Avalon Rare Metals Inc.

RESPONSE TO THE JANUARY 12, 2012 INFORMATION REQUESTS FROM LUTSEL K'E DENE FIRST NATION FOR THE THOR LAKE RARE EARTH ELEMENT PROJECT DEVELOPER'S ASSESSMENT REPORT

Submitted To:
MACKENZIE VALLEY ENVIRONMENTAL IMPACT REVIEW BOARD

January 25, 2012

Avalon Rare Metals Inc. (Avalon) is pleased to provide the following responses to the information requests identified in the Lutsel K'e Dene First Nation's information requests provided via Mackenzie Valley Environmental Impact Review Board (MVEIRB) on January 12, 2012. Avalon's responses are found after each information request.

IR Number:	**LKDFN #1**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Employees' Flights to and from the Nechalacho Mine and flotation Plant Sites
DAR Section:	4.9.1.1 Nechalacho Mine and Flotation Plant Site
TOR Section:	N/A

Preamble

The GNWT in its September 27, 2010 letter to the MVEIRB asked for explicit details on travel and site access policies for local and regional Northern residents and southern hires and, incentives for the company's or contractors employees to live in NWT communities.

Avalon responded by saying that its rotation work schedule is based on fly-in/fly-out transportation, with onsite camp facilities. The planned rotation will include periods of overlap for key personnel to ensure continuity and safe operations. Avalon will provide employees' flights to and from the site. Flights are planned to originate from Edmonton, Yellowknife, Lutsel K'e and Hay River. Page 537, (Avalon Rare Earth Metals Inc., 2010). Further Avalon will attempt to hire 30 per cent of its labour force from its regional study area communities.

According to the Australian Journal, the greatest risk to the economic health of mining towns is the rising tide of fly-in fly-out workers. The more the mining company uses fly-in-fly-out (FIFO) staff, the less likely the local town is to thrive from the presence of a resources operation. Under current Queensland government policies, a mining company is allowed only a proportion of its workforce as FIFO workers; 30 per cent must be local employees (Ryder, 2011).

LKDFN Request #1

1. Please provide explicit details on incentives for the company's or contractors' employees to live in NWT communities; and, will Avalon Rare Metals Inc. commit to adaptive management policies whereby over the lifetime of its mine at least 50 per cent of its employees reside in the NWT on a full-time basis?

Avalon Response #1

As of December 2010, Avalon's employment breakdown was 60% Aboriginal, 24% northern residents and 16% other Canadians (Avalon 2011b), which demonstrates Avalon's commitment and proven ability to hire northern and Aboriginal employees.

Avalon is committed to the development of a northern workforce. Our preference is to have employees live within or re-locate to NWT communities, and as such, Avalon will encourage people from outside the NWT to relocate. A specific list of incentives for relocation and retention has not yet been developed. However, Section 7.1.3 (specifically pages 849-851) of the DAR outline Avalon's training plan for NWT residents to achieve those targets. As indicated in Section 7.1.3 of the DAR, it is anticipated that direct employment of northerners will increase over time due to Avalon's active recruitment strategy and the Mine Training Society.

Furthermore, as part of Avalon's commitment and incentives to hire northern and Aboriginal residents, it is providing transportation to and from several NWT communities. For southern workers moving to the region, there will be a commitment to support long term employment and create a stable population base.

The GNWT, in their 2009 NWT Survey of Mining Employees, identified the two largest barriers for in-migration to the NWT as the cost of living and leaving family and friends. The cost of living was also cited as the main reason northern residents leave the NWT. Labour is attracted to the NWT by high wages and benefits and by Northern experiences and adventures. Mining wages are typically above average, and may attract new residents to the NWT and/or provide incentive for NWT residents to remain in the NWT.

Avalon will develop its list of incentives for relocation and retention based on the research and lessons learned from historic and current mining practices.

It is in the best interest of Avalon Rare Metals Inc. to have a stable employee and contractor base, that is located close to the mine sites (i.e., in the NWT). In this regard, Avalon will adaptively manage its recruiting, retention and procurement strategies to achieve as high a percentage of northern employment as possible, as evidenced by its existing percent of Aboriginal and northern employment. However, due to the numerous external factors that are beyond Avalon's control, it cannot commit to ensuring that over the life of the mint that 50% of its employees will reside in the NWT full-time.

IR Number:	**LKDFN #2**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Impacts and Benefits Agreement
DAR Section:	7.1.3 Employment Opportunities. Potential Effects
TOR Section:	N/A

Preamble

Avalon Rare Metals Inc. has signed Negotiation Agreements with both the Yellowknives Dene First Nation and the Deninu Kue First Nation regarding the development of the Nechalacho rare earth metals deposit at Thor Lake, NWT. Broad principles for co-operation are outlined in the Negotiation Agreement (often referred to as a Memorandum of Understanding), providing the basis for the negotiation towards an Impacts and Benefits or Accommodation Agreement. An Accommodation Agreement typically covers a number of issues including: environmental protection, business and employment opportunities. Page 846, (Avalon Rare Earth Metals Inc., 2010).

LKDFN Request #2

1. Will Avalon Rare Metals Inc. commit to signed Negotiation Agreements with the Lutsel K'e Dene First Nation regarding the development of the Nechalacho rare earth metals deposit at Thor Lake, NWT? Broad principles for co-operation are outlined in the Negotiation Agreement (often referred to as a Memorandum of Understanding), providing the basis for the negotiation towards an Impacts and Benefits or Accommodation Agreement.

