TABLED DOCUMENT 122-17(5)
TABLED ON OCTOBER 16, 2014

MV2007L8-0031

Giant Mine Working Group

10 – 11 April 2014 Meeting Summary

16 April 2014

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1. INTRODUCTION

The Giant Mine Remediation Project (GMRP) Team organized a meeting of the Giant Mine Working Group (GMWG). The meeting was held in the 6th Floor Boardroom of Scotia Centre in Yellowknife, NT, and was scheduled from 9:00 am to 4:00 pm MT on 10 and 11 April 2014.

Meeting participants included members of the GMRP, as well as representatives from the Interested Parties.

Giant Mine Remediation Project Team	Team Member
Aboriginal Affairs and Northern Development Canada (AANDC)	Jane Amphlett Katherine Ross Mark Palmer (10 April only)
Public Works and Government Services Canada (PWGSC)	Chris Doupe (10 April only) Doug Townson (10 April am only) Linda Pickett Henry Westermann (on phone 11 April only)
Government of the Northwest Territories – Environment and Natural Resources (GNWT-ENR)	Erika Nyyssonen
GMRP Interested Party	**Representative**
Environment Canada (EC)	Amy Sparks
Fisheries and Oceans Canada (DFO)	Stuart Niven (10 April only) Francois Larouche (10 April only)
City of Yellowknife (City)	Karin Kronstal
Alternatives North (AN)	Kevin O'Reilly Gordon Hamre
Yellowknives Dene First Nation (YKDFN)	Todd Slack Johanne Black
North Slave Metis Alliance (NSMA)	Matt Hoover
Other	**Representative**
Health Canada (HC)	Asish Mohapatra (On phone 10 April only)
AECOM Canada Ltd. (AECOM)	Rudy Schmidtke (On phone 11 April only)

*Notes were taken by Krista Amey, DPRA.

OBJECTIVES

The intent of this meeting:

Day 1

- To provide a presentation on the results of the monitoring program and plans for the 2014 season
- To provide an update on constraints analysis re future land use

- To discuss the technical advisor

Day 2

- To review and discuss the closure objectives

MEETING MATERIALS (PROVIDED IN APPENDICES)

- Environmental Monitoring at Giant Mine (Presentation Deck)
- Working Group Questionnaire
- 2013-14 Baker Creek Work Package Update
- Technical Advisor to Giant Mine Working Group – considerations document
- Closure Objectives and Criteria

2. UPDATE ON CONSTRAINTS MAPPING WITH THE CITY

Karin Kronstal (City) provided an overview of the status of the constraints mapping. She indicated that one of the key constraints identified is the level of contamination in the soils in undisturbed areas around Site. Prior to the public consultation, the City needs as much information as possible on soil contamination and the potential human health risk. She indicated that the timing may not be right to start the public engagement process in the fall as planned. The Project Team is moving forward on the constraints mapping to populate with the soil results available to date. A document on the consultation strategy has also been prepared and has been circulated to the members of the Steering Committee for comments. Karin noted that the communications department with the City has a number of comments but these have not been issued yet.

Jane Amphlett (AANDC) indicated that the project did complete a soil sampling program in the undisturbed areas in 2013, looking at – vegetated areas, outcrop and bedrock areas. It was noted there are large swaths of land in the Giant lease area, which makes full characterization of the soils challenging.

Karin asked about previous studies that have been conducted by Queen's University and whether or not this work is publicly available. Jane said that the work has been carried out by Heather Jamieson who has worked on it for many years. Heather's work has focussed on bioavailability and speciation of arsenic. Students collected samples from on- and off-site, targeting outcrops and crevices. Results indicate these areas have been impacted by historical operations such as windblown tailings and roaster emissions. Heather's work is what prompted the Project to look at the outcrop/crevices, forests and wetlands onsite in more detail.

Chris Doupe (PWGSC) said that arsenic does not break down well in outcrop areas but does break down in forested areas because of the organics in the soil.

Kevin O'Reilly (AN) asked who did the work for the Project. Jane responded that it was Golder Associates but the report is still in draft. Kevin asked if the report will be issued to the WG. He also

asked if there is any work being conducted off-site. Chris clarified that all work by the project team is being done within the lease area (both near the roaster and broader but still on lease). Jane indicated that the work last year was done late in the season, which limited the team in sampling some areas.

Todd Slack (YKDFN) asked if there had been any sampling done before the new Hwy was constructed. Erika Nyyssonen (GNWT-ENR) said that DOT did not do any baseline sampling before the road went in. Johanne Black (YKDFN) indicated that gravel from when the highway was put in has been distributed to the communities and she wonders if it is safe to use. Erika noted that DOT, at that time, had been made aware of the Queens soils results, and their vicinity to the highway realignment activities.

