Information Request 26

Responses to Information Request 26

IR 26 – Fish Habitat Compensation Plan

References:

EIS Guidelines, Sections 2.7.1.3 and 2.7.2.5
EIS Appendix 2.7.2.5-A (Fish and Fish Habitat Compensation Plan)
EIS Appendix 2.7.2.5-B (MMER Schedule 2 Compensation Plan)

Related comments:

CEAR # 276 (BC Environmental Assessment Office)
CEAR # 277 (Fisheries and Oceans Canada)

Rationale:

The EIS Guidelines state that to compensate for any loss or altered fish habitat, the Proponent shall present a compensation program that complies with Fisheries and Oceans Canada's (DFO) policies and any other Government of Canada policies related to fisheries and is based on technical, economic and biological feasibility. DFO has indicated that information is missing in the EIS to support technical and biological feasibility of the fish and fish habitat compensation program on whether the fish and fish habitat compensation plan has adequately offset the impacts to fish, fish habitat and fisheries.

The following issues are raised by DFO and the BC Ministry of the Environment:

- The Proponent states that there is further information required prior to moving forward with the Haines Creek Diversion and Berm Construction compensation option (Appendix 2.7.2.5-A, page 36); The Proponent lists the feasibility and baseline data collection that is outstanding for the Off-channel Rearing Habitat Compensation option (Appendix 2.7.2.5-B) including: determining land tenure, conducting groundwater assessments, topographic/LIDAR/geodetic surveys and an archaeological assessment.
- A biological rationale was not provided to restore fish passage off the mine site as a compensation option as requested by the EIS Guidelines.
- The two fish habitat compensation plans (*Fisheries Act* and *Metal Mines Effluent Regulations*) do not address the extent to which the compensation measures have effects on existing fish populations and fish habitat, recreation values *(e.g.,* recreational fishing), and the habitat of species at risk.
- The Proponent does not take into consideration the intrinsic value of existing fish habitat where compensation is being proposed.

Information Requested:

The Panel needs to better understand the effectiveness of these fish habitat mitigation measures, and thus requests that Taseko:

a. Provide additional information that relates to the technical feasibility (*e.g.* suitability of the location) and the biological feasibility of the fish and fish habitat compensation options.

b. When evaluating the existing fish habitat and values, provide a rationale for how the proposed measures offset fisheries values impacted by the Project should be provided. The fish habitat quality, fish use, and fish density of the existing stream should be compared with the predicted outcome post improvements to support the habitat compensation rationale.

When determining compensation the Panel requests that Taseko:

c. Describe the net increase in the value of the habitat as a result of the enhancements proposed in existing habitat (e.g. barrier removals that provide fish access to existing habitats and alterations to existing floodplain habitats).

Information Request #26a

Provide additional information that relates to the technical feasibility (e.g. suitability of the location) and the biological feasibility of the fish and fish habitat compensation options.

Response Summary

Based upon the information available, the habitat compensation options proposed by Taseko in both the Fisheries Act Compensation Plan and the Metal Mining Effects Regulation (MMER) Compensation Plan are both technically and biologically feasible. While there is a need for collection of some further baseline information in order to advance these plans to an engineering design level, it is considered premature to proceed to this stage until an environmental assessment certificate has been received. The compensation options proposed by Taseko are not new and the techniques for habitat enhancement have proven to be able to increase the quality and quantity of habitat for fish.

Discussion

Fisheries Act Compensation Plan (Appendix 2.7.2.5-A, Taseko Mines Ltd, 2012)

Fish Lake Tributaries Flow Augmentation, Habitat Enhancement and Barrier Removal

Removal of physical barriers and low stream flow barriers in order to provide fish access to intact habitat is a top priority of Taseko's. Restoration of fish passage has a high likelihood of success, is often observed quickly after restoration is complete, and has long lasting benefits (e.g., Roni et al., 2002; Pess et al., 2005). In combination with Rainbow Trout (RB) specific habitat enhancement, these methods increase productive capacity for RB by increasing the area of quality habitat available to RB in the Fish Lake area.

