

SCREENING REPORT ON THE SA DENA HES MINE PROJECT
Sa Dena Hes Operating Corporation

June 21, 2001

Prepared by: Environment Directorate, Department of Indian and Northern Affairs
Whitehorse, Yukon

1. EXECUTIVE SUMMARY

The Project:

The Sa Dena Hes Project ('the project') is a combined lead zinc underground and open pit mining operation located north of Watson Lake, Yukon. The project is accessed via the Robert Campbell Highway. At approximately km 47 of the Robert Campbell Highway, a 25 km access road extends to the property. The project consists of several underground mining portals, an open pit, a mill facility, tailings management facility and associated infrastructure.

The original proponent was the Mount Hundere Development Corporation. The project was originally subject to an environmental screening in 1989-1990. A water licence pursuant to the *Northern Inland Waters Act* was issued in January, 1990. Mine construction was completed in July, 1991. The mine operated between August 1991 and December 1992. The property was put into, and has remained since, in a 'care and maintenance' status, pending the decision to re-commence production when metal prices increase or to decommission the property. Project ownership was subsequently transferred to the Sa Dena Hes Operating Corporation; Cominco Ltd. is the mine operator under this corporation.

A condition of the original water licence was the submission of a decommissioning and reclamation plan. Cominco Ltd. submitted a Detailed Decommissioning and Reclamation Plan (DDRP) in February, 2000.

The Environmental Assessment:

This environmental assessment was triggered by Cominco Ltd.'s submission of a water licence renewal application as the original licence was to expire in September 2000. Water Licences pursuant to the *Yukon Waters Act* are a Law List trigger pursuant to the *Canadian Environmental Assessment Act* (CEAA). The Department of Indian Affairs and Northern Development (DIAND) was identified as a Responsible Authority (RA) pursuant to CEAA. Also subject to this CEAA screening is the Quartz Mine Production Licence pursuant to the *Yukon Quartz Mining Act* that Cominco Ltd. applied for in February, 2001.

As the project had been subject to previous environmental assessments, DIAND prepared a document entitled 'Draft Scope of Environmental Assessment', with the intention of accurately scoping the project and environmental assessment, bringing forward all of the relevant environmental assessment information on file and identifying areas where additional information was required in order to successfully reach a CEAA determination. This document was broadly distributed to various government departments, First Nations and community groups.

A result of DIAND's scoping exercise was the identification of the Valued Ecosystem Components that the project affects; those identified and scoped into this environmental assessment include:

- Water quality;
- fish;

- wildlife; and
- air quality.

Further factors scoped and considered in this assessment include:

- Effects of environmental changes on human health;
- effects of environmental changes on socio-economic conditions;
- effects of environmental changes on physical and cultural heritage;
- effects of environmental changes on current use of lands and resources for traditional purposes by aboriginal persons;
- cumulative environmental effects;
- effects of possible malfunctions or accidents;
- effects on sustainable use of renewable resources;
- effects of the environment on the project;
- mitigation measures;
- the significance of the effects; and
- the need for and requirements of any follow-up program.

Based on comments received from expert technical advisors, several data deficiencies were identified regarding the potential of various mine related structures contributing contamination to receiving water bodies; numerous concerns were raised regarding the decommissioning of the facility. The technical concerns were forwarded to the proponent and were addressed in a November, 2000 submission prepared for Cominco Ltd. by SRK Consulting entitled '2000 Geochemical Studies Sa Dena Hes Mine'. DIAND subsequently used this information in preparing this environmental assessment.

Proposed mitigation measures include numerous requirements that would carry forward previous regulatory conditions that were part of previous and current water licences. Other mitigation measures require the proponent to continue monitoring water discharges and potential pathways for contamination, confirm assumptions raised in the DDRP, and provide for conditions requiring that the DDRP be updated on a regular basis to incorporate relevant new information that arises from the proponent's ongoing monitoring programs. A follow-up program recommends measures to verify the accuracy and effectiveness of proposed mitigation and compliance with regulatory approvals; this would generally involve the submission and implementation of a detailed monitoring program.

DIAND, as the Responsible Authority for this environmental assessment, concludes that the environmental effects of this project are not likely to be significant with mitigation and have reached a CEEA section 20(1)(a) determination:

...subject to subparagraph (c)(iii), where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out and shall ensure that any mitigation measures that the responsible authority considers appropriate are implemented.

TABLE OF CONTENTS

1.	<u>EXECUTIVE SUMMARY</u>	i
2.	<u>INTRODUCTION</u>	1
	2.1 Project Overview	1
	2.2 Purpose of the Project	2
	2.3 Need for the Project	2
	2.4 Timing Considerations	2
	2.5 Regulatory, Policy and Planning Context	2
3.	<u>PROJECT DESCRIPTION</u>	5
	3.1 Definition of The Project	5
	3.2 List of Activities, Their Location and Schedule	7
4.	<u>PROJECT ALTERNATIVES</u>	9
	4.1 Alternative Means of Carrying out the Project.	9
	4.2 Alternatives to the Project	9
5.	<u>SCOPE OF THE ASSESSMENT</u>	10
	5.1 Scope of the Project	10
	5.2 Factors to be Considered.	11
	5.3 Scope of Factors	11
6.	<u>PUBLIC CONSULTATION PROGRAM</u>	16
7.	<u>DESCRIPTION OF THE EXISTING ENVIRONMENT</u>	17
	7.1 General Environmental Context	17
	7.2 Valued Ecosystem Components in the Study Area	19
	7.2.1 Water Quality	19
	7.2.2 Fish	19
	7.2.3 Wildlife	20
	7.2.4 Air Quality	21
	7.3 Relationships Between Environmental Components	21
	7.4 Sensitivity to Disturbance	22
	7.5 Potential Environmental Hazards	22
8.	<u>PREDICTED ENVIRONMENTAL EFFECTS OF THE PROJECT</u>	23
	8.1 Project Effects on Environmental Components	23
	8.1.1 Water Quality	23
	8.1.2 Fish	29
	8.1.3 Wildlife	30
	8.1.4 Air Quality	31
	8.2 Effects of Environmental Changes	32
	8.2.1 On Human Health	32
	8.2.2 On Socio-economic Conditions	33

8.2.3	On Physical and Cultural Heritage	34
8.2.4	On Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	34
8.3	Effects in Relation to Other Factors	34
8.3.1	Cumulative Environmental Effects	34
8.3.2	Effects on Sustainable Use of Renewable Resources.....	35
8.3.3	Effects of the Environment on the Project.....	35
8.3.4.	Effects of Possible Malfunctions or Accidents	35
9.	<u>MITIGATION MEASURES</u>	38
10.	<u>DETERMINATION OF SIGNIFICANCE</u>	42
11.	<u>FOLLOW-UP PROGRAM</u>	43
12.	<u>CONCLUSION AND RECOMMENDATIONS OF THE RESPONSIBLE AUTHORITY</u>	45
	REFERENCES	46
	Figure 1. Map of Mine Site Overview	49
	Figure 2. Gantt Chart of Key Steps	50
	Figure 3. Map of Study Area Overview	51
	Figure 4. Game Management, Trapping and Outfitting Concessions Map	52
	Table 1: Sa Dena Hes Mine Cumulative Effects Assessment Study Area and Setting Summary	53
	Table 2: List of Previous and Current Activities in the Project Area	54
APPENDIX 1:	Acronyms and Abbreviations	57
APPENDIX 2:	Sa Dena Hes Consultation List	58
APPENDIX 3:	Issue/Response Table	59

2. INTRODUCTION

The purpose of this report is to summarize the results of an environmental assessment that was conducted on the Sa Dena Hes Project. The assessment was conducted pursuant to

section 18 of the *Canadian Environmental Assessment Act* (CEAA¹), and it includes a consideration of the factors set out in subsection 16(1) of the CEAA.

The report is divided into 12 sections. This section provides a general overview of the project and the assessment. Section 3 is a description of the project. Section 4 address project alternatives. Section 5 discusses the scope of the assessment. Section 6 reviews the public consultation done for this assessment. Section 7 describes the environmental setting for the project. Section 8 discusses the predicted environmental effects of the project. Section 9 contains mitigative measures. Section 10 reviews the RA's determination of significance. Section 11 contains the follow-up program. Section 12 contains the conclusions and recommendations of the Responsible Authority. Also included are four figures, two tables and three appendices with related information.

The subsections in this section contain:

- A brief description of the project (2.1 Project Overview);
- the specific objective of the project (2.2 Purpose of the Project);
- DIANDs decision on it's discretion to consider the need for the project (2.3 Need for the Project);
- important time dimensions (2.4 Timing Considerations); and
- discussion of the context of the environmental assessment including a review of previous environmental assessments and licensing that has been done (2.5 Regulatory, Policy and Planning Context).

2.1 Project Overview

The Sa Dena Hes property is located close to Yukon's boundary with British Columbia, approximately 46 km (70 kms by road) north of the Town of Watson Lake. It is accessed by a 25 km access road from approximately km 47 of the Robert Campbell Highway. It is an existing project comprised of underground and open pit mines and a mill facility for the mining and recovery of lead and zinc concentrates. The facility also contains the necessary infrastructure to support a mine and mill, including fuel storage, buildings, shops, warehouses, accommodations, etc. (See Figure 1 for Map of Mine Site Overview). The facility is being kept in 'standby mode', waiting for the return of higher metal prices, or alternatively, a decision to decommission the facility.

¹ Appendix 1: Acronyms and abbreviations, contains a listing of all acronyms used in this report, as well as what the acronym stands for.

2.2 Purpose of the Project

The purpose of the project is for the mining and processing of minerals.

2.3 Need for the Project

Under CEAA the Responsible Authority (RA) has discretion whether to consider Need for the project in the scope of the assessment. It is the RA's decision to not consider this factor in this assessment.

2.4 Timing Considerations

The current water licence will expire on 30 November 2001. It is the RA's objective to complete this assessment at least six months prior to the expiry of the licence, to allow sufficient time for the regulatory process to be conducted and a new licence to be issued assuming that the CEAA S.20(1) determination is that the RA may exercise its regulatory duties and functions that would permit the project to be carried out (see Figure 2: Gantt Chart of Key Steps in the Environmental Assessment).

2.5 Regulatory, Policy and Planning Context

In May 1990, the Mt. Hundere Joint Venture (MHJV), which was comprised of Curragh Resources 80% and Hillsborough Resources 20%, presented a five volume Initial Environmental Evaluation (IEE) to DIAND proposing the development of a lead/zinc/silver deposit located 46 km north of the Town of Watson Lake, Yukon². A sixth IEE volume was submitted in September 1990.

DIAND, with assistance from the Regional Environmental Review Committee (RERC) completed a Level II screening under the *Environmental Assessment Review Process Guidelines Order* (EARPGO) and determined that the MHJV proposal met section 12(c) of EARPGO and could proceed through the regulatory process with the mitigation measures detailed in the IEE and screening report. An EARPGO Decision Report confirmed this and on 29 January 1990, Water Licence IN90-002 was issued to MHJV by the Yukon Territory Water Board (Water Board) pursuant to the *Northern Inland Waters Act* (NIWA). The expiry date of that licence was 15 September 2000.

Mine construction was completed in July 1991. MHJV operated the mine between August, 1991 and December, 1992. Approximately 700,000 tonnes of ore were mined and processed during the 16-month operation of the mine.

² References (pg.46), lists reports cited in this screening report. Reports may be viewed at the Environment Directorate public registry, Room 310 - 300 Main St. (Elijah Smith Building), Whitehorse, Yukon.

The Sa Dena Hes property was purchased by 2931851 Canada Ltd. in March, 1994. Water licence IN90-002 was assigned effective 18 April 1994. The name 2931851 Canada Ltd. was amended to Sa Dena Hes Operating Corporation effective 26 July 1995. Sa Dena Hes Operating Corporation is comprised of Cominco Ltd. 25%, Teck Corp. 25% and Pan Pacific Metal Mining Corp. 50%; Cominco Ltd. is the operator under this joint venture. References to Cominco (or 'proponent') are as operator of the joint venture and in its capacity to act on behalf of the Sa Dena Hes Operating Corporation.

On 19 August 1997, the Sa Dena Hes Operating Corporation submitted an amendment request to the Water Board concerning water licence IN90-002. These amendments were to request delaying submission of a decommissioning plan as Cominco had only recently taken active control of the mine and to accommodate changes to the mine operations and monitoring procedures since the 1990 EARPGO Decision Report. DIAND completed a Level I CEAA screening of these amendment requests on 07 November 1997 and reached a 20(1)a determination under CEAA, that the Water Licence could be amended with appropriate mitigation. Water Licence QZ97-025 was subsequently issued on 20 March 1998; the expiry date remaining the same as for the previous water licence - 15 September 2000.

A condition of Water Licence QZ97-025 required that the license holder submit a decommissioning plan according to specific conditions prescribed by the Water Board. In September 1999 Cominco Ltd. submitted a draft Detailed Decommissioning and Reclamation Plan (DDRP) to the Water Board and provided a draft report for comment to other stakeholders who Cominco Ltd. thought may have an interest in the report (DIAND Water Resources, Environmental Protection, Fisheries and Oceans Canada, YTG Renewable Resources, Yukon Conservation Society, Liard First Nation, Town of Watson Lake). Cominco considered the comments received and submitted a final DDRP on 11 February 2000.

On 28 February 2000, Cominco Ltd, on behalf of the Sa Dena Hes Operating Corporation submitted a Schedule IV application for renewal of Type A water licence QZ97-025 to the Water Board. This application (QZ99-045) triggers an environmental assessment pursuant to s.18 of the Law List Regulations of the *Canadian Environmental Assessment Act* (CEAA). Pursuant to s.14(6) of the *Yukon Waters Act*, the Water Board may issue a Type A licence only with the approval of the Minister of DIAND. As such, DIAND has declared itself a RA for this project under s.5 of the CEAA. The Environment Directorate of DIAND, Yukon Region (Environment Directorate) carried out the environmental assessment of this project.

On 15 May 2000 the Environment Directorate sent a letter to other potential federal RA's enquiring into those agency's role in the screening in accordance with the CEAA Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements (Federal Coordination Regulations). The deadline for response was 01 June 2000, where no response was considered to indicate that the agency in question was not a RA or did not require further information. No additional RA's

identified themselves, however the Navigable Waters Protection Division of the Canadian Coast Guard indicated that new bridges or major upgrades of existing bridges over navigable waterways may trigger a CEAA screening under s. 5(1) or 6(4) of the *Navigable Waters Protection Act*. No upgrades are being proposed for the existing bridges and thus the Canadian Coast Guard is not considered an RA for this assessment.

During the summer of 2000 it became apparent that this environmental assessment could not be completed prior to the 15 September 2000 expiry date of QZ97-025. DIAND recommended to Cominco Ltd. that they apply for a 12 month extension to their water licence. Cominco Ltd. submitted a 60 day (QZ00-047) and a 12 month (QZ00-048) water licence extension request to the Water Board on 09 August 2000. Water Resources Division staff completed a CEAA screening for the 60 day extension application on September 07, 2000. A further CEAA screening was completed by Water Resources Division staff for a 381 day water licence extension on 06 October 2000. The Water Board subsequently amended the expiry date of QZ97-025 from 15 September 2000 to 30 November 2001. Some further changes were made to the water licence to reflect the QZ00-048 CEAA screening report. These included an increase in the security deposit, additional monitoring requirements and a requirement that the DDRP be implemented in the event of permanent closure of the mine.

On 21 February 2001, Cominco Ltd. submitted an application to DIAND for a Quartz Mine Production Licence pursuant to the *Yukon Quartz Mining Act*. This authorization is also a Law List trigger under CEAA and is therefore subject to this environmental screening.

3. PROJECT DESCRIPTION

The subsections in this section:

- Provide a general description of the project (3.1 Definition of The Project); and
- describe in greater detail the specific project activities (3.2 List of Activities, Their Location and Schedule).

3.1 Definition of The Project

The project includes the 25 km access road that starts from km 47 of the Robert Campbell Highway (see Figures 1 and 3, Maps of project site) north of Watson Lake. The road was designed to accommodate the safe and efficient haulage of concentrate. The original access road to the exploration camp has been closed and reclaimed. The DDRP has outlined a plan to decommission the access road; this includes scarification, removal of culverts, recontouring and revegetation. This work will be undertaken after successful reclamation of the mine site, when it is determined that the access road is no longer required.

The Sa Dena Hes lead-zinc-silver mine comprises the Jewelbox and Burnick underground mines, and two undeveloped mineralized zones – Gribbler Ridge and Attila, and a number of other identified exploration targets within the claims group. Mineral reserves, as reported in the Cominco Ltd. 1998 Annual Report, are: proven and probable 1,300,000 tonnes @ 10.1% Zn, 2.3% Pb, 4.3 g/T Ag; indicated: 800,000 tonnes at 10.9%Zn, 3%Pb, 49 g/t Ag (Annual Report, Cominco 2000).

The sulphide mineralization is fairly similar throughout the Sa Dena Hes property, although mineral proportions vary from place to place. It consists of medium to coarse grained sphalerite and galena more or less evenly distributed in skarn layers. There is very little iron sulphide present. Variable but minor amounts of quartz and calcite are commonly present as blebs. The Pb:Zn ratio is generally in the order to 1:2 to 1:3. The Burnick Zone at North Hill is an exception with a 1:30 ratio. Silver values are associated with the galena and no separate silver bearing minerals have been identified. The ratio of Ag to Pb is variable.

The mine operated between August, 1991 and December 1992. A total of 700,000 tonnes of ore was mined and processed. Approximately 120,000 tonnes of zinc concentrates with a grade of 59% Zn and 54,000 tonnes of lead concentrates at a grade of 77% Pb were produced. Mill processing rates exceeded the 1500 tonnes per day design capacity of the milling facility and reached a peak of 1800 tonnes per day. Concentrate was trucked to Skagway for shipment to European and Asian markets.

Waste rock from the Jewelbox underground zone was placed immediately below the 1408

Portal and covers an area of 2.6 hectares. In the upper section of this dump (1.3 ha) the material was placed in two to three lifts with benches providing an overall slope of 2:1 (H:V). However, the lower sections were end-dumped on relatively steep slopes leaving slopes at an angle of repose (1.3:1). The Jewelbox waste rock dump reclamation plan outlined in the DDRP includes resloping the dump to 2:1 and the removal of the safety berms along the adjacent road. The area is in an alpine zone and is not normally vegetated.

Waste rock from the Main Zone pit was end-dumped on hillside slopes below the pit floor and above the headwaters of Camp Creek. The slope of the dump is about 1.3:1 and consists of very coarse, broken rock. The dump covers an area of about 0.3 ha. The waste rock is comprised primarily of limestone with some ore-type skarn material. Some of the skarn had decomposed resulting in the release of coarse sphalerite and galena-rich sand. Reclamation as outlined in the DDRP will consist of pulling back the crest to remove the over-steepened sections and the removal of the safety berm.

The mine camp and mill site are comprised of several bunk/wash houses, the service garage, an office complex, a kitchen/recreation facility, the powerhouse, a reagent storage warehouse and the ore concentrator. The ore concentrator (the “mill”) is comprised of the mill building itself, the crusher house, conveyors, and truck load-out facility. There are metal shop buildings at the Jewelbox 1480 and the Burnick 1200 Portals. In addition there is a safety shack at the Burnick 1300 Portal. The DDRP describes the reclamation plans for the on-site buildings and infrastructure; this generally includes the salvage and removal of materials with a commercial value and where it is not economically viable to remove structures from the site, they will be demolished and buried. Concrete foundations will be demolished to ground level and buried in an approved location.

The tailings management facility consists of three earth structures, which are referred to as the North Dam, the South Dam and the Reclaim Dam (see Figure 1, Map of Mine Site Overview). The North and South Dams, which impound the tailings, were constructed between July 1990 and October 1991. The starter dams for both structures were built to a height of about 13 metres. A small, two metre high cofferdam was also constructed halfway between the two dams to control flow of water and tailings from the north end of the impoundment. The South Tailings Dam was constructed with a silt till downstream face as opposed to the originally proposed rock downstream face. Toe berms were constructed downstream of the South and Reclaim dams to mitigate stability concerns following construction.

