

**Volume 10**

**Supplementary Information**

## Foreword

### *i.* Project Fact Sheet

**Project Name** High Lake Project

**Project** The High Lake Project consists of:

**Components**

- An mine site and processing facility at High Lake located approximately at, 67° 22' 46" N Latitude, 110° 50' 39" W Longitude
- A dock facility at Grays Bay, on the Coronation Gulf coast located approximately at 67° 48' 19" N Latitude, 110° 52' 9" W Longitude
- A 53 km all-season road between the mine site and the dock
- A 2,000 m gravel airstrip at Sand Lake located approximately at 67° 28' 41" N Latitude, 110° 48' 58" W Longitude, about 12 km north of the High Lake mine site

**Location**

The High Lake Project is located in the Kitikmeot Region of Nunavut. The mine site is located approximately 175 km southeast of Kugluktuk. The Grays Bay dock is located on the Coronation Gulf, about 180 km east of Kugluktuk. The Sand Lake airstrip is located about 12 km north of the mine site.

**Property**

The original High Lake deposits, consisting of the AB and D Zones were discovered in the mid 1950s through airborne reconnaissance and prospecting by Kennarctic Explorations. A second round of exploration began in 1991 with Aber Resources operating the property in conjunction with Kennecott Canada. Collectively this work defined two near surface zones of mineralization and led to a drill-indicated resource of 5.3 million tonnes averaging 4.05% copper, 2.36% zinc, 1.76 grams per tonne of gold and 31.73 grams per tonne of silver. Wolfden acquired the property in 2000 and began work in 2001. This work identified West Zone approximately 1.5 km west of the AB and D Zones. The discovery of the West Zone has added significantly to the historical resource.

**Resources**

Wolfden will mine copper, zinc, gold and silver. The resource quantity used in the mine planning and design is 18.2 Mt grading 2.97% copper, 3.33% zinc, 0.87 grams per tonne gold and 61.7 grams per tonne silver. Total primary metal production is expected to be approximately 746 million pounds of copper, 886 million pounds of zinc, 407,000 ounces of gold and 23 million ounces of silver.

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- Mining** The AB and D Zones will be initially mined by open pit methods followed by underground mining. The West Zone will be mined entirely underground. Mining will begin with the AB Zone open pit (2010-2012) followed by D Zone open pit (2012-2013). The AB Zone underground mining will take place from 2013 to 2014 and the D Zone underground 2014-2019. Underground mining in the West Zone will take place from 2012 to 2023.
- Tailings** An estimated 16.4 Mt of tailings will be produced during the life of the Project. Tailings will be disposed in the High Lake impoundment structure, the AB Zone and D Zone pits and underground mines. The waste rock will be disposed in the AB Zone waste rock pile, the D Zone waste rock pile and used as backfill in the West Zone underground mine.
- Process** Ore will be concentrated at the processing facility located at the High Lake mine site. The concentration process will use conventional flotation circuits to separate the zinc, copper gold and silver minerals from the non-economic minerals. Separate copper and zinc concentrate will be produced. Gold and silver are expected to report mostly to the copper concentrates and will be recovered at an off-site smelter. The mill has been designed to sustain a nominal average production rate of 4,000 tonnes per day.
- Mine Life** The mine life is estimated to be about 14 years. Progressive reclamation will take place over the life of the mine. The closure and reclamation phase is anticipated to begin in 2024 and to last about two years.
- Access** To provide access between the Grays Bay dock site and the High Lake mine site, a 49 km winter road will be used during construction and a 53 km all-season road will be used during operation. Ocean-going vessels will be used to bring in materials and supply during all phases of the Project as well as to transport concentrate to markets during operation. A gravel airstrip at Sand Lake will be used during all Project phases.
- Personnel** The peak number of personnel during construction is estimated at 440 people. The peak personnel during operation is estimated at 335 people. All personnel will travel to and from the mine site by aircraft using the Sand Lake airstrip.

**High Lake Oyagakhiokvik Onipkangit**

**Oyakhiokvik Atia** High Lake Oyakhiokvik

**Oyakhiokvik Kanogitoit** Ona High Lake Oyakhiokvik pikaktok okoninga:

- Tamna oyagakhiokvikhak oyagakhokvik ovalo pilokyiligivik ovani High Lake nunamit ittok ovani, 67° 22' 46" N Latitude, 110° 50' 39" W Longitude
- Ona umiakakvikhak ovani Grays Bay, tahmani taggiomiitok nunap elangani 67° 48' 19" N Latitude, 110° 52' 9" W Longitude
- Ona 53 km okiok-aoyak apkotikakniaktok oyagakhiokvikmit umiakakvikmot taggiomi
- Ona 2,000 m oyagaliakmik milvikakiaktok ovani Sand Lake nunam8it ovani 67° 28' 41" N Latitude, 110° 48' 58" W Longitude, ongahiktigiok 12 km tonongani Lake oyagakhiokvikmi

**Homeetok** Ona High Lake Oyakhiokvik nuna ovani Kitikmeot Nunaitni Nunavutmi. Ona oyagakhiokvik hamanitok 175 km hivogaani Kugluktup. Ona Grays Bay umiakakvikhak ovani ittok Coronation Gulf, ongahiktigiok 180 km kivataani Kugluktup. Ona Sand Lake milvikhak ovaniitok 12 km tonongani oyagakhiokviop.

**Oyagakhiokvik** Okoa pilgaangit High Lake nalvaakviit, pikaktot ematot AB onalo D Zones nalvaakviahimayut ovani kitkani 1,950-ni okoatigut tingmiakot takoyaohimayuk ovalo inuit pihokhogo oyagakhiokhimayat okoat Kennarctic Explorations. Aipataok oyagakhiokpagat aolaliktom 1991 okoat Aber Resources nalvaakhioktat ovani pikatigivlogit okoa Kennecott Canada. Pikatigiikhotik havaktat nuna malgok nunap kangani nalvaakhoktast ovalo ekootakhogo naonaiyatiaktat ovani 5.3 million tones aktigiok 4.05% kanohak, 2.36% zinc, 1.76 grams per tonne gold-kaktok 31.73 grams per tonne silvaniklo. Wolfden neoviktat oyagakhiokvik ovani 2000 ovalo havalikta ovani 2001. Hamna havakta Oalikmi Nunami ongahiktigiok 1.5 km aolikmi ovani AB onalo D Zones. Nalvaakvigiyat ovani Oalikmi Nunani angiyuniktok manikaknik.

**Resources** Wolfden oyagakhiokvik algakniaktit kanohait, zinc, gold onalo silvalo. Nalvaak angingmat oyakikinahoaliktat ovalo kanogotokhak oyagakhiokvikhak 18.2 million tonnes manikaknik 2.97% kanohak, 3.33% zinc, 0.87 grams per tonne gold onalo 61.7 grams per tonne silva. Tamaita havikaknit algaktaoyut amogakniaktait aktigiot 746 million pounds kanoyaknik, 886 million pounds zinc, 407,000 ounces gold-nik okoalo 23 million ounces silvanik.

- Oyagakhioknik** Okoa AB onalo D Nunak oyagaktakvioniaktok angmaomanik nunap kangani atpakat nunap ataanoktiklotik. Ona Oalik Nuna algakvioniaktok nunap ataanit. Oyagakhioknik aolalikniaktok ovani AB Nunap kanganit algakvioloni (2010-2012) okoalo D Nuna nunap kangani algaktaoloni (2012-2013). Ona AB Nuna ataanit algaktaoloni ovani aolaliklioni 2013-mit 2014-mot ovalo D Nuna nunap ataanoklogo 2014-2019. Nunap ataanit algakniaktot Oalik Nuna ovani 2012 –mit 2023-mot.
- Emmakokvik** Ehomagiyas emakak 16.4 million tonnes emmakokniaktat oyagakhiokvikmit aolatitlogo Oyakhiovik. Emmaktot kovigakniaktat ovani High Lake matohimaniaktat tahik emakokvik, ona AB Nuna onalo D Nuna algaknit okoalo nunap ataanit. Tabkoa oyagakot kaligiiktikniaktait ovani AB Nuna oyagakot katitiklogit, ona D Nuna oyakokot kaligeektiklogit ovalo atoniaknait elanga oyagaiotikpa himmiktigotiginiaktat nunap ataanot.
- Pilokyiligini** Manikaknik oyagak nuutikniaktat pilokyiliklogo ovani High Lake oyagakhiovikmi. Okoa manikanit oyagat atoniaktot poktallaktiklogo amogakniaktat manikaknik zinc, kanoyak, gold-lo onalo silvalo amogaklogo. Avitikniaktas kanoyat zinc-lo. Goldkanik onalo silvalo amogakniagast okoa kanoyakaknik ovalo engnikvikot amogakniaktat. Ona engnikvikakvik manikaknik amogainiaktok emakak 4,000 tonnes oblotoak.
- Angmaomania** Oyagakhiokvik angmaomaniaktok emakak 14 okioni. Enikat nuna halummaktiktaoniaktok kihime halummaktikataklogo aolatitlogo. Ona umikpat ovalo halummaktiktaolikot aolalikniaktok ovani 2024 ovalo emakak okiokni malgokni.
- Atoktakhak** Ona atokniaktat taggiok Grays Bay umiakakvik ovalo ona High Lake oyagakhiokvik, 49 km okiomi aptkot atokniaktat angmaktilikatjuk ovalo 53 km aoyak-okiook aptkot atokniaktok aolatitlogo. Umiat tikigapakniaktot agyaktot tamayanik omonga Oyakhiovik ovalo manikaknik umiakot aolaktitaovakniakto. Oyagaliaktok milvik atokniaktat ovani Sand Lake tamaini aolatitlogo Oyakhiovik.
- Havaktit** Inuit kafit havakniaktot angmaktaolikot emakak 440 people. Ovani Inugiakniaktok havaktinik aolatitlogo emakak 335 inuni. Tamaita havktit aolaktakniaktot havakvikmit angilgaokataklotik oyagakhiokvikmit tingmiakot atoklogo Sand Lake milvik.

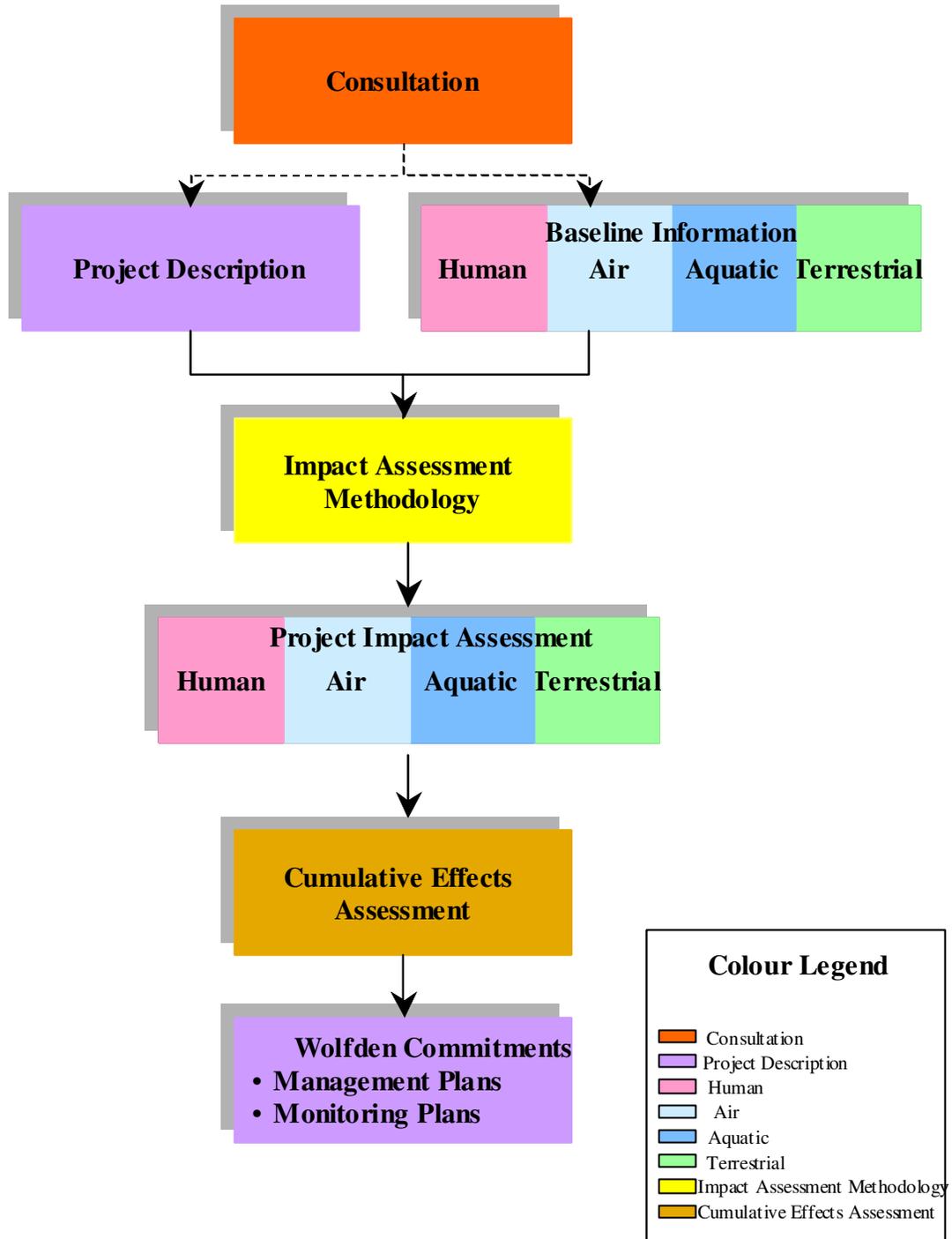






ii. Road Map to Environment Impact Statement

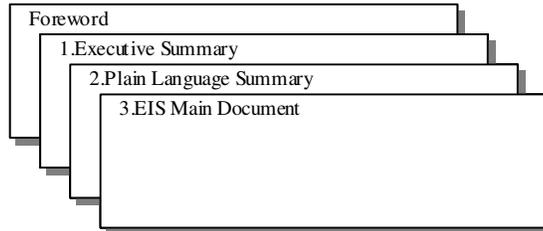
Road Map to EIS – Part 1



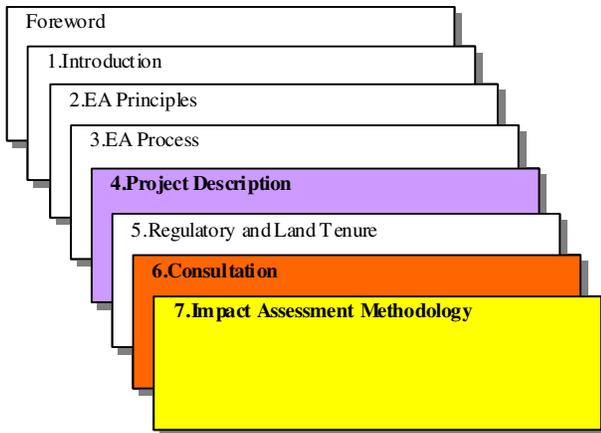
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Road Map to EIS – Part 2