Augmentation of stream flow to provide perennial fish habitat not only increases the total area of habitat available for fish, but the stability of habitat has many benefits. Compared to an ephemeral stream, a permanent stream (perennial flow) reduces the risk of juvenile fish stranding as the stream dries or freezes, stabilizes temperature regime, increases overwinter survival, and increases rearing habitat (Wood, 1997). Rearing habitat has been identified as a main constraint for RB population sustainability, therefore any increase in the area, duration and quality of rearing habitat will increase fish productivity (Cederholm et al., 1997).

The following habitat enhancement techniques have been proposed in the Fish Lake Flow Augmentation compensation element: gravel placements, deep pool excavations, remnant (inactive) beaver dam removal/modification, and large woody debris (LWD) and boulder additions as/if required. Each of these techniques will benefit fish productivity and productive capacity within the two main Fish Lake tributaries and all of these techniques are technically and biologically feasible.

Gravel placement

The most effective spawning habitat for Rainbow Trout consists of clean, loose, suitably sized gravel in the riffle at the end of a pool (Raleigh et al., 1984). Generally, Rainbow Trout will spawn within a range of coarse sand to small gravel substrates, with water velocities of less than 1 m/s, depth of less than 0.5 m, and in pool tail outs (riffles). Specifically, Rainbow Trout require the following characteristics in a spawning area: 0.18 m water depth, 0.48–0.91 m/s water speed and 6–52 mm sized gravel substrate (Whyte et al., 1997). Evaluation of these factors will guide gravel placements for the enhancement of Fish Lake tributaries.

Pool excavation

Pool habitats are occupied year-round by all life stages of Rainbow Trout. This habitat component becomes increasingly important as a refuge area during cold, winter (freezing) conditions. A pool to riffle ratio of 1:1 is considered ideal for Rainbow Trout and will be considered during enhancement planning (Raleigh et al., 1984). The risk of creating isolated pools that can become depleted in oxygen in winter, resulting in fish mortality, will be evaluated prior to the construction of any pool type habitat.

Beaver dam modification/removal

Beaver activity can create partial barriers to fish passage (i.e. dams) and alienate important upstream fish habitats for spawning, rearing and overwintering (Finnigan and Marshall, 1997). Removal or modifications to beaver dams can promote regeneration of this habitat (e.g., flushing of organic substrates, increased flow suitable for spawning, etc.) thereby increasing productivity. Not all beaver activity is detrimental to fish, as juveniles have been found to rear in beaver ponds if they are accessible (Finnigan and Marshall, 1997). The beaver dams scheduled for removal in Fish Lake Tributary 1 and upper Fish Creek (Reach 8) are abandoned (inactive for several years if not decades). Collectively, the removal of these barriers will provide in excess of three kilometers of readily accessible stream habitat. Any renewed beaver activity will be monitored closely as part of the adaptive management program.

