

Information Request 42

Information Request 42

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IR 42 – Health Effects in the Local Study Area

References:

EIS Guidelines, Sections 2.7.3.3 and 2.7.2.3
EIS, Section 2.7.3.3
2009 EIS, Section 6.3.1.2

Related Comments:

CEAR # 265 (Health Canada)
CEAR # 290 (Tsilhqot'in National Government)

Rationale:

In Section 2.7.3.3, the EIS Guidelines require the Proponent to determine the effect of the Project on air quality around the mine site for all receptors, including worker camps and in the broader study area where human receptors may be present. It also directs the Proponent to use appropriate Air Quality Dispersion Models to assess the potential effects on human health at sensitive and other receptors.

In the 2009 EIS (Section 6.3.1.2, p. 6-19), Taseko states that the community of Nemaiah was assessed for air quality impacts because it was the closest receptor to the Project. No other human receptors were explicitly identified.

Health Canada Guidance on *Human Health Preliminary Quantitative Risk Assessments* states that exposure calculations should be performed for all potential human receptors and receptor age groups for which exposure is anticipated. Health Canada stated that the EIS does not contain information on the potential human receptors at Fish Lake, their proximity to all Project activities or the use of the road between the mine site and the TSF. Tsilhqot'in National Government also requested that the Proponent re-assess air quality impacts from all phases of the Project using new 'key receptors' to include human and other biological receptors.

The EIS Guidelines (Section 2.7.3.3, p. 57) instruct the Proponent to provide an evaluation of the severity of predicted changes in noise levels and how they may affect human health including for users of Fish Lake. It is stated that the study must include impacts of blasting activity on human receptors. In addition, the Guidelines state that noise impacts on Aboriginal cultural and spiritual activities in the Project area and Fish Lake in particular shall be identified and assessed.

With respect to the noise assessment, Taseko used the Health Canada guidelines for *Evaluating Human Health Impacts in Environmental Assessment: Noise (April 2011)* and determined no significant overall effects. The determination was prepared under the assumption that effects need be assessed during the daytime period only. This assumption excludes persons camping overnight, possibly for extended periods of time. The Tsilhqot'in National Government (p. 26) state that "it is well established that Teztan Biny and environs are used by the Tsilhqot'in (and others) for overnight occupation."

The Panel would like to better understand the potential health effects that may result from the Project in order to determine the significance of effects on human health to

human receptors in the area of the Project. As one of the key objectives in maintaining Fish Lake is to preserve the lake for existing recreational pursuits, including fishing, the effects of short, intense noise emissions such as blasting and its effect on Fish Lake (day and overnight users) users and nearby backcountry users should also be assessed.

Information Requested:

With regards to the conduct of a human health and ecological risk assessment, the Panel requests that Taseko:

- a. Provide a map showing all sensitive human receptors in the local and regional study areas and the distance to these receptors from specific project activities.
- b. Assess the health effects of the Project on workers who would reside in the project area; on residents of Taseko Lake Lodge; on transient people visiting the project area for recreational purposes (short term and longer term); and on Aboriginal people who would relate to a subsistence lifestyle or who are conducting cultural and spiritual activities at Fish Lake.

With respect to the noise impact assessment conducted, the Panel requests that Taseko:

- c. Describe how a change in the key assumption that “occupied periods” including continuous (daytime/night-time) and extended periods, rather than daytime periods only, would affect modeling results.
- d. Assess noise impacts for potential users of the Project area identified in part b. above. The noise impacts assessment should include estimates for blasting activity frequency, blasting activity intensity and a consideration of blasting effects.

Information Request #42a

With regards to the conduct of a human health and ecological risk assessment, the Panel requests that Taseko:

