Line No.	For Working Group Use					For Proponent Use
	Issue Ref.	Comment Date	Reviewer Name / Agency	Agency Context	Comment	Proponent Response
352	HC-010	15-Sep-16	Allison Denning, Health Canada	When comparing predicted maximum concentrations to acute screening criteria, the EIS states that "if the predicted maximum concentrations were greater than the selected screening criteria and the percent change from Base Case was greater than 10% then the chemical was retained as a COPC and considered further in the acute inhalation assessment." The use of a change of more or less than 10% to screen substances for further assessment in the HHRA is not appropriate and is arbitrary. This approach is not health-based and no rationale was provided in the report as to how this might impact human health. It is recommended that the report clarify this assumption and provide rationale on a chemical-specific basis to identify whether there may be adverse health impacts associated with an increase of <10% relative to baseline. Health-based guidelines are based on human (and animal) toxicity studies and are intended to be protective of human health, whereas screening substances for inclusion in the HHRA based on a >10% increase from baseline conditions or screening out substances from the HHRA based on a <10% increase from baseline has no human toxicological basis. All substances that exceed their applicable regulatory criteria/guideline value should be further evaluated in the HHRA irrespective of the percentage change in concentrations from Base Case. See Health Canada (2012)[1] for more information about appropriate methods for screening substances for further evaluation in an HHRA.	HC-IR-1 (Ref CEAA-IR-40): Additional information is needed to justify screening substances out of further assessment based on a predicted change of less than 10% from baseline conditions. In particular, information about the toxicity of the individual substances needs to be provided to ensure that an increase of less than 10% will not result in adverse human health effects based on the human toxicity of the individual substances. All substances that currently exceed or that are predicted in the future to exceed an applicable health-based guideline value should be further evaluated in the HHRA, irrespective of whether the predicted increase is expected to be more or less than 10% from the Base Case.	See 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project.
353	HC-011	15-Sep-16	Allison Denning, Health Canada	With respect to surface water, the EIS states that "metal concentrations were either predicted to increase by less than 10% from Base Case OR were less than the health-based drinking water guidelines for all parameters with screening criteria. Ammonia, hardness, alkalinity and titanium were predicted to increase by greater than 10% in at least one location." The report did not provide a discussion regarding potential health concerns associated with exceedance of the health-based drinking water guidelines but were less than 10% from the Base Case. Any substance that is predicted to exceed the health-based drinking water quality guidelines should be carried forward in the risk assessment, irrespective of whether it was predicted to increase by less than 10% from Base Case. See Health Canada (2012)1 for more information about appropriate methods for screening substances for further evaluation in an HHRA. In addition, there is a qualitative discussion about why ammonia and hardness were not further evaluated in the HHRA, however, there was no discussion about why alkalinity was excluded from further assessment.	HC-IR-2 (Ref CEAA-IR-40): All substances in surface water that exceed an applicable health-based guideline value should be further evaluated in the HHRA, irrespective of whether the predicted increase is expected to be less than 10% from the Base Case because this could result in an underestimation of health risks. Further, the report should provide rationale for screening out alkalinity from further assessment in the HHRA.	See 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project. A discussion on alkalinity was provided in Section 9.0 of the EA report. Alkalinity is not commonly assessed in risk assessments because human and animal toxicity data are lacking for alkalinity. Alkalinity is an index of the capacity of water to buffer changes in pH. In Canadian surface waters, alkalinity is closely linked to hardness due to the presence of carbonates and bicarbonates in the water (Health Canada 1979) and therefore, similarly to hardness, alkalinity was not retained for further assessment in this risk assessment.
354	HC-012	15-Sep-16	Allison Denning, Health Canada	With respect to soil, the EIS states that "the predicted metal concentrations (incremental + existing) were less than the applicable environmental soil quality guidelines, with the exception of arsenic. However, soil concentrations of arsenic were not predicted to increase by more than 10% above Base Case concentrations". See Health Canada (2012)1 for more information about appropriate methods for screening substances for further evaluation in an HHRA.	HC-IR-3 (Ref CEAA-IR-40): All substances in soil that exceed an applicable health-based guideline value should be further evaluated in the HHRA, irrespective of whether the predicted increase is expected to be less than 10% from the Base Case because not doing so could result in an underestimation of health risks. It is requested that the report include an evaluation of the potential health impacts associated with arsenic in soil in the HHRA because not doing so could result in an underestimation of health risks.	See 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project.

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355	HC-013	15-Sep-16	Allison Denning, Health Canada	Table 9.1-B-3 indicates that at the maximum point of impingement (MPOI), concentrations of lead in ambient air are projected to exceed a 10% increase at the MPOI but because there are no guideline values, lead was not carried forward in the risk assessment. The lack of a guideline is not a reason for screening out substances. Table 9.1-B-4 identifies several substances that exceed guideline values for the 24-hour Application Case, including beryllium at all receptor locations, and PM2.5, PM10, total suspended particulates (TSP), iron and manganese at the MPOI. Beryllium was not screened into the HHRA because it did not exceed a 10% increase in concentration. As noted in HC-IR-01, it is not appropriate to screen out as substance based on a predicted increase of less than 10% from Base Case. Table 9.1-B-6 indicates that chromium, cobalt and nickel exceed annual guideline values for the Application Case, however they were not screened into the human health risk assessment because they did not exceed a 10% increase from the Baseline Case. As noted above, As noted in HC-IR-01 and above, it is not appropriate to screen out as substance based on a predicted increase of less than 10% from Base Case. These predicted elevated levels of lead, beryllium, cobalt, chromium and nickel in air should be considered in the HHRA and failure to do so may result in an underestimate of human health risk. See Health Canada (2012)1 for more information about appropriate methods for screening substances for further evaluation in an HHRA.	HC-IR-4 (Ref CEAA-IR-40): Evaluate lead, beryllium (short-term), and cobalt, chromium, nickel (long-term) and any other substances that exceed their guideline values (or have no guideline value) in air in the HHRA. The current report may underestimate potential human health risks as these substances were not included in the HHRA.	See 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project.
