients and other water quality characteristics) are to be measured. The SNP includes sample stations for:

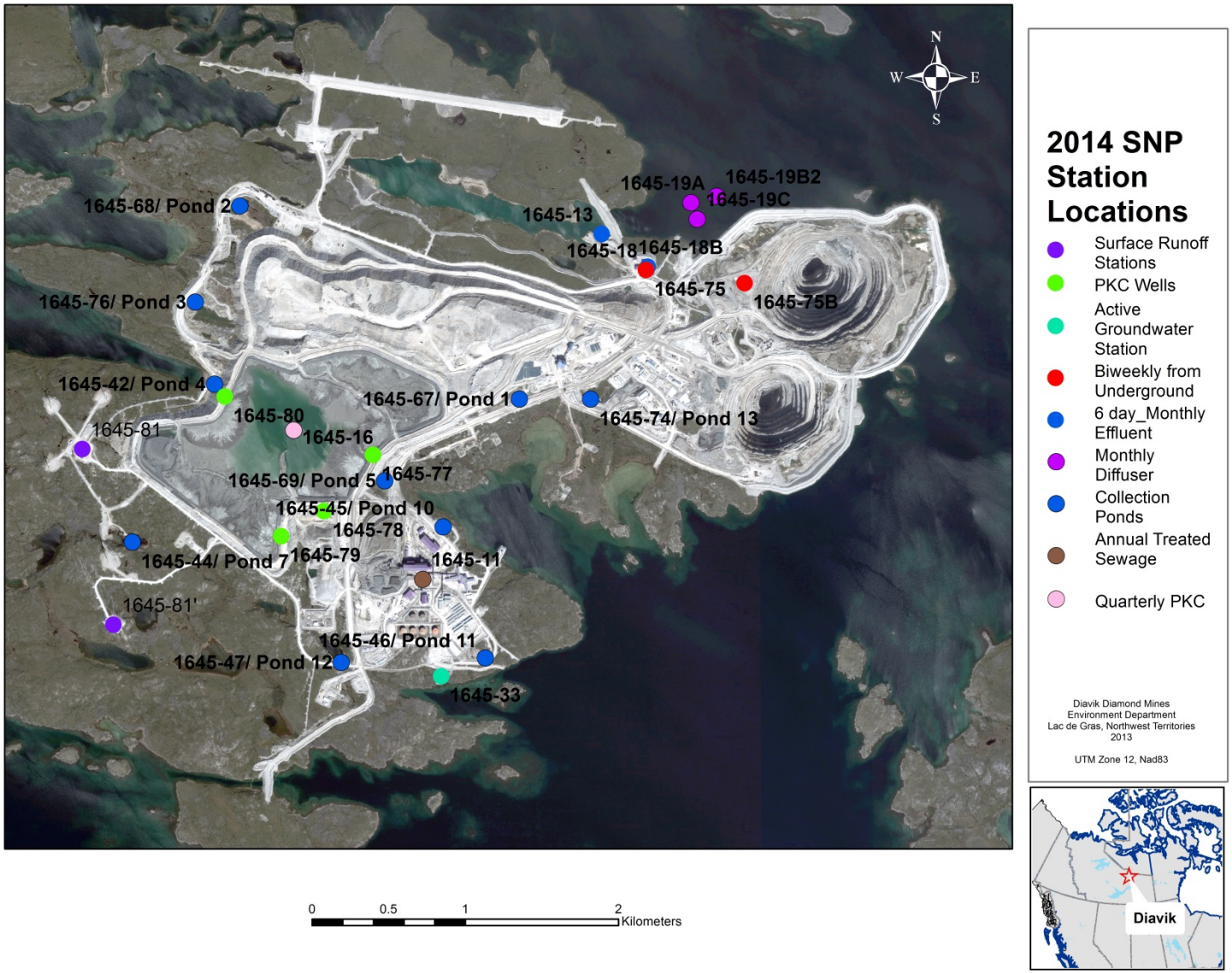
- North Inlet Water Treatment Plant (NIWTP) influent and effluent;
- Lac de Gras water near the NIWTP effluent discharge;
- Pit Water;
- Underground Water;
- PKC Water;
- North Inlet Water;
- Collection Ponds;
- Seepage and Groundwater Stations; and
- Sewage Treatment Plant effluent.

The SNP also outlines sampling requirements for discharges to Lac de Gras during dewatering activities, but no dewatering activities (e.g. dike construction) occurred in 2014. Each month Diavik submits an SNP report to the WLWB outlining the previous month's SNP results. SNP data for the year is also compiled and presented in the Type 'A' Water License Annual Report.

Diavik monitors dams and dikes around the mine site for seepage. The dikes and dams are designed to hold back water; however, some seepage through these structures is expected. The purpose of the survey is to check areas of potential seepage so that Diavik can take appropriate measures to address seepage issues. The monitoring includes regular inspections of the dam and dike structures and collection of water samples. Water samples are collected as part of regular monitoring, and when a new seepage is observed. Typically, seepage occurs from May through to the beginning of October. The PKC contains enough water that it does not completely freeze in the winter, and therefore seepage can occur all year round. Each year, Diavik submits a Seepage Survey Report to the WLWB in March, detailing seepage monitoring and sampling from the previous year. Diavik regularly updates the Lands Inspector of how Diavik is (or plans to) address seepage issues at the mine site.

Diavik has a drainage control and collection system to intercept seepage before it enters Lac de Gras; these are called collection ponds (Figure 4), and they are monitored as part of the seepage survey. There are some times where runoff from other areas of the mine may not go into a pond and will enter Lac de Gras, but it is usually a small amount of water for a short period of time.

Figure 4: Mine Water Quality (SNP) Sample Locations



Wildlife & Plant Monitoring

As per the EA, Diavik developed a Wildlife Monitoring Program to check the accuracy of predictions in the Environmental Assessment and to assess the effectiveness of actions that have been taken to reduce impacts to wildlife. This program was developed based on information from four years (1995 – 1998) of wildlife baseline studies, community consultation, recommendations developed during the Environmental Assessment, and years of project activity monitoring. This program takes into consideration wildlife and wildlife habitat-based technical issues raised by the Environmental Monitoring Advisory Board (EMAB) and Environment and Natural Resources (ENR) during early reviews of this program. The program is now referred to as the Wildlife Monitoring and Management Plan (WMMP).

The WMMP is a method for observing, mitigating and improving procedures for wildlife and habitat management at the mine site. The WMMP is therefore closely linked with Diavik policies and guidelines, management plans and standard operating procedures (SOPs). There are several SOPs to protect wildlife and these are evaluated as part of the WMMP.

The program includes monitoring the following:

- Vegetation/Wildlife Habitat;
- Caribou;
- Caribou Advisory;
- Caribou Mitigation Effectiveness;
- Grizzly Bear;
- Wolverine;
- Waste Management;
- Raptors; and
- Waterfowl.

The Wildlife Monitoring and Management Plan is adaptive. It can be reviewed in response to changes or unexpected outcomes that are identified from monitoring or from new information. An annual report is submitted in March, and a more detailed statistical review of the data, the Analysis of Environmental Effects for Wildlife, is conducted every three years and was last completed in September 2014.

4. Results: Summary of Rolling Effects & Monitoring Program Changes

This section gives a summary of monitoring information and changes that have occurred to each program over time. Many of the changes have been made in response to data collected, observed deficiencies in study designs or based on feedback from various stakeholders. The Environmental Assessment included predicted indicators that would either stay the same over time or would change over time to pre-calculated predicted levels. The predictions for each indicator have been included in this section, followed by a summary of the information collected to verify those predictions over the years. Graphs and figures or tables are given where practical to show the trends over time. Where indicator trends are not similar to those predicted, DDMI has included a brief discussion of possible reasons. Further details can be found in the full reports that Diavik produces for each topic.

Water and Fish

At Diavik, water quality and fish health are monitored through the AEMP, discussed in detail in Section 3 of this report. The discussions below regarding fish and water come from the results of the AEMP.

What effect will the mine development have on water quality?

EA Predictions:

- Water will remain at a high quality for use as drinking water and by aquatic life (i.e. meet CCME thresholds);
- Localized zones of reduced quality during dike construction;
- Nutrient enrichment is likely from the mine water discharge (and may change the trophic status of up to 20% of Lac de Gras);
- Post-closure runoff expected to influence quality of two inland lakes.

2014 Observations:

Annual AEMP reports are usually completed and submitted for review by the WLWB by 31 March of the following year (e.g. the 2014 report would be submitted on 31 March 2015). The 3-year (2011-2013) Summary Report of the AEMP was submitted to the WLWB in October 2014 and DDMI received a directive to produce further information (reference data for Lac de Gras) and then re-submit the 3-year Summary Report after approval of this information by the Board. In this same directive, they noted that it would be necessary to postpone submission of the 2014 Annual AEMP Report. The date that the report will be submitted has yet to be determined.

3-year Summary Report Observations:

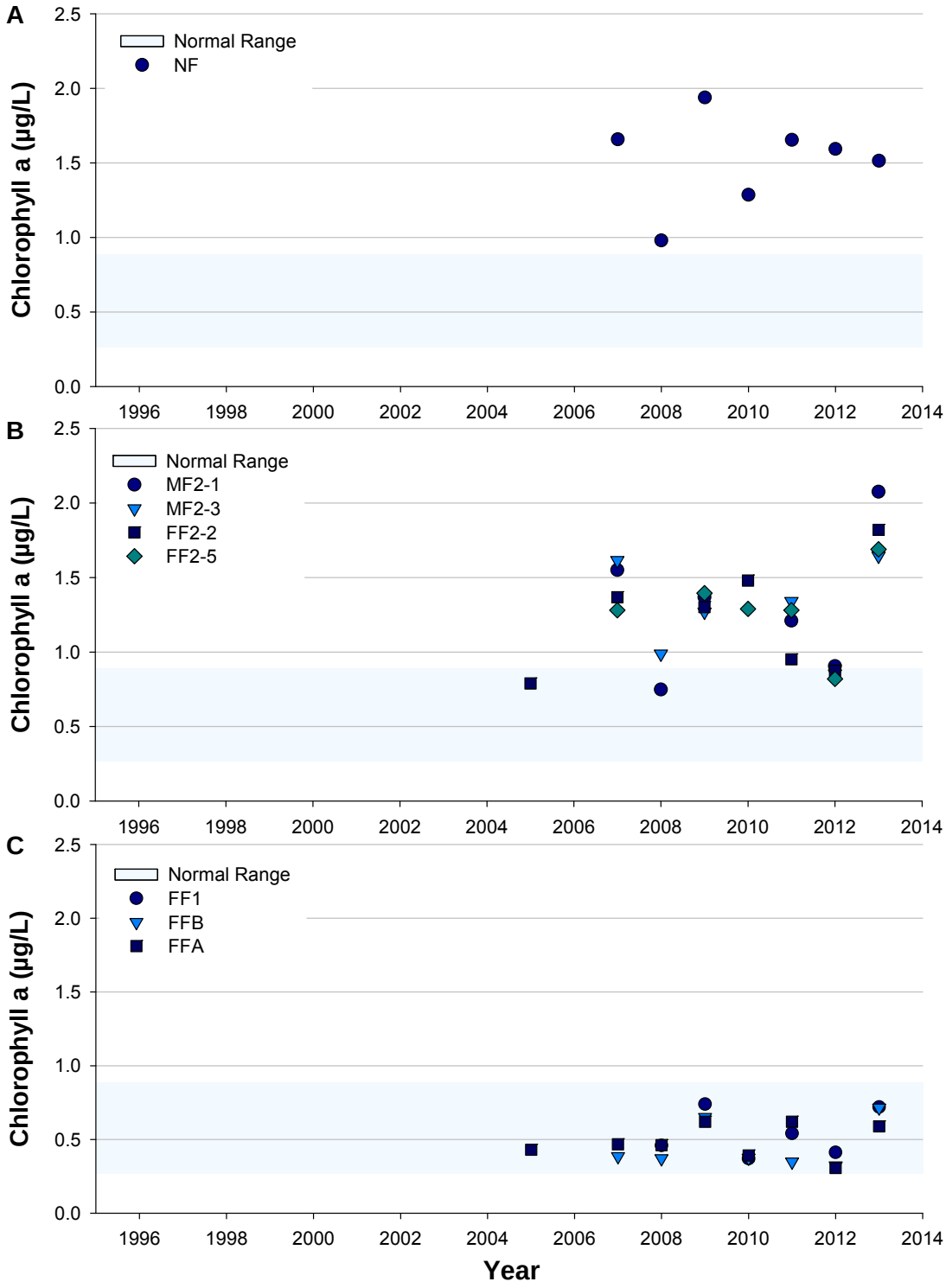
Below is a summary of findings for each of the monitoring activities included in the Aquatic Effects Monitoring Program, and it focuses on results from 2011 to 2013. This report was submitted to the WLWB in October 2014 but has not yet been approved by the Board.

- The treated water that is discharged back into Lac de Gras has shown changes in quality over the years. For example, salts such as calcium and chloride have decreased since

2010. Some metals have increased over time (molybdenum, strontium), however most have decreased (aluminum, barium, manganese) or stayed the same (chromium, uranium, antimony). The tested mine effluent has continued to meet water license criteria. Additionally, most of the effluent tested over the years has been non-toxic, with over 500 toxicity tests conducted since 2002.

- A total of 23 different chemicals had levels that were greater near the mine versus further away. Nine chemicals had higher levels than what is considered normal for Lac de Gras, but this does not necessarily mean that it is harmful. None of the chemicals tested exceeded what are called benchmark values, which are a better measure of when a chemical may be harmful to aquatic life. With the exception of chromium in 2004 and 2006, water quality has remained below the guidelines for protection of aquatic life throughout the life of the mine.
- Increased productivity (eutrophication) was a predicted effect for Lac de Gras because groundwater and treated mine water would introduce more nutrients into the lake. This is why monitoring of nutrients (phosphorous and nitrogen) and algae growth (determined by measuring chlorophyll *a*) is important to measure over time. Concentrations of nitrogen and have been higher than the normal range in over 20% of the lake since 2008 and chlorophyll *a* had the same result in 2009 and 2013. Phosphorus was predicted not to go over 5 micrograms per litre in more than 20% of Lac de Gras; this has only happened twice during ice cover (2008 and 2013), and never during open water.

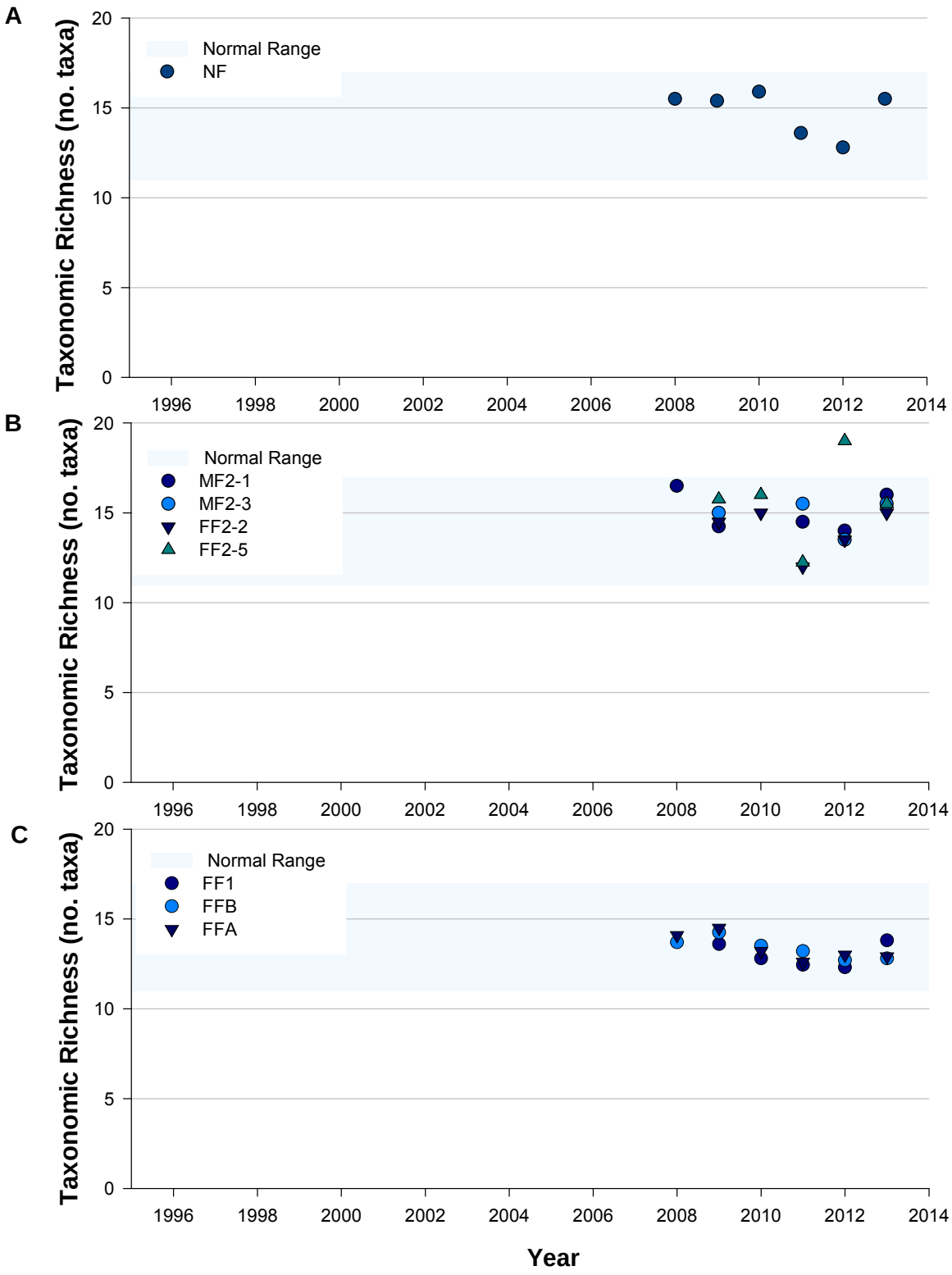
Figure 5 **Chlorophyll a Concentrations in the A) Near-field (NF) Area; at Sampling Stations along the B) MF2-FF2 Transect; and in the C) Three Far-field (FF) Reference Areas during the Open-water Season**



Notes: NF, FF1, FFB, and FFA data points represent the mean of the area; The MF2, FF2 data points represent the station values; Blue shaded area represents the mean of reference area (FF1, FFB, FFA) data ± 2 standard deviations (pooled from 2007 to 2010).
µg/L = micrograms per litre

- Plankton (small plants and animals that live in the water column) are monitored because they are part of the food chain and changes in their population may be seen before any impacts are noted in fish. The amount of plankton (biomass) has consistently been higher closer to the mine versus further from the mine. Monitoring has shown that the mine is not having a harmful/toxicological effect on plankton. Changes to the type of plankton are being seen throughout Lac de Gras, suggesting that a natural change is also occurring.

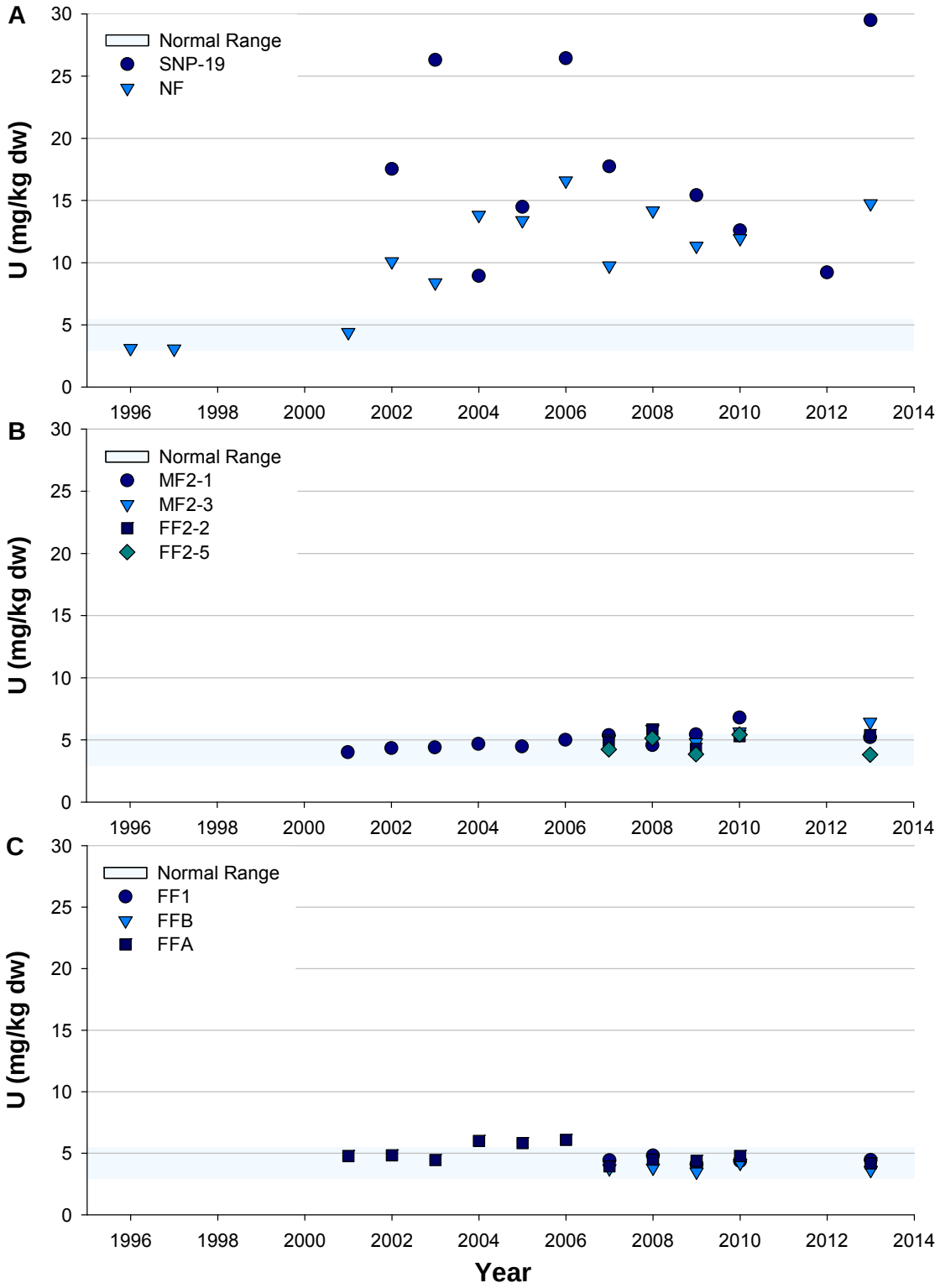
Figure 6 **Zooplankton Taxonomic Richness in the A) Near-field (NF) Sampling Area; at Stations along the B) MF2 and FF2 transect; and in the C) Three Far-field (FF) Reference Areas.**



Notes: no. taxa = number of taxa;
Blue shaded area represents the 2008 to 2010 pooled reference area (FF1, FFB, FFA) mean ± 2 standard deviations.