Avalon Response #2

Avalon signed a negotiation agreement with the Lutsel K'e Dene First Nation (LKDFN) in June 2011. Since that time Avalon and LKDFN have been negotiating an Accommodation Agreement in confidence (as per the Memorandum of Understanding) and in good faith. We recommend that anyone from LKDFN that has further questions about the status of the agreement contact the Lutsel K'e Negotiating Team.

IR Number:	**LKDFN #3**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Beryllium
DAR Section:	4.2 Property Project History, 4.2.2 Highwood Resources Ltd., Page 445
TOR Section:	N/A

Preamble

The overall metal content of rare earth element ores is another geochemical concern associated with rare earth element production. It is important to note rare earth element mining is hard rock mining, so any of the metal concerns associated with hard rock mining should be a concern with rare earth element mining as well. Metals such as aluminum, arsenic, cadmium, cobalt, copper, gold, iron, lead, manganese, silver, and zinc are often associated with hard rock mining. The dangers of metals in the environment are well documented. Metals of special concern at rare earth element mines include, but are not limited to, aluminum, arsenic, barium, beryllium (emphasis added), cadmium, copper, lead, manganese, and zinc (United States Environmental Protection Agency, August 15, 2011).

Beryllium is naturally occurring in rocks and could be found in elevated concentrations at rare earth element mines because beryllium has a 2+ charge like calcium. Calcium is a chemical constituent of carbonate minerals that characterize carbonatites. Beryllium can make its way into air, water, and soil. In air, beryllium exists as very small particles that get carried by wind. Solubility of beryllium in water is dependent on the compound. Some beryllium compounds are soluble while others are not. Weathering processes can change insoluble compounds into soluble (Hurst, 2010) soils, where they can reside for thousands of years without moving into groundwater. Water soluble beryllium compounds pose more of threat to organisms than insoluble forms, however the greatest threat to humans from beryllium is in air. Inhalation of beryllium can harm the lungs of humans and other terrestrial animals. Such damage is similar to pneumonia with reddening and swelling of the lungs. This condition is referred to as "acute beryllium disease." Lung damage stemming from beryllium inhalation can increase a person's risk of lung cancer. The DHHS and IARC have determined beryllium to be a human carcinogen, while EPA believes beryllium is a probable carcinogen (ASTDR, 2002) as found in (United States Environmental Protection Agency, August 15, 2011).

LKDFN Request #3

1. Please report if beryllium will ever be mined, processed and or created as a by-product; even as a waste, during any part of the mining, milling and refining processes.

Avalon Response #3

Avalon is pleased to re-confirm that as stated in Commitment 18 presented in the Developers Assessment Report, "there will not be any Beryllium produced from the operations".

As noted in the DAR. the mineralization in the Nechalacho deposit has no significant beryllium (Be) concentrations. The beryllium content in the Nechalacho ore and host rock is of the same order of magnitude as the average abundance of beryllium in the earth's crust and there is no statistical correlation (increase) of beryllium with rare earths or zirconium in the Nechalacho deposit.

In addition, in response to a Part 1 item raised by the MVEIRB in September 2011, Avalon indicated that as reported in SGS (2011-Appendix F to the DAR), the concentrations of beryllium present in shake flask leach test results for tailings, ore and concentrate were generally measured to be at or below the detection limit of <0.0002 mg/l. This very low concentration is comparable to the concentration of beryllium measured in Thor Lake water, which is also presented in the SGS (2011) report.

IR Number:	**LKDFN #4**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Radon
DAR Section:	4.7.3.1 Environmental Characterization of Waste Rock, Tailings, Ore and Concentrate
TOR Section:	N/A

Preamble

One contaminant associated with rare earth element ores are radionuclides. Rare earth element bearing minerals such as monazite, xenotime, and bastnasite can contain low levels of primordial thorium-232, uranium-238, and their decay products. Uranium-235 is also present but in very low quantities. Thorium-232 and uranium-238 are rather benign, but some of the decay products can represent a danger to the environment due to the energetic particles and gamma rays released during radioactive decay. For example in the uranium-238 decay chain, bismuth-214 has a very energetic gamma release and produces radon-222 that can be inhaled and decay in the lungs (Argonne National Laboratory, 2005) as found in (United States Environmental Protection Agency, August 15, 2011).

Mineralization in the Nechalacho deposit includes LREE found principally in allanite, monazite, **bastnaesite** (emphasis added), and synchysite; yttrium, HREE, and tantalum found in fergusonite; niobium in ferro-columbite; HREE and zirconium in zircon; and gallium in biotite, chlorite, and feldspar in albitized feldspathic rocks. This mineralogy has been studied by SGS Minerals Services, XPS Process Services, and McGill University. Page 487 (Avalon Rare Earth Metals Inc, 2010).

SENES (SENES, 2011) on page 1-8 states that radon exposures in underground mining and in enclosed areas can be an issue if appropriate ventilation is not provided. Further on pages 3-1 and 3-2 SENES notes that The NWT *Mine Health and Safety Act* [*Mine Health and Safety Act*: Consolidation of Mine Health and Safety Regulations R-125-95, MHSA 2011] covers radiation hazards; specifically as follows for exposure to radon progeny:

> *9.90. The manager shall inform any person in writing of the amount of the exposure of the employee to radon daughters when that exposure reaches*
>
> *(a) 0.75 WLM in any one month;*
>
> *(b) 1.5 WLM in any period of three consecutive months; or*
>
> *(c) 2 WLM in any period of 12 consecutive months.*

SENES adds that although predictions of radon levels can be made, such as in underground locations, **direct measurements are required to confirm the exposures** (emphasis added).