356	HC-014	15-Sep-16	Allison Denning, Health Canada	The air quality parameters selected to evaluate vehicle exhaust emissions were particulates, SO2 and NO2. Other substances related to vehicle exhaust, including polycyclic aromatic hydrocarbons (PAHs) and diesel particulate matter may also be relevant for inclusion in the assessment, particularly given that there are ambient air quality criteria for these substances. Some ambient air quality criteria include: - Health Canada has recently published a Human Health Risk Assessment for Diesel Exhaust (http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/exhaust-diesel-gaz-echappement/index-eng.php) which identifies a short-term (2-hour) exposure guidance value of 10 mg/m3 and a chronic exposure guidance value of 5 mg/m3. - The Ontario Ministry of the Environment have published ambient air quality criteria for specific PAHs that could be used for comparison (http://www.airqualityontario.com/downloads/AmbientAirQualityCriteria.pdf). - The California Environmental Protection Agency has published an inhalation unit risk and inhalation slope factor for diesel exhaust, which can be found in Part I: Guidance in Human Health Preliminary Quantitative Risk Assessment (PQRA) Version 2.0, pg. 22. (http://www.oehha.ca.gov/air/hot_spots/2009/AppendixA.pdf).	HC-IR-5: Health Canada advises that PAHs (such as naphthalene to represent non-carcinogenic PAHs and benzo[a]pyrene to represent carcinogenic PAHs) and diesel particulate matter be included in the air quality assessment, and that predicted concentrations be compared to appropriate regulatory guidelines. The exclusion of these contaminants during the construction and operation phase may result in an underestimation of human health risk.	Air quality indicator compounds were defined within the Application Information Requirements (BURNCO Aggregate Project AIR/EIS 2014). Input into the AIR were provided by the Technical working group, BC EAO and CEA Agency. Within the approved AIR, air quality indicator compounds were defined as TSP, PM10, PM2.5, SO2 and NO2. PAHs and diesel particulate matter were not included as an indicator compound, therefore have not been considered in the EAC Application/EIS.
357	HC-015	15-Sep-16	Allison Denning, Health Canada	According to the Table, there are no Federal guidelines for NO2 or SO2 in air, which is incorrect. There are existing National Ambient Air Quality Objectives (NAAQOs), however, currently the Government of Canada is in the process of updating the air quality standards for NO2 and SO2 that will eventually replace the outdated NAAQOs. It is expected that the new standards for these two pollutants will be substantially lower than the NAAQOs. Therefore, it is suggested that a sensitivity analysis using NAAQS issued by US EPA for NO2 and SO2 be conducted for a more meaningful analysis, as the US EPA NAAQS are based on a more current database similar to that being used in Canada to develop the new standards. The USEPA NAAQs can be found at https://www.epa.gov/criteria-air-pollutants/naaqs-table The supporting documents for these NAAQS can be found at: - http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=259167#Download (for NO2); and - http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198843 (for SO2).	HC-IR-6 (Ref CEAA-IR-33): Federal guidelines for NO2 and SO2 currently exist, however, they are in the process of being updated. In the interim, Health Canada advises that predicted future concentrations of these substances be also compared to USEPA NAAQS which are being used to inform new Canadian standards.	At the time of the assessment the BCMOE had adopted interim air quality objectives for NO2 and SO2. These objectives were used to undertake the assessment as specified in detailed model plan (Appendix 5.7-E). At the time of the assessment, these interim BC air quality objectives were lower (more stringent) than the Canadian National Ambient Air Quality Objectives for both NO2 and SO2. Additionally, these interim BC air quality objectives for NO2 and SO2 are equal to, or lower than (more stringent) than the US EPA NAAQS. Therefore a further comparison to the US EPA standard would not change the results or conclusions of the air quality assessment.

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358	HC-016	15-Sep-16	Allison Denning, Health Canada	As presented in Tables 9.1-B-1 and 9.1-B-2, for SO2 (10 minute exposure) the ATSDR minimum risk level (MRL) of 26 mg/m3 and the World Health Organization (WHO) value of 500 mg/m3 were identified as potential acceptable threshold levels. The WHO threshold was selected with the rationale that it was health- based, it considered several studies involving sensitive individuals and was derived more recently than the ATSDR value. The ATSDR MRL was also derived based on health considerations ("a minimal lowest observed adverse effect level (LOAEL) of 0.1 ppm for bronchoconstriction in exercising asthmatics") and is much lower than the WHO value. Given that the ATSDR value is more conservative (more than an order of magnitude lower than the WHO value), it would be more appropriate to use a more conservative value when screening substances for assessment in the HHRA. Health Canada has recently published an HHRA for SO2,[2] which presents a proposed 10 minute reference concentration of 67 parts per billion (or 175 µg/m3) in air which is expected to be protective of human health. In addition, the Government of Canada is in the process of revising its air quality objective for SO2 (see HC-IR-06 for more information) which is expected to be much lower than the current standard.	HC-IR-7 (Ref CEAA-IR-33): Given that Health Canada has recently published an HHRA on SO2, and the Government of Canada is in the process of revising the SO2 ambient air quality objective, in the interim, it would be appropriate to screen substances based on the most conservative health-based criteria unless there is substantial justification to show otherwise. Provide a discussion about whether or not using the ATSDR MRL to screen in SO2 in the HHRA would have any impact on the outcome of air quality assessment or associated health risks in the HHRA.	For the short-term and long-term air quality risk assessment, the predicted 1-hour, 24 hour and annual concentrations of substances expected to be emitted by the Proposed Project were compared to selected 1-hour, 24-hour and annual health-based thresholds, respectively. Predicted SO2 concentrations were provided for the 1-hour, 24-hour and annual averaging times. In each scenario, the lowest (i.e., most conservative) health-based air thresholds were selected as the screening value. Ten-minute air thresholds are available for SO2 from the ATSDR (26 µg/m3) and the World Health Organization (500 µg/m3). Health Canada recently derived a 10-minute reference concentration of 67 ppb (or 176 µg/m3) based on evidence of association between respiratory morbidity and short-term exposure to SO2 in the document titled "Human Health Risk Assessment for SO2" (Health Canada 2016). However, predicted SO2 concentrations were not provided for the 10 minute averaging time. It was not considered appropriate to use the 10-minute ATSDR MRL to screen 1-hour SO2 concentrations. Ambient air quality predictions are provided on an hourly basis which is due to the nature of the meteorological data used in the predictions (e.g., driven by the hourly nature of the weather data used in the modelling). The BCMOE Dispersion Modelling Guidelines does not provide any guidance on deriving 10-minute averages. The use of one hour modelled predictions is consistent with the BC and Canadian ambient air quality objectives. The hourly averaging period of the predicted model concentrations was approved by the BCMOE in their review of the detailed dispersion model plan.