- Sediment samples are analyzed to find out the amount of 15 different metals that may be deposited onto the lake bottom. To date, the amount of metals present has stayed below the guideline that protects animals living in the lake bottom sediments. Concentrations of bismuth, lead and uranium increased from around 2002 to 2008, and it is thought that the construction of the dikes contributed to this increase. The amount of these metals in sediments has remained the same since 2008 and have not exceeded Soil Quality Guidelines.

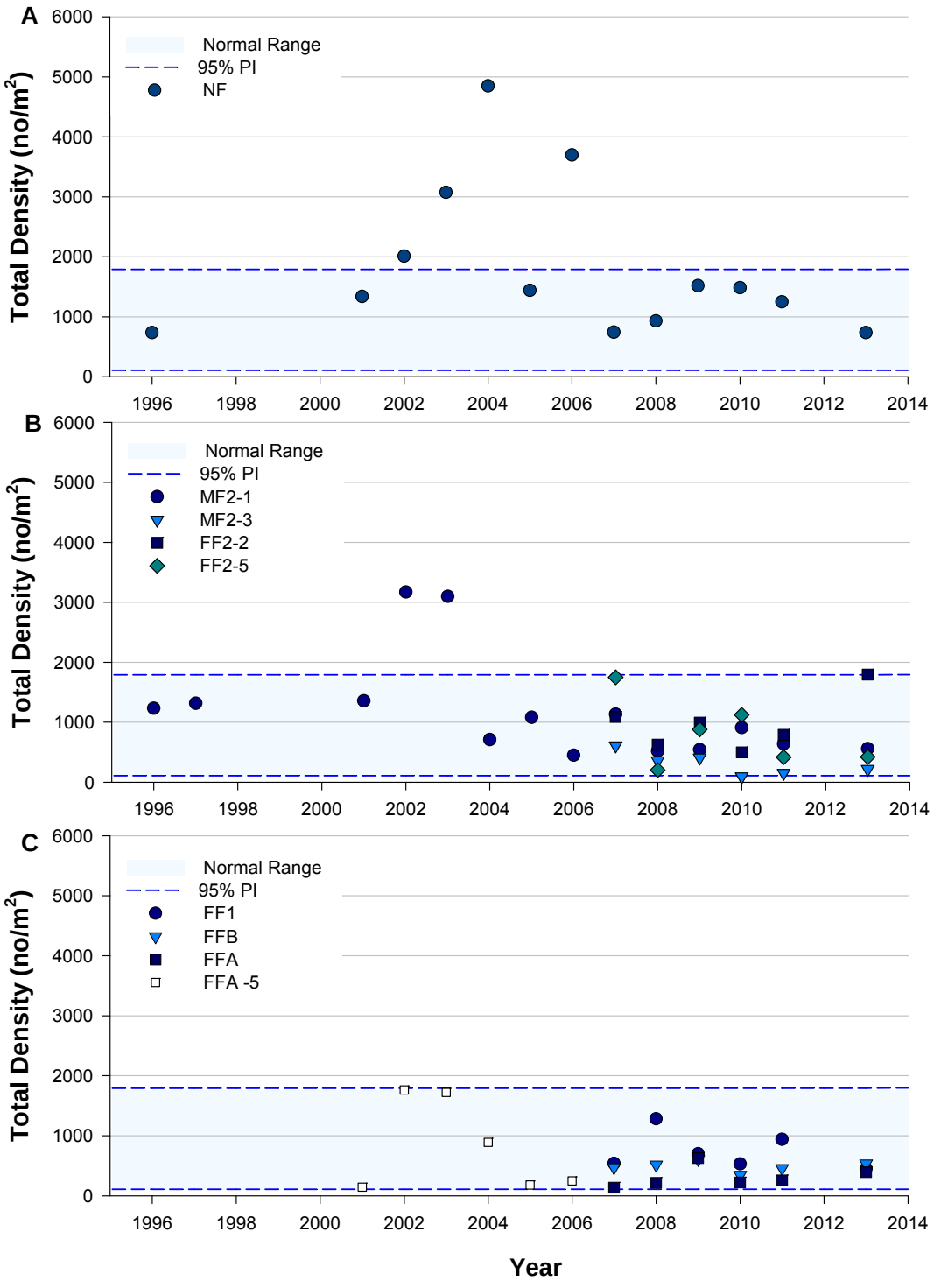
Figure 7 **Mean Concentration of Uranium (U) at A) the Mixing Zone (SNP-19) and Near-field (NF) Sampling Areas; B) Sampling Stations along the MF2-FF2 Transect; and C) at the Three Far-field (FF) Reference Areas**



Notes: mg/kg dw = milligrams per kilogram dry weight;
Blue shaded area represents mean of reference area (FF1, FFB, FFA) data ± 2 standard deviations.
MF2-FF2 area values represent individual station concentrations.

- Benthic invertebrates (bugs that live in the sediment on the bottom of the lake) are studied because they are food for fish. Since 2008, the number of bugs close to the mine has been higher than areas further from the mine, but they are within the normal range for the lake. The types of these bugs have changed over the years, but similar to the findings with plankton, a change over time has also been seen in the reference areas and suggests that natural changes occur over time.

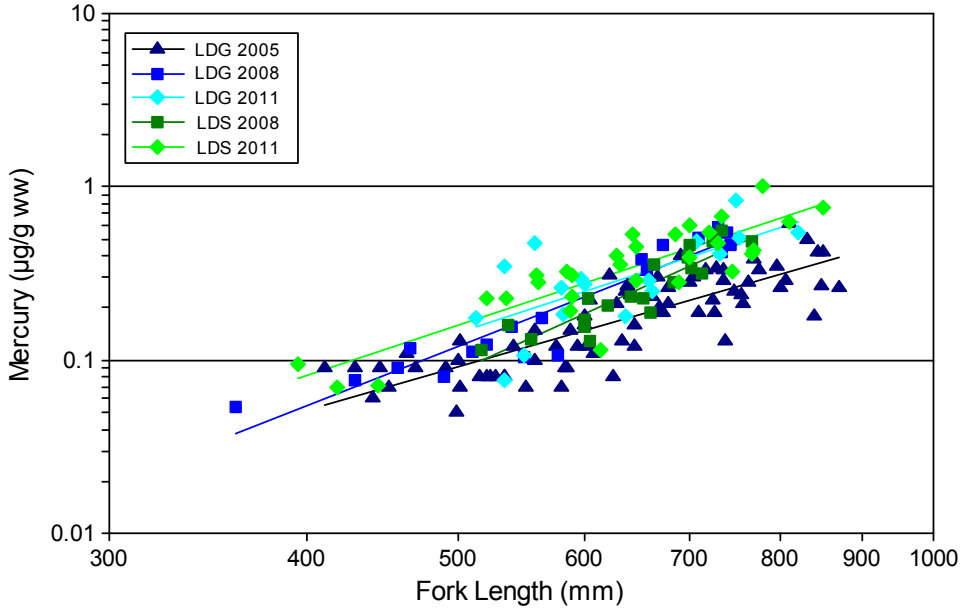
Figure 8 **Mean Total Invertebrate Density over Time at A) the Near-field (NF) Area, B) Midfield Stations along the MF2-FF2 Transect, and C) at the three Far-field Reference Areas**



Notes: no./m^2 = number per square metre;
Blue shaded area represents mean of reference area (FF1, FFB, FFA) data ± 2 standard deviations based on 2007 to 2010 data;
Blue dashed line represents the 95% prediction interval based on the same data.
For density variables, the data used to calculate the normal range were Log+1 transformed and then back transformed before plotting.

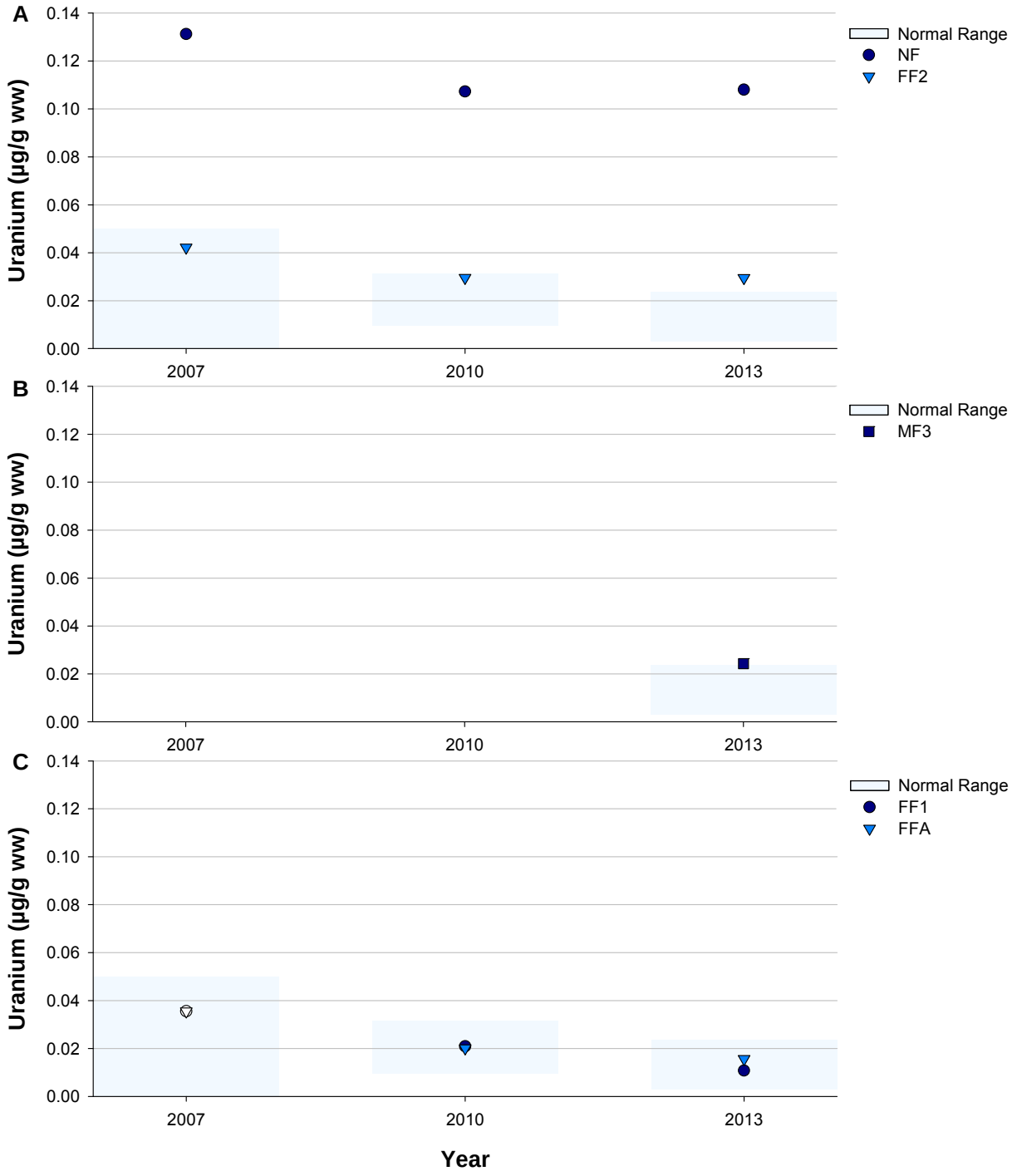
- Small (slimy sculpin) and large (lake trout) fish have been sampled from Lac de Gras. Small fish are good to sample because they tend to live in one area. Large fish are good to sample because they are the top of the food chain and of value to community members. Results from small fish samples have consistently showed increased levels of lead, strontium and uranium even though water quality levels for these chemicals are not of concern. Outside of this, there have been no consistent trends in differences between small fish close to the mine when compared to those further from the mine. Lake trout flesh samples have shown an increase in mercury concentrations, but this has also been observed in fish from Lac du Sauvage, and other areas in the north.

Figure 9 **Linear Regressions of Mercury Concentrations over Fork Length for Lake Trout Collected from Lac de Gras and Lac du Sauvage, 2005 to 2011**



Notes: µg/g = micrograms per gram; mm = millimetre; LDG = Lac de Gras; LDS = Lac du Sauvage. Axes are on a logarithmic scale.

Figure 4 **Mean Concentrations of Uranium in Composite Samples of Slimy Sculpin Collected from A) the Exposure Sampling Areas; B) the Mid-field Sampling Area; and C) the Reference Sampling Areas of Lac de Gras, 2007-2013**

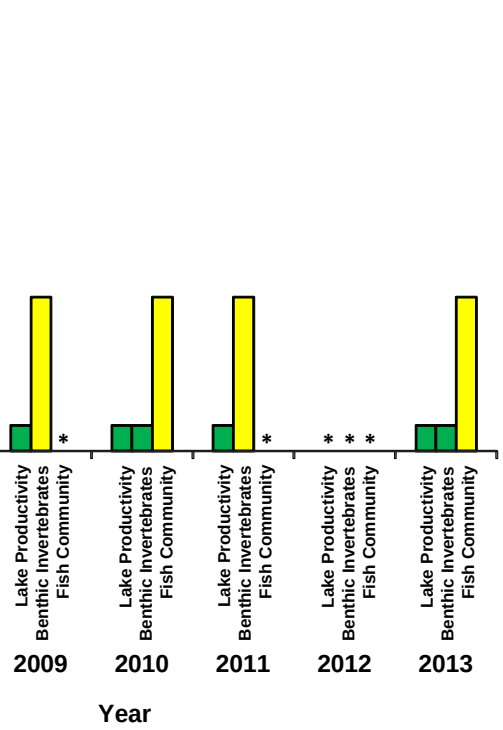


Notes: µg/g ww = micrograms per gram wet weight; NF = near-field; MF = mid-field; FF = far-field.

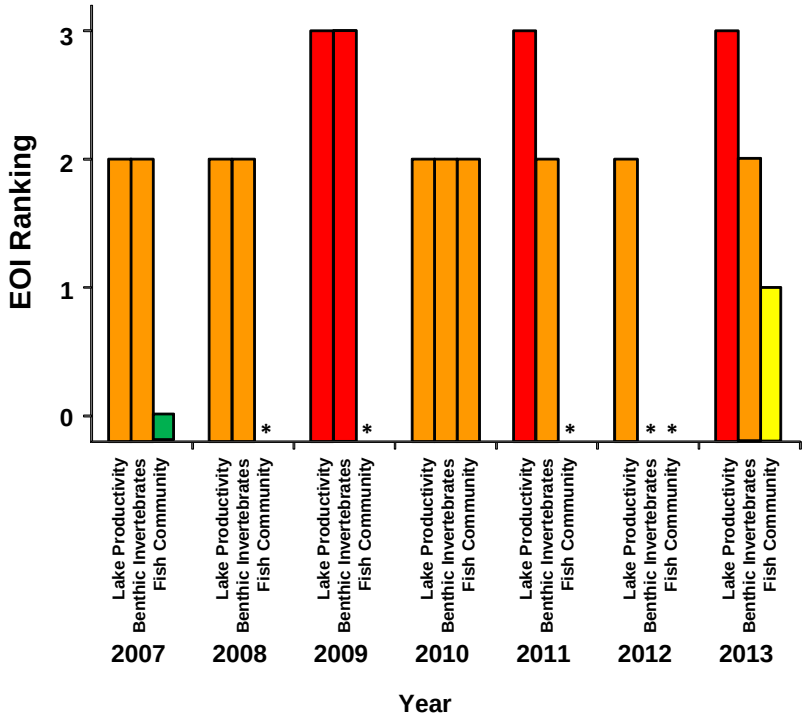
- A weight-of-evidence uses all of the above information in a qualitative process where professional scientists assess the strength of all the results in determining possible nutrient enrichment or harmful/toxicological impacts from the mine. There was strong evidence for nutrient enrichment and weak evidence for toxicological damage from 2011 to 2013.

2007 to 2013 Evidence of Impact Rankings

ment



(b) Nutrient Enrichment



ed

act

2013 Observations:

Revisions to the Aquatic Effects Monitoring Program resulted in 2013 being the year where the majority of sampling requirements for the program are conducted; this runs on a 3-year cycle (refer to Table 4). A summary of the results from the sampling conducted during 2013 is outlined below. Overall, the program determined that nutrients (nitrogen and phosphorus) released into Lac de Gras from the treated mine water discharge continue to increase in Lac de Gras, near the East Island.

- Mine effluent had an effect on 15 water quality variables (conductivity, total dissolved solids, dissolved calcium, chloride, dissolved sodium, sulphate, ammonia, nitrate, aluminum, barium, chromium, molybdenum, silicon, strontium, and uranium). The data showed a trend where the amount of chemical in each sample was highest close to the mine and lowered with increasing distance from the mine. Each of the 15 variables reached Action Level 2, which means that an Effects Benchmark is to be determined. To be cautious, variables that reached Action Level 2 and had an existing Effects Benchmark (AEMP v3.3) were also tested to see if they met Action Level 3 criteria; none of those variables met the criteria.

Table 5: Effects Benchmarks Already Established for Select Water Quality Variables (AEMP v3.3)

Variable	Units	Effects Benchmarks[(a)]	
		Protection of Aquatic Life	Drinking Water
Total dissolved solids	mg/L	50	500
Chloride	mg/L	12	250
Sodium	mg/L	-	200
Sulphate	mg/L	100	500
Ammonia (as nitrogen)	µg/L	3	-
Nitrate as nitrogen	µg/L	300	10000
Aluminum (total)	µg/L	-	100/200
Barium	µg/L	1000	1000
Chromium	µg/L	1 (Cr VI)	50
Molybdenum	µg/L	7	-
Strontium	µg/L	30000	-
Uranium	µg/L	1	20

a = Unless noted, benchmarks are derived from current CWQGs and Canadian Drinking Water Quality Guidelines; the Effects Benchmark shall be the lower of the two values.

- Results relating to eutrophication indicators (chemicals and small plants that show early signs of increasing nutrients) suggest that the mine is causing an increase in nutrients in Lac de Gras as there were greater concentrations of some nutrients and small plants closer to the mine versus further from the mine.

Figure 11a: Chlorophyll a in LDG, 2013

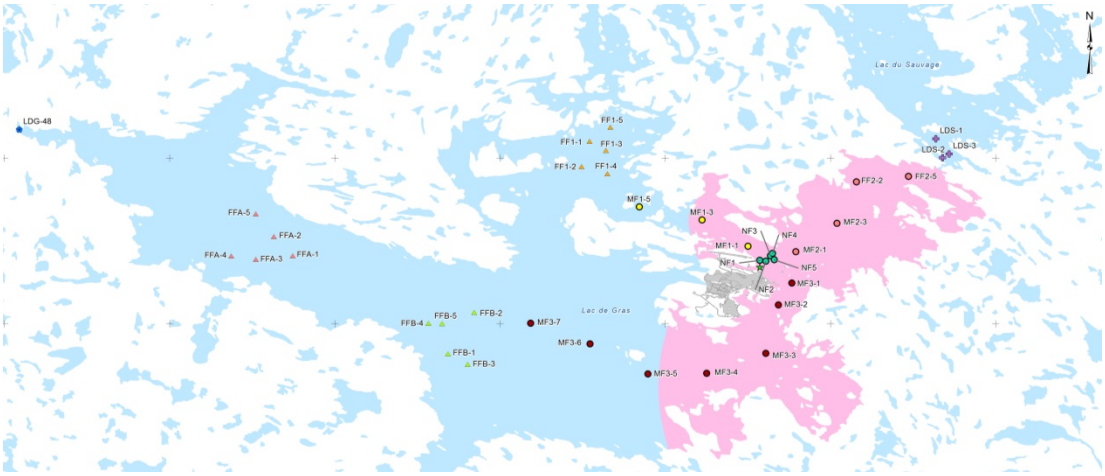
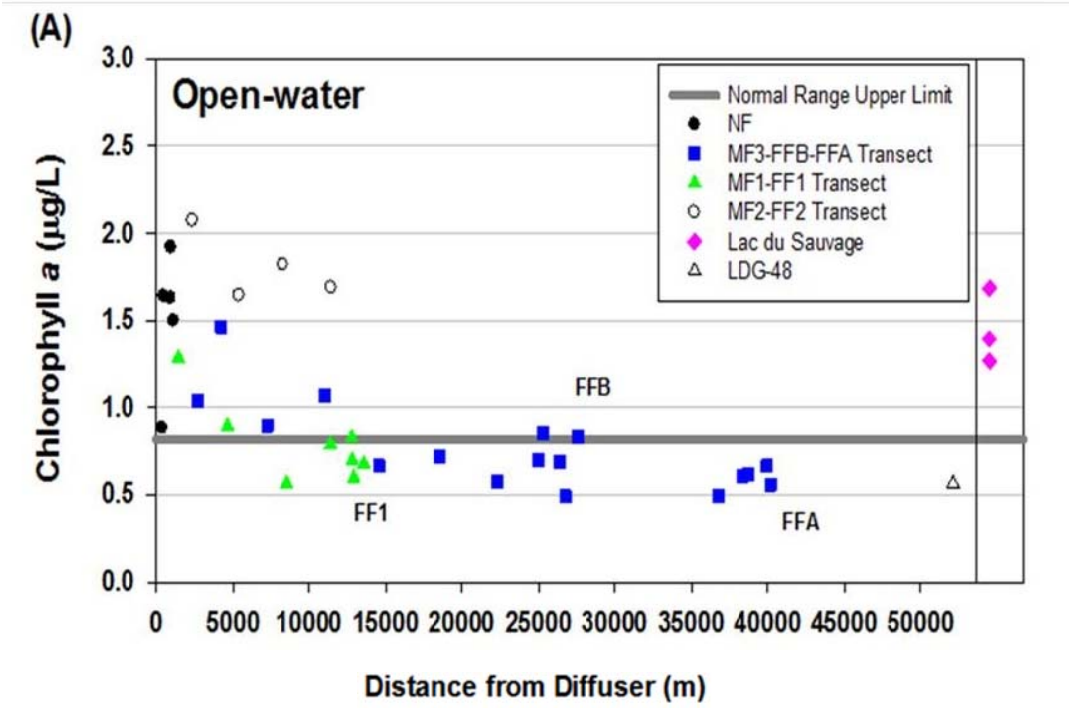


Figure 11b: Total Phosphorous in LDG, 2013

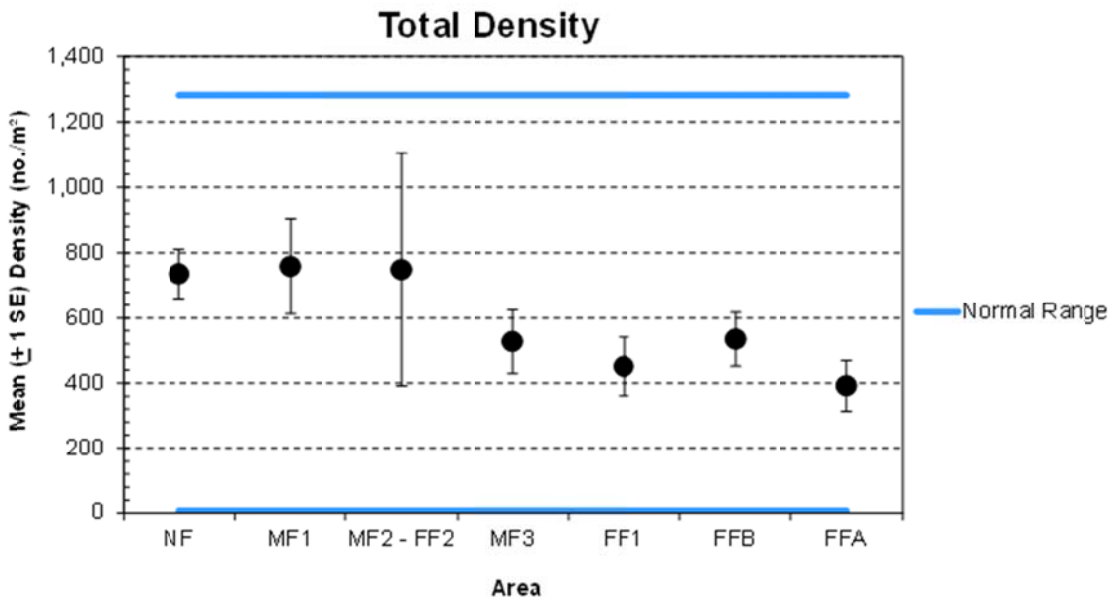
For example, algae (chlorophyll *a*) concentrations were higher than the normal range for Lac de Gras, and the higher amount of algae was found in over 20% of the lake. For this reason, the magnitude of the eutrophication effect is Action Level 2 (requiring an Effects Benchmark to be set) of the Response Framework. The approved AEMP (v3.3) has established an Effects Benchmark for chlorophyll *a* at a concentration of 4.5 µg/L; current results are below this value (Figure 11).