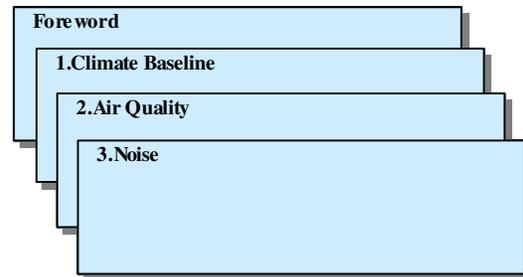
Volume 1 EIS Summary



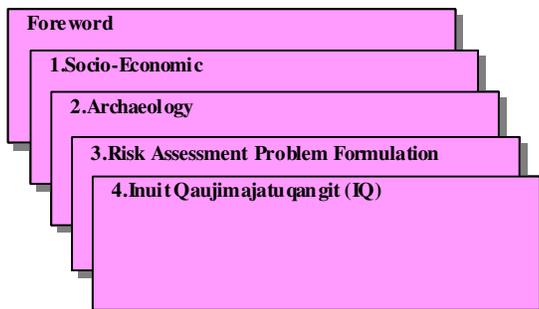
Volume 2 Introduction, Project Description and Assessment Methods



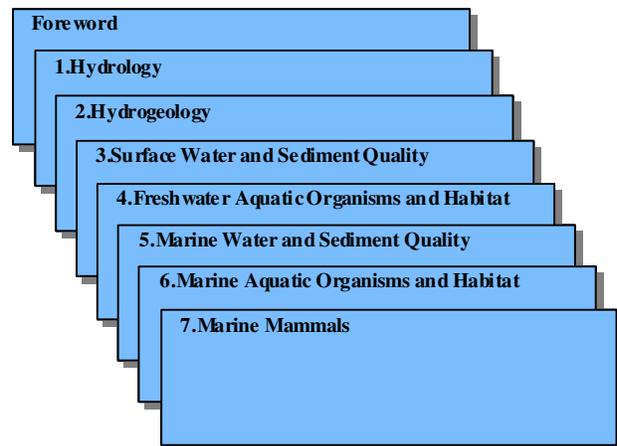
Volume 4 Climate, Air Quality and Noise



Volume 3 Human Environment



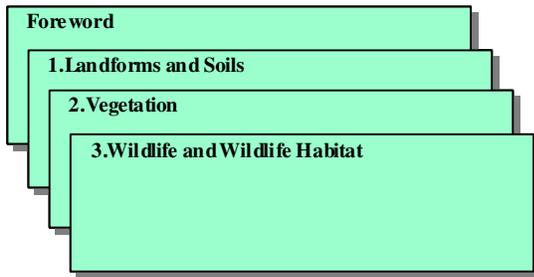
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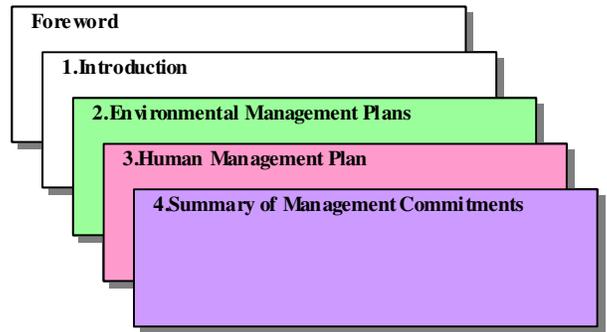
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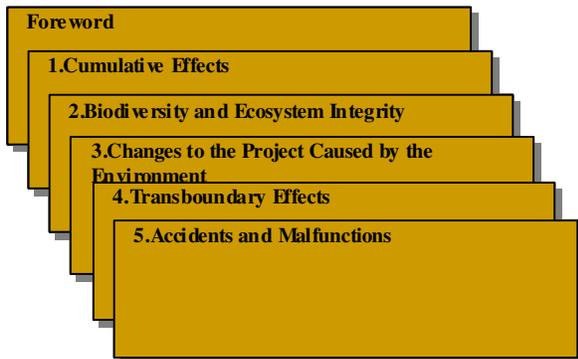
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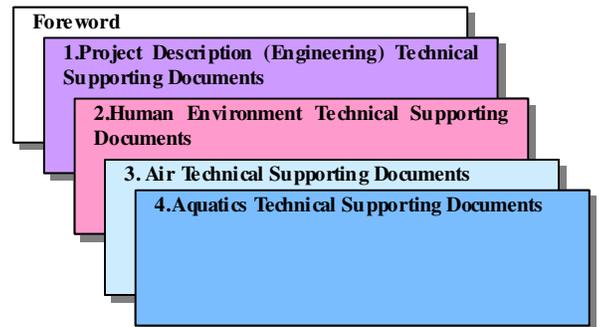
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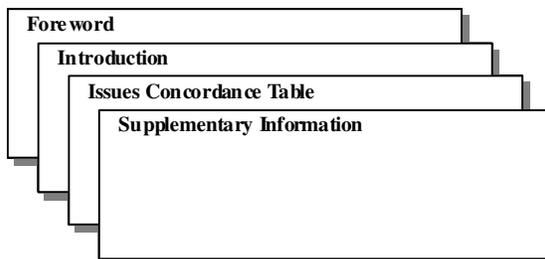
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# 1. Introduction

## Background Information on the Submission of the High Lake Project Proposal

In September of 2006 Wolfden submitted to the Kitikmeot Inuit Association (KIA) its application for access to Inuit Owned Land (IOL) for the High Lake Project. In October of 2006 Wolfden applied for a water licence for water taking and waste disposal related to mining, milling and camp sewage from the Nunavut Water Board (NWB). In October of 2006 Wolfden also submitted an application to Indian and Northern Affairs Canada (INAC) for a land use permit for storage at the Grays Bay Dock and to construct and operate a winter road from the dock to the mine. The application package included a detailed document titled, *Project Description Supporting Regulatory Applications*.

NIRB accepted the three applications and the Project Description as the Wolfden High Lake project proposal, and commenced its screening process on October 16, 2006.

On November 16, 2006 Wolfden hand delivered hardcopies of the additional information to NIRB, in the form of the High Lake Project Proposal, consisting of nine volumes of information. Also included in the submission were the completed NIRB Part 1 and 2 Forms, Response to the December 6, 2005 draft Terms of Reference, High Lake Project Proposal Distribution List and Cover Letter. In the cover letter Wolfden stated:

“Wolfden Resources Inc. (“Wolfden”) acknowledges and agrees that the High Lake Project, by virtue of its scope of development and magnitude of impact potential, should be sent for a part 5, Article 12 review as outlined in the *Nunavut Land Claims Agreement*.”

On November 29, 2006 NIRB sent a letter to interested parties that the Part 4 screening process had begun and invited the interested parties to provide their feedback on the scope that NIRB provided, and whether the Project Proposal should be subject to a Part 5 or 6 Review. Reviewers were also asked to comment on the issue of potential duplication between the two separate federal EA processes of NIRB and the Canadian Environmental Assessment Agency. Additionally, a deadline was set for interested parties to submit their screening/scoping issues to NIRB by January 31, 2007; that date was later changed to February 9, 2007. In the responses received by NIRB, there were issues and concerns that were brought forth and outlined by the interested parties.

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On February 20, 2007 NIRB sent a letter to the Minister of INAC with the following recommendation:

“After examining both the Project Proposal and comments received, NIRB has determined that, pursuant to Section 12.4.4 (b), the proposal requires a public review under Part 5 or 6 of the NLCA.”

On May 30, 2007 The Minister of INAC responded to the NIRB letter with the following decision:

“I have reviewed the Screening Decision Report and concur with the Board’s determination. Pursuant to section 12.4.7(b) of the Nunavut Land Claims Agreement, I am referring the proposal to the Board for a public review under Part 5. It is my view that a Part 5 review is appropriate based on the rationale you have provided and because the physical components of the project are located entirely within the Nunavut Settlement Area.”

Since February 9, 2007, Wolfden has been answering information requests from various parties, and addressing the screening/scoping issues and concerns that were brought to their attention through the NIRB screening process. In the spring of 2007, Wolfden was purchased by Zinifex Limited, an Australian mining company that is interested in further exploration and development of Wolfden’s Nunavut mineral properties. Wolfden changed its name to Zinifex in June 2007.

## **1.1 Purpose of Supplementary Information**

The purpose of the High Lake Project Proposal Volume 10 - Supplementary Information is for Zinifex to provide further information on the commitments made in its original High Lake Project Proposal submission to NIRB on November 16, 2006, and to address the issues and concerns raised in letters from the regulators and interested parties to NIRB. Letters were received by NIRB from the: Kitikmeot Inuit Association (KIA); Nunavut Tunngavik Incorporated (NTI); Environment Canada (EC); Government of Nunavut (GN); Health Canada (HC); Indian and Northern Affairs Canada (INAC); Transportation Canada (TC); Natural Resource Canada (NRCan); and the Department of Fisheries and Oceans (DFO).

## **1.2 Structure of Response**

The *Volume 10 Supplementary Information* document follows a similar structure to the previous nine volumes of the High Lake Project Proposal submitted to NIRB on November 16, 2006.

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The document is laid out with the following sections:

**Foreword** – this contains the same four items found in the Forewords of Volumes 1 to 9 of the High Lake Project Proposal.

**Introduction** – this provides: a brief overview of the status of the High Lake Project Proposal since its submission to NIRB in November 2006; the purpose for Volume 10; and the structure of Volume 10.

**Comments from Reviewers** – contains an annotated list of issues and concerns from reviewers, with concordance references to where to find the information in the main body of Volume 10 and/or in the Appendices. Some issues have been identified as quoted comments, while others have been paraphrased for length.

**Supplementary Information** – Zinifex’s response to the issues and concerns, organized by theme.

## 2. Comments from Reviewers

Table 2.1-1 identifies each issue statement raised in responses to NIRB’s scoping request by discipline theme, which party identified the issue (issue source) and the date of its correspondence to NIRB, and what the issues are. In cases where issues are similar between different parties, these have been combined into one response in this Supplementary Information document in section 3, but have been left separate in the Issues Concordance Table (Table 2.1-1). The Main Report Section column indicates which issues have been addressed and where they can be found in section 3. Where an appendix document is used to support several different issues, the document is located in the appendix where it is first referenced.