359	HC-017	15-Sep-16	Allison Denning, Health Canada	As stated in the Appendix, "the predicted 1-hour air concentrations for selected receptor locations screened against the selected thresholds are presented". It does not appear that Base Case values were included with the predicted future concentrations when screening substances for further evaluation in the HHRA. In order to evaluate concentrations that may be present during project operations, it is essential to include background/baseline concentrations in addition to the predicted emissions from the project to evaluate overall health risks.	HC-IR-8 (Ref CEAA-IR-42): The report should include the total concentration of the substances that will be elevated in air as a result of project activities (i.e. combining the existing baseline contaminant concentrations with the future predicted concentrations) in order to screen substances for further evaluation in the HHRA. Not including background with future predicted concentrations will underestimate the overall future contaminant concentrations in air and human exposure to air contaminants. In order to adequately assess potential health risks it is important to assess not only project-related exposure in the absence of background, but total exposure; failure to do so may underestimate potential risks.	The predicted air concentrations for each receptor location include background (i.e., predictions are equal to background plus project-related contribution). See Section 5.7.3 of the EAC Application/EIS for a more detailed description of the air quality assessment methodology.
360	HC-018	15-Sep-16	Allison Denning, Health Canada	The EIS indicates that crab tissue was analysed for metal concentrations and mussel tissue was analysed for background concentrations of metals and PAHs. Given the historical contamination of Howe Sound which includes dioxins and furans from current and historical industrial operations (e.g. the former pulp mill at Woodfibre) and the fact that marine sediment will most likely be disturbed during construction activities in the marine environment (which could remobilize existing contaminants), it is unclear why these marine species were not also analysed for background concentrations of dioxins and furans. In addition, no marine fish (such as species consumed by local people - e.g. flounder) were analysed as part of the baseline program. No rationale was provided for this.	HC-IR-9 (Ref CEAA-IR-38): Additional justification is needed in order to explain why no marine fish (or other edible species from this area) were sampled and why dioxins and furans were not analysed in both crabs and mussels in the recent baseline sampling program given the historical contamination in Howe Sound. Dioxin and furan concentrations should be assessed in baseline samples for marine species that are likely to be consumed by people given the historical contamination of Howe Sound and the possible re-suspension of sediments during project activities in the marine environment. Consider monitoring other edible species (e.g. marine fish) for metals, PAHs, and dioxins and furans.	Project-related surface water and sediment quality changes were not predicted to occur in McNab Creek and Howe Sound (see Section 5.5 of the EAC Application/EIS). Therefore, concentrations in fish and shellfish tissue are not anticipated to change as a result of the project and this pathway was not retained for the human health risk assessment. For a more detailed discussion on dioxins and furans, please refer to response HC-IR-17. The baseline program was designed to collect information to characterize baseline conditions in support the risk assessment. If an operable pathway were identified for fish consumption, then collection of additional fish tissue samples would be warranted. However, additional sampling was not recommended because the problem formulation did not retain this exposure pathway for the risk assessment.
361	HC-019	15-Sep-16	Allison Denning, Health Canada	In Section 4.2.1, the report states that crabs were analysed for metals, however, this section concludes that "in general, concentrations of metals and PAHs in crab in muscle and organ tissues collected at the reference site and the Project area, were quite similar." Given that no crabs were analysed for PAHs and no PAH results were presented, it is unclear how this conclusion could be reached.	HC-IR-10: Provide a rationale for the conclusion that concentrations of PAHs in crabs in the Project Area and reference site were similar given that no data was presented in the report regarding concentrations of PAHs in crabs.	A typographical error was made in this text, it should read: in general, concentrations of metals in crab in muscle and organ tissues collected at the reference site and the Project area, were quite similar.
362	HC-020	15-Sep-16	Allison Denning, Health Canada	Section 9.1.3.3.1 of the EIS states that "fish tissue data… were used to gain a better understanding of baseline conditions at the site." Section 4.2.1 of Appendix 9.1C indicates that baseline fish data (freshwater fish only) was based on a single sample that was collected from McNab Creek. Analysis of one fish is not sufficient to determine baseline conditions, nor is it possible to determine baseline health risks or future health risks based on one fish sample. EIS Section 9.1.3.3.6 states that First Nations have reported harvesting all five species of salmon, steelhead and Dolly Varden char in McNab Creek. As such, it appears that additional fish species may be present in McNab Creek. In order to acquire sufficient numbers of the various species of fish expected to be present in McNab Creek, it would be useful to collaborate with local people who consume fish from this area to obtain samples for analysis.	HC-IR-11 (Ref CEAA-IR-39): Health Canada advises that additional samples of fish tissue be collected and analysed in order to ensure an adequate baseline value for chemicals of potential concern (COPCs) in fish to reduce the uncertainty associated with the current baseline metals in fish data which is based on one fish sample only.	See response to HC-IR-9
363	HC-021	15-Sep-16	Allison Denning, Health Canada	With respect to the exposure pathways considered in the multi-media assessment, the only exposure pathway considered valid was recreational receptor exposure to titanium in surface water from Pit Lake. Health Canada has concerns related to the screening methods used to determine the COPCs to be evaluated in the HHRA, and this Table needs to be revised to reflect the additional substances and exposure pathways that should have been screened in for further evaluation based on Health Canada's other IRs presented above.	HC-IR-12: Evaluate all substances that exceed regulatory guideline values (either currently or during project construction and operation) for each relevant exposure pathway in the HHRA. Where no guideline values exist, evaluate any substance in any media where concentrations may increase due to project activities (for both baseline and future scenarios).	Further clarification regarding selection of contaminants of potential concern for each relevant exposure pathway in the risk assessment is provided in 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project (see Section 2.0). Substances for which guidelines are unavailable were retained for further evaluation if concentrations increased as the result of the Project (e.g., Titanium was retained as a contaminant of potential concern in surface water despite having no guideline, see Section 9.1.5.6.2 of the risk assessment).