Figure 12: Chlorophyll a Concentrations in Lac de Gras According to Distance from the Treated Water Discharge during the Open-water Period, 2013



- The 2013 monitoring results for plankton communities (tiny plants and animals) in Lac de Gras suggest that there is a mine-related increase in nutrients because there was a difference in the amount and type of them in the exposure area (close to the mine) when compared to the reference areas (further from the mine). There was however no evidence of toxicological damage, so no Action Level (e.g. 1) has been reached.
- Effects of the mine discharge on bottom sediments (mud at the bottom of the lake) in the exposure area of Lac De Gras were evident for 13 metals (aluminum, bismuth, boron, calcium, chromium, lead, lithium, magnesium, potassium, sodium, tin, titanium, and uranium), as areas near the mine had higher average amounts than those further from the mine. Of these 13 metals, three had average amounts that were higher than what would normally be found in the lake. When comparing these results to sediment quality guidelines, it is unlikely that the amounts found in Lac de Gras sediments would be harmful to fish and plants.
- Differences in the total amount of benthic invertebrates (small bugs that live on the lake bottom) were noted between the exposure area (close to the mine) and reference areas (further from the mine). This suggests an increase in nutrients, rather than a harmful effect, so no Action Level was reached. Benthic invertebrates are measured by density, which means counting the number of animals in a given area (Figure 13).

Figure 13: Total Amount of Benthic Invertebrates at Sampling Areas in Lac de Gras, 2013



- The Weight of Evidence assessment is meant to rank impacts to Lac de Gras using the data collected by the AEMP, as summarized in the bullet points above and in the Fish section below. Impacts from different parts of the program (e.g. Fish Health) are rated as being: negligible/none (score of 0), low (1), moderate (2) or strong (3). They are also categorized as either 'toxicological' (harmful response) or 'nutrient enrichment' (increased nutrients).

Table 6 Weight-of-Evidence Results, 2013 AEMP

Ecosystem Component	EOI Rating
Toxicological Impairment	
Lake Productivity	**0**
Benthic Invertebrates	**0**
Fish Population Health (see below)	**1**
Nutrient Enrichment	
Lake Productivity	**3**
Benthic Invertebrates	**3**
Fish Population Health (see below)	**1**

- Graphs and figures that better represent the findings of the AEMP over multiple years will be presented following the end of each 3-year monitoring cycle (e.g. 2014, 2017, etc.).

- SNP samples are taken at various frequencies, depending on location, as outlined in the Water License. Sample results are checked, analyzed and submitted monthly to the WLWB for external review. Any issues with the results are flagged and, if a problem is suspected or undesirable trends are noted, an investigation is done to determine the cause of the problem. It may be related to equipment (e.g. contaminated bottle) or treatment methods (e.g. overuse of a chemical). During 2013, a batch of preservative that is provided by an external lab and added to water samples prior to shipping was found to be contaminated. After investigation, a total of seven metals (cadmium, chromium, cobalt, iron, manganese, molybdenum, and nickel) were found to be in higher concentrations than normal when the contaminated preservative was used, starting in July 2013. Further tests were then done to determine which sample results were incorrect because of this contamination. These seven metals from a total of 114 specific samples (21 samples from 1645-18, 24 samples from 1645-19 and 69 samples from the open water AEMP) were removed from the 2013 AEMP and SNP datasets, and these values were also not used in any analyses.

2012 Observations:

The Aquatic Effects Monitoring Program was successfully revised leading up to the 2012 monitoring season. As a result, only certain aspects of water quality and fish monitoring are conducted in each year. A summary of the results from the sampling conducted during 2012 is outlined below. Overall, the program determined that nutrients (nitrogen and phosphorus) released into Lac de Gras from the treated mine water discharge are causing some enrichment in Lac de Gras, near the east island. A Traditional Knowledge study on fish and water health was also conducted as part of the AEMP during the summer of 2012.

Specific results of note from the 2012 Aquatic Effects Monitoring Program include:

- The analysis of effluent and water chemistry data collected during the 2012 AEMP field program and from relevant sites from the Water License SNP program stations indicated similar trends as observed in 2011, including an increase in arsenic and iron concentrations. Effect levels will be determined during the comprehensive AEMP program in 2013.
- Results to date of the plankton monitoring program, which examines changes in the amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras (LDG), indicate a pattern consistent with weak nutrient enrichment from mine effluent.
- Results of the eutrophication indicators component of the AEMP were similar. Based on the measured higher amounts of phytoplankton (chlorophyll *a*) and total phosphorus (TP) in the near field area relative to the reference areas, the observed enrichment effect has been given a "moderate" effect level designation. Zooplankton biomass resulted in a "low" effect level designation. In the following figures, the areas shaded in pink show the area of the lake that has been affected, e.g. 24% of LDG for Chlorophyll *a* and less than

1% for TP in 2012. The coloured lines represent the depth of water in the lake: Green = shallow (0-6 m/0-20 ft), Yellow-Orange = moderate (8-20m/25-65 ft) and Red = deep (30-50m/100-165 ft). The sample stations denoted by circles are exposure areas whereas those denoted by a triangle are reference areas.

Figure 14a: Chlorophyll *a* in LDG, 2012

Figure 14b: Total Phosphorous in LDG, 2012

- Toxicity testing on the treated mine water that is discharged back to Lac de Gras was done four times in 2012, as part of the SNP program in the Water License. No concerns or issues were noted with any of these tests.
- The results from the 2012 TK camp provided feedback on the context and process for sharing Traditional Knowledge as well as on the health of the fish and water in Lac de Gras. Camp participants noted the importance of TK's context, which is situated in, and interconnected with spirituality (e.g., human-animal transformations), codes of conduct (e.g., respect for and obedience of one another), and connection to the land, animals, and ancestors. Customs and practices (e.g., drumming, feeding the fire and water) and stories about the journey-based creation of unique landscape features (e.g., mountains,

islands, and waterbodies) underscore this context of TK. So, the importance of the setting in which knowledge is shared and of being respectful to others becomes important to ensure proper transfer of knowledge.

- TK camp participants noted the environmental indicators that they use to assess water quality, such as condition of the shoreline and clarity of the water. Additionally, a tea test was used to assess water quality and participants noted that tea made from water of a poor quality results in film or scum on the surface of the cup. None of the water samples from Lac de Gras had this scum or film and all the samples tasted acceptable to participants.

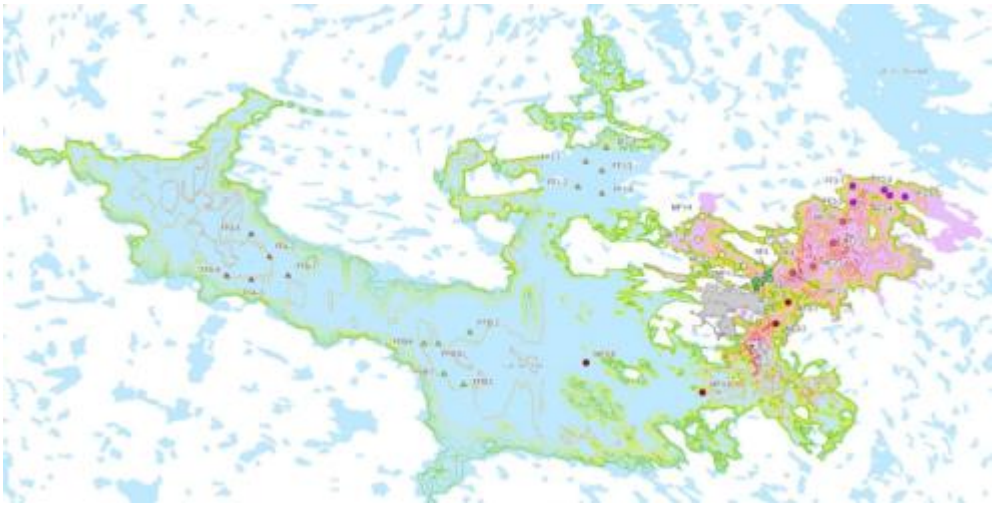
2011 Observations:

The Aquatic Effects Monitoring Program was successfully implemented in 2011. Overall, the program determined that nutrients (nitrogen and phosphorus) released into Lac de Gras from the treated mine water discharge are causing mild enrichment in the bay east of the east island.

Specific results of note from the 2011 Aquatic Effects Monitoring Program include:

- The analysis of effluent and water chemistry data collected during the 2011 AEMP field program and from relevant sites from the Water License SNP stations continued to show a low level effect on water chemistry in the lake resulting from the mine.
- Analysis of the number and types of small organisms that live on the bottom of the lake (benthic invertebrates) indicated a range of effect terms, from no effect to a high level effect, depending on what was analyzed. Low level or early-warning effects were detected for some species between the reference areas and exposure areas. Effects on total density (amount) and other benthic species density were classified as moderate level. A high level effect was found for the amount of one species. Benthic invertebrate monitoring results show effects of mild nutrient enrichment.
- Results to date of a special study to examine changes in amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras show a pattern consistent with nutrient enrichment from the mine. Results of the eutrophication indicators part of the AEMP were similar. Based on the measured higher amounts of algae (chlorophyll *a*) and total phosphorus near the mine versus farther from the mine, this effect remains at a "moderate" level effect designation. Higher zooplankton biomass near the effluent continued to result in a "high" level effects designation.
- Moderate nutrient enrichment from the mine water discharge has been shown for 15.5% of Lac de Gras, based on the amount of algae and phosphorous measured in the lake. This is below the predicted level of 20%.

Figure 15: Chlorophyll *a* and TP in LDG, 2011



- Results of the Lake Trout study suggest that there has been a slight increase in mercury in Lake Trout muscle tissue since 2005. This increase is seen in both Lac de Gras and Lac du Sauvage. The increase in mercury from before the mine was built resulted in a low level effect classification.
- A technical analysis confirmed the nutrient enrichment effect and concluded that there continues to be strong evidence for a mild increase in lake productivity, and associated enrichment of the benthic invertebrate community, as a result of nutrient increases in Lac de Gras. There is some evidence suggesting low-level impairment to the small organisms on the bottom of the lake due to contaminant exposure but these findings have a high uncertainty because the link to contaminant exposure is not strong. The slight increases in mercury levels in fish tissue since 1996 have occurred in both Lac de Gras and Lac du Sauvage (upstream from the mine), and it is not likely that the increase is linked to mine operations. Diavik continues to monitor mercury levels in big and small fish in the lake, as well as monitoring for other possible sources of mercury. This helps to try and find out what may cause any increases that do happen and catch any possible issues.

2010 Observations:

The Aquatic Effects Monitoring Program was successfully implemented in 2010. Overall, the program determined that nutrients (nitrogen and phosphorus) released into Lac de Gras from the treated mine water discharge are causing mild enrichment in the bay east of the east island.

Specific results of note from the 2010 Aquatic Effects Monitoring Program include:

- The analysis of effluent and water chemistry data collected during the 2010 AEMP field program and from relevant sites from the Water Licence SNP stations showed a low level effect on water chemistry in the lake resulting from the mine.
- Results of the sediment analysis did not identify conditions that are likely to affect fish, bug or plant life in the lake through enrichment or harm. Bismuth and uranium were, however,

assigned "high level effects" designations as both areas near the mine and at least one halfway down the lake had average concentrations greater than the areas farther from the mine. Measured levels of bismuth and uranium are unlikely to pose a risk to fish, bugs or plant life.

- Analysis of the number and types of small organisms that live on the bottom of the lake (benthic invertebrates) indicated a range of effect terms, from no effect to a moderate level effect, depending on what was analyzed. Low level or early-warning effects were detected based on statistical differences between the reference areas and exposure areas. Effects on total density and other benthic species density were classified as moderate level. Early-warning/low level effects were detected for the amount, distance and density of one species. Benthic invertebrate monitoring results are indicative of nutrient enrichment.
- A study was completed in 2010 to specifically delineate the spatial extent of the treated effluent (a "plume") in Lac de Gras. The plume extent was similar between summer open-water and winter ice-cover conditions, but concentrations near the discharge point were higher during winter ice-cover conditions.
- One possible explanation for the 2007 finding of elevated mercury in small fish (Slimy Sculpins) was increased mercury being released from sediments because of nutrient enrichment from the treated mine effluent. A sediment core study was done to look in to this and it showed that this explanation was not likely, based on the results.
- Results to date of a special study to examine changes in amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras indicate a pattern consistent with nutrient enrichment from treated mine effluent. Based on the measured higher amounts of algae (chlorophyll *a*) and total phosphorus near the mine versus farther from the mine, this effect has been given a "moderate" level effect designation. Higher zooplankton biomass near the effluent resulted in a "high" level effects designation.

Figure 15: Chlorophyll a and TP in LDG, 2010

- Results for the small fish study indicate a pattern consistent with an increased availability of food and nutrients in the sampling areas near the mine compared to the areas farther from the mine. Despite the moderate-level effects seen in the fish tissue chemistry for bismuth, strontium, titanium and uranium, there was no evidence that tissue metals concentrations were negatively affecting fish health.
- Mercury levels in small fish (Slimy Sculpin) at sampling sites near the mine were lower than reported in the 2007 AEMP. There was no significant difference between samples taken near the mine and those taken farther away from the mine in 2010, most importantly in relation to tissue concentrations of mercury. The reason for the differences between the 2007 AEMP results for mercury and the 2010 results is unknown; however, a different analytical laboratory employing slightly different methods was used in 2010.
- A technical analysis confirmed the nutrient enrichment effect and concluded that there is strong evidence for a mild increase in lake productivity, and associated enrichment of the benthic invertebrate community and fish community, as a result of nutrient increases in Lac de Gras. There is little evidence of harm to lake productivity as a result of any contaminant exposure. Although there is some evidence suggesting potential low-level contaminant issues with benthic invertebrate and fish communities, these observations have a relatively high amount of uncertainty.

2009 Observations:

The Aquatic Effects Monitoring Program was successfully implemented in 2009. There were only a few quality control samples (extra samples taken to test the accuracy of field and/or lab techniques) that were missed because of scheduling issues.

Similar to 2008, the 2009 Aquatic Effects Monitoring Program showed nutrient enrichment (increased levels of phosphorous and nitrogen in the water available for algal growth, where increasing algal growth is a sign of eutrophication, or increased lake productivity) in areas of the lake. Nutrient enrichment is the main change in Lac de Gras that leads to most of the other changes we see relating to the different animals that live in the water.

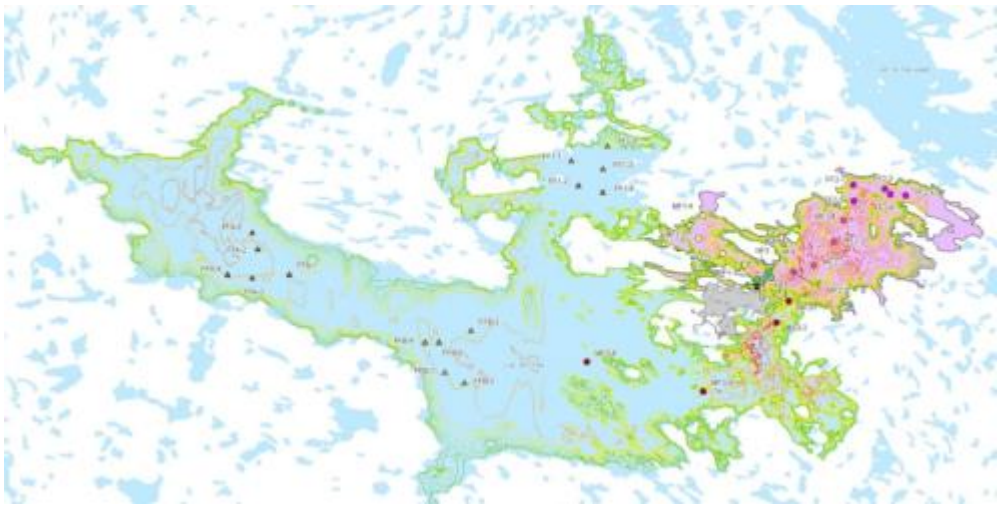
Specific observations that were noticed in the 2009 data include:

- The analysis of effluent (treated water discharged back in to the lake) and water chemistry (quality) data collected during the 2009 AEMP field program and from relevant stations from the Water License Surveillance Network Program stations indicated an early warning/low level effect on water chemistry within Lac de Gras resulting from the Mine. This means that there is a difference between samples taken near the mine and those taken farther away from the mine, but is within the expected range. Some values may be slowly increasing over time, though, so it is important to monitor for any changes that may occur from one year to the next.
- Results of the sediment analysis did not identify conditions that are likely to affect aquatic life through enrichment or impairment. Most of the metals and nutrients measured in the sediment had an early warning/low level effect on sediment chemistry. However, bismuth

was assigned a "high level effect" designation; this means that samples near the mine and at least one sample part way across the lake had average concentrations that were higher than those of the reference area at the other end of the lake.

- Analysis of the number and types of benthic invertebrates (small organisms that live on the bottom of the lake) indicated a range of effect designations, from no effect to a high level effect, depending on what was analyzed. Low level/early warning effects were detected based on significant differences between the reference areas further from the mine and the exposure areas near the mine in eight of twelve benthic invertebrate community variables compared (variables include things like the number of species found, whether one species was found more than another, number of organisms in a given area, number of midges, etc.). Total invertebrate densities, as well as two species densities (Pisidiidae and Heterotrissocladius sp.) were higher closer to the mine than the range measured in areas farther from the mine. Densities of Pisidiidae near the mine and part way across the lake were greater than the range measured in areas at the other end of the lake; for that reason, it was assigned a high level effect. These results relate back to the nutrient enrichment happening in the lake.
- Findings to date on a special study to examine changes in amount, number and types of zooplankton (tiny animals) and phytoplankton (algae) that live in the water of Lac de Gras show a pattern linked to nutrient enrichment from mine effluent. Because there are higher amounts of phytoplankton (chlorophyll a/algae) and total phosphorus in areas near the mine compared with areas farther from the mine, this effect has been given a "moderate" level effect designation. Higher zooplankton biomass (the amount of small animals in an area) near the effluent resulted in an early warning/low level effect designation; this means that there is a difference between the areas closer to and further from the mine, but that it is within the expected range.

Figure 17: Chlorophyll a and TP in LDG, 2009



- A weight-of-evidence (WOE) analysis compares all the information collected (water quality, sediment quality, benthic invertebrates, etc.) to try and answer two questions:

- Could damage to aquatic animals happen due to chemical contaminants (primarily metals) released to Lac de Gras?
- Could enrichment occur in the lake because of the release of nutrients (phosphorus and nitrogen) from treated mine effluent?

The weight-of-evidence analysis confirmed nutrient enrichment and concluded that there is strong evidence for a mild increase in lake productivity due to nutrient enrichment. There was not a lot of evidence of damage to aquatic animals as a result of contaminant exposure. The observation of potential low-level harm of the benthic invertebrate community has a fairly high amount of uncertainty.

2008 Observations:

The Aquatic Effects Monitoring Program was successfully implemented in 2008. There were only a few open water sediment/benthic samples that could not be obtained due to hard/rocky lake bottom and some water quality and plankton stations that were not sampled in the third open water period due to inclement weather. Special Effects Studies for mercury detection limits (measuring mercury at very low levels), chromium VI (a compound Diavik investigated because it could be a concern at lower levels compared to other forms of chromium) and trout fish tissue metals levels (based on previous AEMP studies that showed possible elevated level of metals in fish) were also completed.

Overall, the 2008 Aquatic Effects Monitoring Program determined that nutrients (nitrogen and phosphorus) released into Lac de Gras from the treated mine water discharge are causing mild nutrient enrichment in the bay east of East Island.