3. Overview of Monitoring Program, Results and 2014 Season

Chris began to present the overview of the monitoring program and results. He started by saying that he has been working on the monitoring program for Giant Mine for three years. He said that he will present information regarding the Long-term Environmental Monitoring Program (LTEMP) and some of its components (some that are ongoing and some future); Baseline Aquatic Effects Due Diligence Program; Baker Creek; and the proposed work for the 2014 season.

Long-term Environmental Monitoring Program (LTEMP)

Regarding the LTEMP life span of 30 years, Kevin asked what about after the 30-year mark. Presumably there will be elements to monitor forever (water quality, permafrost, frozen chambers); will these be part of this program or will they be separate? Chris said that the monitoring will not stop after 30 years; however since the project does not have the same level of detail on the project scope beyond 30 years the associated monitoring requirements for post 30 years would be more generic at this stage. Kevin stated that presumably there are some things that the Project knows it will need to monitor forever but perhaps there is a fourth phase (perpetual care) – he indicated the project needs to be thinking about perpetual care from the beginning.

Noise Assessment

Todd asked what the measuring timeframe of the noise monitoring is. Doug Townson (PWGSC) said that the noise sampling was done during a one-week period. He added that the stations were located at the boat launch, Niven Lake, Ndilo and the Frame Lake area. The noise monitoring stations are positioned away from the air quality stations because the generators associated with the air quality stations would affect the results. Information was collected 24 hours a day for seven days, with a loss of one day.

Kevin asked if there will be noise monitoring conducted during the remediation phase. Chris responded that all of the components will be considered. There will still be noise sampling conducted during the summer season as part of the baseline conditions.

Cumulative Effects

Chris indicated that a wide range of information is needed in order to assess cumulative effects. Kevin mentioned that the Cumulative Impact Monitoring Program (CIMP) has specific data requirements for how they want their data collected so that it can be used readily – they have a standardized database so that other studies can feed in. Chris said that the project team is engaging with the CIMP group. It was noted that CIMP has been devolved to GNWT-ENR.

Two main areas of interest regarding cumulative effects are air quality (Jackfish and Niven) and water quality (Back Bay/Yellowknife Bay; water treatment and discharge).

Johanne asked about data gaps and whether or not berries are being considered. Chris said that the Project is now working towards the terrestrial side of things with soil sampling and vegetation work (including edible plants and berries). Todd said it would be good to build off previous work that has been conducted, such as the work done by Iris Koch on arsenic uptake by vegetation, which found that some plants take up more arsenic than others. Chris indicated that they are working with Iris on arsenic speciation. He added that until now, there has been a focus on the aquatics because there were concerns around fish etc but will be doing terrestrial, too.

Surveillance Network Program (SNP)

Todd asked to whom the SNP reports are submitted. Jane indicated that the Board is not interested in receiving them since there is no regulatory requirement. In the past the Inspectors have received them depending on their individual interest but again it is not a regulatory requirement. Kevin was surprised to learn that the Project is required to only have ten SNP stations.

Operational Monitoring Program (OMP)

Todd asked if the Project is interested in flows in addition to contamination. Chris confirmed that both are of interest. The program includes aspects of previous monitoring programs that have now been combined into one 'operational' program. Shallow wells, which are distributed throughout the site will be discontinued, and deep wells located in the mine workings themselves, will continue because they are important in understanding the minewater characteristics. The Effluent Treatment Plant (ETP) will continue to be the responsibility of the care and maintenance contractor and all other pieces will be pulled out and done by a consultant under a separate study.

Kevin asked if "change management" is the same as response frameworks, where there are action levels or thresholds that lead the Project to specific actions. Chris affirmed this and added that any change occurring on site will go through the change management process.

Metal Mining Effluent Regulations (MMER)

Kevin asked how the receiving environment is determined. Chris said that it is a complicated process and involves proximal and distal considerations.

Chris said that studying chronic toxicity is an iterative process and currently there are no significant results. Kevin asked if the Project is sampling fish (actually taking fish out of Baker Creek or Back Bay). Chris said that no fish have been collected recently as part of this specific program but would have to look back to confirm if fish were collected previously under this program.