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364	HC-022	15-Sep-16	Allison Denning, Health Canada	Table 9.1-C-3 provides the input values and sources used to calculate fish and shellfish screening levels. For fish and shellfish ingestion rates Health Canada (2007)[3] is cited. This consumption rate may not be representative of local Indigenous Peoples consumption rates for fish and shellfish. The First Nations Food Nutrition and Environment Study (FNFNES)[4] should be consulted (in addition to any other dietary surveys or consumption studies for local Indigenous Peoples) in order more accurately determine local consumption rates/patterns and those values should be used in screening equations to determine the COPCs to be evaluated in the HHRA. In addition, using consumption rates from Health Canada (2007) does not take into consideration the potential for very high rates of consumption for short periods of time, such as during a weekend fishing trip or a ceremonial event.	HC-IR-13 (Ref CEAA-IR-43): Consider using more site-specific consumption patterns (including factors such as seasonality of exposure) when evaluating acceptable contaminant concentrations in fish and shellfish which are more representative of actual consumption rates/patterns for local Indigenous Peoples. Given that fish and shellfish screening levels were derived using the Health Canada (2007) ingestion rates, not using more site-specific values may result in an underestimation of potential health risk and may result in the screening out of substances which could be relevant from a human health perspective.	Site-specific consumption rates were not available for local First Nations at the time of the assessment. Therefore, the Health Canada fish consumption rates for 'high-consumers' was used to derive screening values for fish tissue. The First Nations Food Nutrition and Environment Study (Chan et al 2010) reports consumption rates for a number of First Nations groups in BC broken down by 'ecozone/culture area'; however, First Nations local to the study area were not represented in the report. The closest regional data are from Pacific Maritime/Subarctic/Northwest Coast and the Pacific Maritime/Plateau ecozones, which included 9 participating First Nations communities in coastal BC. The reported average daily ingestion rates for fish/shellfish consumption (including salmon, halibut, lingcod, mussels, and crab) was 33.8 g/day (96.5 g/day corrected for consumers only) for the Subarctic/Northwest Coast ecozone and 18.9 g/day (67.5 g/day for consumers only). The high-consumer rate reported in Health Canada (2007) is equivalent to the 90th percentile consumption rate of 45 g/day (49 g/day for consumers only) from a Canadian dietary survey. Therefore, use of the Health Canada high-consumer value of 49 g/day (fish and shellfish combined) was considered reasonable for preliminary screening purposes for coastal BC First Nations. It should also be noted that changes in fish/shellfish tissue are not predicted to occur as a result of the project; therefore the fish/shellfish consumption pathway was not retained for the risk assessment. Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Chemical Safety. March 2007. Laurie Chan, Olivier Receveur, Harold Schwartz, Amy Ing and Constantine Tikhonov. 2011. First Nations Food, Nutrition, and Environment Study. Results from British Columbia (2008/2009). Prince George: University of Northern British Columbia, 2011.
365	HC-023	15-Sep-16	Allison Denning, Health Canada	The Base Case HHRA evaluated only those substances that were "screened into the human health risk assessment (i.e. parameters for which the Proposed Project was expected to result in a change to environmental concentrations that people may be exposed to and which exceeded a health-based standard or guideline)". Health Canada identified additional substances that may increase as a result of project activities and should be evaluated in the HHRA (see HC-IR-02 to HC-IR-05). Failure to include these in the baseline HHRA may result in an underestimation of human health risk. Section 9.1.3.3.3 of the EIS states that "health risks were evaluated based on the existing (i.e. Base Case) and predicted (i.e. Application Case) quality of soil, water and air". There was no evaluation of country/traditional foods, despite the fact that samples of fish, mussels, crabs and berries were collected and analysed for baseline contaminant concentrations. As presented in Appendix 9.1-C, for fish, baseline arsenic, chromium, lead and mercury exceeded the calculated fish screening levels (for the one fish sampled). For shellfish, concentrations of arsenic, copper, mercury and strontium exceeded the shellfish screening values in one or more samples. For mussels, concentrations of arsenic, cadmium, copper, lead and zinc exceeded the calculated screening levels in one or more samples. Contaminant concentrations may increase in marine and freshwater species due to project activities such as construction in the marine environment, ship traffic and sediment re-suspension, and discharges from the project to the marine environment via McNab Creek. As such, it is expected that aquatic foods be evaluated in the HHRA for future project-related scenarios as this is expected to be an operable exposure pathway.	HC-IR-14: Conduct a multi-media Base Case and Application Case HHRA which includes exposure to all relevant COPCs for both current and potential future increases in contaminant concentrations in both terrestrial and aquatic country/traditional foods which utilizes reasonable assumptions related to consumption rates by local Indigenous Peoples. It is requested that the assessment of consumption rates consider the amount of time people actually spend at the MPOI as well as the potential that people may collect/harvest country foods near the project site and bring them back to their communities to consume over a longer period of time.	Further clarification regarding selection of contaminants of potential concern for each relevant exposure pathway in the risk assessment is provided in 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project. Changes to concentrations in country/traditional food items are not anticipated as a result of the Project; therefore, this pathway was not retained for the human health risk assessment.
