Narrows Inlet Hydro Project

Environmental Assessment Certificate Amendment Application #4 to EAC #E13-04

Prepared for:

tems sayamkwu Limited Partnership
200, 2723-1 Street SW
Calgary, AB, T2G 4Y8

December 19, 2016

Prepared by:

Ecofish Research Ltd.

ECOFISH RESEARCH

Published by Ecofish Research Ltd., Suite F, 450 8th St., Courtenay, B.C., V9N 1N5

Citation:

Lacroix, D. and H. Regehr. 2016. Narrows Inlet Hydro Project Environmental Assessment Certificate Amendment Application #4 to EAC #E13-04. Consultant's report prepared for Narrows Inlet Hydro Holding Corp. by Ecofish Research Ltd, December 19, 2016.

Certification: *Stamped version on file*

Senior Reviewer:

Deborah Lacroix, M.Sc., R.P. Bio. No. 2089

Senior Ecologist/Project Manager

Technical Leads:

Deborah Lacroix, M.Sc., R.P. Bio. No. 2089

Senior Ecologist/Project Manager

Heidi Regehr, M.Sc., Ph.D., R.P.Bio.

Wildlife Biologist

Disclaimer:

This report was prepared by Ecofish Research Ltd. for the account of tems sayamkwu Limited Partnership (previously Narrows Inlet Hydro Holding Corp.). The material in it reflects the best judgement of Ecofish Research Ltd. in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Ecofish Research Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions, based on this report. This numbered report is a controlled document. Any reproductions of this report are uncontrolled and may not be the most recent revision.

EXECUTIVE SUMMARY

In accordance with Section 19(1) of the BCEAA, the Certificate Holder (tems sayamkwu Limited Partnership, previously Narrows Inlet Hydro Holding Corp.) is applying for an amendment that is material in scope to revise Schedule A (Certified Project Description (CPD)) of the Environmental Assessment Certificate (EAC) for the Narrows Inlet Hydro Project (the Project). Proposed changes include modifying the Project Boundary, the transmission line Right of Way (ROW), and the location of one intake, and to change the classification of one access road from temporary to permanent. Revision of the CPD is required for changes in location that cause an incursion outside the approved Project Boundary and/or the 100 m infrastructure location leeway provided in the CPD that allows flexibility for fine-scale location adjustment and also for a change in the classification of infrastructure as specified in CPD maps. Because the EAC reflects the conclusions of the EAC Application on which the Ministers based their decision to grant Project approval, any change to the CPD requires that the potential consequences of the proposed change to the conclusions of the Applications be evaluated. The objectives of this report are to: 1) evaluate the key potential effects identified during the Environmental Assessment (EA) process that may interact with the proposed changes to the CPD; 2) evaluate the effectiveness of prescribed mitigations measures in mitigating potential Project effects in light of proposed changes and recommend additional mitigation, if necessary; and 3) evaluate whether conclusions of the Project's Application for an EAC (the Application) with respect to the residual effects, characterization of residual effects, and determination of significance differ given the requested changes to the CPD.

Changes to the transmission line alignment are requested for three Project Components: the Substation and Transmission Component, the Upper Ramona Component, and the Chickwat Component. Changes in the Upper Ramona and Chickwat components are requested to shorten the line and, as requested by the shíshálh Nation, to avoid archeological sites and adhere more closely to existing infrastructure. For the Upper Ramona Component, an increase in the infrastructure location leeway to 150 m is also requested for a short section of the alignment to allow fine scale avoidance of archeological sites. Requested changes to the Substation and Transmission Component include minor changes to shorten the line on the west side of Sechelt Inlet, an alternative alignment on the east side of Sechelt Inlet to address private property requirements, and an alternative alignment of the submarine cable to provide an additional option that would increase cable longevity, as well as improve cable laying safety and logistics. Because the exact positions of the cable crossing locations cannot be determined at this stage, a "cable corridor" has been defined that will contain the final cable footprint. Additional flexibility is also requested for the location of the cable entry point, and the associated final portion of the transmission line, on the east side of Sechelt Inlet to allow selection of appropriate substrate for cable installation.

Modification of the intake location is requested for the Lower Ramona Component R1 (Marten - s-p'il-us Creek) tributary tap. The requested location is geologically superior because the currently approved intake location is in a geologically unfavourable area that would require additional structures and an unnecessarily large footprint.

Change in classification from temporary to permanent is requested for the tunnel portal access road of the Upper Ramona Component. Final analysis indicated that the second road to the tunnel portal, which is currently approved as a permanent road, is not needed, and reduction in road requirements from two roads to one in this location is more efficient and entails substantial environmental benefits.

The proposed changes in transmission line alignments interact with Environmental Disciplines and Social and Economic Disciplines. For the Environmental Disciplines, interactions with VCs are due to the change in transmission line Right of Way (ROW) footprint that has the potential to affect the evaluation of impacts to terrestrial, riparian, or marine substrate habitat. Transmission line installation and maintenance, where the ROW crosses watercourses, result in riparian habitat losses which may in turn affect water quality; thus, potentially affecting the evaluation of potential effects for Fish Habitat and Water Quality VCs from the Freshwater Fish and Fish Habitat Environmental Discipline. All five VCs from the Terrestrial Wildlife and Vegetation Environmental Discipline (Vegetation, Invertebrates, Amphibian & Reptiles, Birds, and Mammals) may interact with the proposed changes in transmission line alignment because the newly proposed alignments traverse different terrestrial habitat and riparian habitat from that evaluated in the EA. The addition of an alternative alignment for the submarine cable and increased flexibility in the location of the cable entry point on the eastern shore of Sechelt Inlet may affect VCs from the Marine Fauna and Habitat Environmental Discipline because a change in cable alignment may impact the quantity and/or quality of marine substrate habitat impacted, and therefore also vegetation and benthic marine invertebrates associated with this habitat, as well as Marine Birds that forage on the water surface. Interaction with the Social and Economic Discipline was identified for the Substation and Transmission Component because the alternative transmission line alignment on the east side of Sechelt Inlet may affect the evaluation of impacts to visual quality. Changes that affect terrestrial and riparian habitats have the potential to impact EA conclusions during both construction (when vegetation clearing occurs) and operations (when vegetation maintenance occurs). Potential consequences of changes to the submarine cable alignment is relevant only during construction because cable maintenance needs are negligible. Potential visual quality impacts resulting from changes in transmission line alignment are relevant to both construction and operations.

Changes in the location of the tributary intake for the Lower Ramona Component and the classification of an access road for the Upper Ramona Component have the potential to interact only with Freshwater Fish and Fish Habitat VCs and Terrestrial Wildlife and Vegetation VCs because aquatic, riparian, and terrestrial habitat is affected by intake and road construction and impacts to these habitats may differ relative to those of the approved design. A change in the tributary intake location is relevant to the construction phase and the reclassification of an access road is relevant to both construction and operations.

Substation and Transmission Component

Three of the proposed transmission line alignment changes of the 138 kV transmission line, part of the Substation and Transmission Component, involve stream crossings. The proposed changes in alignment on the west side of Sechelt Inlet are minor in location and in the amount of riparian habitat affected, and there is also little change in the amount of riparian habitat affected by the alternative alignment on the east side of Sechelt Inlet, where two tributary crossings at a higher elevation are required instead of one. In total, 0.04 ha of riparian habitat is additionally impacted from all stream crossings for the new proposed alignment, but the riparian habitat value of the habitat impacted is decreased. Thus, and in light of the mitigation measures prescribed in the EA and subsequent Updated Aquatic Effects Assessments (AEA) for the Chickwat and Upper and Lower Ramona components, these changes do not affect the conclusions of the EA for Freshwater Fish and Fish Habitat VCs for either construction or operations. Considering the similarity of the assessment and approach, there are also no changes to the conclusions of the EA in the evaluation of residual effects for the Coastal Tailed Frog key indicator of the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC from the Terrestrial Wildlife and Vegetation Environmental Discipline.

Potential effects of Habitat Loss, Habitat Change, Change in Behaviour, Increased Mortality were evaluated for all Terrestrial Wildlife and Vegetation VCs in light of the proposed changes in transmission line alignment. However, terrestrial footprints of the two alignments are almost identical in size and differences in forest age classes affected are small. Although the new alignment overlaps an additional 0.51 ha of class 8 (141-205 years old) forest, it also overlaps 0.29 ha less mature forest (101-141 years old), and both alignments have greatest impacts to forests younger than 80 years that have less value than mature forests. There is also little difference between alignments in the quantity or quality of critical or suitable habitat mapped for bird and mammal key indicators. Increased impacts with the new alignment were identified only for bat shelter habitat and these intersections were small in size and on the edges of habitat patches. A small patch of Marbled Murrelet habitat is intersected by the new alignment on the east side of Sechelt Inlet; however, this is moderately-low in suitability. Thus, considering mitigation commitments specified in the EA, the proposed transmission line alignment modifications do not change the conclusions of the EA with regard to the evaluation and characterization of residual effects for any VCs and key indicators for the Terrestrial Wildlife and Vegetation Environmental Discipline during construction and operations.

The change in the marine footprint that would result from the alternative relative to the approved submarine cable alignment and the increase in flexibility for the location of the cable entry point on the eastern shore of Sechelt Inlet have the potential to affect evaluation of potential effects (Mortality Risk, Habitat Loss, and Change in Habitat Quality) for relatively immobile benthic Marine Fauna and Habitat (Skookumchuck Narrows) VCs and potential effects (Habitat Loss) for the Bull Kelp VC. However, footprint sizes and the habitat and species impacted differ little between alignments, and the other considerations used to identify and assess residual effects in the EA (such

as VC vulnerability) are unchanged. Further, mitigation commitments from the EA for these VCs would be effective in minimizing impacts regardless of the final route and entry point that is selected. Thus, provided that these mitigation measures are adhered to, conclusions of the EA for these VCs are unchanged. There are also no changes to conclusions of the EA for the Marine Birds VC (Marbled Murrelets) because footprint size on the water surface and the length of the construction period during which sensory disturbance could result in habitat alienation is virtually unchanged, and both alignments equally intersect foraging habitat.

The proposed alternative alignment on the east side of Sechelt Inlet has the potential to interact with the Sechelt Inlet VC of the Visual Quality subject area within the Social and Economic Discipline because the potential alignment change may affect the visibility of the transmission line ROW from lower elevations including Sechelt Inlet. However, qualitative assessment for two viewpoints assessed in the EA suggested that the conclusions of the EA would not change with the alternative alignment, especially because existing disturbance prevented the VQO guidelines from being met.

Upper Ramona Component

Potential effects of Habitat Loss, Habitat Change, Change in Behaviour, Increased Mortality were evaluated for all Terrestrial Wildlife and Vegetation VCs in light of the proposed changes in alignment for the 25 kV feeder transmission line for the Upper Ramona Component. However, terrestrial footprints of the two alignments are almost identical in size and differences in forest age classes affected are small. Although the newly proposed alignment overlaps with a small amount (0.52 ha) of old growth forest (>251 years), it also results in a small decrease (0.54 ha) in impacts to forest of mature age classes (>80 years), and both alignments have greatest impacts to forests younger than 80 years that have less value than mature forests. There is also little difference between alignments in the quantity or quality of critical or suitable habitat mapped for bird and mammal key indicators. The proposed changes in alignment result in either little difference in the amount of suitable habitat intersected for key indicators, the avoidance of suitable habitat relative to the approved assessment, or an increase in habitat intersected but for habitat that was previously entirely or mostly considered in the EA as part of transmission line Option B. As exceptions, small patches of Grizzly Bear foraging habitat are intersected along an existing road ROW and an additional approximately 0.83 ha of mostly moderately suitable habitat is impacted for Northern Goshawk with the new alignment. No stream crossings or wetlands are affected that were not already assessed in the EA. Thus, considering mitigation commitments specified in the EA, with the exception of the Stick Nest Raptors VC below, the proposed transmission line alignment modifications do not change the conclusions of the EA with regard to the evaluation and characterization of residual effects for any VCs and associated key indicators for the Terrestrial Wildlife and Vegetation Environmental Discipline during construction and operations.

Additional potential effects of Increased Mortality and Increased Risk of Mortality were identified for the Stick Nest Raptors key indicator of the Birds VC and the Marine Birds key indicator of the Marine Fauna and Habitat VC, respectively. As requested by the shíshálh Nation, the new

transmission line alignment is proposed to cross the east side of the head of Narrows Inlet on an existing causeway and this is anticipated to increase mortality risk during operation for marine birds that forage in the estuary and raptors that nest on structures and nest and forage near water. Mitigation is therefore prescribed to increase visibility of the transmission line and reduce the risk of electrocution. However, residual effects were nevertheless identified for both of these key indicators that were non-significant, of low magnitude, affecting the Project Development Area in geographic extent, long-term in duration, continuous in frequency, reversible when the project is decommissioned, and occurring in a disturbed setting.

The proposed increase in the size of the infrastructure leeway (150 m from 100 m) that is requested north of the head of Narrows Inlet does not affect the conclusions of this assessment.

The proposed change in classification of the tunnel portal access road from temporary to permanent does not affect the conclusions of the EA for Freshwater Fish and Fish Habitat VCs or Terrestrial Wildlife and Vegetation VCs. The footprint of the road in question will not differ from that specified in the CPD; thus, it had been previously assessed and mitigation was prescribed. Further, the permanent road that is currently approved, and was to transect a slope forested with mature timber, will no longer be constructed. Thus, the elimination of one road in this location would reduce the Project's footprint and the potential for adverse effects to Project VCs and associated key indicators.

Lower Ramona Component

The proposed change to the location of the intake on Marten - s-p'il-us Creek does not affect the conclusions of the EA for Freshwater Fish and Fish Habitat VCs or Terrestrial Wildlife and Vegetation VCs because the proposed change would result in the intake moving almost back to its original location that was approved prior to the change requested in the second amendment. The new location is within 40 m of the original intake location that was evaluated in the EA; thus, this change does not affect the conclusions of the EA for any VC or associated key indicator.

Chickwat Component

The two alignment changes proposed for the 25 kV feeder transmission line for the Chickwat Component necessitates three stream crossings changes. Proposed changes include changes in the crossing locations of Chickwat Creek and the Tzoonie River, and the additional crossing of a tributary of the Tzoonie River not required with the approved alignment. All proposed changes combined increase riparian habitat loss by 0.21 ha due to the new tributary crossing and the proposed change in ROW crossing angle of the Tzoonie River. In addition, the riparian habitat value of the habitat impacted is higher for the proposed than the approved alignment. However, in light of the stringent mitigation measures prescribed in the EA and Updated AEA to minimize adverse effects and prevent long-term riparian impacts, these changes are not sufficient to affect the conclusions of the EA with regard to the characterization of residual effects for habitat loss and water quality potential effects for the Freshwater Fish and Fish Habitat VCs during either

construction or operations. Similarly, there are also no changes to the conclusions of the EA in the evaluation of residual effects for Coastal Tailed Frog key indicator of the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC from the Terrestrial Wildlife and Vegetation Environmental Discipline.

Potential effects of Habitat Loss, Habitat Change, Change in Behaviour, Increased Mortality were evaluated for all Terrestrial Wildlife and Vegetation VCs in light of the proposed changes. However, terrestrial footprints of the two alignments are almost identical. Further, although the new alignment intersects an additional 0.63 ha of forest greater than 80 years in age, it intersects slightly less (0.18 ha) old growth forest (> 141 years) than the approved alignment, and both alignments have greatest impacts to forests younger than 80 years that have less value than mature forests. There is also little difference between alignments in the quantity or quality of critical or suitable habitat mapped for bird and mammal key indicators. The only exception is for Northern Goshawk (key indicator of the Bird VC) for which a small amount (0.56 ha) of moderately suitable habitat is overlapped by the new alignment. Thus, considering mitigation commitments specified in the EA and Updated AEA, the proposed transmission line alignment modifications do not change the conclusions with regard to the evaluation and characterization of residual effects for any VCs and associated key indicators for the Terrestrial Wildlife and Vegetation Environmental Discipline during construction and operations.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

LIST OF APPENDICES

1. INTRODUCTION

Pursuant to the British Columbia *Environmental Assessment Act* (BCEAA) (2002), Narrows Inlet Hydro Holding Corp. (now tems sayamkwu Limited Partnership) submitted an application for an Environmental Assessment Certificate (EAC) for the construction and operation of the Narrows Inlet Hydro Project, situated approximately 50 km north of Sechelt, British Columbia (Map 1). The Narrows Inlet Hydro Project (the Project) is comprised of three hydroelectric components (Map 2). The proposed Chickwat component is a 19 megawatt (MW) run-of-river hydroelectric facility located on Chickwat Creek, one of the main tributaries of the Tzoonie River. This facility has a main intake on Chickwat Creek and two tributary intake taps (C1 & C2, also referred to as Kid - s-xwixwtl'ay-ulh Creek and Mountain Goat - s-xwitl'ay Creek, respectively). The proposed Upper and Lower Ramona components are both located on Ramona Creek, which feeds directly into Narrows Inlet. The Upper Ramona Component is a 7 MW storage lake design located in the headwaters of Ramona Creek with Ramona Lake as its water storage source. The proposed Lower Ramona Component is a 7 MW run-of-river hydroelectric facility located on Ramona Creek, immediately downstream of the Upper Ramona Component, which has a main intake on Ramona Creek and one tributary intake tap (R1, also referred to as Marten - s-p'il-us Creek). Each hydroelectric component has a 25 kV feeder transmission line that transmits electricity from the component's powerhouse, along with that from the existing Tyson Creek powerhouse, to a new collector substation located near the mouth of the Tzoonie River, approximately 2 km upstream from the head of Narrows Inlet (Map 2) where voltage is increased to 138 kV. The Project's Substation and Transmission Component represents the 138 kV transmission line that will transmit electricity from the new collector substation to the interconnection point at Ruby Lake. The Substation and Transmission Component therefore includes transmitting electricity across Sechelt Inlet through a submarine cable.

The Project was granted an Environmental Assessment Certificate (EAC) (#E13-04) on January 15, 2014, which was subsequently revised on April 8, 2014 (EAO 2014). Three EAC amendments have been requested since this revision in 2014. The first amendment was requested in September 2015 to improve the language and content, and address Project design modifications, primarily associated with the Chickwat Component, in the Certified Project Description (CPD; Schedule A of the EAC) and to correct inconsistencies and incorporate newly acquired information in the Table of Conditions (TOC; Schedule B of the EAC). The amendment was approved on February 12, 2016 (EAO 2016a, b). The second amendment identified a number of design modifications for the Lower and Upper Ramona components that provided opportunities to improve construction logistics, reduce construction risk and cost, and improve operating efficiency, and other minor concerns with the EAC were also identified. This amendment also required changes to both the CPD and the TOC. The amendment was approved on October 28, 2016 (EAO 2016c). The third amendment requested that the EAC Holder's name be changed from "Narrows Inlet Hydro Holding Corp." to "tems sayamkwu Limited Partnership" to better represent the partnership between BluEarth Renewables Inc. and the shíshálh Nation. This amendment is partway along in the approval process

and awaiting written notice by the Certificate Holder of the completion of all aspects of the re-organization (Perry 2016).

Following final design of Project infrastructure, additional modifications of some infrastructure components have now been identified that would require changes to the currently approved CPD. These include modifications of the transmission line alignment, reclassification of two access roads, and a minor modification in the location of one intake. Proposed changes in infrastructure location that require revision of the CPD are those that cause an incursion outside of the Project Boundary as currently defined and mapped in the CPD, or that cause an incursion outside of the 100 m infrastructure location leeway that is provided within the CPD to allow flexibility for fine-scale infrastructure adjustment. A change in the classification of infrastructure as shown on CPD maps also requires a revision to the CPD.

Transmission line alignment modifications, or additions of alternative alignments, are requested for three Project components. The first is the Substation and Transmission Component which represents the 138 kV transmission line that will transmit electricity from a new collector substation located near the mouth of the Tzoonie River to the interconnection point at Ruby Lake, and includes the submarine cable crossing of Sechelt Inlet (Map 2, Map 3). Changes are also requested for the alignment of the 25 kV feeder transmission lines that transmit electricity from the powerhouses of the Upper Ramona (Map 4) and Chickwat (Map 5) components to interconnection points with existing transmission lines or the new substation north of the head of Narrows Inlet. Modification to an intake location is requested for the Lower Ramona Component tributary tap (the intake on the tributary referred to as R1, or preferentially as Marten - s-p'il-us Creek) (Map 6). A change to the classification of an access road to the tunnel portal for the Upper Ramona Component is also requested such that the currently approved permanent road is removed from the CPD and that the currently approved temporary road is reclassified as permanent (Map 6).

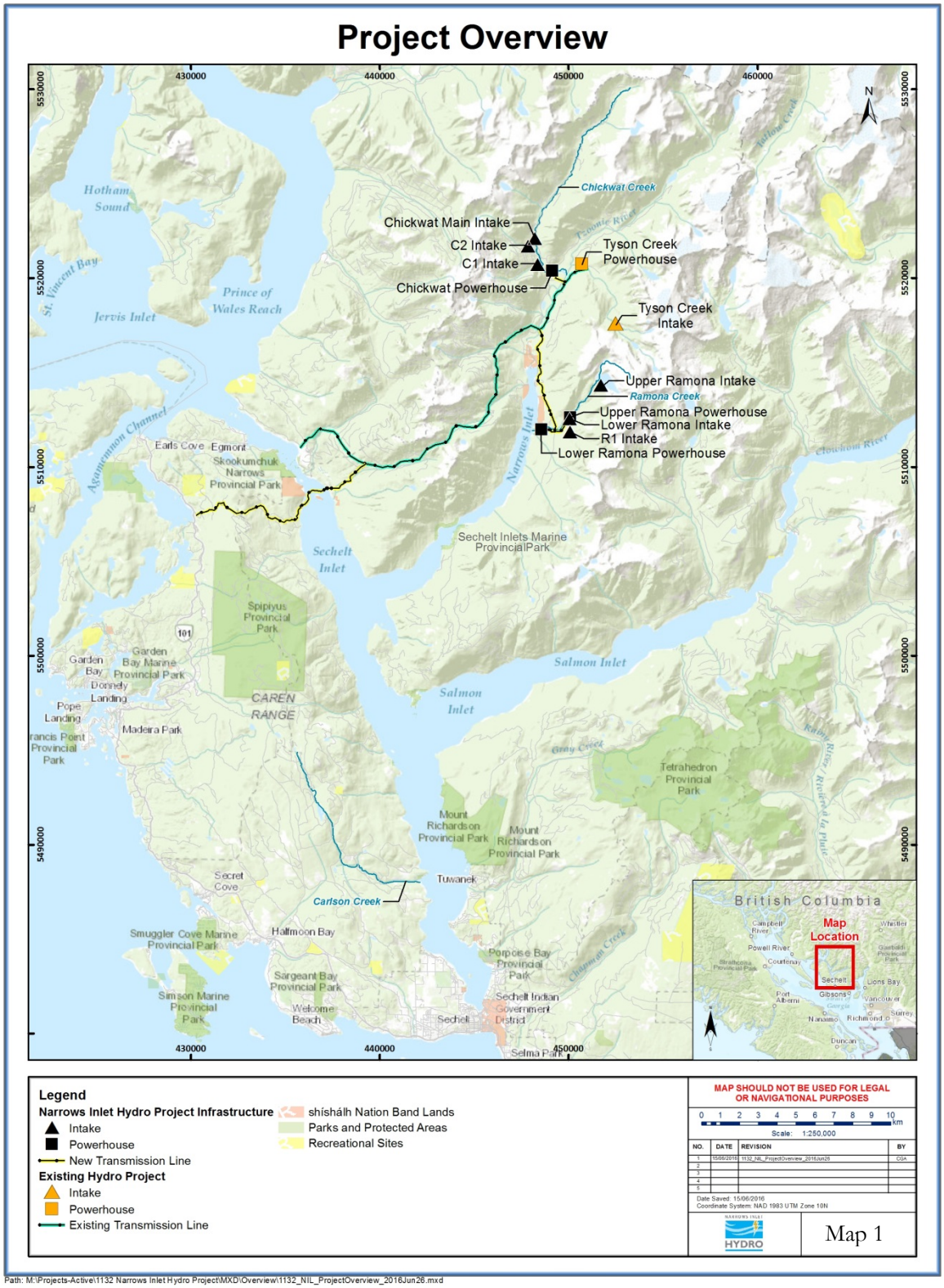
Based on the desired revisions to the Project's transmission line alignments and the location of the intake on Marten - s-p'il-us Creek, as well as reclassification of one of the Project's access roads, and in accordance with Section 19(1) of the BCEAA, the Certificate Holder is applying for an amendment that is material in scope to revise the CPD and modify the Project Boundary, the transmission line Right of Way (ROW), the location of one intake, and the reclassification of one Project road. A revised CPD that reflects the required changes is presented as Appendix A.