Environmental Baseline Data Collection Program

In relation to "baseline", Kevin asked if Traditional Knowledge (TK) is being collected/used as a way to examine baseline conditions. Jane clarified that baseline here is after impact from the mining operations and before moving into remediation; we are not talking about background or natural conditions. Chris added that TK is a component of the study. Johanne mentioned a TK training course that YKDFN will be running for GMAC and is designed to include Project representatives. The course is designed to collect TK from Elders and collectively learn how to effectively communicate it to Industry and Gov't.

Yellowknife Bay Baseline Aquatic Study

Todd brought up concerns that he has regarding the plankton community associations because he has heard that in other studies, the level of plankton sampling has been insufficient. There has not been enough sampling within a year (seasonality) nor were enough years sampled. He mentioned this as a precautionary note. Chris indicated that they have information for zooplankton and benthic invertebrates but phytoplankton is a gap and the studies note recommendations for additional sampling.

Kevin asked about a reference site. Chris responded that Horseshoe Island Bay is the reference site.

Yellowknife Bay Baseline Methodologies

Kevin asked for confirmation that some of the foreshore tailings were covered with crush. It was confirmed that material was placed above the waterline in the early 2000s. Sampling programs undertaken for the Yellowknife Bay Baseline Study was interested in obtaining sediment samples further out into the Bay. Chris indicated that the sampling conducted in 2013 collected no material because the sampling equipment was unable to penetrate the tailings. This issue still needs to be dealt with and they will be returning to take core samples.

Yellowknife Bay Baseline Water Quality Results

Chris said that there were some exceedances against guidelines for freshwater aquatic life and that they did not compare against the guidelines for drinking water.

Yellowknife Bay Sediment Results

Todd asked if sediment sampling was conducted outside the site. Chris said that, yes, there was sampling done at Horseshoe and Mosher islands. Gordon Hamre (AN) wondered if at Mosher Island there would be contamination from Con Mine. Chris said that they do not know, but considerations for cumulative impacts are recognized. He noted that Mosher Island is not the reference rather Horseshoe Island is.

YELLOWKNIFE BAY BASELINE STUDY RECOMMENDATIONS

Kevin asked, with regard to sediment coring, if any other work has been done. He asked if anyone has looked at sediment quality back to the 1940s – take a slice and go back to look before there was mining. Chris noted this is something to consider.

LOWER MARTIN LAKE, UPPER BAKER CREEK & TRAPPER CREEK BASELINE AQUATICS STUDY

Todd asked for confirmation on whether the Project is looking at speciation of arsenic. Chris confirmed the project has included speciation in assessing the upstream environment. Todd also asked if there has been any consideration to pull a core from the upstream areas as well. Chris stated that the scope for additional work in 2014 has not yet been finalized.

In the context of air quality, Kevin asked for confirmation that the Project will not be examining arsenic speciation. Chris confirmed that no they are not because with air quality, they are assuming the worst-case (arsenic trioxide); one of the reasons being that it is a highly specialized analysis and lengthy to determine results, which would create a challenging situation for onsite management of air results. A healthy level of conservatism has been built into the analysis. Kevin feels that this should be re-considered.

LOWER MARTIN LAKE, UPPER BAKER CREEK & TRAPPER CREEK GAP ANALYSIS

Todd asked what the speciation results reveal. Chris indicated that there is no resolution on this yet. Amy Sparks (EC) asked if the water chemistry levels reduce with distance from site. Chris said that there is no consistency through Baker Creek; there are pockets where the concentration is higher. Karin asked if these types of things ever go back to a normal state. Chris indicated that the levels should be decreasing over time. Amy noted that it would take a significant amount of time to do so, but eventually it could. Jane added, that concentrations at Lower Martin Lake (LML) and Trapper Creek (TC) are higher than anticipated indicating that the rate of decrease could be slow. Kevin asked why there would be higher concentrations at LML; because it is a sink? Chris confirmed that is a likely scenario. Stu Niven (DFO) said that there could be anaerobic conditions that would cause persistence. Jane stated that LML will continue to input into Baker Creek regardless if it stays onsite or is rerouted and therefore Baker Creek will not become pristine.

YELLOWKNIFE BAY AND LOWER MARTIN LAKE FISH TISSUE COLLECTION

Chris indicated that they have seen repeatedly an interesting relationship between selenium and arsenic. When selenium concentrations are low, arsenic concentrations are high. Todd asked what evidence is there to support environmental conditions versus contamination with regard to fish health. Chris said that it is unclear but that other variables come into play, too, such as habitat quality and time of year.

Johanne mentioned that part of the Kalemi Dene School program is catching fish out of Yellowknife Bay and eating them, including the liver. She wonders if that is safe. Chris said that he did not know. Asish Mohapatra (HC) indicated that there are no specific guidelines on safe levels of Arsenic in fish (like there

is for mercury) however Health Canada has developed guidance on Human Health Risk Assessment for Country Foods. He stated that for arsenic, site-specific information is needed. The US EPA has some guidelines but it needs to be understood that there is a regional aspect that needs to be accounted for.