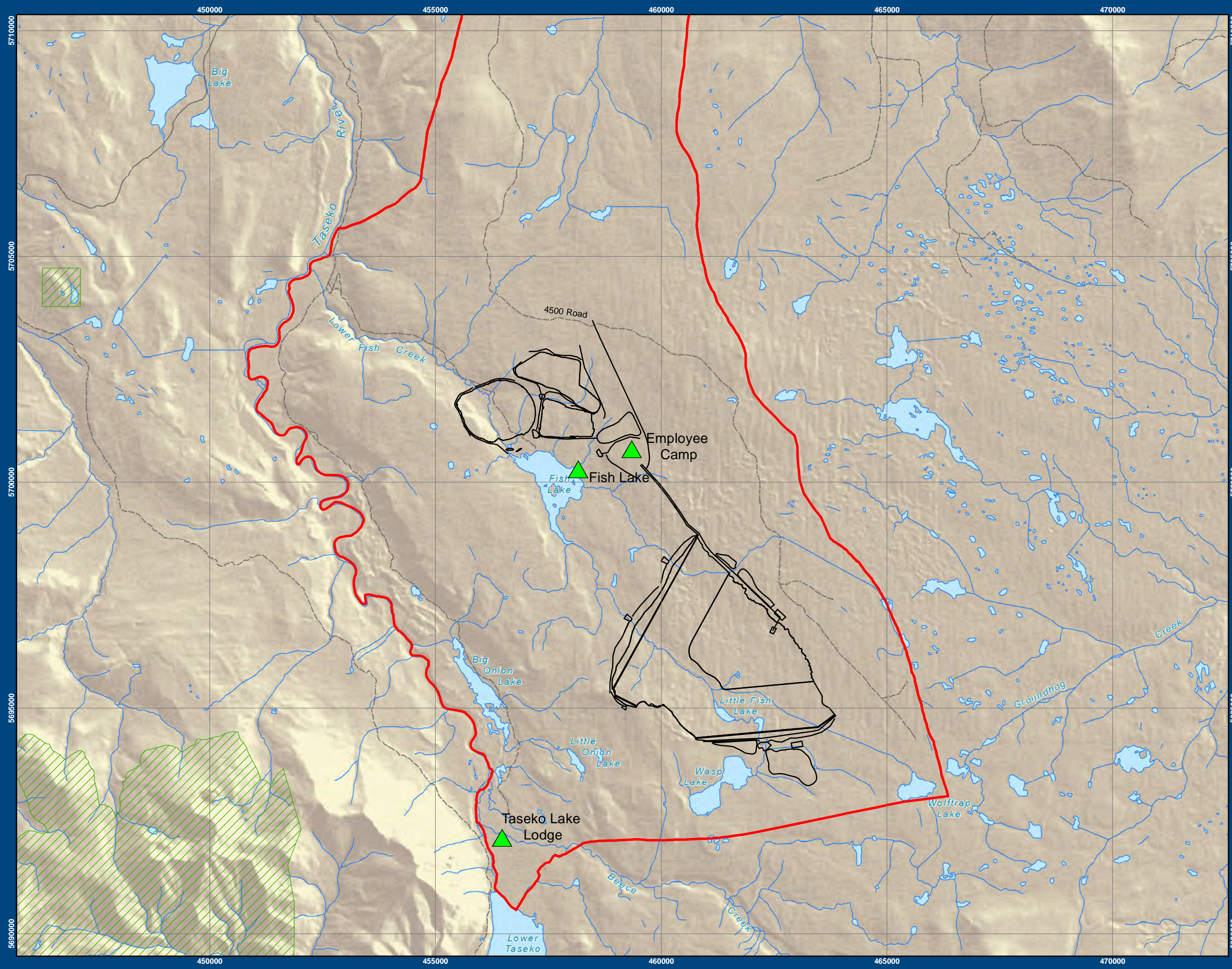
Provide a map showing all sensitive human receptors in the local and regional study areas and the distance to these receptors from specific project activities.

Response Summary

A map showing sensitive human receptor locations and the local and regional study areas is shown in Figure 42A-1. The scale provided in Figure 42A-1 facilitates the determination of distances from project activities to individual receptor location.








Sensitive human receptors indicated, include:

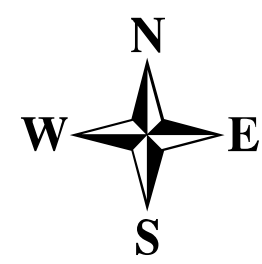
- 1) Employee Camp, approximately 3 kilometers from the center of the pit.
- 2) Proposed Fish Lake dock and recreation site, approximately 2.5 kilometers from the center of the pit. This is the area that people visiting the area for recreation or for people conducting cultural and spiritual activities would most likely frequent.
- 3) Taseko Lake Lodge, approximately 9.5 kilometers from the center of the pit and 5 kilometers from the tailings storage facility.