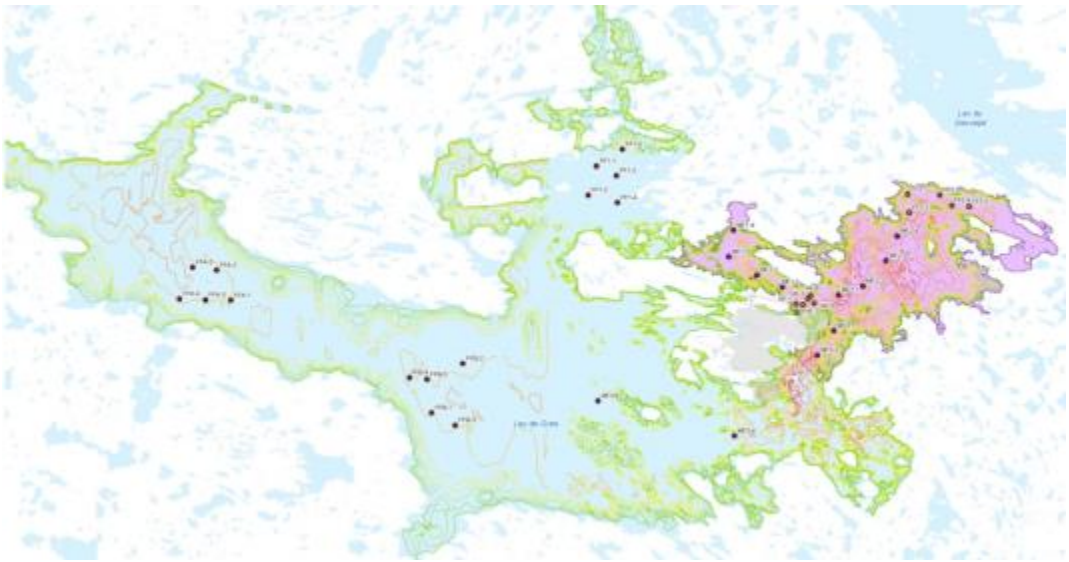
Nutrients are essential to the growth of plants and animals in land and in the water. Adding nutrients to natural waters can result in increased production of plants or algae. Too many nutrients can cause environmental problems generally known as nutrient enrichment or eutrophication. These problems include increased oxygen consumption in the water by algae (fish need this oxygen too) and a reduction in the amount of light getting to plants at the bottom of the water body.

Other results of note from the 2008 Aquatic Effects Monitoring Program include:

- The analysis of effluent and water chemistry data collected during the 2008 AEMP field program and from locations around the mine site (from Surveillance Network Program) indicated a low level effect on water chemistry within Lac de Gras resulting from the mine.
- Results of the sediment analysis did not identify conditions that are likely to affect aquatic life through enrichment or impairment. Bismuth and uranium (metals) were however assigned “high level effects” designation as both near-field and at least one mid field area had mean (average) concentrations greater than the reference area (sites far away from the mine) range.

- Analysis of the number and types of small organisms that live on the bottom of the lake (benthic invertebrates) indicated a range of effect designations, from no effect to a high level effect, depending on the variable analyzed. Low level or early warning effects were detected based on differences between the reference areas (far away from the mine) and exposure areas (near the mine) in eight of eleven benthic invertebrate community variables compared. Density (number of individuals in a specified area) of the midge Procladius in the near-field area were greater than the range measured in the reference areas and was assigned a moderate level effect. Density of Sphaeriidae in the near-field and mid field areas greater than the range measured in the reference areas and was assigned a high level effect. Both results are indicative of nutrient enrichment.
- The fish liver tissue analyses from 1996, 2005, and 2008 has not indicated that there has been an increase in the concentration of metals, including mercury, in lake trout over that period and therefore a no effect classification has been assigned for lake trout usability.
- Findings to date on a special study to examine changes in amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras indicate a pattern consistent with nutrient enrichment from mine effluent. Based on the measured higher amounts of phytoplankton (chlorophyll a) and total phosphorus in the near field areas compared with the reference areas this effect has been given a "moderate" level effect designation. Higher zooplankton biomass near the effluent resulted in a "high" level effects designation.

Figure 18: Chlorophyll a and TP in LDG, 2008



- Mercury and chromium VI levels in the treated mine water discharge, both subject of special studies in 2008, were determined to be at concentrations below the best analytical detection limits available.

- The AEMP confirmed that there is a nutrient enrichment effect and concluded that there is strong evidence for a mild increase in lake productivity due to nutrient enrichment. There is negligible evidence of impairment to lake productivity as a result of any contaminant exposure. The observation of potential low-level impairment of the benthic invertebrate community has a relatively high degree of uncertainty.

No changes to the monitoring program design are recommended at this time. Items have been identified for consideration during the program review that will follow the implementation of the program in 2010. Special studies on dust sampling frequency, mercury detection limits, and chromium VI are now complete. The mine effluent plume delineation survey (a study of the area where treated water from the mine mixes with Lac de Gras water) originally planned for 2009 is proposed to be conducted in 2010 so that the survey can evaluate the effectiveness of the new treated mine water discharge line that is being installed as part of the water treatment plant expansion that has been ongoing since 2007.

Follow-up special studies from the 2007 program finding of elevated mercury levels in slimy sculpin will include a 2009 joint research program with Fisheries and Oceans Canada to assist in understanding if mercury in the slimy sculpin tissue is related to the treated mine water discharge (if nutrient enrichment may affect mercury uptake in fish), and a repeat of the small-bodied fish survey in 2010.

2007 Observations:

- Effluent and water chemistry data collected indicated a low-level effect on water chemistry within Lac de Gras from the mine.
- Lakebed sediment chemistry data indicated a potential low-level effect for lead, and a potential high level effect for bismuth and uranium on sediment chemistry within Lac de Gras from mine activities, although benthic results suggest that sediment exposure concentrations are unlikely to pose risk to aquatic life.
- Benthic invertebrate analyses indicate a low-level nutrient enrichment effect on benthic invertebrates within Lac de Gras.
- The fish study indicated a pattern consistent with an increased availability of food and nutrients in near-field and far-field exposure areas compared to far-field reference areas. Elevated barium, strontium, mercury and uranium in slimy sculpin was assigned a moderate-level effect.
- Dike monitoring results revealed potential dike-related minor changes to water quality and concentrations of lead and uranium in sediment. Overall, analyses suggest benthic communities near the dikes are more likely responding to habitat variation than to changes in water quality or sediment chemistry.
- Eutrophication indicators showed a moderate-level nutrient enrichment effect within Lac de Gras, with the mine being a significant contributor to this effect.

- As with the previous year's results, despite the proximity of SNP Station 1645-19 to the effluent diffuser (60m), open-water and ice-cover water quality results remain within Canadian Council of Ministers for the Environment (CCME) Guidelines for the Protection of Aquatic Life.
- Ice-cover concentrations at SNP Station 1645-19 still tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water, resulting in better initial dilution or mixing.

2005/2006 Observations:

Due to pending changes to the AEMP, data reports were completed for the 2005 and 2006 programs, however, a report of the analysis and interpretation was not submitted.

2004 Observations:

- As with the previous year's results, despite the very close (60m) proximity of SNP Station 1645-19 to the effluent diffuser, open-water and ice-cover water quality results remain within Canadian Council of Ministers for the Environment (CCME) Guidelines for the Protection of Aquatic Life.
- Ice-cover concentrations at SNP Station 1645-19 still tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water, resulting in better initial dilution or mixing.
- Data analysis was conducted following the approved four step process. The results of the first step of the data analysis methods identified that there were changes in the concentrations of six parameters. Total arsenic and total nickel results were compared with original EA predictions (data analysis step 3). Measured changes are within the levels predicted in the environmental assessment and are below levels that would cause environmental effects.
- As with the previous year, the results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations (LDG50) or parameters (nitrite at LDG46) where baseline data are not available and so the data analysis is not possible. Finally there are parameters where baseline detection limits have dominated the baseline statistic and could result in changes not being detected. It is therefore recommended that the Diavik Technical Committee, with Diavik, reset trigger values for the step 1 analysis on a parameter-by-parameter basis.

2003 Observations:

- Despite the very close (60m) proximity of SNP Station 1645-19 to the effluent diffuser, open-water and ice-cover results remain within CCME Guidelines for the protection of aquatic life.

- Ice-cover concentrations at SNP Station 1645-19 tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water resulting in better initial dilution or mixing.
- Data analysis was conducted following the approved 4 step process. The results of the first step of the data analysis identified specific monitoring locations where there were changes in the concentrations of seven water quality parameters. Of these, only total arsenic could be identified as possibly being caused by the NIWTP effluent (data analysis Step 2). Measured changes in total arsenic are within the levels predicted in the environmental assessment (data analysis Step 3) and are below levels that would cause environmental effects.
- The results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations (LDG50) or parameters (nitrite at LDG46) where baseline data are not available and so the data analysis is not possible. It is therefore recommended that in the future the data analysis method be modified so that the baseline references are from the combined mid-field and far field sites instead of each individual monitoring site. This change would reduce the number of false positives results.

2002 Observations:

- Water quality at all Lac de Gras monitoring locations, including sites immediately adjacent to effluent diffuser remained high.
- Increases from location specific baseline levels were measured for turbidity and suspended solids at 3 mid-field monitoring stations, however all remained within typical baseline values for the area.
- Predicted nutrient enrichment effects were not realized although phytoplankton biomass was determined to have increased over baseline at one far-field location but not at any mid-field locations.
- No trends or specific concerns were noted for zooplankton, benthic invertebrates and sediment quality, based on two sampling results.
- Snow chemistry results were all below discharge limits.

Previous Years Observations:

- Localized increases in turbidity, suspended solids and aluminium were measured due to dike construction.
- Water and sediment quality, zooplankton, phytoplankton and benthic invertebrate results were generally consistent with baseline, however some results, particularly benthic invertebrate numbers, showed larger year-to-year variability.

What effect will the mine development have on fish?

EA Prediction:

- On a regional scale the only effect on the fish population of Lac de Gras would be due to angling;
- The effect of increases in metal concentrations in fish flesh would be negligible (i.e. metal concentrations in fish flesh would not exceed consumption guidelines (500 ug/kg for mercury);
- Mercury concentrations will not increase above the existing average background concentration of 181.5 µg/kg; and,
- Local effects due to blasting, suspended and settled sediment from dike construction, increase in metal concentrations around dikes and post-closure runoff.

Observations:

- Slimy Sculpin were sampled in 2013. Differences in the body size (length and weight) of the fish, as well as the condition factor (how 'fat' the fish is, or length in relation to weight), relative liver size, and relative gonad size were observed in fish caught near the mine compared to those in areas further from the mine. This demonstrates a potential toxicological response (a reaction to exposure). These observations are not consistent with the results of previous fish surveys in Lac de Gras or with the other findings of the AEMP that all indicated a nutrient enrichment response. Overall, the fish data indicate that an Action Level 1 (confirm the effect) has been reached, which means this study will be repeated in 2016.

Figure 19: LDG Sculpin Sample Areas, 2013

- M-lakes and West Island Fish Habitat Restoration programs were started in 2009 in order to make up for the fish habitat lost to dike/pit construction. This is a requirement from the Department of Fisheries and Oceans. Streams in these areas were improved to encourage fish use and movement between smaller inland lakes and Lac de Gras.

Construction was finished in 2012 and monitoring of these areas was ongoing during summer 2013.

- An increased amount of mercury was detected in tissue from small fish (slimy sculpin) taken from the lake in 2007. In 2008, Diavik conducted a study to further evaluate the elevated mercury in fish tissue, this time studying large-bodied fish (lake trout). The fish liver tissue analyses indicated that there is no concern relating to the concentration of metals, including mercury, in lake trout, but that some very large/old fish did show higher levels of mercury than smaller fish, as can be expected. A mercury study was also completed on treated mine water discharge and determined that concentrations are below the best analytical detection limits available.
- Based on the results of the 2008 trout survey, it was determined that mercury levels were safe for consumption and that the fish palatability study could be done in 2009. Participants from each of the community groups for the Diavik mine participated in the fish palatability study at site. Four fish were cooked for tasting using the same methods as previous studies, and fish tissue and organ samples were taken for metals testing, including mercury. Each of the four fish that were cooked for the palatability study also had metals samples submitted for testing. Results for the metals levels in the fish tested during the 2009 fish palatability study showed mercury levels below Health Canada's guideline for consumption and that fish were okay for eating.
- Additional follow-up special studies included a 2009 joint research program with Fisheries and Oceans Canada (DFO) to assist in understanding if mercury in the slimy sculpin tissue (identified in 2007) is related to the treated mine water discharge. Results from this study did not support the idea that higher levels of mercury may be because of increased mercury being released from sediments with nutrient enrichment from the treated mine effluent.
- The small-bodied (slimy sculpin) fish survey was also done again in 2010. Results show that there is some change to size and condition of the fish that would be consistent with nutrient enrichment (more availability of food and nutrients); this was found closer to the mine. There were some metals in the fish tissue that could have a moderate effect on fish, but there did not appear to be any impacts to fish health. Mercury levels in the fish tissue were lower than previously reported in 2007 and were within the expected range. A different lab was used to analyze the tissue samples, but the reason for the differences between the 2007 and 2010 studies is not known.
- A large-bodied (lake trout) fish survey was done in 2011 to test mercury levels in fish. The results from this study showed that mercury levels are increasing slightly in both Lac de Gras and Lac du Sauvage. The average mercury concentration in lake trout from Lac de Gras was similar to that found during 2008. This number is a length-adjusted number because mercury concentrations increase with size and age. The lake trout in Lac du Sauvage were found to have average mercury concentrations higher than those found

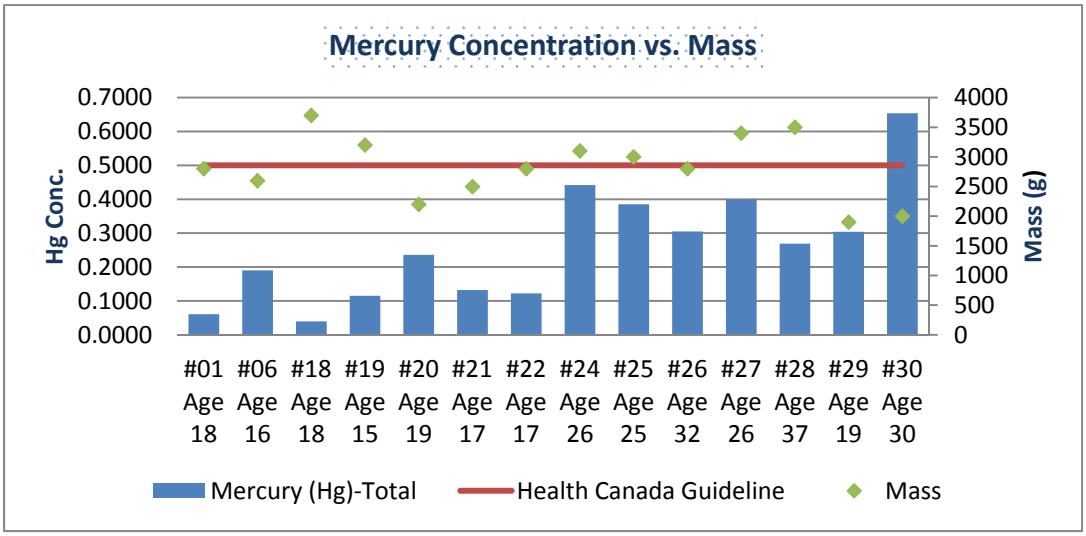
during 2008; this lake is upstream from Diavik. A low-level effect was given for fish mercury levels, though it doesn't appear to be linked to the mine.

- From 2003 until present, the fish from Lac de Gras have tasted good according to participants in the community-based monitoring camps that are held in some summers. Scientific testing for metals levels in fish tissue and organs that were caught during these camps were also as expected - the results showed no concerns.

  Participants from the 2012 Traditional Knowledge fish camp, conducted as part of the AEMP, noted that the status of the fish in Lac de Gras near the Diavik mine is good. Thirty-nine fish were caught and, of these, two fish were identified as being of poorer condition, noting that these fish were skinny and, in the case of one, had a larger head. Another fish was also observed as having some intestinal worms and being of poorer condition. Participants noted that this tends to occur in all fish populations and that the fish are not eaten. Those that were tasted as part of the palatability study resulted in scores of 1 (excellent for eating, looks better than fish usually caught) or 2 (good for eating, looks similar to fish usually caught) from all participants.

- Global concern over mercury levels has increased due to human activity and industrial processes. Increased levels have been noted in the past in small fish in Lac de Gras (Diavik 2007), as well as in other lakes located throughout the Northwest Territories (http://www.hss.gov.nt.ca/health/environment-and-your-health/mercury-levels-fish). Mercury levels are used as one of the main health indicators for the fish palatability study. The figure below shows the results that were observed in fish sampled during the 2012 AEMP TK program.

Figure 20: Mercury Levels in Fish from LDG, Diavik TK Camp 2012



One clear result that we can see on the graph is the difference in mercury concentrations between a whitefish (bottom feeder) and a lake trout (predator fish). Six whitefish were

caught and the one tested (#18) had the lowest mercury level of any fish sampled and, when compared to a lake trout of similar same age and size, the mercury level in the trout was 1.5 times higher than that of the whitefish. Additionally, we can see that the two fish identified as being skinny and unsuitable for eating (Fish 29 & 30) by community participants had quite high mercury concentrations with lower than average body weights and ages of 19 and 30, respectively. The fisheries biologists noted an enlarged gallbladder on Fish 29 and intestinal worms in the stomach of Fish 30, both of which can be indicators of poor health from a scientific perspective. This provides a good example of how science and TK can arrive at a similar result.

- Since 2000, no fish have been taken by recreational fishing from Lac de Gras by Diavik.
- Fish habitat utilization studies showed that lake trout continue to use both natural and man-made shoals near the A154 dike.
- A Blasting Effects Study was done starting in 2003 and showed no effects on fish eggs.

Other observations made in past years include:

- Sediment deposition rates measured during the construction of the dikes were below levels predicted in the Environmental Assessment.
- In 2002, 2526 fish were salvaged from inside the A154 dike pool and released in Lac de Gras. 526 fish were salvaged from the North Inlet and released to Lac de Gras.

In 2006, 725 fish were salvaged from inside the A418 dike pool and released in Lac de Gras.

Runoff and Seepage:

There are known locations where seepage and runoff occur at the Diavik mine site. There have historically been 22 seepage stations that included: 7 survey stations, 5 groundwater monitoring stations and 10 collection ponds. In 2013, 4 groundwater and all 7 survey stations were discontinued. Working with the WLWB, Diavik's program was changed in the fall of 2013 to include:

- 1 surface runoff station;
- 1 groundwater station;
- 4 seepage collection wells (within the PKC dams), and;
- 10 collection ponds.

Seepage is monitored and managed by DDMI staff and the Inspector is kept informed of seepage issues, as well as the short and long term plans for monitoring and repairs. No seepage was seen downstream of seepage collection areas in 2014, as the upstream water collection systems successfully captured and diverted any runoff. Similarly, no seepage occurred in 2013, but 5 seepage samples were taken during 2012.

What effect will the mine development have on water quantity?

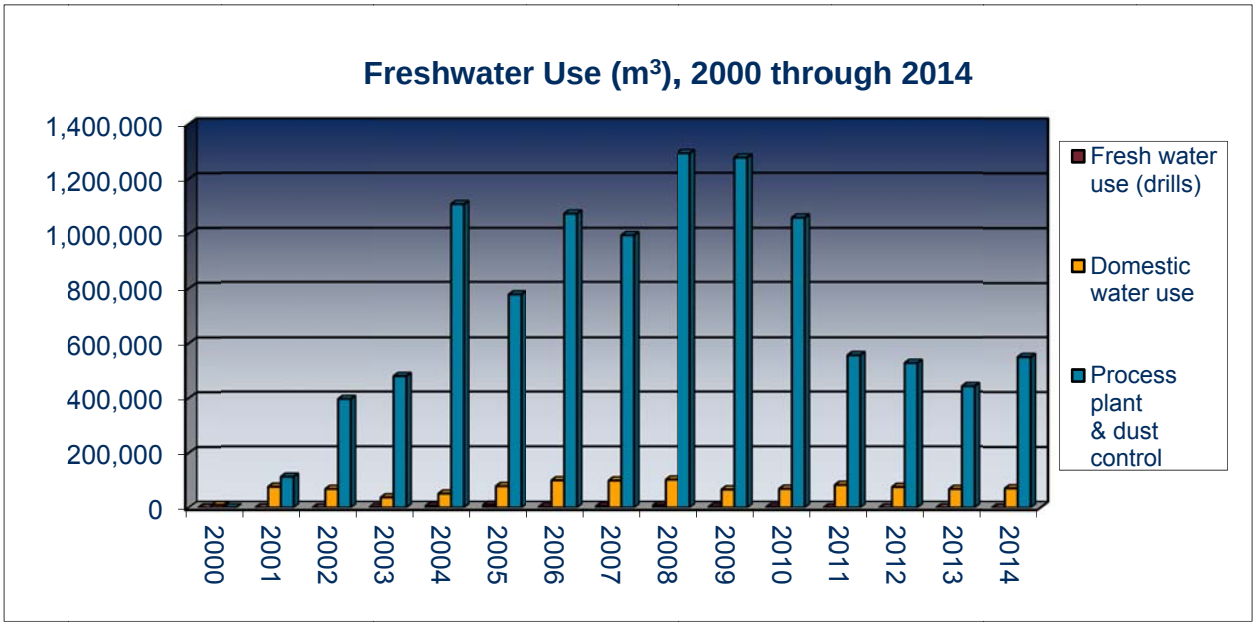
EA Prediction:

- Water supply to the mine is not limited and use of the resource will not cause changes in water levels and discharges from Lac de Gras beyond the range of natural variability.

Observations:

The figure below shows the purpose and amounts of fresh water used from 2000 to 2014. DDMI recycles water from the PKC and North Inlet as much as possible in order to reduce the amount of fresh water needed; in 2014, this amounted to 1.3 million m^3 of recycled water. Use of water from Lac de Gras by Diavik is not causing changes in water levels beyond natural variability. Further information can be obtained from the Water Management Plan.

Figure 21: Freshwater Use Volumes from 2000-2014



Climate and Air Quality

Will the mine development affect air quality around Lac de Gras?

EA Predictions:

- Ambient air quality objectives will not be exceeded; and
- The mine will be a very minor contributor of greenhouse gases.

Observations:

As predicted, dust deposition decreases as one moves away from the mine. The rate of dust being deposited is affected by activities at the mine (for example, higher dust deposition is typically measured at the airport compared to the west part of East Island where there is very

little activity) as well as by wind direction (because wind carries the dust). These trends have been measured each year since dust monitoring began in 2001. Dust suppressants have been investigated for use on the airstrip, but the small runway size and nearness to the lake have prevented the safe use of such chemicals.

