Highway 16 Mile 28 Realignment Conceptual Design: Environmental Asset Analysis and Risk Assessment

2121-00127-00

October 2015

Prepared by:
Garrett Kerr, BSc, RPBio
Project Biologist

Reviewed by:
Brad Pollard, MSFM, RPBio, RPF
Environmental Division Manager

McElhanney Consulting Ltd.
www.mcelhanney.com

Executive Summary

The Ministry of Transportation and Infrastructure is currently working toward re-aligning the last level CN Rail crossing on Highway 16 between Terrace and Prince Rupert. Historically, several general field and desk top based environmental assessment have been conducted along the Skeena River's right bank between Breccia Creek and the Exchamsiks River. Since the completion of the previous assessments, three conceptual design options have been shortlisted, and their proposed footprints refined. The purpose of this assessment was to use these site specific footprints to identify information gaps and then complete the required field assessments and report on potential environmental project constraints. Details of the proposed options can be found in other documents and in this document are referred to as option VAP1A, VAP2, and OPT9.

Current fish inventory work identified fish in three water bodies within the project footprint, and potential for fish presence in a fourth. All three design options are anticipated to have similar impacts to one site, while expected impacts to the other three vary with the designs. Opportunities for onsite compensation to satisfy regulatory requirements will depend upon the design option selected. Option VAP1A, which is anticipated to impact all four sites, presents few opportunities for cost effective onsite compensation, and would likely require offsite habitat restoration or reconstruction. Alternatively, installation of fish passable drainage structures at water bodies avoided by options OPT9 and VAP2 would improve connectivity to the Skeena River mainstem, which may satisfy regulatory requirements for no net loss of fisheries productivity.

All three design options have potential to disturb mountain goats if blasting or other load activity is required between October 31 and June 15. Most potential disturbances can be mitigated through preparation and implementation of a mountain goat monitoring plan, though mitigation does present potential for project delays.

All three options have the potential to result in disturbance of moose during winter construction activities, though only option VAP1A is anticipated to physically impact suitable moose winter range. However, the moose winter range that would be impacted is not considered important within the context of the landscape and moose disturbance can be mitigated.

No evidence of critical habitat for the federally protected bat, the little brown myotis, was identified within the project footprint, and the geology of the study area is not conducive to the formation of hibernacula. Potential summer roosting and maternity colony habitat was observed within the project footprint. Pre-construction surveys for bat presence would mitigate potential impacts to the little brown myotis, though bat presence could present potential for project delays.

Tailed frog habitat assessment identified only one site with potential habitat within the project footprint. However, this site was not considered valuable breeding or rearing habitat due to its low elevation, and surveys did not find any tailed frog tadpoles. Development is not anticipated to impact tailed frogs or tailed frog habitat.

No red- or blue-listed plant species were identified within the project footprint. However, habitat for several species does exist, particularly in advanced forests. Red-listed high-bench floodplain and blue-listed rich receiving site forest ecosystems were identified within the project footprint, and are anticipated to be impacted. Where possible, impacts to these sites should be minimized.

Potential for impacts to fish and wildlife habitat from the proposed realignment of Highway 16 at the Mile 28 crossing varies between the three shortlisted design options. Anticipated mitigation and compensation costs will depend on clearing, blasting, and instream work requirements, though all expected impacts of the three design options can be mitigated and/or offset.

Contents

Introduction

Since the late 1980s, British Columbia's Ministry of Transportation and Infrastructure (MoTI) has been investigating options for realignment of a CN Rail level crossing on Highway 16, approximately 45 km west of Terrace, BC. Given the duration of exploration, several field and desktop environmental assessments have previously been conducted along the Skeena River's right bank between Breccia Creek and the Exchamsiks River. An extensive fisheries and wildlife assessment program was conducted in the early 1990's between Andesite Creek and the Exchamsiks River (Bustard *et al*. 1992, and Bonwick *et al.* 1992). More recently, an in-depth fisheries assessment and a desktop review of valued ecosystem components was completed by Triton Environmental Consultants between Breccia and Polywog Creeks (2007a; 2007b). Finally, McElhanney completed a desktop environmental overview updating regulatory requirements and identifying information gaps for development between Andesite and Polywog Creeks (2013).

Since the completion of the previous assessments, three conceptual design options have been shortlisted and their proposed footprints refined allowing assessment of potential development impacts to be further focused and updated. Because the most recent field assessments were completed eight years prior, there was a potential for changes in stream channels and fish distribution. Additionally, recent amendments to federal fisheries legislation and updates to wildlife species conservation designations suggested that the valued component lists and identification of potential impacts to project constraint planning should be revisited.

The following document identifies the potential impacts of each of the three remaining conceptual design proposals for the transportation corridor realignment and overpass construction at Mile 28 on Highway 16 west of Terrace, BC. The assessment relies heavily on historic data but also includes some current assessments when justified by lack of historic data or the potential for a changed conditions to require re-assessment.

This report is constructed to address fisheries, wildlife, and additional environmental values. Within each section the background information and new information is presented and potential impacts, permitting and mitigation is discussed. Each is completed with a summary table for that value when justified by potential concerns. Also note that this report makes reference to the three current options up for discussion: Option VA1A, Option VAP2, and Option OPT9. A detailed description of these options, not pertaining to environmental risks, is not within the scope of this assessment nor is the impact assessment of ancillary construction areas not identified with these options.

Fish and Fish Habitat

Methods

Using the information associated with each of the shortlisted designs, fish inventory sampling was completed for all water bodies occurring within the proposed footprints. This allowed for detailed investigation of any potential impacts to fish and fish habitat, and determination of the regulatory implications of each design option. The highway right of way was walked for the entire length of the project footprint to identify any fish habitat and stream crossings. Available data on stream locations, fish distribution and culvert data were obtained from previous studies, and public and private mapping databases. Where sufficient water was present, gee type minnow traps were used to sample for fish presence for all water bodies upstream of the highway and rail grades. At each water body, the highway or rail grade was surveyed for culvert presence. Fish presence was assumed in the downstream reaches of all streams, due to their situation on the Skeena River floodplain. The quality of fish habitat was not assessed for areas on the south side of the highway and rail grades during this site investigation.

Results

Eight stream crossings were identified within the study area by Triton (2007a) but only 4 were considered to have fisheries habitat or the potential for fish. During on site investigation, results supported Triton's conclusions and only four waterbodies were identified with potential fish habitat (Figure 1). Fish habitat values within the Skeena River were not assessed during our field investigations. Previous fisheries assessments found no spawning sites along the Skeena's right bank within the project footprint (Bonwick *et al*. 1992).

Site 1 (LKI 104.34; Triton 2007b), consisted of a large pond north of the highway grade and west of the existing level crossing site, providing good rearing and refugia and moderate overwintering habitat, but no spawning habitat. A perennial stream drains the confined valley north of the highway and begins to form a pool approximately 70 m north of the highway. The pond runs south toward the highway, then approximately 150 m along the toe of the grade. Fish sampling at this site identified juvenile coho salmon (*Oncorhynchus kisutch*), Dolly Varden (*Salvelinus malma*) and threespine stickleback (*Gasterosteus aculeatus*). No culverts were identified crossing the highway or rail grade at this site, limiting fish passage.