New Prosperity Gold-Copper Project

Figure 42A-1

-  Human Receptors
-  RSA
-  Mine Components
-  Parks
-  Lakes
-  Rivers
-  Roads

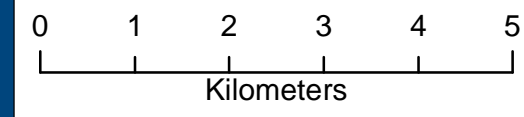


Taseko New Prosperity

1:80,000

Map Prepared by
Taseko Mines Ltd.

Data Sources:
Province of British Columbia, Taseko Mines Ltd.
Projection: UTM Zone 10, NAD 83



Information Request #42b

With regards to the conduct of a human health and ecological risk assessment, the Panel requests that Taseko:

Assess the health effects of the Project on workers who would reside in the project area; on residents of Taseko Lake Lodge; on transient people visiting the project area for recreational purposes (short term and longer term); and on Aboriginal people who would relate to a subsistence lifestyle or who are conducting cultural and spiritual activities at Fish Lake.

Response Summary

The potential effects associated with exposures to criteria air contaminants (CACs) released from the Project have been evaluated for the following receptors with location as labeled on Figure 42A-1:

- Workers who stay in the project area during their work rotation (Employee Camp);
- Residents of Taseko Lake Lodge (Taseko Lake Lodge);
- Transient people in the area for recreational purposes (short term and longer term) (Fish Lake); and,
- Aboriginal people who would relate to a subsistence lifestyle or who are conducting cultural and spiritual activities at Fish Lake (Fish Lake).

Air quality data summarizing the anticipated levels of SO₂, NO₂, CO, Particulate matter (PM_{2.5}, PM₁₀ and TPM) as well as volatile organic compounds (VOCs) 1,3-butadiene, acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, hexane, naphthalene, toluene, and xylenes, were compared to the relevant regulatory guidelines or objectives for these chemicals. The assessments were completed for the construction and operations phases of the Project.

Air quality criteria for the CACs were taken from the BCMOE Air Quality Objectives and Standards (BCMOE, 2009). The values for PM_{2.5} and PM₁₀ were taken from the National Ambient Air Quality Objectives for Particulate Matter (Health Canada, 1998). The province of British Columbia does not provide air quality objectives for the VOCs. Ambient Air Quality Criteria (AAQCs) developed by the Ontario Ministry of the Environment have been used to evaluate potential health concerns associated with the predicted concentrations of the VOCs at each of the identified receptor locations (OMOE, 2012). The results for the Construction and Operations phases of the project are provided in Table 42a-1 and Table 42a-2, respectively.

The regulatory guidelines listed in Tables 42B-1 and 42B-2 represent the acceptable concentrations in air that a person could be exposed to over the identified exposure period (averaging period), without there being a concern for human health. The data presented clearly show that predicted air quality at the identified receptor locations are well below the applicable regulatory limits for ambient air quality for the VOCs, SO₂, NO₂ and CO during the construction and operations phases of the project. Based on these results it is reasonable to conclude that the levels of these chemicals in the air would not represent potential concerns for employees, recreational users of Fish Lake, Aboriginal people who use Fish Lake for spiritual or cultural activities or who pursue a subsistence lifestyle in the area, or for the residents of Taseko Lake Lodge.

Dust modeling carried out as part of the 2009 EIS was used to determine the 24-hr peak dust concentrations (the maximum 24-hr value resulting from 365 days of calculations) at the Employee Camp, Fish Lake and Taseko Lake Lodge. The results indicate that particulate matter levels at the Employee Camp and at Fish Lake can exceed the 24-hour regulatory guideline limits. It should be noted that the dust emission modeling was conservative and subsequent emission calculations taking into account effective dust emission mitigation resulted in 75% less dust. Taseko however, will commit to air quality monitoring to confirm dust fall model predictions and will increase mitigation measures for dust control, during both construction and operations, if and when required.

