SOULE HYDRO, LLC
C/O Alaska Power & Telephone Company
P.O. Box 3222
Port Townsend, WA 98368

March 15, 2013

Lamont Jackson
Office of Electricity Delivery and Energy Reliability
OE-20, Room 8G-024
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: Electricity Export – Presidential Permit Application
Soulé River Hydroelectric Project
FERC No. P-13528-000—Alaska

Dear Mr. Jackson:

Enclosed is a Presidential Permit Application to connect a hydroelectric project located in the State of Alaska, USA, to the power system at Stewart in British Columbia, Canada. The purpose of this cross boundary electrical connection is to provide access to market for this otherwise stranded renewable energy resource. The Soule' Hydropower Project is currently engaged in a licensing process with the Federal Energy Regulatory Commission (FERC) and the primary land manager of the proposed site is the United States Forest Service (USFS). This proposed hydropower project is located very close (12.5 miles) to the electrical system in Canada. To make this project feasible access to market is needed and will require an electrical connection that will cross an international boundary.

If you have any questions, or if I can help you process this application in any way, please contact me at (360) 385-1733 x120.

Respectfully Submitted,

Robert S. Grimm
CEO/President
Soule Hydro, LLC.
(360) 385-1733 x120
(360) 385-7538 fax
bob.g@aptalaska.com

Enc. (as stated)

SOULE RIVER HYDROELECTRIC PROJECT

HVAC TRANSMISSION PROJECT

PRESIDENTIAL PERMIT APPLICATION

Prepared by:

SOULE HYDRO, LLC.

Port Townsend, Washington, USA

MARCH 2013

SOULE RIVER HYDROELECTRIC PROJECT
HVAC TRANSMISSION PROJECT
PRESIDENTIAL PERMIT APPLICATION

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ACRONYM LIST

AC ....alternating current
ADNR ....Alaska Department of Natural Resources
AP&T...Alaska Power & Telephone Company
COD ....commercial operation date
CWA ....Clean Water Act
DC ....direct current
DEC ....Department of Environmental Conservation
DFO ....Department of Ocean & Fisheries (Canada)
DO ....dissolved oxygen
DOE ....U.S. Department of Energy
EA ....Environmental Assessment
EFH ....Essential Fish Habitat
EIS..Environmental Impact Statement
EMF ....electromagnetic field
EMI ....electromagnetic interference
FEMA ....Federal Emergency Management Agency
FERC...Federal Energy Regulatory Commission
GIS ....geographic information system
HVAC ....high-voltage alternating current
HVDC ....high-voltage direct current

kg..kilogram
kV...kilovolt
mg/L ....milligrams per liter
MW ....megawatt
NAD ....North American Datum
National Register ....National Register of Historic Places
NEPA ....National Environmental Policy Act of 1969
NGO ....non-governmental organizations
NMFS ....National Marine Fisheries Service
NOAA ....National Oceanic and Atmospheric Administration
NPS ....National Park Service
NRCS ....Natural Resources Conservation Service
NRE...National Resources Energy, LLC
NWI...National Wetlands Inventory
PCBs ....polychlorinated biphenyls
POD...Permitting Overview Document
Project ....Soule River Hydroelectric Project
PVC ....polyvinyl chloride
ROD ....Record of Decision
ROW ....right-of-way
SHPO ....State Historic Preservation Office
T&E...threatened and endangered
USACE ....U.S. Army Corps of Engineers
USEPA ....U.S. Environmental Protection Agency
USFWS ....U.S. Fish and Wildlife Service
VSC ....voltage source converter

UNITED STATES OF AMERICA

BEFORE THE DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY AND
ENERGY RELIABILITY

SOULE HYDRO, LLC

Docket No. PP-________

APPLICATION OF SOULE HYDRO, LLC FOR A PRESIDENTIAL PERMIT FOR THE SOULE RIVER HYDROELECTRIC HVAC TRANSMISSION PROJECT

MARCH 2013

In accordance with Executive Order 10485, as amended by Executive Order 12038, Soule Hydro, LLC hereby applies to the United States Department of Energy for a Presidential Permit authorizing the construction, operation, maintenance, and connection of facilities for the transmission of electric energy at the international border between the United States and Canada. This application is made pursuant to the United States Department of Energy's applicable administrative procedures (10 CFR § 205.320 *et. seq.*).

Executive Summary of FERC Process To-Date

The Applicant recognizes that the National Environmental Policy Act of 1969 (NEPA) requires the DOE to give due consideration to the environmental impacts associated with issuing a Presidential Permit. The DOE's implementing regulations at 10 CFR Part 1021 describe the agency's NEPA review process. This Project does not qualify for a categorical exemption and the Applicant understands that an Environmental Impact Statement (EIS) may need to be completed. However, the Applicant has already developed an Environmental Assessment (EA) that has had an initial resource agency review, which DOE may find adequate to use instead of an EIS; please see Appendix J.

This project has been going through the Federal Energy Regulatory Commission (FERC) licensing process since 2005 when the first preliminary permit was applied for; in mid-2006 the first 3-year preliminary permit was issued (P-12615). A second 3-year preliminary permit was issued in September 2009 (P-13528). A third preliminary permit was applied for on September 1, 2012 (Docket P-13528).

The Applicant has been pursuing this project utilizing the FERC Alternative Licensing Process (ALP). Most field studies and a license application level design were completed by February 2011 when the Applicant submitted a Draft License Application and Preliminary Draft Environmental Assessment for resource agency review. Agency comments were received after a 90-day review period. Currently, the process is continuing forward with the Applicant's application for a third FERC preliminary permit.

A joint meeting between the Applicant and the FS took place on February 14, 2013, where discussions focused on the potential market for the power relative to project feasibility and of our applying for a Presidential Permit Application and the role the Department of Energy (DOE) will have in evaluating project feasibility (National Interest Finding). Having a third party (DOE) conduct the feasibility analysis will allow the FS to move forward (the FS said they were unable to make the feasibility analysis in-house). The Applicant believes the DOE National Interest Finding should demonstrate feasibility which will greatly assist the USFS in their decision process.

Assuming a Presidential Permit is issued, or expected to be issued pending the Applicant filing a license application, a revised Draft License Application and Preliminary Draft Environmental Assessment are anticipated to be issued in late 2013 for agency review. In the second quarter of 2015, a license application to the Federal Energy Regulatory Commission (FERC) is anticipated to be submitted. The FERC licensing process may take approximately 3 years from the time an application is submitted to when a license is issued.

The Applicant requests that NEPA occur among all federal agencies with authority to issue permits be coordinated with FERC regarding their respective NEPA responsibilities to prepare one NEPA analysis and thereby avoid duplication of effort and unnecessary expense and delay. If FERC determines that an EIS is necessary, that the other agencies coordinate/cooperate with FERC to develop just one EIS.

Section 1
Information Regarding the Applicant

1.1 Legal Name of Applicant
Soule Hydro, LLC, hereafter referred to as "Applicant", is applying for this Presidential Permit. Soule Hydro, LLC is a limited liability company, organized and existing in the State of Delaware. Soule Hydro, LLC's Corporate Headquarters is located at 193 Otto Street, P.O. Box 3222, Port Townsend, Washington 98368.

Alaska Power & Telephone Company (AP&T) is the parent company and sole shareholder for Soule Hydro, LLC., the company that is licensing the Soule River Hydroelectric Project. Soule Hydro, LLC will own and operate the transmission line that will cross the International Boundary and connect to the BC Hydro Stewart Substation in Stewart, B.C.

1.2 Legal Name of All Partners
Soule Hydro, LLC is the sole Applicant for this Presidential Permit.

1.3 Communications and Correspondence
All communications and correspondence regarding this application should be addressed to:
Mr. Robert S. Grimm, CEO/President
Soule Hydro, LLC
c/o Alaska Power & Telephone Company
193 Otto Street
P.O. Box 3222
Port Townsend, WA 98368
Phone: (360) 385-1733 x120
Cellular: (360) 301-3636
Fax: (360) 385-7538
Email: bob.g@aptalaska.com

1.4 Foreign Ownership and Affiliations
Neither the Applicant nor its proposed transmission facilities are owned wholly or in part by any foreign government or instrumentality thereof.

1.5 List of Existing Contracts with Foreign Governments or Foreign Private Concerns Relating to the Purchase, Sale or Delivery of Electric Energy
The Applicant does not have any existing contracts with any foreign government or any foreign private concerns relating to the purchase, sale, or delivery of electric energy. However, Soule Hydro, LLC may seek to sell power to private enterprises (i.e. mines, LNG plants, etc.) within British Columbia or may wheel the electricity down to the

Lower 48 States. BC Hydro may also choose to purchase power from the Applicant to meet their expected future energy needs in the northern part of British Columbia.

1.6 Opinion of Counsel

Appendix A includes a signed opinion of counsel attesting that the construction, connection, operation, and maintenance of the proposed Soule River Hydroelectric Project is within the Applicant's corporate powers and that Soule Hydro, LLC has complied with or will comply with all pertinent federal and state laws.

Section 2

Information Regarding the Proposed Transmission Facility

2.1 Project Overview

Soule Hydro, LLC proposes to construct the 77.4 megawatt (MW) Soulé River Hydroelectric Project located on the Soulé River, on Portland Canal, approximately 9 miles (14.5 km) Southwest of Hyder, in Southeast Alaska. The Project would occupy federal land administered by the Ketchikan-Misty Fjords Ranger District of the U.S. Forest Service (Forest Service). Other lands involved are State of Alaska submerged land (submarine cable and other in-water structures) at the Soulé River, Portland Canal, and the Stewart, B.C. waterfront (requiring a Presidential Permit). The submarine cable will require a U.S. Army Corp of Engineer permit and its equivalent in Canada. Land owners in Canada consist of the City of Stewart and Crown lands for the cable landing and right-of-way (ROW) for the overhead transmission line to the BC Hydro Stewart substation on the north side of Stewart.

The Applicants proposed 77.4 MW hydroelectric project would include:

- Main Dam 265-feet-tall (81m) by 903-feet-long (275m);
- Saddle Dam approximately 2,024 feet long (617m) adjacent to the Main Dam;
- Intake structure just north of Main Dam;
- Reservoir with a surface area of approximately 1,072 acres (434 Ha) and approximately 102,300 acre-feet of storage;
- (5) 16-foot-diameter (5m) by 11,400-foot-long (3,475m) water conduit tunnel;
- 3.1-mile-long (5km) access road;
- (7) 120-foot-long (37m) single lane bridge to cross the river;
- (8) 80-foot-wide (24m) by 160-foot-long (49m) powerhouse; a tailrace that will discharge into the river mouth;
- (9) Three 138 kilo-volt (kV) transformers substation next to the powerhouse;
- (10) Marine access facilities that include a staging area, boat ramp with 2-3 dolpins for landing craft, barge basin for offloading barges, and float for small watercraft to dock;
- (11) Temporary log transfer facility;
- (12) 10-mile-long (16 km), 138 kilo-volt (kV) high voltage alternating current (HVAC) submarine cable to Stewart, B.C. (approximately 2 miles [3.2 km] will be in Canadian waters and 2.5 miles [4 km] on land) to connect with the BC Hydro Stewart substation.

Soule Hydro, LLC proposes to develop the Soule River Hydroelectric Project (Project) to provide a renewable resource for either power needs within British Columbia or to the Lower 48 States. The Project will include underwater, underground, and overhead HVAC 3-phase, 138kV transmission cable connecting the Project with market mentioned above. The point of connection to get to market is the BC Hydro Stewart substation.

The nearest U.S. community is Hyder, Alaska, which is adjacent to Stewart, B.C.; the terrestrial U.S. – Canada border crossing is just outside and north of downtown Hyder on Highway 37A (Glacier Hwy) that connects both communities.

From the hydroelectric project an 8 mile long (13 km) 138kV, 3-phase submarine cable will be laid on the floor of Portland Canal to a point off of the community of Hyder, Alaska, waterfront before the cable crosses the International Boundary and goes another approximately 2 miles (3.2 km) to land at Stewart, B.C. Arrow Dock. The causeway that forms Arrow Dock will have a cable splice vault at the cable landing where the transmission line will either be buried or proceed on upgraded overhead single wood pole structures following the existing road. This configuration would then turn onto the "Industrial Route" around the east side of Stewart, where it will be buried to avoid the flight path from the south end of the Stewart Airport. Once past the flight path the transmission line will transition to overhead using upgraded single wood pole structures to reduce the potential for sedimentation (by burying the transmission cable) in moderate and high quality fish habitat between the airport and the road the transmission line will follow.[1] The overhead transmission line will terminate at the BC Hydro Stewart Substation on the north side of Stewart. Total distance from the cable landing to the substation is approximately 2.5 miles (4 km); a total of approximately 4.5 miles (7.24 km) from submarine border crossing to substation.

Portland Canal

The Portland Canal is an arm of Portland Inlet, one of the principal inlets of the British Columbia Coast. Despite its naming as a canal, the inlet is a fjord, a completely natural geographic feature and extends 70 miles (112.7 km) northward from the Portland Inlet at Pearse Island, British Columbia, to Stewart, British Columbia and Hyder, Alaska. Portland Canal forms part of the border between southeastern Alaska and British Columbia. The name of the entire inlet in the Nisga'a language is K'alii Xk'alaan, with /xk/alaan/ meaning "at the back of (someplace)". The upper end of the inlet was home to the Tsetsaut ("Jits'aawit" in Nisga'a), who after being decimated by war and disease were taken under the protection of the Laxsgiik (Eagle) chief of the Nisga'a, who holds the inlet's title in native law

The placement of the international boundary in the Portland Canal was a major issue during the negotiations over the Alaska Boundary Dispute, which heated up as a result of the Klondike Gold Rush and ended by arbitration in 1903. Together with Pearse Canal and Tongass Passage, the Portland Canal is defined by the Alaska Boundary Settlement

[1] Recommended by Fisheries and Oceans Canada.

(the Hay-Herbert Treaty) as part of Portland Channel, a term used as forming the marine boundary in the Anglo-Russian Treaty of 1825 but which was undefined at the time.

Port of Stewart, B.C.

The economy of Stewart (pop. 400) is supported by a varied range of industries including logging, mining and mining exploration and is destined to become a major port for distribution of ore and logs. Stewart offers a paved highway to major transportation routes and a salt water port which supports a barge terminal and bulk commodity loader. The Portland Canal is a mere 80-90 miles from the Pacific Ocean allowing ore and log ships to come from all over the world.

It is important to note that Stewart is Canada's most northerly ice-free port. The Portland Canal extends almost all the way through the coast range so that its head, at Stewart, is closer to many interior locations, and all locations north of Kitwanga, than all other ports in BC. It is the most convenient and economic location to service cargos which do not require rail access.

The existing port area, locally known as the "Arrow Dock" was used by Arrow trucking for storing and shipping asbestos trucked from Cassiar. Cassiar also barged fuel into the site, which was backhauled to Cassiar mine on the return trucks.

The log dump is the responsibility of the District of Stewart and will remain so through all phases of the Project and after the Project is complete. The Department of Fisheries and Oceans has brought the issue of aquatic impacts to the attention of the District, and although the District of Stewart is responsible for the log dump, the upgrading costs are prohibitive for this small and economically challenged community.

The Project's precise final route is subject to a number of factors, including resource issues, permitting, and right-of-way easements with the Canadian Government, Crown, and District of Stewart. A general map of the Project is presented in Appendix B of this application. A Google Earth image showing the physical location, longitude, and latitude of the proposed international border crossing is presented in Appendix C.[2]

The 8-mile-long (13 km) section of the Project located within the United States will be owned and operated by the Applicant. The 4.5 miles (7.24 km) of transmission infrastructure in Canada to the BC Hydro Stewart Substation will also be owned and operated by the Applicant. The power generated from the Applicant's Project will be delivered to the BC Hydro Stewart substation where it can be wheeled to market. The customer could be BC Hydro, or it could be another market, possibly in the Lower 48. The Applicant is starting consultation with the Canadian government and agencies to permit the Canadian segment of the transmission line.

The Applicant anticipates that the permitting phase of this Project will continue through the second quarter of 2015. Field studies for the hydropower site have for the most part

[2] This location is currently our best estimate, but as we move forward with design this may change; depends on where we determine the best location is to bring the submarine cable through to Stewart.

been completed. If this timeline remains intact, construction could begin in late 2018 or early 2019. Construction is expected to last up to four years due to the sites remote location and complexity of design (i.e. dams, tunnel, etc.).

2.2 Technical Description

As noted above, the Project will utilize HVAC technology, such as the ABB HVAC cross-link polyethylene (XLPE) cable for the submarine portion. Less shielding will be needed for the terrestrially buried portion, and the overhead will have minimal shielding. Specific technical information regarding the proposed Project is presented below.

2.2.1 HVAC Cables

Cable Description

The system will consist of a single 138kV three-phase x 10-mile-long (16 km) submarine XLPE cable, and a single three-phase x 2.5-mile-long (4 km) combination overhead and buried transmission cable.

Conductor

The exact width of the copper conductor has not yet been determined, but would be round, stranded and compacted. The copper would meet with the requirements of ASTM-B3. Stranding is compact round concentric lay stranded in accordance with ASTM B496. The conductor is longitudinally water sealed by using compound material that is compatible with the conductor and the extruded shield. A semi-conductive binder is applied over the conductor.

Insulation System

The triple-extruded XLPE insulation system consists of:

- Conductor shield
- Insulation
- Insulation shield

Longitudinal Water Barrier

Bedding of swellable semi-conducting tape is placed under the metallic sheath to prevent longitudinal water penetration.

Metallic Sheath

A sheath of lead alloy provides protection against radial moisture penetration and also serves as metallic insulation shield. The metallic sheath is capable of handling the specified single-phase earth fault current.

Core Jacket

A semi-conducting core jacket is applied over the metallic sheath to protect the metallic sheath mechanically. The jacket is semi-conducting to even out charging currents in the lead sheath. Since the PE jacket on the cable core is semi-conducting, the charging currents can easily be evened out and no significant longitudinal charging current will run in the underlying lead sheath.

Armor Wires
Galvanized steel wires will give tensile strength to the cable and protect it during laying and against anchors, fishing gear, etc., when installed. Bitumen compound together with the zinc galvanization will protect the steel wire armor against corrosion.

The HVAC transmission cables use a triple-extruded, dry-cured polymer insulation system. Submarine cables include a polyethylene sheath extruded over a lead alloy sheath to provide superior mechanical and corrosion protection. A layer of tensile armor comprised of galvanized steel wires embedded in bitumen and laid in counter helix provides additional protection for submarine cables. The outer serving of the submarine cables will consist of an asphaltic compound with polypropylene reinforcement. For terrestrial cables, the outer sheathing will be an ultraviolet-stabilized, extruded polyethylene layer. The diameter of the proposed submarine HVAC transmission cable will be approximately 13 inches, and the cable will each have a weight of about 37-lbs per ft (56 kg/m). The terrestrial cable may have an outside diameter of approximately 4.5 inches and a weight of about 20 lb per ft (9 kg/m).

Due to the submarine cable having three conductors wrapped in the same cable, and due to the many research papers that have been published about electro-magnetic fields (EMF) for high-voltage transmission lines, the Applicant believes there will be negligible EMF at ground level. The Project will have a maximum operating voltage of 138 kV.

Preliminary technical diagrams of the proposed HVAC cable design has been furnished by ABB and has been included in Appendix D of this application document. Please note this technical document is general information, but has too much copper conductor for the Applicant's use at this time.

<u>Cable Installation</u>
Initially, the seabed would be surveyed to identify any obstacles or hazards and determine the best route for laying the cable (flat terrain is preferred). A bathymetric map would be created of the seabed for analysis from the survey. There are currently no existing submarine cables or pipelines in this area to present issues often found in the Lower 48 States. Please see Appendix E for a complete analysis of the Stewart cable landing and for the submarine cable environmental analysis.

At both ends of the submarine cable the landings will include a splice-vault to transition from submarine to terrestrial infrastructure. A diagram of a similar vault that may be used is included in Appendix F.

After installation of the cable splice-vault and anchoring system for the cable, a cable laying ship would anchor off the Project site and the submarine cable would be winched onto shore to connect to the anchoring system and splice-vault. Once connected, the cable laying ship would proceed north up Portland Canal toward Stewart, B.C. Submersibles with video cameras may be used to observe the cable as it is laid on the seabed. Burial of the submarine cable will rely on the cables weight in what is expected to be a thick sediment layer on the seabed. The rivers in the north end of Portland Canal also have a heavy sediment load that is expected to contribute to burying the cable. Because the cable will be laid near the center of the canal, on the U.S. side of the canal, issues with ship anchors in this remote area is not likely. As the cable buries itself the potential for interaction with an anchor becomes even more negligible. However, the U.S. and Canadian Coast Guards will be notified so that future marine lane mapping will indicate the cables location. At the Port of Stewart the submarine cable will have to be laid in a specific area to avoid the Stewart Bulk Transfer facility's deep sea anchorage for ships waiting to be loaded. This specific route is still being determined.

It is anticipated that the vast majority of the cable will be buried using the method described above, however, the use of a proven low impact technique known as water-jetting could also be use; this may be the preferred method in the Port of Stewart, but further design work on the cables location needs to occur. To get the cable to both splice-vaults in the intertidal zone, it may be necessary to use a backhoe at low tide to create a trench for the cable that can then be backfilled and armored with riprap.

Overland sections make up a relatively small portion of the Project's overall route. In general, the transmission cable will be routed overland once the Port of Stewart causeway is reached; the south end of the rock filled causeway is currently named Arrow Dock. It is anticipated that the transmission cable will be on overhead structures for most of the 2.5-mile-long terrestrial route. However, the District of Stewart hopes to make improvements to the causeway to improve the potential for economic development, which may require burying the transmission cable along the causeway; currently a distribution line goes to the end of the causeway and this would be the route of the Projects transmission cable. The cable would need to be buried at the south end of the Stewart Airport for flight safety as the cable route follows the "Industrial Route" around Stewart. The transmission cable is then expected to transition to overhead structures following an existing overhead distribution line route to the BC Hydro Stewart Substation at the north end of Stewart.

2.3 Bulk Power System Information

Pursuant to the requirements of 10 CFR § 205.322(b)(3), the Applicant is providing the following bulk power supply information for this Project. The Applicant's project is not a Bulk Power System, but is a single generation source providing power to a Bulk Power System that is owned and operated by BC Hydro of British Columbia, Canada. The connection to the BC Hydro system would occur at Stewart, B.C., Canada.

Enclosed in Appendix G are maps of the BC Hydro Bulk Power System grid. The following Internet address will provide additional information on BC Hydro's system:
http://transmission.bchydro.com/transmission_system/maps/scheduling_path_map.htm

In 2007, the Applicant contracted with a then subsidiary of BC Hydro, the British Columbia Transmission Corporation (BCTC)[3] to conduct an interconnection feasibility analysis. BCTC determined that the interconnection would be feasible. A copy of the analysis report is enclosed in Appendix H.

2.3.1 Expected Power Transfer Capability

The proposed maximum power transfer capability is 77.4 MW. The ultimate maximum capacity will be determined as the Project's design is finalized. In general, the amount of water available for the hydropower project at different times of the year and the power transfer capability that is limited by the maximum thermal capacity of the proposed transmission line would affect the ultimate maximum capacity.

2.3.2 System Power Flow

Federal regulations at 10 CFR § 205.322(b)(3)(ii) does not apply to this Project because the Applicant is not a Bulk Power System. The Applicant will deliver hydropower to a Bulk Power System owned and operated by BC Hydro. The Project does not have access to any other Bulk Power System unless it was wheeled through BC Hydro to the Lower 48 or sold directly to BC Hydro. The Applicant proposes to connect its generated power to the BC Hydro Stewart substation so that BC Hydro could be the end user or to wheel the power elsewhere. The Applicant will continue to look at other end-users for the Projects power.

If the Applicant is unable to connect to the BC Hydro Bulk Power System, the Project will not be constructed; or if the BC Hydro system were temporarily unavailable, the Project would not operate. However, currently when there is an outage to Stewart, B.C. by BC Hydro, the community has no backup power generation available. The Applicant's project would be able to fill that need through BC Hydro who would purchase the power from the substation, the point of connection. Hyder, Alaska is unique in that it currently receives its electricity from BC Hydro through Stewart via a U.S. corporation formed by BC Hydro named Tongass Power; a cross boundary arrangement. Tongass Power is a certified public utility through the State of Alaska. Hyder suffers along with Stewart when there is a power outage as they do not have backup generation either.

Appendix H contains a Feasibility Analysis conducted by BCTC for this project that may provide additional information about their system flow.

2.3.3 Interference Reduction Information

The Applicants proposed transmission cable is not expected to interfere with the use of waters in Portland Canal up to and through the international boundary between the

[3] BC Hydro has since absorbed BCTC so that all transmission lines and infrastructure are owned and operated by BC Hydro.

United States and Canada. This is because there are no other existing submarine cables or pipelines in this area of Portland Canal. In addition, the cable is expected to bury itself within a year due to its weight and the continued depositing of sediment from the areas glacially fed rivers.