Site 2 (LKI 104.94–105.00; Triton 2007b), consisted of a ponded area approximately 70 m in length on the north side of the rail grade, providing good rearing and refugia, poor overwintering, and no spawning habitat. This pond appears to have been formed during railway construction as a result of a steep rock cut. As such, there is no available fish habitat upstream of the pond. Fish sampling at this site identified juvenile coho salmon and threespine stickleback. No culverts were identified crossing the highway or rail grade at this site, limiting fish passage.

At Site 3, a defined channel was identified, but the stream gradient and water level precluded the presence of fish.

Site 4 (LKI 105.62; Triton 2007b), consisted of a large pond (approximately 500 m^2 area) north of the rail grade that provided good rearing and refugia and moderate overwintering habitat, but no spawning habitat. Similar to Site 1, a stream drains a confined valley north of the railway and creates a triangular pool that runs along approximately 40 m of the rail grade toe. Sampling at this location identified juvenile coho salmon and threespine stickleback, as well as a pair of

subadult northwestern salamanders (*Ambystoma gracile*). No culverts were identified crossing the highway or rail grade at this site, limiting fish passage.

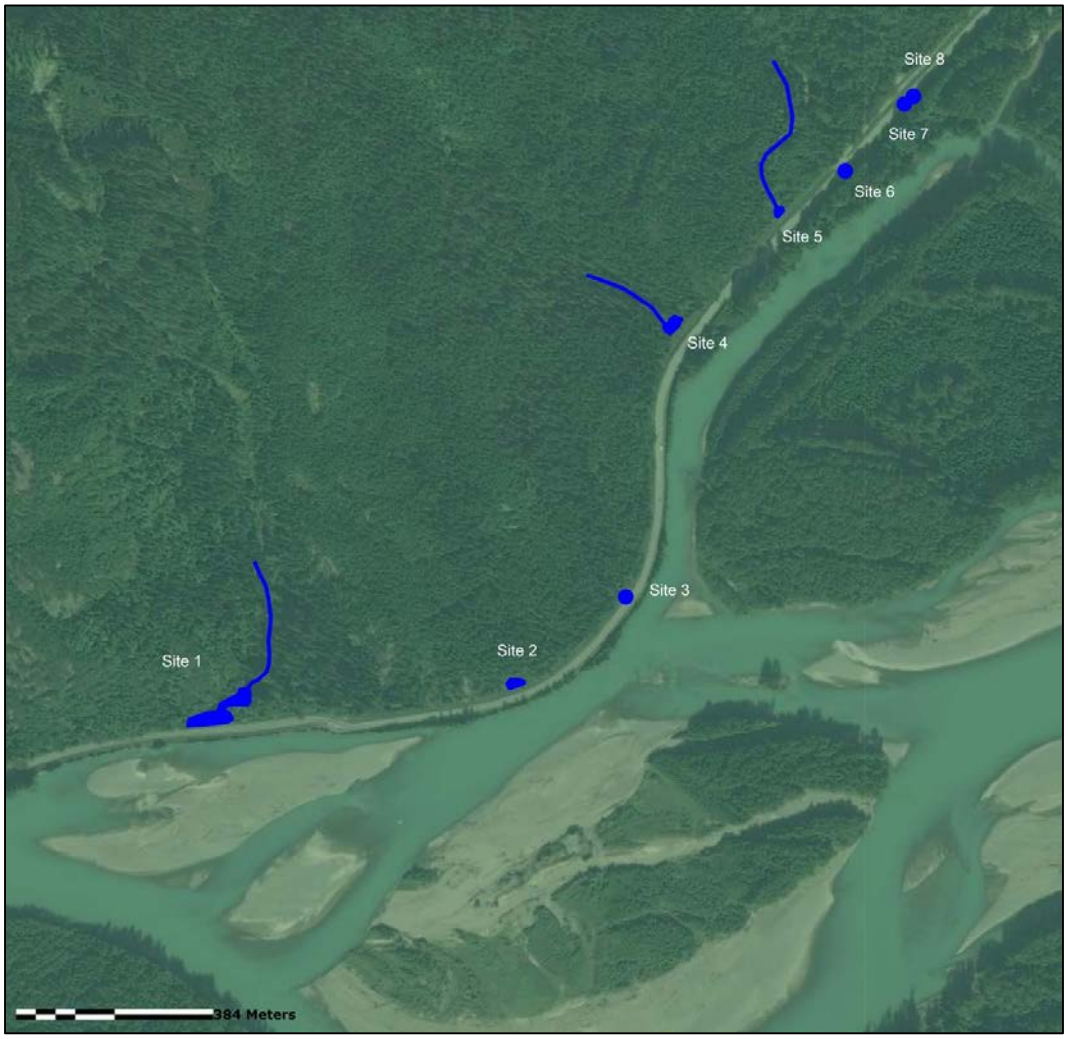

Figure 1. Aerial overview of water bodies and stream crossing sites identified and assessed within the proposed project footprint for the Highway 16 Mile 28 realignment west of Terrace, BC.

Site 5 (LKI 106.00; Triton 2007b), consisted of a small pond situated on the north side of the rail grade, opposite the Dumont boat launch site. This pond was formed by pooling of a shallow, fine-substrate stream that drained the floodplain forest north of the highway. However, it was unclear whether this location would be perennially watered, as heavy rains in the days prior to the site investigation may have increased water levels. If perennial, this site could provide moderate value refugia and poor rearing habitat, but does not provide suitable overwintering or spawning habitat. No fish were caught at this location and no culverts were identified crossing the rail or highway grade; however, seasonal fish presence could not be precluded, as the highway and rail grades did not provide a barrier to fish passage from the Skeena River.

Sites 6 through 8 had corrugated steel pipe culverts crossing the highway and rail, but did not have defined channels upstream of the grades, and no water was present during site investigations.

Table 1. Results of fish stream assessment and fish inventory within the footprints of the three design options.

Site	Location (LKI*)	Stream Class	Culvert	Inventory Results	Habitat Type and Quality
1	104.34	FBW	None	CO/DV/ TSB	Moderate overwintering, good rearing, good refugia
2	104.97	FBW	None	CO/TSB	Poor overwintering, good rearing, good refugia
3	105.24	S6**	None	N/A	None
4	105.62	FBW	None	CO/TSB	Moderate overwintering, good rearing, good refugia
5	106.00	FBW	None	NFC	No overwintering, poor rearing, moderate refugia
6	106.20	NCD	CSP	N/A	None
7	106.56	NCD	CSP	N/A	None
8	106.62	NCD	CSP	N/A	None

* Triton 2007b, ** MoF 1998.

FBW – fish-bearing water, NCD – non-classified drainage, CO – coho, DV – Dolly Varden, CSP – Corrugated steel pipe, TSB – threespine stickleback

Potential Impacts

All three of the conceptual design options are expected to have a similar impact on fisheries values at Site 1. Highway grade expansion to the north is anticipated to require infilling of a 15 m wide section of the pond over approximately 150 m of the alignment, though the majority of the pond will not be impacted.

Option VAP1A is anticipated to have the largest impact to the fish habitat assessed. This design requires complete infill for Sites 2, 4 and 5. Additionally, there is potential for grade expansion on the south side of the highway to require expansion of erosion protection works into the Skeena River.