Most of the changes to the transmission line alignment that require a change to the CPD are related to straightening and thereby shortening the currently approved transmission line. However, requested changes in alignment, or the addition of an alternative alignment, result from other issues, such as those related to transecting private property, avoiding archaeologically significant areas, and adhering more closely to existing infrastructure. The addition of an alternative alignment is also requested for the submarine cable that crosses Sechelt Inlet, because this would improve cable laying safety and logistics and cable life span. In addition, one location has been identified where the 100 m infrastructure leeway incorporated into the CPD does not provide sufficient flexibility to avoid

archaeological sites and a 150 m leeway is thus requested. Similarly, additional flexibility is requested for the location of the submarine cable entry point on the east side of Sechelt Inlet and for the two cable crossing alignment options. The change in location of the intake on Marten - s-p'il-us Creek is requested because the approved location is in a geologically unfavourable area that would require additional protection structures and an unnecessarily large footprint. The reclassification of one of the Project's access roads is requested to increase efficiency, cost and reduce environmental impacts that would result from replacement of two roads with a single one.

Ecofish Research Ltd. (Ecofish) was retained to determine if the conclusions of the original Environmental Assessment (EA), on which the Ministers based their decision to grant Project approval, are maintained with the proposed changes to Schedule A (CPD) of the EAC. The objectives of this report are to: 1) evaluate the key potential effects identified during the EA process that may interact with the proposed changes to the CPD; 2) evaluate the effectiveness of prescribed mitigations measures in mitigating potential Project effects in light of proposed changes and recommend additional mitigation, if necessary; and 3) evaluate whether conclusions drawn in the Project's Application for an EAC (the Application) with respect to the residual effects, characterization of residual effects, and determination of significance are changed given the requested changes to the CPD.

Map 1. **Location of the Chickwat, Upper Ramona, Lower Ramona, and Substation and Transmission Components of the Narrows Inlet Hydro Project.**



2. ASSESSMENT METHODS FOR EAC AMENDMENT

During the EA process, potential adverse effects were identified and evaluated for selected Valued Components (VCs) to assess potential effects from all phases of Project development. This included adverse effects for the Substation and Transmission (Robertson 2012a), Upper and Lower Ramona (Robertson 2012b), and Chickwat components (Robertson 2012c), as well as Socio-Economic effects for all Project components (Robertson 2012d). Mitigation measures were prescribed to avoid or minimize such adverse effects. Some of this mitigation was incorporated into the schedules of the EAC to address concerns raised through the EA process, such as the legally-binding project description, Schedule A of the EAC (the CPD), which includes constraints in Project design. The assessment presented in this EAC amendment application will evaluate whether changes to the CPD modify the conclusions of the EAC Application, upon which the Ministers made their decision to grant Project approval.

The assessment methods for the evaluation of the potential consequences of the requested amendment were to firstly determine which VCs originally selected for the EA (also referred to as the Application) for the environmental and the social and economic disciplines would interact with the proposed transmission line modifications. Those VCs that do not to interact with the proposed transmission line modifications were discounted. The VCs that may interact with the proposed changes were assessed for each potential adverse effect identified to determine whether conclusions of the EA would be affected if the requested changes were made and whether or not additional mitigation would be required to address potential adverse effects that may result from the proposed changes.

The assessment was conducted by evaluating the potential for the proposed changes to affect the conclusions of the EA given the approach taken during the Application, including selection of VCs, identification of potential effects, and characterization of residual effects. However, evaluation of the consequences of the proposed changes included consideration of additional potential effects or residual effects not originally identified. This assessment also included providing the rationale for each proposed change and determining the Project phase during which the proposed change could impact assessment of the potential effects, and therefore the conclusions of the EA. VCs from the environmental disciplines and the social and economic disciplines, and the potential for each to interact with each change proposed for the CPD, are summarized in Table 1 and Table 2, respectively.

The requested changes to the CPD affect four Project components and this assessment considers each of these individually. Changes are requested to the transmission line alignment for three Project components, to an intake location for one Project component, and to the reclassification of an access road in one Project component. In some cases, assessment required that footprint calculations were compared between transmission line alignments for specific habitat types (GeoBC 2015). In such cases, existing road ROWs were not included in footprint comparisons because they represent disturbed, not forested, habitat. When riparian habitat value was assessed, this followed

the definition provided in Lacroix *et al.* (2015) that classify riparian habitat value as Negligible, Low, Medium, High, and Climax, based on fish bearing status and riparian stand age.

Table 1. VCs from the environmental disciplines and their potential to interact negatively with changes requested to the CPD (Schedule A of the EAC) for each Project Component. VCs with the potential to interact with each component are highlighted with grey shading.

Environmental Disciplines	VCs	Substation & Transmission	Upper Ramona		Chickwat	Lower Ramona
		TL[1] Alignment	TL[1] Alignment	Road Classification	TL[1] Alignment	Tributary Intake Location
1. Atmospheric Environment	Air Quality	No	No	No	No	No
	Noise	No	No	No	No	No
2. Geophysical Environment	Soils and Geology	No	No	No	No	No
	Channel Stability	No	No	No	No	No
	ARD/ML Potential	No	No	No	No	No
	Terrain Stability	No	No	No	No	No
3. Hydrology	*N.B. - Flow and volume of water addressed under Freshwater Fish*					
4. Freshwater Fish and Fish Habitat	Water Quality	Yes	No	Yes	Yes	Yes
	Fish Habitat	Yes	No	Yes	Yes	Yes
	Fish Species	No	No	No	Yes	No
5. Terrestrial Wildlife and Vegetation	Vegetation	Yes	Yes	Yes	Yes	Yes
	Invertebrates	Yes	Yes	Yes	Yes	Yes
	Amphibian & Reptiles	Yes	Yes	Yes	Yes	Yes
	Birds	Yes	Yes	Yes	Yes	Yes
	Mammals	Yes	Yes	Yes	Yes	Yes
6a. Marine Fauna and Habitat (Lower Ramona and Shared Elements)[1]	General Infauna	No	No	No	No	No
	General Epifaunal and Motile Crabs	No	No	No	No	No
	Clam Beds	No	No	No	No	No
	Eelgrass	No	No	No	No	No
	Pacific Salmon	No	No	No	No	No
	Pacific Herring	No	No	No	No	No
	Other Fish Species	No	No	No	No	No
	Marine Birds	No	Yes	No	No	No
	Marine Mammals	No	No	No	No	No
6b. Marine Fauna and Habitat (Skookumchuck Narrows)	Pelagic	No	No	No	No	No
	Benthic - Mobile Invertebrate	Yes	No	No	No	No
	Benthic (surface) - Sessile Invertebrate	Yes	No	No	No	No
	Benthic (sub-surface) - Sesssile Invertebrate	Yes	No	No	No	No
	Marine Intertidal Vegetation	No	No	No	No	No
	Kelp Species	Yes	No	No	No	No
	Salmonids	No	No	No	No	No
	Pelagic & Rockfish	No	No	No	No	No
	Bentho-Pelagic Fish	No	No	No	No	No
	Benthic Fish	No	No	No	No	No
	Marine Birds	Yes	No	No	No	No
	Marine Mammals	No	No	No	No	No

[1] TL: Transmission Line.

Table 2. VCs from the social and economic disciplines and their potential to interact negatively with changes requested to the CPD (Schedule A of the EAC) for each Project Component. VCs with the potential to interact with each component are highlighted with grey shading.

Social and Economic Disciplines	VCs	Substation & Transmission	Upper Ramona		Chickwat	Lower Ramona
		TL[1] Alignment	TL[1] Alignment	Road Classification	TL[1] Alignment	Tributary Intake Location
1. Community Economy	Socio-economics	No	No	No	No	No
2. Land, Resource, and Water Use	Forestry and Timber Harvesting		No	No	No	No
	Tourism and Recreation	No	No	No	No	No
	Wilderness Quality	No	No	No	No	No
	Mineral Extraction and Exploration	No	No	No	No	No
	Aquaculture	No	No	No	No	No
	Hunting, Trapping, and Fishing	No	No	No	No	No
	Private Land Use	No	No	No	No	No
	Historical, Archaeological, Paleontological, and Architectural Features	No	No	No	No	No
	Industrial and Domestic Water Use	No	No	No	No	No
3. Infrastructure and Services	Infrastructure and Services	No	No	No	No	No
4. Visual Quality	Sakinaw and Ruby Lake	No	No	No	No	No
	Sechelt Inlet	Yes	No	No	No	No
	Narrows Inlet/Ramona Falls	No	No	No	No	No
	Tzoonie Backcountry	No	No	No	No	No
5. Public and Worker Health and Safety	Public and Worker Health and Safety	No	No	No	No	No
6. First Nations Interests	Traditional Land Use	No	No	No	No	No
	Traditional Resource Use	No	No	No	No	No
	Aboriginal Rights and Title	No	No	No	No	No
	Socio-economic/Community	No	No	No	No	No
	Archaeology and Heritage	No	No	No	No	No

[1] TL: Transmission Line.

3. MODIFICATIONS AND RATIONALE

Modifications in the transmission line alignment that would require a change to the CPD are requested for three Project Components: Transmission, Upper Ramona, and Chickwat. A summary of the requested changes to the transmission line alignments, that require revision of the CPD, is provided in Table 3. The modification requested to the location of the intake in Marten - s-p'il-us Creek, and the change to access road classification, are shown in Map 5. Details of the modifications and rationale for the proposed changes for each component are presented in the sections below.

Table 3. Proposed changes to the NIHP transmission lines (TL) that would affect the Project's current CPD (Schedule A of the EAC).

Project Component	Reference Map / Transmission Line Section	TL Length that Incurs Outside 100 m leeway (km)	TL Length that Incurs Outside Project Boundary (km)
Substation & Transmission Component (138 kV Transmission Line)	Map 3 - Substation to east side of Sechelt Inlet[1]	2.22	1.80
	Map 3 - Structure 209-211 (west side of Sechelt Inlet)	0.19	–
	Map 3 - Structure 220-221 (west side of Sechelt Inlet)	0.04	–
	Map 3 - Structure 230 (west side of Sechelt Inlet)	0.08	–
	Map 3 - Submarine Cable across Sechelt Inlet[1]	1.76	0.97
Upper Ramona Component (25 kV Transmission Line)	Map 4 (Inset 1) along Causeway	0.28	–
	Map 4 (Inset 2) within shíshálh Nation Band Lands #8	1.22	–
Chickwat Component (25 kV Transmission Line)	Map 5 (Inset 1) - along New Powerhouse Road	0.18	–
	Map 5 (Inset 2) - across Tzoonie River	0.35	–

[1] Additional alignment added as an alternative option.

3.1. Substation and Transmission Component - 138 kV Transmission Line

A total of five modifications are proposed for the 138 kV transmission line of the Substation and Transmission Component which would require changes to the CPD due to incursions of the 100 m infrastructure leeway and/or changes to the Project Boundary. Three of these changes are located on the west side of Sechelt Inlet, one is located on the east side of Sechelt Inlet, and the fifth is the crossing of Sechelt Inlet (Table 3, Map 3).

The three modifications in the transmission line alignment west of Sechelt Inlet (three insets on Map 3) are minor changes that would serve to straighten and shorten the transmission line. These three sections that are outside of the 100 m infrastructure leeway permitted by the CPD are 0.4 to 0.19 km in length and they extend outside of the leeway by a maximum of approximately 40 m. These modifications in alignment would have no effect on the approved Project Boundary.

On the east side of Sechelt Inlet the final alignment of the transmission line has not yet been determined because there are still private property issues to resolve. The current approved alignment on the east side of Sechelt Inlet bisects private property owned by Solberg Hills Estates Ltd., with the subsurface rights owned by Lafarge Canada Inc. Both landowners have requested that the alignment be routed to the edge of the property, as the approved alignment may be incompatible with future development (Obee pers. comm. 2016). In response, the EAC Holder is seeking an

alternative transmission line which will follow the edge of the private property, resulting in an approximately 2 km long section of the transmission line being rerouted (Map 3). The approved alignment, that is being retained as an option, runs relatively straight in a south westerly direction to the east side of Sechelt Inlet. The alternative that is being requested as an additional option runs due south for approximately 1 km, following the property line then due west for approximately 2 km to Sechelt Inlet. For this alternative option, a 2.22 km section of the approved alignment therefore incurs outside the 100 m infrastructure leeway, and a 1.80 km section incurs outside the approved Project Boundary (Table 3). This assessment therefore specifically considers whether conclusions of the original EA would be affected if the alignment is changed to the alternative option. If the alternative alignment is approved, both options would be authorized in the CPD.

An additional request for the transmission line on the east side of Sechelt Inlet is that flexibility is incorporated into the location of the eastern entry point of the submarine cable. This flexibility is required to provide the cable providers with greater entry options which will allow selection of appropriate (predominantly bedrock) substrate. Incorporation of this flexibility into the CPD requires that the infrastructure leeway is increased for the westernmost approximately 300 m of the transmission line and the eastern cable entry point (shown as a grey polygon in Map 3 within which this infrastructure must be located).

The preferred alignment for the submarine cable that crosses Sechelt Inlet also has not yet been finalized. The approved alignment of the submarine cable takes a rounded path north around Skookum (Boulder) Island (Map 3), located in the centre of Sechelt Inlet. Analyses to date have suggested that a preferred route for the submarine cable is to cross the inlet south of Skookum Island. This modification in alignment may be desired because there is reduced current flow in this area (10 knots compared to 25 knots west of Skookum Island) which would almost double cable longevity, as well as improve cable laying safety and logistics (Obee pers. comm. 2016). However, because the decision regarding the preferred alignment has not been finalized, it is requested that this southern route is added as an alternative option, rather than a modified alignment. For this alternative alignment, a 1.76 km section incurs outside the approved 100 m infrastructure leeway and a 0.97 km section incurs outside the approved Project Boundary. This assessment therefore specifically considers whether conclusions of the original EA would be affected if the alignment is changed to the alternative option. If the alternative alignment is approved, both options would be authorized in the CPD. In addition, although the approximate locations of both cable alignments are known, the exact position of the cable cannot be determined until the detailed design phase when it can be finalized by the cable supplier and installer. Some flexibility in Project design and submarine cable alignment is therefore required. As such, it is requested that the two potential cable alignment options (Map 3) are not associated with the typically 100 m infrastructure leeway but that flexibility will instead be provided through a wider "cable corridor", which coincides with the Project Boundary, within which the cable will be deployed and installed. This cable corridor has been considered in this assessment. The installation and deployment of submarine cables are considered standard activity in which case a DFO review of serious harm as defined by the *Fisheries Act* (1985) is

not required. Similarly, under the *Navigation Protection Act* (1985) the installation of submarine cables is listed as designated works under the Minor Works Order and thus can proceed without a Notice to the Minister, as long as they comply with the legal requirements.

3.2. Upper Ramona Component – Feeder Transmission Line and Road Reclassification

Requested changes to the Upper Ramona Component include modifications to the transmission line alignment and a change in the classification of the approved temporary access road to the tunnel portal.

Two changes are proposed for the alignment of the Upper Ramona feeder 25kV transmission line that incur outside of the 100 m infrastructure leeway as specified in the CPD. These modifications do not affect the approved Project Boundary. The first change is to a 0.28 km section that runs along the east side of the head of Narrows Inlet along an existing causeway and incurs outside the 100 m leeway permitted by the CPD by approximately 80 m (Table 3, Inset 1 in Map 4). The approved transmission line alignment is currently routed on land along the east side of the head of Narrows Inlet, whereas the proposed alignment makes use of the existing causeway and is routed due north across the east side of Narrows Inlet. This change was requested by shíshálh Nation to avoid crossing the upland area near the causeway that has high archaeological significance and to more closely follow existing infrastructure, including the causeway (Deguise pers. comm. 2016).

The second change in transmission line alignment is the 1.22 km section immediately north of the head of Narrows Inlet that currently is routed to continue north from the east side of the head of Narrows Inlet, within shíshálh Nation Band Lands #8 (Table 3, Inset 2 in Map 4). This change is the logical continuation of the alignment to the north, given that the southern change is proposed to avoid archeological sites and that existing road ROWs are employed to the extent feasible. The proposed change is for this section is to veer northwest along an existing road from the north end of the causeway, then circle to the northeast to join with the original alignment approximately 1 km south of the new substation (Inset 2 in Map 4). The new alignment incurs outside the 100 m leeway permitted by the CPD by approximately 350 m. This change would improve construction and maintenance access and safety because the new alignment avoids a steep talus slope to the south that is traversed by the approved alignment.

Another requested change related to the transmission line alignment for this component is that a 150 m infrastructure leeway is incorporated into the CPD in one section of the transmission line alignment (within the Project Boundary), instead of the 100 m leeway generally applied. This increase in leeway width is requested for the approximately 600 m section of the transmission line alignment within the Tzoonie River estuary and immediately north of the head of Narrows Inlet, within shíshálh Nation Band Lands No. 8 (Map 4). The increase in flexibility in the final transmission line alignment in this location is required to allow fine scale avoidance of identified archeological sites in this area.

A change is also requested regarding access to the tunnel portal. Two approved access roads to the tunnel portal are currently specified in the CPD. One of these, currently approved to be permanent, branches off of existing roads due east of the Upper Ramona powerhouse and traverses a forested slope on route to the tunnel portal (Map 5). The other road, currently approved to be temporary, makes a direct connection between the Upper Ramona powerhouse and the tunnel portal and requires a series of switchbacks in its northern portion. Each road involves two stream crossings. The requested change for these two roads is that the permanent road is removed from the CPD and that the temporary road becomes the single permanent road to the tunnel portal. This change is requested to improve efficiency and decrease environmental impacts. Reducing the requirement from two roads to one eliminates the need for a second temporary road which reduces the Project's overall footprint, its costs, and the work that would have been associated with restoring a temporary ROW. Further, the current permanent road traverses mature forest which can completely be avoided with the proposed change. The two roads had been originally proposed because the feasibility of scheduling and logistical requirements related to tunnel construction using only a single road had been uncertain (e.g., transportation of materials, locations of laydown and spoil areas). Following final design it has been determined that construction of a single road, which is a superior design and entails substantial environmental benefits, will be adequate.

3.3. Lower Ramona Component – Intake in Marten - s-p'il-us Creek

A change is proposed for the location of the tributary intake (on Marten - s-p'il-us Creek) of the Lower Ramona Component (Map 5). This change is requested because final field inspections determined that the valley upstream of the amended intake location is situated at the mid-point of a large post-glacial rock slide, composed of a talus/scree deposit, which has its apex approximately 200 to 300 m above the approved intake location (Chehalis 2016). This location is not favourable for the intake because the presence of large voids in the deep scree materials would pose challenges with respect to seepage losses and seepage control. In addition, there are several stream channels upstream of the approved location and containment to a single channel would be required. This would require the construction of significant berms or structures and would therefore increase overall intake footprint size. It is therefore requested that this intake is moved downstream of the distal edge of the rockslide apron into an area where the channel is confined to a single stream in a narrower valley (Chehalis 2016). The new location is approximately 160 m to the northwest, or approximately 170 m downstream, of the approved location (Map 5). This new location therefore falls outside of the 100 m infrastructure leeway allowed by the CPD. However, the intake was previously moved from its original location following approval of the second amendment (EAO 2016c) that was requested to increase hydroelectric potential and improve construction logistics. Thus, the newly proposed location is between the original (prior to the second amendment) and the approved (following approval of the second amendment) locations (Map 5). Further, it is now proposed to be located less than 40 m upstream from the location that was approved in the original CPD, and which therefore falls within the 100 m infrastructure leeway that would logically have been associated with this original location.

3.4. Chickwat Component – Feeder Transmission Line

Two changes are proposed for the alignment of the Chickwat feeder 25kV transmission line that incur outside of the 100 m infrastructure leeway as specified in the CPD but do not affect the Project Boundary. The first change is to the transmission line in the immediately vicinity of the powerhouse (Table 3, Inset 1 in Map 6). In the approved alignment, the transmission line runs northeast from the powerhouse to join with an existing road, then follows this road south in the direction of the Tzoonie River and crosses Chickwat Creek about 250 m southeast of the powerhouse. The proposed change is that the transmission line crosses Chickwat Creek immediately south of the powerhouse then runs directly towards the Tzoonie River and does not veer first to the northeast to follow the existing road (Table 3, Inset 1 in Map 6). As a result, a 0.18 km section of transmission line therefore incurs approximately 100 m outside of the 100 m infrastructure leeway as specified by the CPD. This change is desired because the existing road has been decommissioned and the new alignment shortens the transmission line. The shíshálh Nation has reviewed and approved this change (Deguise pers. comm. 2016).

The second change in alignment is at the crossing of the Tzoonie River. The approved alignment continued southeast in a straight line across the Tzoonie River to join with the existing transmission line from the Tyson Creek powerhouse. The proposed change is that the alignment crosses the Tzoonie River in a southerly direction and joins with the existing transmission line from the Tyson Creek powerhouse approximately 0.5 km to the southwest of the original location (Inset 2 in Map 6). A 0.35 km section of transmission line therefore incurs a maximum of approximately 300 m outside of the 100 m infrastructure leeway, as specified by the CPD. This change would shorten the length of the transmission line and has been reviewed and approved by the shíshálh Nation (Deguise pers. comm. 2016).

4. ASSESSMENT OF PROPOSED CHANGES

4.1. Substation and Transmission Component - 138 kV Transmission Line

Changes to the transmission line proposed for the Transmission Component have the potential to interact negatively with some Environmental Disciplines (Table 1) and some Social and Economic Disciplines (Table 2). The proposed change in transmission line alignment on the east side of Sechelt Inlet interacts with the Sechelt Inlet VC of the Visual Quality Social and Economic Discipline because approximately 2 km of the transmission line ROW is proposed to be moved almost 1 km to the south, which may affect visibility of this portion of the ROW from lower elevations including Sechelt Inlet (Section 4.1.2.1). Other Social and Economic Disciplines, including Land, Resource, and Water Use, Community Economy, Infrastructure and Services, Public and Worker Health and Safety, and First Nations Interests, do not interact with the proposed changes to the Substation and Transmission Component. Within the Environmental Disciplines, several VCs in the Freshwater Fish and Fish Habitat, Terrestrial and Wildlife, and Marine Fauna and Habitat have

the potential to interact negatively with the proposed changes in transmission line and submarine cable alignment (Table 1) and these are assessed in Section 4.1.1 below.

4.1.1. Assessment of Environmental Disciplines

The proposed changes in the alignment of the 138 kV transmission line will affect the riparian, terrestrial, and marine footprint in the locations where modifications are proposed; thus, some Freshwater Fish and Fish Habitat (4.1.1.1), all Terrestrial Wildlife and Vegetation (Section 4.1.1.2), and several of the Marine Fauna and Habitat (Section 4.1.1.1) VCs have the potential to interact with these changes (Table 1). Because potential impacts are related to vegetation clearing and maintenance of the ROW in terrestrial and riparian habitat, potential interactions for Freshwater Fish and Fish Habitat and Terrestrial Wildlife and Vegetation are relevant to both the construction and operational phases. The submarine cable is largely maintenance free. It has a life expectancy of 40 years and maintenance is limited to inspections of the cable every five years and conducting repairs (likely splicing) if required (CEC 2016). Thus, the assessment of the alternative cable alignment is focused on the construction phase. The proposed changes do not interact with VCs in either the Atmospheric or Geophysical Environment because there is no change in construction methods and because the terrain traversed in the new alignment differs little in topography or other components of the geophysical environment.

4.1.1.1. Freshwater Fish and Fish Habitat

Three of the proposed transmission line alignment changes for the Substation and Transmission Component involve stream crossings and therefore have the potential to affect evaluation of some of the VCs of the Freshwater Fish and Fish Habitat Environmental Discipline (Table 1). Transmission line installation and maintenance does not require instream works or disturbance of instream habitats; thus, all potential impacts to freshwater fish and fish habitat related to the proposed alignment changes are associated with impacts to riparian areas. Riparian habitat contributes both directly and indirectly to maintaining high quality fish habitat because it provides nutrients to aquatic areas, contributes channel stabilizing large woody debris, maintains stable thermal regimes, and prevents sedimentation. Vegetation clearing causes riparian habitat loss where the transmission line ROW crosses watercourses and may also affect water quality (temperature, sedimentation). Hence, clearing and maintenance associated with transmission line construction and operation was considered in the EA, when evaluating potential effects to the Fish Habitat and Water Quality VCs (Robertson 2012a).

Two of the proposed changes in transmission line alignment that affect stream crossings are on the west side of Sechelt Inlet (Structures 220-221 and 209-211 on Map 3, Section 3.1) and in both of these locations the proposed changes to the stream crossing are minor. In both locations, the stream crossing has changed location by 200 m or less and the angles of the ROW crossings relative to the stream channel are similar; thus, there is little difference in the amount of riparian habitat impacted between alignments (Table 4). In total for all proposed changes on the west side of Sechelt Inlet, the

amount of riparian habitat of climax value decreases slightly and that of medium habitat value increases slightly relative to the approved alignment.