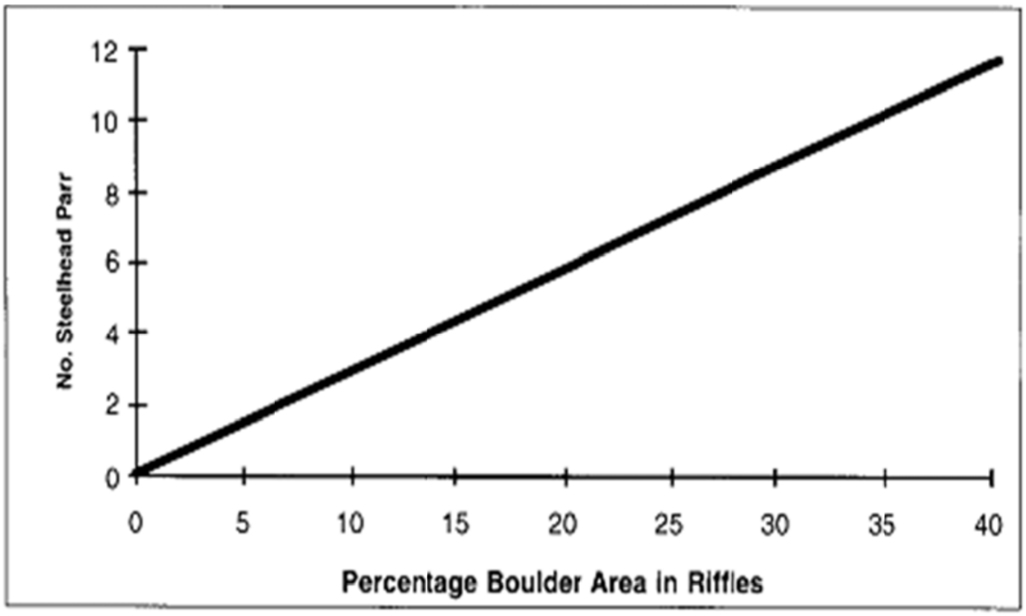
Large woody debris (LWD) addition

Habitat complexity generated by LWD is important for all fish life stages and is positively related to the abundance of fish in a stream (Slaney and Martin, 1997). A study conducted in Oregon demonstrated an increase in salmonid smolt production (specifically Steelhead/Rainbow Trout) after the addition of conifer logs (in Cederholm et al., 1997). Physical benefits of properly placed LWD include channel stabilization, energy dissipation, nutrient addition and sediment storage. LWD provides juvenile and adult fish with cover (e.g., scour pools, over-stream cover), velocity breaks and is commonly associated with important resting and refuge pool habitat (Cederholm et al., 1997). LWD can also contribute to the upstream accumulation of gravels and increased spawning potential.

Boulder addition

Boulders also (>0.3 m) contribute to in stream habitat complexity. Water flow over and around boulders can provide beneficial variation in water depth and velocity and provide refuge areas for fish. A positive relationship between area of boulders and abundance of Steelhead was observed in the Keogh River, BC (Figure 26A-1; in Ward, 1997).

Figure 26A-1. The number of steelhead parr in riffle habitat (100 m^2) of the Keogh River was a function of the amount (%) of riffle area with boulders > 30 cm, here expressed as though overstream cover was zero (from Figure from Ward, 1997).



Fish Passage Restoration and Enhancement

Barriers to fish passage at road crossings contribute to a major loss of upstream habitat for juvenile and adult salmonids (Cariboo Envirotech Ltd., 2008). Improperly installed, undersized, or damaged culverts may impede or prevent fish passage due to increases in water velocity, inadequate water depth, elevated outlet or debris accumulation (Whyte et al, 1997). Technical feasibility in terms of suitability of the proposed fish passage restoration locations is supported by the documents used to guide site choice, the Fish Passage Culvert Inspection (FPCI) data consolidation database (Triton, 2007) and a fish passage assessment report prepared for the Xeni Gwet'in First Nation on stream crossing restoration opportunities (Cariboo Envirotech Ltd., 2008). Triton (2007) used existing databases to create a list of fish barriers that require restoration. The list was prioritized based on the value of fish habitat, the risk of fish-passage concern, and habitat gains:cost ratio according to the methods of Parker (2000) and Robison (2006). Cariboo Envirotech (2008) conducted stream crossing site visits to assess fish passage, maintenance and sedimentation concerns. Those sites which could be improved by restoration were assessed based on fish presence and habitat quality following the methods of Robison (2006).

Haines Creek Diversion and Berm Construction

The proposed upgrades to the Haines Creek Diversion infrastructure are technically and biologically feasible. The outstanding information requirements listed in the EIS concern the ability to quantify potential habitat gains and assess costs. They do not affect the feasibility of this compensation component. The feasibility of this component was originally assessed by MFLNRO as they were the drivers behind this project. As the Tete Angela Creek diversion and containment berms are currently not functioning at capacity or efficiently, infrastructure upgrades are required to realize full-flow benefits to fish habitat in Haines Creek watershed, including the Eleven Sisters Chain of lakes. Specifically, the diversion structure and storage pond capacity require upgrading, and the containment berms need to be re-engineered and constructed with a keyed-in rock base to prevent seepage and water loss from Haines Creek mainstem.

Reinforcing berms with riprap is a proven, technically feasible method applied for the prevention of stream bank erosion and water loss through seepage is a (MELP, 2000; in Babakaiff et al., 1997). Riprap absorbs and deflects the impact of flowing water and gaps in the rocks slow down water flow. Proper selection of rock type, size, shape, gradation and placement (i.e. ‘interlocking’ of individual rocks) influences the effectiveness of riprap (in Babakaiff et al., 1997).