Option VAP2 appears to have the lowest potential impact to Sites 2, 4 and 5, but may also widen the highway grade's eastbound lane east of the bridge, which would require expansion of erosion protection works into the Skeena River.

Option OPT9 would also require complete infill of the pond at Site 2. However, this design is not expected to impact Sites 4 or 5. In addition, this design does not appear to require expansion of erosion protection along the Skeena River.

Potential impacts to the mainstem of the Skeena River were difficult to assess using the drawings provided. If widening, and thus extension of erosion protection, is required east of the bridge for either option VAP1A or VAP2, additional fish habitat assessment should be completed to identify potential impacts to spawning habitat.

Permitting Requirements

In British Columbia, changes in and about a stream are regulated under the federal *Fisheries Act* and the provincial *Water Act*. Provincially, instream works are regulated under Section 9 of the provincial *Water Act*. Provincial permitting requirements for Works In and About a Stream will depend upon the nature of the activities. Authorization will be required for any watercourses, waterbodies, or channels that are expected to be impacted during construction, whether containing water or not. Where works within a stream can be restricted to the installation or extension of a culvert in a defined channel, a Section 9 Notification would be sufficient to receive authorization to proceed. However, if works will require more extensive instream disturbance, such as the encroachment of the highway or rail grade into a pond, a Section 9 Approval would be necessary.

Federally, Section 35 of the *Fisheries Act* prohibits serious harm to fish that are part of a commercial, recreational of Aboriginal fishery, or that support such a fishery. Serious harm to fish is defined as the death of fish or any permanent alteration to, or destruction of, fish habitat. Where the potential to cause serious harm to fish cannot be fully avoided or mitigated, authorization to carry out the work may be granted under Subsection 35(2) of the Act, in accordance with prescribed conditions. Prescribed conditions generally include offset measures intended to counterbalance the loss of fish habitat and fisheries productivity. While replacement of the same type of habitat within the same watercourse may be the most desirable offsetting strategy, habitat improvements at other sites or for other species may be more suitable in other situations. Preferred offset measures depend upon the contribution of the relevant fish to the ongoing fisheries productivity, as well as fisheries management objectives and priorities.

Compensation Opportunities

When approaching a project that has potential to result in serious harm to fish, Fisheries and Oceans Canada (DFO) recommends a three part hierarchy to ensure fish habitat and fisheries productivity are protected. Proponents are required to demonstrate that considerations have been made to first avoid, then mitigate, and finally offset any impacts to fish habitat and/or productivity. The ongoing evolution of the Ministry's plans to upgrade the level crossing at Mile 28 on Highway 16 has included the removal of certain design options based on potential impacts to critical spawning habitat in the Andesite and S-bend side channels (Bonwick *et al.*1992). As such, demonstration of attempts to avoid impacts to fisheries values should not be a concern. Furthermore, mitigation of potential impacts to fish can include the use of best management practices and timing windows.

The third part of the fisheries protection hierarchy involves compensation, or offsetting, of residual impacts that cannot be fully avoided or mitigated. Preferred offsetting strategies vary, depending on regional fisheries objectives and the priorities of regulatory bodies. These measures can often include improved access across anthropogenic barriers such as transportation corridors. While no potential spawning habitat was observed upstream of the identified barriers, several upstream areas likely serve as good refugia, rearing and overwintering habitat. Fish inventory results indicate that some fish passage is already occurring through the coarse ballast of the highway and rail grades, though installation of culverts would greatly improve connectivity to fish habitat upstream of the highway and rail grades.

The potential for onsite compensation will depend upon which design option is selected. If option VAP1A is selected, opportunities for cost effective onsite compensation are relatively limited, as

all four water bodies with fish habitat will be impacted. Onsite compensation may be possible through habitat reconstruction and restoration; however, the costs of satisfying the regulatory requirements for no net loss of fisheries productivity could be relatively high. Alternatively, more cost effective compensation opportunities may be available in nearby offsite locations.

For options OPT9 and VAP2, the avoidance of fish habitat at some of the sites would likely present cost effective onsite compensation opportunities. For example, the installation of fish passable drainage structures through the highway and rail grades at Sites 4 and 5 (for OPT9 and VAP2) and Site 2 (for VAP2) would improve productivity and habitat access. This may be sufficient to satisfy regulatory requirements.

Additional Listed Fish Species

Two fish species are provincially blue-listed, and were identified by provincial databases as potentially occurring within the study area. Eulachon (*Thaleichtys pacificus*) spawning occurs in the Skeena River mainstem, downstream of the Kasiks River. Bull trout (*Salvelinus malma*) could potentially occur within the study area, but were not identified during fish inventory and are usually found in deep pools in cold rivers and large tributaries. Neither species is considered at risk within any of the three 0ptions.

Wildlife

Four vertebrate wildlife species were prioritized for assessment of suitable habitat and potential impacts from the shortlisted design options. Field investigations assessed ungulate winter range for mountain goat (*Oreamnos americanus*) and moose (*Alces alces*), roosting and hibernacula habitat for the little brown myotis (*Myotis lucifugus*), and rearing and breeding streams for the coastal tailed frog (*Ascaphus truei*). Field assessments were followed by analysis of potential impacts from each design option, and possibility for associated project constraints.

A provincial database search for provincially or federally listed wildlife species that could occur within the region identified several additional species that were not included in the prioritized assessments. However, some of these species should still be considered for potential impacts and project constraints (Appendix I – Table 1). Additionally, the provincial *Wildlife Act* provides year-round protection for the nests of a number of raptors that could occur within the study area.

Mountain Goat

Mountain goats are a regionally important species in northwest BC and have recently been designated to the provincial blue-list. Mountain goat management focuses on the identification and protection of mountain goat winter range. Mountain goat ungulate winter range (UWR) polygons are legally designated, and development adjacent are subject to prescribed general wildlife measures. These measures are primarily focused on habitat protection, access management, and avoidance of goat disturbance during high risk timing windows. They may apply to activities carried out within 500 m or 2 km of legally designated UWR, depending on the associated level of disturbance.

Aerial mountain goat surveys were conducted during initial environmental assessment of the project area, and found healthy a goat population throughout the mountain range north of the proposed project footprint (Bonwick *et al*. 1992). More recently, mountain goat winter range mapping was completed for the Kalum Forest District, resulting in the establishment of UWR Order u-6-001 (MoE 2005). Within 2 km of the proposed footprint of the three designs, there are

two legally designated UWR polygons, although neither of the polygons is situated within 500 m of the proposed works. However, based on Resource Selection Probability Functions used during the winter range mapping, additional potential winter range not included within the legally designated UWR has been identified within 500 m of the west end of the study area (MoE 2008). To ensure avoidance of impacts to wintering mountain goats, further field investigation was completed to assess potential habitat adjacent to the study area and identify evidence of use.

Where safely accessible, rock outcrops and cliffs within 500 m of the proposed footprints were assessed for gradient, aspect, and rock characteristic to determine escape terrain suitability (Figure 2). Additionally, surrounding forested areas were assessed for canopy characteristics and forage availability. While field investigation of the accessible areas of potential winter range near the west end of the project footprint found no evidence of mountain goat use, much of the area could not be safely accessed. Furthermore, given the suitability of the habitat assessed and its proximity and connectivity to verified mountain goat winter range, the potential for mountain goat presence within 500 m of the project area could not be ruled out.

