Giant Mine Remediation Project

Government of Northwest Territories

Canada

The 2017-18 Annual Report of the Giant Mine Remediation Project

Moving Toward Remediation

DATE: October 2018

Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada
Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

ABOUT THIS REPORT

Welcome to *Moving Toward Remediation*– the third annual report of the Giant Mine Remediation Project (GMRP). The report provides an overview of the Project's key activities and performance for the 2017-18 reporting year[1], with a particular focus on environmental management, health and safety, and community involvement. The goal of this report is to verify that the defined Project objectives are being met, that it meets the requirements of the Environmental Agreement, and that interested stakeholders, members of nearby communities and the broader public have accurate and timely information on the GMRP should the report be shared beyond the Giant Mine Oversight Board (GMOB), the independent oversight body that was established through the Environmental Agreement (additional information is provided below: see Environmental Agreement – Report Alignment).

The content of this report was largely shaped by the Environmental Agreement, signed in June 2015, and by feedback from the GMOB on previous reports. The content was also influenced by input collected from Project Team members. The report aligns with existing GMRP reporting obligations.

For additional information on the GMRP, please visit: www.giant.gc.ca.

A list of acronyms is provided in Appendix A.

ENVIRONMENTAL AGREEMENT – REPORT ALIGNMENT

A significant driver for the development of the GMRP Annual Report is the Environmental Agreement, which is a mandatory requirement per Measure 7 of *The Report of Environmental Assessment and Reasons for Decision* (MVRB, 2013). This agreement establishes an independent oversight body (i.e., GMOB) for the Project, and was signed in June 2015 by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC; formerly Aboriginal Affairs and Northern Development Canada [AANDC]), the Government of the Northwest Territories (GNWT), the City of Yellowknife, the Yellowknives Dene First Nation (YKDFN), Alternatives North, and the North Slave Métis Alliance (NSMA).

Article 5 of the Environmental Agreement stipulates that "the Co-Proponents shall prepare, provide to GMOB and make available to the public an annual report on the Project each year," to be submitted to GMOB "no later than October 1 in each year," starting October 1, 2016 (the report addressing the 2015-16 fiscal year).

The Environmental Agreement specifies what content must be included in each annual report. The table below outlines each requirement and where the content can be found in this 2017-18 report.

[1] April 1, 2017 – March 31, 2018

Environmental Agreement Requirement	Section of Report
A summary of the Project's key operational activities and associated expenditures	Year in Review: Operational Summary
A summary of any other significant developments relating to the Project	Environment Health and Safety Community
A summary of the results or findings of all monitoring done for the Environmental Programs and Plans and a description of actions taken or planned to implement Adaptive Management	Environment Health and Safety
An assessment of the effectiveness of actions already taken to address the results or findings of all monitoring completed for the Environmental Programs and Plans	Environment: Air Environment: Water
A summary of any environmental or engineering studies conducted by the Co-Proponents in relation to the Project	Year in Review: Operational Summary Environment: Water; Land
A summary of any changes to, or plans for changes to, the Environmental Program and Plans	Not applicable for this reporting year
A summary of the environmental audits of the Project, and the Co-proponents' response to the audit	Year in Review: Operational Summary
A summary of any reportable spills, accidents or significant malfunctions, and a summary of the Co-Proponents' responses	Year in Review: Operational Summary Environment
A listing of regulatory inspections, reports or directions, and a summary of the Co-Proponents' response to any issues arising therefrom	Year in Review: Operational Summary
An analysis of trends in environmental effects data over time	Environment Health and Safety Community
A summary of significant public engagement activities, or matters raised as public concerns, and the Co-Proponents' responses	Community: Engagement
A summary of the Project's planned key operational activities for the coming year and associated planned expenditures, subject to the need to protect commercially sensitive financial information	Year in Review: Operational Summary In Closing
A summary of the progress of the Project, including with respect to the Mackenzie Valley Resource Management Act (MVRMA) Measures, MacKenzie Valley Environmental Impact Review Board (MVEIRB) Suggestions, and Co-Proponents' Commitments	Year in Review: Progress on Commitments Appendix C
References to all sources relied on by the Co-Proponents in coming to conclusions in the annual report	References
A plain language summary of the annual report	Plain Language Summary

ADDRESSING GMOB RECOMMENDATIONS

In the GMOB feedback on the 2016-17 report, it was noted that many of their recommendations were not incorporated in a meaningful way and they did not find the report helpful in assessing the full status of the Project as it moves toward remediation. GMOB also stated that the role and utility of the annual report is not clear, suggesting that because it is published 7-months after the end of the reporting period, it could be "best viewed as a kind of reference document that provides a substantive record and summary of what happened in any given past year." The Project team recognizes the benefit in producing a report soon after the close of the fiscal year, however following the federal government accounting for fiscal year end close-out (early June), time is required to assemble and analyze information, and to develop and review the report.

The Project team endeavors to meet the requirements within the Environmental Agreement and recognizes that there have been gaps in the information reported, as identified in the GMOB's letter, as outlined in the table below.

Report Gaps	GMRP Response in 2017-18
A summary of changes to environmental programs/plans	As in previous years, the annual report does not explicitly report a summary of changes to environmental programs/plans. Environmental Programs and Plans are developed when and to the extent that those matters are applicable to the Project.
An analysis of environmental trends	Where possible, this report does include trend information for a three-year period (2015-16 to 2017-18), namely metrics related to Health & Safety and Procurement & Employment. The Project team is working to develop and finalize a set of performance indicators that will allow the Project to better assess environmental and socio-economic trends. There were also provisions included in the new Main Construction Manager's (Parsons Inc.) contract requirements regarding the collection and reporting of performance data. The previous Care and Maintenance contracting mechanism was a limitation to collecting and analyzing the data requested by GMOB.
A summary of public concerns	A summary of public concerns can be found Section 5.1.1 of the 2017-18 Report
A summary of planned expenditures	A summary of planned expenditures for 2018-19 can be found in Section 2.1 of the 2017-18 Report
A plain-language summary	A plain language summary can be found on page 12 of this report

The Project team will continue to work toward addressing the outstanding recommendations, as well as any further feedback on this year's report, and to continuously improve stewardship and transparency of our actions at the GMRP.

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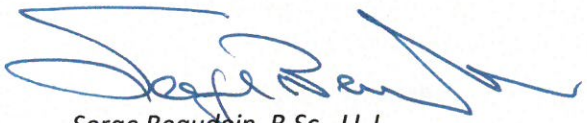
MESSAGE FROM THE CIRNAC PROJECT LEADER – ADM, NORTHERN AFFAIRS ORGANIZATION

On behalf of the entire Giant Mine Remediation Project team, I am pleased to present the third Annual Progress Report to the Giant Mine Oversight Board. This report provides our stakeholders and the public with a transparent, comprehensive record of our progress over the last year as we work towards advancing the Giant Mine Remediation Project. We are committed to following the mandate given to us by the Government of Canada to use public investment to spur economic growth, job creation, and to improve economic opportunity for Northerners and Indigenous Peoples. We will also use this opportunity to support the effort towards reconciliation and the renewed relationship between Canada and Indigenous Peoples based on recognition, rights, respect, co-operation, and partnership.

This third annual report builds on our prior submissions, with the benefit of input and advice from the Giant Mine Oversight Board and our other stakeholders. We will continue to communicate our progress, improve our engagement with, and reporting to, the public, and welcome feedback on our planning and management of the Giant Mine Remediation Project. Our goal is to achieve an outcome we can all be proud of that addresses the legacy left behind by Giant Mine, and benefits our Indigenous peoples, Northerners, and all Canadians through collaboration, sincere dialogue, and learning from each other to continually improve.

The Giant Mine Remediation Project team looks forward to engaging with others throughout the project life cycle, seeking a collaborative approach that is inclusive and forward-looking. We hope our work, and the lessons we learn through it, will inform the management of other complex remediation projects and will allow the Government of Canada to adapt and improve both its management practices and decision-making processes related to resource extraction and land use in the North.



Serge Beaudoin, B.Sc., LL.L

Assistant Deputy Minister, Northern Affairs Organization

SUMMARY OF PROGRESS IN 2017-18

In the closing section of the 2016-17 annual report, a table summarized the key activities planned for 2017-18. That table is reproduced here with the addition of a column providing a brief description of progress in 2017-18 relative to the plans for the year. This summary enables readers of this report to see whether the Giant Mine Remediation Project (GMRP) team achieved what it planned, and, where it did not, to understand the reasons why.

Component		Plans for 2017-18	Progress in 2017-18
Operations	Care and Maintenance (C&M)	Maintain site infrastructure, Operate the Water Treatment Plant, Site Security 24/7, weekly inspections of the Material Storage Area, road maintenance.	**Completed:** C&M continued in accordance with contract and regulatory requirements and site conditions.
	Underground	Backfilling the last remaining high-risk stope complex (C5-09) as part of the Site Stabilization Plan (SSP).	**Delayed:** Based on advice from the Independent Peer Review Panel (IPRP), an alternate approach was considered and ultimately decided upon. Additional studies and design work were conducted in 2017-18. Back-filling of C5-09 will be conducted in 2018-19.
	Immediate Risk Mitigation	Evaluation of Site Security Options, and implementation of recommendations from the evaluation, Annual Infrastructure Assessment.	**Completed:** infrastructure review of building stability per multi-year schedule. Completed design and initiated upgrades to the Akaitcho Deep Well Pump Station. Evaluation of Site Security Options completed. **Advanced/Underway:** Design report on recommendation for Site Security initiated; expected to be finalized in 2018-19 and implementation of the recommendation to begin.

Component		Plans for 2017-18	Progress in 2017-18
EA Measures	Measures	Initiate the Health Effects Monitoring Program sampling program. Finalize the Human Health Ecological Risk Assessment (HHERA). Finalize Baker Creek realignment location. Establish long-term funding. Initiate drafting of the Water Licence application package.	**Completed:** First round of Health Effects Monitoring Program sampling completed. Final HHERA report published by the Government of Canada in January 2018. Final Baker Creek Alignment Report completed in March 2018 and shared with stakeholders and the public. The GMRP team is in the process of preparing the Water Licence application package, with submission anticipated in early 2019. **Advanced / Underway:** Draft report on Long Term Funding Options was provided in July 2017; revisions are now underway.
Environment	Air	Continue air quality monitoring program and host open houses to introduce Niven and Ndilo communities to air stations. Pilot test and full application of new dust suppressant (SoilTac). Update fenceline air monitoring equipment from Dust Trak monitors to e-samplers.	**Completed:** Air quality monitoring program continued. An open house was held at the new Niven Lake community monitoring station (the Ndilo air monitoring community station open house was not held at the request of YKDFN staff.) Fenceline air monitoring equipment was switched to Met-One e-samplers in July 2017 to allow for more reliable cold weather operation and to allow for filter analysis. Concluded pilot test of new dust suppressant (SoilTac) and applied it to appropriate areas throughout the site.
	Water	Continue effluent treatment and water quality monitoring. Gather additional information on water conditions in Baker Creek and Yellowknife Bay to inform setting the Effluent Quality Criteria. Finalize Baker Creek alignment report and share with stakeholders and the public.	**Completed:** Seasonal effluent treatment and seasonal and year-round water quality monitoring continued at surface locations in accordance with the Metal Mining Effluent Regulations and the former Surveillance Network Program. Additional water quantity and quality monitoring was completed at additional surface water, groundwater and underground locations to supplement existing baseline data. Water quantity and quality were modelled in Baker Creek and Yellowknife Bay and draft Effluent Quality Criteria were developed. Final Baker Creek Alternative Alignment Report completed in March 2018.

Component		Plans for 2017-18	Progress in 2017-18
	Land	Select a location for a future non-hazardous landfill site.	**Completed:** Location for non-hazardous landfill site has been chosen and the details were shared and input received from the Giant Mine Remediation Project Working Group (GMRP WG) and YKDFN Giant Mine Advisory Committee (GMAC). Ground-truthing, including an archaeological impact assessment, will be conducted in 2018-2019.
	Biodiversity	Continue baseline monitoring (Long - Term Monitoring Program - LTMP). Develop an Aquatic Effects Monitoring Program (AEMP), conduct additional baseline monitoring at new effluent discharge location, and complete the current investigation of cause study under the Metal Mining Effluent Regulations.	**Completed:** LTMP baseline monitoring continued in Yellowknife Bay (including the new proposed water treatment plant outfall location). Work began on draft AEMP designs for Baker Creek and Yellowknife Bay; this work will continue in 2018-19. Additional baseline monitoring was conducted at the new proposed effluent discharge location. The Phase 5 Environmental Effects Monitoring (EEM) Investigation of Cause (IOC) study was completed in June 2017.
Health and Safety	Health and Safety (H&S)	Oversee and manage occupational health and safety through tracking of training and incidents. Conduct additional engagement, then initiate the Health Effects Monitoring Program sampling program. Finalize the HHERA and communicate results. Host focus groups regarding scoping of the stress assessment.	**Completed:** Training and incidents were tracked and managed. Additional engagement sessions held, and the first round of Health Effects Monitoring Program sampling was completed. Final HHERA report published by Government of Canada in January 2018. Results of HHERA communicated to public in community meetings held October 2017 and at the annual public forum in March 2018. **Deferred:** The Stress Assessment Study is still under development and was not advanced in 2017-18 due to other Project priorities and in response to feedback from stakeholders in 2016-17 indicating engagement fatigue. It was also recognized by the GMRP and stakeholders the possible confusion and difficulties in distinguishing among the three health studies if conducted concurrently.

Component		Plans for 2017-18	Progress in 2017-18
Community	Engagement	Engage on the Closure and Reclamation Plan (CRP) and objectives and on the socio-economic strategy. Determine ways to ensure traditional knowledge continues to inform planning. Develop a centralized system to catalogue stakeholder concerns. Continue existing engagement and outreach mechanisms.	**Completed:** Engagement sessions were held on the CRP [Presented scope of plan to Working Group in December 2017, GMAC in January 2018 and at the public forum in March 2018]. Engagement with relevant departments of the GNWT on the socio-economic strategy. Continued existing engagement and outreach mechanisms. **Underway:** The GMRP funded the first phase of a Traditional Knowledge study, which was conducted through the YKDFN by Trailmark. The report has not yet been released. Phase 1 work was completed in 17/18; the Project co-proponent GNWT, committed to funding the second phase of this work in 2018-19. **Deferred**: A centralized system to track stakeholder concerns has not been developed; however, the Project team uses the consultation log as well as meeting minutes to record concerns.
	Procurement	Evaluate bids and award contract for the Main Construction Manager (MCM). Through MCM, post tenders for Care and Maintenance contract and environmental monitoring.	**Completed:** Bids for the MCM contract were evaluated and the contract awarded to Parsons Inc. in December 2017, with a transition date of July 1, 2018 as Mine Manager responsible for Care and Maintenance of the site. No tenders were awarded through the MCM in 2017-18.

PLAIN LANGUAGE REPORT SUMMARY

INTRODUCTION TO THE GIANT MINE REMEDIATION PROJECT

The Giant Mine is a former gold mine situated within the City of Yellowknife, Northwest Territories (NWT), about 5 km north of the city centre. The site lies within the asserted traditional territory of Indigenous communities: the Akaitcho Territory Dene First Nations, the extended Monfwi (Môwhì Gogha Dè Nîîtåèè) and the Northwest Territory Métis Nation. The Giant Mine was in operation from 1948 to 2004 and left behind large amounts of contaminants including arsenic trioxide dust.

The Giant Mine Remediation Project (GMRP or the Project) is jointly managed by the Government of the Northwest Territories and the Government of Canada. Together, these two governments manage the site to protect human health and the environment while they plan how they will clean up the site.

ABOUT THE ANNUAL REPORT

The Giant Mine Remediation Project is committed to keeping interested parties informed about its progress, activities and plans. There are several ways in which the Project engages and shares information throughout the year, and one way is through preparing an Annual Report. The Annual Report describes what's happened on the site and what activities have supported planning the clean up in a given year (the Federal government's fiscal year – April 1 to March 31). The report provides a detailed explanation of activities, important findings and future plans so that interested parties may keep track of the Project's progress.

Preparing the annual report is a requirement of the Giant Mine Remediation Project Environmental Agreement. The Agreement outlines the information that the Project must include in the report. The Giant Mine Oversight Body reviews the annual report each year and provides comments to the Project Team. This writing and review process will continue to inform the structure and the content of the annual report over time.

This report is the third annual report for the Giant Mine Remediation Project and covers the one-year period from April 1, 2017 to March 31, 2018. While readers may be aware of additional updates or activities related to the Project, they may not be included in this report because they don't fall within the one-year reporting period; however, they will be covered in the report for the next year. This plain language summary is accompanied by the full annual report, which provides additional details about progress in 2017-2018.

PROJECT STATUS

In 2007, the Giant Mine Remediation Project team submitted a remediation plan to the Mackenzie Valley Land and Water Board as part of a Water Licence application. The remediation plan addressed all aspects of the underground and surface clean-up of the mine. This plan was then referred to Environmental Assessment by the City of Yellowknife, which was completed in 2014. The remediation plan is currently undergoing revision to address measures identified in the Report of Environmental Assessment. Once complete, the Project team will resubmit the revised plan (called the Closure and Reclamation plan) to the Mackenzie Valley Land and Water Board. The Project team must submit this revised Closure and Reclamation Plan as part of the Water Licence application package before

remediation can proceed. The Project team will apply for its Water Licence in January 2019 and remediation is anticipated to begin in 2020-2021.

KEY ENGAGEMENT

Engagement is an important and valued part of the Giant Mine remediation process. In 2017-18, the Project team continued its engagement of key affected parties through the Giant Mine Oversight Body, the Giant Mine Advisory Committee, the Giant Mine Working Group and annual forums. Specific engagement sessions focused on key Environmental Assessment measures including the Human Health and Ecological Risk Assessment, Health Effects Monitoring Program, Baker Creek alignment and the locations of the new Water Treat Plant outfall and the non-hazardous landfill. In 2018-19, engagement will continue to focus on the Water Licence application, including Quantitative Risk Assessment, and the Closure and Reclamation Plan.

PLANNING THE REMEDIATION OF GIANT MINE

The Project team has spent over 10 years assessing the Giant Mine to gather the necessary information to develop the Closure and Reclamation Plan. The plan will address all aspects of the underground and surface cleanup of the mine. The plan is the result of extensive engagement and design work, which has been undertaken since the Report of Environmental Assessment. In 2017-18, the Project team finalized the scope of the plan and discussed it with the Giant Mine Working Group and the Giant Mine Advisory Committee. High-level concepts of the plan were also presented to the public at the Annual Public Forum in March 2018. The Project team expects to complete the Closure and Reclamation plan in 2019 and will continue to engage with the public before finalizing the plan.

PROGRESS ON ENVIRONMENTAL ASSESSMENT MEASURES

Since the final approval of the Report of Environmental Assessment in 2014, the Project has completed and advanced many Environmental Assessment measures. The Project team's immediate focus is to address the measures with set timelines, and those with the biggest impact on the scope of the project. In 2017-18, the Project finalized and published the Human Health and Ecological Risk Assessment report, completed the first round of sampling for the Health Effects Monitoring Program, completed and shared the Final Baker Creek Alignment Report and shared a draft report on Long Term Funding Options. Further details are provided on each of these elements below.

In addition, the Project continued or began working on several measures that will be included in the Project's Water Licence application in 2019. Progress in 2017-18 included drafting Site-Specific Water Quality Objectives, developing a plan for a pilot program to treat effluent, undertaking extensive water quantity and quality modelling, drafting an Aquatic Effects Monitoring Program, developing a conceptual design for covering tailings and advancing a Tailings Monitoring and Management Plan.

Human Health and Ecological Risk Assessment: The Environmental Assessment process highlighted that there were continued public concerns around human health due to Giant Mine. In 2016, Canada North Environmental Services was hired to complete a Human Health and Ecological Risk Assessment for the Project. The assessment considered what types of contaminants would be of concern, who could be exposed and how they might be exposed. Arsenic is the key contaminant of concern and exposure through a variety of pathways (such as drinking water, breathing air, touching soils, swimming or

consuming country or supermarket foods) were studied. The risk assessment assessed potential exposure of the residents of Ndilo and Dettah communities, the City of Yellowknife, Latham Island, those who reside along the Ingraham Trail, people who camp at the Fred Henne Campground, and those who swim at Long Lake. The study determined that the risks to people are mainly within the very low to low risk range and are mostly related to direct contact with arsenic-contaminated soils. Residents of Ndilo are at greater risk than other locations but are still at low risk – which is a comparable risk level to having x-rays or a medical scan. In January 2018, the Government of Canada published the final report and the findings will inform the Closure and Reclamation plan.

Health Effects Monitoring Program: The Health Effects Monitoring Program is being put in place to ensure that the remediation of the Giant mine does not have negative health impacts to the people of Yellowknife, Ndilo and Dettah. Dr. Laurie Chan of the University of Ottawa is leading the design and implementation of the program. The monitoring program is currently establishing a baseline (i.e., residents' current levels of exposure to arsenic) so that this may be compared to future exposure of residents, once remediation has begun. Three community information sessions were held in April 2017 to present the program and talk about how residents can get involved. The first sampling period was completed in 2017-18 and included a total of 898 participants from the three (3) communities. Further sampling occurred in the spring/summer of 2018 and follow-up sampling will occur five or ten years later, depending on the age of participants.

Baker Creek Re-Alignment: As part of the Environmental Assessment measures, the Project team was asked to look at whether Baker Creek should be diverted off-site. The Project team consulted on this decision with community members and stakeholders through the Surface Design Engagement process. That engagement process is now complete, and the draft Baker Creek Alignment Report was finalized in 2017-18. This report evaluates various Baker Creek alignments and concludes that Baker Creek will remain in an on-site alignment as part of the final remediation plan.

Long Term Funding Options: The Project also was directed, as part of the Environmental Assessment measures, to investigate long-term funding options for the ongoing maintenance of the Project and for contingencies. A draft report on Long Term Funding Options was provided to a subcommittee of the Giant Mine Working Group for review in July 2017. The Project then hired a consultant to rework the report. After further engagement in 2018-19, the report is expected to be finalized in October 2018.

Freeze Design: Environmental Agreement Measure 18 directed the Project team to conduct "a comprehensive quantitative risk assessment evaluating both wet and dry methods for the initial freezing design." As per this measure, the Project compared the two methods for freezing through an independent study. The assessment concluded that the dry method worked just as well as the wet at reaching the target freeze temperature to ensure that the arsenic trioxide remains enclosed in frozen rock, preventing contact with water flowing through the mine. In addition, if future technologies provide a better option for managing the arsenic trioxide dust, a dry freeze is easier to reverse than a wet one. A Freeze Plain Language Report was drafted in 2017-18 but has not been shared yet due to technical challenges in finalizing the report. It is expected that the report will be finalized and distributed by December 2018.

ONGOING SITE MANAGEMENT

While the Project is planning the long-term cleanup of the Giant Mine, it also undertakes activities to keep the site safe and stable. These efforts include maintaining the site, managing risks, conducting repairs, monitoring the environment, treating water, suppressing dust and planning for emergencies. The following highlights some of the key activities in 2017-18, including ongoing care and maintenance, continued site stabilization, an infrastructure review, a pump station upgrade and an inspection of dams.

Care and Maintenance: Ongoing care and maintenance at Giant Mine are critical to ensuring that the current hazards at the site are managed to prevent harm to staff, surrounding communities, and the environment. In 2017-18, care and maintenance activities continued in accordance with contract and regulatory requirements and site conditions. These activities included operating the Effluent Treatment Plant, conducting ongoing monitoring and sampling of water and effluent, reducing dust from roads and tailings, maintaining site infrastructure and roads, providing site security at all times and conducting weekly inspections of the Material Storage Area.

Site Stabilization: Since 2013, the Project has been consistently working to stabilize (or secure) the underground, which has several hollowed-out areas that were created during mining operations. At the start of 2017-18, all but one of the high-risk areas had been filled. The final high-risk area (stope complex C5-09) is particularly challenging to stabilize due to its size and shape and work to fill it was delayed in 2017-18, based on advice from the Project's Independent Peer Review Panel. This advice led the Project to further study the material and construction approach that will be used to fill the stope and resulted in a decision to use a concrete plug, rather than a strong-paste plug as part of the mitigation approach to backfilling. A contract to complete the backfilling of stope complex C5-09 was awarded in February 2018 and the work began in late May 2018.

Infrastructure Review: Every few years, the Project examines the structure of buildings at the site to see if they pose any risks and require any action prior to their planned removal in the remediation phase (between 2022 and 2025). In August 2017, AECOM Canada Ltd. (AECOM) examined the buildings (by sight) and determined that no buildings were at risk of immediate structural failure. However, seventeen (17) buildings showed extensive decay and may need to be taken down before the Project had planned. The assessors recommended that these buildings be reviewed at least every two years and that all buildings be reviewed every four years.

Akaitcho Deep Well Pump Station Upgrade: The Akaitcho Deep Well Pump Station pumps water out of the underground at the Giant Mine to manage water levels. After four years of operation, the pump system was working at a slower rate, which was a concern because it could potentially cause risks at the site. In 2017-18, the Project finished a plan to upgrade the Station and work was started. This work will continue in 2018-19.

Dams Inspection: Each year, dams at the Giant Mine (which are used to manage mine and surface water and to retain solids from tailings) are inspected for safety and to assess water levels. The annual inspection was completed by Golder Associates Ltd. on June 13-14, 2017. Cracks, leaks, erosion, and settlement were observed at the dams. As a result of the inspection, Golder recommended that the Project update some of its operational procedures (including the Emergency Preparedness Plan), conduct further studies to understand the settlement and cracking at of one of the dams and undertake further maintenance, monitoring, reviews and studies at the dams. The Project will consider the

recommendations and implement them as appropriate. The Project will continue to complete the inspection annually. The Project will also be completing the Canadian Dam Association (CDA) Dam Safety Reviews in 2018-19, which must be completed every 10 years for compliance.

HEALTH AND SAFETY PERFORMANCE

Health and safety on site are critically important to the Project team. The Project keeps track of incidents and near misses each month and reports these results to the Project Director. Similar to 2016-17, there were no major incidents on site in 2017-18. However, there was one (1) moderate incident and five (4) minor incidents. Incidents and near misses are discussed at daily safety meetings to review lessons learned, root causes and corrective measures.

The Project also monitors arsenic levels of workers on site. In 2017-18, there were nine (9) instances when urine samples were above the accepted level. This number was lower than the previous year, which could either reflect the type of work (i.e., less exposure to arsenic-impacted materials) or a greater focus on prevention. Where urine samples are above the accepted level, immediate action is taken to reduce the exposure of workers and the cause of exposure is investigated.

In addition, the Care and Maintenance Contractor ensures employees and subcontractors receive relevant health and safety training such as first aid, wildlife safety, water safety, and fire response, as required by applicable regulations. In 2017-18, the employees and contractors received a total of 3,763 hours of training.

ENVIRONMENTAL PROGRAMS AND PLANS

The Giant Mine Remediation Project currently has several active monitoring programs in place for key environmental issues and is also planning future management and monitoring approaches for when the remediation begins and after it is complete. The Project's Long-Term Monitoring Program (LTMP) is a combination of all monitoring components that are currently ongoing or will be required at Giant Mine. The Program includes both environmental components as well as structural monitoring that are required on site. The LTMP is used to determine baseline conditions, monitor existing performance, and inform the design process for remediation activities. Input on the future approaches will be sought when the Project applies for its Water Licence in 2019.

The Project routinely monitors air quality and water quality. In 2017, air quality results indicated that the Project's airshed (the area where the Project's air emissions are located) was similar to regional and local air quality. The air quality monitoring program will be reviewed in 2018-19 to ensure it is robust and continues to meet the needs of the Project and stakeholders. Effluent treatment occurs at the site's Effluent Treatment Plant, in line with the Project's expired Water Licence and in compliance with relevant regulations. In 2017, a total of 312,404 m^3 of treated effluent was released into the environment. Daily, weekly, and monthly effluent testing show that all water discharged to the environment during the 2017 treatment season met the discharge criteria. Water monitoring was completed at locations on site in accordance with the Surveillance Network Program outlined in the former water licence. When the Project applies for a Type A Water Licence in 2019, it will propose a new Surveillance Network Program for effluent and water quality monitoring.

In 2017-18, two key decisions were taken on how effluent and solid waste will be managed once remediation begins. Both decisions were made following a review of options and discussion with

stakeholders. First, an outfall location (in Yellowknife Bay, near Baker Creek) for the new Water Treatment Plant was selected in consultation with the Giant Mine Working Group. The next step is to undertake water modelling to determine the precise location of the outfall. Second, a location for a non-hazardous landfill was selected and shared with the Giant Mine Working Group. The location for the landfill will be ground-truthed in 2018-19, which will include an archaeological impact assessment.