366	HC-024	15-Sep-16	Allison Denning, Health Canada	Tables 9.1-D-1 to D-4 identify the locations where predicted annual deposition rates were calculated. There were no predicted soil concentrations presented for the location(s) where the highest deposition of airborne particulates could occur. It also does not appear that the nearest community (McNab Strata community) was evaluated with regard to increases in concentrations of substances in soil as a result of deposition of airborne particulate matter during project operation. In addition, there are two locations (Unknown First Nations and Unknown Residence) that were not identified either on a map or by geographical coordinates. Failure to evaluate soil at the nearest receptor locations may result in underestimation of potential human health risks associated with project activities.	HC-IR-15 (Ref CEAA-IR-44): Current and predicted future soil concentrations at the MPOI and at the community of McNab Strata should be presented in the EIS in order to ensure that the worst-case scenario for exposure to soil and associated terrestrial country foods is evaluated. In addition, the two unknown locations should be identified as to their geographical location(s) and proximity to the project site. Given that changes to soil quality were also used to determine whether there would be changes in concentrations of substances in edible vegetation and game meat, failure to evaluate soil concentrations at these locations will affect the assessment of foods and may result in underestimation of potential health risks.	Annual deposition rates are not provided for the MPOI. The MPOI is only considered for short-term exposures, as there are no human health receptor locations in the MPOI location. McNab Creek Strata was included as a receptor location and annual deposition rates and soil concentrations were predicted at this location. The maximum predicted application case soil concentration among all receptor locations was used to identify COPCs in soil. The predicted concentrations of metals in soil were greatest at the McNab Creek Strata (see Table 9.1-C-2 in Appendix 9.1-C), which represents the worst-case scenario for exposure to soil and associated terrestrial country foods. The Unknown First Nations receptor location is shown on Figure 9.1-1 as "First Nations Cultural Site" (Key 12). The Unknown Residence, which should be identified as Key 13 on Figure 9.1-1, is located west of the Project area. No soil COPCs were identified at McNab Strata.
367	HC-025	15-Sep-16	Allison Denning, Health Canada	The report states that "unlike other disciplines, field data were not used to directly measure existing risks to public health, and a stand-alone baseline assessment was not conducted". There is no explanation as to why no stand-alone baseline assessment was conducted.	HC-IR-16: In order to fully understand baseline health risks prior to project commencement, it is necessary to conduct a site-specific, multi-media human health risk assessment which includes exposure to COPCs in air, soil, water, and foods (particularly given that country/traditional foods were analysed as part of the baseline sampling program). See HC-IR-14 for more information.	As stated in provincial guidance and the AIR, the scope of an environmental assessment is to 'identify and evaluate potential human health effects related to predicted project-related effects to water quality, air quality, contamination of country food (see 05-Dec-16 Technical Memo entitled Re-evaluation of identification of contaminants of potential concern (COPCs) for the Human Health Risk Assessment, BURNCO Aggregate Project for additional detail). Therefore, it was not within the scope of the assessment to evaluate risks based on background conditions for substances and pathways that were not predicted to change as a result of the project. The purpose of the baseline study was to collect data to support the prediction of project-related concentrations and to calculate baseline risks for those parameters/pathways that were predicted to change as a result of the project. As changes to soil, water, and sediment quality were not predicted, a detailed evaluation of country food pathway was not conducted.

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368	HC-026	15-Sep-16	Allison Denning, Health Canada	The Appendix states that "the purpose of the [baseline] sampling program was to provide site-specific chemistry results that will be used to determine baseline exposure concentrations and calculate site-specific bioaccumulation factors as a part of the public health assessment". There was no discussion of bioaccumulation factors and no evaluation of the baseline risk from consumption of terrestrial or aquatic country foods in the Public Health Assessment (EIS Section 9.1).	HC-IR-17 (Ref CEAA-IR-37): Given that Health Canada has identified additional substances that should be assessed as part of the HHRA (as noted in comments above), as well as the potential for bioaccumulation of certain contaminants (e.g. mercury, PCDDs/PCDFs), it requested that the report provide a discussion about possible bioaccumulation of contaminants and the impact of increased levels of those substances on human health.	No residual changes are anticipated to water and sediment quality (in freshwater or marine) fish-bearing watercourses) as a result of the Project. In addition, dioxins, furans, and other bioaccumulative substances will not be emitted / discharged to the aquatic environment as a result of the Project. Historic sediment contamination (including dioxins and furans) does exist within Howe Sound due to past industrial activities in the region. Aquatic biota may be exposed to existing dioxin and furan contaminants as a result of Project-related sediment disturbances and introduction of suspended sediments into the water column. The potential for resuspension of sediments was evaluated as part of the Marine Resources assessment (See section 5.2). Results indicate that localized short-term increases in suspended sediment concentrations could occur during construction (due to pile driving) and as a result of propeller scour during berthing activities. Impacts on water quality and aquatic biota related to pile driving would be controlled with the application of known and effective mitigation (e.g. silt curtains around wetted pile). Impacts on water quality and aquatic biota related to propeller scour would be limited to the immediate seafloor area beneath the barge load-out jetty; an area presently associated with low value benthic habitat and low productivity due to extensive carpeting of the seafloor with woody/bark debris as a result of historical log handling activities in this area. Therefore, given that residual changes in water/sediment quality are predicted to be negligible – not significant in this context, measurable increases in tissue concentrations of aquatic species associated with country foods are not expected as a result of the Project.