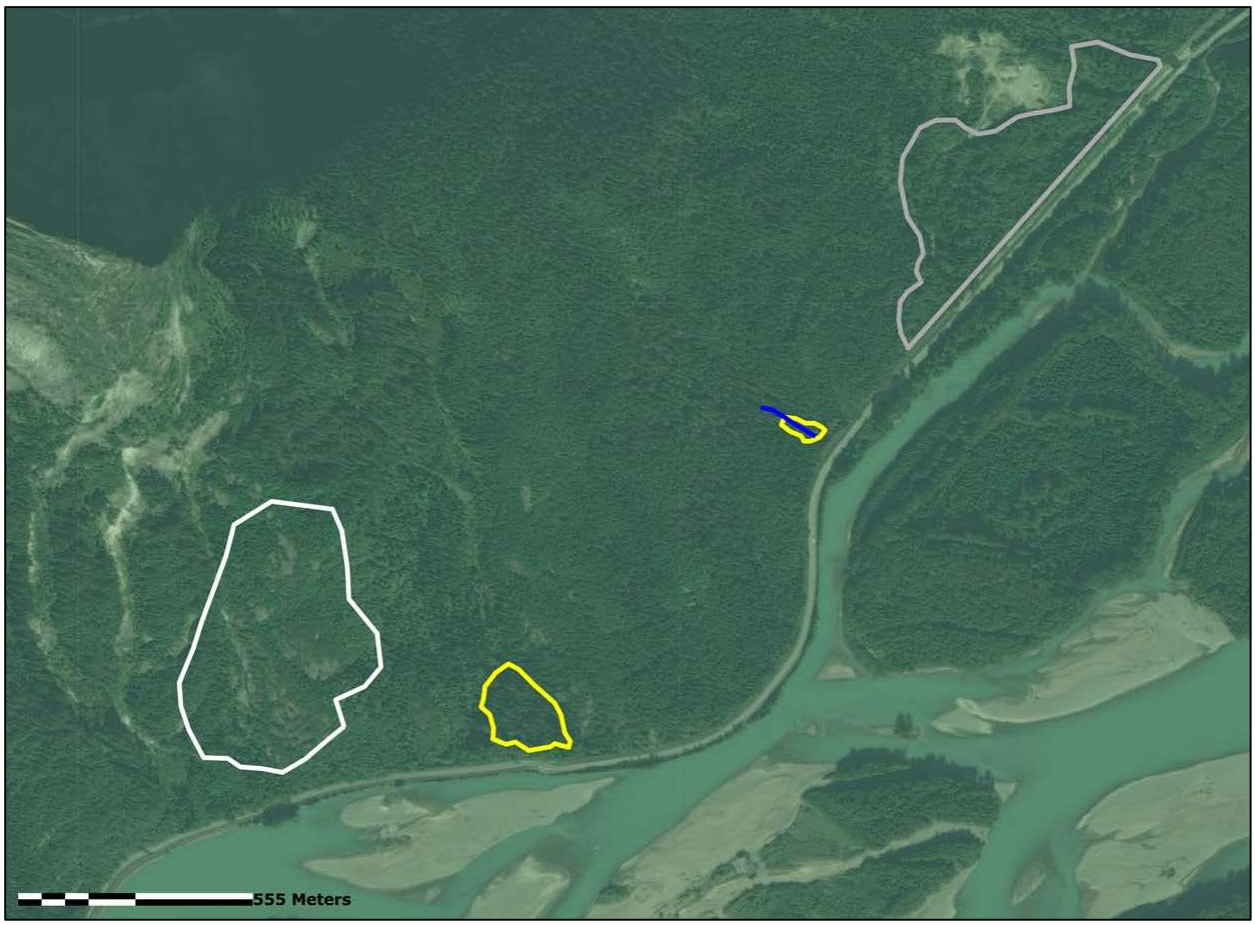

Figure 2. Aerial overview of wildlife habitat assessment results in and adjacent to the project footprint, including suitable mountain goat (white) and moose (grey) winter range within 500 m, a potential tailed frog stream (blue), and mature or old growth forested stands that could provide bat roost habitat (yellow).

While there is no potential for physical impacts to mountain goat winter range from any of the proposed alignments, there may be potential for disturbance of goats during winter construction

activities. The simplest method to mitigate potential mountain goat disturbance is to schedule high disturbance activities, such as blasting, outside of the critical and cautionary timing windows. If such activities cannot be scheduled outside of this period, disturbance can be mitigated through mountain goat disturbance monitoring. However, the implementation of mountain goat monitoring plans can be

While mitigation of potential impacts to goats is possible for all three design options, OPT9 presents some potential for scheduling delays if blasting is required between November 1 and June 15, depending on goat distribution at that time.

Moose

Moose are a provincially yellow-listed species and are protected under the *Wildlife Act*. They are considered a regionally important ungulate species, whose management focuses on the identification and protection of winter range, and avoidance of moose disturbance in the winter. Moose winter range requires a combination of suitable winter browse and canopy characteristics that provide snow interception. Such conditions are common on the floodplain of the Skeena River and in adjacent low elevation forests. Moose surveys during the initial environmental assessment of the project area identified the Skeena Islands downstream of the Exstew River as important winter range (Bustard *et al.* 1992). In addition, moose winter range in the lower Skeena Valley has been mapped for the legal designation of moose UWR. The proposed footprints for all three design options fall within moose UWR under Order u-6-009 (FLNRO 2015). However, detailed field investigation had not been previously completed within the project footprint.

Moose winter range was assessed during field investigations, both within and adjacent to the proposed footprints of the three design options (see Figure 2). Floodplain and rich receiving site forests were assessed for suitable vegetation and canopy characteristics, and surveyed for evidence of moose use, including pellets, browse, tracks, trails and antler rubs.

The segment of the footprint situated along the Skeena floodplain east of Site 4 provides two distinct ecosystem types; mid-bench floodplain in a young forest seral stage, and mature high-bench floodplain closer to the base of the slope. These two types provide a good combination of forage availability and snow interception; however, the adjacency of this area to a busy highway and railway corridor reduces the moose habitat value of this area substantially due to the constant disturbances. Furthermore, the abundance of suitable UWR elsewhere on the Skeena River floodplain likely limits the winter range value of this portion of the UWR. Field studies adjacent to the highway in the same area have indicated that the density of forage use increases proportional to the distance from the highway (Pollard 2004). Potential moose winter range was identified in the floodplain and rich receiving forests at Sites 1 and 3, which provide both forage availability and snow interception. Moose tracks and pellets were identified within the project footprint at both of these sites. However, the winter range value of these areas is limited by their small size and isolation from adjacent floodplain.

Options OPT9 and VAP2 are not anticipated to have a physical impact on moose winter range. Option VAP1A could potentially impact moderate value moose winter range, depending on the extent of clearing required along the floodplain near the Andesite gravel pit. However, little evidence of use was observed during the field investigation, and the proximity of the highway and rail suggests that this area is not important moose winter range. Additional potential impacts to moose for all three design options include disturbance during winter construction, though scheduling of clearing and other construction activities can mitigate these effects. It should be

noted that any moose winter range area disturbed during construction but not required to support the final infrastructure should be restored to original forest types to maintain the habitat values for moose.