Elkin Creek Diversion Upgrade and Set-Back Berm Construction

In addition to upgrading the existing water control structure and constructing a setback berm, stabilization of several bank erosion sites will be necessary in upper Elkin Creek. There are three types of bank stabilization methods; rock, vegetative and integrative (in Babakaiff et al., 1997). Rock stabilization, including riprap, is a well-known and reliable technique, although it can be costly. Vegetative stabilization can be more cost-effective, although it takes longer to reach its full stabilization potential (i.e., it takes time for the roots to develop) and there are many site-specific factors to consider, including soil moisture, elevation, and the presence of competitor species. Integrated methods involve the use of both vegetative and inorganic materials (in Babakaiff et al. 1997). On-site geotechnical and biological assessments of the Elkin Creek diversion upgrade site will be conducted prior to construction to determine the most appropriate bank stabilization methods.

Riparian Reclamation

Reclamation of affected riparian areas is an important component of re-establishing the productive capacity of fish-bearing streams. Intact riparian zones provide nutrient input via vegetative litter, future supplies of large woody debris, and moderate stream temperature (Slaney and Martin, 1997). Replanting with live cuttings of pioneer riparian species, such as willow (*Salix spp*.) or red-osier dogwood (*Cornus stolonifera*), is a common method of riparian zone rehabilitation. Reduction of bank erosion and nutrient additions from vegetation are observed more quickly with this method than seeding methods. Combining riparian restoration with in stream fish habitat enhancement is recommended to increase fish productivity potential (Slaney and Martin, 1997).

Metal Mining Effects Regulation (MMER) Compensation Plan (Appendix 2.7.2.5-B, Taseko Mines Ltd, 2012)

Taseko Lake Off-Channel Habitat

Off-channel habitat creation is technically and biologically feasible in the proposed location. While field visits to the site will be required to determine optimal placement of habitat features (pools, riffle, runs), an overview assessment of the Taseko Lake Off-Channel Habitat (TLOC) location conducted by BGC Engineering (Trevor Crozier, pers. comm., 2013) determined the likely presence of sufficient groundwater to support the TLOC habitat flow requirements. As the TLOC is located in a groundwater discharge area and is hydraulically connected to Taseko Lake/River, groundwater is likely within a few meters of ground surface. Groundwater-collection piping or piping from the lake could be employed to augment groundwater seepage in the TLOC as/if required. There is a general lack of low velocity off-channel habitat in the Taseko River which may be production-limiting (Cariboo Envirotech Ltd. 2008; Taseko Mines Ltd., EIS, 2012). As such, the TLOC will provide critical rearing, overwintering and spawning habitat for salmon, trout and char, that is currently lacking.

The results of the groundwater overview assessment (BGC Engineering, 2013) are provided below:

"The data available for evaluating ground water flow assumptions in the area of the proposed the Taseko Lake Off-Channel habitat area (TLOC) includes aerial photographs, satellite images, topography, regional geological maps, terrain assessment, and some test pitting in the Onion Lakes catchment.

The shallow soils stratigraphy in the proposed area is anticipated to be Fluvial and/or Glaciofluvial similar to the other river valley soils on the northeast side of the Taseko. Soils may also include alluvial fan type deposits from the nearby Beece Creek. Sands and gravels and mixtures would be anticipated for the fluvial and glaciofluvial deposits. The alluvium (and potentially colluvium derived from Beece Creek) may result in interbedding with finer grained deposits (silts) and organics.

Based on topography, inferred soils and available hydrology data in the Fish Creek catchment and along the Taseko River, the area is likely to be a groundwater discharge zone, with some *infiltration of precipitation and snowmelt in flatter areas locally modifying groundwater quality seasonally (e.g. spring melt).*

Depth to groundwater is likely within several meters of ground surface, and the groundwater system in this area is likely to be hydraulically connected to Taseko Lake/River depending on what part of the compensation area you are in. The higher up the Beece Creek fan you go, the deeper the depth to groundwater may be; especially if the deposits are sands and gravels, but the off-channel habitat area is proposed within 0 and 300 m of the Taseko River, minimizing the inferred depth to groundwater. Therefore, based on available information it is reasonable to assume that detailed site investigation will demonstrate sufficient groundwater inflow to support the proposed off-channel habitat."