Todd asked why there is a limit identified for mercury but not for arsenic. Asish said that arsenic has both cancer and non-cancer effects but looking at it from a risk perspective it depends on how much of the chemical is being consumed from other sources. He added that most organic forms of arsenic do not do anything; it is the inorganic form that comes with a higher risk. Jane said that the next step is to update the human health risk assessment with the latest fish tissue results. Jane and Chris said that it is an objective based process and need to establish criteria through collaboration with parties.

Todd asked if this is a Health Canada issue. Asish said that it will be a collaborative process and HC will be a part of the WG. HC can provide guidance and support, and will be able to bring in expertise from the food group when required.

Todd wondered which governing body would issue advisories if the need should ever arise. Erika stated that the GNWT Department of Health and Social Services (HSS) would send out the advisory but that a separate party would have to complete the risk assessment and recommend they send out the advisory because they don't have the expertise. Health Canada and GNWT Health will work together to determine what has occurred in other cases, and what information is required for this 'determination' to occur.

Asish wondered if the group was jumping ahead too far. In the future, we will be at the point where we can say there are risks. The next step would be to discuss limits and variability in concentrations.

Todd re-asked why there is a limit for mercury but arsenic needs a risk assessment. Asish said that mercury also has risk but it is a global concern and there have been many studies conducted. Arsenic is a more regional issue and it has unique features (distribution and health effects). He added that it is critical to establish baseline for a particular site, which will further define risk.

Kevin said that it is good that there will be a collaborative health risk assessment but wonders why it was not part of the original plan or done for the air plan.

Kevin also asked at what point in the life cycle of the fish are they exposed to arsenic – what is the life cycle as it relates to potential contamination? Stu indicated he would look into this further.

Todd asked Asish the difference between bioaccessibility and bioavailability but then he indicated that he would ask the question again in a follow-up email.

Habitat Assessment of Potential Baker Creek North Diversion

Kevin asked about the elevation of the lakes (Gar, Trapper and Shots) and how they would change in the event of implementing the North Diversion. Chris indicated that preliminary work indicates the elevations of the lake are suitable for drainage to the North. Kevin asked DFO if they are concerned

about habitat compensation. Stu said that channel re-alignment only looks at fish habitat. They are examining Baker Creek to determine what would be lost, etc. Kevin asked if DFO considers Baker Creek to be fish habitat. Stu responded that, yes, Baker Creek is managed as a fishery (recreational fishery but is closed); it does not need to be an active fishery. Kevin indicated that Elders say there used to be a pickerel run in Baker Creek.

Jane said that the final EA decision is not out yet and until that time the project will not make a decision on completing a Baker Creek options analysis. The project is planning and preparing for an options analysis but cannot proceed with it until the EA decision is issued.

Gordon noted that the proposed route for the North Diversion empties into marshland. Jane said that water management and drainage will be part of the analysis.

Baker Creek Workplan

Jane indicated that the workplan for Baker Creek in 2014 includes baseline collection from the 4 lakes along the North route (Gar, Trapper, Shots), characterization of ground conditions North diversion route and assessing the remaining portion of the old Baker Creek if diverted. Again it was noted that this work is pending a final EA decision. Erika added that they are also looking at wetland potential for the remaining onsite channel.

Matt asked if there is a community engagement plan. Chris said that community engagement will occur. Erika told Matt that they presented the environmental monitoring results in plain language to GMAC and that they could do the same for NSMA. Kevin asked if it would be a consultant taking on the community engagement. Jane confirmed that AANDC has requested a proposal from Daryl Hockley at SRK to facilitate an engagement process for design. The tentative agenda for the next working group meeting will include Daryl presenting the proposal. It was agreed that good communication tools are required for Baker.

Kevin said that it might be a good idea to have a three-dimensional model of Baker Creek to take to the community engagement sessions. Erika indicated that there is a GNWT technical specialist currently working on a virtual three-dimensional "fly-through" of Baker Creek. Stu said that it would be important to have reference points in the model.

4. Technical Advisor

Gordon gave a brief overview of the document that he prepared and that the WG has commented on. In his view, because the federal departments already have expertise at their disposal and that there will be sufficient demands on the technical advisor just from the four principal clients (AN, YKDFN, NSMA and the City), that perhaps EC and DFO are not principal clients of the technical advisor. He added that he does not feel that it is reasonable to expect the technical advisor to answer to four parties and that it should be up to the four main clients to coordinate tasks and questions.