The NWT regulations following the A.E.C.B (now the CNSC) limits for allowable dose and radon progeny levels. Current regulations specify that radon concentrations are multiplied by a dose conversion factor (DCF) of 5 mSv per WLM. Limits on total dose are 50 mSv in any one year and 100 mSv over five years (equivalent to 20 mSv/y) or equivalently, 4 WLM/y.

For protection SENES (SENES, 2011) states that good workplace ventilation is used to control workplace radon decay products levels. As for dust, experience suggests that ventilation provided for diesel and potential non- radiological exposures is often adequate for radiation protection purposes; and further emphasis this point on page 4-6 wherein SENES states that standard mine ventilation practices developed for conventional pollutants, such as diesel exhaust, are expected to control radon and its decay products to acceptable levels.

LKDFN Request #4

1. To Avalon. How will Avalon provide direct measurement of radon exposure for its underground work force?
2. To Avalon. Will the underground workforce have knowledge of the degree of radon exposure they are experiencing and cumulatively?
3. To Avalon. What constitutes “standard mine ventilation”?
4. To Avalon. How will Avalon monitor mine ventilation to ensure unacceptable radon gas accumulation?
5. To the GNWT. Does it have the capacity to effectively monitor work place safety with respect to Radon; and if not, what will the GNWT do to ensure the application of the NWT Mine Health and Safety Act [Mine Health and Safety Act: Consolidation of Mine Health and Safety Regulations R-125-95, MHSA 2011 with respect to radon.

Avalon Response #4.1

Based on the uranium levels in the ore, personnel monitoring for radon is not anticipated to be an on-going requirement. However, to confirm the expected levels, the exposures of a representative group of underground workers to radon will be measured using monitors called PADs (personal alpha dosimeters). These monitors are the same devices used to monitor the exposures of uranium miners and are certified for such measurements by the Canadian Nuclear Safety Commission (CNSC).

The PAD, which is typically worn on the belts of the workers during their entire shift, includes a battery-operated pump that draws air through a filter at a constant rate. The dust and alpha particles that deposit on the filter are measured by special dosimeters in the PAD, which are subsequently analyzed in the lab. The PADs actually measure the alpha decay products of radon which are responsible for essentially the entire radiation dose due to radon exposure. The results are reported in Working Level Months (WLM) for comparison to applicable regulatory limits. The PADs

measure exposures to two types of radon: radon (Rn-222 due to uranium) and thorium (Rn-220 due to thorium). The PADs also measure the total exposure to the long-lived alpha particles in the mine dust.

The necessity and frequency of the monitoring of the workers will be determined by the concentrations, measured when the mine is in operation, and resulting WLM exposures relative to the exposure limits outlined in the NWT *Mine Health and Safety Act*.

Avalon Response #4.2

Yes. The results from any monitoring of the workers will be given to the workers. As part of the Radiation Protection Plan (RPP) for the facility, the workers will be given training on what the levels mean and how they compare to applicable limits.

For perspective, the radon exposure of the underground mine workers is expected to be well below applicable limits. Even in uranium mines, the radon exposures of workers are comparable to the typical exposures received from natural background radon in homes.

Avalon Response #4.3

"Standard mine ventilation" is the ventilation required to maintain the exposure of workers to standard mine contaminants to below regulatory limits. This is largely determined by the ventilation requirements necessary to control exposures to emissions from diesel-powered equipment. Experience in uranium mines has shown that the ventilation necessary for this purpose, as well as other standard practices, such as having workers situated in the fresh ventilation air flow, are sufficient to keep exposures to radon to below applicable limits. The monitoring of the workers will be used to confirm that acceptable levels can be met.

Avalon Response #4.4

Radon gas does not accumulate in the environment when it is released from mines. Radon is radioactive and decays away in time with 3.8 day half-life, meaning that its concentration is reduced by a factor of two every 3.8 days. More significantly, the radon concentrations in the mine ventilation air are rapidly reduced by standard atmospheric dispersion as the radon moves with the prevailing winds. Even around uranium mines, the radon from the mines reaches background concentrations within short distances (< 2 km) from the mines.

If necessary, passive (no power required) environmental monitors that continually measure the radon concentration over the time they are exposed (e.g. months) can be used to confirm the concentrations of radon at locations around the mine. The frequency and necessity for any on-going radon monitoring will be determined as part of the overall environmental monitoring program for the proposed mine.

IR Number:	**LKDFN #5**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Tailings Impoundment
DAR Section:	4.7.3.1 Environmental Characterization of Waste Rock, Tailings, Ore and Concentrate
TOR Section:	N/A

Preamble

Rare earth deposits are often associated with elevated levels of thorium and/or uranium, both of which are radioactive elements. Radioactivity is an issue of concern as it relates to worker health in terms of exposure to radiation underground, mineral processing; transportation of radioactive materials; radioactive releases into the natural environment, and disposal of any radioactive product.