Interference could occur as the submarine cable comes into the Port of Stewart. To address this potential, not only to prevent interference to port activity but also to protect the Project cable, either burial of the cable would occur in the deepwater anchorage of the Port of Stewart as the cable passes through it, or the cable would be laid on the seabed further west, closer to the Hyder mudflats, away from the deepwater anchorage. This is the area known as the Stewart Bulk Transfer facility (SBT) deepwater anchorage noted on the enclosed Figures in Appendix I. If buried, the distance of burial would be approximately <4,900 feet (<1500 m); laying the submarine cable on the seabed away from this anchorage may reduce the total length of cable needed. North of the SBT anchorage area the submarine cable will be brought through the intertidal zone with a combination of burial and HDPE conduit for continued protection. The Stewart Marina is located near the SBT facilities, both of which are west of the proposed project cable route and should not be interfered with by the Projects infrastructure.

The Project would come up on the west side of the Arrow Dock and causeway to avoid interfering with the periodic dredging that occurs at the Bear River mouth, located on the east side of the causeway. The cable buried through the intertidal zone would be housed in a steel conduit once above tidewater to a buried cable splice vault [buried in the existing rock fill of Arrow Dock] that would transition the cable from a marine cable to a terrestrial cable. The burial with steel conduit would prevent interference from any surface activity on Arrow Dock. The transmission cable would then transition to either being buried in Arrow Dock and causeway or on upgraded overhead single wood pole structures following the existing overhead distribution line infrastructure to the "Industrial Route" around the airport at the north end of the causeway. The transmission cable would be buried at the south end of the airstrip that the "Industrial Route" travels around and then transition back to overhead structures using upgraded single wood pole structures and following the existing distribution infrastructure route.

The transmission cable would then terminate at the BC Hydro Stewart Substation, currently connected to the BC Hydro system with a 138kV transmission line.

The Bear River has been filling in the Project cable landing site around the man-made causeway for many years; filling in so much that the barge facility at the south end of the causeway is no longer used except at high tide. Thus this area would provide negligible interference with the Project.

The Applicant anticipates that the proposed HVAC technology and the installation methods will be sufficient to eliminate any potential television and/or radio electromagnetic interference (EMI) along the transmission corridor.

2.3.4 Description of the Relay Protection Scheme

Any relay protection scheme would be by BC Hydro. Appendix H contains a Feasibility Analysis conducted by BCTC for this project that may provide additional information about their relay protection. The enclosed One-Line Diagram of the Applicant's project shows how the Project will address Relay Protection.

The Applicant will work with BC Hydro to ensure an adequate relay protection scheme is in place.

2.3.5 System Stability Analysis

As provided in 10 CFR § 205.322(b)(3)(v), the U.S. Department of Energy (DOE) may require the Applicant to prepare a system stability analysis following the DOE's review of the power flow plots. Appendix H contains a Feasibility Analysis conducted by BCTC for this project that may provide additional information about their system stability with regard to this project.

Section 3

Information Regarding Potential Environmental Impacts

3.1 Introduction

Soulé Hydro, LLC proposes to construct the 77.4 megawatt (MW) Soulé River Hydroelectric Project (Project) located on the Soulé River, on Portland Canal, 9 miles Southwest of Hyder, in Southeast Alaska. The Project would occupy federal land administered by the Ketchikan Misty Fjords Ranger District of the U.S. Forest Service (Forest Service). Other lands involved are State of Alaska submerged land (submarine cable and other in-water structures) at the Soulé River, Portland Canal, and the Stewart, B.C. waterfront. City of Stewart and Crown lands are the primary land owners involved for the cable landing and right-of-way (ROW) for the overhead transmission line to the BC Hydro Stewart substation on the northeast side of Stewart.

This project will deliver up to 77.4 MW of renewable energy from the Soule River Hydroelectric Project in Alaska to load centers in British Columbia, Canada, or to the Lower 48.

The Project, as proposed, would be operated as a storage project. The Applicant's proposed measures for the protection and enhancement of environmental resources:

- Measures to prevent soil erosion and sedimentation during construction;
- Measures to reduce the projects footprint to reduce environmental impacts;
- Measures to avoid potential mountain goat habitat on ridges around project;
- Measures to avoid existing (not necessarily active) bald eagle nests above and below the project on Portland Canal;
- Re-vegetation, landscaping as needed;
- Measures to reduce the visual impact of project features
- Measures to eliminate an invasive species on the river delta.

These measures are described in detail in the Preliminary Draft EA, which can be found in Appendix J.

3.2 Substrates & Water Quality

3.2.1 Environmental Setting

At this time no survey of the seabed in Portland Canal has occurred. However, because of the amount of glacial flour, sediment and bedload that is discharged by the Soule River, and presumably the Salmon River, Bear River, and Marmot River, which all originate from glacial sources around Hyder, Alaska, and Stewart, B.C., the seabed is likely covered by a thick coating of sediment. The substrate of the seabed is expected to remain fairly consistent along the submarine cable route; although a bathymetric survey will be necessary to ground-truth this assumption.

Portland Canal is a large waterbody that is 70-miles-long before entering the Pacific Ocean. The canal, as expected, is tidally influenced. Off the Soulé River mouth, the canal is 2-miles-wide by 900-feet-deep (274 m). The canal seabed gradually rises as it heads north toward Stewart, B.C. The Soulé River contributes a large amount of glacial flour to Portland Canal. The upper canal is highly turbid near the surface due to this glacial flour not only from the Soulé River, but also from the other rivers mentioned above and the Davis River which is less than 4 miles south of the Soulé River, plus other smaller drainages on the opposite side of the canal.

The proposed submarine transmission cable will enter Portland Canal at the Soule River Hydroelectric Project and precede approximately 8 miles north in Portland Canal until almost directly off of the Hyder waterfront where the cable will cross the International Boundary between the U.S. and Canada. The submarine cable would then continue north another 2 miles to the Port of Stewart, B.C. where it would make landfall.

No other submarine cables or pipelines or any utilities exist along the submarine cable route, virtually eliminating the potential for conflict.

3.2.2 Environmental Impacts

A complete review of the submarine cable impacts can be found in an analysis in Appendix E. While the installation of a submarine cable will cause temporary disturbance, the Applicant does not anticipate that this Project will have a significant, long-term impact to the substrate or bottom sediments along the proposed route. As described above, the proposed submarine cable will due to its weight and the expected seabed substrate of sediment, generally bury its self as it settles and the rivers will continue to provide more sediment to cover the cable.

The preferred method of burial when the SBT facilities deep water port anchorage is reached would be by water-jetting, where burial is accomplished by gently fluidizing the seabed with low-pressure water released from jets and directed backwards, allowing the cable to sink by its own weight. As the cable sinks into the trench, the water-jetting machine moves forward, allowing the fluidized material to backfill the trench. In certain instances, mechanical plowing may be used in conjunction with water-jetting to achieve burial depth requirements. However, the exact route through this area is still being determined because of the expense associated with burying a submarine cable. An alternative being considered is to bring the cable west, closer to the Hyder mudflats to avoid the deepwater anchorage altogether and lay the cable on the seabed rather than bury.

The proposed Soulé Project submarine cable landing would have minimal and temporary effects upon the geomorphology of the Portland Canal. The cable will be laid on the seabed of the canal, having minimal and temporary disturbance of the bottom sediment. Over time the cables weight will help bury it in bottom sediments and other sediment from the Upper Portland Canal drainages will continue to settle on the seabed to further bury the cable (four other rivers besides Soule River contribute sediment and bedload to the canal). Material will not be removed from the Portland Canal seabed until the deep water port anchorage at Stewart for a distance of approximately 1,500 m (4921 ft), where the excavated material from trenching in the cable will be used to backfill; if this route is chosen. Stewart Harbor will also have the cable trenched into the aggregate and sediment deposited from the Bear River for about 100 m (328 ft) to the south end of the Stewart causeway. For most or all of this 100 m section the cable will be enclosed in a conduit. The same material excavated would be placed over the cable, or the natural sediment deposition that is constantly occurring would be allowed to bury the cable over time.[4]

The river will continue to add material to the end of the causeway, further burying the cable. Limited and temporary impacts to the geomorphology of this area by burying the cable to the causeway could occur, but the cable would be buried with the same excavated material and conditions are in constant flux due to the continued aggregation and sedimentation of the area from the Bear River in particular and the other four rivers on the incoming tide.

Burying the submarine cable to the cable landing will have no long term impact on the geomorphology of the harbor because aggregate and sediment are continuously deposited at and around the causeway.

Research related to previous submarine cable projects has shown that the suspension of sediments associated with water-jetting techniques is generally limited to the hypolimnion[5] and the benthic zone. Existing sediment transport patterns restore the deposition of sediments to ambient conditions (OSI 2005; Applied Science Associates, 2006). In evaluating the impact of water-jetting on mollusks, the USACE (2004) equated jet plowing with a storm event, "… which causes an increase in suspended sediment load for a short period of time for which clams have the ability to close and survive for the

[4] The Project makes the assumption that with the Bear, Salmon, Marmot, Soule and Davis rivers all contributing sediment from glaciers in Upper Portland Canal, which is in part evidenced by the cloudy/milky conditions usually present in the canal throughout the warmer months, there is significant sediment disposition occurring to the canal seabed.

[5] The **hypolimnion** is the dense, bottom layer of water in a thermally- stratified lake. It is the layer that lies below the thermocline. Source: Wikipedia.

duration of such events." Other researchers have reported that benthic communities impacted by submarine cable installation should be able to opportunistically re-colonize within a short time period after the disturbance (Scott Wilson Ltd. and Downie 2003).

Disturbance of bottom sediments may result in a temporary increase in turbidity and suspended sediment concentrations during installation, but is not expected to impact temperature, DO levels, or salinity within the water column. Notwithstanding these considerations, water-jetting will disturb bottom sediments, but due to the projects location, no known chemical contaminants are known to exist that could otherwise be resuspended as well.

3.3 Aquatic Resources

3.3.1 Environmental Setting

Soule River

The Soulé River watershed is approximately 81 square miles in size with 7.8 miles of active riverbed divided into 3 major segments. The Main Stem of the Soulé River is approximately 2.5 miles long, while the West and North Forks are 1.7 and 3.6 miles long, respectively. Both forks converge at the top or beginning of the Main Stem. The higher elevations of the watershed consist of glaciers and ice fields, which total approximately 33 square miles. A total of 47.5 square miles of the watershed are not covered by glacier or ice. A total of 44.4 square miles of the drainage would lie above the dam built for the storage reservoir. Glacial meltwater enters the Soulé River through the West Fork, primarily from April through October. The low river flow period extends from November through March. The Soulé River exhibits major seasonal fluctuations in flow primarily driven by glacier meltwater. The West Fork accounts for approximately 80% or more of the total river flow in the summer, but less than 20% in the winter, while the North Fork seasonally accounts for 20% and 80% respectively. Total summer river flows can be in excess of 3000 cfs, while low winter flows are in the range of 50-500 cfs.

A U. S. Geological Survey (USGS), Water Resources Division stream gauging station 15009000 (Station 15009000) was installed in 2007 to measure flow within the Main Stem of the Soulé River, just south of the confluence of the West and North Forks at the emergence of the Upper Gorge into the Main Stem.

There are a total of five bodies of water potentially affected by this project, three of which are segments of the Soulé River:

1. No-Name Lake
2. North Fork Soulé River
3. West Fork Soulé River
4. Main Stem Soulé River, and
5. Portland Canal.

Two of these waterbodies, No-Name Lake and Portland Canal are not likely to be significantly impacted. No-Name Lake is above the proposed "full" elevation of the project reservoir and Portland Canal is a large waterbody that is 70-miles-long. Off the Soulé River mouth, the canal is 2-miles-wide by 900-feet-deep. The Soulé River contributes a large amount of glacial flour to Portland Canal. The upper (north) canal is highly turbid near the surface due to this glacial flour not only from the Soulé River, but also from the other rivers previously mentioned. The contribution of glacial flour from the Soulé River will not be significantly altered by the project. The canal is tidally influenced, which reduces impacts associated with man-made activity by naturally cleansing itself, much like a river can if the point of pollution is limited and of short duration. The Applicant believes this project will have limited aquatic impacts and most will be of short duration.

The other three waterbodies, segments of the Soulé River, are more directly influenced by this project. The North Fork drains from No-Name Lake (mostly snow and rain fed) and the West Fork drains from the Soulé Glacier (mostly glacially fed). The North and West forks have a confluence at the top of the Upper Gorge, a bedrock ridge with a fracture or gorge through it that the river flows through. This gorge is considered both a falls and velocity barrier to anadromous fish. The vertical bedrock walls of this gorge are 100-200 feet in height. The Main Stem flows from the Upper Gorge through the Lower Gorge, which is another bedrock ridge, where the river drops precipitously through falls and velocity barriers to anadromous fish movement before entering Portland Canal. The vertical bedrock walls of the Lower Gorge have heights of approximately 60-100 feet.

A Tier II Habitat Survey of the Main Stem of the river showed the substrate throughout the river was similar consisting of oval to round boulders, cobble and gravels. There was a notable absence of angular particles. Small pockets of medium to fine gravel, sands and silts occasionally occurred in the river. However, a majority of the larger particles were lying on top of each other with no significant embedment by fines such as sands and silts. This was in contrast to the higher shoreline areas where a majority of particles showed some embeddedness by fines (Shipley Group. 2010). Quantitative sediment samples from the area showed that fines smaller than sands comprise from 5-20% of the samples by weight. Regardless of methodology, 50% of the particles measured in Wolman pebble counts were greater than 90.5 mm. Approximately 23% were less than 32 mm.

The east side of the river had considerable exposed bedrock which decreased with distance below the upper gorge. However, there was exposed bedrock below Dolly Varden Creek[6] on the east bank as well. In general the forest extended down to the river edge except where bedrock occurred on the east bank. The west bank consists of a broad floodplain of alder shrub adjacent to the steeper slopes. Most of these slopes show numerous avalanche chutes. The most extensive avalanche area is on the west side opposite Dolly Varden Creek. Vegetation on the east side of the river is also affected by this avalanche activity. The vegetation in this active avalanche area on both sides of the

[6] Referred to as both Dolly Varden Creek and Zapus Creek in field reports; the EA will use Dolly Varden Creek because it is more descriptive.

river is dominated by alders. The forest follows the edge of the floodplain rather than the river course on the west side.

The Soulé River Delta extends about a ¼ mile out into Portland Canal. The north river delta extends from the tree line approximately 1,000 ft offshore to the mid-littoral zone at approximately +5 ft elevation above the zero tidal datum. The delta runs approximately 1,500 ft to the northeast before terminating in a steep rocky shoreline in a bay north of the delta. The Powerhouse site lies at the river mouth on the south side of the north delta in the treeline. The substrate on the delta is composed of gravel, cobble, boulder, and glacial silts and sands.

The Alaska Department of Fish & Game (ADF&G) Fish Distribution Database Atlas for Alaska listed the Soulé River as an anadromous stream (101-15-10390) in the "Catalog of Waters important for the Spawning, Rearing, or Migration of Anadromous Fishers and associated Atlas." A map from the "catalog" indicates that Chum salmon are present throughout the river system, and Pink salmon are present in the Main Stem below the forks. Our investigations indicated that this is not the case.

Mapping of the watershed by Novak and Downey (1975)[7] indicates that both a barrier falls and a potential velocity barrier exist within the Lower Gorge at the mouth of the river which would preclude use of the river by migratory salmonids. The Lower Gorge extends from the mouth of the river upstream for a distance of approximately ¼ mile.

For these reasons the Applicant focused studies on determining if barriers existed to anadromous fishes as well as conducting minnow trapping, fly fishing, and observations for fish carcasses or signs of feeding on fish on river banks and at the river mouth delta. Sign of predators, i.e. bear and other mammals or avian species having fed on fish at these locations was also sought. The Lower Gorge contains a vertical falls that is estimated at 30 ft in height (based on a topographic survey), one of several fish barriers in the Lower Gorge. The Upper Gorge has a falls in excess of 12 ft high. Water temperature of the river is on average 1-2°C throughout the summer, too cold for salmon to reproduce in the river or on the delta. These conditions indicate that it is not a suitable stream for salmonids.

Dolly Varden

Young of the year and juvenile Dolly Varden (*Salvelinus alpinus*), a species of char that is very widespread and abundant in northwestern North America, were found in the North Fork of the Soulé River immediately below No-Name Lake. Dolly Varden was the only fish species found in the Soulé Watershed. The North Fork is a non-glacial tributary to the Soulé River with environmental conditions suitable for the propagation of salmonids. Juvenile Dolly Varden were also found in No-Name Lake and in a small tributary at the midpoint of the Main Stem.

[7] A report submitted to the Applicant by the ADF&G.

Delta Fish
A number of ponds occur in the intertidal zone on the south Soulé Delta.[8] These are periodically inundated by high spring tides. These ponds usually held juvenile and adult Threespine Sticklebacks (*Gasterosteus aculeatus*). Salmon parr were also common in these ponds in late spring and summer (ponds are only present on the south delta). A small sculpin was also seen on a single occasion in one of the clear streams running across the delta. In 2007 two sculpins were caught in traps fished in the main channel of the river mouth.

The following conclusions were reached from the Soule River fish studies:

1. Dolly Varden rearing and foraging habitat is in No-Name Lake rather than in the North Fork
2. A portion of the juvenile Dolly Varden rear in the North Fork down to "Waterfall Creek", which is about 3500 feet down river from the lake
3. Dolly Varden spawn in the lake outlet, but not below the first 0.3 mile of the outlet stream (primarily closer to the lake sill than further downstream).
4. Dolly Varden are flushed down the river and are unable to return to above the Upper Gorge or above the Lower Gorge on a seasonal basis
5. Dolly Varden have found habitat in a stream (Dolly Varden Creek) that enters from the east side of the Main Stem between both gorges; supports all life stages
6. Salmon are unable to get up the Lower Gorge due to velocity and falls barriers
7. No evidence of salmon was found to use the river mouth for spawning
8. No salmon were found in any portion of the river.
9. No evidence of salmon carcasses from predation was found along any portion of the river.
10. No evidence of salmon were found to use the river mouth for spawning.
11. Water temperatures are too cold (1-2ºC) during the spring and summer months in the West Fork and Main Stem of the river and at the river mouth for spawning
12. Sediment load is significant enough to cover redds if spawning were attempted at river mouth; no evidence of redds was found.
13. Juvenile fish foraging habitat can be affected if the delta decreases in size from lack of deposition of sediments

Portland Canal
Several rivers in upper Portland Canal have salmon runs. The Davis River is purported to have Chum and Pink salmon. The Salmon River supports dominant runs of Chum, Pink and a smaller run of Coho salmon. The Bear River, located at the head of Portland Canal,

[8] No ponds were found on the north Delta.

also supports small runs of Chum and Coho, particularly in the lower reach and channels. The marshes and tidal flats of these estuaries provide important and productive rearing habitat for the juvenile salmon that enter the Portland Canal in early spring and summer.[9] Juvenile chum salmon use the Soulé River delta for foraging habitat as they move down Portland Canal to the ocean each spring.

Portland Canal is used by the residents of Hyder and Stewart to harvest shrimp, fish, and crab (crab is harvested in the bay just north of the Soule River north delta).

<u>First Nation Concerns</u>
The Nisga'a Lisims Government raised concerns regarding the submarine cable and its potential impacts on marine fish and invertebrates.

The issue of the potential impacts from the submarine cable on marine life is addressed above in the Aquatic Impacts section. However, in summary, the EMF of two or more cables either laid side-by-side or wrapped in the same armoring will cancel the EMF out to about the distance of the armor and outer sheathing. Marine mammals and fish will avoid the cable laying activity, which will be moving slowly, but take very little time to traverse the cable route.

To answer their specific questions:

- Noise – With the cable laid on the ocean floor, rather than buried, there will be little-to-no noise from the cable laying activity other than the sound from the slow moving ship spooling out the cable and a smaller boat using a submersible, remote camera to see what the cable is laying on to avoid geographic features such as cliffs, large boulders, etc. These are temporary noises for the few days it will take to lay the cable to Stewart. Boat activity is common in Upper Portland Canal so that the noise from laying the cable will be within the normal range of existing noise.

- Entanglement – The cable will be approximately 23-28 cm (9-11 inches) in diameter with an internal armoring, making it relatively heavy. In addition, the cable will partially bury itself in the ocean floor sediments as it lies on the bottom from its own weight. Additional sediment deposits over time will continue to bury the cable. Entanglement by marine mammals or other aquatic species is unlikely to occur, even during deployment due to the cables size and singular nature, i.e. just one cable.

<u>International Boundary</u>
Mean tide elevation for the Stewart Harbor area is 5.3 m (17.39 ft) with a range of 8.2 m (26.9 ft) (Hay & Co. 1986). Most of the land on the northwest part of the Stewart Harbor is a brackish marsh of significant environmental importance.

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[9] Environmental Assessment Office. Stewart Bulk Terminal Wharf Expansion Project. Report and Recommendations: with Respect to the Issuance of a Project Approval Certificate. p. 8. Sept. 2002.

Over time the size of the marsh has expanded due to the Bear River dike and Arrow Dock and causeway, which have allowed new substrate to become established; the river has also progressively advanced southward into the Portland Canal as a result of the containment of the river to the east side of the valley [by the manmade causeway, log transfer facility, and Arrow Dock] and the extremely high annual bedload which advances the Bear River delta annually.

Information on plant life in the marshes of Upper Portland Canal comes from the Alaska Department of Transporation's *Hyder Causeway Reconstruction and Trestle Replacement – Environmental Assessment*, April 2011.

"During 2006, Heutte and Lamb (2006) conducted a survey of vegetation on the tidal-influenced meadow in the adjacent estuary (above the neap tide line) and the sedge community (below the neap tide line) traversed by the Hyder Causeway (Appendix E)."[10] Plants found during this survey include:

- A narrow strip of American dunegrass (*Leymus mollis*) at extreme high tide line
- Pacific water parsley (*Oenanthe sarmentosa*) at extreme high tide line
- Sweet gale (*Myrica gale*) in broader tidal area below the rye and water parsley
- Fine grasses (*Festuca rubra* and *Agrostis stolonifera*)
- Silverweed cinquefoil (*Argentina anserina*)
- Lyngby's sedge (*Carex lyngbyei*) accounted for 80% of the emergent alluvial deltaic fan; is considered a pioneer colonizer of tidal mudflats
- Perennial sowthistle (*Sonchus arveniss* L. ssp. *arvensis* Asteraceae) an invasive plant species that is listed as a Noxious Weed in Alaska.

These aquatic plants are also likely found in the Stewart Harbor marsh. Aquatic plants in the Portland Canal are likely limited to near shore areas due to the heavy glacial flour load present, which will filter out light and therefore not penetrate very deep to support photosynthesis.

Although eelgrass grows in estuaries, bays, lagoons, and other marine environments where water is clear and light is plentiful, no evidence of eelgrass was found at the Hyder Causeway Project and we assume that it is not present in the Stewart Harbor marsh as well. Eelgrass was also not found at the Soulé River delta, approximately 17.7 km (11 miles) south of Stewart. As far as eelgrass in Portland Canal, because eelgrass growth depends on the amount of light available and on the clarity of the water, due to significant glacial flour and sediment from the rivers and drainages around Upper Portland Canal eelgrass is not likely present at depth.

The aquatic habitat in the Project area consists of two main types: 1) intertidal – the area around the Arrow Dock and causeway that are influenced by tidal activity; and, 2)

[10] Alaska Department of Transporation's *Hyder Causeway Reconstruction and Trestle Replacement – Environmental Assessment*, p. 44. April 2011.

subtidal – areas in the Portland Canal (the same is true for the cable landing at Soule River). None of the intertidal foreshore of the existing Stewart Causeway is classified as highly productive (red-coded) or moderately productive (yellow-coded) fish and wildlife habitat (see Appendix E for map). Instead, the causeway is considered low productivity (green-coded) fish and wildlife habitat, due to existing man-made impacts, i.e. causeway and log sorting and booming activities, and because of the continuous encroachment of aggregate and sediment from the Bear River, which covers habitat that could potentially be more productive. Construction of the submarine cable, i.e. trenching the cable into the intertidal zone to the causeway, requires the trenching and infilling of approximately 83.6 m^3 (109 cu yd)[11] of intertidal habitat classified as low productive (green-coded) habitat and approximately 1,254 m^3 (44,289 ft^3 = 1,640 yd^3 = 1,254 m^3) subtidal habitat (excavation = existing aggregate and sediment substrate) (infilling = submarine cable and excavated material) through the deep water anchorage used by ships waiting to enter the SBT facility.

