



Information Request 44

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IR 44 – Assumptions of the Human Health Risk Assessment

References:

EIS Guidelines, Section 2.7.3.3
EIS, Section 2.7.3.3
2009 EIS, Section 6.3.1.6

Related Comments:

CEAR # 290 (Tsilhqot'in National Government)

Rationale:

In Section 2.7.3.3, the EIS Guidelines state that the Proponent will include both quantitative and qualitative risk assessment methods to assess the Project impacts on the health of receptors such as recreational users, local residents and communities, worker camps, users of Fish Lake, and users of the area for the consumption of country foods (including Aboriginal people as a sub-population).

The Proponent relies on the human health and ecological risk assessment in the 2009 EIS for a description of the effects of the Project on human health. In the EIS (Section 2.7.3.3, p. 806), Taseko provides an update to the assessment and identifies several assumptions used in conducting its human health and ecological risk assessment. One such assumption is that the consumption of fish from Fish Lake would occur 60 days per year. Another assumption is that the Canadian Council for Ministers of the Environment (CCME) Guidelines for soil ingestion are the most appropriate for this type of assessment.

The Tsilhqot'in National Government (p. 46) stated that studies have shown that the traditional foods consumption rate of the Xeni Gwet'in is much higher than the assumptions made in the 2009 EIS. It also noted that recent scientific investigations have concluded that the CCME Guidelines for soil ingestion do not accurately estimate intake levels of soil by those who consume traditional foods and in this regard is not precautionary. In addition, the Tsilhqot'in National Government pointed out several gaps in the analysis including an assessment of dust generated from all sources of the Project, the effects of exposure to particles finer than soil, and increased level of exposure due to the use of Fish Lake.

Information Requested:

With regards to the Human Health and Ecological Risk Assessment, the Panel requests that Taseko:

- a. Identify the assumptions made in the risk assessment calculations including food consumption rates, soil ingestion rates, transport of contaminants, soil particle size and pathways of exposure to sensitive receptors and discuss how these assumptions represent conservatism.

- b. Describe the process by which assumptions were validated.
- c. Describe any consultation activities that were undertaken with land users and other stakeholders to justify assumptions associated with potential exposure to contaminants.

Information Request #44a

With regards to the Human Health and Ecological Risk Assessment, the Panel requests that Taseko:

Identify the assumptions made in the risk assessment calculations including food consumption rates, soil ingestion rates, transport of contaminants, soil particle size and pathways of exposure to sensitive receptors and discuss how these assumptions represent conservatism.

Response Summary

Food Consumption Rates

- i. The food consumption rates used to assess both baseline and post-closure exposures to metals through the consumption of country food are listed Table 44A-1.

Table 44A-1. Food Consumption Rates

Food	Yearly-Averaged Daily Intake Rate		Reference
	Toddler	Adult	
Moose (major body parts)	72 g/day	168 g/day	Derived from Galore 2006 Galore Creek Country Foods baseline Assessment for moose major body parts consumption (Rescan 2006)
Muskrat	2 g/day	5 g/day	Derived from Galore 2006 for hoary marmot major body parts consumption (Rescan 2006)
Ptarmigan (major body parts)	7 g/day	16 g/day	Derived from Galore 2006 for grouse major body parts consumption (Rescan 2006)
Labrador Tea	1 g/day	2 g/day	Derived from Galore 2006 for caribou weed usage (Rescan 2006)
Fish	43 g/day	100 g/day	Derived From Galore 2006 for salmon major body part Consumption (Recan 2006)

The food consumption rates used in assessing potential exposures through country foods are the same as the values used in assessing baseline exposures in the 2009 EIS for the Prosperity Project.

ii. Discussion of Conservatism:

Exactly the same food consumption rates are used to assess baseline (pre-development exposures) and post-closure exposures. While country food consumption rates are used to evaluate baseline and project-related exposures to metals that may occur as a result of the consumption of country foods, the determination of project effects is not based on the numeric values of the pre- and post-development exposures, but rather on the incremental change in exposures that are predicted to occur between the pre-development baseline and the post-closure conditions.

For example, the 2009 and 2012 EIS submissions used consumption rates for moose of 168 g/day for an adult and this consumption rate was assumed for both the baseline and post-closure condition. Baseline hazards quotients (HQs) based on the mean and 95th percentile concentrations for chromium are 0.0420 and 0.0920, respectively, and the post-closure predicted HQs are 0.0423 and 0.0926, respectively (see Table 2.7.3.3.-9 from the 2012 EIS). The relationship between country food consumption rates and estimated exposures and the associated risks is linear, meaning that increasing the assumed country food consumption rate by a factor of 10 (ie. raising the rate from 168 g/day to 1,680 g/day) would increase the predicted HQs for baseline and post-closure exposures by the same 10-fold factor. The mean and 95th percentile baseline exposures would increase from 0.0420 and 0.0920 to 0.420 and 0.920, respectively, and the post-closure exposures from 0.0423 and 0.0926 to 0.423 and 0.926, respectively.