Regulations governing radioactivity include:

- Transportation of Dangerous Goods Regulations (TDGR), with limit of 70 Bq/g;
- Health Canada Regulations on Naturally Occurring Radioactive Material (NORM);
- Northwest Territories Mine Health and Safety Act and Regulations which require control on worker exposures where radon decay product levels exceed 0.4 WLM/y (Working Level Months per year); and
- Canadian Nuclear Safety Commission if uranium and/or thorium materials are produced. Pages 490-491 (Avalon Rare Earth Metals Inc, 2010).

Potential radiation exposures of workers are specifically addressed in the NWT Mines Act. The NWT regulations provide limits on allowable radiation dose and exposure to radon gas and its radioactive decay products. The NWT regulations are based on the regulations of the Canadian Nuclear Safety Commission (CNSC), the federal agency that regulates the use of nuclear energy and materials. However, the mandate of the CNSC specifically excludes NORM; the CNSC regulations apply only to radioactive substances used in the nuclear fuel cycle, and to the transport and import/export of radioactive materials. To address situations where the exposure to NORM is not regulated in Canada, the Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM) were developed in 2000 by a federal-provincial-territorial NORM working group, with the support of Health Canada and the CNSC. Page 542 (Avalon Rare Earth Metals Inc, 2010).

In the United States however, the mining companies such as Rare Element Resources plans to work within the boundaries of Nuclear Regulatory Commission (NRC) rules for construction of a tailing impoundment to properly dispose of their wastes in case (emphasis added) thorium and uranium become concentrated enough to warrant regulation by the NRC (Pickarts, 2011) as found in (United States Environmental Protection Agency, August 15, 2011).

LKDFN Request #5

1. Given rare earth deposits are often associated with elevated levels of thorium, can Avalon confirm that there is no thorium at its mine.
2. If there is thorium at its mine or metallurgical plant, is it willing to meet similar standards as Rare Elements Resources just "in case" thorium levels become concentrated enough to warrant more stringent disposal regulation?

(United States Environmental Protection Agency, 1997)

(Agency for Toxic Substances and Disease Registry, 2002)

Avalon Response #5.1

As indicated in Section 4.7.3.1 of the DAR, the Thor Lake rare earth deposit does have levels of thorium and uranium that are higher than average naturally occurring granite but are far below levels typically experienced in other rare earth deposits. The thorium levels in the Nechalacho deposit are anomalous, but given the lower radioactivity equivalency of thorium relative to uranium, the overall effect of typical Nechalacho mineralization as a rock mass is predicted to be very low.

The rare earth concentration process to be employed at the Flotation Plant will concentrate the rare earths, including the low levels of thorium in the rock minerals. However, it should be noted that the overall levels of thorium in the REE products are predicted to be below Canadian Transportation of Dangerous Goods Regulations (TDGR) and will not require special handling.

However, as also indicated in this section of the DAR, there will be no production of thorium or uranium resulting from the mining, flotation processing and hydrometallurgical processing of the Nechalacho rare earth deposit.

Avalon Response #5.2

The level of thorium in Rare Elements Resources' Bear Lodge Property is significantly higher than the level found at Thor Lake. The thorium from the Thor Lake Project is concentrated with the rare earths, not the mine tailings.

The preamble states that the Rare Elements Resources company has agreed to use U.S. Nuclear Regulatory Commission (NRC) rules for the construction of a tailings impoundment. The NRC standards simply describe best practices in tailings management and require proponents to submit plans for review by regulators. The environmental standards are comparable to those being evaluated in this environmental assessment that would be monitored through various management plans. Engineering standards are comparable to the Canadian standards for the design of dams. All aspects of Avalon's design of the tailings management facility have been completed in compliance with the following documents:

- Mining Association of Canada's (MAC) Guide to the Management of Tailings Facilities (MAC 1998)
- Canadian Dam Association's (CDA) Dam Safety Guidelines (CDA 2007)

There are two unique provisions in NRC standards that are not applicable to the Thor Lake Project. Firstly, NRC requires testing of the radon emission rate from the impoundment cover. Radon is created from the decay of thorium and uranium. The low levels of uranium and thorium in the Thor Lake Project tailings would not require testing of radon. Secondly, NRC outlines a process for the eventual government ownership of tailings sites under an NRC general license. The objective of Avalon's Tailings Management Facilities is to achieve effective reclamation at mine closure, not government ownership.

IR Number:	**LKDFN #6**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Toxicity of Rare Earth Elements
DAR Section:	9.1.3 Environmental Effects of Concentrate in Great Slave Lake
TOR Section:	N/A

Preamble

The United States Environmental Protection Agency (US EPA) states that the toxicity of rare earth elements in the environment are not completely understood but are considered metals at their elemental level (United States Environmental Protection Agency, August 15, 2011).

Avalon (Avalon Rare Earth Metals Inc., 2010) concludes that the anticipated environmental effects of any residual rare metal concentrates remaining on the bottom of Great Slave Lake in the vicinity of such a most unlikely incident would be expected to be of a negligible and insignificant nature with no significant residual impacts expected to occur.

LKDFN Request #6

1. Does Avalon agree with the US EPA that the toxicity of rare earth elements in the environment is not completely understood?
2. Will Avalon commit to increasing the public understanding of the toxicity of rare earth elements so that pre-emptive action can be taken to mitigate unforeseen environmental impacts?
3. If Avalon is open to increasing the public understanding of the toxicity of rare earth elements, will it commit to funding independent research into the subject over the lifetime of the Avalon Rare Earth Metals Inc. project?