**Table 2.1-1. Issues Concordance Table**

Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
Engineering	Transport Canada March 16, 2007	“Grays Bay Dock, operational components: The degree and extent of dredging. These works would be within a navigable waterway and should be reviewed to determine any impacts to navigation.”	3.1.1.1	-
Engineering	Indian and Northern Affairs Canada	Dredging Activities in Grays Bay.	3.1.1.1	-

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
	March 20, 2007			
Engineering	Indian and Northern Affairs Canada March 20, 2007	Airstrip navigational aids.	3.1.1.2	A1 High Lake Airstrip Assessment of Locations
Engineering	Natural Resources Canada March 19, 2007	“It is stated that the 2005 bathy contours are lower than the 2004 contours by as much as 4 m in depths less than 15 m and significantly more in deeper water (as much as 17 m difference at one point 100 m from shore). On the other hand, the 15 m contour is in the same location. There is no discussion of the reason for these differences or of which survey is considered correct. This consultant report concludes that “further assessment should be carried out to determine the reasons for the discrepancy”.	3.1.2.1	A2 Grays Bay Dock Site Bathymetry Differences
Engineering	Natural Resources Canada March 19, 2007	Seafloor conditions. “Figure 4-6-2: Shipping route into Coronation Gulf and Grays Bay is not well covered by hydrographic charts. ArcticNet surveys have demonstrated unmarked pinnacles and very irregular seabed topography in eastern Coronation Gulf. Detailed bathymetric surveys would be needed along the proposed shipping route in the approaches to Grays Bay and within the bay. NRCan did not find any mention of this in the sections reviewed.”	3.1.2.2	A3 2006 Geotechnical Investigation Report
Engineering	Natural Resources Canada March 19, 2007	“The proponent should include in their EIS a thermal analysis that shows that frozen conditions will be maintained during mining an post-closure. They should state whether the conditions would be maintained naturally or through the use of thermosyphons. The Proponent should also present their plan for long-term monitoring of the permafrost and their contingency plan in the case where frozen conditions are	3.1.2.3	A4 Climate Change Design Criteria memo  A5 Permafrost Aggradation in Roadfill Embankment

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
		not maintained. Construction of the barrier early in the construction phase would be beneficial, as it could allow sufficient time for aggradation of the permafrost to occur and for testing (and perhaps implementation of a contingency plan) to occur.”		memo
Engineering	Natural Resources Canada  March 19, 2007	“..the Proponent is proposing that a road constructed across the groundwater flow pathways between High Lake and Granite Lake (L4) and L15 will allow permafrost aggradation and form a barrier to shallow groundwater flow from the High Lake tailing containment to the other two lakes. Thermal analysis is therefore required to determine if frozen conditions will be maintained over the long-term and prevent shallow groundwater flow from High Lake to the other lakes.”	3.1.2.4	A5 Permafrost Aggradation in Roadfill Embankment memo
Engineering	Natural Resources Canada  March 19, 2007	“Preliminary dam designs have been presented but the results of thermal analysis utilized to determine the maintenance of frozen conditions in the dam foundations over the intended lifetime of the structure have not been presented...” “...the Proponent indicates that modifications to the dam design including passive cooling systems may be required to ensure frozen conditions, the likelihood that frozen conditions will be maintained with the designs presented has not been determined.” “...the Proponent indicated that the effect of impoundment of water and increased water level have not been considered in the preliminary/conceptual dam design. To adequately conduct a technical review, the details of the analysis conducted by the Proponent with respect to the thermal condition of the dam foundations are required.”	3.1.2.5	A6 High Lake TCF Feasibility Design Report
Engineering	Natural Resources	“There is little information provided on the materials and ice content of the	3.1.2.6	A3 2006

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
	Canada  March 19, 2007	proposed borrow sources. Glaciofluvial sediments (including eskers) may potentially be ice-rich and this has implications for the impacts related to the borrow source extraction including the total amount of material to be extracted and the area to be disturbed. No specific information on borrow sources is provided in Vol. 9 (Section 1.5) or Vol. 8 (Section 2.5) which outlines the results of geotechnical investigations. Further information is required to adequately conduct a technical review.		Geotechnical Investigation Report
Engineering	Natural Resources Canada  March 19, 2007	Thermal regime in backfilled pits.	3.1.2.7	-
Engineering	Natural Resources Canada  March 19, 2007	"..the results of the analyses conducted to determine the long-term thermal condition of the waste rock piles and the effectiveness of the design in the maintenance of frozen conditions has not been presented. This information is required to conduct the technical review and assess the Proponent's conclusions regarding impacts related to water quality. .	3.1.2.7	-
Engineering	Natural Resources Canada  March 19, 2007	Taliks and underground workings. (in terms of L12) "..given the small distance an the proximity to mine activities, which could cause thawing of the permafrost, there is potential for the L12 "closed talik" to become a "through talik". Has the proponent performed any analysis/thermal modeling of the degree of permafrost melting to be expected? This information would be required to do a proper assessment of the impacts of Project activities upon groundwater quality. There are similar concerns regarding L14.." "...Information on the depth on the depth of tunnelling beneath (or around) Lake L22 is not	3.1.2.8	-

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			Main Report Section #	Appendix #
		presented and would also be required to perform adequate assessment of effects on groundwater quality..”		
Engineering	Natural Resources Canada  March 19, 2007	“The Proponent has not presented results from the analysis and thermal modeling to determine whether frozen conditions will be maintained under climate warming or to assess the effectiveness of proposed design and mitigation techniques to ensure maintenance of frozen conditions. The results of the thermal analysis conducted by the Proponent are required to conduct a technical review and to assess the validity of conclusions regarding the maintenance of frozen conditions and containment of waste in perpetuity.”	3.1.2.9	A4 Climate Change Design Criteria memo  A6 High Lake TCF Feasibility Design Report
Engineering	Natural Resources Canada  March 19, 2007	“Please use NBCC 2005 ( <i>National Building Code of Canada</i> ) and not NBCC 1995. Ensure Canadian Dam Safety Guidelines are being used and that the classification level is justified. No discussion on seismicity or the effects thereof in the documentation reviewed.”	3.1.2.10	A6 High Lake TCF Feasibility Design Report
Engineering	Natural Resources Canada  March 19, 2007	“The only information on storage of ammonium nitrate is at the end of this section (4.2.35) indicating that as part of the facility there will be “An ammonium nitrate tote bag storage area with 3000 tonne capacity, located 300 m south of the detonator magazine”. Information on the structure of the storage area, containment, collection, etc is lacking and is required.”	3.1.2.11	A7 AN Storage drawing, Explosives Compound drawing,
Engineering	Natural Resources Canada  March 19, 2007	”There is little information on the explosives mixing plant other than there will be “...a 10,000 L dual-walled fuel oil holding and a metering/mixing system to mix the ANFO in the specified ratio. The ANFO is discharged to 25 kg capacity tote (sic) bags for transfer to the mining sites”. In Section 4.2.5.3, it is indicated	3.1.2.11	A7 ANFO Plant drawing

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		that tote bags will be discharged into a hopper from which an auger process is used. What will this ANFO plant be housed in? How will the AN totes be discharged (i.e., indoors? Containment?) What will be done with any wastes or effluents?"		
Engineering	Natural Resources Canada  March 19, 2007	(ANFO mix truck)"In section 4.2.5.3, under Surface Mixing, the use of an explosives mixing truck is cited. An explosives mix truck must be supported by a garage with a wash bay. This facility must be separate from other mine facilities and is part of the explosives factory licence. There was no indication that such a facility is planned."	3.1.2.11	A7 ANFO Plant drawing
Engineering	Natural Resources Canada  March 19, 2007	"There is mention of an explosive laydown area 800 m to the south east of the dock. Figure 4.3.1 shows a location that is near the construction material laydown area and about 550m from the camp and other facilities. At this distance from inhabited dwellings, NRCan allows no more that 10,000 kg of explosives."	3.1.2.11	-
Engineering	Natural Resources Canada  March 19, 2007	"In Section 4.3.3.4 an amount of 200 t is mentioned as being flown in. The document needs to give the maximum amount of explosives to be stored and demonstrate that the maximum distance to vulnerable features is respected."	3.1.2.11	A7 Explosives Compound drawing
Engineering	Natural Resources Canada  March 19, 2007	"The proximity of explosives storage area the construction laydown is of concern. More information is required. More information is required for this area. Will there be activity in this area at the same time there is activity at the magazine? It seems likely and this would be of concern, given the proximity."	3.1.2.11	-
Engineering	Natural Resources Canada  March 19, 2007	15 m vs. 14 m. "Depth required is stated as 15 m, 1 m deeper than considered in Vol. 9, section 1.1 Analysis of dock foundation conditions."	3.1.2.12	-

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
Engineering	Natural Resources Canada  March 19, 2007	Steel pile option for dock vs. cellular sheet piles. “Notwithstanding recommendations on Vol. 9, section 1.1 (see below), this states that the dock will be cellular sheet piles.”	3.1.2.13	-
Engineering	Natural Resources Canada  March 19, 2007	Ice and mooring forces. “States that the dock structure “will be designed to resist ice and mooring forces as an energy reflecting structure”. No data on ice conditions or forces in this section. No data on wave conditions in this section.”	3.1.2.13	-
Engineering	Natural Resources Canada  March 19, 2007	Closure plan monitoring.	3.1.2.14	-
Engineering	Natural Resources Canada  March 19, 2007	“Long-Term monitoring of permafrost conditions will also be important”.	3.1.2.14	-
Engineering	Natural Resources Canada  March 19, 2007	“Seven years of monitoring for the Initial Monitoring Period seems brief considering the large scale of the Project. The final EIS reclamation plan should include details on what findings from the Initial Monitoring Period would necessitate an Extended Monitoring Period. The length of time of a potential Extended Monitoring Period for various triggers should also be presented.	3.1.2.14	-
Engineering	Natural Resources Canada  March 19, 2007	“There is little information provided on the materials and ice content of the proposed borrow sources. Glaciofluvial sediments (including eskers) may potentially be ice-rich and this has implications for the impacts related to the borrow source extraction including the total amount of material to be extracted and the area to be disturbed. No specific information on borrow sources is provided in Vol. 9 (section 1.5) or Vol. 8 (section 2.5) which outlines the results of geotechnical	3.1.2.15	-

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			Main Report Section #	Appendix #
		investigations. Further information is required to adequately conduct a technical review.”		
Aquatic Environment	Indian and Northern Affairs Canada March 20, 2007	Stream Flow Diversions and alternative water courses, water waste and sediment management structures in the High Lake mine site.	3.2.1.1	B1 High Lake Project Water Crossing Report
Aquatic Environment	Transport Canada March 16, 2007	“High Lake Mine Site Identification of any stream flow diversions and alterations to navigable watercourses.”	3.2.2.1	B1 High Lake Project Water Crossing Report  B2 High Lake Mine Site Diversions/ Alterations
Aquatic Environment	Natural Resources Canada March 19, 2007	“The Project Proposal notes that selenium may be present at concentrations above threshold for protection of aquatic environment. A method of treatment for selenium reduction, or a discussion as to why it may not be required, should be included in the Water Management – Treatment.”	3.2.3.1	B3 Selenium Treatment at High Lake
Aquatic Environment	Department of Fisheries and Oceans March 23, 2007	No Net Loss Plan. “While impacts to fish habitat have been identified in the project description, there are no proposals presented for the fish habitat compensation that would make up a portion of the mitigation of potential effects.” “In the absence of an identified fish habitat no-net-loss-plan, DFO is of the opinion that the mitigation measures available have not been fully presented in the Project Proposal and therefore that this requirement of an EIS has not been fully met.	3.2.4.1	B4 draft No Net Loss Plan
Aquatic Environment	Department of Fisheries and Oceans	Fisheries Authorizations to be considered for: <ul style="list-style-type: none"> <li>■ “The construction, operation, maintenance and decommissioning</li> </ul>	3.2.4.1	B4 draft No Net Loss Plan

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			Main Report Section #	Appendix #
	February 9, 2007	<p>of the proposed dock at Grays Bay;</p> <ul style="list-style-type: none"> <li>■ The construction, operation, maintenance and decommissioning of watercourse crossings along the all-season road and mine site roads where fish habitat exists;</li> <li>■ Infilling of a portion of L800 to facilitate construction of the all season road;</li> <li>■ Water withdrawal from L4 and L5;</li> <li>■ Channel diversions at the mine site in streams adjacent to lakes L4, L15, L17, L18, L20 and L21;</li> <li>■ The construction, operation, maintenance and decommissioning of dams to contain the proposed tailing s impoundment area and;</li> <li>■ The deposit of deleterious substance (e.g., Tailings) into High Lake (L15).</li> </ul>		
Groundwater Quality	<p>Natural Resources Canada</p> <p>March 19, 2007</p>	<p>”It seems as though a lot of assumptions have gone into the conclusion that the groundwater flow system between High Lake and the Kennarctic River is capable of attenuating metal concentrations over the long term. Likewise for attenuation of contaminants between High lake and Lake L4. Given the uncertainties, the proponent should describe in detail how this hypothesis will be tested with field sampling. Given the difficulties with sampling deep groundwater quality is that in the shallow groundwater and in the talik beneath lakes and therefore should be tested regularly at several locations. Water quality at groundwater discharge zones would be difficult to determine as the discharge zone is wide and mixing of waters will occur here. Also the travel time is estimated at 34 years to the Kennarctic River and 100 years for L4.” “...consider collecting groundwater seepage below High Lake and pumping it to the surface for</p>	3.3.1.1	-

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			Main Report Section #	Appendix #
		treatment if tests show concentrations of contaminants to be unacceptable. Ideally, plans for this type of treatment would be incorporated into the EIS.”		
Groundwater Quality	Natural Resources Canada  March 19, 2007	“Detailed discussion of marine water and sediment quality but no discussion of natural sediment mobility (by currents, waves, or ice) and potential transport pathways for contaminated sediments in the Grays Bay area.	3.3.1.2	-
Geochemical Characterization	Natural Resources Canada  March 19, 2007	The proponent also provided preliminary results for the humidity cells. As noted in their Project Proposal, the final EIS should incorporate results and evaluation for the complete test.	3.4.1.1	C1 Humidity Test Cell Results
Geochemical Characterization	Natural Resources Canada  March 19, 2007	Nitrogen releases from blasting using ANFO. “Given that the nitrogen compounds are very water soluble, the only mechanism that would explain the discrepancy is the removal of most of the nitrogen compounds from the tailings and water and it was not evident that this had been demonstrated in the documentation.”	3.4.1.2	C2 Technical Memorandum on Nitrogen Releases
Air	Natural Resources Canada  March 19, 2007	There is no precipitation data on site due to unforeseen precipitation gauge failure...” “..it is recommended that the Proponent remedy the situation with precipitation gauge and start recording precipitation amounts again.	3.5.1.1	-
Air	Natural Resources Canada  March 19, 2007	“There is no on-site data used to determine monthly evaporation values. Estimated evaporation values from other sites should be verified with on-site evaporation pan data.”	3.5.1.1	-
Air	Government of Nunavut  February 9, 2007	“...no monitoring is proposed for the air strip. GN believes dust emissions from aircraft landing and take-off could contribute cumulatively with these other components, leading to dust emissions locally affecting air quality and VEC’s such as vegetation. The proponent should justify why monitoring at the air strip is not included in the project proposal.”	3.5.2.1	-