Williams (1995) conducted a shoreline habitat classification of the head of the Portland Canal from Marmot Basin on the east to Salmon River on the west. The classification is used by the District of Stewart to assist with shoreline industrial development planning. The Project area is within the Central Bear River Estuary and the Eastern Shoreline of Portland Canal habitat units. Both units are classified as Low Productivity Habitat.[12]

Site-specific information regarding the marine life in Portland Canal has not been located; however, it is assumed that the canal supports the typical array of marine species that are associated with deep sea and steep shore fjords in Southeast Alaska. As an example, just above Glacier Point, approximately 14.5 km (9 miles) south of Stewart on the U.S. side of the border is a seal haul-out.[13] Harbor porpoises have also been observed in the Portland Canal near the Soulé Project and the occasional report of a humpback whale.

<u>Essential Fish Habitat</u>

The proposed cable corridor passes through areas designated as Essential Fish Habitat (EFH) by the National Marine Fisheries Service (NMFS). EFH is defined under the Magnuson-Stevens Fishery Conservation and Management Plan, as amended by the Sustainable Fisheries Act of 1996, as “those waters and substrate necessary to fish for spawning, breeding, and feeding or growth to maturity.” The Sustainable Fisheries Act requires that EFH is identified for those species actively managed under federal fishery management plans. EFH can consist of both the water column and underling surface (substrate) of a particular area and it includes habitats that support the different life stages of each managed species.

[11] Formula: 3 ft deep x 3 ft wide x 328 ft long = 2,952 ft^3 = 109.33 yd^3 = 83.59 m^3

[12] “Bear River Gravel Project – Revised Project Description.” Cambria Gordon Ltd for Glacier Aggregates Inc. p. 9. 2006.

[13] Noted on USGS map Ketchikan (D-1) as “Seal Rks.” Source: The Soulé River Hydroelectric Project Preliminary Draft Environmental Assessment. Alaska Power & Telephone Co. February 2011.

The Soule River delta, the Hyder, Alaska mudflats, and the Stewart, B.C. marsh/mudflats to the west of the cable landing contain EFH for rearing.

Electromagnetic Fields (EMF)

Quote from National Marine Fisheries Service (NMFS) May 5, 2011, letter to AP&T: "*The Aquatic Resources report discusses the potential for the submarine transmission cable to create and* (sic) *electromagnetic field (EMF) and concludes that the cable burial would prevent significant EMF impacts on fisheries or other aquatic resources. Power transmission cables can transmit both an electric or E-field and a magnetic or B-field. Unlike magnetic fields which can penetrate most substances, electric fields cand* (sic) *be blocked by conducting materials, such as the insulation and sheathing that the proposed cable would incorporate. Thus the E-fields can be contained within a properly installed, grounded cable. Depending on the amount of current carried by the line, a B-field greater than the earth's magnetic field (e.g.,50 microtesla) may extend in all directions a short distance from the cable and into the marine environment. This B-field can, in turn, interact with ocean currents or the movements of living organisms to induce a secondary electric field (iE-field). Burial cannot block these fields, which can extend a short distance from the cable (up to 5 five* (sic) *meters) but does provide an additional buffer (CMACS 2003). NMFS recommends the applicant assess both the E-field and B-fields of the proposed submarine cable and the likely effects of these fields on migrating marine and anadromous fish and marine mammals using the best available science from the large body of recent research on the effects of EMF on marine ecosystems and biota. To date, most studies have focused on the effects of EMF exposure on elasmobranchs, electro-sensitive marine fish that rely, at least in part, on the earth's magnetic field for navigation and prey detection of iE-fields.*"[14]

One concern about submarine power cables, as expressed above, is the occurrence of electromagnetic fields and their potential impact on aquatic species. Magnetic fields are generated by flow of current and increase in strength as current increases. Since the voltage on a power line remains more or less constant with time, changes to the power or load will result in changes to the current, and hence the magnetic field.

An electromagnetic field (EMF) is a physical field produced by electrically charged objects. It affects the behavior of charged objects in the vicinity of the field. The EMF extends indefinitely throughout space and describes the electromagnetic interaction. It is one of the four fundamental forces of nature (the others are gravitation, the weak nuclear interaction, and the strong nuclear interaction).

The field can be viewed as the combination of an electric field and a magnetic field. The electric field is produced by stationary charges, and the magnetic field by moving charges (currents); these two are often described as the sources of the field. The way in which charges and currents interact with the electromagnetic field is described by Maxwell's equations and the Lorentz force law.[15]

[14] NMFS comment letter on Draft License Application and Preliminary Draft EA. P. 2. May 5, 2011.
[15] Electromagntic Field, Wikipedia. http://en.wikipedia.org/wiki/Electromagnetic_field

"*The occurrence of directly generated electric fields can be controlled by application of metal shields (steel plates, sheaths within the cable insulating the conductor etc.), those of magnetic fields (and consequently of indirectly generated electric fields) by neutralisation using appropriate conductor / cable placement patterns and/or configuration geometry. For example, when using two separate single-conductor cables, they should be buried in the seabed parallel to and at the shortest distance possible from each other, so that the (electro) magnetic fields would neutralise each other as far as possible. In a two-conductor cable this neutralisation reaches ideally 100 % when using a coaxial-design. In addition, here the two conductors lie within a common shield. With perfect shielding a cable does not directly generate an electric field outside the cable, however, as already mentioned an electric field is also induced by the presence of the magnetic field in the vicinity of the cable (Kramer 2000, CMACS 2003).*

"*For three-phase AC transmission the same options as for DC transmission exist: either a three-conductor cable solution or three single conductor cables can be considered (Deutsche WindGuard GmbH 2005). In a three-conductor cable each conductor is insulated separately, with the metal shield and outer insulation covering all three conductors in one. The electromagnetic field of the three conductors is almost neutralized at the surface of the cable, since the sum of the voltages and currents of the three phases is zero at any one time. Using three single conductor cables again they have to be installed as close as possible and parallel to each other to achieve sufficient field compensation*." [16]

"*Magnetic fields generated by power lines decrease with distance and this happens more quickly when the individual wires are closely spaced, either in a bundled overhead cable or when buried. Where the wires are close together, the magnetic fields from electric currents flowing in opposite directions cancel more completely. Overhead and underground power lines will often produce similar levels of magnetic fields on nearby streets and paths. In some cases the fields from underground cables may be greater. Underground power lines will usually produce lower fields at the distance of nearby houses*."[17]

The above excepts from published articles indicates that two or more power cables either laid close to each other or wrapped within the same armoring will cancel out the EMF from each other. The Project will have three conductors wrapped together into one cable.

3.3.2 Environmental Impact

The Project footprint in the Portland Canal and the Stewart Harbor should only have a temporary and short-term impact to aquatic plants, fish, shellfish, and marine mammals because:

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[16] OSPAR Commission, 2008. Background Document on potential problems associated with power cables other than those for oil and gas activities. p. 25-26.

[17] ARPANA (Australian Radiation Protection and Nuclear Safety Agency) – Magnetic & Electric Fields from Power Lines. August 13, 2009. http://www.arpansa.gov.au/radiationprotection/factsheets/is_emf.cfm

- Aquatic plants are not likely to exist in the part of the Stewart harbor the Project will traverse through because of aggregate and sediment deposition from the Bear River that is constantly filling the harbor; at the end of a man-made structure, Arrow Dock and causeway.
- At the Soule River north delta, non-sensitive (listed) aquatic plants will be impacted by placement of the marine access facilities on the delta and trenching of the submarine cable through the intertidal zone. However, the same aquatic plants exist outside the project boundary and will also revegetate the disturbed area.
- The bottom of the Portland Canal receives significant sediment load from the Bear, Salmon, Marmot, Soule, and Davis rivers as well as other glacially fed drainages in Upper Portland Canal. Also, due to the canals depth and the cloudiness of the water from glacial flour, aquatic plant life is likely very limited and located on the fringes of the canal seabed where light may still filter through.
- With the submarine cable laid on the canal seabed, its weight (approximately 37-lbs/ft or 56 kg/m) will eventually help submerge it into the seabed sediment; the cable would be approximately 33 cm (13 inches) in diameter with an internal armoring, making it relatively heavy.
- Over time the deposition of sediment from the Upper Portland Canal glacially fed drainages will also help to bury the cable.
- Laying the cable on top of the seabed would provide the least disturbance to the seabed and to marine life in the canal (although any disturbance from laying the cable, i.e. burying or on top of seabed, will be short term and temporary, as once the cable is in place there is no noise because the activity has ceased). Any benthic organisms, fish, or marine mammals will only temporarily be displaced.
- Will not affect wetland function of the Hyder or Stewart marshes because of the temporary nature of this activity; once the cable is in place there will be no potential to impact the marshes.
- Crabbing may be temporarily or periodically interrupted during construction because of boat activity, but the crabbing may take place far enough out in the bay to not be impacted; Glacier Bay is fairly large at a mile wide. Cable laying activity will only occur once, so any disturbance will be brief and limited. Fishing by boat off the delta should not be impacted at any time.

Passing through EFH at the Soule River delta is unavoidable as juvenile Chum salmon (O. keta) from Fish Creek on the Salmon River located nine miles north of the project at Hyder, each spring use the Soulé River delta to forage as they head out to the ocean. The submarine cable will avoid the Hyder mudflats by being out in the middle of the canal at depth; although final location is still be evaluated. The high value EFH in the Port of Stewart does not include the cable landing on the causeway, nor does the cable have to pass through it.

The project will not affect large-scale tidal flow in Stewart Harbor, nor impede fish passage because the cable will be buried under the harbor floor. Flood tide flows will be unchanged in the vicinity of the project because the project will not obstruct water movement.

Considered in the Soulé River Hydro Project Draft License Application and Preliminary Draft Environmental Assessment dated February 1, 2011, and mailed to the DFO, was to bury the cable, but further analysis indicates laying the cable on the seabed of the canal would be sufficient due to the cables weight, which will help to self-bury it along with the continued natural sediment deposition that will cover the cable over time; except in the deep water anchorage for the SBT facility.

Organisms that were either undamaged by the trenching or next to the impact area would resettle in or on the sediment. The area would be re-colonized by benthic organisms (Newell, et al. 1998), first by organisms with rapid reproduction and growth rates and later by longer-lived, slower growing and reproducing organisms. Marine benthic organisms are distributed by their pelagic larvae that enter their adult stage after settling on suitable substrate. This is expected within one reproductive season, which would occur within one month to one year (Newell, et al. 1998)[18] post construction. This will depend on the existing composition of the seabed, which will vary between mud, sediment, gravel, and bedrock; however, canal seabed recovery is expected to be rapid with currents redistributing sediments over disturbed areas. Return rates of groundfish that may have been displaced could be immediate. Overall, long-term impacts to benthic habitat from trenching and propeller wash would be ***low***.

Because the impact zone in Portland Canal would be spread out over a 16 km (10 miles) strip that is barely wider than the 33 cm (13 inches) cable rather than a single block of land, the potential for organisms to be within this corridor would be relatively low and the probability of impacting entire colonies of benthic organisms would be very low. This is a small area relative to the total expected benthic habitat within the canal and harbor. Overall, impacts to benthic species due to direct or incidental contact with the cable, cable-laying ship, or trenching equipment for the harbor would be ***low*** due to the small area of impact and low quality of the habitat. Trenching to bury the transmission cable in or near the deepwater anchorage in the Port of Stewart would potentially have a more significant impact on benthic organisms by displacing them by a 2-3 foot-wide (0.6-0.9 m) trench for about 5,000 feet (1524 m) that would backfill from the liquefied sediment behind the laid cable.

Within a few hours of the cable being laid on the seabed and of the trenching activity at the deep water port anchorage at Stewart, mobile benthic scavenger species such as crab and shrimp would typically migrate to the impact area to feed on benthic organisms that have been killed or injured.

Bottom fish, such as halibut, and other fish species such as salmon could be temporarily displaced by the cable laying and deep water anchorage trenching activity; however, fish

[18] The Newell, et al. 1998 document is in the enclosures.

would most likely just avoid the activity until it passes before moving back through that area. In addition, due to the short duration of the cable laying activity, fish species movement should only be interrupted or displaced over a few hours at most for any specific location. Fish will be able to move freely around project activity because of the width of the canal and Stewart Harbor, providing plenty of passage capacity. The construction activities would not affect any known fish spawning areas. This is a very short term impact; there should be no long term impacts.

Marine mammals such as whales, seals, and harbor porpoises could be in the area during the cable laying activity. Noise from the cable laying activity would consist of the ship propulsion and a small boat with its propulsion. A small submersible with remote control camera may also be used to view the seabed to make sure the cable is not bridged from a cliff or over an obstacle that would place additional stress on the cable. The submersible would add an additional noise source to this activity. The sound of ships and other various sized watercraft are common to these marine waters because of the existing boat traffic, including ships, to and from both Hyder and Stewart (both have marinas). This onetime event to lay the cable is unlikely to add additional stress to marine mammals or be inconsistent with the existing background noise. There is no reason to assume that the marine mammals will not avoid boat activity related to laying the cable as they normally avoid boat activity in this area. In addition, the submarine cable will be approximately 33 cm (13 inches) thick. This will be a single cable, not multiple. There will be no possibility of marine mammals getting entangled in the submarine cable.

Open water fish and marine mammals would most likely hear or feel the vibrations of the ship and equipment and would leave or avoid the area. There is a slight potential for fish or a marine mammal to be incidentally hit by the ship, or to collide with the cable, or to be struck by trenching equipment (at the harbor) or the cable. However, considering how slow the ship will be moving and the mobility of fish and marine mammals in general, collisions are considered to be unlikely, so that the probability is low.

Overall, because the ship and trenching equipment would be moving slowly, because most fish and mammals would leave the general area of noise and vibration, it is unlikely that fish or marine mammals would incidentally be struck by the cable lay-operations. Impacts would be ***low***.

The Project footprint in the Portland Canal and the Stewart Harbor should only have a temporary and minimal impact to fish and marine mammals from sediment stirred up by the burying of the cable at the deep anchorage used by ships waiting to enter the SBT facility near the entrance to the harbor; assuming the cable is brought through this area or even buried. Due to the proximity of the Bear River, i.e. in its direct path, any suspended sediment raised by the burial of the cable will be dispersed into the Portland Canal. Tidal flood or ebb would also have some impact on the direction of suspended sediment. There is very little that can be done to eliminate the suspended sediment from occurring in this environment; no way to reduce suspended sediment; other than to not bury the cable.

Due to the heavy aggregate load the Bear River has, the area the cable will be buried in may have a combination of both, which may reduce the amount of suspended sediment.

A survey of this route will need to be completed to determine its true composition before burying the cable. Due to the glacial flour found in Upper Portland Canal drainages, the small amount of suspended sediment from burying the cable is not likely to be either visible at the surface nor harm fish and marine mammals or any other aquatic species during its short term presence. Benthic organisms in the harbor could be impacted in this narrow swath of about 1.0 m wide for approximately <1600 m (<5,249 ft) in length. But this would only be a small part of the existing habitat.

Impacts to the existing marshes around the harbor are also expected to be minimal because the amount of sediment stirred up is not expected to be significant and the river and tidal currents will widely disperse the sediment. Existing marine conditions also have glacial flour and sediment present from the various drainages around Upper Portland Canal.

The area the submarine cable would be located in, as previously surveyed for the proposed Stewart bulk terminal facility expansion and the Bear River Gravel Project, is considered to be "Low Productivity Habitat." It is important for the cable to be buried to avoid anchors to protect the Project infrastructure. A timing window for this aquatic work may be needed to avoid interfering with critical fish life stages in the harbor area.

The length of time cable laying activity would take place would be very short; coming from the Project site at the Soulé River, the cable should be laid within 3 days. Timing for this activity would be during the summer months, i.e. June – September, in order to take advantage of good weather for smooth seas. Upper Portland Canal is included in the Department of Fisheries and Ocean's (DFO) Area 3 – Lower Nass. In regards to a "window" for in-water work, the DFO website identifies the summer as a period that has no specific window. Because installation of the cable would be best between June and September due to good weather, we will request that the DFO evaluate when sensitive life stages for different fish species occur to help us find the best "window" for our activity. This will help us assess the potential impacts. The shoreline at the cable landing is considered "Low Productivity Habitat" according to two previous environmental reviews conducted in the Stewart Harbor and Bear River mouth. Because of the constant bedload of the Bear River expanding out into the Portland Canal and into Stewart Harbor, we agree with that analysis and therefore impacts should be minimal from the installation of the cable. A window for avoiding any critical fish life stages will contribute to minimizing potential impacts.

The submarine cable is unlikely to impact riparian or important intertidal habitat due to the low quality of the habitat present or their lack of presence. Overall, impacts from laying (motion and noise) and burying the cable, which may cause some suspended sediment, should be minimal to fish and marine mammals because:

1. They should avoid the temporary activity of laying the cable; natural or learned behavior to avoid movement and objects in the water
2. The amount of temporary suspended sediment from trenching the cable into the intertidal zone to the causeway, requires the trenching and infilling of

approximately 83.6 m³ (109 cu yd)[19] of intertidal habitat classified as low productive (green-coded) habitat that is primarily aggregate and sediment. Additional trenching and backfilling approximately 1,254 m³ (44,289 ft³ = 1,640 yd³ = 1,254 m³) of subtidal habitat (excavation = existing aggregate and sediment substrate) (infilling = submarine cable and excavated material) through the deep water anchorage (1986 survey showed 37 fathoms) used by ships waiting to enter the SBT facility would also occur. Although this is nearly 1.6 km (1 mile) in length, with the amount of aggregate and sediment that is deposited by the Bear River annually, this likely makes the area poor habitat as well. Therefore, no significant impacts are expected.

3. This temporary suspended sediment should be flushed out of the area (due to Bear River flow) into the Portland Canal where it will dispersed into the rest of the sediment and glacial flour laden waters of the canal (this is due to the many glacially fed tributaries that enter the area). In addition, the ebb and flood tides twice a day will flush suspended sediment as well.
4. The seal haulout approximately 14.5 km (9 miles) south of Stewart on the Portland Canal is the only known sensitive habitat for marine mammals in the area; which should not be significantly impacted due to temporary suspended sediment from burying the cable in Stewart Harbor or laying the cable in the middle of the canal; marine mammals will avoid this temporary activity as well as the sediment will disperse in the canal and eventually settle out onto the canal floor with depths up to 150 fathoms (274 m or 900 ft).
5. The habitat the cable would be buried in, in Stewart Harbor, is considered "Low Productivity Habitat."[20]

For these reasons, we do not believe aquatic plants, biotic organisms, fish, or marine mammals will be significantly impacted by the activity of laying this cable. Impacts would be short term and mainly consist of temporary avoidance.

<u>EFH</u>

EFH has been designated for several species along the proposed cable route. Potential impacts on EFH would differ between species, as the cable installation is more likely to affect demersal (bottom-oriented) species and life stages than pelagic species. Short-term water quality impacts to EFH due to cable installation would most likely be limited to changes in turbidity levels and suspended solids within the immediate vicinity of the proposed cable route. Impacts would be short term due to currents and the ebb and flow of tides twice a day.

<u>EMF and Marine Organisms</u>

"*The electricity produced by offshore wind turbines is transmitted by cables over long distances. The electric current generated produces magnetic fields. Studies of possible effects of artificial static magnetic fields have been carried out on various species under*

[19] Formula: 3 ft deep x 3 ft wide x 328 ft long = 2,952 ft³ = 109.33 yd³ = 83.59 m³

[20] "Bear River Gravel Project – Revised Project Description." Cambria Gordon Ltd for Glacier Aggregates Inc. 2006.

various experimental conditions. Artificial electromagnetic fields could interact with marine organisms to produce detectable changes. Usually, however, only very slight differences in control groups have been recorded."

"*The magnetic field may affect mollusks, crustaceans, fish and marine mammals that use the earth's magnetic field for orientation during navigation. But it is still unknown whether the magnetic fields associated with wind turbines influence marine organisms (Gill, 2005).*

"*Elasmobranches, one of the more electro-sensitive species, are attracted by electrical fields in the range of 0.005-1 μV cm1 and avoid fields over 10 μV cm1.*"

"*Electro-sensitive species could be attracted or repelled by the electrical fields generated by submarine cables. Special attention must be paid in areas of breeding, feeding or nursing because of the congregation or dispersion of sensitive individuals in the benthic community (Gill, 2005).*

"*Experimental analysis on several benthic organisms exposed to static magnetic fields of 3.7 mT for several weeks have shown no differences in survival between experimental and control populations. Similarly, mussels living under these static magnetic field conditions for three months during the reproductive period do not present significant differences with the control group. The conclusions are that static magnetic fields of power cable transmissions don't seem to influence the orientation, movement or physiology of the tested benthic organisms (Koeller et al, 2006).*

"*The results from the study carried out on Nysted about the influence of electromagnetic fields on fish are not conclusive. Some impact on fish behaviour has been recorded, but it was not possible to establish any correlation. There is not enough knowledge about this topic and additional research is needed (DEA, 2006).*

"*The magnetic fields of both types of cable (bipolar and concentric) used in marine wind farms, are small or zero. The Greenpeace study mentioned earlier concludes that the electromagnetic fields of submarine cables have no significant impacts on the marine environment (Greenpeace, 2005). Studies with a long-term perspective are necessary to confirm the negligible impact of electromagnetic fields of wind energy on marine ecosystems (Koeller et al, 2006).*"[21]

"*According to Compagno (1984), the distribution of the great white shark extends to the western end of the Kenai Peninsula. Several sightings have been reported in Southeast Alaska over the past 50 years, but this species apparently only ventures into Alaska waters during years of abnormally high sea surface temperatures.*"[22]

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[21] Wind Energy, The Facts. Electromagnetic Fields and Marine Organisms. European Wind Energy Association. http://wind-energy-the-facts.org/en/environment/chapter-2-environmental-impacts/electromagnetic-fields-and-marine-organisms.html
[22] *Field Guide to Sharks, Skates, and Ratfish of Alaska, p. 37. 2007.* ISBN: 978-1-56612-113-2

In conclusion, *Elasmobranches* (i.e. sharks, stingrays, etc) may not occur in any abundance in the Portland Canal and the canal is very deep (varies from 150 fathoms, or 274 m, or 900 ft at the Soule River end to approximately 30 fathoms, or 58 m, or 190 ft at the deep anchorage in Stewart Harbor) and wide (varies from 3.22 km, or 2 miles at the Soule River end to approximately 1.61 km, or 1 mile at the deep anchorage in Stewart Harbor), allowing for significant capacity for elasmobranches to pass by unharmed. Therefore, the Projects submarine cable would have little impact, other than to cause avoidance from motion and sound, upon these species while the cable is being laid. The EMF of the submarine cable, according to the published literature, will cancel itself out if there are two or more cables close together. Over time the cable, because of its weight, will bury itself in the seabed sediment and the areas rivers will continue to contribute more sediment to the canal. Based on this information, we believe little or no effect to marine mammals and fish will occur from the projects submarine cable.

3.4 Threatened and Endangered Aquatic Species

3.4.1 Environmental Setting

The Project will traverse near the center and in the deepest part of the single waterway of Portland Canal. The Threatened, Endangered, Species of Concern TES species that could be present in Portland Canal according to U.S. agencies include:

Otter, Northern Sea southwest Alaska DPS (*Enhydra lutris kenyoni*) (T)
Sea-lion, Steller eastern pop. (*Eumetopias jubatus*) (T)
Whale, humpback (*Megaptera novaeangliae*) (E)

3.4.2 Environmental Impact

As previously explained, marine mammals such as whales, seals, and otters could be in the area during the cable laying activity. Noise from the cable laying activity would consist of the ship propulsion and a small boat with its propulsion. A small submersible with a remote control camera may also be used to view the seabed to make sure the cable is not bridged from a cliff or over an obstacle that would place additional stress on the cable. The submersible would add an additional noise source to this activity. The sound of ships and other various sized watercraft are common to these marine waters because of the existing boat traffic, including ships, to and from Hyder and Stewart. This onetime event to lay the cable is unlikely to add additional stress to marine mammals or be inconsistent with the existing background noise. There is no reason to assume that the marine mammals will not avoid boat activity related to laying the cable as they normally avoid boat activity in this area. In addition, the submarine cable will be approximately 33 cm (13 inches) thick. This will be a single cable, not multiple. There will be no possibility of marine mammals getting entangled in this single submarine cable.

Marine mammals would most likely hear or feel the vibrations of the ship and equipment and would leave or avoid the area. There is a slight potential for a marine mammal to be incidentally hit by the ship, or to collide with the cable, or to be struck by trenching equipment (at the harbor) or the cable. However, considering how slow the ship will be moving and the mobility of marine mammals in general, collisions are considered to be unlikely, so that the probability is low.

Overall, because the ship and trenching equipment would be moving slowly, because most marine mammals would leave the general area of noise and vibration, it is unlikely that they would incidentally be struck by the cable lay-operations. The potential for impacts to TES marine mammals should be considered ***low***.

3.5 Terrestrial Threatened and Endangered Species

3.5.1 Environmental Setting

Over the field study period from 2007-2009 in which biologist conducted studies for this project, no Threatened, Endangered, or Species of Concern or Forest Service Sensitive species were observed other than fly-bys of two separate osprey, and bald eagles observed along the shoreline on Portland Canal. Below are to TES species listed by U.S. agencies.

