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392	DFO-023	4-Nov-16	Fisheries and Oceans Canada	See CEAA-199 (CEAA-IR-5)	DFO-IR-1 (Ref. CEAA-IR-5): Characterize the salmonid spawning habitat within WC2 (upper and lower reaches) and describe how the loss of this habitat will impact the various VC populations within WC2 and recruitment to WC2.	A description and quantification of potential spawning habitat in the upper section of WC2 is provided in section 3.1.3.1 of Appendix 5.1-A and in Table 6 of the same appendix. A spawner survey conducted on 13 November 2016 (Technical Memorandum) re-affirmed the baseline description and observed less than 200 m2 of suitable salmonid spawning habitat based on the presence of exposed gravels and adequate depth (> 18cm). As described in section 3.1.3.2 of Appendix 5.1-A the lower section of WC2 consists of low gradient run and pool habitat with exposed gravels present in the runs and fines occurring in the pool areas. The distribution of pool to run habitat is approximately 1/1 along the length of the lower section. There is approximately 3,920 m2 of wetted area in the lower section of WC2 suggesting that there is approximately 1960 m2 of run habitat that may be suitable for spawning, based on the presence of exposed gravels and adequate depth. During the 13 November 2016 spawner survey chum salmon were observed to be spawning in the available run habitat present in the lower section of the channel (Figure 1, 30 Dec-2016 Technical Memo entitled BURNCO Aggregate Project: Additional Information Regarding Watercourse Two (WC2), Fish and Fish Habitat). The Fish Habitat Offset Plan proposes to create more than 5,000 m2 of additional groundwater-fed channel habitat with approximately a 1/1 ration of pool to run habitat. The offset channel extension uses the design of the existing lower channel as a template so it is reasonable to expected that approximately 2,500 m2 of the new habitat will have conditions similar to the run habitat present in the existing channel where chum salmon where observed to be spawning. A 30-Dec-2016 Technical Memo entitled BURNCO Aggregate Project: Additional Information Regarding Watercourse Two (WC2), Fish and Fish Habitat provides the results of 2016 spawner surveys for WC2 and a description of salmonid species utilization of habitat provided by groundwater-fed channels.
393	DFO-024	4-Nov-16	Fisheries and Oceans Canada	Table 8 is stated to contain returning adult salmon counts from 2009-2013. The 2013 data has not been provided. It is unclear which reaches witin WC2 were visually surveyed.	DFO-IR-2: Clarify if any surveys for returning adult salmon were conducted in 2013 and if yes, provide survey data. Identify which reaches were visually surveyed and where the returning salmon were observed.	A spawner survey was only conducted for McNab Creek in 2013. The dates of each spawner survey are provided in Table A-15 of Appendix 5.1-A. Spawner surveys were conducted on 13 October and 10 November of 2016 and the results including numbers observed and locations are provided in the 30-Dec-2016 Technical Memo entitled BURNCO Aggregate Project: Additional Information Regarding Watercourse Two (WC2), Fish and Fish Habitat.
394	DFO-025	4-Nov-16	Fisheries and Oceans Canada	See CEAA-200 (CEAA-IR-6)	DFO-IR-3 (Ref CEAA-IR-6): To improve the adequacy of the proposed offsetting plan and to ensure sufficient recruitment to no loss in fish productivity in the species utilizing watercourse 2, spawning habitat to increase recruitment to the proposed rearing channel and to offset for lost spawning habitat in upper watercourse 2 should be included in the offset plan. Offsetting options for the creation of spawning habitat downslope of the pit lake or in adjacent fish bearing watercourses should be considered. If no opportunities exist within or near the local study area, opportunities within the region could also be explored. Changes to the proposed channel design optimizing slopes and groundwater capture to increase velocities and to maximize groundwater upwelling may be beneficial.	As described in the 30-Dec-2016 Technical Memo entitled BURNCO Aggregate Project: Additional Information Regarding Watercourse Two (WC2), Fish and Fish Habitat, the lower section of WC2 was constructed to provide spawning habitat for chum salmon. The lower channel was designed to provide suitable conditions for chum salmon spawning and constructed under the supervision of DFO habitat restoration staff. The Fish Habitat Offset Plan includes a 790 m extension of the existing lower channel using the design of the existing channel as a template. Chum salmon were observed to be spawning in the run sections of the existing lower channel so it is expected that the new channel will provide similar conditions. The channel extension is expected to provide approximately 2,500 m2 of run habitat with conditions similar to the run habitat present in the existing channel. The loss of the upper section of WC2 will involve less than 200 m2 of habitat suitable for spawning so it is assumed that this loss will be more than offset by the channel extension proposed in the Fish Habitat Offset Plan.
395	DFO-026	4-Nov-16	Fisheries and Oceans Canada	Salmonid spawning has been observed at the bend in the lower segment of WC2, near MT6. This is the only stated spawning location in the lower reaches of WC2. Baseflows in lower WC2 are predicted to drop by 19% to 37%. Impacts to fish habitat in lower WC2 have only been described in the context of lost wetted width and generic instream habitat.	DFO-IR-4: Flow reductions have the potential to reduce the quality and suitability of spawning habitat in a channel. Will the predicted 19% to 37% drop in base flows impact the quality or suitability of the spawning habitat in lower WC2? Will the flow reductions or changes in water characteristics (temperature, nutrients, dissolved oxygen etc.) impact egg to fry survival in WC2?	A reduction in surface flow can lead to a change in the suitability of habitat for spawning. If it renders the habitat too shallow or there is not enough water flow through the substrate to maintain exchange for eggs and alevins. Table 5.5-13 of Surface Water Resources indicates that the average depth will be increased in WC2 so depth is not expected to be a problem. Chum salmon spawners are known to focus on areas above riffles where surface flow is forced down through gravels and in areas where groundwater upwelling occurs. These areas provide adequate water exchange through the gravels for eggs and alevins. The majority of chum spawning observed in the lower WC2 was observed in run habitat suggesting they were focusing on areas of groundwater upwelling in the lower section of WC2. Groundwater influx to the lower portion of the channel is predicted to increases by between 45% during early operations and 110% at closure for the lower section of WC2. The increased levels of groundwater influx into the channel is expected to lead to more groundwater upwelling and move interstitial movement through the gravels. The water quality of groundwater supply to both the lower section of WC2 and the offset channel extension were considered in the Aquatic Health Assessment (Section 5.5.1.1.1) of Surface Water Resources. Potential effects on surface water quality and aquatic health were predicted to be negligible. Surface flow from the pit lake will only occur after closure. Appendix 5.5-B provides a summary of the hydrodynamic modelling assessment conducted for the pit lake outflows. The surface overflow from the pit lake is only expected to occur periodically between October to April. Overflow from the lake will enter the constructed groundwater-fed watercourse (WC 2) through the extension that would be constructed as habitat offsetting for the Project. Monthly average outflow water temperature predictions for the pit lake are provided in Table 5 of Appendix 5.5-B. A review of these temperature predictions indicates that the predicted average outflow temperatures are with in the range of temperatures suitable for salmonids to complete all life history stages.
396	DFO-027	4-Nov-16	Fisheries and Oceans Canada	See CEAA-195 (CEAA-IR-1)	DFO-IR-5 (Ref CEAA-IR-1): Given the recent changes to the Provincial regulations, will the pit lake containment berm be classified as a dam requiring an outlet or overflow structure? If yes, where will the outlet or structure be located and will there be any fish or fish habitat impacts resulting from the structure or the release of any overflow water?	It is BURNCO's understanding that the containment berm is not going to be classified as a dam. The location and design of the pit lake outlet structure, that will only become active following operations, is provided in the figures describing the habitat offset channel in Appendix 5.1-B of the EAC Application/EIS (Figures 8 and 10).
397	DFO-028	4-Nov-16	Fisheries and Oceans Canada	See CEAA-196 (CEAA-IR-2)	DFO-IR-6 (Ref CEAA-IR-2): In order to evaluate the likely effectiveness of the proposed mitigation, provide further details regarding how the pit lake elevation will be manipulated / engineered to "manage" the groundwater and base flows within McNab Creek and the groundwater channels below the pit lake? What conditions will trigger the pit lake elevation active management and what are the details of the proposed monitoring strategy to inform pit lake elevation management?	Baseflow loss from McNab Creek to the groundwater system is influenced by the gradient between the creek water surface and the groundwater table. Decommissioning the upper segment of the Constructed Groundwater Channel is predicted to result in an increase in the groundwater levels in the area of the pit. This will result in a predicted reduction in the rate of baseflow loss from McNab Creek to the groundwater system. There will be no outlet structure present for the Pit Lake during operation so no active management of the Pit Lake elevation would be practical. Monitoring of the gradient between the water surface of McNab Creek and the groundwater table will be used to adaptively manage the size of the pit area and avoid increasing loss of baseflow from McNab Creek. Once operations finish the outlet structure will be activated and the elevation of the outlet structure will be adjusted to avoid increased baseflow losses from McNab Creek. Surface flows in the groundwater channels below the pit lake will also be monitored and used to refine the elevation of the pit lake outlet. The elevation of the outlet structure will be adjustable through the addition or removal of stop logs. Once set the elevation of the pit lake outlet will passively release water when the lake elevation is above the set elevation.