Amy pointed out that EC and DFO don't have expertise in all areas relevant to the EA and would like to have the ability and freedom to ask questions to the technical advisor.

Asish asked for clarification on the notion of the technical advisor. Jane explained that it would be someone who would attend the WG meetings, either face-to-face or by phone, and would be available to the Parties for specific questions and clarification of certain topics.

Kevin indicated that, in general, he is in favour of the technical advisor to the Parties. He is concerned with the budget allotted for the technical advisor (it may be costly flying him from Whitehorse for WG meetings) and the amount of time that he will be able to commit to this (he would also have to be available for the Parties outside of WG meetings). Jane said that they have budgeted about $100k and she cannot recall the time commitment (perhaps about 20-30 hours per month). Kevin said that maybe it would be prudent to have someone from Yellowknife instead. Jane said that names of other people are welcome but she feels that Bill Slater will bring a lot of value to the table. Kevin suggested that they give Bill a six-month trial run. Gordon said that it will be important to establish a reporting relationship and Jane said that he would answer to the principal clients. Erika asked if either the City or AN could be the point of contact for the technical advisor. Kevin indicated that he would provide input but would not be interested in playing that role. Kevin then suggested that perhaps Bill Slater could attend a WG meeting and things could be discussed further based on his experience with other stakeholder groups.

Day 1 adjourned at 2:30 pm.

5. CLOSURE OBJECTIVES (DAY 2)

Day 2 was devoted to closure objectives. Tony Brown (SENES) was unable to attend today's meeting due to a family emergency. Jane indicated that it has been a while since the WG discussed closure objectives and that it is important to get back to it. The WG was reminded that Tables 1, 7 and 8 had already been covered by the old EMS WG. Henry Westermann (PWGSC) and Rudy Schmidtke (AECOM) were on the phone to provide input. Henry explained that Rudy is the lead/coordinator for the four design contracts (AECOM and Golder).

Regarding the information in the tables, Erika noted that the foundation of the content was the generic Closure guidelines developed by AANDC and the Boards.

In addition to details on the re-wording of the various closure objectives (live-captured in a projected working table) and related specific discussion, there were a few key points raised:

- **Measurable Criteria** – important for the inspectors and engineers to have very specific and measureable criteria in order to ensure compliance and conformity
- **Time Frame of these Objectives (Remediation vs Perpetual Care)** – the objectives in the tables are specific to remediation and closure; objectives and criteria specific to perpetual care would be located in a perpetual care plan

- **Perpetual Care Workshop** – AN and YKDFN, in conjunction with Memorial University of Newfoundland (MUN) who conducted a literature review, will be holding a perpetual care workshop in mid-June in Ndilo. In an earlier WG meeting, Mike Nahir had committed to having a Project Team member attend
- **Reversibility** – something to keep in mind when designing is the notion that at some point in the future with new emerging technologies that there may be a need to reverse what has been done. Rudy pointed out that the intent of closure is that no one will have to go down below surface post-remediation but if required, that it can be done (drill and remove "cap")
- **Collaboration on Options Analyses and Design** – collaboration with the WG will occur during the options analyses and various aspects of the design.

Day 2 adjourned at 3:00 pm.

6. NEXT MEETING

The WG meeting is tentatively scheduled for May 21st and will be a full day. Tentative agenda items:

A) Present the lessons learned on air quality from the questionnaire (Brian McGee – Arcadis)
B) Overview and discussion on air quality
C) Darryl Hockley to present process for engagement on design of surface elements
D) Meet Bill Slater and discuss technical advisor relationship

ACTION ITEMS

DAY 1

1. Project will provide a package of reports produced by the various programs and sub-programs.
2. Chris to look into whether collecting of fish occurred with respect to MMER.
3. Stu to look into the fish life cycles in the area and how they use Baker Creek and Yellowknife Bay.
4. Completed Working Group Questionnaire is due April 16 2014.
5. Erika to provide the plain language presentation to City and NSMA and the WG.
6. Matt to note whether a specific community meeting would be desired for the NSMA.
7. Jane to invite Bill Slater to the next WG meeting

DAY 2

8. Project to include SRK feasibility report in the package noted in action item #1.
9. Erika will revise the Closure Objectives Tables incorporating all comments and input received during the meetings and distribute as draft back to WG members for further input.
10. Follow up with Mike Nahir regarding Project Representation at Perpetual Care Workshop mid June.