The Project also began drafting two key plans in 2017-18 that will be part of the Water Licence application. The Wildlife and Wildlife Habitat Management and Monitoring Plan will be put in place to document and lessen effects to wildlife from remediation activities. The Aquatic Effects Monitoring Plan will be put in place to document and lessen effects to aquatic life downstream of effluent/water discharges (i.e., in Baker Creek from 2019-2026 while effluent is still discharged from the Effluent Treatment Plant; and in Yellowknife Bay from 2026 onwards once water is discharged from the new Water Treatment Plant).

SOCIO-ECONOMIC PERFORMANCE

The Giant Mine Remediation Project strives to deliver social and economic benefits to Indigenous and Northern communities while protecting the environment and people's health. In 2017-18, the Main Construction Manager contract was awarded to Parsons Inc., which assumed the role of Mine Manager on July 1, 2018. The Main Construction Manager uses several tools to help the Project team achieve their goals, including incorporating criteria into all tenders that: fosters employment, training, and apprenticeships for Indigenous workers; and encourages subcontracting to Indigenous and Northern businesses.

The Project tracks total employment and employment by certain categories, namely Northern, Indigenous, Aboriginal Opportunities Considerations[2] (AOC), and Women. Northern employment is trending downward year over year since 2015-16, while female employment is trending up. There is no discernable trend for Indigenous and AOC, likely due to high variability since they represent a small proportion of overall employment. In 2017-18, the percentages of Indigenous and AOC employees were comparable to 2016-17, while the percentage of Northern employees was lower in 2017-18 and the percentage of female employees was higher in 2017-18. The Project also tracks suppliers by type, specifically Northern, Indigenous and AOC. In 2017-18, the proportion of money spent on contracts decreased for Northern (47% of all $ spent on contracts) and Indigenous (41%) suppliers and increased for AOC (35%) suppliers, compared to the previous year.

In 2016-17, the Project team released a Socio-Economic Strategy for the Project. The goal of the strategy is to maximize socio-economic benefits to Indigenous peoples and Northerner’s in the remediation phase of the Project. In 2017-18, the Project developed a draft governance structure to advance socio-economic priorities, which proposes three new bodies – a Socio-Economic Working Group, a Socio-Economic Advisory Body, and an Indigenous Benefits Plan Monitoring and Advisory Committee. The Project team also developed an updated Labour Resource Study in 2017 that looks at the local employment and procurement capacity available relative to the Project’s needs for particular types of labour. The study also provided a summary of relevant training and capacity building programs that the

[2] AOC is used by procurement officers to review proposals and evaluate the commitments made by firms, such as the percentage (%) of labour force that is local Indigenous peoples. Incentives and penalties are applied to encourage firms to meet or exceed commitments outlined in their proposal.

Project could support or use to help achieve socio-economic objectives. The next steps for 2018-19 are to establish the socio-economic advisory / coordinating bodies, develop a more specific Socio-Economic Action Plan for 2018-2021 and develop a socio-economic monitoring and reporting framework.

1.0 PROJECT OVERVIEW

The GMRP addresses the long-term containment and management of the arsenic trioxide waste, the demolition and removal of all surplus buildings on the surface, and the remediation or risk management of all impacted surface areas, such as soils and tailings ponds. It also includes water management and treatment. The overall objectives of the GMRP are to:

- Minimize public and worker health and safety risks;
- Minimize the release of contaminants from the site to the surrounding environment;
- Remediate the site in a manner that instills public confidence; and,
- Implement an approach that is cost effective and robust over the long term.

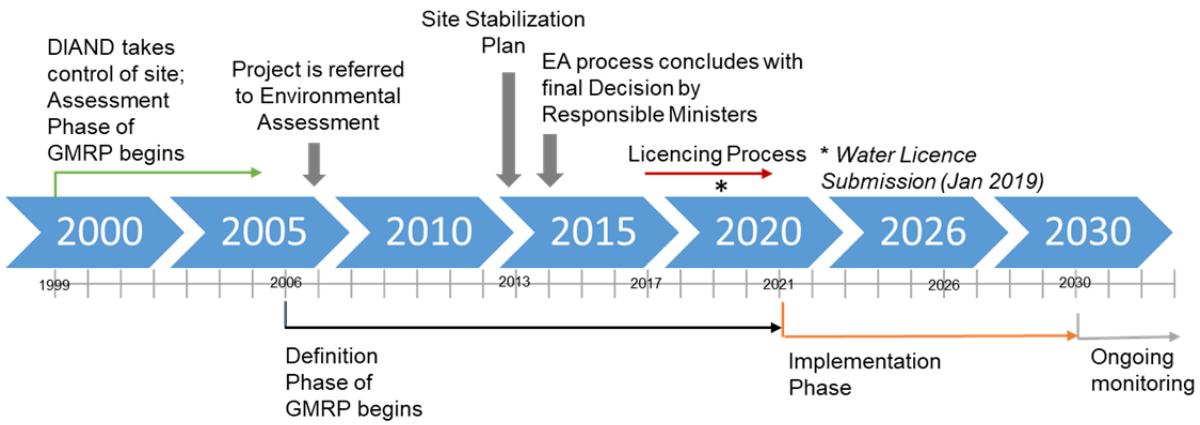
The successful remediation of the Giant Mine will yield the following outcomes:

- Safeguard the health and safety of Northerners;
- Protection of water, soils, flora and fauna at the Giant Mine Site;
- Reduction of the federal liability associated with the site by using industry best practices for remediation in a cost-effective manner;
- Improved relationships with the local Indigenous groups;
- Demonstrated federal commitment, which illustrates how economic development can be carried out without adversely affecting the environment; and,
- Demonstrated federal leadership in complying with all applicable environmental Acts, Regulations and standards.

Phases of the GMRP

Figure 1 illustrates the past, current and planned activities of the GMRP. Appendix B provides more information on the GMRP, including the Mine's legacy and the GMRP's background, phases, management structure, integrated management system, and risk management approach.

Figure 1: GMRP Activities and Timeline



2.0 THE YEAR IN REVIEW: 2017-18 OPERATIONAL SUMMARY AND PROGRESS ON EA MEASURES

2.1 OPERATIONAL SUMMARY

The Project team – which includes Crown-Indigenous and Northern Affairs Canada (CIRNAC), Public Services and Procurement Canada (PSPC), and GNWT personnel – focused their activities in five main areas over the 2017-18 year (April 1, 2017 – March 31, 2018):

1. Continuing the implementation of the Site Stabilization Plan (SSP), including underground stabilization work;
2. Undertaking immediate risk mitigation activities (urgent works) as and when a need is identified, including power upgrades;
3. Ensuring ongoing care and maintenance (C&M) of the site;
4. Conducting studies and advancing surface design options (described in Sections 3, 4, and 5); and
5. Undertaking environmental and health monitoring and studies / baseline assessments (described in Sections 3 and 4).

In addition, the Project team maintained an active risk identification and management program (described in Appendix B).

Project Expenditures
Expenditures for the project include personnel and operations and maintenance (C&M, risk mitigation activities and design). Actual expenditures in 2017-18 were $36,290,301. Further details on key expenditures are shown in section 2.1.5, Table 3.

2.1.1 Site Stabilization Plan

Underground Stabilization Project

An important element of the Giant Mine Closure and Reclamation Plan (CRP) includes stabilizing stopes and other voids, which are areas that were hollowed out underground during mining operations, as ore and rock material was removed. As part of the GMRP's ongoing risk management process, the Project team identified underground areas that required immediate action to reduce risks to staff, the public, and the environment. Underground stabilization work started in 2013 and continued each year since. To address the risks of rock collapse or underground flooding, stopes were filled with a paste made from Giant mine tailings, water, binder (cement), fly-ash, and in some cases inert rock material. Once the paste cures, it helps to stabilize the underground mine structure and prevent collapse.

As of the start of the 2017/18 fiscal year, all but one of the stope complexes identified as high risk had been backfilled. The outstanding stope complex (C5-09) is particularly challenging to stabilize due to its size, the intricacy of the stope geometry, and the fact that arsenic chamber 9 is situated above it. Accordingly, the backfill material and construction methodology was carefully considered to plan appropriate stabilization approaches and account for a range of possible future scenarios. With the design now complete, C5-09 is anticipated to be filled in the summer of 2018, once the final backfill conceptual mitigation approach is designed, and a contract is procured to complete the work. The other

remaining stopes that have not been backfilled do not pose an immediate risk to public safety or the integrity of the underground and will therefore be addressed through final remediation activities.

Key activities in 2017-18 included:

- Discussions and engagement with GMRP Independent Peer Review Panel (IPRP) regarding the designs for Stope C5-09;
- Comparative evaluation of strong-paste plug and concrete plug options for part of the C5-09 stope stabilization approach, in response to and with input from the IPRP, ultimately leading to a decision by GMRP Leadership to advance the concrete plug design;
- Conducting additional testing to inform mix designs, delivery methods, and specifications for the new concrete plug design; and,
- Tendering the work package to conduct stope back-filling and stabilization (contract was awarded in February 2018).

Next steps:

- The backfilling for C5-09 began in late May 2018 and is expected to be completed in the autumn of 2018.

2.1.2 Immediate Risk Mitigation

Infrastructure Review

Every few years, the GMRP conducts a structural review of the numbered buildings at the Giant Mine site to assess risks associated with them and determine whether immediate action is required to mitigate the risk. A review was conducted in August 2017. Before that, the most recent review was in 2014.

Key activities in 2017-18 included:

- AECOM conducted visual assessments of the buildings to identify types of structural defects, signs of structural distress and deformations, and signs of material deterioration.

Results:

- During the review, each building is assigned a category based on its risk level. The results of the 2017 infrastructure assessment are shown below.

Table 1: Results of the 2017 Infrastructure Assessment

Risk Category	Description	Number of Buildings in 2017
Black	Risk of immediate structural failure	0
Red	Risk of structural failure within 5 years	17
Yellow	Risk of structural failure between 5 – 10 years	52
Green	Expect to last beyond 10 years	36
Not Reviewed	*Buildings remote and difficult to access, missing, or demolished*	*39*

The assessors noted that several buildings on site remain unsecure. Most are small sheds with either no purpose or that are used to store small equipment such as sampling points or small pumps. Most

buildings noted as unsecure in the 2014 inspection have been locked and barricaded. Safety perimeters have been erected around all the selected buildings to prevent unauthorized access and to minimize risks to the safety of the mine staff.

Based on the structural reviews and field observations, the assessors recommended that all buildings rated Red should be monitored every two (2) years. The 17 red-categorized buildings are showing extensive deterioration and may require demolition before the demolition scheduled to start between 2022 and 2025. The current buildings showing significant deterioration could be improved and the deterioration halted or considerably slowed with minor repairs to fix damaged structures and seal the building envelope to minimize water ingress (when water infiltrates a property), which is leading to collapsed ceilings and possible damage to some electrical equipment in buildings still in use. If all seventeen (17) buildings rated Red were demolished within 5 years, the assessors estimated that this will cost $14.5 Million in 2022 dollars if completed as a single project.

Next Steps:

- The assessors recommended that buildings on site be reassessed with the following frequencies:
    - Buildings rated Red should be reviewed at a minimum every two years; and,
    - All buildings should be reviewed every four years.

Upgrades to the Akaitcho Deep Well Pump Station

The existing dewatering system at Akaitcho keeps the Giant Mine underground water levels within required limits. After four years of operation, it was observed that the dewatering system was discharging water at a decreased rate compared to when it was initially installed. This change could cause risks at the Giant Mine Site. AECOM assessed potential improvements to the Akaitcho Deep Well Pump Station to increase its reliability.

To select which of the options identified by AECOM would be used, analysis, evaluation and costing of the options was undertaken by the Project team. An options evaluation matrix was used as the basis for the selection of the preferred option.

In 2016 a workshop was held in Yellowknife, NT and attended by representatives from CIRNAC, PSPC, AECOM, Golder Associates Ltd. (Golder), Deton'Cho / Nuna Joint Venture (DCNJV) and Parsons, as the Interim Construction Manager (ICM). During the workshop, the group completed the pumping options evaluation matrix.

The outcome of this meeting was the decision to complete the pumping system upgrades at Giant Mine using two deep well pumps located near the Akaitcho shaft. The key advantages of the selected well-based pumping system are that it precludes the need for any personnel in the northern part of the mine, efforts associated with maintaining safe drifts and ramps in that area would no longer be required, and water levels could potentially be allowed to recover in this area of the mine. Additionally, the dual deep well system provides pumping redundancy – that is, a single well could maintain the mine in dewatered state, which enables pump removal and servicing (which may be necessary on a periodic basis) without affecting pumping rates or capacity.

Results:

In 2017 a conceptual design was developed by AECOM on the preferred Akaitcho Deep Well Pump Station. This design consisted of two large wells to be drilled from the surface equipped with submersible pumps to maintain the mine in a dewatered condition. The collected groundwater will be discharged to the Northwest Pond and then treated by on-site treatment facilities, as is currently done. Well development and pumping system options were analyzed for economic feasibility, which would adhere to the general pump performance parameters required. The estimated cost of this design (based on the preliminary design, construction costs only, and including a 30% contingency) was $4,296,500.

Next Steps:

- A detailed design on the mechanical properties of the piping and connections, new electrical distribution equipment, well development, and additional civil and structural items (all in consideration of required operating conditions) will be required.
- The schedule for this project at the end of FY 2017-18 indicated a completion date of August 2018.
- An early pump supply contract will be required to meet project schedule requirements.
- Implementation tasks include:
    - Supply of pumps, transformer and electrical building (with installed switchgear)
    - Drilling and casing of boreholes
    - Installation of pumping system

Geotechnical Inspection of Dams

At the Giant Mine, dams are used for mine water management, surface water management and tailings solids retention. Surface water management addresses water that has not come in contact with tailings. These dams manage surface water runoff or creek flows. Dams are inspected annually to assess water level restrictions and geotechnical considerations.

Key Activities in 2017-18:

- An annual inspection of the dams at Giant Mine was conducted on June 13-14, 2017.
    - A geotechnical inspection was conducted at approximately 28 dam, dyke and berm locations.
    - A review of monitoring data was conducted for two of the dams.

Results:

- Observations at the dams included cracks, seepage, erosion, and settlement.
- In the resulting report, the recommendations were to update the operational procedure documentation (such as the Operational, Maintenance and Surveillance (OMS) Manual and Emergency Preparedness Plan), conduct further studies to understand the settlement and cracking of one of the dams, and further recommendations related to maintenance, monitoring, elevations, operation guidance, review and studies.

- A complete list of results and recommendations can be found in the 2017 Geotechnical Inspection of Dams Report by Golder Associates Ltd.[3]

Next Steps:

- The GMRP team will consider the recommendations and implement as appropriate.
- The annual geotechnical inspection of dams will occur again in 2018-19 to assess the condition of the dams.
- Canadian Dam Association (CDA) 10-year Dam Safety Review will occur in 2018-19

2.1.3 Care and Maintenance

Ongoing care and maintenance at Giant Mine are critical to ensuring that the current hazards at the site are managed to prevent harm to staff, to surrounding communities, and to the environment. The Project team and the care and maintenance contractor ensure the site is kept safe, secure, and in compliance with regulations by maintaining facilities, controlling and inspecting contaminated waste storage areas, managing mine water, and treating water effluent on site.

Key activities in 2017-18 included:

- Preparation for spring freshet; the 2017 spring freshet occurred without incident;
- The underground communication cables were replaced with the installation of new fibre optic lines, fusing cables, new phone installations, as well as all commissioning and testing, which was the bulk of work completed in 17-18.
- Ongoing dust management activities; application of calcium chloride on roads and a dust-control product (SoilTac) on tailings;
- Discharge of treated effluent: 312,404 m^3 of treated mine effluent discharged into Baker Pond;
- Completed upgrades of the surface electrical systems and underground communications system; and
- Continued water and effluent monitoring and sampling to meet the SNP outlined in the former Water Licence and requirements of the current Metal Mining Effluent Regulations.

Underground Electrical Upgrades

During a routine inspection in 2016, the Worker Safety Compensation Commission (WSCC) expressed concerns with some of the electrical equipment being used in the underground areas. Upgrades to underground electrical systems were required to address failing infrastructure and safety concerns, including providing reliable power to the underground area for refuge stations, communications, lighting, and high test arsenic sump pumps. The upgrades were started in 2016-17 as part of the C&M contract and were completed in 2017-18.

[3] (Golder Associates, 2017)

2.1.4 UBC Bridge Repair

The UBC Bridge over Baker Creek was constructed in 2007. It is a single span timber deck bridge with steel girders (the superstructure). It is supported on concrete pile caps and steel pipe piles (the abutments or substructure). It was being used to support care and maintenance activities at the site up until the fall of 2015. In October of 2015, the Interim Care and Maintenance Mine Manager, DCNJV, noticed the abutments under the UBC Bridge deck had moved inward and rotated. The bridge was deemed unusable and CIRNAC (then INAC) ordered the bridge be closed pending an assessment.

AECOM conducted a structural inspection of the bridge on January 13, 2016 and found the bridge superstructure and decking to be in good condition. AECOM confirmed DCNJV's observations, specifically noting the following:

- the substructure (the abutment or piles and concrete cap) had moved and rotated below the bridge deck;
- the bolts connecting the bridge superstructure and decking to the abutments were broken or deformed;
- the fill material around the abutments on the east and west banks of the river had shifted, putting lateral earth pressure on the substructure.

Key Activities in 2017-18 included:

- This work was conducted under its own water licence and land use permit (applications were approved in 2017).
- A new design was developed in the 2017-18 fiscal year, which is anticipated to address the issues with lateral movement of the approach fill because it will be designed to withstand the identified lateral earth pressure. It will provide improved stability to the approach fills by using the bridge structure components to act as retaining walls, which will reduce lateral movement.
- A contract for the repair work was awarded in January 2018 and construction began in March 2018. No in-stream work was necessary to complete the bridge repairs. Activities included removing the existing bridge decking and girders (the superstructure, replacing the piles and concrete caps (foundation / substructure) with an improved pile and cap design, then reinstalling the existing bridge deck.

2.1.5 Surface Design and Studies to Inform the Closure and Reclamation Plan

The Project team has continued to advance several work packages related to the final closure and reclamation plan (CRP) for the site, including undertaking studies to gather information, engaging interested parties on the surface design options, and advancing engineering design for the CRP.

Studies

The below table lists environmental or engineering studies conducted in 2017-18 by the GMRP or their contractors in relation to the Project. It includes studies that were completed, as well as several that are still underway. Many of these studies are intended to provide information needed to inform closure design, while some are monitoring programs to ensure the safety of the surrounding communities during current site operations. Additional details on these studies can be found throughout the report.

Table 2: Studies Undertaken in 2017-18

Theme	Study / Report
Design	• Supplemental Borrow Source Identification Report and Update to figures in Supplemental Borrow Source Identification • Geotechnical Inspection of Dams • Geotechnical and Geochemical Investigation of Ponds • Conceptual Tailings Cover Design • Tailings Remedial Options Report • General Freeze Gap Analysis and 3-D Modelling of Passive Freeze • Remedial Scenarios for the Townsite and Shoreline Lands • Remedial Options and Scenarios for the Core Industrial Area • Update to Remedial Strategy for Disturbed Areas • Update to Remedial Strategy for Existing Road Network • Baker Creek Re-Alignment Alternatives Evaluation
Air	• Air Quality Monitoring Program (AQMP)
Water	• Surveillance Network Program (SNP) • Surface Water Quantity and Quality Monitoring Results at Giant Mine • Groundwater Quantity and Quality Monitoring • 3-D Hydrogeological Model Development and Calibration • Annual MMER/EEM Effluent and Water Quality Monitoring • New ETP Outfall Location Options Analysis • Supplemental Winter Water Sampling Near the Potential Effluent Treatment Plant Outfall Location • Preliminary Design for New ETP Outfall
Land	• Site Location Study for Non-Hazardous Waste Landfill • Remedial Strategy for Contaminated Soil and Sediment
Biodiversity	• Phase 5 EEM Program – Investigation of Cause Study • Site-wide Bird Survey • Draft Wildlife and Wildlife Habitat Management and Monitoring Plan • Draft Baker Creek AEMP Design Plan (initiated in 2017-18) • Draft Yellowknife Bay Conceptual AEMP Program Design Plan (initiated in 2017-18)
Health & Safety	• Health Effects Monitoring Program (Health Study) • HHERA, including: o Dietary Survey o Voluntary Sampling Program for Country Foods
Community	• 2017 Labour Resource Study

Baker Creek Re-Alignment

Baker Creek was a key component in the surface design engagement (SDE) process over the past three years. In 2017-18, the Project developed the Baker Creek Alignment Report, which evaluates potential routes for the creek and will be used to inform the final remediation plan for the creek per Measure 11 of the Environmental Agreement.

- The report on the SDE process, which was finalized in 2016-17, demonstrated general stakeholder support for choosing an alignment for Baker Creek that remains within the project boundaries. The GMRP will also fill pits to address public safety, flood risk and remove contaminated sediments to minimize exposure to fish in Baker Creek;

- The draft Baker Creek Options Analysis Report was presented to the GMRP Working Group in June 2017 and finalized at the end of 2017-2018. The document analyzed a series of options for Baker Creek including on and off-site alignments;
- The Project team consulted with community members and stakeholders about the decision on the alignment of Baker Creek through the SDE process, the GMRP Working Group and GMAC. The input received from stakeholders has been included in the Baker Creek Alignment Report, which evaluates potential routes for Baker Creek and will inform the final remediation plan for the creek;
- The report is intended to meet the requirements of Environmental Assessment (EA) Measure 11. The draft report was submitted to the GMRP WG and the GMOB for comment in July 2017;
- The Project team incorporated feedback into the final report issued March 2018.

Closure and Reclamation Plan (CRP)

The CRP for the Giant Mine site is the culmination of the engagement and design work the team has been working on since the Report of Environmental Assessment. During 2017-18, the GMRP team worked to finalize the scope of the CRP, which was presented to and discussed with the GMRP WG at the December 2017 meeting and with GMAC at the January 2018 meeting. High-level draft CRP concepts were then presented to the public at the Annual Public Forum in March 2018.

Other activities in 2017-18 that relate to the CRP are listed in Table 2, under studies related to design.

Next Steps:

- In 2018-19, the GMRP team will incorporate input from these sessions into the draft CRP report. Further engagement with the communities will follow once the draft report is ready.

2.1.6 Summary of Fiscal Year 2017-2018 Operational Activities, Incidents, and Expenditures

Table 3 below summarizes the main operational activities from April 1, 2017 to March 31, 2018, including whether there were incidents or issues (e.g. schedule delay) and the associated expenditures.

Table 3: Summary of 2017-18 Operational Activities

Activity	Progress[4]	Issues/Incidents	Expenditures
Site Stabilization Plan			
Underground Stabilization Project	Underway	The conceptual mitigation approach and design for the final remaining high-risk / immediate-mitigation stope complex (C5-09) was reconsidered and revised in response to a suggestion from the IPRP. This delayed the tendering and construction schedule. The C5-09 backfilling contract was awarded in February 2018, with work expected to be completed by Fall 2018.	$662,060.66

[4] "Underway" is denotes a discrete undertaking that has start and end dates, whereas "Ongoing" refers to activities that continue each year

Activity	Progress[4]	Issues/Incidents	Expenditures
Immediate Risk Mitigation			
Infrastructure Review	Completed August 2017	No issues or incidents were encountered on this activity.	$74,410
Upgrades to Akaitcho Deep Well Pumping Station	Underway	No issues or incidents were encountered on this activity.	$1,235,537
Care and Maintenance			
Care and Maintenance	Ongoing	No major incidents, 1 moderate incident, 5 minor incidents and 99 near misses reported. 1.8% of urinalysis samples exceeded Action Level of >35 micrograms of arsenic per litre of urine.	$10,816,969
Communications Upgrades	Completed July 2017 (on schedule)	No issues or incidents were encountered on this activity.	$183,738
Tendering and Evaluation of Bids for Main Construction Manager (MCM)	Completed	Contract awarded December 2017 to Parsons Inc. with a start date of July 1, 2018	$464,517
Dust Suppression	Ongoing	Standing offer awarded in May 2017 to ALX Exploration Services Inc. (a Whitehorse based company)	$303,264
UBC Bridge Repair	Underway	Contract awarded in January 2018 to 851791 NWT Ltd. O/A Rowe's Construction for UBC Bridge Construction	$1,176,138

Planned Expenditures in 2018-19

The planned expenditures in 2018-19 are outlined in the table below.

Table 4: Planned Expenditures in 2018-19

Category	Operations and Maintenance	Grants and Contributions	Salary and EBP	Totals
C&M	$17,103,381			
Regulatory	$602,500			
Consultation	$136,800	$1,795,872		**$1,932,672**
Investigation & Assessment				
Remediation	$42,215,999	$1,276,270		**$43,492,269**
Monitoring				
Program Management	$7,538,712		$2,928,639	**$10,467,351**
Totals	**$67,767,392**	**$3,072,142**	**$2,928,639**	**$73,798,173**

2.1.7 Audits and Inspections in 2017-18

In 2017-18, there were five external regulatory inspections of the GMRP and zero audits, although the GMRP continued to implement corrective actions in response to the Environment, Health and Safety (EHS) Compliance Audit conducted the previous year. In addition to these external inspections, contractors on-site conduct their own inspections to ensure workers maintain compliance with standard operating procedures (SOPs), protocols, and standards.

Regulatory Inspections

In 2017-18, five inspections were conducted by external regulators – three by CIRNAC, one by ECCC, and one by the Worker's Safety and Compensation Commission (WSCC). This compares to six inspections by external regulators in the previous year and 14 in 2015-16. The number of inspections per year is determined by the regulator based on a variety of factors, including by not limited to the nature of work being undertaken at the site.

The 2017-18 regulatory inspections collectively identified zero non-compliance incidents. The GMRP is committed to addressing any non-compliances as soon as possible and would assign responsibility and timelines for addressing any issues should they be identified by any party.

Table 5: Summary of Inspections Performed

Regulatory Body	Inspection Date	Inspection Type / Purpose	#of Non-Compliances	Findings / Recommendations
CIRNAC Resource and Land Management	5-May-17	Ensure compliance with the terms and conditions of the water licence and approved management plans	0	• No findings and/or recommendations were issued as a result of this regulatory inspection.
	15-Jun-17	Baker Creek Inspection	0	• No findings and/or recommendations were issued as a result of this regulatory inspection. The objective of the visit was to tour site with the new INAC summer student.
	30-Jun-17	Annual water samples at discharge sampling location (SNP 43-1)	0	• No findings and/or recommendations were issued as a result of this regulatory inspection.
Environment and Climate Change Canada (ECCC)	5-Jul-17	Annual MMER sampling and regulatory review Brief review of Storage Tank Systems for Petroleum Produces and Allied Petroleum Products Regulations (SOR/2008-197) Formal request of the E2 Plan for Arsenic Trioxide	0	• No findings and/or recommendations were issued about MMER sampling. • No findings and/or recommendations were issued about Storage Tank System Regulations. The inspectors were satisfied that a pressure test was completed on all storage tanks. • Recommendation of submittal of an Environmental Emergency Plan for the Arsenic Trioxide stored on site. The recommendation was completed, as per ECCC's request with testing of the plan in

Regulatory Body	Inspection Date	Inspection Type / Purpose	#of Non-Compliances	Findings / Recommendations
				November 2017.
Workers' Safety and Compensation Commission (WSCC)	31-Oct-17	Inspect and discuss subsidence at B Shaft	0	• Effect of B shaft subsidence localised and not extended/connected to B shaft. • Other: • A copy of the list of asbestos containing buildings shall be submitted to WSCC. • Ensure that the safety program is developed and implemented to minimise the exposure of arsenic at all active work areas on the surface. • A copy of the arsenic exposure control shall be submitted to the WSCC.

In addition to these external regulatory inspections, as part of responsible operations, the C&M contractor, as well as all contractors and subcontractors, also conducted their own internal inspections on a regular basis to ensure safe operation at the site. These internal inspections include daily site inspections by C&M staff and regular engineering inspections of major structures (e.g. dams, arsenic chamber bulkheads) and equipment. Non-conformances identified during internal inspections in 2017-18 were minor and promptly corrected.

Environment, Health and Safety (EHS) Compliance Audit – Aboveground

In 2016, Stratos Inc. (Stratos) conducted an EHS and site security audit of the Giant Mine site to confirm compliance of DCNJV (the C&M contractor) with applicable EHS and site security requirements (regulatory and other). The audit was conducted on-site in June 2016 with a team of two auditors and was limited to aboveground facilities and activities. The 2016-17 annual report detailed the audit findings, with the majority of deficiencies addressed that fiscal. Work continued in 2017-18 to address the audit findings, with the audit considered closed in November 2017 with a review of completed corrective actions. The outstanding recommendations from the audit are being reviewed by the GMRP and will be incorporated into future work plans. These include improvements to site signage and site security and updating emergency response plans.

Key Activities in 2017-18:

In 2017-18, the GMRP team continued implementing corrective actions and recommendations to address the findings of the 2016 EHS Compliance Audit. An additional nine corrective actions were completed, collectively addressing one Priority 2 finding, five Priority 3 findings, and three Priority 4 findings.

