

**Yukon Water Board**  
*Office des eaux du Yukon*



**APPENDIX B:**

**TABLE OF CONTENTS FOR  
WATER USE LICENCE APPLICATION REPORTS  
FOR QUARTZ MINING UNDERTAKINGS**

October 2011

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## **Preamble**

The Yukon Water Board has developed this document to guide Applicants in the development of application reports required to support Type A and Type B water use licence applications for quartz mining undertakings. The document presents an annotated outline of the recommended table of contents and provides guidance in regards to the nature of information expected within identified sections of the application report.

The Board recognizes that each quartz mining undertaking is a unique project; however, the requirement for a consistent table of contents will aid the Board and third parties in efficiently reviewing applications. Moreover, the guidance provided within this document should allow Applicants to prepare applications that more readily meet the Board's information requirements and therefore shorten the adequacy review period.

The Board expects the application report to be a summary document for the detailed plans, studies, assessments, and preliminary designs that have been completed to advance and support the project. It is expected that the supporting documents that present the evidentiary basis of the project will be included as appendices to the application report.

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## Water Use Licence Application Report TABLE OF CONTENTS

### Front Matter

**Section i:** Transmittal & Cover Letter

**Section ii** Mandatory Forms

The mandatory forms section must include the following Yukon Water Board forms:

- Schedule 4
- Agent Authorization Form (if applicable)
- Project Confirmation Sheet

**Section iii:** Executive Summary

**Section iv.** Abbreviations and Acronyms

### Report Body

## 1 INTRODUCTION

### 1.1 PROJECT OVERVIEW

Provide a high level, concise overview of the project including a description of the planned mining and mineral processing activities and technologies, projected mine life, location, summary details in regards to the magnitude and scope of associated activities, and summaries of uses of water and deposits of waste associated with the undertaking. A more detailed project description is required under section 4.1 of the Table of Contents.

### 1.2 PROPONENT INFORMATION

Provide a description of the mine proponent including corporate structure, experience, and relevant policies on environmental management, stakeholder engagement, or sustainable development.

### 1.3 REGULATORY AUTHORIZATIONS AND APPROVALS

#### 1.3.1 SUMMARY OF YESAA PROJECT ASSESSMENT

Provide a concise summary of the completed YESAA project assessment process that has been completed for the project. The resulting Decision Document as well as the Project Evaluation or Project Screening Report should be provided as an appendix of the application report.

#### 1.3.2 SUMMARY OF POST ASSESSMENT STAKEHOLDER ENGAGEMENT

Provide a summary of engagement with stakeholders that has occurred since and/or concurrent to the YESAA project assessment. Stakeholders should include but not be limited to: First Nations governments; federal and territorial regulators; non-government organizations; and any other interested parties identified in the YESAA assessment process.

### **1.3.3 EXISTING REGULATORY APPROVALS**

List the Applicant's currently held regulatory approvals and submitted regulatory applications. Define the scope (term, spatial limits, and enabled activities) of all held approvals.

### **1.3.4 EXISTING WATER USERS**

List existing water use licences or pre-existing water use licence applications held by other parties within the watershed area(s) that could potentially be affected by the proposed project and/or contribute to potential cumulative effects to the water source(s) or receiving environment(s) that will be utilized for this project. Also list un-licensed water users including traditional First Nation water users that may be affected by the project.

A precautionary approach should be utilized in this section to define the spatial limits, both upstream and downstream, of potential water licences or water users.

In the event that significant numbers of water users need to be identified, summary information can be presented and detailed information attached as an appendix to the application report.

### **1.3.5 REQUESTED WATER USES AND WASTE DEPOSITS**

Identify all proposed water uses and waste deposits that require a Type A or Type B water use licence to authorize as defined by the licensing criteria presented in Schedule 7 of the Waters Regulation. For direct water use identify the volume, frequency, source, and timing of the proposed use(s). For other water uses (watercourse crossings, watercourse training, flood control or diversions) provide general information on the nature of the use.

For proposed waste deposits identify the location, rate, timing, frequency, and duration of the deposit. Also identify the anticipated constituents of the deposit and the concentration (or anticipated range of concentrations) of the constituents.

For both water uses and waste deposits that may vary significantly in nature or magnitude over the course of the project identify the anticipated nature and/or magnitudes at key stages over the course of the life cycle of the project including the post-closure phase.

## **2 PROJECT LOCATION & BACKGROUND**

### **2.1 LOCATION**

Provide a description of the project location(s) including but not limited to information such as:

- Geographic Location;
- Legal Land Description;
- Study Area Boundaries for YESAA effects assessments;
- Land Tenure within the study area(s), including First Nation Traditional Territory and First Nation settlement lands and known First Nation uses;

- Access roads and public highways serving the location;
- Mineral Rights (quartz and placer);
- Registered Trapline Concessions; and
- Outfitting Concessions.

Provide scaled, geo-referenced figures conveying the above information.

## **2.2 PROJECT BACKGROUND**

### **2.2.1 PAST DEVELOPMENT OR EXPLORATION**

Describe past development at the project site including previous exploration or extraction of minerals, or developments of other nature that may have occurred.

### **2.2.2 EXISTING MINE WORKINGS AND WASTE EMPLACEMENTS**

Identify the nature and extent, if any, of existing mine workings, mine infrastructure and waste emplacements at the project site.