APPENDIX A – ENVIRONMENTAL MONITORING AT GIANT MINE (PRESENTATION DECK)

APPENDIX B – WORKING GROUP QUESTIONNAIRE

1. Were the goals of the 2013 air quality monitoring program communicated adequately to you?
2. Were the technical aspects of the air quality monitoring program communicated adequately to you? For example, were you informed about the reasons for and objectives of the onsite, fenceline and community monitoring programs?
3. Are you aware of how the air quality monitoring program is designed to protect public health?
4. Are you familiar with the differences/distinction between the Roaster AQMP and the Site Wide AQMP?
5. Do you feel you were sufficiently involved in the development of the air quality monitoring programs?
6. Do you feel your input was acknowledged/considered/incorporated in the development of the programs?
7. Do you feel that you were well informed of the results of the 2013 air quality monitoring program?
8. Are you aware that arsenic was not detected at all in the community monitors on most days and when it was detected, it was well below the risk-based criterion of 0.011 ug/m^3?
9. Are you aware that arsenic in air at the community monitors did not exceed the regulatory criterion of 0.3 ug/m^3?
10. Do you feel that the air quality monitoring program met your needs?
11. How do you feel the air quality monitoring program is perceived by the general public?
12. Questions about GNWT website:
    a. Are you aware of the web-based air quality monitoring data available from the GNWT?
    b. Did you find the web-based data easy to view/extract?
    c. Do you feel that the web-based data provided you with reasonable understanding of the results from the air quality monitoring program?
    d. What aspects of the web-based data did you feel were done well?
    e. What aspects of the web-based data do you feel should be improved?
    f. Do you feel any additional information on this program should be included on the GNWT Air Quality Monitoring data website?
13. Do you have any concerns about the air quality monitoring program or the manner in which results are communicated to the public?
14. What aspects of the air quality monitoring program as executed need to be changed from 2013?
15. In your opinion, what efficiencies can be implemented in the design of the 2014 program?

APPENDIX C – 2013-14 BAKER CREEK WORK PACKAGE UPDATE

2013-14 Baker Creek Work Package Update

Baker Creek Remedial Planning (SENES)

- Main objective was to develop a process to follow for the selection a suitable remedial option.

Aquatics Program – Data Collection in Lower Martin Lake, Upper Baker Creek and Trapper Creek (Stantec)

- The main objectives of the project were to:
    - Provide additional insight into environmental conditions in Lower Martin Lake, Upper Baker Creek and Trapper Creek, upstream of the Site; and,
    - Provide a sound record on reference conditions in Upper Baker Creek for use in future assessments on the recovery of Lower Baker Creek
- The project involved two main components: aquatic baseline data collection in Lower Martin Lake; and, aquatic baseline data collection and fish habitat assessment of Upper Baker Creek, between Lower Martin Lake and Baker Creek Pond, and the length of Trapper Creek from Trapper Lake to Baker Creek Pond.
- Aquatic baseline data collected included in-situ data, water and sediment chemistry, chlorophyll a, benthic invertebrate taxonomy, and benthic invertebrate tissue analysis for metals.

Baseline Fish Tissue Study (Stantec)

- Primary objective is to create a 'pre-remediation' dataset for fish tissue in the Baker Creek area including: Back Bay, Yellowknife Bay, Horseshoe Island Bay and Lower Martin Lake.
- Fish collected in fall of 2012 and summer of 2013 –
- Targeted a 3 types of fish: predatory (Northern Pike), forage (Lake Whitefish) and small-bodied (Lake Chub).

Baker Creek Ecosystem Summary Report (Stantec/Golder)

- A historical summary of the data that has been collected on Baker Creek with a focus on a present-day.
- This includes the geomorphologic setting, fish habitats (i.e. riffle, pool, runs, etc.), fish use, channel shapes, substrate types, and biological data (benthic communities) that have been collected on Baker Creek for each reach (0-6) with seasonal considerations.
- A detailed summary of the abovementioned parameters are required for each reach with seasonal considerations, in addition to the sum of the system.

Preliminary North Alignment Evaluation (Stantec)

Originally a restoration concepts was planned for Lower Baker, however the contents of the REA resulted in a scope change. The new scope included:

- Assign quantitative values through habitat suitability Units (models) to fish habitat in lower Baker Creek.
- Determine fish habitat loss associated with a northern diversion.
- Identify alternate alignments and conceptual level designs and costs.
- Determine fish habitat gain with a northern diversion.
- Compare habitats lost vs habitats gained.
- Review the success of fish habitat compensation projects in the North.