Little Brown Myotis

While the little brown myotis is one of the most abundant bats in BC and is a provincially yellow-listed species, it recently received an emergency endangered listing on Schedule 1 of the federal *Species at Risk Act* (SARA). The harm or destruction of species designated as Threatened or Endangered, or their residences, is prohibited under the SARA (SARA 2002). The emergency listing of the little brown myotis was a response to steep declines of populations in eastern North America from the rapid spread of White-nose Syndrome, a fungal infection that can cause extremely high mortality in hibernating colonies (COSEWIC 2013). While White-nose Syndrome has not yet been documented in BC, the little brown myotis has become a high priority species for conservation. Of particular concern is the identification and protection of hibernacula for this species.

The hibernating behaviour of the little brown myotis is not well-documented in northwest BC. Elsewhere within the province, hibernacula records have been restricted to deep caves or abandoned mine shafts. Little brown myotis hibernacula tend to be well-established sites that are used perennially, and can contain up to tens of thousands of hibernating bats that migrate 50 to 200 km from summer roosts (Nagorsen and Brigham 1993). In addition, this species utilizes deep rock crevices and cavity trees for summer roosting and maternity colony sites.

The habitat distribution of the little brown myotis has not been previously assessed within or adjacent to the proposed footprints for the three design options. During field investigations, observations of features that could provide potential bat habitat, such as rock outcrops, crevices and wildlife trees were noted if observed.

While no suitable hibernacula sites were identified within or adjacent to the project footprint, established hibernacula sites are not well known in the region. However, bedrock at the site consists of granitic derived gneisses which is generally very strong and not susceptible to dissolution, or chemical degradation that could result in the formation of deep crevices or cavities in the rock (E. Contantinescu, pers. comm. October 19, 2015).

The damp conditions and standing water in the project area could provide good foraging habitat for bats. Furthermore, mature and especially old forest stands found in and adjacent to the project footprint could have large snags and cavity trees suitable for roosting habitat (see Figure 2). As such, construction activities requiring extensive clearing of such forests could potentially result in direct impacts to habitat used by the little brown myotis.

Potential for direct physical impacts to summer roost or maternity colony sites can be assessed and avoided using pre-construction roost surveys to determine the activity of potential habitats (RISC 1998). However, if active sites are found within the project footprint, there is potential for project delay. Potential for little brown myotis impacts, and associated project delays, can be mitigated by limiting the footprint of the project within mature or old growth forests, and scheduling clearing activities to occur between October 1 and May 15. All three design options are anticipated to have similar impacts to mature and old growth forest.

Coastal Tailed Frog

The coastal tailed frog (tailed frog) is a provincially blue-listed amphibian and is a species of Special Concern under SARA Schedule 1. Tailed frog conservation focuses on the identification and protection of rearing streams. These sites are typically cool, perennial mountain streams with coarse cobble substrate and step-pool morphology where tadpoles can take up to four years to develop.

Tailed frog presence and potential habitat distribution within the proposed footprints for the three design options had not been previously assessed. A total of five streams intersecting the study area were identified. Each stream was qualitatively assessed for tailed frog habitat and surveyed for tadpole presence. Stream surveys were completed by a team of two, covering a minimum of 100 m upstream of the existing highway and railway rights of way, with qualitative habitat assessment and light-touch surveys completed.

Of the five streams surveyed, only the stream feeding the pond at Site 4 (LKI 105.62; Triton 2007b) was identified to have useable tailed frog habitat (see Figure 2). This stream appears to be permanent, as aquatic insects were observed during surveys and no vegetation was growing within the wetted width. The cobble and pebble substrates within the stream provide interstitial spaces for tadpoles. The system also contains step-pool morphology from bedrock, boulders and debris within the stream. During the survey, three deeper pools were identified that would provide cover and refugia for tadpoles, if water levels were to decrease.

Although there was good habitat present for tailed frog larvae, no tadpoles were detected during the survey. The low elevation of the study area suggests that both tadpoles and ovipositioning sites would be restricted to higher elevation areas outside of the project footprint. As such, no potential impacts to tailed frog are anticipated for any of the three design options, if development is restricted to the proposed footprint.

Other Wildlife

A review of provincially or federally listed wildlife species that could occur within the region identified a variety of species that were not identified as valued components. However, some of these species should still be considered for potential impacts and project constraints (Appendix I – Table 4). Additionally, the provincial *Wildlife Act* provides year-round protection for the nests of a number of raptors that could occur within the study area. In addition, the active nests of all bird species are protected under the provincial *Wildlife Act* and the federal *Migratory Birds Convention Act*.

Birds

The *laingi* subspecies of the northern goshawk (*Accipiter gentilis*) is the only provincially red-listed bird species that could occur in the region. This subspecies is also listed as Threatened under SARA Schedule 1. While old-growth forests within and adjacent to the project footprint could provide suitable nest sites, goshawks generally avoid areas with high levels of human activity. Therefore, they are not anticipated to occur within the project footprint.

Three other wildlife species occurring in the region are listed as Threatened under SARA Schedule 1: the marbled murrelet (*Brachyramphus marmoratus*), common nighthawk (*Chordeiles minor*), and olive-sided flycatcher (*Contopus cooperi*). Marbled murrelet nesting habitat is generally restricted to old-growth forest within 30 km of the ocean and is unlikely to occur greater than 50 km inland (Env Can 2014). Furthermore, marbled murrelets require wide open approach

and departure lanes to access old growth canopies. While the project area provides some old growth forest that could present suitable nesting opportunities, the confined nature of the sites, the distance from the ocean, and the level of regular disturbance from the adjacency of the highway and rail corridors suggests that their presence is very unlikely.

The common nighthawk nests in open, vegetation-free habitats such as rocky outcrops and gravel pits (Env Can 2015a). Potential nesting habitat exists within the study area on rock outcrops and in the Andesite gravel pit.

The olive-sided flycatcher is most commonly found in relatively open coniferous or mixed forests with tall snags, adjacent to water and wetlands. While the riparian situation of the project area may present potentially foraging habitat, olive-sided flycatchers are most commonly found in areas where recent burns or cutblocks provide large open spaces (Env Can 2015b). While presence cannot be ruled out entirely, the project footprint is unlikely to be used as olive-sided flycatcher nesting habitat.

The remaining six provincially blue-listed bird species that could occur within the region are all listed under Special Concern on SARA Schedule 1. No suitable nesting habitat occurs within the project footprint for rusty blackbirds (*Euphagus carolinus*), black swifts (*Cypseloides niger*), or barn swallows (*Hirundo rustica*). The band-tailed pigeon (*Patagioenas fasciata*) has been known to forage for spilled grain along the rail line west of Terrace, so their presence within the project footprint is a possibility. Nesting habitat for band-tailed pigeons is highly variable, with the construction of a platform nest 4-10 m from the ground occurring in either shrubs or trees. As such, there is potential for band-tailed pigeon nesting to occur within the project footprint.

The *kennicottii* subspecies of the western screech-owl (*Megascops kennicottii kennicottii*) can be found in moist coniferous and mixed forests, but are most commonly associated with deciduous forests such as black cottonwood (*Populus trichocarpa*) stands. Nest sites typically utilize existing cavities from woodpecker excavations or other natural causes. While western screech-owl presence is possible within the project footprint, an abundance of more suitable nesting habitat is available on the Skeena River floodplain, making potential impacts to nest sites unlikely.