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398	DFO-029	4-Nov-16	Fisheries and Oceans Canada	Limited information on the groundwater flow patterns around the existing groundwater channels in the foreshore area and in the proposed mitigation area has been provided. The hydraulic properties of the sediments present in the area of the groundwater channels and foreshore below pit lake have not been described. More detailed baseline information and predictions are required to ascertain where the increased groundwater from the pit lake will discharge into the aquatic / marine environments.	DFO-IR-7: An increase in ground water has been predicted in WC3 through WC5 and the estuary. As well, the proposed mitigation channel will rely on groundwater flow. It is unclear from the information provided, where this water will leave the ground and enter the watercourses, estuary and marine environment. A better understanding of where and how the ground water will be flowing into the aquatic and marine environments will assist in understanding mixing and potential effects. It is also unclear where the groundwater will be sourced (from the Pit Lake or deep groundwater), which could have implications on the temperature. Provide information on the depth and hydraulic properties of the sediments in the lower WC2 and mitigation area, including information on the recent back hoe dug test hole and logs of test holes located south of the hydro power line right of way. Provide a tabulation of current and predicted water sources and inflow quantities into, and from, the WC2 channel and the mitigation area channels. The sources to include Pit Lake and deep groundwater.	As described in Appendix 5.6-A of the EAC Application/EIS, for pre-development conditions the main discharge from the valley fill aquifer is occurring to Howe Sound, WC2, possibly the lower reaches of McNab Creek and other minor surface water features adjacent to the ocean shoreline. These hydrogeological boundaries result in a groundwater flow pattern that is generally from north to south and converging near the site centre where WC2 is located. A pit lake would form during mining; this lake would act as a "flow through" lake, where groundwater would recharge the lake along its northern boundary and lake water would discharge to groundwater along its southern boundary. As presented in Appendix 5.6-D of the EAC Application/EIS, model results indicate that average annual groundwater discharge to the minor surface water features located along the southern mine area and the ocean would gradually increase throughout the mine life. The proportion of groundwater flow to the WC2 channel and the southern minor channels from the pit lake water and deep groundwater is provided in Appendix 5.6-D Table 1 (Predicted Changes in Groundwater Fluxes During Mining - Base Case). Based on these results, groundwater inflow into the WC2 channel and foreshore channels during operations and at the end of mining mostly originates for the pit lake. Based on investigations carried out in the lower portion of WC2 and mitigation area, WC2 sediments are composed of sand, gravel and boulders that are considered to be highly permeable material. The logs for wells DH10-13 and MW5-04 located downstream of the pit lake, are attached. Discharge temperatures from the pit lake to groundwater were assessed using a hydrodynamic model and the results are described in Appendix 5.5-B of the EAC Application/EIS. Discharge temperatures to groundwater at closure were predicted to be very similar to temperatures measured in McNab Creek.
399	DFO-030	4-Nov-16	Fisheries and Oceans Canada	See CEAA-198 (CEAA-IR-4)	DFO-IR-8 (Ref CEAA-IR-4): Provide current and predicted post operation seasonal water temperatures in the WC2, WC3, WC4 and WC5 as well as the proposed mitigation rearing channels. Discuss any potential impacts (positive and negative) to the fish communities utilizing the watercourses including any changes to the habitat quality and food availability resulting from potential changes to the benthic macroinvertebrate and macrophyte communities.	The predicted baseflow increases for WC3 , WC4 and WC5 will only involve increases of groundwater influx. These channels currently derive most of their flow from groundwater inputs so there are not expected to be any changes in the average seasonal temperature within these channels. Therefore there are no predicted effects on average temperatures within these channels. The water quality of groundwater supply to both the lower section of WC2 and the offset channel extension were considered in the Aquatic Health Assessment (Section 5.5.1.1.1) of Surface Water Resources. Potential effects on surface water quality and aquatic health were predicted to be negligible. Surface flow from the pit lake will only occur after closure. Appendix 5.5-B provides a summary of the hydrodynamic modelling assessment conducted for the pit lake outflows. The surface overflow from the pit lake is only expected to occur periodically between October to April. Overflow from the lake will enter the constructed groundwater-fed watercourse (WC 2) through the extension that would be constructed as habitat offsetting for the Project. Monthly average outflow water temperature predictions for the pit lake are provided in Table 5 of Appendix 5.5-B. A review of these temperature predictions indicates that the predicted average outflow temperatures are with in the range of temperatures suitable for salmonids to complete all life history stages.
400	DFO-031	4-Nov-16	Fisheries and Oceans Canada	See CEAA-201 (CEAA-IR-7)	DFO-IR-9 (Ref CEAA-IR-7): Describe any impacts or risk associated with the increased ground water flow and associated hydrostatic pressure on the stability of the sediments and slopes in the marine estuary, the potential for movement and any associated impacts to fish and fish habitat?	The numerical hydrogeological model was used to estimate groundwater conditions prior to the construction of the groundwater channel. Compared to this pre-construction scenario, the construction of the groundwater channel resulted in a reduction of the groundwater flow to and the pressures in the estuary slopes. The model predicts that although these pressures and groundwater flows during the life of the project will be greater than the baseline condition with the groundwater channel present, they will be less than or equal to the flows and pressures experienced prior to the construction of the groundwater channel. Therefore, no changes are expected to the stability of the delta in the marine foreshore, and by extension, no adverse effects are anticipated on fish and fish habitat.
401	DFO-032	4-Nov-16	Fisheries and Oceans Canada	See CEAA-202 (CEAA-IR-8)	DFO-IR-10 (Ref CEAA-IR-8): In order to ensure all potential effects have been considered, identify the location of the closest known sponge reefs in relation to the project area. Given the location, depth and distance to the project will there be any potential effects and if so, what?	The closest known individual glass sponges to the proposed BURNCO site are located on a subtidal rock wall (49.33.55 N, 123.22.66 W) approximately 1 km to the east of the barge load-out jetty, or approximately 100-150 m east of the outlet of McNab Creek (on the east side of the estuary), in water depths around -25 m depth chart datum (CD). This site is located within the Marine Resources LSA and RSA. The closest known sponge reefs (i.e., bioherms) to the BURNCO site are on the north side of the eastern Defence Island (49.34.67 N, 123.16.26 W - west side of Porteau sill),) in water depths between -28 m and -35 m (CD). This site is approximately 9 km east of the proposed barge load-out jetty, and is located outside the Marine Resources LSA but within the RSA. The closest known sponge reefs to the proposed shipping corridor occur at the entrance to Howe Sound (west of Passage Island in Queen Charlotte Channel), where two known sponge reef sites directly overlap with the proposed shipping route in water depths ranging from -40 m to -120 m depth (CD). Both of these sites are located in the Marine Resources LSA and the RSA. Within Howe Sound, the shipping route also passes within 990 m of a known sponge reef in Ramillies Channel (in water depths of -20 to -30 m CD); as well as within 574 m of a known sponge reef in Thornbrough Channel (in water depths of -150 to 160 m CD). Both sites are located outside the Marine Resources LSA but within the RSA. All known sponge reef locations in the vicinity of the Project footprint including the proposed shipping corridor are below -20 m (CD). At these depths, potential impacts from Project shipping would be limited to potential propeller wash effects. In consideration of this potential impact, propeller scour effects on the seabed were assessed at a modelled depth of -20 m (CD) to correspond with the uppermost depths of glass sponge habitat. Jet velocities generated by the tug propeller at -20 m were compared to natural velocities derived from wave and tidal activity in Howe Sound. Estimates of maximum horizontal velocity associated with wind waves were developed from wave hindcasts based on available wind data for the Strait of Georgia using the Halibut Bank Ocean Buoy (Environment Canada Station 46146), as summarized in Table 5.2-12. At -20 m depth, the jet velocities of the proposed tug-assisted barge movements were shown to be within the same magnitude as tidal currents present at this depth, and below the velocity threshold (0.25 m/s) required for seabed particle mobilization (USACE 1989). Given that all known glass sponges and sponge reefs in the RSA occur in water depths below -20 m (CD), the potential effects of tug propeller scour on glass sponge assemblages in the proposed shipping corridors were considered negligible and were not carried forward in the assessment.
402	DFO-033	4-Nov-16	Fisheries and Oceans Canada	The baseline data provided for the fisheries and freshwater habitat sections and associated appendices was collected between 2009 and 2012. This information is four plus years old and is becoming outdated.	DFO-1: Typically fisheries related baseline data should not be more than five years old. The majority of baseline data in the fisheries section was collected between 2009 and 2012. If this project proceeds to the regulatory phase, updated fisheries baseline data (adult spawner counts, fish abundance surveys etc.) would be required in WC2 through WC5 and McNab Creek to adequately characterize localized effects, serious harm, to be used as the basis for developing offsetting effectiveness metrics and in support of the follow up effects monitoring. Current fisheries data from both even and odd years would be warranted given the nature of the pink salmon spawning runs in the area.	BURNCO expects that current fisheries baseline data will be collected prior to project implementation to support environmental effects monitoring and effectiveness monitoring for habitat offset works. Recent spawner counts conducted during 2016 in WC2 serve to emphasize the variable nature of salmon returns prior to any project activities. BURNCO agrees that conducting salmon spawner counts in both odd and even years would be useful to supplement the 10 years of spawner returns that have already been collected.