Table 42B-1. Comparison of Predicted Air Quality and Air Quality Guidelines: Construction Phase

CONCENTRATION DATA - CRITERIA CONTAMINANTS					
Contaminant	Averaging Period	Employee Camp	Taseko Lake Lodge	Fish Lake	Relevant Regulatory Objectives/ Guidelines ($\mu\text{g}/\text{m}^3$)
	UTM Easting	459352	456570	458117	-
	UTM Northing	5700735	5692575	5700222	-
SO ₂	1-hour ($\mu\text{g}/\text{m}^3$)	1.70E+00	1.33E-02	1.76E-01	450
	24-hour ($\mu\text{g}/\text{m}^3$)	6.00E-01	3.10E-03	2.70E-02	150
	Annual ($\mu\text{g}/\text{m}^3$)	0.00E+00	1.50E-04	7.62E-03	30
NO ₂	1-hour ($\mu\text{g}/\text{m}^3$)	1.80E+02	2.10E+01	9.91E+01	400
	24-hour ($\mu\text{g}/\text{m}^3$)	1.05E+02	3.67E+00	3.37E+01	200
	Annual ($\mu\text{g}/\text{m}^3$)	2.41E+01	2.40E-01	8.82E+00	60
CO	1-hour ($\mu\text{g}/\text{m}^3$)	1.10E+03	1.69E+01	1.54E+02	15000
	8-hour ($\mu\text{g}/\text{m}^3$)	6.22E+02	6.60E+00	7.99E+01	6000
PM _{2.5} *	24-hr 98th percentile ($\mu\text{g}/\text{m}^3$)	7.59E+00	2.49E-01	3.15E+00	25
PM ₁₀ *	24-hour peak ($\mu\text{g}/\text{m}^3$)	2.17E+01	2.14E+00	2.62E+01	50
TPM *	24-hour peak ($\mu\text{g}/\text{m}^3$)	2.17E+01	2.14E+00	2.62E+01	150
CONCENTRATION DATA - VOC/PAH CONTAMINANTS					
1,3 Butadiene	24-hour ($\mu\text{g}/\text{m}^3$)	3.64E-02	5.45E-04	6.71E-03	1.00E+01
	Annual ($\mu\text{g}/\text{m}^3$)	4.94E-03	2.85E-04	1.38E-03	2.00E+00
Acetaldehyde	24-hour ($\mu\text{g}/\text{m}^3$)	4.90E+00	7.35E-02	9.05E-01	5.00E+02
Acrolein	24-hour ($\mu\text{g}/\text{m}^3$)	3.99E-01	5.98E-03	7.37E-02	4.00E-01
Benzene	24-hour ($\mu\text{g}/\text{m}^3$)	3.22E-01	4.82E-03	5.94E-02	2.30E+00
	Annual ($\mu\text{g}/\text{m}^3$)	4.37E-02	2.52E-03	1.22E-02	4.50E-01
Ethylbenzene	24-hour ($\mu\text{g}/\text{m}^3$)	5.52E-02	8.26E-04	1.02E-02	1.00E+03
Formaldehyde	24-hour ($\mu\text{g}/\text{m}^3$)	2.62E+00	3.92E-02	4.83E-01	6.50E+01
Hexane	24-hour ($\mu\text{g}/\text{m}^3$)	2.76E-02	4.13E-04	5.09E-03	2.50E+03
Naphthalene	24-hour ($\mu\text{g}/\text{m}^3$)	7.24E-02	1.08E-03	1.34E-02	2.25E+01
Toluene	24-hour ($\mu\text{g}/\text{m}^3$)	4.67E-01	7.00E-03	8.62E-02	2.00E+03
Xylenes	24-hour ($\mu\text{g}/\text{m}^3$)	3.71E-01	5.56E-03	6.85E-02	7.30E+02

* - All Emission Sources

Table 42B-2. Comparison of Predicted Air Quality and Air Quality Guidelines: Operations Phase