In addition to the North and South Dams, a Reclaim Dam was built to retain supernatant water decanted from the tailings pond for reuse in the mill. The Reclaim Dam is about 15 metres high at the maximum section. The mine plan involved recycling of the reclaimed water to the mill with a controlled discharge into Camp Creek from April to October each year. During operations and when the pond water level becomes too high, water is decanted from the tailings pond to the reclaim through a concrete decant tower located adjacent to the upstream crest of the South Dam. The spillway on the Reclaim Dam has been reconstructed

following failure during high flow events. As part of the reclaim dam construction, Camp Creek has been diverted just to the west of the Reclaim Dam. All modifications including designs were reported to the Water Board.

Tailings Management Facility (TMF) decommissioning plans are described in section 3.3 of the DDRP. Two scenarios are provided. The first scenario is if the mine does not reopen, the TMF will be reclaimed in its current condition. This would include breaching the South Dam and constructing a permanent spillway. The interceptor ditches would be breached and re-graded. The tailings pond decant tower would be removed. The Reclaim Dam would be breached and a rip-rapped channel constructed to convey Camp Creek flow through it. All constructed facilities would be designed to withstand a 1:1000 year flood event.

The second TMF closure scenario, following further operation, would involve leaving the North and South dams in place. A tailings impoundment spillway would be constructed in native soil, at the west abutment of the South Dam. A rip-rapped channel would be constructed downstream of the spillway to convey flow to a restored Camp Creek. As with scenario 1, all constructed facilities would be designed to withstand a 1:1000 year flood event.

The North Creek Dyke, constructed in 1991, is located about one kilometre from the TMF. This structure was constructed to provide a reservoir from which water was pumped to the mill. The structure was built without authorization and without sufficient evaluation of design parameters. To address concerns raised by Water Resources Inspectors, reduce risks to downstream resources and withstand a 200 year flood event, the structure was eventually upgraded. The North Creek Dyke was included in the scope of the 1997 CEAA screening.

3.2 List of Activities, Their Location and Schedule

The project has been constructed and therefore those potential environmental effects from construction activities have already occurred. The facility is in 'standby mode' and therefore there is little activity occurring at the site, other than that of the caretaker. As such, many potential environmental effects such as wildlife avoidance from human activity and traffic, generation and disposal of liquid and solid wastes, air emissions from dust and engines, etc. are not occurring or are minimal.

If the facility were to resume operations, then it is anticipated that the magnitude and quantity of environmental effects would increase. The duration of the effects from operations would likely be for the mine life of 3.8 years, unless events occur that prolong the operating life, such as the processing of additional ore resources. As noted previously, these effects were subject to an environmental assessment back in 1990, and it was determined then that the potential environmental effects were insignificant with mitigation.

If the facility is decommissioned and reclaimed, it is anticipated that the magnitude of environmental effects would increase over those effects arising from the standby mode due

to an increase in traffic and construction activity in the area while reclamation activities are being conducted. However it is expected that these effects would be of short duration while major demolition and reclamation activities were being conducted and then the magnitude of the effects would rapidly drop as the scale of reclamation activities reduced to monitoring and residual reclamation tasks.

The magnitude and extent of the effects would be minimal to non-existent once all decommissioning has been done. Any minor residual effects will continue to diminish and disappear as the years pass and revegetation takes hold. For more information on decommissioning activities and environmental effects, readers are referred to the Detailed Decommissioning and Reclamation Plan.

4. PROJECT ALTERNATIVES

This section identifies the RA's decision as to its discretion to consider the two categories of alternatives in this environmental assessment.

4.1 Alternative Means of Carrying out the Project.

For 'screening' type assessments under CEAA the RA has discretion whether to consider Alternative Means of Carrying out the project in the scope of the assessment. It is the RA's decision not to consider this factor in this assessment.

4.2 Alternatives to the Project.

For 'screening' type assessments under CEAA the RA has discretion whether to consider Alternatives to the project in the scope of the assessment. It is the RA's decision not to consider this factor in this assessment.

5. SCOPE OF THE ASSESSMENT

The subsections in this section:

- Identify the components of the undertaking that the DIAND as the RA, considers to be part of the project for the purpose of the environmental assessment (5.1 Scope of the Project);
- identifies the factors to be considered in the environmental assessment (5.2 Factors to be Considered); and
- describes the process by which the environmental focus of the assessment was established (5.3 Scope of Factors).

5.1 Scope of the Project

The scope of the project for this assessment includes the physical works and undertakings in relation to the operation, maintenance, temporary closure, decommissioning and closure of the Sa Dena Hes Mine and Mill facility. The scope includes routine maintenance and minor modifications that may be done at the project in accordance with regulatory requirements in effect at the time. A minor modification is one which, when effected, will achieve equivalent or superior performance, will not compromise design objectives and intent and will not pose any increased environmental, health or safety risk. The discretion to determine what constitutes a minor modification rests with regulatory inspectors when such modifications are conditions of regulatory authorizations and with the Responsible Authority (DIAND and/or the YTWB) when they are not. Minor modifications shall not increase the temporal or geographic scope of the project or effects, as defined in this assessment.

An expert reviewer has indicated that due to the instability of the Burnick waste dump, a new waste dump may be necessary if mining operations resume (M. Stepanek, June, 6, 2000). This project description and therefore this evaluation does not include consideration of a new waste dump and therefore any new waste rock dump would be considered a major modification to the project requiring environmental assessment.

The scope of the project for this assessment also includes follow-up monitoring, updates and minor revisions to the Detailed Decommissioning & Reclamation Plan, February 2000, which are consistent with the concepts and principles in the DDRP, and which may be done in accordance with, or as a result of, recommendations in this screening report or in response to regulatory requirements. The scope also includes the implementation of the DDRP, including environmental monitoring and inspection done once all closure measures have been implemented. The DDRP discusses monitoring planned for 5 years immediately following completion of the reclamation work but notes that monitoring may need to be continued based on the results of monitoring done and regulatory requirements in effect at

the time.

The temporal scope of the project is the time involved in continuing to maintain the site in standby mode, or to resume and conduct operations, or to decommission and reclaim the site, including post-reclamation monitoring. Cominco recognizes government and public concern with mines continuing for lengthy periods of time in a state of 'temporary' closure. As such, Cominco has committed to being a responsible steward of the site, and to undertake measures to ensure no environmental impacts arise from keeping the site in a 'standby' mode (see s.9 Mitigation Measures).

5.2 Factors to be Considered

Section 16 (1) of CEAA requires that the assessment consider the following factors:

- Environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects.
- The significance of the effects.
- Public comments.
- Mitigation measures.
- Any other matter, such as the need for the project and alternatives to the project, the RA may require to be considered.

With respect to item 5, there were no other matters that the RA required to be considered as part of the assessment.

5.3 Scope of Factors

The Sa Dena Hes Project has been constructed and operated and is now in temporary closure. As such, the project has undergone previous environmental assessments and received water licences. Cominco Ltd. recently submitted a decommissioning plan to the Water Board and had also submitted a Cumulative Effects Assessment Report to the Environment Directorate in anticipation of being required to do so as part of this assessment.

In accordance with CEAA, the Environment Directorate considered and used the previous information provided and assessment work done on the project as part of this assessment. The Environment Directorate also considered the new information that was provided in the decommissioning and cumulative effects reports. This was done through the preparation of a draft document titled: Scope of Environmental Assessment, Sa Dena Hes Project, June 28, 2000 (draft Scoping Document).

The purpose of the draft Scoping Document was to summarize the extensive information on file regarding the description of the project, geographical and temporal scope of assessment, valued ecosystem components (VECs), project effects on VECs, mitigation and significance.

The draft Scoping Document would also identify areas where additional information is needed in order to complete the environmental assessment.

In the cumulative effects assessment report Cominco identified the geographical scope considered for that study (see Figure 3, Map of Study Area Overview). The study area includes both the Sa Dena Hes Project and the project access road to its junction with the Robert Campbell Highway. All watersheds draining areas occupied or affected by the project were used to define the spatial extent of the study area. Cominco noted that although the area encompassed by the study area boundary may appear abbreviated, it has been limited to the immediate project drainages only, due to the lack of any other substantial projects in the region and the extent to which the mine operation itself may significantly impact the environment.

False Canyon Creek and the Frances River to the east and north of the project, Tom Creek to the south, and the Robert Campbell Highway to the west were chosen as a natural physiographic boundary as they encompass both the project footprint and downstream aquatic ecosystems. It should be noted that some regional environmental elements (e.g. wildlife habitat and recreational uses) might not fall entirely within the study boundary identified but were nonetheless included to consider mesoscale effects. This scope was identified in the draft Scoping Document as the geographical scope of the environmental assessment.

The VECs that were identified in the draft Scoping Document and assessed in this report were taken from the previous assessments done (1990 IEE documents submitted by Mount Hundre Join Venture, the 16 December 1990 EARPGO screening, the 07 November 1997 CEAA screening) and from the Cumulative Effects Assessment Report that was submitted. The VECs considered are as follows:

- Water quality;
- fish;
- wildlife; and
- air quality.

Furthermore, consideration was also given to the following other factors:

- Effects of environmental changes on human health;
- effects of environmental changes on socio-economic conditions;
- effects of environmental changes on physical and cultural heritage;
- effects of environmental changes on current use of lands and resources for traditional purposes by aboriginal persons.
- cumulative environmental effects;
- effects of possible malfunctions or accidents;
- effects on sustainable use of renewable resources;
- effects of the environment on the project;

- mitigation measures;
- the significance of the effects; and
- the need for and requirements of any follow-up program.

Due to the extensive baseline information collected, previous assessment work done, lack of significant changes to the project since the previous assessments, present standby mode of the facility, and the recent submission of a detailed decommissioning plan and cumulative effects report, it was proposed in the draft Scoping Document that other than a need to conduct further consultation with the Liard First Nation regarding archeological assessments in the area, no further information was required from the proponent in order to complete the screening.

On June 29, 2000, the draft Scoping Document was distributed to 35 people including members of the Regional Environmental Review Committee³ as well as other parties who may be interested in the environmental assessment (See Appendix 2: Sa Dena Hes Consultation list). In the cover letter to the draft Scoping Document, reviewers were requested to advise whether further information was needed on:

- Description of the project or the environment;
- the effects from the project;
- measures proposed or required to mitigate the effects; and
- the significance of the effect and of the project as a whole.

A table listing each of the comments received and how they were addressed can be found in Appendix 3: Issue/Response Tables. It should be noted that there were no concerns raised with the geographical and temporal scope, the VECs identified, or that new ones should be included. It was determined that most of the comments could be addressed by including them as recommendations in the screening report to be considered by regulatory agencies during the permitting process. However, it was also felt that additional information may be required on potential environmental effects and mitigation in relation to specific components of the project as follows:

- seepage from the Main Pit and Burnick portals; and
- questions regarding 'semi-quantitative' seepage estimates used in projecting seepage from the north and south dams at the tailings management facility.

³ “The Regional Environmental Review Committee (RERC) is a multi-disciplinary inter/intra-governmental advisory committee. The purpose of the RERC is to provide specialist or expert information or knowledge to DIAND, Yukon Region to assist with the screening and comprehensive study of Level II development projects...” Regional Environmental Review Committee Terms of Reference 4. Purpose of the Committee, in: Administrative Procedures for Environmental Assessment of Major Mining Project in Yukon, October, 2000.

The Environment Directorate followed up on these technical issues by arranging a teleconference with the proponent and the technical reviewers who provided comments on these issues or who had identified an interest in this issue, in order to discuss the issues raised and ways to resolve them. During the teleconference, the proponent offered to provide a technical report containing the results of the water quality sampling they were conducting last summer on the seepages, a assessment of the implications of this seepage, and if necessary, additional mitigation measures to address impacts from the seepage.

It was decided by DIAND that it was not necessary to revise the draft Scoping Document to identify the requirement to provide more information on the outstanding technical issues as these were captured and agreed upon during the teleconference and were reflected in a letter dated 08 September 2000 from Kevin McDonnell to David Parker of Cominco Ltd. Instead, time and resources would be better spent on following up with the First Nations, and preparing the screening report. The draft Scoping Document performed the function it was intended to - to bring forward the information on file, and to focus the assessment on issues not addressed by previous screenings or permitting.

On 10 November 2000, Cominco submitted *2000 Geochemical Studies Sa Dena Hes Mine* (Geochemical Study report) prepared by SRK Consulting Inc. The Geochemical Study report was made available to the RERC and copies were forwarded to the technical reviewers who had raised these concerns, for their review and comment. The responses from the technical reviewers on the report were assessed and after additional consultation with the reviewers it was determined that the screening report could be prepared with specific recommendations to ensure the implementation of mitigation. It should be noted that while the resolution of these technical issues was done between a small group of technical reviewers and the proponent, the RERC were free to participate in discussions or review the results of the work at any time.

During the course of the assessment, the Environment Directorate solicited input from the First Nations who may have an interest in the assessment. First Nation organizations contacted were: Council for Yukon First Nations, Liard First Nation, Kaska Tribal Council, Kaska Dena Council, Lower Post First Nation and the Ross River Dena Council. The First Nations organizations were sent all relevant correspondence and were given opportunity to provide input into this assessment.

The Liard First Nation advised the Environment Directorate that the project lies within their traditional territory. They also advised that they were unable to speak for other Kaska Nations, such as the Ross River Dena Council. The Ross River Dena Council subsequently advised the Environment Directorate that the Liard First Nation comments are reflective of Ross River Dena Council concerns. No other Kaska Nation organizations provided any comments during the assessment. Readers may refer to Appendix 3: Issue/Response Tables to see a summary of the comments provided by the First Nations and how they were addressed.

6. PUBLIC CONSULTATION PROGRAM

This section describes the public consultation that was undertaken.

The draft scoping document was broadly distributed to government and non-government agencies for comment. There was no indication from the comments received of any public interest in the project or the assessment. (See Appendix 2 for Sa Dena Hes consultation list).

The Environment Directorate broadly distributes a Quarterly Public Bulletin which contains summaries of environmental assessments and provides contact information if anyone has any questions. The environmental assessment of the Sa Dena Hes Project was included in previous bulletins, however there were no public inquiries regarding the project or the assessment.

The Environment Directorate maintains a Public Registry of the relevant documents for major environmental assessments including the Sa Dena Hes Project. The public can review the documents on file during regular business hours. No comments from the public were submitted in regards to documents on the Public Registry.

During the course of the assessment, no potential for public concerns were brought to the attention of Environment Directorate staff from other federal, territorial, municipal, and First Nation government agencies, or from stakeholder groups on the Regional Environmental Review Committee.

No public meetings were held for the following reasons:

- The project had already undergone an extensive public consultation during the initial environmental assessment, and the project has since been built and operated;
- there has been no issues raised in the media regarding any concerns with this project over the past few years;
- there are no documented issues in the public registry suggesting any public concern with the project;
- the project is remotely located with no residential areas nearby and relatively low utilization in the area and thus the potential for any direct contact between the public and the project are low; and
- there has not been any indications of public interest during this screening.

The draft screening report was advertized and made available for public comment prior to DIAND as the RA finalizing it's section 20(1) screening decision and issuing the screening report.

7. DESCRIPTION OF THE EXISTING ENVIRONMENT

The subsections in this section:

- Give the reader the general environmental context for the project, and leave the reader with an appreciation for the project's overall environmental setting (7.1 General Environmental Context);
- provides details of the VECs to allow the reader to understand their importance and be in a better position to assess the potential for environmental effects arising from the project activities (7.2 Valued Ecosystem Components in the Study Area);
- identifies the key environmental relationships that may be affected by the project (7.3 Relationships Between Environmental Components);
- describes the sensitivity of each environmental component to the project activities that may affect it (7.4 Sensitivity to Disturbance); and
- describes the environmental hazards that could potentially affect the project (7.5 Potential Environmental Hazards).

7.1 General Environmental Context

Most of the information on baseline conditions was taken from various reports and documentation provided as part of the initial environmental assessment and regulatory requirements under the Water Licence. A complete summary of existing environmental conditions at the Sa Dena Hes Project is found in the DDRP, Table 1: Sa Dena Hes Mine Cumulative Effects Assessment Study Area and Setting Summary, extracted from the Sa Dena Hes Cumulative Effects Assessment (Access Mining Consultants Ltd., June 2000), provides a summary of the project area setting.

The Sa Dena Hes property is located in the upper basin of the Liard River, close to Yukon's southern boundary with British Columbia, approximately 70 kilometres by road from the Town of Watson Lake. The Sa Dena Hes mine site is located in the Liard Basin Ecoregion (ESWG, 1995). The reader is referred to the IEE, Volume IV, Section 2.1.2 (SRK, 1990) for a discussion of the terrain mapping that was conducted to document generalized terrain features. Terrain mapping was done using aerial photographic interpretation augmented with field reconnaissance.

Surficial deposits throughout the mine site area are primarily morainal, fluvial or glaciofluvial. Organics overlying morainal or fluvial material occur in wetlands such as the tailings impoundment areas. Upper alpine zones are bedrock while zones of colluvium occur on the steeper upland slopes.

A layer of silty loam or gravely sandy loam supports white spruce and mixed deciduous forests. These moderately well drained soils are slightly acidic to neutral (pH 6.1 to 7.3)

with low to moderate organic matter and with a low level of available nutrients. Wetlands supporting black spruce vegetation have soils of mesic, fibric peat or silty loam. These poorly drained soils are slightly to strongly acidic, have high organic matter and contain very little available nutrients. Alpine and subalpine vegetation is found on moderately well drained silty loam or loamy sand. These soils are slightly acid to neutral with low organic matter and with a low level of available nutrients.

The climate is dictated by a number of factors, mainly altitude, latitude and distance to mountain barriers. The property is in the rain shadow of the Coast and St. Elias Mountains. These two mountain ranges form an effective barrier against Pacific influences and allow a continental climate to exist over most of the Yukon. The Cassiar Mountains cause a secondary rain shadow effect.

An extensive water monitoring program is conducted year-round at the mine site and has been in place since the Initial Environmental Evaluation (IEE) was prepared. The results of detailed discussions of the pre-mine (baseline) site water chemistry are available in the IEE (SRK, 1990). The baseline water chemistry data collected prior to development showed that the waters in the project area are moderately hard to very hard. The creeks within the study region were thought to have had good buffering capacities and therefore should display low sensitivities to acid inputs and pH alterations. Seasonal changes were evident in the water chemistry, particularly for total metals and suspended solids which were elevated during high flow periods (April to July).

Various water quality parameters are monitored routinely in effluent discharges and receiving waters as part of the Water Licence QZ97-025 surveillance network and reported to the Water Board. The Annual Reports submitted by the project proponents (Curragh Inc., 1991-1993 and Cominco Ltd., 1994-2000) contain a complete record of all the water quality sample results from each monitoring station during the operational and temporary closure periods. A comprehensive water quality database for the project is presented in Appendix C of the DDRP.

The site includes boreal forest, subalpine and alpine vegetation zones with treeline at an approximate elevation of 1400 metres above sea level. The vegetation inspection conducted in July 1999 forms the basis for the following description of the vegetation at the site.

Climax vegetation in the boreal forest zone is either white spruce (*Picea glauca*), black spruce (*Picea mariana*), subalpine fir (*Abies lasiocarpa*) or a combination of these species. Black spruce and alpine fir are the most common boreal vegetation communities in the area. Black spruce forest is prevalent on poorly drained bogs and fens such as those in the tailings impoundment area. Open stands of black and white spruce are found on upland slopes. The area around the mill and camp upwards to the treeline is primarily subalpine fir.

Paper birch (*Betula papyrifera*) occurs on moist sites throughout the area. Trembling aspen

(*Populus tremuloides*) is found on well-drained south-facing slopes, and balsam poplar (*Populus balsamifera*) colonizes alluvial gravel bars and other moderately well-drained disturbed sites. Lodgepole pine (*Pinus contorta*) forms pure even-age stands in some upland areas on the mine site, presumably following fire. Larch (*Larix laricina*) is found in lowland bogs along the main access road.