On the east side of Sechelt Inlet, the approved transmission line alignment requires a single crossing of the tributary to the south arm of Earle Creek approximately 1.3 km from Sechelt Inlet. Due to the newly proposed routing of the transmission line to the southeast (i.e., the alternative option; see Section 3.1), two tributary crossings are required, both upstream of the approved crossing by about 0.75 km (Map 3). However, little difference results from these changes in the amount of riparian habitat affected (Table 4). This is because the two tributaries crossed in the alternative alignment are non fish-bearing. In total, for the east side of Sechelt Inlet, less riparian habitat of climax and medium value, and more habitat with negligible value, is affected by the alternative than the approved proposal.

Combined effects to riparian areas from the proposed changes in alignment on both the east and west sides of Sechelt Inlet are therefore relatively small in terms of the amount of riparian habitat that will be intersected by the transmission line ROW. In total, the amount of riparian habitat affected is slightly greater for the proposed than the approved alignment (0.04 ha), but the value of it is decreased (Table 4). Mitigation commitments, as prescribed in the EA and subsequent Updated Aquatic Effects Assessments (AEA) for the Chickwat and, Upper and Lower Ramona components (Lacroix *et al.* 2015, Lewis *et al.* 2016), include numerous measures to reduce effects of riparian clearing on fish habitat and water quality, as well as prescriptions that vegetation maintenance along the transmission line will follow existing BMPs detailed in the Integrated Vegetation Management Plan for Transmission Line Rights-of-way (BC Hydro, 2010) and Approved Work Practices for Managing Riparian Vegetation (BC Hydro *et. al.* 2003).

Assuming implementation of prescribed mitigation, the EA nevertheless anticipated non-significant residual effects for habitat loss for the Fish Habitat VC, as well as for some key indicators of Water Quality VC that may be affected by riparian clearing. Thus, given the prescribed mitigation, and because the change in amount of riparian habitat affected by the proposed changes is small and there is a reduction in the value of the riparian habitat affected (i.e. lower value riparian habitat being removed), the proposed changes in alignment do not change the evaluation of potential effects or the conclusions of the EA with regard to the characterization of residual effects for Freshwater Fish and Fish Habitat VCs during either construction or operation, and no additional mitigation is required.

Table 4. Overlap between the transmission line ROW riparian footprint by riparian habitat value for the original and new transmission line alignments for the Transmission Component.

Riparian Habitat Value	East of Sechelt Inlet			West of Sechelt Inlet			Total		
	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[1] (m^2)	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[1] (m^2)	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[1] (m^2)
Negligible	0	780	780	801	739	-62	801	1518	718
Medium	1014	842	-172	1720	2230	511	2734	3072	338
High	0	0	0	0	0	0	0	0	0
Climax	1493	1179	-314	1169	847	-321	2662	2027	-635
Total	2508	2801	293	3689	3816	127	6196	6617	421
Total Medium - Climax	**2508**	**2021**	**-486**	**2888**	**3078**	**189**	**5396**	**5099**	**-297**

[1] Proposed minus approved footprint area.

4.1.1.2. Terrestrial Wildlife and Vegetation

All Terrestrial Wildlife and Vegetation VCs (Vegetation, Invertebrates, Amphibian & Reptiles, Birds, and Mammals) have the potential to interact with the proposed changes in the alignment of the 138 kV transmission line, part of the Substation and Transmission Component. The potential interactions are anticipated as the new proposed alignment traverses different terrestrial habitat from that evaluated in the EA, and because changes to previously approved stream crossings are proposed which could change the amount and quality of riparian habitat affected by the ROW. The EA evaluated potential effects of Habitat Loss for all VCs, Habitat Change for all VCs except Invertebrates, and Change in Behavior and Increased Mortality for Amphibians & Reptiles, Birds, and Mammals VCs. Vegetation clearing and maintenance associated with transmission line construction and operation was considered when assessing these potential effects. The proposed change therefore has the potential to affect evaluation of Habitat Loss and Habitat Change for all VCs. The evaluation of Change in Behaviour and Increased Mortality potential effects may also be affected by the change in alignment if impacts to suitable or critical habitat differ for any VCs.

Potential changes in the evaluation of potential effects related to the changes in stream crossings associated with the proposed changes in alignment for the Substation and Transmission Component (Map 3; Section 3.4) were assessed for the Freshwater Fish and Fish Habitat Environmental Discipline in Section 4.1.1.1. This assessment is also relevant for the Coastal Tailed Frog key indicator of the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC because these key indicators inhabit streams and riparian areas in the Project area (Coastal Tailed Frogs), forage in streams, or nest in riparian areas (Riverine Birds). Potential effects identified for Coastal Tailed Frogs and Riverine Birds in the EA included Habitat Loss, Change in Behaviour, and Increased Mortality (the latter for Coastal Tailed Frogs only). The EA considered the potential effects of clearing and maintenance associated with transmission line construction and operation on both key indicators, in relation to Habitat Loss, Habitat Change, Change in Behaviour, and Increased Mortality (the latter for Coastal Tailed Frogs only). As discussed in 4.1.1.1, the proposed changes do not affect the conclusions of the EA with regard to the characterization of residual effects for Freshwater Fish and Fish Habitat VCs during either construction or operation, in light of the mitigation measures prescribed to minimize adverse effects. Thus similarly, there is also no change to the conclusions of the EA with regard to the potential effects identified for Coastal Tailed Frogs and Riverine Birds during either transmission line construction or operation, and no additional mitigation is required.

No wetlands are affected by the proposed changes to the transmission line alignment for the Substation and Transmission Component; thus, all other key indicators from the Amphibian & Reptiles VC assessed (Northern Red-legged Frog and Western Toad), the Butterflies and Dragonflies key indicator of the Invertebrates VC, and some rare plants and rare plant communities that are associated with wetlands, do not interact with the proposed changes.

The terrestrial footprints of the newly proposed and approved transmission line ROWs for the Substation and Transmission Component are almost identical in size, and any differences in forest age classes affected are small (Table 5). The new alignment would result in an increase in overlap of 0.51 ha of age class 8 (141-205 years old) forest; however, the overlap with mature forest (101 to 141 years old) is reduced by 0.29 ha (i.e., the increase in overlap with mature forest is 0.22 ha). Most of the increase in overlap with age class 8 forest would occur on the west side of Sechelt Inlet. The majority of overlap of the transmission line ROW with forested habitat affects young forests (< 80 years) for both alignments (80% and 78% for approved and new alignments, respectively).

Habitat loss and change in mature forests can, in general, be considered more significant due to the high replacement time required for old forests to regenerate and in this regard, mature and old growth forests therefore have greatest value. Further, key indicators of both the Birds and Mammals VCs are associated with mature forests.

Key indicators for the Birds VC such as Northern Goshawk, Marbled Murrelet, and Western Screech-owl, are associated with mature forests. Both the new and the approved alignments intersect suitable habitat for Northern Goshawk and Western Screech-owl. The new alignment reduces impacts to Northern Goshawk habitat because no moderate or highly suitable habitat is intersected by the new alignment, whereas a small amount of habitat of moderate suitability (0.05 ha) is intersected by the approved alignment (Table 6). For Western Screech-owl, no highly suitable habitat intersects with the proposed changes in transmission line alignment, and there is no difference in the amount of moderately suitable habitat affected between alignments (Robertson 2012d, Figure 6-160). No suitable Marbled Murrelet habitat (classes 1 to 3, as identified for the EA) exists in the vicinity of the proposed changes, although a small patch of habitat of moderately-low suitability (class 4) is intersected on the east side of Sechelt Inlet with the alternative alignment that is not currently intersected with the approved alignment (Robertson 2012e, Figure 6-158).

Mature forests also provide suitable habitat for a number of key indicators of the Mammals VC, specifically Mule Deer, Roosevelt Elk, and bats. Mature forest, defined as greater than 100 years in age, was used as a proxy of suitable habitat for Mule Deer in the EA because it provides winter shelter and winter foraging habitat. However, the increase in footprint size of the newly proposed relative to the approved transmission line ROW in mature forest is small (0.21 ha when defining mature forest for Mule Deer). For comparison, 1,250 ha of structural stages 6 and 7 (101-140 years) were identified in the Interconnection local assessment area (LAA) that may serve as winter shelter and winter foraging habitat for Mule Deer (Robertson 2012a). Thus, the predicted loss represents a small percentage (0.02%) of what is currently available.

There is also little difference in impacts to mapped suitable habitats between alignments for bats, Roosevelt Elk, and Grizzly Bear. Bat shelter habitat is mapped on the east and west sides of Sechelt Inlet and intersects with both the approved and newly proposed alignments. On the east side and in one location on the west side (Map 3; structure 209-211) of Sechelt Inlet, bat shelter habitat is intersected by the new alignment that is not intersected by the approved alignment (Robertson

2012e, Figure 6-161). However, the additional intersections are small in size and occur on the edges of habitat patches. Large patches of suitable elk shelter habitat were identified especially along the western side of the northern portion of the Sechelt Peninsula; however, both alignments intersect it to the same extent (Robertson 2012e, Figure 6-163). No suitable elk winter feeding habitat (class 1 to 3; Robertson 2012a) or Grizzly Bear suitable spring, summer, or fall habitat (class 1 to 3; Robertson 2012a) intersects with either the approved or the new alignment (Robertson 2012e, Figures 6-162, 6-164, 6-165, 6-166).

Overall, there is no difference in the evaluation of residual effects for Terrestrial Wildlife and Vegetation VCs between the newly proposed and the approved alignment. The similarity in terrestrial footprint sizes between alignments and in the amount and quality of suitable habitat affected for key indicators, along with the small differences in the amount of mature forest intersected by the two ROWs, indicates that conclusions of the EA with regard to the evaluation and characterization of residual effects for Habitat Loss and Habitat Change are unchanged. Further, no additional mitigation is required. This also indicates that the evaluation and characterization or residual effects for Change in Behavior and Increased Mortality, which may result from the activities that cause habitat loss and alteration, are unchanged for the Amphibians & Reptiles, Birds, and Mammals VCs.

Table 5. Overlap between the transmission line ROW and forest by age class for the approved and newly proposed transmission line alignments for the Substation and Transmission Component.

Forest Age (years)	East of Sechelt Inlet		West of Sechelt Inlet		Difference[1]
	Approved (m^2)	Proposed (m^2)	Approved (m^2)	Proposed (m^2)	(m^2)
0 (default)	22,449	34,028	13,481	11,557	9,655
1-20	0	0	23,936	23,465	-471
21-40	9,427	12,874	25,128	21,185	-497
41-60	12,920	5,891	24,312	22,458	-8,883
61-80	0	0	6,764	5,662	-1,102
81-100	6,023	3,427	7,259	10,027	172
101-120	0	0	4,064	4,062	-2
121-140	805	0	7,436	5,311	-2,930
141-250	1,886	2,358	8,216	12,816	5,072
Total	**53,510**	**58,578**	**120,597**	**116,543**	**1,014**

[1] Proposed minus approved footprint area.

Table 6. Overlap between the transmission line ROW and Northern Goshawk habitat for the approved and newly proposed transmission line alignments for the Substation and Transmission Component.

Northern Goshawk Habitat Suitability	East of Sechelt Inlet		West of Sechelt Inlet		Difference[1] (m^2)
	Approved (m^2)	Proposed (m^2)	Approved (m^2)	Proposed (m^2)	
High	0	0	0	0	0
Moderate	539	0	0	0	-539
Total	**539**	**0**	**0**	**0**	**-539**

[1] Proposed minus approved footprint area.

4.1.1.1. Marine Fauna and Habitat (Skookumchuck Narrows)

The proposed alternative alignment of the submarine cable that crosses Sechelt Inlet (Section 3.1, Map 3) has the potential to interact with several VCs of the Marine Fauna and Habitat (Skookumchuck Narrows) Environmental Discipline because it affects the location and size of the marine footprint. The EA identified 12 VCs for the Marine Fauna and Habitat (Skookumchuck Narrows) Environmental Discipline (Table 1). Of these, five have the potential to interact with the proposed change in cable alignment. These VCs are associated with the marine substrate, the water surface, or nearshore habitat and the evaluation of potential effects is therefore dependent on the disturbance footprint size and location (Table 1). Although benthic fish are also associated with the marine substrate, no potential effects were identified for Bentho-Pelagic Fish and Benthic Fish in the EA due to their mobility, which would allow them to move out of the way of the cable, and the anticipated minor effects to habitat (Robertson 2012a, Table 15-51). Potential effects were also not identified for the Marine Intertidal Vegetation VC because no trenching or burial of the cable is required, the footprint within the intertidal zone is small, and the construction period is short. Evaluations for the benthic fish and intertidal vegetation VCs are equally applicable to the new cable alignment (Table 1). Pelagic VCs do not interact with the proposed change in cable alignment or the flexibility in the location of the eastern cable entry point.

Bull Kelp

The increased flexibility required for the cable entry point on the east shore of Sechelt Inlet has the potential to affect the evaluation of the Bull Kelp VC. Bull Kelp was identified to occur along both the eastern and western shorelines of Sechelt Inlet and impacts to the foreshore zones are anticipated during cable installation due to barge landings and foreshore construction activities. Although many aspects of the works and materials are unchanged such as construction methods, the number of shoreline cable entry and exit points, and size of the cable (and therefore footprints of entry and exit points are also unchanged), the increased flexibility that is being requested for the location of the eastern cable entry point indicates that the nearshore footprint may be in a different

location than that which was considered in the EA, which could therefore affect the evaluation of the impacts to Bull Kelp.

During baseline studies, impacts to Bull Kelp from cable installation were evaluated through intertidal transects and by viewing subtidal video footage collected through Remotely Operated Vehicle (ROV) technology. These surveys allowed identification of kelp occurrences within the cable and construction disturbance footprint and provided comparative estimates of occurrences and stem densities within and outside of this footprint. Because kelp beds were identified within the construction zone of impact, prescribed mitigation included recommendations for a construction timing window during which impacts would be minimized (late fall to early winter), which coincides with one of the timing windows prescribed within DFO's Marine/Estuarine Timing Window for the Protection of Fish and Fish Habitat for the Project area (i.e., Area 16 – Pender Harbour) (DFO 2014). However, alternative mitigation was also prescribed in case this timing restriction was not possible. The alternative mitigation included control of barge landings, keeping propellers of vessels outside of kelp beds, conducting work at slack tides and in appropriate weather windows to maintain maximum control of vessels, and the developing contingency plans prior to the commencement of cable installation that would address the potential for poor conditions during the cable installation period. In light of this mitigation, the EA identified short-term low magnitude residual effects for Habitat Loss for the Bull Kelp VC.

The existing baseline data on Bull Kelp distribution and abundance does not extend far enough along the eastern shoreline to allow comparison of the area evaluated for the EA to the entire area within which the cable entry point may occur if the requested flexibility in location is approved (Map 3, grey polygon). However, it is reasonable to assume that similar Bull Kelp densities may occur throughout this area, especially because stem densities in two patches of kelp beds quantified during baseline surveys immediately north and south of the approved cable entry point were similar (Robertson 2012e, Appendix 13, Figure 3). Thus, given that footprint size and construction methods will not differ, and provided that mitigation commitments prescribed in the EA are adhered to, the conclusions of the EA will not be affected by the requested increased flexibility in cable entry location and no additional mitigation is required.

Benthic Invertebrates

The proposed change in marine substrate footprint that would result from the alternative cable alignment may affect the evaluation of potential effects for relatively immobile benthic VCs. The change in cable location has the potential to change the quantity and/or quality of marine substrate and habitat type affected by cable installation and therefore also impacts to benthic marine invertebrates associated with this habitat. The EA identified Increased Mortality Risk potential effects related to the submarine cable crossing for the Benthic – Mobile Invertebrates VC, and Increased Mortality Risk, Habitat Loss, and Change in Habitat Quality potential effects for the Benthic (surface) Sessile Invertebrates VC.

In the EA, the potential adverse effects for benthic invertebrate VCs were assessed by conducting literature reviews and benthic surveys of the proposed submarine cable alignment using video footage from ROV technology. These results were used to identify valuable substrates and species or species groups present or potentially present in the cable footprint. Species at risk or of particular concern identified included the Northern Abalone (a benthic mobile invertebrate), which is federally Endangered and provincially red-listed (CDC 2016), and sensitive sponge and soft coral species (benthic sessile invertebrates). Substrates/habitats important for these and other invertebrates were identified near one or both shorelines that included bedrock outcroppings, dense beds of seaweed, kelp and algae, and areas of shell/sandy/muddy substrate. These substrates/habitats provide stable substrate for attachment, areas of shelter, and areas for foraging. For all potential effects identified for each VC, mitigation was prescribed to conduct pre-installation surveys, using ROV, quadrate counts, or digital still photography, along the cable corridor to identify areas where groups of sensitive invertebrates may occur in high densities and to adjust the footprint to avoid such areas. Given that areas of suitable habitat were found along the cable alignment and that limited baseline data were available for species occupancy and density, it was assumed for the EA that the entire submarine cable footprint (which included the footprint of three 4 cm diameter cables laid over 2 km of the seabed as well as the concrete blocks required to anchor it) represented suitable habitat for the identified VCs. This footprint was used, in relation to the habitat available in the LAA (with all of the LAA considered to support suitable habitat), along with the vulnerability of each VC (e.g., mobility of a VC, predicted recovery time) to evaluate residual effects following mitigation.

If the alternative cable alignment is adopted, this may affect the habitat types or qualities that occur within the cable footprint and therefore also potentially the number of invertebrates impacted; thus, potentially affecting evaluation of habitat and mortality potential effects. Another ROV survey was conducted in August 2016 along the alternative cable route during which data on marine substrate and encounters of invertebrate species were recorded (Terra 2016). Direct comparison of data collected during 2016 surveys to data presented during baseline surveys (Robertson 2012e) was not possible. However, similar substrates were recorded during both ROV surveys that included predominately cobble, gravel, and boulder, along with areas of bedrock, mud, and shell. Further, all of the species groups detected during the 2016 survey (sea pens, urchins, shells, hydroids or tube worms, and feather stars) were detected or considered present (based on literature reviews) in the EA. Thus, roughly similar habitat types are contained within the two footprints. Hence, species groups potentially affected are comparable. Nevertheless, some habitat characteristics, such as depth and current, differ between the two footprints, especially in the central part of the channel where the two alignments are most divergent. Further, because the cable entry point on the east side of Sechelt Inlet may differ from the approved location, differences in impacts to valuable nearshore habitats and species are possible near the eastern shore.

In addition to the potential differences in habitat type associated with a change in footprint location, footprint size may also change with the alternative alignment because a direct crossing requires a shorter cable than one that is less direct. The EA conservatively calculated a cable footprint size of

27 m^2 based on a cable length of 2 km. The new cable crossing length would be 2.28 km (assuming central cable position within the proposed "cable corridor"; Section 3.1; Map 3). Thus, given that cable size and anchoring requirements are unchanged (i.e., width of the footprint is unchanged), and assuming that the entire footprint of the newly proposed cable alignment also contains suitable habitat, the newly proposed marine substrate footprint is greater than the approved by approximately 14%, which is equivalent to 31 m^2. Thus, due to the narrow cable footprint width, the additional 280 m of cable length in the alternative alignment causes little difference in marine footprint (4 m^2), especially in relation to that estimated for the LAA (3,003.1 m^2 as presented in Robertson 2012a).

In summary, the submarine cable footprint size differs little between alignments and the habitat and species impacted are similar. Further, the other considerations used to identify and assess residual effects such as VC vulnerability (based on mobility and potential for recovery) are unchanged. However, because some aspects of the habitat characteristics associated with the potential changes in alignment are not well established (i.e., the effect of the change in depth and current that would result from the alternative alignment on species occurrence and abundance; the effect of the requested flexibility along the eastern shore for the cable entry point on valuable nearshore habitats) the mitigation prescribed in the EA to minimize impacts to nearshore habitats and areas of high invertebrate density are especially important. Because these mitigation measures include pre-installation surveys, and because fine-scale cable alignment would be modified in accordance with these results, these mitigation measures would be effective in minimizing impacts regardless of the final route that is selected. Thus, assuming that mitigation prescribed in the EA is implemented, no changes to the conclusions of the EA with regard to the identification and characterization of residual effects for benthic invertebrates VCs result from the proposed changes in submarine cable alignment and increased flexibility of the eastern cable entry point location, and no additional mitigation is required.

Marine Birds

The potential effect of Habitat Loss was identified for one key indicator, Marbled Murrelet Foraging, due to the potential for habitat alienation resulting from sensory disturbance (Robertson 2012a). Sensory disturbance resulting in habitat alienation was predicted to occur due to traffic from a barge and smaller support vessels in Skookumchuck Narrows during cable installation throughout the anticipated one week construction period. In the EA, Marbled Murrelets were assumed to forage throughout the length of Skookumchuck Narrows and an area of disturbance of 8,000 m^2 was estimated around the barge and support vessels. However, residual effects of Habitat Loss were not anticipated given the small size of the disturbance area relative to the habitat available in Skookumchuck Narrows and that the disturbance time is restricted to one week. This conclusion is unchanged for the alternative cable alignment because there is no difference in construction period length and cable footprint size is virtually unchanged. Thus, there is no change in the evaluation of Marbled Murrelet foraging habitat loss due to disturbance and no additional mitigation is required.

4.1.2. Assessment of Social and Economic Disciplines

The proposed alignment change for the Substation and Transmission Component on the east side of Sechelt Inlet has the potential to interact with one VC of the Social and Economic Disciplines (Table 2). A consequence of the change in alignment on the east side of Sechelt Inlet, which is requested to resolve issues related to private land use, is an interaction with the Sechelt Inlet VC of the Visual Quality subject area within the Social and Economic Discipline.

4.1.2.1. Visual Quality

The potential rerouting of the transmission line alignment on the east side of Sechelt Inlet to the south to avoid a parcel of private land has the potential to impact visual quality at Sechelt Inlet during construction and operation because the proposed change may affect the visibility of the transmission line ROW from lower elevations including Sechelt Inlet. The original EA considered effects on visual quality that were anticipated as a result of the construction and installation of Project infrastructure which can alter the natural elements of the landscape. The assessment of these activities on the visual quality of the Sechelt Inlet VC are not expected to change for the proposed alternate alignment due to the similarity of the ROW in size and shape, construction requirements, and operational maintenance requirements relative to the approved alignment.

Visually altered landscapes are categorized based on the extent of alteration (i.e., size, shape and location of cutblocks, roads, and linear developments) for the area and how these are perceived (i.e., aesthetics, size, appearance) from significant viewpoints. The presence of the transmission line on the east side of the Sechelt Inlet was quantitatively and qualitatively evaluated in the Socio-economic EA (Robertson 2012d) for the Project using the methods based on the evaluation of the Visual Quality Objective (VQO) (BC MOF 1997). The VQOs is a recommendation describing the level of alteration that would be appropriate for a Visual Sensitivity Unit (VSU). VQOs are defined within the *Forest and Range Practices Act* (FRPA 2002) and three primary measures are relied upon to determine if the VQO has been met: (1) the percent alteration goals (these are established for different categories of visually altered landscapes (i.e., 0.5% to 1.5 % for "Retention" and 1.5 % to 7.0 % for "Partial Retention"), (2) location of the alteration on the landform, and (3) the shape of the alteration.

Two potential interactions are pertinent to the proposed alternate alignment, specifically:

a) Potential for transmission lines on Sechelt Peninsula to affect aesthetic quality; and

b) Potential effect (visual/aesthetic) on recreational kayakers using Skookumchuck Narrows.

The reduced aesthetic quality of the landscape was evaluated for the approved alignment in the EA (Robertson 2012d) and may interact with the alternate alignment. Two viewpoints evaluated in the EA are relevant to the newly proposed alignment: a Sechelt Inlet viewpoint and a popular kayak viewing location near the westernmost point of Skookumchuck (Sechelt) Rapids.

Two VSUs, which correspond to the proposed area of the alternate transmission line routing, were evaluated in the EA (#1066 and #1089). The Sechelt Inlet baseline visual assessment report

summarized these units (Chartwell 2011). VSU #1066 is categorized by the "Partial Retention" definition which indicates that the VSU assessed from a significant viewpoint is: (i) easy to see, (ii) small to medium in scale, and (iii) natural and not rectilinear or geometric in shape (Figure 1). VSU #1066, which corresponds to the private land area, contains many large disturbances and does not meet the % alteration goals for the "Partial Retention" objective (Chartwell 2011). The VQO for #1089 was categorized as having a "Retention" objective which indicates that the disturbance is: i) difficult to see, (ii) small in scale, and (iii) natural in appearance (Figure 2). The results of the baseline study concluded that the % alteration of VSU #1066 and VSU #1089 were both not within the relevant VQO guidelines. Thus, for both VSU, existing disturbance prevented the VQO guidelines from being met.