The nine corrective actions completed in 2017-18 included:

- Two corrective actions that address chemical and hazardous materials storage, use, and disposal;
- Two corrective actions that address environmental planning and response;
- One corrective action that addresses environmental issues;

- Two corrective actions that address security; and,
- Two corrective actions that address procedures.

Next Steps:

Outstanding recommendations from the audit are being reviewed and implemented by the GMRP and include improved site signage and security and updating environmental response plans including that for arsenic trioxide.

2.2 PROGRESS ON EA MEASURES

The *Report of Environmental Assessment and Reasons for Decision* (MVRB, 2013) listed 26 Measures that must be addressed, as well as 16 suggestions that may be implemented at the Project team's discretion. The Project team's immediate focus is to address the Measures with set timelines, and those with the biggest impact on the project scope. Measures completed to date deal with the negotiation of an Environmental Agreement and the creation of the GMOB (Measures 3, 4, 7 & 8), as well as investigating and engaging stakeholders and the public in discussions of long-term funding options (Measure 6). The summary below provides a highlight of the progress made in 2017-18, and **Appendix C** provides a complete summary of progress against all EA Measures and Suggestions in 2017-18, as well as plans for the 2018-19 year.

Environmental Agreement and GMOB (Measures 3, 4, 7 & 8)

- The Environmental Agreement came into effect June 2015, which formalized requirements to meet Measures 3, 4, 7 and 8
    - Measures 3 and 4: The GMRP provides ongoing funding to the GMOB to manage a research program;
    - Measures 7 and 8: The Environmental Agreement provided for the creation of the GMOB, which formed in the fall of 2015, and funding to fulfill the obligations outlined under Measure 8.

"Environmental Agreement – Report Alignment", Section 5.1 and Appendix B provide more information about the Environmental Agreement and GMOB.

Long-Term Funding Options (Measure 6)

- A draft report on Long Term Funding Options was provided to the GMRP WG for review in July 2017 and a subcommittee of the GMRP WG was convened to provide feedback. A consultant was retained to provide a revamped report.
- Additional engagement with the consultant and the working group subcommittee will occur in 2018-19, and a final report is expected by March 31, 2019.

Health Effects Monitoring Program (Measure 9)

- In 2016, the Project team worked with the GNWT, the GMRP WG, and the Yellowknives Dene First Nation (YKDFN) Giant Mine Advisory Committee (GMAC) to identify people to be part of an advisory committee for the Health Effects Monitoring Program (HEMP);

- The Project team established an advisory committee in 2016 for the HEMP with the HEMP research team, which included representatives from GNWT Health, GMRP, HC, YKDFN, NSMA, and the City;
- The University of Ottawa's Dr. Laurie Chan, who is leading the design and implementation of the Health Effects Monitoring Program, hosted three community information sessions in April 2017 to present the program and talk about how residents can get involved;
- The monitoring program will endeavor to sample 2,000 participants over two years, collecting samples of toenail clippings, urine and saliva for lab analysis to determine their exposure to arsenic and other contaminants. The first sampling period has been completed and included a total of 898 participants from Yellowknife, Ndılo, and Dettah. The second wave of sampling will occur in the spring/summer of 2018-19, with the results communicated to participants in late winter 2018-19. The Program will also carry out follow up sampling five years later for participants younger than 18 years of age, and within 10 years for adult participants, with population results to be reported on in fall/winter;
- Communications will be ongoing to ensure community members are well-informed. Monitoring results will be shared regularly, with plain-language explanations of the findings. For privacy and confidentiality reasons, results shared publicly will only report population-level findings.

Section 4.2 provides more information about the Health Study.

Human Health and Ecological Risk Assessment (HHERA) (Measure 10)

- In 2016, PSPC contracted Canada North Environmental Services (CanNorth) to complete the HHERA;
- The YKDFN and North Slave Metis Alliance (NSMA) participated in a voluntary country foods sampling program by providing over 130 samples of wild game, berries, medicinal plants, and fish, to be tested for contaminant concentrations;
- In January 2018, the Government of Canada released a final report on the Giant Mine HHERA. The report found that there is low risk to very low risk from past activities at the Giant Mine. The report also considered the effect that clean-up activities would have on local wildlife and plants, stating that the clean-up will reduce the risks but that potential for risks to small animals still exists. In Yellowknife Bay, low risks to small insects in the sediments were found, but these conditions will slowly improve;
- In 2018-19, the Project will initiate indirect stress effects study.

Section 4.2 provides more information about the HHERA.

Investigating Options for Baker Creek (Measure 11)

- As described in Section 2.1.4, the Baker Creek Options Analysis Report was finalized at the end of 2017-18. The draft Baker Creek Alignment Report was provided to the GMRP WG and the GMOB for comment in 2017; the Project team incorporated feedback into the final report issued March 2018.

Developing Site-Specific Water Quality Objectives (SSWQO) (Measures 12)

- Predictive modelling and development of site-specific water quality objectives (SSWQO) were initiated in 2015-16 and continued in 2017-18 in order to support evaluation of expected water

quality in Baker Creek under various realignment options. The results of this work were used to support a detailed options analysis that will influence decisions regarding the remediation and alignment of Baker Creek. Draft site-specific water quality objectives were developed, which the Project team presented to the Working Group in January 2018. Additional engagement is planned for 2018-19 during the pre-water licence application phase. The site-specific water quality objectives will be finalized prior to the Water Licence Application submission.

Addition of ion exchange process to proposed water treatment process to produce water treatment plant effluent that at least meets Health Canada drinking water standards (Measure 14)

- In 2017-18 a plan to implement an onsite pilot testing program at the Effluent Treatment Plant was developed to test different ion-exchange media to determine performance characteristics to inform design of the Water Treatment Plant (WTP);
- In 2018-19 the Onsite Pilot Testing Program will test different ion-exchange media during the open-water season of 2018. Design of the WTP will commence include siting of the WTP intake, and discharge line and preliminary design of the WTP.

Consideration of arsenic and any other contaminants of potential concern (Measure 15)

- Significant modelling effort was completed in 2017-2018 to model surface and underground water quantities and quality, including water quality modelling in Baker Creek and Yellowknife Bay. Draft Effluent Quality Criteria were developed and presented to the Working Group in January 2018.

Implement a comprehensive Aquatic Effects Monitoring Program (AEMP) (Measure 17)

- In 2017-18 a draft AEMP design for Baker Creek and conceptual design for Yellowknife Bay were developed;
- In 2018-19 engagement on the AEMP is planned to occur and the AEMP to be finalized by Water Licence Application submission, January 2019.

Freeze Design Options (Measure 18)

- Environmental Agreement Measure 18 directed the Project team to conduct “a comprehensive quantitative risk assessment evaluating both wet and dry methods for the initial freezing design.” As per this measure, the Project team, along with SRK Consulting and a technical review by the Independent Peer Review Panel, compared the two methods for freezing. This assessment, as part of the Design Basis Report, concluded that the dry method worked just as well as the wet at reaching the target freeze temperature to ensure that the arsenic trioxide remains encapsulated in frozen rock, preventing contact with water flowing through the mine. In addition, if future technologies provide a better option for managing the arsenic trioxide dust, a dry freeze is easier to reverse than a wet one. This information was provided to the Project team in the freeze design basis report, which was finalized in 2016-17. Engagement with the GMRP WG followed.
    - In 2017-18 the Freeze Plain Language Report was drafted internally. Changes to the draft document have been ongoing; delays are due to software compatibility;
    - In 2018-19 it is planned that the plain language report will be finalized and distributed to the GMRP WG, GMAC and email distribution list by December 2018.

Develop conceptual design of tailings cover and objectives (Measure 22)

- In 2017-18, the conceptual tailings cover design was developed;
- Further investigation work is planned in 2018-2019, with field studies for cover design planned for 2019-2020.

Tailings Monitoring and Management Plan (Measure 23)

- Drafting of the Tailings Monitoring and Management Plan was initiated in 2017-18;
- The Tailings Monitoring and Management Plan will be part of the full Water Licence package and the Project team will engage interested parties as part of the Water Licence application submission in January 2019.

3.0 ENVIRONMENT

3.1 ENVIRONMENTAL MANAGEMENT

The care and maintenance contractor, DCNJV, has in place an Environmental Management Plan, which includes Environmental Protection Plans (EPPs) for major components of the Mine Site, including:

- Materials and Equipment Handling (e.g. halocarbon management);
- Non-Hazardous and Hazardous Waste Management;
- Traffic Management;
- Erosion and Sediment Control;
- Water Management; and,
- Heritage Protection.

These EPPs guide the management of each of the above components. For example, the EPP for water management includes details of how water is treated at the mine's ETP as well as a description and requirements of the different water monitoring and sampling programs.

The following report sub-sections (**Air**, **Water**, **Land** and **Biodiversity**) describe the key activities and results of these ongoing management programs, in addition to other assessments and monitoring as described in the LTMP summary below.

Long-term Monitoring Program (LTMP)
The LTMP is a combination of all monitoring components that are currently ongoing or will be required at Giant Mine. The Program includes both environmental components as well as structural monitoring that are required on site. The LTMP is used to determine baseline conditions, monitor existing performance, and inform the design process for remediation activities.

The components of the LTMP include regulatory and due diligence monitoring and can be separated into the following components:

Environmental	Structural
• SNP • MMER including EEM Program • AEMP • WWHMMP • Air quality – fence-line & community • Operational Monitoring Program (ETP, underground, annual site-wide bird survey) • Noise • Cumulative effects	• Freeze • Dams and seeps • Landfill • Pit stability • Tailings covers • Underground Structures • Baker Creek (icing)

LTMP is structured in three phases: pre-remediation, remediation, and post-remediation. The intent is for the LTMP to be operational for the lifetime of the project (100 years). Section 3 provides additional information on the individual components of the monitoring program. A new Type A Water Licence will include conditions related to monitoring and reporting for many of the above components.

Spills, Accidents, and Significant Malfunctions
There were no reportable spills or significant malfunctions in 2017-18.

3.2 AIR

Activities undertaken at the Giant Mine Site have the potential to release contaminants from the Site into the air. Of primary interest are particulates carrying arsenic, asbestos, iron, lead, or dust. If these contaminants become airborne, they may be transported off-site and deposited elsewhere. To monitor and minimize air quality impacts, the Project team has established an air quality monitoring program – including ongoing air quality monitoring on-site and in nearby communities – and actively manages air quality through dust suppression (e.g. application of calcium chloride on roads or dust suppressor on tailings).

2017-18 Highlights

- Results of the ambient air quality monitoring indicated the air quality of the airshed encompassing the GMRP was representative of regional and local air quality
- A monitoring station was added to Niven at Moyle Park in 2017, and the Project team hosted an open house in Niven in the summer of 2017, inviting the public to learn more about air quality monitoring for the project and to give residents of Niven an opportunity to learn about the newest air quality monitoring station in Moyle Park
- The Project Team used a new product for dust suppression (SoilTac), as a result of the options assessment initiated in 2015.

3.2.1 Air Quality Monitoring

The Project team conducts real-time air quality monitoring of particulate matter (PM_{10} and $PM_{2.5}$) and analysis of arsenic, asbestos, iron, lead, and other contaminants in airborne dust at three levels: near specific activities taking place on the site, such as deconstruction or drilling; at the "fenceline" (site perimeter); and in the local community at three locations. This data helps the Project team to:

- Monitor concentrations of airborne contaminants;
- Assess potential effects on the local air;
- Establish whether these contaminants are the result of activities at the Giant Mine Site; and,
- Determine whether mitigation measures are required if air quality results exceed established Action Levels and criteria (summarized in Table 7 below).

The Giant Mine aims to avoid contributing to exceedances of the following thresholds for various air quality indicators, as measured by air quality monitoring stations within the community.

Table 6: AQMP Parameters, Sampling Frequency, and Criteria

Parameter	Averaging Time Period	Source[5]	Criterion (µg / m^3 unless otherwise specified)
Antimony (Sb)	24 hr	[1]	25
Arsenic (As)	24 hr	[1]	0.3
Asbestos as fibre > 5µm in length	24 hr	[1]	0.04 fibres/cm^3
Iron (Fe)	24 hr	[1]	4
Lead (Pb)	24 hr	[1]	0.5
Nickel (Ni)	24 hr	[1]	0.2
Particular matter less than 10µm (PM_{10})	24 hr	[1]	50
Particular matter less than 2.5µm ($PM_{2.5}$)	24 hr	[2]	28
Total suspended particulates (TSP)	24 hr	[3]	120
	Annual	[3]	60
Fence line – TSP Risk Based Action Level (RBAL)*	15-minute	-	333
Fence line – PM_{10} RBAL*	15-minute	-	159

* The Giant Mine team initiates additional procedures if the following levels of particulates are detected by monitoring stations positioned along the Site perimeter

In 2017-18, there were no activities that required activity-specific monitoring, but the fenceline and community monitoring programs continued as per usual. The final annual report was provided by SLR in June 2018.

The fenceline program monitors for dust around the perimeter of the site to ensure dust and contaminants are not being released from the GMRP. Nine stations with e-samplers are positioned in fixed locations to ensure consistent coverage of various wind directions. The stations run 24-hours a day throughout the work season (May – November).

The Project team hosted an open house at the new Niven Lake community air monitoring station in the summer of 2017, inviting the public to learn more about air quality monitoring for the Project and to give residents of Niven an opportunity to learn about the newest air quality monitoring station in Moyle Park.

[5] SOURCES: [1] Ontario Ambient Air Quality Criteria (December 2016), [2] Canadian Council for Ministers of the Environment (2015) Canadian Ambient Air Quality Standards, [3] Guideline for Ambient Air Quality Standards in the Northwest Territories (February 2014)

Results

- Results of the ambient air quality monitoring indicated the air quality of the airshed encompassing the GMRP was representative of regional and local air quality;
- One total (total suspended particulate (TSP)) arsenic concentration measured at the fenceline monitoring locations was equal to the Ontario Ambient Air Quality Standard (AAQS). (In cases where this is no applicable GNWT standard, results are compared to the Ontario AAQS.) One total iron concentration and three total nickel concentrations measured at the fence line monitoring locations were above the Ontario AAQS. There were no reported site activities coinciding with the measured concentrations of fenceline 24-hour integrated arsenic, iron, or nickel from TSP that may have contributed to exceedances of their respective AAQS;
- There were no concentrations of arsenic, trace metals or asbestos above the AAQS at any of the community stations;
- All particulate matter, trace metals, and asbestos data indicated that concentrations measured above reference criteria were likely caused by isolated, transient fugitive emissions sources such as smoke from regional forest fires, road dust from vehicle traffic (on and off-site), and interference from mist or fog and freezing fog;
- The majority of fence line particulate concentrations and community station particulate concentrations measured above the Risk-based Activity Level (RBAL) or AAQS were measured in August and were determined to be likely caused by the presence and influence of smoke from regional forest fires.

Next Steps

- The air quality monitoring program will continue, including ongoing community monitoring, and fenceline monitoring, with activity-specific monitoring conducted as applicable;
- To ensure the AQMP is robust and continues to meet the needs of the GMRP and stakeholders, a review of the AQMP will be conducted in 2018-19.

More details on the air monitoring program, including real-time data and weekly reports are available on the NWT Air Quality Monitoring Network. You can also receive the weekly reports via email by requesting to be added to the distribution list by writing to giantmine@aandc-aadnc.gc.ca.

3.2.2 Dust Suppression

Dust suppression activities continue to take place at the Giant Mine site. Dust can be caused by many sources, particularly in dry climates such as Yellowknife. Dust detected at the site doesn't necessarily contain arsenic trioxide or other mining by-products. Real-time monitors that make up the Air Quality Monitoring Program use conservative criteria to ensure residents are not being exposed to unacceptable levels of contaminants from the activities occurring at the Giant Mine site.

The Project team takes active measures to reduce dust from the site's tailings ponds and roads. These measures include communicating daily wind forecasts to Project team members each morning, applying a dust control product to the tailings ponds, and wetting both the tailings ponds and the tailings stockpiles.

Results

In 2017 the Project team began using SoilTac, a more effective dust suppressant for the tailings ponds than the SoilSement previously used. SoilTac was deemed effective based on visible observations of the lack of airborne dust, verified by air quality monitoring results.

Next Steps

The Project team will continue to ensure there is a sufficient stockpile of dust suppressant on site, and that water trucks are available to wet drying areas that could generate dust.

3.3 WATER

To monitor and minimize water quality impacts, the GMRP has ongoing effluent and water quality monitoring on-site.

2017-18 Highlights

- Seasonal effluent treatment and year-round water quality monitoring was ongoing.
- The Project team gathered additional information on the baseline conditions of the water in Baker Creek and Yellowknife Bay. The sampling results will be added to the existing data. These data will be used in the development of the water quality models, which will be used to set the proposed effluent quality criteria and site-specific water quality objectives.
- Sampling at the existing groundwater wells was reinitiated.

3.3.1 Effluent, Surface Water and Groundwater Quality Monitoring

To protect the health and safety of workers, the public, and the environment, water from the Giant Mine Site is treated at the on-site ETP before being discharged to the environment. The ETP system consists of various components including reaction tanks, a settling pond, and a polishing pond that are used – in this order – to treat the mine water. Discharged effluent water must meet standards set by the MMER under the *Fisheries Act* and the GMRP has also committed to meeting the standards outlined in its former Water Licence. Part of the water quality monitoring program includes testing of effluent chemistry. If the level of arsenic in the water is near the maximum allowable limit, the Project team stops the release of effluent to Baker Creek and recycles it back through the treatment plant.

Contaminated water is generated throughout the year and stored on-site in the Northwest Pond. Treatment of this water typically begins in June of each year, with discharge to the environment occurring between July and September, once the Arctic Grayling have left Baker Creek.

The Project team undertakes effluent and water quality monitoring in and around the Giant Mine site via different programs in order to report on surface water, groundwater and underground mine water. These programs track parameters such as the volume of water pumped or discharged, water quality, and the performance of the ETP. The effluent and surface water quality monitoring encompasses the programs outlined below. These programs are used to monitor existing performance and to inform the design process for remediation activities.

- **Surveillance Network Program (SNP):**
    - The SNP is comprised of seven active sampling locations (Table 7) five of which are located within the project boundary area. Natural waterbodies include Trapper Creek, Baker Creek, Pocket Lake, and the Yellowknife Bay area near the Baker Creek breakwater.
    - Although the Water Licence expired in 2005, the Project team has committed to continue site monitoring as outlined in the SNP, which involves frequent (four times per week) water quality analyses of the discharge from the ETP (at SNP 43-1) during the treatment season and weekly or monthly analysis at six other sites (four on-site and two off-site).
- **Metal Mining Effluent Regulations (MMER)/Environmental Effects Monitoring (EEM) Effluent and Water Quality Monitoring Program**
    - During the period of active discharge, monitoring is completed at the point of discharge (SNP 43-1), an upstream location in Baker Creek (SNP 43-11) and a station downstream of the point of discharge (Baker Creek Exposure Point). This monitoring is completed to meet the requirements of the MMER and associated EEM program for annual effluent and water quality monitoring. Section 3.5.3 provides additional information on this monitoring program and its results.
- **Operational Monitoring Program (OMP)**
    - The OMP continued in 2017-2018 in support of site operations. OMP stations include underground mine locations, groundwater wells, operational ETP feed and discharge (to settling pond), settling and polishing ponds, sumps, and surface waters of tailings containment areas.
- **Supplemental surface water and groundwater baseline data collection** (additional information provided below).

Table 7: Water Quality Monitoring Station Locations and Frequency

ACTIVE WATER MONITORING STATIONS 2017-18		
STATION	**LOCATION**	**FREQUENCY**
SNP 43-1*	Treated effluent discharge pipe – (autosampler location prior to discharge in Baker Pond)	Daily during discharge from ETP (June – Sept in 2017); weekly autosampler samples and monthly grab samples (during active discharge period)
Baker Creek Exposure Point*	Baker Creek Reach 5 just downstream of Baker Pond	
SNP 43-5	Baker Creek, prior to entering Yellowknife Bay	Weekly during open water (May-Oct)
SNP 43-11*	Baker Creek, upstream of SNP 43-1	Monthly during open water (May-Oct)
SNP 43-12	End of the breakwater at the outlet to Baker Creek	Weekly during open water (May-Oct)
SNP 43-15	Outflow of Trapper Creek from Trapper Lake	Monthly during open water (May-Oct)
SNP 43-21	Akaitcho pumping system	Weekly, throughout the year
SNP 43-22	Pocket Lake	Monthly during open water (May-Oct)

* SNP 43-1 and SNP43-11 are sampled to meet requirements for Metal Mining Effluent Regulations and the SNP outlined in the former water licence. Baker Creek Exposure Point is only monitored for MMER purposes at this time.

Parameters tested at all stations include standard general parameters (e.g., temperature, pH, conductivity, hardness), major ions, total and dissolved metals and metalloids, and nutrients. There are also specific station requirements for other tests such as cyanide, oil and grease, and radium-226. Samples collected at SNP 43-1 must meet federal requirements under Metal Mining Effluent Regulations (MMER) as well as the discharge criteria defined in the former Water Licence (N1L2-0043).

Surface Water Quantity and Quality Monitoring

Golder was retained to support the 2017 field program by leading the surface water program, which included three main components:

- Surface water quantity: Record hydrometric data from spring (before freshet) to fall and conduct water surface elevation and discharge measurements during and after freshet.
- Surface water quality and toxicity sampling:
    - Surface runoff: collected surface runoff water samples in the spring (during freshet) and in the fall (during a rain event) from various locations at a subset of the stations sampled in 2014/15.
    - Baker Creek and Yellowknife River: collect water quality and toxicity samples from locations in Baker Creek prior to the start of effluent discharge, and from a potential reference area, Yellowknife River.
    - Yellowknife Bay: collect water quality and toxicity samples and conduct water column profiling in Yellowknife Bay.

The main objective of the 2017 surface water program was to supplement work completed under previous monitoring programs to further characterize existing surface water quantity and quality conditions across the Mine and in Yellowknife Bay.

Spring and Fall Groundwater Monitoring Programs

Golder was also retained to reinitiate the spring and fall groundwater monitoring programs at the Site. The samples collected from the existing functional groundwater wells were tested for:

- Standard general parameters (pH, acidity, specific conductivity, hardness, total alkalinity, total suspended solids, total dissolved solids, and turbidity);
- Major ions;
- Nutrients;
- Dissolved organic carbon;
- Total and dissolved metals and metalloids; and,
- Total cyanide.

The following recommendations were included in the resulting report: completing a geodetic survey; replacing, repairing and/or decommissioning wells that could not be sampled; maintaining current sampling procedures, including field filtration for all groundwater sampling events, based on an assessment of field filtering methodology; evaluating the overall groundwater monitoring requirements to support finalizing remedial designs (short term) and to establish baseline in the areas that will require monitoring post-closure (long term); and expanding the sampling locations based on short-term and long-term monitoring requirements. These recommendations will be considered in the development of the 2018-19 monitoring program

Results

- In 2017, a total of 312,404m^3 of treated effluent was released into the environment;
- Daily, weekly, and monthly analyses show that all treated effluent discharged to the environment during the 2017 treatment season met the discharge limits as set forth in the former Water Licence and as defined under the federal MMER. No exceedances were reported for the treated effluent discharged to the environment (SNP 43-1);
- A field review and sample collection from site groundwater wells was conducted in 2017. Further characterization and groundwater well program review will occur in 2018-2019.

Next Steps

- Monitoring of the treated effluent will continue prior to and during discharge to ensure discharge limits defined in the former Water Licence and MMER are met prior to discharge to the receiving environment;
- Existing water quality monitoring (SNP, MMER/EEM, OMP) will continue to characterize the conditions on site and downstream of the site, which will enable these results to be used to assess potential site-related effects in the biota;
- OMP sample collection and analysis will continue at various surface water, groundwater, and underground water monitoring stations. The results will inform and confirm operational practices at the ETP and ensure that discharge from the ETP meets the requirements of the SNP, as well as inform water management practices on site;
- The GMRP will apply for a new Type A Water Licence for the implementation phase of the project; the submission of the water licence application is anticipated in January 2019. The water licensing process requires the Project team to gather significant local stakeholder and public input into these plans. In the interim, CIRNAC has agreed to continue monitoring and reporting on effluent and water quality from specified locations in and around the Site, as outlined in the SNP (a condition of the now-expired Water Licence N1L2-0043).
- A proposed revised SNP program will be submitted as part of the water licence application. To this end, SNP and OMP station locations, parameters for analysis and frequency of sampling were reviewed beginning in 2017-2018. The proposed revised SNP will be finalized in 2018-2019 based on stakeholder feedback.
- The Project team is assessing ways to create a public library for stakeholders to access monitoring reports, while working within federal policies. It is anticipated that the SNP data files will be posted to the Mackenzie Valley Land and Water Board (MVLWB) in FY 2018-19. Until then, any document – including SNP data – is available by request to the Project team.

3.3.2 Outfall Location

New Water Treatment Plant Outfall Location Options Analysis

AECOM and Golder partnered to complete a preliminary design report for the new WTP outfall, provided in October 2017. To inform the preliminary design, Golder assessed mixing and water quality concentrations in Yellowknife Bay for three outfall options. Among the findings of the Golder report was that a submerged single port outfall was estimated to provide enough mixing of effluent to meet the aquatic life and drinking water guidelines at 200 m from the end-of-pipe.

Four consultation sessions were held to gather input on the outfall preliminary design.

Results

- Eleven outfall options were initially considered and were ranked based on the overall scores from the options evaluation criteria. (Four location options were selected from the 11 at the first of four consultation sessions.) The criteria weightings and scorings were developed from stakeholder input and finalized at a design meeting held with CIRNAC, PSPC, AECOM and Golder staff. Cost estimates were also completed for each of the 11 options.
- Stakeholder input was also considered for pre-cooling the treated effluent in the winter months prior to discharge, since the warmer effluent may present thin-ice safety issues for lake users. Pre-cooling the effluent was evaluated for passive cooling and active cooling options.
- From the outfall options evaluation, an outfall in the vicinity of Baker Creek, with no-cooling, had the highest score, and therefore ranked first overall.

Next Steps

- The next steps for the outfall will include a comprehensive effluent quality criteria modeling study for the effluent quality criteria to define a more precise location for the WTP outfall.
- Detailed design for the outfall for a no-cooling option at the selected location in the vicinity of Baker Creek will be completed once the comprehensive effluent quality criteria modeling has been completed.

3.4 LAND

The Project team undertook several activities to monitor and minimize impacts to land and to protect the health and safety of the public and on-site workers. These activities included monitoring and management of arsenic impacted waste and considering the location of a new non-hazardous landfill.

2017-18 Highlights

- The C5-09 Stope Stabilization contract was awarded to Nahanni Construction Limited. This entails backfilling the last remaining high risk stope complex as part of the underground component of the site stabilization plan.
- Continued monitoring and management of arsenic-impacted waste on site.
- The Project team has been carefully considering where they can build a new non-hazardous landfill when remediation starts.
- Supplemental soil sampling programs were conducted to characterize arsenic in disturbed and undisturbed areas of the site.

3.4.1 Site Stabilization/Risk Mitigation

The C5-09 stope stabilization is a complex project that has evolved over the last two fiscal years as the project obtained new data and understanding of the geometry of the stope complex and surrounding mine workings. The history of C5-09, and the purpose of the backfill program, is to replace a large quantity of existing fill material that moved out of the stope and into lower mine workings resulting in a

large void and risk of collapse due to an unsupported crown pillar. The approach to stabilizing this void requires the installation of a self-leveling concrete "plug" layer prior to bulk backfill. This "plug" would be placed on top of newly placed strong paste, as well as existing fill to provide integrity to the stope should an event occur, and existing fill move further down into mine workings below. Bulk paste backfill would be placed between the "plug" and crown pillar. This will allow the newly placed backfill to remain in place while the team works to respond to fill movement, should that occur in the future. The design approach of this "plug" is the key aspect of the program.

Results

During FY 16/17 Golder completed the design and tendered specifications based on a strong paste plug and bulk paste backfill. This design was presented to the Independent Peer Review Panel (IPRP) in February 2017 as part of the GMRP technical oversight process. The IPRP requested the consideration of a concrete plug rather than the strong paste fill plug and a subsequent follow-up meeting was required in April 2017. The IPRP had concerns regarding longevity of a strong paste plug over the long term (structural failure, shrinkage, etc.) and the team's ability to respond to an event of existing fill moving further down the mine (i.e. the timeframe the plug would "hold"). Through these presentations/meetings it was decided that the design approach be changed from a strong paste plug to a concrete plug. This change in design approach impacted the schedule of the project and extended the project end date milestone due to the additional efforts and time required by Golder to complete the necessary testing, mix designs, delivery methods and specifications of the concrete plug. This impact to schedule meant that backfill operations could not start until the Spring of 2018.

The C5-09 Stope Stabilization contract was awarded to Nahanni Construction Limited. This entails backfilling the last remaining stope complex as part of the underground component of the site stabilization plan. This contract was awarded in February 2018.

Next Steps

The backfilling for C5-09 will begin in late May 2018 and is expected to be completed in the Fall of 2018.