Willow (*Salix* spp.), alder (*Alnus crispa*), rose (*Rosa acicularis*) and Labrador tea (*Ledum groenlandicum*) are the common understorey shrubs. Mountain ash (*Sorbus scopulina*) is found in the tailings impoundment area. Ground cover is dominated primarily by kinnikinnick (*Arctostaphylos uva-ursi*), bearberry (*Arctostaphylos rubra*), crowberry (*Empetrum nigrum*), lignonberry (*Vaccinium vitis-idaea*), bunchberry (*Cornus canadensis*) and toadflax (*Geocaulon lividum*).

Shrub birch (*Betula glandulosa*), along with alpine fir and willows dominate the subalpine zone. Low ericaceous shrubs are common in alpine areas, along with a groundcover of mosses and lichens.

Bluejoint reedgrass (*Calamagrostis canadensis*) is a prominent graminoid in the area, particularly in moist semi-shaded areas. Altai fescue (*Festuca altaica*) is dominant on drier slopes. Fowl bluegrass (*Poa palustris*) prevails in moist open areas. Slender wheatgrass (*Agropyron pauciflorum*), violet wheatgrass (*Agropyron violaceum*) and bearded wheatgrass (*Agropyron subsecundum*) are the primary invaders of disturbed areas.

Legumes are not prominent in the native flora. Elegant milk vetch (*Astragalus eucosmus*) and arctic lupine (*Lupinus arcticus*) are the most common indigenous legumes in the Sa Dena Hes area.

7.2 Valued Ecosystem Components in the Study Area

7.2.1 Water Quality

The Sa Dena Hes mine is located in the drainage basin of False Canyon Creek, a left bank tributary of Frances River. False Canyon Creek has a total catchment area of 492 km² and discharges some 55 km above the Frances River and Liard River confluence. Access to the mine development is from the south across the drainage basin of Tom Creek, a left bank tributary of the Liard River.

7.2.2 Fish

Pre- and post-development fish sampling indicate that fish production capabilities in the upper False Canyon Creek drainage are relatively low. The most productive area within the system appears to be the lower reaches of False Canyon Creek near the confluence with the Frances River. Fish distribution and catch results collected over the study period indicate little change in the abundance or species assemblage.

Six species of fish were found within the False Canyon Creek drainage: slimy sculpin (*Cottus cognatus*), Arctic grayling (*Thymallus arcticus*), round whitefish (*Prosopium cylindraceum*), burbot (*Lota lota*), northern pike (*Esox lucius*), and char species (*Salvelinus sp.*). Slimy sculpin were the most abundant species captured representing 75% of the total catch, followed by Arctic grayling at 20%.

Benthic invertebrates and stream sediment studies have also been conducted in the project area prior to and during operations, as per water licence requirements. These studies were generally conducted concurrently with the fish monitoring programs. The DDRP, Appendix B, provides a summary of these study programs. Generally, the benthic invertebrate community within the False Canyon Creek drainage were relatively diverse and had good representation for the major benthic groups typical of most lotic waters.

7.2.3 Wildlife

The Sa Dena Hes mine site is located within the False Canyon Creek watershed and the mine access road traverses the headwaters of various tributaries of the Tom Creek watershed. The area encompasses several mature mountains with a predominance of boreal forest and limited alpine and sub-alpine terrain. This habitat is capable of supporting various ungulates, large carnivores, small fur-bearers and many bird species.

A wildlife utilization and habitat potential investigation within the Sa Dena Hes Mine project area was undertaken in 1989 to complement similar studies conducted in the area by other agencies. This investigation involved a review of published and unpublished reports on wildlife in the Southeast Yukon, wildlife surveys and trapline catch information, interviews with personnel knowledgeable about the area, and field reconnaissance. For further information readers should refer to Section 2.4 in the "Mt. Hundere Development Initial Environmental Evaluation, Supporting Document IV, Biophysical Evaluation" (SRK, 1990).

Summer and fall/winter moose habitat exists in the mine study area. As noted within the IEE, moose are the most prevalent ungulate in the study area, with some sightings from the timberline to the valley bottoms, although in general moose are reported to be very infrequent visitors to the project area.

While it was reported that a few caribou were seen in the area prior to the IEE submission, no caribou herd is known to reside in the mine study area. The project is not located in a caribou migratory route. While the general project area does have some capability to support caribou it is primarily restricted to the higher elevations. Previous assessments have estimated the caribou density in the area to be approximately 0.01 individuals per square kilometre (Hoefs, M. and Lortie, G. 1976. *Big Game Inventory in Game Management Zone 11* Unpubl. Report on file with

YTG Ren.Res. Fish and Wildlife Branch).

The IEE (SRK, 1990) report states that some local residents indicated that a small herd of stone sheep formerly ranged on the mountains north of the original (now abandoned/reclaimed) access road. Excessive hunting pressure due to access provided by the construction of the Campbell Highway is perceived to have had the greatest diminishing effect on the local sheep population. It should be noted that the Mt. Hundere area and the immediate mine project area do not provide suitable escape terrain or winter range to support a sheep herd. One stone sheep was noted by a helicopter pilot in the alpine zone of the mine study area.

There is good black bear habitat in the project area, although they are only occasionally seen within the vicinity of the mine site itself. Grizzly bears may also be found in the area, although the area is not deemed to be good grizzly bear habitat.

Signs of beaver have been noted along virtually all watercourses and at all lakes in the study area. An assessment of beaver activity in the area was completed in 1998 (Laberge Environmental Services, 1998). Cycles of flooding and abandonment attributable to beavers result in ponded wetlands used by many species including waterfowl.

The Wildlife Resource Assessment detailed in the IEE (Vol. IV, SRK 1990) noted few sightings of raptorial birds. Suitable nesting sites for these species are limited in the project area, although one unused golden eagle nest was noted on a cliff north of the existing access road.

7.2.4 Air Quality

Air quality was not addressed during the 1990 EARPGO or 1997 CEAA screenings. As such, no baseline information was provided on air quality.

7.3 Relationships Between Environmental Components

There is a direct relationship between water quality and fish health. Poor water quality may result in fish avoidance, death, and impair growth and reproduction. It will therefore be important to ensure there is no degradation of water quality.

There is also a relationship between water quality and terrestrial life that may drink the water. Poor water quality may impact the health of terrestrial life, although the degree to which this might occur is difficult to assess. Nevertheless, it can be assumed that maintaining good water quality will also help prevent impacts to terrestrial life who may drink the water.

7.4 Sensitivity to Disturbance

There is some sensitivity to disturbance due to the project being located in the north. This is due to a slower rate of growth of vegetation and thus it takes longer for vegetation to regenerate after being disturbed. This in turn extends the duration of the effects to wildlife who depend on the vegetation. On the other hand, the remoteness of the area and the lack of other disturbances to the vegetation once the project is reclaimed and abandoned means that there is a better potential for the site to recover faster and more completely.

There are no known unique or rare features in this area (i.e. unique habitat, rare species, scarcity of a particular resource, etc.) requiring special consideration.

7.5 Potential Environmental Hazards

A seismic hazard assessment was completed by the Pacific Geoscience Centre in November 1989 and reported in Volume V of the IEE (SRK, 1990), Appendix A: Geotechnical Evaluation. The report identifies the area as a relatively low risk area in terms of both seismic risk and loss of life (due to the remoteness of the site).

Minesite structures were constructed to withstand a peak horizon acceleration for a 1:475 year seismic event with a 1.25 amplification factor. All structures were inspected by competent engineers during construction and are routinely monitored as part of the company's ongoing licensed physical monitoring program.

There are no known unusual or unique environmental hazards at the project area.

8. PREDICTED ENVIRONMENTAL EFFECTS OF THE PROJECT

The subsections in this section:

- Discuss the changes that the project will cause to the the valued ecosystem components identified in the previous section (8.1 Project Effects on Environmental Components);
- discuss the effect of environmental changes (if any), on human health, socioeconomic conditions, physical and cultural heritage and on current use of lands and resources for traditional purposes by aboriginal persons (8.2 Effects of Environmental Changes); and
- address cumulative environmental effects, effects on sustainable use of renewable resources, effects of the environment on the project and effects of possible malfunctions or accidents (8.3 Effects in Relation to Other Factors).

8.1 Project Effects on Environmental Components

8.1.1 Water Quality

The previous screening determined that the effects to water quality are not likely to be significant. The following is a review of the results of the previous assessment as well as new information that was provided.

A potential effect to water quality could occur from runoff water picking up soluble metals and transporting these metals to receiving surface water bodies. Mining activities increase the exposed surface areas of rock and this could result in an increase (above natural levels) of the amount of metals being picked up and transported to receiving water bodies. At certain concentrations these metals can detrimentally impact the water quality in the receiving water course, and may make conditions unsuitable for aquatic or terrestrial life who may depend on the water.

A concern with mining developments is the occurrence of acid rock drainage (ARD) which is a phenomena that increases the amount and rate of metals being dissolved and transported to receiving water bodies. A further concern is neutral metal leaching which can lead to high zinc concentrations at some locations.

Rock sampling and testing done for the initial environmental evaluation showed that the sulphur content of the rock was variable but the abundance of carbonate in the ore and host rocks offset the acid generation potential. Some ore grade materials with greater than 5% sulphur were identified as potentially acid generating. However, the sulphur occurs predominantly as sphalerite and galena, which can be sources of dissolved zinc and lead but not acidity. Deionized water shake flask tests on the samples indicated leachable sulphate

and zinc in several rock types including ore and oxidized ore. Humidity cells that were conducted for 20 weeks in 1990 indicated ongoing leaching of zinc from ore-type materials.

The DDRP discusses the potential for ARD at various locations of the mine and concludes that there is very limited ARD potential due to the geochemistry of the area. Although there hasn't been any recent specific work to evaluate ARD potential, the ongoing water quality work and the recent work on groundwater in the tailings provide some guidance on the likelihood for ARD. In essence it appears that any acidity created by oxidation of these minerals is neutralized by abundant limestone sources.

Zinc, cadmium and lead leaching are controlled by the oxidation of sphalerite (Zn, Cd) and galena under pH-neutral atmospheric conditions. Breakdown of sphalerite is apparent throughout the site. Acceleration of sphalerite oxidation is not expected in the absence of a mechanism to lower pH. While the abundant limestone is sufficient to raise pH, it is not sufficient to remove the zinc from solution (i.e. the limestone provides for pH control in the neutral range, not in the basic range necessary to precipitate zinc). In conclusion, acid generation conditions are not expected to develop but there is the potential for elevated levels of some heavy metals, notably zinc.

Water quality monitoring at the minesite began in 1991 under a water licence and it continues under the QZ97-025 licence. The mine operates with quality standards for waste water as stated in the water licence. Cominco notes that these permit levels are consistent with the Metal Mining Liquid Effluent Regulations issued under the Fisheries Act. The water licence does not stipulate downstream receiving water quality standards, however for closure planning purposes, Cominco used the CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life to assess downstream water quality and possible effects to aquatic life.

Project components where runoff or discharge may have contaminants of concern includes open pits, adits and portals, tailings ponds, waste rock dumps, ore stockpiles, reagent storage, and roads and trails. The following sub-sections discuss these potential sources in more detail.

Main Pit

The Main Zone Pit is a box cut located in the headwaters of Camp Creek. A portal is located at the south end of the cut. In June, 1999, Cominco noted drainage from the portal. The drainage disappears into the coarse rock fill at the mouth of the box cut. The portal was observed to discharge at a rate of 15 to 120 l/minute during the summer, with zinc concentrations ranging from 40 to 60 mg/l. During this assessment, expert advisors noted that water quality modelling done in the DDRP to assess the effects of metals contaminant loading to receiving water bodies did not take this source into account. A concern was raised that if this discharge turns out to be a significant potential loading to Camp Creek, then the DDRP will have to be

modified to take this into account. It was suggested that the mitigation of this source might be difficult and expensive. As such, expert technical advisors recommended that further information on the nature of this source, its implications, and if necessary mitigation measures is required for environmental assessment purposes.

To address this concern, Cominco initiated a monitoring program on the portal discharge. The study was designed to evaluate the hypothesis that the flow from the Main Zone Pit was ephemeral and to clarify if the reason that metal loading was not apparent in Camp Creek, was due to the monthly sampling frequency, or because the discharge from the Main Zone Pit was added slowly via groundwater throughout the spring and summer.

Cominco concluded from monitoring during the wet summer of 2000 that the Main Zone pit discharged continuously and that the zinc loads observed at MH-4 were much less than the zinc load discharged from the Main Zone Pit. Modelling of the process of mixing of Main Zone Pit discharge with Camp Creek showed that the attenuation of the zinc, lead and cadmium metals occurs by formation of zinc, lead and cadmium carbonates, probably as precipitates in Camp Creek. This occurs due to contact with limestone and mixing with alkaline surface waters. (Refer to *2000 Geochemical Studies Sa Dena Hes Mine*, SRK Consulting for detailed description of discharge quality from Main Pit area).

Expert technical advisors identified concerns with the accuracy of the conclusions and recommended that empirical information continue to be collected to verify the impact of the Main Pit Discharge on Camp Creek. Expert technical advisors also noted that there may be a need for a contingency plan if there turns out to be a potential effect from this seepage. Verification of the accuracy of the conclusions is addressed in s.11 Follow-Up Program.

Jewelbox Development

The Jewelbox ore zone is located near the drainage divide between Tom and False Canyon Creeks. All drainage from the Jewelbox development is directed to Camp Creek, a steep-gradient tributary of False Canyon Creek that drains the eastern flank of Mount Hunderere. The Jewelbox ore zone has several openings to surface. The lowest opening is the 1408 Portal which is the main entrance to the Jewelbox mine. It has two ventilation raises that exit at a higher elevation. All other mine workings are lower than the 1408 Portal. Water from the mine workings does not flow out of this opening. After the mine was closed for many years, only the lower portion of the mine had flooded. Cominco suggests that even if the mine were to completely flood, the vast majority of the water would be below the elevation of the 1408 Portal, so there is no risk of major quantities of water being built up above the 1408 Portal.

Original mine plans called for the development of the 1250 Portal, but this never

occurred due to increased knowledge of the ore body, which forced a relocation of the production portal to the current 1408 Portal. The 1250 Portal is 3 metres deep at present. An expert technical advisor commented that they recalled a flow of water near the 1250 Portal during the spring of 2000. While the advisor did not see this as a significant source of loading of contaminants, the advisor recommended that this seepage be monitored to confirm this assumption. This monitoring is addressed in s. 11 Follow-Up Program.

Burnick Portal

Another area of concern regarding impacts to water quality is seepage at the Burnick Zone. The Burnick Zone is located 3 km from the Sa Dena Hes mill. The mineralization is accessed by two portals (1200 and 1300) which are entirely confined in the headwaters of another False Canyon Creek tributary, which has been designated Tributary D.

The lower portal drains continuously. The drainage flows through a buried culvert and cascades over the crest of rock fill deposited at the portal and disappears to subsurface. The general flow direction is thought to be directly downslope and towards Tributary E of False Canyon Creek. Expert technical advisors had questions about the attenuation of zinc and the potential for the zinc load from this source to have an impact on zinc concentrations in False Canyon Creek as the capacity for attenuation is depleted.

Cominco designed and implemented a field program to evaluate the degree to which attenuation is occurring. It was concluded from the study that the Burnick discharge does not emerge at any specific location but eventually recharges Tributary E - West Fork, 1600 m downslope from the portal after passing through extensive silty surficial deposits. It was noted that this represents an extremely long flow path for attenuation by contact with silty soils, and given the relatively low zinc concentrations in the Burnick Zone drainage, the likelihood of this capacity being exhausted is negligible.

After considering this additional information, expert technical advisors determined that the risk presented by this discharge was low. However, they also identified a requirements for further monitoring of the Burnick discharge. This follow-up requirement is reflected in s.11 Follow-Up Program.

Tailings Management Facility

The tailings management facility consists of three earth structures, which are referred to as the North Dam, the South Dam and the Reclaim Dam (see Figure1, map of

Mine Site Overview). The TMF is constructed in a saddle that lies along the drainage divide between Camp Creek and Tributary E. The primary effluent releases from the mine site to the receiving waters occur from the tailings dam seepage discharges at the North Dam (MH-2) and the Reclaim Dam (MH-7).

Tailings and mine surface drainage is directed to the TMF. Most of the tailings accumulated against the south face of the North Dam and are now dry on the surface. Water levels in the TMF are controlled by a decant tower. Overflow was directed to a reclaim pond. Water from the reclaim pond was either recycled for use in the mill or was discharged. There is no chemical water treatment plant. The water licence permitted a discharge of a maximum of 490,000 m³ of water between April 15 and October 15. Effluent discharge had to meet quality standards as outlined in the water licence.

At station MH-2, water quality discharge standards have been consistently met for all parameters, except total suspended solids, which showed occasional exceedances during the operational period. Concentrations of lead and zinc are generally within permit limits as set out in the water licence (QA97-025). Occasional increases in lead and zinc concentrations at MH-7 were observed during the operating period. The cause of these incidents were likely due to a tailings spill which occurred during mine operations.

The DDRP identified a chemical stability issue related to the release of zinc from the tailings in the tailings impoundment and suggested that on the basis of water quality monitoring at MH-2, zinc concentrations appear to have stabilized. Expert technical advisors identified a concern that the data does not support this conclusion and that further study was necessary. There was a concern that metal levels in pore water may increase, which subsequently results in increased metals concentrations in the seepage from the TMF.

Cominco initiated studies on the tailings pore water chemistry in response to this concern. The objective of the study was to determine if pore water zinc concentrations in the tailings indicate that zinc and cadmium concentrations in seepage would increase substantially in the future. It was concluded by Cominco from mineralogical and pore water analysis that pore water chemistry in the tailings is controlled by the formation of secondary minerals. Zinc concentrations in the tailings appear to be stable and reflect the formation of zinc carbonate in the tailings. Expert technical advisors commented that while the risk of effects from this component was low, additional monitoring is required. This follow-up activity is addressed in s.11 Follow-Up Program.

A concern was raised regarding the need for the control of the water velocity in the Camp Creek tie-in. Fast water that is discharged may cause bank and substrate erosion in receiving water courses and detrimentally impact habitat and water quality

for aquatic life. This issue is addressed in s. 9 Mitigation Measures.

Cominco proposed that the south tailings pond and reclaim pond spillway channels would be trapezoidal, while the connecting channel and the re-routed Camp Creek channel would be V-shaped. This contradiction raised a question regarding the technical feasibility of the method of construction and it was recommended that trapezoidal channels be provided throughout. This recommendation is addressed in s. 9 Mitigation Measures.

Ore Stockpile

There are no ore stockpiles remaining at the facility.

Waste Rock Storage Areas

The waste rock storage areas are located immediately below the 1408 Portal, immediately east of the Jewelbox Pit (Main Zone waste dump) and immediately below the Burnick Portal on a sidehill. Runoff from these areas ultimately flows into Camp Creek. Zinc loading at Camp Creek was confirmed to be less than the Main Zone portal drainage, implying that contact with limestone and mixing with alkaline surface water has removed zinc from the solution (2000 Geochemical Studies, SA Dena Hes Mine, SRK Consulting, 2000) and that run off from waste rock dumps does not pose a significant risk to water quality in Camp Creek.

Expert technical advisors identified some stability issues with these dumps, and these are discussed further in s. 8.3.4 Effects of Possible Malfunctions or Accidents.

Fuel and Reagent Storage

Runoff water that flows through spilled reagents, or reagents that are improperly stored may pick up toxic contaminants and transport them to receiving surface water bodies. Improperly stored fuel or waste fuel products may also pose a hazard to surface water bodies.

Reagents are stored on pallets in a covered warehouse near the entrance gate to the site. It is likely that if and when operations commence, additional reagents will be brought to the site and stored. These materials have to be transported in accordance with the *Transportation of Dangerous Goods Act*, in appropriate vehicles per the *Highways Act*, and stored in compliance with the Mine Safety Regulations under the *Workers Compensation Act*. Bulk fuel storage tanks have to be registered pursuant to the *Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations*. A condition regulating hazardous materials storage, including a requirement to submit a spill contingency plan to the Water Board, is included in the present water licence.