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691	DFO-034	14-Feb-17	Fisheries and Oceans Canada	Flow monitoring stations: Flow monitoring stations should be set up to measure flow in the lower 5km of McNab Creek. The data would be useful to inform order of magnitude checks on model simulations of flow loss during low flow periods and to indicate when adaptive management or contingency plans need to be implemented. The hydrogeological model sensitivity analysis (noted in the summary section of Volume 4, 22.0 – Appendix 5.6-D) describes the ranges of predicted pit lake water elevations to range between approximately 4.0 m and 6.3 m in relation to the base case prediction of 5.0m; the prediction of the water loss from McNab Creek ranges between 5,700 m3/day and 40,500 m3/day compared to the base case of about 17,600 m3/day. It is understood, that these values represent the estimated losses from McNab Creek that could occur prior to the commencement of mining along a section of the McNab Creek channel that extends from an unspecified location upstream of the project area and down to a location just above tidewater. These values have to be viewed in context with the estimated McNab five year return period low flow of between 16,943 m3/day (0.196 m3/s) and 22,896 m3/day (0.265 m3/s). These values suggest that all or portions of lower McNab Creek could be dry of 20 days or more at frequent intervals. The losses along this 1.5 kilometer length of creek channel will likely not be uniform and hence a more detailed analysis is required.	Provide the following information at six stations along McNab Creek as indicated below. These stations should be spaced at approximate 300 m intervals, starting 300 m upstream of station MCUS and ending 300 m downstream of MC-DS. If these stations were numbered from north to south, Stations 2 and 5 would be at MC-US and MC-DS respectively. The information required at each station should include: o An elevation profile of the existing creek channel covering the wetted area required to pass the estimated annual low flow, and assuming the lowest estimated seepage loss. o A photograph of channel at the site. o An opinion on the degree of hydraulic connection between invert of the channel and the local area water table. In some cases, this may require digging down to the water table. o Estimates of the flow past the station for 5 and 10 year frequency low flow events, for both the 5 and 10 day periods. These estimates should to account for the lowest, most likely and highest estimate of seepage loss over the previous (upstream) 300 m interval. These sets of calculations should then be repeated for project operation Years 5, 10 and 16.	There is no resistance to groundwater flow beneath McNab Creek. That is, the creek has a direct hydraulic connection to the groundwater flow system. The evidence for this is that (1) piezometers in the northern portion of the alluvial fan that are close to McNab Creek have hydraulic heads similar to the water level elevations observed in McNab Creek and (2) the creek bed deposits consist of granular material that is similar in nature and permeability to that of the alluvial fan. To achieve calibration of the hydrogeology model results with the measured water levels in McNab Creek as a boundary condition, no lower permeable layer beneath McNab Creek was required. In order to monitor flows at the proposed stations and measure changes in flow between these stations, a series of flow measurements at each station would be required. Measurements would be required through the range of flows of interest to establish relationships between water levels and discharge. The ability to accurately measure flow rates and develop stable and accurate rating curves at the proposed locations would be compromised by several factors: -A significant fraction of the flow would be unmeasurable as it would be passing through the coarse bed materials, particularly significant during periods of low flow; -The channel bed is mobile and periodically deposits large woody debris resulting in variable stages for a given flow rate (a rating requires a unique flow rate for a given stage); -The channel is broad which would result in minimal variation in stage as a result of changes in flow; and, -The channel has multiple stems, obstructions, turbulence and eddies. These factors would result in an unacceptably large margin of error which would be significantly larger than the magnitude of the difference in flow between the stations (which would be the primary purpose of collecting this data). The collection of data which is not indicative of the actual conditions would lead to a misinterpretation of baseline conditions and effects of the Project.
692	DFO-035	14-Feb-17	Fisheries and Oceans Canada		McNab Creek Habitat Assessment: Provide aquatic habitat characterization for the abovementioned sections, including substrate, vegetation and cover, bank morphology, capability/suitability to support fish at various flows and fish utilization of the location. Reliance should not simply be placed on Wetted Usable Areas, but estimates of suitable habitat for various life history aspects and species of fish.	The requested approach to evaluating and quantifying available fish habitat for various species and life history stages of fish under differing flows makes sense, if there was a prediction that the Project would cause a reduction in surface flows. Currently the surface water flow predictions all indicate minor increases in baseflows within McNab Creek during the life of the Project. Is this request seeking to quantify and compare the availability of fish habitat for various species and life history stages during natural seasonal variations in flow? If so how will this information be used to evaluate the effects of the predicted increases in baseflows? The use of weighted usable area rather than wetted usable area is standard practice in BC for the evaluation of instream flow effects (see link below). If weighted usable area is to be used to monitor flow related effects we would like to discuss an alternative approach. Riffle habitats are the mesohabitat that will be the most sensitive to flow related effects and will show greater changes in weighted usable area associated with changes in flow. However, the ability to accurately measure flows in McNab Creek at the proposed locations is expected to be of limited accuracy and unlikely to detect actual variations in flow. http://www.env.gov.bc.ca/wld/documents/bmp/assessment_methods_instreamflow_in_bc.pdf
693	DFO-036	14-Feb-17	Fisheries and Oceans Canada	Seasonality of the Hydrogeological Model: A primary concern is that the hydrogeological model uses only the late summer/early fall timing to inform the base case simulation (Volume 4, 22.0 – Appendix 5.6-D, Section 2.3.1). In the gravel extraction simulation of the model, parameters have been adjusted to represent average annual conditions (Volume 4, 22.0 –Appendix 5.6-D, Section 3.2.1). This may have implications for the ability of the model to predict impacts to flow and fish habitat in summer months. The fluctuations in baseline flow should be assessed on a monthly scale.	The potential reductions in flow should be quantified on a monthly scale taking into account seasonal dry and drought conditions. Potential reductions in baseline flow in the lower 5km of McNab Creek should be further divided into smaller (300 m) sections (for greater precision in the analysis.	In order to monitor flows at the proposed stations and measure changes in flow between these stations, a series of flow measurements at each station would be required. Measurements would be required through the range of flows of interest to establish relationships between water levels and discharge. The ability to accurately measure flow rates and develop stable and accurate rating curves at the proposed locations would be compromised by several factors: -A significant fraction of the flow would be unmeasurable as it would be passing through the coarse bed materials, particularly significant during periods of low flow; -The channel bed is mobile and periodically deposits large woody debris resulting in variable stages for a given flow rate (a rating requires a unique flow rate for a given stage); -The channel is broad which would result in minimal variation in stage as a result of changes in flow; and, -The channel has multiple stems, obstructions, turbulence and eddies. These factors would result in an unacceptably large margin of error which would be significantly larger than the magnitude of the difference in flow between the stations (which would be the primary purpose of collecting this data). The collection of data which is not indicative of the actual conditions would lead to a misinterpretation of baseline conditions and effects of the Project. See Tables 1 and 2 (dated 07-Apr-2017) for seasonality analysis details. How these values factor into the trigger response plan is provided in the WMP. As requested, additional analysis to predict low flow for McNab Creek at the BURNCO Project site using the Box Canyon data for McNab Creek, and correlated with the long term Capilano flow data will be carried out. This analysis will be presented in a separate technical memo prepared as a supplement to the Water Management Plan at permitting. As with the analysis presented in the EA, these data will be used to create a synthetic hydrograph and will be used as a means to quantify a predicted positive effect (i.e., reduction in drought duration). The results of this analysis will in no way influence the assessment of any negative site-specific impacts of the BURNCO Project on McNab Creek including the predicted direction of an effect (positive vs. negative) or the magnitude of the effect (the rate at which water moves from McNab Creek to the groundwater table).
694	DFO-037	14-Feb-17	Fisheries and Oceans Canada		Characterize Uncertainty: Estimate the likelihood of losses to baseflow in McNab Creek for each month of project operations and on closure for each 300 m section of the channel, and characterize the uncertainty associated with the impacts to McNab Creek.	The losses to baseflow in McNab Creek during the Project are predicted to be less than the current conditions. Positive effects on flow rates in McNab Creek are predicted for early phases of the Proposed Project. Deviations between the predicted and monitored pit lake water levels may identify a reduction in the magnitude of the predicted positive effect on McNab Creek and the need for mitigation years in advance of flows in McNab Creek approaching current conditions. Additional details regarding the later stages of the mine plan are provided in the Water Management Plan (See attached DRAFT Water Management Plan (WMP, dated 07-Apr-2017)). The WMP will incorporate a buffer to account for the uncertainty in the model predictions so that losses from McNab Creek will be less than current conditions (e.g., the mine plan will be adjusted accordingly to meet this objective).

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695	DFO-038	14-Feb-17	Fisheries and Oceans Canada	MC-US and MC-DS Data: Water levels have been recorded in MC-US and MC-DS over the period August 2010 to October 2014 but there does not appear to be any information on estimated low flows using this level information, along with and channel geometry data. Given the lack of measured low flow data in this area this information would be very useful to help refine and cross-check with other estimates.	Use water level data and channel geometry at MC-US and MC-DS to provide estimates of low flows at these two stations and compare this with computer generated estimates.	In order to use recorded water levels at MC-US and MC-DS to characterize flows at these stations and changes in flow between these stations, a series of flow measurements would be required through the range of flows of interest in order to establish a relationship between water level and discharge. The ability to accurately measure flow rates and develop stable and accurate rating curves at these two locations would be compromised by several factors: -A significant fraction of the flow would be unmeasurable as it would be passing through the coarse bed materials, this is particularly significant during periods of low flow; -The channel bed is mobile and periodically deposits large woody debris resulting in variable stage for a given flow rate (a rating requires a unique flow rate for a given stage); -The channel is broad which would result in minimal variation in stage as a result of changes in flow; and, -The channel has multiple stems, obstructions, turbulence and eddies. These factors would result in an unacceptably large margin of error which would be significantly larger than the magnitude of the difference in flow between the two stations (which would be the primary purpose of collecting these data). The collection of data which is not indicative of the actual conditions would lead to a misinterpretation of baseline conditions and effects of the Project.