## **3 PROJECT ENVIRONMENT**

Provide detailed descriptions of the project environment in the context of pre-development or of the current development status if development already exists. The amount of information presented should be sufficient to establish baseline conditions for all relevant parameters of the project environment.

Depending on the level of information available for each aspect of the environment and the complexity of the environment and/or the project, it is also likely that additional subsections will be necessary for each of the primary topics identified below; the subsections should be grouped or split so that the information is logically presented.

For each section also provide a summary of the sources of data that has been relied upon to develop the description of the project environment. This should include listing public data sources (regional climatic records, etc.) and project specific data collection programs undertaken by applicant.

For data highly relevant to water licensing, such as water quality, water quantity, aquatic biota, and geochemistry provide details on data collection methodologies and limitations.

Also summarize site specific data and data collection programs (if any) undertaken by others at the site as part of previous resource studies or site developments. Where such historical data is known to exist and is not being utilized in the development of baseline conditions or for the prediction of project effects identify why it is not being considered (for example insufficiently sensitive detection limits, etc.).

Contemporary and historical data collection reports should be included as appendices to the application report. For historical reports that contain significant amounts of information that is not relevant to the application, or is excessively repetitive, a summary of the completed program(s) and excerpts of relevant data can be provided.

### **3.1 CLIMATE**

Provide an overview of the regional and local climate setting, temperature and precipitation statistics and trends based on regional and project-specific climate station data. Use tables and figures to help summarize and depict data.

For precipitation provide statistics on the proportion of precipitation occurring as snow; snow depth and water content; magnitude and timing of the snow melt and other major runoff events; snow-free period; and evapo-transpiration estimates.

For projects that will be utilizing or proposing to utilize engineering covers as a mitigative measure to reduce or prevent effects related to contaminants released from waste emplacements, the Board expects that climatic parameters related to actual and potential evapo-transpiration will be provided and the methodologies used to develop estimates of actual evapo-transpiration will be described and their use justified.

The Board expects that the site specific climate dataset will build upon data presented during the preceding project assessment phase conducted under YESAA. Data acquired after or not considered during the Project Assessment by YESAB is expected to be incorporated into any description or analysis of the climatic environment.

The Board also expects that a discussion of the possible implications of climate change to key climatic parameters will be addressed in the context of the project life cycle including the post-closure phase.

### **3.2 GEOLOGY AND SOILS**

Present descriptions of the regional and project specific surficial and bedrock geology. Use maps, photomosaics, tables, and figures to help summarize and depict data and information.

The Applicant should note that a detailed description of the geochemistry of geologic materials will be required in section 5.2; thus only high level information on geochemistry is necessary in this section of the application report.

#### **3.2.1 PHYSIOGRAPHY**

Provide an overview of the regional and local physiography (i.e. topography and relative relief, and drainage patterns).

#### **3.2.2 SURFICIAL GEOLOGY AND SOILS**

Provide an overview of the characterization mapping of the surficial geology (unconsolidated materials) present at the project site. Provide terrain maps at scales of up to 1:2000. Also specifically identify and discuss:

- The suitability of surficial materials for later site reclamation activities;
- The presence, extent, and nature of permafrost soils;
- Soils units that will be utilized in the construction or the support of mine infrastructure; and
- Any potential terrain hazards associated with surficial soils.

### 3.2.3 BEDROCK GEOLOGY

Provide detail on the regional and project specific bedrock geology. Describe the regional geological setting and provide an overview of the geology of the area. This should include a description of the tectonic belt(s), physiography, regional metamorphism and structure, and regional seismicity. Any known geologic hazard associated with geologic materials should also be described.

For the project specific geology provide a detailed description of the ore bodies and adjacent country rock at the project site. For the ore bodies describe the physical nature including location, known dimensions and approximate shape. Include separate descriptions of any recognized ore types and waste rocks within the ore bodies. Also include information on:

- the ore mineralogy including alteration type, deposit character, deposit classification and age of mineralization;
- general ore controls; and
- average assay values and reserve information (proven, probable).

Describe the country rock in the vicinity of the ore body, paying particular attention to any rocks that will be excavated during mining or will remain in pit walls or workings. For each country rock unit, waste rock unit or ore type; describe the mineralogy of the unit, listing the constituent minerals and their average percentage weights. Provide a summary chemical analysis of the rock types, including trace elements.

For both ore and country rock, the mineralogy should emphasize the presence of sulphidic minerals and other potential contaminants (metals, metalloids, and non-metals) that could result in degradation of the environment if allowed to mobilize from their existing form.

## 3.3 WATER AND WATER QUALITY

### 3.3.1 SURFACE WATER

Describe the surface water environment including surface water bodies, water courses, and drainage systems. Water bodies that will be either water sources or receiving environments for the project should be specifically identified. Key subsections are to include hydrology and water quality.

For surface water, the Board expects that near continuous monitoring data will be provided for key watercourses at the site unless it can be shown that the stream flows are such that near continuous monitoring was/is not feasible. Such information will normally be required to be based on measurements and/or observations from a period of at least two consecutive years, inclusive of all available monitoring programs conducted at the site by the Applicant and/or past parties managing the site. The Board also expects that surface water data collection will be continued during and subsequent to the YESAB project assessment and that data collected after the submission of the Project Proposal will be incorporated into the water use licence application.