369	HC-027	15-Sep-16	Allison Denning, Health Canada	Table 9.1-4 presents the authors proposed magnitude (i.e. acceptability) of risk for both non-carcinogens and carcinogens. However, the proposed 'acceptable' risks are not consistent with Health Canada guidance. The report identifies that for non-carcinogens, a low and likely to be negligible risk is defined as being a hazard quotient (HQ) of 1.0 to ≤10 and a potentially elevated risk is defined as an HQ>10. The report did not provide a rational on a chemical-specific basis as to whether there may be potential health risks associated with a HQ >1. The report identifies that for carcinogens, a low and likely to be negligible risk is defined as an incremental lifetime cancer risk (ILCR) of 1x10-5 to ≤1x10-4, and a potentially elevated risk is an ILCR >1x10-4. These target risk values are higher than Health Canada's negligible target HQ of <1 and Health Canada's acceptable ILCR of <1x10-5. No rationale was provided to identify how levels above the targets identified by Health Canada would be protective of health.	HC-IR-18: The report should present rationale on a chemical-specific basis as to whether there may be health risks associated with an HQ greater than 1.0 for non-carcinogens (including non-site-related exposure) or 0.2 (for site-specific exposures), and/or an ILCR greater than 1 x 10-5 for carcinogens (as per Health Canada, 2012[5]).	As part of the risk assessment, risk estimates greater than the target level (e.g., HQ > 1) were further evaluated to determine magnitude of risks (see approach in Table 9.1-5 of the Application). The evaluation was conducted on a chemical specific basis considering the following: frequency of exceedances, spatial extent, sources of conservatism, and sources of uncertainty. These factors in combination were used to determine the overall significance of effect (rather than solely relying on the magnitude of exceedance). Magnitude of Risk tables are available in Section 9.1.6.1.1.2.
370	HC-028	15-Sep-16	Allison Denning, Health Canada	With respect to screening game meat and plants using soil quality guidelines, Health Canada would prefer that any contaminants of potential concern (COPCs) that are expected to be released as a result of project-related activities (and where uptake to plants or other terrestrial country foods may occur); that these substances be screened in for further assessment in a multi-media HHRA (for both Base and Application Cases) irrespective of whether the contaminant concentrations in soil are predicted to exceed soil quality guidelines, as site-specific differences in the soil matrix may impact the modelling. This is particularly relevant given that baseline vegetation sampling has been undertaken. It was noted in Table 9.1-9 that ingestion of game meat was considered a potential exposure pathway, however, no game meat was collected or analysed as part of the baseline sampling and no background data from literature was identified.	HC-IR-19: Consider evaluating all COPCs that are expected to be released to the environment and may be taken up by terrestrial country foods for the Base Case, Application Case and cumulative effects assessments to evaluate potential health risks associated with existing conditions, project-related conditions and overall increases in health risks to human receptors in the vicinity of the project. If there is sufficient concern or uncertainty related to the lack of game meat samples, baseline sampling for game could also be undertaken.	Environmental quality guidelines for vegetation and game meat to do not exist for the protection of human health. Typically, COPCs selected in soil are also evaluated for the terrestrial country food pathways whereas COPCs in water are evaluated for aquatic country food pathways (e.g., fish, shellfish). No soil COPCs were identified as part of the screening, and concentrations in soil were not predicted to increase based on deposition modelling. Therefore, given that soil quality changes are not predicted, changes in vegetation and game quality are also not expected, and these pathways were not retained for the assessment. A change in titanium was predicted at one location only (pit lake during operations phase); however, because this lake will not support fish or shellfish during operations, an aquatic country food pathway was not evaluated for titanium.
371	HC-029	15-Sep-16	Allison Denning, Health Canada	A significant effect was determined to be "when the magnitude of the effect is high (greater than air quality criteria at residences) and an effect that is irreversible". The significance definition does not consider risks at the MPOI nor does it evaluate exposure to substances such as some non-carcinogenic risks, where adverse effects may occur but are not irreversible (e.g. respiratory irritants which may have acute effects but which can be reversed once exposure has ceased).	HC-IR-20: The definition of significance should include receptors at the location(s) of the highest potential exposure (e.g. MPOI) and should include any adverse effect whether it is irreversible or not.	The determination of significance was based on assessment results at receptor locations, and include all the receptor locations identified in the Human Health Risk Assessment. From an air quality perspective, as defined in Section 5.7.3.3.3, all effects are reversible since after the project any Project related effects on air quality indicators will cease since Project related air emissions will cease.
372	HC-030	15-Sep-16	Allison Denning, Health Canada	A residual effect on human health was considered to be significant if the effect of the proposed project would "affect the viability of the VC (i.e. the ability of the community to work and function over time within the defined spatial and temporal boundary)". It is unclear what this statement means.	HC-IR-21: Provide additional explanation of the meaning of this statement, including examples, to provide context.	This statement should be as follows for the human health risk assessment: "adversely affect the physical health of people within the defined spatial and temporal boundary".
373	HC-031	15-Sep-16	Allison Denning, Health Canada	According to the Table, the proposed Woodfibre LNG facility may result in emissions of TSP, PM10 and PM2.5. In addition to these, LNG facilities are also likely to release SO2 and NO2. These substances should be considered in the cumulative assessment of health risks.	HC-IR-22: Include all relevant COPCs from other proposed projects in the cumulative assessment of human health risks.	Residual effects with negligible significance were not moved forwarded to the cumulative effects assessment. Residual effects for NO2 and SO2 were deemed to be negligible, and therefore were not included in the cumulative effects assessment.

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374	HC-032	15-Sep-16	Allison Denning, Health Canada	According to the Table, all data from 8 pm until 1 am at NR5 was considered 'not valid'. Thus, there is no understanding of what typical baseline noise levels would be during the evening hours at NR5 (McNab Strata community). The uncertainty associated with this baseline sample should be discussed and a rationale for why the data was not valid should be provided.	HC-IR-23: Given that NR5 is the closest human receptor location to the project (approximately 500 m from the project fenceline), it is important to have valid baseline noise data for all time periods to compare to future predicted or measured noise levels to evaluate any changes. Discuss the potential implications of this uncertainty in terms of future predicted noise levels and provide a rationale for why the data was not considered valid. Consider collecting additional baseline noise data, particularly for the evening and night-time period.	As per Section 4.5.1 of Appendix 9.2 of the EA, the invalid data was due to high wind speeds. The invalid data was recorded but excluded during analysis, which led to more conservative baseline results, as high winds increased the noise levels. Note that Directive 038 requires three hours of valid monitoring data for the monitoring result to be deemed valid. For the nighttime period of this measurement, there was more than five hours of valid monitoring data and is therefore considered valid by Direction 038. Measurements were repeated without logging, an activity which only occurs during the daytime period. The nighttime period results of the two measurements were within 1 dBA of each other (see Table 9.2-9 in Section 9.2 of the EA), which is within the error of the monitoring equipment.