Nevertheless, assessment of the potential for the conclusions of the EA to change with the alternate alignment was conducted through a qualitative evaluation based on available information. The approved and alternate routings of the transmission line on the east side of Sechelt Inlet are modelled in Figure 3, which represents the simulated view from the Sechelt Inlet viewpoint. The highest elevation portion of the alternate alignment will run alongside an existing disturbance (i.e., logging road) at the top of the ridge and it is likely that the visual disturbance along the ridge will blend into the existing landscape and will not create any new "major lines" or unnatural bisection of the landscape. Further, the western portion of the transmission line for the alternate alignment will span the gully (central in Figure 3) to connect to this existing disturbance and will therefore not impact the mature forest in the gully or cause a visual corridor within it. The vertical descent of the alternate transmission line will produce a new visible corridor or line in the landscape. However, once this descent is complete the new alignment is routed to the north through a depression and is not visible until it emerges in a similar location as the approved alignment and runs to the shoreline. In comparison, the vertical descent of the approved alignment will traverse a forested area on the north side of the gully which is currently less disturbed than the area that will be transected by the alternate alignment (on the south side of the gully). Based on our qualitative evaluation it is therefore not expected that the visual quality of VSU #1066 will differ substantially between the approved and alternate routing considering that the alternate routing would impact an already disturbed area (Figure 4), leaving the currently forested corridor on the north side of the gully intact. The visual quality of VSU #1089 will also not differ between alignments because both ROWs transect forested habitat in a similar fashion and would therefore be equally visible. Thus, based on this qualitative assessment, and given that the existing disturbance prevented the VQO guidelines from being met, the conclusions of the EA, in which a non-significant residual effect from the Sechelt Inlet viewpoint was identified, are unlikely to change for the alternative alignment.

From the kayaker viewpoint, the vertical descent of the alternate routing will likely be more visible than the approved routing (Figure 5). However, while this change will result in a line bisecting the vista, the disturbance will occur in an already disturbed area in which the VQO guidelines are currently not met. Moreover, the kayaker viewpoint is adjacent to existing disturbance associated with the Lafarge's existing gravel pit adjacent to Skookumchuk Narrows. It is therefore not expected

that this change to the visual quality of the view from the kayaker's perspective will alter the conclusions of the EA, which did not identify a residual effect. However, this assessment is based on a qualitative evaluation of the available data and historical photographs and is not intended to replace a more quantitative evaluation of % alteration of the landscape by the alternate alignment.

Figure 1. Original assessment of VSU #1066 by Chartwell (2011).

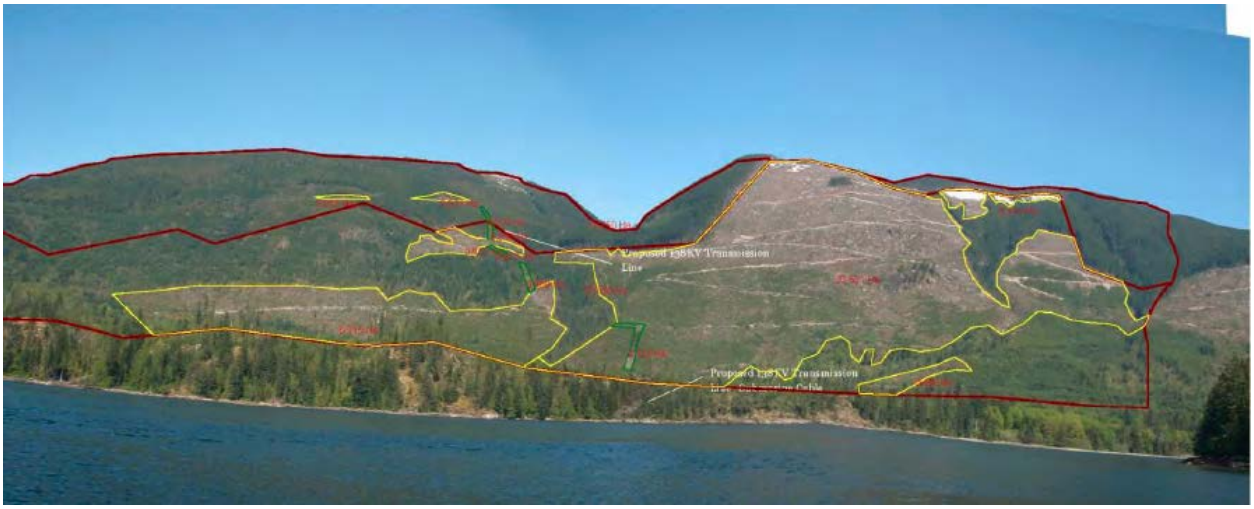


Figure 2. Original assessment of VSU #1089 by Chartwell (2011)

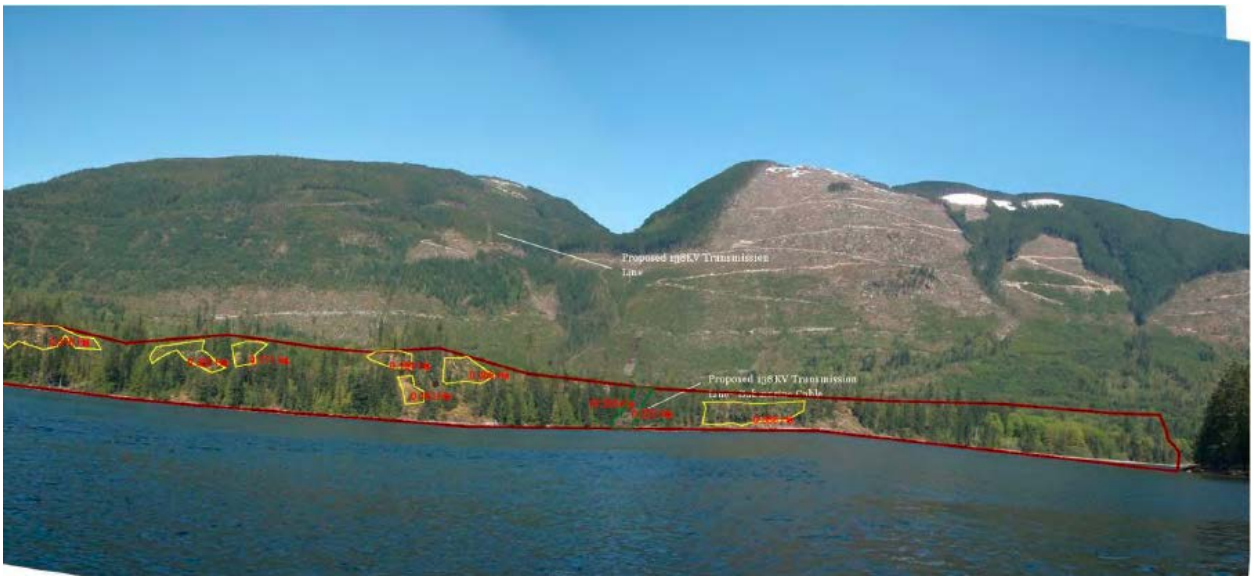


Figure 3. **Visual depiction of the east side of Sechelt Inlet (looking east) displaying the approved and alternate transmission line from the Sechelt Inlet viewpoint.**

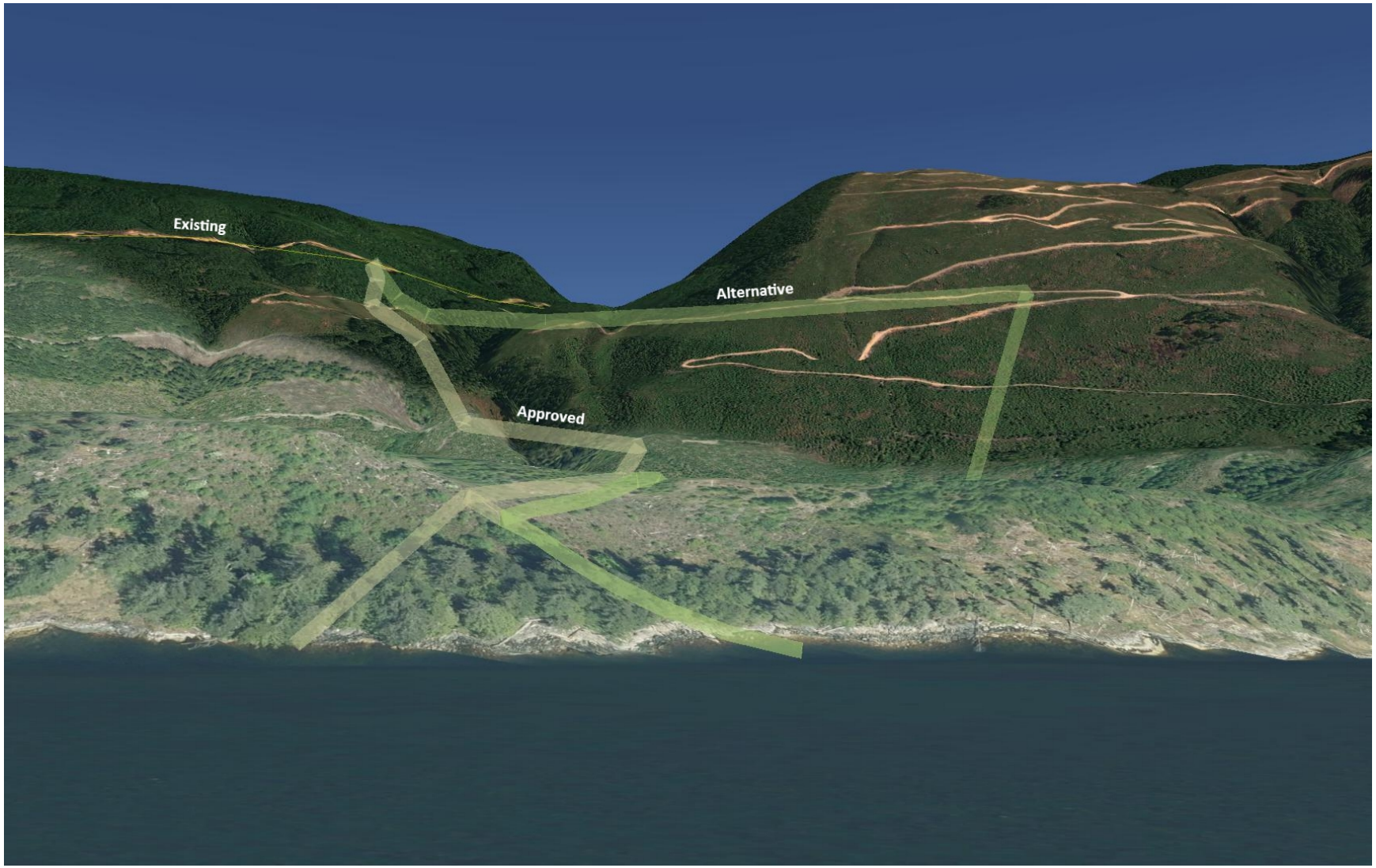


Figure 4. **Forest harvesting on private land from Skookumchuk Rapids, looking east (Figure 4 of Chartwell 2011).**

Figure 5. **View from the Kayakers viewpoint looking east (Figure 13 of Chartwell 2011).**

Figure 6. Viewpoint directly north of the Skookumchuk Narrows (Sunshine Coast Tourism 2016).

4.2. Upper Ramona Component

Two types of changes are requested for the Upper Ramona Component, changes to the transmission line alignment and changes to the classification of the access road to the tunnel portal. Neither change has the potential to interact with the Social and Economic Disciplines (Table 2). The newly proposed transmission line alignment follows the existing road ROWs to a similar extent as the approved alignment; thus, there is no potential for Land, Resource, and Water Use VCs, and Visual Quality VCs to be affected. The new alignment also improves logistics and worker safety and has no impact on infrastructure and services or public health and safety. There is also no negative interaction with First Nations Interests given that one of the changes is proposed to avoid areas of Aboriginal archaeological significance and both have been made in collaboration with the shíshálh Nation. Similarly, the proposed change to the access road classification does not affect evaluation of any of the Social and Economic VCs because one road is being removed from the CPD and the other, which is being reclassified as permanent, is already approved as a temporary road. Several VCs in the Terrestrial and Wildlife Environmental Discipline and one VC in the Marine Fauna and Habitat Environmental Discipline do have the potential to interact adversely with the proposed changes (Table 1) and these are assessed below.

The proposed increase in the size of the infrastructure leeway (i.e., 150 m) that is requested for a section of the transmission line alignment immediately north of the head of Narrows Inlet (Section 3.2; Map 4) does not affect the conclusions of this assessment because it applies only to a short, approximately 600 m section, and the increase in flexibility, required to avoid small archeological sites, is increased by only 50 m on each side.

4.2.1. Assessment of Environmental Disciplines

There is potential for VCs in the Environmental Disciplines to interact with the proposed changes in transmission line alignment for the Upper Ramona Component if the resulting change in footprint size or location has the potential to cause a change in the assessment of potential effects (Table 1). The proposed changes do not interact with VCs in either the Atmospheric or Geophysical Environment because the new alignment will take advantage of existing road ROWs and in one location avoids difficult terrain (Section 3.2). Similarly, no changes to the conclusions of the EA could result for the Freshwater Fish and Fish Habitat VCs because no streams are crossed by the new alignment and, in contrast, one stream crossing is avoided (Map 4). The proposed changes have no potential to affect VCs in the Marine Fauna and Habitat Environmental Discipline, with one exception. Because the transmission line is routed over the existing causeway, evaluation of potential effects for the Marine Birds VC could be impacted by the transmission line that will now bisect a portion of the estuary and potentially pose an increased risk of collision and/or electrocution (Section Marine Fauna and Habitat). This risk is also applicable to one key indicator of the Birds VC (Stick Nest Raptors) (Section Terrestrial Wildlife and Vegetation). In addition, all five Terrestrial Wildlife and Vegetation VCs have the potential to interact with the proposed change in transmission line alignment because a change in the location and size of the terrestrial footprint could affect impacts to terrestrial habitat (Section Terrestrial Wildlife and Vegetation).

There is also potential for VCs in the Environmental Disciplines to interact with the proposed change to the classification of the tunnel portal access road (Table 1). The road that is proposed to become permanent crosses two streams and affects terrestrial habitat; thus potential for this change to affect evaluation of Freshwater Fish and Fish Habitat VCs and Terrestrial Wildlife and Vegetation VCs must be considered.

4.2.1.1. Feeder Transmission Line

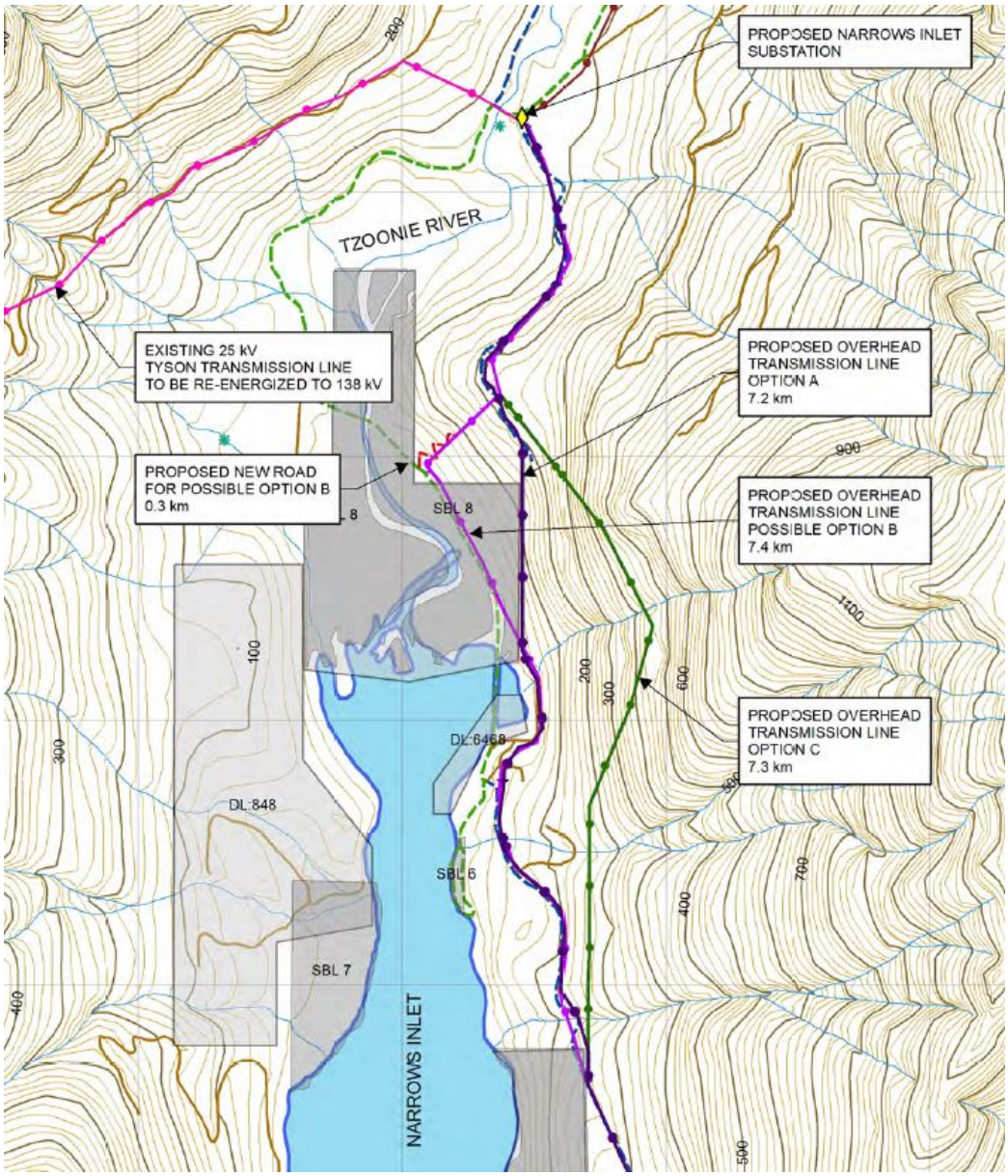
Terrestrial Wildlife and Vegetation

All Terrestrial Wildlife and Vegetation VCs (Vegetation, Invertebrates, Amphibian & Reptiles, Birds, and Mammals) have the potential to interact with the proposed change to the transmission line alignment of the Upper Ramona Component because the new alignment traverses different terrestrial habitat from that evaluated in the EA. The EA evaluated potential effects of Habitat Loss for all VCs, Habitat Change for all VCs except Invertebrates, and Change in Behavior and Increased Mortality for Amphibians & Reptiles, Birds, and Mammals VCs. Vegetation clearing and maintenance associated with transmission line construction and operation was considered in the EA. The proposed change has the potential to affect evaluation of Habitat Loss and Habitat Change for

all VCs. The evaluation of Change in Behaviour and Increased Mortality potential effects may also be affected by the change in alignment for some VCs if impacts to suitable or critical habitat differ or if the change in footprint raises issues not originally encountered. For one key indicator, Stick Nest Raptors, routing the transmission line over the causeway has the potential to change the evaluation of the Increased Mortality potential effect because the new location, within the estuary, increases vulnerability to collision and electrocution. Potential for interaction with the Terrestrial Wildlife and Vegetation VCs due to a change in ROW footprint affects both the Project's construction and operation phase. The potential collision and electrocution risk to Stick Nest Raptors apply only to the Project's operation phase.

The EA assessed three transmission line options (A, B, and C) in the location where changes are proposed (Figure 7; Robertson 2012f, Figure 2-12). Among these, Option A is similar to the approved alignment and Option B is similar to the newly proposed alignment. Nevertheless, there are some differences between Option B and the proposed alignment. Option B avoided the causeway and the road immediately north of the causeway, and the two alignments have a different northeast trajectory when departing the Tzoonie Mainline forest service road (FSR) and rejoining the main alignment (compare Inset 2 of Map 4 with Figure 7). Thus, only the central portion of the proposed alignment along the Tzoonie Mainline FSR was assessed in the EA.

Figure 7. **Portion of Figure 2-12 cropped from Robertson (2012f) showing the three transmission line alignment options (Options A, B, and C) at the north end of Narrows Inlet that were assessed in the original EA for the Upper Ramona Component.**



No streams are affected by the proposed change in transmission line alignment; thus, the Coastal Tailed Frog key indicator from the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC; do not interact with the proposed changes. Small wetlands and Northern Red-legged Frog breeding areas were identified in the EA north of the estuary, in the immediate vicinity of the large easterly bend in the Tzoonie River (Robertson 2012e, Section 6.10.4.1.2, Figure 6-127).

However, potential effects related to transmission line construction and operation were assessed in the EA because the wetlands are situated along the portion of the transmission line that is the same as Option B. Mitigation was prescribed in the EA to protect these wetlands from transmission line construction and maintenance that included conducting surveys for wetlands in and within 50 m of the Project footprint, implementing water quality protection measures, and establishing riparian buffers around wetlands. Thus, the conclusions of the EA are unchanged by the newly proposed alignment and additional the mitigation is not needed (Robertson 2012b, Section 14.3.4.1.4.).

The terrestrial footprints of the newly proposed and the approved transmission line ROWs for the Upper Ramona Component are almost identical in size, which reflects similarity in the extent of use of existing road ROWs, and differences in forest age classes affected are small (Table 7). The newly proposed alignment overlaps with a small amount (0.52 ha) of old growth forest (>251 years) that is located immediately north of the causeway along the existing road ROW and that was not intersected by the approved alignment. However, the newly proposed alignment also results in a small decrease (0.54 ha) in impacts to forest of mature age classes (>80 years). Both alignments would predominantly affect young forests (<80 years). The approved alignment has greatest impacts to forests of age class 2 (21-40 years) whereas the newly proposed alignment has greatest impacts to age class 4 (61-80 years) (Table 7).

Habitat loss and change in mature forests can, in general, be considered more significant due to the high replacement time required for old forests to regenerate and in this regard, mature and old growth forests therefore have greatest value. Further, key indicators of both the Birds and Mammals VCs are associated with mature forests.

Key indicators for the Birds VC, such as Northern Goshawk, Marbled Murrelet, and Western Screech-owl, are associated with mature forests. Both the new and the approved alignments intersect suitable habitat for Northern Goshawk and Western Screech-owl, especially north of Narrows Inlet (Inset 2 of Map 4). However, no habitat of high suitability for Western Screech-owl is affected by the changed alignment in this location, and although more moderately suitable habitat is intersected by Option B (which is most similar to the new alignment) than Option A in the EA (an additional 2.06 ha). This intersected habitat occurs along the portion of the new transmission line alignment that is the same as that of Option B (Robertson 2012e, Figure 6-50), and thus has already been considered in the EA. In contrast, more moderately suitable, and a small amount of highly suitable, Northern Goshawk habitat is intersected by the newly proposed alignment than the approved one, owing to the forested habitat intersected north of the estuary. The difference in habitat intersection between alignments is 1.8 ha (Table 8). However, in the EA, Option B intersects 1.05 ha more moderately suitable habitat than Option A. Hence, only approximately 0.83 ha of the 1.8 ha in Table 8 was not considered in the original assessment (i.e., EA). Any intersection with moderately suitable Marbled Murrelet habitat is avoided by the proposed change (Robertson 2012e, Figure 6-47).

Mature forests also provide suitable habitat for a number of key indicators of the Mammals VC, specifically Mule Deer, Roosevelt Elk, Grizzly Bears, and bats. In the EA, mature forest, defined as

greater than 100 years in age, was used as a proxy of suitable habitat for Mule Deer because it provides winter shelter and winter foraging habitat. However, the increase in footprint size of the newly proposed relative to the approved transmission line ROW in mature forest is small (0.13 ha when defining mature forest for Mule Deer). For comparison, 994 ha of structural stages 6 and 7 (101-140 years) were identified in the Ramona Creek LAA that may serve as winter shelter and winter foraging habitat for Mule Deer (Robertson 2012b). Thus, the predicted loss represents a small percentage (0.01%) of what is currently available. Further, there is a decrease in overlap with forests greater than 80 years of age with the new alignment. The small amount of old growth forest impacted by the new alignment is adjacent to the Tzoonie Mainline FSR, and thus the new transmission line ROW will not cause fragmentation.

Small differences in the amount of mapped suitable habitat intersected by the newly proposed and the approved transmission line alignments exist for the Bats, Roosevelt Elk, and Grizzly Bear key indicators of the Mammals VC. All proposed alignment options transect a patch of bat shelter habitat north of Narrows Inlet and transmission line Option B impacts more habitat than Option A (difference of 0.34 ha; Robertson 2012b, Table 14-67). However, the great majority of this difference is due to the intersection of habitat in the location where Option B and the new alignment do not differ (Robertson 2012e, Figure 6-51); thus, this habitat loss was assessed in the EA. A very small amount of bat shelter habitat may be affected immediately north of the estuary which was not assessed as part of Option B; however, this is negligible in area and located along the edge of a habitat patch (Robertson 2012e, Figure 6-51). The newly proposed alignment also results in a slight increase in the amount of Roosevelt Elk suitable (class 1 to 3) winter feeding habitat affected (difference of 1.25 ha between Option A and B; Robertson 2012b, Table 14-69). This increase is due to the presence of habitat north of the estuary, which, similar to bat shelter habitat, was mostly previously assessed due to its location along the Option B alignment (Robertson 2012e, Figure 6-53). In contrast, the intersection of suitable (class 1 and 2) elk winter shelter habitat is slightly reduced with the new alignment (0.75 ha; Robertson 2012b, Table 14-71, Figure 6-54). The intersection of Grizzly Bear suitable feeding habitat (class 1 to 3 for spring, summer, and fall) is greater for all seasons for Option B than Option A (difference of 0.27 ha, 0.26 ha, and 0.26 ha for spring, summer, and fall feeding habitat, respectively; Robertson 2012b, Tables 14-73, 14-75, and 14-77) due to a patch of habitat north of the estuary. There is also additional habitat (class 1 to 3; including class 1 habitat for spring feeding habitat) overlapped by the new transmission line alignment that was not considered in the EA because it was not intersected by the Option B alignment because it is immediately north of the estuary (Robertson 2012e, Figure 6-57). However, the amount of this habitat that will be overlapped by the new ROW is small and adjacent to an existing road ROW (Tzoonie Mainline FSR). Further, the herb and shrub species that Grizzly Bears utilize for foraging are maintained during vegetation clearing and maintenance for the transmission line ROW.