Based on the collected dataset provide representative measurements of annual stream flow/volume distribution including annual peak and low

flows. The measurements should be sufficient to develop proper stage-discharge curves.

For surface water quality, the Board expects that sampling will encompass conditions representative of a wide range of seasonal flow conditions that have occurred at the site. Moreover, it is expected that more intense sampling will have been conducted during the higher discharge periods of the project's water courses. Best efforts should also be made to sample during storm events or during the flow recession from storm events.

### **3.3.2 GROUNDWATER**

Establish and map flow rate and gradient of groundwater within project watersheds including measurement of spatial and temporal variability. Groundwater aquifers that will either be used for water supply or for disposal of project wastes should be specifically identified.

The frequency of the baseline/monitoring will be relative to the flow rate and should be sufficient to adequately define the baseline physical hydrogeological conditions at the site. Identify linkages between hydrogeological and surface flows particularly for base flow conditions and where groundwater reports to surface. Identify if, and where, permafrost may affect groundwater flows.

Baseline groundwater quality sampling should characterize spatial and temporal (seasonal) variation in groundwater quality over the project area. Sampling stations should be established at sites suitable as future monitoring and compliance points. Sampling stations should be situated to provide adequate spatial coverage relative to the project including both reference/control locations and potentially affected stations. Provide measurements of baseline water quality where project-affected groundwater reports to surface (i.e., seeps).

Where existing mine development or historic mine workings are present at the site, provide specific details of groundwater flows and quality associated with those workings.

### **3.4 FISH AND FISH HABITAT**

Describe the aquatic organisms and aquatic habitat in the environmental assessment study area, including in waterbodies on the mine site, as well as upstream and downstream watercourse and water bodies that may be affected by the development. Describe the following for key aquatic species:

- seasonal and life cycle movements;
- local and regional abundance and distribution;
- known or suspected sensitive habitat areas for different development stages and times of year;
- the food chain that supports the species
- the effects of the water use on fish and their habitats, as per section 14.8.4.1 of the First Nation Final Agreements; and
- any known issues currently affecting fish and other aquatic life forms in the area.

### **3.5 WILDLIFE AND WILDLIFE HABITAT**

The Board anticipates that wildlife and wildlife habitat descriptions provided during the project assessment by YESAB are sufficient to utilize for this section. Having said this, the Board recommends that added emphasis be placed on describing wildlife interactions

with water resources, as well as the effects of the water use on wildlife and its habitat, as per section 14.8.4.1 of the First Nation Final Agreements.

### **3.6 VEGETATION**

The Board anticipates that vegetation descriptions provided during the project assessment by YESAB are sufficient to utilize for this section. Having said this, the Board recommends that added emphasis be placed on describing riparian vegetation and wetland vegetation that may be affected by the project.

### **3.7 SOCIAL ENVIRONMENT**

The Board anticipates that the socio-economic descriptions developed for the YESAB project assessment can be summarized in this section. This section should specifically focus on the relationship between the project and existing water users including First Nations traditional use of water resources. In particular, it is required that the nearest and/or most potentially affected First Nation Settlement Lands for each watershed of the project are identified.

## **4 PROJECT DESCRIPTION**

### **4.1 MINE PLAN**

Provide a narrative overview of the mine plan for the mine development, operation, and closure phases of the project. The narrative overview should include descriptions of development activities, schedules, production schedules, mining and processing methods, and required infrastructure for the project. The narrative may present lesser detail in respect to the closure phase of the proposed development as a detailed description of closure planning is required in section 8 of the application report.

The narrative should include abundant figures and tables to present the information. In regards to figures, an overall development site plan or plans at a scale not less than 1:5000 should be included in the application report. This site plan or site plans should show the locations of all of the main components of the project, including but not limited to the mining claims, mine, mill, rock dump(s), ore stockpile(s), dam(s), tailings area(s), access road(s), camp(s), water supply source(s), waste discharge(s) and any other facilities proposed to be licensed through this application.

### **4.2 DESCRIPTION OF PROJECT COMPONENTS**

Following from the narrative description, this section should include more detailed descriptions of the project components. Where appropriate, the descriptions should draw from completed preliminary designs that will be included as appendices to the report. No significant changes to project components should be made after the completion of the preliminary design, although it is anticipated that additional details of the design will be developed. Significant changes to project components are likely to require licence amendments.

Note that preliminary designs submitted to the Board will be required to be sealed by Professional Engineers registered to practice in Yukon.

Where a given project component has a hazard classification of high, very high, or extreme based on the hazard classification system of the Canadian Dam Association or similar relevant hazard classification system, the Board will expect that a Failure Modes Effects Assessment (FMEA), or similar hazard/risk study will be completed as part of the preliminary design process for that infrastructure. Such studies normally involve the participation of a wide range of stakeholders and the Board would expect that the Applicant

has made and or can show that best efforts have been made to include stakeholders in any FMEA studies completed to support the submitted application.

#### **4.2.1 DESIGN AND PERFORMANCE CRITERIA**

Include an overview of the design and performance criteria (codes, standards, guidelines, and specific performance criteria) that have been adopted for the project. Key points can be summarized and additional details provided in an appendix.

For criteria related to risk, such as the selection of the inflow design flood and design earthquake ground motion parameters, provide the rationale for the selection of the criteria. The rationale should be linked to the risk level of the project component and should reference criteria for similar infrastructure in Canada.