375	HC-033	15-Sep-16	Allison Denning, Health Canada	The Local Study Area (LSA) was defined as extending out 1.5 km in all directions from the project fence line/boundary (which is based on the British Columbia Noise Control Best Practices Guideline). This LSA includes not only land but also the surface water of Howe Sound. According to Schomer and Sanders (1978)[6], "community noise problems are generally worse when the sound propagates over water". Given that there are human receptors across Howe Sound, that prevailing winds are from the west/southwest, and that very little attenuation of noise is expected because of the presence of Howe Sound, predicted noise levels at these receptor locations may be underestimated. Noise from the facility may be even more apparent in downwind and/or calm conditions with a strong temperature inversion (where cold air underlies warmer air at higher altitudes) (ISO 9613-2; 1996).[7]	HC-IR-24: Given the potential for noise levels to be higher than predicted at receptor locations on the other side of Howe Sound, Health Canada advises that the LSA be expanded to include additional receptors near this shore. In addition, noise management and noise monitoring plans, including a formalized complaint response and resolution plan, should be included as part of an Environmental Management Plan.	The noise model developed for the prediction of noise effects for this project accounted for noise propagation over water and attenuation (or lack thereof) due to barriers and topography. The model included conservative assumptions such as modelling a downwind condition in every direction from the project. Considering these factors, the modelled Project contributions to noise levels at NR4 (Eakins Point, inside the LSA and across the water from the Project) were below baseline and resulted in Negligible-Not Significant effects. Therefore the LSA will not be expanded. A noise management plan will be developed prior to construction, which will include a commitment to noise monitoring and a response plan to noise concerns received from nearby property owners, including receptors across the water such as Eakins Point.
376	HC-034	15-Sep-16	Allison Denning, Health Canada	No cumulative effects assessment was undertaken for noise, based on the assumption that "all potential Project-related residual adverse effects were determined to be negligible and requiring no further consideration. No residual effects were carried forward to a cumulative effects assessment." Given that there are other industrial activities occurring in the vicinity of the project (including logging), it is unclear why no cumulative assessment of noise was undertaken.	HC-IR-25 (Ref CEAA-IR-41): Undertake a cumulative effects assessment of noise on nearby human receptors or provide additional justification as to why this was not considered necessary.	Cumulative effects due to noise were not assessed because the significance of the noise VC was Negligible, Not Significant. The cumulative contribution of noise from other facilities such as the Box Canyon project is expected to be minimal, based on previous assessments of run-of-river projects (e.g. Narrows Inlet Hydro Project, 2012). Logging was included in the baseline noise levels and therefore was included in the Application Case noise levels.
377	HC-035	15-Sep-16	Allison Denning, Health Canada	Surface water ingestion is considered to be an exposure pathway, however, groundwater ingestion is not evaluated. Table 9.1-9 states that well water is available at the First Nations and community residential locations, however, there is no discussion about what impacts the project may have on groundwater as a drinking water source.	HC-IR-26: If groundwater is likely to be ingested, explain how the project may or may not impact groundwater-sourced drinking water supplies. If changes to the quality of drinking water as a result of project activities are possible, this pathway should be evaluated in the HHRA.	The McNab Creek Strata holds two water licenses for use of McNab Creek, one of which is for use as a potable water source. As such, ingestion of surface water as drinking water was considered as a potential pathway for residents of the McNab Creek Strata. However, no COPCs were identified in surface water from McNab Creek. Groundwater is not likely to be ingested in the future as drinking water as a potential surface water source is available and there are no groundwater supply wells on the property. Potential inputs from groundwater to surface water have been included in the surface water predictions.
378	HC-036	15-Sep-16	Allison Denning, Health Canada	With respect to land-based hazardous material spills and the potential to impact surface water quality, thirteen "key" mitigation measures are presented. No human health-based mitigation measures were presented. In the event of chemical spills to surface water, drinking water supplies may be impacted (if applicable) and fish and other aquatic foods consumed by Indigenous Peoples may also be impacted.	HC-IR-27 (Ref CEAA-IR-52): Provide mitigation measures that are relevant from a human health perspective or provide justification as to why additional mitigation measures are not necessary (e.g. surface water is not expected to be consumed by people).	The mitigation measured in Table 15-5 regarding land based hazardous materials include measures to prevent potential spills. These preventative measures would also be applicable to human health, therefore addition mitigation measures (above and beyond those listed) are not needed. Unacceptable risks were not identified as part of the risk assessment based on the conservative exposure scenarios evaluated (e.g., children swimming regularly in the end pit lake). Therefore, additional mitigation measures were not recommended based on the outcome of the human health risk assessment.
379	HC-037	15-Sep-16	Allison Denning, Health Canada	Section 4.2 states that for carcinogenic parameters, adult body weight and ingestion rates were used. In order to evaluate all life-stages in the calculation of carcinogenic risks, a more appropriate receptor would be the composite lifetime receptor, which includes the infant, toddler, child, teen and adult with life expectancy of 80 years, 60 of which are as an adult (Health Canada, 20121 and 2013[1]).	HC-01: Consider utilizing a composite lifetime receptor when evaluating risk from exposure to carcinogens which takes into consideration all life stages and provides a more technically accurate estimation of risk (see Health Canada, 2012; 2013).	Recommendation noted. No carcinogenic COPCs were retained for the risk assessment; therefore, use of a composite receptor was not warranted. The assessment for non-carcinogenic effects focused on the most sensitive applicable life stage (e.g., children in a swimming scenario).