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
Health	Health Canada March 15, 2007	“it is important that the section ”Impact on human and ecological health” include all impacts on human health through: noise, air quality, and drinking water quality, in addition to traditional foods.”	3.6.1.1	D1 Human Health Risk Assessment Report
Health	Health Canada March 15, 2007	Impact on Human Health needed to be fully assessed, “HC finds the proposal to be inadequate. Specifically regarding the human health chapter (Vol. 3, section 3), this risk assessment only undertakes a problem formulation and does not provide the complete assessment needed. Furthermore, the chapter only looks at traditional foods and does not look at all the other aspects which impact health (such as noise). We do note that the baseline human health conditions were very well described.”	3.6.1.1	D1 Human Health Risk Assessment Report
Health	Government of Nunavut February 9, 2007	“The area of health appears to be under-represented in the discussion of socio-economic indicators. Discussion of health indicators such as the number of days of work lost per year due to sickness, incidence of certain diseases in the region, and information on child mortality are helpful in providing the full picture of the region. Establishing the baseline for health indicators in the region could help the company in preliminary decision-making and also allow for impact assessment of project activities on these indicators overtime. Where relevant health data exists and is readily available, it is suggested that the company monitor and report on this data.”	3.6.2.1	-
Shipping and Marine Transportation	Natural Resources Canada March 19, 2007	“No presentation of marine hazard issues including sea levels and storm surges, winds, waves, currents, sea ice as they would affect shipping operations, dock design, construction, and operation, and movement of spills or contaminated sediment.”	3.7.1.1	E1 Marine Transportation System Servicing the Coronation Gulf

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
Shipping and Marine Transportation	Natural Resources Canada  March 19, 2007	Shipping route bathymetry. Shipping route into Coronation Gulf and Grays Bays is not well covered by hydrographic charts. Detailed bathymetric surveys would be needed.	3.7.1.2	E1 Marine Transportation System Servicing the Coronation Gulf  E2 Bathymetric Surveys Grays Bay Dock Site
Shipping and Marine Transportation	Government of Nunavut  February 9, 2007	Ocean Shipping and the increase in traffic (40%) through the Northwest Passage. Effects on sensitive wildlife, wildlife habitat, Dolphin, Union and Peary Caribou and the Arctic ecosystem should be addressed.	3.7.2.1 3.7.2.2 3.7.2.3 3.7.2.4 3.7.2.5	E1 Marine Transportation System Servicing the Coronation Gulf
Wildlife	Government of Nunavut  February 9, 2007	"GN believes musk-ox is a VEC for the purposes of the High Lake project; especially in light of decreasing populations of these animals in the recent years. We recommend a full impact assessment of the project on this VEC be undertaken with full consideration of impact mitigation, management and monitoring.	3.8.1.1	-

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Theme	Issue Source	Issue Statement/Details Needed	Location of Response	
			Main Report Section #	Appendix #
Archaeology	Government of Nunavut  February 9, 2007	Archaeology issues. "...GN is concerned that the proponent's cumulative effects analysis understates the potential for impacts on archaeological resources..." "...the indirect impacts of the mine on archaeological resources is weak and the proponent should consider more fully the effects. Specifically Wolfden should provide greater clarity on the effects of activities such as changing winter road alignment, road construction and maintenance. In addition, the proponent's monitoring plan for archaeological resources and discussion of education programs are vague and should be refined.	3.9.1.1	F1 Points West Heritage Consulting Addendum Report
Socio-economics	Government of Nunavut  February 9, 2007	"While the issue of training and employment is clearly recognized, there needs to be a plan to act on the on the anticipated "opportunities."	3.10.1.1	G1 Socio-economic Response
Socio-economics	Government of Nunavut  February 9, 2007	"Consultations between the company, the GN and other stakeholders should be pursued to examine ways to better prepare the local business sector to service the mining project."	3.10.1.1	G1 Socio-economic Response
Socio-economics	Government of Nunavut  February 9, 2007	"The proposal mentions that providing signs and training materials will be translated into local languages where possible and country food will be served from time to time. These issues should be considered priorities for Wolfden Resources Inc. as these will be important issues for many employees who are from Nunavut."	3.10.1.1	G1 Socio-economic Response
Socio-economics	Hamlet of Kugluktuk  November 16, 2006	Socio-economic Agreement Signature.	3.10.2.1	-

## 3. Supplementary Information

### 3.1 Engineering

#### 3.1.1 Transport Canada & Indian and Northern Affairs Canada

##### 3.1.1.1 Dredging Details for Grays Bay Dock

###### Issue Statement 1 (TC)

There is a need to provide the extent and degree of dredging that would occur at Grays Bay Dock during operational components.

###### Issue Statement 2 (INAC)

Require more details on dredging activities at Grays Bay dock, including volumes of rock and sediment moved, and construction techniques.

###### Response to Issue Statements 1 & 2

The most recent estimate of excavation volumes for the dock is as follows:

- 10,000 m<sup>3</sup> rock; and
- 1,000 m<sup>3</sup> marine sediment.

The marine sediment thickness varied up to a maximum of about 2.9 m within the footprint. This material will be excavated with the blasted rock and dumped in the shoreline disturbance area adjacent to the dock cells as fill. The entire area will be enclosed within a silt curtain during construction. Final details of the dock structure will be prepared as part of the licensing submission at a later date.

###### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response

Volume	Section	Details
2	4.3.3.2	Marine Dredging, Blasting and Drilling (construction phase)

##### 3.1.1.2 Airstrip Navigational Aids (INAC)

###### Issue Statement

Need to provide airstrip navigational aids.

## **Response to Issue**

Please refer to Appendix A1 for the High Lake Airstrip Assessment of Locations report, which includes general airstrip layouts and recommendations for air navigational aids.

## **3.1.2 Natural Resources Canada**

### **3.1.2.1 Grays Bay Bathymetry**

#### **Issue Statement**

There appears to be differences in bathymetry readings that are unexplained.

#### **Response to Issue**

The apparent differences noted between bathymetric measurements obtained by means of marine seismic surveys and those obtained by drilling within the proposed dock site footprint at Grays Bay are investigated and explained. For design purposes, the borehole depths to the various stratigraphic interfaces and coordinates are considered to provide the best and most accurate positioning of the seabed stratigraphy. It was noted that the bathymetric surveys could be improved to  $\pm 5\%$  if drill hole data was used to re-calibrate the interpretation. It was recommended that this be undertaken for the next phase of ongoing design work.

For the complete response to this issue, please refer to the Grays Bay Dock Bathymetry Differences memo in Appendix A2.

### **3.1.2.2 Seafloor Conditions**

#### **Issue Statement**

There is a need to provide information on the seafloor conditions at the Grays Bay dock site.

#### **Response to Issue**

A Site Investigation Report was completed for the High Lake Project in 2006. Section 4.2 of this Site Investigation Report provides information on the seafloor conditions at the proposed Grays Bay dock site.

The complete 2006 Geotechnical Investigation Report can be found in Appendix A3.

**3.1.2.3 Maintenance of Permafrost at High Lake Mine Site**

**Issue Statement**

There is a need to provide a thermal analysis in the EIS as well as a long term monitoring plan for permafrost.

**Response to Issue**

Permafrost conditions are discussed in several design documents, including: Climate Change Design Criteria (Appendix A4), and Permafrost Aggradation in Roadfill Embankment memo (Appendix A5).

**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
9	1.10	High Lake and Area Talik Assessment Memo
9	1.3	Conceptual Design Tailings Containment Facility Report

**3.1.2.4 Thermal Analysis of Road**

**Issue Statement**

The need to perform thermal analysis to ensure the road between High Lake and Granite Lake allows permafrost aggradation and forms a barrier to shallow groundwater flow.

**Response to Issue**

Please refer to Permafrost Aggradation in Roadfill Embankment memo found in Appendix A5.

**3.1.2.5 Thermal Analysis of Dam Foundation**

**Issue Statement**

Thermal analysis of dam foundations.

**Response to Issue**

A complete thermal and geotechnical analysis, and design of dams is provided in the feasibility level engineering report for TCF dams for the High Lake Project.

The complete High Lake TCF Feasibility Design Report can be found in Appendix A6.

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**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
9	1.3	Conceptual Design Tailings Containment Facility Report

**3.1.2.6 Permafrost Samples**

**Issue Statement**

Samples of permafrost with ice content.

**Response to Issue**

This information is contained in the 2006 Site Investigation Report, which can be found in Appendix A3.

**3.1.2.7 Waste Rock Pile Design and Thermal Analysis & Thermal Regime in Backfilled Pits**

**Issue Statement 1**

Need to provide the results of the analysis conducted to determine the long-term thermal condition of the waste rock piles and the effectiveness of the design in the maintenance of frozen conditions.

**Issue Statement 2**

More information required on backfilled pits thermal regimes.

**Response to Issue Statements 1 & 2**

Regulators have questioned the feasibility of “freezing” the core of the proposed waste rock dumps at the High Lake site. The vast majority of the dumps are located over land, which is located in continuous permafrost and hence, subzero and likely frozen (except for the active layer in summer periods only). Lorax (2006)<sup>1</sup> notes that the design objective for waste rock is to place PAG rock within the centre of the dumps where subzero temperatures will occur. In addition, the A/B Toe Dike is proposed to limit lake water intrusion into the base area of the dump, preventing any convective heat transfer.

The conceptual model for waste dumps in permafrost areas consists of surface water infiltrating into the void spaces within the rockfill. Since the rockfill and underlying foundation materials are subzero, any infiltration water freezes *in situ* within the void space and none to very little water discharges from the toe

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<sup>1</sup> Lorax Environmental Services Ltd., 2006. Geochemical Characterization and Source Loading Study, High lake Project. Report submitted to Gartner Lee Ltd., October 2006.

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of the dump. Discharge from the toe would be limited to seasonal active layer thaw that occurs on the top surface and along the perimeter of the dump.

The High Lake site is located in the region of continuous permafrost, with estimated mean annual ground temperatures of approximately  $-6^{\circ}\text{C}$ . In addition, deep thermistors have measured the bottom of permafrost at approximately 440 m below ground surface. Therefore, the foundation (on-land portion) for the waste dump is frozen.

Climatic conditions at site are cold, with a mean annual air temperature (MAAT) for the High Lake Project Site of  $-11.8^{\circ}\text{C}$ . Based on mean expected conditions, 8 of 12 months have mean monthly air temperatures that are below zero. Hence, the waste rock as extracted from the ground should be subzero for the majority of the year.

In summary, the waste dump will be constructed of subzero excavated rock placed over top of a subzero foundation. Fill placed over permafrost moves the active layer upwards and creates permafrost aggradation (subsurface cooling over the longer term).

As an actual example, The Ekati Diamond Mine, located approximately 300 km northeast of Yellowknife, has two waste rock areas with subsurface temperature measurements. In the Panda/Koala Waste Rock Storage Area (WRSA), subsurface temperatures at depth below the dump has cooled to values of  $-11^{\circ}$  to  $-16^{\circ}\text{C}$ . These temperatures are significantly colder than natural permafrost and reflect some supercooling effects due to winter winds and/or convective currents within the dump rockfill. At the Misery WRSA, the native overburden beneath the dump location cooled from approximately  $-4^{\circ}\text{C}$  down to  $-8^{\circ}\text{C}$  between June 2002 and November 2004, indicative of permafrost aggradation.

### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
9	1.9	Conceptual Design Outline – A/B Waste Dump Toe Dike

#### 3.1.2.8 Taliks and Underground Workings

##### Issue Statement

Thawing of permafrost proximal to underground mine openings leading to potential for seepage from nearby lake taliks.

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Within underground mines in permafrost, it is necessary to ensure that the underground rockmass remains stable to prevent both safety hazards and ore dilution issues. As such, northern mines usually take a permafrost-specific approach to the mine ventilation requirements of heating and cooling. Some examples of northern mining ventilation practices are summarized below.

Pronovost (1999) reports on ventilation practices for Raglan Mine in northern Quebec, where the mean annual air temperature is about  $-7^{\circ}\text{C}$ . The mine is located at  $61^{\circ}39'\text{N}$  within continuous permafrost. Rock temperatures underground close to the surface are approximately  $-5.5^{\circ}\text{C}$  with the base of the permafrost estimated to be 425 m below surface. Fresh ventilation air is unheated to preserve the permafrost, which does result in cold working temperatures in the winter months. Thermistors installed in an exploration drift in 1991-1992 showed that only 1.5 m of thaw occurred in the rock surrounding the excavation.