The Board believes that the Applicant should be forward looking in terms of risk criteria and should utilized more strident risk tolerances where international trends indicate a movement towards increasingly protective tolerances.

#### **4.2.2 MINING WORKINGS**

Include detailed descriptions of proposed underground and surface (open pit) workings that are proposed for the project. Volumes of removed materials and sequencing of development should be emphasized.

The presented plans should also emphasize source control measures that have been incorporated into the proposed design of mine workings. Source control measures reduce or eliminate the quantity or hazardous nature of contaminants and waste at the point of generation. Source control includes strategies to predict the occurrence of acid-forming materials, contaminants and toxic metals likely to be mobilized by mining activities and design operations to avoid or minimize contact with these materials and/or assure their isolation.

Examples of source controls include locating mine development workings outside of reactive waste rock and/or mineralized zones, backfilling of mine voids, and flooding of mine workings.

#### **4.2.3 WASTE EMPLACEMENTS**

For all proposed waste emplacements, including but not limited to tailings facilities, waste rock dumps, treatment sludge holding cells, overburden, and soil stockpiles provide a description based on developed preliminary engineering plans that should be attached as appendices to this application.

The Board looks favourably upon waste emplacement designs that eliminate the long term geological risk posed by water/fluid retaining structures and that creates landforms with similar or better potential for long term performance with respect to erosion and other mass wasting phenomenon as exhibited by stable natural landforms in the development area. The Board also views the underground and sub-aqueous disposal of reactive waste materials as prudent where it is possible to do so. Finally, waste emplacement designs that optimize the potential for progressive reclamation are encouraged.

Where the Applicant presents designs contrary to the above preferences of the Board it is expected that strong rationale will be supplied by the Applicant to justify the use of the submitted designs.

#### **4.2.4 PROCESSING FACILITIES**

A description of the process is required. Flow sheets that indicate process streams, quantities and significant equipment can be used to describe the process(es). The chemicals or reagents that will be used in the process must be identified and the use of any particularly hazardous products must be noted.

Where heap leaching is to be utilized, a preliminary design of the heap leach facility is required.

#### **4.2.5 WATER MANAGEMENT STRUCTURES**

Include descriptions of all water management structures including, but are not limited to, water supply dams, water intake structures, groundwater supply wells, water conveyance systems, water diversion systems, water storage and treatment ponds, underground sumps, water treatment plants and treated wastewater discharge facilities.

All such structures and infrastructure must be described on the basis of completed preliminary designs that must be attached to the Application report.

#### **4.2.6 ADDITIONAL MINESITE INFRASTRUCTURE**

Any additional mine site structures, including on-site accommodations and offices, workshops, storage facilities, fuel storage facilities, explosive storage and/or manufacturing facilities must be described in terms of location and construction. Items of particular relevance to the reclamation plan are locations, foundations, and nature of construction (e.g. movable modular units or 'permanent' structures).

Access and transportation modes and routes for mine personnel and mine supplies and products (including ore or concentrate) must be described. Specific mention must be made of the requirements that restrict road access.

## **5 PREDICTED PROJECT PERFORMANCE**

In this section the predicted performance of the project, as well as the tools and analytic models used to predict the performance will be presented.

### **5.1 PRODUCTION OF PRODUCTS AND WASTES**

On the basis of the mine plan detail the products (metals, concentrates, etc.) and the waste streams that will be produced by the project over its life cycle. All identified products and waste streams must be characterized such that there is sufficient information to incorporate the waste streams into predictions of drainage chemistry from mine residuals (tailings, leached ore, waste rock, un-processed ore stockpiles, treatment sludge, etc.). Furthermore, the characterization is necessary to support monitoring activities that are proposed during the project life and to provide bench marks for potential adaptive response plans.

Characterization of products and wastes should include water content, geochemistry, presence of reagents and blast residuals, physical properties and depositional form, volumes and tonnages, and production schedules over the life cycle of the project.

## 5.2 PREDICTION OF DRAINAGE CHEMISTRY FROM WASTE STREAMS

In the context of a water use licence application, drainage chemistry includes the water quality of surface or groundwater originating from waste emplacements and mine workings at the project site. These flows are considered to be the inputs into project effluent treatment systems or if suitable direct effluent releases into the environment.

For the application report predict the drainage chemistry for each waste stream. This will primarily entail a metal leaching/acid rock drainage (ML/ARD) assessment to predict resulting drainage chemistry from disturbed geological materials. The assessment of potential drainage chemistry problems is primarily concerned with ARD because of its frequency and the magnitude of its impacts. However, Applicants are also required to predict the potential for leaching of metal and non-metal contaminants (metalloids, salts, etc.) under neutral or alkaline drainage conditions that may be present or predicted for a given development.

It is recommended that the assessment be completed in accordance with the '*Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials*' (MEND Report 1.20.1) and the '*Guidelines For Metal Leaching and Acid Rock Drainage at Mine sites in British Columbia*'.

In addition, predictions of the drainage chemistry resulting from the mining and mineral processing technologies are also required. This will include consideration of potential nitrogen residuals from blasting, and residuals or by-products of processing reagents such as cyanide.

## 5.3 WATER BALANCE MODELLING

In this section Applicants must present a summary of a developed site-wide water balance model for the project and the results of modelling. A comprehensive report on the development and application of the model must be included as an appendix to the application report.