Queen Charlotte Goshawk (*Accipiter gentilis laingi*) (E – listed by USFS)
Kittlitz's murrelet *(Brachyramphus brevirostris*) (S- listed by USFS)

<u>Avian</u>
TES avian species listed are also unlikely to occur at the project site because none were observed during the three years biologist spent on site. A thorough goshawk audio and visual survey was conducted, but no responses were heard and none were ever observed during the whole field study period from 2007-2009. However, northern Goshawks have been sighted in the Hyder area along the Salmon River and could occur at the Soulé River watershed as transitory.

<u>Mammal</u>
TES mammal species were not present during the whole field study period from 2007-2009.

<u>Botanically Sensitive</u>
Nineteen vascular plants are designated as sensitive in the Alaska Region. The following sensitive plants shown in Table 21 are known or suspected to occur in the Ketchikan Ranger District of the Tongass National Forest and were evaluated in the Preliminary Draft Environmental Assessment prepared by the Applicant for the FERC licensing process; which can be found in Appendix J.

Table 1 – Sensitive Plant Species

Scientific Name	***Common Name***
Botrychium tumux	Moosewort fern
Botrychium yaaxudakiet	Moonwort fern

Botrychium spathulatum	Spatulate moonwort
Cirsium edule var. macounii *	Edible thistle
*Cypripedium montanum**	Mountain lady’s slipper
Cypripedium parviflorum var. pubescens	Large yellow lady’s slipper
Ligusticum calderi	Calder loveage
*Papaver alboroseum**	Pale poppy
*Piperia unalascensis**	Alaska rein orchid
*Platanthera orbiculata**	Lesser round-leaved orchid
Polystichum kruckebergii	Kruckebuerg’s swordfern
*Romanzoffia unalaschcensis**	Unalaska mist-maid
*Sidalcea hendersonii**	Henderson’s checkermallow
Tanacetum bipinnatum subsp. *huronense*	Dune tansy

Field Survey for Sensitive Plants
Surveys were conducted by botanists who were in the field in the project area for eight days, eight plus hours a day, from August 14 through August 21, 2009.

The following seven species are those listed in Table 1 that has potential habitat within the project area:

Cirsium edule var. *macounii*	Edible thistle
Cypripedium montanum	Mountain lady's slipper
Papaver alboroseum	Pale poppy
Piperia unalascensis	Lesser round-leaved orchid
Platanthera orbiculata	Alaska rein orchid
Romanzoffia unalaschcensis	Unalaska mist-maid
Sidalcea hendersonii	Henderson's checkermallow

3.5.2 Environmental Impact

Avian
Any TES avian species in the Soule River watershed appear to just be transitory and should therefore have only short term impacts (avoidance) from the noise of construction. No TES species were found nesting in this watershed; at least not in the projects vicinity.

Avian species in Stewart should not be impacted because any overhead transmission cables installed by the Project, either on the causeway or along the “Industrial Route” around the Stewart Airport, will follow the same route s the existing overhead distribution line infrastructure, although this infrastructure will be upgraded for the Projects but will continue to be single wood pole structures. In addition, the overhead transmission cable will be configured for avian protection by keeping conductors spaced per regulations. This will keep man-made structures within the same corridor with similar configurations that as presently exists, reducing the potential to impact avian species who are already familiar with the location of these potential obstructions (imprinted), reducing the chances of strikes or electrocutions.

Mammal

Field surveys did not find any evidence of use of the Project area by TES species after extensive field studies from 2007-2009. The field studies also showed a low number of different mammal species present. If any TES species visit the site during construction, they are likely transient and will avoid the area when noise and activity occur. During operations it is unlikely that transient TES species would be impacted by this project.

At Stewart, TES mammal species are unlikely to be impacted by this project because of the existing manmade corridors and infrastructure that is already in place that the Project will use. Temporary impacts (avoidance) could occur from installation activity only.

Botanical

None of the seven species that has potential habitat within the Project area were found in the project area though the edible thistle (*Cirsium edule* var. *macounii*) has been collected in Hyder, Alaska, nine miles northeast of the project area, up Portland Canal. It has also been collected on talus slopes in Misty Fjords National Park, over the ice fields to the west of the Soule River drainage.

Potential Sensitive Species and Their Habitats and Project Impacts and Direct and Indirect Effects of Those Impacts

No sensitive species were found during sensitive and rare plant surveys conducted during the summer of 2009 at the Soule River. This project is not expected to significantly impact any sensitive botanical species because none were found and because other similar habitat either exists in the watershed outside of the project boundary or elsewhere in the region. A more in-depth analysis can be found in the Preliminary Draft Environmental Assessment prepared by the Applicant for the FERC licensing process; which can be found in Appendix J.

International Boundary and the Port of Stewart

The submarine cable Project Impacts in Portland Canal and the Port of Stewart: The Project footprint is void of terrestrial vegetation and most likely sessile aquatic vegetation because of the sediment and aggregate that comes down the Bear River. The sediment and aggregate has degraded aquatic habitat at the river mouth while creating habitat from the settling out of sediment in the harbor, i.e. mudflats and marsh to the west of the proposed cable landing. The proposed land based infrastructure will be located on the existing industrial area known as Arrow Dock and the log transfer facility located on a rock-fill causeway, which are mostly void of vegetation. The Projects infrastructure would only be in open areas on the causeway. Additional infrastructure will be within the dike road right-of-way (Industrial Route) around the airport to the BC Hydro Stewart substation, following the existing wood pole distribution line infrastructure but replacing it with upgraded single wood pole structures. There should be only minimal vegetation disturbance along the right-of-way if maintenance of the power line corridor is needed. Brushing is normally needed on a regular basis along power line corridors. Being within a road right-of-way may minimize or reduce this typical maintenance activity.

No riparian habitat is present at the cable landing location, so no revegetation should be necessary. However, measures to control erosion from excavation of the causeway will be implemented, i.e. silt fencing around any spoils pile. Due to the disposition from the Bear River, it is unlikely that aquatic plants exist at the south end of the causeway because they would be quickly buried. In addition, the Bear River mouth is occasionally dredged because of the amount of sediment and bedload that comes through it, potentially reducing access to the Port of Stewarts marine and SBT facility. Impacts to aquatic plants should be minimal to nonexistent and terrestrial plants would only have minor impacts from brush in the existing right-of-way. Overland transmission cables for the Project are limited to Stewart using existing, manmade clearings and rights-of-way. No impacts to sensitive plant species are expected.

Conclusion

Terrestrial impacts from the Project to TES species are expected to be temporary only and be in the form of avoidance from the activity of construction, but not operations and not the removal of habitat.

3.6 Historic and Cultural Resources

3.6.1 Environmental Setting

The affected environment in the Soulé River Watershed is from the marine shoreline to No-Name Lake and from the Soule marine shoreline to the BC Hydro Stewart substation. In 2009, a heritage resources field study occurred to assess the potential impacts this project might have for the Soule River watershed.[23]

The following are excerpts from an archaeological report from the Heritage Resources Survey conducted in 2009:

In 2009, personnel reviewed heritage resource report and site files of the Alaska Heritage Resources Survey (AHRS), housed at the Office of History and Archaeology (OHA), Alaska Division of Parks, Department of Natural Resources, Anchorage, as well as files housed at the Ketchikan-Misty Fiords Ranger District. A total of four heritage resource inventories (Belvin 2008, Grover 2009, Stanford 2008, Stanford and Autrey 2004) have been undertaken in or near parts of the proposed Project Area. The file reviews also resulted in locating information about seven previously recorded sites within one mile of the Project and related features. These sites include two prehistoric or early historic petroglyphs – human or animal figures carved into exposed bedrock or boulders. Both of these sites are considered significant by the Ranger District archaeologist (Stanford

[23] Survey was conducted by T. Weber Greiser, Associate Archaeologist, Historical Research Associates, Inc. Missoula, MT.

2008), but National Register of Historic Places (National Register) determinations of eligibility have not been completed. The remaining five are historic sites and include the Portland City (as the town before Hyder was called) District, the Hyder Dairy Barn, the Hyder Dock Trestle, the Salmon River Trading Company, and the East Site. The first four of these sites have been determined eligible for listing in the National Register by the Alaska State Historic Preservation Officer (SHPO).

In addition, personnel reviewed copies of documents related to Native use of Southeast Alaska in general and the Project Area in particular. Two published resources that were reviewed are Native Cemetery and Historic Sites of Southeast Alaska (Sealaska 1975) and Haa Aaní, Our Land: Tlingit and Haida Land Rights and Use (Goldschmidt and Haas 1998), and Tongass National Forest Cultural Resource Overview (Arndt et al. 1987), but no sites are reported in or near the APE.

The research indicates that the Tsetsaut (or Wetalth) are an Athabaskan-speaking group who inhabited coastal and riverine areas and were primarily concentrated along Portland Canal, southern Behm Canal, the Unuk River, and the mainland between these waterways. They intermarried with the neighboring Sanykwan band of Tlingit. However, feuding between the Tsetsaut and Tlingit reportedly started as early as the 1700's, with the encroachment of Tlingit groups into Behm and Portland canals following the Kaigani Haida invasion of southern Prince of Wales Island. Acrimony gradually escalated and by 1835 most of the Tsetsaut were either killed or enslaved by the Tlingit. The remaining Tsetsaut aggregated in Portland Canal between Hyder and Tombstone Bay, and established new trade relations with the Niska Tsimshian of the Nass River area.

Following the discovery of copper and other minerals in the Salmon and Bear River valleys above Hyder, in the late 1800's, the remaining 12 Tsetsaut men, along with their women and children, were forced to join the Niska at Kincolith Mission on the Nass River. Soulé River (Tsukanatle) is mentioned as important to the Tsetsaut as a location for salmon fishing, hunting mountain goat, and the harvesting of berries and fireweed. According to Dangeli, a descendent of the Tsetsaut, a sweat lodge fed by a hot spring was located along the Soulé River and was used by both the Tsetsaut and later by the Niska Tsimshian (Dangeli 1985).

<u>First Nations Setting & Consultation</u>

Nisga'a Nation

> The Project is located within the geographical area identified in the Nisga'a Treaty as the *Nass Wildlife Area*, and the Bear River is identified in the list of *Streams in Nisga'a Angling Guide License*. A fee-simple property, approximately 20 ha (49.42 acres) in size and previously identified as IR 19, was converted to Category A fee-simple land under the Nisga'a Final Agreement and is owned by the Nisga'a Nation. This property is presently identified as Sgamagunt, or DL 7222 Coast District, and is located approximately 500 m (1,640 ft) upstream of

the Project area, on the mountain slope on the east side of the Bear River. The property is not inhabited nor has any structures.

The Bear Glacier located approximately 30 km (18.64 miles) upstream of the Project is a provincial park, managed by the provincial government in consultation with the Nisga'a Lisims Government. The park is a place of Nisga'a cultural significance.

During the study phase [2007-2009] for the Soulé Project, the Federal Energy Regulatory Commission (FERC) sent consultation letters about the project to the Ketchikan Indian Community, the Organized Village of Saxman, the Metlakatla Indian Community, the Wrangell Cooperative Association, and the Nisga'a Lisims Government in British Columbia, in Government-to-Government consultation. In addition, John Autrey, Tongass National Forest Tribal Government Relations Specialist, supplied several names of local tribal members, to the Project archaeologist, who might have knowledge of use of the area; calls were made and messages left. In both cases, no responses were received.[24]

When a Draft License Application [DLA] and Preliminary Draft Environmental Assessment [PDEA] were sent to interested parties on February 1, 2011, for the Soulé River Hydroelectric Project, the following tribes were sent copies of these documents and comments were requested to be submitted by May 2, 2011.

Norman Arriola, Tribal President
Ketchikan Indian Community
2960 Tongass Ave.
Ketchikan, AK 99901

Lee Wallace, Tribal President
Organized Village of Saxman
Route 2, Box 2
Ketchikan, Alaska 99901

Wilma Stokes, Tribal President
Wrangell Cooperative Association
P.O. Box 1198
Wrangell, AK 99929

Karl Cook, Mayor
Metlakatla Indian Community
P.O. Box 8
Metlakatla, AK 99926

Nelson Leeson, President
Nisga'a Lisims Government
PO Box 231
2000 Lisims Drive
New Aiyansh, BC VOJ 1A0

[24] Greiser, T. Weber. Associate Archaeologist, Historical Research Associates, Inc. Missoula, MT. 2009.

The Nisga'a Lisims Government was the only Native organization to respond, which they did in a letter dated May 6, 2011. A complete copy of their letter is enclosed in Appendix J. Two concerns raised by the Nisga'a Lisims Government were concerns about impacts to fish and mammals by the submarine cable, previously mentioned and addressed above in Aquatic Resources.

Tsimshian Nation

Metlakatla and Lax Kw'alaams' are members of the Tsimshian Nation. Their Statement-of-Intent boundaries lie approximately 100 km (62.14 miles) south of the Project area near the mouth of Portland Canal. There are no identified Tsimshian Indian Reserves in or around the Project area.

No comments have been received by the Project from these Native organizations. To the Projects knowledge, no comments were received from these Native organizations by FERC either.

3.6.2 Environmental Impacts

The cultural resource study was conducted following the predictive model developed by archaeologists on the Tongass National Forest and incorporated into the Second Amended Programmatic Agreement with the Advisory Council on Historic Preservation and the Alaska SHPO (Programmatic Agreement 2002). The field crew inventoried a total of approximately 620 acres that included about 350 acres along the shore and in the adjacent lower elevation areas; about 90 acres along the main river; about 50 acres in open areas along the North Fork, including the proposed dam area; about 20 acres at the inlet of No Name Lake; and about 110 acres in the high elevation alpine areas, where the higher area was about half covered with snow and ice. Cultural resource studies were not conducted in Stewart, B.C. because at the time of the survey it was believed Hyder, Alaska would be cable landing location.

Even though there was no cultural resource survey in Stewart, the location of the project features is located on manmade fill. Arrow Dock and the causeway are rock filled and the "Industrial Route" around the east side of Stewart is also on fill (dike with road and an overhead distribution line). The projects cable transmission infrastructure avoids the historic Stewart downtown. First Nation cultural resources are also unlikely to be present in a way they could be impacted as they would be already covered by fill previously placed by modern man.

While no heritage resources were identified in the Project area of potential effect (APE) during the inventory, there is always a possibility for unanticipated resources found through ground disturbance. If any prehistoric, historic, or cultural object or site is encountered during work on the project, operations within 100 feet of the area should be suspended and a professional heritage resource person or representative of the Tongass National Forest and/or the Alaska SHPO should be notified. If any burials are encountered during work on the project, operations within 100 feet of the area should be suspended and representatives of the Tongass National Forest and the Alaska SHPO notified. In either circumstance, the notified persons will determine how to proceed. If any are found in Canada, the Port of Stewart and the Crown would be notified with the above procedures followed.

3.7 Public Health and Safety (Electromagnetic Fields)

3.7.1 Environmental Setting

The Project will connect a renewable source of power generation in the U.S. with Canada. The Applicant proposes to connect to BC Hydro, the owner and operator of the Province of British Columbia's transmission system. A single 3-phase 138kV HVAC cable will be installed in Portland Canal from a substation at the Soule River Hydroelectric Project to the BC Hydro Stewart substation.

3.7.2 Environmental Impact

An EMF analysis is included above in the Aquatic Resources section. The substance of the analysis results was: "*…the Projects submarine cable would have little impact, other than to cause avoidance from motion and sound, upon this species while the cable is being laid. The EMF of the submarine cable, according to the published literature, will cancel itself out if there are two or more cables close together. Based on this information, we believe little or no effect to marine mammals and fish will occur from the projects submarine cable*."

In addition, the cable at 37 lbs/ft will settle into the seabed sediment and the areas rivers will continue to supply sediment to the canal to further covering the submarine cable; which will contribute to blocking EMF.

3.8 Transportation

3.8.1 Environmental Setting

The proposed submarine transmission cable will be installed along an existing waterway (Portland Canal) to avoid or minimize the landscape impacts typically associated with conventional, overhead transmission lines. Shipping utilizes Portland Canal to haul ore from Canada to other ports of destination. Both Hyder, Alaska, and Stewart, B.C. have marinas for recreational and economic use; fishing, hunting, crabbing, shrimping, sight-seeing, etc. The submarine cable may pass through the SBT facilities deep water anchorage (this is a preliminary route with the final yet to be determined). The Projects overhead transmission cable will use the existing travel routes at Stewart to get to the BC Hydro Stewart substation.

3.8.2 Environmental Impact

Portland Canal is 2-miles-wide at the Soule River mouth, and since the cable will be laid on the U.S. side of the International Boundary (middle of canal), other marine traffic will have ample space to pass the slow moving cable laying ship. Similarly, small water-craft traffic should have not problems avoiding the cable laying activity. Although we are unaware if any long-line fishing occurring in the north end of Portland Canal, there would only be a temporary disruption to the activity in the area of cable laying.

To avoid anchors and the potential disruption of the SBT facility deep water anchorage, the submarine cable would be buried through the deep water anchorage and up to Arrow Dock. Alternatives are presently being evaluated to hopefully avoid the deepwater anchorage altogether. In Stewart, existing overhead infrastructure routes with upgraded overhead infrastructure will be used. This will eliminate potential impacts to the use of the existing roads. At the south end of the Stewart Airport the transmission cable will be buried to mitigate the potential for impacts to aircraft flying in or out of the airport.

In terms of navigational concerns, regulations regarding permanent safety and security zones allow for temporary, occasional, or intermittent use, pending notification and permission from appropriate state agencies, the U.S. Coast Guard Commandant, COTP, and the National Geospatial-Intelligence Agency, Hydrographic Center.

The Applicant will contact the affected agencies and operators if construction activities are expected to infringe on the designated safety and security areas within the Project vicinity. At a minimum, the Applicant anticipates publishing a Notice to Mariners, coordinating with the local pilot associations to minimize any potential impacts between the construction of the proposed Project and pilotage, and facilitating the publishing of the location of the transmission cables on nautical charts. An engineering analysis will be conducted to consider, among other factors, water depths, lift, geology, and structural constraints. It is anticipated the bulk of this work will occur as a condition for permitting.

3.9 Noise

3.9.1 Environmental Setting

Elevated noise levels could be associated with the construction and operation phases of the Project. However, underwater noise levels would rise above background levels only due to the presence of vessels and cable installation equipment (including HDD equipment). Construction activities will generate noise around the proposed cable landing locations from trenching and burying the cable, but will not generate acoustic noise during operation.

3.9.2 Environmental Impact

Underwater noise from the operation of vessels and installation of cables could impact fish and mammal behaviors, temporarily displacing them. The cable installation vessel will move slowly along the transmission corridor, with engines running at low revolutions per minute, and trenching activities are not expected to involve breaking rock. Therefore, it is expected that noise levels would be below those levels that could cause temporary hearing impairments or physical injury. Because the installation would produce a fairly constant noise, fish and other aquatic species could hear the noise and avoid the area. The Applicant will consult with state and federal agencies to determine if limiting in-water work to certain seasons would further mitigate the impact.

Construction at Soule River will be unlikely to impact the residents and businesses of Hyder and Stewart because they are approximately 9 miles (14.5 km) away from that activity. Only boaters directly off of the Soule River watershed may experience occasional noise from construction. Noise during operations is expected to be low to non-existent and would require someone to possibly land on the river delta to hear the turbines in operation.

Construction activity at the Arrow Dock and causeway at Stewart would consist of a backhoe excavating the causeway to place a cable splice-vault and transformer as well as installing new overhead pole structures in place of the existing ones along the roadway. Burial of the transmission cable at the south end of the airport runway will also create some temporary noise, but all these activities will be short term and have a small acoustic impact. Under consideration is whether burying the cable in the causeway is practical since it is made of rock, which would eliminate overhead structures but could be expensive.

3.10 Visual

3.10.1 Environmental Setting

The Project’s principal features at the Soule River will be primarily oriented toward the water, with existing forest and ridgelines breaking up the visual impact. The cable laying ship will be similar to other ships utilizing Portland Canal. The Applicant has chosen to use similar overhead infrastructures for the transmission cable in Stewart, i.e. single wood pole structures.

The Forest Service has different Scenic Integrity Objectives (SIO) for the Remote Recreation LUD at the Soule River site. The following guidelines exist for maintaining the SIO of this watershed:

SCENERY
High Scenic Integrity Objective (SIO)

- Design activities to not be visually evident to the casual observer. This objective should be accomplished within 6 months following project completion.

- Log Transfer Facilities are generally not appropriate in this SIO setting.

Under the current LUD with its SIO for the Soule River, the hydroelectric project would not be able to meet these guidelines.

Portland Canal is approximately 70 miles long with only two communities along its length, the community of Hyder, Alaska, and Stewart, B.C. at its northern end,[25] only two miles apart. Very little development has occurred along the canal. However, one industrial installation, the Swamp Point Aggregate Quarry, which is a sand and gravel mining operation, is approximately 31 miles south of Hyder on the east side of Portland Canal; in British Columbia. An aerial view of the Swamp Point facility shows a significant clearing, providing a visible signature of development on Portland Canal. In addition, there are fuel storage tanks, a deep water ship loading facility, dock, deep water barge landing facility, generator building, office trailers, etc.

The Soulé River Hydroelectric Project will have much smaller clearings than this and provide a smaller visible footprint from both the Visual Priority Route in Portland Canal and from the air.

The affected environment would be from the Visual Priority Route (VPR)(middle of Portland Canal) looking back toward the shoreline from just south of the Soulé River mouth to just north of the delta in the Glacier Bay just north of the river delta.

The affected environment covers the river mouth, delta, and mountain hemlock and sitka spruce forest ridge at the shoreline. Visual impacts to the high SIO will primarily be located at the north river delta because of the marine access facilities, staging area, powerhouse, tailrace, substation, and access road traversing up the slope behind the powerhouse. The powerhouse and substation are being placed behind shoreline trees to screen them from view.

3.10.2 Environmental Impacts

The Project's features at the Soule River will offer some evidence of man, although most of the project will not be visible from the marine transportation route. Utilization of natural features to hide the project is proposed for certain features, but the access road to the powerhouse is likely to have a visual impact. However, from the air the project cannot be hidden and will leave a footprint.

Under the Applicants Alternative, the placement of project features at the Soule River would not be able to meet the current SIO for this LUD. The only way this project can meet an SIO is if a different LUD is chosen for within the project boundary with the current LUD remaining for outside the project boundary, as we propose. The act of

[25] Hyder is at the mouth of the Salmon River and Stewart is at the mouth of the Bear River, both of which converge at the north end of Portland Canal.

laying the submarine cable will offer little visual impact as large and small marine vessels frequently travel up and down Portland Canal.

The Applicant proposes that the Forest Service modify the LUD for the lands within the project boundary to a Transportation and Utility Systems (TUS) LUD, or another less restrictive LUD, which will allow modification to the landscape. The Applicant also proposes that the land surrounding the project remain in the current Remote Recreation LUD, minimizing the impacts this project will have to the current land use of the area. In addition, the Applicant proposes that the project be confined to as narrow a corridor as possible to minimize impacts to the environment, which will also reduce the amount of land needed for reclassification to another LUD. The Powerhouse and Substation will be placed behind shoreline trees at the delta to hide them from view. Lastly, the Applicant proposes that they will follow their design to have 1,900 feet of the Access Road, over 11,000 feet of the Power Tunnel (water conduit) under ground, and 10-miles of Submarine Cable to reduce impacts to the environment and the LUD for the area. As the Applicant has made every effort to minimize project surface impacts to this watershed, and if the Forest Service will modify the existing LUD within the project boundary to a less restrictive LUD, we recommend a finding of no significant impacts to land use for this project.

Impacts of Overhead Transmission Line in Stewart, B.C. on the Scenic Integrity Objective

The best route to get power to the B.C. Hydro transmission system[26] has been determined to be the landing of the submarine cable at the Stewart, B.C. log transfer facility which is partially owned by the City of Stewart and the Crown. The reasons this approach was chosen are:

- The poor quality of the soils along the road between Hyder and Stewart
- The existing overhead infrastructure is only within a few feet of the pavement
- The numerous snow slides and rock slides that occur on the stretch of road between Hyder and Stewart, and
- B.C. Hydro may eventually change this section to underground cable, necessitating the project changing its infrastructure as well

All of the above adds up to the potential for considerable maintenance activity. Bringing the submarine cable into Stewart avoids areas of slide activity and avoids going through either community as the Project will use a paved truck route around Stewart to the substation, avoiding changes within the community.

Because the overhead transmission line will be in Canada, there will be no impacts to the scenic integrity of Forest Service lands from transmission lines. The transmission line will be typical in appearance of existing overhead structures in the community of Stewart,

[26] The BC Hydro transmission grid was until 2010 the B.C. Transmission Company, or BCTC.

or it will be buried and the same routes as the existing infrastructure will be used. This will keep the visual impacts at current levels in Stewart.

Section 4

Alternatives to the Proposed Project

Potential alternatives to the proposed Project are discussed in this Section of the application document.