The ratio between baseline and post-closure exposures and risks, which forms the basis of the effects determination, does not change between the two country food consumption rate assumptions. The same result is seen if the country food consumption rates are reduced by a factor of 10 to 16.8 g/day (see Table 44A-2 below).

Table 44A-2. Ratios Between Baseline and Post-Closure for Varied Moose Consumption Rates

Daily Moose Consumption rate (Adult)	Mean Concentration (Chromium)			95th percentile concentration (Chromium)		
	Baseline	Post-closure	Ratio	Baseline	Post-Closure	Ratio
16.8 g/day	0.0042	0.00423	1.007143	0.0092	0.00926	1.006522
168 g/day	0.042	0.0423	1.007143	0.092	0.0926	1.006522
1,680 g/day	0.42	0.423	1.007143	0.92	0.926	1.006522

These results demonstrate that the country food consumption rates used in the assessment have a neutral effect neither over-predicting nor under-predicting the incremental change in exposures that occur between predevelopment and post-closure conditions.

Soil Ingestion Rates

- i. The soil ingestion rates recommended by Health Canada (Health Canada 2010a) were identified for use in the baseline and effects assessments. The soil ingestion rates for a toddler were assumed to be 80 mg/day (0.08 g/day) and for an adult a soil ingestion rate of 20 mg/day (0.02 g/day) was assumed. The same soil ingestion rates are used to estimate exposures for pre-development and post-closure conditions.

Metals that are present in soil at concentrations below the CCME and/or BC Ministry of Environment (MOE) guideline values for residential land are not considered to represent a concern for the health of people (including sensitive members of the population – young children, pregnant women and the elderly) who would be in contact with the soil 365 days per year.

In the assessment, the mean and 95th percentile concentrations of metals in surface soil both at baseline and closure were below the CCME and BC MOE guideline acceptable concentrations for residential land. It was assumed that metals in surface soil below the guideline values were not a potential concern for direct contact exposures (soil ingestion, dermal contact and soil particulate inhalation) to people in contact with the soil 365 days per year over a lifetime, incidental soil ingestion, dermal contact with soil and inhalation of soil particulate exposures were not a risk.

The reworked modelling completed for the 2012 New Prosperity Project for the vicinity of Fish Lake is based on the worst-case deposition; the results of this 2012 assessment are

similar to those of the original HHERA presented in the 2009 EIS. Metal concentrations in soil in the vicinity of Fish Lake are not expected to increase measurably above baseline conditions and thus, direct exposures to metals in soils would not be a concern for humans or terrestrial ecological receptors (wildlife and vegetation) in the vicinity of Fish Lake.

ii. Discussion of Conservatism:

The CCME and/or BC Ministry of Environment (MOE) guideline for residential land were used which are protective of sensitive members of the population – young children, pregnant women and the elderly - who would be in contact with the soil 365 days per year

Worse-case deposition was used in modeling for the Fish Lake area in 2012.

Soil ingestion rates used were those recommended by Health Canada.

The same soil ingestion rates are used to estimate exposures for pre-development and post-closure conditions (which, as was show with the discussion of country foods in the section above, the choice of soil ingestion rate has a neutral effect on the estimation of the incremental change in exposure that may occur between pre-development and post closure conditions).

Drinking Water Ingestion Rates

- i. The drinking water ingestion rates identified by Health Canada (Health Canada 2010a) were used in the baseline and effects assessment. The drinking water ingestion rates recommended for toddlers and adults are 0.6 L/day and 1.5 L/day respectively.

Surface water quality was modeled for Upper Fish Creek, Fisk Lake and Tributary 1 daily for a 100-year period (1 year of construction, 19 years of operation and 80 years post closure). Yearly-averaged mean metal concentrations in surface water for each of these locations were calculated for each of the 100 years that data were provided for. For each metal the maximum yearly-averaged mean concentration was selected for comparison with the Canadian Drinking Water Quality Guidelines (CDWQG), regardless of the year in which this maximum was predicted. Comparison of these maximum values with the CDWQG showed that for each of the metals of concern, the maximum yearly-averaged mean concentration was well below the concentrations that Health Canada and the BCMOE deems acceptable for protecting drinking water quality.

The CDWQG represent the maximum allowable levels of chemicals that can be present in drinking water without there being a concern for human health. These values are based on the assumption that a person would have daily access to the drinking water and that all the water consumed every day of a lifetime would come from that source.