- Annual AEMP reports, which include dust monitoring analysis, are usually completed and submitted for review by the WLWB by 31 March of the following year (e.g. the 2014 report would be submitted on 31 March 2015). The 3-year (2011-2013) Summary Report of the AEMP was submitted to the WLWB in October 2014 and DDMI received a directive to produce further information (reference data for Lac de Gras) and then re-submit the 3-year Summary Report after approval of this information by the Board. In this same directive, they noted that it would be necessary to postpone submission of the 2014 Annual AEMP Report. The date that the report will be submitted has yet to be determined.
- The first air quality monitoring report was completed for the 2013-2014 monitoring season, following the installation of two TSP monitoring stations at the Diavik site. Even with the monitoring stations being located on the mine site, all TSP values measured during 2013 and 2014 were below the GNWT Ambient Air Quality Guideline (except for one day in December 2013 that was thought to be due to snow clogging the sensor) and the results agreed with DDMI's updated dispersion model predictions completed in 2012 (Figures 22a & 22b).

Figure 22a: Annual 24-hr TSP Amounts – Communication Building

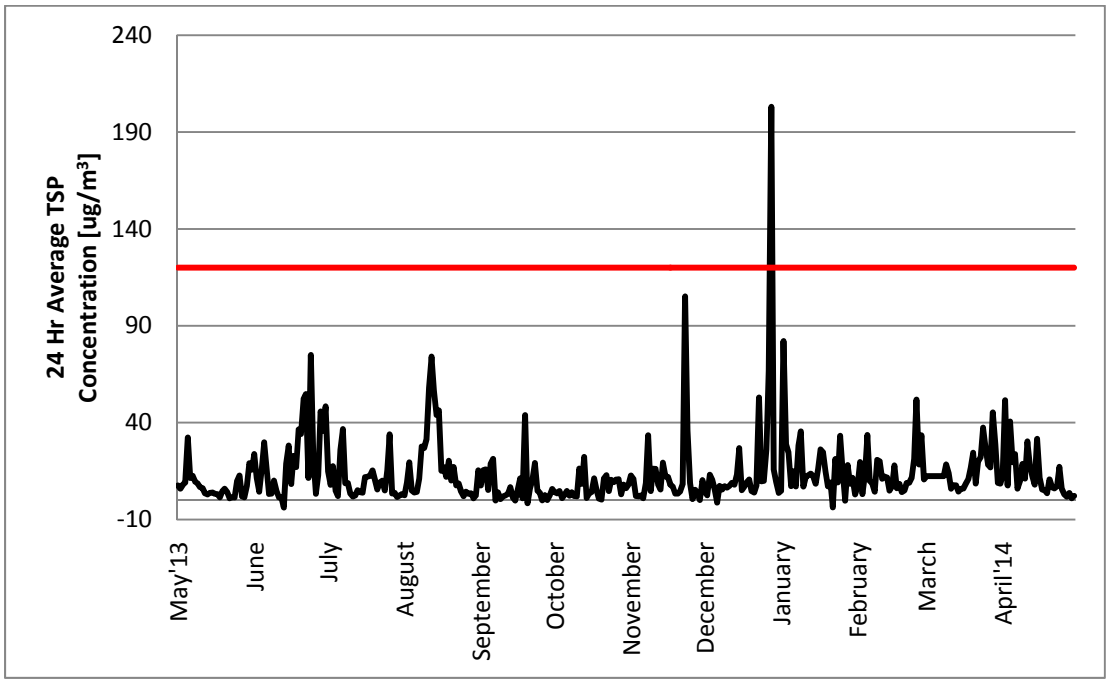
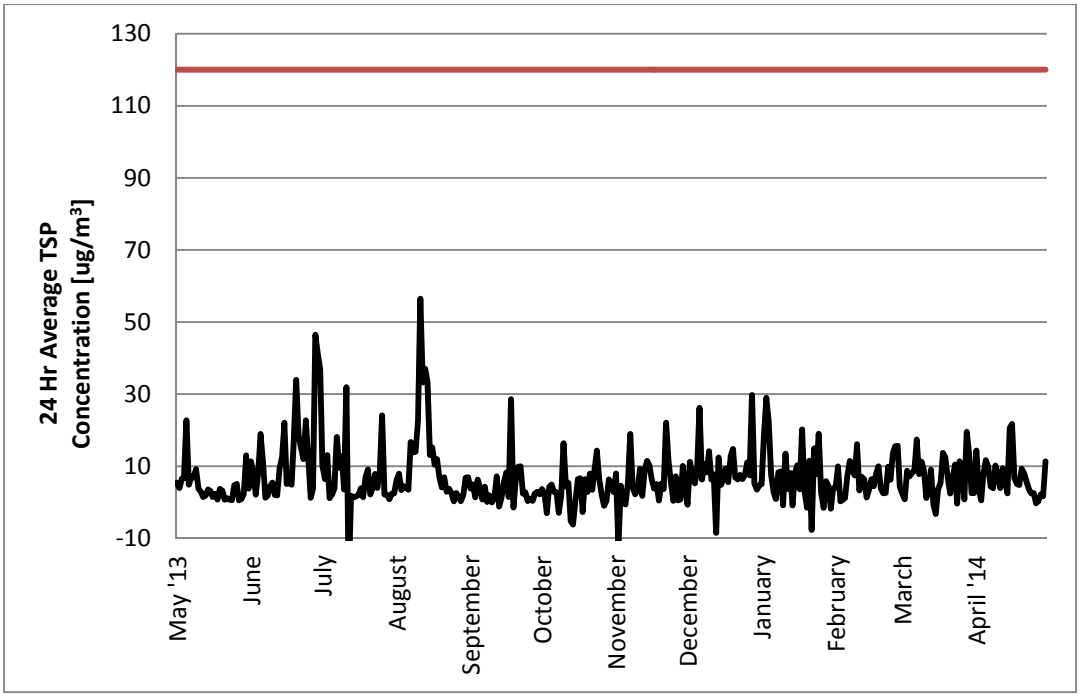
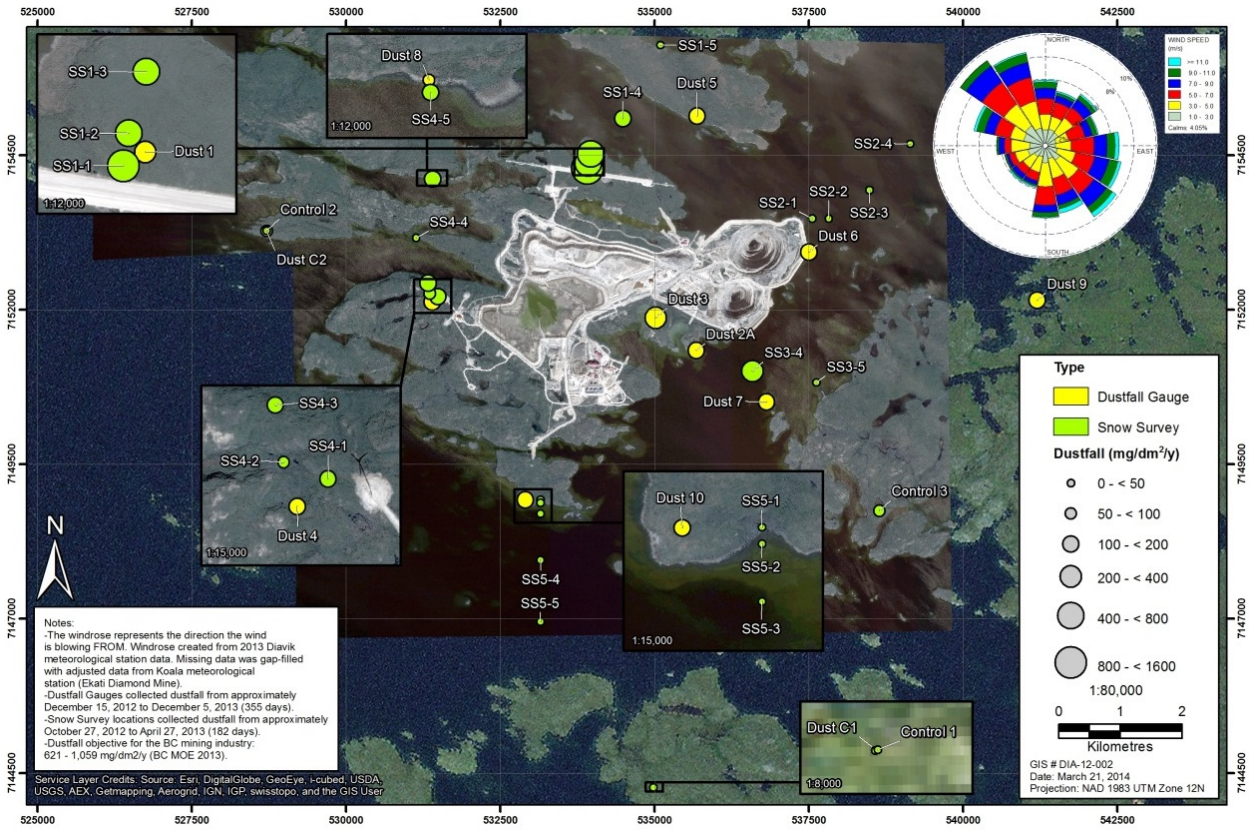


Figure 22b: Annual 24-hr TSP Amounts – A154 Dike



- In 2013, dust fall levels were lower than in previous years, with the exception of the area close to the airstrip (common with gravel runways) and an area downwind of the prevailing winds (Figure 23). The British Columbia (BC) dustfall objectives for the mining industry were used as a comparison against Diavik's dustfall levels, as there are no criteria for the NWT. Values recorded for each of the 12 dust gauges and 22 of the 24 snow survey stations were below the BC objective range of 621 to 1,059 mg/dm^2/y. The two stations that exceeded the BC objective were located beside the airstrip.

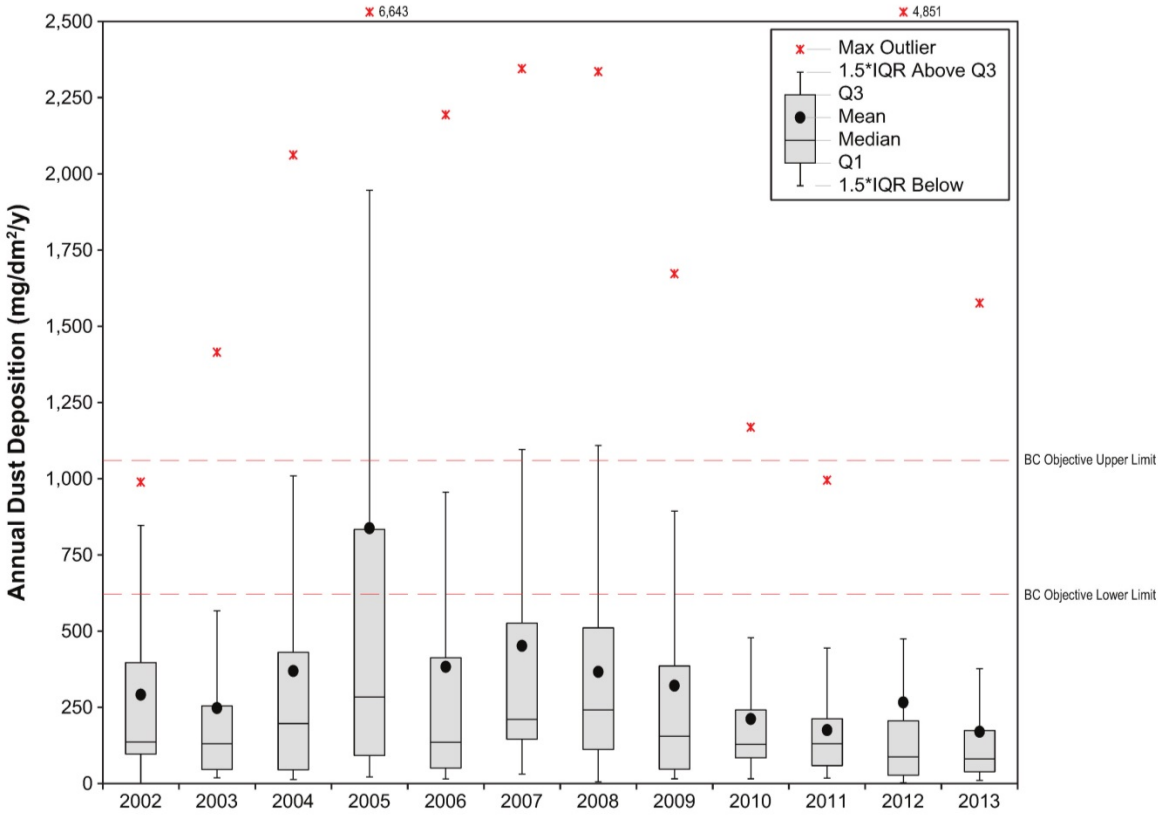
Figure 23: Dust Deposition Rates (mg/dm^2/d) at Dust Gauge and Snow Survey Stations Sampled in 2013



- In 2012 there was a decrease in dust levels at 7 of the 12 dust gauges as construction slowed down and Diavik transitioned from an aboveground to underground mine. Dust levels were still higher than predicted, most notably 250 meters (750 feet) from the airstrip. Dust levels were also higher near the PKC area, due to construction activities.

  For the past seven years, overall dust deposition rates have been more than what was predicted by models in the Environmental Effects Report, because that model did not account for additional construction and operational activities planned for underground mine development. However, all except one of the average dust deposition levels remained below the BC Objectives for mining (Figure 24).

Figure 24: Annual dust deposition rates compared to BC Objective for Mining - 2002 to 2013



- Snow water chemistry analyses (measurements of chemicals in the water from melted snow collected from 26-28 April 2013) indicate that the concentrations of regulated parameters (the chemicals in the Water License that Diavik must keep below set levels) measured in 2013 were below the maximum allowable concentration outlined in the Water License (Table 7) and also generally decreased for all parameters, except nickel, in comparison with past results.

Table 7: Summary of 2013 Snow Water Chemistry Analysis

Distance from Mine	Aluminum	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Nitrite	Phosphorus	Zinc
Water License Limit	3.0 mg/L	12.0 mg/L	0.1 mg/L	0.003 mg/L	0.04 mg/L	0.04 mg/L	0.02 mg/L	0.1 mg/L	2.0 mg/L	n/a	0.02 mg/L
101-250 m	0.153	0.039	0.00012	0.000005	0.00114	0.00046	0.00024	0.0025	0.0033	0.0175	0.002
251-1000 m	0.531	0.083	0.0002	0.000011	0.00275	0.00156	0.00079	0.0065	0.0103	0.139	0.0043
	0.146	0.027	0.00007	0.000005	0.00081	0.00036	0.0002	0.0022	0.0037	0.0202	0.0019
	0.862	0.12	0.00044	0.000015	0.0101	0.00271	0.00253	0.0305	0.0079	0.0982	0.0094
1001-2500 m	0.13	0.034	0.00008	0.000005	0.0008	0.027	0.00022	0.0018	0.0032	0.0091	0.0015
	0.094	0.032	0.00011	0.000005	0.00053	0.00035	0.00016	0.0013	0.002	0.0174	0.0012
	0.108	0.052	0.00018	0.000005	0.00041	0.0131	0.00072	0.0009	0.002	0.0112	0.002
	0.072	0.055	0.00006	0.000005	0.00074	0.00038	0.00011	0.0025	0.0025	0.0143	0.0012
	0.103	0.05	0.0001	0.000005	0.00115	0.00334	0.00023	0.0035	0.002	0.0081	0.0014
	0.24	0.076	0.00009	0.000005	0.00396	0.0006	0.00047	0.0129	0.0046	0.0514	0.0025
	0.061	0.025	0.00008	0.000005	0.00106	0.00047	0.00015	0.0036	0.0022	0.0139	0.0017
	0.044	0.02	0.00004	0.000005	0.00082	0.00028	0.0001	0.003	0.0023	0.0065	0.001
>2500 m (Control)	0.028	0.019	0.00003	0.000005	0.00049	0.0003	0.00006	0.0011	0.002	0.0062	0.0015
	0.057	0.022	0.00006	0.000005	0.00068	0.00024	0.00009	0.002	0.0039	0.007	0.0013
	0.139	0.015	0.00013	0.000005	0.00217	0.00057	0.00024	0.0068	0.002	0.019	0.0033

- Diavik began revisiting air quality modelling (last completed in 1998 as part of the Environmental Assessment) to further assess dust deposition and other air quality parameters. During 2012, input on a revised model and monitoring approach was obtained from Environment Canada and the GNWT, and the prediction of deposition rates was completed. An Air Quality Monitoring Program was finalized and implemented during 2013.

  Analysis of the trends in TSP can be used to inform dust control practices and changes to monitoring programs. Diavik will analyze and present the TSP data, and calculate the average annual TSP concentration, from both monitoring stations each year. The 24-hr and average annual data will be examined for trends or variations and compared with updated air dispersion modelling assessment predictions. Seasonal influences or other events may result in elevated TSP concentrations, so such occurrences will be compared with known site activities to assist with identification of a possible source.

  TSP monitoring and emissions data collected during each year will be summarized in an annual report and entered into the National Pollutant Release Inventory (NPRI). After the first year, TSP monitoring will be re-assessed to determine the suitability of the monitoring methods, locations, interpretation and reporting. The annual report is to be submitted to EMAB and the GNWT on 30 June of the following year (i.e. 30 June 2015).

- Total greenhouse gas emissions for Diavik in 2014 were 182,427 tonnes of CO_2e, a 10,117 tonne reduction from last year. *"CO2 e"* is an abbreviation of 'carbon dioxide (CO_2) equivalent'. CO_2 is a greenhouse gas, but there are many more greenhouse gases. To make it easier to understand greenhouse gases, a standardized method is to report all of the greenhouse gases from a site together as if they were equal to a set volume of CO_2; this is the *CO2e* referred to above. The wind turbines were able to offset carbon dioxide emissions by 14,068 tonnes in 2014.

Vegetation and Terrain

How much vegetation/land cover will be directly affected by the mine development?

EA Predictions:

- Approximately 12.67 km^2 of vegetation/land cover will be lost at full development; and
- Slow recovery of vegetation following mine closure.

Observations:

- There was a very slight increase in direct vegetation/habitat loss in 2014 due to mine development. Total habitat loss to date from mining activities is 10.15 km^2. This is within the predicted amount of 12.67 km^2. The map below shows the land disturbed over time on the Diavik mine footprint. The table below shows a running total of the habitat loss to date.

Table 8: Cumulative Habitat Loss Each Year

Predicted Vegetation Habitat Loss (km^2)	Up to 2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
12.67	3.12	5.88	6.32	7.30	8.15	8.86	9.40	9.66	9.78	9.65	9.71	10.1	10.12	10.15

How will the vegetation communities outside the mine footprint be changed as a result of mine development?

EA Prediction:

- Localized changes in plant community composition adjacent to mine footprint due to dust deposition and changes in drainage conditions.

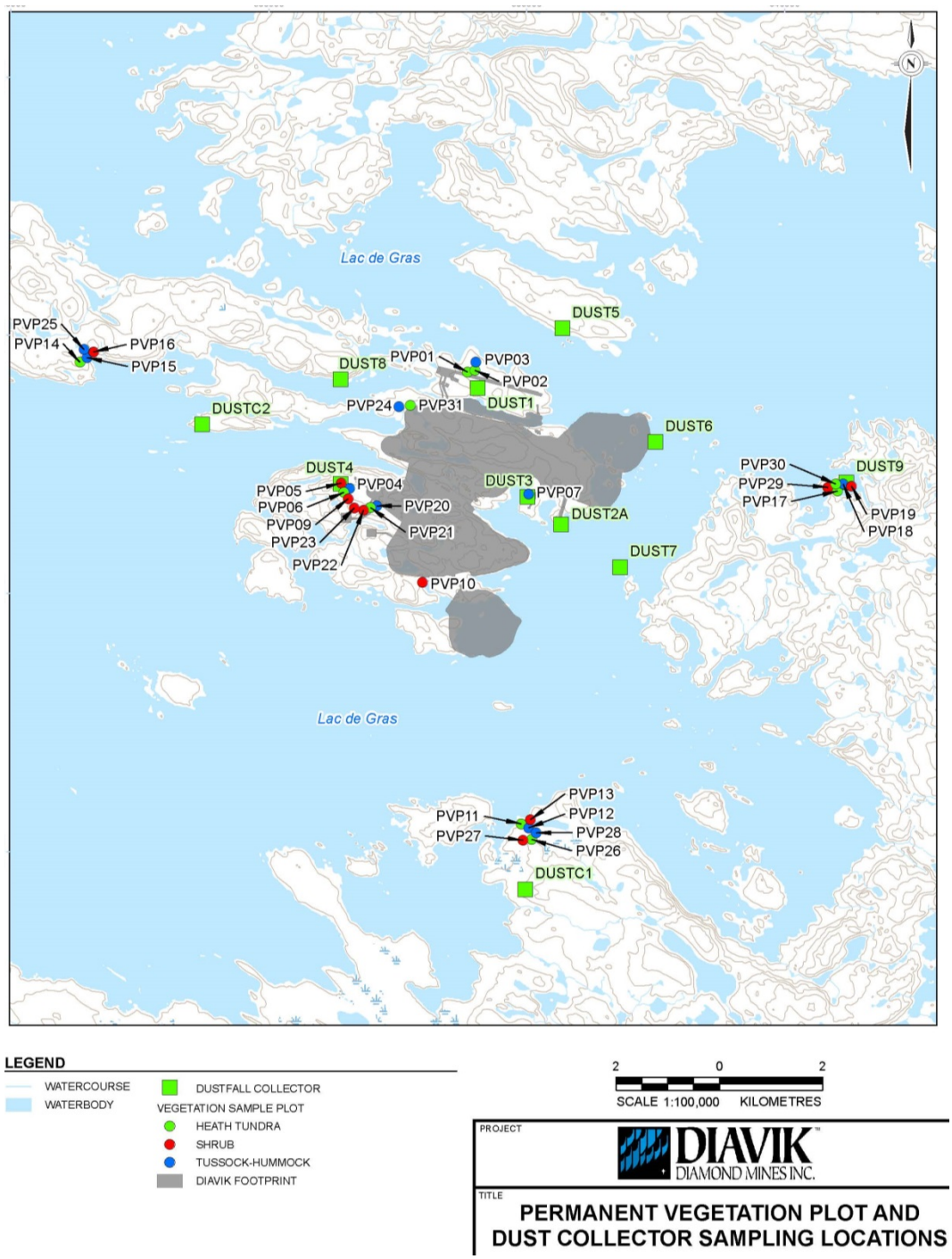
Observations:

- Permanent vegetation plots (PVPs) were established close to and far from the mine site in 2001 to monitor if there are differences in vegetation and ground cover near the mine and farther away from the mine. The program is conducted every 3 years and in 2004, the program expanded to include 15 mine plots and 15 reference plots (far from the mine). In each of these areas, 5 sample plots for each of 3 vegetation types (heath tundra, tussock-hummock and shrub) were set up so as to reduce within site variability of

plant communities (which was high) and increase the likelihood of capturing true change in plant abundance between mine and reference areas over time. Figure 25 shows the PVP locations.