CONCENTRATION DATA - CRITERIA CONTAMINANTS					
Contaminant	Averaging Period	Employee Camp	Taseko Lake Lodge	Fish Lake	Relevant Regulatory Objectives/ Guidelines ($\mu\text{g}/\text{m}^3$)
UTM Easting		459352	456570	458117	-
UTM Northing		5700735	5692575	5700222	-
SO ₂	1-hour ($\mu\text{g}/\text{m}^3$)	4.00E-01	2.70E-01	5.34E-01	450
	24-hour ($\mu\text{g}/\text{m}^3$)	1.00E-01	7.00E-03	8.90E-02	150
	Annual ($\mu\text{g}/\text{m}^3$)	0.00E+00	2.00E-04	8.00E-03	30
NO ₂	1-hour ($\mu\text{g}/\text{m}^3$)	1.37E+02	6.06E+01	1.44E+02	400
	24-hour ($\mu\text{g}/\text{m}^3$)	8.22E+01	9.81E+00	6.06E+01	200
	Annual ($\mu\text{g}/\text{m}^3$)	1.02E+01	5.70E-01	1.51E+01	60
CO	1-hour ($\mu\text{g}/\text{m}^3$)	7.72E+02	4.50E+01	5.27E+02	15000
	8-hour ($\mu\text{g}/\text{m}^3$)	3.64E+02	1.25E+01	2.51E+02	6000
PM _{2.5} *	24-hr 98th percentile ($\mu\text{g}/\text{m}^3$)	2.46E+01	7.70E-01	1.29E+01	25
PM ₁₀ *	24-hour peak ($\mu\text{g}/\text{m}^3$)	1.23E+02	6.15E+00	1.11E+02	50
TPM *	24-hour peak ($\mu\text{g}/\text{m}^3$)	1.79E+02	6.15E+00	1.11E+02	150
CONCENTRATION DATA - VOC/PAH CONTAMINANTS					
1,3 Butadiene	24-hour ($\mu\text{g}/\text{m}^3$)	3.42E-02	2.38E-03	3.29E-02	1.00E+01
	Annual ($\mu\text{g}/\text{m}^3$)	3.42E-02	8.28E-05	2.51E-03	2.00E+00
Acetaldehyde	24-hour ($\mu\text{g}/\text{m}^3$)	6.74E-02	3.21E-01	4.43E+00	5.00E+02
Acrolein	24-hour ($\mu\text{g}/\text{m}^3$)	6.74E-02	2.61E-02	3.61E-01	4.00E-01
Benzene	24-hour ($\mu\text{g}/\text{m}^3$)	6.74E-02	2.11E-02	2.91E-01	2.30E+00
	Annual ($\mu\text{g}/\text{m}^3$)	2.12E-03	7.32E-04	2.22E-02	4.50E-01
Ethylbenzene	24-hour ($\mu\text{g}/\text{m}^3$)	2.12E-03	3.61E-03	4.98E-02	1.00E+03
Formaldehyde	24-hour ($\mu\text{g}/\text{m}^3$)	2.12E-03	1.71E-01	2.37E+00	6.50E+01
Hexane	24-hour ($\mu\text{g}/\text{m}^3$)	7.73E-03	1.80E-03	2.49E-02	2.50E+03
Naphthalene	24-hour ($\mu\text{g}/\text{m}^3$)	7.73E-03	4.74E-03	6.54E-02	2.25E+01
Toluene	24-hour ($\mu\text{g}/\text{m}^3$)	7.73E-03	3.06E-02	4.22E-01	2.00E+03
Xylenes	24-hour ($\mu\text{g}/\text{m}^3$)	4.61E+00	2.43E-02	3.35E-01	7.30E+02

* - All Emission Sources

Information Request #42c

With respect to the noise impact assessment conducted, the Panel requests that Taseko:

Describe how a change in the key assumption that “occupied periods” including continuous (daytime/night time) and extended periods, rather than daytime periods only, would affect modeling results.

Response Summary

Changing the assumptions that “occupied period” includes continuous (daytime/night time) and extended periods, rather than daytime only, results in increased apparent sound levels. However, through the implementation of mitigation measures it is anticipated that noise impacts associated with the Project will still meet Health Canada guidelines for Human Health Impacts.

Discussion

The daytime period is defined as being the fifteen hours from 7:00 AM to 10:00 PM while the night time period is the nine hours between 10:00 PM to 7:00 AM. In accordance with the Health Canada Guidance for Evaluating Human Health Impacts in EA: Noise (April 2011), the day-night sound level (L_{dn}), a 24-hour average in which the contribution from night time events is artificially increased by 10 dB, is used to determine the potential for widespread complaints L_{dn} is calculated by the following equation:

$$L_{dn} = 10 \log_{10} [((15 \times 10^{L_d/10}) + (9 \times 10^{(L_n + 10)/10})) / 24]$$

The Health Canada guidelines consider the percentage of the exposed population that could be “highly annoyed” by increased noise levels caused by projects. Impacts are considered to be of concern and requiring mitigation where a source of noise may cause the percentage of the population that are Highly Annoyed (HA) by noise to increase by 6.5%, or the specified impact or impulse noise indicator (HCII) exceeds 75 dBA. The percent highly annoyed (%HA) was determined from the methods prescribed in the Health Canada guideline (April 2011).