The metal concentrations in surface water in the Fish Lake watershed are well below the acceptable concentrations established by Health Canada and BCMOE and thus, would not represent a potential concern for the health of people using this water as their sole source of drinking water over a lifetime. Surface water quality outside of the operating area of the mine, including Fish Lake, is not predicted to change. For this reason, direct exposures for people who may take drinking water from the Fish lake watershed on an occasional basis were not directly evaluated in either the baseline or effects assessments.

ii. Discussion of Conservatism:

The drinking water ingestion rates were used in the assessment. The CDWQG for drinking water were used which assumes the water is consumed every day of a lifetime from that source. The CDWQG considers the protection of human health and for some metals aesthetic considerations, which makes the guideline more stringent.

The CDWQGs that are based on the protection of human health are derived using toxicological reference values (TRVs) (estimates of toxic potency) developed by Health Canada. In deriving these TRVs, Health Canada incorporated considerations for sensitive subpopulations.

Land use practices in the Fish Lake watershed mean that surface water from the area would not be used as the sole source of drinking water over a person's lifetime. Therefore, applying the CDWQGs (which assume daily drinking water use over a lifetime) assumes a greater degree of drinking water consumption than would occur and thus, over estimates potential exposures. Further, should surface water from the Fish Lake watershed be used as the sole source of drinking water at some point in the future, the predicted surface water quality data for metals shows that the water would be deemed acceptable for human consumption by Health Canada and the BC MOE.

Contaminant Transport

- i. Increases in metal concentrations in surface soil were estimated using particulate deposition rates over the working life of the mine and were based on the assumption that metals present in the dust deposited on soil in the vicinity of Fish Lake would accumulate in the top 5 cm of soil. In recreational areas, it is the top 5 cm that contributes to exposures experienced by recreational users of the site. It was further assumed that there would be no loss of metals from this layer, either due to erosion or movement of the metals through the top layer to underlying soil horizons.

It was further assumed that there would be no loss of metals from this top soil horizon due to leaching into lower soil. This approach provides a maximum estimate of the potential metal concentrations that are likely to be present in the soil.

ii. Discussion of Conservatism:

Assuming that there is no loss of metal from the top 5 cm of soil due to erosion or movement of metals deeper into the soil provides the upper-bound estimate of metal concentrations in soil. These maximum concentrations then provide maximum human health and ecological exposures to these metals providing a conservative estimate of the incremental changes that could occur between pre-development and post-closure conditions.

Information Request #44b

With regards to the Human Health and Ecological Risk Assessment, the Panel requests that Taseko:

Describe the process by which assumptions were validated.

Response Summary

Direct validation of exposure assumptions such as the rates of soil ingestion were not undertaken for the project. The potential effects that the choice of receptor parameter assumption (soil ingestion rates, country food consumption rates for example) could have on the overall estimation of the incremental changes in exposures and health risks that could occur between pre-development baseline and post-closure conditions, was assessed through the evaluation of the conservatism (see response to Part a) associated with each of the assumptions used.

Information Request #44c

With regards to the Human Health and Ecological Risk Assessment, the Panel requests that Taseko:

Describe any consultation activities that were undertaken with land users and other stakeholders to justify assumptions associated with potential exposure to contaminants.

Response Summary

The HHERA assumed:

- Aboriginal people use the site for fishing, hunting, trapping, camping, gatherings/teachings, as a water source, plant gathering and harvesting;
- The general public use the site for hunting, camping, and fishing;
- Tenure holders use the site for trapping, horse grazing, trail riding, and hunting; and,
- There is no current residence on the site.

The assumptions made with regard to the exposure of humans to contaminants were based on research, document review, and consultation with Aboriginal groups, stakeholders and other land users that is documented extensively in the 2009 Prosperity EIS (Volumes 2 and 8), in the Panel Transcripts from the Prosperity Federal Panel Review (summary of transcripts is provided in the 2012 EIS Appendices), and in the 2012 New Prosperity EIS (Section 2.5.1).

Since the early 1990s, there has been engagement with all groups to confirm assumptions of how the landscape has been used and potential for exposure to contaminants. Through these consultations, no data had been made available on consumption rates; however, as indicated in the response to IR44a, that information is not required to determine effects from exposure.

Throughout the research, document review, and engagement, there is no evidence to suggest our assumptions are incorrect.

Discussion

The list of information, research and consultation used to determine land use is described below.

Literature Review

For the Tsilhqot'in people the review included: Alexander, Diana, 1997. *A Cultural Heritage Overview of the Cariboo Forest Region*; Alexander, Diana, 1996. *A Cultural Heritage Overview of the Western Half of the Williams Lake Forest District*; Farrand, Livingston, 1900. *Traditions of the Chilcotin Indians. Memoirs of the American Museum of Natural History*; Friends of the Nemiah Valley Website, 2008; Glavin, Terry and the People of the Nemiah Valley, 1992.