Great blue herons (*Ardea herodias fannini*) have been identified in the study area previously, though no nest sites have been observed in or adjacent to the project footprint. Herons often nest in large, conspicuous rookeries, though small colonies (less than 10 nests) or solitary nest sites appear more common in northern BC. Nest sites are usually found close to foraging habitat, though avoidance of disturbance from human activity may have a large influence on nest site selection. The presence of great blue heron nest sites within or adjacent to the project footprint cannot be dismissed; however, there is a low likelihood that nest sites would occur in close proximity to the existing highway and railway corridors.

Both bald eagles (*Haliaeetus leucocephalus)* and osprey (*Pandion haliaetus*) build large, conspicuous nests in trees or snags along major river systems such as the Skeena River. Well-established nest sites tend to be reused from year to year. Bald eagles were identified within the study area during field investigations and are known to forage along the Skeena most of the year. Osprey were not identified within the study area, though potential presence could not be dismissed. No nest sites of either species were identified within or adjacent to the study area, suggesting that impacts to either species are unlikely.

Mammals

Presence of important habitat for three provincially blue-listed mammals – the grizzly bear (*Ursus arctos horribilis*), wolverine (Gulo gulo luscus) and fisher (*Martes pennanti*) – is very unlikely (McElhanney 2013). Presence of individuals is possible, though all three species generally avoid areas with high levels of human activity.

Amphibians

The western toad (*Anaxyrus boreas*) is a provincially blue-listed amphibian species and SARA Species of Concern. This species breeds in low-lying perennial ponds, then migrates *en masse* to upland forests. Western toad breeding could occur in any of the slow-moving ponds on the north side of the highway and rail grades. Toad breeding may present potential for project delay, depending on the timing of instream construction activities.

Plants and Ecosystems

The study area is situated in the Coastal Western Hemlock biogeoclimatic zone. The project footprint itself is in a transition between the submontane variant of the very wet maritime (CWHvm1) and wet submaritime (CWHws1) subzones (Triton 2007a, McElhanney 2013, DataBC 2015). A review of provincially red- or blue-listed vascular plants potentially occurring within these local subzones identified one red- and five blue-listed plant species (BC Species and Ecosystem Explorer 2015). Of these, the whitebark pine is listed as Endangered on SARA Schedule 1, while no other plants were federally listed (Appendix I – Table 2). A review of the Species and Ecosystems Explorer also identified three red- and 13 blue-listed ecological communities that could potentially occur within the study area (BC Species and Ecosystem Explorer 2015; Appendix I – Table 3). At this time, no ecosystems are listed federally.

During terrestrial site investigations, wetlands and forests were assessed for the occurrence of listed lichens, vascular plants and ecological communities. While suitable habitat occurs within the study area for all five of the blue-listed vascular plants, none of the species were identified during field investigations. No suitable habitat was identified for the red-listed eminent bluegrass which normally occurs on marine sites with rapidly drained soils.

At Site 1, old growth forest that begins approximately 40 m north of the highway grade and extends up the confined valley to the north includes both the red-listed high-bench floodplain (CWHvm1/09) and blue-listed rich receiving site (CWHvm1/08) ecosystems (Figure 3). All three design options are anticipated to require some clearing of forested areas at this site. While disturbance of this area may be necessary to develop the highway right of way, restriction of excessive disturbance would help limit project impacts to these rare and endangered ecosystems. Both of these ecosystems were also identified at Site 4. Impacts to these sites are only anticipated for option VAP1A. No other red- or blue-listed ecosystems were identified within the project footprint.

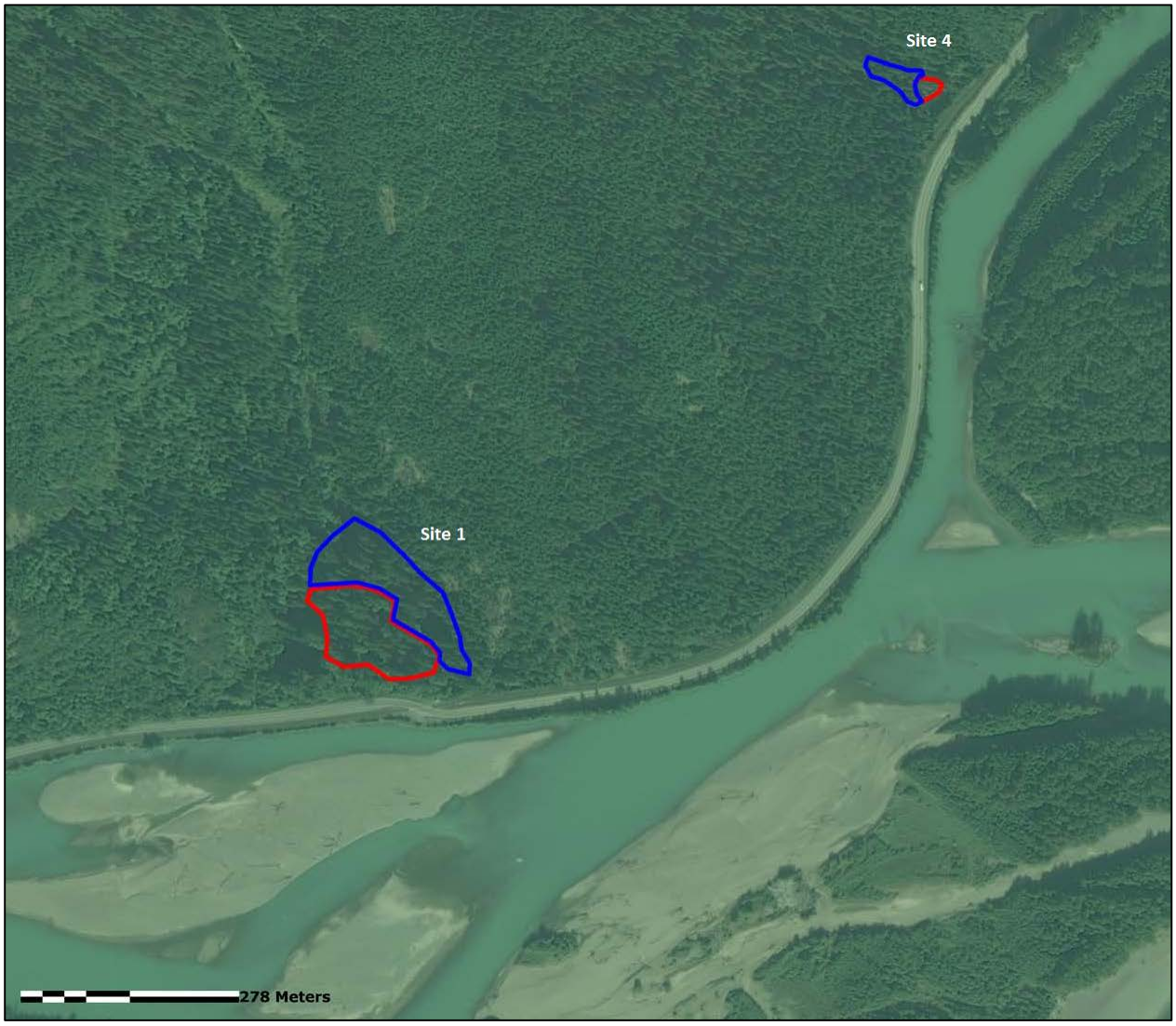

Figure 3. Aerial overview of red- and blue-listed ecosystem assessment results in and adjacent to the project footprint. Red-listed high-bench floodplain (red) and blue-listed rich receiving site (blue) ecosystems were identified at Sites 1 and 4.