The developed model will need to incorporate, where appropriate:

- surface water inputs into the site and outputs from the site;
- precipitation inputs and evaporation/evapo-transpiration outputs;
- seasonal snow-pack development and melt;
- glacial and permafrost melting (i.e., negative storage);
- groundwater contributions from dewatering mine workings, groundwater supply wells, natural springs, and groundwater inputs to surface water systems;
- existing and project-affected runoff conditions;
- influence of project components that could affect the water balance, such as storage of water in concentrates, tailings and mine waste;
- hydrological variability between wet years and dry years especially flood volumes and frequency; and
- results of sensitivity analyses on the developed water balance model.

The water balance model must be used to develop results and projections for a variety of operating and climatic scenarios including specific consideration of all key stages of the mine

life cycle and variations on climatic cycles (dry, normal, and wet years or periods). The rationale for the selected scenarios that have been modelled must be provided. In particular the return period of selected wet and dry years/scenarios must be presented and defended.

The water balance must also include a discussion of climate change implications on the water balance and how climate change implications have been incorporated into the water balance scenarios.

Output from the model must specifically identify transfers of water from one watershed to another (if any) and must explicitly identify and quantify the reuse and recycling of water that will occur. In this context reuse is where water from one process is used in a subsequent process without treatment and recycling is where water from one or more uses is collected and treated so that it can be used again for some purpose at the site. The Board expects that reuse and recycling of water will be maximized wherever possible in proposed activities for quartz mining undertakings.

Proponents should consider providing a functional electronic version of their water balance model that is broadly accessible. This allows reviewers to fully understand the assumptions, inputs, mass balances, etc. which were used.

## **5.4 WASTEWATER DISCHARGE**

### **5.4.1 WASTEWATER TREATMENT**

Describe the wastewater treatment processes that will be applied to wastewater discharges that will be released to the environment. The description should build upon the drainage chemistry and water balance predictions to show the resulting water quality of all discharges from all discharge locations to the receiving environment(s) throughout the life of the project.

The predicted water quality of contaminants and potential contaminants of concern must be provided both in terms of mean expectations as well as potential variance. The predictions should identify achievable outcomes for the applied processes and not just back calculated maximum concentrations that may allow for maintenance of receiving water quality objectives.

The sensitivity of predicted outcomes to changes to input water quality or quantity should be discussed.

It is expected that wastewater treatment technologies that are proposed will be supported by at least bench scale trials and preferably by field-scale trials or applications of similar scale to that being proposed. Evidence from such trials must be provided in appendices to the application report.

### **5.4.2 RECEIVING ENVIRONMENT(S)**

Provide a summary of the characterization of the receiving environments for the project. The characterization should include identification of critical species and water quality objectives suitable for those species. If site specific water quality objectives are proposed the development of those objectives should be summarized. If standard water quality objectives such as CCME objectives are proposed these should be identified and their applicability discussed.

Any proposed degradation of the background water quality in the receiving environments must be identified and the rationale for the level of degradation provided.

Relevant studies and analysis supporting the selection of proposed water quality objectives must be included as appendices

The Board advises Applicants that water quality objectives are normally considered by the Board in the context of evaluating and establishing effluent discharge criteria that will be included as conditions in the water use licence.

### 5.4.3 WATER QUALITY MODELING

This section should summarize and describe a water quality model or models developed for the project and present the results of water quality modelling for a robust set of development, operational, and closure scenarios considered for the project.

The water quality model or models must be developed utilizing the predicted drainage chemistry, water balance, mine plan, and predictions of water treatment processes, to predict the resultant water quality of receiving environment(s) proposed for this project. The water quality model(s) must be clearly coupled to the water balance model and must be suitable to make accurate predictions for all phases of the project life cycle. The model(s) should account for variability in both the discharge effluent streams and the receiving environment water quality and quantity parameters.

Full details on the development of the model and the applicability of the modelling methodology should be included with the full results of completed modelling in an appendix to the Application report.

### 5.4.4 PROPOSED EFFLUENT DISCHARGE STANDARDS

Proposed discharge standards for effluent discharges from the project need to be presented and substantiated. The proposed standards shall identify all contaminants of concern and potential contaminants of concern. The standards shall also include release timing and quantity elements as may be required as part of the effluent discharge strategy. If applicable, proposed standards for various phases of the project must be presented.

The proposed effluent discharge standards must be compared to the identified water quality objectives for the receiving environment and shown through completed water quality modelling to be protective of the receiving environment(s).

As previously noted the proposed effluent discharge standards should be based on achievable outcomes of proposed treatment processes and not just back calculated maximum concentrations that may allow for maintenance of receiving water quality objectives. With respect to metal mining effluent regulation (MMER) discharge standards, the Board accepts them as statutory maximum discharge concentrations for contaminants regulated by MMER, but does not view them as necessarily appropriate maximum discharge standards for any given application. In many cases the Board expects that more stringent standards will be required than those maximum standards represented in MMER.

## 5.5 PREDICTED EFFECTS ON SETTLEMENT LAND AND TRADITIONAL WATER USES

Chapter 14 of the Umbrella Final Agreement (UFA) between the Government of Canada, the Government of Yukon and the Council of Yukon First Nations creates specific duties that the Board must fulfill in terms of considering for the possible effects of water use and waste deposition on First Nation Settlement lands and on the traditional use of water by a Yukon First Nation people on non-Settlement Land.