3.4.2 Waste Management

In 2017-18, the Project team and contractors managed existing waste and carefully disposed of new waste created during the year.

In 2014, the decontamination and deconstruction of the Roaster Complex as part of the SSP produced hazardous waste, primarily arsenic- and asbestos-containing materials. The wastes were safely packaged in lined Transportation of Dangerous Goods (TDG) bags and stored on site, held in shipping containers within an area secured by a chain-link fence. Runoff water from the storage area is collected and treated in the GMRP's ETP. Until the material can be appropriately disposed, the safest place to store it is on an already contaminated site, away from water and people. The materials have therefore remained on-site and appropriately cared for during 2017-18.

The Project team has been carefully considering where they can build a new landfill when remediation starts. This landfill would be for non-hazardous waste. AECOM performed a site location study for the non-hazardous waste landfill. To identify a recommended location for the landfill, AECOM reviewed background information, regulatory guidelines, developed a decision matrix, prepared interim reports, completed a site assessment for the potential landfill locations, reviewed geotechnical and

topographical considerations, reported on the outcome of the site selection study and identified a recommended location for the landfill based on the decision matrix developed.

The findings of the report have been shared for feedback with the GMRP WG and GMAC.

Results

- Non-hazardous wastes were safely stored on site, within designated areas;
- There was continued monitoring and management of hazardous wastes;
- Run-off water from the hazardous waste storage area was collected and treated.

Next Steps

- Hazardous waste safely packaged and stored on-site will remain until it can be appropriately disposed of, which may take several years;
- Waste material stored on-site will be safely managed until full remediation can begin;
- The selected non-hazardous landfill location will be ground-truthed in 2018-19, which will include an archaeological impact assessment.

3.4.3 Remedial Strategy for Contaminated Soil and Sediment

In support of the CRP, Golder was retained to evaluate and select remedial / risk management strategies associated with contaminated soil and sediment at Giant Mine. Investigative programs were completed in 2016 to support the development of remedial strategies; for example, Golder developed a soil quality terrain model to understand the extent of contamination to allow for the identification of potential remedial / risk management methods and develop potential remedial scenarios/strategies.

A range of closure alternatives were evaluated and assessed, for the bedrock/forest/wetland terrain and Baker Creek, during a Contaminated Soils Workshop in June 2017. Attendees of the workshop included federal and territorial representatives (CIRNAC/PSPC/GNWT), consultants (Golder/AECOM/CanNorth), and the GMRP WG and GMOB. The workshop attendees reviewed, discussed, ranked, and selected the preferred remedial scenarios/management alternatives for the following key site areas: Shoreline Lands; Core Industrial Area; Downgradient of Dam 3; Baker Creek; and Roaster Contaminated Surficial Material. At the end of the analysis, the workshop participants reviewed the overall linkages between preferred scenarios for the five key project elements.

Results of the June 2017 workshop were used as an input to the overall site material balance with regards to alternatives for disposal of contaminated soils or sediments.

Results:

- Shoreline and townsite lands will be remediated to residential soil quality criteria.
- The core industrial area will include a physical barrier to restrict access to contaminated soil within the bedrock/forested/wetland terrain with total arsenic concentrations greater than 3000 mg/kg.
- Downgradient of Dam 3: Soil within the tailings impacted areas will be remediated using conventional excavation techniques and a Reclamation Research Plan (RRP) will be developed as part of the Closure and Reclamation Plan for pond water-impacted areas.

- Baker Creek: includes removal of contaminated sediment from lower Baker Creek, Baker Pond, and the Jo-jo Tailings Area. Baker Pond and Jo-jo Tailings area will be backfilled to support revegetation.

Next Steps:

- The Remedial Strategy for Contaminated Soil and Sediment report is expected to be released in October 2018, which will support the CRP for Giant Mine.
- The Remedial Strategy for Mill Pond, Calcine Pond, Area 4 and the four deep pocket areas will be reviewed and assessed in 2018-19, including the cover design as required.
- Conduct further field investigations in order to finalize substantive designs.

3.5 BIODIVERSITY

The Giant Mine Project team is undertaking activities to actively manage risks related to wildlife and to aquatic life, including establishing and undertaking studies on animals, plants, and habitat, as described below. The results of these and other biodiversity-related studies from recent years were considered in the HHERA and remediation design to better understand current impacts on wildlife and to consider wildlife uses of the site when planning the design, schedule, and nature of activities in remediation. Additional details on how wildlife has been considered in the remediation design will be provided in future, once the remediation design is further advanced.

2017-18 Highlights

- Results of site-wide bird survey and MMER/EEM were similar to previous year;
- Results of biodiversity studies and monitoring were considered in the remediation design and the HHERA.

3.5.1 Site-wide Bird Survey

The annual bird survey was conducted by Golder in spring of 2017-18 to:

- document bird use of infrastructure and habitat at the site where work is planned or ongoing;
- identify risks of industrial activities to birds, their eggs and nests; and
- recommend appropriate mitigations to minimize detrimental impacts on birds.

The methods, risk factor categories considered, and recommendations were consistent with those from the previous year (spring 2016). The surveys focused on areas where birds were considered to be at greatest risk due to current or planned future site activities and/or the presence of artificial perching or nesting structures such as buildings.

Results

Recommendations were provided to reduce the risk of contributing to the incidental take of migratory birds, their young, eggs and/or nests.

These recommendations were considered when determining when and how activities were carried out on site. For example, site work in support of the C5-09 backfill program commenced prior to the bird nesting season to minimize the risk of nesting in an active work zone.

Next Steps

- The Project team will consider the recommendations as part of the WWHMP design;
- Annual site-wide bird monitoring will continue in 2018-19.

3.5.2 Wildlife Monitoring

No specific wildlife monitoring took place in 2017-18. However, wildlife interactions are logged by DCNJV and reported, as required.

A draft Wildlife and Wildlife Habitat Management and Monitoring Plan (WWHMMP) was developed in 2017-18. It will be finalized in 2018-19 in consultation with GNWT Environment and Natural Resources (ENR) and stakeholders and submitted as part of the water licence package in early 2019.

The objectives of the WWHMMP include the following:

- Document and mitigate effects to wildlife from the Project remediation activities;
- Describe the application of adaptive management for the protection of wildlife to Project remediation activities;
- Describe how the Project will meet relevant guidelines and regulatory requirements;
- Constitute part of the engagement with communities, regulatory agencies, and interested parties in wildlife mitigation and monitoring.

The objectives of the WWHMMP take into account investigations, studies and input from the Project team, the GMRP WG (which includes GMOB), and input from the environmental assessment and surface design engagement processes.

This WWHMMP incorporates learnings from the current care and maintenance operations at the Site. Some examples provided below include learnings from interactions with black bears and nesting birds at the Site:

- Black bears are observed regularly within the lease area, and observations are documented and communicated to staff and contractors. Following a bear sighting, workers in the area are typically encouraged to work in pairs, stay vigilant, avoid leaving food waste, and can be accompanied by security staff if necessary. On occasion, GNWT Environment and Natural Resources has deployed bear traps to manage habituated or problem bears on site and relocated the bears away from the Site;
- Migratory birds have used structures at the Site for roosting and nesting, leading to concerns for the safety of the nest if it was located in an area of frequent activity or on a structure scheduled to be demolished. Surveys of the Site infrastructure for nesting birds were completed each spring to identify pre-nesting behaviour and the presence of nests. Nests identified were communicated to the Mine Manager, resulting in avoidance of the area until the chicks had fledged. In some instances, demolition was postponed, or schedules were altered to avoid disturbance to the nest. These processes are formalized and will be continued through the WWHMMP.

The scope of the WWHMMP expands spatially to the entire extent of the proposed project boundary and temporally to the duration and subsequent long-term care and maintenance activities. Once finalized, the WWHMMP will be submitted as part of the overall water licence application.

3.5.3 Environmental Effects Monitoring

The MMER under the *Fisheries Act* require metal mines to conduct EEM. This includes monitoring of effluent and surface water quality, toxicological testing of the treated effluent, and biological monitoring. These results are used to assess and identify any effects that may be caused by the treated effluent. The overall objective of these studies is to protect fish and fish habitat in order to protect fisheries and maintain the safe use of fish by people. Effluent and water quality are monitored annually during periods of discharge and these data are used to help interpret the effects observed in the fish and benthic invertebrates from Baker Creek (i.e., the results from the biological program that is completed every three years).

The Project team, led by Golder, completed effluent characterization and surface water quality sampling during the discharge period between June 22 and September 28, 2017. Samples of treated effluent and surface water were analyzed for the eight deleterious substances and pH as outlined in Schedules 3 and 4 of the MMER, as well as the required parameters outlined in Schedule 5 (EEM) of the MMER and applicable site-specific parameters recommended by Environment Canada (2012). In addition, treated effluent was tested for acute and sub-lethal toxicity as required by the MMER (Government of Canada, 2012).

Golder also led the Phase 5 Investigation of Cause (IOC) study, published in June 2017. The previous IOC study was completed in 2012. The main objective of the Phase 5 IOC study was to determine the cause(s) of effects observed in benthos and fish in the EEM exposure areas within and close to Baker Creek. The study tested four hypotheses to explain effects that were observed in previous EEM phases. The hypotheses were assessed by considering lines of evidence: benthos taxa and abundance; growth and reproduction of fish; fish liver assays; effluent/sediment toxicity; presence/absence of metal sensitive benthos species; metals in fish and benthos tissue; physical habitat; food quality; effluent chemistry; and, historical benthos and fish abundance.

Results

- Treated effluent was determined to be not acutely toxic as tested (no acute toxicity effects were observed for either Rainbow Trout or *Daphnia magna* survival, with zero mortality observed in 100% treated effluent). Sublethal toxic effects on growth and/or reproduction of small plants and animals (microalgae *Pseudokirchneriella subcapitata*, water flea *Ceriodaphnia dubia*, and water plant *Lemna minor)* were observed, in addition to an adverse effect on the water flea *C. dubia* survival. No toxic effects were observed in growth or survival of fish (fathead minnow *Pimphales promelas)*. Sublethal effects were observed for effluent concentrations below 30% for *C. dubia* (IC_{25} of 4.4%). Overall, sublethal toxicity testing results for the 26 July 2017 treated effluent sample are consistent with results from previous years. Unlike 2016, no adverse effects on *L. minor* growth (biomass) were observed in 2017;
- Treated effluent and surface water quality in the exposure and reference areas was tested as required under Schedules 3, 4, and 5 of the MMER. All parameters were below applicable

MMER discharge limits defined in Schedule 4 for the 2017 samples. Current results were consistent with results from previous years.

- The following conclusions with respect to causation were reached after consideration of the lines of enquiry in a weight of evidence synthesis:
    - It is likely that exposure to contaminants has contributed to the effects observed in the EEM studies (high confidence).
    - It is unlikely that nutrient enrichment has contributed to the effects observed at Baker Creek (high confidence).
    - It is likely that habitat differences have contributed to the effects observed at Baker Creek (moderate confidence).
    - It is unlikely that effluent quality changes over time have influenced the most recent effects observed in fish at Baker Creek, which are likely due to historic sediment contamination. It is likely that recent increases in conductivity including total dissolved solids, sulphate, and chloride have influenced benthos exposed to effluent (high confidence).

Next Steps

- Annual effluent and surface water quality monitoring for the MMER/EEM will continue in 2018-19.
- The study design for Phase 6 of the IOC will be completed 2018-19, with a return to standard monitoring as per the recommendation in the Phase 5 report. The next field program is anticipated during the summer/fall 2019, with the final report anticipated in June 2020.

3.5.4 Aquatic Effects Monitoring Plan

The GMRP is in the process of preparing an application to the Mackenzie Valley Land and Water Board (MVLWB) for a Type A Water Licence for the Site, with an anticipated submission date of January 2019. An AEMP will be required under the new water licence. As described in the *Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development in the NWT* and the *Draft Guidelines for Aquatic Effects Monitoring Program,* four different types of documents are required to be submitted under the AEMP. These include a Design Plan, Annual Report, Re-evaluation Report, and Response Plan.

The GMRP is proposing to build a new WTP, which will discharge directly to Yellowknife Bay; however, until the new WTP is commissioned, the existing ETP will be used. The two different treatment plants discharge to different locations and so will have different monitoring requirements and different AEMP programs:

- Baker Creek AEMP (provisionally 2019 to 2026) – existing ETP with discharge to Baker Creek, under status quo treated effluent discharge conditions;
- Yellowknife Bay AEMP (provisionally 2026 onwards) – proposed new WTP with discharge into Yellowknife Bay

Results

- Development of a Draft Baker Creek AEMP Design Plan, and a Draft Yellowknife Bay Conceptual AEMP Design Plan began in 2017/2018 and will be finalized in 2018/2019 based on public review and comment and feedback from GNWT ENR.

Next Steps

The AEMP Baker Creek Design Plan is intended to cover the Project Definition Phase (Phase 1) and the starting years of the Active Remediation Phase (Phase 2) before the new WTP is commissioned. It is anticipated the main activities that will occur will include:

- Treatment of the effluent and surface runoff water with the ETP;
- Demolition of Townsite buildings near the mouth of Baker Creek;
- Construction and operation of a non-hazardous landfill, removal and capping of contaminated soils, completion of pit filling, and completion of covering of tailings containment areas (TCAs); and,
- The main stressors to the environment for this AEMP Design Plan are exposure to treated effluent/runoff and existing contaminated sediment.

An EEM program has been conducted since 2003, with five phases of monitoring completed to date. An EEM program will continue to be required and will run concurrently to the development of the AEMP for Yellowknife Bay. The conceptual Yellowknife Bay AEMP Design Plan is provisionally applicable from 2026 onward. It is intended to be conceptual to allow discussion of the monitoring program with regulators and affected parties. For this conceptual AEMP Yellowknife Bay Design Plan, harmonization of the AEMP and EEM programs is proposed. A preliminary sampling design has been outlined in this conceptual design plan with the objective of receiving regulatory and public feedback for the future detailed AEMP Design Plan.

4.0 HEALTH AND SAFETY (H&S)

4.1 OCCUPATIONAL HEALTH AND SAFETY

CIRNAC provides oversight for occupational health and safety, while PSPC provides oversight and manages contractors to ensure that they have in place a health and safety plan, health and safety procedures, and emergency response plans, and that contractors follow the procedures and report any health and safety incidents.

The care and maintenance contractor / Main Construction Manager maintains overall health and safety responsibility as the prime contractor at the Giant Mine. To ensure that on-site safety plans are implemented, there is a designated occupational health and safety manager who organizes ongoing training and occupational health and safety support for managers, supervisors and other employees.

2017-18 Highlights

- There were 5 H&S incidents in 2017-18: 1 moderate and 4 minor;
- The number of reported near misses decreased from 179 in 2016-17 to 99 in 2017-18;
- 1.8% of urinalysis samples were above the action level of 35 micrograms of arsenic per litre of urine (µg/L) in 2017-18;
- The number of hours spent in training in 2017-18 decreased from those spent in 2015-16, due to less physical and construction work being required on site compared to the previous year.

4.1.1 Health and Safety Incidents

GMRP tracks the number of major incidents, moderate incidents, minor incidents, and near misses on a monthly basis, and reports the incidents to the Project Director and Project team.

Results

There were no major incidents and one moderate incident in 2017-18 (

Table 8). This compares with no major or moderate incidents recorded in the two previous years. The moderate incident is summarized below:

- In December 2017, an underground worker was struck in the face with a scaling bar, with sutures to the face and head required. Corrective actions included the delivery of a scaling refresher workshop and practical field exercise with all underground personnel. In addition, all similar areas throughout the mine will be supported and screened on a priority basis.

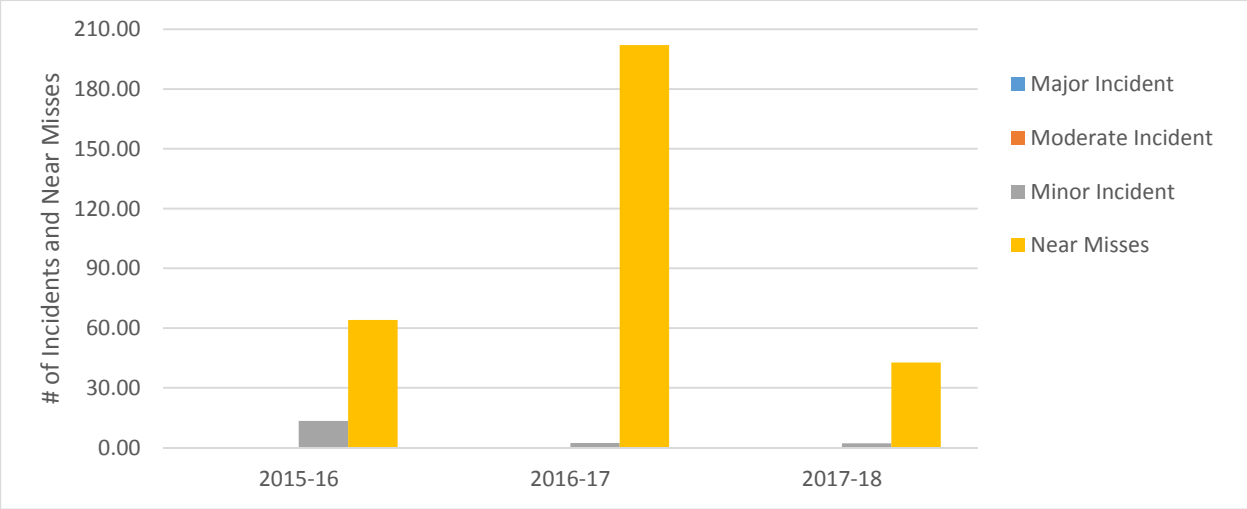
The number of minor incidents in 2017-18 (4) increased from 2016-17 (2) but is less than 2015-16 (11). The number of reported near misses decreased from 179 in 2016-17 to 99 in 2017-2018. All near misses are reviewed and appropriate corrective actions are implemented to reduce the risk of an incident occurring.

Table 8: H&S Incidents and Near Misses in 2017-18

Incidents and Near Misses	2017-18 Total
Major Incident: An incident resulting from activities performed at the Project Site that results in a severe and irreversible disability, impairment, injury, illness or fatality to an individual or individuals.	0
Moderate Incident: An incident resulting from activities performed at the Project Site that results in a reversible disability, impairment, injury or illness that temporarily alters the lives of an individual or individuals.	1
Minor Incident: An incident resulting from activities performed at the Project Site that results in injury or illness that inconveniences an individual or individuals.	4
Near Misses: An unplanned incident resulting from activities performed at the Project Site, which did not result in any disability, impairment, injury, illness or fatality, but had the potential to do so.	99

Figure 2 highlights the number of H&S Incidents and Near Misses from 2015-16 to 2017-18. The number of incidents is normalized by person-hours worked to enable comparison across years, when the amount of activity on site may differ. However, this normalization does not account for differences in the nature of activities undertaken from one year to another. Additionally, the high number of near misses does not necessarily represent poor safety performance, but could represent a strong safety culture, demonstrating high awareness of H&S concerns and a willingness to report those concerns.

Figure 2: H&S Incidents and Near Misses per 200,000 Person-hours Worked, by year (2015-16 to 2017-18)



Key Actions

- Incidents and near misses are discussed at daily safety meetings to review lessons learned, root causes and corrective measures.

Next Steps

- The Project team will continue to track and report H&S incidents.

4.1.2 Monitoring of Arsenic Levels in Workers

In the 2017-18 reporting year, the Project team monitored arsenic levels in the workers who spend time on-site by taking baseline urinalysis samples when workers start on site and then subsequent regular urinalysis samples (weekly samples if on-site full-time). Samples were compared against the Action Level of 35 micrograms of arsenic per litre of urine (µg/L) adopted by the Workers Safety and Compensation Committee (WSCC).

Results

Table 9 below shows the total number of samples and the number of samples above the Action Level of 35 micrograms of arsenic per litre of blood. The percentage of samples above the action level is lower than it was in the previous year (2.6% in 2016-17 versus 1.8% in 2017-18). This may reflect the increased emphasis from the Project team and the C&M contractor on prevention but should be interpreted with caution as it may also be influenced by the nature of work undertaken in 2016/17 and in 2015/16 (i.e. how much arsenic-impacted material workers were exposed to in each year).

Table 9: Summary of Urinalysis Sampling and Results in 2017-18

Total samples	Number of samples above the Action Level (35 µg/L)	Percentage of samples above the Action Level (35 µg/L)
498*	9	1.8%

*This value includes 19 baseline samples, and does not include invalid test results (45 samples)

Key Actions

- For any urinalysis sample above the Action Level, the contractor notified WSCC, CIRNAC, and PSPC and investigated the root cause (e.g. diet, poor hygiene practices, inadequate procedures). The contractor then took immediate actions to reduce exposure to workers, such as improvement of dust control measures, adoption of more rigorous personal protective equipment procedures, re-training of staff on proper procedures, placing affected workers on limited duty to limit exposure to higher risk activities, or reassigning personnel to other duties (in the rare case of continued / recurring high levels of arsenic);
- Tracking of results that are below but nearing the Action Level also allows for identification of those workers who could benefit from preventive interventions, to avoid reaching the Action Level.

Next Steps

- The Project team will continue to provide oversight and manage the health and safety of its employees and contractors through the established management system and associated health and safety procedures, including urinalysis for on-site workers.

4.1.3 Health and Safety Training

The C&M Contractor's occupational health and safety manager ensures that employees and sub-contractors receive relevant health and safety training, including first aid, wildlife safety, water safety, and fire response, as required by applicable regulations. Each year, all new employees are assessed to ensure they have the required training to complete their jobs safely and effectively. Workers involved in

the underground stabilization project are trained on the hazards of arsenic and silica, the required personal protective equipment (PPE), and decontamination and work procedures.

Results

PSPC and CIRNAC track the number of person-hours that employees and sub-contractors receive in training, as shown in Table 10.

Table 10: Total Hours of H&S Training Received by Employees and Contractors On-site

Health and Safety Training	2017-18 Total Hours
HAZWOPER (Hazardous Waste Operations and Emergency Response)	8
WHMIS (Workplace Hazardous Materials Information System)	14
First Aid	416
Wildlife Safety	31
Water Safety	-
Fire Response	-
Other (non-H&S)	3,294
Total Training Hours	3,763

Key Actions

- None to report.

Next Steps

- The Project team will continue to track the type and amount of training received by employees and contractors to ensure that all employees receive the required training. The Project team also shares this information with interested parties and stakeholders – such as the GMOB and the community – to assure them that on-site personnel are appropriately trained to do their job safely and effectively and are getting some training that is potentially transferable to other employment.

4.2 PUBLIC HEALTH AND SAFETY

Since the Government of Canada took over responsibility for the Mine Site in 1999, the Giant Mine Project team has monitored the Site and ensured it is kept safe and secure through 24-hour-a-day care and maintenance work. This work involves ensuring public safety through site security, suppressing dust, and managing mine water and effluent.

In response to Measure 9 of the Report of Environmental Assessment, the GMRP commits to working with other federal and territorial departments to design and implement a broad Health Effects Monitoring Program. In response to Measure 10 of the EA, the GMRP committed to evaluating the direct and indirect effects of potential exposures to arsenic on wellness, including stress, through a Human Health and Ecological Risk Assessment, the final report completed in January 2018, and a Stress Assessment.

2017-18 Highlights

- The Health Effects Monitoring Program, which determines current level of arsenic exposure in residents, completed its first sampling period. Community information sessions were hosted throughout the year;
- The report on the HHERA was finalized; and,
- The Stress Assessment was deferred due to other Project priorities and stakeholder capacity.

4.2.1 Health Effects Monitoring Program

The health effects monitoring program in Ndilo, Dettah and Yellowknife focuses on effects in people related to arsenic and other contaminants[6] that might result from the GMRP. The monitoring includes studies of baseline health and ongoing periodic monitoring, in accordance with Measure 9 of *The Report of Environmental Assessment and Reasons for Decision* (MVRB, 2013). The purpose of this baseline and ongoing monitoring is to ensure that the implementation of the CRP activities do not cause negative health impacts on the people of Yellowknife, Ndilo and Dettah and to adjust activities as necessary if adverse effects are discovered. The monitoring program has completed its first sampling period.

Results

- No results to date.

Key Actions

An Advisory Committee as established for the program with representatives from GNWT Health and Social Services, Health Canada, the City of Yellowknife, the Yellowknives Dene First Nation, the North Slave Metis Alliance, GMOB and the Project team. The committee meets monthly and provides advice to the program.

The University of Ottawa's Dr. Laurie Chan, who is leading the design and implementation of the Health Effects Monitoring Program, hosted three community information sessions in April 2017 to present the program and talk about how residents can get involved. In addition, the program team met with various organizations in Yellowknife to review and finalize the questionnaires, as well as to settle logistical details such as staff training protocols and data management.

To recruit participants to the program, the program team mailed invitations to Yellowknife households, chosen by statistically-based random selection. Additional efforts were made to identify members of the YKDFN and the NSMA as participants. The monitoring program will endeavor to sample 2,000 participants over two years, collecting samples of toenail clippings, urine and saliva for lab analysis to determine their exposure to arsenic and other contaminants.

The first sampling period included a total of 898 participants from Yellowknife, Ndılo, and Dettah.

[6] Including antimony, cadmium, lead, manganese, and vanadium, which are being measured because other research and studies have shown that they are present at the Giant Mine site.

Next Steps

Those who participated in the first sampling process will find out their current exposure to arsenic and other contaminants in a personal letter in September 2018. The research team will sample more households in 2018.

The implementation schedule for the Health Study is as follows:

1. **2017/2018:** Implement sampling program. The first wave of sampling completed September to December 2017. Included a lifestyle questionnaire, biological samples of toenails, urine and saliva, a food frequency questionnaire, medical records review, a medical questionnaire and a brief medical exam with a nurse practitioner (for YKDFN participants only). Sample and data analysis.
2. **2018/2019:** Second wave April to June 2018. Communicate individual participants results; 2019/2020 overall community baseline results reported
3. **Follow-ups:** The Program will also carry out follow up sampling five years later for participants younger than 18 years of age, and within 10 years for adult participants.

Communications will be ongoing to ensure community members are well-informed. Monitoring results will be shared regularly, with plain-language explanations of the findings. For privacy and confidentiality reasons, results shared publicly will only report population-level findings.

For additional details on the Health Effects Monitoring Program, please refer to the Frequently Asked Questions (FAQs) on the program's public-facing website: http://www.ykhemp.ca/faqs.php .

4.2.2 Human Health and Ecological Risk Assessment (HHERA)

Since 2000, several human health and ecological risk assessments have been completed to determine the health and ecological risks from arsenic contamination associated with Giant Mine. *The Report of Environmental Assessment and Reasons for Decision* (MVRB, 2013) concluded that there were continued public concerns around human health due to the remediation of Giant Mine. An updated HHERA, previously referred to as an HHRA, was used to address these concerns and provided an estimate of current and predicted future exposures to contaminants associated with the Giant Mine. It provides information about the possible sources and pathways of exposure. In 2016, PSPC contracted CanNorth to complete the HHERA for the Giant Mine. During the project, CanNorth had held extensive engagements, including five meetings with representatives of the GMRP WG to discuss the best approach to implement the study and to share the study results. In January 2018, the Government of Canada finalized the report on the Giant Mine HHERA.

The HHERA looked at what changes to risk might happen once the Giant Mine has been cleaned up. Risk assessment looks at exposure across a community and not at any one individual person. The ongoing, separate Health Effects Monitoring Program looks at individuals. The HHERA follows guidance outlined by Health Canada and ECCC and over 200 reports were reviewed for information to be used in the risk assessment.

Arsenic and other chemicals (such as antimony and manganese) pose a human health risk to those living near the Giant Mine, so their levels in soil, water and sediments were studied in the HHERA at multiple locations near the Giant Mine. Arsenic is the key contaminant of concern.

Exposure can occur through drinking water, breathing air, touching backyard soils and dust from houses (which comes from outdoor soil being brought into the house by shoes), wading or swimming, eating supermarket food, fish, wild game, berries, mushrooms and medicinal plants. Each of these exposure pathways were studied.

Results

In January 2018, the Government of Canada released a final report on the Giant Mine HHERA. The report found that there is low risk to very low risk from past activities at the Giant Mine. The report also considered the effect that clean-up activities would have on local wildlife and plants, stating that the clean-up will reduce the risks but that potential for risks to small animals still exists. In Yellowknife Bay, low risks to small insects in the sediments were found, but these conditions will slowly improve.

The HHERA assessed potential exposure of people namely residents of Ndilo and Dettah communities, the City of Yellowknife, Latham Island, those that reside along the Ingraham Trail, people that camp at the Fred Henne Campground, and those who swim at Long Lake.

The HHERA showed that levels of arsenic in soils around Ndilo were higher than other areas assessed. The calculated risks for residents in Ndilo were higher than other areas assessed, however they were still within the low risk range, which is analogous to risk levels from having x-rays or a CT scan.

Chemicals other than arsenic (such as antimony and manganese) were also studied in the HHERA, but they were found within safe levels.