Andres (1999) reports on underground mining conditions at Polaris Mine, located at  $75^{\circ}23'\text{N}$  on Little Cornwallis Island. Rock temperatures range from approximately  $-14^{\circ}\text{C}$  near surface to about  $-3^{\circ}\text{C}$  at the lowest mining levels. The ore was competent in its frozen state but exhibited little strength after thawing. After several thaw induced ground falls, a 450 tonne refrigeration plant was installed for ventilation. This plant operated from June to early September each year and was able to lower the ventilation intake temperatures by  $3^{\circ}$  to  $4^{\circ}\text{C}$ . Depending upon equipment activity in the mine, the fresh air volume was also reduced to maintain an optimum heat balance.

Saltis (1999) reports on rock temperatures measured in a decline constructed at the Jericho Project, at  $66^{\circ}\text{N}$  latitude, approximately 25 km north of Lupin Mine. Ventilation for the decline was supplied by one 100 hp fan using ambient temperature air. Rock temperatures were measured in both granite near the surface and kimberlite at depth. Temperatures of  $+2^{\circ}\text{C}$  were measured in the granite at 3.3 m depth in August while temperatures in the kimberlite did not rise above  $-2^{\circ}\text{C}$ . As such, no refrigeration plant was ever required.

Nanisivik Mine is located on the northern end of Baffin Island at about  $73^{\circ}\text{N}$  latitude. Lecuyer (2001) reported that the rock temperature was a constant  $-12^{\circ}\text{C}$  in the permafrost. The shallow depth of the ore body, coupled with the permafrost present, presented excellent conditions for post pillar recovery. Ventilation of the mine was done with ambient temperature air year round and no chilling was undertaken.

As such, the following will be undertaken during underground mining operations at High Lake:

- Mine ventilation will be undertaken using ambient air temperatures (cold to very cold for nine months and just above freezing for three months).

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- Monitoring of the ventilation temperatures and the associated thermal regime in the walls and back could be undertaken to quantify the depth of thawing during the summer months but it is expected that the thaw depth would only be on the order of a few metres or less.
- As such, no extensive thawing of permafrost near mine openings is forecast to result from mine ventilation.
- Mine operations will likely need to review specific issues (permafrost existence and seepage potential) when mine developments are located directly proximal to potential taliks.

### References

- Andres, D., 1999. The evolution of pillar mining at Polaris Mine. Proceedings of the 5<sup>th</sup> International Symposium on Mining in the Arctic, Yellowknife, June 14 to 17, 1998, pp.125 – 134.
- Lecuyer, N.L. 2001. Ground control at the Nanisivik Mine. Proceedings of the 6<sup>th</sup> International Symposium on Mining in the Arctic, Nuuk, May 28-31, 2001, pp.167 – 174.
- Pronovost, F., 1999. Arctic mining in Raglan. Proceedings of the 5<sup>th</sup> International Symposium on Mining in the Arctic, Yellowknife, June 14 to 17, 1998, pp.15 – 28.
- Saltis, A.R., 1999. The Jericho project: An underground kimberlite bulk sample, NWT, Canada. Proceedings of the 5<sup>th</sup> International Symposium on Mining in the Arctic, Yellowknife, June 14 to 17, 1998, pp.165 – 175.

### 3.1.2.9 Climate Change Effects on Permafrost

#### Issue Statement

Need to provide results from the analysis and thermal modeling to determine whether frozen conditions will be maintained under climate warming or to assess the effectiveness of proposed design and mitigation techniques to ensure maintenance of frozen conditions.

#### Response to Issue

Please refer to the Climate Change Design Criteria memo (Appendix A4) and the High Lake TCF Feasibility Design Report (Appendix A6).

#### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
9	1.3	Conceptual Design Tailings Containment Facility Report

### 3.1.2.10 Seismicity

#### Issue Statement

Question as to whether seismicity was addressed.

#### Response to Issue

The 2005 National Building Code recommendations for seismic parameters were used in the stability analysis for the tailings dams. Details of the analysis are provided in the High Lake TCF Feasibility Design report (Appendix A6).

### 3.1.2.11 Explosives, Explosives Storage and Explosives Transport

#### Issue Statements

1. More detail on the Ammonium Nitrate tote bag storage area.
2. Information on the explosives magazine.
3. More detail on the ANFO plant.
4. Details on ANFO truck and cleaning after use.
5. More details on the distance from inhabited building to the explosives storage at the dock site.
6. Flying-in of explosives.
7. More details about the proximity of explosives storage to the lay down area.

#### Response to Issues

##### *Issue 1: Ammonium Nitrate tote bag storage area:*

- For details about the design specifications of the Ammonium Nitrate storage area, please refer to drawing *0751310200-DWG-R0002-00\_AN\_Storage* appended to this response. The location of the Ammonium Nitrate storage facility can be found on drawing *0751310200-DWG-R0003-00\_Explosives-Compound*. These drawings are attached in Appendix A7.
- Drainage from within the storage building and from areas of potential spillage adjacent to the storage structure will be collected and directed to a temporary storage tank for ultimate disposal to the waste water treatment system in the mill.
- The Ammonium Nitrate will be loaded onto a flat-bed truck at the port site and transported to the storage facility at High Lake. At the storage facility it will be moved indoors with a fork-lift.
- When the ANFO plant is to be operated, the Ammonium Nitrate will be moved to the plant via a fork-lift and emptied into the hopper/silo.

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***Issue 2: Explosives Magazine:***

- For details about the location of the explosives magazine please refer to drawing *0751310200-DWG-R0003-00\_Explosives-Compound*. These drawings are attached in Appendix A7.
- We propose to have 12 (10' x 40') Type 4 magazines in the explosives compound.
- The total capacity for the explosives magazine area will be 240 tonnes with the detonator magazine shown on drawing *0751310200-DWG-R0003-00\_Explosives-Compound* capable of holding an additional 20 tonnes.
- The drawing is attached in Appendix A7.

***Issue 3: ANFO plant:***

- For details about the ANFO plant we have submitted a typical design which shows the proposal for High Lake. Please refer to drawing *0751310200-DWG-R0001-00\_ANFO\_Plant*, attached in Appendix A7.

***Issue 4: ANFO mix truck:***

- The ANFO mix truck will be stored indoors when the ANFO plant is not in operation. When the ANFO plant is operating, the ANFO truck will be moved outdoors.
- The ANFO plant will be equipped with a wash bay and sump. The sump water will be collected and transferred to the tailings area.
- For location of the wash bay, please refer to drawing *0751310200-DWG-R0001-00\_ANFO\_Plant*, attached in Appendix A7.

***Issue 5: Distance from Inhabited Buildings to Explosives Storage at the Dock Site***

There are two phases involved with this area. One will be the construction phase and the second phase will be the operational phase. As indicated in the Project Description on Figure 4.3.1 in the High Lake Project Proposal Volume 2, Section 4.

**Construction Phase**

During the construction phase it is proposed to have one Type 4 magazine (10'x40') capable of storing up to 20 tonnes of explosives, which will be a temporary storage facility. This magazine will be situated at the extreme east side of the area designated as the explosive storage area. The required D7 distance from the 50 person camp is 610 m and we will be placing the magazine 625 m from the camp. The magazine will be out of line of site from the camp due to natural ground contours.

**Operations Phase**

When the construction phase has been completed, the 50 person camp will be removed. Operational personnel for the dock facility will be housed in a 4-trailer/12 person camp adjacent to the port. The area designated as the explosives area will be used as a temporary storage area for ammonium nitrate, which will be brought in by ship and is not considered to be an explosive. The intention is to move this material to the storage facility at the mine site storage area as quickly as practical. Between the explosives storage area and the accommodation area at the dock will be a distance of 675 m as well as a 60 m high hill. The area marked as a detonator storage area will not be utilized.

***Issue 6: 200 Tonnes Flown In***

- The explosives being flown in are emulsion type explosives. They will be unloaded from the plane and moved directly to the explosives magazine, the location of these magazines is shown on 0751310200-DWG-R0003-00\_Explosives-Compound, attached in Appendix A7.

***Issue 7: Proximity of explosives storage to lay down:***

- The laydown area is primarily designed for the marshalling of the Nanisivik mill, which will be brought in before the construction phase at the port has been initiated. The area designated for explosive storage will not be utilized for this purpose until the material stored in the laydown area has been shipped to the mine site.

**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
2	4	Project Description Figure 4.3-1

**3.1.2.12 Grays Bay Dock Design Alternatives**

**Issue Statement**

Depth required at 15 m rather than what was considered; 14 m.

**Response to Issue**

The depth required will be 15 m.

### 3.1.2.13 Grays Bay Dock Design Criteria

#### Issue Statement 1 (NRCan)

More details on the consideration of both the steel pile construction and the cellular sheet pile construction options for the Grays Bay dock.

#### Issue Statement 2 (NRCan)

Need to present information on the ice and mooring forces.

#### Response to Issue Statement 1

A number of alternative sites and alternative configurations at the Grays Bay site were considered for the construction of the dock facility. The final location and configuration was chosen on the basis of cost, constructability, function and environmental impact. A number of the alternative locations would have resulted in significantly greater disturbance to cultural resources as well as more problematic operations from the marine and land operations perspectives. The final configuration consisting of rock filled sheet pile cells at Grays Bay was selected because it is a simple and straightforward design that has demonstrated adequate performance and durability elsewhere in the arctic and was the lowest cost, least complex design to build. Furthermore, the bottom conditions at the selected dock site were quite amenable to this type of construction with little or no soft sediment over a rocky bottom, which further simplified the construction methodology and reliability of the design. Other alternatives would have involved more disruptive activities such as deep blasting, which were considered unnecessary complications considering the site conditions and the applicability of the sheet pile cell design.

#### Response to Issue Statement 2

These issues will be addressed in detail during the detailed design phase of the project.

#### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
9	1.2	High Lake Project Alternatives Analysis

### 3.1.2.14 Closure and Post-Closure Monitoring

#### Issue Statement 1, 2 & 3 (NRCan)

More details on the closure plan monitoring (IS 1), the long-term monitoring of permafrost (IS 2), and extended post-closure monitoring (IS 3).

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**Response to Issues 1, 2 & 3**

Preliminary monitoring plans were submitted with the High Lake Project Proposal, which will be finalized in consultation with the regulatory agencies during the regulatory approvals phase.

**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
8	2.6	Preliminary Closure and Reclamation Plan

**3.1.2.15 Borrow Sources Ice Testing**

**Issue Statement**

Need to provide more information on the materials and ice content of the proposed borrow sources.

**Response to Issue**

Further drilling is planned for the 2007 summer field season for the High Lake Project.

## **3.2 Aquatic Environment**

### **3.2.1 Indian and Northern Affairs Canada**

#### **3.2.1.1 Water, Waste and Sediment Management at High Lake Mine Site**

**Issue Statement**

Need to address stream flow diversions and alternative watercourses, water, waste and sediment management structures in the High Lake mine site.

**Response to Issue**

Details of the stream flow diversions are provided the High Lake Project Water Crossing Report, found in Appendix B1.

The details of the designs for water, waste and sediment management structures will be addressed in the final detailed design phase of the project.

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**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
8	2.4	Preliminary Water Management Plan

**3.2.2 Transport Canada**

**3.2.2.1 Stream Flow Diversions and Alterations to Navigable Waters**

**Issue Statement**

Need for identification of any stream flow diversions and alterations to navigable watercourses.

**Response to Issue**

Design drawings are provided for watercourse crossings, found in the High Lake Project Water Crossing Report, attached as Appendix B1. A summary of the High Lake Mine Site Diversions/Alterations are provided in Appendix B2.

**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
5	3	Figure 3.7-4
5	4.5.3.1,	High Lake Sub-drainage
5	4.7.2.3	Pathway Three: Channel Diversions
5	4	Appendix F, Figures 5.4-1 & 5.4-2
5	3	Figure 3.7-4

**3.2.3 Natural Resources Canada**

**3.2.3.1 Reduction and Treatment of Selenium**

**Issue Statement**

A better explanation for the treatment of selenium (Se) is needed or an indication as to why it is not an issue. Se may be present at concentrations above threshold for protection of aquatic environment. A method of treatment for Se reduction, or a discussion as to why it may not be required, should be included in the Water Management Plan.

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As discussed on Volume 5, Section 3.7.4, of the High Lake Project Proposal, concentrations of selenium in the receiving environment (Kennarctic River) are predicted to be marginally above the CCME Guideline for the Protection of Aquatic Life (0.001 mg/L) as a result of the discharge from the High Lake Tailings Facility. Specifically during the open water season, the surface discharge from High Lake results in predicted concentrations of selenium in the Kennarctic River above the guideline for total of three years during operations with a maximum concentration of 0.0019 mg/L. During the post-closure period, from Years 44 to 49, the predicted under-ice concentrations of selenium are also marginally above the guideline due to the input of selenium from deep ground water originating from High Lake, with a maximum predicted concentration of 0.0012 mg/L. Under the drought scenario, there are no measurable changes to the predicted water quality except in Years 10 and 11 during periods of extremely low flow, with higher peak concentrations of 0.0018 and 0.0024 in September of Years 10 and 11 respectively.