2014-15 Baker Creek Work Plan and Gap Analysis

Characterize Ground Conditions along diversion channel

- Geo-physical program with various survey types over a total distance of approximately 4 km, to characterize rocks, clay, etc

Lake Data (Gar, Trapper, Shot) – bathymetry, aquatic biology, sediment

- Baseline data including fisheries surveys/habitat mapping at Gar, Trapper and Shot Lakes.
- Looking at inputs required for design and permitting

Lower Baker Creek – Drainage concepts

- If BC is diverted off-site, local drainage into the remaining channel would still need to be managed.
- REA Suggestion 10 notes that wetland treatment should be considered as mitigation for potential exceedances.
- Investigate a physical wetland design to convey and attenuate flow along the existing BC, including features of a constructed wetland treatment system (CWTS)

PDR for off-site Baker Diversion

- To provide basis for full options analysis between off-site and on-site alternatives.
- Alternatives evaluation will consider a conveyance-only and fish passage alternatives.
- One alternative will proceed for preliminary engineering design.
- PDR will include preliminary design of a structure to divert flow out of the existing Baker Creek valley between Lower Martin Lake and above the Giant Mine site.
- Incorporate required modifications to the existing BC channel and floodplain between Baker Pond and YK Bay.

Freshet Water Quality Characterization and Soil Sampling

- Spring Freshet samples above Baker Pond and soil samples in the upper watershed.

Revised HHERA

- 2006 HHERA will be revised and included data collected since 2006 as well as refine site-specific exposure assumptions through local resource knowledge and land-use planning.

Fill Gaps in Baker Creek Sediment Study

- Reviewing water quality data for silver, thallium free cyanide and total cyanide.
- Additional arsenic concentrations samples in Burbot samples from Back Bay and/or Yellowknife Bay
- Samples in Reach 4 to examine the effects of the May 2011 sediment release on concentrations in that restored reach.

Fishery Act - Serious Harm (i.e. Lower BC Ecosystem Summary, Upper BC (data and access)

- REA Suggestion 9 addresses fish habitat measures that would need to be designed and implemented as part of the off-site alternative.
- Start the conversation and development of fish habitat offset plans with regulators and stakeholders.
- Planning and design of specific habitat features.
- Investigate on-site compensation through new fish access to upper BC via northern diversion and the quality of Lake-based habitat suitability units.

Update Existing PDR and investigate on-site alternative

- A desk top exercise to update existing PDR to capture potential changes.
- PDR will include preliminary design of required modifications to the local runoff management to address passive treatment of arsenic and other contaminants of concern.

Revisit BC On-site alternative options A, B & C with the specific purpose of filling data gap

Baker Creek Update and 2014-2015 Work Plan
Background Information for April 10th, 2014

2014-14 Work Plan and Gap Analysis – Overarching Assumption

The analysis of the BC off-site alternative (northern diversion) is to continue until such time as a fatal flaw is encountered rendering the off-site alternative unfeasible. If the off-site alternative is deemed unfeasible then efforts will need to be refocused on the analysis of the on-site alternative.

Characterize Ground Conditions along diversion channel

- The off-site geophysical program will include ground penetrating radar (GPR) surveys over a total distance of approximately 4 km, supplemented by electrical resistivity (e.g., OhmMapper) surveys where required to provide more detailed information in clay-rich areas.
- Rock samples for chemical composition (radioactive?)

Lake Data (Gar, Trapper, Shot) – bathymetry, aquatic biology, sediment

- Collection of baseline data to support regulatory consultation / applications, including fisheries surveys (e.g., gill nets, minnow traps) and fish habitat mapping at Gar, Trapper and upper and lower Shot Lakes.
- Work limited to critical inputs required for design and permitting (e.g., presence of contaminated sediments; characterization of existing fish communities, etc).
- Further studies could be completed if this alternative goes to detailed design.
- Bathymetric surveys of Gar, Trapper and Shot lakes sufficient to characterize their storage characteristics and fish habitat potential, conducted either from an ice cover using GPR equipment or open water using boat-mounted acoustics.
- Is CIMP an option to fill some of these gaps?