Avalon Response #6.1

Avalon acknowledges that the general statement referred to on Page 13 of the EPA report (United States Environmental Protection Agency, August 15, 2011) is reasonably valid. However, it should be noted that the quotation cited was an incomplete sentence which actually ends with the words …*"but are considered metals at their elemental level"*.

This is an important elaboration because rare earth metals typically do not exist in nature as pure metals. As also stated on Page 13 of this EPA report, *"this highlights the chemical uniqueness of every rare earth metal deposit, and the importance of extensive chemical analysis in determining environmental concerns at individual deposits"*.

The term Rare Earth Elements(REEs) is used to describe the 15 lanthanide elements or metals and, more recently, the metals yttrium and scandium; all of which display similar physical and chemical properties. REEs are not particularly rare and have a similar abundance in the earth´s crust to nickel, tin or tungsten.

As indicated in Section 4.4.2 of the DAR the REEs, tantalum, niobium and zirconium mineralization in the Nechalacho deposit occur in broad enriched sub-horizontal replacement zones, in addition to being widely disseminated over much of the deposit. Potential ore minerals consist primarily of fergusonite, ferro-columbite, allanite and zircon. Minor or accessory assemblages include bastnaesite group minerals, monazite, and apatite. The highest grades of heavy rare earth elements(HREEs), light rare earth elements (LREEs), niobium, and tantalum appear to occur in magnetite and zircon-rich areas within the sub-horizontal replacement zones.

For further clarification, as reported in Section 4.4.3 of the DAR, the mineralization in the Nechalacho deposit includes LREEs, found principally in allanite, monazite, bastnaesite and synchysite; yttrium, HREEs and tantalum found in fergusonite; niobium in ferro-columbite; HREE and zirconium in zircon; and gallium throughout but especially high in albitized feldspathic rocks. The relative abundance of the various rare earth bearing minerals, as from a Qemscan study of 30 selected samples from three drill holes (SGS 2011) is:

- Zircon averaging 11%
- Allanite averaging 3.6%
- Monazite averaging 1.5%
- Synchisite averaging 0.9%
- Fergusonite averaging 0.6%
- Bastnaesite averaging 0.4%
- Columbite (not a REE mineral) averaging 0.9%

These averages should not be taken as statistically representing the whole mineralized body because there were an insufficient number of samples and they were not randomly collected. For example, the 11% zircon content is clearly higher than the average for the Nechalacho deposit. However, they do give a general indication of the relative abundance of the minerals.

Apart from the REEs present in the mineralization, rare earth element ores typically contain a host of other metalloids (metals) and radionuclides in their crystal structure, all of which can contribute to possible toxicity.

For these and other reasons, comprehensive metallurgical testing has been conducted by SGS Canada Inc. (SGS 2011)for Avalon. Shake flask tests conducted by SGS (2011) determined that essentially no chemical parameters went into solution during 24 hours of agitation in water. All values reported, including radionuclides and metals, were found to be exceedingly low and at least one magnitude below applicable MMER values. In particular, the concentrations of radionuclides measured were below the detection limit for the three radionuclide parameters measured.

According to Dr. John Goode, Avalon's rare earth metallurgical expert, "the component minerals are recognized as some of the most inert on the planet. Our tests show that we have to use strong acids to get any sort of reaction from the concentrate. To get anything to dissolve from the concentrates takes very high free acid conditions. To get substantial dissolution we need to cook the concentrate at 600 °C in molten sodium hydroxide" (J.Goode Pers Comm 2011).

This testing has demonstrated that the REEs and other minerals present in the Nechalacho deposit, including the ore, concentrate and tailings are very tightly bound in the form of intimate admixtures. In the past, these admixtures have presented metallurgical difficulties (in other words the REEs are difficult to separate). In addition, the testing undertaken for radionuclides have demonstrated that all of the Thor Lake Project materials, including rock, concentrate and tailings from metallurgical testing for radioactive element leaching were well below World Bank, U.S. and Canadian requirements to protect people and the environment.

In conclusion, while complete understanding of the toxicity of rare earth elements is not available, the studies of the rare earth elements from Thor Lake have demonstrated that the characteristics of these elements are as stable compounds in the natural environment. Analysis has shown that they do not release metals, radionuclides or rare earth elements into the environment and thus it is difficult to foresee any associated toxicity from the Thor Lake project.

Avalon Response #6.2

Avalon is committed to increasing the public understanding of rare earth elements, their nature, uses, etc. Also, please refer to Avalon response #6.1 regarding the toxicity of rare earth elements. Examples of initiatives undertaken and ongoing are the information bulletin entitled 'Rare Earths 101', the development of the Rare Earths Blog, and the numerous initiatives with advanced educational institutions and industry associations to better understand and communicate about rare earths. Well-informed partners and stakeholders are in a better position to participate in and provide more effective feedback about Avalon's environmental management and are being consulted regarding rare earth elements.

Avalon has and will continue to complete environmental testing of its effluents in an effort to identify potential impacts. Should any concerns be identified, actions will be taken, as required under existing regulations and Avalon's Health Safety and Environment Policy, to mitigate any and all concerns. Avalon will continue to be open and transparent with the public in its regular communications, including an annual Sustainability Report.

Avalon Response #6.3

As stated in the above responses, Avalon has and will continue to develop and communicate its knowledge regarding the toxicity of Rare Earth elements (or the lack thereof) as they relate to Avalon operations to increase the public understanding of them.