IFlows can also be augmented through the installation of an infiltration gallery (buried, perforated, groundwater-collection piping) along the Taseko shoreline and/or along the base (groundwater collection area) of the Beece Creek overflow channel. TLOC baseline flow (and temperature) could also be augmented/regulated through the installation of two or three large diameter (1 m x 50 m) pipes (with valves), originating in Taseko Lake (extending 10 – 15 m from shore) to deliver supplemental discharge to the TLOC at two to three key locations along the length of the channel.

Other alternate locations that offer road access, low relief terrain, a perennial source of water (ground- and/or surface water) and within close proximity to where the effects occur (Fish Creek watershed; i.e., as close as possible to the ecosystem in which the effect occurs – DFO priority) have not been identified at this time.

References

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Personal Communications

T. Crozier, M. Eng., P. Eng., Senior Hydrogeological Engineer, BGC Engineering Inc.

Information Request #26b

When evaluating the existing fish habitat and values, provide a rationale for how the proposed measures offset fisheries values impacted by the Project. The fish habitat quality, fish use and fish density of the existing stream should be compared with the predicted outcome post improvements to support the habitat compensation rationale.

Response Summary

The existing fish habitat that will be affected by the project consists of small shallow streams that have intermittent flows. There is no flow in any of the effected streams in winter. The measures being proposed to offset fisheries values are enhancements over the original value of these streams. Not only is the amount of fish habitat being more than tripled through barrier removals, passage restoration and construction of off-channel habitat, but the overall quality of each of these enhancements will also greatly surpass the original habitat, fish use and recreational value of the streams being effected.

Discussion

This information request is addressed in the EIS (Taseko Mines Ltd., 2012), *Fisheries Act* and MMER Compensation Plans (Appendices 2.7.2.5-A and 2.7.2.5-B, respectively). This request is also partially addressed in IRs 26(a), 26(c) and 22.

<u>*Fish Lake Tributaries Flow Augmentation, Habitat Enhancement and Barrier Removal*</u>

The rationale for flow augmentation and the enhancement of Rainbow Trout habitat in tributaries to Fish Lake includes:

1. Providing compensation for losses of tributary habitats associated with the Project and thereby addressing DFO's guiding principle of no net loss of productive capacity; and,
2. Ensuring sufficient spawning habitat is maintained to exceed the minimum viable population of Rainbow Trout (defined as 3,800 individuals; see EIS Section 2.7.2.5 for discussion) for Fish Lake during life-of-mine and beyond and therefore addresses MFLNRO Benchmark Statement objectives for maintaining the genetic integrity of Fish Lake Rainbow Trout.

Implementation of this compensation element will also help to maintain fishing opportunities (First Nation and recreational) in Fish Lake.

The primary objectives of this element are to:

- Create additional spawning and rearing habitat in Fish Lake Tributary 1 by excavating (daylighting) a 100 to 200 m long remnant channel (fish migration barrier), immediately upstream from tributary B2D (see EIS Figure 2.6.1.5-1), to provide an additional 1 km of currently non-fish bearing habitat.

- Convert seasonal habitat in Fish Creek Reach 8 and Fish Lake Tributary 1 Reach 2 to perennial habitat through year round flow augmentation.
- Enhance Rainbow Trout spawning and rearing habitats in Fish Lake Tributary 1 through gravel placements, deep pool excavations, remnant beaver dam removal/modification, and large woody debris (LWD) and boulder additions as/if required.
- Modify remnant beaver dams (as/if required) to increase spawning habitat availability in upper Fish Creek.
- Remove a gradient barrier in Fish Lake Tributary 3 to provide an additional 350 m of fish bearing habitat which is currently non-fish bearing.