Lower Baker Creek – Drainage concepts

- If BC is diverted off-site, local drainage into the remaining channel would still need to be managed (runoff vol. greatly reduced).
- This task may also require consideration of upland diversion alternatives (e.g., from headwater areas along the new Highway 4 diversion) to reduce runoff into the mine site.
- Runoff could contain elevated COPC concentrations (REA Measure 13).
- REA Suggestion 10 notes that wetland treatment should be considered as mitigation for potential exceedances.
- Develop a physical wetland design to convey and attenuate flow along the existing BC, including features of a constructed wetland treatment system (CWTS).
- Review of design alternatives for passive treatment of arsenic and other metals in surface runoff and initial work on a pilot scale CWTS.
- Completion of indoor and outdoor pilot scale CWTS, including performance monitoring and reporting, would extend into subsequent fiscal years.
- CWTS applications may also be considered for on-site alternatives in areas where concentrations of arsenic or other contaminants are expected to cause exceedences in BC. (Development of these

concepts is not presently included in the anticipated scope of work, but if such a need is identified, it is assumed that the design alternative review and site-specific pilot work would provide a valuable starting point.)

PDR for off-site Baker Diversion

- To provide a basis for Class B cost estimates, in a format similar to the existing PDR for the BC on-site alternative.
- The design basis from the existing PDR will be able to be used with minimal changes, and LiDAR will be used to support the design instead of ground surveys.
- Alternatives evaluation will consider a conveyance-only and several fish passage alternatives, as previously identified in draft studies, with all of these limited to the area identified in Section 2.
- Only one alternative will proceed for preliminary engineering design. A 1-D hydraulic model (e.g., HEC-RAS) will be used to define water depths and velocities in a proposed channel cross-section, again based primarily on work done for the existing PDR.
- PDR will include preliminary design of a structure to divert flow out of the existing Baker Creek valley between Lower Martin Lake and above the Giant Mine site.
- Incorporate required modifications to the existing BC channel and floodplain between Baker Pond and YK Bay.

Freshet Water Quality Characterization and Soil Sampling

- Collection of baseline water and sediment quality data to identify whether there may be significant effects on the water quality and biota in YK Bay downstream of the off-site diversion outfall.
- Spring Freshet samples collected above Baker Pond.
- Soil samples collected in the upper watershed.
- This along with sediment samples in Lake Data section used to identify if additional mitigation (REA Suggestion 10) would be required.

Revised HHERA

- 2006 HHERA will be revised an include data from the 2011 BC Assessment, YK Bay Toxicity, Spring Freshet and Soil Program.
- Refine site-specific exposure assumptions through local resource knowledge and land-use planning.

Fill Gaps in Baker Creek Sediment Study

- A sediment study of Baker Creek, examining sediment quality and biota, was completed in March 2013.The report included several recommendations for additional work, including:
    - Reviewing water quality data for silver and thallium with the analytical laboratories
    - Additional sampling to examine differences between free cyanide and total cyanide
    - Additional Burbot samples from Back Bay and/or Yellowknife Bay to provide a better understanding of arsenic concentrations in that species.
    - Conducting further sampling at Reach 4 to examine the effects of the May 2011 sediment release on concentrations in that restored reach.
- Additional work may be required to address baseline conditions and potential effects in Yellowknife Bay, but this is not presently considered.

APPENDIX D – INDEPENDENT TECHNICAL ADVISOR TO GIANT MINE WORKING GROUP

Preamble

- The requirement is for a contracted Independent Technical Advisor to advise members of the Working Group on an as-needed basis.

- The principal clients are:

    - Alternatives North,
    - Yellowknives Dene First Nation,
    - North Slave Métis Alliance, and
    - City of Yellowknife.

- The advice is to be independent, and should augment that provided by departments and agencies with expert advisors.

- Technical support is not legal advice or independent oversight and does not replace or substitute therefor.

Considerations

- Administration:
    - Funded by the Giant Project.
    - Must meet federal requirements for funding.
    - Could contract from federal government standing offer.
    - Initial term of one year – TBD.

- Should the contract be administered directly by AANDC or under a contribution agreement by one of the non-federal/non-territorial government parties?

- Any contractual relationship requires a responsible party to oversee and assign work, set scope and key direction, and determine performance. A "one-window" approach for the contractor, so to speak. Need to decide who this would be. There is no remit for the Advisor to work unilaterally or under direction of the federal or territorial governments.

Duties of the Advisor

- Attend Working Group meetings (in person or by teleconference);

- Upon request of the Working Group:
  - review materials and provide comments to the Working Group;
  - compile background research, etc.;
  - prepare 'plain language' interpretations as requested;
  - review and comment on regulatory submissions;
  - participate in public events;
  - provide strategic advice for each organization as requested;
  - other activities as requested.

Example Tasks

- Under the direction of the Working Group, participate in
  - the risk assessment, human health risk assessment, broad health effects monitoring program for Ndilo/Dettah & Yellowknife,

review and evaluate Baker Creek work.

APPENDIX E – GIANT MINE REMEDIATION PROJECT CLOSURE OBJECTIVES AND CRITERIA