IR Number:	**LKDFN #7**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Carbonate mineral dissolution
DAR Section:	4.7.3.1 Environmental Characterization of Waste Rock, Tailings, Ore and Concentrate
TOR Section:	N/A

Preamble

Modified acid base accounting (ABA) test results reported by SGS (2011) for the Basal Zone ore composites (Master Comp 1 and Master Comp 2), concentrates (F-29 Gravity Conc, F-30 Gravity Conc and F-3 Conc), low grade sample (SW-SAG Reject) and Basal Zone sample (S-BZ-A SAG Reject) indicated that these samples are potentially acid neutralizing (PAN). Similarly, although ABA test results for the upper ore sample (S-UZ-A SAG Reject) and the tails samples (Test F-29 Tls and Test F-30 Tls) suggested some minor uncertainty, the very low sulphide concentrations reported, coupled with the **significant carbonate (CO3) neutralization** (emphasis added) potential ratios (NP/AP), indicate that these samples are highly unlikely to generate acidity. The alkaline final pH values reported after **aggressive oxidation** (emphasis added) of these samples during net acid generation (NAG) testing, confirmed the highly unlikely acid generation potential of these samples (Avalon Rare Earth Metals Inc., 2010).

It is important to note the natural buffer of carbonate minerals in rare earth element ores can cause potential environmental concerns as well. Too much carbonate mineral dissolution represents just as much danger as sulfide mineral dissolution. Carbonate mineral dissolution introduces alkaline materials into water, where they can raise the pH of water to elevated levels. The dissolution of carbonate minerals can also introduce possible contaminants into the environment similar to how sulfide mineral dissolution can. Bastnasite is one of the carbonate minerals that can undergo dissolution. The dissolution of this carbonate mineral is what would release the rare earth elements into the environment. Another contaminant to be concerned about in carbonate mineral dissolution is fluorine. Fluorine is also a constituent of rare earth element bearing bastnasite (United States Environmental Protection Agency, August 15, 2011).

LKDFN Request #7

1. As the mineralization in the Nechalacho deposit includes LREE found principally in allanite, monazite, **bastnaesite** (emphasis added), has Avalon reported the likelihood and possible impact that the dissolution of this carbonate mineral could release rare earth elements into the environment?

Avalon Response #7

The mineralization in the Nechalacho deposit consists of a number of rare earth minerals containing carbonate and hydroxides that are presently not readily available to the environment. These minerals

were formed under the original basic conditions and are not expected to be soluble until an acid is used to break open the matrix (e.g. the acid baking process).

In the SGS (2011) report entitled "Characterisation of Ore, Concentrate and Tailings from the Nechalacho Rare Earth Deposit Element Project – Phase 2" previously submitted to the EIRB, solutions from the processing plant were evaluated for their possible contamination of the environment. Solutions from two samples:

- The preleach and wash (CH-WY1) from the acid bake process, and
- The filtrate from the rare earth precipitation (RAR-1)

were treated with $BaCl_2$ (Ra Removal) and $Fe_2(SO_4)_3 \bullet 5H_2O$ to simulate the process water to tailings. In all cases, the rare earth analyses were very low in solution and there are no potential environmentally significant concentrations of rare earths (Table 1). There are presently no MMER limits for the rare earths.

The insoluble aspects of rare earths are also demonstrated during the purification process for rare earths. Rare earth carbonates can be produced as a final product from an aqueous solution indicating that the carbonate forms are insoluble in water. The processing plant will be completely contained to prevent any releases to the environment using a number of Health, Safety and Environmental practices and engineering technologies.

Table 1: ICP-OES Solution Analyses for Hydrometallurgy Plant At Pine Point

Characteristic	Units	MMER*	Thor Lake Water #4	Thor Lake Water #7	CH-WT1 PLS + Wash	RAR-1 Filtrate
pH		6.0 - 9.5	8.19	8.26	7.73	7.46
Ce	mg/L		<0.00007	<0.00007	0.00529	0.791
Dy	mg/L		<0.000003	<0.000003	0.0008	0.008
Er	mg/L		0.000001	0.00001	0.0004	0.0015
Eu	mg/L		0.000006	0.000006	0.0001	0.0027
Gd	mg/L		<0.00005	<0.00005	0.0009	0.0313
Ho	mg/L		<0.00001	<0.000001	0.0002	0.001
La	mg/L		<0.00004	<0.00004	0.012	0.566
Lu	mg/L		<0.00001	<0.000001	<0.000001	0.0001
Nd	mg/L		<0.00003	<0.00003	0.0037	0.219
Pr	mg/L		<0.00001	<0.000001	0.0009	0.0685
Sc	mg/L		0.00061	0.0005	0.0012	0.0012
Sm	mg/L		<0.00001	<0.000001	0.000088	0.0256
Tb	mg/L		<0.00001	<0.000001	0.0001	0.0001
Tm	mg/L		<0.00001	<0.000001	0.0001	0.0001
Y	mg/L		0.000007	0.000007	0.009046	0.0344
Yb	mg/L		<0.000002	<0.000002	0.0003	0.0006

MMER* Department of Justice Canada 2002
Metal Mining Effluent Regulations
Fisheries Act SOR-20002-222

IR Number:	**LKDFN #8**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Radiation Protection Program in Support of the Thor Lake Project
DAR Section:	(SENES, 2011) Section 5.0 Summary and Discussion
TOR Section:	N/A

Preamble

Modern mines are required to comprehensively evaluate environmental concerns at the earliest stages of mine planning and design. Environmental controls are now considered as an integral part of overall mine management (EPA, 1997). **However, mining and refining of rare earth elements, if not carefully monitored, can pose threats to human health and the environment** (emphasis Added). Nowhere is this more apparent than in the nation dominating rare earth element production today (United States Environmental Protection Agency, August 15, 2011).