Noise prediction results following the implementation of mitigation measures for receptors at Fish Lake, Taseko Lake Lodge and the Nemiah Valley Community are summarized in the Tables 42C-1, 42C-2 and 42C-3 respectively, for the construction, operation, and closure phases of the Project.

Table 42C-1. Noise Annoyance Indicators at Fish Lake

Project Phase	Baseline Daytime Ld (dBA)	Baseline Nighttime Ln (dBA)	Baseline Day-night Ldn (dBA)	Adjusted Baseline Ldn ¹ (dBA)	%HA Baseline (%)	Project Daytime Ld (dBA)	Project Nighttime Ln (dBA)	Project Day-night Ldn (dBA)	Adjusted Project Day-night Ldn ¹ (dBA)	Baseline + Project Ldn (dBA)	%HA Baseline + Project (%)	Change in %HA from Project (%)	Exceeds 6.5% increase in %HA (y/n)
Construction	45	35	45	55	4.2	53.2	--	51.2	61.2	62.1	10.0	5.8	N
Operation	45	35	45	55	4.2	45.2	43.6	50.3	60.3	61.4	9.2	5.0	N
Closure	45	35	45	55	4.2	53.2	--	51.2	61.2	62.1	10.0	5.8	N

--" not applicable

¹ When receptors are identified as living in a quiet rural area, 10 dBA is added to both the baseline Ldn and Project Ldn to obtain the adjusted values.

Table 42C-2. Noise Annoyance Indicators at Taseko Lake Lodge

Project Phase	Baseline Daytime Ld (dBA)	Baseline Nighttime Ln (dBA)	Baseline Day-night Ldn (dBA)	Adjusted Baseline Ldn ¹ (dBA)	%HA Baseline (%)	Project Daytime Ld (dBA)	Project Nighttime Ln (dBA)	Project Day-night Ldn (dBA)	Adjusted Project Day-night Ldn ¹ (dBA)	Baseline + Project Ldn (dBA)	%HA Baseline + Project (%)	Change in %HA from Project (%)	Exceeds 6.5% increase in %HA (y/n)
Construction	45	35	45	55	4.2	35.7	--	33.7	43.7	55.3	4.3	0.2	N
Operation	45	35	45	55	4.2	29.3	25.1	32.4	42.4	55.2	4.3	0.1	N
Closure	45	35	45	55	4.2	31.7	--	29.7	39.7	55.1	4.2	0.1	N

--" not applicable

¹ When receptors are identified as living in a quiet rural area, 10 dBA is added to both the baseline Ldn and Project Ldn to obtain the adjusted values.

Table 42C-3. Noise Annoyance Indicators at Nemiah Valley Community

Project Phase	Baseline Daytime Ld (dBA)	Baseline Nighttime Ln (dBA)	Baseline Day-night Ldn (dBA)	Adjusted Baseline Ldn ¹ (dBA)	%HA Baseline (%)	Project Daytime Ld (dBA)	Project Nighttime Ln (dBA)	Project Day-night Ldn (dBA)	Adjusted Project Day-night Ldn ¹ (dBA)	Baseline + Project Ldn (dBA)	%HA Baseline + Project (%)	Change in %HA from Project (%)	Exceeds 6.5% increase in %HA (y/n)
Construction	45	35	45	55	4.2	19.3	--	17.6	27.6	55.0	4.2	0.0	N
Operation	45	35	45	55	4.2	21.3	16.7	24.1	34.1	55.0	4.2	0.0	N
Closure	45	35	45	55	4.2	15.3	--	14.0	24.0	55.0	4.2	0.0	N

--" not applicable

¹ When receptors are identified as living in a quiet rural area, 10 dBA is added to both the baseline Ldn and Project Ldn to obtain the adjusted values.

The noise effect along the northern tip of Fish Lake is expected to be the highest. Other potential receptors located outside of the Project area are expected to experience Project noise effects below those predicted at the northern shore of Fish Lake. The new Fish Lake recreation site will be located near the southern end of the lake, away from the area of highest noise impacts.

Noise mitigation measures for the construction phase will include:

- where practical, construction activity will be restricted to daytime hours;
- routine maintenance and service of vehicles to ensure optimal operation and that mufflers are in good working condition; and,
- where possible, turn equipment off when not in use.