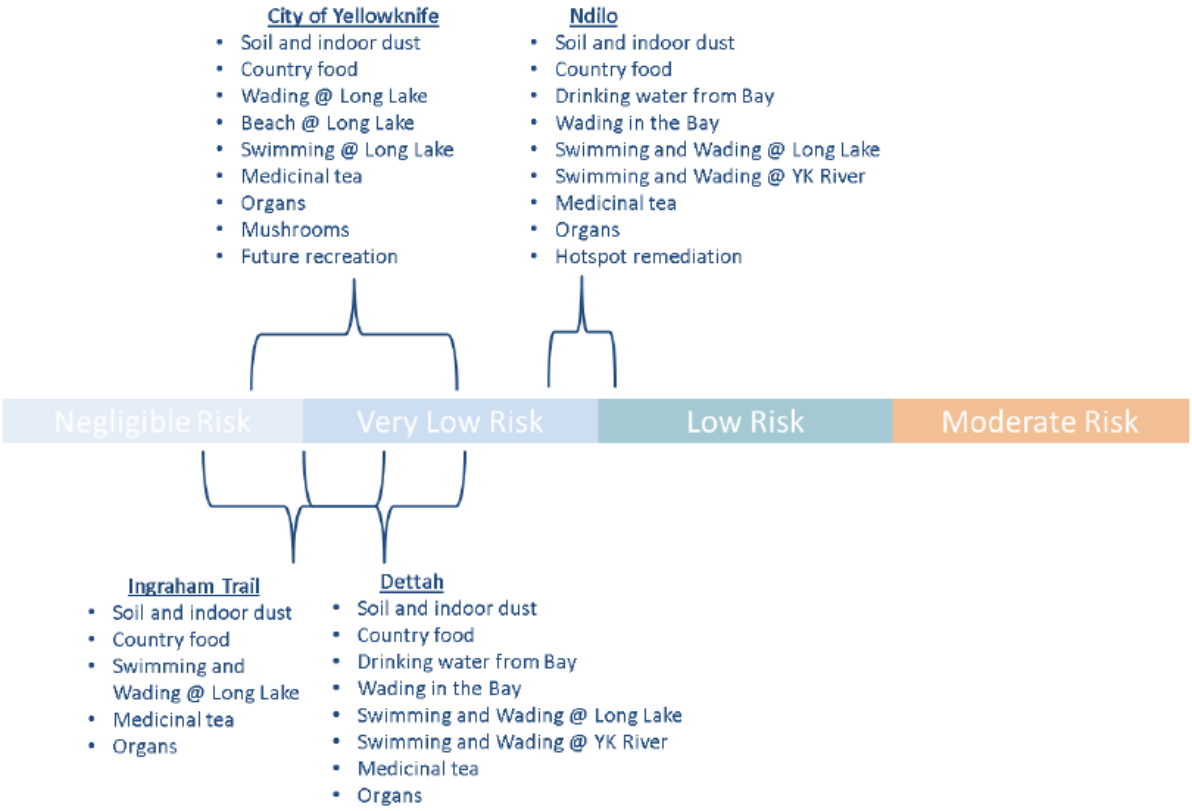
The YKDFN, NSMA, and Yellowknife residents participated in a voluntary country foods sampling program by providing over 130 samples of wild game, berries, medicinal plants, and fish, to be tested for contaminant concentrations. The HHERA showed the following levels of arsenic contamination in the country foods sampled:

- Fish caught in Yellowknife Bay had similar levels of contaminants to those caught elsewhere (i.e. present in naturally occurring or uncontaminated areas). Of the wild game samples caught within 10 km of the Giant Mine, rabbit and ptarmigan/grouse samples had the highest levels of contaminants, and beaver and duck were similar to levels present in naturally occurring or uncontaminated areas (i.e. similar to beaver and duck caught elsewhere in the territory);
- Mushrooms and berries picked farther than 25 km from the Giant Mine had contaminant levels similar to those present in naturally occurring or uncontaminated areas. Mushrooms picked within 10 km of the Giant Mine had about seven times higher levels of contaminants than those farther away, which was consistent with the researchers' expectations, as certain types of mushrooms are known to store high levels of arsenic;
- Levels of contaminants in rat root were low and similar to levels present in naturally occurring or uncontaminated areas;
- Fish and insects within Baker Creek sediments could have effects that will be monitored.

Overall, the HHERA showed that there are high levels of arsenic in the sediments of Yellowknife Bay close to the Giant Mine, but these are likely to decrease over time. The risks to people are mainly within the negligible to very low risk range and are mostly related to direct contact with arsenic-contaminated soils. Residents of Ndilo are at greater risk than other locations but are still at low risk – approximately

the same risk level as having x-rays or a medical scan. A summary of estimated incremental lifetime cancer risks from arsenic found in the HHERA is presented below (Figure 3).

Figure 3: Estimated Incremental Lifetime Cancer Risks from Arsenic Found in the HHERA[7]



The HHERA also noted that these risks will not change over the course of the closure of the Giant Mine as these closure activities will not change the arsenic levels in soils across the Yellowknife area. In the former townsite, closure plans include cleaning the soils to meet GNWT residential value, with sediments at the shore being dredged or capped. People possibly residing in the townsite after this clean up could be at similar risk to those living in the City of Yellowknife or Dettah.

Key Actions

CanNorth recommended that a plan to clean up soils in Ndilo be considered, as residents of that area are at an increased risk of exposure.

Next Steps

- The results of the HHERA will be considered in developing the draft Closure and Reclamation Plan.
- The CIRNAC Regional Office plans to work with the YKDFN to develop remedial options for Ndilo.

[7] GIANT MINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT - Final Report – January 2018

4.2.3 Stress Assessment

The direct effects of arsenic exposure are being evaluated through the HHERA as outlined above; however, Measure 10 of the EA requires the Project team to also evaluate the indirect effects of potential exposures to arsenic on wellness, including stress.

The Stress Assessment, led by Dr. Ketan Shankardass, is still under development and was not advanced in 2017-18 due to other Project priorities. The scope of the stress study is to:

- evaluate indirect effects on health from stress related to the possibility of arsenic exposure via the implementation of a survey tool;
- design and development of the survey tool will include consultation with affected community members.

Next Steps

- The Project team plans to meet with community groups in 2018 to gather information to inform the survey question for launch prior to the end of the fiscal year; delays in meeting with various key community stakeholders may translate to an overall delay in achieving that before March 31, 2019.

5.0 COMMUNITY

This section provides an overview of the relevant management and performance information that applies to the community engagement and socio-economic elements of Giant Mine.

5.1 ENGAGEMENT

Engagement has always been a significant part of the GMRP, from the initial examination of remediation options, to the EA process and Site Stabilization work, to the more recent SDE and health-related studies. The GMRP Vision for engagement is that, as a result of the GMRP communications and engagement program, the majority of stakeholders, affected parties, including First Nations communities, and residents of Yellowknife, Ndilo and Dettah, and special interest groups, are well-informed about the Project, support the approach being taken to remediation, feel their party has the opportunity to be involved in the exchange of information with the GMRP, are confident that the Project is being well managed by the Government of Canada and GNWT, and are optimistic about the future of the site. The GMRP Communications and Engagement Strategy for 2015-20, guides the approach to communications and engagement at the site.

Since the Report of Environmental Assessment, the engagement process has focused on the SDE activities (2015-2017), the HHERA (2015 – 2018) and the outfall location assessment (2016-2017). In addition to these specific engagements, working groups are a key way for the GMRP team to engage with key affected parties in a meaningful way, both to provide information and to solicit input. Working groups include the GMOB, GMAC, GMRP WG, and the Health Effects Monitoring Program Advisory Committee. Table 11 below provides additional information on these groups, as well as other organizations that receive updates on the GMRP and provide input to the Project team.

Table 11: Types of Engagements and Frequency of Meetings

Independent Bodies	Frequency
Giant Mine Advisory Committee (GMAC) (YKDFN membership through designates) • The GMAC is a forum for engagement and Crown Consultation with the YKDFN.	Monthly
Giant Mine Working Group (GMRP WG) (EA Interveners and Chair of the GMAC) • A group of interested parties that meets regularly with the GMRP team to receive updates and provide input on the remediation project. Standing membership includes contaminated sites experts from ECCC, Health Canada, and Fisheries and Oceans Canada (DFO); City of Yellowknife staff; YKDFN staff; NSMA staff; Alternatives North; the GMOB; and an independent technical advisor. It's open to other interested parties.	Monthly

Independent Bodies	Frequency

Giant Mine Oversight Board (GMOB)
• The GMOB was established to provide advice and to promote public awareness of the GMRP, as well as offer independent advice to the federal Project team and conduct research into better solutions for the arsenic trioxide problem at the mine.
• The Oversight Board is guided by the legally-binding Environmental Agreement. Each party to the Environmental Agreement is entitled to appoint a director of the Oversight Board Society. The six Directors include:
  • Ginger Stones (appointed by the Government of Canada)
  • Ken Hall (appointed by the GNWT)
  • David Livingstone (appointed by Alternatives North)
  • Tony Brown (appointed by the City of Yellowknife)
  • Dr. Ken Froes (appointed by the NSMA)
  • Dr. Kathy Racher (appointed by the YKDFN)
	Two semi-annual meetings with the Parties, and one annual meeting with the public

Human Health Effects Monitoring Program Advisory Committee: • This Advisory Committee includes representatives from the City of Yellowknife, NSMA, YKDFN, GNWT Chief Public Health Office, Health Canada, and the University of Ottawa Research team. • The Committee provides advice and recommendations for the implementation of the Human Health Effects Monitoring Program.	Monthly

Meetings	Frequency
Yellowknife Dene First Nation Chief and Council	Yearly
Yellowknife Dene First Nation Land & Environment	Monthly
Yellowknife City Staff	Monthly
Yellowknife City Council Updates	Yearly
North Slave Métis Alliance	As required
Mackenzie Valley Land and Water Board	As required
Site tours	As required
Public Meetings	As required
Individual group meetings	As required
Community meetings attended by GMRP Team (e.g. Great Slave Sailing Club; Back bay Community Association)	As needed / requested

2017-18 Highlights

- The Project team continued its engagement of key affected parties through the established working groups, including the GMOB, GMAC, and GMRP WG.
- Specific engagement sessions in 2017-18 focused on the HHERA, the outfall location, the Health Effects Monitoring Program, the Non-Hazardous landfill location, and Baker Creek alignment.
- Key decisions made based on input from engagement sessions included the alignment of Baker Creek onsite, the location of the outfall, the location of the non-hazardous landfill;
- Regular communications continued (e.g. newsletter, website, Twitter account, public service announcements, media briefings and responses to inquiries, school presentations).

The CRP for the Giant Mine site is the culmination of the engagement and design work the team has been working on since the Report of Environmental Assessment. The Project team issued the draft CRP in June 2018, with community engagement sessions planned for 2018-19.

Also planned for 2018-19 are engagements on the Quantitative Risk Assessment, Archaeological Impact Assessment, the draft water licence package, and the stress study (described in Section 4.2.3 above).

The Project team is engaged in continual learning and improvement in all aspects of its operation, including communications and engagement. The Project team assesses the effectiveness of its communications through various means, such as gathering feedback from the public and keeping a media log to track inquiries and topics. The team also tracks the number and type of engagement activities planned and achieved.

5.1.1 Engagement and Events

In 2017-18, the Project team undertook or participated in 59 engagement activities and events, aligned with and in support of Project or related activities. This is up slightly from 50 engagement events in 2016-17.

Key GMRP engagement activities in 2017-18 included:

- **CRP (multiple dates, 2017-18):** As described above, the CRP for the Giant Mine site is the culmination of the engagement and design work the team has been working on since the Report of Environmental Assessment. Engagements in 2017-18 specific to the CRP included a meeting with the GMRP WG in December 2017, a meeting with the GMAC in January 2018, and the Annual Community Forums in March 2018 (discussed further below);
- **The Health Effects Monitoring Program (throughout 2017):** Various engagement activities occurred as a part of this program, including three community information sessions held in April 2017 (a general session and ones specific to YKDFN and NSMA), meetings with various organizations in Yellowknife to review and finalize the questionnaires, and invitations, using random sampling method, were sent to community members to seek participation in the program;
- **Contaminated Soils Workshop (June 2017):** Potential remedial scenarios and management alternatives to address contaminated surface soil and sediment at Giant Mine were discussed at a Contaminated Soils Workshop with the Project team as well as the Technical Advisor to the GMRP WG and GMOB.
- **Baker Creek Alignment (summer 2017):** as described in Section 2.1.4, the Project team engaged with the GMRP Working Group, community members and other stakeholders regarding Baker Creek re-alignment through the SDE process as well as through specific engagements to discuss the draft report (Baker Creek Alignment Report);
- **Air Quality Monitoring Open House (August 2017):** The Project team hosted an open house, to give residents of Niven an opportunity to learn about the newest air quality monitoring station in Moyle Park;
- **Annual update to the YKDFN Chiefs and Council (August 2017):** The Project team, led by Deputy Director (Region) Natalie Plato and then Director (Ottawa) Craig Wells, presented a Project status update to the YKDFN Chief and Council. Chief and Council were able to voice their questions and concerns in discussion with the Project Directors;

- **HHERA (October 2017):** in addition to discussions held with the GMRP WG, the Project team hosted engagement sessions on the HHERA, with the NSMA, with the YKDFN and with the general public to discuss the development and results of the HHERA;
- **Annual Community Forums (March 2018):** The Project team hosted a public forum and co-hosted two annual forums, with the NSMA and with the YKDFN, to present the CRP for the site and to introduce the MCM (Parsons Inc.);
- **GMOB Meetings:** The Project team met with the GMOB several times throughout the year; members of the GMOB attend the GMRP WG meetings, there are two formal meetings with the Project team each year, a Meeting of the Parties, participation in the Annual Public Meeting, as well as informal meetings between the Project Deputy Director and the Chair of the GMOB;
- **Outreach to Youth:** The Project team conducted outreach to local schools and students, including hands-on science experiences (e.g. biology students from École St. Patrick High School learned about environmental monitoring from biologists working on the project) and site tours (e.g. students participating in the BEAHR Eco-Remediation training through the YKDFN were given an up-close look at work opportunities they might be interested in pursuing);
- Engagement with relevant GNWT Departments and the City of Yellowknife on the implementation of the socio-economic strategy; and,
- Regular communications continued (e.g. newsletter, website, Twitter account, public service announcements, media briefings and responses to inquiries).

The GMRP team also participated in the following events:

- YKDFN Career Day in Dettah (summer 2017);
- Yellowknife Chamber of Commerce's Annual Spring Trade Show (May 2017);
- Rivers to Oceans Day, a water education day for Yellowknife youth (Grades 1 and 5) (June 2017);
- Healing the Land ceremony, with the YKDFN in Dettah, which involved a Feeding the Fire ceremony (October 2017); and,
- Yellowknife Geoscience Forum (November 2017).

In addition to the above regularly scheduled meetings, the Project team provides updates on GMRP activities and progress through multiple communication techniques, including:

- E-newsletter: sent monthly to more than 300 email addresses and posted on the GMRP website;
- Website (https://www.aadnc-aandc.gc.ca/eng/1100100027364/1100100027365);
- Twitter account (@GiantMine);
- Media briefings and responses to media requests
    - There were 26 media interactions, including interviews and requests for information, in 2017-18;
- Responses to unforeseen events;
- Topic-specific public service announcements, as required;
- School presentations;
- Topic-specific engagements as appropriate.

GMOB Grant Authority

The GMRP has now established the grant authority for the GMOB. This not only meets the commitment in the Environmental Agreement, it also addresses the Board's recommendation in their 2016 Annual Report.

Key Stakeholder Concerns

The Project team captures stakeholder concerns through their meeting minutes, the Project's Consultation Log, emails and other correspondence. The Project team endeavours to respond in a timely manner. Key concerns raised in 2017-18 were as follows:

Concern	GMRP Response
Performance Measurement: lack of performance measures and targets related to socio-economic and environmental performance (GMOB letter and Working Group minutes)	The Project team is currently in the process of developing a set of performance measures and targets to align with evolving performance measurement and reporting requirements in the Government of Canada and best practices in performance management. For example, in 2018-19, the Project team will share draft socio-economic indicators and targets with the Socio-Economic Advisory Body and the Indigenous Benefits Plan Monitoring and Advisory Committee for review and comment [Section 5.3.1 provides additional information on these bodies]. The Project team will share these measures and targets with the Oversight Board for discussion once they are available.
Labour Resource Study and Socio-Economic Strategy: the overall vision and accompanying socio-economic goals remain elusive; the GMRP should initiate a consultative process similar to the Project's successful SDE focussed on developing a solid Socio-Economic Framework (GMOB letter)	A response was not provided to the GMOB in 2017-18, however in a letter dated May 7, 2018, the Project team noted that it is developing a Socio-economic Benefits Approach, which provides an overarching framework to guide the Projects' actions to maximize economic opportunities for Northerners and local Indigenous people and to address socio-economic impacts [additional information on this approach is provided in Section 5.3.1 below]. The letter also noted that the Project has been engaged in ongoing dialogue with Indigenous communities to discuss and consider additional measures to support their capacity to engage.
Measure 6 Report: Stakeholders were dissatisfied with the level of detail in the initial Measure 6 Report circulated for review by the GMRP WG (a draft report on Long Term Funding Options was provided to the GMRP WG for review in July 2017 and a subcommittee of the Working Group was convened to provide feedback) (Engagement Log)	The Project team engaged a consultant to provide a report addressing the stakeholder concerns with input from the subcommittee during the drafting and revising process.
Traditional Land Use: the YKDFN were not consulted on traditional	Through the Surface Design Engagement and the HHERA, the Project team gathered information on the traditional use of the

Concern	GMRP Response
land use for the Baker Creek alternatives evaluation and there is no documentation of traditional use / knowledge (Working Group minutes)	Yellowknife River and other areas. The HHERA also gathered information on the areas commonly used, and submitted country foods for analysis. In addition, the GMRP funded phase 1 of a traditional knowledge study in 2017-18, and Phase 2 will be funded by the GNWT in 2018-19.
Criteria and Objectives: the Closure and Reclamation Plan objectives and criteria are not sufficiently detailed, not always linked to closure activities to ensure performance achieved (Working Group minutes)	The Closure and Reclamation team will consider how to take the Working Group's comments into account in the Closure and Reclamation Plan.
Water Quality Model: the Yellowknife Bay data is limited and there is not enough data to calibrate the model (Working Group minutes	The Project team will collect additional data in Yellowknife Bay in 2018-19.

Next Steps

- In 2018-19, engagement will continue the momentum built up through the SDE process and will focus on advancing the Water Licence submission (intended for submission in January 2019), including engagement specific to the CRP and the Quantitative Risk Assessment.
    - Water Licence: the Project team will host a Water Licence information session and technical workshop in 2018-19, in addition to regular GMAC and GMRP WG meetings; the public will have an opportunity to comment on items within the Water Licence package prior to submission, including the CRP.
    - Quantitative Risk Assessment: four phases of engagement throughout 2018-19, focused on: introducing the QRA and validating the engagement approach; identifying failure scenarios; discussing consequences of failure scenarios; reaching agreement on failure scenarios being assessed; reviewing results.
- The GMRP will continue to host community forums for YKDFN, NMSA and Yellowknife, to engage with the external advisory bodies, and to communicate in a frequent and transparent manner via the established channels (e.g. newsletter, website, Twitter, radio, school outreach).

5.2 INCORPORATION OF TRADITIONAL KNOWLEDGE (TK)

Incorporating TK into planning and work on site is a requirement for obtaining the Water Licence. While some TK has been incorporated in GMRP activities to date (e.g. to help determine the best time of year to deconstruct buildings), the Project team acknowledges that there is a need for continual improvement. In 2017-18, the GMRP funded Phase 1 of a TK study that researched the ways in which the Project has incorporated TK. The study is currently with the YKDFN. In 2018-19, the GNWT will fund Phase 2 of the TK study.

5.3 PROCUREMENT AND EMPLOYMENT

2017-18 Highlights

- The GMRP awarded the MCM contract to Parsons Inc. in December 2017; Parsons Inc. will assume the role of Mine Manager on July 1, 2018;
- The Project team developed a draft governance structure to advance socio-economic priorities, which proposes three new bodies – a Socio-Economic Working Group, a Socio-Economic Advisory Body, and an Indigenous Benefits Plan Monitoring and Advisory Committee. The Project team also developed an updated Labour Resource Study in 2017;
- In 2017-18, the proportions of Indigenous and AOC employees were comparable to 2016-17, but these numbers are down from 2015-16 (from 10-11% in 2015-16 to 4% in 2017-18). The proportion of Northern employees was lower in 2017-18 (20%, down from 23%); however, the proportion of female employees was higher in 2017-18 (35%, up from 33%);
- The proportion of expenditures with Northern suppliers was lower in 2017-18 (47%, from 64-68% in the previous two years). The proportion spent with AOC suppliers was higher in 2017-18 than the previous two years (35% in 2017-18 and 28-31% in previous years). Contracts with Indigenous suppliers decreased as a proportion of total spending since last year (from 28% in 2015-16 to 45% in 2016-17 to 41% in 2017-18).

5.3.1 Socio-Economic Strategy and Implementation to Deliver Socio-Economic Benefits

CIRNAC and the GNWT are committed to promoting socio-economic benefits and supporting reconciliation efforts with Indigenous peoples of Canada. To date, the GMRP has delivered some economic benefits to the region through procurement and employment. In preparation for the Implementation Phase of the Project, the GMRP plans to be more deliberate and strategic in its approach to maximize economic benefits.

The Project team released a Socio-Economic Strategy in 2016-17. The overall aim of the strategy is to maximize socio-economic benefits and deliver on the socio-economic commitments and requirements within guiding policies and other requirements. To accomplish this goal, the strategy involves three distinct streams of activity:

- Providing access to employment and procurement opportunities;
- Supporting capacity and skills development; and,
- Anticipating, monitoring and mitigating negative impacts.

Potential barriers to strategy implementation include insufficient Northern and Indigenous workforce capacity and fluctuating Northern and Indigenous business/contracting capacity.

To enhance coordination and preparedness for socio-economic benefits, the Project team will establish the following advisory and coordinating bodies (to be established in 2018-19):

- **Socio-Economic Advisory Body**: the Socio-Economic Advisory Body's mandate is to provide direction and guidance to the Socio-Economic Working Group and act as senior government champions for the implementation of the Socio-Economic Working Group's approach;

- **Socio-Economic Working Group**: The Socio-Economic Working Group's objectives are to coordinate activities related to the implementation of the GMRP Socio-Economic Strategy through sharing information and seeking opportunities to improve collaboration and to report to and seek advice from the Senior Project Committee and Socio-Economic Advisory Body on the implementation approach.

Key Activities related to the Socio-Economic Strategy in 2017-18

Awarding of MCM Contract

A major activity in 2017-18 was the awarding of the MCM Contract to Parsons Inc. Parsons Inc. will be responsible for developing and contracting the remediation project work packages and, as such, will be a key partner in implementing the Socio-Economic Approach.

What the MCM's role involves

- Managing the entire remediation of the Site and tendering subcontracts accordingly for remediation work, which will begin in 2020;
- Developing the implementation approach (project work packages and schedule) and advising on the scheduling, sequencing, and constructability of various components of the remediation plan;
- Managing work packages according to schedule; monitoring and reporting regularly on progress.

Parsons Inc. will play an important role in contributing to socio-economic benefits by maximizing local workforce in its core staff as well as through the sub-contracts it will award for remediation project work. Most socio-economic benefit opportunities will be accessed through the sub-contracts issued by Parsons Inc. Parsons Inc. will be encouraged to apply the following Government of Canada procurement tools to maximize Northern Indigenous procurement:

1. **Aboriginal Opportunities Considerations (AOC):** AOC applies evaluation criteria to quantifiable commitments such as % of labour force that are local Indigenous peoples. Incentives and penalties are applied to encourage firms to meet or exceed commitments outlined in their proposal.
2. **Procurement Strategy for Aboriginal Business (PSAB):** Where adequate Indigenous capacity exists, PSAB sets aside procurements for Indigenous business bidders only.

The contract requires that Parsons Inc. complete the following actions to realize socio-economic benefits:

- Develop and implement a **Socio-Economic Benefits Strategy** for maximizing local employment within Parsons Inc. core staff;
- Develop an **Indigenous Benefits Plan** which includes:
    - A Labour Capacity Study to understand skills and availability of the local workforce, updated at key milestones; and,
    - A Procurement Plan that outlines how socio-economic benefits will be maximized through procurement tools (see text box below) and work packaging and sequencing

- Establish a **Yellowknife office** and maintain a website to communicate existing and upcoming contracts, provide training on procurement and contract requirements, post employment opportunities from contractors and provide links to other relevant training and development programs;
- Establish an **Economic Development Officer** position, based out of the Yellowknife office, responsible for the development and implementation of the Aboriginal Benefits Plan. This position was filled in 2017-18; and,
- Regularly **report on socio-economic benefits**, including key performance indicators such as Parsons and subcontractors' Northern, Indigenous and female employment, provisions for Northern or Indigenous employees and contractors, value of contracts to Northern suppliers, etc.

The Project team will meet regularly with Parsons Inc. to ensure the above requirements are fulfilled. An **Indigenous Benefits Plan Monitoring and Advisory Committee**, to be established in 2018-19, will monitor the Parsons and its sub-contractors' implementation of the Indigenous Benefits Plan, and provide advice and guidance on how to address barriers and improve performance.

Completion of the 2017 Labour Resource Study

The 2017 Labour Resource Study provides an assessment of local employment and procurement capacity to meet GMRP labour resource needs and a detailed description of relevant training programs that can address identified gaps. In preparing this report, GMRP engaged with a broad range of stakeholders, including Indigenous governments and economic development corporations, Northern business associations, Northern educational and training institutions, the territorial government and other federal government departments.

The findings demonstrate that there is Northern Indigenous capacity for GMRP entry-level and semi-skilled occupational needs, as well as some skilled occupational needs (e.g. some trades, technicians, blasting/drilling, and environmental monitoring). There is a potential local labour supply for some skilled occupational needs (e.g. some trades, technicians, supervisors, underground miner), where additional training may help increase the available local supply. Finally, there is limited or no local labour supply for some skilled and all professional occupational needs, indicating a need for local capacity building and/or recruitment of out-of-territory workers.

The report concluded that the natural resource sector forecasts for both Canada and the NWT indicate an expected decline in employment levels over the next decade, providing an opportunity for the GMRP to hire mining and construction sector workers who are unemployed due to project closures or slowdowns. The GMRP should consider targeting its communication of job opportunities accordingly (e.g. communicating to former employees of Ekati, which is expected to close in 2019), in addition to targeted communication with local Aboriginal and northern communities and businesses.

The MCM (Parsons) is responsible for updating the Labour Resource Study on an annual basis. This update should include a review of recent labour market studies that have been released since this study was last published, as well as interviews with key stakeholders. The Project team should also review and refine the GMRP labour resource requirements on an ongoing basis to inform future studies.

Next Steps for the Implementation of Socio-Economic Actions

Priority socio-economic implementation actions over the 2018-19 fiscal year include:

- 'Standing-up' (i.e. establishing) the socio-economic advisory / coordinating bodies;
- Developing a 2018-2021 Socio-Economic Plan, with a supporting 2018-2019 Socio-Economic Action Plan, for endorsement by the Socio-Economic Advisory Body and approval by the Senior Project Committee;
- Implementing the 2018-19 Socio-Economic Action Plan in collaboration with Parsons Inc.;
- Delivering a Business Preparedness Conference, in partnership with Parsons Inc. The Conference is intended to engage, inform and support local northern and Indigenous businesses ahead of formal procurement processes to improve their preparedness, and to use their feedback to enhance local opportunities. The conference will present the most current information on the scope of the project, the general timeline, the nature of opportunities and their relevance for Indigenous businesses, and how to access these opportunities; and,
- Development of a socio-economic monitoring and reporting framework.

5.3.2 2017-18 Employment and Procurement Results

5.3.2.1 Employment Statistics

The GMRP tracks the total employment and employment by certain categories, namely Northern, Indigenous, AOCs, and Women. Table 12 shows the employment statistics for 2017-18.

Table 12: Total Number of Persons and Total Person Hours for 2017-18, by Category

Employee type[8]	Total # persons *(incl. contractors)*	Total person-hours	Persons as % of all employees
Northern employees	139	112,103	20%
Indigenous employees	29	47,594	4%
AOC employees	25	29,373	4%
Female employees	236	69,796	35%
TOTAL	680	463,707	100%

The following figures highlight key trends of the Total Number of Persons and Total Person Hours by Category, for 2015-16 to 2017-18. Northern employment is trending downward year over year, while female employment is trending up. There is no discernable trend for Indigenous and AOC, likely due to high variability since they represent a small proportion of overall employment.

[8] Note that these categories may overlap (e.g. a single employee may simultaneously be counted as Northern, Indigenous, AOC, and female – or a combination or subset thereof) and that some employees fit into none of these categories. For both of these reasons, the totals indicated in the bottom row of the table do not represent the sum of the preceding rows.