SENES (SENES, 2011) notes that due to the **absence of laboratory results on Hydrometallurgical concentrate samples, projections of radiological constituents of concern were conducted** (emphasis added) by SENES. SENES concludes that "**the radiation dose to some workers when exposed to average ore grades was estimated to be above 1 mSv per year, the dose limit for incidentally exposed workers recommended in the Canadian NORM Guidelines** (emphasis added). The dose limit for incidentally exposed workers is the same as that of general members of the public. Should such exposures occur, a radiation protection program (RPP) would be indicated."

LKDFN Request #8

1. Can Avalon please provide information as to how it will monitor worker exposure to radiological constituents of concern?
2. Will workers at the hydrometallurgical plant know their level of exposure to radiological constituents of concern?
3. Will Avalon have a radiation protection program at its hydrometallurgical plant?

Avalon Response #8.1

As described in Response 4.1, the radon exposure of a representative group of workers can be monitored using PADs (personal alpha dosimeters). As described in Section 4.3.2 of SENES (2011), the gamma radiation exposure of the workers can be measured using TLDs (thermoluminescent dosimeters). These are small badges worn by exposures available from the National Dosimetry Services (NDS) operated by Health Canada. All radiation workers in Canada wear such monitors, and the results are reported to the workers and recorded in the National Dose Registry (NDR) managed by Health Canada. In this way, the cumulative radiation exposure of the

workers is measured and recorded. The frequency of the monitoring and which workers might require on-going monitoring will be part of the overall worker monitoring program to be outlined in the Radiation Protection Program (RPP) for the facility. The RPP will include a description of any personal protective equipment (PPE) that might be required. It is not anticipated that PPE beyond standard industrial PPE (e.g. coveralls, protective eyeglasses, gloves. etc.) will be required for the proposed mine.

Avalon Response #8.2

Yes. The results from any worker radiation monitoring that is undertaken will be reported and explained to the workers. This will be one of the requirements of the Radiation Protection Program (RPP) for the facility.

Avalon Response #8.3

Yes. A Radiation Protection Program (RPP), which will include any necessary monitoring requirements and worker training, will be developed for the hydrometallurgical plant.

IR Number:	**LKDFN #9**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Hydrometallurgical Plant Process Flow Outputs
DAR Section:	(SENES, 2011) 2.2.3 Hydrometallurgical Plant Process Flow
TOR Section:	N/A

Preamble

According to the Chinese Society of Rare Earths, every ton of rare earth elements produced generates approximately 8.5 kilograms of fluorine and 13 kilograms of flue dust. Additionally, sulfuric acid refining techniques used to produce one ton of rare earth elements generates 9,600 to 12,000 cubic meters of gas laden with flue dust concentrate, hydrofluoric acid, sulfur dioxide, and sulfuric acid. Not only are large quantities of harmful gas produced, alarming amounts of liquid and solid waste also resulted from Chinese refining processes. They estimate at the completion of refining one ton of rare earth elements, approximately 75 cubic meters of acidic waste water and about one ton of radioactive waste residue are produced.

China produced over 130,000 metric tons of rare earth elements in 2008 alone (IAGS, 2010). Extrapolation of the waste generation estimates over total production yields extreme amounts of waste. With little environmental regulation, stories of environmental pollution and human sickness remain frequent in areas near Chinese rare earth element production facilities. United States government agencies, including EPA, can learn a lot from China's environmental issues related to rare earth element production (United States Environmental Protection Agency, August 15, 2011).

SENES (SENES, 2011) describes the Hydrometallurgical Plant Process Flow. The process flow includes an Acid Bake wherein Concentrate will be mixed with concentrated sulphuric acid, heated to a temperature of about 200ºC, quenched with water and the resulting slurry will be pumped to automatic filter presses. The washed and blow-dried acid bake residue will be repulped and refiltered then conveyed to the acid bake residue handling system.

LKDFN Request #9

1. Will the Avalon Rare Metals Inc. project generate fluorine, gas laden flue dust and/or sulfur dioxide?
2. If the answer to any of the above is yes, please explain how much will be produced and potential impacts on human and animal health.

Avalon Response #9.1

The three sources of emissions at the plant site will be:

1. The generation of power using conventional diesel engines (meet all standard legislation limits for diesel engines).
2. The generation of SO_2 from the sulphuric acid facility is expected to be well below the standard for a new sulphuric acid plant of 950 mg/Nm^3 through engineering design and control.
3. The acid bake process will generate fluoride complexes and a small amount of sulphur dioxide.

The scrubbing system for the acid bake process will remove these contaminants from the off gases to meet existing Canadian work-safe requirements for clean air emissions. Engineered systems will be in place to scrub the off gases from the air stream and transfer these contaminants into a basic solution or slurry.

The fluorides and sulphates will be removed to acceptable levels from this solution using a liming process that will convert the fluoride and sulphates to a very stable and insoluble calcium fluoride and calcium sulphate solid. These solids will then be stored in the tailings facilities with the spent ore and not available for human or animal inhalation or ingestion. The clean gases will meet existing air quality standards from the three point sources.