The primary source of the selenium to High Lake is the tailings supernatant water, based on preliminary bench scale flotation testing, primarily that associated with the West Zone ore material. During operations, it is estimated that selenium levels in the mill effluent will range from 0.013 in Year 1 to 0.086 mg/L in Year 14. The maximum predicted concentration of selenium in High Lake is estimated to be 0.056 mg/L.

Assessment of the impacts of these levels on the aquatic environment, specifically fish and fish habitat, is presented in Volume 5, Section 4.7.1.1. Included in this assessment is a discussion on the suitability of the CCME guideline for selenium. The CCME guideline of 0.001 mg/L for total selenium is a water-based criterion. Other jurisdictions are starting to take a different approach to setting limits for selenium. Both British Columbia and the U.S. EPA have suggested that using the level of selenium in the whole body tissue may be a more appropriate way to assess if selenium inputs have the potential to affect fish populations. The primary reason for this new approach is due to the difficulty predicting the behaviour of selenium in the aquatic environment and the level of toxicity of selenium. Some forms of selenium are more biologically available than others and therefore can pose more of an impact. The U.S. EPA recommended criteria for whole body levels of selenium has been adopted as a threshold for selenium for the High Lake Project. Full details of this discussion can be found in Volume 5, Section 4.7.1.1.

Given the potential selenium issues, NRCan requested that a discussion be provided on the possibility of treating for selenium and other options for dealing with selenium. In response to this Zinifex carried out preliminary assessment of the treatment of selenium at High Lake. This assessment was carried out by EnvirAubé and presented in Appendix B3. Overall the current treatment plan for the discharge from the High Lake Tailings Facility includes lime addition with ferric sulphate addition when required. This method of treatment is not the preferred method for selenium.

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Selenium is a difficult compound to treat and is not easily treated by conventional means. There are options for treatment, such as membrane processes, but the application of these methods is cost prohibitive. It is possible to partially remove some of the selenium by ferric co-precipitation (depending on speciation). The ferric treatment system that is planned for the site might result in some removal of selenium, but the optimal pH for metals removal is not consistent with that required for selenium removal.

Given that the predicted concentrations of selenium in the Kennarctic River only slight exceed the CCME guidelines and the difficulty to treat selenium, it was felt the best way to deal with this issue through an adaptive management approach (Volume 5, Section 4.7.1.1). As outlined in Volume 5, Section 4.7.1.1, the U.S. EPA recommended criteria will be as a threshold for selenium. If pre-winter values of selenium in whole body fish tissue is between 5.85 µg/g (dry weight) and 7.9 µg/g (dry weight) then whole body concentrations will be monitored over winter to see if they rise above 7.9 µg/g. If concentrations meet or exceed 7.9 µg/g plans to reduce the selenium inputs to the Kennarctic River will be developed prior to the next discharge period. If fish collected from upstream control sites show the same increase in selenium concentrations further sampling may be required to determine if the increases of selenium in fish are due to the mine operation or other causes.

In addition Zinifex is currently developing an Aquatic Risk Assessment problem formulation to support the High Lake Project Proposal. The anticipated date for completion of this document is July 2007.

### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
5	3.7.4	LSA and RSA Operations Through Post-Closure Phases – Impact Statement SWQ4
5	4.7.1.1	Pathway One: Discharge from Tailings Impoundment

## 3.2.4 Department of Fisheries and Oceans

### 3.2.4.1 No Net Loss Plan / Fisheries Authorizations

#### Issue Statement

There is no indication of fish habitat compensation and/or mitigation. Fisheries authorizations will likely need to be considered for: Grays Bay, water crossings for the all season road, infilling L800, blasting at Grays Bay, and others.

## **Response to Issue**

The draft No Net Loss Plan is provided in Appendix B4. This document also addresses fisheries authorizations that may be required for the project.

## **3.3 Groundwater Quality**

### **3.3.1 Natural Resources Canada**

#### **3.3.1.1 Groundwater Management**

##### **Issue Statement**

Need to include monitoring of shallow groundwater and groundwater in the talik beneath the lake in order to confirm the attenuation of metal concentrations along the flow paths to the Kennarctic River.

##### **Response to Issue**

Attenuation was used in the groundwater flow model in an attempt to match current water quality in High Lake (i.e., high metals) and generally improved water quality in the groundwater below the lake. This inferred attenuation allowed us to use the baseline water quality information (High Lake, groundwater below High Lake and Kennarctic river) with the estimated groundwater flow rates and have the model match current baseline water quality conditions in High lake and the Kennarctic River. It might also be possible to match current conditions without attenuation by using lower groundwater flow velocities.

Along the deep groundwater pathway to the Kennarctic River, the attenuation was only considered for cadmium, copper and zinc with predicted attenuation rates of 4, 30 and 110 respectively. All other parameters are assumed to undergo no attenuation. Based on the output of the High Lake Water Quality Model, the concentrations of cadmium, copper and zinc in High Lake are predicted to drop (after mine operations commence) to concentrations well below those found naturally in the lake as a result of the introduction of mill effluent (Volume 8, Water Management Plan, Section 6.1.3). Therefore, the overall impact of the assumed attenuation rates of the water quality in the Kennarctic River is negligible given that during operations, closure and post-closure the concentrations of cadmium, copper and zinc in High Lake are predicted to be below the natural baseline levels.

In summary, we are not relying on attenuation for treatment of metal or other concentrations from mining. The current assessment indicates that High Lake water quality is currently not impacting the Kennarctic River and that mill effluent deposition will actually improve High Lake water quality. However, a monitoring program is outlined below to confirm our analysis including the estimated groundwater flow rates and contaminant attenuation estimates.

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***Well Installation***

Groundwater monitors will be installed at the following locations to confirm that groundwater quality water quality is similar or better than predicted. (see map for locations)

Shallow wells (3 to 6 m deep) will be installed at two locations immediately down gradient of the tailings north dam and at two locations downgradient of the southeast lake outlet dam. These wells will be monitored during summer weather when the active zone has melted.

Deep ground water monitors will be installed in the talik. Wells will be installed at a depths of 20 m and 40 m below the bottom of the lake. Bentonite and cement grout subsurface well seals will be carefully installed to prevent surface water from migrating down the borehole annulus to the well screen. Assume two well locations at north and northeast end of lake installed along a coffer dam and a third installed at eastern outlet installed in the coffer dam. The coffer dams will permit the drill rig and the samplers access to areas of the lake that will not have permafrost below them.

Further details on well installation procedures and methods will be provided during the regulatory approvals phase of the project.

***Water Quality Testing***

We propose to sample the monitoring wells four times prior to placement of tailings in High Lake in order to establish baseline water quality conditions. Once baseline conditions are established, the sampling frequency will be reduced to once per year in each well. If the annual concentrations for key indicators parameters are more than 30% higher than the maximum baseline results then the sampling frequency will be increased to twice per year or more frequently if warranted.

The analytical parameters would include a low level metals scan and general water quality parameters including an anion scan, alkalinity, conductivity, ammonia, and sulphide. Eh, pH and conductivity will be measured in the field to provide the most accurate information possible for geochemical equilibrium modeling and other geochemical calculations. Surface water in the High Lake tailings facility will be measured for these same parameters at the same time that the groundwater is tested.

***Water Level Monitoring***

The potential for water quality impacts on the Kennarctic River is equivalent to the contaminant concentrations time the volume of contaminated groundwater that discharges per unit time. This combined measure of water quality and water quantity is referred to as the contaminant loading and is usually expressed as kilograms of contaminants discharged per year. In order to assess water quality impacts it is also essential to measure groundwater flow rates. For this reason we propose to install vibrating wire piezometers at several locations in the talik below High Lake and also within the lake. This will allow us to calculate the vertical hydraulic gradient between the lake and the deeper groundwater

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flow system. Water elevations will be recorded on a hourly or daily frequency. We will be able to plot how water levels changes in the lake affect groundwater levels. We may be able to determine the hydraulic conductivity values from the response to rapid events. Because the lake receives no input for runoff, precipitation or shallow groundwater during the long winter months without any significant decline in surface water levels, we do not believe there are any permeable groundwater pathways for rapid subsurface movement of High Lake water to the Kennarctic River. The monitoring program will be designed to provide data to better prove that this is the case.

***Permanent Closure and Reclamation***

NRCAN suggests that the Initial Monitoring period of Seven years seems brief. Details of the closure monitoring program will be dealt with in detail during the licensing stage and during consultations with regulatory authorities during the operating life of the mine.

**3.3.1.2 Sediment Mobility in Grays Bay****Issue Statement**

Need to provide information on natural sediment mobility (by currents, waves, or ice) and potential transport pathways for contaminated sediments in the Grays Bay area.

**Response to Issue**

This issue will be addressed with further work to be conducted as part of the final design for the Grays Bay dock facilities.

**3.4 Geochemical Characterization****3.4.1 Natural Resources Canada****3.4.1.1 Humidity Cell Results****Issue Statement**

The final EIS should incorporate results and evaluation for the complete humidity cell test.

**Response to Issue**

This issue is addressed in the Humidity Cell Test Results – High Lake Project report found in Appendix C1.

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**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
9	1.4	Geochemical Characterization and Source Loading Study High Lake Project

**3.4.1.2 Nitrogen Releases from Blasting**

**Issue Statement**

Prediction of water quality impacts due to nitrogen loading from explosives residue.

**Response to Issue**

On Page 5 of their submission, NRCan raised a concern with respect to the assumptions used to determine estimate ammonium nitrate losses during the use of ANFO. In particular they referred to a citation in a paper by Wiber *et al.*, 1991, “It is well known that, even with good practices, there is significant, 5-15%, loss during the use of ANFO”, and requested that the 15% loss scenario be investigated to determine the impact of a worst case. In response to this request, Lorax Environmental carried out a review of the cited document and assessed the applicability of it to the High Lake Project. As part of this review they expanded the discussion on the methodology used in the Project Proposal for the calculation of nitrogen loading from blasting residues. Lorax’s review is presented in Appendix C2.

Based on Lorax’s review of the cited paper presented by Wiber *et al.*, 1991 the following conclusions were made:

- the cited paper does not provide any reference or details for the surveys conduction in support of the conclusion of 5 to 15% losses;
- the cited paper does not indicate whether the 15% represents the early years of mine development when greater nitrogen losses are expected; and
- the cited paper does not indicated whether the 15% represents measurements made before or after best management practices are implemented.

In summary is has been determined that, at this early stage in the review process and taking into consideration the planned implementation of best management practices, applying a 15% loss scenario is overly conservative and would not accurately predict nitrogen loads expected from waste rock that will be stored at the site.

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Another issue raised in NRCan's review is a discrepancy in the in the nitrogen mass balance for the nitrogen residues from explosives, specifically the predicted concentrations in the Kennarctic River. The following is an excerpt from NRCan's submission.

*"NRCan has tried to work out a mass balance for the nitrogen residues from explosives. The total nitrogen loss is given as 134,223 kg (Volume 9, Section 1.4, Part 13, Table 13-1). The flow of the Kennarctic River from June to October is given as 56,189,279 m<sup>3</sup> (Volume 5, Section 3, Part 3.7.3.2 Table 3.7-11). Thus if the total nitrogen is discharged over twenty years the mean concentration would be 0.12 mg/L...."*

*"The Project Description gave a maximum predicted combined concentration of ammonia, nitrate and nitrite nitrogen in the Kennarctic River of 0.052 mg/L (Volume 8, Section 2.4, Table 6.1-4)."*

*"Given that the nitrogen compounds are very water soluble, the only mechanism that would explain the discrepancy is the removal of most of the nitrogen compounds from the tailings and water and it is not evident that this have been demonstrated in the documentation."*

To support the preparation of a response to these comments, a replication of NRCan's calculations was carried out. In doing this, it became apparent that in making their calculations the wrong numbers may have been used for the maximum predicted concentrations of ammonia, nitrate and nitrite nitrogen. Specifically the reviewers use the maximum existing Kennarctic River concentrations, not the maximum predicted (Table 1).

**Table 3.4-1. Combined Nitrogen Calculations**

	<b>Maximum Existing Kennarctic River Concentrations (mg/L)</b>	<b>Maximum Predicted Concentrations (mg/L)</b>
Ammonia Nitrogen	0.0262	0.026
Nitrate Nitrogen	0.025	0.049
Nitrite Nitrogen	<0.005	0.019
<b>Total Combined Nitrogen</b>	<b>0.0512 (0.0562 including nitrite at detection limit)</b>	<b>0.094</b>

The value calculated using the correct concentrations is more inline with NRCan's estimated mean of 0.12 mg/L. Furthermore, the discharge of the estimated total nitrogen loss to the receiving environment takes place over a much longer period of time. Based on the model output, the residual levels of nitrogen species in High Lake, primarily due to explosives residue, will remain above elevated above natural

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concentrations for a period of approximately 40 plus years. Using a period of 40 years results in a mean concentration of 0.06 mg/L.

### **Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
5	3.7.3.2	Table 3.7-11
8	2.4	Table 6.1-4
9	1.4	Part 13 Table 13-1

## **3.5 Air**

### **3.5.1 Natural Resources Canada**

#### **3.5.1.1 Precipitation and Evaporation**

##### **Issue Statement**

More on-site precipitation and evaporation data needed.

##### **Response to Issue**

A climate station was installed at the High Lake mine site in 2004 to record baseline climate data and provide input data for the air quality model (e.g., wind speed, direction). The climate station is equipped with a variety of sensors and provides continuous monitoring and recording of the following:

- temperature;
- wind speed and direction;
- barometric pressure;
- solar radiation; and
- precipitation.