During a site visit by staff from Environment Directorate and a representative from the Liard First Nation, a number of leaking and tipped over waste oil barrels were seen. Cominco subsequently cleaned up the area and disposed of the waste oil. Cominco has a waste oil handling program, and it is anticipated that Cominco will make better efforts at handling and disposing of waste oil. Water Resources Inspectors will continue to inspect this facility and follow-up on spills and potential discharges to water courses as appropriate.

Roads and Trails

The main access road was constructed in 1990 with associated ditch drainage and culvert installations. A network of service and haul roads with drainage and culvert installations also exists on the property. No problems with the stream crossings were reported during this assessment.

Closure objectives for the service and haul roads include slope and drainage stabilization, erosion prevention and revegetation. No criteria were provided to identify the locations that require additional erosion protection. If roads are not reclaimed properly and areas where erosion may occur not stabilized, then there may be increased sediment loading to receiving water courses. This issue is addressed in s. 9 Mitigation Measures.

Landfills and Scrap steel

Cominco noted in the DDRP that during decommissioning, scrap steel would be either removed for salvage or buried. The burial of scrap steel that has hazardous materials may contaminate groundwater that flows through the buried steel. This groundwater may carry contaminants to surface waters which may in turn impact aquatic life. The requirement to ensure that no contaminated scrap is landfilled is reflected in s. 9 Mitigation Measures.

8.1.2 Fish

As noted in s. 7.3: Relationships Between Environmental Components, any impacts to water quality from the project will result in impacts to fish. Therefore the effects, mitigation and significance of the projects effects on water quality are also important in relation to the effects on fish.

Construction activities that occur in and around water courses may disturb or destroy fish habitat. The effect from the loss of fish habitat to the construction of the project components was considered in the original project design. For example the existing TMF site was chosen in part because it had the lowest potential environmental impact on fish resources when compared to the alternative sites. The TMF does not occupy any utilized fish habitat, nor do

fish frequent the receiving waters directly below the impoundment. The previous environmental assessment determined the potential environmental effects to fish to be insignificant.

There are no changes to the project being proposed that require the construction of major structures which may have an effect on fish or fish habitat.

The previous environmental assessment determined that fishing pressure was not expected to increase as a result of the project operation. Access road restrictions, the documented difficulty in accessing the middle and lower reaches of False Canyon Creek (IEE, Vol. IV, SRK 1990), and the likely low level of employee angling (if it occurs) would limit the effect of increased fishing pressure on fisheries. Furthermore, the access road will be deactivated after decommissioning and reclamation of the property further limiting access to fish.

8.1.3 Wildlife

Project effects on wildlife may occur from:

- Loss of habitat from the construction of the project;
- habitat fragmentation or interference with migration routes;
- wildlife avoidance due to human activity;
- increased hunting pressure on big game species due to better access for hunters;
- drinking water sources being contaminated;
- wildlife death and injuries from collisions with mine vehicles; and
- spills of hazardous materials that poison wildlife or destroy their habitat.

All these project effects were considered in the previous assessment and it was determined that these effects were insignificant with mitigation. There are no new structures being proposed to the project, nor is there any change in the project footprint that would increase or change the effects to wildlife.

One aspect to consider in this assessment is the effect of the increased duration of the project and thus the effects on wildlife. The effects to wildlife from continuing the project in standby mode are likely to be fairly minimal. This is because there will be a low level of human activity and disturbance in the area that would result in wildlife avoidance or death. Maintaining a caretaker on site will enable monitoring of the facilities and allow for response to any problems that may occur, and this will help prevent any impacts to wildlife from the project being in stand-by mode.

A resumption of operations would result in increased effects to wildlife, but these would be for a relatively short term for the project life of 3.8 years. The effects to wildlife from operations was previously assessed and deemed to be insignificant. It is anticipated that once mining activity ends and the site restored, the wildlife would re-colonize the area.

A key factor in reducing the significance of the loss of habitat is that the duration of most of the effects ends when the site is decommissioned and reclaimed and the habitat is returned to near natural conditions. To do this, structures are removed or destroyed, the ground contoured, topsoil added, and seed mixes planted. These steps are part of Cominco's plan to revegetate much of the project site.

Cominco noted that additional soil sampling is required in order to determine areas of localized nutrient deficiencies. They will also be experimenting with seeding and fertilizer rates to determine the optimum mixes. Cominco will also be testing various plant species for metals uptake to assess if there are any potential concerns of ingestion of the plants by grazing and/or browsing animals. Cominco proposed to plan the program in 2000 and initiate test plots in 2001. Test plots will also be established on the tailings impoundment in order to determine the optimum soil treatments and seed mixtures. These test plots will include applications of topsoils, fertilizers, as well as different agronomic seed mixes. This study work is addressed in s.9 Mitigation Measures.

An expert technical advisor noted that the proponent proposes to cover the landfill with two 200 mm lifts of compacted till to shed water, and then reseed the site. In order to assist revegetation at decommissioning, the landfill should be covered with an uncompacted layer of till, and the minimal combined thickness of compacted and uncompacted till or reclamation growth media should be 1 metre. This recommendation is addressed in s. 9 Mitigation Measures.

8.1.4 Air Quality

While air quality was not considered in the previous assessment, Cominco Ltd. discussed it in their Cumulative Effects Assessment (CEA) report (Access Mining Consultants, June 2000). Air quality may be impacted from the project due to the use of diesel power generators, diesel and gas powered equipment, the combustion of garbage and fugitive dust from mining and roads.

Air quality may also be impacted from tailings dust being picked up by the wind. During a site visit by Environment Directorate staff and a representative from the Liard First Nation, fine tailings were seen along the outside edge of the North Dam. It was apparent that these tailings had been blown from the impoundment area by the wind. Cominco was advised of this and in October, 2000 they picked up the blown tailings and put them back into the tailings pond. They also placed a gravel cover over the western edge of the tailings pond to prevent further blowing of tailings.

Mitigation identified in the CEA included road watering as required to suppress dust, and the implementation of standard industrial practices for emissions control. Cominco may also be required to obtain an air emissions permit pursuant to the Air Emissions Regulations under the Yukon's *Environment Act* for the burning of garbage waste, depending on quantities, and this permit will ensure burning is done in an appropriate manner. If the open

burning of waste material is to take place between 01 May and 30 September, a burning permit pursuant to the Yukon Forest Protection Regulations under the *Territorial Lands Act* is required, however this is for the purpose of wildfire prevention, not air emissions control.

The CEA concluded that effects on air quality as a result of this project were mitigable and that the magnitude, interaction and significance were low. The RA concurs with this assessment.

8.2 Effects of Environmental Changes

8.2.1 On Human Health

Potential project effects that may impact human health are through inhalation or ingestion of contaminants and consumption of country foods or water contaminated from project activities. Projects may also impact the environment in ways which may affect the emotional or spiritual well-being of people.

There are no changes in the environment due to the project that have been identified to affect human health. This is due in part to the remoteness of the site and the lack of any human habitation in the area. This is also due to the lack of any environmental effects to pathways that would impact humans such as impacts to groundwater which subsequently impacts drinking water wells.

In the event of resumption of operations, the proponent is required to comply with territorial worker safety legislation which require measures be taken to prevent the inhalation or ingestion of contaminants by employees. Cominco has committed to maintaining a full-time care taker on site to ensure that the project site, workings, reagent storage areas and other mine related facilities remain in satisfactory and safe condition while in stand-by mode.

The current water licence has waste water discharge standards to prevent the discharge of water with unacceptable quality. Water quality and biological surveillance programs are in place to monitor receiving water aquatic health. These measures and progressive reclamation and restoration of the site as outlined in the DDRP will further reduce the potential for impacts to human health.

Effects to air quality are discussed above and while there will be some localized effects due to vehicle and equipment emissions, these effects are minimal in a regional context and will be rapidly dispersed.

8.2.2 On Socio-economic Conditions

Land use in the area surrounding the Sa Dena Hes Mine property was addressed in the IEE for the project (SRK, 1990). The previous environmental assessment determined that the socio-economic impacts from the project are insignificant with mitigation. No changes are

being proposed to the project that would cause a change in the impacts to socio-economic conditions, and therefore the results of the previous assessment still stand. The following is a brief recap of the results of the previous assessment and summary of the new information provided in the DDRP.

Table 2: List of Previous and Current Activities in the project Area, was extracted from the DDRP, Appendix B, and provides a summary of current and historical projects/activities within this area. The information was obtained from a number of government agencies and boards responsible for the issuance of various permit authorizations.

Local non-First Nation residents may hunt and fish for recreation and for food in the area. The project site has temporarily rendered a small portion of land unsuitable to hunting and trapping due to safety concerns however the registered trapper in the area has authorization to pass through the mine area to access his trapping concession.

Hunting is mostly for big game such as moose and caribou. Hunting is also an important part of the 'way of life' for many local residents and First Nations. This project may cause a localized reduction in wildlife numbers in the immediate project area, although the magnitude of which will depend upon the state of operations. If the project is in 'standby mode' there will be a lower magnitude of impacts to wildlife than if the project is operating.

A study done in support of the IEE (Volume III Appendix C (SRK, 1990)) hypothesized that the impact of the project on hunting would not necessarily come from the mine itself, but rather the increased pressure of hunting from both aboriginal and non-aboriginal persons along the access road. There continues to be access for hunting via the Robert Campbell Highway and along the access road. A resumption in operations would result in increased road traffic which could result in more direct mortality of wildlife due to collisions. The 1990 EARPGO screening addressed the issues of increased access, site restriction, 'no stopping' policy along the access road and a 'no firearms' policy for employees and contractors working at the project site.

There are no commercial fishing activities in the area that may be impacted by the project (confirmed with DFO Whitehorse, 07/06/00, YTG Ren. Res., 06/06/00 by Access Consulting).

The DDRP outlines the reclamation plan that Cominco intends to implement prior to site abandonment; this will restore the area to near pre-development conditions for hunting and trapping.

8.2.3 On Physical and Cultural Heritage

The cultural resources of the study area have been previously examined as part of the IEE (SRK, 1990). The results of the Heritage Resource Overview found that the archaeological potential of the study area is low and no zones of high or even moderate potential are

encroached upon by the development. No spiritual or special places were identified. However it is noted in the study recommendations that the area is relatively unknown in terms of heritage resource site distribution and recommends an awareness of the potential for discovery.

The 1990 EARPGO screening determined that no further archaeological studies were considered necessary except for any new sites proposed for development as part of the project. No new archaeological issues or sites have been identified to DIAND since the initial screening report.

8.2.4 On Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons

An evaluation in 1990 of current use of the Mount Hundere area by Liard First Nation residents found that primary use of the area was for hunting, fishing, and trapping. The previous environmental assessment determined that the effects from the project on current use of lands and resources for traditional purposes by aboriginal persons are insignificant with mitigation. No changes are being proposed to the project that would cause a change in the effects or would impact interim protected LFN settlement lands, and therefore the results of the previous assessment still stand.

8.3 Effects in Relation to Other Factors

8.3.1 Cumulative Environmental Effects

Cumulative environmental effects could arise when an effect of this project is combined with the effects of a past, existing or imminent project or activity within a defined spatial and temporal scope.

Cumulative environmental effects were not in the scope of the 1990 EARPGO screening, and only limited consideration was given to cumulative environmental effects with the project in the 1997 CEAA screening. Cominco Ltd. contracted Access Consultants Ltd. to undertake a cumulative effects assessment. The resultant report, *Cominco Ltd. Sä Dena Hes Mine Yukon Territory Cumulative Effects Assessment* (“CEA”), was submitted to DIAND in support of this assessment.

The CEA concludes that the effects of the project and other activities in the study area on VEC’s can be mitigated. The RA has carefully assessed the CEA contents and cross referenced the maps provided with DIAND Land Use maps, and conclude that it accurately reflects the cumulative effects of the Sa Dena Hes project with other projects that have or will occur in the area.

It is the RA’s position that the CEA submitted to DIAND by Cominco adequately addresses the issue of cumulative effects associated with this project and that the cumulative impacts

on VEC's are insignificant with the implementation of the mitigation identified.

8.3.2. Effects on Sustainable Use of Renewable Resources

The predominant use of renewable resources in the project area are for personal hunting, trapping and fishing activities. The registered trapper in trapping concession #356 (see Figure 4) has the authority to pass through the mine site to exercise his trapping rights. While there are some outfitters and fishing camps near the project, the project is not anticipated to have any effects on them. There are no commercial operations using renewable resources in the area that would be impacted by the project.

As noted in the wildlife section above, the effects on wildlife are determined to be insignificant with mitigation. Reclamation and the cessation of activities will allow for the local ecosystem to return to close to natural conditions and thus support sustainable activities such as hunting, trapping, berry picking and fishing. As such, the project has little effect on the sustainable use of renewable resources.

8.3.3. Effects of the Environment on the Project

As noted in Section 7.5 Potential Environmental Hazard, there are no unique or unusual environmental hazards that require assessment.

8.3.4. Effects of Possible Malfunctions or Accidents

The initial EARPGO for the Sa Dena Hes project assessed the environmental effects associated with potential malfunctions and spills. In particular, the EARPGO recognized the need for emergency response and spill contingency plans for both the mill site, to address accidental spills of chemicals, oils, fuels or other hazardous materials and from accidental spills associated with haul road transport of concentrate. It is anticipated that as per usual practice, there will be requirements for an emergency response and spill plan in the renewed water licence and likely the quartz mine production licence.

Water quality may be effected if inadequate design criteria are used and facilities fail, releasing sediments or contaminants to water bodies. To ensure appropriate design criteria were used, detailed climatological analysis was completed for the project area (see Appendix B, DDRP). The analysis of the data assisted in determining design parameters for project facilities. A number of hydrological studies have been completed for the project area, with the most recent study completed for the DDRP. On site stream flow measurements and regional analyses were used to characterize mine site hydrology and empirical relationships used to estimate stream flows at un-gauged locations on the mine site. Information from the climatological and hydrological studies assisted in determining design parameters for flood events and water quality predictions.

The engineered structures of the mine, including the Camp Creek diversion, tailings pond

spillway and diversion ditches, were designed to withstand a 200-year flood event during operations and will be designed for a 1000-year flood event for permanent closure (DDRP). The IEE (vol. IV) outlined some stream runoff calculations for flooding within the project area. These calculations have been updated due to longer-term data collection at streamflow gauging stations and are detailed in the DDRP. (IEE, vol. I, IV, SRK 1990)

During the summer of 2000, an expert technical advisor had their geo-technical consultant assess the stability of the major structures at the project site⁴. The consultant noted the following issues:

- A more durable material such as sand and gravel should be used rather than geotextile for the separation of rip-rap and its subgrade in the construction of spillways for closure. (Failures of spillways may lead to eroding of embankments and possibly even to failure of the embankment, with the consequent loss of tailings and sediments to receiving watercourses; this in turn would have a negative impact on aquatic life).
- Deformation of the outer edge of the Jewelbox Waste Rock Dump. While the consultant did not see this as a significant hazard, he recommended it should be addressed. (Failure of waste dumps may result in the deposition of sediments into water courses. It may also result in putting waste rock in an area and situation that enhances the rate of metals leaching from the rock, which in turn results in increased metal levels in the water course. Waste rock may also end up blocking or impeding the flow of water and forming a pond. This 'waste rock dam' may subsequently fail, resulting in a sudden flow of water that could have effects such as washing out downstream structures, destroying riparian habitat, scouring stream beds, and carrying sediments to down gradient water courses and impairing life or habitat in these water courses).
- Instability with the Burnick waste dump. The consultant suggested that more extensive remedial work (regrading) may be required than suggested in the DDRP.
- Need for placement of erosion-resistant surfacing on the downstream face of the South Dam. (This will prevent gullyng of the dam, and the subsequent deposition of sediments to water courses, as well as ensuring the stability of the dam).

None of the issues identified by the consultant were determined to be of significant impending hazard, but should be addressed by the regulatory process. Therefore all the issues are reflected in s. 9 Mitigation Measures.

⁴ Letter Report Re: Review of Sa Dena Hes Mine Decommissioning and Reclamation Plan, M. Stepanek, Geo-engineering (M.S.T.) Ltd., June 6, 2000

It is proposed in the DDRP (pg. 35) that decommissioning of the main zone open pit (a sidehill excavation) will include stabilization by drilling and blasting and resloping by a dozer. The coarser rock fragments will be placed at the base of the fill to allow free drainage from the pit. An expert reviewer noted that it is unclear how coarse rock will be placed at the base of the fill, and therefore if it is not done, whether water will pond in the pit. Free drainage should be maintained from the open pit to prevent ponding of water back into the pit. It is unlikely that blockage of drainage will result in a significant impact due to the low volume of ponded water that may collect, the distance it has to travel to water courses, and the low level of contaminants that might accumulate, however it is an avoidable impact that should be prevented. As such, actions to address this issue are described in s. 9 Mitigation Measures.

9. MITIGATION MEASURES

This section identifies technical and economically feasible measures that will mitigate the project's likely adverse environmental effects. Mitigation is the elimination, reduction, or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.

1. The mitigation measures proposed as part of the initial EARPGO screening and previous CEAA screenings that were implemented as terms and conditions of the Water Licence QZ97-025, must continue to be fulfilled . These measures address such things as:

- i. Reporting requirements;
 - ii. water treatment and water management practices;
 - iii. water recycle;
 - iv. settling ponds;
 - v. erosion control;
 - vi. tailings studies;
 - vii. effluent discharge standards for wastewater;
 - viii. spill contingency plans;
 - ix. water quality and biological surveillance programs;
 - x. physical monitoring programs;
 - xi. progressive reclamation measures; and
 - xii. security deposits.
2. Further to x. in item 1 above, the implementation of the follow-up program as described in Section 11 must occur. Should follow-up reveal that discharges from the Burnick Portal, Jewelbox Portals, Main Portal or North Dam are contributing to zinc loadings in receiving water that are beyond thresholds (see #3 below), contingency mitigation measures must be taken to rectify the situation.
3. Further to items 1 and 2 above, it is recognized that the Water Board has the authority and mandate to set waste discharge limits for this project under the *Yukon Waters Act*. However, the evaluation of impacts to downstream water quality and effects on aquatic life done by the proponent in the DDRP used CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999). This evaluation was considered by DIAND as the RA, and other reviewers who advised DIAND during the assessment, when assessing the significance of environmental effects in downstream receiving waters. Any component of the Sa Dena Hes Mine within the scope of this assessment should meet the CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life in downstream receiving waters.
4. Cominco has committed to be a responsible steward of the site and made commitments to enable the monitoring, maintenance and access to the site. The following commitments made by Cominco must continue to be implemented while the site is in temporary closure:
 - i. The site will be under the care of an on-site caretaker;
 - ii. the main access road will be maintained in a manner such that heavy equipment can be brought on site on short notice to deal with any environmental emergency;
 - iii. the buildings and facilities (i.e. tailings facilities) will be monitored and maintained; and
 - iv. major fixed equipment and buildings will remain essentially intact onsite.

Further to the above, the proponent must submit documentation every 4 years to

substantiate the efforts that have been taken to ensure the above; if the above conditions were not substantially met then the temporary closure status of the mine should be deemed to be of a 'permanent' nature and the implementation of the DDRP must occur. The timing of this submission should coincide with the update of the DDRP as described in #5 below.

5. The DDRP must be updated every 4 years during temporary closure, or within 2 years of resumption of operations, whichever occurs first. The purpose of this update is to incorporate developments in best applicable technology and any relevant additional information that has been acquired through site monitoring, into a revised DDRP to best accomplish the site decommissioning and reclamation goals described in the document dated February, 2000.
6. Further to #5 above, security deposits must be reviewed every four years to ensure that security held reflects the current legislative and policy framework surrounding security.
7. The Quartz Mine Production Licence shall contain terms and conditions concerning, but not limited to the following:
 - The implementation of the revegetation program described on page 79 and 91 of the DDRP. The licence shall include a requirement to annually report on the results of the study program;
 - solid waste disposal landfill standards to be adopted;
 - conditions under which reagents and hazardous chemicals may be stored at the mine site;
 - requirements for the characterization and disposal of residual contaminants and hazardous wastes in mine site building materials prior to demolition and landfilling;

It is further recommended that the terrestrial aspects of the Sa Dena Hes mine as described in the DDRP be regulated under a Quartz Mine Production Licence.