The most recent survey of the PVP's was done in 2013 and results showed that dust on vegetation may be changing the amount (abundance) and types (composition) of some plant species in vegetation types near the mine. Lichen cover on heath tundra and shrub mine plots continues to decrease over time, while the average numbers of vascular plants (e.g. grasses, small plants) in these same areas are increasing. This has also been observed in other studies looking at the effects of road dust on different types of plants.

Figure 25: Permanent Vegetation Plots



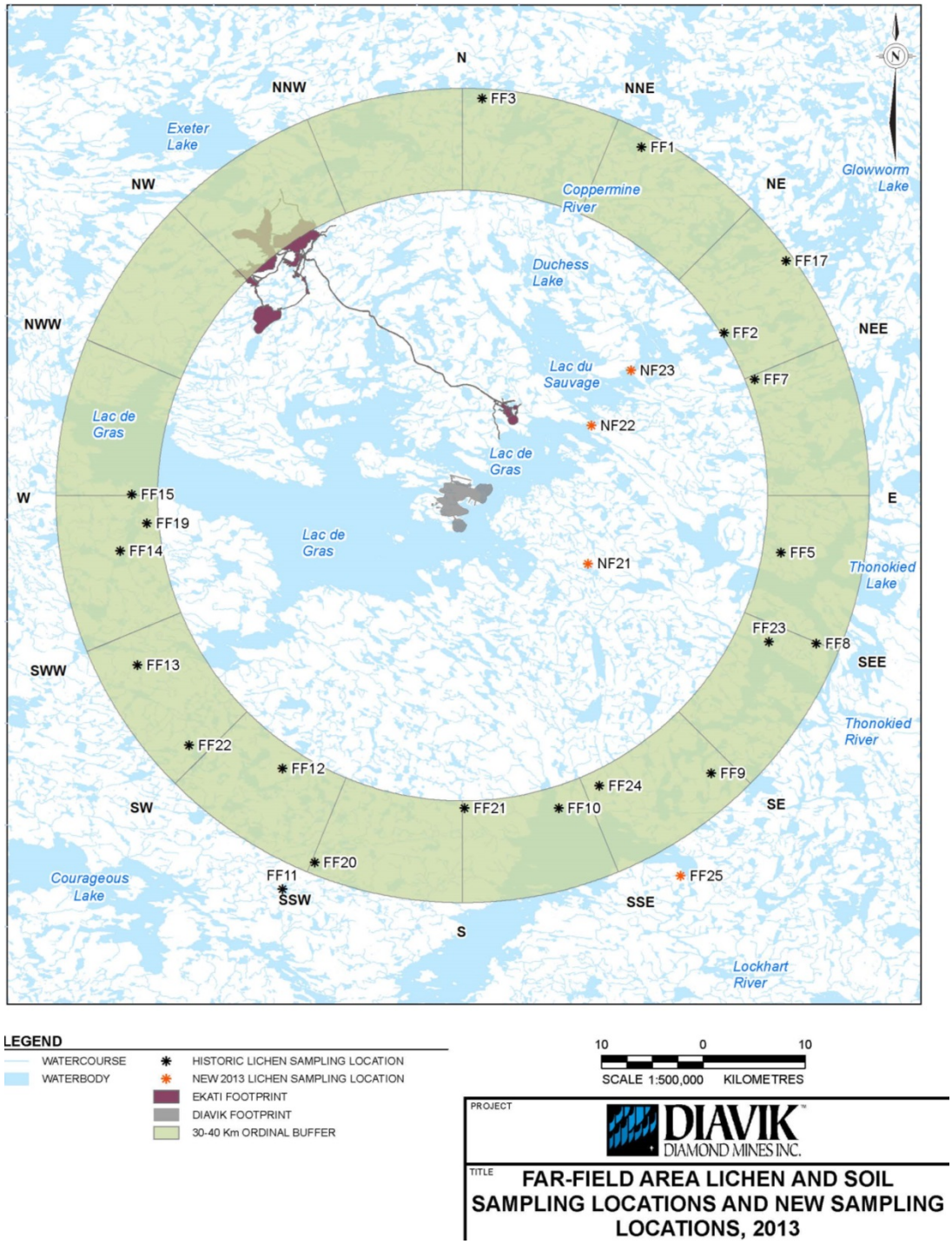
Observations of PVPs done in 2010 showed that there were more grasses and flowering plants closer to the mine versus further from the mine, and there was also lower soil lichen cover and higher litter cover values closer to versus further from the mine. During the previous sampling year, there was no ecologically significant difference in vegetation

and ground cover between mine and reference plots for each of the plant communities assessed. The map below shows the locations of the PVPs.

- A lichen study was conducted in 2013 (every three years) to determine the amount of metals in lichen from dust deposition closer to and further away from the mine. Sample areas for lichen near the mine were in the same areas as the dust collectors, while the sample sites further away from the mine were chosen by TK holders at a distance approximately 40 km (24 miles) away, as noted on Figure 26.

  The 2013 sampling program had a scientific component focusing on metal levels in lichen and soil, as well as a TK component focused on assessing the type of landscapes caribou prefer for forage, use and migration, and to assess lichen conditions at various sample sites to see how dust from the mine potentially affect caribou use of the area. During the program, Elders noticed dust on lichen in near-mine areas, but did not see dust on lichen in areas further from the mine. The analysis of metal concentrations in lichen confirmed the Elder's observations, as the amount of most metals in lichen samples near the mine were significantly higher than those further from the mine. The Elders suggested that caribou would avoid near-mine sites because of poor food quality. It should be noted that the amount of metals found in lichen during the 2013 sampling program was lower than those found in 2010; this means that a follow-up risk assessment is not necessary as the level of exposure to metals remains at a safe level for caribou. Similar to the PVP program, lichen is sampled every 3 years, with 2016 being the next year this program is scheduled.

Figure 26: 2013 Lichen Monitoring Sites



- The 2010 lichen study also looked at the metals data to find out how much dust caribou are exposed to (could eat) by eating the lichen with dust on it. With the exception of 4 metals, concentrations of all other parameters were higher close to the mine, as was expected. Aluminum levels were slightly high but the assumptions made for the risk assessment were very conservative (meaning that it was assumed that caribou feed in

the area of the mine 100% of the time). Based on the risk assessment performed, the level of exposure to metals was within safe levels for caribou.

Wildlife

Will the distribution or abundance of caribou be affected by the mine development?

EA Predictions:

- At full development, direct summer habitat loss from the project is predicted to be 2.97 habitat units (HUs). (A habitat unit is the product of surface area and suitability of the habitat in that area to supply food for caribou and cover for predators);
- The zone of influence (ZOI) from project-related activities would be within 3 to 7 km;
- During the northern (spring) migration, caribou would be deflected west of East Island and during the southern migration (fall), caribou would move around the east side of Lac de Gras; and
- Project-related mortality is expected to be low.

Observations:

- There was no direct summer habitat loss in 2014 from the mine footprint. The total loss to date is 2.6 HUs (see table below). This is less than the loss that was predicted.

Table 9: Caribou Habitat Loss by Year

Predicted Caribou Habitat Loss (HUs)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Loss to Date
2.97	0.39	0.59	0.28	0.15	0.32	0.23	0.15	0.18	0.13	0.04	0.00	0.02	0.13	0.00	0.00	**2.6**

Caribou summer habitat loss was greatest in 2001, when the majority of haul roads and laydown areas for mine infrastructure were constructed. The loss of habitat in 2008 was associated with expansion of mine infrastructure to support underground mine development. Plant loss for the species that caribou use was within the expected (predicted) amount at the end of 2010, as there was little additional development of the mine footprint.

- Golder (2005) completed a comprehensive analysis of the Diavik and EKATI caribou data from 1998 through 2007, within the regional study area for the Diavik mine. The results indicated that the estimated Zone of Influence (ZOI - the size of area where caribou avoid the mine) on the probability of caribou occurrence around the Diavik mine ranged from 22 km to 26 km for the northern and southern migration periods. In 2006, Diavik expanded the study area for aerial surveys to assess the possibility of a larger ZOI. Based on feedback received during 2008 and 2009, Diavik revised their aerial survey in 2009 in

order to survey a larger, combined footprint in cooperation with the EKATI mine. These surveys were done weekly from July to October, until caribou were no longer seen in the area. Each line flown during the aerial survey was spaced 8 kilometers apart and covered a distance 30 km away from mine development.

An external, independent review of the Diavik and EKATI survey data was done by Boulanger et al. and the results indicated a ZOI of approximately 14 km. This ZOI prediction is largely supported by stakeholders. While it is double the size of the original prediction, it does not appear to be directly related to the level of activity at the mine site. It is not known what kind of influence large lakes like Lac de Gras have on the distribution of caribou, but it is likely a contributing factor to the ZOI.

Aerial surveys have been suspended since 2009 (with the exception of 8 July to 13 October 2012), and re-analysis of the data is not expected to result in different information about the animals or their habitat use. Diavik and EKATI requested to omit the zone of influence requirements for the caribou monitoring program in 2013 and this was approved by ENR on 2 May. Additional analysis was being planned for caribou movement in the Lac de Gras area to look at the response of caribou to mines and natural environmental factors such as wind direction, landscape, habitat, lakes, and insect harassment using high frequency GPS collar locations of Bathurst caribou cows from 2009 to 2013. It is recommended that aerial surveys continue to be suspended in favour of other studies that will either examine possible reasons that may cause caribou to avoid the Mine, and/or support the GNWT Barrenground Caribou Management Strategy. The GNWT (Environment and Natural Resources) has been holding stakeholder workshops to discuss the future of caribou monitoring in the NWT.

The caribou movement analysis showed that caribou move more slowly when they are in good quality habitat. It found that more than half of the caribou paths were at least 100 km (61 mi) away from the mine and 24 km (15 mi) from the nearest lake. Previous scientific and TK research have both suggested that the amount of black flies present changes caribou behaviour. Model results showed a decrease in movement as black flies increase, suggesting that the animals remain still in the presence of high numbers of flies. The relationship between difficult terrain and the distance caribou travel supported TK observations that caribou use flatter terrain and prefer to travel along shorelines. Despite there being a low number of movement paths near lakes in this study, caribou would move more slowly and stay in an area longer when they were near a lake. The analysis also showed that caribou move more quickly as they approach and spend time near the Diavik-Ekati mine complex. Lastly, long term scientific monitoring and TK have shown that caribou were usually present around the mine area in July and August. From 2009 to 2013, caribou remained closer to Contwoyto Lake and approached the areas of the mine during the fall rut period.

- Diavik staff also completes caribou behavioural observations, or scans, throughout the summer. The goal of the program is to generate enough observations to test possible

impacts to caribou based on how they behave closer to and further from the mines. In past years, DDMI has had community Elders and youth participate in this work and contribute their input and knowledge to the program results. Caribou behavioural observations/scans (ground-based) were conducted a total of 9 times in 2014, 90 times in 2013, 86 in 2012, 104 in 2011, 83 in 2010 and 89 in 2009. Diavik works with EKATI mine to collect and share data that covers distances from less than 2 km to greater than 30 km from mine infrastructure.

A summary of key behaviours from the 2013 data has been included in Table 10 and compared with the results from the GNWT caribou surveys done in the post-calving and summer ranges (2014 data was not analyzed, due to the low number of observations). Behaviour of caribou groups from DDMI's observations were consistent with those observed from 2007 to 2009 by the GNWT. Diavik intends to focus caribou activity budgets to distances between 2 and 30 km from the site, and would also consider installing and monitoring insect trap stations in the study area, with assistance from the GNWT. This information could be used to better understand the influence of human and natural factors on changes in caribou behaviour.

Table 10: Average percent of time spent on bedded, feeding and resting behaviours by caribou groups

Activity	DDMI With Calves (38 grps)	DDMI Without Calves (52 grps)	GNWT Summer Range (2007-9)
Bedded	15.1%	14.7%	12.8%
Feeding	49.2%	49.5%	44.2%
Moving	32%	28.6%	27.2%
Other	3.7%	7.2%	15.8%

During the early years of this monitoring, Diavik had limited opportunities to study caribou behaviour on the ground through scanning observations; in 2003, 2004, 2005, 2006, 2007 and 2008, ground observations of caribou behaviour were successfully completed for 12, 14, 5, 8, 24 and 7 caribou groups, respectively.

- Data from satellite-collared animals record cows in the Bathurst herd west of the mine site during the northern migration in 2014 (Figure 27a). Collar maps for the 2014 southern migration suggest that cows remained further north longer than usual and then travelled west of Diavik later in the fall (Figure 27b). Past analysis showed that from 2002 to 2010, with the exception of 2006, caribou movement patterns agreed with the EER prediction that the majority of collared caribou would travel beside or through the southeast corner of the study area.

Figure 27a: 2014 Northern Migration of Caribou

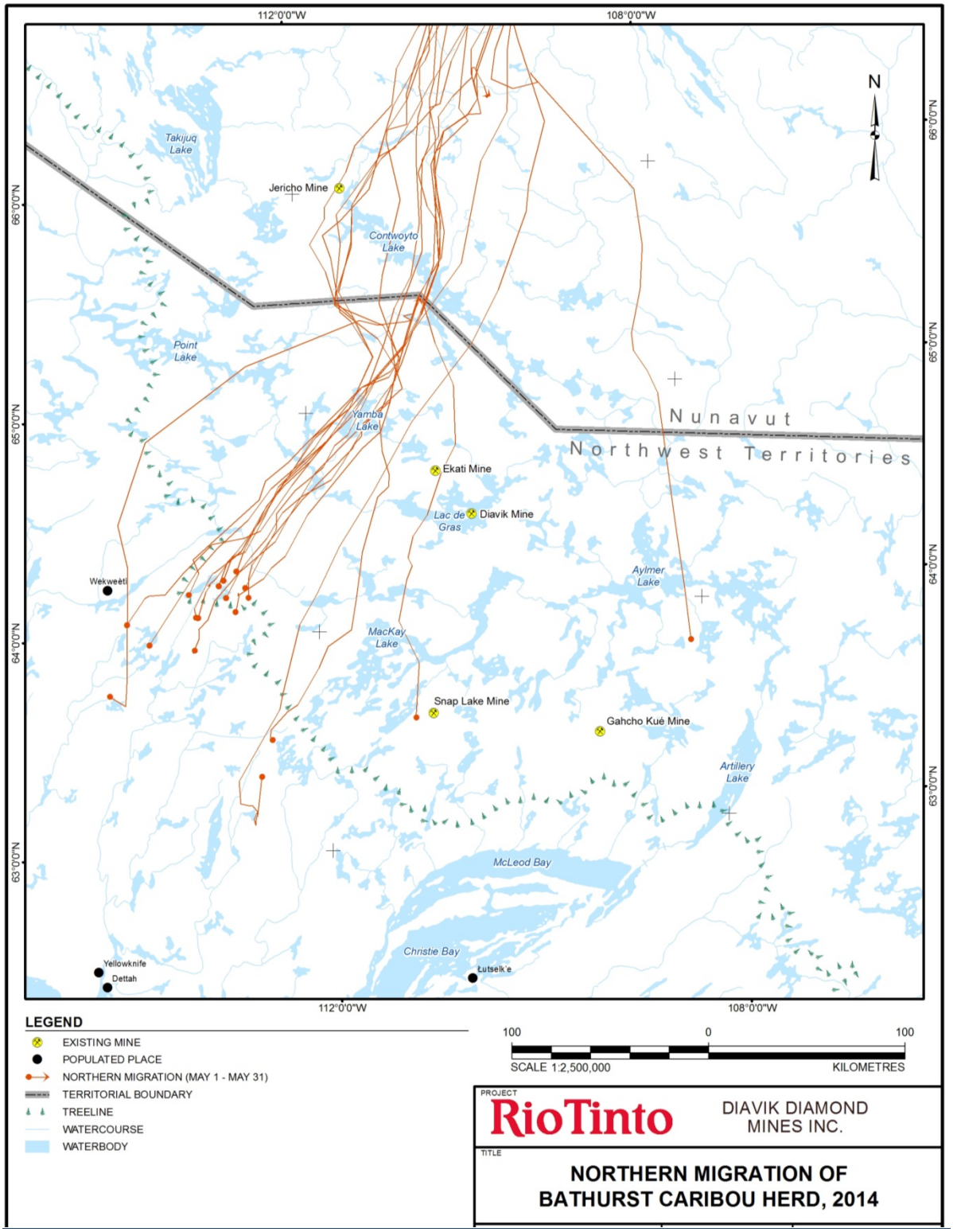
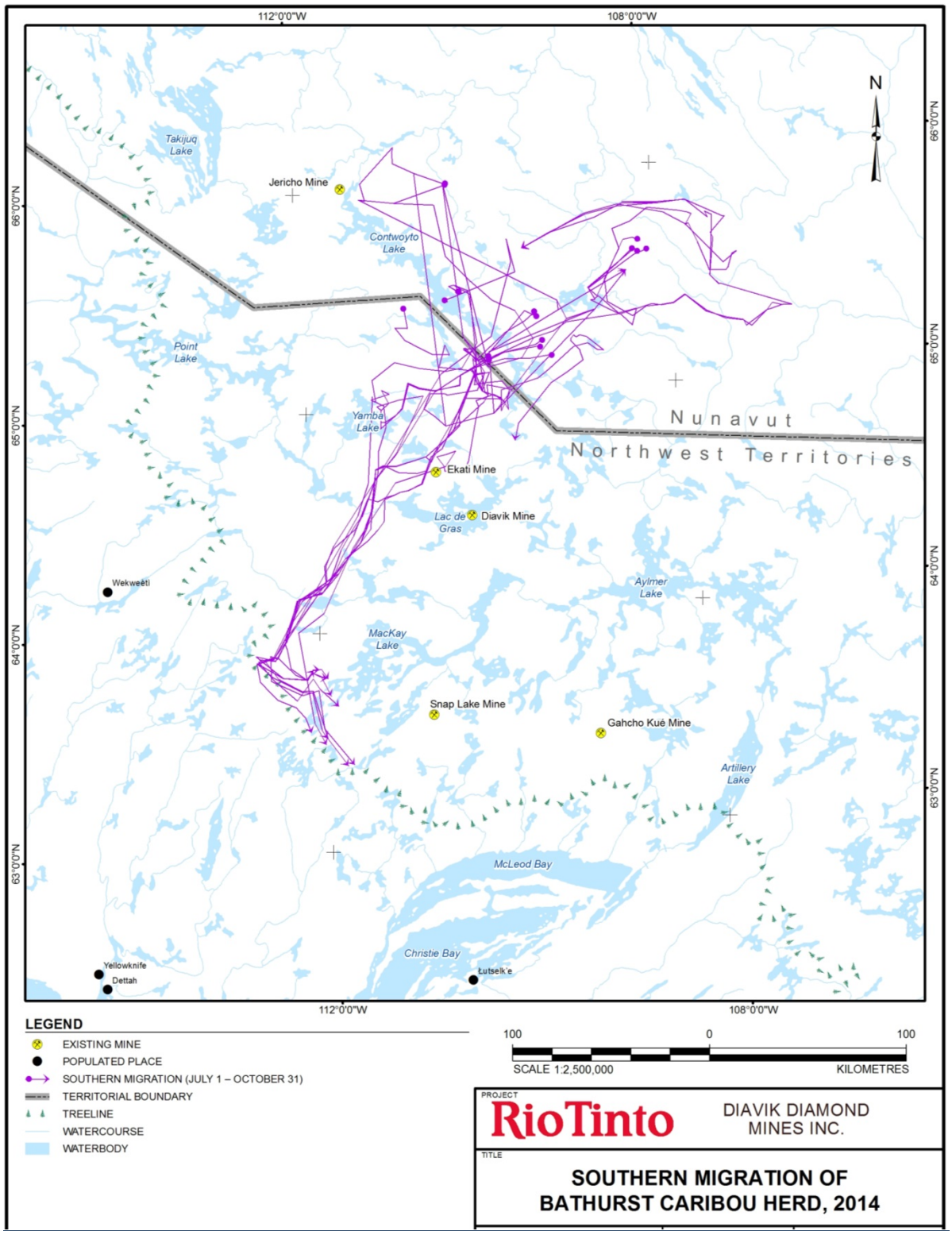


Figure 27b: 2014 Southern Migration of Caribou



- There were no caribou mortalities or injuries caused by mining activities in 2014. There was a report of a single, small caribou on the AN road on 2 May, and the following day both a wolf and a fox were separately observed in the area, each with a caribou leg. This was recorded as a natural caribou mortality. There has been only one caribou mortality caused by mining activities (2004) since baseline data began being collected in 1995.
- The level of caribou advisory monitoring remained at "no concern" (no caribou or fewer than 100 caribou) for 365 days in 2014, as it did in 2013 and 2012. A total of 58 caribou were seen on the mine site during 2014, most (56) of which were seen during the northern migration. The majority of the sightings were single animals, but there was one group of 18 animals on 29 April and one group of 30 animals on 30 May.

  For all days in 2008, 2007, 2006, 2005, 2004, and 2003, the sign remained at "no concern'. The sign was changed to 'caribou advisory' from 7-27 October 2011 due to a herd of approximately 200 caribou on the southwest side of the east island. On one day in 2009 (29 April) the board was at "Caribou Advisory" due to 150 animals off the south road. "Caribou Advisory" was also posted for 29 October 2010 when 120 animals were spending time on the south side of the island. The sign was at 'no concern' for 362 of 365 days in 2002.
- Caribou road, rock pile and PKC surveys were discontinued in 2014 in favour of ground-based surveys conducted in response to caribou presence. These surveys were conducted over 50 times per season since the mine began operating in 2003 (a total of over 600 surveys) and very few caribou had ever been observed. For this reason, it was recommended to only conduct surveys when collar data indicate that caribou are within 5 km of the mine, or when caribou are reported on the island by employees, environment staff or pilots.
- One herding event took place on 10 May 2014 in order to move a single caribou away from entering the PKC area. No caribou herding events took place in 2013 or 2012. In 2011, caribou were required to be herded away from mine infrastructure three times. There were also two herding events in 2009 – one for 27 animals near the airstrip with an incoming flight and one for a single caribou walking on the Type I rock pile. Very few herding events have been required since the mine began operating.

Will the distribution or abundance of grizzly bears be affected by the mine development?