Figure 4: Persons as % of all Employees by Category from 2015-16 to 2017-18

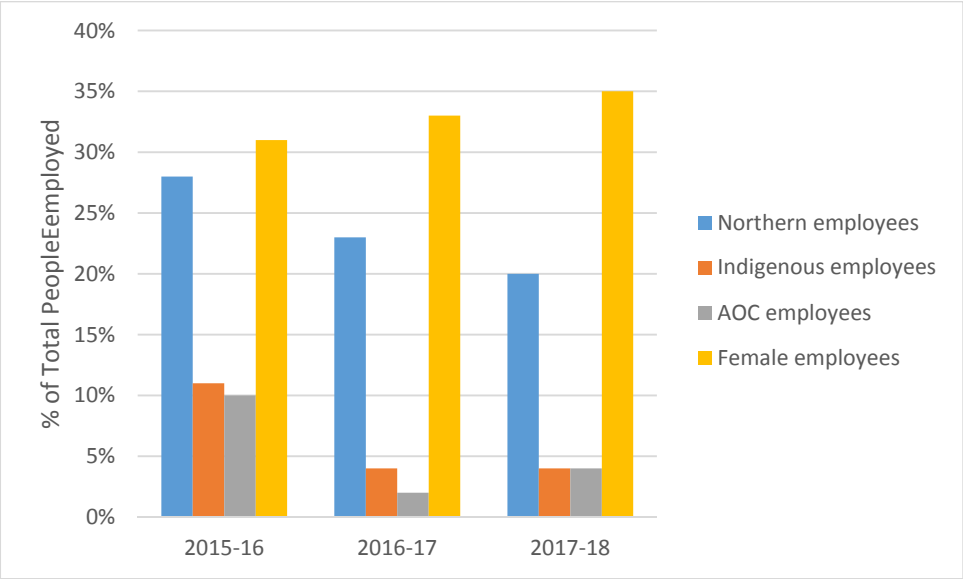
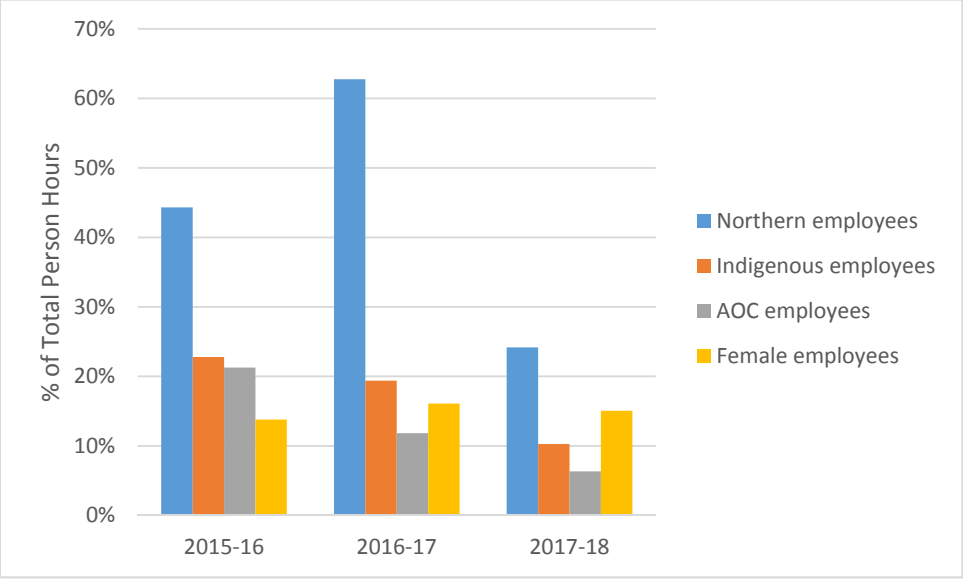


Figure 5: Percentage of Person Hours by Category from 2015-16 to 2017-18



5.3.2.2 Major Procurements

Main Construction Manager (MCM)

As described above in Section 5.3.1, the MCM Contract was awarded to Parsons Inc. in December 2017, representing a potential total value of $31.7M over the three-year contract period. Tendering for the MCM is among the largest-ever procurement efforts for CIRNAC. Parsons Inc. will provide construction management services to the Giant Mine Remediation Project team over two terms. Work completed in Term 1 will centre around responsibility for site care and maintenance and emerging risks on site, as well as supporting planning efforts for the full remediation in Term 2. This work will be undertaken until

March 31, 2020. In Term 2, Parsons Inc. will oversee the implementation of the overall remediation plan and associated activities.

Parsons Inc. will assume the role of site Mine Manager on July 1, 2018.

Contracts Awarded between April 1, 2017 and March 31, 2018

The section below provides a summary of the contracts awarded in 2017-18.

- $31,719,286.20 – contract awarded to Parsons Inc. for a Main Construction Manager (2017-12-14);
- $630,000.00 – standing offer awarded to ALX Exploration Services Inc. (a Whitehorse based company) for Dust Suppressant (2017-05-18); and,
- $18,331,719.32 – contract awarded to Nahanni Construction Ltd (a Yellowknife based company) for C5-09 Stope Complex Stabilization Activities (2018-02-23).

The MCM did not award any work packages during this period.

Work packages awarded by the Interim Construction Manager included:

- $690,417.50 awarded to Purcee Industrial Power Ltd. for Giant Mine Akaitcho Underground Pumping Station – Electrical Component Study (2017-12-21);
- $2,488,980.69 awarded to Nahanni Construction Ltd (a Yellowknife based company). for Giant Mine Akaitcho Underground Pumping Station – Well Drilling (2017-12-21);
- $1,176,137.70 awarded to 851791 NWT Ltd. O/A Rowe's Construction for Giant Mine UBC Bridge Construction (2017-12-22); and,
- $959,771.31 awarded to Nahanni Construction Ltd (a Yellowknife based company). for Giant Mine C-Shaft Power Feed Replacement – Drilling (2018-01-15).

5.3.2.3 Suppliers Statistics

The GMRP also tracks the total number of suppliers, the total value of contracts and the number of suppliers and value of contracts by three categories: Northern, Indigenous and AOC.

Table 13 includes the supplier statistics for 2017-18. The GMRP also tracks purchase of goods and services by supplier category, namely Northern, Indigenous, and AOC.

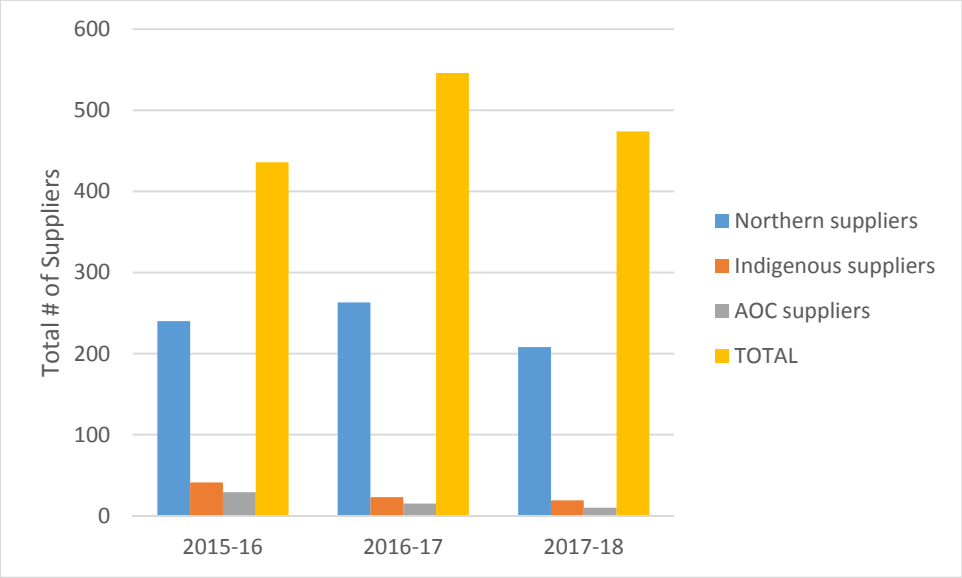
The proportion of expenditures with Northern suppliers this year (47%) decreased from 2016-17 (64%) and in 2015-16 (68%). The proportion spent with AOC suppliers this year (35%) increased from previous years (28% in 2015-16 and 31% in 2016-17). Contracts with Indigenous suppliers (41%) decreased from 45% in 2016-17 but was an increase from 28% in 2015-16. Overall, the total number of suppliers (474) decreased in 2017-18 from 546 in 2016-17. The decreases are likely due to less construction and physical works occurring on the site compared to the previous years

Table 13: Total Number of Suppliers and Total Value of Contracts for 2017-18, by Category

Supplier type[9]	# suppliers	$ spent	% of total $ spent
Northern suppliers	208	$10,840,300	47%
Indigenous suppliers	19	$9,325,568	41%
AOC suppliers	10	$7,943,531	35%
TOTAL	474	$22,830,985	100%

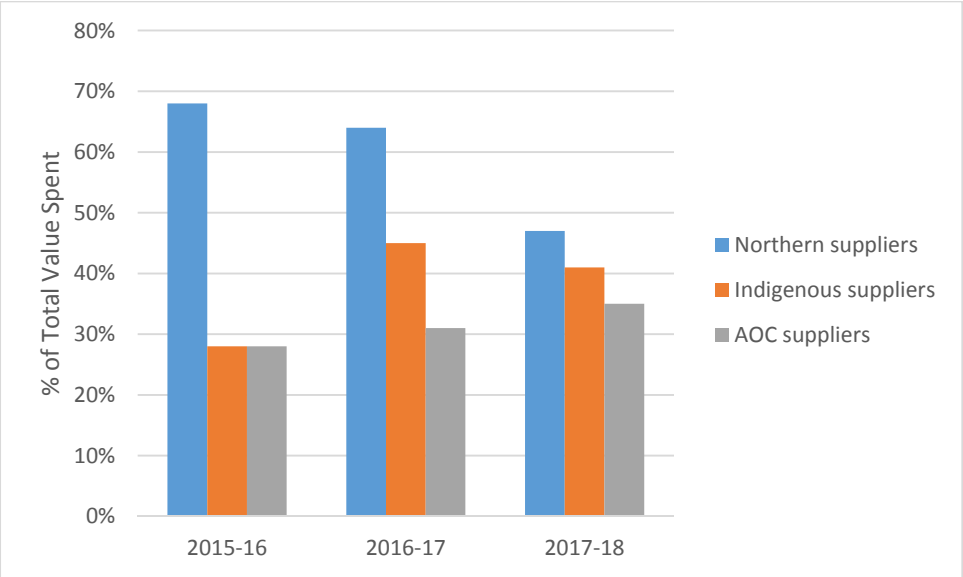
The following figures highlight the Total Number of Suppliers and Total Value of Contracts by Category, for 2015-16 to 2017-18. Figure 6 indicates that the total value spent on Northern suppliers has decreased, while the total value spent on Indigenous and AOC suppliers has increased, since 2015-16.

Figure 6: Total Number of Suppliers from 2015-16 to 2017-18



[9] Note that these categories may overlap (e.g. a single supplier may simultaneously be counted as Northern, Indigenous, and AOC – or a combination thereof) and that some employees fit into none of these categories. For both of these reasons, the totals indicated in the bottom row of the table do not represent the sum of the preceding rows.

Figure 7: Percent of Total $ Value Spent from 2015-16 to 2017-18



5.4 TRAINING AND CAPACITY BUILDING

2017-18 Highlights

- In 2017-18, total workforce training decreased overall, but remained relatively consistent across the categories (Northern, Indigenous, AOC and Female employees).
- The GMRP funded the Yellowknives Dene First Nation Dechita Nàowo Giant Mine Remediation Training Program.

In addition to the occupational H&S training, GMRP contractors are required to ensure that employees are properly trained to perform their responsibilities. Contractors deliver workforce training, including site orientations. The inclusion of AOC in contracts ensures Indigenous employment and capacity building is considered and implemented where possible by all GMRP contractors.

The GMRP tracks its workforce training by number of people who have participated in training exercises, as well as the number of person hours. Table 14 below highlights the training statistics for 2017-18, organized by category of Northern, Indigenous, Women and Total.[10]

In 2017-18, workforce training provided to AOC employees (24) increased from 2016-17 (15), and training provided to Indigenous employees remained the same. Workforce training to female and northern employees decreased. The total people trained decreased from 2016-17 (230) to 2017-18 (138). The overall decrease is likely due to less construction and physical works occurring on the site compared to the previous years.

Table 14: Total Number of People trained and Total Person Hours of Training in 2017-18, by Category

Workforce training[11]	Total # persons	Total person-hours
Northern employees	79	4,175
Indigenous employees	25	1,146
AOC employees	24	1,139
Female employees	24	398
TOTAL	138	4,419

The following figures highlight the number of people trained and number of person hours of training by employee category, for 2015-16 to 2017-18.

[10] The total does not reflect the sum of the other categories because there is overlap between the categories and the total includes all workforce training (e.g., non-Northern).
[11] Note that these categories may overlap (e.g. a single employee may simultaneously be counted as Northern, Indigenous, AOC, and female – or a combination or subset thereof) and that some employees fit into none of these categories. For both of these reasons, the totals indicated in the bottom row of the table do not represent the sum of the preceding rows.

Figure 8: Number of People Trained from 2015-16 to 2017-18

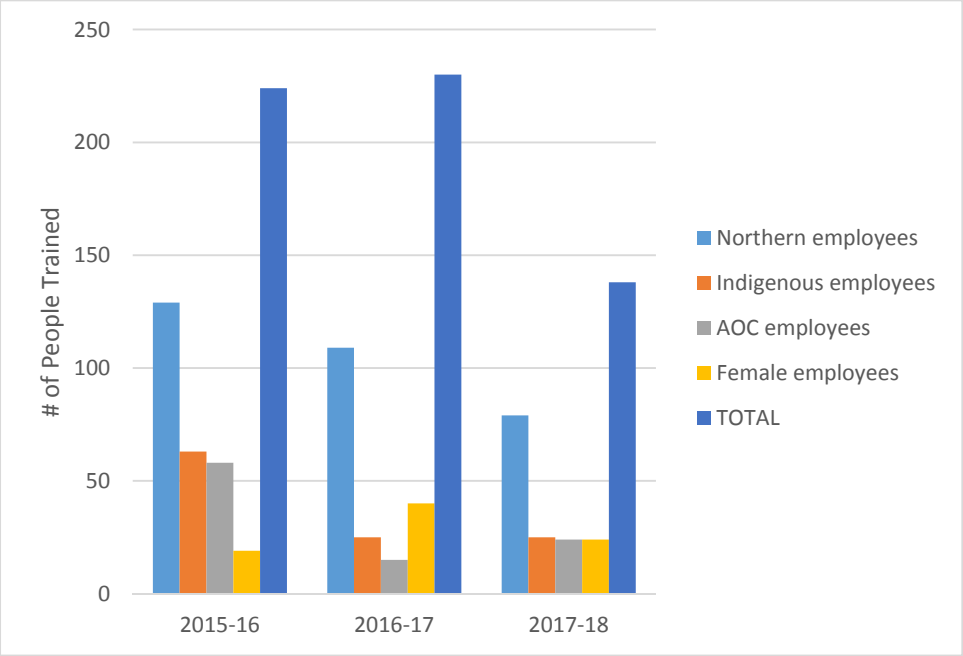
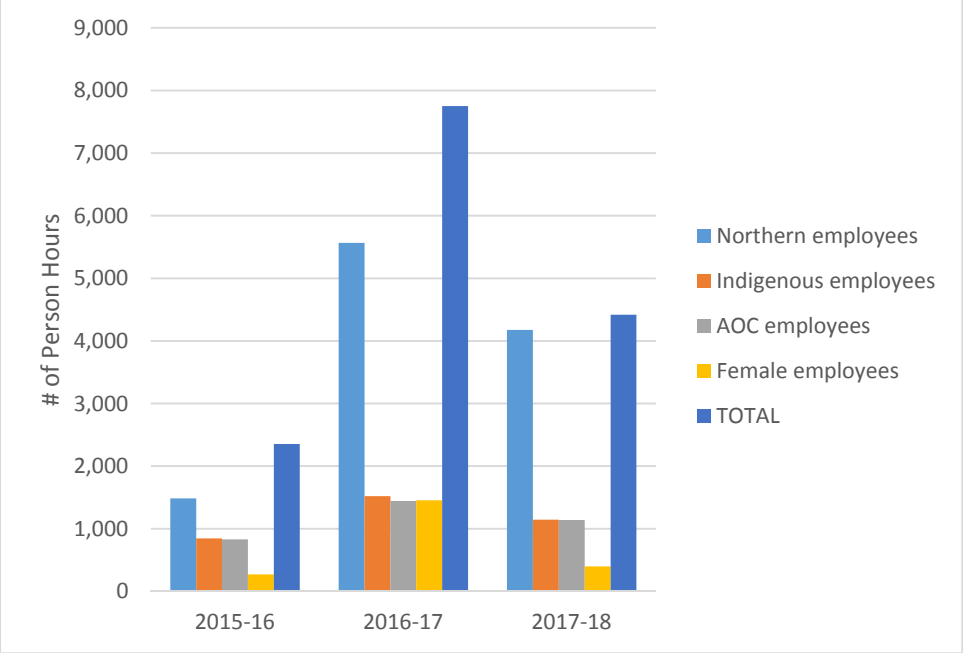


Figure 9: Number of Person Hours of Training by Employee Group from 2015-16 to 2017-18



Dechita Nàowo

Through a Contribution Agreement, the GMRP funded the Yellowknives Dene First Nation Dechita Nàowo Training Program in 2017-18. A Training Coordinator was hired, who led student recruitment, meeting with industry and partners, and coordination of training. Training delivered in 2017-18 included:

- Employment Readiness and Employment Transition Modules
- BEAHR Module 1 – Environmental Core Skills (9 participants)
- BEAHR Module 2 – Environmental Remediation Program (Essentials of Contaminated Sites remediation) (10 participants)
- Caribou Monitoring
- Heavy Equipment Operator Hands-on Training (13 participants)
- HAZWOPER (those students not in Heavy Equipment Operator)
- Standard First Aid (those students not in Heavy Equipment Operator)
- GIS Training (on certain training days – online) (those students not in Heavy Equipment Operator)

Next Steps

Training is delivered by contactors on an as and when needed basis.

Through the Labour Resource Study and Socio-Economic Strategy, the Project team is exploring opportunities to support and partner with training and capacity building programs that can help local communities realize greater socio-economic benefits from the GMRP. The GMRP will continue to support the Dechita Nàowo program throughout 2018-19.

6.0 IN CLOSING

In 2017-18, the GMRP made important strides towards completion of the CRP and preparation of the application package for a Water Licence, while continuing site operations (C&M), immediate risk mitigation activities, community engagement, and health studies. The focus for the 2018-19 fiscal year will be as follows:

Component		Plans for 2018-19
Operations	C&M	The Project will transition all Care and Maintenance activities, including the role of the Mine Manager to the new MCM, Parsons Canada. Parsons will be required to sub-contract all activities related to surface and underground care and maintenance, including effluent treatment plant operation and EMS/site security services.
	Underground	Complete backfilling the last remaining high-risk stope complex (C5-09) as part of the Site Stabilization Plan. Continuation of the annual backfilled -stope monitoring program.
	Immediate Risk Mitigation	Review deteriorating infrastructure onsite through conducting the Annual Infrastructure Assessment.
EA Measures	Measures	Continue the Health Effects Monitoring Program sampling program. Initiate the Stress Assessment (indirect stress effects study). Continue engaging on SSWQO and complete final report. Continue engagement on long-term funding options and complete final report. Submit the Water Licence application package.
Environment	Air	Continue air quality monitoring program and dust suppression activities. A review of the Air Quality Monitoring Program (AQMP) to be conducted to ensure a robust program that continues to meet the needs of the GMRP and its stakeholders.
	Water	Continue seasonal effluent treatment and year-round water quality monitoring. Run pilot treatment plant to test various adsorption media to exhaustion. Data will be collected to assist in the design of the new water treatment plant. Conduct comprehensive modeling to inform Effluent Quality Criteria. Conduct Detailed design for the effluent outfall for a no-cooling option at Location A. Submit application for a new Type A Water Licence. Finalize Baker Creek alignment report and share with stakeholders and the public. Look at options to improve the clarification/filtration process of the existing ETP to meet new MMER requirements.
	Land	Continuing managing wastes on site. Dam Safety Review to be conducted.
	Biodiversity	Continue baseline monitoring (LTMP). Finalize AEMP.

Component		Plans for 2018-19
Community	Health and Safety	Continue to oversee and manage occupational health and safety through tracking of training and incidents. Undertaken second round of sampling for Health Effects Monitoring Program. Initiate the stress assessment, including engagement for the development of an assessment tool (survey) and pilot testing of the survey.
	Engagement	Engage on the Quantitative Risk Assessment (QRA), Archaeological Impact Assessment (AIA), CRP, and the Water Licence. Determine ways to ensure traditional knowledge continues to inform planning. Develop a centralized system to catalogue stakeholder concerns. Continue existing engagement and outreach mechanisms.
	Procurement	Provide onboarding and orientation for the MCM. Through MCM, post tenders for C&M contract and environmental monitoring.

The GMRP will continue to prepare annual reports that describe the progress and performance of the GMRP. In the spirit of continual improvement, we welcome your comments on this report and how it can be enhanced in the future.

For more information or to provide comments on the report, please contact: Natalie Plato, GMRP Deputy Director, natalie.plato@canada.ca, 867-669-2838.

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APPENDICES

Appendix A – List of Acronyms

Appendix B – Project Overview and Risk Tables

Appendix C – Progress on EA Measures and Suggestions

APPENDIX A – LIST OF ACRONYMS

AAQS	Ambient Air Quality Standard
AOC	Indigenous Opportunity Considerations
ADM	Assistant Deputy Minister
AEMP	Aquatic Effects Monitoring Program
AQMP	Air Quality Monitoring Program
C&M	Care and Maintenance
CanNorth	Canada North Environmental Services
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CRP	Closure and Reclamation Plan
DCNJV	Deton'Cho / Nuna Joint Venture
DFO	Fisheries and Oceans Canada
DG	Director General
DM	Deputy Minister
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EHS	Environment, Health and Safety
EHSC	Environment, Health, Safety and Community
EPP	Environmental Protection Plan
ETP	Effluent Treatment Plant
FAQ	Frequently Asked Questions
FOS	Freeze Optimization Study
GMAC	Giant Mine Advisory Committee
GMOB	Giant Mine Oversight Board
GMRP	Giant Mine Remediation Project
GMRP WG	Giant Mine Remediation Project Working Group
GNWT	Government of the Northwest Territories
H&S	Health and Safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHERA	Human Health Ecological Risk Assessment
IOC	Investigation of Cause
IPRP	Independent Peer Review Panel
LTMP	Long-term Monitoring Program
MB	Management Board
MCM	Main Construction Manager
MMER	Metal Mining Effluent Regulations
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board

MVRMA	Mackenzie Valley Resource Management Act
NAO	Northern Affairs Organization
NCSB	Northern Contaminated Sites Branch
NCSP	Northern Contaminated Sites Program
NSMA	North Slave Metis Alliance
OHS	Occupational Health and Safety
OMP	Operational Monitoring Program
OMS	Operational, Maintenance and Surveillance
PMC	Project Management Committee
PMT	Project Management Team
PPE	Personal Protective Equipment
PSAB	Procurement Strategy for Indigenous Business
PSPC	Public Services and Procurement Canada
RBAL	Risk-Based Action Levels
SDE	Surface Design Engagement
SNP	Surveillance Network Program
SOP	Standard Operating Procedure
SPAC	Senior Project Advisory Committee
SSP	Site Stabilization Plan
SSWQO	Site-specific Water Quality Objectives
TDG	Transportation of Dangerous Goods
TK	Traditional Knowledge
TSP	Total Suspended Particulates
WHMIS	Workplace Hazardous Materials Information System
WSCC	Workers' Safety and Compensation Committee
WTP	Water Treatment Plant
WWHMMP	Wildlife and Wildlife Habitat Management and Monitoring Plan
YKDFN	Yellowknives Dene First Nation

APPENDIX B – PROJECT OVERVIEW

Giant Mine Legacy

The Giant Mine is located close to Yellowknife's city centre (about five kilometres from the north end) and within the asserted traditional territory of the Akaitcho Territory Dene First Nations, within the extended Monfwi (Môwhì Gogha Dè Nîîtåèè) boundary as defined in the Tlicho Land Claim and Self Government Agreement, and adjacent to, or on the boundary of, the Interim Measures Agreement Area of the Northwest Territory Métis Nation.

Between 1948 and 2004 when the Giant Mine was operational, it produced over 220,000 kilograms (7 million ounces) of gold. To release the gold, arsenopyrite ore had to be roasted at extremely high temperatures, which also released arsenic rich gas, a highly toxic by-product. During the mine's first several years of operation (1948-1950), arsenic was released directly into the air, resulting in human health impacts, including two deaths, and the contamination of local soil and vegetation. The introduction of pollution control equipment in the 1950's reduced arsenic air emissions dramatically but resulted in the by-product of arsenic trioxide dust (which is approximately 60% arsenic). The collection and storage of this dust has amounted to approximately 237,000 tonnes and is stored on-site in underground stopes[12] and chambers.

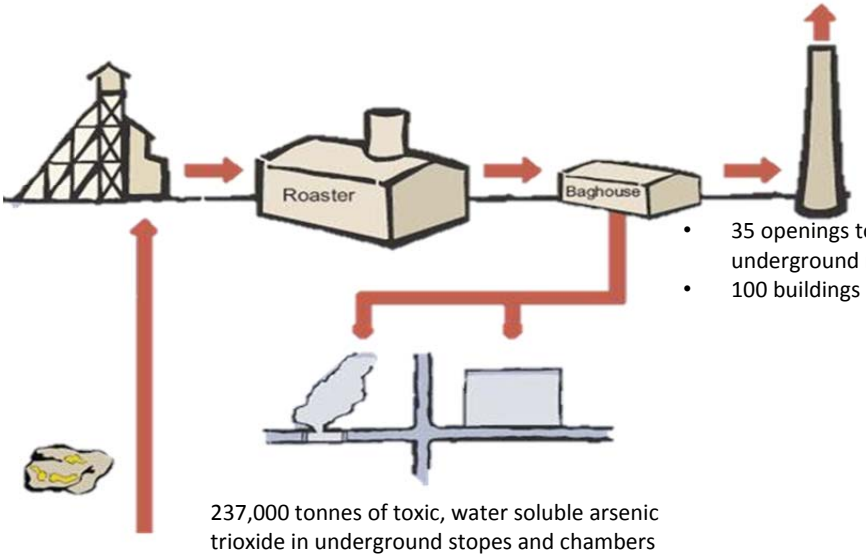
Arsenic trioxide dissolves in water and is dangerous to both people and the environment. If left unmanaged, the dust stored at Giant Mine could gradually dissolve and arsenic concentrations in groundwater would increase substantially. The contaminated groundwater would make its way into local water bodies downstream of the Site, particularly Great Slave Lake.

In addition to the significant risk posed by the storage of arsenic trioxide waste, there are other legacy concerns at the Site. The recovery of gold produced approximately 14 million tonnes of tailings[13] that contain arsenic. During the first few years of operations, tailings (flotation tailings) were discharged uncontrolled into a valley leading to Yellowknife Bay. Commonly referred to as the "historic tailings area", residual tailings are still present at the Site. Arsenic-contaminated soils exist across the Site, and there are more than 100 buildings on-site, many of which are contaminated with arsenic and asbestos. Eight open pits and 35 openings to the underground mine also represent safety hazards.

[12] Large underground spaces created during the mining process.
[13] Ground rock and process effluents that are generated as a waste slurry in the mining process.

Figure 10: Giant Mine Site

- 950 hectare footprint
- 8 open pits
- 4 tailings ponds
- 325,000 cubic metres of contaminated soil



- 35 openings to the underground mine
- 100 buildings on-site

237,000 tonnes of toxic, water soluble arsenic trioxide in underground stopes and chambers

The Remediation of Giant Mine

Background

In 1999, the Government of Canada took over responsibility for Giant Mine after the mine's last owner went bankrupt. After the Government took over responsibility, the biggest concern was the arsenic trioxide dust stored underground. The Site became the subject of several studies, workshops, community engagement sessions, and the work of experts to find a solution for the dust. From a possible 56 different management alternatives for dealing with the arsenic trioxide waste, the list was narrowed down to the 12 most viable options. Following this extensive community engagement period, the 12 options were further refined to two options: one which would keep the arsenic trioxide waste in the ground while limiting its movement ("leave in") and another that would involve removing it and storing it above ground ("take it out"). These two options were presented to the public by the GMRP Office at several community meetings and public information workshops. Based on feedback from public workshops, and the recommendations of the Technical Advisor and the Independent Peer Review Panel, the "leave-in" option was selected and the frozen block method[14] of immobilizing the arsenic trioxide was incorporated into the Remediation Plan for Giant Mine.