8. Prior to the implementation of the DDRP, the proponent must submit the following information to the Yukon Territory Water Board for review and approval:
 - Detailed designs and QA/QC plans for structures and works included in the DDRP, including dams, diversions, spillways and stream training. These must demonstrate that the proposed design criterion will achieve the decommissioning objectives as described in the approved DDRP;

Further to the above, the following specific details must be provided prior to DDRP implementation:

- engineered rock drain specifications for Burnick 1200 Portal;
 - details of how coarse rock will be placed at the base of the Main Zone open pit to allow free drainage from the pit;
 - design analysis including stability analysis, of the physical integrity of the tailings dam embankment upon decommissioning;
 - details of type and application of erosion-resistant materials for surfacing of the remaining portions of the south tailings pond dam;
 - detailed designs of type and application of permanent material to be used for separation of rip-rap and subgrade in permanent spillways;
 - detailed designs for trapezoidal channels for all spillways/diversions;
 - detailed designs for velocity control for the Camp Creek tie-in;
 - updated monitoring data and consideration of the data in closure planning;
9. Prior to the implementation of the DDRP, the proponent must submit the following information to the Chief of Mining and Land Use, for review and approval:
- evaluation of the long term stability of waste rock dumps and details of reclamation plans to achieve objectives as described in approved DDRP;
 - plans for the characterization and disposal of any spilt ore material or concentrate;
 - plans for the fate of any unprocessed ore stockpiles that remain upon mine closure;
 - an evaluation of the risk of, and, if necessary, mitigation plan for possible underground subsidence upon decommissioning;
 - summary of the results of the revegetation study program and any changes planned for the study program;
 - criteria and mitigation measures for road stabilization work where erosion is a concern; and
 - if mining resumes, revisions to decommissioning and reclamation plan for the Burnick ore body;
10. Cominco has stated that the decision to permanently close the main access road will be made in consultation with regulatory agencies. As road reclamation is largely a land based activity, it is anticipated that this activity will be regulated under the Quartz Mine Production Licence. Therefore, this commitment should be a term and condition in the Quartz Mine Production Licence to ensure road decommissioning is done after consideration of any outstanding issues in relation to site stability.

10. DETERMINATION OF SIGNIFICANCE

This section discusses the methods used to determine significance and presents the results of the determination.

The method used to determine significance for this assessment was consideration of the results of previous assessments done and consultation with expert technical advisors to solicit their professional opinion on project effects, mitigation and significance.

CEAA permits the Responsible Authority to use previous environmental screenings to whatever extent it considers appropriate (s.74(3)). For this screening the RA used the results of the previous assessment on fish, wildlife, heritage/cultural resources and socio-economic conditions to help in determining significance of effects on these factors. It was concluded in the December 16, 1990 screening report and confirmed in the January 2, 1991 Decision report that:

“...the proposal, with mitigation as identified in the Initial Environmental Evaluation (IEE), addendums to the IEE, the screening report and the clarifications in this document, meets the requirements of Section 12(c) of the Environmental Assessment and Review Process Guidelines Order and can proceed to the regulatory process for issuance of the necessary licences, leases and permits.”.

Consideration was also given to the possibility of new or different project effects on these issues due to the period of time that has lapsed since the original assessment. Also, there were some additional factors that CEAA requires to be considered. To address the possibility of new or different issues, as well as the outstanding factors, the RA prepared a draft scoping document. The purpose of the document was to bring forward the results of the previous assessment and new information provided and solicit expert technical and non-expert comments and concerns.

The comments received during consultation are listed in Appendix 3: Issue/Response Table. Most of the comments were in relation to water quality. No new or additional concerns in relation to fish, wildlife, heritage/cultural, and socio-economic conditions were identified by expert reviewers.

The proponent provided additional information to address concerns with water quality issues. This additional information and the expert advice on this information enabled the RA to determine that the potential environmental effects to water quality are not likely to cause significant adverse environmental effects with mitigation, at the time of this assessment. However, the expert technical advisors have also raised some questions with the conclusions reached by the proponent, which suggests that a Follow-Up Program is required. As such, the RA has decided to exercise its discretion and require a Follow-Up Program as described in s.11 Follow-Up Program.

11. FOLLOW-UP PROGRAM

Under the Act, a follow-up program is used to verify the accuracy of the environmental assessment and to determine the effectiveness of any mitigation measures that have been implemented. In addition, monitoring and follow-up programs can be established to check compliance with approval conditions or to monitor for unanticipated effects. The following is a list of items in the follow-up program as well as a short rationale for each item.

1. In addition to the ongoing monitoring program described in the current licence and in the DDRP, Cominco shall submit, as a supplement to its February, 2000 water licence renewal application, a seepage monitoring and contingency plan. This plan shall include but not be limited to the following:
 - i. Plans for the ongoing monitoring of the Main Pit portal discharge including receiving environment, Burnick portal discharge, discharge adjacent to the Jewelbox portal 1250, possible future discharge from the 1408 Jewelbox portal, and tailings pore water chemistry;
 - ii. method of sampling, location of sampling, frequency of sampling, parameters to be analysed, how the data will be evaluated, and the reporting of the results of sampling and evaluation; and
 - iii. monitoring of the Burnick 1200 Portal to confirm unrestricted flow of water from the portals after completion of closure methods.

Rationale: Expert technical advisors have recommended that further data collection and evaluation is needed to confirm the conclusions and assumptions made in the Geochemical Studies report until such time as it can be shown that the zinc and cadmium concentrations have stabilized.

2. Pursuant to item #1 above, it is expected that the proponent will be submitting a report on the results of water sampling and evaluation at the end of the next sampling season that is subject to authorizations arising from this screening. The following information shall be submitted to the Water Board with the results of the monitoring done pursuant to item 1:
 - i. Confirmation of potential flow patterns and piezometric surface in the tailings management facility, by surveying the monitoring points or conducting an elevation survey;
 - ii. a review of mineralogy and key factors at DP7 versus other tailings drillholes to assess whether the situation at DP7 is reflective of how tailings will react as pond settles; and
 - iii. Evidence/data to support the creation of carbonates and/or other secondary

mineral precipitates in Camp Creek soils in support of the zinc, lead and cadmium removal from the Main pit portal or other attenuation processes contributing to the metal removal along the flow path.

Rationale: While the additional information provided by Cominco in the Geochemical Studies report has addressed the concerns with the potential for significant impacts from seepage and leachate, there were still some questions and suggestions regarding the study methodology, assumptions and data to support the conclusions in the report that should be followed up in regard to the confirmation of long term maintenance of these processes.

3. Cominco shall submit, with the water licence renewal application, a plan to investigate the drainage of water that collects in the Jewelbox pit and whether it drains into the 1380 Portal.

Rationale: In the DDRP Cominco noted that during the spring freshet, water collects in the bottom of the Jewelbox pit and may drain through a fault line into the 1380 Portal and that further investigations are required to confirm if this assumption is correct.

4. Cominco shall, with the water licence application submit a plan for the continued collection of surface water hydrology data, and the evaluation of the data based against design flood estimates used for critical water conveyance and retaining structures.

Rationale: Cominco has proposed to continue monitoring surface water hydrology. The data should be used to verify design flood estimates to confirm that they are appropriate.

12. CONCLUSION AND RECOMMENDATIONS OF THE RESPONSIBLE AUTHORITY

It is the determination of the Responsible Authority that taking into account the implementation of mitigation measures and follow-up, the project is not likely to cause significant adverse environmental effects and that the Sa Dena Hes Project may proceed to the regulatory stage.

CEAA determination:

20(1)(a):

...subject to subparagraph (c)(iii), where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out and shall ensure that any mitigation measures that the responsible authority considers appropriate are implemented.

Authorization:

Ian Church
Director, Environment Directorate
Indian and Northern Affairs Canada, Yukon Region

Date

REFERENCES

12. CONCLUSION AND RECOMMENDATIONS OF THE RESPONSIBLE AUTHORITY


It is the determination of the Responsible Authority that taking into account the implementation of mitigation measures and follow-up, the project is not likely to cause significant adverse environmental effects and that the Sa Dena Hes Project may proceed to the regulatory stage.

CEAA determination:

20(1)(a):

...subject to subparagraph (c)(iii), where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out and shall ensure that any mitigation measures that the responsible authority considers appropriate are implemented.

Authorization:


Ian Church
Director, Environment Directorate
Indian and Northern Affairs Canada, Yukon Region

June 22/01
Date

- Access Mining Consultants Ltd. and SRK Consulting, *Sa Dena Hes Mine Detailed Decommissioning & Reclamation Plan*. Prepared for Cominco Ltd, 2000.
- Access Mining Consultants Ltd., *Cominco Ltd. Sa Dena Hes Mine Yukon Territory - Cumulative Effects Assessment*. Prepared for Cominco Ltd, June 2000.
- Canadian Council of Ministers of the Environment, (CCME), *CCME Canadian Water Quality Guidelines*, 1999.
- Canadian Environmental Assessment Agency, *Responsible Authorities Guide*, November, 1994.
- Canadian Environmental Assessment Agency, *Guide to the Preparation of a Comprehensive Study for Proponents and Responsible Authorities*, 1997.
- Cominco Ltd., *Sa Dena Hes 2000 Annual Report, Yukon Water Licence QZ97-025*, February 2001.
- Cominco Ltd., letter from David McMurdo to Ian Church, Re: *Draft Screening Report, Sa Dena Hes Mine*, May 24, 2001.
- DIAND, *Level II Screening Report Under the Environmental Assessment and Review Process Guidelines Order: Mount Hundere Development Proposal*, December, 1990.
- DIAND, *Canadian Environmental Assessment Act Level I Screening, Water Resources Division, Northern Affairs Program, Yukon Region - Water Licence Application QZ97-025, Sa Dena Hes Operating Corporation/ Sa Dena Hes*, November, 1997.
- DIAND, *Canadian Environmental Assessment Act Level I Screening, Water Resources Division, Northern Affairs Program, Yukon Region - Water Licence Application - QZ00-047, Sa Dena Hes Operating Corporation / Sa Dena Hes Mine 60 Day Licence Extension*, September, 2000.
- DIAND, *Canadian Environmental Assessment Act Level I Screening, Water Resources Division, Northern Affairs Program, Yukon Region - Water Licence Application - QZ00-048, Sa Dena Hes Operating Corporation / Sa Dena Hes Mine 1 Year Licence Extension*, September, 2000.
- DIAND Mining Land Use and Reclamation, memorandum from Hugh Copland to Kevin McDonnell, Re: *Sa Dena Hes Decommissioning and Reclamation Plan*, July 25, 2000.

- DIAND Mining Land Use and Reclamation, memorandum from Hugh Copland to Kevin McDonnell / Derek Fraser, Re: *Sa Dena Hes Pre-Draft Screening Report*, April 06, 2001.
- DIAND Water Resources, memorandum from Bill Slater to Kevin McDonnell, Re: *Sa Dena Hes Mine - Draft "Scope of Environmental Assessment"*, August 01, 2000.
- DIAND Water Resources, memorandum from Bill Slater to Kevin McDonnell, Re: *Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan*, August 01, 2000.
- DIAND Water Resources, memorandum from Bill Slater to Kevin McDonnell, Re: *Geochemical Studies/Seepage Estimates*, December 20, 2000.
- DIAND Water Resources, e-mail from Bill Slater to Derek Fraser, Re: *Sa Dena Hes*, April 19, 2001.
- DIAND Water Resources, letter from Bill Slater to Derek Fraser, Re: *Sa Dena Hes Draft Screening Report, April 25, 2001*, May 19, 2001.
- Environment Canada, Environmental Protection, letter from Benoit Godin to Kevin McDonnell, Re: *Draft Scope of Environmental Assessment Sa Dena Hes - Water Licence Renewal Application QZ99-045*, July 20, 2000.
- Environment Canada, Environmental Protection, letter from Benoit Godin to Kevin McDonnell, Re: *2000 Geochemical Studies, Sa Dena Hes Mine and Seepage Estimates for Post Closure Conditions of the Tailings Management Facility (TMF) at the Sa Dena Hes Mine*, December 20, 2000.
- Environment Canada, Environmental Protection, letter from Benoit Godin to Kevin McDonnell, Re: *Screening Report on the Sa Dena Hes Mine Project*, April 12, 2001.
- Environment Canada Aquamin Working Group '5', "*Assessment of the Aquatic Effects of Mining in Canada: Supporting Document II: Western Cordillera*". Case Studies, Sa Dena Hes, September, 2000.
- Hoefs, M. and Lortie, G. 1976. *Big Game Inventory in Game Management Zone 11* (Unpubl. Report on file with YTG Ren.Res. Fish and Wildlife Branch), 1976.
- Laberge Environmental Services and White Mountain Environmental Consulting, *Environmental Monitoring at False Canyon Creek, 1994*. Prepared for Sa Dena Hes Joint Venture, 1995.

- Laberge Environmental Services, "*Environmental Monitoring at False Canyon Creek 1996*". Prepared for Sä Dena Hes Operating Corporation, 1996
- Laberge Environmental Services and Can-Nic-A-Nick Environmental, *Environmental Monitoring at False Canyon Creek, 1998*. Prepared for Sä Dena Hes Operating Corporation, 1998.
- Liard First Nation, letter (sent by facsimile) from Lloyd Roberts to Kevin McDonnell, (No Title), August 17, 2000.
- Liard First Nation, facsimile from Lloyd Roberts to Kevin McDonnell, (No Title), September 12, 2000.
- P.A. Harder & Associates Ltd, *Environmental Assessment of False Canyon Creek, 1992 Study*. Prepared for Curragh Resources, 1992.
- Steffen Robertson and Kirsten (B.C.) Inc. (SRK), *Mt. Hundere Project, Initial Environmental Evaluation*. Vols. I-VI. Prepared for Mt. Hundere Joint Venture, 1990.
- Steffen Robertson and Kirsten (Canada) Inc. (SRK), *2000 Geochemical Studies Sa Dena Hes Mine*. Prepared for Cominco Ltd, November, 2000.
- Stepanek M., Geo-engineering (M.S.T.) Ltd., Letter Report Re: *Review of Sa Dena Hes Mine Decommissioning and Reclamation Plan*, June 6, 2000.
- Yukon Territory Water Board, *Type 'A' Water Use Licence QZ97-025: Sa Dena Hes Operating Corporation, Sa Dena Hes Mine*, 1998.

Figure 1. (Map of Mine Site Overview)

Figure 2. (Gantt Chart of Key Steps)

Figure 3 (Map of Study Area Overview)

Figure 4 (game mgt, trapping and outfitting concessions map)

Table 1 Sä Dena Hes Mine Cumulative Effects Assessment Study Area and Setting Summary	
Region:	Yukon
Topographic Map Sheet:	NTS 105 A/6, 105 A/7, 105 A/10, 105 A/11
Geographic Location Name Code:	Mt. Hundere
Latitude:	60° 42' 21" (max.) 60° 18' 31" (min.)
Longitude:	129° 11' 38" (max.) 128° 34' 08" (min.)
Drainage Region:	Mackenzie River
Watersheds:	False Canyon Creek, Tom Creek, Frances River, Liard River
Nearest Community:	Watson Lake, Yukon, approx. 70 kilometres south at the Alaska/Campbell Highway intersection
Access:	25 km Sä Dena Hes Mine Access Road (at km 47 of the Robert Campbell Highway)
Traditional Territory:	Liard First Nation
Surrounding Land Status:	Federal Crown Land & First Nation Settlement Lands
Special Designations:	None
Ecoregion:	Liard Basin
Study Area Elevation:	671-1579 m. (2200-5180 ft.)
Site Climate:	Mean annual temperature of -6.6°C. Mean annual total precipitation is 630mm
Vegetation Communities:	White and black spruce, Lodgepole pine, aspen, larch, alpine fir, Paper birch, alder, rose, Mountain ash, Labrador tea, crowberry, bunchberry, toadflax, bearberry, lignonberry, bunchberry, kinnikinnick, buck brush/willow. Discontinuous permafrost is present on site
Wildlife Species:	Moose, caribou, Stone sheep, Grizzly and black bears, beaver, muskrat, mink, otter, marten, weasel, wolverine, lynx, coyote, fox, wolf, red squirrel. Bird species include: spruce grouse, ruffed grouse, ptarmigan, golden eagle, bald eagle, Harlan's hawk, waterfowl species, and a variety of smaller birds
Fish Species:	In <u>False Canyon Creek</u> , Arctic grayling, round whitefish, Northern pike, burbot, Dolly varden and Arctic char. In <u>Tom Creek</u> , Arctic grayling, burbot, Dolly Varden and slimy sculpin; In the <u>Frances River</u> , Arctic grayling, burbot, and slimy sculpins;
Heritage Resources:	None Identified (other than use of general region for traditional game harvest/cultural activities)
Note: Information summary drawn for various sources including several Mt. Hundere/Sä Dena Hes Project reports and the DIAND/RERC EARPGO and CEAA Screening reports.	

Extracted from: Access Mining Consultants Ltd, *Cominco Ltd., Sa Dena Hes Mine Yukon Territory Cumulative Effects Assessment*, Prepared for Cominco Ltd., June 2000.

Table 2: List of Previous and Current Activities in the Project Area

	Activity Type	Holder	Comments
MA P SHE ET 115 A/6	Land Use/Tenure		
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 40 Robert Campbell Highway (1.0 ha± RHS)
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 50.5 Robert Campbell Highway (1.0 ha± LHS)
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 51 Robert Campbell Highway (1.0 ha± LHS)
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 52 Robert Campbell Highway (1.0 ha± RHS)
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 58 Robert Campbell Highway (1.0 ha± RHS)
	Forest Science Sample Plot	Federal Forest Resources	Approx. km 59 Robert Campbell Highway (1.0 ha± RHS)
	Campground	YTG	Lot 2, Group 807, Approx. km 58 Robert Campbell Highway (2.19 ha± LHS)
	Fire Lookout Tower	Yukon Forest Service	Approx. km 37 (RHS)
	Residential	Michael Lexow	South End of Target Lake, Approx. km 36.5 (1.0 ha± RHS)
	Planned Logging	Not Yet Determined	South of Target Lake. This area is planned for future logging. Approximately 925 ha. Timber Volumes approximately 100,000m ³ (See Figure 6)
	S-70, S-67, S168, S-219, S-221, S-265, S-279	Liard First Nation	Interim Protected Settlement Lands
	Registered Trapping Concession #358	Leo Stuart	
	Logging	Various Permit Holders	North of Target Lake. Approximately 290 ha. (See Figure 6)
	Land Use Permit YA6S187	YTG - CTS - Transportation and Engineering	Geotechnical investigations at various locations between km 55-232 Robert Campbell Hwy.
	Mineral Tenure		
	MC Lots. 1-21	Glimmer Resources	Mineral claims designated GMS (expire 01/08/11)
MC Lots. 1-21	Minfocus International Inc.	Mineral claims designated BOMB (expire 99/10/10)	
MC Lots 1-32	Pacific Bay Minerals	Mineral claims designated CAM (expire 02/02/26)	

Activity Type		Holder	Comments
	MC Lots 13-1583 (various)	Cominco	Mineral claims designated HOLMES (expire 01/12/15)
	MC Lots 1-144	McCrorry Holdings Ltd.	Mineral claims designated EAGLE (expire 05/08/24)
MA P SHE ET 115 A/7	Water Use		
	MS97-091 (CANCELLED)	Sa Dena Hes Operating Corporation	Type 'B' Water Use Licence (CANCELLED)
	Land Use/Tenure		
	Planned Logging	Not Yet Determined	South of Target Lake. This area is planned for future logging. Approximately 925 ha. Timber Volumes approximately 100,000m ³ (See Figure 6)
	MINERAL TENURE		
	MC Lots 1-144 (various active)	Sä Dena Hes Operating Corp.	Mineral claims designated GMN (expire 05/10/26)
MA P SHE ET 115 A/10	Water Use		
	QZ97-025	Sa Dena Hes Operating Corporation	Type 'A' Water Use Licence for the operation of the mine, mill, and campsite
	Mineral Tenure		
	MC Lots 42-46	Sä Dena Hes Operating Corp.	Mineral claims designated JEWEL (expire 99/08/24)
	MC Lots 120-308	Sä Dena Hes Operating Corp.	Mineral claims designated HUN (expire 09/03/01)
	MC Lots 329-422	Sä Dena Hes Operating Corp.	Mineral claims designated HUN (expire 02/09/06)
	MC Lots 1-8	Sä Dena Hes Operating Corp.	Mineral claims designated HAWK (expire 03/08/24)
	MC Lots 1-78	Sä Dena Hes Operating Corp.	Mineral claims designated CIMA (expire 09/03/01)
	MC Lots 1-12, 40, 41	Sä Dena Hes Operating Corp.	Mineral claims designated MICA (expire 09/03/01)

	Activity Type	Holder	Comments
	MC Lots 1-22	Sä Dena Hes Operating Corp.	Mineral claims designated THUNDER (expire 03/08/24)
	Land Use/Tenure		
	S-113, S-193, R-15	Liard First Nation	Interim Protected Settlement Lands
	Registered Trapping Concession #356	Jimmy Stuart and Andy Szabo	
	Surface Lease (13509)	Sa Dena Hes Operating Corporation	Commercial Mine Site, located near Mount Hundere (headwaters area of False Canyon Creek), 412.8 ha±
	Other		
	Residential, Recreational, commercial/tourism	Various	Outside Study Area, at various locations on Stewart Lake
MA P SHE ET 115 A/11	Land Use/Tenure		
	S-220, S-36, S218, S-264., S-35, S-34, S-33, S-91, S-277, S-160, S-31, S-54, R-2, R-5	Liard First Nation	Interim Protected Settlement Lands
	Registered Trapping Concession #355	Raymond Donnessey	-
	Forest Science Sample Plot	Federal Forest Resources	Outside Study Area at various locations along Robert Campbell Highway from approx. km 61-80 (1.0 ha± RHS and LHS)

Note: Only R-5, R-15, S-70, S-67, S-168, and S-279 (Liard First Nation Interim Protected Settlement Lands) are within the Cumulative Effects Assessment Study Area.