696	DFO-039	14-Feb-17	Fisheries and Oceans Canada	Existing Streamflow Data Referenced in 2014 Draft Report: In the description of the finite element model used to simulate September 2010 steady state groundwater flow in the BURNCO pit area, (p.4 in Appendix 5.6-D) it was indicated that "The loss from McNab Creek to valley fill sediments was simulated by the model at approximately 22,000 m3/day, which falls within the range of creek losses of 13,000 m3/day and 66,000 m3/day estimated based on stream flow data for the dry season (Golder 2014a)". This report is not available and it is unclear which existing stream flow data is being referred to.	Provide a copy of Golder's Draft September 29, 2014 report entitled "Surface Water Hydrology Baseline" and clarify which data is utilized to determine the creek losses referenced.	The Surface Water Hydrology Baseline report was finalized and is included as Appendix 5.5-A of the EAC Application/EIS. Measurements of baseflow in McNab Creek are presented in the attached technical memorandum. The hydraulic heads in the groundwater system and the flow in WC 2 were the primary calibration targets for the groundwater model. The highly variable measurements of baseflow ranged from 12,772 m3/day to 66,372 m3/day, with an average based on five measurements of 26,793 m3/day. Due to the highly viable nature of these measurements their reliability/accuracy rendered them as unreliable calibration targets therefore they could only be used as a reality check. That is, as long as the predicted baseflows fell within this measured range and the more reliable hydraulic head and WC 2 flows were simulated by the calibrated model, the model was considered a reliable tool in predicting the relative effects of the Project compared to current conditions.
697	DFO-040	14-Feb-17	Fisheries and Oceans Canada	Clarification of MC-US-01: On page 24 and on Table 4 (page 6) of Appendix 5.5-A, there is reference to a McNab Creek monitoring station called MC-US-01, located 400 m upstream of the Box Canyon Creek confluence, which has flow data for the period Nov 2011 to Nov 2012.	Provide information on the flow monitoring station MC-US-1, including construction information, a flow rating curve and graphical and/or tabulated flow data. Discuss how this data was used to estimate low flows in McNab Creek in the channel north of the BURNCO project site.	Please see the attached technical memo that details the construction, rating curve development and the data recorded at MC-US-01.
698	DFO-041	14-Feb-17	Fisheries and Oceans Canada	Clarify Figures C1 to C5 in Appendix 5.6-A: The graphs of McNab Creek water levels (Stations MC-US and MC-DS) are presented on Figures C1 to C5 in Appendix 5.6-A, but as the elevation of the lowest part of the channel invert is not indicated, the reviewer cannot determine water depths and if the channel was "dry" at any time during the monitoring period.	Indicate the lowest elevation of the channel inverts at each station on all four of the graphs presented on Figures C1 to C5 in Appendix 5.6-A. Also indicate if there were any areas in the McNab Creek channel north and east of the Project site where no surface flow was observed during the monitoring period, and if so, how large an area and for what duration?	Yes, there were periods were no surface flows were observed. The entire area affected was not quantified. Based on transducer data at MC-DS that was installed in a side channel/pond in McNab Creek, the following estimates of periods of very low flow/no flow were made: - 2011, this was estimated to extend from September 2 to 15 - 2012, it was estimated to extend from August 19 to October 12 with a rainfall event initiating some flow from September 9 to 13. Visual confirmation of no flow occurred on September 7, 2012 - 2013, it was estimated to extend from July 27 to August 27 - 2014, it was estimated to extend from August 1 to September 23 with short duration flows (1 to 2 days) due to rainfall events around August 15 and September 3. Although the full extent of this very low flow/no flow area is unknown it extend at least the entire area down stream of MC-DS or about 500 metres. The lowest elevation of the channel inverts at each station on all four of the graphs presented on Figures C1 to C5 in Appendix 5.6-A are: GC-DS = 0.45 m GC-US = 2.65 m MC-DS = 4.75 m MC-US = 14.22 m
699	DFO-042	14-Feb-17	Fisheries and Oceans Canada	Box Canyon Hydro Project Information: The consultants working on the Box Canyon hydro project installed several flow monitoring stations in the McNab Creek basin and monitored water levels for at least four years (2007 to 2012). One of these stations is located on McNab Creek, about 3 km north of the BURNCO site. A rating curve was developed and used to calculate flow data from the recorded water levels. In addition, this data has been correlated with long term Capilano River flow data to develop a synthetic set of flow data for McNab Creek. This includes: average monthly flows along with 7-day low flows for mean annual, 5-year, 10-year and 20-year return periods. The drainage area above this station is 50.3 km2 and the Proponent reports the drainage area above the BURNCO site as 63.3 km2, or 26% larger. Using simple proportionality to adjust the Box Canyon data and comparing it with the Proponent's data the Box Canyon low flows appear to be consistently lower than that estimated by the Proponent. As the Box Canyon data is based on measured flow data it is likely more reliable than the data presented for the BURNCO project which appears to be based on limited measured flows and correlated with the Chapman Creek flow regime. The Chapman Creek flow regime is a poor surrogate of McNab Creek as it is regulated through an upstream reservoir which moderates the flow extremes.	Provide low flow predictions for McNab Creek at the BURNCO project site using the Box Canyon data for McNab Creek, and correlated with the long term Capilano flow data. Discuss the changes in predictions and how they will potentially impact fisheries VCs and adaptive management plans.	As requested, additional analysis to predict low flow for McNab Creek at the BURNCO Project site using the Box Canyon data for McNab Creek, and correlated with the long term Capilano flow data will be carried out. This analysis will be presented in a separate technical memo prepared as a supplement to the Water Management Plan at permitting. As with the analysis presented in the EA, these data will be used to create a synthetic hydrograph and will be used as a means to quantify a predicted positive effect (i.e., reduction in drought duration). The results of this analysis will in no way influence the assessment of any negative site-specific impacts of the BURNCO Project on McNab Creek including the predicted direction of an effect (positive vs. negative) or the magnitude of the effect (the rate at which water moves from McNab Creek to the groundwater table).

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700	DFO-043	14-Feb-17	Fisheries and Oceans Canada	Fish Utilization of McNab: Currently limited fish utilization data has been provided as zero impacts to McNab Creek were predicted in the fisheries impact section of the application. Given that flow modeling results indicate potential impacts to McNab Creek, impacts to CRA species as a result of flow reductions need to be assessed. Different species life stages and seasonal presence in the lower 5km of McNab Creek should be considered. If any section of lower McNab Creek is predicted to have no surface flow, consider the timing and duration of changes in no flow periods and impacts on fish access in relation to species life stage requirements. Baseline data should describe the current fish utilization (species, life stages and abundance) of the areas potentially impacted by reduced water quantity and habitat connectivity.	Provide CRA species baseline data for the lower 5km of McNab Creek. Compare the timing and location of fish utilization in McNab Creek to the timing and location of potential reduction in baseline flow and describe how these populations may be impacted. It may be possible to utilize and expand upon the baseline data collected in support of the box Canyon Hydroelectric project to help describe baseline conditions within McNab Creek. Sufficient data should be provided in order to adequately assess impacts to the fish stocks in the system. Given yearly variation in spawning returns, multi-year baseline data may be necessary if the project proceeds to the regulatory stage.	Baseline CRA fish presence and habitat utilization information for McNab Creek is provided in Appendix 5.1-A . This includes electrofishing, Fyke netting, smolt outmigration netting and spawner counts. Multiple years of spawner return data has been documented (2009 to 2012) and as expected it is highly variable. Additional spawner return information gathered by Hatfield (2004 to 2008) has also been provided. The variability in spawner returns is to be expected and is likely due to a range of density dependent and density independent factors that influence freshwater and ocean survival. The assessment has indicated that baseflows in McNab Creek are predicted to increase because the loss to groundwater is expected to be reduced due to a change in the water table gradient. This would mean that at no time will the surface flows be lower than the current baseline. Based on the flow predictions it is expected that the amount of habitat for CRA fish will be increased in McNab Creek during all seasons.
701	DFO-044	14-Feb-17	Fisheries and Oceans Canada	Temperature in McNab: The reach of McNab Creek located downstream of Station MC-DS likely receives upwelling groundwater (springs along the banks) discharging from the toe of the fan sediments. When the Pit Lake is established, this groundwater will likely be mixed with Pit Lake seepage which could have an impact on the temperature of the upwelling water into this reach of the creek. Quantify potential changes in temperature in the lower 5 km of McNab Creek and the potential effects of changes in temperature on CRA species. Take into account climate change predictions for southern BC and the sustainability of viable CRA populations, given project related changes, and probable temperature increases as a result of climate change.	Provide the predicted monthly range of water temperatures of groundwater seeping into the reach of McNab Creek located below elevation 5 m (see attached Fig. 1), before and after the Pit Lake is established. Discuss how this will alter the temperature in the creek.	See 07-Apr-2017 and 10-Apr-2017 Technical Memos that address the predicted monthly range in water groundwater temperatures that could seep into lower McNab Creek and WC 2 and the potential effects to fish populations. Seepage from the fan to McNab Creek does not occur currently and is not expected to occur in the first 5 years of mining. Seepage from the pit lake to the lower reaches of McNab Creek will only occur in the latter years of mining and at closure.