Overall, there is no difference in the evaluation of residual effects for Terrestrial Wildlife and Vegetation VCs between the newly proposed and the approved alignments and the conclusions of

the EA are unchanged for Habitat Loss and Habitat Change potential effects for all VCs. Terrestrial footprint sizes and impacts to mature forest differed little between alignments and less mature forest greater than 80 years is impacted by the new alignment. Further, the proposed changes in alignment resulted in either little difference in the amount of suitable habitat intersected for key indicators, the avoidance of suitable habitat relative to the approved assessment (Marbled Murrelet habitat, elk winter shelter habitat), or an increase in habitat intersected but for habitat that was previously entirely or mostly considered in the EA, as part of Option B. The evaluation and characterization of residual effects for Habitat Loss and Habitat Change are therefore unchanged from the EA by the proposed alignment modifications and no additional mitigation is required. This also indicates that (with the exception of Stick Nest Raptors – see below) the evaluation and characterization of residual effects for Change in Behavior and Increased Mortality, which may result from the activities that cause habitat loss and alteration, are unchanged for the Amphibians & Reptiles, Birds, and Mammals VCs.

Table 7. Overlap between the transmission line ROW footprint by forest age class for the currently approved and newly proposed transmission line alignments for the Upper Ramona Component.

Forest Age (years)	Transmission Line ROW		Difference[1] (m^2)
	Approved (m^2)	Proposed (m^2)	
0 (default)	0	508	508
1-20	0	0	0
21-40	17,268	137	-17,131
41-60	0	0	0
61-80	2,428	23,933	21,505
81-100	6,879	58	-6,821
101-120	0	0	0
121-140	3,790	0	-3,790
141-250	0	0	0
>250	0	5,165	5,165
Total	**30,365**	**29,801**	**-564**

[1] Proposed minus approved footprint area.

Table 8. Overlap between the transmission line ROW and Northern Goshawk habitat for the currently approved and newly proposed transmission line alignments for the Upper Ramona Component.

Northern Goshawk Habitat Suitability	Transmission Line ROW		Difference[1] (m^2)
	Approved (m^2)	Proposed (m^2)	
High	0	261	261
Moderate	2,672	21,249	18,576
Total	**2,672**	**21,509**	**18,837**

[1] Proposed minus approved footprint area.

One of the proposed changes in alignment may affect the evaluation of the potential effect Increased Mortality for the Stick Nest Raptors key indicator of the Birds VC during the operation phase. The portion of the proposed alignment following the existing causeway has the potential to negatively affect this key indicator because raptors, particularly those that forage and nest near water, may be more likely to collide with, or be electrocuted by, a transmission line that bisects a portion of the estuary. A discussion of the risk of collision and electrocution is provided in Section 'Marine Fauna and Habitat' for marine birds. Among avian groups, raptors are particularly susceptible to electrocution (NABU 2006) and those raptors that tend to use structures for nesting and/or that nest and forage near water (e.g., Bald Eagle and Osprey) would be particularly at risk by the proposed change in alignment.

Although no active raptor nests were found during the helicopter survey conducted as part of baseline studies, and regenerating forest in the Ramona and Tzoonie River Valley Project areas was considered generally too young to support large platform nests, patches of mature forest exist along the northern edge of the estuary (GeoBC 2015) that would not have been surveyed. Further, two inactive Bald Eagle nests were documented near the head of Narrows Inlet (approximately 750 m south of the causeway and 1 km north of the causeway; Robertson 2012e, Figure 6-140) and the presence of an active nest in the estuary area was suspected based on observations of a Bald Eagle pair. Two ospreys were also detected incidentally at the head of Narrows Inlet during radar surveys for Marbled Murrelets (Robertson 2012e, Table 6-165). Ospreys frequently nest on power poles and the proposed transmission line along the causeway may represent an attractive nesting substrate, especially if natural nesting structures are scarce due to generally immature forests. Thus, collision with the transmission line and/or electrocution due to collision or nesting on power poles represents a mortality risk for these and potentially other raptor species. Additional mitigation has been prescribed to address this potential effect (see Section Marine Fauna and Habitat - Marine Birds VC). In summary, the transmission line along the causeway will be designed to reduce the risk of collision and electrocution (CEC 2002, APLIC and USFWS 2005, NABU 2006, Liguori 2008), including the use of transmission line markings, or other effective technique (APLIC 2012).

Increased Mortality was not identified as a potential adverse effect for Stick Nest Raptors in the EA. The change in transmission line route over the causeway is anticipated to lead to a residual effect for increased mortality due to risk of collision/electrocution for this key indicator that cannot be fully mitigated. Thus, provided that the mitigation prescribed in Section 'Marine Fauna and Habitat' is implemented, residual effects of Increased Mortality for the Stick Nest Raptor key indicator are anticipated that are characterized to be non-significant, of low magnitude, affecting the Project Development Area in geographic extent, long-term in duration, continuous in frequency, reversible when the Project is decommissioned, and occurring in a disturbed setting.

Marine Fauna and Habitat

The Marine Birds VC in the Marine Fauna and Habitat Environmental Discipline has the potential to interact with the proposed changes to the Upper Ramona Component transmission line alignment (Table 1) because the transmission line is proposed to cross the causeway which bisects the estuary (Map 4, Section 3.2). This change has the potential to result in collisions and/or electrocution of marine birds with the transmission line because it will bisect habitat used by marine birds. The proposed change may therefore affect the evaluation of the potential effect of Increased Risk of Mortality during the Project's operation phase. This potential effect was not originally identified in the EA due to the transmission line options considered. Evaluation of the other two potential effects assessed in the EA, Change in Behaviour and Change in Habitat Quality, are unaffected by the proposed change because the marine habitat would be unaffected and any increases in sensory disturbance due to construction of the transmission line is anticipated to be negligible, given that the causeway already exists and is in use and that the length of time required for constructing the transmission line in this location would be short.

Risk of bird injury and mortality due to physical impact or electrocution that results from interaction with transmission lines is well documented (summarized in APLIC 2012). The susceptibility of birds to collisions with transmission lines varies substantially among avian groups and is particularly linked with species that have the following characteristics: large heavy body, long wing span, poor maneuverability, relatively poor vision, and a tendency to fly in flocks. Tendencies toward specific behaviours, such as flushing in response to disturbance events, may also increase risk of collision due to distraction. When transmission lines intersect flight pathways that are frequently used (e.g., those between foraging and nesting areas or among foraging areas) or that are used infrequently but by many individuals (e.g., migratory pathways), this may also increase susceptibility to collision and mortality risk (APLIC 2012). In a ranking of risk susceptibility among groups of birds, Bevanger (1998) ranked waterbirds, including loons, grebes, herons, cormorants, swans, ducks, and geese, as being particularly susceptible. This is due to their large and heavy bodies, rapid flight, and poor maneuverability, and, for some species, flocking behavior and relatively poor eyesight as a result of adaptation to underwater vision (APLIC 2012).

Baseline inventory for the Ramona Creek Watershed reported that the Tzoonie River estuary and adjacent Narrows Inlet provides habitat for marine birds and waterfowl, particularly in winter

(Robertson 2012e). Waterbirds that make use of the estuary include Trumpeter Swans, Canada Geese, Great Blue Heron, dabbling ducks, diving ducks, loons, grebes, and some sea birds such as gulls, cormorants, guillemots, and Marbled Murrelets. Among these, species at risk include Great Blue Heron (provincially blue-listed, federally of special concern) and Marbled Murrelet (provincially blue-listed and federally threatened). The causeway is located near the eastern shore of the head of Narrows Inlet; thus, the transmission line is unlikely to cross migratory pathways or routes between feeding and nesting sites. Nevertheless waterbirds frequently fly among foraging areas and the transmission line may fall between foraging areas, such as between the main part of the estuary and the eastern corner of the head of Narrows Inlet. Information on fine-scale foraging areas or bird flight behavior was not available; hence, it must conservatively be assumed that flights over the causeway occur and that risk for collisions with the proposed transmission line therefore exists.

The severity of the collision and electrocution risk is difficult to predict, given that it depends on numerous and interacting site-specific factors (including interacting biological, environmental, and engineering factors (APLIC 2012)), and that site-specific information (including preferred foraging areas and marine bird flight behavior) are not available. However, mitigation can be prescribed to reduce collision and electrocution risk. Many studies suggest that collision risk can be lowered by 50-80% through line marking although the reported success varies greatly and some studies suggest that the risk reduction is much less (e.g., 9.6%) (summarized in APLIC 2012). Electrocution is largely a distribution line system problem and medium voltage range (1 kV to 60 kV) lines pose the greatest electrocution risk because spacing between conducting phases and between conductors and ground structures on distribution systems are within the wingspan or flesh-to-flesh distance of birds (CEC 2002, NABU 2006). However, beneficial spacing of transmission line components can substantially reduce this risk (CEC 2002, APLIC and USFWS 2005, NABU 2006, Liguori 2008).

Given that line markers can be expected to reduce mortality risk due to avian collisions and that the design of the transmission line can substantially reduce electrocution risk, the following mitigation is prescribed:

- The section of transmission line installed on the causeway on the east side of the head of Narrows Inlet will be designed to minimize the risk of bird collision and electrocution. This will include the installation of markers, or other effective technique, to increase line visibility and reduce collision risk and optimal spacing of components (insulators, transmission lines, other energized and grounded parts) to reduce electrocution risk. Design of this section of the transmission line to reduce the risk of bird collision and electrocution will occur in consultation with available guidelines (e.g., CEC 2002, Haas *et al.* 2003, NABU 2006, APLIC 2006, 2012) and will be approved by a qualified professional.

Implementation of this mitigation measure is anticipated to reduce the risk of mortality for Marine Birds due to collision with the transmission line on the causeway. However, although this risk can be reduced, available studies suggest that collision risk cannot be fully mitigated. Thus, a residual effect for Increased Risk of Mortality is anticipated for the Marine Birds VC that is characterized to be

non-significant, of low magnitude, affecting the Project Development Area in geographic extent, long-term in duration, continuous in frequency, reversible when the project is decommissioned, and occurring in a disturbed setting.

4.2.1.2. Access Road Reclassification

A change in the classification of the tunnel portal access road from temporary to permanent has the potential to interact with Freshwater Fish and Fish Habitat VCs and Terrestrial Wildlife and Vegetation VCs because aquatic, riparian, and terrestrial habitat may be affected permanently by the proposed change (Table 1). Although the road footprint will not differ, if the road classification is changed from temporary to permanent, the road will then not be deactivated and the ROW will not be restored following tunnel construction (i.e., the temporal scale of potential Project effects will be changed). This change therefore affects both the Project's construction and operation phases. However, given that the road footprint will not differ from that specified in the CPD, the construction of this road and its impacts on Freshwater Fish and Fish Habitat and Terrestrial Wildlife and Vegetation VCs have already been assessed and mitigation has been prescribed. Further, and most importantly, if the currently approved temporary road can be reclassified to permanent, then the currently approved permanent road, which was to transect a slope forested with mature timber, will no longer be required. Thus, by reducing Project requirements from two roads (one permanent and one temporary) to one (permanent), the requested change reduces the overall footprint of this Project component and therefore represents a reduction in the potential for environmental impacts, including the impacts associated with stream crossings. There is therefore no potential for the conclusions of the EA to be affected by the proposed change in road classification for any VC or associated key indicator in the Environmental Disciplines and no additional mitigation is required.

4.3. Lower Ramona Component – Tributary Intake

The minor change proposed to the Lower Ramona Component R1 (Marten - s-p'il-us Creek) intake location has the potential to interact only with two of the Environmental Disciplines (Table 1). It has no potential to interact with any of the Social and Economic Disciplines (Table 2).

4.3.1. Assessment of Environmental Disciplines

A change in intake location has the potential to interact with the Fish Habitat and Water Quality VCs of the Freshwater Fish and Fish Habitat Environmental Discipline and all of the VCs of the Terrestrial Wildlife and Vegetation Environmental Discipline because aquatic, riparian, and terrestrial habitat is affected by intake construction which would differ in location, and potentially in value, relative to that of the approved design (Table 1). This could therefore affect the evaluation for some potential adverse effects. There is no potential for negative interaction for any other VCs, given that the R1 tributary is not fish-bearing, and that the location is being changed to improve geophysical stability. However, although there is potential for interaction with Freshwater Fish and Fish Habitat and Terrestrial Wildlife and Vegetation VCs, the small change in location and its proximity to a previously assessed location prevent this change from having the potential to affect

the conclusions of the EA. The newly proposed intake location is between the approved and the original intake location and is less than 40 m upstream from the original location (Section 3.3, Map 5). Because the original intake location was evaluated in the EA and the newly proposed location is within 100 m of the original location, there is no potential for the conclusions of the EA to be affected by the proposed change for any VC or associated key indicator in the Environmental Disciplines.

4.4. Chickwat Component – Feeder Transmission Line

The two changes to the transmission line proposed for the Chickwat Component have no potential to interact negatively with the Social and Economic Disciplines (Table 2). The lengths of the sections of the alignment that would be changed are short (180 and 350 m in length) and transect similar habitat as those currently approved. There is also no negative interaction with First Nations Interests and shíshálh Nation has reviewed and approved these changes. VCs in the Freshwater Fish and Fish Habitat and Terrestrial and Wildlife Environmental Disciplines do have the potential to interact negatively with the proposed changes (Table 1) and these are assessed below.

4.4.1. Assessment of Environmental Disciplines

There is potential for VCs in the Environmental Disciplines to interact with the proposed changes in transmission line alignment if the resulting change in terrestrial or riparian footprint size or location has the potential to cause a change in the assessment of potential effects (Table 1). The changes in alignment proposed for the two locations in the Chickwat Component do not have the potential to negatively affect VCs in either the Atmospheric or Geophysical Environment because there is no change in construction methods and because the sections in which the alignment is modified are short, thus there is little potential for topography or other components of the geophysical environment to differ. However, the proposed changes in transmission line alignment will affect the riparian and terrestrial footprint of the ROW, thus some Freshwater Fish and Fish Habitat (Section 4.4.1.1) and all Terrestrial Wildlife and Vegetation (Section 4.4.1.1) VCs have the potential to interact with these changes. Because potential impacts are related to initial vegetation clearing as well as vegetation maintenance of the ROW, potential interactions are relevant to both the construction and operational phases.

4.4.1.1. Freshwater Fish and Fish Habitat

The proposed modifications in alignment of the Chickwat Component involve changes to the locations of two stream crossings and the addition of one more stream crossing (Insets 1 and 2 in Map 6, Section 3.4). Consequently, the proposed modifications have the potential to affect the evaluation of some of the VCs of the Freshwater Fish and Fish Habitat Environmental Discipline (Table 1). Vegetation clearing causes riparian habitat loss where the transmission line ROW crosses watercourses and may also affect water quality (temperature, sedimentation). Hence, clearing and maintenance associated with transmission line construction and operation was considered in the EA, when evaluating potential effects to the Fish Habitat and Water Quality VCs (Robertson 2012c).

Both changes in alignment involve a change in the location of a stream crossing: (1) Chickwat Creek will be crossed in the immediate vicinity of the powerhouse, and (2) the Tzoonie River will be crossed about 1 km south of the powerhouse (Insets 1 and 2 in Map 6, respectively; Section 3.4). In addition, the transmission line is now proposed to join the existing Tyson Creek transmission line further south than originally planned and as a consequence a tributary to the Tzoonie River must be additionally crossed by the ROW instead of sharing the existing Tyson Creek transmission line ROW adjacent to the Tzoonie Mainline FSR (Map 6, inset 2).

At both locations, the change in crossing location is minor (moved by less than 250 m; Insets 1 and 2 in Map 6) and the total amount of riparian habitat that intersects the ROW is similar between alignments (Table 9). At the Chickwat Creek crossing, there is virtually no difference in the amount of riparian habitat affected between alignments. At the Tzoonie River crossing, slightly more riparian habitat (0.17 ha) is intersected than the approved alignment because the crossing angle of the new alignment is no longer perpendicular to the stream channel. The additional crossing of the tributary southeast of the Tzoonie River, required for the new alignment, also represents an increase in riparian habitat loss. Thus, combined losses to riparian habitat from both proposed changes are anticipated to increase by a total of 0.21 ha owing mostly to the Tzoonie River crossing change and the added tributary crossing (Table 9). In the Updated Aquatic Environmental Effects Assessment (AEA), a total of 44,694 m^2 of riparian habitat were anticipated to be lost for the Chickwat Component for all infrastructure combined (Lacroix *et al.* 2015). Thus, the additional riparian habitat that is impacted due to the new alignment represents a 4.6% increase.

In addition to an overall small increase in riparian footprint size, the riparian habitat impacted is of higher value for the new than the approved alignment (more climax habitat lost) (Table 9). This is due to mature forest stand age in the new crossing locations. The crossing of the additional tributary also affects high value riparian habitat owing to inferred fish-bearing status and mature forest. This loss in riparian habitat value at all crossings will be short-term due to the additional stringent riparian area clearing mitigation intended to prevent long-term riparian impacts that have been prescribed in the Chickwat Updated AEA (Lacroix *et al.* 2015). Mitigation measures include restrictions on construction (e.g., infrastructure placement, machinery use) and vegetation clearing (e.g., topping of trees, retention of woody vegetation) additional to BMPs detailed in the Integrated Vegetation Management Plan for Transmission Line Rights-of-way (BC Hydro 2010) and the Approved Work Practices for Managing Riparian Vegetation (BC Hydro *et. al.* 2003).

Assuming implementation of prescribed mitigation, the EA and subsequent Updated AEA anticipated non-significant residual effects for habitat loss of the Fish Habitat VC, as well as for some key indicators of the Water Quality VC that may be affected by riparian clearing. Residual effects associated riparian habitat losses were assessed for both construction and operation that were low in magnitude and medium or long-term in duration. Although the proposed change to the transmission line alignment increases impacts to riparian habitat relative to the approved alignment, given prescribed mitigation that will minimize effects of riparian clearing in the ROW, this

difference is not sufficient to change the conclusions of the EA with regard to the characterization of residual effects for Freshwater Fish and Fish Habitat VCs during either construction or operations. Low magnitude residual effects are still anticipated. Further, the previously prescribed mitigation during the EA and Updated AEA is anticipated to be equally applicable and effective for the new alignment as it was for the approved alignment; thus, no additional mitigation is required.

4.4.1.1. Terrestrial Wildlife and Vegetation

All Terrestrial Wildlife and Vegetation VCs (Vegetation, Invertebrates, Amphibian & Reptiles, Birds, and Mammals) have the potential to interact with the proposed changes in transmission line alignment for the Chickwat Component because the new alignment traverses different terrestrial habitat from that evaluated in the original EA, and because changes to previously approved creek crossings are proposed which could change the amount and quality of riparian habitat affected by the ROW. The original EA evaluated potential effects of Habitat Loss for all VCs, Habitat Change for all VCs except Invertebrates, and Change in Behavior and Increased Mortality for Amphibians & Reptiles, Birds, and Mammals VCs. Vegetation clearing and maintenance associated with transmission line construction and operation was considered among other Project infrastructure and activities for all of these potential effects due to the potential for the transmission line ROW clearing and maintenance to affect terrestrial habitat. The proposed change therefore has the potential to affect evaluation of Habitat Loss and Habitat Change for all VCs. The evaluation of Change in Behaviour and Increased Mortality potential effects may also be affected by the change in alignment if impacts to suitable or critical habitat differ for any VCs.

Potential changes in the evaluation of potential effects related to the changes in stream crossings associated with the proposed alignment (Insets 1 and 2 in Map 6; Section 3.4) were assessed for the Freshwater Fish and Fish Habitat Environmental Discipline in Section 4.4.1.1. This assessment is relevant for the Coastal Tailed Frog key indicator of the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC because these key indicators, as previously stated, utilize streams and riparian areas in the Project area. The EA considered the potential effects of clearing and maintenance associated with transmission line construction and operation on both key indicators, in relation to Habitat Loss, Habitat Change, Change in Behaviour, and Increased Mortality (the latter for Coastal Tailed Frogs only). As discussed in Section 4.4.1.1, the proposed changes are not sufficient to affect the conclusions of the EA with regard to the characterization of residual effects for Freshwater Fish and Fish Habitat VCs during either construction or operation, in spite of the increase in the amount and value of riparian habitat affected and in light of the mitigation measures prescribed to minimize adverse effects. Thus similarly, there is also no change to the conclusions of the EA with regard to the potential effects identified for Coastal Tailed Frogs and Riverine Birds during either transmission line construction or operation, and no additional mitigation is required.

Table 9. Overlap between the transmission line ROW riparian footprint by riparian habitat value for the original and new transmission line alignments for the Chickwat Component.

Riparian Habitat Value	Chickwat Creek[1]			Tzoonie River[2]			Tributary[2]			Total		
	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[3] (m^2)	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[3] (m^2)	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[3] (m^2)	Approved ROW (m^2)	Proposed ROW (m^2)	Difference[3] (m^2)
Medium	1,095	0	-1,095	0	610	610	0	0	0	1,095	610	-486
High	1,078	541	-537	548	0	-548	0	0	0	1,626	541	-1,085
Climax	223	1,367	1,144	1,115	2,794	1,678	0	803	803	1,338	4,963	3,625
Total	**2,396**	**1,907**	**-489**	**1,663**	**3,404**	**1,740**	**0**	**803**	**803**	**4,059**	**6,114**	**2,054**

[1] Map 5, Inset 1.

[2] Map 5, Inset 2.

[3] Proposed minus approved footprint area.

No wetlands are affected by the proposed changes to the transmission line alignment; thus, all other key indicators from the Amphibian & Reptiles VC assessed for the Chickwat Component (Northern Red-legged Frog, Western Toad), Butterflies and Dragonflies key indicator of the Invertebrates VC, and some rare plants and rare plant communities that are associated with wetlands, do not interact negatively with the proposed changes.

The terrestrial footprint of the newly proposed and approved transmission line ROWs for the Chickwat Component are almost identical in size (Table 10). The similarity in footprint sizes reflects the extent of use of existing or planned (and approved) road ROWs, and the slight reduction in footprint size for the new alignment is due an overall shortening of the transmission line (1,301 m relative to the approved 1,344 m). Overall, the new alignment would intersect an additional 0.63 ha of forest greater than 80 years in age, but slightly less (0.18 ha) old growth forest (> 141 years), than the approved alignment. The increased overlap with 81-100 year old forest is largely due to the change in location for the crossing of the Tzoonie River, which accounts for 0.69 ha of the footprint for this age class. Both alignments nevertheless have greatest impacts to forests younger than 80 years, although the proportion of young forest intersected is greater for the approved (83%) than the proposed (55%) alignment (Table 10).

Habitat loss and change in mature forests can, in general, be considered more significant due to the high replacement time required for old forests to regenerate and in this regard, mature and old growth forests therefore have greatest value. Further, key indicators of both the Birds and Mammals VCs associated with mature forests.

Key indicators for the Birds VC such as Northern Goshawk, Marbled Murrelet, and Western Screech-owl, are associated with mature forests. For Northern Goshawk and Western Screech-owl, suitable or critical habitat was mapped in the vicinity of the proposed changes (Robertson 2012e, Figures 6-48 and 6-50); thus, there is the potential for the proposed changes to affect the evaluation of potential effects for these key indicators. Slightly more Northern Goshawk habitat of moderate suitability is intersected by the new than the approved alignment (Table 11); however, this difference is small (0.56 ha) and no habitat of high suitability is intersected. There is also no highly suitable habitat for Western Screech-owl in the vicinity of the powerhouse or the ROW crossing of the Tzoonie River, and there is little difference in the potential overlap of habitat of moderate suitability between alignments. No suitable Marbled Murrelet habitat is affected by the proposed changes (Robertson 2012e, Figure 6-47).