Noise mitigation measures which will be employed during operations include:

- routine maintenance and service of vehicles to ensure optimal operation and that mufflers are in good working condition;
- enforcement of speed limits;
- maintenance of Project roads to minimize vehicle noise associated with vibration;
- housing noise generating equipment inside buildings with metal cladding for improved noise suppression; and,
- enclosing conveyors.

Mitigation measures which may be employed during the closure phase include:

- routine maintenance and service of vehicles to ensure optimal operation and that mufflers are in good working condition;
- enforcement of speed limits; and,
- maintenance of Project roads to minimize vehicle noise associated with vibration.

Maintaining a noise rating of 85 dBA or below at a distance of 15 m during the construction phase and meeting the noise ratings below for the operational phase:

- Crusher building with an acoustic performance of 70 dBA at 15 m
- Mill building with an acoustic performance of 80 dBA at 15 m
- Covered conveyor belt with a noise rating of 70 dBA at 15 m
- Grader, backhoe, fork lift, utility truck, boom truck with noise rating of 80 dBA at 15 m

- Front end loader and haul truck with noise rating of 75 dBA at 15 m

Taseko will ensure that following the application of mitigation measures, the change in Project noise will meet the Health Canada target of 6.5%.

Predicted outdoor noise levels at the Project's camp facility during different Project phases are summarized in Table 42C-4. The results include the mitigation measures listed above.

Table 42C-4. Predicted Daytime and Nighttime Outdoor Noise Level at Camp

Project Phase	Daytime, L _d (dBA)	Nighttime, L _n (dBA)
Construction	67	--
Operation	58	58
Closure	67	--

-- "not applicable"

The WHO's Guidelines for Community Noise (1999) report a threshold for sleep disturbance of an indoor night time sound level of no more than 30 dBA for continuous noise. A fully enclosed trailer or camp unit with sufficient ventilation (assumed no windows opened during summer season) should have a minimum STC rating of 40 STC (sound transmission class) to meet the WHO limit of 30 dBA indoor level.

References

United States Environmental Protection Agency (EPA). (1974). Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (Report No. 550/9-74-004).

Health Canada 2011. Health Canada Guidance for Evaluating Human Health Impacts in EA: Noise, April 2011.

Berglund, B., Lindvall, T. & Schwela, D.H (Eds.). (1999). Guidelines for Community Noise.

World Health Organization (WHO). Available at:
www.who.int/docstore/peh/noise/guidelines2.html

Information Request #42d

Assess noise impacts for potential users of the Project area identified in part b above. The noise impacts assessment should include estimates for blasting activity frequency, blasting activity intensity and a consideration of blasting effects.

Response Summary

The potential users identified in IR42b are 1. workers who reside in the project area, 2. residents of Taseko Lake Lodge, 3. transient people visiting the project area for recreational purposes, and 4. aboriginal people who would relate to a subsistence lifestyle or who are conducting cultural and spiritual activities at Fish Lake.

1. It is not anticipated that workers will reside in the area other than residents from existing communities, the nearest of which is Nemiah where there will be no noise impact from the project. Workers who are at work will have noise monitoring, hearing protection, and noise exposure regulation as per Section 2 of the Health, Safety, and Reclamation Code for Mines in British Columbia while they are on duty. During their off duty hours they will be residing in a company supplied camp that will be located, constructed, and configured in a manner which will maintain noise within the camp at or below normal tolerable levels. Blasting noise will occur daily or semi-daily but can be planned for the time of day which will minimize sleep disturbance of off duty personnel. Blasting noise at the camp will decrease as the pit deepens. Occasionally weather conditions such as low cloud cover will act as a reflector of the pressure waves which occur as a result of blasting and on those occasions the blast noise at the camp could approach the 115 dB level which would be similar to a blast at surface. Specific blasting assumptions are discussed at the end of this section.
2. There will be occasions when residents of Taseko Lake Lodge will be able to hear equipment working on building the west embankment of the tailings storage facility. This work will occur only occasionally and during daylight hours only. Taseko Lake Lodge is 8.5 kilometers from the mining operation and behind a relatively high ridge which will act as a deflector of the air pressure waves from blasting which are experienced as blasting noise. It is unlikely that residents of Taseko Lake Lodge would be aware of blasting events other than as a slight ground vibration or perhaps a low distant rumble in certain atmospheric conditions as described above.
3. Transient people visiting the project area for recreational purposes would experience some ambient noise from operations but, as described in IR42c, they would be distant noises and would be at low dB levels. Blasting will require a cleared zone of approximately 1 km for safety reasons so any recreational visitors will be at least that distance from any blasting. As for the workers in camp, blast noise experienced beyond

the pit limit will decrease as the pit deepens other than in certain atmospheric conditions but in all instances is expected to be below the 115 dB of a blast at surface at a distance of 1 km.