Hydroelectric Project Alternatives

Two action alternatives were discussed in the Preliminary Draft Environmental Assessment. The preferred alternative is the 77.4 MW storage project and the other alternative is the 550 kW run-of-river project. In addition, a No-Action alternative was considered.

The alternative project would consist of a 27-foot-high low-head diversion dam, powerhouse, power tunnel, suspension bridge, penstock, overhead and buried transmission line, 10-mile submarine cable, staging areas, and a trail instead of roads and would generally be visually screened to avoid any adverse effects on the natural setting of the project area. All construction materials and personnel would, by necessity, be transported into the project area by helicopter and landing craft and potentially the use of mules or horses to pack materials via an access trail from the shoreline to the project features.

The Land Use Alternative is not only uneconomical because of the expense to construct this small project in relation to the amount of energy produced, but would not be in the publics best interest because the project would still impact the current Remote Recreation LUD for the area with little public benefit because the available resource is not fully developed. This watershed is unique in that there are no habitats that would be completely eliminated, being available outside of the project features, and no sensitive species utilize the watershed, and no salmon use the river. The flora and fauna in this watershed is depauparate, and those species that do occur here are in small numbers. Opportunities to find and develop a location like this are rare and the Applicant believes this resource should be developed to its full potential.

Under the No-Action Alternative, the physical environment would not change, the Forest Service would not need to amend the land use designation for the site, and Hyder, Alaska or Stewart, B.C. would not experience any economic benefits from the project, either during construction or in the future as a tax base for an incorporated Hyder Borough; or even as a backup source of electricity during power outages to this remote area.

IMPACTS AND MITIGATION

Impacts are insignificant if the aforementioned methods are used to protect the environment. Through consultation, the Applicant determined that the primary issues associated with licensing the Project were:

- Aesthetic effects as viewed from Portland Canal

- Effects on human use of Glacier Bay, just north of the river delta (recreation and subsistence)
- Potential use of the project area by anadromous salmonids and corresponding potential effects of the project on fish and aquatic habitat in the lower Soule River and delta.
- Effects of the project on the existing Remote Recreation LUD, and whether a hydropower project would be feasible under the standards and guidelines of a Remote Recreation LUD as set forth in the Tongass National Forest Land and Resource Management Plan.

<u>Significant impacts are avoided by the following:</u>

- ✓ Dam locations are out of sight of the Visual Priority Route (middle) of Portland Canal
- ✓ Upper 0.3 miles of the North Fork watershed is left undisturbed as a wildlife corridor and for Dolly Varden spawning and juvenile rearing habitat
- ✓ Water conduit is underground, eliminating visual impacts as well as vegetation removal, impacts to wetlands, and impacts to wildlife movement and habitat
- ✓ Water will be discharged back into the Soulé River main channel, transporting glacial flour back to the river to be dispersed in a natural way into Portland Canal
- ✓ Powerhouse and substation will be screened by existing trees, avoiding visual impacts and impacts to delta wetland habitat, and also significantly reducing blocking a wildlife movement corridor along the shoreline as well as saving wildlife forage habitat
- ✓ Submarine cable to Stewart, B.C. avoids overhead lines along the shoreline, which would impact terrestrial habitat and the visual quality of Upper Portland Canal
- ✓ A tunnel of 1,900 feet will be used for part of the access road to avoid wetlands and steep slopes, also reducing potential habitat fragmentation and visual impacts

<u>Impacts are minimized by the following:</u>

- ✓ Access road alignment will avoid wetlands as much as possible
- ✓ A single lane bridge will be used to cross the river to reduce impacts to the rivers riparian corridor
- ✓ Access road will be limited to a single lane travel surface of 20 feet wide with occasional pullouts to limit the physical impacts to as narrow a corridor as possible
- ✓ Footprint of marine access facilities on the delta will be kept to as minimum a corridor as possible to minimize impacting wetlands
- ✓ Barge landing, staging area, tailrace will be riprapped to minimize or eliminate erosion and sedimentation and will be permanent features
- ✓ Project design minimizes blocking bear and deer movement across the delta

- ✓ An Erosion and Sedimentation Control Plan and Storm Water Protection Plan will protect resources and minimize impacts
- ✓ Materials to fill dam will be quarried locally at the project site, reducing the opportunity for acid rock drainage

<u>Mitigation for Impacts</u>

- ✓ Preserved spawning and most rearing habitat for juvenile lake population of Dolly Varden; reservoir will also provide a significant amount of juvenile rearing habitat
- ✓ Will maintain minimum pool in reservoir to protect fish from stranding that move downstream
- ✓ Will enhance rearing side channels in upper section of the North Fork to replace lost juvenile rearing habitat
- ✓ Will minimize visual effects of project infrastructure from the visual priority route in Portland Canal by using terrain, existing vegetation, coloring, and a small corridor
- ✓ Grass seed may be used on staging area on delta after construction to mitigate loss of wildlife forage habitat
- ✓ Propose land reclassification to a less restrictive LUD to only within the project footprint

Submarine Cable Route Alternatives

Originally the Applicant proposed to bring the submarine cable into Hyder, Alaska, and then utilizing overhead infrastructure get the power over to Stewart, B.C. However, after evaluating the route between Hyder and Stewart, the following reasons determined going through Hyder was not the best route:

- ➢ The poor quality of the soils along the road between Hyder and Stewart
- ➢ The existing overhead infrastructure is only within a few feet of the pavement
- ➢ The numerous snow slides and rock slides that occur on the stretch of road between Hyder and Stewart, and
- ➢ B.C. Hydro may eventually change this section to underground cable, necessitating the project changing its infrastructure as well

All of the above adds up to the potential for considerable maintenance activity. Bringing the submarine cable into Stewart avoids areas of slide activity and avoids going through either community as the Project will use a paved truck route around Stewart (Industrial Route) to the substation, avoiding changes within the community.

The best route to get power to the B.C. Hydro Stewart substation[27] has been determined to be the landing of the submarine cable at the Stewart, B.C. log transfer facility which is partially owned by the City of Stewart and the Crown.

Because the overhead transmission line will be in Canada, there will be no impacts to the scenic integrity of Forest Service lands from transmission lines. The transmission line will be typical in appearance of existing overhead structures in the community of Stewart, or it will be buried.

No Action Alternative

Under the no action alternative, the Project would not be constructed as described in this Application and the potential environmental impacts described herein would not occur as a result of Project construction or operations. However, the loss of the 77.4 MW of renewable energy generation capacity with an average annual generation of 283 GWh that would offset the equivalent of fossil fuels of 27,000,000 gallons (diesel) and the equivalent of 540,000,000 pounds of CO^2 annually cannot be understated, this Project could be an important step in reducing the carbon footprint of North America.

With this renewable energy source, other fossil fuel burning energy projects are less likely to be built or operated.

[27] The BC Hydro transmission grid was until 2010 the B.C. Transmission Company, or BCTC.

Section 5

Verification Statement

The undersigned attests that he is an officer of Alaska Power & Telephone Company and that he has read and has knowledge of the matters set forth in this application for a Presidential Permit, and that the facts and representations set forth in said application are true and correct to the best of his knowledge.

Section 6

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http://www.akenergyauthority.org/PDF%20files/SE%20Alaska%20Transmission%20Intertie%20Study%201987%20-%201st%20Half.pdf

http://www.cityofsitka.com/government/departments/electric/documents/KPTL-Report-Final.pdf

http://www.akenergyauthority.org/PDF%20files/SE%20Conference%20Final%20Report_Acres_Jan%2098.pdf

http://www.seconference.org/pdf/KPI-FinalDraftReport_2.pdf (Kake-Petersburg Intertie Update, 2010)

http://www.akenergyauthority.org/EnergyPolicyTaskForce/Phase2-Report-Final.pdf

http://wind-energy-the-facts.org/en/environment/chapter-2-environmental-impacts/impacts-on-benthos-and-fish.html (EMF)

http://en.wikipedia.org/wiki/Electromagnetic_field

http://omega.twoday.net/stories/508324/

http://www.mareco.org/khoyatan/spongegardens/home/

http://www.ville-ge.ch/mhng/hydrozoa/pdf/schuchert-reiswig-2006.pdf (glass sponges)

http://www05.abb.com/global/scot/scot245.nsf/veritydisplay/0911cdb677acd657c1256e3600454ac1/$File/Project%20South%20Padre%20Island%20138%20kV%20XLPE%20subm-.pdf

http://www05.abb.com/global/scot/scot245.nsf/veritydisplay/2fb0094306e48975c125777c00334767/$file/XLPE%20Submarine%20Cable%20Systems%202GM5007%20rev%205.pdf

http://www.offshorewindfarms.co.uk/Assets/COWRIE_Final_compiled.pdf

http://www.offshorewindfarms.co.uk/Pages/Publications/Archive/Reports/The_Potential_Impact_o12653662/

http://efw.bpa.gov/environmental_services/Document_Library/PortAngeles/DraftEISweb.pdf (Port Angeles-Juan de Fuca Transmission Project)

http://nepa.energy.gov/nepa_documents/docs/deis/eis0378/chap7.pdf (Port Angeles-Juan de Fuca Transmission Project – Chapter 7.0 References)

http://efw.bpa.gov/environmental_services/Document_Library/Klondike/DraftEIS.pdf (Draft Environmental Impact Statement Klondike III/Biglow Canyon Wind Integration Project)

http://www.marklynas.org/2011/06/new-ipcc-error-renewables-report-conclusion-was-dictated-by-greenpeace/

http://en.wikipedia.org/wiki/Elasmobranchii

http://seagrant.uaf.edu/bookstore/sharksandskates/sharks-p37.pdf

Stevenson, D.E., Orr, J.W., Hoff, G.R., and McEachran, J.D. "*Field Guide to Sharks, Skates, and Ratfish of Alaska.*" **ISBN:** 978-1-56612-113-2. p. 37. 2007.

http://en.wikipedia.org/wiki/Faraday_cage

APPENDICES

Appendix A:	Opinion of Consul
Appendix B:	Project Maps
Appendix C:	Map Showing Location of International Boundary Crossing
Appendix D:	Preliminary Submarine Cable Technical Information and Diagrams
Appendix E:	Stewart Cable Landing Analysis
Appendix F:	Cable Splice-Vault Diagram
Appendix G:	BC Hydro Transmission System Maps
Appendix H:	BCTC Transmission Feasibility Analysis
Appendix I:	Photos of the Port of Stewart and the transmission route
Appendix J:	Draft License Application / Preliminary Draft EA

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX A

OPINION OF CONSUL

Davis Wright Tremaine LLP

March 15, 2013

The Department of Energy
Office of Electricity Delivery and Energy Reliability
OE-20, Room 8G-024
1000 Independence Avenue, S.W.
Washington, DC 20585

Re: Presidential Permit Application by Soule Hydro LLC

Ladies and Gentlemen:

We have acted as counsel for Soule Hydro LLC, a Delaware limited liability company ("**Soule Hydro**"), in connection with the Application of Soule Hydro LLC for a Presidential Permit for the Soule River Hydroelectric HVAC Transmission Project, dated March 2013 (the "**Application**").

The law covered by the opinions expressed herein is limited to the Delaware Limited Liability Company Act and the federal laws of the United States of America. We express no opinion as to the effect of the application of any other laws on the resolution of the issues discussed herein. Our lawyers are admitted to practice in Washington and various other jurisdictions but are not admitted to practice in Delaware. We call to your attention the fact that the existence and the validity of actions of a Delaware limited liability company are governed not only by the Delaware Limited Liability Company Act, but also by the validity and interpretation of a company's limited liability company agreement, which matters may be subject to principles of the general law of contracts in the State of Delaware, as to which we express no opinion. Accordingly, for purposes of the opinions herein, we have assumed with your opinion that there exists no law or principle in Delaware, other than the Delaware Limited Liability Company Act, which would differ from Washington law in a manner that would be material to the opinions expressed herein.

This opinion letter is to be interpreted in accordance with the Guidelines for the Preparation of Closing Opinions (including the appended Legal Opinion Principles) issued by the Committee on Legal Opinions of the American Bar Association's Business Law Section as published in 57 Business Lawyer 875 (February 2002) and the Statement on the Role of Customary Practice in the Preparation and Understanding of Third-Party Legal Opinions as published in 63 Business Lawyer 1277 (August 2008).

A. Transaction Documents and Matters Examined

In connection with this opinion letter, we have examined originals, or copies certified or otherwise identified to our satisfaction, of such documents, records, certificates and statements of government officials, officers and other representatives of the persons referred to therein, and such other documents as we have deemed relevant or necessary as the basis for the opinions herein expressed, including the following:

A-1 The Application.

A-2 The Certificate of Formation of Soule Alaska Power, LLC filed with the Office of the Secretary of State of the State of Delaware on November 13, 2008, as amended by the Certificate of Amendment of Soule Alaska Power, LLC filed with the Office of the Secretary of State of the State of Delaware on April 1, 2009 (effecting a name change to Soule Hydro LLC), each as certified by the Office of the Secretary of State of Delaware on March 14, 2013 (collectively, the "**Certificate of Formation**").

A-3 A Certificate stating that Soule Hydro is in good standing and has a legal existence, issued by the Delaware Secretary of State dated March 14, 2013.

A-4 The Amended and Restated Operating Agreement of Soule Hydro LLC, dated and effective April 8, 2011 (the "**Operating Agreement**").

Our opinion expressed in C-1 below as to the formation and valid existence of Soule Hydro under Delaware law is based solely upon the documents listed in A-2 and A-3 without further investigation as to the criteria for valid existence, good standing, due qualification or any related legal issues. We have made no additional investigation after the respective dates of those documents listed A-2 and A-3 hereto in rendering our opinions expressed in C-1 below.

B. Assumptions

For purposes of this opinion letter, we have relied on customary assumptions.

C. Opinions

Based on the foregoing examinations and assumptions and subject to the qualifications and exclusions stated below, we are of the opinion that:

C-1 Soule Hydro is a limited liability company duly organized and validly existing under Delaware law.

C-2 Soule Hydro has all necessary limited liability company power and authority under the Certificate of Formation, Operating Agreement and the Delaware Limited Liability Company Act to operate and maintain the facilities, as proposed in the Application.

D. Qualifications

The opinions set forth herein are subject to customary qualifications.

E. Exclusions

The opinions set forth herein are subject to customary exclusions.

This opinion letter is delivered as of its date and without any undertaking to advise you of any changes of law or fact that occur after the date of this opinion letter even though the changes may affect the legal analysis, a legal conclusion or information confirmed in this opinion letter. This opinion letter is rendered only to you and is solely for your and their benefit in connection with the transaction contemplated by the Application. This opinion letter may not be used or relied on for any other purpose or by any other person without our prior written consent.

Very truly yours,

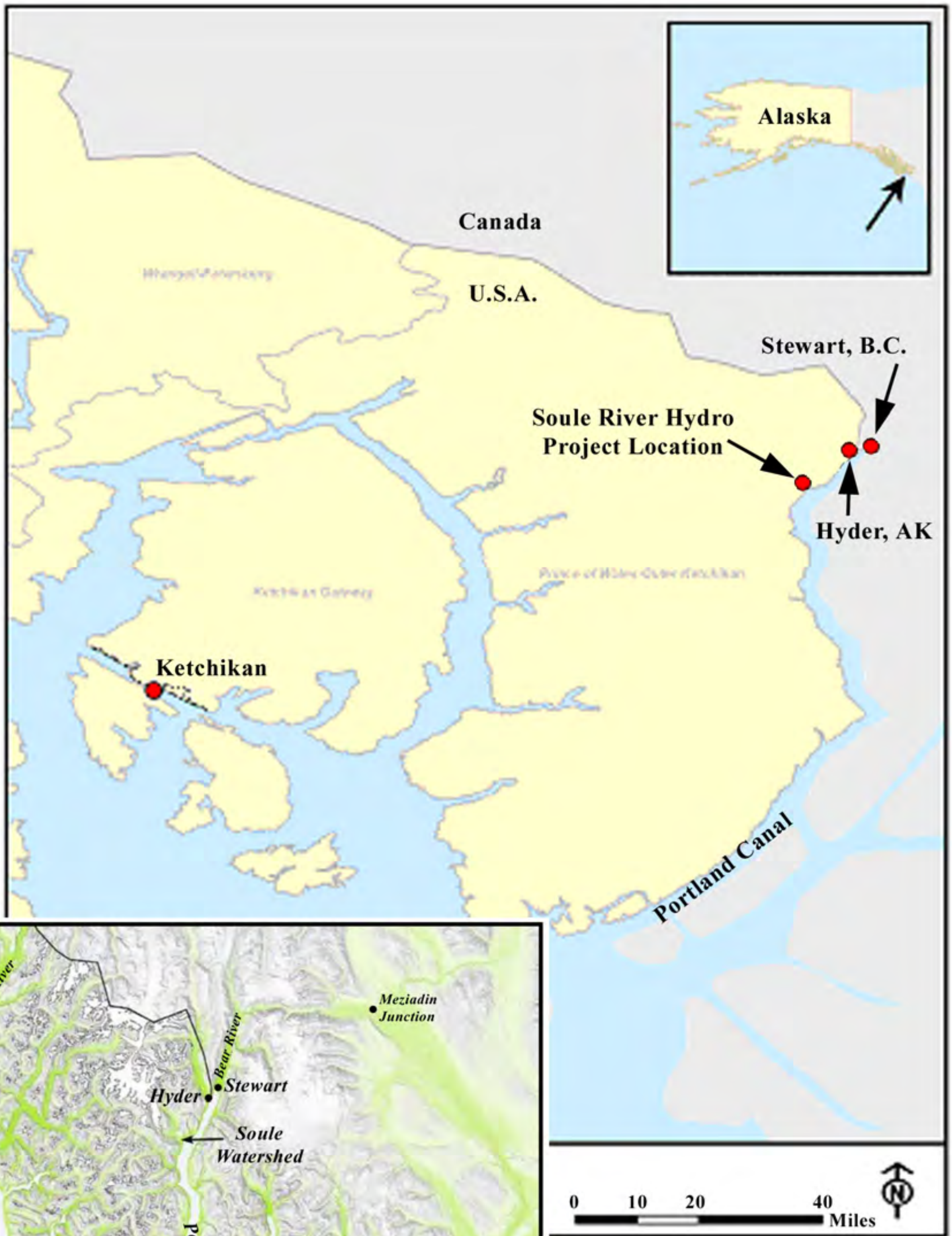
Dorsey Whitney LLP

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX B

PROJECT MAPS



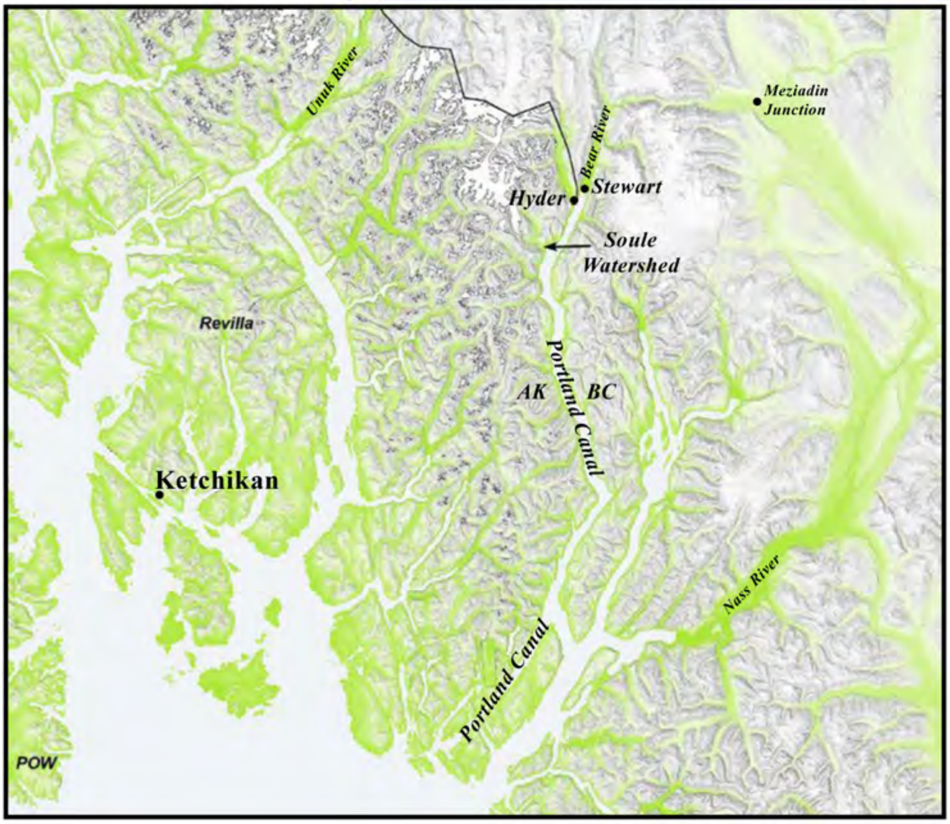
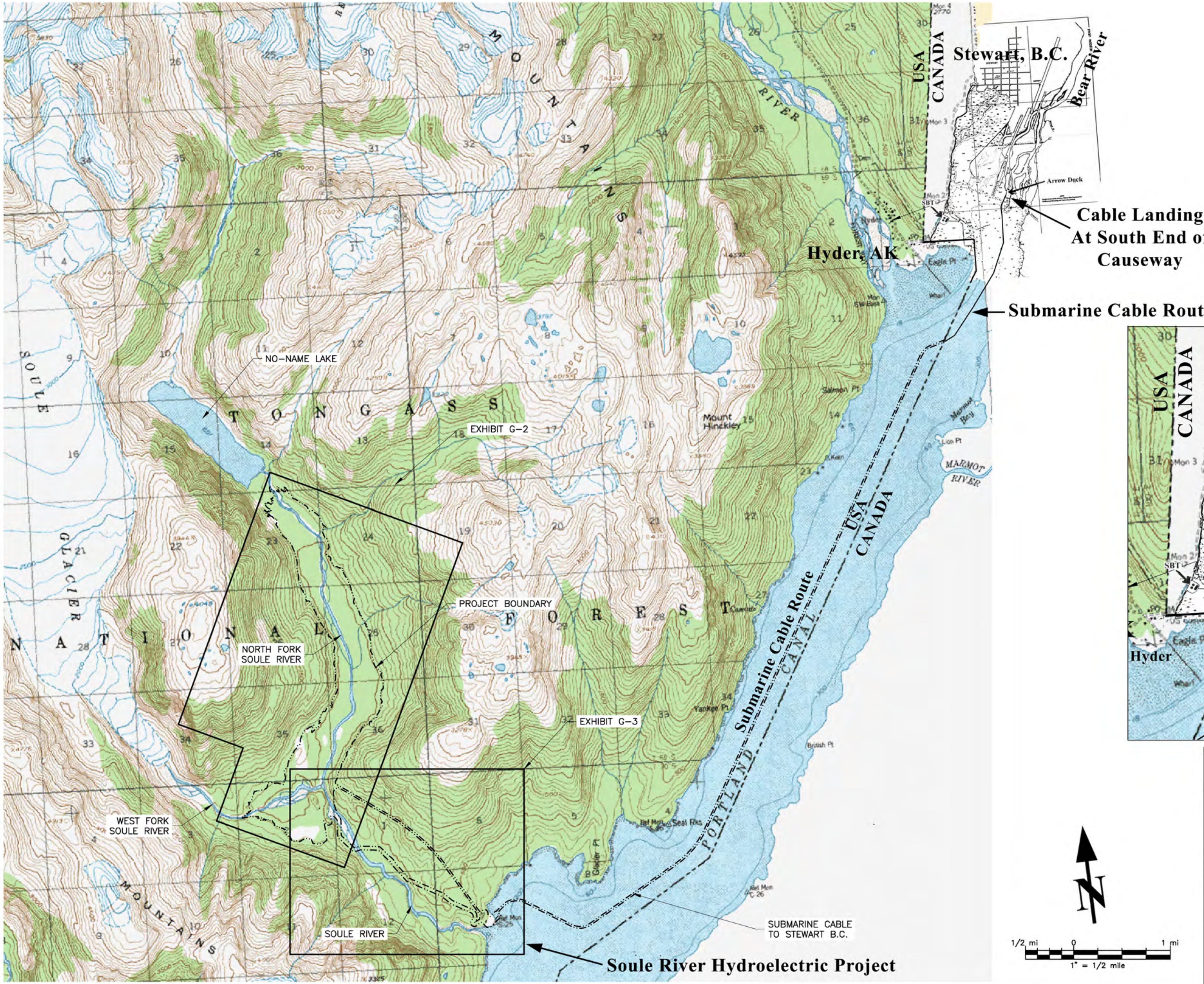


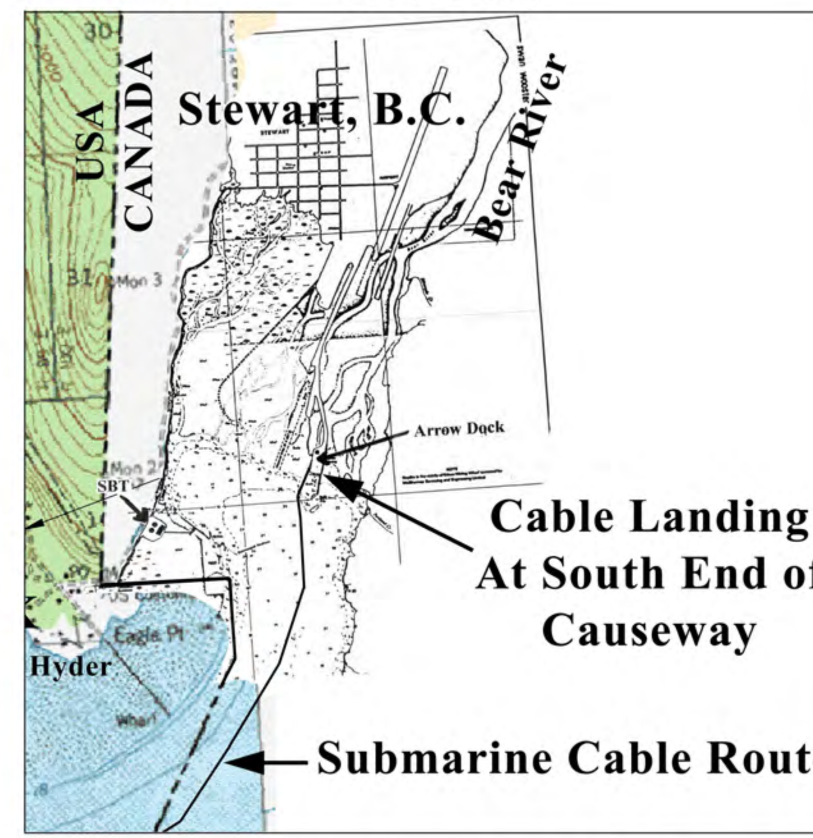
FIGURE 1: PROJECT LOCATION

NOTES:

1. Final alignment for the submarine cable in Canadian waters will be determined after a bathymetric survey is completed a year before the cable is to be laid.