Extracted from: Access Mining Consultants Ltd, SRK Consulting, *Sa Dena Hes Mine Detailed Decommissioning & Reclamation Plan*, Appendix B. Prepared for Cominco Ltd, 2000.

APPENDIX 1: Acronyms and Abbreviations

CEA

Cumulative Effects Assessment.

CEAA	The <i>Canadian Environmental Assessment Act</i> .
CCME	Canadian Council of Ministers of the Environment
Coordination Regulations	Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements, established pursuant to s. 59(a) of the <i>Canadian Environmental Assessment Act</i> .
DIAND	The Department of Indian Affairs and Northern Development.
DDRP	Detailed Decommissioning and Reclamation Plan.
EARPGO	The <i>Environmental Assessment Review Process Guidelines Order</i> .
IEE	Initial Environmental Evaluation.
LFN	The Liard First Nation.
MHJV	Mount Hunderere Joint Venture
RA	Responsible Authority pursuant to s.11 of the <i>Canadian Environmental Assessment Act</i> .
RERC	Regional Environmental Review Committee.
RRDC	The Ross River Dena Council.
The project	The Sa Dena Hes Project.
TMF	Tailings Management Facility.
VEC	Valued Ecosystem Component.
Water Board ('the Board' or YTWB)	Yukon Territory Water Board.
Water Licence	Water Use Licence as per the <i>Yukon Waters Act</i> .

APPENDIX 2:

Sa Dena Hes Consultation List

I. Church	Chair, RERC, Environment Directorate, NAP
K. McDonnell	Environment Directorate, NAP
C. Tavernor	Environment Directorate, NAP

D. Fraser	Environment Directorate, NAP
B. Casella	Water Resources, NAP
J. Hough	Land Resources, NAP
F. Privett	Socio-Economic Benefits, NAP
H. Copland	Mineral Resources, NAP
L. Spicer	Environmental Specialist, I&I
B. Godin	Environmental Contaminants Div., DOE
B. Nutton	Habitat & Enhancement YT&NBC, DFO
K. Kiemele	Renewable Resources, YTG R-8
F. O'Brien	Environmental Health , YTG #2H Rd.
D. Brent	Economic Development, YTG F-1
R. Gotthardt	Heritage, YTG L-2A
V. Labelle	Municipal & Community Affairs, YTG M-3
N. Prasad	Worker's Compensation Board WCHSB
W. Hidinger	Community & Transportation Services, YTG S-3
G. Kent	Lands, YTG M-5
C. Noble	Council for Yukon First Nations
Chief D. Morris	Liard River First Nation
Chief H. Dick	Kaska Tribal Council
D. Groat	Lower Post First Nation
J. Gleason	Kaska Dena Council
Chief N. Sterriah	Ross River Dena Council
J. Peepre	CPAWS
C. Cleghorn	YCS
C. Sidney	YSC
L. Joe	YFWMB

Ross River Development Society
Yukon Land Use Planning
Yukon Chamber of Mines
Town of Watson Lake
Watson Lake Chamber of Commerce

APPENDIX 3:

Issue/Response Table

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
<p>1. Water Resources agrees with many of the findings in the draft scope of environmental assessment, though final recommendations do not reflect the need for further discussions in several areas.</p>	<p>Conducted follow-up discussions, including a teleconference with the proponent, as well as discussions between the proponent and Bill Slater and between Bill Slater and Environment Directorate staff occurred.</p>
<p>2. Scope of Environmental Assessment Report attempts to presuppose findings of an environmental assessment, prior to consultation with expert agencies or the public.</p>	<p>There is extensive information on file regarding valued ecosystem effects, the project environment interactions, mitigation and significance of effects. CEAA allows for the utilization of previous environmental assessments which had been done on this project. The purpose of the scoping document was to bring forward and utilize this existing information, including information on significance. The cover letter to the scoping document requested comments on the scoping document (see issue/ response #3 below). This approach and request for input was also discussed at RERC meetings.</p>
<p>3. June 29 letter does not provide clear indication that Environment Directorate is seeking reviewer's detailed comments on the project.</p>	<p>Pg. 2: "DIAND requests that you review the draft and provide comments as to whether further information is needed on: description of the project or the environment; the effects from the project; measures proposed or required to mitigate the effects; the significance of the effects and of the project as a whole."</p>

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
<p>4. Letter does not direct reviewers to complete their reviews of project documentation.</p>	<p>Purpose of letter was to convey the scoping document and solicit input. The letter identifies the submission of the cumulative effects report and the decommissioning plan, and identified a web site where the decommissioning plan can be downloaded. Water Resources provided copies of these reports. The scope document identifies references. All documents on the public registry and available for public viewing during regular business hours. RERC members were asked if they required copies of decommissioning plan. Reviewers were requested to contact Environment Directorate if required any further information. All relevant documentation identified - up to reviewers to determine their specific need to review other project documentation.</p>
<p>5. Several key reviewers were not aware that a detailed project review was intended at that this time.</p>	<p>This approach of scoping is a new approach. Follow-up phone discussions with these reviewers cleared up misconceptions.</p>
<p>6. Environment Directorate decided not to provide the RERC with copies of the project documentation.</p>	<p>There are about 20 binders and reports on the public registry - it is not practical or necessary for Environment Directorate to provide the RERC with copies. See response to Issue 4 above.</p>
<p>7. Prudent to contact YCS.</p>	<p>YCS was on the distribution list for the scoping document and were invited to submit comments. YCS will be sent copy of draft screening report for review/comment.</p>
<p>8. Scope of Environmental Assessment fails to identify the scope of the project for purposes of CEAA.</p>	<p>Scope of project and assessment clarified in s. 5 Scope of Assessment in screening report.</p>

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
9. Document fails to describe decommissioning program and renewal activities (term of renewal) that constitute the project.	Decommissioning program and renewal activities clarified ins. 5.1 Scope of the Project and s. 3 Project Description in screening report. Temporal scope linked to expected duration of activities and not to term of licence.
10. Scope does not identify future activities, including dam raises, tailings deposit, mining and waste discharge to form part of renewed operations.	Scope of future activities described in s. 5.1 Scope of the Project in screening report.
11. Assessment aspects of scoping document do not effectively identify the associated environmental effects.	Environmental impacts clarified in s. 8 Predicted Environmental Effects in screening report. Focus is on those effects not considered in previous assessments.
12. Scoping document does not appear to consider effectiveness of past mitigation and/or additional effects.	Scoping document considers effectiveness of past mitigation through evaluation of monitoring data and information in cumulative effects and decommissioning reports, and through review of documentation on file. Purpose of scoping document was to in part, solicit input/advise from expert advisors and public on existing or new effects. Results of scoping discussed in s. 8 Predicted Environmental Effects, in screening report.
13. Scoping document does not support comprehensive review of decommissioning plan.	Decommissioning plan included in scope of this assessment. Plan available for review (see above).
14. Scoping document, s. 4, identify initiative for 1997 amendments related to Cominco's desire to delay submission of decommissioning plan.	Noted in s. 2.5 Regulatory, Policy and Planning Context, in screening report.
15. Scoping document, s.4, Intervention submitted by Water Resources was DIAND intervention.	Clarification made in s. 2.5 Regulatory, Policy and Planning Context, in screening report.

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
16. Scoping document, s. 4, Not certain that decommissioning plan 'incorporated' stakeholder's comments.	Statement not included in screening report.
17. Scoping document, s. 5, statements like: "modifications associated with dam were undertaken following engineered designs and inspection and fully reported in accordance with terms and conditions of the Water Use Licence" may or may not be accurate	Statement not included in screening report.
18. Scoping document, s. 5, last par. Revise par. to remove implication that north creek dyke was constructed in accordance with standard engineering design practices and inspection procedures.	Implication not included in screening report.
19. Scoping document, s. 6 fails to establish clear temporal boundary.	Temporal boundary of assessment clarified in s. 5 Scope of Project, in screening report.
20. Scoping document, s. 7 wording suggests most sources will continue to leach zinc at current rates while data suggests concentrations continue to rise.	Discussion of zinc and sulphate trends revised - See s. 8.1.1 Water Quality, in screening report.
21. Scoping document states MH-4 receives drainage from main zone, but this hasn't been proved.	Follow-up study done by Cominco indicates that this is likely where drainage goes to. Cominco noted that drainage from the Main Zone Pit can be seen and heard in the waste rock dumps above the upper reaches of Camp Creek and the distance from the pit to Camp Creek is less than 200 m (S.4.3 Interpretation, in: 2000 Geochemical Studies Sa Dena Hes Mine, November, 2000.

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
22. Lack of source concentration information to determine that releases have reached stable levels.	Cominco concluded that the majority of attenuation is a result of the high alkalinity in Camp Creek water. As Camp Creek drains limestone, this source of alkalinity will continue indefinitely, providing natural attenuation of the zinc, lead and cadmium load originating from the main zone pit. Ongoing monitoring of the source contribution and Camp Creek (MH-4) will be required.
23. S.7 of scoping document incorrectly suggests licence monitoring results are available in IEE	Location of water quality results clarified in s. 7.1 General Environmental Context
24. S.7 of scoping document suggests lead and zinc generally within permit limits, which is true for most discharge locations, but not for portal discharges.	See s. 8.1.1 Water Quality for revised discussion of lead and zinc.
25. 1999 data does not reflect stabilizing zinc trend, at MH-2 additional information required.	See s. 8.1.1 Water Quality for revised discussion of zinc.
26. S.9 fails to identify relevant aspects of project, thus not clear whether mitigation measures are applicable or effective.	Relevant aspects of project covered in s. 3 Project Description, s. 5.1 Scope of Assessment and in s. 8: Predicted Environmental Effects of the Project.
27. S.9.2 water quality additional study needed to assess potential effects.	See screening report, s.8.1.1 Water Quality and 11 Follow-Up program regarding follow-up monitoring of water quality.
28. S.9.2 mitigation measures not applicable to decommissioning phase.	S.9 Mitigation measures in screening report, correspond to relevant phase of operations.
29. Further issue resolution, and/or mitigation measures necessary regarding decommissioning plan.	See s. 8.1.1 in screening report: Water Quality for additional study done, and s. 11 Follow-up for on-going monitoring.
30. S.9.7 Effects of Environmental Change on Human Health, clarify what is meant by follow-up actions can be taken as necessary.	Statement not included in screening report - see s. 8.2.1 On Human Health, in screening report.

Bill Slater, Water Resources, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Draft "Scope of Environmental Assessment.", 01 August 2000.

Issue	Response
31. S.9, need to clarify how mitigation measures will be implemented	See s. 9 in screening report: Mitigation measures, and also s.11 Follow-Up program, which identifies follow-up monitoring and evaluation.
32. S.9.13 more accurate to state that structures are being designed to withstand a 1:1000 year flood event for permanent closure rather than were...	See s. 8.3.2 in screening report: Effects of Possible Malfunctions or Accidents where change made.
33. S.9.13, revise section to reflect current and expected conditions (i.e. fails to present updated information on dam such as toe berms).	Updated information on screening report included in s. 3.1 Definition of The Project.
34. S.9.13, storage of chemicals and reagents on-site is not acceptable. Some materials should be removed immediately to reduce likelihood of accidents and diminish liability	Problems with waste oil storage covered screening report: S.8.1.1 Water Quality Site. Reagents/materials stored in covered warehouse. On-site caretaker, and ongoing inspections of site indicate accidents unlikely. Spills or improper storage practices addressed by regulatory process and enforced by inspectors.
35. S.10 further assessment of whether decommissioning plan addresses closure and post closure issues required.	Assessment process addresses closure and post-closure issues as raised and discussed in screening report.

Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.

<p>1. Screening report should require implementation of progressive reclamation to diminish duration of effects - implement decommissioning of Jewel Box Hill.</p>	<p>There is no evidence demonstrating significant effects occurring that justify imposing progressive reclamation. Proponent has caretaker, commits to environmental steward, will be required to supply security deposit to enable decommissioning. Regulatory agency may wish to impose progressive reclamation. Proponent required to decommission Jewelbox once decision about future of project made.</p>
<p>2. Requirements of site monitoring and maintenance, site security, and commitment to mine operation should be in screening report.</p>	<p>Included in s. 9 Mitigation Measures, item #4.</p>
<p>3. New date should be established for implementation of final decommissioning.</p>	<p>Due to inability to predict metal prices and thus when or if to re-open, difficult to set date. No environmental effects predicted if no date set as proponent responsible to maintain site, will continue environmental monitoring, and will have to comply with water licence, will have to provide security. Proponent proposes 4 year review of temporary closure and if commitments not met, deem closure permanent. See s. 9 Mitigation Measures, item #4.</p>
<p>4. Likelihood for discharge from Jewelbox 1408 portal and need for mitigation measures should be investigated.</p>	<p>“Water from the mine workings does not flow out of this opening. Even if the mine were to completely flood, the vast majority of the water would be below the elevation of the 1408 Portal so there is no risk of major quantities of water being built up above the 1408 Portal.” Pg. 29, DDRP. Screening report includes follow-up (S.11 Follow-up Program, item #1(i).</p>

Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.

<p>5. Plan does not identify existence of seepage in vicinity of 1250 Portal.</p>	<p>The seepage here does not seem to be the source of loading to receiving surface waters, which is confirmed by water quality monitoring. Seepage to be monitored per s.9 item #1,2 and s. 11 Follow-up Program to confirm that it is not a source of loading.</p>
<p>6. Further discussion of options to follow-up to possible connection between Jewelbox pit and discharge from the main portal.</p>	<p>Additional study has shown that the dissolved zinc levels in the receiving water body (Camp Creek) are low and thus no significant impact from seepage from the main pit portal. S.11 Follow-up Program item #1(i) to require further monitoring of Main Pit portal discharge, s.9 Mitigation Measures item 2 requires implementation of contingency mitigation in event that portal discharges are found to be contributing to zinc loadings above threshold.</p>
<p>7. Concern with long term Jewelbox waste rock dump instability - screening report require submission, review and approval of detailed plans for waste dump reclamation measures through the regulatory process.</p>	<p>S.9 Mitigation Measures, item #9 to require submission of detailed plans for review and approval.</p>
<p>8. Screening report should require clarification of how placement of coarse material at base of Main Zone open pit is to be accomplished using methods proposed in DDRP.</p>	<p>S.9 Mitigation measure item #8 to require Cominco to provide in the next submission of the DDRP, details of how coarse rock will be placed.</p>
<p>9. Main Zone Portal - need to evaluate the trends and flow paths in water quality from this discharge.</p>	<p>Issue addressed through 2000 Geochemical study, and s. 11 Follow-up Program to continue to monitor to confirm no increase in metals loading.</p>
<p>10. Main Zone Waste Dump - concern that water flowing from the dump could contribute to neutral mine drainage.</p>	<p>Issue addressed through s.11 Follow-up Program to continue to monitor to confirm no increase in metals loading.</p>
<p>11. Burnick Zone 1200 Portal - want engineered rock drain specifications and ice plug monitoring.</p>	<p>Issue addressed through s. 9 Mitigation Measures, item #8 to provide spec's with next submission of DDRP, and in s.11 Follow-up program item #1(iii)to verify unrestricted flow of water from portal.</p>

<p>Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.</p>	
<p>12. Instability of Burnick Zone Waste Dump and requiring remedial action.</p>	<p>This issue was discussed in s. 8.3.2 Effects of Possible Malfunctions or Accidents, and addressed in s.9 Mitigation Measures, item #9 by requiring a evaluation of the dump stability.</p>
<p>13. Tailings Management Facility - question raised as to Cominco's conclusion that zinc concentrations appear to have stabilized in 1999.</p>	<p>Additional evaluation done as described 8.1.1 <u>Water Quality</u>. Requirement for monitoring of tailings pore water identified in Follow-up Program to confirm zinc levels not an issue.</p>
<p>14. Screening report should require submission of detailed plans for placement of erosion resistant surfacing on downstream face of the South Dam.</p>	<p>Included in s. 9 Mitigation Measures, item #8.</p>
<p>15. Screening report should require submission of detailed plans for use of trapezoidal channels for all spillways/diversions.</p>	<p>Included in s. 9 Mitigation Measures, item #8.</p>
<p>16. Screening report should require submission of detailed plans for velocity control in the Camp Creek tie-in.</p>	<p>Included in s. 9 Mitigation Measures, item #8</p>
<p>17. Screening report should require submission of detailed plans for use of more durable material such as sand and grave than geo-textile for separation of rip-rap and its subgrade in South Dam spillway.</p>	<p>Included in s.9 Mitigation Measures, item #8.</p>
<p>18. Screening report should specify investigation program to determine requirement for placement of adequate soil material and establishment of stable long-term plant cover, and require implementation.</p>	<p>Included in s. 9 Mitigation Measures, item #7.</p>
<p>19. Screening report should specify criteria and mitigation measures to stabilize trails where erosion is concern.</p>	<p>Included in s. 9 Mitigation Measures, item #9.</p>
<p>20. No certificate of closure issued under Yukon Waters Act.</p>	<p>This is a clarification and does not require further discussion or specific mitigation measures in the screening report.</p>

Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.