4. Aboriginal people who would relate to a subsistence lifestyle or who are conducting cultural and spiritual activities at Fish Lake would experience noise at the same level that transient people visiting the project area would.

Blasting Specific Discussion

Noise associated with blasting is a short-term event in which the blast wave propagates through the atmosphere and can be experienced as a brief (several seconds) but intense incident of low frequency noise or vibration. This instantaneous pressure wave is measured in linear decibels (dB) and typically falls in the range of 120 to 135 dB in the vicinity of the blast.

Health Canada advises that the U.S. EPA criterion for sonic booms (EPA 1974) can be used to assess the noise effects due to blasting events. According to the EPA (1974), little or no public annoyance is expected to result from any number of daytime sonic booms per day if the measured or predicted peak value is below 125 dB for one blast per day. The U.S. Bureau of Mines advises that a peak sound pressure level of 134 dB is recommended as a criteria level for no structural damage. The Ontario Ministry of Environment (1985) (OME 1985) set out a cautionary limit and a standard limit of 120 dB and 128 dB, respectively.

Typical anticipated blasting parameters are summarized in Table 42D-1.

Table 42D-1. Typical Blasting Parameters

	Ore	Waste	Construction
Number of blasts per week	2	2	--
Holes per blast	116	78	--
Explosives (kg/blast)	73,063	49,152	--
Explosives (kg/delay)	630.5	630.5	75.3
Depth of stemming (m)	7.0	7.0	--

-- "not available"

The level of air pressure produced by blasting in a straight line of sight unconfined surface blasting situation is estimated by using the following “scaled distance” calculation:

$$P = K \times (R / (Q)^{1/3})^{-N}$$

Where:

- 1) P is the overpressure level expressed in kPA
- 2) The ratio $R / (Q)^{1/3}$ is the “cubed root scaled distance”
- 3) R is the direct distance from the centre of the blast in meters
- 4) Q is the charge weight per delay in kilograms
- 5) K and N are site constants that depend on local conditions

Site constants vary depending on the local conditions at the time of blasting but the standard values recommended for conservative estimates of overpressure levels from confined charges in conventional free face bench blasts are $K = 3.3$ and $N = 1.2$.

The air blast overpressure calculated by the above formula can be converted to sound level by using the formula:

$$L_p = 20 \times \log (P / P_0)$$

Where:

- 1) L_p is the overpressure level expressed in dB
- 2) P is the overpressure level in pascals
- 3) P_0 is a reference pressure of 2×10^{-5} pascals

The above equations are generally used to predict noise levels within the direct line of site of a surface blast such as occurs in road construction. With open pit mining, blasting produces pressure waves that are deflected upward by the pit walls so that significant blast noise at ground level is rarely experienced more than a kilometer or two away. This phenomenon is well known and experienced at many residential sites in BC that are in close proximity to open pit mining operations such as Quintette, Afton, Highland Valley Copper, Elkview, Gibraltar and so on. Also, modern controlled blasting operations may fire many separate holes per blast but, with downhole electronic delay systems, each hole can be fired separately which is common practice to contain the blast energy to the desired rock that is to be broken. This practice naturally reduces

air blast (noise), flyrock which causes equipment damage, and pit wall vibrations which can cause local wall instability.

In order to minimize the risk of injury due to fly rock during blasting events, standard blast area clearing procedures will clear all personnel from an area approximately 1km in radius from the source. Therefore the blast to receptor distance at Fish Lake is assumed to be a minimum of 1 km. The calculated peak sound level at that distance during a blast event at surface is calculated to be 115 dB which will decrease as the pit gets deeper.

In blasting for construction, the peak sound pressure levels (P) can be estimated from the following equations for construction activities (Oriard 2005):

$$P = 24.8 \times SD_3^{-1.1}$$

A blast charge per delay of 75.3 kg/delay (Table 42d-1) is expected for the Project construction activities. In order to meet the standard limit of 128 dB OME 1985 criteria, the minimum distance to the blast source should be 150 m.

References

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