In 2007, the GMRP submitted a Water Licence application to the Mackenzie Valley Land and Water Board (MVLWB) for the remediation of the Site. While the MVLWB determined that the project should advance directly to the regulatory process, the Yellowknife City Council voted unanimously to refer the project to Environmental Assessment (EA), as the mine is within the boundaries of the City.

[14] An explanation of the frozen block method is available online. For more information, see https://www.aadnc-aandc.gc.ca/eng/1100100027422/1100100027423 and https://www.aadnc-aandc.gc.ca/eng/1100100023281/1100100023292

The EA processes involve very thorough public and technical reviews. For the GMRP, the assessment took seven years to complete and included a Developers Assessment Report[15], the Freeze Optimization Study (FOS), five days of technical sessions, five days of public hearings, more than 400 information requests and hundreds of meetings and discussions with stakeholder groups, the Yellowknives Dene, and the public.

On August 14, 2014, the Responsible Ministers issued their Decision of Environmental Assessment, and stipulated 26 legally-binding Measures, many of which must be completed before a Water Licence for the GMRP will be issued, which would allow the GMRP to proceed to remediation. These 26 Measures help focus the Project team's work for the next phase of engagement, design and decision-making. Section 3 includes additional information on the status of each Measure.

Throughout the EA process and until remediation can begin, the Project team monitors the Site and ensures it is kept safe and secure through 24-hour-a-day care and maintenance work. This work involves ensuring that the mine remains in compliance with relevant environmental regulations, ensuring site security and public safety, maintaining facilities, suppressing dust, and managing mine water and effluent. The team also conducts risk mitigation activities and studies related to the remediation program (see Section 4.3 of this report for more detailed information on risk and studies).

Freeze Optimization Study

Since 2011, the Project team has conducted a FOS to gather information about the freeze option, such as power requirements and rates of freezing. The FOS showed that a passive freezing system (using thermosyphons) can be used to achieve the same results as a fully active system (where a mechanical pump is used to circulate fluid). The FOS also showed that the chambers and stopes will remain safely frozen when cooled to a temperature of minus-five degrees Celsius, and it demonstrated how the efficiency of the design could be improved by freezing multiple stopes as one block. This information is incorporated into the updated remediation plan to freeze the remaining stopes and chambers.

General Freeze Gap Analysis

The Frozen Block Method will safely manage the arsenic trioxide waste at Giant Mine. Safety was the most important factor in choosing the frozen block method to address the arsenic trioxide waste. The safest way to manage the waste is to freeze it where it is, undisturbed, and prevent it from contaminating the underground water.

This involves cooling the surrounding rock to create a frozen block, or a shell. Freezing the arsenic trioxide dust and the surrounding rock will isolate the dust from the environment. Water will not seep in or out of the frozen zones, preventing the release of arsenic.

Freezing the arsenic trioxide in place is the best strategy for managing the arsenic for the long-term to protect people and the environment. Of all the options considered, it offers the fewest risks. Freezing the arsenic has the lowest risk of:

- Harming worker and community health and safety;

[15] The Developer's Assessment Report was developed based on the direction provided in the Review Board's Terms of Reference for the Environmental Assessment; the report identifies and assesses any likely adverse environmental effects that might be caused during the implementation of the Remediation Project, the selected mitigation measures and a monitoring framework.

- Releasing arsenic into the environment; and,
- Releasing arsenic over the long term.

Removing the waste would be unsafe for the workers and for the nearby communities. In addition, it is not possible to get all the waste out of the chambers and stopes, meaning this area would require additional levels of management. Removed waste would also need to be stored, creating another contaminated area.

This decision came after three years (2001-2003) of extensive scientific and technical research, and community consultation. The Project team considered 56 options for managing the arsenic. Twelve were studied in detail. Finally, the frozen block method was chosen based on:

- Scientific evidence;
- Community input; and,
- Support from the Independent Peer Review Panel

While the EA concluded the frozen block method was the most appropriate technical solution currently available, it also determined that emerging technologies should continue to be investigated. The Giant Mine Oversight Board (GMOB) is tasked with supporting research into technical approaches that could serve as a permanent solution. More information is available here.

There are five stopes and 11 chambers on the site that workers will freeze using the Frozen Block Method. Stopes are large, irregular-shaped spaces left underground when the gold-bearing rock was mined out. The chambers were built to contain the arsenic trioxide dust. Chambers have a more uniform, rectangular shape than stopes. Arsenic trioxide dust was pumped into the five stopes and 10 of the chambers. The last chamber will hold arsenic-impacted waste after site remediation. Freezing the arsenic trioxide will occur in stages over a number of years. This will ensure the chambers, stopes and surrounding rock are completely frozen, at -5C or lower.

The Project team will achieve the freezing by using a passive system. This system uses tall, metal tubes called thermosyphons. Thermosyphons draw and expel heat from the ground, using pressurized carbon dioxide. When heated below ground, the carbon dioxide rises as a gas. This gas then cools above ground and becomes a liquid, which – because it is heavier – drops back down underground, warms up, and becomes a gas that rises again. Because of this ongoing cycle, thermosyphons do not need an external source of power to keep the ground frozen.

Thermosyphons are commonly used to keep ground frozen. For example, thermosyphons are used in the parking lot of the Legislative Assembly in Yellowknife. There, they prevent the natural permafrost from thawing. Thermosyphons are also used to maintain frozen core dams at the BHP Ekati Diamond Mine.

When the system is in place, the frozen blocks should stay frozen indefinitely. Even without thermosyphons, once frozen, the solid ice block would take more years to melt. Thermosyphons do not need power. Instead, they use the cold air in winter to cool the ground. As a precaution, thermometers will monitor the ground and air temperatures. If the blocks start to thaw, the Project would take actions to refreeze the ground either through an active freeze system or additional thermosyphons.

Climate change was also taken into consideration. The technical advisor's calculations show that the system will work even if the region's average temperatures go up several degrees. Sophisticated

equipment will monitor the site on an ongoing basis. The Project team will make adjustments to maintain the frozen areas.

Major Phases of the GMRP

The overall approach to the GMRP is divided into four major phases. The first phase was **project assessment**, which included initiating care and maintenance, understanding all of the risks and complexities of the Site and identifying remediation options. This phase began in 1999 and ended in 2006.

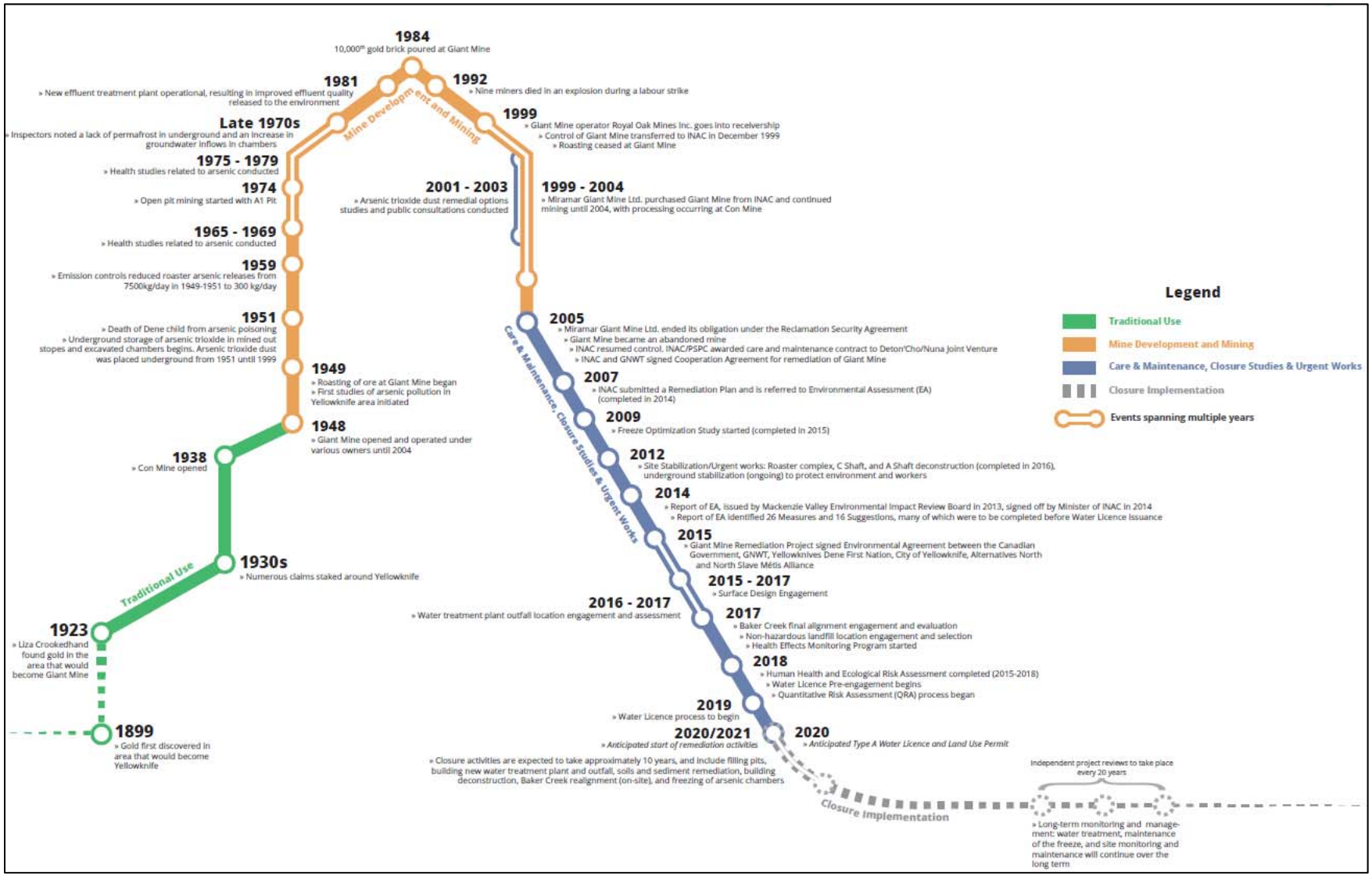
The second and current phase is referred to as **project definition.** As a result of the Measures coming out of the EA, this phase is now projected to last until 2021. It is during this phase that the EA was completed, the detailed remediation plan is being developed and all permits and licences will be obtained. This phase has also involved addressing urgent health and safety risks and several remediation elements that were intended to be completed in the third phase of the project, such as the deconstruction of the Roaster Complex (structures where ore was roasted at high temperatures to extract gold) (see Section 2.3 for more detailed information).

The third major phase is referred to as **project implementation** and is when the majority of the remediation work will be completed. This includes a variety of activities including the containment of approximately 237,000 tonnes of arsenic trioxide dust by freezing 15 underground chambers, capping 95 hectares of tailings, demolishing over 100 mine buildings and infrastructure, as well as constructing and operating a waste water treatment facility to treat arsenic contaminated mine water, to name a few. This phase is currently projected to take place between 2021 and 2030 and represents the majority of activity and costs associated with the remediation project.

The final phase of the project is **monitoring and maintenance**. This is the longest phase as it is projected to begin in 2030 and to last for at least 100 years. This phase has the lowest level of activity but will include elements such as post-remediation adaptation, water treatment, long-term monitoring and infrastructure renewal as required.

Figure 11 showcases the timeline of Giant Mine since 1899.

Figure 11: Giant Mine Timeline



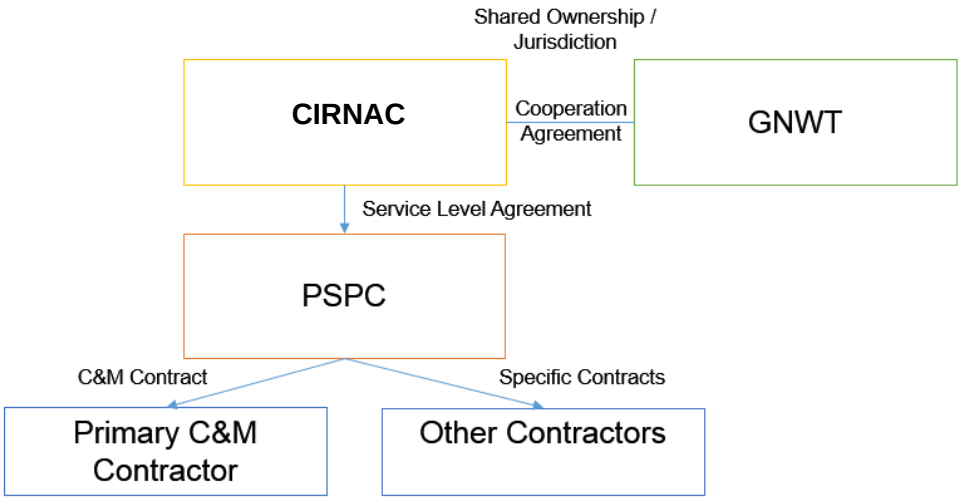
Management of the GMRP

Project Team

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and the Government of the Northwest Territories (GNWT) share jurisdiction for the Site and jointly oversee the remediation through a Cooperation Agreement. CIRNAC currently has care and control of the Site and has retained the support of Public Services and Procurement Canada (PSPC) for the management of the Site through the care and maintenance (C&M) contractor and management of the implementation of the GMRP.

Figure 12 shows the management structure for the GMRP.

Figure 12: Management Structure for the GMRP



The key members of the Project team are:

a. Project Leader: Assistant Deputy Minister, Northern Affairs Organization (ADM NAO);
b. Project Sponsor: Director General, Northern Contaminated Sites Branch (DG, NCSB);
c. CIRNAC Project Director; and
d. Project Implementation team, including the CIRNAC Senior Project Leads and Project Leads and the PSPC Senior Project Managers, Project Managers and GNWT representative

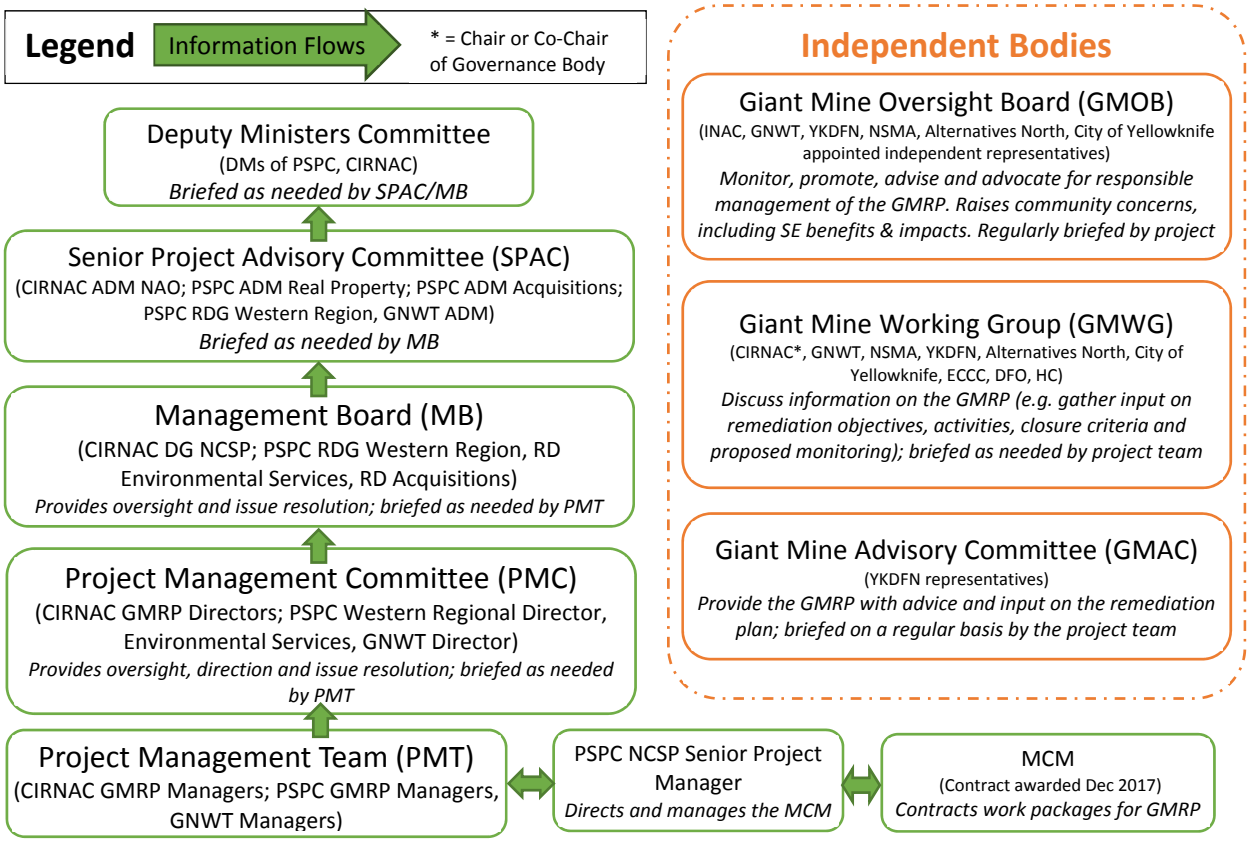
The Assistant Deputy Minister (ADM) of the Northern Affairs Organization (NAO) of CIRNAC is the **Project Leader** and is accountable to the CIRNAC Deputy Minister (DM) for the overall delivery of the GMRP. The Project Leader is also accountable for the project liability and the use of funds. The **Project Sponsor's** role is to ensure that project objectives are established early in the project and maintained throughout to project completion. The Project Director reports to the Project Sponsor and is supported by the **Project Implementation team** – a combination of CIRNAC, PSPC, and GNWT personnel.

Project Governance

A joint CIRNAC - PSPC project governance structure has been established to provide oversight, direction, and advisory services to the Project team. The governance and management of the GMRP is also

supported by external, independent and technical reviews, provided by multiple groups, such as the GMOB, which was formed in 2015, the Giant Mine Community Alliance, and the Independent Peer Review Panel. Figure 13 shows the governance structure of the GMRP.

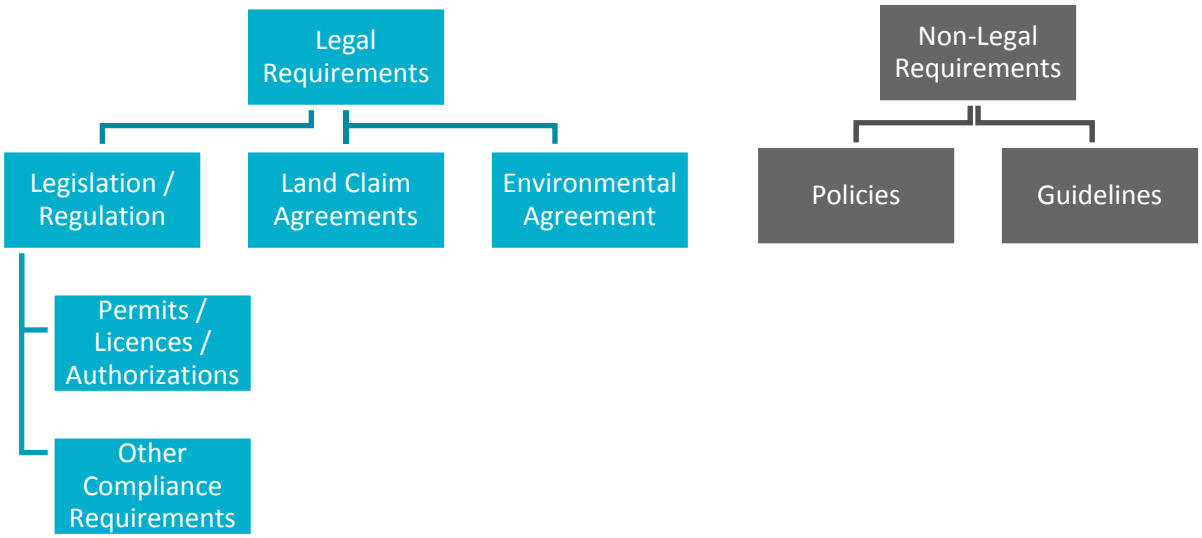
Figure 13: Governance Structure of the GMRP



Obligations of the GMRP

The activities and operations of Giant Mine are regulated through various pieces of legislation and guided by other non-legal requirements, as demonstrated in the below figure (Figure 14).

Figure 14: Obligations of the GMRP



The GMRP occurs in an area covered by the *Tlicho Land Claims and Self Government Agreement* and CIRNAC meets its specific obligations by providing Indigenous employment and Indigenous business opportunities (see Section 5.2 for more information). As of 2014-15, the Akaitcho First Nation was in negotiations with the GNWT for a comprehensive land agreement; they signed an Interim Measures Agreement in 2001. Should the land claim be settled in the Akaitcho territory during the GMRP's lifecycle, the GMRP will work within the provisions set out in the agreement to meet its obligations.

A significant legal instrument for the GMRP is the Environmental Agreement, which established an independent oversight body (GMOB). The Environmental Agreement was signed in June of 2015. Signatories included CIRNAC, the GNWT, the City of Yellowknife, the Yellowknives Dene First Nation (YKDFN), Alternatives North, and the North Slave Métis Alliance (NSMA).

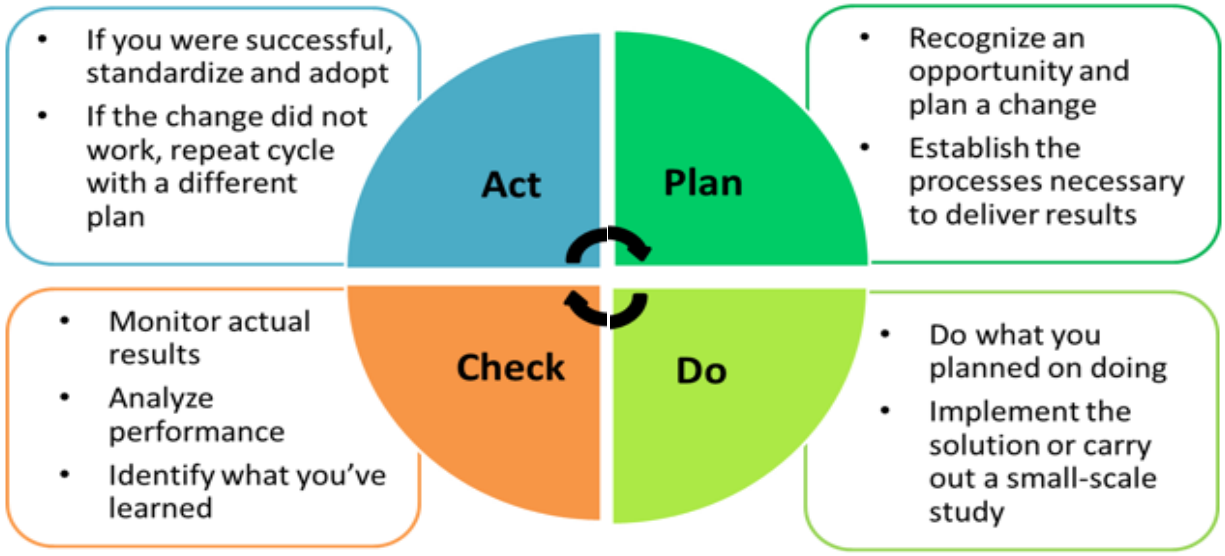
A key regulatory instrument for environmental management is a Type A Water Licence, issued by the MVLWB under the *Mackenzie Valley Resource Management Act*, *Northwest Territories Waters Act* and *NWT Water Regulations*. CIRNAC will apply for a Type A Water Licence for the implementation phase of the GMRP. Currently, CIRNAC voluntarily manages water on the Site consistent with the standards specified in a historical Type A Water Licence (expiry 2005), issued to a former operator of the Site. In March 2013, the GMRP received a Type B Water Licence from the MVLWB for the Site Stabilization Plan (SSP) (the Roaster Demolition and Underground Stabilization work are under this licence).

Integrated Management System

GMRP has an integrated Environment, Health & Safety, and Community (EHSC) Management System[16], which improves the management of key environment, health, safety and social issues at the Site. A management system is a process of systemizing how things are done – it is a series of processes and procedures for ensuring activities are performed correctly, consistently, and effectively to meet objectives and to drive continual improvement. The EHSC Management System provides the foundation for the GMRP to:

- Identify and manage risks;
- Track performance; and
- Ensure continual improvement through a "plan-do-check-act" approach.

Figure 15: EHSC Management System



Key parts of the GMRP EHSC Management System include a **Policy**[17], which provides direction and sets commitments for the management of environment, health, safety and community for the GMRP, as well as a **Manual** that acts as a roadmap for the whole system by describing roles and responsibilities, procedures and requirements. The Management System also includes specific procedures and requirements within Environmental Management Plans and Health and Safety Standard Operating Procedures.

[16] The GMRP EHSC Management System is in alignment with internationally recognized standards in order to enable a single integrated approach (specifically, the ISO 14001:2004 Environmental Management Systems standard and the OHSAS 18001: 2007 Occupational Health and Safety Management Systems standard).
[17] Giant Mine Remediation Project: Environment, Health, Safety and Community Policy: https://www.aadnc-INAC.gc.ca/eng/1340835251072/1340835309566

Project Risks and Mitigation

Risk management has been an important and ongoing management activity for the GMRP since 2002-03. Risk is about uncertainties, or unknowns, and how these could impact the objectives of the GMRP, such as the objective to minimize impacts to the environment. Risk management involves identifying and understanding risks, ranking them (which ones are low or high), and taking steps to prevent risk events from happening or to reduce their impact if they do happen. Organizations with strong risk management processes are better prepared to anticipate, avoid or reduce the impact and/or likelihood of risk events, should they occur.

The GMRP has a risk management procedure and process[18] which it uses to reduce risks to acceptable levels (e.g., legacy risks; see text box) and to manage risks which may increase with increased project activity (e.g., project activity risks; see text box).

Examples of GMRP Risks

1. **Legacy Risks**: risks related to the infrastructure (e.g., dams) and environmental conditions (e.g., underground chambers) left by the former mining operation that could have human health and environmental impacts. Examples include: the release of arsenic trioxide from the underground chambers, or the injury or death of a trespasser from falling into a mine opening.
2. **Activity Risks**: risks related to the remediation project and the activities involved in reducing the legacy risks. These risks include risks to scope, budget, schedule, health and safety of workers and the surrounding environment. Examples include: delays in advancing work (and associated cost impacts), health and safety impacts to workers while conducting remediation activities (e.g., moving earth), and air pollution due to dust from remediation work.

There are many examples of how risk management has informed Project decision-making. When the risk management process was first implemented in 2002-03, the identification of various public access risks led to the implementation of a range of site security measures to prevent unauthorized entry to the Site. More recently, the identification of significant risks related to the Roaster Complex, Baker Creek, and underground chamber instability led to the development of a SSP – a set of remediation measures (including the demolition of the Roaster Complex) that were approved and implemented ahead of schedule to minimize impacts to human health and safety and the environment. An overview of current legacy and activity risks for the GMRP, and associated risk treatment activities, is presented below.

[18] GMRP's risk management procedure and process aligns with best practice and the international risk management standard CAN/CSA-ISO 31000-10 (R2015).

Risk Profile Summary – 2017-18

This section provides a summary of the GMRP 2016-17 risk profile. The information is from the GMRP Risk Register (a large excel file) and summarizes the number of risks by status (i.e. active, closed), number of risks by category (e.g. dams), the distribution of risks across levels (e.g. low, moderate), the distribution of risks across types (active vs legacy), the active risk drivers, and the historical profile since 2010.

A more detailed summary report is available under separate cover. The detailed summary report describes each active risk, its driver, level, and treatment.