Mature forests also provide suitable habitat for a number of key indicators of the Mammals VC, specifically Mule Deer, Roosevelt Elk, Grizzly Bears and bats. As previously stated, mature forest, defined as greater than 100 years in age, was used as a proxy of suitable habitat for Mule Deer. The increase in footprint size of the proposed relative to the approved transmission line ROW in mature forest is relatively small (0.63 ha when defining mature forest for Mule Deer). For comparison, 1,019 ha of forest in structural stages 6 and 7 (101-140 years) were identified in the Chickwat Creek LAA (Robertson 2012c). Thus the predicted loss represents a small percentage (0.06%) of what is

currently available. For Roosevelt Elk and Grizzly Bear, there is little difference in the amount of habitat affected between alignments. Roosevelt Elk suitable winter feeding and winter shelter habitat (class 1 to 3) exists in a band along the Tzoonie River at the ROW crossing location and suitable winter shelter habitat exists in the vicinity of the powerhouse (Robertson 2012e, Figures 6-53 and 6-54). However, the proposed change in alignment has little effect on the extent to which this habitat is intersected because both alignments cross this band of habitat at their respective Tzoonie River crossings and because the new alignment in the vicinity of the powerhouse is shorter in length and affects habitat of the same value as that affected by the approved alignment. Suitable (class 1 to 3) Grizzly Bear foraging habitat also exists along the Tzoonie River during spring and fall (Robertson 2012e, Figures 6-57, 58, 59). However, similar to winter habitat for Roosevelt Elk, the proposed changes will not change the extent to which this habitat is intersected because both alignments cross the Tzoonie River. No identified bat shelter habitat is affected by the proposed changes (Robertson 2012e, Figure 6-51).

Overall, there is no difference in the evaluation of residual effects for Terrestrial Wildlife and Vegetation VCs between the newly proposed and the approved alignments. Hence, the conclusions of the EA are unchanged. The similarity in terrestrial footprint sizes between alignments and in the amount and quality of suitable habitat affected for key indicators, along with the small differences in mature and old growth forest intersected by the two ROWs, indicates that conclusions of the EA with regard to the evaluation and characterization of residual effects for Habitat Loss and Habitat Change are unchanged. Further, no additional mitigation is required. This also indicates that the evaluation and characterization of residual effects for Change in Behavior and Increased Mortality, which may result from the activities that cause habitat loss and alteration, are unchanged for the Amphibians & Reptiles, Birds, and Mammals VCs.

Table 10. **Overlap between the transmission line ROW and forest by age class for the currently approved and newly proposed transmission line alignments for the Chickwat Component.**

Forest Age (years)	Transmission Line ROW		Difference[1] (m^2)
	Approved (m^2)	Proposed (m^2)	
0 (default)	0	0	0
1-20	3,837	3,511	-326
21-40	7,074	4,183	-2,892
41-60	2,449	1,944	-505
61-80	7,078	3,092	-3,986
81-100	2,326	10,412	8,086
101-120	0	0	0
121-140	0	0	0
141-250	1,801	0	-1,801
Total	**24,566**	**23,142**	**-1,424**

[1] Proposed minus approved footprint area.

Table 11. **Overlap between the transmission line ROW and Northern Goshawk habitat for the currently approved and newly proposed transmission line alignments for the Chickwat Component.**

Northern Goshawk Habitat Suitability	Transmission Line ROW		Difference[1] (m^2)
	Approved (m^2)	Proposed (m^2)	
High	0	0	0
Moderate	7,713	13,360	5,646
Total	**7,713**	**13,360**	**5,646**

[1] Proposed minus approved footprint area.

5. CONCLUSION

With two exceptions, the proposed changes in transmission line alignment, intake location, and reclassification of one access road did not affect the conclusions of the EA for VCs of the Freshwater Fish and Fish Habitat, Terrestrial Vegetation and Wildlife, and Marine Fauna and Habitat Environmental Disciplines, and the Social and Economic Disciplines. The exceptions are related to proposed changes to the 25 kV feeder transmission line for the Upper Ramona

component. In response to a request by the shíshálh Nation, the newly proposed alignment crosses the east side of the head of Narrows Inlet on an existing causeway which has the potential to increase risk of collision and/or electrocution for marine birds, that forage in the Tzoonie River estuary and Narrows Inlet, and raptors, especially those that nest on structures and forage near water. This therefore affects the evaluation of potential effects of Increased Mortality and Increased Risk of Mortality for the Stick Nest Raptors key indicator of the Birds VC and the Marine Birds key indicator of the Marine Fauna and Habitat VC, respectively, during Project operations. Additional mitigation is therefore prescribed to increase visibility of the transmission line and reduce the risk of electrocution. Nevertheless, residual effects were identified for both of these key indicators due to the proposed change. The residual effect were characterized as non-significant, of low magnitude, affecting the Project Development Area in geographic extent, long-term in duration, continuous in frequency, reversible when the Project is decommissioned, and occurring in a disturbed setting.

The proposed changes in transmission line alignment for the Substation and Transmission and the Chickwat components affected some stream crossings. However, none of these affected the evaluation of VCs of the Freshwater Fish and Fish Habitat Environmental Discipline or the conclusions of the EA for construction or operation phases. For the Substation and Transmission component, the newly proposed alignments (east and west side of Sechelt Inlet) will affect a minor amount of additional riparian habitat (0.04 ha in total) but the riparian habitat value of the impacted habitat would decrease. For the Chickwat Component, combined changes cause an increase in riparian habitat loss of 0.21 ha due to the change in crossing angle at the Tzoonie River and the need for an additional tributary crossing. Moreover, the riparian habitat value impacted is higher for the proposed than the approved alignment due to mature riparian forest in the crossing locations. The mitigation prescribed in the EA and in the Chickwat and Lower and Upper Ramona Updated AEA (Lacroix *et al.* 2015, Lewis *et al.* 2016) is equally appropriate for the proposed alignments, and thus the changes to riparian habitat do not affect the characterization of residual effects for the relevant Freshwater Fish and Fish Habitat VCs. Considering the similarity of the assessment and approach, there are also no changes to the conclusions of the EA in the evaluation and characterization of residual effects for the Coastal Tailed Frog key indicator of the Amphibian & Reptiles VC and the Riverine Birds key indicator of the Birds VC from the Terrestrial Wildlife and Vegetation Environmental Discipline.

The proposed changes in transmission line alignment for the Substation and Transmission, Upper Ramona, and Chickwat components modified the terrestrial footprints of the ROWs. However, there were no changes to the conclusions of the EA with regard to the evaluation and characterization of residual effects that had been identified in relation to the transmission line ROW for any VC or associated key indicator for the Terrestrial Wildlife and Vegetation Environmental Discipline. For all three components, there is little difference in the size of footprints between the newly proposed and the approved alignments and the value of the forested habitat impacted by the ROWs. There is also little difference between the proposed and approved alignments in the quantity or quality of critical or suitable habitat mapped for bird and mammal key indicators. Suitable habitat

that was not previously assessed in the EA included bat shelter habitat and Marbled Murrelet habitat for the Substation and Transmission Component, Grizzly Bear foraging habitat in the Upper Ramona Component, and Northern Goshawk habitat in the Upper Ramona and the Chickwat components. However, bat habitat intersections are small in size and on the edges of habitat patches, the Marbled Murrelet habitat intersected is moderately-low in suitability, and the patches of Grizzly Bear foraging habitat intersected are small in size, adjacent to the existing road ROW, and the herb and shrub species that Grizzly Bears utilize for foraging are maintained during ROW vegetation clearing and maintenance. Finally, all of the additional Northern Goshawk habitat impacted in the Chickwat Component, and most of it in the Upper Ramona Component, is moderate in suitability and the amount of area that had not been assessed in the EA is small (0.56 ha and 0.85 ha for the Chickwat and Ramona components, respectively).

The potential change to an alternative submarine cable alignment and increased flexibility in the location of the cable entry point on the eastern shore of Sechelt Inlet affected the location and size of the marine substrate footprint which may, in turn, affect potential impacts to the Bull Kelp VC and the relatively immobile benthic Marine Fauna and Habitat (Skookumchuck Narrows) VCs. However, footprint sizes and the habitat and species impacted differ little between alignments, and the other considerations used to identify and assess residual effects in the EA (such as VC vulnerability) are unchanged. Further, mitigation commitments from the EA for these VCs would be effective in minimizing impacts regardless of the final route and entry point that is selected. Thus, provided that these mitigation measures are adhered to, conclusions of the EA for these VCs are unchanged. The Marbled Murrelet key indicator of the Marine Birds VC also interacts with the alternative cable footprint due to the potential for foraging habitat alienation from construction disturbance; however, conclusions of the EA were unchanged because footprint size on the water surface and the length of the construction period are virtually unchanged.

The potential transmission line alignment change for the Substation and Transmission Component on the east side of Sechelt Inlet also does not affect evaluation of the Sechelt Inlet VC of the Visual Quality Social and Economic Discipline. Although there are visual differences in the transmission line ROW from lower elevations including Sechelt Inlet between the alternative and the approved alignments, qualitative assessment for the two VSUs, which involved comparison of visual models from two viewpoints assessed in the EA, suggested that the alternative option does not negatively impact the evaluation of impacts to visual quality. These results, and given that existing disturbance prevented the VQO guidelines from being met, suggested that the conclusions of the EA would not change with the alternative alignment.

The proposed reclassification of one access road of the Upper Ramona Component from temporary to permanent does not affect the conclusions of the EA because construction of this road was previously assessed and because the second access road (that is currently approved as a permanent) will no longer be constructed, thereby reducing the Project's footprint and the potential for adverse effects to VCs and associated key indicators. The proposed change to the location of the tributary intake on Marten - s-p'il-us Creek of the Lower Ramona Component also does not affect the

conclusions of the EA because the intake is proposed to move almost back to its original location that had been approved prior to the initial change was requested and approved during the second EAC amendment.

REFERENCES

APLIC and USFWS (Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service). 2005. Avian Protection Plan Guidelines. Available online at: http://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf. Accessed on October 21, 2016.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested Practices for Avian Protection On Power Lines: The State of the Art in 2006. Eds. Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. Available online at: http://www.aplic.org/uploads/files/2613/SuggestedPractices2006(LR-2watermark).pdf. Accessed on September 14, 2011.

APLIC (Avian Power Line Interaction Committee). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C. Available online at: http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf. Accessed on October 21, 2016.

BC Hydro, Fisheries and Oceans Canada, BC Ministry of Water, Land and Air Protection and BC Transmission Corporation. 2003. Approved Work Practices for Managing Riparian Vegetation. Available online at: https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/bctc_documents/work_practices_riparian.pdf. Accessed on November 28, 2016.

BC Hydro. 2010. Integrated Vegetation Management Plan For Transmission Rights-of-way. Available online at: https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/safety/pdf/safety_-_ivmp_web.pdf. Accessed on November 28, 2016.

BC MOF (Province of British Columbia Ministry of Forests). 1997. Visual Landscape Inventory: Procedures and Standards Manual. Available online at: http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vli_procedures__standards_manual97.pdf. Accessed on November 25, 2016.

BCEAA (British Columbia *Environmental Assessment Act)*. 2002. Environmental Assessment Act (SBC 2002) Chapter 43. Available online at: http://www.bclaws.ca/Recon/document/ID/freeside/00_02043_01. Accessed on August 27, 2015.

Bevanger, K. 1998. Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biol. Conserv. 86:67–76.

CDC (BC Conservation Data Centre). 2016. BC Species and Ecosystems Explorer. Government of British Columbia, Ministry of the Environment, Victoria, BC. Available online at: http://a100.gov.bc.ca/pub/eswp/search.do. Accessed on July 7, 2015.

CEC (California Energy Commission). 2002. A Roadmap for PIER Research on Avian Power Line Electrocution in California. Commission Staff Report, Prepared by. K. Hunting for the California Energy Commission. Available online at: http://www.energy.ca.gov/reports/2002-12-24_500-02-070F.PDF. Accessed on October 21, 2016.

CEC (Clean Energy Consulting Inc.) 2016. Narrows Inlet Hydroelectric Project Engineering Review. Consultant's report prepared for BluEarth Renewables Inc. by Clean Energy Consulting Inc. October 2016.

Chartwell (Chartwell Consultants Ltd.). 2011. NI Hydro Holding Corp. Stl'ixwim Renewable Energy Initiative Project: Visual Impact Assessment for Sechelt Inlet, Supplemental Visual Baseline Report for Visual Sensitivity Unit #s 1066, 1089, 1128, & 1129. Project # 10-601. Available online at: http://a100.gov.bc.ca/appsdata/epic/documents/p313/d34839/1345587555596_fbbafe7b2834d79d2caa1ffaa7095de2206cf5409f83f6ffa5b8982d5f07cc09.pdf. Accessed on November 25, 2016.

Chehalis (Chehalis Consulting Ltd.). 2016. Rationale for Martens Creek Intake Relocation, NIHP Hydro Project. Consultant's memorandum prepared for BBA Engineering Consultants Ltd. by Raveen R. Singh of Chehalis Consulting Ltd. December 7, 2016.

DFO (Fisheries and Oceans Canada). 2014. British Columbia Marine/Estuarine Timing Windows for the Protection of Fish and Fish Habitat - South Coast and Lower Fraser Areas. Available online at: http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/bc-s-eng.html. Accessed on November 18, 2016.

EAO (Environmental Assessment Office). 2014. Environmental Assessment Certificate # E13-04 for the Narrows Inlet Hydro Project. January 15, 2014.

EAO (Environmental Assessment Office). 2016a. EAO's Assessment of an Application for Amendment. Narrows Inlet Hydro Project, EA Certificate #E13-04. February 12, 2016. Available online at: http://a100.gov.bc.ca/appsdata/epic/documents/p313/d39811/1455902212946_1rn4WHLT2G1TGjKp10JRyS1KjTy94QTRn6vVnbJ97yhxJfvl1gH3!-1415767880!1455901614705.pdf. Accessed on March 18, 2016.

EAO (Environmental Assessment Office). 2016b. EAC Amendment #1: Narrows Inlet Hydro Project, EA Certificate #E13-04. February 12, 2016. Available online at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_313_39811.html. Accessed on March 18, 2016.

EAO (Environmental Assessment Office). 2016c. EAC Amendment #2: Narrows Inlet Hydro Project, EA Certificate #E13-04. October 28, 2016. Available online at: http://a100.gov.bc.ca/appsdata/epic/documents/p313/1479342837705_vlHJYsLJMJQxjX8RTQKLlNnqT11rg3NBh7dpQfvpFL91G13Y61zM!1951556897!1479330676102.pdf. Accessed on November 18, 2016.

Fisheries Act. 1985. Fisheries Act (RSBC 1985) c. F-14. Available online at: http://laws-lois.justice.gc.ca/eng/acts/f-14/FullText.html Accessed on December 14, 2016.

FRPA *(Forest and Range Practices Act,* S.B.C). 2002, C.69. Available online at: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02069_01. Accessed on November 23, 2016.

GeoBC. 2015. VRI – Forest Vegetation Composite Polygons and Rank 1 Layer. Geographic Data Layer (2015 data). Available online at: http://catalogue.data.gov.bc.ca/dataset/vri-forest-vegetation-composite-polygons-and-rank-1-layer. Accessed on November 24, 2016.

Haas, D., M. Nipkow, G. Fiedler, R. Schneider, W. Hass, and B. Schürenberg 2003. Protecting birds on transmission lines: A practical guide on the risks to birds from electricity transmission facilities and how to minimise any such adverse effects. NABU – German Society for Nature Conservation, Registered Charity and BirdLife Partner Germany. Bonn, Germany.

Lacroix, D., M. Hocking, S. Faulkner, A. Newbury, K. Healey, D. West, X. Yu, Y. Imam, D. and A. Lewis. 2015. Chickwat Creek Updated Aquatic Effects Assessment. Consultant's report prepared for Narrows Inlet Hydro Holding Corp. by Ecofish Research Ltd, July 23, 2015.

Lacroix, D., T. Jensma, and A. Newbury. 2013. Results of the Riparian Habitat Analysis for Ramona Creek, Chickwat Creek and Interconnection Components of the Narrows Inlet Hydro Project. Ecofish Research Ltd. memorandum prepared for Narrows Inlet Hydro Holdings Corp. April 26, 2013.

Lewis, A., I. Girard, D. West, J. Abell, K. Healey, D. Lacroix, S. Faulkner, A. Newbury and X. Yu. 2016. Narrows Inlet Hydro Project - Upper and Lower Ramona Components Updated Aquatic Effects Assessment. Consultant's report prepared for Narrows Inlet Hydro Holding Corp. by Ecofish Research Ltd, April 25, 2016.

Liguori, S. 2008. Protecting birds while powering America: An overview of efforts by the electrical utility industry to reduce bird mortality and improve power reliability. Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics.

NABU. 2006. Caution: Electrocution! Suggested practices for bird protection on power lines. M. Nipkow and B. Losem, eds. NABU – German Society for Nature Conservation, Registered Charity. Bonn, Germany.

Navigation Protection Act. 1985. Navigation Protection Act (RSBC 1985) c. N-23. Available online at: http://laws-lois.justice.gc.ca/eng/acts/N-22/FullText.html. Accessed on December 14, 2016.

Perry, M. 2016. Request to Transfer the Environmental Assessment Certificate E13-04 to tems sayamkwu General Partnership Corp. Letter to Isabelle Deguise, BluEarth Renewables Inc. Available online at: http://a100.gov.bc.ca/appsdata/epic/documents/p313/1478544486670_plnGYgLMGxPWm3PY7PQhd0h0GyJZyMLfqqNJC29STMwHphvlMT7w!763175324!1478544172282.pdf. Accessed on November 22, 2016.

Robertson (Robertson Environmental Services Ltd.). 2012a. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part K: Assessment of Project Effects of Interconnection. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Robertson (Robertson Environmental Services Ltd.). 2012b. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part J: Assessment of Project Effects of Ramona Upper and Lower Creek Components. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Robertson (Robertson Environmental Services Ltd.). 2012c. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part G: Assessment of Project Effects of Chickwat Creek Component. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Robertson (Robertson Environmental Services Ltd.). 2012d. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part N: Assessment of Socioeconomic Effects. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Robertson (Robertson Environmental Services Ltd.). 2012e. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part D: Biophysical Environment. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Robertson (Robertson Environmental Services Ltd.). 2012f. Narrows Inlet Hydro Project Application for an Environmental Assessment Certificate. Part A: Project Description. Consultant's report prepared for the Narrows Inlet Hydro Holding Corporation by Robertson Environmental Services Ltd. April 2012.

Sunshine Coast Tourism. 2016. Welcome to the Sunshine Coast. Available online at: http://www.sunshinecoastcanada.com/blog/194-52-weeks-of-trails-week-18. Accessed on November 29, 2016.

Terra (Terra Remote Sensing Ltd.). 2016. ROV route survey seabed video Sechelt Inlet Cable Crossing. Consultant's report prepared for NI Holding Corporation by Terra Remote Sensing Ltd. October 28, 2016.

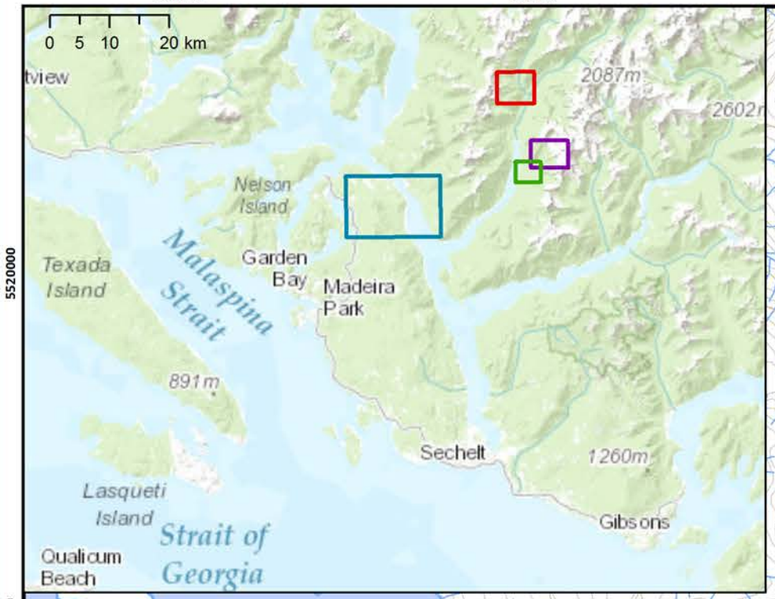
Personal Communications

Deguise, I. 2016. Lead, Regulatory and Environment, BluEarth Renewables Inc., North Vancouver, BC. Personal Communication. Email communication with Deborah Lacroix of Ecofish Research on September 30, 2016.

Obee, M. 2016. Clean Energy Consulting, Inc., Vancouver, BC. Personal Communication. Email communication with Deborah Lacroix of Ecofish Research on September 23, 2016.

NARROWS INLET HYDRO PROJECT

Project Overview Amendment Request



Legend

Hydroelectric Component
- Chickwat
- Lower Ramona
- Upper Ramona
- Interconnection

Infrastructure
- Intake
- Powerhouse
- Portal
- Substation
- Interconnection
- Surface Mounted Penstock
- Tributary Tap
- Buried Penstock
- Tunnel

Transmission Lines
- Overhead Transmission Line - Existing
- Overhead Transmission Line - Approved
- Submarine Transmission Line - Approved
- Underground Transmission Line - Approved
- Overhead Transmission Line - Amended
- Overhead Transmission Line - Amended Alternative
- Submarine Transmission Line - Amended

Roads
- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features
- shíshálh Nation Band Lands
- Parks and Protected Areas
- 100m Contour

0 0.5 1 2 3 4 Km

Scale: 1:85,000

NO.	DATE	REVISION	BY
1	14/12/2016	1132_NIL_OverviewProjectExtents_2016Apr01	
2			
3			
4			
5			

Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

Data sources:
Project infrastructure provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

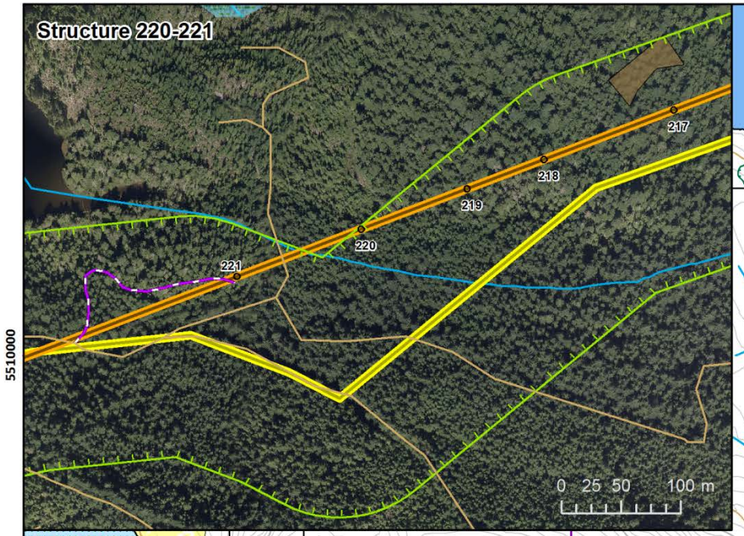
NARROWS INLET HYDRO

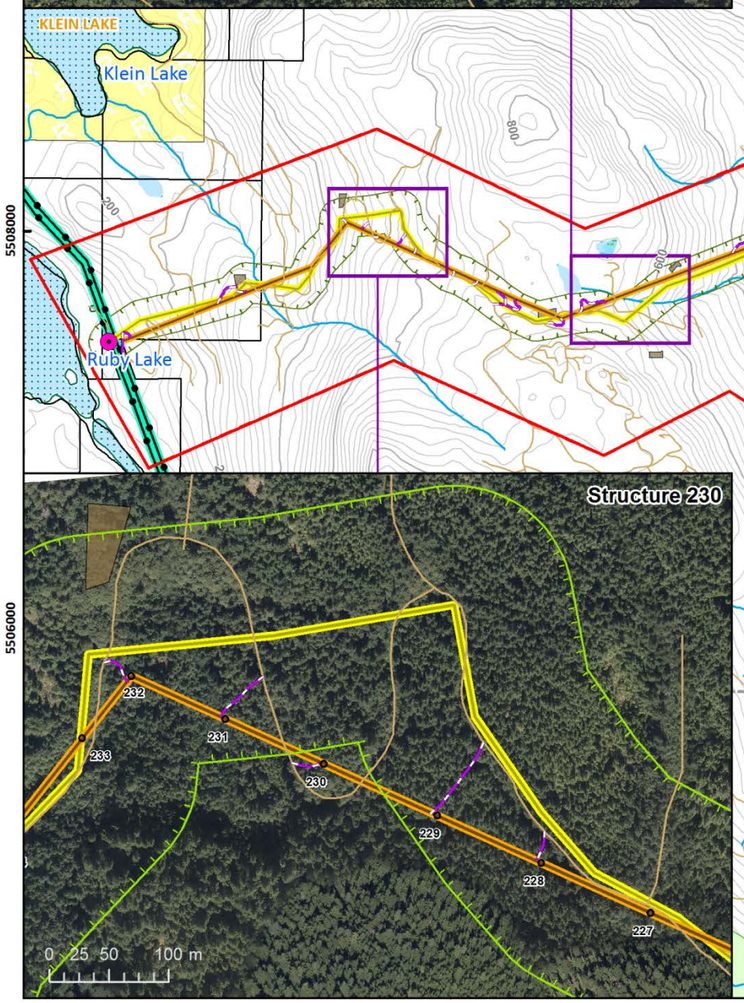
Map 2

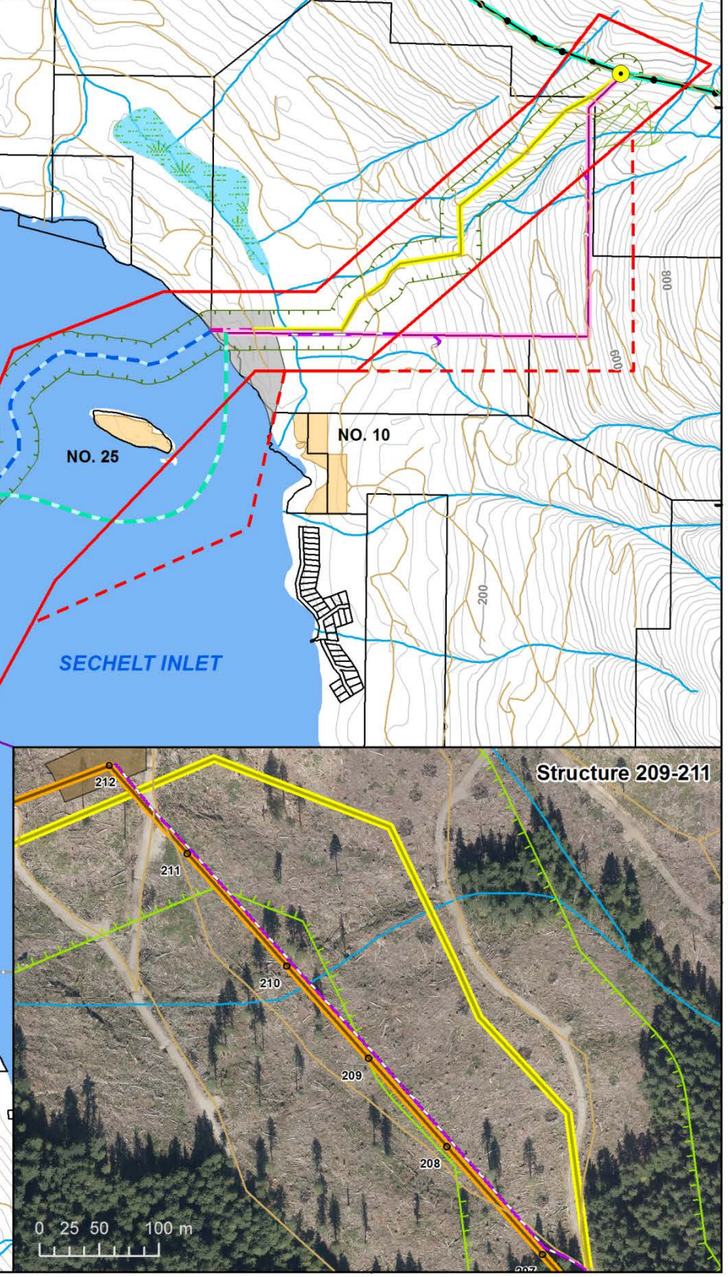
Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\Overview\1132_NIL_OverviewProjectExtents_2016Apr01.mxd