Specifically a Yukon First Nation has the right to have water which is on or flowing through or adjacent to its Settlement land remain substantially unaltered as to quantity, quality, and rate of flow, including seasonal rate of flow.

Also where an applicant is proposing to substantially alter the quantity, quality, or rate of flow, including seasonal rate of flow, in a drainage basin such that the traditional use of water by a Yukon First Nation person in that person's tradition territory will be adversely affected, a First Nation can request that the Water Board consider alternatives and reasonable measures to avoid the adverse impact.

Therefore, in this section the applicant must provide the results of analyses that show whether:

- (a) The quantity, quality, and rate of flow, including seasonal rate of flow of water through or adjacent to Settlement Lands will be substantially altered; and
- (b) Traditional uses of water by a Yukon First Nation person (or people) will be adversely affected by a proposed substantial alteration of the quantity, quality, or rate of flow, including seasonal rate of flow in that person's traditional territory.

The analyses must be accompanied by sufficient figures to clearly define the Settlement Lands and Traditional Territories that will be potentially affected by the project. The analyses must also be explicit, based on evidence, and continue downstream to the extent that any reasonably predicted substantial alteration of quantity, quality, and rate of flow, including seasonal rate of flow is expected to occur. The analyses must consider all drainage basins or watersheds that may be affected by the proposed Quartz mining activity. Finally the analysis must describe the definition(s) of "substantial alteration" used in evaluating the results of completed analyses and the rationale supporting that definition(s).

In the event that the completed analyses find that:

- (1) the quantity, quality, or rate of flow, including seasonal rate of flow will be substantially altered where water flows through or adjacent to Settlement Land, or
- (2) that the traditional use of water by a Yukon First Nation person in that person's traditional territory will be adversely affected by a substantial alteration of quantity, quality or rate of flow, including seasonal rate of flow, in that person's traditional territory,

Then this section should include or reference evidence and arguments showing that:

- (a) there is no alternative which could reasonably satisfy the requirements of the applicant, and
- (b) there are no reasonable measures whereby the applicant could avoid the interference.

In addition, this section must also provide or reference evidence regarding the effect of the proposed water uses on fish, wildlife and their habitats and the effect of the water use on the Yukon First Nation or on a Yukon Indian Person enrolled pursuant to that Yukon First Nation Final Agreement.

Finally, if the applicant is proposing water use resulting in an adverse effect to the water rights of a First Nation or First Nation person, then the Board would expect that a compensation agreement would be provided as part of the application and summarized in this section of the Application report.

## **6 WATER AND WASTE MANAGEMENT PLANS**

Water and waste management plans are documents that outline the objectives, strategies, activities and methods to manage water and waste either produced or affected by the project. The plans should highlight the use of strategies for source reduction of potential contaminants, potential reuse or recycling of waste products, the treatment of waste products (before or after placement) and the application of diversions and barriers to prevent contaminants from entering the receiving environment. Achievable management objectives based on the results of modelling and testing should be proposed.

For most quartz mining applications, the Board anticipates that waste management plans would be required for, but not limited to, waste rock, tailings, heap leach residuals, treatment sludge, domestic waste, and sewage. The water management plan must be integrated with the various waste management plans to show how water will be managed from sources to discharge from the site.

It is expected that the various plans will be included as standalone appendices and that summaries of the various waste management plans and of the integrated water management plan will be presented in this section and its subsections. Typical subsections may include:

- Waste Rock Management Plan;
- Underground Development Plan;
- Open Pit Development Plan;
- Tailings Management Plan
- Heap Leach Management Plan;
- Sludge Management Plan;
- Management of sewage and domestic waste; and
- Integrated Water Management Plan.

In describing the water and waste management plans, the emphasis can be placed on the development and operations phases of the project as a standalone preliminary closure plan will also be required and can include the summary of the closure phase water and waste management plans.

## **7 HAZARDOUS MATERIAL MANAGEMENT PLAN(S)**

In the context of quartz mining water use licence applications hazardous materials exclude mine wastes for which separate management plans are required. Hazardous materials more generally refer to hazardous materials used in the direct or indirect support of the mining operation including but not limited to fuels, lubricants, antifreeze, process reagents (including cyanide), pesticides, and explosives.

The applicant is required to develop management plans for the transportation, storage, use and disposal of such hazardous materials. In addition, contingency plans to respond to, contain, and treat spills of these materials must also be developed.

It is anticipated that a single overarching plan may be suitable for smaller or less complex projects. For larger or more complex projects or projects utilizing very hazardous materials, such as cyanide, standalone plans for various categories of materials are likely required.

In either case, the plan or plans should be summarized in this section of the application report and the full plans included as appendices. The applicant is cautioned that hazardous material management plans must be consistent with any applicable Federal or Territorial legislation governing the management of hazardous materials. It is the duty of the applicant to ensure this consistency irrespective of the decision of the Yukon Water Board to acceptance (or not) the management plans submitted as part of this application.

## **8 DECOMMISSIONING AND RECLAMATION**

During the project assessment process undertaken by YESAB, the applicant will have developed and submitted a preliminary decommissioning and reclamation plan that accounts for both potential temporary closures and the ultimate permanent closure of the proposed development. It is generally expected that such a plan would have been based upon conceptual planning of the project.