DETAIL

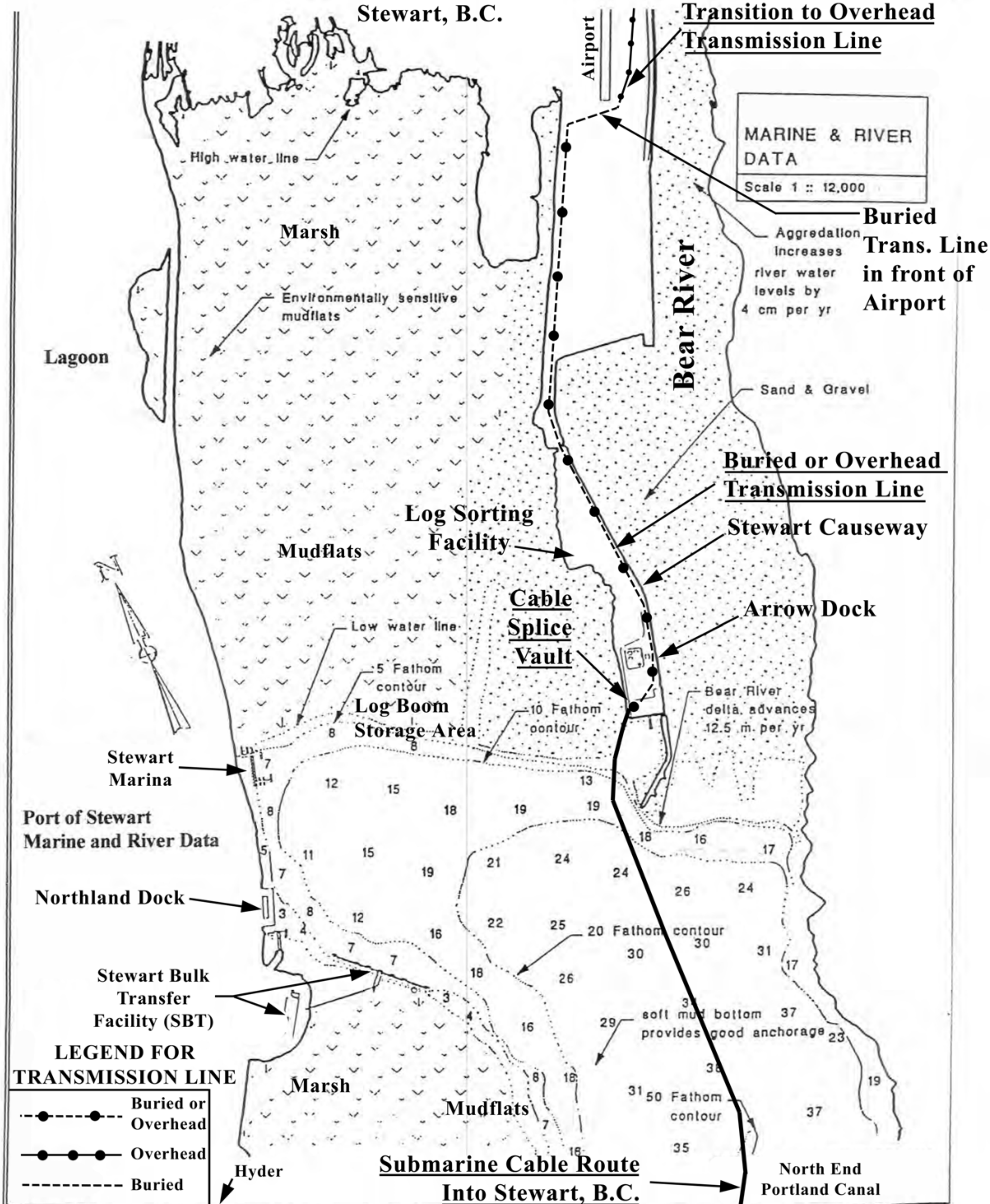


SOULE RIVER HDYROELECTRIC PROJECT - FERC NO. P-12615/P-13528

SUBMARINE CABLE ROUTE & LANDING IN CANADA

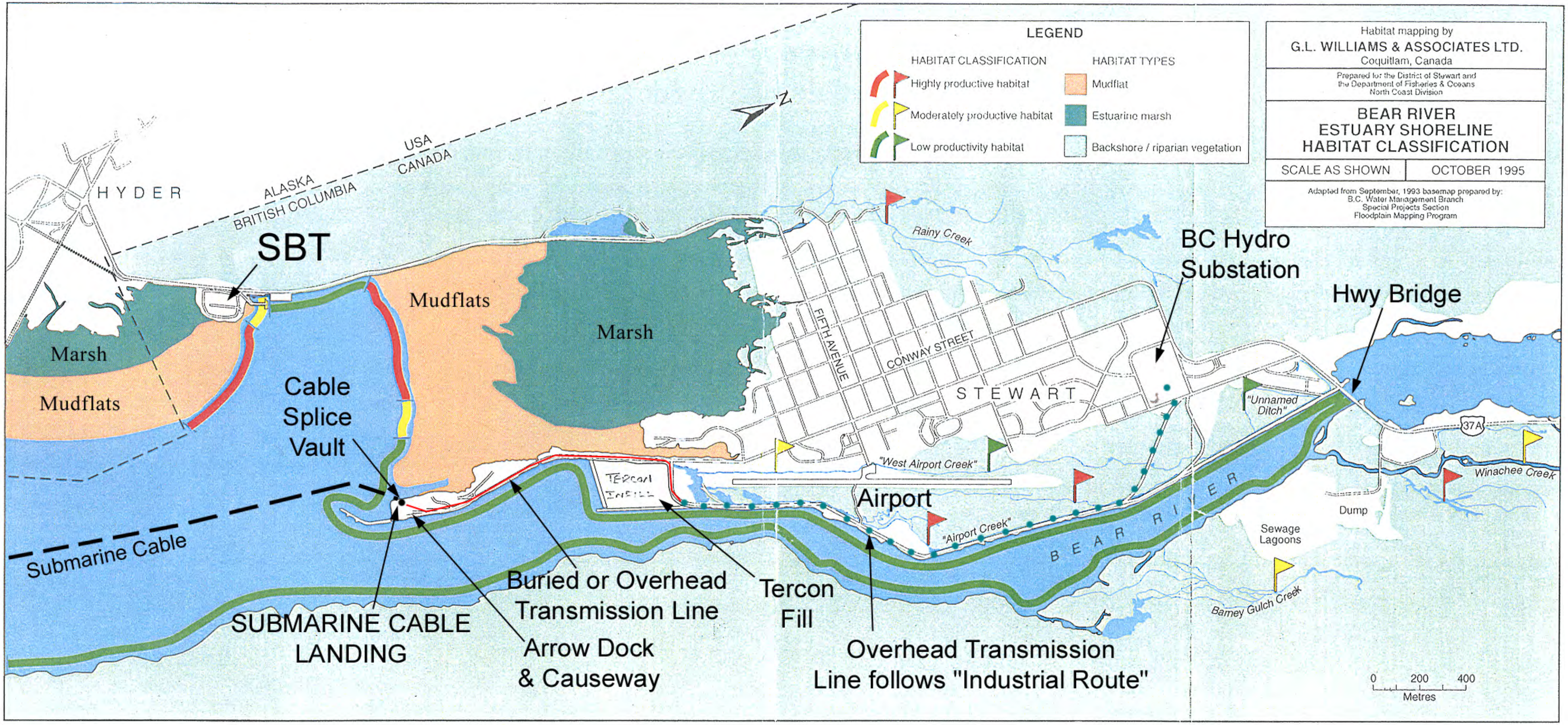
FIGURE 2: PROJECT BOUNDARY IN CANADA

FIGURE 3



Original Map From:
Lauga & Associates Consulting Ltd
Marine & River Data; Details - 1986 Survey

Prepared For: Ministry of Small Business, Tourism, Culture
Province of British Columbia, Stewart Port Development
Business Plan, 1995



LEGEND

Submarine Cable Route

Buried or Overhead Transmission Line

Overhead Transmission Line

FIGURE 4

SOULE RIVER
HYDROELECTRIC PROJECT
FERC PROJECT NO. 13528 & 12615

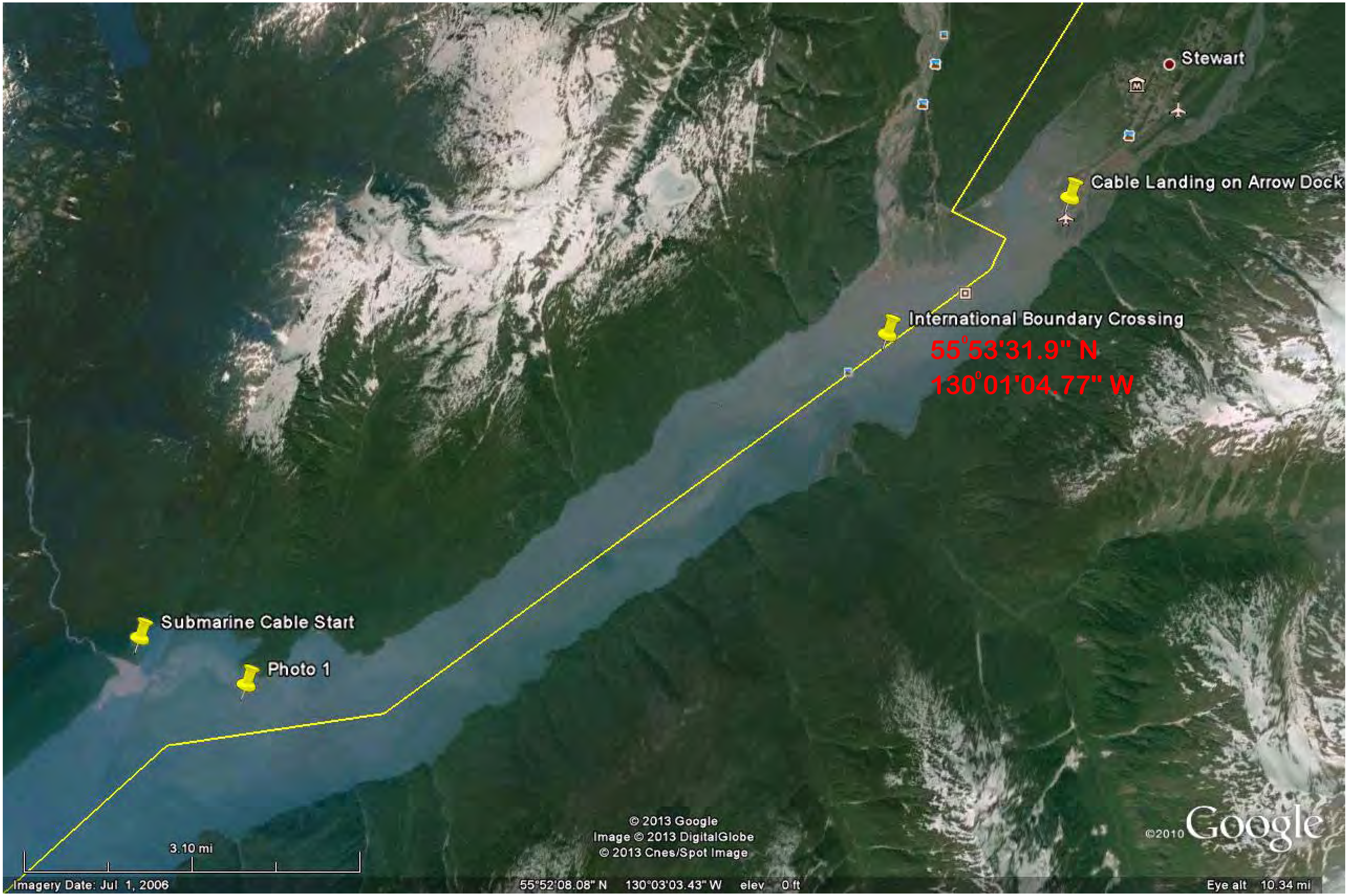
Submarine Cable Landing
Aquatic Habitat Classifications

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX C

LOCATION OF INTERNATIONAL BOUNDARY CROSSING



Stewart
Cable Landing on Arrow Dock
International Boundary Crossing
55°53'31.9" N
130°01'04.77" W
Submarine Cable Start
Photo 1
3.10 mi
© 2013 Google
Image © 2013 DigitalGlobe
© 2013 Cnes/Spot Image
©2010 Google
Imagery Date: Jul 1, 2006
55°52'08.08" N 130°03'03.43" W elev 0 ft
Eye alt 10.34 mi

SOULE RIVER HYDROELECTRIC PROJECT

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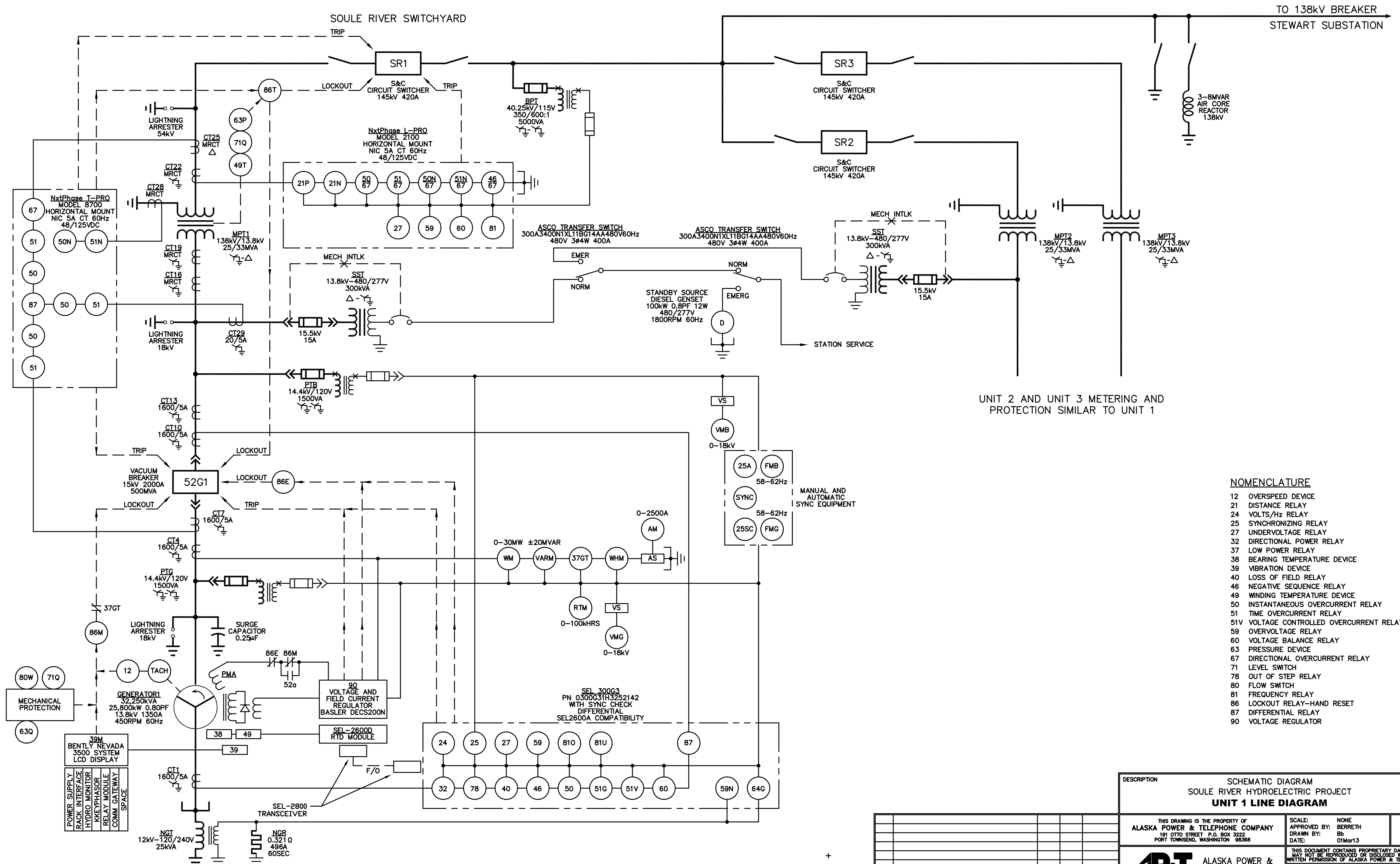
APPENDIX D

PRELIMINARY SUBMARINE CABLE TECHNICAL INFORMATION



NOMENCLATURE

12	OVERSPEED DEVICE
21	DISTANCE RELAY
24	VOLTS/Hz RELAY
25	SYNCHRONIZING RELAY
27	UNDERVOLTAGE RELAY
32	DIRECTIONAL POWER RELAY
37	LOW POWER RELAY
38	BEARING TEMPERATURE DEVICE
39	VIBRATION DEVICE
40	LOSS OF FIELD RELAY
46	NEGATIVE SEQUENCE RELAY
49	WINDING TEMPERATURE DEVICE
50	INSTANTANEOUS OVERCURRENT RELAY
51	TIME OVERCURRENT RELAY
51V	VOLTAGE CONTROLLED OVERCURRENT RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE BALANCE RELAY
63	PRESSURE DEVICE
67	DIRECTIONAL OVERCURRENT RELAY
71	LEVEL SWITCH
78	OUT OF STEP RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
86	LOCKOUT RELAY-HAND RESET
87	DIFFERENTIAL RELAY
90	VOLTAGE REGULATOR

REV	DESCRIPTION	AUTH	REV BY	DATE
0	ORIGINAL ISSUE	Bb		01Mar13

STAMP

DESCRIPTION
SCHEMATIC DIAGRAM
SOULE RIVER HYDROELECTRIC PROJECT
UNIT 1 LINE DIAGRAM

THIS DRAWING IS THE PROPERTY OF
ALASKA POWER & TELEPHONE COMPANY
191 OTTO STREET P.O. BOX 3222
PORT TOWNSEND, WASHINGTON 98368

SCALE: NONE
APPROVED BY: BERRETH
DRAWN BY: Bb
DATE: 01Mar13
SIZE D

AP&T ALASKA POWER & TELEPHONE COMPANY

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DRAWING TYPE: SCHEMATIC DIAGRAM | SHEET NO. 1 | REV. NO. 0

FILE NO. I:\AP&T\autocad_drawings\hydro_plants\soule_river\1_line_01.dwg

Submarine cable technical report is included as a separate document.

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX E

STEWART, B.C.
CABLE LANDING ANALYSIS

SOULÉ RIVER HYDROELECTRIC PROJECT
STEWART, B.C. SUBMARINE CABLE LANDING
PROJECT DESCRIPTION

ENVIRONMENTAL ANALYSIS

BY: SOULE HYDRO, LLC
P.O. Box 3222
Port Townsend, WA 98368

2013

SOULÉ RIVER HYDROELECTRIC PROJECT
STEWART, B.C. SUBMARINE CABLE LANDING
PROJECT DESCRIPTION

1.0 PROJECT DESCRIPTION

1.1 PROJECT LOCATION, GENERAL DESCRIPTION, AND RATIONAL

The 77.4 megawatt (MW) Soulé River Hydroelectric Project [Soulé Project] is located approximately 17.7 kilometers (km) (11 miles) south of Stewart, B.C. on Portland Canal [see Figure 1]. The Soulé River is on the west side of the canal, in Alaska. The Soulé Project will consist of dams, a road, reservoir, power tunnel, powerhouse, marine access facility, substation with three transformers, and a 138-kilovolt (kV) three-phase submarine cable.

The submarine cable and appurtenant infrastructure to connect to the BC Hydro substation [Project] will go from the marine access facilities up the Portland Canal for approximately 12.87 km (8 miles) and then cross the International Boundary between the U.S. and Canada and go for approximately 4.82 km (3 miles) to Stewart [see Figure 2].

The cable will land far out in the harbor at the south end of the existing causeway on Arrow Dock, a rock filled jetty/platform that abuts the Bear River on its east side and tidal flats on its west side. Prior to laying the cable a bathymetric survey of the Portland Canal up to the causeway in the Stewart Harbor would take place to find the best route. The survey will help determine how close to the causeway the cable can be buried[1] before needing to excavate a trench from a barge at low tide to the causeway [if an excavator could be driven out on the built-up aggregate from the river at low tide, this may be a more economical option for the final <100 meters (<328 feet [ft]); the bathymetric survey will help make those determinations].

The cable will be protected in an HDPE pipe from below the minimum low tide elevation to above the mean high tide elevation. The cable will then have a steel anchor sleeve to protect the cable while crossing land above high tide to the splice vault. The steel anchor sleeve may also consist of several 1.2 m (4 ft) high by 1.2 m (4 ft) wide by 2.54 centimeter (cm) (1-inch) thick steel plates attached to a 50.8 – 60.9 cm (20-24 inch) steel pipe [these features would be placed in Arrow Dock]. Trenching will take place during low tides for the area. Excavated material will be used to backfill over the cable and its protective conduits. The cable will have the anchor sleeve placed at the time of the cable laying. With no riparian habitat here and low quality aquatic habitat, impacts should be negligible.

[1] Burial would only occur through the SBT deep anchorage area noted on the enclosed Figures, a distance of approximately <1500 m (<4,921 ft) otherwise the submarine cable will be laid on the surface of the seabed in Portland Canal.

The Project would come up to a buried cable splice vault [buried in the existing rock fill of Arrow Dock] that would transition the cable from a marine cable to a terrestrial cable either buried in the Arrow Dock and causeway or on the existing overhead structures to the “Industrial Route” around the airport at the north end of the causeway. After being buried at the south end of the airstrip, the transmission line would be above ground on single wood poles, similar to what is presently in the community [see Figures 3 & 3A], possibly using the existing overhead poles along this same route. The aerial power cable would follow the “Industrial Route” along the Bear River to the north side of Stewart where the BC Hydro substation is located [see Figure 4].

The Bear River has been filling in the Project cable landing site around the man-made causeway for many years; filling in so much that the barge facility at the south end of the causeway is no longer used except at high tide. This is the area we propose to bring the submarine cable into shore.

The purpose of bringing the submarine cable into Stewart, B.C. is because there is a BC Hydro substation at the north end of Stewart that the Soulé Project must connect to. The BC Hydro substation is connected to the BC Hydro grid via a 138 kV transmission system; which is the reason the Soulé Project must be at 138 kV. Landing in Hyder would require the power cable to pass through important habitat found in the mudflats and marsh at the Hyder causeway, as well as use the existing road between both communities that is narrow, prone to landslides and occasional avalanches, and is expected to have upgrades made to it sometime in the future that could impact the projects infrastructure.

Figure 4 is a diagram taken from the permitting process for the expansion of the Stewart Bulk Terminal facility showing the Arrow Dock, log transfer facility, and causeway and the habitat quality in that area. Project features have been placed on this diagram. Also enclosed are satellite photos from Google Earth showing the same general area along with the project features overlaid.