EA Predictions:

- Approximately 8.7 km^2 of grizzly bear habitat will be lost and there will be some avoidance of the area, but the abundance and distribution of grizzly bears in the regional area will not be affected measurably;
- The maximum zone of influence from mining activities is predicted to be 10 km; and,

- Bear mortalities due to mine related activities are expected to average 0.12 to 0.24 bears per year over the mine life.

Observations:

The table below shows the grizzly bear habitat that has been lost to date (in square kilometers), which falls within what was predicted. Plant loss for the species that grizzly bear use was also within the expected amount at the end of 2014.

Table 11: Grizzly Bear Habitat Loss by Year

Predicted Grizzly Habitat Loss (km^2)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Loss to Date
8.67	1.25	1.62	0.94	0.42	0.93	0.69	0.43	0.50	0.26	0.12	0.00	0.06	0.39	0.03	0.04	**7.61**

- There were a total of 69 grizzly bear visits to site from 17 May to 6 September 2014. Three of these sightings were of a sow with two cubs. This number is not considered to be the number of bears in the Diavik area, as it is likely that these sightings include multiple observations of the same bear. The number of grizzly bear sightings in any given year does not appear to be influenced by the number of people on site (Table 12).

Table 12: Average Camp Population and Number of Incidental Grizzly Bear Observations, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average # people in camp	1100	470	397	646	716	747	979	562	579	630	629	537	484
# Grizzly Bear Seen on island	5	19	24	43	21	41	5	22	44	56	97	67	69

- The calculated mine mortality rate for grizzlies since 2000 is 0.07, which is below the range predicted. One mortality occurred at the mine in 2004. A total of 39 deterrent events were done in 2014.
- Grizzly bear habitat surveys were conducted from 2001 to 2008, but they were not successful at determining a ZOI for bears within the study area. Diavik started looking at safer ways to get similar information and ran a trial study for hair snagging techniques (i.e. no DNA analysis) using the old habitat plots in 2010. A total of 47 hair samples were collected. EKATI mine also conducted a pilot program in 2011 to test a different post design and lure than what was used in the trial study conducted by DDMI in 2010. The two mines then jointly reviewed the results of both pilot (trial) programs in consultation with communities and regulators and Diavik submitted a request to remove the Zone of Influence monitoring requirement; this was supported by GNWT-ENR and EMAB.

  A new study design and methods were developed to study grizzly bears in the Diavik and EKATI mine areas in 2012, as well as for De Beers Canada Inc. properties. TK/IQ was used

to identify the preferred habitat of grizzly bear and then determine the location in which to set the 113 posts to collect hair samples. Community assistants were also involved with post construction and deployment. The study was conducted in the summers of 2012 and 2013, in cooperation with the EKATI mine, and De Beers joined in 2013. The number of posts with grizzly bear hair varied throughout the 6 sampling sessions each year. In 2012, it ranged from 20% to 44% of posts, while in 2013 it was between 46% to 57%. The GNWT is planning a workshop in November 2015 to discuss the methods and timing of future monitoring for this program.

Will the distribution or abundance of wolverine be affected by the mine development?

EA Predictions:

- The mine is not predicted to cause a measurable shift in the presence of wolverines in the study area; and
- Mining related mortalities, if they occur, are not expected to alter wolverine population parameters in the Lac de Gras area.

Observations:

- Wolverines were observed on East Island 6 times during 2014. See Table 13 for historic visitations, relocations and mortalities.

Table 13: Wolverine Observations, Relocations and Mortalities, Baseline to 2014

	Baseline[(a)]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Days with Visits	27/year Total = 82	25	36	4	38	14	43	31	19	46	21	28	4	11	3	6
Relocations	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities	1	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0

[(a)] Includes wolverine occurrences recorded at three different camps (i.e. Diavik, Kennecott, and/or Echo Bay Road camps) annual numbers are not available for baseline investigations.

- The number of occurrences of wolverine on East Island in 2008 was higher compared to other years (46); however it is important to realize that many of the sightings were of a male animal that was denning under South Camp and another wolverine that had a snow den on the west side of East Island.
- Snow track surveys began in 2003, and have been conducted with the assistance of community members, as available. In 2008, Diavik revised the wolverine track survey in favour of an increased number of transects of standard length compared to the surveys completed in previous years. They are 4 km straight lines that are randomly distributed

throughout the study area, but some bias is placed on tundra areas identified as preferred habitat for wolverine based on TK.

Diavik conducted wolverine snow track surveys in 2014. A total of 25 tracks were found from 23 to 26 March 2014, with an average track density of 0.13 (per kilometer) for all transects. Over the years the number of tracks identified has remained relatively consistent.

Table 14: Wolverine Track Index, 2003-2014

Year	Survey Period	Number of Tracks	Distance Surveyed (km)	Track Index (Tracks/km)
2003	April 10 – 12	13	148	0.09
2004	April 16 – 24	22	148	0.15
2004	December 2 - 8	10	148	0.07
2005	March 30 – 31	7	148	0.05
2005	December 7 – 12	18	148	0.12
2006	March 30 – 1	5	148	0.03
2008	April 30 – May 2	15	160	0.09
2009	April 2 – 4	11	156	0.07
2010	No community assistant available			
2011	March 30 – April 3	23	156	0.15
2012	March 28 – April 3	22	160	0.14
2013	April 2 – 6	26	156	0.17
2014	March 23 – 26	25	160	0.13

In years when snow track surveys are completed for wolverine, Diavik has recommended increasing the frequency that transects are surveyed so that they would be done twice between mid-March to mid-April. The purpose of repeating the surveys would be to account for imperfect detection of wolverine snow tracks.

- Diavik participates in a joint research program with the GNWT and EKATI mine in certain years. This program was conducted at Diavik in 2005, 2006, 2010, 2011 and 2014. Up to 2011, a total of 50 individuals (25 males, 25 females) were identified in the Diavik area in 4 years of the program. DNA sampling occurred again in spring 2014, and 16 individuals were identified, nine males and seven females. Seven of the wolverine identified in 2014 had been previously detected in the Diavik area. Interestingly, two individuals identified in the Diavik area this year were also seen in the Snap Lake study area. A similar declining trend in the number of wolverine in the Diavik study area has been seen with both the wolverine track survey and the DNA hair-snagging study.

Will the distribution or abundance of raptors be affected by the mine development?

EA Predictions:

- Disturbance from the mine and the associated zone of influence is not predicted to result in measurable impacts to the distribution of raptors in the study area; and
- The mine is not predicted to cause a measurable change in raptor presence in the study area.

Observations:

- Productivity and occupancy surveys were conducted annually in the Daring Lake, Diavik and EKATI study areas, cooperatively with the GNWT and EKATI mine, from 2000-2010. The falcon monitoring results from Daring Lake have been used as control data for productivity from an undisturbed area. Previously identified potential nesting sites were visited by helicopter in May to determine if nesting sites were occupied, and again in July to count any young in the nest.

  Nest occupancy remained relatively high in the Lac de Gras region throughout those 10 years (raptors were preferentially using the area within 14 km of the mine), supporting the prediction that mine activity levels would have a negligible impact on the presence and distribution of raptors in the study area. Annual changes in nest success were also not related to the level of activity at the mine site.

  As a result of these findings, discussions during the wildlife monitoring program review process from 2009-2011 supported a change in falcon monitoring methods to align with the Canadian Peregrine Falcon Survey (which in turn is aligned with the North American Peregrine Falcon Survey). This survey is conducted across Canada (and North American) every five years, with 2015 being the next planned monitoring year.

- Chick production in past years has ranged from zero to seven in the DDMI study area. Observations made over the years were consistently similar to those of the control site at Daring Lake, where productivity and occupancy rates have changed little since baseline.

Table 15: Falcon Nest Occupancy and Production at Diavik and Daring Lake, 2000 to 2010

Year	Survey Area	Total Sites	Occupied	Productive	Total Young
2000	Diavik	6	2	2	5
	Daring	-	-	-	-
2001	Diavik	6	2	0	0
	Daring	13	3	1	3
2002	Diavik	6	4	1	3
	Daring	18	10	9	15
2003	Diavik	6	1	0	0
	Daring	10	5	3	4
2004*	Diavik	6	5	4	7
	Daring	12	6	1	2
2005*	Diavik	6	3	1	2
	Daring	10	5	1	1

Year	Survey Area	Total Sites	Occupied	Productive	Total Young
2006*	Diavik	6	3	0	0
	Daring	10	4	1	3
2007*	Diavik	6	3**	2	7
	Daring	10	1	2	8
2008*	Diavik	6	5***	2	3
	Daring	12	6	3	4
2009*	Diavik	6	4	2	5
	Daring	12	5	3	6
2010*	Diavik	8	6	3	7
	Daring	12	5	3	7

Daring Lake data originates from the Daring Lake research station (S. Matthews, personal communication, ENR).
*Diavik data includes spring (occupancy only) and summer (productivity only) monitoring data. Previous occupancy values based on productivity survey only.
**Occupancy data for May provided by BHPB and GNWT – site DVK 11 not checked
***Does not include additional site (DVK 19-1) found occupied during the June survey

- Since May 2005, peregrine falcons have been seen nesting on Diavik buildings and pit walls. A total of 31 pit wall/mine building inspections were carried out in 2014, with 3 active nests found (2 with rough-legged hawks, 1 with peregrine falcons). Four peregrine falcon nests were seen in 2013 and one in 2012, but no raptors were found nesting at the mine site in 2010 or 2011.

Table 16: Nests Observed on Mine Infrastructure and Open Pits in 2014

Area	Species	Date	Active Nest	Observations
A154 Lookout #1	Rough-legged hawk	May 15	No	300 m SE of south pit wall; occupied on 30 May and 1 June; nest no longer occupied from 4 June onwards.
A154 Lookout #2	Peregrine falcon	May 15	No	Nest observed on 15 May; birds present again on 26 May; no longer occupied after 30 May onwards.
A418 Lookout #1	Rough-legged hawk	June 1	Yes	Nest observed on 1 June; one fledgling observed in nest on 7 & 10 June; no activity after 14 June.
A418 Lookout #2	Rough-legged hawk	May 23	Yes	Nest observed 23 May; bird observed 30 May; fledgling observed 16 June; no known activity after 19 June.
Site Services Building	Peregrine falcon	June 1	Yes	Nest observed on 1 June; 1 fledgling seen on 25 June and 7, 10 & 21 July; 3 fledglings on 13, 22 & 25 July and 3 August; 2 fledglings on 20 July; nest no longer occupied as of 13 August.
Boiler House	Common raven	June 1	No	Nest observed on 1 June; nest no longer occupied as of 25 July.

- There were no falcon deaths at the mine in 2014. Two falcon mortalities occurred at the Diavik Mine site in 2013. On 20 July 2013, a peregrine falcon carcass with 3 wounds was found by the A154 dike; it is suspected to have hit a power line. On 17 November 2013, a juvenile carcass that had been heavily scavenged was found below the ore storage area in the A154 pit. There was no nearby infrastructure that would indicate that the mortality

resulted from the Mine. No falcons died because of mine operations from 2009 to 2011, but one peregrine falcon was found dead in 2012.

Will the distribution or abundance of waterfowl be affected by the mine development?

EA Predictions:

- At full development, 3.94 km^2 of aquatic habitat will be lost; and
- The mine is not predicted to cause a measurable change in waterfowl presence in the study area.
- Early open water or early vegetation growth might attract waterfowl during spring migration.

Observations:

- By the end of 2007, a total of 2.56 km^2 of shallow and deep water habitat had been lost due to mine development, and there have been no additional shallow or deep water areas developed since that time. Therefore the total area of water habitat loss remains below predictions.
- East Island shallow bays (natural bays in Lac de Gras) and mine-altered water bodies (ponds that have been changed or created for the mine site) have been surveyed annually, on a daily basis, over a 5 week period during the peak spring migration (late May to late June) for waterfowl presence from 2003 to 2013. The results of surveys indicate that Mine-altered water bodies are used by water birds, including ducks, geese, gulls, loons and shorebirds, during spring. However, the range of dates when water birds are first detected do not support the predictions that waterfowl or shorebirds are using mine-altered water bodies earlier than the East and West bays. As there is no similar control site that can be used for the shallow bays (they are a unique feature of the region), detailed statistical analysis on waterfowl presence is not conducted. Over the years, almost 20 different species of shorebirds have been observed, in addition to 5 species of dabbling ducks, 14 types of diving ducks and 4 kinds of geese. Each year, the shallow bays have the highest abundance of birds, followed by the north inlet. Overall, data collected suggest that construction and operation of the mine has had little effect on the presence of birds in the area.

  Diavik consulted with Environment Canada, EMAB and other stakeholders about removing the requirement to monitor bird species abundance and diversity at East and West bays, given the results to date. This monitoring program was discontinued in 2014. Diavik plans to review opportunities to contribute to regional monitoring databases through either participation in the Program for Regional and International Shorebird Monitoring (PRISM) or the North American Breeding Bird Survey (NABBS).

- Diavik has been operating 4 wind turbines since September 2012. During consultations with Environment Canada (EC) prior to installation, it was noted that no post-construction follow up monitoring for bird fatalities is required. However, Diavik voluntarily implemented a post-construction monitoring program in 2013 to assess the potential direct impacts the wind farm may have on birds. Surveys for bird carcasses below the turbines were undertaken to estimate bird strikes. Monitoring was completed by Diavik personnel twice per week, within a 50 meter radius of each turbine using the Baerwald Spiral method. In 2013, a total of 23 inspections were completed at the wind farm during post-construction mortality monitoring between 11 June and 23 August and no bird carcasses were observed. Instead of continuing with the more formal Baerwald surveys, Diavik now includes monitoring for bird mortalities at the wind turbines as part of the overall site compliance monitoring program.

- No birds have been killed at the mine site from 2011 to 2014. Four other project-related bird mortalities have occurred, one each in 2010, 2009, 2005 and 2002.

5. Traditional Knowledge Panel: Re-vegetation

The TK Panel identified an interest in having a session focussed on re-vegetation during the summer of 2014. They recommended that women be included in such discussions, as they are traditionally much more familiar with plants. DDMI organized TK Panel Session 7 as a site-based, re-vegetation discussion from 14-18 August 2014. At DDMI's request, each PA organization arranged for a woman representative to assist with the Panel, and breakout sessions were scheduled to ensure that participants had a comfortable space in which to share their knowledge. Field work opportunities were also scheduled, and Panel members identified their priorities for this work. An EMAB representative was also available to attend part of the August 2014 session as an observer. The key questions posed to the Panel in relation to re-vegetation were:

- How do we re-vegetate to keep wildlife safe?
- Which habitats or plants create safety for wildlife?
- Where should different types of habitats or plants be placed?
- What should DDMI do with site roads?

Panel members and facilitators have incorporated a cross-cultural approach to learning that has demonstrated an increased understanding of the technical challenges associated with closure and has resulted in more practical recommendations from the Panel.

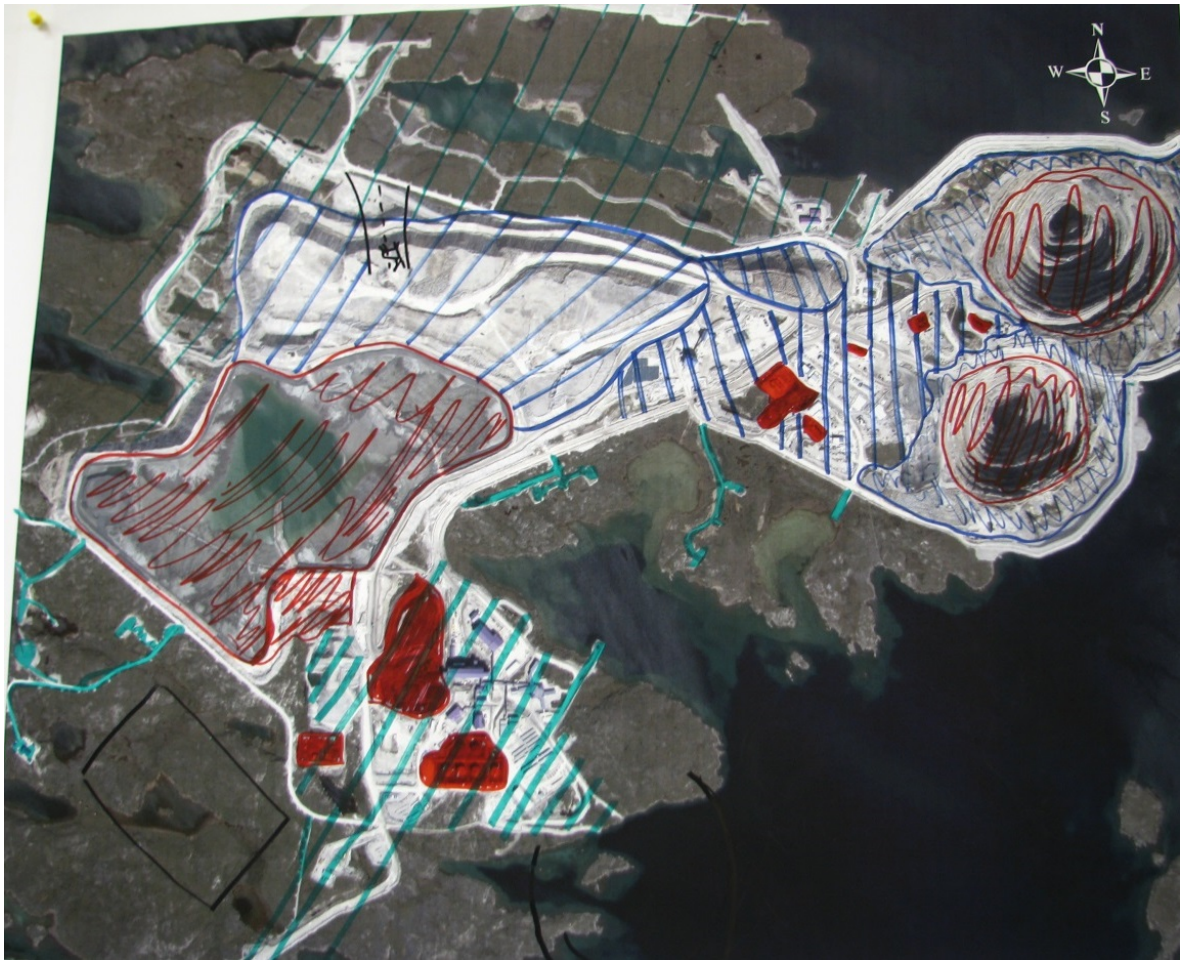
The concept of re-vegetation was difficult for many TK Panel members to consider, largely based on a fundamental belief that nature is powerful and will heal itself, and that interfering with this process is disrespectful. After much discussion, many of the Panel members acknowledged that there is value in assisting the re-vegetation process, given that disturbance from mining is more extensive than the natural range of disturbance (e.g. flood). There was much discussion as to

whether re-vegetation efforts should attract or deter wildlife. One of the most useful exercises during the session involved participants marking a map of the mine site according to the following 3 categories:

- areas you don't want wildlife to go (red);
- areas you want to encourage re-vegetation or re-growth (green); or,
- areas to encourage wildlife passage through modifications (e.g. landscaping) (blue).

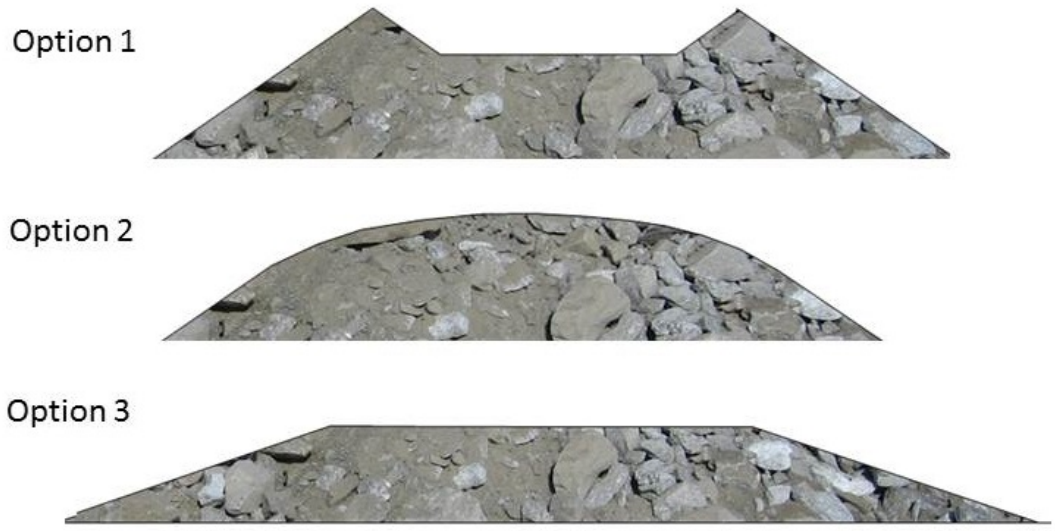
The resulting map (Figure 28) that was developed by the women was most supported by the Panel and will serve as a useful tool for engaging community leadership and members on this topic. Generally, areas that are seen as contaminated and a risk for wildlife were coloured red (e.g. former fuel & waste storage areas, open pits), low use or natural habitat areas were coloured green (e.g. plant site, laydown areas, wind turbine pads) and landforms considered as obstacles or barriers for wildlife were coloured blue (e.g. north country rock pile, dikes). There was disagreement among some Panel members in relation to vegetation use in the north inlet area; members determined that they require more information on pond water quality before determining how this area should be classified.

Figure 28: Site Map Indicating TK Panel's Preferred Re-vegetation Design for Closure



Panel members also evaluated three design options for site roads at closure (Figure 29). While the Panel's overall preference is to avoid further disturbance to areas of natural vegetation, all Panel members acknowledged that road berms should be pushed out to allow for safe wildlife passage (Option 3). It was determined that any loss to natural vegetation for this reason was acceptable. Similarly, Panel members felt that if development of A21 should proceed, the associated rock pile should be wider at the base to allow for a lower pile height. Again, while this would result in a greater loss of natural vegetation, the benefit of safe wildlife passage post-closure was viewed as more important than the vegetation loss.

Figure 29: Design Options for Site Roads at Closure



Two other areas of interest for the TK Panel were the airstrip and north country rock pile. Many Panel members felt that there is benefit in leaving the airstrip intact. There was discussion over the maintenance, liability and ownership requirements if the airstrip were to be registered, versus simply leaving it 'as is' and letting nature takes its course. Overall, many Panel members saw value in having an emergency landing option for future aircraft operations in this region. Lastly, the north country rock pile is considered a barrier and hazard to caribou in its current state. Past recommendations from the Panel have addressed considerations such as flattening the berms on top of the pile, smoothing the slopes and rounding the top edges of the pile. This session resulted in a desire to create safe access for caribou over the pile. This generally translated to creating access ramps on the north and southeast sides of the pile, together with a trail across the top of the pile that would connect these areas. However, Panel members are also interested in reviewing traditional caribou trail maps from DDMI's baseline work to confirm that this is the best route for which to encourage caribou to use. The smooth surface and slope of the capped test rock pile was seen as acceptable for safe wildlife passage by members of the TK Panel, largely because there were no exposed large boulders that could injure caribou hooves and legs.