NARROWS INLET HYDRO PROJECT

Amendment Request for the Transmission Line and Interconnection







Data sources:
Project infrastructure and proposed old-growth managment areas provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

Legend

- Project Boundary - Approved
- Project Boundary - Amended

Infrastructure

- Substation
- Interconnection
- Submarine Cable Entry Point
- Laydown Area

Transmission Lines

- Overhead Transmission Line - Existing
- Overhead Transmission Line - Approved
- Submarine Transmission Line - Approved
- Underground Transmission Line - Approved
- Overhead Transmission Line - Amended
- Overhead Transmission Line - Amended Alternative
- Submarine Transmission Line - Amended
- CPD Transmission Line 100 m Buffer

Roads

- Existing Road
- New Road - Temporary

Land Designations and Features

- Wetland
- Non-Sensitive Occurrences
- Old-growth Management Area (proposed)
- Wildlife Tree Retention Area
- shíshálh Nation Band Lands
- Recreational Sites
- Parks and Protected Areas
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 1.5 km

Scale: 1:30,000

NO.	DATE	REVISION	BY
1	14/12/2016	1132_INT_Components_AMD4_2016Nov22	
2			
3			
4			
5			

Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

Prepared by:
Ecofish Research Ltd.
for NIHHC

Map 3

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_INT_Components_AMD4_2016Nov22.mxd

NARROWS INLET HYDRO PROJECT

Amendment Request for the Upper Ramona Component

448000 450000 452000

5518000 5516000 5514000

N

Tzoonie River

NO. 8

NO. 7

NO. 6

Floating Camp

Land Camp

NARROWS INLET

Inset 2

Tzoonie River

NO. 8

0 50 100 m

Inset 1

0 25 50 m

BCGS Mapsheet: 92G.082

BCGS Mapsheet: 92G.072

Tyson Creek Intake

Ramona Lake

Upper Ramona Intake

IFR Pipe Outlet

Ramona Creek

Alimak Shaft Building

Portal

Data sources:
Project infrastructure, private lands and proposed old-growth managment areas provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

Legend

- Project Boundary

Infrastructure

- Intake
- Portal
- New/Replacement Bridge
- Existing Bridge
- Substation
- Surface Mounted Penstock
- Buried Penstock
- Tunnel
- IFR Discharge Pipe
- Tunnel
- Overhead Transmission Line - Existing
- Overhead Transmission Line - Approved
- Overhead Transmission Line - Amended
- CPD Transmission Line 100 m Buffer
- Requested 150 m buffer

Roads

- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features

- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:20,000

NO.	DATE	REVISION	BY
1	24/11/2016	1132_RAM_Components_AMD4_2016Nov22	CGA
2			
3			
4			
5			

Date Saved: 24/11/2016
Coordinate System: NAD 1983 UTM Zone 10N

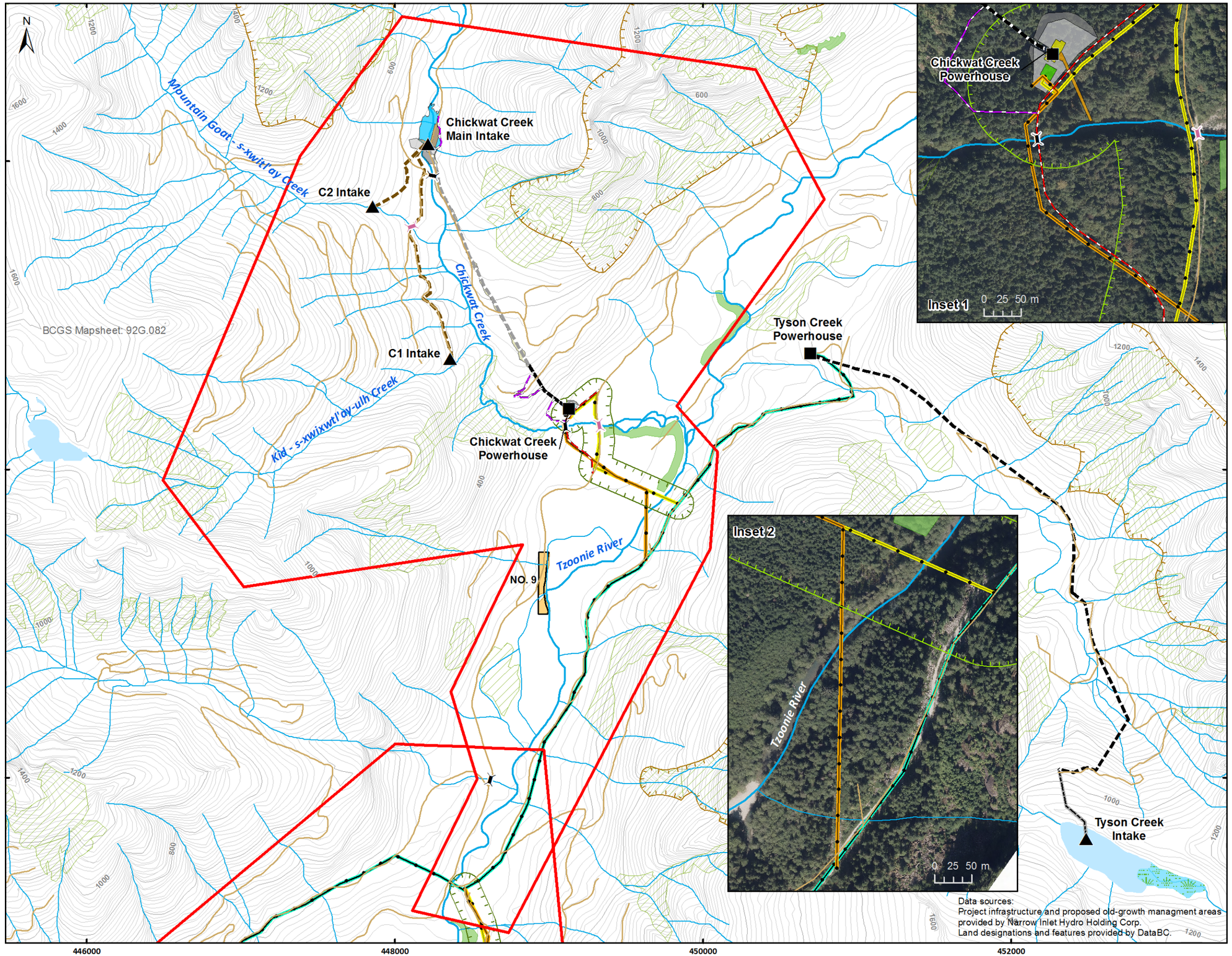
NARROWS INLET HYDRO

Map 4

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_RAM_Components_AMD4_2016Nov22.mxd

NARROWS INLET HYDRO PROJECT

Amendment Request for the Chickwat Component



Data sources:
Project infrastructure and proposed old-growth managment areas provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

Legend

- Project Boundary

Infrastructure

- Intake
- Powerhouse
- New/Replacement Bridge
- Existing Bridge
- Tunnel
- Surface Mounted Penstock
- Tributary Tap
- Buried Penstock
- Overhead Transmission Line - Existing
- Overhead Transmission Line - Approved
- Overhead Transmission Line - Amended
- CPD Transmission Line 100 m Buffer
- RipRap
- Headpond
- Intake Structure
- Clearing Area
- Temporary Construction Boundary
- Laydown Area
- Penstock Temporary ROW

Roads

- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features

- Wetland
- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:24,000

NO.	DATE	REVISION	BY
1	23/11/2016	1132_CHK_Components_2016Nov22	
2			
3			
4			
5			

Date Saved: 23/11/2016
Coordinate System: NAD 1983 UTM Zone 10N

NARROWS INLET HYDRO

Map 5

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_CHK_Components_2016Nov22.mxd

NARROWS INLET HYDRO PROJECT
Amendment Request for the Upper & Lower Ramona Components

448000 450000 452000

5514000 5512000

NO.6A

NARROWS INLET

NO. 6A

Ramona Creek

Lower Ramona Powerhouse

IFR Pipe Outlet

Upper Ramona Intake

Ramona Lake

Alimak Shaft Building

Portal

Approved Permanent Road No Longer Required

Approved Temporary Road To Become Permanent

BCGS Mapsheet: 92G.072

Upper Ramona Powerhouse

Lower Ramona Intake

Originally Approved Intake

Proposed Intake

EAC Amendment #2 Intake

Marten - s-p'il-us Creek

0 50 100 200 m

0 25 50 m

Originally Approved Intake

Proposed Intake

EAC Amendment #2 Intake

Marten - s-p'il-us Creek

Data sources:
Project infrastructure, private lands and proposed old-growth managment areas provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

Legend

- Project Boundary

Infrastructure

- Intake
- Powerhouse
- Portal
- New/Replacement Bridge
- Existing Bridge
- Surface Mounted Penstock
- Buried Penstock
- Tributary Tap - Amended
- Tributary Tap - Approved
- Tunnel
- IFR Discharge Pipe
- Overhead Transmission Line - Approved
- Overhead Transmission Line - Amended
- CPD Transmission Line 100 m Buffer
- CPD Tributary Tap 100 m Buffer
- Borrow Area (proposed)
- Laydown Area (proposed)

Roads

- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features

- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Private Land
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:20,000

NO.	DATE	REVISION	BY
1	14/12/2016	1132_RAM_Components_AMD4_2016Nov22	CGA
2			
3			
4			
5			

Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

NARROWS INLET HYDRO

Map 6

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_RAM_Components_AMD4_2016Nov22.mxd

APPENDICES

Appendix A. Revised Schedule A – Certified Project Description

Schedule A

Certified Project Description

Table of Contents

1. OVERVIEW

Narrows Inlet Hydro Holding Corporation (the Certificate Holder) is certified to develop the Narrows Inlet Hydro Project (the Project) in the vicinity of the Tzoonie Valley at the head of Narrows Inlet, approximately 75 kilometres (km) north-west of Vancouver, British Columbia (Map 1 in Appendix A).

The project will include the following infrastructure:

- Up to three hydroelectric generating stations with a combined design capacity of 33 megawatts:
  - Chickwat Creek - A conventional run-of-river hydroelectric generating station with a design capacity of 19 megawatts (MW);
  - Upper Ramona Creek - A hydroelectric generating station which uses Ramona Lake as its water source with a design capacity of 7 MW; and
  - Lower Ramona Creek - A run-of-river hydroelectric generating station which uses water from Ramona Creek and the outflow from the Upper Ramona Creek component as its water sources with a design capacity of 7 MW.
- Up to three 25 kilovolt (kV) transmission lines, connecting each of the three new powerhouses, will feed into a new collector substation at the mouth of the Tzoonie River, along the existing Tyson Creek transmission line;
- The existing 25 kV line from Tyson Creek will be upgraded to 138 kV to transmit electricity from Narrows Inlet Hydro Project to the point of interconnection with BC Hydro 1L37, less than 6 km north of the Malaspina substation;
- One Operator's Residence;
- Upgraded and new roads and bridges for temporary construction activity and permanent operations; and
- Temporary construction facilities, including a land and floating construction camps, concrete batch plants, laydown and staging areas, borrow pits, and spoil areas.

With the exception of existing roads and bridges that do not require upgrades, all Project infrastructure must be located within the red Project boundaries identified on Map 2 to 5 in Appendix A. The location of permanent roads, new and replacement bridges, and temporary roads approximately 1,000 metres (m) or longer associated with the components are shown on the maps; however, temporary roads or tracks less than 1,000 m are not shown. Permanent Project infrastructure, as listed above and described for each component, will be constructed within 100m of locations shown on the Project's component maps (Map 2 to 5 in Appendix A). This 100m leeway is intended to allow relatively fine-scale adjustment of infrastructure location based on conditions and logistical limitations that may be encountered in the field during final design. ~~In all cases, t~~The 100m leeway refers to all portions of the infrastructure in question such that any point within the structure could be transposed a maximum of 100m in any direction. There are three exceptions to the 100 m leeway. First, a 150 m leeway will be allowed for a 600 m section of the 25 kV feeder transmission line alignment for the Upper Ramona Component immediately north of causeway that spans the east side of the head of Narrows, within shíshálh Nation Band Lands No. 8 Inlet (Map 4 in Appendix A), to allow avoidance of identified archeological sites.

Second, flexibility will be provided for the submarine cable entry point on the east side of Sechelt Inlet by specifying an area within which the end of the transmission line and cable entry point must occur (shown on Map 5 in Appendix A as a grey polygon). Third, the submarine cable alignment will not be required to follow either of the two potential alignment options shown on Map 5 in Appendix A, but will be permitted to follow any route within the Project boundary.

Existing access roads to be used by the Project are shown on the maps. Requirements for new access roads are introduced under each component but their detailed restrictions are specified in Section 4.

The Project life has three phases: construction, operation, and decommissioning. The construction phase is defined as the period of time during which any of the following activities occur that are related to the building of new Project components and upgrades to existing infrastructure: vegetation clearing, earthworks, building, installing, replacing, repairing, altering, maintaining or removing works that modifies the land, vegetation and/or natural environment. Operation begins once the Leave to Commence Operation, associated with the *Water Act* license, is issued. Decommissioning begins once the Project shuts down operations and begins removing permanent Project infrastructure and rehabilitating the Project area.

2. DESCRIPTION OF THE HYDROELECTRIC COMPONENTS

2.1. CHICKWAT COMPONENT

The Chickwat Creek hydroelectric component will be composed of the following infrastructure, all of which must be located entirely within the red outlined Project boundary: upstream works, waterways, powerhouse and switchyard, and feeder transmission line (Map 2 in Appendix A).

Upstream Works. The upstream works will include three separate intakes, the main intake on Chickwat Creek and a tributary intake on each of two un-named tributaries to Chickwat Creek (referred to as C1 and C2 respectively), and associated headponds.

Main Intake. The main intake will be located on Chickwat Creek approximately 3 km upstream of the confluence with the Tzoonie River, and within 100m of UTM NAD 83 5522113 Northing, 448217 Easting, zone 10. It will be constructed of reinforced concrete. It will include a traditional lateral intake with an Obermeyer type gated overflow weir, an intake channel, and sluiceway. A fish ladder will be installed to support upstream and downstream fish migration, and mitigate potential fish entrainment at the intake. The intake will also maintain an instream flow release (IFR). Access to the intake will be through an existing logging road unless the location of the intake changes. If the location changes by less than 100 m, a new permanent (less than 300m) access road will be created to connect to the existing logging road.

Tributary Intakes. The intakes on C1 (Kid - s-xwixwtl'ay-ulh Creek) and C2 tributaries (Mountain Goat - s-xwitl'ay Creek) will be located within 100m of UTM NAD 83 5520719 Northing, 448359 Easting, and of UTM NAD 83 5521709 Northing, 447858 Easting, zone 10, respectively. The two tributary intakes will allow for maintenance of an IFR. Access to the C1 Tributary will follow an upgraded road

and will require the construction of a short new permanent road (less than 500m). Access to the C2 Tributary will be via an access track (less than 800m) adjacent to the C2 penstock.

Waterways. There will be a total of three penstock pipes. A penstock pipe will convey water from each of the two tributary intakes to the main intake, and another from the main intake to the powerhouse. The pipes may have both buried and above ground sections. Their locations, within a 100m leeway, are shown on Map 2 in Appendix A.

Powerhouse. The powerhouse will be located on the east side of Chickwat Creek approximately 1 km upstream of the confluence with the Tzoonie River and within 100m of UTM NAD 83 5520401 Northing, 449138 Easting, zone 10. The powerhouse will contain no more than 2 turbines and 2 generators, and associated control equipment. The control equipment must allow for the regulation of flow rates during start-up and shut-down so that ramping rates in Chickwat Creek, as specified in the Table of Conditions, are not exceeded. Access to the powerhouse will be provided by reactivating a decommissioned logging road and rail bed. The transformer will be located in a switchyard located outside of the powerhouse.

Water from the turbine(s) will be released into a tailrace and returned to Chickwat Creek.

Feeder Transmission Line. The electricity generated at the Chickwat powerhouse will be transmitted along a new 25 kV transmission line, maximum of 2 km long, that will tie into the existing Tyson Creek transmission line approximately 3 km from the new collector 138 kV substation at the mouth of the Tzoonie River (Map 4).

2.2. UPPER RAMONA COMPONENT

The Upper Ramona hydroelectric component will be composed of the following infrastructure, all of which must be located entirely within the red outlined Project boundary: upstream works, waterway, powerhouse and switchyard, and feeder transmission line (Map 3 in Appendix A).

Upstream Works. The upstream works will include a submerged intake located in Ramona Lake within 100m of UTM NAD 83 5514344 Northing, 451708 Easting, zone 10. The intake will be a tunnel tap design located on the lake bed at a depth of 26 m ± 5 m below the natural lake surface elevation, within. An Alimak shaft building will be constructed to access the intake controls within 100 m of UTM NAD 83 5514325 Northing, 451619 Easting, zone 10. The IFR will be provided by gravity through the tunnel tap and will discharge near 207 m downstream of the natural lake outlet within 50 m of UTM NAD 83 5514374 Northing, 451380 Easting, zone 10. Access to the intake will be by helicopter during construction and operation. No permanent roads will be built but no more than 1,000m of temporary access roads may be constructed, if required.

Waterway. A tunnel and penstock pipe will convey water from the intake to the powerhouse. The penstock may have both buried and above ground sections and will connect with the tunnel at the portal within 100m of UTM NAD 83 5513470 Northing 450678 Easting, zone 10. The waterway location, within 100m, is shown on Map 3 in Appendix A. A new permanent road (less than 2,5000m) will be constructed to access the tunnel portal from the powerhouse and ~~. A temporary road (less than 2,500m) will be required to~~ construct the penstock.

Powerhouse. The powerhouse will be located on the north side of Ramona Creek approximately 3 km upstream of the confluence with Narrows Inlet and within 100m of UTM NAD 83 5512612 Northing, 450054 Easting, zone 10. The powerhouse will contain a turbine, a generator, a transformer and associated control equipment. The control equipment will include regulation of flow rates during start-up and shut-down so that ramping rates, as specified in the Table of Conditions, are not exceeded. The transformer will be located in a switchyard outside the powerhouse. Access to the powerhouse will be provided by an existing logging road that will be reactivated unless the location of the powerhouse changes. If the location changes, a new access road (less than 500 m) will be created to connect to the existing logging road.

A tailrace will return the water to Ramona Creek above the main intake of the Lower Ramona component.

Feeder Transmission Line. The electricity generated at the Upper Ramona powerhouse will be transmitted to the collector 138 kV substation at the mouth of the Tzoonie River via a new single pole overhead 25 kV transmission line with maximum length of 10 km~~. The feeder transmission line will follow one of the two alignments shown, within 100m, as options on~~ Map 3 and Map 4 in Appendix A). As described in Section 1, the 100 m leeway on transmission line location will be increased to 150 m for a 600 m section north of the causeway that spans the east side of the head of Narrows Inlet to allow fine-scale avoidance of archeological sensitive areas.~~The option preferred by the Certificate Holder is "Option B".~~

Comment [ERL1]: The two options were mentioned here. This is a mistake from the past CPD

2.3. LOWER RAMONA COMPONENT

The Lower Ramona hydroelectric component will be composed of the following infrastructure, all of which must be located entirely within the red outlined Project boundary: upstream works, waterways, powerhouse and switchyard, and feeder transmission line (Map 3 in Appendix A).

Upstream Works. The upstream works will include two separate intakes and associated headponds.

Main intake. The main intake will be located on Ramona Creek approximately 3 km upstream of the confluence with Narrows Inlet and within 100m of UTM NAD 83 5512563 Northing, 450051 Easting, zone 10. It will be constructed of reinforced concrete. An IFR pipe will be included to meet IFR requirements. Access will be provided by an existing logging road that will be reactivated unless the location of the intake changes. If the location changes by less than 100 m, a new access road (less than 500 m) will be created to connect to the existing logging road.

Tributary Intake. One tributary intake will be located on an un-named tributary of Ramona Creek (referred to as R1 but preferentially referred to as Marten - s-p'il-us Creek) within 100m of UTM NAD 83 -5511963~~5511860~~ Northing, 449947~~450073~~ Easting, zone 10 (Map 3 in Appendix A). It will be constructed of reinforced concrete. Access to will be provided by a new no more than 1,000 m permanent road.

Waterways. A penstock pipe will convey water from the tributary intake to the main intake and another pipe from the main intake to the powerhouse. Both penstocks may have both buried and above ground sections. Their locations, within 100m, are shown on Map 3 in Appendix A.

Powerhouse. The powerhouse will be located on the south side of Ramona Creek approximately 500 m upstream of the confluence with Narrows Inlet and within 100m of UTM NAD 83 5511987 Northing, 448538 Easting, zone 10. The powerhouse will contain a turbine, a generator, a transformer and associated control equipment. The control equipment design will provide regulation of flow rates during start-up and shut-down so that specified ramping rates in Ramona Creek are not exceeded. The transformer will be located in a switchyard located inside or outside of the powerhouse.

A tailrace will return the water to Ramona Creek. The design and operation protocol that ensures that fish are not stranded will be approved by a QP. Access to the powerhouse will be provided by a new no more than 1,000m permanent road.

Feeder Transmission Line. The electricity generated at the Lower Ramona powerhouse will be transmitted to the 138 kV new collector substation at the mouth of the Tzoonie River via the same single pole overhead transmission line as the Upper Ramona component. A maximum of 10 km of new feeder 25 kV transmission line will be constructed to bring the power from the Lower Ramona powerhouse to a connection point on the Upper Ramona feeder transmission line. A temporary road (construction track) less than 1,000m will be required to construct this new transmission line segment between the existing road and the main penstock.