The Board expects that this original “conceptual” plan will have been expanded or revised to include any changes or additions of detail necessary or beneficial as a result of:

- the findings of the project assessment (i.e. Conditions within a Decision Document);
- the results of any further studies, such as on, but not limited to, mineral processing, water and waste treatment, and the logistical development and operation of the mine;
- the implications of expanded environmental data sets;
- the input of further stakeholder engagement; and
- the knowledge of more advanced engineering designs that has been completed or in progress since the original plan was prepared for the project assessment.

The updated preliminary decommissioning and reclamation plan must be included as a supporting document to the application report and in this section of the application report, key aspects of the preliminary decommissioning and reclamation plan must be summarized. In particular the following must be presented:

- Statements of the overarching reclamation goal(s) and of the global and mine component specific objectives needed to achieve that goal(s);
- For specific mine components, measurable closure criteria that are proposed to identify when the component specific objectives have been achieved and the rationale for those criteria;
- Realistic descriptions and expected results of proposed reclamation activities;
- Conceptual descriptions of proposed contingency measures to augment proposed activities if required;
- A description of the evidentiary basis that shows the stated reclamation objectives can be achieved through the described activities and proposed contingency measures;
- The need and plans for reclamation research necessary to further refine the proposed closure activities and contingency plans, thereby reducing the level of uncertainty regarding the likelihood of these activities achieving the closure criteria selected for the project;
- The proposed post-closure monitoring requirements and the rationale for the selection of those monitoring activities;
- The schedule of proposed reclamation activities, including studies associated with refinement of the plan, with specific identification of progressive reclamation activities proposed for the operational phase of the mining undertaking;
- Projections of the likely post-reclamation risks to the aquatic environment resulting from completion of the proposed decommissioning and reclamation plan. The projections to include consideration of uncertainty in at least a qualitative level; and
- Reclamation liability costs and financial security estimates to a level of detail consist with the preliminary engineering designs completed and scientific understanding available. The Board requires that the security estimates be based on third parties undertaking the closure activities and include incidental costs, such as project familiarization, mobilization/demobilization, and project management, for third parties to complete the tasks.

In addition to these requirements, the Board also requires the applicant to include a specific summary of the temporary or interim closure planning that is also detailed in the preliminary decommissioning and reclamation plan. Specifically the following must be provided:

- Definition of temporary and permanent closure;
- Statements of the temporary closure goal(s) and objectives;

- For specific mine components, measurable temporary closure criteria that are proposed to confine that the component specific objectives are being achieved and the rationale for those criteria;
- Realistic descriptions of activities necessary during temporary closure, including identification of systems and processes (water treatment, heating, dewatering, water collection, snow removal, etc.) that must be maintained during the temporary closure period;
- Expected staffing requirements and identification of required consumables necessary to maintain the site;
- Conceptual descriptions of proposed contingency measures to augment proposed activities if required;
- The proposed monitoring and reporting requirements during temporary closure and the rationale for the selection of those monitoring activities; and
- An estimate of the cost of maintaining the site during temporary closure with the cost estimate to include staffing, consumables, and external resources. The cost estimate shall be based on a weekly or monthly time units and shall incorporate costs that may be associated with specific seasonal activities, for example management of the annual freshet or winter operations. A range of potential costs that might be expected based on the point in time that the temporary closure occurs can also be provided. Lacking this level of detail, the costing should be specific to the most critical time that a temporary shutdown could occur.

In evaluating the plan, the Board will be conscious of whether the applicant has clearly designed and planned the undertaking for closure without imposing undue levels of risk as to the potential success of closure. The Board will expect that to the extent possible closure will achieve a “walk away” solution that requires only minimal future management and monitoring. Where passive treatment options of long term site discharges are proposed the Board will seek strong evidence that such options can be expected to perform as required.

Moreover, the Board will expect that field trials of proposed closure measures and technologies, for example cover systems and passive water treatment technologies, will be proposed and scheduled for as early as possible in the project life cycle.

## **9 MONITORING AND REPORTING PLAN**

Monitoring and reporting is an essential part of managing quartz mining projects; therefore, the Board requires that applicants develop and submit a detailed monitoring and reporting plan as part of the Application report. Monitoring and reporting plans are expected to include various monitoring programs designed to monitor different aspects of the project performance. These programs may be relatively straight forward or extremely complex depending upon:

- the nature and scale of the proposed mining activities;
- the nature, complexity, and sensitivity of the project and receiving environments; and
- the potential challenges associated or anticipated with the project.

Depending on the complexity of the developed monitoring and reporting plan, the plan can either be presented in its entirety in this section of the application report, or summarized in this section with the full plan presented in an appendix to this report. Regardless of how it is presented it is essential that the developed plan state the objectives of its component programs and include the justification for its proposed program activities. Moreover, the

developed plan should utilize descriptive figures, tables, and plain language descriptions to convey the plan to the Board and third parties.