702	DFO-045	14-Feb-17	Fisheries and Oceans Canada	Range of Potential Contingency Plans : The Proponent recommends that surface water monitoring of McNab Creek and Water Course 2 be continued throughout the mine life, and that daily levels in the Pit Lake are recorded on a daily basis. They also recommend that this monitoring data be reviewed throughout the mine life on an annual basis. If these reviews indicate the changes in hydrogeological conditions are substantially different from model predictions they recommend that the model be revised and used to prepare revised predictions. However, no contingency plans have been provided to address issues that would arise if flows and/or lake levels are substantially different than predicted. The proponent should address concerns with a monitoring and contingency plan that is adequate to reduce/eliminate impacts to McNab Creek through real time surface flow and groundwater evaluation during operations. The Proponent should provide information on strategies they would use to further mitigate impacts if the flows and/or lake levels are substantially different than predicted.	A range of potential contingency plans (based on different scenarios) should be identified for consideration in the EA. If the lake level or the flow in McNab Creek is lower than the baseline at any given time during pit operations, what threshold/elevations of flows will trigger a re-assessment of the mining operations and what contingency plans would be available for rectifying the problems?	See attached DRAFT Water Management Plan (WMP, dated 07-Apr-2017) that addresses the trigger action response plan and the adaptive management plan for the Proposed Project.
703	DFO-046	14-Feb-17	Fisheries and Oceans Canada	Flood protection dyke and pit lake containment berm: Movement of rivers within their floodplain, especially on alluvial fan deposits, is an important factor in the process of creating and maintaining productive fish habitat. Diking typically reduces the supply of sand and gravel to the active channel and prevents the ongoing creation of habitat diversity in both the main stem and side channels. Since fish habitat is renewed through the ongoing process of stream meandering within a floodplain, habitat complexity and diversity in the river and its floodplain is typically depressed in dyked systems.	Identify if the McNab flood protection dyke and the pit lake containment berm located within the floodplain of McNab Creek. Provide a map of the McNab Creek floodplain given a 1/100 year flood. If the structures are located within the 1/100 year floodplain, discuss what steps have been taken to protect fish habitat given the presence of these structures.	The flood protection dike, the pit lake containment berm and the 1/100 flood inundation area are presented in the attached Figure 2 entitled 100 Year Flood Inundation Area. As shown, the proposed works have been designed as set-back structures and they are to be developed on existing ground which is generally higher than the Creek and the floodplain relative to the current hydrologic regime. The model results indicate that the instantaneous 1/100 year peak would encounter the flood protection dike over a length of approximately 40 m to a maximum depth of 0.17 m. The dike at this location would be located approximately 100 m south of the current top of bank of McNab Creek. The proposed dike has been set back from the bank in order to protect fish habitat and allow for the natural movement of the river.
704	DFO-047	14-Feb-17	Fisheries and Oceans Canada	Serious Harm and Offsetting: All potential impacts to McNab Creek and CRA populations need to be assessed and quantified. No impacts have been predicted to date, as no physical disturbance to McNab Creek is proposed and water levels were stated to increase following the plugging of upper Water Course 2 resulting in a gradual drawdown during operations and the plan to stop mining at the point where flows match current conditions.	In light of the new information, variability and error analysis of modelling results and analyses that will be produced in response to the above information requests, potential impacts to McNab Creek should be reassessed and quantified. According to the Fisheries Protection Program Policy (2013), when avoidance is not possible, then efforts should be made to mitigate impacts caused by the project. Any residual impacts should then be addressed by offsetting. If serious harm is predicted, provide appropriate mitigation measures and offsetting.	The modelling results predict small to moderate increases in baseflows throughout the year and throughout the operation of the Project. If DFO would like the modest increases in fish habitat to be quantified that is possible however we are not clear how this information will be used to evaluate beneficial effects.

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705	DFO-023.1	29-May-17	Fisheries and Oceans Canada	The Technical Memorandum dated December 30, 2016 estimates that the offsetting channel will provide 2000 m2 of chum spawning run-type habitat. This is significantly larger than the area of spawning habitat within the channel that would be expected to be frequently and successfully utilized. The likelihood of successful chum spawning throughout the entire length of the proposed offsetting channel is low. The proposed offsetting channel is expected to provide similar habitat to lower WC2. In all years of baseline monitoring, chum spawning was only reported in the lower WC2 along one bend in the channel, with the exception of 2016. In 2016, chum spawning was also observed along the section of lower WC2 parallel to the hydro right-of-way. In 2016 there was a high return of chum spawners in Howe Sound and conditions in WC2 were suitably wet with high flow. WC2 and the proposed offsetting channel are located in an area that will experience changing conditions as a result of proposed aggregate mine. They are anticipated to have lower water quantity and flow (see DFO's water comments on DFO-029), and wider range of water temperatures (see DFO's temperature comments on DFO-030) from what WC2 currently experiences. These changes introduce uncertainty regarding the degree of spawning utilization and egg to fry survival.	Offsetting channel habitat should only be characterised as spawning habitat if there is a high confidence that the habitat would be frequently utilized (ideally on an annual basis) and could support viable redds with egg to fry survival success (see DFO's fish baseline data comments on DFO-024).	The run habitat within the proposed offsetting channel it is expected to provide conditions suitable for salmonid spawning and the incubation of salmonids eggs. These predictions are based upon the physical habitat design (e.g., gradient, depth, substrate material) and baseline water quality (e.g., temperature and DO) along with groundwater modelling prediction that indicate there will be high levels of groundwater influx and intergravel water transport. It would be inappropriate to guarantee that suitable habitat will be utilized by salmonids for spawning when it is not a closed system and a wide array of biotic and abiotic factors may influence salmonid returns to spawning habitat. A review of 40 years of DFO salmon escapement results for the McNab Creek system shows that salmon returns to the system are highly variable.
706	DFO-024.1	29-May-17	Fisheries and Oceans Canada	The 13 October and 10 November 2016 adult salmon survey results were provided along with additional fish survey results in the Fish and Fish Habitat Baseline Report. The dates given in table A-15 in the appendix of the Fish and Fish Habitat Baseline Report and the number of surveys listed in the Year Column of Table 2 appear inconsistent. The number of days where a survey on WC2 was conducted equals less than the number of surveys listed in Table 2 of the new Technical Memo (2010 shows only 5 surveys, 2011 shows only 3 surveys and 2012 shows only 4 surveys). Based on the survey dates, it is possible that runs in WC2 may have been missed. In 2010 any runs after Nov 2 could have been overlooked. In 2011, the surveys were conducted Oct 6 and Dec 2 missing the month of November for potential chum spawners as observed on November 10, 2016. It is important to move forward without gaps in the adult chum, coho, and odd year pink spawning surveys. This could result in fish utilization of WC2 being underrepresented, which has implications for accurately describing serious harm as well as to inform and clarify follow-up success and effectiveness monitoring initiatives.	Should the project proceed to the regulatory phase, a two year collection of baseline fish utilization data with a consistent methodology and timing is recommended prior to construction of the BURNCO project. This should include all Commercial, Recreational and Aboriginal (CRA) fish species and their life stages in WC2-WC5 as well as McNab and Harlequin Creeks which have been proposed as reference streams and as a potential offsetting site. The frequency of fish utilization should be further assessed and include further data on rearing juvenile density and adult spawner numbers. The number of fry production/m2/year is a good measure of channel success over time. Measuring accumulated thermal units may be the best approach for determining the best timing to collect data on fry outmigration. An annual redd count or estimation of the number of redds and the approximate area (m2) of redds in WC2 and Harlequin Creek should be presented. As oxygen concentration in the gravel is a primary determinant for the egg to fry survival rate, an intragravel DO logger should be installed at the typical depth of a chum redd to ensure that DO levels are appropriate for egg to fry survival (greater than 5 mg/L) in the lower portion of WC2 where spawning was observed (at the bend and in the reach parallel to the poweline road). If the project should proceed to the regulatory phase, it is recommended that fish utilization metrics be incorporated into the offsetting monitoring plan in addition to the abiotic channel design metrics already presented.	A habitat offset monitoring program that includes physical metrics to evaluate habitat suitability along with biological metrics to evaluate habitat functionality and utilization will be included in the application for authorization under the Fisheries Act. A Before-After-Control-Impact (BACI) approach will be used to monitor impact and reference sites. This approach along with the baseline fisheries data that has already been collected in each of these systems is expected to be adequate. It is not clear that an additional year of baseline data would provide any additional strength to the design of the program as interannual variation is expected to be high within each system. The Environmental Effects Monitoring Program will collect fish population information for McNab Creek, WC2, WC3, WC4 , WC5 and Harlequin Creek. Fisheries information in McNab Creek and Harlequin Creek will be collected for reference purposes as no project related effects are predicted for these systems. The monitoring program will include adult spawner returns, redd counts and the relative abundance of rearing juveniles. We assume the suggestion to use thermal units to determine timing is for chum and pink salmon as coho will rear in fresh water prior to smoltification. The number of thermal units necessary for chum salmon smoltification is often highly variable (400-600tu hatching and 700-1000tu yolksac absorption) and is normally spread over a month in smaller systems (Groot and Margolis 1991). The duration of the smolt out migration tends to make it impractical to collect information on the total number of smolts produced in a system however an inclined-plane trap will be used to collect information of smolt outmigration from WC2 and Harlequin Creek. The high spring flows within McNab Creek make the use of an inclined-plane trap impractical.