On-Site Activities

- Trenching through the Portland Canal deep water anchorage just south of the Stewart Harbor approximately one meter deep to bury the cable and avoid ship anchors; <1500 m (<4,921 ft);
- Trenching of sand and aggregate at south end of the existing industrial causeway for <100 meters (<328 ft) to bury a conduit enclosed 138 kV submarine cable;
- Trenching through riprap on side of causeway to a buried splice vault that would be between 2.5 m – 4.0 m (8.2 ft – 13.12 ft) in diameter; where the cable will transition from aquatic to a terrestrial cable.
- Burial of cable in causeway or use of existing overhead power poles on causeway for Project conductor;
- Placement of conductor on existing overhead infrastructure, or new overhead infrastructure to the BC Hydro Substation.

2.0 REGIONAL DEVELOPMENT

The Project is located within the District of Stewart boundaries on the outskirts of the Community of Stewart. The Project land base is zoned Industrial land in the District's Official Community Plan. Stewart is located at the head of the 120 km (74.57 miles) long Portland Canal, which also separates the southern portion of the State of Alaska and northern British Columbia (B.C.). The Project is accessible by a year-round paved highway connected to northern B.C. routes. Stewart is also a deep-sea port, supporting year-round marine transportation.

The Port of Stewart issued a Draft Environmental Assessment in June 2011, for improvements to the harbor.

The Project encompasses an area of approximately 40 hectares (ha) (98.84 acres) including sections of the Portland Canal, Stewart Harbor intertidal zone, and the District industrial land base. The submarine cable component of the Project is located within the Stewart Harbor and in Portland Canal. The existing industrial land base is owned by the Province of British Columbia and is managed by the District of Stewart (Glacier Aggregates Inc. 2006), other portions are owned by the District of Stewart and BC Hydro. A location map is shown in Figure 1.

Stewart, B.C. is the only location on the Portland Canal in the vicinity of the Soulé Project that provides access for connecting to the BC Hydro electrical grid. Stewart, along with its 138 kV substation, also has year round paved road access and an airport to allow access for construction and servicing of the Project during operations. Locals from both Hyder and Stewart can be hired to help operate and maintain the Project infrastructure.

Due to power outages that occur for both Stewart and Hyder from the BC Hydro grid with no backup power available, these two communities could use power at those times. This Soulé Project has the potential to provide backup power, which could be very important during winter months.[2] The majority of power from the Soulé Project will be wheeled over the BC Hydro transmission system to the Lower 48 States for sale to California or Washington utilities.

3.0 ENVIRONMENT

The previous environmental reviews for the proposed expansion of the Stewart Bulk Terminal facility and the proposed Bear River Gravel Project are used as background information for this Projects environmental review. The Port of Stewart Port Development Final Environmental Assessment won't be out till late in 2011 that may provide additional information.

---

[2] This electricity would only be available if the grid to Stewart failed, not if the failure was within Stewart; a failure in Stewart would require BC Hydro to send a crew to make repairs.

3.1 EXISTING ENVIRONMENT

MAN-MADE FEATURES: The lands surrounding the Project at the Stewart Harbor, with the exception of the mountains to the east of Bear River, have been, and continue to be used for industrial purposes.

The major existing facilities in the Port of Stewart are shown in Figure 3. Going clockwise on Figure 3, the Stewart Bulk Terminal (SBT) occupies a 2 ha (4.94 acres) footprint southwest of the Projects submarine cable landing, across the harbor from each other. The Northland Dock [owned by the District of Stewart], is just north of the SBT and lies to the west of the Projects submarine cable landing. To the north of the Northland Dock is a set of floating docks which serves the Stewart Yacht Club [identified as the Stewart Marina], that has some fishing and charter boats and floating homes/offices.[3]

Just north of the SBT, Northland Dock, and the Stewart Yacht Club Marina is a brackish marsh and mudflats. These marsh and mudflats fill in the north side of the harbor. On the east side of the Stewart Harbor is the Arrow Dock and causeway. The causeway is part of the riprap dyke that contains the Bear River along its west bank. The dyke commences immediately upstream of the Route 37A highway bridge at the north end of Stewart and terminates in the intertidal zone near the location of the Project submarine cable landing. The Industrial Route (Bypass Route) is a paved community by-pass road for industrial traffic, located on a portion of the river dyke. This route from the industrial area causeway will have, as a part of the Project, an overhead powerline on single wood pole structures along its route around the airport until the cutoff road to the BC Hydro substation at the north end of the community.

The Arrow Dock was built by the Provincial government to support the Cassier Mine [now closed]. The main facility is a floating RO-RO ramp for barge service, which is now inactive due to siltation because the confined Bear River delta has pro-graded beyond the end of the Arrow Dock at the end of the causeway. The log sorting facility for raw log exports is midway down the causeway. Log booms are formed out in the harbor on the west side of the causeway and southeast of the brackish marsh [see the assorted Google Earth Images enclosed]. The log dump is owned by the District of Stewart and leased to operators. It is very active during the logging season. This completes the circumnavigation of the harbor back to the SBT site.

Also on the west side of the river, east side of the causeway, the District of Stewart constructed an industrial site for future use, which is located at the southern end of the Industrial Route, north of the Project. This site, known as the Tercon Fill, is a non-vegetated level area abutting the river; see Figure 4 for its location.

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[3] Extracted from the "*Comprehensive Study Report of a Proposed Wharf at Stewart Bulk Terminals, Stewart BC.*" S. Graham Engineering and Geology Inc. for Stewart Bulk Terminals Ltd. 2002

Within the riverbed, gravel extraction for various local construction activities has occurred on past occasions through two privately held Licenses of Occupation as well as by the District for flood prevention works.

The District of Stewart has plans to make improvements to their port facilities, possibly starting in 2012. A Draft Environmental Assessment for the District of Stewart was issued in June 2011.

GEOMORPHOLOGY: Hay & Co. (1984, 1986, 1993) and Golder (2000) conducted an aggradations rate analyses in the lower Bear River and within the Project area. Golder's findings, which included a review of Hay & Co. analyses, found that the bed elevation where the river drains into Portland Canal, had risen with an average bed change of 0.08 m/year (3.15 inches), and that the thalweg (main flow) was subject to movement across the river bed as a result of sediment deposition. In addition to the increase in bed elevation, the 1986 analysis calculated the annual deposition rate of approximately 300,000 m^3 contributes to delta advancement of 12.5 m/year (41 ft). Based on an industry average gravel density of 1.8 tonnes/m^3, this volume is equivalent to 540,000 tonnes/year.[4]

AQUATIC HABITAT: The project is located on the edge of the Salmon River estuary. The Salmon River supports dominant runs of chum, pink and a smaller run of coho salmon. The Bear River, located at the head of Portland Canal, also supports small runs of chum and coho, particularly in the lower reach and channels. The marshes and tidal flats of these estuaries provide important and productive rearing habitat for the juvenile salmon that enter the Portland Canal in early spring and summer.[5]

Mean tide elevation for the Stewart Harbor area is 5.3 m (17.39 ft) with a range of 8.2 m (26.9 ft) (Hay & Co. 1986). Most of the land on the northwest part of the Stewart Harbor is a brackish marsh of significant environmental importance. Over time the size of the marsh has expanded due to the Bear River dike and Arrow Dock and causeway, which have allowed new substrate to become established; the river has also progressively advanced southward into the Portland Canal as a result of the containment of the river to the east side of the valley [by the manmade causeway, log transfer facility, and Arrow Dock] and the extremely high annual bedload which advances the Bear River delta annually.

Information on plant life in the marshes of Upper Portland Canal comes from the Alaska Department of Transporation's *Hyder Causeway Reconstruction and Trestle Replacement – Environmental Assessment*, April 2011.

"During 2006, Heutte and Lamb (2006) conducted a survey of vegetation on the tidal-influenced meadow in the adjacent estuary (above the neap tide line) and the sedge

---

[4] "Bear River Gravel Project – Revised Project Description." Cambria Gordon Ltd for Glacier Aggregates Inc. p. 7. 2006.

[5] Environmental Assessment Office. Stewart Bulk Terminal Wharf Expansion Project. Report and Recommendations: with Respect to the Issuance of a Project Approval Certificate. p. 8. Sept. 2002.

community (below the neap tide line) traversed by the Hyder Causeway (Appendix E)."[6] Plants found during this survey include:

- A narrow strip of American dunegrass (*Leymus mollis*) at extreme high tide line
- Pacific water parsley (*Oenanthe sarmentosa*) at extreme high tide line
- Sweet gale (*Myrica gale*) in broader tidal area below the rye and water parsley
- Fine grasses (*Festuca rubra* and *Agrostis stolonifera*)
- Silverweed cinquefoil (*Argentina anserina*)
- Lyngby's sedge (*Carex lyngbyei*) accounted for 80% of the emergent alluvial deltaic fan; is considered a pioneer colonizer of tidal mudflats
- Perennial sowthistle (*Sonchus arveniss* L. ssp. *arvensis* Asteraceae) an invasive plant species that is listed as a Noxious Weed in Alaska.

These aquatic plants are also likely found in the Stewart Harbor marsh. Aquatic plants in the Portland Canal are likely limited to near shore areas due to the heavy glacial flour load present, which will filter out light and therefore not penetrate very deep to support photosynthesis.

Although eelgrass grows in estuaries, bays, lagoons, and other marine environments where water is clear and light is plentiful, no evidence of eelgrass was found at the Hyder Causeway Project and we assume that it is not present in the Stewart Harbor marsh as well. Eelgrass was also not found at the Soulé River delta, approximately 17.7 km (11 miles) south of Stewart. As far as eelgrass in Portland Canal, because eelgrass growth depends on the amount of light available and on the clarity of the water, due to significant glacial flour and sediment from the rivers and drainages around Upper Portland Canal eelgrass is not likely present at depth.

The aquatic habitat in the Project area, as shown in Figures 4 & 5, consists of two main types: 1) intertidal – the area around the Arrow Dock and causeway that are influenced by tidal activity; and, 2) subtidal – areas in the Portland Canal. None of the intertidal foreshore of the existing Stewart Causeway is classified as highly productive (red-coded) or moderately productive (yellow-coded) fish and wildlife habitat. Instead, the causeway is considered low productivity (green-coded) fish and wildlife habitat, due to existing man-made impacts, i.e. causeway and log sorting and booming activities, and because of the continuous encroachment of aggregate and sediment from the Bear River, which covers habitat that could potentially be more productive. Construction of the submarine cable, i.e. trenching the cable into the intertidal zone to the causeway, requires the trenching and infilling of approximately 83.6 m^3 (109 cu yd)[7] of intertidal habitat classified as low productive (green-coded) habitat and approximately 1,254 m^3 (44,289 ft^3 = 1,640 yd^3 = 1,254 m^3) subtidal habitat (excavation = existing aggregate and sediment

[6] Alaska Department of Transporation's *Hyder Causeway Reconstruction and Trestle Replacement – Environmental Assessment*, p. 44. April 2011.

[7] Formula: 3 ft deep x 3 ft wide x 328 ft long = 2,952 ft^3 = 109.33 yd^3 = 83.59 m^3

substrate) (infilling = submarine cable and excavated material) through the deep water anchorage used by ships waiting to enter the SBT facility.

Williams (1995) conducted a shoreline habitat classification of the head of the Portland Canal from Marmot Basin on the east to Salmon River on the west. The classification is used by the District of Stewart to assist with shoreline industrial development planning. The Project area is within the Central Bear River Estuary and the Eastern Shoreline of Portland Canal habitat units. Both units are classified as Low Productivity Habitat.[8]

Site-specific information regarding the marine life in Portland Canal has not been located; however, it is assumed that the canal supports the typical array of marine species that are associated with deep sea and steep shore fjords. As an example, just above Glacier Point, approximately 14.5 km (9 miles) south of Stewart on the U.S. side of the border is a seal haul-out.[9] Harbor porpoises have also been observed in the Portland Canal near the Soulé Project and the occasional report of a humpback whale.

PREVIOUS SURVEYS: In December 1994, the District of Stewart approved preparation of The Port of Stewart Environmental Management Plan (PSEMP). The purpose of the Plan was to develop a more efficient system to deal with proposed port development in the estuary and gravel removal in the Bear River. DFO and the District of Stewart actively supported the plan. The plan was officially signing by the District and DFO in February, 1996. The Bear River estuary habitat inventory and classification involved review of existing information and a joint DFO habitat survey in June 1995 (Williams 1995).

The plan components included an estuarine inventory and habitat classification, project environmental design guidelines, establishment of the District of Stewart Project Registry and project review process, and identification of cooperative habitat enhancement and restoration options for the Bear River estuary. There was also the provision for the establishment of a habitat compensation bank to provide a proactive tool for improving port development and habitat management in the estuary.

Habitats inventoried included mudflat, estuarine marsh and backshore/riparian vegetation. Once the inventory was completed, the shoreline was classified according to a simple three-color coding, based on the relative value rating: red for highly productive, yellow for moderately productive and green for low productivity. The shoreline habitat inventory and classification is shown in Figure 5.

In 2002, Stewart Bulk Transfer Terminals Ltd applied to the District of Stewart and the DFO to enlarge their barge handling facilities on the west side of the boat harbor. This expansion was eventually dropped, perhaps due to the global economy.

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[8] "Bear River Gravel Project – Revised Project Description." Cambria Gordon Ltd for Glacier Aggregates Inc. p. 9. 2006.
[9] Noted on USGS map Ketchikan (D-1) as "Seal Rks." Source: The Soulé River Hydroelectric Project Preliminary Draft Environmental Assessment. Alaska Power & Telephone Co. February 2011.

As a result of a continuous and real threat of community flooding, the District assessed long-term alternatives for flood management. As a result, in the late 1990's, the District obtained a License of Occupation for the bed of the Bear River, downstream of the highway bridge, for the purpose of gravel removal. They also assessed options to manage the gravel extraction, and in the early 2000's sourced private companies that would be interested in developing a gravel extraction project with two primary objectives:

1. Reduce the flood threat to the community, and
2. Provide economic benefits for the community.

Glacier Aggregates Inc. responded to the District's Call for Proposals in 2003 and, as a result, is presently entering into arrangements for the Bear River bed License of Occupation, with the intent to extract gravel for sale to clients in the Pacific Rim.

In 2006, Glacier Aggregates Inc. proposed to develop the Bear River Gravel Project (BRGP), to the District of Stewart to alleviate the increasing threat of community flooding from the rising elevation of the Bear River, located immediately east of town. This rising elevation is attributed to aggradations of gravel in the lower 15 km (9.32 miles) of the river, which are transported down from the steep and narrow mountain passes. The BRGP would develop the gravel resource to reduce the flood risk and associated commercial and livelihood damages, while providing social and economic benefits to the community of Stewart.

The Soulé Project [the portion for this permitting, i.e. in Canada] is located within the intertidal and subtidal zones at the north end of the Portland Canal. The Portland Canal tidal exchange affects the water levels in the cable landing vicinity in Stewart's harbor.

VEGETATION: Stewart is located in the coastal western hemlock (CWH) biogeoclimatic zone, which is characteristically dominated by mature forests of western hemlock, amabilis fir, and western red cedar. Riparian zones along the river banks upstream of the Project area are a mix of coniferous and deciduous species, typical of vegetation found along the flood plains and valley bottoms in the region. There is no riparian zone however at the south end of the Stewart industrial causeway, which is a man-made riprap structure that has had sand and aggregate filling in around it from the Bear River.

WILDLIFE: The floor of the Bear River valley provides limited habitat and forage for ungulates and non-hibernating animals due to the significantly high snow loads and limited available habitat. Habitat is limited by the Portland Canal at the south end of the valley, the narrow valley floor, the steep mountains, and the restricted available travel corridor at the headwaters of the Bear River, which is bounded by a glacial lake, glacier, and steep mountains.

The only ungulate sightings within the Bear River valley are mountain goats, which remain in safe environments on the higher flanks of the mountains. Black and grizzly bears exist in the valley and black bear are commonly encountered along the paved

Industrial Route and within Stewart itself. Wolves have been known to enter the lower valley on rare occasions.

The valley supports common bird species typical of the CWH biogeoclimatic zone. Bald eagle populations are prevalent during salmon spawning periods, and the Stewart/Hyder estuaries are known to be used by migratory bird species on route to their seasonal destinations.

4.0 FIRST NATIONS SETTING & CONSULTATION

4.1 Nisga'a Nation

The Project is located within the geographical area identified in the Nisga'a Treaty as the *Nass Wildlife Area*, and the Bear River is identified in the list of *Streams in Nisga'a Angling Guide License*. A fee-simple property, approximately 20 ha (49.42 acres) in size and previously identified as IR 19, was converted to Category A fee-simple land under the Nisga'a Final Agreement and is owned by the Nisga'a Nation. This property is presently identified as Sgamagunt, or DL 7222 Coast District, and is located approximately 500 m (1,640 ft) upstream of the Project area, on the mountain slope on the east side of the Bear River. The property is not inhabited nor has any structures.

The Bear Glacier located approximately 30 km (18.64 miles) upstream of the Project is a provincial park, managed by the provincial government in consultation with the Nisga'a Lisims Government. The park is a place of Nisga'a cultural significance.

During the study phase [2007-2009] for the Soulé Project, the Federal Energy Regulatory Commission (FERC) sent consultation letters about the project to the Ketchikan Indian Community, the Organized Village of Saxman, the Metlakatla Indian Community, the Wrangell Cooperative Association, and the Nisga'a Lisims Government in British Columbia, in Government-to-Government consultation. In addition, John Autrey, Tongass National Forest Tribal Government Relations Specialist, supplied several names of local tribal members, to the Project archaeologist, who might have knowledge of use of the area; calls were made and messages left. In both cases, no responses were received.[10]

When a Draft License Application [DLA] and Preliminary Draft Environmental Assessment [PDEA] were sent to interested parties on February 1, 2011, for the Soulé River Hydroelectric Project, the following tribes were sent copies of these documents and comments were requested to be submitted by May 2, 2011.

Norman Arriola, Tribal President
Ketchikan Indian Community
2960 Tongass Ave.
Ketchikan, AK 99901

[10] Greiser, T. Weber. Associate Archaeologist, Historical Research Associates, Inc. Missoula, MT. 2009.

Lee Wallace, Tribal President
Organized Village of Saxman
Route 2, Box 2
Ketchikan, Alaska 99901

Wilma Stokes, Tribal President
Wrangell Cooperative Association
P.O. Box 1198
Wrangell, AK 99929

Karl Cook, Mayor
Metlakatla Indian Community
P.O. Box 8
Metlakatla, AK 99926

Nelson Leeson, President
Nisga'a Lisims Government
PO Box 231
2000 Lisims Drive
New Aiyansh, BC VOJ 1A0

The Nisga'a Lisims Government was the only Native organization to respond, which they did in a letter dated May 6, 2011. A complete copy of their letter is enclosed. Two concerns they had pertaining to the submarine cable, and therefore related to the project in Canadian waters were:

- "*In our opinion, the Proponent has not provided sufficient evidence to demonstrate that there will be no impact to fisheries from the laying of the submarine cable for the Proposed Project. We request that the Proponent conduct marine studies of the presence and distribution of marine fish and invertebrates. If such studies have been conducted, we request that this information be provided to us.*"
- "*We further note that the marine mammal section of the PDEA appears to be brief and dismissive of potential impacts of the Proposed Project on marine mammals. From our review of the PDEA, it appears that the field study conducted with respect to the Proposed Project did not include any systematic examination of the cable route for marine mammals. As well, there is no mention of the potential for underwater construction noise impacts on marine mammals. Given that construction in the marine environment has been included as a component of the Proposed Project, we request that an assessment of the underwater noise and entanglement issues as they pertain to marine mammals be undertaken. Any such assessment should take into consideration the extent to which the underwater noise from the Proposed Project will propagate to the surrounding marine environment at levels known or suspected to pose adverse effects to marine mammals.*"

4.2 Tsimshian Nation

Metlakatla and Lax Kw'alaams' are members of the Tsimshian Nation. Their Statement-of-Intent boundaries lie approximately 100 km (62.14 miles) south of the Project area near the mouth of Portland Canal. There are no identified Tsimshian Indian Reserves in or around the Project area.

No comments have been received by the Project from these Native organizations. To the Projects knowledge, no comments were received from these Native organizations by FERC either.

5.0 PROJECT IMPACTS

Existing Uses Project Impacts: The proposed Soulé Project submarine cable landing would have little effect upon any of the existing facilities or activities in the Stewart Harbor other than where the deep anchorage is located for ships waiting to access the Stewart Bulk Transfer facility. The submarine cable will traverse this area through the deepest channel and may require burying to prevent the potential for snagging by anchor. According to a 2007 NOAA map, Chart 17425, of Upper Portland Canal, this deep anchorage consists of depths ranging between 35-70 fathoms [or 64-128 meters].

With the cable making landfall at the south end of the causeway on the west side of Arrow Dock, in the industrial area, another potential impact is the removal of about 9.3 m^2 (100 ft^2) of the dock surface for use as the location of a buried splice vault. The splice vault is where the submarine cable would transition to a terrestrial power cable, taking away some parking at the end of the causeway. The splice vault would have a shed placed over it, making the total surface area removed from its existing use (parking) approximately 13 m^2 (139.93 ft^2 or about 0.003 acres = 0.001 ha). From the buried splice vault where the submarine cable will transition to a terrestrial cable, the cable will either be buried along the causeway road, or will be included on the existing overhead poles structures (or on new pole structures) running along the causeway. Using either method, the power cable would be buried at the Industrial Route (Bypass Route) at the south end of the airport. The Industrial Route is a paved community by-pass road for industrial traffic located on a portion of the dyke on the east side of Stewart. After clearing the takeoff and landing path at the south end of the airport with a buried transmission line, the Project would go to overhead structures, possibly using poles that currently existing along this road. No impacts should occur from the terrestrial portion of the transmission line, in part because the cable will be in existing disturbed environs where the Projects disturbance will be minimal in comparison and similar structures, i.e. overhead lines, are already in existence. Avian species will be familiar with the existing power pole locations and conductor between the poles, reducing the risk of introducing something new to the environment.

This Project will not displace existing uses or activities by its infrastructure.

Geomorphology Project Impacts: The proposed Soulé Project submarine cable landing would have minimal and temporary effects upon the geomorphology of the Portland Canal. The cable will be laid on the seabed of the canal, having minimal and temporary disturbance of the bottom sediment. Over time the cables weight will help bury it in bottom sediments and other sediment from the Upper Portland Canal drainages will continue to settle on the seabed to further bury the cable (four other rivers besides Soule River contribute sediment and bedload to the canal). Material will not be removed from the Portland Canal seabed until the deep water port anchorage at Stewart for a distance of approximately 1,500 m (4921 ft), where the excavated material from trenching in the cable will be used to backfill. Stewart Harbor will also have the cable trenched into the aggregate and sediment deposited from the Bear River for about 100 m (328 ft) to the south end of the Stewart causeway. For most or all of this 100 m section the cable will be enclosed in a conduit. The same material excavated would be placed over the cable, or the natural sediment deposition that is constantly occurring would be allowed to bury the cable over time.[11]

The river will continue to add material to the end of the causeway, further burying the cable. Limited and temporary impacts to the geomorphology of this area by burying the cable to the causeway could occur, but the cable would be buried with the same excavated material and conditions are in constant flux due to the continued aggregation and sedimentation of the area from the Bear River in particular and the other four rivers on the incoming tide.

Burying the submarine cable to the cable landing will have no long term impact on the geomorphology of the harbor because aggregate and sediment are continuously deposited at and around the causeway.

Aquatic Project Impacts: The Project footprint in the Portland Canal and the Stewart Harbor should only have a temporary and short-term impact to aquatic plants, fish, and marine mammals because:

- Aquatic plants are not likely to exist in the part of the harbor the Project will traverse through because of aggregate and sediment deposition from the Bear River that is constantly filling the harbor; at the end of a man-made structure, Arrow Dock and causeway.
- The bottom of the Portland Canal also receives significant sediment load from the Bear, Salmon, Marmot, Soule, and Davis rivers as well as other glacially fed drainages in Upper Portland Canal.
- With the submarine cable laid on the canal seabed, its weight will eventually help submerge it into the sea floor sediment; the cable would be approximately 23-28 cm (9-11 inches) in diameter with an internal armoring, making it relatively heavy.
- Over time the deposition of sediment from the Upper Portland Canal glacially fed drainages will also help to bury the cable.

[11] The Project makes the assumption that with the Bear, Salmon, Marmot, and Soule rivers all contributing sediment from glaciers in Upper Portland Canal, which is in part evidenced by the cloudy/milky conditions usually present in the canal throughout the warmer months, there is significant sediment disposition occurring to the canal seabed.

- Laying the cable on top of the seabed would provide the least disturbance to the seabed and to marine life in the canal (although any disturbance from laying the cable, i.e. burying or on top of seabed, will be short term and temporary, as once the cable is in place there is no noise because the activity has ceased).
- Will not affect wetland function of the Hyder or Stewart marshes because of the temporary nature of this activity; once the cable is in place there will be no potential to impact the marshes.