The climate station was inspected in the late summer, 2006 and a remote data access system added to facilitate data downloads directly from the High Lake camp. The system is considered a permanent installation and will continue to collect data throughout the construction and operation phases of the project.

## 3.5.2 Government of Nunavut

### 3.5.2.1 Air Quality Monitoring at the Airstrip

#### Issue Statement

Air quality monitoring at the airstrip is missing.

#### Response to Issue

Air monitoring recommendations focused on primary emission sources and materials that would likely contribute most to predicted impacts (i.e., NO<sub>x</sub> and TSP monitoring). The recommendation also focused on the mine site and dock where issues associated with concentrate handling are most pronounced.

Due to the infrequent nature of aircraft flights and the minimal supporting facilities, airport activities are not considered primary emission sources. Passive and environmental effects monitoring would be considered as part of an overall environmental monitoring program for the project to be developed as part of the licensing phase.

Options for monitoring at locations such as the airstrip could include dustfall canisters, moss bags and vegetation and soil monitoring.

A comprehensive (and coordinated) environmental monitoring program would be developed following completion of the EIS review process (i.e., part of the Licensing process).

## 3.6 Health

### 3.6.1 Health Canada

#### 3.6.1.1 Human Health and Ecological Risk Assessment

##### Issue Statement 1 (Health Canada)

Need to include all human health impacts in the section “Impact on human and ecological health” including noise, air quality and drinking water quality, in addition to traditional foods.

##### Issue Statement 2 (Health Canada)

Impact of the High Lake Project on human health needs to be fully assessed, problem formulation is not adequate by itself.

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### **Response to Issue Statements 1 & 2**

A human health risk assessment (HHRA) has been prepared, in accordance with the Problem Formulation included in the High Lake Project Proposal, that addresses impacts on air, water, soil and traditional food quality. This commitment was clearly stated in the EIS. The HHRA can be found in Appendix D1.

The assessment will include human receptors in the region and mine workers. Potential health issues associated with socio-economic and noise impacts are addressed elsewhere in the EIS and will not be addressed by the HHRA. Both potential noise and socioeconomic impacts will be addressed through a combination of design (noise) and mitigation. Noise is not included in the HHRA – noise impacts are very localized and will not impact regional residents.

Noise impacts on-site will be addressed through design and mitigation as outlined in the Noise impact section of the EIS. Issues related to occupational health and emergency preparedness will be the subject of detailed Health and Safety and Mine Operation Plans that will be developed as part of the facility development and licensing process.

### **Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
3	3	Human Health Risk Assessment Problem Formulation

## **3.6.2 Government of Nunavut**

### **3.6.2.1 Socio-Economic Human Health Indicators**

#### **Issue Statement**

Need to provide more information on health as a socio-economic indicator. Suggested that the company monitor and report on this data.

#### **Response to Issue**

Discussions are ongoing with the appropriate authorities to clarify the company's role in the collection of basic socio-economic information relating to individuals health within the region. These discussions are expected to result in a monitoring strategy that is appropriate for this subject respecting the confidentiality of the members of the surrounding communities and the roles of public agencies and private-sector businesses.

## **3.7 Shipping and Marine Transportation**

### **3.7.1 Natural Resources Canada**

#### **3.7.1.1 Marine Transportation Management Plan**

##### **Issue Statement**

Need to present marine hazard issues including sea levels and storm surges, winds, waves, currents, sea ice as they would affect shipping operations, dock design construction, and operation, and movement of spills or contaminated sediment.

##### **Response to Issue**

A report entitled “A Study of Marine Environmental Issues Associated with a Marine Transportation System Servicing the Coronation Gulf, N.W.T. was prepared by Canarctic Shipping Company Limited for Minnova Inc. in November of 1992. This report is presented in Appendix E1. This report provides a number of details relating to the above noted issues. The operations described in this report will be fundamentally the same as the operations contemplated for the High Lake Project; therefore, this report can be considered for the most part to be directly relevant to this project.

Further details will be provided in subsequent phases of design for the dock facilities and in consultation with potential shipping contractors who customarily provide this information to their customers as they relate to their fleet operations. Specific design features incorporated into the dock facilities to deal with marine hazards will be provided as the level of detail in the engineering design is progressed.

#### **3.7.1.2 Shipping Route Bathymetric Surveys**

##### **Issue Statement**

The shipping route into Coronation Gulf and Grays Bay is not well covered by hydrographic charts. Detailed bathymetric surveys would be needed.

##### **Response to Issue**

Bathymetric surveys were conducted in the approach channels to the Grays Bay Dock site by Challenger Geomatics Limited in 2004. The results of these surveys are provided in Appendix E2. Additional information regarding shipping issues in the Coronation Gulf is provided in a report prepared by Cannarctic Shipping for Minnova Inc. in 1992. This report is provided in Appendix E1.

### 3.7.2 Government of Nunavut

#### 3.7.2.1 Changes in Sea Ice Regime Due to Icebreaking Activities

##### Issue Statement

Assess changes to ice regimes as a result of icebreaker supported shipping, which may impact migratory routes of species.

##### Response to Issue

A report entitled “A Study of Marine Environmental Issues Associated with a Marine Transportation System Servicing the Coronation Gulf, N.W.T. was prepared by Canarctic Shipping Company Limited for Minnova Inc. in November of 1992. This report is presented in Appendix E1. This report provides a number of details relating to the above noted issues. The operations described in this report will be fundamentally the same as the operations contemplated for the High Lake Project; therefore, this report can be considered for the most part to be directly relevant to this project.

Icebreaker support will only be used when necessary during the open water season (Volume 2, Section 4.6.2.1). Given the very small number of ships identified within the Project Proposal (Volume 7, Section 1, Table 3.1-3), it is very unlikely that changes in sea ice occurrence, formation, strength, and timing of melting or freezing will occur. Zinifex stresses that ice-breaking support during the open water season is only planned if necessary (Volume 2, Section 4, Table 3.1-1), and thus not likely to have any impact on the natural ice regimes in the Arctic. As an example, ice-breaking support in the open water season (e.g., in mid August) might occur if ice flows, released from multi-year pack ice beyond the shipping lanes, drifted into the NW passage.

##### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
2	4.6.2.1	Icebreaker support only be used when necessary
7	1	Table 3.1-3 small amount of ships identified in project proposal
2	4	Table 3.1-1 ice breaking is only planned if necessary

#### 3.7.2.2 Environmental Contamination from Spills and Other Accidents

##### Issue Statement

Assess impacts resulting from accidents or malfunctions, which may occur during shipping, including spills of ore concentrate and fuel.

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**Response to Issue**

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Zinifex is confident that this concern has been adequately addressed in the Preliminary Emergency Response Plan (Volume 8, Section 2.2). Zinifex will take all reasonable precautions to prevent any spills or contamination from entering the marine environment. The *Canada Shipping Act* stipulates that all Canadian and foreign owned ships operating in Canadian waters must be inspected annually to ensure that the ships construction, fittings, systems, etc. are in compliance with the Regulations. Therefore, all ships contracted by Zinifex are anticipated to be in good working order, and highly unlikely to produce spills. In the unlikely event of a spill, the incident will immediately be reported to a pollution prevention officer and the procedures outlined in the Preliminary Emergency Response Plan (Volume 8, Section 2) will be implemented, including the Spill Response Plan (Volume 8, Section 2, Subsection 7). The Plan contains specific information outlining exactly how spills will be dealt with, including a list people available for spill response, the types and quantity of equipment available for use in containing and cleaning up spills and a detailed description of the treatment and recovery procedures that will be implemented.

Governance of waste deposition in the Arctic is regulated by the *Arctic Waters Pollution Prevention Act*, and states that “Except as authorized by regulations made under this section, no person or ship shall deposit or permit the deposit of waste of any type in the arctic waters or in any place on the mainland or islands of the Canadian arctic under any conditions where the waste or any other waste that results from the deposit of the waste may enter the arctic waters” [R.S.C. 1985, c. A-12., s.4].

It is noteworthy that Zinifex’s plans surpass the *Arctic Shipping Pollution Prevention Regulations*, as the Project Proposal stated, “Ships will not discharge wastewater and sewage within the LSA [area between dock site and the northwest passage shipping corridor]” (Volume 5, Section 7.3.2).

**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
8	2.2	Emergency Response Plan
8	2	Subsection 7 - Spill Response Plan
5	7.3.2	Ships to not discharge wastewater and sewage within LSA

### **3.7.2.3 Shipping Activities on Sensitive Wildlife and Wildlife Habitat**

#### **Issue Statement**

Address the impacts of shipping activity and development on critical and sensitive wildlife and wildlife habitat.

#### **Response to Issue**

A report entitled “A Study of Marine Environmental Issues Associated with a Marine Transportation System Servicing the Coronation Gulf, N.W.T. was prepared by Canarctic Shipping Company Limited for Minnova Inc. in November of 1992. This report is presented in Appendix E1. This report provides a number of details relating to the above noted issues. The operations described in this report will be fundamentally the same as the operations contemplated for the High Lake Project; therefore, this report can be considered for the most part to be directly relevant to this project.

Potential impacts associated with ocean shipping on wildlife and wildlife habitat adjacent to the shipping lanes is an important concern. However, based on the distribution of animals, their preferred habitats and restrictions on the timing of shipping operations, the likelihood that the shipping traffic would cause significant changes to wildlife populations or habitats is remote.

#### **Polar Bear**

In the context of ice-related concerns, the Government of Nunavut identified potential impacts to polar bear habitat due to shipping activities as potential concern. As explained in Volume 5, Section 7.5.4.8 of the Project Proposal, the presence and abundance of polar bears is influenced primarily by the availability of sea ice on which they hunt seals. Because of the melting of annual ice and the occurrence of open water in the summer months, polar bears near the Eastern route are typically found on the edge of the pack ice in Larsen Sound. In years with little or no pack ice, polar bears may also congregate along the coastline or on barrier islands. In order to minimize the potential impacts to polar bears on coastlines, Zinifex will take into account sensitive coastal and offshore areas, wildlife migration timing and shipping considerations found in the North Baffin Regional Land Use Plan (Volume 2, Section 4.6.2) in order to reduce potential impacts to polar bears. As an example, the North Baffin Regional Land Use Plan requires that ships remain at least 10 km from all shorelines when safe and practical. An adaptive management approach will also be used so that any significant changes in polar bear numbers or behaviour will lead to the review and implementation of changes to Zinifex’s mitigation practices (Volume 8, Section 2.).

#### **Important Wildlife Habitat**

Open water impacts to important wildlife habitat (particularly that of migratory birds) were also identified in the scoping responses. Zinifex acknowledged in Volume 6, Section 3.5.1.6 of the Project Proposal those areas, such as the Queen Maud Gulf Migratory Bird Sanctuary, Jenny Lind Island, Lambert Channel Polynya, and Lancaster Sound, are ecologically important areas, and that migratory birds and seabirds

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typically congregate along the shorelines and in areas of shallow water. It is acknowledged in the report that there is some direct and indirect habitat loss for seabirds at the port site (i.e., common eider) and for upland breeding birds along the project footprint. However, the proposed shipping activities are not anticipated to adversely affect bird populations since Zinifex has committed to consider implementing the North Baffin Regional Land Use Plan mitigation measures (Volume 2, Section 4.6.2), whereby ships will remain at least 10 km from all shorelines when safe and practical, and at least 20 km from the coasts of Lancaster Sound. Only two federally listed bird species were identified within the Regional Study Area (RSA), the peregrine falcon and the short-eared owl. Both species were assessed in the report despite only two sightings of short-eared owl in three years of fieldwork. All other bird species present in the RSA designated under a risk category by the Government of Nunavut were considered 'Sensitive'. The designation of 'Sensitive' is primarily because of perceived small populations on the periphery of natural ranges. The American tree sparrow for example, is listed as 'Sensitive', but is one of the most ubiquitous species found in the Bathurst Inlet area.

**Ship Wakes**

In response to the concerns regarding large ship wakes affecting shoreline habitat and water quality when traveling to and from the Grays Bay dock site, additional material is provided below, although this is beyond the scope of the assessment included in the Project Proposal. It is acknowledged that ship wakes can contribute to shoreline erosion and suspend bottom sediments (Lindholm *et al.* 2001, Soomere 2005). However, these ship wake impacts have all been documented in areas with very high shipping traffic (i.e., hundreds of ships per year) and/or areas with ships traveling at high rates of speed. Considering that the barges resupplying the High Lake Project will be traveling at low speeds, and because there will only be four to six additional concentrate-carrying ships passing through the proposed shipping route each year (Volume 7, Section 1, Table 3.1-3), it is anticipated that there will be no significant reductions in shoreline habitat or water quality.

**Marine Mammals**

As the shipping routes are typically located mid channel and most marine mammals and birds congregate in coastal areas, it is anticipated that most animals will not come into close contact with the ships (presented in Volume 7, Section 1 and Volume 5, Section 7). Nevertheless, Zinifex stated in Volume 7, Section 1, Subsection 4.2.1.1 that all ships and barges travelling through the eastern or western shipping routes will maintain a straight course and a constant speed whenever possible so that the ships will be less disturbing to wildlife. Zinifex will also employ an Access and Air Traffic Management Plan (Volume 8, Section 2.3) to ensure that no shipping takes place during sensitive periods, and monitor the environmental conditions and marine life activity within Grays Bay.