707	DFO-025.1	29-May-17	Fisheries and Oceans Canada	Upper WC2 has been described as having spawning riffle habitat; the proposed offsetting is pool-glide habitat and has a high uncertainty of supporting successful chum spawning recruitment. As there is a lower likelihood of successful chum spawning in the proposed offsetting it should not be characterised as spawning habitat. The proposed offsetting habitat will likely provide additional coho rearing habitat. The footprint of rearing habitat is greater than that to be lost, however due to changes in habitat conditions; it is still unclear if the existing coho rearing productivity will be sufficient to offset the lost fisheries productivity in the system. Potential effects from the change in temperature regime could include improved coho rearing but it could also result in impaired coho smoltification and decreasing survival as well as reduced chum egg incubation conditions and success. Uncertainty around the reduction in surface flow velocities in WC2 could potentially result in less suitable spawning habitat even with the increase in groundwater upwelling. The higher quality and quantity invertebrate community in upper WC2 may change from EPT to chironomids in the offsetting channel extension. The quality and quantity of the baseline fisheries data collected result in difficulty making seasonal and annual comparisons and difficulty in determining existing fisheries productivity and the degree of utilization. Different methodologies, inconsistent timing of fish surveys, potential for missed spawning runs and outmigration, and not capturing seasonal fish utilization within the various intertidal watercourses increases the uncertainty associated with the proposed offsetting and its ability to achieve a net gain in fisheries productivity, in keeping with DFO's offsetting policy objectives. Based on the data in the baseline report, lower Watercourse 2 tends to have	To ensure that DFO's offsetting policy objectives will be achieved, which requires a net gain in fisheries productivity DFO recommends additional offsetting be provided. This can likely be satisfied by the inclusion of the Harlequin Creek offsetting option presented to DFO on May 17, 2017.	The proposed habitat offsetting plan currently includes a substantial net gain in fish habitat for the fish species potentially effected. The proposed plan includes more than 2,000 m2 of net gain in instream habitat and more than 30,000 m2 of net gain in riparian habitat. Preconstruction of the proposed offset habitat to avoid time lags and allow monitoring, evaluation and adjustment prior to impacts occurring and the offset design using currently functional habitat in the same system as a template reduces uncertainty and increase the potential for success. The offset habitat will be monitored both physically and biologically to support the achievement of DFO's offsetting policy objectives. BURNCO has identified the potential to enhance and create additional salmonid habitat within Harlequin Creek. The potential for additional habitat work in Harlequin Creek is described in the 19-June-2017 Technical Memo entitled BURNCO Aggregate Project: Harlequin Creek Contingency Option for Habitat Offset Plan to support Fisheries Act Authorization. The Harlequin work has been identified as a contingency measure that would be developed if monitoring identified that the currently proposed habitat offsetting works were not fully addressing the habitat offsetting requirements in terms of quantity, functionality and utilization.
708	DFO-026.1	29-May-17	Fisheries and Oceans Canada		Information has been provided. See DFO-024.1 for comments regarding DO.	See response to DFO-024.1.
709	DFO-027.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.

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710	DFO-028.1	29-May-17	Fisheries and Oceans Canada	The current system of nutrient-groundwater transport, sediment-groundwater transport and sediment balance of the downstream creeks will be altered by the pit location. Groundwater from the pit will be filtered naturally through 'native soils' from the pit lake to the offsetting channel and lower WC2. Over time silts could clog up this water pathway and reduce groundwater upwelling into the lower channels along the marine alluvial fan.	Considerations if project proceeds to Regulatory Phase: The 30 December 2016 Technical Memo references a monitoring program for the offsetting channel that will include analysis of substrate embeddedness and the use of a flushing flow as a mechanism to clear fines from spawning gravels and limit the infilling of overwintering pools. It is recommended that a contingency plan be developed in case flushing flows prove detrimental to fish habitat or ineffective for removing accumulated fines from the gravel and overwintering pools, especially given the low velocity and flows exhibited in the lower WC2 channel. As chum spawners clean out gravel, regular utilization of the channel by spawners may provide this gravel-cleaning service although the high proportion of sandy material in the channel may render this advantage ineffective. It is also still unclear if chum spawners will regularly utilize this channel.	The design of the maintenance flow release system is based upon baseline information gathered regarding substrate particle size in the existing channel and the sheer force necessary to mobilize fines within the designed channel. The offset channel and habitat features have been designed to accommodate flows much larger than what the channel forming flows that would be necessary to mobilize accumulated fines. If channel maintenance flows are called for it is fully expected that some erosion of unarmoured portions of the banks and re-distribution of streambed material will occur in a fashion similar to how channel forming flows would modify a natural stream channel. Allowing these processes to occur would allow some minor adjustments in the channel that are not expected to reduce its functionality.
711	DFO-029.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
712	DFO-030.1	29-May-17	Fisheries and Oceans Canada	New information on temperature in two technical memorandums titled "Pit Lake Hydrodynamic Modeling for BURNCO Aggregate Project" dated April 7, 2017 and "Pit Lake Hydrodynamic Modeling for BUNRCO Aggregate Project – Implications to Fish and Fish Habitat" dated April 10, 2017 were received by DFO on April 28, 2017 and have been reviewed. These memos described the predicted average monthly temperatures in WC2 based on one year of baseline temperature data in 2011 and made monthly average predictions for years 5, 10 and on closure of the mine and compared the seasonal timing to a fish periodicity chart for difference life stages. The proponent states that summer rearing temperatures will improve for coho rearing as the temperatures will increase facilitating faster growth. In review of the literature referenced in these memos, DFO has concerns regarding the projected temperatures on closure as compared to the baseline range which is highly moderated by the current groundwater system in the area. Potential effects from the change in temperature regime could include improved coho rearing but it could also result in impaired coho smoltification and decreased survival as well as reduced chum egg incubation conditions and success. The proponent states that the temperature range for egg incubation in WC2 will be downgraded from optimal to good in terms of egg survival. For chum and coho the baseline range in temperatures during egg incubation is 6.33 oC to 8.17oC but this is expected to change on closure to range from 4.38 oC to 9.72oC. The monthly temperature in February is just below the recommended range excluding any fluctuation below that average value. Overall the moderated baseline range in average monthly temperature of 6.35oC to 8.56oC will be changed to the range on closure of 4.35oC to 13.4oC.	The predicted instantaneous and monthly maximum and minimum temperatures in WC2 are also important factors, Only considering changes to monthly mean temperatures introduces uncertainty that the temperature related impacts to fisheries productivity have been fully described and uncertainty in the amount of fisheries productivity gains the proposed offsetting channel will provide. Analysis of the instantaneous and monthly maximum and minimum predicted temperatures within lower WC2 and the proposed offsetting channel and the effects on fisheries productivity would help to reduce the uncertainty.	In the 07-Apr-2017 Technical Memo entitled Pit Lake Hydrodynamic Modelling for BURNCO Aggregate Project, the predicted groundwater temperature in the discharge to the lower WC2 for Year 5 and Year 10 of mining are compared to the measured temperatures in the groundwater channel for 2011. In addition the predicted groundwater discharge temperatures at closure are compared to measured surface water temperatures in WC2 and McNab Creek. The atmospheric data for 2011 are considered to be near average conditions. These data are presented in the memorandum as minimum, average and maximum temperatures for each month. As described in the 10-Apr-2017 Technical Memo entitled Pit Lake Hydrodynamic Modelling for BURNCO Aggregate Project - Implications to Fish and Fish Habitat, predicted temperatures are within the range of suitability for salmonids at all life stages.
713	DFO-031.1	29-May-17	Fisheries and Oceans Canada	The McNab marine estuary is sensitive salmonid rearing habitat rare to this area. The freshwater channels and the marsh environment at the marine foreshore along the lower fan areas adjacent to McNab Creek provide high value rearing habitat for salmonids (particularly coho salmon), because of the freshwater inputs into the marine environment. The geography within Howe Sound limits the number of fan/creek estuary environments and development has occurred on most of them. The project it is located in the Howe Sound-Burrard Inlet Coho Conservation Unit. The conservation unit was established through the implementation of Canada's Policy f or Conservation of Wild Salmon in May 2008.	As part of the Environmental Assessment (EA) effects assessment monitoring, the foreshore marsh habitat area and the estuary, fan should be monitored to ensure no increases in erosion/ loss of habitat occur. Appropriate mitigation should be applied if increased erosion is observed as a consequence of project operations or vessel wake.	This suggestion will be incorporated into the Environmental Effects Monitoring Program and aerial photography will be used to photo-document the footprint of the shoreline marsh habitat between McNab and Harlequin Creek. Aerial photos will be taken prior to operation and during years 1, 2, 5 and 10. The images will be collected at the height of the growing season during low tide when the marsh is fully exposed.