Figure 16: GMRP Risk Profile Summary

Figure 17: Active Risks by Level

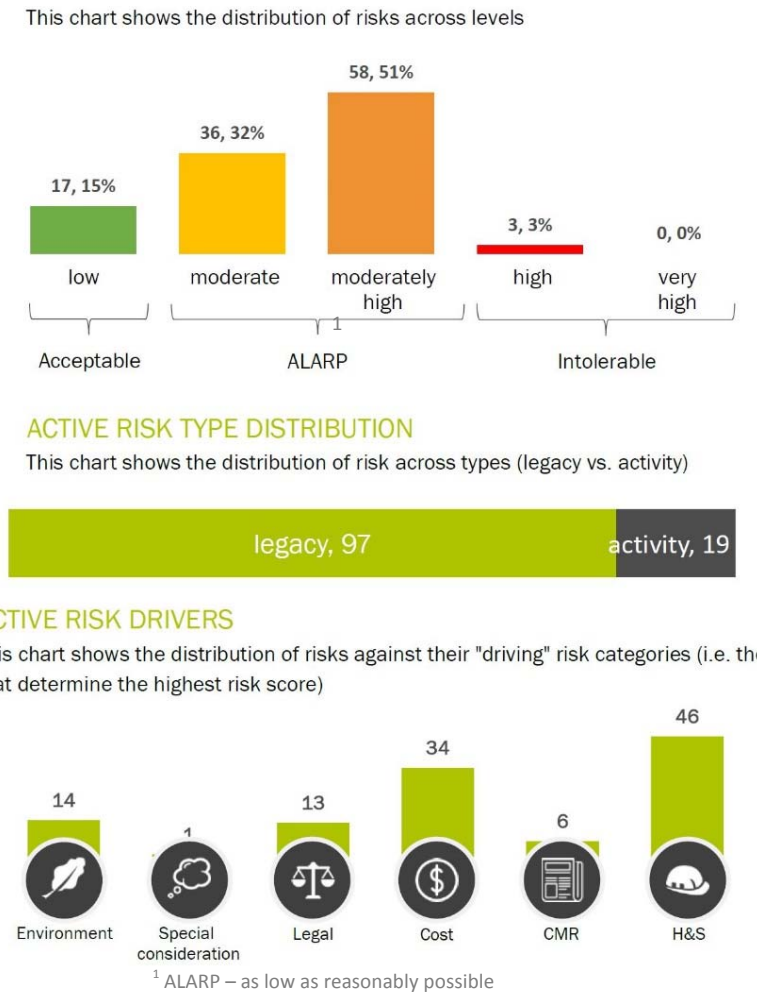
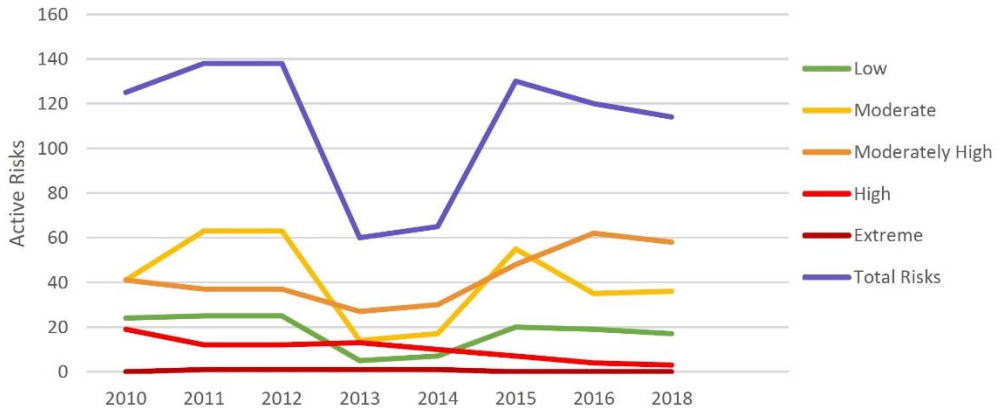


Figure 18: Historical Risk Profile

This chart graphs the historical risk numbers by level and type as entered on the Risk History Tab



APPENDIX C: PROGRESS ON EA MEASURES AND SUGGESTIONS – DETAILED TABLES

This appendix provides supplemental details about progress toward achieving the Measures stipulated via The Report of Environmental Assessment and Reasons for Decision (MVRB, 2013), *and plans for 2017-18. Throughout these tables, "the Project" refers to the GMRP. The language in the Measure column is drawn directly from The Report of Environmental Assessment and Reasons for Decision* (MVRB, 2013).

Table 15: Giant Mine EA Measures Tracking Table (as of May 8, 2018)

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
1	To prevent the significant adverse impacts on environment and the significant public concern from the proposed perpetual timeframe, the Project will proceed only as an interim solution, for a maximum of 100 years.	No Action Required		
2	Every 20 years after the beginning of Project implementation, the Developer will commission an independent review of the Project to evaluate its effectiveness to date, and to decide if a better approach can be identified. This will: 1. consider results of the ongoing research 2. be participatory in nature 3. follow the requirements of procedural fairness and be transparent in nature. If the periodic review identifies a better approach that is feasible and cost-effective, the Developer will further study it, and make the study and its results of the study public.	Future action required	Article 8 of the June 9, 2015 Environment Agreement further formalized the process through which the future Independent Project Review will be conducted.	No action required in 2018-2019
3	To facilitate active research in emerging technologies towards finding a permanent solution for dealing with arsenic at the Giant mine site, the Developer will fund research activity as advised by stakeholders and potentially affected Parties through the GMOB. The ongoing funding for this research activity, and additional resources required to manage its coordination, will be negotiated and included as part of the Environmental Agreement specified in Measure 7 and will make best use of existing research institutions and programs. The GMOB will ensure through the research activity that, on a periodic basis: 1. reports on relevant emerging technologies are produced; 2. research priorities are identified; 3. research funding is administered; 4. results of research are made public, and 5. results of each cycle are applied to the next cycle of these steps.	Complete	Articles 7 & 11 of the June 9, 2015 Environmental Agreement provide a commitment of funding for the Oversight Body (which will be known publicly as the Giant Mine Oversight Board, or GMOB) to manage a research program as required by Measure 3. Initial funding flowed for this Measure in 2016-2017 and will be ongoing.	Funding in the amount of $175,00 (2015 dollars) will be provided to GMOB to continue research priorities.
4	The GMOB will provide the results of the research funded by the Developer to	Complete	Article 8 of the	No action required until

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
	the periodic reviews of the Project described in Measure 2. If better technological options are identified through the funded research in-between these periodic 20-year reviews, these will be reported publicly by the GMOB to the Parties, the Developer and the Canadian public. The Developer will consider these technologies and make decisions regarding their feasibility. The Developer will make any such decisions public.		Environmental Agreement further formalized this obligation for the for the Oversight Body (GMOB).	closer to the 20-year review date.
5	In order to mitigate significant adverse impacts that are otherwise likely, the Developer will commission an independent quantitative risk assessment to be completed before the Project receives regulatory approvals. This will include: 1. explicit acceptability thresholds, determined in consultation with potentially affected communities 2. an examination of risks from a holistic perspective, integrating the combined environmental, social, health and financial consequences. 3. possible events of a worst-case/ low frequency high consequence nature 4. additional considerations specified in Appendix D of the Report of EA From this, the Developer will identify any appropriate Project improvements and identify management responses to avoid or reduce the severity of predicted unacceptable risks.	Underway.	Independent consultant retained to complete the QRA. Engagement consultant retained to develop engagement component in coordination with QRA consultant. Draft QRA process methodology and engagement plan developed.	Working Group review of QRA process methodology including engagement. Initial Screening step of the QRA process including two community level engagement efforts will be completed and will include an interim report summarizing the Initial Screening exercise. Following Initial Screening, the QRA portion of the QRA Process will be completed and a validation session with community members will be held before the end of 2018-2019.
6	The Developer will: • investigate long-term funding options for the ongoing maintenance of this Project and for contingencies, including a trust fund with multi-year up front funding, • involve stakeholders and the public in discussions on funding options; and, • make public a detailed report within three years that describes its consideration of funding options, providing stakeholders with the opportunity to comment on the report.	Underway	The requirement to have long-term funding in place was included in the overall project schedule for planning purposes. A draft report on Long Term Funding Options was provided for review in July 2017 and a subcommittee of the Working Group was convened to provide feedback. A consultant was retained to provide a revamped report.	Additional engagement with the consultant and the working group subcommittee will occur while developing the Long Term Funding options report. A final report is expected by March 31, 2019.

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
7	The Developer will negotiate a legally-binding environmental agreement with, at a minimum, the members of the Oversight Working Group, and other appropriate representative organizations, to create an independent Oversight Body (GMOB) for the GMRP. These negotiations will build on the existing discussion paper and draft environmental agreement of the Giant Oversight Working group. This GMOB will exist for the life of the Project unless otherwise agreed by the Parties to the Environmental Agreement. Every effort will be made to have the GMOB in place as early as possible. The negotiations will make significant progress within six months of the Ministers' environmental assessment decision or proceed to mediation. The Developer will cover any mediation costs. The environmental agreement will include a dispute resolution mechanism to ensure compliance with the agreement and a stable funding mechanism for the GMOB.	Complete	The Environmental Agreement came into effect on June 9, 2015.	None
8	The activities of the oversight body will include: • keeping track of monitoring activities by the Developer and the results of those activities, including water quality and aquatic effects monitoring, health monitoring and other monitoring; • considering the adequacy of funding for the Project and ongoing research; • providing advice to the Developer, regulators and government on ongoing improvements in monitoring and Project management to prevent risks and mitigate any potential impacts; • sharing the oversight body's conclusions with the general public and potentially affected communities in a culturally appropriate manner	Complete	The Environmental Agreement provides for the creation of the Oversight Body (GMOB) and funding to fulfill these obligations going forward.	None
9	The Developer will work with other federal and territorial departments as necessary to design and implement a broad health effects monitoring program in Ndilo, Dettah and Yellowknife focusing on arsenic and any other contaminants in people which might result from this Project. This will include studies of baseline health effects of these contaminants and ongoing periodic monitoring. This will be designed with input from: • Health Canada, GNWT Health and Social Services and the Yellowknife medical community; and • The Yellowknives Dene and other potentially affected communities. The organization conducting the monitoring will provide regular plain language explanations of the monitoring results in terms that are understandable to lay people, and communicate this to potentially affected communities in a culturally appropriate manner.	Underway	Dr. Laurie Chan was confirmed as lead for Health Effects Monitoring Program. Advisory Committee was established with representatives of Health Canada, GNWT HSS, Office of Chief Medical Officer, YKDFN, City of Yellowknife, NSMA, GMOB and other stakeholders (2016-2017). Public engagement was completed in 2017-2018. Finalized the scope of Health Effects Monitoring Program. Recruited participants and implemented first year of program.	Recruit participants and implement the second year of Health Effects Monitoring Program.

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
10	The Developer will commission a comprehensive quantitative human health risk assessment by an independent, qualified human health risk assessor selected in collaboration with Health Canada, the Yellowknives Dene, the City of Yellowknife, and the Developer. This human health risk assessment will be completed before the Project receives regulatory approvals. It will: 1. Include a critical review of the 2006 Tier II human health risk assessment and the previous screening reports; 2. Consider additional exposures and thresholds (as specified in Appendix F of the Report of EA); 3. Decide whether a Tier III risk assessment is appropriate; 4. Provide a plain language explanation of the results in terms that are understandable to the general public, and communicate this to potentially affected communities in a culturally appropriate manner; 5. Provide interpretation of results and related guidance; and 6. Inform the broad health effects monitoring program (described in Measure 9 above). The Developer may conduct the human health risk assessment concurrently with the quantitative risk assessment described in Measure 5. Based on the results of this human health risk assessment, and on any existing results of the health effects monitoring program (described in Measure 9 above), the Developer will, if necessary in response to this information, identify, design and implement appropriate design improvements and identify appropriate management responses to avoid or reduce the severity of any predicted unacceptable health risks. Also, footnote #133 in the Report of EA (Appendix D) is revised to read, in its entirety, “Including inference of causality and pathologies deducted from any available health studies.”	Underway	Engagement on results of HHERA was completed. Final report issued January 2018.	Initiate an indirect stress effects study
11	The Developer, with meaningful participation from the Oversight Body and other parties, will thoroughly assess options for, and the environmental impacts of, diversion of Baker Creek to a north diversion route previously considered by the Developer or another route that avoids the mine site and is determined appropriate by the Developer. Within one year of the project receiving its water license, a report outlining a comparison of options including the current on-site realignment will be provided to the appropriate regulatory authorities, the Oversight Body and the public. Once informed by the advice of the Oversight Body and regulatory authorities, the Developer will determine and implement the preferred option. In doing so, the Developer will consider the advice of the Oversight Body, regulatory	Complete	Draft Baker Creek Options Analysis Report was presented to the Giant Mine Working Group in June 2017 and finalized at the end of 2017-2018. The document analyzed a series of options for Baker Creek including on and off-site alignments. The options analysis included a Multiple Accounts Analysis and concluded the on-site	N/A

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
	authorities, and the public, and will ensure that the primary considerations in selecting an option are to: a) minimize the likelihood of Baker Creek flooding and entering the arsenic chambers, stopes and underground workings, and b) minimize the exposure of fish in Baker Creek to arsenic from existing contaminated sediments on the mine site, surface drainage from the mine site or tailings runoff. If off-site diversion is selected, the Developer will seek required regulatory approvals to implement the diversion within five years of receiving its water license.		alignment was preferred.	
12	To prevent significant adverse impacts on Great Slave Lake from contaminated surface waters in the existing or former channel of Baker Creek, should it be re-routed to avoid the mine site, the Developer will ensure that water quality at the outlet of Baker Creek channel will meet site-specific water quality objectives based on the CCME *Guidance on the Site-Specific Application of Water Quality Guidelines in Canada.*	Underway	Draft SSWQOs were developed and presented to Working Group (Jan,2018).	Additional engagement during pre-water licence application phase. Finalize SSWQOs prior to Water Licence Application submission.
13	The Developer will design and, with the applicable regulators, manage the Project to ensure that, with respect to arsenic and any other contaminants of potential concern, the following water quality objectives are achieved in the vicinity of the outlet of the existing or former channel of Baker Creek, should it be re-routed to avoid the mine, excluding Reach 0: a) Water quality changes due to discharge from the former channel of Baker Creek will not reduce benthic invertebrate and plankton abundance or diversity; b) Water quality changes due to discharge from the former channel of Baker Creek will not harm fish health, abundance or diversity; c) Water quality changes due to discharge from the former channel of Baker Creek will not adversely affect areas used as drinking water sources, d) Water quality changes due to discharge from the former channel of Baker Creek will not adversely affect any traditional or recreational users; and, e) There is no increase in arsenic levels in Great Slave Lake due to discharge from the former channel of Baker Creek beyond the parameters described in Measure 12.	Future Action Required	See Measures 11 & 12	See Measures 11 & 12

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
14	The Developer will add an ion exchange process to its proposed water treatment process to produce water treatment plant effluent that at least meets Health Canada drinking water standards (containing no more than 10µg/L of arsenic), to be released using a near shore outfall immediately offshore of the Giant mine site instead of through the proposed diffuser. The Developer will achieve this concentration without adding lake water to dilute effluent in the treatment plant.	Future Action Required	A plan was developed to implement an onsite pilot testing program at the Effluent Treatment Plant to test different ion-exchange media to determine performance characteristics to inform design of the Water Treatment Plant (WTP)	The Onsite Pilot Testing Program will test different ion-exchange media during the open-water season of 2018. Design of the WTP will commence include siting of the WTP intake, and discharge line and preliminary design of the WTP.
15	The Developer and regulators will design and manage the Project so that, with respect to arsenic and any other contaminants of potential concern: 1. Water quality at the outfall will meet the Health Canada Guidelines for Canadian Drinking Water Quality; and, 2. The following water quality objectives in the receiving environment are met: a) Water quality changes due to effluent discharge will not reduce benthic invertebrate and plankton abundance or diversity at 200 metres from the outfall; b) Water quality changes due to effluent discharge will not harm fish health, abundance or diversity; c) Water quality changes due to effluent discharge will not adversely affect areas used as drinking water sources; and, d) There is no increase in arsenic levels in Yellowknife Bay water at 200 metres from the outfall: and, e) There is no increase in arsenic levels in Yellowknife Bay sediments at 500 metres from the outfall	Future Action Required	Significant modelling effort completed in 2017-2018 to model surface and underground water quantities and quality including water quality modelling in Baker Creek and Yellowknife Bay. Draft Effluent Quality Criteria (EQC) were developed and presented to Working Group (Jan, 2018)	The Effluent Quality Criteria will be engaged upon during pre-water licence application engagement and finalized prior to Water Licence Application Submission Jan, 2019
16	Before construction, the Developer will model re-suspension of arsenic from sediments and resulting bioavailability in the vicinity of the outfall. If the modeling results indicate that the outfall may resuspend arsenic from sediments, the Developer will modify the outfall design until operation does not cause resuspension of arsenic from sediment.	Underway	None	The outfall design will commence, including analysis of outfall to potentially suspend sediment. Design criteria will include the requirement to avoid resuspension of arsenic from sediments.
17	Before operating the outfall, the Developer will design and implement a comprehensive aquatic effects monitoring program that is sufficient to determine if the water quality objectives listed in Measure 15 are being met. This program will: 1. at a minimum, be able to identify any accumulation of arsenic over time in the water, sediment or fish in the receiving environment; 2. include appropriate monitoring locations near N'dilo, in Back Bay	Underway	Draft AEMP developed.	Engagement on the AEMP to occur and the AEMP to be finalized by Water Licence Application submission, Jan 2019

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
	and in Yellowknife Bay, with a focus on areas in the vicinity of the outfall and areas used by people; 3. include the establishment of a baseline for aquatic effects in Back Bay before beginning Project construction and installation of the outfall; 4. be developed according to AANDC *Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories, June 2009*, with corresponding action levels and management response framework.			
18	Prior to preparing chambers and stopes for freezing, the Developer will conduct a comprehensive quantitative risk assessment evaluating both wet and dry methods for the initial freezing design, with respect to current risks and implications for future removal. This will include an evaluation of potential effects of the proposed freezing and wetting method on the thawing or frozen excavations, and potential impacts of ongoing design changes prior to implementing the Project. The Developer will release a plain language report to the public describing its considerations and the resulting design.	Underway	Freeze design basis report was finalized and engagement occurred with the Working Group. Evaluation of wet vs dry completed in Design Basis Report. Project is proceeding with dry method. (Work was completed in 2016-2017). Freeze Plain Language Report drafted internally Changes to the draft document have been ongoing; delays are due to software compatibility.	Finalize plain language report and distribute to WG, GMAC and email distribution list by Dec 2018
19	Considering the results of the risk assessment described in Measure 18, the Developer will not adopt any method of freezing that significantly reduces opportunities for future arsenic removal or other remediation by future technologies.	Complete	Decision to proceed with dry method for freezing and passive approach will allow for reversibility if needed (2016-17). This was agreed to by the Project and IPRP	None
20	The Developer will conduct all major demolition and construction activities with the potential to release large amounts of dust or contaminants into the air when wind directions will minimize the chances of dust and contaminants blowing into the City of Yellowknife, Dettah and N'dilo.	Future Action Required	None	None anticipated
21	The Developer will collect dust and contaminant level data from soil and vegetation in the vicinity of major reclamation activities before and after major demolition or construction activities to serve as a baseline for any related adaptive management activities that may follow.	Future Action Required	None	None anticipated
22	The Developer will conduct a study to determine appropriate depth of the tailings cap and B1 pit cover, in consultation with Environment Canada and responsible regulators, to verify that the depth proposed will ensure the tailings cap and B1 pit cover are not compromised by vegetation growth. The	Underway	Conceptual tailings cover design was finalized. The selection of a rock cover supports addressing this	Further investigation work for 2018-19 with field studies for cover design planned for 2019-20.

#	Measure	Status (as of May 2018)	Progress in 2017-18	Plans for 2018-19
	Developer will provide a report of this study to the Mackenzie Valley Land and Water Board before it issues a water license for the Project.		measure.	
23	The Developer will work cooperatively with responsible regulatory authorities and interested Parties in the development and submission of a Tailings Monitoring and Management Plan prior to receiving regulatory approvals. This plan will not only identify potential issues for the management of tailings but will also identify mitigation measures to prevent problems related to the tailings cap failure, and will include consideration of the B1 pit cover as applicable.	Underway	Drafting of the Tailings Monitoring and Management Plan initiated.	Tailings Monitoring and Management Plan will be part of the full Water Licence package and will be engaged on as part of the Water Licence application submission.
24	The Developer will physically prevent all-terrain vehicle access to the tailings cap and B1 pit cover to prevent the surface from being eroded or otherwise compromised. The Developer will monitor the effectiveness of this prevention, and will take any additional management measures as necessary to prevent all-terrain vehicle access.	Future Action Required	The selection of a rock cover supports addressing this measure.	To be considered in the detailed cover design and the Tailings Monitoring and Management Plan, see measure 23.
25	The Developer will work cooperatively with responsible regulatory authorities and interested Parties in the development and submission of an Air Quality Management Plan which incorporates an ongoing air quality monitoring program. This ongoing monitoring program will include all previously identified on-site air quality monitoring stations and one off-site air quality monitoring station near Niven Lake. At a minimum, ambient concentrations of NO2 and PM2.5 will be monitored at the Niven lake site. Total suspended particulate and metal concentrations will be monitoring at the on-site locations. This air quality monitoring program will identify action levels and trigger additional management and mitigation activities, if required.	Underway	The Air Quality Monitoring Program (AQMP) continued throughout 2017-18, with the eight fenceline and three community stations (Ndilo, Niven, and near Great Slave Sailing Club) operational as per the AQMP.	The AQMP will continue for 2018-19. As well, a re-evaluation of the air program will be completed to identify areas for improvement and efficiencies leading into active remediation.
26	In conjunction with Measure 10 above, the Developer will consider the results of the comprehensive human health risk assessment, and consult with the YKDFN and City of Yellowknife when determining suitable end uses of the site, to ensure that those proposed uses do not pose a health risk to people, including toddlers.	Underway	Engagement on results of HHERA completed. Final HHERA report issued January 2018.	Ongoing engagement. Constraints to end land uses to be presented in Closure and Reclamation Plan. Engagement with WG on GMAC on Closure and Objectives and Criteria. Draft Closure Plan to be engaged on from June to September 2018 as part of pre-engagement to Water Licence process.

Table 16: Giant Mine EA Suggestions Tracking Table (as of September 20, 2018)

#	Suggestion	Status	Progress in 2016-17	Plans for 2017-18
1	The Developer should consult with surrounding communities, including Dettah, Ndilo and the City of Yellowknife, prior to finalizing its Project design, so that design improvements may be incorporated to address any remaining concerns.	Underway	Ongoing consultation efforts through regular meetings with the Giant Mine Working Group and the YKDFN GMAC. Surface Design Engagement Process (SDE) completed in 2016/17 and follow-up on design decisions continued in 17/18. Engagement on location of outfall and landfill completed. Ongoing meetings with City of Yellowknife staff to provide updates on the Project.	Ongoing engagement activities with GMAC, Working Group and the City of Yellowknife. Ongoing consultation for finalization of Closure and Reclamation Plan.
2	The Developer should create a monument as a memorial to the impacts of past contamination from Giant Mine on Indigenous communities and the environment.	Future Action Required	None	None planned. Discussions may take place as part of regular Project engagement throughout the year.
3	To encourage widespread learning from and remembering of the experiences of the Giant Mine, the Developer, in conjunction with the GNWT Department of Education, Culture and Employment, should: 1. develop an education resource unit on the impacts of Giant Mine on the land and on people, including impacts on Indigenous peoples, and 2. distribute this resource unit for use within the school curriculum across Canada.	Future Action Required	GNWT-ENR has approached ECE to discuss the suggestion. The Toxic Legacy's Project has worked with ECE focusing on an insert for the Grade 10 Northern Studies curriculum	Preparation of information both from a Project and YKDFN perspective is under development. This background information will be included within a student-led inquiry chapter of a larger unit about resource development,
4	The Federal Contaminated Sites Action Program should develop a policy framework and guidance for the perpetual care and management of remediated contaminated sites.	Not a Project responsibility.	Project team contacted FCSAP to make them aware of the suggestion	Unknown
5	To ensure long-term funding throughout the life of the Project, the Developer should create an independently managed self-sustaining trust fund with multi-year up-front funding for the ongoing maintenance of this Project and for contingencies. A third-party expert should independently manage this trust fund. Annual reports on the condition of the fund should be provided to stakeholders and the public.	Outside of the Project scope	Linked to Measure 6.	Linked to Measure 6
6	To reduce public concern about the multiple roles of AANDC in this Project and to increase public confidence, AANDC should produce guidelines to clarify reporting structures to ensure that Project	Outside of the Project scope	The existing Treasury Board Values and Ethics Code for the Public Sector which came into force April 2012 provides this	None.

#	Suggestion	Status	Progress in 2016-17	Plans for 2017-18
	inspectors, advisors and managers employed by the federal government can perform their duties objectively and without undue pressure from within the federal government. These should be made available to the public within six months of Ministerial acceptance of this Report of Environmental Assessment.		clarity and is available to the public at http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=25049	
7	Based on the results of the health risk assessment described in Measure 10, the appropriate government authorities should remediate garden and playground soils where arsenic concentrations exceed current guidelines for urban soils in Canada.	Outside of the Project scope	As a result of the Project's HHERA, GNWT Health Advisories have assessed the outcomes (low risk in Ndilo, and very low risk in Yellowknife and Dettah) _and have issued any relevant public health advisories for the Yellowknife area. Further information can be found at: https://www.hss.gov.nt.ca/en/newsroom/arsenic-lake-water-around-yellowknife The CIRNAC regional office initiated discussions with the YKDFN to address areas of concern.	GNWT-ENR are evaluating their Contaminated Site Remediation Guidelines, which includes arsenic specific criteria. Revised Guidelines will be engaged on publicly in 2019. CIRNAC regional office is anticipating a proposal from YKDFN or soil remediation of contaminated Ndilo soils.
8	The Developer should consider the Trail Human and Environmental Health Committee as a model for the development of the health program.	Future Action Required	Links to Measure 9 (the Health Effects Monitoring Program). The work on Measure 9 included consideration of the Trail work.	Ongoing work on Measure 9 has incorporated the Trail model.
9	During its review of the diversion of Baker Creek, the Department of Fisheries and Oceans should consider the habitat loss of the existing Baker Creek and decide on any habitat design requirements for the diversion to the extent it deems appropriate. Any resulting habitat compensation requirements should be applied on the new diversion.	Future Action Required	The Project finalized the Baker Creek Alternative Evaluation Report that documents decision to not divert Baker Creek. This report documented input received from all stakeholders including DFO,	The Project continues to engage DFO on all issues involving Baker Creek and potential habitat loss.
10	The Developer should investigate the potential advantages and disadvantages of adding an engineered wetland to the Project to reduce arsenic in surface drainage. This investigation should include possible locations in the channel that formerly contained Baker Creek and in the Baker Creek diversion. On completion, the Developer should make a public report of the results of this investigation and of any resulting changes to Project design. This should be completed before a water license is issued for the Project.	Future Action Required	Assessment of wetland feasibility was initiated by Project Team.	Advantages and disadvantages of wetlands will continue to be assessed and will be submitted for approval by the MVLWB as a Reclamation Research Plan.

#	Suggestion	Status	Progress in 2016-17	Plans for 2017-18
11	To manage the risks of airborne exposure of contaminated dust from deconstruction of buildings or other structures on site, the Developer should: • prepare a dispersion model of dust plume given typical wind direction and speed • define the meteorological window of opportunity to describe acceptable wind conditions to eliminate the potential for a dust cloud release and transport of surrounding communities. • consult a meteorologist to develop a sound model of weather conditions, to indicate when winds are steady and not gusting, blowing to the north • stop if winds change or any dust controlling equipment fails	Underway	The GMRP Site Wide Air Quality Management and Monitoring Plan (AQMMP) is an existing and ongoing program that was designed to adapt to changing activities on site, and will incorporate all suitable measures and activities to mitigate the risks of exposure to contaminated dust throughout the life of the Project.	The Project will continue to evaluate the type of work being completed on a regular basis based on weather, wind direction, and as a result will employ further dust suppression or stop work until weather and wind conditions are more favorable.
12	To prevent impacts on people from potentially harmful contaminant releases from deconstruction of buildings or other structures on site at the Giant Mine site, the Land and Water Board should specify allowable wind directions and wind speeds in degrees, to ensure that contaminated structures are not demolished during blustery multi-directional winds at ground level.	Outside the Project Scope	None	The Project will consider any direction from the Land and Water Board with respect to Project activities.
13	The Developer should investigate options for filling in the pits, in consultation with the City of Yellowknife and YKDFN.	Underway	Ongoing work to review results from the SDE process and development of the revised Closure and Reclamation Plan.	The Open Pit Options Assessment Report to be finalized, including a recommendation to proceed with filling the pits,
14	The Developer should consider the baseline conditions for existing fish habitat in Back Bay (including a fish habitat assessment in the area of the foreshore tailings and the aquatic effects baseline required in Measure 17) and develop a foreshore tailings cover design and foreshore tailings monitoring and mitigation plan for review by the Department of Fisheries and Oceans pursuant to habitat provisions of the *Fisheries Act*.	Future Action Required	None	Included in Project scope.
15	The Developer should consult with the City of Yellowknife in the design of any landfill on the Giant Mine site.	Future Action Required	The Project held discussions with City officials on the selected location for the landfill.	Included in Project scope. Once there is a preliminary design for the landfill, the Project team will share it with the City of Yellowknife for their input.

#	Suggestion	Status	Progress in 2016-17	Plans for 2017-18
16	The Developer should consult with Indigenous groups with respect to reduced traditional use cumulatively resulting from the proposed Project in combination with contamination from Giant Mine. This should occur prior to finalizing Project design, so that design improvements may be used to address any remaining concerns.	Underway	Ongoing consultation with the YKDFN through the GMAC group. YKDFN and representatives with traditional knowledge were participants in the SDE process. Engagement on HHERA incorporated information on traditional use through a dietary survey of Indigenous residents and a voluntary country food sampling program.	The Project team is providing funding for YKDFN to hire a TK consultant; Trailmark consultants will support the incorporation of Traditional Knowledge into Project studies and design. They will also be developing a separate TK study for the YKDFN, with Giant mine as a focus. Ongoing consultation and engagement to occur as detailed design is developed.