380	HC-038	15-Sep-16	Allison Denning, Health Canada	The EIS states that "in the absence of screening criteria for these media (game meat and plants), changes to soil quality as the result of aerial deposition was used as a surrogate to determine whether there would be potential for changes in vegetation and game meat concentrations". According to Section 7.3 of the CCME (2015)[2] scientific criteria document for Canadian soil quality guidelines for nickel, "exposure from direct soil contact is the primary derivation procedure used for calculating environmental quality guidelines for residential/parkland, commercial and industrial land uses. Exposure from direct soil contact as well as soil and food ingestion are considered in calculating guidelines for agricultural land use, with the lower of the two values generated from these derivation procedures being recommended as the environmental soil quality guideline for this land use" Based on Table 9.1-C-2 in Appendix 9.1-C, it appears residential land use criteria were used. If the intention is to evaluate food ingestion, the more appropriate screening criteria would be the CCME soil quality guidelines for agricultural land use.	HC-02: If changes in soil concentrations are used to evaluate changes in foods, CCME soil quality guidelines for agricultural land use should be used instead of residential criteria where they are more conservative.	The soil quality guidelines for cadmium, cobalt, molybdenum and tin are lower for agricultural land use than residential land use. The soil quality guidelines for the other metals are the same for both land uses. The soil quality guidelines for agricultural land use are 1.4 mg/kg, 40 mg/kg, 5 mg/kg and 5 mg/kg for cadmium, cobalt, molybdenum and tin, respectively. The predicted maximum soil concentrations for these metals are 0.19 mg/kg, 11 mg/kg, 0.88 mg/kg and 2 mg/kg, respectively, which are below the agricultural land use guidelines. Taking into account the lower soil quality guidelines for agricultural land use for screening COPCs does not change the conclusions of the HHRA.

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381	HC-039	15-Sep-16	Allison Denning, Health Canada	This section identifies noise mitigation measures that will be implemented to reduce noise levels. Additional mitigation measures that could be implemented to reduce noise levels can be found in the New South Wales Construction Noise Guidelines (attached).	HC-03: Consider implementing all technically and economically feasible noise mitigation measures, such as those found in the New South Wales Construction Noise document, in addition to the specific measures presented in EIS Section 16.2.2.9.	Table 9.2-56 in Section 9.2 outlines additional mitigation measures that relate to noise for the project, many of which are consistent with the mitigation measures discussed in the New South Wales Construction Noise document. Any additional technically and economically feasible noise mitigation measures from the New South Wales Construction Noise document will be considered when developing the noise management plan.
382	HC-040	15-Sep-16	Allison Denning, Health Canada	At several receptor locations during Construction Phase 5, change in %HA is approaching the acceptable level of 6.5% (e.g. R9 and R14 are predicted to be 6.1% and several others are above 5.5%). In addition, at several receptor locations speech intelligibility levels are approaching the acceptable value of 55 dBA (e.g. R9 and R14 are predicted to be 53.9 dBA). Given the stated computer noise model accuracy is +/- 5 dB, these values could exceed the acceptable standards at certain receptor locations. It is advisable, particularly during Construction Phase 5, to ensure that people have the opportunity to express any concerns about noise and that additional mitigation measures be implemented in the event of noise complaints.	HC-04: Consider implementing a formalized complaint-response-resolution process.	A noise management plan will be developed prior to construction, which will include a response plan to noise concerns received from nearby property owners.
383	HC-041	15-Sep-16	Allison Denning, Health Canada	Proposed monitoring for impacts to groundwater is described in this section. There is no discussion about monitoring local drinking water supplies for potential impacts.	HC-05: If there is the potential for groundwater to be consumed in nearby cabins/residences, it would be useful to establish baseline concentrations of contaminants in drinking water sources prior to project construction and in the event of potential changes to the quality of drinking water as a result of project activities and/or in the event of public complaints about changes in taste or quality of drinking water supplies.	As described in Section 9.1 (Public Health) of the EAC Application/EIS, ingestion and dermal contact with potable water in nearby communities was included as an exposure pathway in the human health risk assessment. A water quality monitoring program is proposed and will be implemented. Details to be confirmed in discussions with MEM and FLNRO through permitting.
384	HC-042	15-Sep-16	Allison Denning, Health Canada	The EIS states that surface water monitoring will be conducted in accordance with procedures described in the BC Field Sampling Manual 2013. If the surface water is used for potable drinking water, water quality should be compared to the Guidelines for Canadian Drinking Water Quality or the provincial equivalent.	HC-06: In the event that surface water is expected to be consumed by local people, compare future contaminant concentrations from the surface water monitoring program to aquatic life guidelines and drinking water guidelines.	As indicated in the conceptual monitoring plan outlined in Volume 3 Part E of the EAC Application/EIS, surface water quality will be monitored in the aquatic receiving environment to verify EA predictions. Further details will be provided in the forthcoming Water Management Plan, but data collected by the Surface Water Monitoring Program will be compared to relevant BC Water Quality Guidelines, including those protective of aquatic life and drinking water.
385	HC-043	15-Sep-16	Allison Denning, Health Canada	Section 9.1.3.3 states "the framework of risk assessment, described in more detail in Section 9.1.3.3….." references the same section as the statement.	HC-07: Reference the correct section/subsection where this information can be found.	Typo noted; should be Section 9.1.3.3.3.
386	HC-044	15-Sep-16	Allison Denning, Health Canada	In the section titled "Comparison of Predicted Maximum Concentrations to Chronic Screening Criteria", the following statement appears: "if the predicted maximum concentrations were …… considered for further [evaluation] in the acute inhalation risk assessment". Given that this section relates to how substances were screened in for chronic exposure, this statement appears to be incorrect.	HC-08: Ensure the correct terminology is used when assessing risks.	Typo noted; should be "chronic inhalation risk assessment"

end.