714	DFO-032.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
715	DFO-033.1	29-May-17	Fisheries and Oceans Canada		See DFO comments on response to IR DFO-24.	See response DFO-024.1

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716	DFO-034.1	29-May-17	Fisheries and Oceans Canada	McNab changes from a losing stream immediately above and adjacent to the project to a gaining stream near the bottom of the project in the lowest reaches of the creek. The intent of the flow monitoring stations situated every 300 m in the lower 5 km of McNab Creek is to establish the baseline conditions and to verify that the relationship between groundwater and surface water components of the water balance remain intact during the course of the project and to be able to detect any changes if they were to occur. This would ensure that any changes to fish and fish habitat in McNab Creek at localized points are identified. Alterations in flow and water quantity on a small localized scale have a potential to impact fisheries productivity in the lower 5 km of McNab Creek which is highly utilized for salmonid spawning. Estimations on the average loss from the whole creek to the fluvial fan area have been provided but this information is of a course scale so there is some uncertainty in the effects assessment that no impacts to fish and fish habitat in McNab Creek. The absence of surface flow in a particular section of the creek (as well as the duration and extent), should flow goes subsurface, is valuable baseline information as loss of surface water wetted area would directly impact fish habitat, fish utilization and fish passage.	The proponent states that the flow monitoring strategy proposed by DFO is impracticable. To verify the effects assessment and provide adequate detailed baseline data, DFO recommends that a robust monitoring alternative for the lower 5 km of McNab Creek to achieve the intent of the original flow monitoring strategy be proposed for consideration and incorporation into the projects follow-up monitoring program.	BURNCO proposes the installation of water level monitoring stations situated in the lower 5 km of McNab Creek approximately as shown in the attached Figure DFO-034. The intent of the hydrologic monitoring is to establish the baseline conditions and to verify that the relationship between groundwater and surface water components of the water balance remain intact during the course of the project and to be able to detect any changes if they were to occur. The development of a reasonable stage to discharge relationship which represents low flow conditions on this reach of McNab Creek would be challenging and inaccurate due to the nature and geometry of the channel in this reach of McNab Creek. In order to achieve the intent of the requested flow monitoring strategy, it is proposed that a relationship between the water level at each of the water level monitoring stations and a qualitative characterization of fish passability and aquatic habitat suitability be developed. The relationship would be established by observing and characterizing the habitat conditions of the channel, in terms of suitability for each stage of life history (spawning, rearing and overwintering) at each of the monitoring sites at varying flow conditions on McNab Creek. Fish sampling will also be conducted at each of the monitoring sites when flow and temperature conditions are safe and appropriate for sampling.
717	DFO-035.1	29-May-17	Fisheries and Oceans Canada	There is still uncertainty associated with the predicted negative loss of McNab Creek baseflow, especially following year 10 of mining operations. The proponent states that the groundwater model does not have reliable predictions for years 11-16 of mining operations.	An understanding of the fish habitat values in McNab Creek prior to mining operations is recommended to verify the impacts assessment to McNab Creek and to be included in the EA follow-up monitoring program. Fish habitat characterization in McNab Creek should be corresponding to water station monitoring every 300 m. Fish habitat characterization should include substrate, vegetation and cover, bank morphology, capability/suitability to support fish at various flows and fish utilization of the location. Area estimates of suitable habitat for various life history aspects and species of fish should be provided.	See response to DFO-34.1.
718	DFO-036.1	29-May-17	Fisheries and Oceans Canada		See DFO comments on DFO-034.	See response to DFO-34.1.
719	DFO-037.11	29-May-17	Fisheries and Oceans Canada		The proponent has proposed a 10% buffer to manage uncertainty in the adaptive water management plan. The annual average predictions will not be suitable to inform this 10% buffer value given the seasonal changes that are predicted.	The Water Management Plan (WMP) includes a response trigger based in the Pit Lake water levels and the hydraulic gradient between McNab Creek and the Pit Lake. These triggers are measurable onsite and considered as an appropriate metric for direct site measurement. It should be noted that the trigger for the dry season (i.e., when base flows in McNab Creek are lowest) was the predicted water level in the Pit Lake and hydraulic gradient at the end of the simulated dry season, which corresponded to the lowest pit lake level and highest hydraulic gradient. Therefore, the triggers for the dry season are not averages for the dry season but a conservative point in time at the end of the season. For the first 10 years of mining, the model predictions are that there will be at least 19 % less loss from McNab Creek. Beyond year 10, the model predicts that the losses become closer to what would occur under the current site configuration under equivalent atmospheric conditions. Therefore, since conservative values have been used for the triggers and the model predictions of the buffer for the first 10 years are nearly twice the 10% buffer, then using annual averages (semi-annual as there is a trigger for wet and dry season) is considered appropriate. Data collected during mining will be used to reduce the model uncertainty so that the 10% buffer is maintained beyond Year 10.
720	DFO-037.12	29-May-17	Fisheries and Oceans Canada		It is recommended that the Adaptive Management Plan rely on specific, readily measurable (at the site) thresholds or triggers.	As discussed in DFO-037.11, The Water Management Plan (WMP) includes a response triggers based in the Pit Lake water levels and the hydraulic gradient between McNab Creek and the Pit Lake. These triggers are measurable onsite and considered as an appropriate metric for direct site measurement.
721	DFO-037.13	29-May-17	Fisheries and Oceans Canada		The percent change of loss from McNab Creek should be linked to specific trigger point values for the pit lake elevation and the groundwater table elevations at key groundwater monitoring wells, stated in the plan and used as triggers.	The Water Management Plan (WMP) includes response triggers based in the Pit Lake water levels and the hydraulic gradient between McNab Creek and the Pit Lake. The percent change in loss from McNab Creek is linked to these triggers. For example, in Year 10 of mining the trigger predicts 19% less loss from McNab Creek at end the end of the dry season at that time of mining compared to the current configuration with the groundwater channel still in place.
722	DFO-038.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
723	DFO-039.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
724	DFO-040.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
725	DFO-041.1	29-May-17	Fisheries and Oceans Canada	The proponent has provided the lowest elevation of the channel inverts of the figures in Appendix 5.6-A as requested. Estimated and observed periods when there was no surface flow in the section of McNab Creek downstream of the MC-DS monitoring station have been provided.	Baseline data quantifying the areas that experience no surface flow for the whole of McNab Creek may be required. As detailed in DFO-034, given that the proponent states that the recommended flow monitoring strategy is impracticable, propose an alternative solution to monitoring the lower reaches of McNab Creek to capture any changes in water flows and levels that may result from the project given that McNab Creek changes from a losing to a gaining stream in the lower sections.	See response to DFO-34.1.
726	DFO-042.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided. The proponent has committed to provide an Analysis of Box Canyon Data for estimates of low flow predictions to DFO should the project proceed to the regulatory phase.	No further response required.
727	DFO-043.1	29-May-17	Fisheries and Oceans Canada	Some baseline data for McNab Creek has been collected in support of this EA including one day of electrofishing in the summer of 2010, one out-migrating fyke net setup in 2013, adult spawner counts and beach seining in the marine estuary in 2011.This data indicates fish species presence in McNab Creek however is insufficient to show seasonal and annual variability in fish stocks, fish utilization and dependency.	To verify the impact assessment, it is recommended that additional fish baseline data be obtained to understand species abundance (density) and different fish life stages associated with the variety of habitat types/locations in the lower 2.5km of McNab Creek. Multiple surveys to capture the seasonal variation in abundance and fish presence should be conducted to better inform the baseline data. A monitoring program in McNab Creek which surveys for species abundance (density) and different fish life stages associated with the variety of habitat types/locations in the lower 2.5 km of McNab Creek should be developed and implemented prior to the start of construction. See DFO comments on DFO-024.	See response to DFO-34.1.

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728	DFO-044.1	29-May-17	Fisheries and Oceans Canada		The Proponent's submission on ground water flow modelling indicates that groundwater with temperatures influenced by the pit lake will be flowing into the lower 1 km of McNab Creek. Changes in surface water temperature and water temperatures in the intragravel spaces have the potential to impact egg incubation, fry survival habitat quality and fish productivity. To verify the effects assessment, it is recommended that baseline information on surface water and intragravel water temperature in the lower 1 km of McNab Creek and the lower section of WC2, including the daily and monthly mean, maximum and minimum temperatures be provided. Effects monitoring should include continuous monitoring of temperatures in lower McNab Creek as this is a sensitive area to increased temperatures given the occurrence of low seasonal flows, pit lake influenced groundwater inputs and its importance as salmonid spawning habitat. Dissolved oxygen (DO) should be measured in the intragravel opposed to the surface water in lower WC2 and the proposed offsetting channel. An intragravel DO logger should be installed at the typical depth of a chum redd to ensure that DO levels are appropriate for egg to fry survival (greater than 5mg/L) in the lower portion of WC2.	As described in the response to DFO-044, seepage from the alluvial fan to McNab Creek does not occur at present and is not expected to occur in the first 5 years of mining (modelling predicts it will not occur until after Year 10 of mining) . Under current conditions; therefore, because there is no groundwater discharge into the intergravels, baseline temperatures in the intergravel spaces will be similar to that of the temperature of the surface water in McNab Creek. In addition, under current conditions the baseline temperature of water occurring in intergravel spaces of WC 2 to WC 5 will be similar to the surface water temperatures measured in the Groundwater-fed Channel, which are similar to groundwater temperatures measured in the alluvial fan. These baseline temperature data for surface water (McNab Creek and the Groundwater-fed Channel) and for groundwater are presented in Appendix 5.6-A of the EAC Application/EIS. Temperature of the water within McNab Creek is dependent on daily and seasonal atmospheric conditions, principally air temperature, amounts of precipitation, surface water velocity and temperature of precipitation. The approximately four and one half years of continuous temperature data are representative of that period only; future temperatures will be dependent on future temporal atmospheric conditions. In the 07-Apr-2017 Technical Memo entitled Pit Lake Hydrodynamic Modelling for BURNCO Aggregate Project, the predicted groundwater temperature in the discharge to the lower section of WC 2 and to WC 3 to WC 5 for Year 5 and Year 10 of mining are compared to the measured temperatures in the groundwater-fed channel for 2011. In addition the predicted groundwater discharge temperatures at closure are compared to measured surface water temperatures in McNab Creek. The atmospheric data for 2011 are considered to be near average conditions. These data are presented as minimum, average and maximum temperatures for each month. In the 10-Apr-2017 Technical Memo entitled Pit Lake Hydrodynamic Modelling for BURNCO Aggregate Project - Implications to Fish and Fish Habitat, that considers the hydrodynamic modelling predictions and potential temperature effects on fish and fish habitat, the range of suitable temperatures for each life history stages were considered based on monthly averages. When the maximum and minimum values are taken into consideration the conclusion that seepage water temperatures will be suitable for salmonids at each life history stage is still valid based on the published values provided. The Water Management Plan (WMP) will be revised to include measurement of dissolved oxygen in the intergravel in lower WC 2 and the proposed Offset Habitat. Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting.