<p>21. Criteria used to select timing for road decommissioning and requirement to decommission road should be in screening report.</p>	<p>Cominco has noted that road will be maintained until reclamation program has been successful, and physical structures at site stable. It is noted in Table 4-1 that “decision to permanently close the main access road made in consultation with regulatory agencies and Liard First Nation.”. This commitment included in s. 9 Mitigation Measures to ensure road decommissioned at appropriate time.</p>
<p>22. Cominco commitment to request increased security must be addressed.</p>	<p>Included in Mitigation Measures, items #1 (xii) and item # 6.</p>
<p>23. Winter stream flow data should be collected and reflected in future operation closure planning.</p>	<p>The failure to collect streamflow data even though it was required as a licence condition is an enforcement problem and not an environmental assessment issue. Cominco has committed to continue conducting compliance monitoring according to present water licence (pg. 105 DDRP). Interventions to the Water Board during the renewal hearing can affirm the need to keep this licence condition. It is the responsibility of the regulatory personnel who enforce the licence to ensure it is implemented. Requirement to consider monitoring data in updated DDRP specified in s. 9 Mitigation Measures, item #5.</p>
<p>24. Crude estimates of seepage from Tailings Management Facility not adequate for calculating mass balance for downstream contamination and program should be established to collect additional information.</p>	<p>Cominco provided a sensitivity analysis for seepage flow estimates for North and South dams in its Geochemical Study. While Water Resources had concerns with the analysis Water Resources noted that the risks associated with the seepage discharges appear to be small and issues could be addressed through updated modelling through the regulatory process (Slater to McDonnell, December, 20, 2000). See s. 9 Mitigation Measures.</p>

<p>Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.</p>	
<p>25. Screening report include a mitigation measure that requires protection of aquatic ecosystems by ensuring that mine does not cause exceedances of CCME guidelines during operations or post-closure.</p>	<p>Addressed in s. 9 Mitigation Measures, items 2 and 3.</p>
<p>25. Not possible to evaluate environmental effects in absence of test-work from ongoing programs.</p>	<p>Results of test-work provided in report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.</p>
<p>26. Implications of seepage from Jewelbox Hill zone at 1250 portal.</p>	<p>Follow-up discussion with reviewer noted that not likely a significant source, but further monitoring required. Monitoring addressed in s. 11 Follow-Up Program, item #1.</p>
<p>27. Further discussion required for collecting and evaluating information on discharge of contaminated mine waters.</p>	<p>As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.</p>
<p>28. Test-work to evaluate attenuation of zinc from Burnick Portal should be identified as mitigation measures.</p>	<p>Results of test-work provided in report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000. Follow-up monitoring addressed in s.11 Follow-Up Program item #1, s.9 Mitigation Measures, item #2.</p>
<p>29. Environmental assessment should not proceed until renewal application has been revised to include proposal for increased security.</p>	<p>See #22 above.</p>
<p>30. Screening report should specify requirement for establishing process to re-evaluate temporary closure on periodic basis.</p>	<p>Addressed in s. 9 Mitigation Measures, item #4.</p>
<p>31. Mean Annual Precip value in Cumulative Effects Assessment (630 mm) differs from value in DDRP (690).</p>	<p>This is a clarification and does not require further discussion or specific mitigation measures in the screening report.</p>

Bill Slater, Water Resources Division, DIAND, memo to Kevin McDonnell Re: Sa Dena Hes Mine - Renewal Application and Detailed Decommissioning and Reclamation Plan, 01 August 2000.

32. Two methods used in tables 5 and 6 of Cumulative Effects assessment not clear.

This is a clarification and does not require further discussion or specific mitigation measures in the screening report since as noted by the reviewer there was a “lack of effect (of) interaction between projects”.

Bill Slater, Water Resources Division, DIAND , memo to Kevin McDonnell Re: Geochemical Studies/Seepage Estimates, 20 December 2000.

1. Screening report identify mitigation and follow-up to ensure no adverse effects occur in long term from main pit portal discharge.

Discussed in s. 8.1.1 Water Quality, addressed in s.11 Follow-Up Program, item #1 and s.9 Mitigation Measures, item #2.

2. As risks associated with seepage discharges appear to be small, may be possible to consider approach that requires updated modelling through regulatory process with requirement established as mitigation measure.

Discussed in s. 8.1.1 Water Quality and seepage monitoring and follow-up addressed in s.11 Follow-Up Program, item #1.

Bill Slater, Water Resources Division, DIAND, e-mail to Derek Fraser Re: comments on Sa Dena Hes Screening Report Pre-draft, 19 April 2001.

Issue

Response

1. Section 3.1 last paragraph, noted that primary purpose of North Creek Dyke was to create a reservoir for water supply to the mill and that much of the upgrade work done on it in 1997 to address concerns raised by inspectors.

Changes made.

2. Section 5.1, concern that definition of minor modifications could be left to discretion of a professional engineer, without leaving discretion for inspectors. No problem with scope of screening report including minor modifications however, discretion to define minor modification to be left to responsible authority

Changes made, discretion to define what constitutes a minor modification rests with regulatory inspectors and the Responsible Authority.

Bill Slater, Water Resources Division, DIAND, e-mail to Derek Fraser Re: comments on Sa Dena Hes Screening Report Pre-draft, 19 April 2001.

Issue	Response
3. Section 7.5, description of seismic hazards should be clarified.	Some wording modified to clarify description of seismic hazards.
4. Section 8.1.1, seems to suggest that the two main issues concerning water quality are mobilization of metals by run-off and ARD; note that neutral metal leaching is ongoing at the site and results in high zinc concentrations at some locations.	Changes made to describe neutral mine drainage as a concern.
5. Section 8.1.1 Main Pit, first paragraph should include a general description of discharge quality to create the necessary link to the discussion that follows.	Noted discharge rate and zinc concentrations in text; referred readers to 2000 Geochemical Study (SRK Consulting 2000).
6. Section 8.1.1, second paragraph, note that monitoring program was initiated to evaluate the hypothesis rather than the conclusion as stated.	Changes made.
7. Noted that the discussion related to the Main Pit discharge suggests that contingency measures may need to be implemented if water quality deteriorates. However, only follow-up is proposed. This appears to be an adaptive management proposal and should be identified as mitigation. Without these, there is an uncertain effect that has not been adequately addressed in the screening report which may require a 20(1)(c) determination.	Section 9, item #2 ensures that contingency mitigation is implemented in the event that the follow-up program identifies this as necessary.

Bill Slater, Water Resources Division, DIAND, e-mail to Derek Fraser Re: comments on Sa Dena Hes Screening Report Pre-draft, 19 April 2001.

Issue	Response
<p>8. Section 8.1.1, Jewelbox Development, the screening report does not address the potential for discharge from the Jewelbox mine. While Cominco has suggested that there is no risk for major quantities of water being built up above the 1408 portal, this does not address concerns related to discharge and quality. Rather, it only addresses concerns related to ice plugs and blow-outs. There is no well supported evidence to conclude that the mine will not fill and discharge in the long term. In the absence of such information, the screening report should identify mitigation or conclude that a discharge is not likely to cause significant effects.</p>	<p>See s. 9 Mitigation Measures, item #10.</p> <p>Also s.11, item #1(i).</p>
<p>9. Section 9, Item 1, suggest re-wording to ensure that mitigation is implemented.</p>	<p>Changes to wording made to ensure mitigation from previous EARP and CEAA screenings is carried through to new permits.</p>
<p>10. Section 9, Item 2, The mitigation measure appears to allow the Board to consider effluent limits that would not provide receiving water protection in accordance with CCME Guidelines. It should be clear that the assessment has been conducted on the basis of CCME, and that further assessment may be necessary for any proposals (or licences) that would not meet CCME.</p>	<p>(#9.3 in revised screening report)</p> <p>Noted that components of the Sa Dena Hes Mine within the scope of this assessment should meet CCME guidelines in downstream receiving waters.</p>
<p>11. Section 9, Detailed Designs - There are several specific facilities for which the screening report identifies the need for submission of detailed designs at a later date. In order to ensure that facilities meet the design criteria and the intent of the ea, we need to see detailed designs for all proposed facilities. The mitigation should make this clear - not just specific facilities.</p>	<p>See s.9 Mitigation Measures, items #8 and 9.</p>

Bill Slater, Water Resources Division, DIAND, e-mail to Derek Fraser Re: comments on Sa Dena Hes Screening Report Pre-draft, 19 April 2001.

Issue	Response
12. Section 9, Item 8, the second bullet should provide clarification regarding locations, etc.	Changes made to clarify locations.
13. Section 9, Item 8, it is unclear what is intended by the third bullet. Is this intended to ensure submission of design analyses including stability analysis.	Language clarified, require submission of design analysis including stability analysis.
14. Section 9, Item 8, the sixth and seventh bullets should refer to detailed designs (not plans).	Suggested changes made.
15. Section 9, Item 8, it is unclear why use of updated data for operational purposes would be included in an updated DDRP as proposed in the seventh (sic) bullet (seventeenth bullet)	Changes made, reference to operational purposes removed.
16. Section 9, In accordance with my August 01 2000 comments on the decommissioning plan, the mitigation section should include a requirement that the security for the site meet some general principles...	Refer to Section 9, Mitigation Measures, items #1(xii) and #6.
17. Section 11, item 1(i), the follow-up program for the Main portal discharge should include requirements for monitoring of the receiving environment adjacent to the Main Portal (ie. Camp Creek d/s of the Main portal) so that effects of a discharge can be identified quickly.	Changes made to include monitoring of receiving environment.
18. Section 11 Item 1(v), this item is a contingency measure that should be identified as contingent mitigation, not as follow-up.	See section 9 Mitigation Measures, item #2.
19. Section 11 - The proposed follow-up programs all identify the activity as submission of a plan. The follow-up is actually the monitoring that will be done as a result of the plan. This distinction should be clarified.	See section 9 Mitigation Measures, item #2.

Bill Slater, Water Resources, DIAND, letter to Derek Fraser Re: 'Sa Dena Hes Draft Screening Report, April 25, 2001' (letter dated 18 May 2001)

Issue	Response
<p>1. Noted that final paragraph of section 2.5 notes that a Quartz Mine Production Licence has been applied for. Will this be circulated for review, if not, why?</p>	<p>QMPL scoped into this screening, will be submitted for review on completion of final screening report.</p>
<p>2. Noted in section 3.1 final paragraph related to the North Creek Dyke does not accurately reflect the history of this structure.</p>	<p>Paragraph revised.</p>
<p>3. Section 7.5 Potential Environmental Hazard - unclear what is meant by statement "risk levels used in the design of buildings" and risk of seismic events in the area.</p>	<p>Quoted statement removed.</p>
<p>4. Section 8.1.1 - Main Pit The first paragraph should include a general description of discharge quality to create the necessary link to the discussion that follows.</p> <p>Concerned with the fact that the discussion on the main pit discharge suggests that there are contingency measures that may need to be implemented if water quality deteriorates, yet only follow up monitoring is proposed. This appears to be an adaptive management proposal and should be identified as mitigation. What are the contingency measures proposed? Have they been assessed as part of this assessment or will they require additional assessment once proposed? Without the identification and evaluation of the contingency measures, there is an uncertain effect that has not been adequately addressed in the screening report which would require a 20(1)c determination</p>	<p>Sentence added after the fourth sentence: "the portal was observed to discharge at a rate of 15-120 l/minute during the summer, with zinc concentrations ranging from 40 to 60 mg/L."</p> <p>See mitigation measure #2, section 9.</p> <p>November 2000 Geochemical Report (SRK, 2000) concluded that attenuation of the zinc occurred as a result of this discharge contacting limestone and mixing with alkaline surface water prior to reaching Camp Creek. This information adequate to reach CEAA 20(1)a determination, yet follow up is proposed to verify the accuracy of the environmental assessment.</p> <p>No new or unproven mitigation would be required to mitigate the effects of the Main Pit portal discharge, yet none were assessed as part of this screening because none were deemed necessary at the time of this review.</p>

Bill Slater, Water Resources, DIAND, letter to Derek Fraser Re: 'Sa Dena Hes Draft Screening Report, April 25, 2001' (letter dated 18 May 2001)

Issue	Response
<p>5. Section 8.1.1 Jewelbox Development - Concern with water build up above 1408 portal, no evidence that the mine will not fill with water and discharge in the long term.</p>	<p>Water level in 1408 portal to be monitored as part of follow up program (s.11, item #1(i)).</p>
<p>6. Section 9, Item 8 - The draft screening report identifies several specific facilities for which designs must be provided as part of an updated DDRP; require detailed designs for all proposed structures and facilities; can only confirm they will perform as proposed by reviewing these designs.</p>	<p>See s. 9 Mitigation Measures, items #8 and 9. Detailed designs required prior to DDRP implementation, not with updated DDRP.</p>
<p>7. Section 9, Item 8 - The final three items relating to the landfill require additional clarification; are we seeking design details? The last item only requires that the updated DDRP plan include 'need for runoff diversion channels', is only the need to be addressed or should justification for the decision and design details be included?</p>	<p>See mitigation measure #7, section 9, Quartz Mine Production Licence to specify landfill standards to be adopted.</p>

Bill Slater, Water Resources, DIAND, letter to Derek Fraser Re: 'Sa Dena Hes Draft Screening Report, April 25, 2001' (letter dated 18 May 2001)

Issue	Response
<p>8. Section 9, Item 12 - Noted that follow up is not contingency mitigation. Contingency measures would be used if the follow up program identified that primary mitigation had been ineffective. If DIAND is uncertain about some effects or mitigation, then we must be certain that there are proven and effective contingency mitigation measures that can be implemented if a problem arises. We must put in place an effective monitoring program to identify the problem, and understand the conditions under which the contingency measures would be undertaken. The screening report should identify (1) a proven, practical and feasible contingency measure (specific) (2) an effective monitoring program to identify the onset of a potential problem, and (3) specific conditions under which the contingency measure would be implemented (triggers).</p>	<p>Section 11 identifies a monitoring program.</p> <p>See s. 9 Mitigation Measures, item #2, which states that contingency mitigation would be required to rectify specific situations where water discharges are found to be contributing to zinc loadings exceeding licence standards in receiving waters.</p> <p>No new or unproven mitigation measures would be required to mitigate the effects of the water discharges that are subject to the follow up program.</p>
<p>9. Section 9 - The mitigation requirements for security bonding should be brought forward from the original EARPGO Screening Report. Where necessary, the mitigation requirements relating to security should be updated to reflect the current legislative and policy framework surrounding security.</p>	<p>See s.9 Mitigation Measures, item #6.</p>
<p>10. Issue/Response Table, p.61, Item 13 - Note that Cominco's distribution of the DDRP for comment has no direct relationship to review for environmental assessment purposes.</p>	<p>Statement referring to regulatory review of DDRP removed.</p>

Bill Slater, Water Resources, DIAND, letter to Derek Fraser Re: 'Sa Dena Hes Draft Screening Report, April 25, 2001' (letter dated 18 May 2001)

Issue	Response
11. Issue/Response Table, p.64, Item 34 - Concern with storage of reagents and dangerous chemicals on site, noted that regulatory process is reactive, brought forward concern at environmental assessment stage to be pro-active, Cominco should reevaluate its decision to continue storing dangerous chemicals and reagents on site.	Chemical and reagent storage to be regulated under a Quartz Mine Production Licence, conditions under which long term storage is acceptable to be a permit condition.
12. Issue/Response Table p. 70, Item 31 - The response suggests that the issue has been addressed because it is only clarification. It has not been clarified for me. Which value is correct? Why are two different values used?	Assume value in later document (Cumulative Effects Assessment, June 2000) is correct, will follow up with proponent.

Benoit Godin, Environmental Protection, Environment Canada, Re: Draft Scope of Environmental Assessment Sa Dena Hes - Water Licence Renewal Application QZ99-045, 20 July 2000.

Issue	Response
1. Information and mitigation from Main Pit Portal discharge insufficient and further information required.	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.
2. Water Quality and flow data for seep below Jewel Box dump.	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.

Benoit Godin, Environmental Protection, Environment Canada, Re: Draft Scope of Environmental Assessment Sa Dena Hes - Water Licence Renewal Application QZ99-045, 20 July 2000.

Issue	Response
3. Information from Cominco's work on elevated metals content in pore water drainage necessary.	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.
4. How would licence incorporate review of plan every 5 years or within 2 years of operations?	How the Board incorporates this review into the licence is up to the Board.
5. How would DIAND meet their CEAA obligation towards a new proposal for decommissioning the mine?	See s. 5 Scope of Assessment regarding how DIAND has scoped the project and is meeting it's CEAA obligations, ie: major modifications to Feb. 2000 DDRP would require further assessment.
6. What are the evidence of the short duration of the flow from this portal?	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.
7. What is the nature of the further investigation referred in the document.	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000.
8. If the spillway can easily accommodate the PMF of 14.8 m ³ /sec without overtopping, why not call the spillway design for PMF rather than 1000 year design?	This is a clarification and does not require further discussion or specific mitigation measures in the screening report.

Benoit Godin, Environmental Protection, Environment Canada, Re: Draft Scope of Environmental Assessment Sa Dena Hes - Water Licence Renewal Application QZ99-045, 20 July 2000.

Issue	Response
<p>9. Testwork to be used for the confirmation of geochemical predictions regarding the tailings stability are to begin in summer 2000. What is the duration of the testwork.</p>	<p>As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000. See also ongoing monitoring per s. 11 Follow-up Program and as committed to in DDRP.</p>
<p>10. Company should keep in mind regulations under the Fisheries Act (MMLER) and the proposed amendment.</p>	<p>Copy of comments sent to proponent. This is a clarification and does not require further discussion or specific mitigation measures in the screening report. This is also a regulatory issue to be addressed by the appropriate regulatory body.</p>
<p>11. Need to await investigations to clarify nature of flow at main zone pit.</p>	<p>As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000. See also ongoing monitoring per s. 11 Follow-up Program and as committed to in DDRP.</p>
<p>12. The effect of release control mechanisms (solubility or otherwise kinetic) for zinc and cadmium need to be confirmed from the investigations.</p>	<p>As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000. See also ongoing monitoring per s.11 Follow-up Program and as committed to in DDRP.</p>

Benoit Godin, Environmental Protection, Environment Canada, Re: Draft Scope of Environmental Assessment Sa Dena Hes - Water Licence Renewal Application QZ99-045, 20 July 2000.

Issue	Response
13. Input data resulting from investigations need to be updated in water quality model.	As noted in s. 5.3 Scope of Factors, teleconference arranged to facilitate further discussion for collecting and evaluating information. Culminated in submission of report: 2000 Geochemical Studies Sa Dena Hes mine, November, 2000. See also ongoing monitoring per s.11 Follow-up Program.

Benoit Godin, Environmental Protection, Environment Canada, Re: 2000 Geochemical Studies, Sa Dena Hes Mine and Seepage Estimates for Post Closure Conditions of the Tailings Management Facility (TMF) at the Sa Dena Hes Mine, 20 December 2000.

Issue	Response
1. Monitoring of pore water chemistry should continue.	Follow-up monitoring addressed in s.11 Follow-Up Program
2. More empirical information be collected to verify the impact of the Main Pit discharges on Camp Creek or a contingency plan be put forward for the potential effect.	Follow-up monitoring addressed in s.11 Follow-Up Program. Need for contingency planning also identified, see s.9 Mitigation Measures, item #2.
3. Seasonal effect of release of metals and if there is a noticeable influence upon downgradient/downstream receiving waters from overland flow.	Follow-up monitoring addressed in s.11 Follow-Up Program.
4. Details of the potential mass loading of available zinc contributing to the drainage loading and the potential mass of attenuating soils, as well as the most probably attenuating mechanisms which are at play.	Evaluation of results of follow-up monitoring to be done in regulatory process as described in s.11 Follow-Up Program.
5. Clarification of smithsonite's presence in unoxidized tailings	Copy of comments sent to proponent. This is a clarification and does not require further discussion or specific mitigation measures in the screening report

Benoit Godin, Environmental Protection, Environment Canada, Re: 2000 Geochemical Studies, Sa Dena Hes Mine and Seepage Estimates for Post Closure Conditions of the Tailings Management Facility (TMF) at the Sa Dena Hes Mine, 20 December 2000.

Issue	Response
6. Proponent to survey or conduct elevation survey of monitoring points to determine flow patterns and piezometric surface.	Follow-up work to confirm flow patterns and piezometric surface addressed in s. 11 Follow-Up Program.
7. Possibility that situation at DP7 reflective of how tailings will react as pond recedes.	Question to be addressed during regulatory process via ongoing monitoring and evaluation of results, see s. 11 Follow-Up Program.
8. Questions regarding possible influences to sampling of tailings pore water.	See s.11 Follow-Up Program, item #2.
9. Questions regarding sampling protocol.	Clarification of sampling protocol for previous sampling events can be done via a phone call to the proponent. Information on sampling protocol for future sampling events to be provided per s. 11 Follow-Up Program (Item 1. ii.).
10. Discuss relative stabilities of zinc carbonates and of sphalerite in tailings pore water, and environmental conditions under which each is most stable, and hence conditions necessary to be maintained at the site to promote optimal stability for each of the minerals active in metals release.	Addressed in s.11 Follow-Up Program, item # 2.
11. Mineralogical differences between DP-7 and other drive points in tailings facility.	Addressed in s.11 Follow-Up Program, item # 2.
12. Append full chemistry results for the sampling program containing each of the sampling analyses.	Cominco requested to provide results.
13. What is role of other attenuation processes along flow path for main zone drainage to Camp Creek, are they of long-term consequence?	Addressed in s.11 Follow-Up Program, item # 2.
14. Evidence to support assertion that secondary minerals necessary for equilibrium of Camp Creek system being created at the site and the kinetics of formation and dissolution.	Addressed in s.11 Follow-Up Program, item # 2.