Summary

The following is a summary of potential fish and wildlife impacts for each of the three shortlisted design options, and includes anticipated mitigation requirements and project constraints that may

OPT 9

Infill for OPT9 is anticipated to impact two fish habitat sites, totaling approximately 2150 m^2 (Table 2), while opportunities for onsite compensation include two sites for fish passage improvement. Clearing of advanced forest west of the level crossing may impact red- and blue-listed ecosystems, and would require roost surveys for little brown myotis (Table 3). No impacts are expected for moose or tailed frog habitat.

VAP1A

Infill for VAP1A is anticipated to impact all four fish habitat sites, totalling approximately 2700 m^2 (Table 2). Onsite compensation opportunities would likely be restricted to reconstruction of impacted habitat, which can be very costly. Alternate compensation opportunities may be available at nearby offsite locations. Clearing of advanced forest west of the level crossing and near station ST1059 may impact red- and blue-listed ecosystems, and would require roost surveys for little brown myotis (Table 3). Clearing east of station ST1061 would impact moose winter range and could result in seasonal moose disturbance, though habitat rehabilitation is possible. No impacts are expected for tailed frog habitat.

VAP2

Impacts to fish habitat from VAP2 appear to be restricted to infill at Site 1, totaling approximately 2000 m^2 (Table 2). Opportunities for onsite compensation include three sites where fish passage improvements sites would improve productivity. Clearing of advanced forest west of the level crossing may impact red- and blue-listed ecosystems, and would require roost surveys for little brown myotis (Table 3). No impacts are expected for moose or tailed frog habitat.

Table 2. Potential impacts to identified fish habitat from each shortlisted conceptual design option, and opportunities for onsite or offsite compensation. Water bodies and stream crossings that did not provide fish habitat are not included.

Option	Site 1	Site 2	Site 4	Site 5	Compensation Opportunities
OPT9	Partial Infill (2000 m^2)	Complete Infill (150 m^2)	None	None	Onsite passage improvements
VAP1A	Partial Infill (2000 m^2)	Complete Infill (150 m^2)	Complete Infill (500 m^2)	Complete Infill (50 m^2)	Onsite reconstruction, Offsite passage improvements
VAP2	Partial Infill (2000 m^2)	None	None	None	Onsite passage improvements

Table 3. Activities associated with each shortlisted conceptual design option that could result in impacts to wildlife.

Option	Mountain Goat	Moose	Little Brown Myotis	Coastal Tailed Frog
OPT9	Blasting – Seasonal Disturbance	None	Clearing – Habitat Impact, Seasonal Disturbance	None
VAP1A	Blasting – Seasonal Disturbance	Clearing – Habitat Impact, Seasonal Disturbance	Clearing – Habitat Impact, Seasonal Disturbance	None
VAP2	Blasting – Seasonal Disturbance	None	Clearing – Habitat Impact, Seasonal Disturbance	None

Conclusion

The potential for impacts to fish and wildlife habitat from the proposed realignment of Highway 16 at the Mile 28 level crossing west of Terrace, BC varies between the three shortlisted conceptual design options. Anticipated mitigation and compensation costs vary depending on requirements for clearing, blasting, and instream work; however all potential impacts of the three design options can be mitigated and/or offset.

Literature Cited

B.C. Ministry of Environment (MoE). 2005. Order – Ungulate Winter Range #U-6-001.

B.C. Ministry of Environment (MoE). 2008. Kalum 1:50,000 Predictive Goat Winter Range Mapping.

B.C. Ministry of Forests (MoF). 1998. Fish-stream Identification Guidebook. Victoria, B.C.

B.C. Ministry of Forests, Lands and Natural Resource Operations (FLNRO). 2015. Order – Ungulate Winter Range #6-009.

B.C. Species and Ecosystem Explorer. 2015. Ministry of Environment, Ecosystems Branch, Conservation Data Centre. [http://a100.gov.bc.ca/pub/eswp/] *Accessed August 26, 2015.*

Bonwick, G., *et al*. 1992. Highway 16: Exchamsiks River to Andesite Creek, Environmental Impact Assessment and Mitigation Recommendations. *Prepared for the* B.C. Ministry of Transportation and Highways.

Bustard, D., *et al.* Highway 16: Exchamsiks to Andesite Creek. Environmental Impact Assessment and Mitigation Recommendations. . Prepared for the B.C. Ministry of Transportation and Highways, Terrace, 1992.

COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus,* Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp.

DataBC. 2015. iMapBC 2.0. [http://www.data.gov.bc.ca/dbc/geographic/view_and_analyze/imapbc/index.page] *Accessed August 25, 2015.*

Environment Canada (Env. Can.). 2014. Recovery Strategy for the Marbled Murrelet (*Brachyramphus marmoratus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. v+49 pp.

Environment Canada (Env. Can.). 2015a. Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi+48 pp.

Environment Canada (Env. Can.). 2015b. Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi+51 pp.

Fisheries Act, R.S.C. 1985, c. F-14. Department of Justice Canada. [http://laws-lois.justice.gc.ca/PDF/F-14.pdf]. *Accessed October 12, 2015*.

McElhanney Consulting Services (McElhanney). 2013. Environmental Overview: Dumont Crossing. *Prepared for* Ministry of Transportation and Infrastructure. Prince George, B.C.

Migratory Birds Convention Act, S.C. 1994, c. 22. Department of Justice Canada.

Nagorsen and Brigham. 1993. *Bats of British Columbia*. Vancouver, BC. UBC Press and Royal British Columbia Museum.

Pollard, T.B. 2004. Moose Winter Range Management in the Skeena Floodplain. Contracted report to Small Business Forest Enterprises Program, Ministry of Forests, Terrace, BC.

Resource Inventory Standards Committee (RISC). 1998. Inventory Methods for Bats: Standards for Components of British Columbia's Biodiversity No. 20. Ministry of Environment, Lands and Parks. Victoria, BC.

Species at Risk Act, S.C. 2002, c. 29. Department of Justice Canada. [http://laws-lois.justice.gc.ca/PDF/S-15.3.pdf]. *Accessed October 12, 2015*.

Triton Environmental Consultants (Triton). 2007a. Highway 16: Polywog Creek to Breccia Creek, Environmental Assessment Report: Identification and Assessment of Valued Ecosystem Components. *Prepared for* B.C. Ministry of Transportation.

Triton Environmental Consultants (Triton). 2007b. Highway 16: Polywog Creek to Breccia Creek, Detailed Fisheries Assessment. Prince George, B.C.: *Prepared for* B.C. Ministry of Transportation.