729	DFO-045.1	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	Pit Lake Levels: During operations the amount of surface flow from the West slopes will be controlled to manage the level of the Pit Lake. The water management plan should clearly identify how this water (from the west slope of the valley) will be managed / routed during closure. The proposed plan is to monitor the Pit Lake spillover elevation for 2-3 years post mining operations to adjust the lake elevation for the long term. The plan should also contain monitoring considerations if seasonal adjustments are required to maintain fish habitat in the offsetting area and to maintain natural baseflow in McNab Creek. The Adaptive Management Plan should be robust enough to ensure water quality and quantity protection over the life of the mine and on closure.	The installation of an outlet structure and spillway from the Pit Lake at closure makes diversion of runoff from the west slope unnecessary. Valved culverts used to manage runoff from the west slope during operations will be removed at closure and runoff from the west slope will be conveyed to the Pit Lake in ditches. The height of the Pit Lake outlet structure will be determined to manage water level elevations in the wet season so that the losses from McNab Creek are less than the current conditions (under equivalent atmospheric conditions). During the dry season, Pit Lake water level will be as high as possible to maintain base flow in McNab Creek while enabling potential releases of maintenance flows into the Habitat Offset (WC 2 extension). Water levels in the Pit Lake during the dry season are predicted to be lower than the anticipated height of the overflow structure. The Water Management Plan (WMP) will be revised to include consideration of seasonal management of the outlet structure for maintaining McNab Creek base flows and the Habitat Offset, if this is found to be necessary based on monitoring data during mining operations. Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting.
730	DFO-045.2	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	Reporting: Page 15 of the Draft Water Management Plan states that surface and groundwater well data will be reported on an annual basis. An annual reporting schedule may be inadequate to capture any relevant changes that would trigger implementation of adaptive measures. If this data is to be used to inform the adaptive management, data should be downloaded and analyzed, at a minimum, every month and possibly weekly during the dry season to ensure that predictions are still appropriate.	The water level data will be monitored on a continuous basis (every 15 minutes). The use of daily averages for reviewing surface water levels against triggers is considered appropriate since mining will progress at a rate that will not result in rapid changes in pit lake water levels, and averaging would remove any water levels in the pit lake resulting from short-term events such as waves produced by wind action or the gravel extraction process itself. Although the DRAFT Water Management Plan (WMP) states that the surface water and groundwater levels will be reported annually, the data will be reviewed more frequently to determine if an action response is triggered. The WMP will be revised to clarify that data will be downloaded and reviewed against triggers weekly during the dry season (May to September) and bi-monthly during the wet season (October to April). Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting.
731	DFO-045.31	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	Triggers: Information on planned triggers are only provided up to year 10. Years 11-16 and onward into closure are most critical as this has been identified as where predictions in groundwater flow contributions are less reliable in the model. The planned triggers from year 11 to 16 and on closure should also be provided.	As discussed in response to DFO-037.1, as mining progresses beyond Year 10 the model predicts that the losses from McNab Creek become closer to what would occur under current conditions and under equivalent atmospheric conditions. The model is not any less accurate over this period, but predicted gains in base flow in McNab Creek compared to current conditions become small and less than the uncertainty in the model. Data collected during mining will be used to reduce model uncertainty. Section 8.1.1 of the Water Management Plan (WMP) states that changes in mine plan or other mitigative measures will be undertaken to maintain a 10% buffer (10% less loss than current conditions under equivalent atmospheric conditions) for years 11 to 16 and at closure. Data collected during the first 6 years of mining will be used to develop action level triggers that maintain a 10% buffer for years 11 through 16 of operations and at closure.

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732	DFO-045.32	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	Quantify the meaning of greater on average for the groundwater gradient and pit lake water level triggers and for the surface water trigger in WC2. Typically it is best not to use an averaged number for a trigger or threshold value. It is recommended that a specific value be defined for each proposed trigger that can be easily measured on site.	We acknowledge that the term "greater on average" for the gradient and "less on average" for the Pit Lake level needs to be clarified in the WMP. The water level data will be monitored on a continuous basis (every 15 minutes); data collected each day would be averaged and this would represent one point in the monitoring period. The use of daily averages for reviewing surface water levels against triggers is considered appropriate since: - Mining will progress at a rate that does not result in rapid changes in pit lake water levels. - Averaging would remove any water levels in the pit lake resulting from short-term events such as waves produced by wind action or the gravel extraction process. - Groundwater tends to average out responses so that gradients would not be as affected by short term changes in the water levels in the pit. - Groundwater flow to WC 2 would not be as affected by short-term changes. The WMP will be revised to clarify that data will be downloaded and reviewed against triggers weekly during the dry season (May to September) and bi-monthly during the wet season (October to April). Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting. The depth of flow and details of the channel conditions at the WC 2 monitoring site are not yet known. The proposed concept of using a deviation from the predicted conditions based on average annual conditions was presented to normalize the trigger value such that it would be meaningful in the context of the site specific conditions. The value that is proposed to be measured and compared to the trigger would be a value directly measured at the site.
733	DFO-045.33	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	A two week time period on which the average trigger metric will be analyzed May not be appropriate. A time period with biological application and meaning should be chosen. Results averaged over a two week time period will not capture potential shorter time period impacts during critical fish utilization in the streams. The time frame proposed for downloading, review and analysis of the data may allow for delayed notification of a trigger or threshold being reached. It is recommended that a specific instantaneous threshold be used for ease of identification and implementation of the plan in a timely manner to avoid potential effects.	The Pit Lake and WC 2 water level data will be monitored on a continuous basis (every 15 minutes). The DRAFT Water Management Plan (WMP) states that the download would occur every three months. The WMP will be revised to clarify that data will be downloaded and reviewed against triggers weekly during the dry season (May to September) and bi-monthly during the wet season (October to April). Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting.
734	DFO-045.34	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	The response to the Surface Water Trigger in WC2 is inadequate. Sampling and analytical methods should be reviewed in advance of the trigger being met not on the occasion that it is exceeded. The primary response to the trigger should not be to review methodology and to confirm values but to have a plan in place to actively rectify the situation.	In the event that a there is a trigger is recorded in WC 2 the initial response will be to understand the mechanism behind the trigger to determine if it is project-related or a natural occurrence. It is anticipated that project related triggers at WC 2 will be mitigated through physical modifications to the channel. These may include deepening and/or constricting (e.g., construction of physical obstructions to increase depth) to modify the hydraulic properties of the channel (e.g. increase the collection of groundwater).
735	DFO-045.35	29-May-17	Fisheries and Oceans Canada	The proponent has provided a Draft Water Management Plan with the Adaptive Management Plan provided as an appendix.	Details of the proposed plan (and associated construction mitigation measures) to install a cut-off wall should more permeable material be encountered during mining should be included in the Adaptive Management Plan.	Based on the known pit stratigraphy and hydrogeologic data on groundwater levels obtained in the proposed pit area, the probability of encountering discrete zones of material with hydraulic conductivities significantly different than those assessed previously is considered to be very low. If a condition of hydrogeological concern that could affect the pit lake levels was identified during development of the Habitat Offset or the pit, then potential options for hydraulically isolating the pit from McNab Creek or the downstream environment would be reviewed and a suitable option identified based on the particular geologic nature of the issue. An option for hydraulically isolating a portion of the pit would be to backfill the area of concern with low permeability materials. The WMP will be revised to remove explicit reference to a "cut-off wall" in favour of the adaptive management approach described in WMP Section 8.1.2. Revisions to the WMP will be made prior to its completion and submission for review by FLNRO and DFO at permitting.
736	DFO-046.1	29-May-17	Fisheries and Oceans Canada		Sufficient information has been provided.	No further response required.
737	DFO-047.1	29-May-17	Fisheries and Oceans Canada		See DFO-45 for DFO's comments on the Adaptive/Water Management Plan proposed.	See response to DFO-45.1 - 45.3.

end.