**Shipping Traffic**

The proportional increase in shipping traffic due to the High Lake Project was also raised in the context of ecological impacts. While the percentage increase in marine traffic appears relatively high, this is simply

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because very few large vessels use these waters now (Volume 7, Section 1, Table 3.1-3), making a proportional measurement misleading. Shipping traffic is presently extremely low in the Arctic, and will continue to be extremely low with the addition of the High Lake Project. For perspective, vessel traffic at the Vancouver Port is well over 100,000 vessels annually (Vancouver Port Authority 2006).

As identified in the preceding sections of this response it is not the proportional increase in shipping that should be of concern, but how the individual ships navigate through the shipping lanes. Zinifex is committed to ensuring that the cargo ships and marine barge traffic associated with the High Lake Project follow applicable federal legislation that applies to Arctic shipping, and adhere to the commitments related to shipping activities already made in the High Lake Project Proposal.

### Relevant Sections in the Project Proposal / Draft EIS

The following sections of the High Lake Project Proposal are relevant to this response.

Volume	Section	Details
5	7.5.4.8	Polar Bears presence and abundance
2	4.6.2	North Baffin Regional Land Use Plan
8	2	Wolfden (Zinifex) Mitigation Practices
6	3.5.1.6	Important Wildlife Habitat and open water impacts
7	1	Ships and shipping routes
5	7	Marine Mammals and shipping routes
8	2.3	Access and Air Traffic Management Plan

#### 3.7.2.4 Shipping Activities and the Effects on Caribou Species

##### Issue Statement

Address the impacts of shipping activity on the Dolphin and Union caribou species and the Peary caribou species.

##### Response to Issue

The movement of Dolphin and Union caribou is restricted to portions of the year when ice is formed and can support their weight. This reliance is of primary importance and is summarized in Volume 6, Section 3.5.1.3, and assessed in Volume 6, Section 3.6 of the High Lake Project Proposal. Peary caribou were beyond the Regional Study Area for the Project, and are found on the Arctic Islands, on Banks Island, and on the northwest portion of Victoria Island. Inter-island movements of Peary caribou takes place primarily in winter months, although there is substantial variation in the timing of such movements. As explained in Volume 2, Section 4.6.2.1, Wolfden (Zinifex) has agreed to abide by Requirement 6.2 of the draft West Kitikmeot Regional Land Use Plan (2004) that states that ships should avoid ice-breaking for the protection of caribou and human traffic and that shipping may not take place a) outside the normal open water season between July 1st and October 15th, or b) during the normal ice-forming period

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between October 15th and October 30th unless the shipping does not break ice. It should be noted that for the EIS, caribou-crossing data from collared animals was analyzed and presented, showing the earliest crossing south was on October 21<sup>st</sup> and the latest crossing north was on June 29<sup>th</sup>. Note that these dates are fairly close to those in the West Kitikmeot Regional Land Use Plan.

In discussions with the Department of Environment, Government of Nunavut, it is acknowledged that information regarding the Dolphin Union herd is based on “uncertainties and weaknesses in data” due to few collared animals. The Government of Nunavut is looking for contingency planning for the years when ice conditions or caribou movements may mean potential conflicts outside the stated shipping window. Until there is more funding for caribou collars, it has been suggested that simple aerial surveys could be conducted in conjunction with on going monitoring at critical periods at the ends of the ice season. This would be beneficial to address any local concerns or indications that caribou migration might be affected by shipping at the start or end of the season.

Zinifex intends to implement a caribou-monitoring program. This plan is outlined in Volume 8, Section 2.1 of the Project Proposal. The caribou-monitoring program will monitor potential influences of the High Lake Project on the abundance and/or behavior of caribou within the Regional Study Area identified in the Project Proposal. If significant changes are detected, Zinifex will review and implement changes to their mitigation process, in consultation with the appropriate government departments.

### **Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
6	3.5.1.3	Dolphin and Union caribou movements
6	3.6	Assessment of Dolphin and Union caribou movements
2	4.6.2.1	West Kitikmeot Regional Land Use Plan
8	2.1	Wolfden’s (Zinifex) Caribou Monitoring Program

### **3.7.2.5 Potential Impact on Arctic Ecosystem via Introduction of Exotic Species**

#### **Issue Statement**

The potential impact on the Arctic ecosystem via introduction of exotic species by ships is a concern to the Government of Nunavut, and should be addressed.

#### **Response to Issue**

In response to the concerns raised regarding the potential introduction of exotic species from ships, additional material is provided below, although such material is beyond the scope of the assessment included in the Project Proposal. Currently, the introduction of exotic species due to shipping is mitigated

through the *Ballast Water Control and Management Regulations* [SOR/2006-129., s.8 and 11] under the *Canada Shipping Act*.

The prime means of species introductions would be through the discharge of ballast water, which is water that is pumped into tanks or cargo holds for stability during ocean voyages. Ballast water is usually taken from the loading port and is composed of coastal water containing a variety of invertebrate and benthic species and this water has historically been discharged into the receiving port prior to loading (Hines and Ruiz 2000). Thus, ballast water has been identified as one of the key introduction vectors of exotic species in marine environments (Hines and Ruiz 2000, Claudi and Ravishankar 2006, Gollash 2006). Currently, legislation requires all ships entering Canadian waters to exchange their ballast water in open seas to minimize the number of species transferred between ports (*The Ballast Water Control and Management Regulations, Canada Shipping Act*). The number of introduced species in a given ecosystem appears to be directly correlated with the number of ships that utilize the port and typically, high latitude ecosystems have been shown to support fewer introduced species than more temperate environments (Hines and Ruiz 2000, Gollash 2006). Considering that the Grays Bay dock site will likely house only four to six foreign going ships per year, and shipping contractors will adhere to the *Canada Shipping Act*, the risk of exotic species introduced from ballast water would be considered remote, especially considering any organisms carried in ballast water would be unlikely to survive in an arctic environment.

## 3.8 Wildlife

### 3.8.1 Government of Nunavut

#### 3.8.1.1 Muskox as a Valued Ecosystem Component (VEC)

##### Issue Statement

For the purposes of the High Lake Project, muskoxen should be considered a VEC and a full impact assessment is recommended with full consideration of impact mitigation, management and monitoring.

##### Response to Issue

Valued Ecosystem Components (VECs) can act as proxies for other species, and for the High Lake Project, caribou were selected as a proxy for other ungulates in the area, muskoxen and moose (to a lesser extent). The selection of VECs was issue driven, and the communities or regulators did not raise muskoxen as an issue during this process. The Dolphin and Union caribou are VECs for the High Lake Project, and at the RSA scale the ungulate surveys for distribution and abundance can adequately address muskoxen. Impact mitigation, management and monitoring for caribou are also directly transferable to muskoxen. That said, the patchy and clumped distribution of muskoxen do not lend themselves to robust analysis of distribution or habitat selection. In previous EAs where caribou and muskoxen have both been

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considered a VEC (Jericho, Meadowbank), the habitat modeling and assessment for these species has generally been similar.

In discussions with the Department of Environment, Government of Nunavut, it was acknowledged that there was little community concern over muskoxen, but that biologists were concerned with the potentially declining numbers in the region and the impact of developments on populations. It was recognized that with baseline (predevelopment) data collected for the High Lake Project a comparison could be made to muskoxen distribution post-development. It would however, take longer to collect enough data for robust analysis and assessment of distribution, habitat use, and potential effects of development on muskoxen.

The Department of Environment was content with the reasoning, and clarified that we will continue to monitor, mitigate impacts, and assess muskoxen as the project continues.

### **Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
6	3.5.1.3	Ungulate baseline descriptions
6	3.2	Wildlife VEC's

## **3.9 Archaeology**

### **3.9.1 Government of Nunavut**

#### **3.9.1.1 Archaeology Issues**

##### **Issue Statement**

Cumulative effects analysis may understate the potential for impacts on archaeological resources. As well, indirect impacts of the mine on archaeological resources should be considered more fully.

##### **Response to Issue**

An addendum to Points West Heritage Consulting's report provided in the Project Proposal has been prepared and is provided in Appendix F1 providing a detailed response to this issue.

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**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
3	2	Archaeology

## **3.10 Socio-Economics**

### **3.10.1 Government of Nunavut**

#### **3.10.1.1 Education and Training, Business Opportunities, and Cultural Sustainability**

##### **Issue Statements**

1. An information campaign on what skill sets will be required for the project might yield more jobs for local people and hence more opportunities for the territory.
2. Consultations between Wolfden, the GN and other stakeholders should be pursued to examine ways to better prepare the local business sector to service the High Lake Project.
3. Cultural sustainability should be considered a priority for Wolfden as this will be an important issue for many employees from Nunavut.

##### **Response to Issues**

Additional information on these issues can be found in Appendix G1.

##### ***Education and Training***

Zinifex has committed to promote mining opportunities with students, schools and in the communities in hope of encouraging youth to stay in school and graduate (Vol. 3, Section 1.17.2.3). Zinifex will create a granting fund that can be applied for by schools and school groups, as well as scholarships for students who complete Grade 12 and are accepted to a post-secondary institution. In addition, Zinifex will support job-shadowing initiatives for high school students, as well as provide staff who will give presentations regarding the mining trade and its opportunities. Zinifex's support of high school trades initiatives will be flexible and tailored to the request of schools. These promotional activities will largely be done by the Community Liaison Officer to be hired (Volume 8, Section 1.4.7). Zinifex will support the Kitikmeot Hamlets and GN in development of a skills inventory, and identify potential employees for the mine (Volume 3, Section 1.17.1.4).

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Zinifex has committed to use the following mechanisms (Volume 3, Section 1.17.3.3):

- Information sessions in the Kitikmeot on contracting opportunities and expectations.
- Advanced notification of routine procurement up to a year in advance, providing Kitikmeot contractors with the lead time needed for sealift (barge) and Kitikmeot businesses with the potential to supply items for specific procurement, will be provided with general notification lists supplemented with detailed information and specifications.
- Zinifex intends to support the development of the following types of service businesses in the Kitikmeot:
  - security,
  - counselling,
  - camp services,
  - site maintenance,
  - waste management,
  - administration/payroll,
  - mine site environmental services,
  - logistics expediting/scheduling of flights, and
  - airstrip and port operations.
- Efforts will focus on re-supply and mine operations contracts, rather than on construction contracts, as these are businesses that will be needed long-term in the North (Volume 3, Section 1.17.3.3).
- Zinifex will advocate for funding to support development of existing and new Inuit businesses (Volume 3, Section 1.17.3.6).

***Cultural Sustainability***

As stated in the Project Proposal, Zinifex understands and recognizes the importance of maintaining the Inuit language and a hunting way of life as a means of encouraging cultural sustainability. In this sense, Zinifex has developed the Inuit Language and Cultural Support Policy in its Human Resources Plan (Volume 8, Section 1.8) which includes:

- Support for the use of Inuit language during work, without compromising health and safety;
- Assignment of Inuit supervisors who will play a mentoring role to entry level Inuit workers;
- Translation of signs and training materials into Inuit languages;
- Opportunity to take time off for traditional resource harvesting activities;
- Provision of country food from time to time; and
- Cultural awareness training will be provided to non-Inuit employees.

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**Relevant Sections in the Project Proposal / Draft EIS**

The following sections of the High Lake Project Proposal are relevant to this response.

<b>Volume</b>	<b>Section</b>	<b>Details</b>
3	1	Socio-economic

**3.10.2 Hamlet of Kugluktuk**

**3.10.2.1 Socio-Economic Agreement with Kugluktuk**

**Issue Statement**

The Hamlet of Kugluktuk would like a Socio-Economic Agreement with Wolfden.

**Response to Issue**

Zinifex is not anticipating signing Socio-Economic Agreements with the Hamlets at this time. However, Zinifex is prepared to work closely with the Hamlets to ensure issues and concerns are adequately addressed.

# Appendices

# Appendix A

## Engineering

- **A1 High Lake Airstrip Assessment of Locations Report**
- **A2 Grays Bay Dock Site Bathymetry Differences Memo**
- **A3 2006 Geotechnical Investigation Report**
- **A4 Climate Change Design Criteria Memo**
- **A5 Permafrost Aggradation in Roadfill Embankment Memo**
- **A6 High Lake TCF Feasibility Design Report**
- **A7 AN Storage, Explosives Compound, and ANFO Plant drawings**

# Appendix B

## Aquatic Environment

- **B1 High Lake Project Water Crossing Report**
- **B2 High Lake Mine Site Diversions/Alterations**
- **B3 Selenium Treatment at High Lake (EnvirAubé Report)**
- **B4 draft No Net Loss Plan**

# Appendix C

## Geochemical Characterization

- **C1 Humidity Test Cell Results**
- **C2 Technical Memorandum on Nitrogen Releases**

# Appendix D

## Health

- **D1 Human Health Risk Assessment Report**

# Appendix E

## Shipping and Marine Transportation

- **E1 Marine Transportation System Servicing the Coronation Gulf**
- **E2 Bathymetric Surveys Grays Bay Dock Site**

# **Appendix F**

## **Archaeology**

- **F1 Points West Heritage Consulting Addendum Report**

# Appendix G

## Socio-Economics

- **G1 Socio-economic Response**