Avalon Response #9.2

The production of the fluorine and sulphur dioxide will be controlled and meet existing air quality standards for release. It is expected that the quantities of fluorine and sulphur dioxide in the gases will be very low after the scrubbing system has cleaned the exhaust gases. Regular monitoring of the scrubber stack by certified testers and on line instrumentation will serve to confirm conformance with specifications. Therefore no potential impacts on human or animal health are anticipated to occur.

IR Number:	**LKDFN #10**
Source:	Lutsel K'e Dene First Nation
To:	Avalon Rare Metals Inc.
Subject:	Water Treatment from the Tailings Basin if Required
DAR Section:	4.7.4.1 Environmental Characterization of Waste Rock, Tailings, Ore and Concentrate; and, 6.4.2.6 Assessment
TOR Section:	N/A

Preamble

The tailings and water management strategy for the Nechalacho Mine and Flotation Plant site consists of a closed loop system to minimize effects on the natural hydrologic flows within the Thor Lake watershed area. All tailings solids and fluids, as well as, process effluent from the Flotation Plant will report to the tailings basin. The TMF design currently includes a polishing pond. Excess water from the tailings basin **will be treated (if necessary)** and discharged from the polishing pond to Drizzle Lake. Ultimately, all water from the TMF will return to Thor Lake via Drizzle and Murky lakes. Page 499 (Avalon Rare Earth Metals Inc., 2010).

Based on the foregoing, water quality in Thor Lake and further downstream is not anticipated to be adversely affected by mining activities and discharges of decant water from the TMF. No adverse residual effects are therefore predicted. Water quality and biological monitoring will be carried out according to requirements of the Water License and the MMER. Monitoring results will be used to confirm that water quality downstream of the TMF discharge remains within allowable limits. Page 693 (Avalon Rare Earth Metals Inc., 2010).

LKDFN Request #10

1. How will Avalon provide assurance there will be no downstream impacts on Thor Lake or Great Slave Lake if it has no means of treating water from the tailings basin should such a need arise. If water treatment is found to be necessary, how will the water be treated? Using a water treatment plant or some other method?

Avalon Response #10

As indicated in the DAR, Avalon is committed to implementing the highest levels of environmental performance to ensure that there will be no downstream environmental impacts on Thor Lake or Great Slave Lake from Avalon's operations. Avalon's current approach to achieving this goal has been described in the above preamble to the question, which was drawn from the DAR.

The water quality modelling results presented in Section 6.4.2.6 of the DAR predict that the MMER effluent criteria for all parameters will be met over the entire 20 year simulation period, in each of the lakes within the Thor Lake system. This is projected to be the case even for aluminum and iron, which are the only metals in the effluent predicted to exceed CCME guideline values for the protection of aquatic life. Concentrations of metals reaching Thor Lake are predicted to be

extremely low. For example, arsenic will be 0.034% of the CCME guideline; mercury 0.3% of the CCME guideline; and copper, 0.04% of the CCME guideline.

As indicated in the preamble above, water quality and biological monitoring will be carried out according to requirements of the Water Licence and the MMER. Monitoring results will be used to confirm that water quality downstream of the TMF discharge remains within allowable limits.

Although not anticipated to occur, the ongoing monitoring that will be conducted will assist in determining if a potential water or downstream environmental quality problem could develop which would warrant further treatment at that time. However, since such a concern is not anticipated to arise based on current testing and modelling, it is considered to be a bit premature to identify a specific water treatment option that may or may not be required to address currently unforeseen potential future issues of concern. Nevertheless, there are a wide variety of treatment technologies available that could be implemented to target specific elements or compounds of concern that Avalon will implement if required.

IR Number:	**LKDFN #11**
Source:	Lutsel K'e Dene First Nation
To:	Department of Fisheries and Oceans Canada
Subject:	Fisheries Authorization Permitting the harmful alteration, disruption or destruction of fish habitat (HADD)
DAR Section:	6.6 Fish and Fish Habitat
TOR Section:	N/A

Preamble

Section 35 of the *Fisheries Act* provides for the protection of fish and fish habitat. Under the Act, no one may carry out any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat (HADD) unless authorized by the Minister of Fisheries and Oceans Canada.

> 35. (1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat. Alteration, etc., authorized
>
> 35. (2) No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act (Fisheries Act. R.S.C., 1985, c. F-14).

LKDFN Request #11

1. What means and/or conditions are being considered by DFO and how will they satisfy DFO‟s No Net Loss and Fish Compensation policy?
2. Will DFO provide the MVEIRB a draft of its proposed Fisheries Authorization before the conclusion of the environmental assessment?

Avalon Response #11

Avalon notes that these questions are actually addressed to the Department of Fisheries and Oceans (DFO) and has advised the MVEIRB that these questions be conveyed to DFO for the appropriate responses. However, Avalon is pleased to advise that the Company is committed to implementing a number of key mitigation measures to satisfy DFO's No Net Loss and Fish Habitat Compensation policy. These include:

- The location of the Tailings Management Facility in the Ring and Buck lakes catchment area, which has been demonstrated to only contain non-fish-bearing waterbodies.
- The use of open bottom arch culverts to cross Fred Lake Creek, and if needed the narrows between Thor Lake and Long Lake.
- The selection of seasonal, floating barge docks and suspended ramps at both dock sites to effectively eliminate possible impacts on fish habitat in Great Slave Lake.