The Panel also requested that a literature review be conducted to identify the existing traditional knowledge available on plants in the Lac de Gras region. DDMI commissioned Thorpe Consulting Services (TCS) to conduct this high-level review, as they also serve as facilitator for the TK Panel. DDMI also had the University of Alberta (U of A, who conducts re-vegetation research at the mine site) conduct a review of the scientific literature available on re-vegetation in the north. The goal of the TK literature review was to identify any existing TK on vegetation that could inform the Diavik closure plan and be used as a reference for the TK Panel and communities when considering ecosystem needs at closure, from an Aboriginal perspective. While much of the existing, documented TK is focused at species level, there were some learnings from this review that could help to inform DDMI's closure planning process. Additionally, gaps in the TK literature were also identified and can be used to provide guidance to future efforts of various stakeholders related to TK research of vegetation. Most importantly, the review helped to identify "indicators" of healthy land or wildlife populations, as Aboriginal people's survival relied on this knowledge when living on the land. Accordingly, many of these same indicators help communities understand the changes they see as a result of development. These same observations and indicators could therefore be useful in communicating closure plans and developing post-closure monitoring programs that are relevant and understandable to communities.

The purpose of the complementary literature review by U of A was to evaluate reclamation projects conducted in the north and determine their potential application to current or future reclamation research and closure planning for the mine. A total of 226 references were examined as a part of this review.

Predictably, many challenges were found in relation to plant growth and reproduction given the harsh northern climate in which reclamation occurs. For diamond mines, low water content in substrates has been found to be the most limiting factor. Other physical challenges include: soil structure, erosion by wind and water, short growing season and grazing by wildlife. Limited knowledge of many northern species may also confound research efforts, including dormancy of seeds and shoot cuttings and optimal seasons to harvest. Lastly, mosses and lichens are critical for healthy tundra communities, but little is known on which types of moss and lichen establish best in northern climates, or how to propagate them.

Some successful examples of reclamation methods were also captured in this review; however, results indicate that site-specific conditions greatly influence the level of success of any given method. Identification of substrates available for reclamation, and knowledge of how best to combine such substrates to develop preferred soil properties is essential. Amendments to substrates are also important in developing appropriate soil structure and nutrient availability, as these are not commonly available in existing diamond mine substrates (e.g processed kimberlite, lake bed sediments). Fertilizer is likely to be necessary, and optimum performance is expected if maintenance applications are used to assist with succession over multiple years. Salvaged topsoil from nearby areas of natural vegetation has proven very effective in multiple reclamation research projects. Erosion control methods have been developed that may assist with seed loss

due to high winds common in northern climates. Microsites have also proven effective in protecting seeds and plants through the development process, but it can be a fine balance.

Despite increasing research efforts, knowledge of long term soil and plant community development is still limited, largely due to poor documentation and inconsistent monitoring. While natural recovery may occur, it would be slow; therefore, assisted recovery is recommended for re-establishing soil and vegetation at disturbed sites.

6. Operational Activities

The information below provides a summary of the operational activities that occurred during 2014. More detailed information can be found in the Type 'A' Water License annual report.

- Required SNP stations were sampled during each month. Where samples were unable to be obtained (e.g. safety concerns, weather, equipment issues), samples were re-scheduled or postponed. There was one oil and grease exceedance at 1645-18 in October that was determined to be a lab error. Some higher levels of zinc were found in samples analyzed between June and November 2014. This concern was investigated and it was determined that the gloves used for sampling water were introducing zinc into the samples. The brand of nitrile gloves used by environment staff was changed.
- The Tibbitt to Contwoyto Winter Road operations were successful and Diavik trucked 3,149 loads to the mine site, and backhauled stored hazardous wastes for off-site recycling or disposal.
- Quarterly toxicity samples from stations 1645-18 and 1645-18B were collected in March, June, September and December with no concerns identified.
- The AEMP was conducted in April and August.
- Annual snow core surveys were completed in April.
- Wolverine track surveys were done in March.
- Inspections for raptor nest sites on mine infrastructure & pit walls ran from May to October.
- The PKC dam raise (Phase 6) continued in 2014, with a final elevation of 465 m on the north and east sections.
- Diavik's re-vegetation research with the University of Alberta continued through the summer of 2014.
- The TK Panel met at the mine site to discuss re-vegetation at closure.
- Caribou activity budgets/behavioural observations were done from September to October.
- The average camp population for the year was 483.

- The final open pit bottom elevations are 9055 (A154) and 9125 (A418); the surface of the water on Lac de Gras is 9415.26 m asl.
- A total of 7,771 m was developed underground, including 3,196 m of waste rock and 4,575 m of ore development.
- In addition to regular mine water collection pond dewatering activities, the following operational and construction projects were carried out in 2014, and are planned to continue into 2015:

  Surface Projects

  - PKC Phase VI Dam Raise 9460 m to 9465 m asl (East and North sections)
  - Deconstruction of the Type I Test Pile
  - A21 access road upgrades

  Underground Projects (numbers below are associated with levels (masl) in the mine)

  - SLR Bulkheads constructed on A9125
  - Mine Dewatering piping installed between D8975 and D8950
  - Ore Pass #6 A9065 – A8995
  - A9080 – A8995 Escapeway
  - Mine Dewatering piping Installed A9065 – A8995
  - N9025 – N8950 Escapeway
  - A8995 Pump Station
  - D8925 Pump Station excavation
  - D8925 Level Sump
  - S8950, N8950, A8995 MLC (electrical sub-stations)
  - N9000 MCC (electrical room)
  - A9085-A9045 Vent Raise and Fan Install
  - A9085 Ore Handling Dump points
    - North B-Block Grizzly (screen) Construction

References for Further Information

Water Quality

- Monthly Surveillance Network Program (SNP) Reports
- 2014 Type A Water License Report
- 2014 Seepage Survey Report
- AEMP Study Design, Version 3.5 (2014)
- Three Year AEMP Results Summary for 2011 to 2013

All reports: http://www.mvlwb.ca/Boards/WLWB/SitePages/search.aspx?app=W2007L2-0003

Wildlife

- 2014 Wildlife Monitoring Report (EMAB Public Registry)
- 2012 Wildlife Monitoring & Management Plan (EMAB Public Registry)
- 2014 Comprehensive Analysis (EMAB Public Registry)
- Waterbird Comprehensive Analysis , 1996-2014 (EMAB Public Registry)
- 2012 & 2013 Grizzly Bear DNA Study Report (EMAB Public Registry)

Re-vegetation/Traditional Knowledge

- ICRP 2014 Annual Update
- TK Panel Session #7 Final Report: Re-vegetation
- Literature Review: Traditional Knowledge of Plant Life at the Diavik Mine
- Reclamation of Disturbed Sites in the North: Implications for Diamond Mines, A Literature Review

All reports: http://www.mvlwb.ca/Boards/WLWB/SitePages/search.aspx?app=W2007L2-0003

Air Quality

- Air Quality Monitoring Program (EMAB Public Registry)
- 2013-2014 Air Quality Monitoring Report (EMAB Public Registry)
- National Pollutant Release Inventory (http://ec.gc.ca/inrp-npri/donnees-data/index.cfm?do=facility_substance_summary&lang=en&opt_npri_id=0000018241&opt_report_year=2011)

Socio-economics /Sustainable Development

- 2014 Sustainable Development Report (http://www.diavik.ca/ENG/resources/661.asp)

Management & Operating Plans (as per Table 2)

http://www.mvlwb.ca/Boards/WLWB/SitePages/search.aspx?app=W2007L2-0003

Appendix I

Summary of Adaptive Management & Mitigation Measures

Table I-A - Adaptive Management & Mitigation

Aspect	Compliance	Adaptive Management Response	Mitigative Measures	Effectiveness of Measures
Waste	- Minimize waste management issues. - Maintained dump site for inert waste materials. - Waste rock is managed to reduce the chance of acid runoff	- All domestic and office wastes are incinerated at the waste transfer area. - Use of clear plastic bags in all areas for domestic and office space waste. - New WTA facility incorporated access road around the facility to allow equipment access and snow removal during winter to reduce opportunities for animals to climb over the fence; fencing angled and extended further in to ground to prevent access to burrowing animals; extensions placed on gate & gate automated in an effort to prevent animal access; improved sump facilities for contaminated soil containment area. - New incinerator housed in a building to further prevent animal attraction & rewards. - New, more efficient incinerator that burns more cleanly & completely. - Inert solid waste facility (landfill) access restricted. - Liner repairs conducted in areas where seepage from the dam was found. - More instrumentation was added in some areas to monitor dam and rock pile temperatures and movement. - Seepage monitoring stations changed in response to observations over the years. - Re-vegetation research is testing the use of waste rock as a substrate for plant growth.	- All employees and contractors are provided orientation on proper waste management. Color-coded collection bins and posters for non-food waste around site. - DDMI Environment Staff conduct regular toolbox meeting discussions regarding waste management. - Regular waste inspections are conducted by Environment Staff at the Waste Transfer Area and Landfill. A site-wide compliance inspection is completed weekly. - Site Services implemented clear plastic bags in all domestic and office areas to allow staff to verify contents prior to disposal. - Surface Operations staff collecting waste bins inspect bins prior to pick-up and notify Environment department to arrange for sorting. - Gate installed at inert solid waste facility to limit access to dump area. - Waste rock is classified according to sulphur level and is tested and sorted prior to disposal. - The waste rock pile is designed to encapsulate the rock with the highest sulphur content, and the PKC contains the waste kimerlite rock; each of these areas are surrounded by collection ponds to capture any seepage or runoff. - Granite (lowest sulphur content) is the rock permitted for use as a construction material at the mine site. - Instruments were installed to monitor performance of structures such as the PKC dam and the rock pile. - Extensive lab and field (test piles) experiments are done to test how the rock pile will perform. - Sewage sludge holding cell relocated to prevent human health concerns. - Installation of a waste oil heater for the batch plant. - New approach to waste management plans includes Solid Waste & Landfill, Hydrocarbon Contaminated Materials and Incinerator Management plans.	- During Inspector's visits in 2014, no concerns were raised regarding food waste, or the landfill. - Bear visits on East Island remained similar to 2013 & bears sightings were not associated with waste management areas. - Improper disposal of waste is identified during DDMI waste inspections (including food waste) despite training and awareness sessions with site staff, but it is minimal when compared to the volume of waste disposed. - Sulphur testing has been an effective means of rock segregation. - Installation of seepage collection wells has proven effective. - Seepage and runoff events have occurred in the past, but there were no such events in 2014. - Monitoring efforts and data were helpful in designing seepage program changes. - Type I test pile scheduled for removal during 2014-15 because study of this structure is complete. - Significant efforts undertake to identify, inventory, remove, re-use or dispose of site infrastructure as a means of progressive reclamation.

Aspect	Compliance	Adaptive Management Response	Mitigative Measures	Effectiveness of Measures
Water	- Effluent is treated before being discharged to Lac de Gras, or is recycled. - Ammonia levels within water license limits. - Prevent seepage water entering Lac de Gras - Seepage water quality to be within license limits. - Decrease freshwater use. - Have fish and water quality that are safe for use.	- Review loading and blasting procedures and materials for opportunities to reduce ammonia levels in pit and underground water. - Re-use North Inlet water as supply water to facilities at the mine site. - Treatment plant expanded and some components re-designed to accommodate additional water flow from underground. - Evaluated the use of treated effluent for dust suppression. - Conducted a study with the University of Alberta to evaluate the biological removal of ammonia and other nitrogen compounds in the North Inlet. - Special Effects Studies (SES) are completed when unexpected effects are measured during the AEMP. - Established Action Levels to respond to findings of various parameters of the AEMP. - Evaluate seepage prevention or interception methods upstream or downstream of areas of concern. - Investigate, assess and repair site infrastructure where seepage issues arise, and where possible.	- The North inlet provides retention time for mine water before treatment, allowing for ammonia reduction by natual attenuation; mine water discharge located far away from treatment plant intake. - Influent and effluent in the NIWTP is monitored consistenly via instream sensors (immediate feedback) and the SNP for parameters that are indicators of water treatment effectiveness. - Daily sampling of pit, underground & effluent water to produce trends & track compliance. - Plant able to automatically stop discharging treated water that meets or exceeds DDMI's *internal* limits (which are set below the water license limits). - Sulphuric acid is available for secondary treatment of water with high ammonia levels. - Ammonia Management Plan followed to minimize ammonia loss; includes use of blast hole liners to reduce ammonia dissolution in water and limiting holding times for loaded blast hole patterns to 4 days for wet holes and 2 days for sump blasts. - Batch and paste plants utilize treated effluent as a water source instead of fresh water. - Sumps and pumps installed underground to collect and transport water to the North Inlet. - Ability to re-use water from the North Inlet and PKC, prior to treatment, to reduce freshwater intake volumes. - Frequent visual inspections of areas downstream of dams, dikes & ponds. - Seepage intercepted with the use of sumps installed downstream of seepage areas. - Repairs to damaged infrastructure to prevent future seepage. - Source water (North Inlet, Collection Ponds, PKC) chemistry around site are monitored as part of the SNP. - On-going SES to determine mercury concentration/availability in fish and sediments within Lac de Gras. - Separation of water collection systems underground to capture clean groundwater and divert it to the North Inlet prior to it coming in contact with mine infrastructure/water. - Use of absorbent berms or skimmers to remove oil from water in underground sumps. - Sediment collection sumps installed underground to separate dirt from the mine	- Ammonia levels in 2014 were well below the license limit of 12 mg/L. - Ammonia levels in mine water and effluent have remained low over time. - Parameters regulated in the Water License in NIWTP effluent remain well below discharge criteria. - No seepage events occurred in 2014. - Over 500 toxicity tests have been done on treated effluent since 2002 and most have been non-toxic. - Traditional Knowledge study of fish and water health completed in 2012 and next scheduled for 2015.

Aspect	Compliance	Adaptive Management Response	Mitigative Measures	Effectiveness of Measures
Wildlife	- Minimize wildlife-related compliance issues.	- Wildlife monitoring programs are adjusted based on results of previous years of studies. - Review of wildlife monitoring programs has been done with all 3 mines, Monitoring agencies, government and communities. - Study area expanded for caribou based on potentially larger mine zone of influence than predicted. - Participation in a regional wolverine DNA study with BHP-Billiton and GNWT to gain further insite on the wolverine population in the Lac de Gras region and around the mine. - Monitoring methods for grizzly bear changed to consider a more regional objective, while being safer for field crews. - Pit wall & infrastructure surveys for raptors that may nest in the pit or on other structures was added to the raptor monitoring program. - Raptor surveys changed to align with the North American Peregrine Falcon Survey. - Nests relocated or work activity ceased in response to wildlife presence. - Bird mortality monitoring conducted after installation of wind turbines. - Building installed to contain new incinerator and prevent wildlife attraction. - New Waste Transfer Area designed to minimize opportunities for scavengers to enter the area and access attractants/rewards. - Inclusion of community members in wildlife monitoring programs to allow consideration of both TK and science when evaluating impacts.	- Orientation and environmental awareness training related to wildlife on site is provided to all employees. - Employees notify Environment department of any wildlife sightings; these are then recorded. - Caribou advisory board & site-wide radio notifications for caribou presence on island. - Waste inspections conducted regularly. - Waste management system in place. - Caribou are herded away from high-risk areas, such as the airstrip, as requried. - Bears are deterred from the mine site, as required. - Problem wildlife is relocated or destroyed, in consultation with the GNWT. - Wildlife reporting system is in place site-wide, for wildlife observations. - Wildlife have the 'right-of-way' on site. - No hunting or fishing is permitted by employees. - Buildings are skirted and higher-risk areas are fenced or bermed in an effort to deter animal access. - Surveys have been completed to look for caribou on roads, the rockpile and PKC when caribou are getting close to the mine. - Wind turbines equipped with flashing beacons designed to reduce wildlife impacts. - Mine-altered pond water levels are kept low to discourage use by waterfowl. - Re-vegetation research has been on-going for 10 years and will help to determine habitat available for wildlife after closure. - TK Panel focuses on wildlife concerns when considering closure planning options and operational monitoring programs. - Ground-based caribou surveys initiated when caribou seen on site or collar maps show them approaching.	- Mine-related wildlife incidents and mortalities have remained low over the years. - There were no mine-related mortalities during 2014. - No bird mortalities have been found near the wind turbines. - One herding event took place for caribou in 2014, in order to preven the animal from entering the PKC area.

Aspect	Compliance	Adaptive Management Response	Mitigative Measures	Effectiveness of Measures
Dust	- Isolated higher deposition levels due to construction activities (dust deposition is expected to decrease as construction activities at Diavik decrease and the mine switches from open pit to underground operations).	- Evaluate dust control measures used to minimize dust released from construction and operations. - Evaluate the use of treated mine effluent for dust supression, which would reduce fresh water use from Lac de Gras. - Evaluate dust suppressants that can be used in key areas to reduce dust levels. - Assess vegetation and dust sample locations to provide better coverage of the area for improved data collection. - Recalculate dust emission predictions to consider underground mining methods and construction activities. - Use of BC Objectives for Dustfall at mining operations as a comparison for DDMI levels. - Investigate the benefit of installing on-site TSP monitors.	- Dust suppression on roads and mine areas using water during non-freezing periods. - New crusher comissioned in 2009 is contained inside a building and has an advanced dust control and collection system. - Dust suppressant used on the apron, taxiway and helipad (approved by both the Lands Inspector and Transport Canada). - Addition of vegetation monitoring stations to improve ability to detect potential changes to plant cover or composition. - Modified lichen monitoring program to obtain more samples from further distances & link metal levels to caribou exposure. - Use of blast mats to control dust in smaller-scale blasts. - Transition to a completely underground mine has reduced dust levels from previous years.	- Control of dust from crusher, small blast areas and roads. - Dust suppressant continued to be used on the airport's taxiway, apron and helipad in 2014. - The transition from open pit to underground mining reduced dust levels from blasting. - Dust levels are generally below the BC Objectives for mining operations. - TSP levels in 2013-2014 were below the GNWT Ambient Air Quality Guideline within the vicinity of the mine site.
Air Quality	- Measure consumption of applicable sources of GHGs - primarily diesel combustion. - Meet Internal GHG Reduction Targets. - Report GHG Emissions to regulatory agencies and within Rio Tinto.	- Evaluate new technologies and equipment that may allow for pollution controls/reduced emissions. - Wind power generation research. - Determine energy draws, optimal use and options to reduce power requirements for buildings on site. - Various fuel consumption reduction initiatives, e.g. no idling. - Review of air quality monitoring program and equipment requirements. - Added monitoring of TSP in 2013. - Conducted energy audits on site buildings in 2014. - Determine optimal operating temperatures for the underground mine. - Evaluate energy efficient equipment options. - Evaluate and optimize transportation schedules and volumes to/from site.	- Use of low sulphur diesel. - Archaeological assessment for areas where wind turbines could be installed. - Installation of Delta V fuel consumption monitoring system for all key power consuming buildings on site. - Boiler optimization program. - Installation of 4 wind turbines, integrated into the power distribution system, to reduce fuel consumption. - New waste incinerator (with pollution prevention device). - "Waste" heat from powerhouse generators used to heat facilties connected to powerhouse (camps, maintenance shops, etc.). - Underground air quality monitoring conducted. - Improving efficiencies of plant operations to reduce power draw. - 2 TSP monitors installed at the mine site. - Installation of waste oil heaters on site. - Adjust (lower) underground mine operating temperature by 1°C. - Install energy efficient motors on underground haul truck fleet. - Optimize the glycol heat recovery system in Powerhouse 2 to reduce boiler use.	- DDMI reports GHG emissions annually to appropriate regulators and internally to Rio Tinto. - GHG emissions reduced by 10,117 tonnes of CO_2e during 2014. - Decrease in GHG despite an increase in the amount of ore mined (by ten per cent) and the total ore processed (by eight per cent). - The wind turbines offset GHG emissions by 14,068 tonnes in 2014.

Aspect	Compliance	Adaptive Management Response	Mitigative Measures	Effectiveness of Measures
Hazardous Materials	- No significant spills or non-compliance issues. - Disposal practices that minimize possible environmental impacts	- All reported spills are investigated and taproots are conducted on external spills. - Electronic system for MSDS tracking for chemicals on site. - New products being brought to site are reviewed by Health, Safety and Environment personnel. - Equipment identified as having issues relating to frequency/volume of spills can be taken out of service for repairs/overhaul, as required. - Vehicle inspection and storage procedures improved in an effort to reduce spills. - Scheduled preventative maintenance for heavy equipment. - Addition of underground spill response procedures to the Operational Phase Contigency Plan (OPCP). - Evaluate best practices for spill prevention and hazardous material storage underground.	- Orientation and specific training for employees and contractors is provided for storing and handling hazardous materials. - Regular waste inspections are conducted by Environment Staff at the Waste Transfer Area and Landfill. - A site-wide compliance inspection is also completed weekly. - Hazardous materials are backhauled each year on the winter road; materials are either recycled or disposed of in a safe manner. Prior to backhaul, hazardous materials are stored and inventoried at the Waste Transfer Area (contained, lined area). - A Lube Storage Building was built beside the truck shop to fully contain maintenance products. - Containment facilities exist for underground product storage and dispensing, as well as above-ground tankfarms - Pipelines that feed the powerhouse from the south tank farm are encased in cement. - All employees and contractors take WHMIS training. - NIWTP expansion provided improved containment for sulphuric acid and other water treatment chemicals stored on-site. - Alternative biodegradable products are encouraged, as are bulk orders. - Spill containment & clean up kits are located throughout the mine site (on surface & underground). - The on-site Emergency Response Team has spill response equipment & capabilities, and practices such drills annually. - Installation of a waste oil burner at a plant on site to reduce on-site storage, shipment and off-site disposal risks with backhauling product. - Use of absorbent berms or skimmers to remove oil from water in underground sumps. - Hydraulic hoses on underground equipment are wrapped in a plastic sheath to prevent leaks or blow outs caused by abraded or cut hoses.	- Spills are reported, recorded and quickly and effectively cleaned up. Follow up actions resulting from external spills are documented and reported to the Inspector. - No significant hazardous materials compliance issues were identified in 2014. - Spill volumes and frequency from problem equipment remained low during 2014.