Benoit Godin, Environmental Protection, Environment Canada, Re: 2000 Geochemical Studies, Sa Dena Hes Mine and Seepage Estimates for Post Closure Conditions of the Tailings Management Facility (TMF) at the Sa Dena Hes Mine, 20 December 2000.

Issue	Response
15. Presence of carbonates or precipitates in Camp Creek.	Addressed in s.11 Follow-Up Program, item # 2.

Benoit Godin, Environmental Protection, Environment Canada, letter to Kevin McDonnell, comments on Screening Report pre-Draft, 12 April 2001.

Issue	Response
1. Noted recommendation for Main Pit Portal discharges considered as a follow-up item, no trigger for action item.	See s. 9 Mitigation Measures, item #2.
2. Section 9, subsection 4 describes the commitments to be made by the proponent in order to maintain the temporary closure status referred to in subsection #2; we think that the onus should be on the company to convince the Board that the temporary closure is necessary after 4 years. Therefore the mitigation measure should read as such : “Closure is deemed to be permanent after 4 years of temporary closure. The company must implement the DDRP unless the regulatory authority can be convinced otherwise.”	See s. 9 Mitigation Measures, item #4. Onus on company to justify status of temporary closure every 4 years.
3. Section 9 subsection 5 indicates a review of the DDRP every 5 years; this pre-supposes the status of temporary closure every 4 years. Suggest review of DDRP be every 4 years.	Changes made, review of DDRP every 4 years.

Hugh Copland, Mineral Resources, DIAND, Memo to Kevin McDonnell Re: Sa Dena Hes Decommissioning and Reclamation Plan, 25 July 2000.

Issue	Response
1. Review of within first two years of four year mine life adequate.	Addressed in s. 9 Mitigation Measures, item # 5.

Hugh Copland, Mineral Resources, DIAND, Memo to Kevin McDonnell Re: Sa Dena Hes Decommissioning and Reclamation Plan, 25 July 2000.

Issue	Response
2. Decommissioning plan be revised once mining commences and if Burnick mine plan changes to new configuration.	Addressed in s. 9 Mitigation Measures, item # 9.
3. Encourage removal of scrap metal for salvage	Cominco has committed in the DDRP to salvage and remove materials with a commercial value and where it is not economically viable to remove structures from the site, they will be demolished and buried (See s.3.1 Definition of the Project).
4. Scrap metal to be landfilled shall be clean of any hazardous materials	Addressed in s .9 Mitigation Measures, item # 7.
5. Documentation and reporting of quantities of steel landfilled.	This issue is not listed as a mitigation measure in this screening report as it is a regulatory reporting requirement. Cominco has applied for a Quartz Mine Production licence and this issue can be a term and condition of that licence.
6. Combine salvage scrap metal site south of mill with existing landfill.	The environmental assessment is unable to require proponents to conduct retro-active actions such as recommended here. These actions are regulatory and can be issued as a term and condition of the Quartz Mine Production Licence.
7. Location and size of any new landfill should be discussed with Mineral Resources - conditions regarding solid waste disposal will be included in quartz mining licence.	The environmental assessment is unable to require and enforce proponents to take such actions as this. As noted in reviewers comments, requirements to consult and take actions regarding landfills are regulatory issues and can be addressed through the Quartz Mine Production Licence.
8. To assist revegetation uncompacted layer of till should be placed on compacted till (instead to two layers of compacted till).	Addressed in s. 9 Mitigation Measures, item # 7, landfill standards to be QMPL condition.
9. Mineral Resources to be kept informed of results of revegetation plots.	Addressed in s. 9 Mitigation Measures, item # 7.

Hugh Copland, Mineral Resources, DIAND, Memo to Kevin McDonnell Re: Sa Dena Hes Decommissioning and Reclamation Plan, 25 July 2000.

Issue	Response
10. Not known what aspects of closure certificate of closure will deal with.	An information item and does not require further discussion or specific mitigation measures in the screening report.
11. Ore stockpiles - question as to what may become of any low grade ore stockpiles that have not been run through the mill facility upon mine closure.	Addressed in s. 9 Mitigation Measures, item # 9.
12. Question whether any underground workings close to surface, if so, potential for subsidence and need for decommissioning measures.	Addressed in s. 9 Mitigation Measures, item # 9.
13. Question regarding how will residual contaminants and hazardous wastes in mine site building material be characterized, disposed of as well as spilt ore material or concentrate.	Addressed in s. 9 Mitigation Measures, item # 9.

Hugh Copland, Mineral Resources, DIAND, memo to Kevin McDonnell/Derek Fraser, Comments on pre-Draft Screening Report, 06 April 2001.

Issue	Response
1. Section 2, up until 2.1 Introduction appears to repeat table of contents.	CSR Format.
2. Section 2.5, Regulatory, Policy and Planning Context, why Cumulative Effects Assessment only asked for now?	Original screening done under EARP, CEA not considered under EARP, previous CEAA screenings did consider cumulative effects, deemed them insignificant.
3. Section 3.1 Definition of Project, suggested changes to mine reserves from Cominco's Annual Reports.	Changes made.
4. Section 7.1, General Environmental Context, third paragraph first sentence, change wording to "Surficial Deposits..."	Changes made.

Hugh Copland, Mineral Resources, DIAND, memo to Kevin McDonnell/Derek Fraser, Comments on pre-Draft Screening Report, 06 April 2001.

Issue	Response
5. Mitigation Measures, items 4,5: timelines for DDRP review and temporary closure status should match.	Changes made.
6. Follow-up Program, Item #2, is information to be submitted to the Board, should this be stated in the first sentence of that item as it is for item #1 or does the reference in the rationale that it'll be submitted at the end of the next sampling season refer to all this info?	Clearer wording used in item #2, Follow-up Program.

Lloyd Roberts, LFN, Comments made during meeting with DIAND F.N. Liasion Resource Officer Kelly Johnston, 27 June 2000.

Issue	Response
1. Concern raised over effect to water bodies in area if operations were to happen	On basis of water quality modelling demonstrating no effects to date, water licence regulating effluent treatment and discharge quality, and other measures discussed in s. 8.1.1 Water Quality, s. 9 Mitigation Measures, and s. 11 Follow-Up Program, it was determined by DIAND that there are no potential significant effects to water quality.
2. Noted overlap with RRDC and Kaska Dena Nation.	See s. 5.3 Scope of Factors - consultation with RRDC also done.
3. Would like to participate in site visit	LFN representative participated in site visit.
4. Have a meeting with Chief and Council.	Environment Directorate made number of attempts to set-up meeting but due to lack of response it was assumed no further concerns.

Lloyd Roberts, LFN, Comments made during meeting with DIAND F.N. Liasion Resource Officer Kelly Johnston, 27 June 2000.

Issue	Response
5. Identified apparent outstanding issue with heritage and archaeological assessment	Environment Directorate tried to clarify issue with LFN, but was unable to get response from LFN. On basis of heritage work done in support of previous assessment; previous mitigation measures identified/implemented; and no evidence of new potential significant impacts, DIAND has determined that potential significant environmental effects insignificant with mitigation.
6. Asked about money for LFN to do assessment.	Environment Directorate responded not able to fund LFN to do assessment.

Lloyd Roberts, LFN, Letter to Kevin McDonnell, 17 August 2000.

Issue	Response
1. Consultation with LFN does not mean consultation with Kaska Dena. Ross River Dena Council have overlap territories and consultation with LFN does not mean consultation with RRDC	Environment Directorate consulted with other Kaska organizations including Kaska Dena Council, Kaska Tribal Council, Lower Post First Nation, Ross River Dena Council.

Lloyd Roberts, LFN, Letter to Kevin McDonnell, 17 August 2000.	
Issue	Response
<p>2. Asset sale agreement between Expatriate Resources Ltd. and Cominco includes transfer of Sa Dena Hes assets therefore no certainty of Expatriate's willingness to conduct mitigation.as LFN and other Kaska First Nations do not have agreement with Expatriate, more information is required from Expatriate in relation to current use of lands and resources for traditional purposes by aboriginal persons; and</p> <p>Until full endorsement by Expatriate of Cominco's past commitments, demonstration by Expatriate to meet project's financial requirements, willingness to comply with project's terms and conditions, and negotiation of socio-economic agreement with Kaska, LFN can't provide it's comments in relation to scope of the environmental assessment.</p>	<p>LFN advised by Cominco that asset sale agreement between Cominco and Expatriate does not include Sa Dena Hes.</p>

Lloyd Roberts, LFN Facsimile to Kevin McDonnell, 12 September 2000.	
Issue	Response
<p>1. Cominco/LFN socio-economic agreement must be reviewed by LFN to ensure it meets elements described in draft Scoping Document. Scope of assessment should include review of this document and confirmation by parties that elements have been met</p>	<p>Environment Directorate advises that socio-economic agreement private agreement between Cominco and LFN, DIAND not privy to it, any concerns with socio-economic agreement should be resolved between Cominco and LFN. Cominco requests LFN advise them of any concerns with socio-economic participation agreement</p>
<p>2. Fencing or gates be set up at all open portals or roadways</p>	<p>Cominco confirms that portals have been fenced, also Cominco maintains permanent caretaker who controls main gate to property on 24 hr per day basis</p>

Lloyd Roberts, LFN Facsimile to Kevin McDonnell, 12 September 2000.	
Issue	Response
3. LFN would like to commence own testing of tailings, South dam, reclaim dam, would like funding to complete these tasks	Cominco retains consultant to do geotechnical inspections, mine caretaker to do water tests. This information available to LFN for review.
4. Fence tailings pond in and winter netting erected to address windblown tailings	Cominco placed windblown tailings back into pond, covered tailings, reviewed actions with LFN.
5. Action on leaking 45 gallon drums and 5 gallon oil pails	Cominco cleaned up leaking barrels and oil pails and reviewed actions with LFN.

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001	
Issue	Response
1. p. 13 statement “due to the extensive baseline information collected, previous assessment work done, present standby mode of the facility, the recent submission of a detailed decommissioning plan, and cumulative effects report.....no further information was required from the proponent in order to complete the screening” - Cominco agreed with this statement.	Quoted statement was the RA’s conclusion reached during the development of the draft <i>Scope of Environmental Assessment Document, Sa Dena Hes Mine</i> (August 2000). However, subsequent distribution of this document brought forward several concerns which led to the development of the November 2000 <i>Geochemical Studies, Sa Dena Hes Mine</i> (SRK, 2000).
2. Executive Summary and Introduction should identify that this screening also applies to the Quartz Mine Production Licence, not only Water Licence renewal	Executive Summary and Introduction have been amended to note the inclusion of the Quartz Mine Production Licence Application.

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001

Issue	Response
<p>3. Noted reference to project as ‘Low Risk’ which Cominco agrees with.</p>	<p>Section 7.5 refers to the effects of environmental events on the project, seismic events namely.</p> <p>Section 8.1.1, last paragraph under reference to Burnick Portal; expert technical reviewers noted that the risk presented by the Burnick Portal discharge as low risk yet it is the Responsible Authority’s position that a follow-up monitoring program is warranted.</p> <p>Section 8.1.1, last paragraph on p. 27; expert technical reviewers noted that the effects and likelihood of zinc concentrations in tailings pore water may pose a low risk, but that further follow-up monitoring is required.</p>
<p>4. In the interests of avoiding future duplication, overlap or conflict of responsibilities, it would be appropriate for the RA to recommend the destination for each and every condition arising from the environmental assessment.</p>	<p>The screening report has been revised to clarify the division of mitigation (s. 9) between the water and terrestrial issues.</p>
<p>5. Require clarification of references to Cominco Ltd. as acting on behalf of the Sa Dena Hes Operating Corporation.</p>	<p>Clarification made, p.3, paragraph 2.</p>
<p>6. Section 2.2, Purpose of the Project - Purpose of project is “mining and processing of minerals”.</p>	<p>Suggested change made.</p>
<p>7. Section 3.1, Definition of the Project - The third paragraph, p. 7 should include “following further operation” after “second TMF closure scenario”.</p>	<p>Suggested change made.</p>

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001

Issue	Response
<p>8. Section 5.1 Scope of the Project - It is Cominco's belief that a dump design modification or a new dump would not represent a change in the scope of the project.</p>	<p>Waste dumps will be regulated under a Quartz Mine Production Licence; it is the discretion of DIAND's Mineral Resources Directorate to determine whether a dump modification will trigger further environmental assessment. A new dump would require an amendment to the Quartz Mine Production Licence which would trigger further assessment.</p>
<p>9. Section 5.3 Scope of the Factors, third paragraph page 14 - Cominco is of the opinion that there are instances where technical reviewers (for government) have, without substantive explanations, rejected the conclusions tendered by expert professionals working on behalf of the Sa Dena Hes Operating Corporation. This has implications for follow up requirements. In the absence of reasoned explanation or evidence for conclusion, the proponent is unable to determine how its own work is not fully adequate or what further work is justified to achieve consensus. Without that understanding, the proponent must conclude that further investigative work is not justified.</p>	<p>It is the Responsible Authority's position that technical issues were resolved satisfactorily to justify a s.20(1)a determination pursuant to the <i>Canadian Environmental Assessment Act</i> (CEAA). In no way does reaching this determination preclude the need for a follow-up program, or for that matter, any other monitoring that will be a requirement of a renewed Water Licence or Quartz Mine Production Licence.</p>
<p>10. Section 8.1 Project Effects on Environmental Component page 24 - The discussion of the Main Pit indicates that portal drainage was not accounted for in water modelling included in the DDRP, contrary to diagram 4-4 and definition of MH-4 in the referred document, and requires clarification.</p>	<p>Discharge emanating from the Main Pit portal only discovered in June, 1999. 4.4 of DDRP accounts for Main zone and dump discharges but no specific reference is made to the Main Pit portal discharge and whether or not it has been factored into the water modelling.</p>

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001

Issue	Response
<p>11. Section 8.3.4 - We believe that replacement of geotextile by sand and gravel is unwarranted since the alternate medium would not prevent spillway failure. We have observed geotextile in widespread use for similar applications adjacent to Yukon highways.</p>	<p>Section 9 Mitigation # 8, Requires the submission of detailed designs for the construction of permanent spillways for closure be submitted to the YTWB for review and approval prior to the implementation of the DDRP. It will be incumbent on the regulatory body to ensure that the designs provided will meet the objectives as outlined in the approved DDRP.</p>
<p>12. Section 9.3 - The terms of 9.3 are specific to conditions of temporary closure and should be so stated.</p>	<p>9.3 has been clarified to reflect the fact that the terms listed are for temporary closure status.</p>
<p>13. Section 9.4 - Cominco believes that this recommendation in the draft screening report introduces an unacceptable degree of uncertainty and would create, in essence, a four year licence.</p>	<p>9.4 has been removed. 9.3 has been expanded by the addition of a request for documentation to substantiate that the terms listed are adhered to, but that if they are not substantially met then the temporary closure status of the site should be deemed permanent and the DDRP must be implemented; this documentation request is to coincide with the submission of an updated DDRP every 4 years while the mine is in temporary closure. Our choice of words is nearly identical to what the proponent committed to in section 2.4 of the DDRP. We believe that this approach maintains the onus on the proponent to demonstrate active maintenance of the site, yet provides for more certainty to the proponent than was outlined in 9.4 of the 25 April draft screening report.</p>
<p>14. Section 9.5 - We believe that the periodic review of the DDRP should be confined to those items and conditions that have undergone significant change or for which application of new technologies and procedures is reasonable and realistic. This would be consistent with the standards employed by the Responsible Authority in the present assessment.</p>	<p>Section 9.5 has been clarified to note that the purpose of the update is to "...incorporate any relevant additional information that has been acquired through site monitoring into a revised DDRP to best accomplish the site decommissioning and reclamation goals described in the document dated February, 2000."</p>

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001

Issue	Response
<p>15. Section 9.6 - We believe that this condition is onerous, excessive and arbitrary since it requires submissions to and approvals by two regulatory authorities and fails to define the standards to be met. As suggested by the Environment Directorate, it should be clarified in written form that any such review is not intended to trigger a further CEAA assessment. An explicit program of review, such as that which was stipulated in Sections 66 and 67 of the current water licence , should be similarly stipulated.</p>	<p>We have clarified the distinction between terrestrial based activities to be regulated under a Quartz Mine Production Licence and activities that are regulated under a Water Licence. Waste rock dumps are to be regulated by the former. Further clarified is the requirement that detailed designs for waste rock dump reclamation plans be submitted to the Chief of Mining and Land Use for review and approval prior to DDRP implementation.</p> <p>The Responsible Authority remains unequivocal about the fact that the scope of this CEAA screening includes the decommissioning of the project site, including updates and minor revisions to the February, 2000 DDRP; this is clearly stated in section 5.1 Scope of the Project. Only major revisions to the February, 2000 DDRP would require re-assessment.</p> <p>Programs of review such as section 67 of the current Water Licence reflect administrative processes of regulatory bodies and are beyond the control of the Environment Directorate.</p>
<p>16. Section 9.8 - While we are proposing periodic review of the DDRP be related to exceptions, we believe it is appropriate to submit an updated DDRP prior to final closure. However, we question some of the items identified in the Draft Screening Report for inclusion in the DDRP. These are cases which are already covered by regulation, or have already been submitted in the DDRP, or because details may not become available until final closure.</p>	<p>We have clarified the requirements of the DDRP update submissions to reflect changes in best applicable technology and to incorporate additional information acquired as a result of monitoring programs. Much of the information that was originally being requested in an updated DDRP in four years is instead being requested prior to DDRP implementation.</p>

David McMurdo, Cominco Ltd., letter to Ian Church, Re: Draft Screening Report, Sa Dena Hes Mine, 24 May 2001

Issue	Response
<p>17. Section 10 Determination of Significance-</p> <p>While we recognize the technical advisor has raised some uncertainties as reported on p. 41 and in the appendices, we request that those uncertainties which are not substantial be further assessed in the context of the Sa Dena Hes property to determine if they are reasonable, or unfounded. The uncertainties raised which are largely matters of opinion and not fact have significant impact on proposed licence conditions and follow up program.</p>	<p>The Responsible Authority has duly considered the input of all technical experts involved in the screening and subsequently reached a s.20(1)a determination pursuant to CEAA. We are of the opinion that uncertainties have been adequately addressed to allow the project to proceed yet a follow-up program is warranted to verify the accuracy of the information that led to the s. 20(1)a determination; this is consistent with the provisions of CEAA.</p>
<p>18. Section 11.1 Follow up Programs -</p> <p>Note that in the interests of safety, on going access to all parts of the dormant property not always possible and some aqueous discharges freeze in winter. Long term monitoring has to be consistent with final closure which includes reclamation of access roads.</p>	<p>RA recognizes seasonal constraints on access and the limitations that this imposes on long term monitoring. Expect monitoring programs will be regulated with a reasonable consideration of such constraints. Mitigation of the main access road (s.9, #10) requires that permanent decommissioning occur only after consideration of any outstanding issues in relation to site stability, as Cominco Ltd. committed to in the DDRP.</p>
<p>19. Section 11.2 Follow up Programs -</p> <p>Question the usefulness of further interpretation of data and also the reasonableness and appropriateness of in-depth investigations of a scientific research nature.</p> <p>“Next sampling season” should be qualified.</p>	<p>Have clarified the provisions of the follow up program (items 11.1 and 11.2).</p> <p>11.2 follow-up requirements rationale has been clarified to define the temporal scope of the follow-up work as confirming that the processes as defined in the Nov. 2000 Geochemical Studies (SRK, 2000) will be maintained.</p> <p>Next sampling season subject to this follow up program is 2002; 2001 season is regulated under the existing Water Licence.</p>