Water Act, RSBC 1996, c. 483. [http://www.bclaws.ca/civix/document/id/complete/statreg/96483_01]. *Accessed October 12, 2015.*

Wildlife Act, RSBC 1996, c. 488. [http://www.bclaws.ca/Recon/document/ID/freeside/00_96488_01]. *Accessed October 12, 2015.*

Appendix 1: BC Species and Ecosystems Explorer Listed Species and Ecosystems

Table 4. Provincially and federally listed vertebrate animals identified by the provincial database as potentially occurring in the study area, including, preferred habitat, and the potential for presence within the project footprint.

Species	Scientific Name	BC/SARA Listing	Habitat	Presence
Northern goshawk	*Accipiter gentilis laingi*	Red/Threatened	Nest/forage in old growth forest	Possible
Great blue heron	*Ardea herodias fannini*	Blue/Special Concern	Nest in mature riparian forest	Confirmed
Band-tailed pigeon	*Patagioenas fasciata*	Blue/Special Concern	Forage along railway corridor	Possible
Western screech-owl	*Megascops kennicottii kennicottii*	Blue/Special Concern	Moist coniferous forest; nest in cavity trees	Possible
Rusty blackbird	*Euphagus carolinus*	Blue/Special Concern	Grassland	Unlikely
Olive-sided flycatcher	*Contopus cooperi*	Blue/Threatened	Open forest near water bodies	Possible
Marbled murrelet	*Brachyramphus marmoratus*	Blue/Threatened	Old growth forest w/in 50 km of coast	Unlikely
Black swift	*Cypseloides niger*	Blue	Cliffs and waterfalls	Unlikely
Barn swallow	*Hirundo rustica*	Blue	Eaves of buildings	Unlikely
Common nighthawk	*Chordeiles minor*	Blue/Threatened	Gravel pits, rock outcrops	Possible
Little brown myotis	*Myotis lucifugus*	Yellow/Endangered	Caves, mines, rock crevices, tree cavities	Possible
Grizzly bear	*Ursus arctos horribilis*	Blue	Varies widely; avoids human activity	Unlikely
Wolverine	*Gulo gulo luscus*	Blue	Varies widely; avoids human activity	Unlikely
Fisher	*Martes pennanti*	Blue	Advanced forests; avoid human activity	Unlikely
Mountain goat	*Oreamnos americanus*	Blue	Cliffs, steep rocky outcrops, adjacent to forests	Confirmed
Caribou	*Rangifer tarandus*	Blue/Special Concern	Boreal plains	Dismissed
Western toad	*Anaxyrus boreas*	Blue/Special Concern	Vegetated ponds	Confirmed
Coastal tailed frog	*Ascaphus truei*	Blue/Special Concern	Mountain streams	Unlikely
Bull trout	*Salvelinus confluentus*	Blue	Deep pools in large tributaries	Possible
Eulachon	*Thaleicthys pacificus*	Blue	Lower Skeena River mainstem	Dismissed

Table 5. Provincially and federally listed vascular plants identified by the provincial database as potentially occurring in the study area, including the required habitat subtypes and the potential for presence within the project footprint.

Species	Scientific Name	BC/SARA Listings	Habitat Subtype	Potential Presence
Vascular Plants				
Kamchatka spike-rush	*Eleocharis kamtschatica*	Blue	Marsh; Meadow; Pond/Open Water	Yes
Hornemann's willowherb	*Epilobium hornemannii* ssp. *behringianum*	Blue	Swamp; Marsh; Riparian Shrub; Stream/River; Meadow; Riparian Herbaceous	Yes
White adder's-mouth orchid	*Malaxis brachypoda*	Blue	Riparian Forest; Rock; Moist-Wet Conifer Forest	Yes
Bog adder's-mouth orchid	*Malaxis paludosa*	Blue	Swamp; Moist-Wet Conifer Forest	Yes
Whitebark pine	*Pinus albicaulis*	Blue/ Endangered	Cliff; Rock; Mesic-Dry Conifer Forest	Yes
Eminent bluegrass	*Poa eminens*	Red	Beach; Intertidal Marine	No

Table 6. Provincially red- or blue-listed ecosystems identified by the provincial database as potentially occurring in the study area, including site series and potential or documented presence within the project footprint

Ecological Community	Scientific Names	Site Series	BC List	Ecosystem Type	Presence
Amabilis fir – Sitka spruce/ devil's club	*Abies amabilis – Picea sitchensis/Oplopanax horridus*	CWHvm1/08	Blue	Rich receiving site	Confirmed
Amabilis fir – western redcedar/ devil's club	*Abies amabilis – Thuja plicata/Oplopanax horridus*	CWHws1/06	Blue	Rich receiving site	Possible
Amabilis fir – western redcedar/oak fern	*Abies amabilis – Thuja plicata/Gymnocarpium dryopteris*	CWHws1/04	Blue	Lower slope rich site	Possible
Black cottonwood – red alder/ salmonberry	*Populus trichocarpa – Alnus rubra/Rubus spectabilis*	CWHvm1/10; CWHws1/08	Blue	Mid-bench floodplain	Possible
Labrador-tea/ western bog-laurel/peat-mosses	*Rhododendron groenlandicum/Kalmia microphylla/Sphagnum* spp.	CWHvm1/Wb50	Blue	Bog	Unlikely
Shore sedge – buckbean/ peat-mosses	*Carex limosa – Menyanthes trifoliata/Sphagnum* spp.	CWHws1/Wb13	Blue	Bog	Unlikely
Sitka willow/ Sitka sedge	*Salix sitchensis/Carex sitchensis*	CWHvm1/Ws06	Blue	Swamp	Possible
Western redcedar – Sitka spruce/ skunk cabbage	*Thuja plicata – Picea sitchensis/Lysichiton americanum*	CWHvm1/14 CWHws1/11	Blue	Swamp forest	Possible
Western redcedar – western hemlock/sword fern	*Thuja plicata – Tsuga heterophylla/Polystichum munitum*	CWHvm1/04	Blue	Rich dry site	Possible
Western hemlock – amabilis fir/deer fern	*Tsuga heterophylla – Abies amabilis/Blechnum spicant*	CWHvm1/06	Blue	Medium wet site	Possible
Western hemlock – western redcedar/ salal	*Tsuga heterophylla – Thuja plicata/Gaultheria shallon*	CWHvm1/03	Blue	Medium-poor dry site	Possible
Western hemlock – lodgepole pine/ red-stemmed feathermoss	*Tsuga heterophylla –Pinus contorta/Pleurozium schreberi*	CWHws1/03	Blue	Rich dry site	Possible
Buckbean – slender sedge	*Menyanthes trifoliata – Carex lasiocarpa*	CWHws1/Wf06	Blue	Wetland fen	Unlikely
Sitka sedge/peat-mosses	*Carex sitchensis/Sphagnum* spp.	CWHvm1/Wf51	Red	Wetland fen	Unlikely
Dune wildrye – beach pea	*Leymus mollis – Lathyrus japonicus*	no site series	Red	Marine beach	Dismissed
Sitka spruce/ salmonberry	*Picea sitchensis/Rubus spectabilis*	CWHvm1/09; CWHws1/07	Red	High-bench floodplain	Confirmed
Lodgepole pine/ kinnikinnick	*Pinus contorta/Arctostaphylos uva-ursi*	CWHws1/02	Red	Xeric site	Possible