Should the spawning population of Rainbow Trout in Fish Lake tributaries remain unchanged throughout life-of-mine, spawner density (fish/m^2) would likely be less than baseline values, as there would be more spawning habitat available through flow augmentation. Should the number of tributary spawners decline throughout life-of-mine, the density of those fish (fish/m2) would be less, based on fewer fish utilizing more available habitat.

Should annual flow augmentation continue throughout the late fall to the spring period (i.e., continuous) when tributary channels are typically dry or partially dewatered, and beaver dam/barrier removal programs are implemented, the fish density in those streams would be less than baseline due to similar or fewer numbers of fish utilizing more area, that was previously unavailable.

Fish Passage Restoration and Enhancement

The rationale for the restoration or enhancement of fish passage compensation is to:

- Expand the distribution of fish species and increase productivity in the region to replace, in part, project-related habitat losses in upper and lower Fish Creek and tributary habitats.

The restoration of fish passage at identified road crossing sites intends to replace, in part, a net loss of productive capacity in upper and lower Fish Creek watershed. This strategy element is consistent with the Policy for the Management of Fish Habitat (DFO, 1986) second level (create or increase the productive capacity of unlike habitat in the same ecological unit at or near the development site) and third level (create or increase the productive capacity of habitat in a different ecological unit) of the hierarchy of preferences (DFO, 1986).

The restoration of stream crossings and the installation of structures that allow fish passage is standard practice with linear developments in the resource (e.g., forestry), transportation (e.g., railways, MOT), and industrial sectors (e.g., pipelines). The primary guideline document available for the installation of crossing structures is the Fish-Stream Crossing Guidebook (MOF, 2002). This guidebook provides the requirements for the installation of closed and open bottom structures on fish bearing streams.

Fish habitat credits (m^2) gained through the restoration of stream crossings is currently under discussion with Fisheries and Oceans Canada (DFO). All habitat credits gained through implementation of this compensation element will be used to offset project-related habitat (quality and quantity) losses incurred under the *Fisheries Act*.

Post-barrier-removal fish densities in the upper watershed(s) are difficult to predict at this time, but would likely increase over time as fish utilization (colonization) of these new habitats occurs. Fish use will be monitored regularly over time to determine fish densities and final productive capacities. As fish absence is known or suspected in stream channels upstream from the proposed barrier removal sites, any use of newly accessible upstream habitat in those watersheds would represent an increase over baseline values.

Haines Creek Diversion and Berm Construction

Implementation of the Haines Creek Diversion and Berm Construction is consistent with the Policy's second level (create or increase the productive capacity of unlike habitat in the same ecological unit at or near the development site) of the hierarchy of preferences (DFO, 1986). Implementation of this element will also mitigate the risk to potential loss of angler opportunity in Fish Creek watershed by increasing spawning habitat capacity in the Haines Creek watershed (through increased discharge over a longer duration), including the Eleven Sisters chain of lakes. Mitigation gains are described in Section 2.7.2.5, of the EIS document (Taseko Mines Ltd., EIS, 2012).

The upgrade of the Haines Creek Diversion infrastructure will enhance Rainbow Trout habitat by increasing and maintaining flows over a longer duration in Haines Creek and in the inlets and outlets (Haines Creek) to one or more of the Eleven Sisters chain of lakes. Therefore, implementation of this compensation element will address, in part, DFO's guiding principle of no net loss of productive capacity.

The primary objectives of the Haines Creek Diversion and Berm Construction will be to:

- Upgrade the diversion structure and increase the storage capacity of the retention pond to enable increased flow regulation and augmentation of Haines Creek, over a longer duration (i.e., at a minimum, throughout the Rainbow Trout spawning period). This will increase spawning habitat capacity (m^2 habitat gain);
- Replace/restore existing berms or construct new berms as required to prevent substantial seepage losses occurring at several locations along the diversion channel and upstream from the Taseko Lake Road culvert crossing.

An additional objective, identified by MFLNRO, proposes the replacement of the twin Haines Creek culverts on Taseko Lake Road with an open bottom structure (OBS) to facilitate fish passage for a longer duration each year and to provide sufficient capacity during extreme event flows (see Section 3.2).