3. SUBSTATION AND TRANSMISSION COMPONENT

The 25 kV transmission lines (See Map 2, Map 3 and Map 4 in Appendix A) from each of the three new powerhouses and the existing Tyson Creek powerhouse will all feed into a new collector substation located near the mouth of the Tzoonie River approximately 2 km upstream from the head of Narrows Inlet (Map 4 in Appendix A). Here the voltage will be increased to 138 kV. The substation will consist of a 3-phase step-up transformer, approximately 100 MW in capacity, and associated cooling heat exchangers, 3 phase breakers, disconnect switches, and manual and automatic controls.

Electricity will be transmitted from the collector substation to the point of interconnection with BC Hydro's transmission grid via a 138 kV transmission line (Map 5 in Appendix A). The point of interconnection is located on the Sechelt Peninsula near Ruby Lake. The transmission line will connect with BC Hydro 1L37, less than 6 km north of the Malaspina substation.

There are two potential transmission line alignment options on the east side of Sechelt Inlet, as shown in Map 5 in Appendix A. The alignment for the submarine cable has not been finalized, and although two potential alignment options are shown on Map 5 in Appendix A, the cable alignment may occur anywhere within the Project Boundary. As described in Section 1, the cable entry point on the east side of Sechelt Inlet and the end of the transmission line in this location will have the flexibility to be placed anywhere within the grey polygon shown on Map 5 in Appendix A.

The 138 kV transmission line will consist of the following elements:

- No more than 20 km of existing line built for the Tyson Creek Project;
- No more than 15 km of new single pole overhead line;
- No more than 3 km of new submarine cable under Sechelt Inlet; and

Comment [ERL2]: New cable length as shown on map is 2.28 km. Possible it will be longer if route is further to south or bows more, but would not increase to 3 km. Please confirm.

Matt confirmed this cable length is ok but this was in reference to reinstating the northern alternative. Confirm this leeway is also sufficient for the southern route.

- No more than 500 m of buried cable where the cable enters and leaves Sechelt Inlet.

Access to the majority of the transmission line will be by existing roads (at the request of shíshálh Nation). However, temporary access tracks will be required to install some poles, while others may require helicopter access.

4. ACCESS INFRASTRUCTURE

A combination of existing access roads and newly constructed permanent and temporary roads and tracks will be required to access Project locations. Map 2 to 5 in Appendix A identify the locations (within 100m) of all permanent roads, and all temporary roads that may be 1,000 m or longer. Temporary roads or tracks that will be less than 1,000 m are not shown on the maps. New and replacement bridges associated with access to the hydroelectric components are also shown on the maps.

Temporary roads and tracks are defined as those that are only required for Project construction. Permanent roads and bridges are defined as those that are required for Project operation, and may also be used for Project construction. All temporary, new, and upgraded roads will be located within the red Project boundary. The use of existing permanent access roads and forestry roads that do not require upgrades may occur outside of the red Project boundary.

Access road restrictions are specified at the level of the entire Project and not individually restricted in terms of length, width, or start and end points. A maximum of 10 km of new permanent road and 5 km of new temporary roads and tracks will be constructed for the Project. Permanent and temporary reactivation of existing roads will occur in the vicinity of all Project components.

A permanent helipad may be required to access the Upper Ramona intake, with maximum size of 1 ha. Temporary helicopter landing pads and staging areas (helipads) may also be required during the construction of the transmission line.

5. TEMPORARY PROJECT COMPONENTS

Temporary project components are those facilities which are required only during the construction phase of the Project. The temporary components shown on Map 2 to 5 in Appendix A (construction camps and certain laydown areas) will be located within 100m of the locations indicated. Locations of some of the temporary Project components not shown on maps are described below. All temporary project components must be located entirely within the red Project boundary. Temporary project components include:

- Construction Camp – The Project will require two temporary camps. A temporary land camp designed to house up to 99 workers will be built at the staging area at the head of Narrows Inlet (Map 4 in Appendix A). The temporary land camp shall have a footprint not exceeding 5 ha. A floating camp will accommodate up to 50 workers.
- Concrete Batch Plants – No more than three concrete batch plants will be required to produce the concrete needed for construction of Project infrastructure.

- Laydown and Staging areas – Laydown areas are used to temporarily store construction material and equipment. There are several laydown areas associated with each hydroelectric component.
- Borrow pits and spoil areas – Borrow pits are used to source the aggregate required during construction. Spoil areas are used to store excavated soil either temporarily or permanently. There are several borrow pits and spoil areas associated with each Project component.

5.1. Decommissioning of Temporary Project Components

At the end of the construction phase all temporary project components will be removed and the sites rehabilitated to the standards described in the Construction Environmental Management Plan (CEMP).

Temporary facilities that will be decommissioned are:

- temporary access roads and tracks;
- temporary bridges;
- temporary helipads;
- temporary concrete batch plant sites;
- temporary borrow pits and spoil areas;
- temporary laydown and staging areas; and
- temporary construction camps.

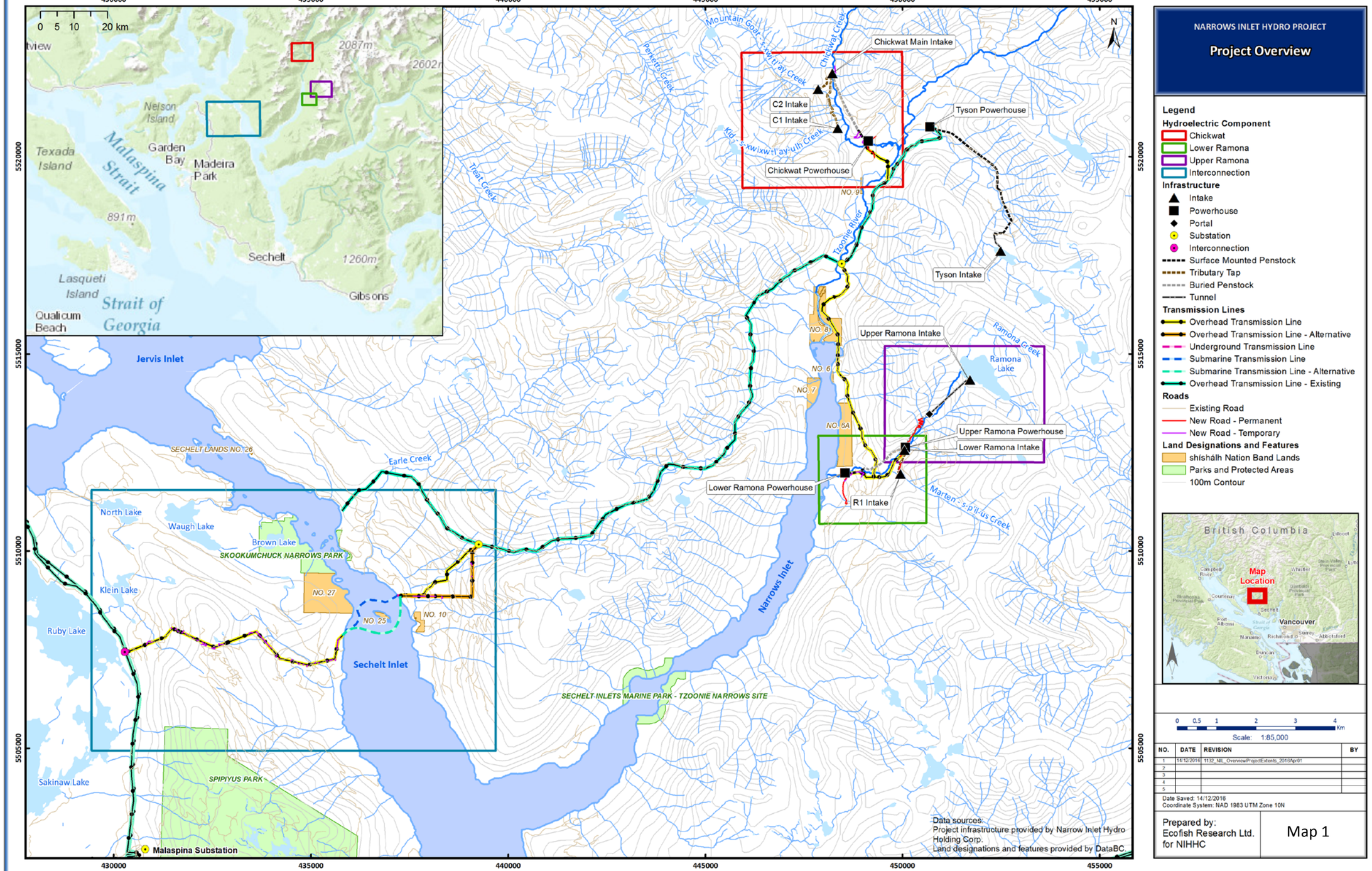
6. OPERATOR'S RESIDENCE

An operator's residence will accommodate no more than 5 persons during Project operation. The operator's residence will be located on the same site as the temporary construction camp. The residence will use the septic field and water source installed for the construction camp.

Appendix A – Project Maps

NARROWS INLET HYDRO PROJECT

Project Overview



Legend

Hydroelectric Component
- Chickwat
- Lower Ramona
- Upper Ramona
- Interconnection

Infrastructure
- Intake
- Powerhouse
- Portal
- Substation
- Interconnection
- Surface Mounted Penstock
- Tributary Tap
- Buried Penstock
- Tunnel

Transmission Lines
- Overhead Transmission Line
- Overhead Transmission Line - Alternative
- Underground Transmission Line
- Submarine Transmission Line
- Submarine Transmission Line - Alternative
- Overhead Transmission Line - Existing

Roads
- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features
- shíshálh Nation Band Lands
- Parks and Protected Areas
- 100m Contour

0 0.5 1 2 3 4 Km

Scale: 1:85,000

NO.	DATE	REVISION	BY
1	14/12/2016	1132_NIL_OverviewProjectExtents_2016Apr01	
2			
3			
4			
5			

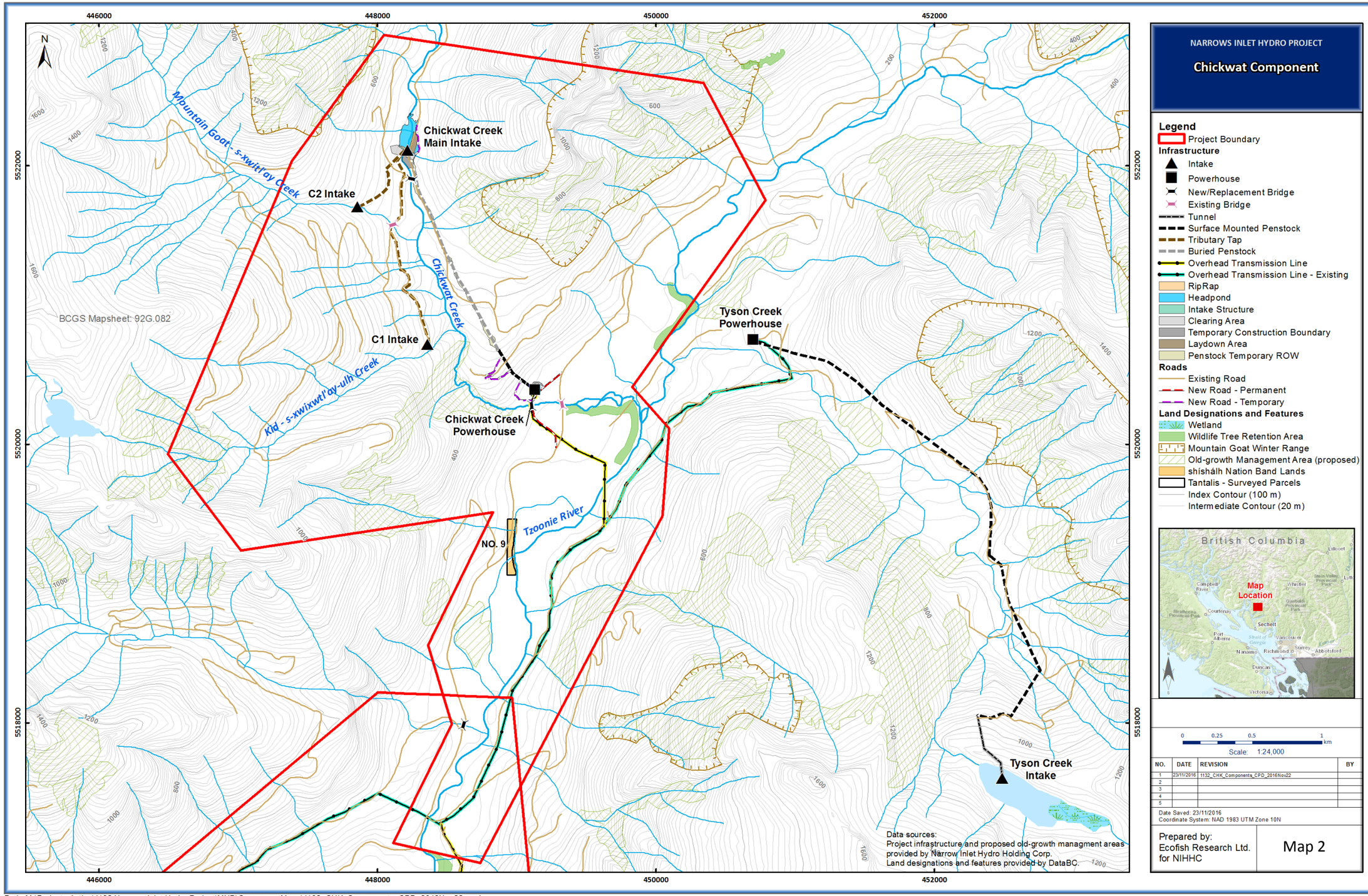
Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

Data sources:
Project infrastructure provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC

Prepared by:
Ecofish Research Ltd.
for NIHHC

Map 1

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\Overview\1132_NIL_OverviewProjectExtents_2016Apr01.mxd



NARROWS INLET HYDRO PROJECT

Chickwat Component

Legend

Project Boundary

Infrastructure

- Intake
- Powerhouse
- New/Replacement Bridge
- Existing Bridge
- Tunnel
- Surface Mounted Penstock
- Tributary Tap
- Buried Penstock
- Overhead Transmission Line
- Overhead Transmission Line - Existing
- RipRap
- Headpond
- Intake Structure
- Clearing Area
- Temporary Construction Boundary
- Laydown Area
- Penstock Temporary ROW

Roads

- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features

- Wetland
- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:24,000

NO.	DATE	REVISION	BY
1	23/11/2016	1132_CHK_Components_CPD_2016Nov22	
2			
3			
4			
5			

Date Saved: 23/11/2016
Coordinate System: NAD 1983 UTM Zone 10N

Prepared by:
Ecofish Research Ltd.
for NIHHC

Map 2

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_CHK_Components_CPD_2016Nov22.mxd

448000 450000 452000

5514000 5512000

NO.6A

Ramona Creek

Lower Ramona Powerhouse

0 50 100 200 m

NARROWS INLET

NO. 6A

IFR Pipe Outlet

Upper Ramona Intake

Ramona Lake

Ramona Creek

Alimak Shaft Building

Portal

Upper Ramona Powerhouse

Lower Ramona Intake

Lower Ramona Powerhouse

R1 Intake

Marten - s-p'il-us Creek

BCGS Mapsheet: 92G.072

Data sources:
Project infrastructure, private lands and proposed old-growth managment areas provided by Narrow Inlet Hydro Holding Corp.
Land designations and features provided by DataBC.

N

NARROWS INLET HYDRO PROJECT

Upper and Lower Ramona Components

Legend

- Project Boundary

Infrastructure

- Intake
- Powerhouse
- Portal
- New/Replacement Bridge
- Existing Bridge
- Surface Mounted Penstock
- Buried Penstock
- Tributary Tap
- Tunnel
- IFR Discharge Pipe
- Overhead Transmission Line
- Borrow Area (proposed)
- Laydown Area (proposed)

Roads

- Existing Road
- New Road - Permanent
- New Road - Temporary

Land Designations and Features

- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Private Land
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:20,000

NO.	DATE	REVISION	BY
1	14/12/2016	1132_RAM_Components_CPD_2016Nov22	CGA
2			
3			
4			
5			

Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

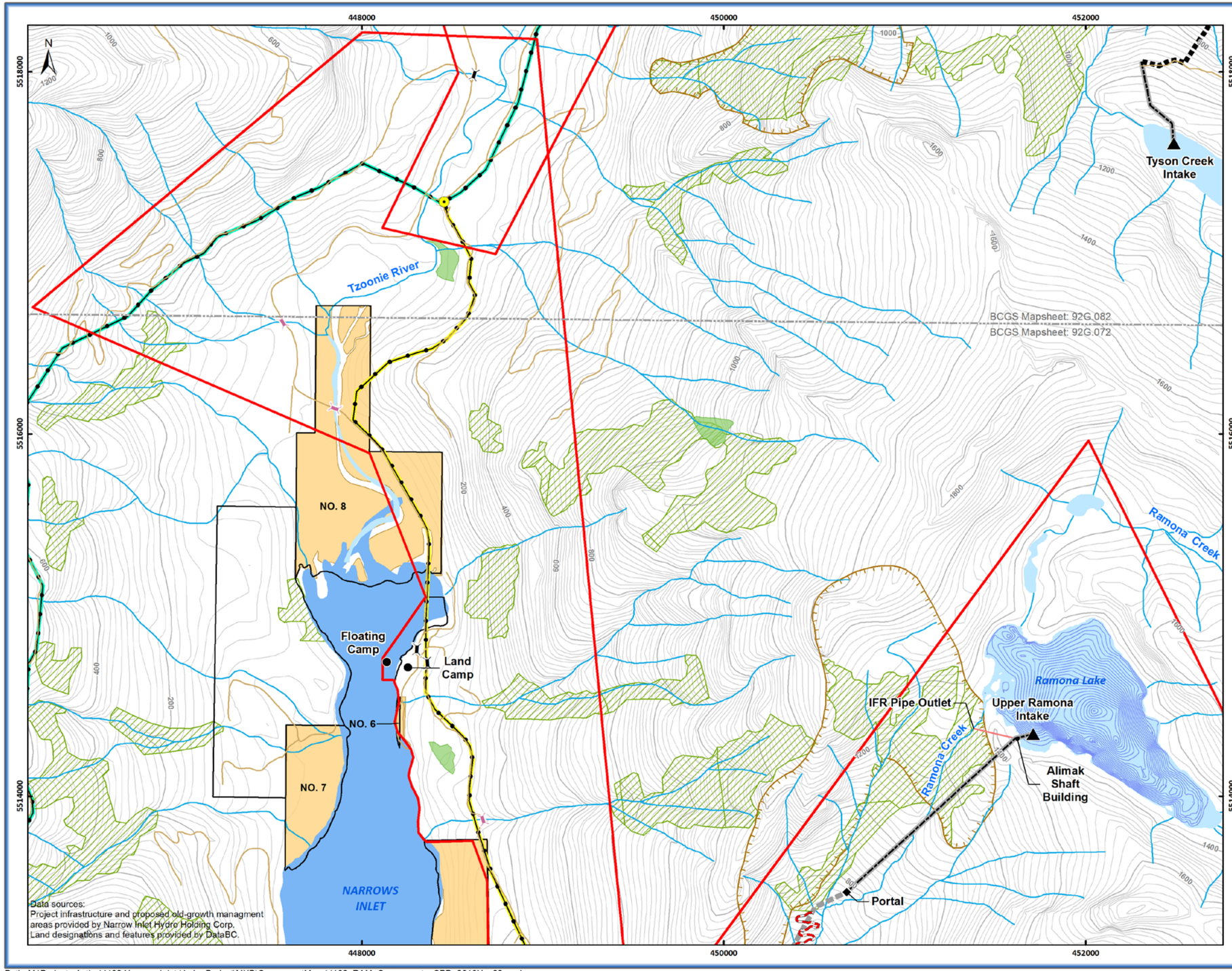
Prepared by:
Ecofish Research Ltd.
for NIHHC

Map 3

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_RAM_Components_CPD_2016Nov22.mxd

NARROWS INLET HYDRO PROJECT

Collector Substation and Construction Camps



Legend

- Project Boundary

Infrastructure

- Intake
- Construction Camp
- Portal
- New/Replacement Bridge
- Existing Bridge
- Substation
- Surface Mounted Penstock
- Buried Penstock
- Tunnel
- IFR Discharge Pipe
- Tunnel
- Overhead Transmission Line
- Overhead Transmission Line - Existing

Roads

- Existing Road
- New Road - Permanent

Land Designations and Features

- Wildlife Tree Retention Area
- Mountain Goat Winter Range
- Old-growth Management Area (proposed)
- shíshálh Nation Band Lands
- Tantalis - Surveyed Parcels
- Index Contour (100 m)
- Intermediate Contour (20 m)

0 0.25 0.5 1 km

Scale: 1:20,000

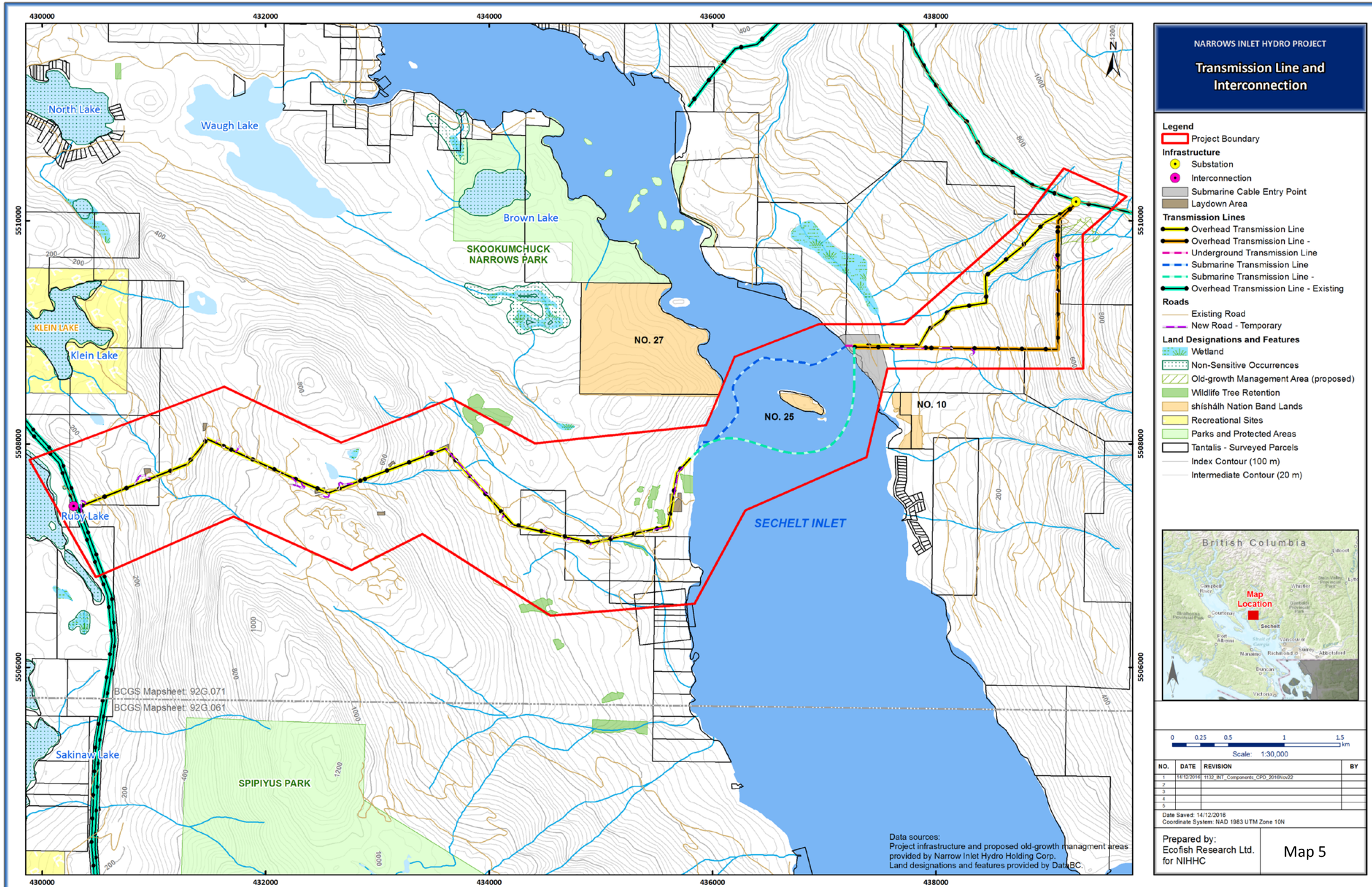
NO.	DATE	REVISION	BY
1	14/12/2016	1132_RAM_Components_CPD_2016Nov22	CSA
2			
3			
4			
5			

Date Saved: 14/12/2016
Coordinate System: NAD 1983 UTM Zone 10N

Prepared by:
Ecofish Research Ltd.
for NIHHC

Map 4

Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_RAM_Components_CPD_2016Nov22.mxd



Path: M:\Projects-Active\1132 Narrows Inlet Hydro Project\MXD\ComponentMaps\1132_INT_Components_CPD_2016Nov22.mxd