In respect to the Board's expectations for a monitoring and reporting plan, the Board expects that the monitoring programs comprising the plan will encompass all phases of the undertaking and that they will be sufficient to ensure the collection, analysis, and reporting of data necessary to validate assumptions and predictions of:

- a) Climatic, geochemical, hydrologic, and hydro-geologic inputs to the project;
- b) The nature and quantity of mine waste materials produced;
- c) The quality, quantity, and time history of water use and waste deposition;
- d) The performance of water and waste management infrastructure or of components of such infrastructure including, but not limited to, tailings dams, heap leach pads, water treatment plants, treatment pond liners, and waste cover systems;
- e) The effectiveness of measures taken to mitigate any adverse environmental effects of the project; and
- f) The effects of water use and waste deposition on the receiving environment.

With respect to monitoring of infrastructure, the monitoring effort should be designed to reflect the hazard associated with potentially poor performance of the infrastructure. Therefore, visual inspection of a diversion ditch, for example, may be acceptable whereas detailed instrumentation would likely be expected for a large tailings dam.

The monitoring program must also be designed to guide management decisions related to the environmental performance of the project.

Accordingly, the monitoring plan shall include programs designed to capture data related to, but not necessarily be limited to:

- Site climatic parameters;
- Surface water quality and quantity;
- Groundwater quality and quantity;
- Process water quality and quantity;
- Stream sediment quality;
- Physical performance of water retaining and waste containing structures, including any embankments, liners, covers, and water management systems associated with those structures;
- Physical performance of flow conveyance infrastructure;
- The production, nature, deposition, and release (if any) of waste materials; and
- Project effects on the receiving environment.

The individual programs developed to monitor these aspects of the project shall detail sampling or measurement locations, sampling media, procedures, frequency, analytical techniques – including expected precision and accuracy, and monitored parameters for both field and, if relevant, subsequent laboratory measurement. Programs shall identify quality control and quality assurance processes, means of recording and managing collected data, and internal and external reporting protocols that will be followed to utilize and present the collected data.

For each program it is expected that an annual or more frequent reports will be prepared and that the report(s) will include analysis of the collected data that interprets any implications that the data may imply with respect to the current and future performance of the project.

Irrespective of proposed reporting frequencies, the Board encourages Applicants to include provisions in its monitoring plan to release monitoring data, in its raw form, in a publicly accessible media, such as websites, on a timely and routine basis.

## **10 ADAPTIVE MANAGEMENT PLAN**

The Board accepts that planning for a mining development will contain uncertainties that may result in the unexpected performance of the project leading to impacts of some magnitude in the aquatic environment. The monitoring plan developed for the project must be designed to monitor the performance of the project and thereby directly or indirectly allow for the potential impacts of the project on the aquatic environment to be determined. However, the monitoring plan does not necessarily describe the actions that will be taken and the trigger levels to initiate those actions if or when unexpected and/or more significant impacts are or may be indicated based on the results of monitoring.

Thus in order to ensure that the applicant can reasonably foresee and prepare for potential variations in the performance of the project and the potential resulting changes to aquatic impacts that may occur, the Board requires that an adaptive management plan be prepared and submitted with the application. In this section of the application report, the adaptive management plan must be summarized and the basis for its development presented.

To assist in completing this section and the required adaptive plan document, the Board notes that the purpose of the adaptive management plan will be to identify the response of the applicant to monitoring results that could be suggestive of a future adverse impact on the receiving environment. In particular, the plan must identify trigger levels for management actions and potential management actions that would be enacted based on the results of monitoring activities.

Therefore, the contents of an adaptive management plan will include the following:

- a summary of environmental interactions and predictions of project-related effects on the aquatic environment;
- a summary of monitoring programs and how monitoring results are linked to potential effects on the aquatic environment;
- a description of how environmental change in the aquatic environment will be measured and considered;
- a description of significance thresholds for valued aquatic ecosystem components and/or contaminants of potential concern, where the significant thresholds represent the on-set of adverse impacts on valued aquatic ecosystem components;
- a description of appropriate action levels, specific to monitoring results, that would be set well below significance thresholds so that action is necessarily taken prior to an adverse impact arising; and
- a description of the management response plans that would be enacted if a given action level is reached.

With respect to action levels and management response plans, the Board expects that action levels may be tiered for any given monitoring result or group of results. For example, a lower action level may lead to a management response such as repeating the monitoring activity and re-assessing results. A higher action level may lead to a management response that includes changes in the monitoring program or in the operations of the project. In either case all action levels must be set below the significance threshold(s).

## **Supporting Documents**

The following is a list of generally expected categories of supporting documents that will provide much of the evidentiary support for the proposed project. These supporting documents should be grouped into appendices as indicated below. It is expected that many of the appendices will include multiple reports in sub-appendices. As an aid to the Board and third parties, appendices with multiple documents should include an overall summary document that describes in general the contents and purpose of the various sub-appendices included.

- Appendix 1: Decision Document and YESAB Screening or Evaluation Report
- Appendix 2: Project Environment Baseline Data Reports
- Appendix 3: Preliminary Design Reports
- Appendix 4: Geochemical Characterization and Drainage Chemistry Prediction Reports
- Appendix 5: Water Balance Modelling Reports
- Appendix 6: Wastewater Treatment Reports
- Appendix 7: Receiving Environment Reports
- Appendix 8: Water Quality Modelling Reports
- Appendix 9: Water and Waste Management Plans
- Appendix 10: Hazardous Material Management Plans
- Appendix 11: Preliminary Decommissioning and Reclamation Plan
- Appendix 11: Monitoring and Reporting Plan
- Appendix 12: Adaptive Management Plan