Post-diversion/berm upgrade fish densities are difficult to predict at this time, but would likely increase over time as fish use of sustained/stable habitats occurs (e.g., potential increased immigration of Rainbow Trout from Scum Lake) and more extensive and prolonged use of Haines Creek habitats, commensurate with increased discharge. Fish use will be monitored regularly over time to determine fish densities and final productive capacities. As Haines Creek is presently fish bearing, fish density could likely decrease initially (e.g., no increased immigration from Scum Lake) as the existing population becomes more dispersed over increased habitat availability. The increase in available habitat would offset, in part, project-related effects on fish habitat in Fish Creek watershed. Increased habitat availability in Haines Creek is predicted to increase the overall productivity (unknown value at this time) of Rainbow Trout in Scum Lake (part of the Eleven Sisters chain of lakes), which could offset, in part, loss of angling opportunities (if any) in Fish Lake (e.g., more Rainbow Trout available to the recreational fishery in Scum Lake).

Elkin Creek Diversion Upgrade and Set-Back Berm Construction

The rationale for the upgrade of the existing diversion structure, construction of a containment berm(s) in upper Elkin Creek, and bank stabilization in lower Elkin Creek is:

- During freshet, upper Elkin Creek breaches its banks at two to three locations and flows into a low gradient tributary and wetland complex associated with Konni Lake at the headwaters of the Nemaia Creek drainage. The resultant reduction of flows and partial dewatering of lower Elkin Creek during the freshet periods is thought to have an adverse effect on Chinook Salmon and Steelhead Trout redds and incubating egg survival. Therefore, implementation of this compensation element will address, in part, DFO's guiding principle of no net loss of productive capacity.

The primary objective of the Elkin Creek compensation element would be to confine and maintain flood water discharge to the Elkin Creek watershed. As well, several bank erosion sites in lower and upper Elkin Creek will require stabilization to eliminate ongoing sedimentation of Chinook Salmon and Steelhead Trout spawning and rearing habitats.

As with the Haines Creek diversion/berm upgrade, the Elkin Creek compensation element will sustain mainstem flows and available habitats over a longer period on an annual basis. Fish use will be monitored regularly over time to determine fish densities and final productive capacities. The increase in available habitat and fish densities due to increased discharge and duration of flow is difficult to predict at this time, but would offset, in part, project-related effects on fish habitat in Fish Creek watershed. Increased flow over a longer duration will benefit Steelhead Trout and Chinook Salmon spawning success in lower Elkin Creek during their respective spring and fall spawning periods. Additional studies to collect baseline information on habitat availability and species use are required to accurately evaluate post-construction increases in fish densities.

Taseko Lake Off-Channel Habitat (TLOC)

Implementation of the TLOC element will address the Metal Mining Effluent Regulations (MMER) Section 27.1 requirements and DFO’s Policy for the Management of Fish Habitat (DFO, 1986) guiding principle of no net loss (NNL) of habitat productive capacity.

The primary objective of this compensation element is to offset all Tailings Impoundment Area (TIA) -related habitat losses through the creation of spawning, rearing, and overwintering habitat for Chinook Salmon, Rainbow/Steelhead Trout, Bull Trout, and Mountain Whitefish.

Implementation of this element will replace Rainbow Trout habitat loss in upper Fish Creek and Little Fish Lake with anadromous salmonid habitat (and resident Rainbow Trout), and as such is consistent with the third level in the hierarchy of preferences (create or increase the productive capacity of habitat in a different ecological unit) described in DFO’s Policy for the Management of Fish Habitat (1986).

Construction and maintenance of the TLOC will create approximately 96,000 m^2 perennial, high quality salmon, trout, char and whitefish habitat for spawning, rearing and overwintering. Species densities within the TLOC will be monitored regularly and are expected to increase over time, based on colonization rate, overwinter survival and spawning success of the target species from Taseko River (all species) and Beece Creek (Bull Trout) mainstems. There is presently no fish use within the proposed TLOC site, so any post-construction fish use will result in an increase in fish density.

References

Taseko Mines Ltd. 2012. Environmental Impact Statement for the Proposed New Prosperity Gold-Copper Mine Project. Available at: http://www.ceaa.gc.ca/050/document-eng.cfm?document=80858

Information Request #26c

When determining compensation describe the net increase in the value of the habitat as a result of the enhancements proposed in existing habitat (e.g. barrier removals that provide fish access to existing habitats and alterations to existing floodplain habitats).