Nemiah The Conquered Country; Lane, Robert, 1981 *Chilcotin*; Littlemore, Richard, 2000. *Nemiah: Home of the Xenigwet'in Pacific Salmon Forests Project*; Matson, R.G. and Magne, Martin, 2007. *Athapaskan Migrations: The Archaeology of Eagle Lake, British Columbia*; Rothenburger, Mel, 1978. *The Chilcotin War*; Tsilhqot'in National Government Website, 2008; Tsi Del Del Website, 2008; Unknown Author, 2008. *We do not know his name: Klatassen and the Chilcotin War* website; Xenigwet'in: People of Nemiah Website, 2008; Lane, Robert, 1953. *Cultural Relations of the Chilcotin of West Central British Columbia*. Unpublished Ph.D.; Tyhurst, Robert, 1984. *The Chilcotin: An Ethnographic History*. Unpublished M.A.

For the Secwepemc people the review included: Alexander, Diana, 1997. *A Cultural Heritage Overview of the Cariboo Forest Region*; Alexander, Diana, 1996. *A Cultural Heritage Overview of the Western Half of The Williams Lake Forest District*; Bouchard, Randy and Kennedy, Dorothy, 1979. *Shuswap Stories*; Brow, James, 1972. *Shuswap of Canada*; Dawson, George, 1891. *Notes on the Shuswap People of British Columbia*; Ignace, Marianne Boelscher, 1998. *Shuswap*; Jack, Rita; Matthew, Marie; and, Matthew, Robert, 1993. *Shuswap Community Handbook*; Palmer, Andie, 2005. *Maps of Experience: The Anchoring of Land to Story in Secwepemc Discourse*; Secwepemc Cultural Education Society and Simon Fraser University, 1999. *Re tsuwet.s re Secwepemc: The Things We Do*; Wolf, Annabel Cropped Eared and Matthew, Robert, 1996. *Shuswap History: A Century of Change*

Court Files

William (*Tsilhqot'in Nation*) case documents (*Tsilhqot'in Nation*) - The case documents of William (*Tsilhqot'in Nation vs. British Columbia*), 2007 BCSC 1700, (Government of British Columbia 2007a) including the appendices, maps, and case testimonies were reviewed for relevant Traditional Knowledge information within the LSA. The case files are public documents and contain oral history information and numerous testimonies regarding the *Tsilhqot'in Nation* and Traditional Land Use. (<http://www.courts.gov.bc.ca/jdb-txt/CA/12/02/2012BCCA0285.html>)

Studies

The Heritage Significance of the Fish Lake Study Area: Ethnography and An Overview of the Heritage Significance of the Proposed Power Transmission Corridor Servicing the Fish lake Project (Ehrhart-English) Taseko commissioned these studies in the mid 1990s and they provides a comprehensive assessment of the historical and traditional land use of the project area. (EIS 2009 – Appendices 8.2.B and 7.2.A)

Visitor and Creel surveys conducted in 2007 with results (EIS 2009 - Appendix 5-3-J documenting general public fishing use).

Meetings

- Meetings directly with leadership, individuals, and groups of First Nations (2009 EIS, Volume 2 and Volume 8 and their Appendices; 2012 EIS Section 2.5.1 and Appendices)
- Public and stakeholder engagement records including meetings with local sportsman clubs, ranchers, and trappers (2009 EIS, Volume 2 and Appendices)
- Contact with Taseko Lake Lodge and their submitted information on their use of the area for commercial recreation and trail riding (EIS 2012 – Section 2.7.3.1 Effects on Resource Uses)

Reports/ Presentations Submitted to Panels

- Submission and Presentation by Esketemc First Nations to the 2010 Prosperity Panel (EIS 2012 Appendix 2.6.4.-A)
- Tsilhqot'in Nations Government Current Use and Traditional Values Submission and Presentation to the 2010 Federal Review Panel for Prosperity (EIS 2012 Appendix 2.6.4.-B)
- Comments provided by members of the general public about the use of the established recreation site at the north end of Fish Lake during 2010 Prosperity Panel Hearings (<http://www.ceaa-acee.gc.ca/050/details-eng.cfm?evaluation=44811>)
- Summary tables of 2010 Prosperity Panel Hearing transcripts as a reference for traditional knowledge and current use information (2012 EIS Appendix 2.5.1-C).

References

Rescan. 2006. Galore Creek Country Foods Baseline Assessment. Rescan Environmental Services Ltd. March 2006