Response Summary

There will be a net increase of 3.7 to 1 in the value of the habitat as a result of the enhancements proposed in the existing habitat.

Discussion

As stated in Taseko's *Fisheries Act* Compensation Plan (Taseko Mines Ltd 2012, Table 3.6), there will be an increase in available fish (Rainbow Trout) habitat associated with barrier removal. Based on upstream watershed areas and stream channel line-work, partial credits for barrier removal and non-barrier/habitat enhancement projects, it is approximated that the increase in habitat availability will be **276,500 m^2**. Based upon levels previously approved by the CEAA, (Clowater and Phillips 2008), further discounting of potential fish habitat gains associated with barrier removals are applied. This reduced the estimate to **172,000 m^2** of habitat that will still become accessible to Rainbow Trout and/or Bull Trout (Table 26C-1).

Table 26C-1. Summary of instream habitat gains associated with fish passage restoration and enhancement compensation element by site category

		EIS (Taseko Mines Ltd. 2012) [a]		CEAA Approved Upstream Habitat Discount Rate for Barrier Removal [b]	
Category	**Total Upstream Habitat (m^2)**	**Percent Habitat Credit**	**Habitat Gain (m^2)**	**Percent Habitat Credit**	**Habitat Gain (m^2)**
Full Barrier Non-status Road	35,000	100%	35,000	50%	17,500
Partial Barrier Non-status Road	157,000	50%	78,500	33.3%	52,281
Full Barrier MOTI Road	151,000	75%	113,250	37.5%[c]	56,625
Non-Barrier *Enhancement Project*	453,547	10%	45,355	10%[c]	45,354
Total	796,547		276,445		171,761

[a] Information from Table 3.5 in Appendix 2.7.2.5-A (Taseko Mines Ltd 2012)

[b] Clowater and Phillips 2008

[c] This value was calculated by applying the value used in Taseko's *Fisheries Act* Compensation Plan (Taseko Mines Ltd., 2012) to a discount value(s) previously accepted by CEAA (Clowater and Phillips, 2008)

The net increase in the value of the habitat would be similar to that of a **172,000 m^2 habitat creation** project (i.e., 0 m^2 to 172,000 m^2). The selection process for the proposed barrier removal and non-barrier/enhancement projects considered: upstream gradient, potential downstream fish populations (i.e., presence/absence), permanence of the barrier, road maintenance jurisdiction, and the probability that the upstream habitat was of sufficient quality (gradient) to support a population of Rainbow Trout. The final assumption will require field assessment of habitat quality and identification of any deficiencies (e.g., spawning, rearing and overwintering habitat) that might limit fish production. Any habitat deficiencies determined during the field assessment, could be readily enhanced as required. Fish sampling during the field assessment will also confirm fish absence (or presence) upstream and downstream from the barrier. Should the field assessment determine that a culvert does not obstruct fish migration (i.e., fish present upstream), habitat enhancements could be readily implemented to increase habitat value, as/if required.

Conclusion

The predicted *Fisheries Act* -related effect on instream habitat due to the project is **46,703 m^2** (*Fisheries Act* Compensation Plan, Taseko Mines Ltd., 2012). The amount of inaccessible upstream habitat predicted to become available for fish use is **172,000 m^2**, or a habitat gain: habitat loss ratio of 3.7:1.

References

Clowater, D and M. Phillips. 2008. Fish Habitat Compensation on the TransCanada Highway Project in New Brunswick. Paper prepared for presentation at the “Fish Habitat Compensation – A Requirement for Some Transportation Projects” Session of the 2008 Annual Conference of the Transportation Association of Canada, Toronto, Ontario. Available at: http://www.tac-atc.ca/english/resourcecentre/readingroom/conference/conf2008/docs/a2/clowater.pdf

Taseko Mines Ltd. 2012. “Environmental Impact Statement for the Proposed New Prosperity Gold-Copper Mine Project.” http://www.ceaa.gc.ca/050/document-eng.cfm?document=80858.