The project will not affect large-scale tidal flow in Stewart Harbor, nor impede fish passage because the cable will be buried under the harbor floor. Flood tide flows will be unchanged in the vicinity of the project because the project will not obstruct water movement.

Considered in the Soulé River Hydro Project Draft License Application and Preliminary Draft Environmental Assessment dated February 1, 2011, and mailed to the DFO, was to bury the cable, but further analysis indicates laying the cable on the seabed of the canal would be sufficient due to the cables weight, which will help to self-bury it along with the continued natural sediment deposition that will cover the cable over time.

Organisms that were either undamaged by the trenching or next to the impact area would resettle in or on the sediment. The area would be re-colonized by benthic organisms (Newell, et al. 1998), first by organisms with rapid reproduction and growth rates and later by longer-lived, slower growing and reproducing organisms. Marine benthic organisms are distributed by their pelagic larvae that enter their adult stage after settling on suitable substrate. This is expected within one reproductive season, which would occur within one month to one year (Newell, et al. 1998)[12] post construction. This will depend on the existing composition of the seabed, which will vary between mud, sediment, gravel, and bedrock; however, canal seabed recovery is expected to be rapid with currents redistributing sediments over disturbed areas. Return rates of groundfish that may have been displaced could be immediate. Overall, long-term impacts to benthic habitat from trenching and propeller wash would be ***low***.

Because the impact zone would be spread out over a 4.82 km (3 miles) strip (seabed within Canada) that is barely wider than the 23-28 cm (9-11 inches) cable rather than a single block of land, the potential for organisms to be within this corridor would be relatively low and the probability of impacting entire colonies of benthic organisms would be very low. This is a small area relative to the total expected benthic habitat within the canal and harbor. Overall, impacts to benthic species due to direct or incidental contact with the cable, cable-laying ship, or trenching equipment for the harbor would be ***low*** due to the small area of impact and low quality of the habitat.

Within a few hours of the cable being laid on the seabed and of the trenching activity at the deep water port anchorage at Stewart, mobile benthic scavenger species such as crab

[12] The Newell, et al. 1998 document is in the enclosures.

and shrimp would typically migrate to the impact area to feed on benthic organisms that have been killed or injured.

Bottom fish, such as halibut, and other fish species such as salmon could be temporarily displaced by the cable laying and deep water anchorage trenching activity; however, fish would most likely just avoid the activity until it passes before moving back through that area. In addition, due to the short duration of the cable laying activity, fish species movement should only be interrupted or displaced over a few hours at most. Fish will be able to move freely around project activity because of the width of the canal and Stewart Harbor, providing plenty of passage capacity. The construction activities would not affect any known fish spawning areas. This is a very short term impact; there should be no long term impacts.

Marine mammals such as whales, seals, and harbor porpoises could be in the area during the cable laying activity. Noise from the cable laying activity would consist of the ship propulsion and a small boat with its propulsion. A small submersible, remote control camera may also be used to view the seabed to make sure the cable is not bridged from a cliff or over an obstacle that would place additional stress on the cable. The submersible would add an additional noise source to this activity. The sound of ships and other various sized watercraft are common to these marine waters because of the existing boat traffic, including ships, to and from Hyder and Stewart. This onetime event to lay the cable is unlikely to add additional stress to marine mammals or be inconsistent with the existing background noise. There is no reason to assume that the marine mammals will not avoid boat activity related to laying the cable as they normally avoid boat activity in this area. In addition, the submarine cable will be approximately 23-28 cm (9-11 inches) thick. This will be a single cable, not multiple. There will be no possibility of marine mammals getting entangled in the submarine cable.

Open water fish and marine mammals would most likely hear or feel the vibrations of the ship and equipment and would leave or avoid the area. There is a slight potential for fish or a marine mammal to be incidentally hit by the ship, or to collide with the cable, or to be struck by trenching equipment (at the harbor) or the cable. However, considering how slow the ship will be moving and the mobility of fish and marine mammals in general, collisions are considered to be unlikely, so that the probability is low.

Overall, because the ship and trenching equipment would be moving slowly, because most fish and mammals would leave the general area of noise and vibration, it is unlikely that fish or marine mammals would incidentally be struck by the cable lay-operations. Impacts would be ***low***.

The Project footprint in the Portland Canal and the Stewart Harbor should only have a temporary and minimal impact to fish and marine mammals from sediment stirred up by the burying of the cable at the deep anchorage used by ships waiting to enter the SBT facility near the entrance to the harbor. Due to the proximity of the Bear River, i.e. in its direct path, any suspended sediment raised by the burial of the cable will be dispersed into the Portland Canal. Tidal flood or ebb would also have some impact on the direction of suspended sediment. There is very little that can be done to eliminate the suspended sediment from occurring in this environment; no way to reduce suspended sediment.

Due to the heavy aggregate load the Bear River has, the area the cable will be buried in may have a combination of both, which may reduce the amount of suspended sediment. A survey of this route will need to be completed to determine its true composition before burying the cable. Due to the glacial flour found in Upper Portland Canal drainages, the small amount of suspended sediment from burying the cable is not likely to neither be visible at the surface nor harm fish and marine mammals, or any other aquatic species. Benthic organisms in the harbor could be impacted in this narrow swath of about 1.0 m wide for approximately <1600 m (<5,249 ft) in length. But this would only be a small part of the existing habitat.

Impacts to the existing marshes around the harbor are also expected to be minimal because the amount of sediment stirred up is not expected to be significant and the river and tidal currents will widely disperse the sediment. Existing marine conditions also have glacial flour and sediment present from the various drainages around Upper Portland Canal.

The area the submarine cable would be located in, as previously surveyed for the proposed Stewart bulk terminal facility expansion and the Bear River Gravel Project, is considered to be “Low Productivity Habitat.” It is important for the cable to be buried to avoid anchors to protect the Project infrastructure. A timing window for this aquatic work may be needed to avoid interfering with critical fish life stages in the harbor area.

The length of time cable laying activity would take place would be very short; coming from the Project site at the Soulé River, the cable should be laid within 3 days. Timing for this activity would be during the summer months, i.e. June – September, in order to take advantage of good weather for smooth seas. Upper Portland Canal is included in the DFO’s Area 3 – Lower Nass. In regards to a “window” for in-water work, the DFO website identifies the summer as a period that has no specific window. Because installation of the cable would be best between June and September due to good weather, we request that the DFO evaluate when sensitive life stages for different fish species occur to help us find the best “window” for our activity. This will help us assess the potential impacts. The shoreline at the cable landing is considered “Low Productivity Habitat” according to two previous environmental reviews conducted in the Stewart Harbor and Bear River mouth. Because of the constant bedload of the Bear River expanding out into the Portland Canal and into Stewart Harbor, we agree with that analysis and therefore impacts should be minimal from the installation of the cable. A window for avoiding any critical fish life stages will contribute to minimizing potential impacts.

The submarine cable is unlikely to impact riparian or important intertidal habitat due to the low quality of the habitat present or their lack of presence. Overall, impacts from laying (motion and noise) and burying the cable, which may cause some suspended sediment, should be minimal to fish and marine mammals because:

1. They should avoid the temporary activity of laying the cable; natural or learned behavior to avoid movement and objects in the water
2. The amount of temporary suspended sediment from trenching the cable into the intertidal zone to the causeway, requires the trenching and infilling of approximately 83.6 m^3 (109 cu yd)[13] of intertidal habitat classified as low productive (green-coded) habitat that is primarily aggregate and sediment. Additional trenching and backfilling approximately 1,254 m^3 (44,289 ft^3 = 1,640 yd^3 = 1,254 m^3) of subtidal habitat (excavation = existing aggregate and sediment substrate) (infilling = submarine cable and excavated material) through the deep water anchorage (1986 survey showed 37 fathoms) used by ships waiting to enter the SBT facility would also occur. Although this is nearly 1.6 km (1 mile) in length, with the amount of aggregate and sediment that is deposited by the Bear River annually, this likely makes the area poor habitat as well. Therefore, no significant impacts are expected.
3. This temporary suspended sediment should be flushed out of the area (due to Bear River flow) into the Portland Canal where it will dispersed into the rest of the sediment and glacial flour laden waters of the canal (this is due to the many glacially fed tributaries that enter the area)
4. The seal haulout approximately 14.5 km (9 miles) south of Stewart on the Portland Canal is the only known sensitive habitat for marine mammals in the area; which should not be significantly impacted due to temporary suspended sediment from burying the cable in Stewart Harbor; marine mammals will avoid this temporary activity as well as the sediment will disperse in the canal and eventually settle out onto the canal floor with depths up to 150 fathoms (274 m or 900 ft).
5. The habitat the cable would be buried in, in Stewart Harbor, is considered "Low Productivity Habitat."[14] See Figure 4.

For these reasons, we do not believe aquatic plants, biotic organisms, fish, or marine mammals will be significantly impacted by the activity of laying this cable.

Accidental petroleum spills

Water quality that has been impacted from any accidental oil or fuel spills during construction could cause morbidity or mortality of marine biota, including fish, invertebrates, and seabirds, through direct contact or ingestion of the material. Oil can smother aquatic organisms depriving them of oxygen. Sea birds' insulating feathers and marine mammals' fur can be infiltrated with oil, causing them to die from hypothermia or to sink. Because it is expected that water quality impacts due to accidental oil or fuel spills would be low (relatively small amounts of fuel oil would be carried on ships, and

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[13] Formula: 3 ft deep x 3 ft wide x 328 ft long = 2,952 ft^3 = 109.33 yd^3 = 83.59 m^3
[14] "Bear River Gravel Project – Revised Project Description." Cambria Gordon Ltd for Glacier Aggregates Inc. 2006.

spill plans would be implemented), the potential impact to marine species by oil or fuel spills would also be ***low***.

Electromagnetic Fields (EMF)

Quote from National Marine Fisheries Service (NMFS) May 5, 2011, letter to AP&T: "*The Aquatic Resources report discusses the potential for the submarine transmission cable to create and* (sic) *electromagnetic field (EMF) and concludes that the cable burial would prevent significant EMF impacts on fisheries or other aquatic resources. Power transmission cables can transmit both an electric or E-field and a magnetic or B-field. Unlike magnetic fields which can penetrate most substances, electric fields cand* (sic) *be blocked by conducting materials, such as the insulation and sheathing that the proposed cable would incorporate. Thus the E-fields can be contained within a properly installed, grounded cable. Depending on the amount of current carried by the line, a B-field greater than the earth's magnetic field (e.g.,50 microtesla) may extend in all directions a short distance from the cable and into the marine environment. This B-field can, in turn, interact with ocean currents or the movements of living organisms to induce a secondary electric field (iE-field). Burial cannot block these fields, which can extend a short distance from the cable (up to 5 five* (sic) *meters) but does provide an additional buffer (CMACS 2003). NMFS recommends the applicant assess both the E-field and B-fields of the proposed submarine cable and the likely effects of these fields on migrating marine and anadromous fish and marine mammals using the best available science from the large body of recent research on the effects of EMF on marine ecosystems and biota. To date, most studies have focused on the effects of EMF exposure on elasmobranchs, electro-sensitive marine fish that rely, at least in part, on the earth's magnetic field for navigation and prey detection of iE-fields.*"[15]

One concern about submarine power cables, as expressed above, is the occurrence of electromagnetic fields and their potential impact on aquatic species. Magnetic fields are generated by flow of current and increase in strength as current increases. Since the voltage on a power line remains more or less constant with time, changes to the power or load will result in changes to the current, and hence the magnetic field.

An electromagnetic field (EMF) is a physical field produced by electrically charged objects. It affects the behavior of charged objects in the vicinity of the field. The EMF extends indefinitely throughout space and describes the electromagnetic interaction. It is one of the four fundamental forces of nature (the others are gravitation, the weak nuclear interaction, and the strong nuclear interaction).

The field can be viewed as the combination of an electric field and a magnetic field. The electric field is produced by stationary charges, and the magnetic field by moving charges (currents); these two are often described as the sources of the field. The way in which

[15] NMFS comment letter on Draft License Application and Preliminary Draft EA. P. 2. May 5, 2011.

charges and currents interact with the electromagnetic field is described by Maxwell's equations and the Lorentz force law.[16]

"*The occurrence of directly generated electric fields can be controlled by application of metal shields (steel plates, sheaths within the cable insulating the conductor etc.), those of magnetic fields (and consequently of indirectly generated electric fields) by neutralisation using appropriate conductor / cable placement patterns and/or configuration geometry. For example, when using two separate single-conductor cables, they should be buried in the seabed parallel to and at the shortest distance possible from each other, so that the (electro) magnetic fields would neutralise each other as far as possible. In a two-conductor cable this neutralisation reaches ideally 100 % when using a coaxial-design. In addition, here the two conductors lie within a common shield. With perfect shielding a cable does not directly generate an electric field outside the cable, however, as already mentioned an electric field is also induced by the presence of the magnetic field in the vicinity of the cable (Kramer 2000, CMACS 2003).*

"*For three-phase AC transmission the same options as for DC transmission exist: either a three-conductor cable solution or three single conductor cables can be considered (Deutsche WindGuard GmbH 2005). In a three-conductor cable each conductor is insulated separately, with the metal shield and outer insulation covering all three conductors in one. The electromagnetic field of the three conductors is almost neutralized at the surface of the cable, since the sum of the voltages and currents of the three phases is zero at any one time. Using three single conductor cables again they have to be installed as close as possible and parallel to each other to achieve sufficient field compensation.*" [17] A copy of the report from the OSPAR Commission is enclosed.

"*Magnetic fields generated by power lines decrease with distance and this happens more quickly when the individual wires are closely spaced, either in a bundled overhead cable or when buried. Where the wires are close together, the magnetic fields from electric currents flowing in opposite directions cancel more completely. Overhead and underground power lines will often produce similar levels of magnetic fields on nearby streets and paths. In some cases the fields from underground cables may be greater. Underground power lines will usually produce lower fields at the distance of nearby houses.*"[18]

The above excepts from published articles indicates that two or more power cables either laid close to each other or wrapped within the same armoring will cancel out the EMF from each other.

EMF and Marine Organisms

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[16] Electromagntic Field, Wikipedia. http://en.wikipedia.org/wiki/Electromagnetic_field

[17] OSPAR Commission, 2008. Background Document on potential problems associated with power cables other than those for oil and gas activities. p. 25-26.

[18] ARPANA (Australian Radiation Protection and Nuclear Safety Agency) – Magnetic & Electric Fields from Power Lines. August 13, 2009. http://www.arpansa.gov.au/radiationprotection/factsheets/is_emf.cfm

“*The electricity produced by offshore wind turbines is transmitted by cables over long distances. The electric current generated produces magnetic fields. Studies of possible effects of artificial static magnetic fields have been carried out on various species under various experimental conditions. Artificial electromagnetic fields could interact with marine organisms to produce detectable changes. Usually, however, only very slight differences in control groups have been recorded.*”

“*The magnetic field may affect mollusks, crustaceans, fish and marine mammals that use the earth's magnetic field for orientation during navigation. But it is still unknown whether the magnetic fields associated with wind turbines influence marine organisms (Gill, 2005).*

“*Elasmobranches, one of the more electro-sensitive species, are attracted by electrical fields in the range of 0.005-1 μV cm1 and avoid fields over 10 μV cm1.*”

“*Electro-sensitive species could be attracted or repelled by the electrical fields generated by submarine cables. Special attention must be paid in areas of breeding, feeding or nursing because of the congregation or dispersion of sensitive individuals in the benthic community (Gill, 2005).*

“*Experimental analysis on several benthic organisms exposed to static magnetic fields of 3.7 mT for several weeks have shown no differences in survival between experimental and control populations. Similarly, mussels living under these static magnetic field conditions for three months during the reproductive period do not present significant differences with the control group. The conclusions are that static magnetic fields of power cable transmissions don't seem to influence the orientation, movement or physiology of the tested benthic organisms (Koeller et al, 2006).*

“*The results from the study carried out on Nysted about the influence of electromagnetic fields on fish are not conclusive. Some impact on fish behaviour has been recorded, but it was not possible to establish any correlation. There is not enough knowledge about this topic and additional research is needed (DEA, 2006).*

“*The magnetic fields of both types of cable (bipolar and concentric) used in marine wind farms, are small or zero. The Greenpeace study mentioned earlier concludes that the electromagnetic fields of submarine cables have no significant impacts on the marine environment (Greenpeace, 2005). Studies with a long-term perspective are necessary to confirm the negligible impact of electromagnetic fields of wind energy on marine ecosystems (Koeller et al, 2006).*”[19]

“*According to Compagno (1984), the distribution of the great white shark extends to the western end of the Kenai Peninsula. Several sightings have been reported in Southeast*

[19] Wind Energy, The Facts. Electromagnetic Fields and Marine Organisms. European Wind Energy Association. http://wind-energy-the-facts.org/en/environment/chapter-2-environmental-impacts/electromagnetic-fields-and-marine-organisms.html

Alaska over the past 50 years, but this species apparently only ventures into Alaska waters during years of abnormally high sea surface temperatures."[20]

In conclusion, *Elasmobranches* (i.e. sharks, stingrays, etc) may not occur in any abundance in the Portland Canal and the canal is very deep (varies from 150 fathoms, or 274 m, or 900 ft at the Soule River end to approximately 30 fathoms, or 58 m, or 190 ft at the deep anchorage in Stewart Harbor) and wide (varies from 3.22 km, or 2 miles at the Soule River end to approximately 1.61 km, or 1 mile at the deep anchorage in Stewart Harbor), allowing for significant capacity for elasmobranches to pass by unharmed. Therefore, the Projects submarine cable would have little impact, other than to cause avoidance from motion and sound, upon this species while the cable is being laid. The EMF of the submarine cable, according to the published literature, will cancel itself out if there are two or more cables close together. Based on this information, we believe little or no effect to marine mammals and fish will occur from the projects submarine cable.

<u>Vegetation Project Impacts:</u> The Project footprint is void of terrestrial vegetation and most likely sessile aquatic vegetation because of the sediment and aggregate that comes down the Bear River, which has degraded aquatic habitat at its mouth while creating habitat from the settling out of sediment in the harbor, i.e. mudflats and marsh. The proposed land based infrastructure will be located on the existing industrial area known as Arrow Dock and the log transfer facility, which are mostly void of vegetation. The Projects infrastructure would only be in open areas on the causeway. Additional infrastructure will be within the dike road right-of-way around the airport to the BC Hydro substation, possibly using the existing wood pole infrastructure to string the Projects conductor on. There should be only minimal vegetation disturbance along the right-of-way if maintenance of the power line corridor is needed. Brushing is normally needed on a regular basis along power line corridors.

No riparian habitat is present at the cable landing location, so no revegetation should be necessary. However, measures to control erosion from excavation of the causeway will be implemented, i.e. silt fencing around any spoils pile. Due to the disposition from the Bear River, it is unlikely that aquatic plants exist at the south end of the causeway because they would be quickly buried. Impacts to aquatic plants should be minimal to nonexistent and terrestrial plants would only have minor impacts from brush in the existing right-of-way.

<u>Wildlife Project Impacts:</u>

In regards to terrestrial wildlife species, Project activity and infrastructure will occur on man-made fill and clearings, i.e. the Industrial Route around Stewart, and the causeway built out into the Bear River mouth and Stewart Harbor. Any overhead power line, either on the causeway or along the "Industrial Route" around the Stewart Airport will be configured for avian protection by keeping conductors spaced per regulations and using the existing power line corridor. Existing overhead power lines will be either adjacent to the Projects power line, or the existing poles will be used to hang the Projects power line. This will keep man-made structures within the same corridor with similar configurations,

[20] *Field Guide to Sharks, Skates, and Ratfish of Alaska, p. 37. 2007.* **ISBN:** 978-1-56612-113-2

as presently exists, reducing the potential to impact avian species who are already familiar with the location of these potential obstructions, reducing the chances of strikes or electrocutions. Some portions of the power line will be buried in existing power line right-of-ways or access road right-of-ways. Impacts would be temporary for wildlife from the noise of any installation, but long term impacts should be negligible.

First Nation Concerns

The Nisga'a Lisims Government raised concerns regarding the submarine cable and its potential impacts on marine fish and invertebrates.

The issue of the potential impacts from the submarine cable on marine life is addressed above in the Aquatic Impacts section. However, in summary, the EMF of two or more cables either laid side-by-side or wrapped in the same armoring will cancel the EMF out to about the distance of the armor and outer sheathing. Marine mammals and fish will avoid the cable laying activity, which will be moving slowly, but take very little time to traverse the cable route.

To answer their specific questions:

- Noise – With the cable laid on the ocean floor, rather than buried, there will be little-to-no noise from the cable laying activity other than the sound from the slow moving ship spooling out the cable and a smaller boat using a submersible, remote camera to see what the cable is laying on to avoid geographic features such as cliffs, large boulders, etc. These are temporary noises for the few days it will take to lay the cable to Stewart. Boat activity is common in Upper Portland Canal so that the noise from laying the cable will be within the normal range of existing noise.
- Entanglement – The cable will be approximately 23-28 cm (9-11 inches) in diameter with an internal armoring, making it relatively heavy. In addition, the cable will partially bury itself in the ocean floor sediments as it lies on the bottom from its own weight. Additional sediment deposits over time will continue to bury the cable. Entanglement by marine mammals or other aquatic species is unlikely to occur, even during deployment due to the cables size and singular nature, i.e. just one cable.

The Soule River Hydroelectric Project submarine cable, cable landing, and transmission line will have no significant impact to existing uses in the Stewart Harbor and industrial area.

6.0 ENVIRONMENTAL PROTECTION MEASURES

	Impact	Mitigation
Existing uses	Deep water anchorage for SBT ships	Bury submarine cable through this area; continued deposition by river will help further bury the cable; Coast Guard would be notified of cable location for future navigational charts

	Strikes or electrocutions by avian species from the overhead transmission line	Use existing poles, or replace in same location with new poles for transmission line because avian species are use to these features, including their location and elevation. Use avian protection design for power pole conductor spacing.
Geomorphology	Burying cable through harbor floor: at the end of the causeway the harbor floor is in constant change due to deposition from the river.	No mitigation is necessary as impacts are only slight and temporary. Tidal flow will not be inhibited nor will habitat be impacted. If any material (e.g., rock, cobble, woody material) is moved to place the cable on the bottom, it should be relocated to a similar depth within the water body in close proximity to its original location.
Aquatic	Construction noise: Noise from laying the submarine cable in the Portland Canal will consist of the ship propulsion and a small boat and its propulsion	Noise from laying the submarine cable will be of short duration and will be similar or the same as existing noise in the canal because of current boat and ship traffic, including tug boats pulling log booms down the canal.
	Riparian habitat	No aquatic plants or shoreline plants are expected to be impacted by the submarine cable in Canadian waters because of the existing cloudy/sediment laden appearance which likely prevents photosynthesis along the canal seabed. In addition, because of aggregate and sediment deposition from the Bear River and other drainages and because the Project does not pass through any riparian habitat (man-made Arrow Dock and causeway have only low quality fish habitat and no riparian habitat where the cable will come in), there is no riparian habitat impacts to mitigate. Use existing trails, roads, or cut lines wherever possible to avoid disturbance to any riparian vegetation. During dry land trenching, stockpile the material that is moved from the bank of the water body (below the **HWM**) and return it to its original location once the cable is installed. Restore the original contour, gradient and bottom of the water body, bank and shore. Allow sediment to fully settle inside any isolated area before removing sediment and erosion control measures.
	Marine mammals	An observer will be watching ahead of the ship for marine mammals during cable laying operations so that they can be avoided or operations can cease till they pass. If marine

		mammals are sighted, the small boat will keep the required NMFS distance. The slow moving ship will maintain its position; there is no reason to assume that the whale will not naturally avoid the ship.
	Fish species	A timing window for this aquatic work may be needed to avoid interfering with critical fish life stages in the harbor area.
	Entanglement	No mitigation is necessary because the single 23-28 cm (9-11 inches) thick submarine cable will not cause entanglement.
	EMF	No mitigation necessary because having side-by-side cables or three cables enclosed in the same armor and sheathing reduces the EMF to just about the distance of the sheathing due to the current in each cable cancelling the others EMF out.
	Fuel and Oil Spills	Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks, invasive species and noxious weeds. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
Vegetation	Terrestrial vegetation loss	No mitigation because no sensitive terrestrial habitat will be impacted. Only brush trimming is likely to occur along the transmission line route.
Wildlife	Overhead wood poles	Placing conductor on existing overhead structures or on new overhead structures next to the existing overhead structures will significantly reduce the potential for avian strikes because avian species will be use to their presence in those locations. The avian protection configuration of the conductor placed on the overhead structures will also be followed.
	Avian corridor at south end of airport	This open area, which could be an avian flight path, will have the cable buried for approximately 100 m, until the existing overhead structures are reached where the Projects cable will go overhead as well.
First Nation	Submarine cable impacts on aquatic life	As mentioned under Aquatic above, boat or ship propulsion noise is common to the canal. T

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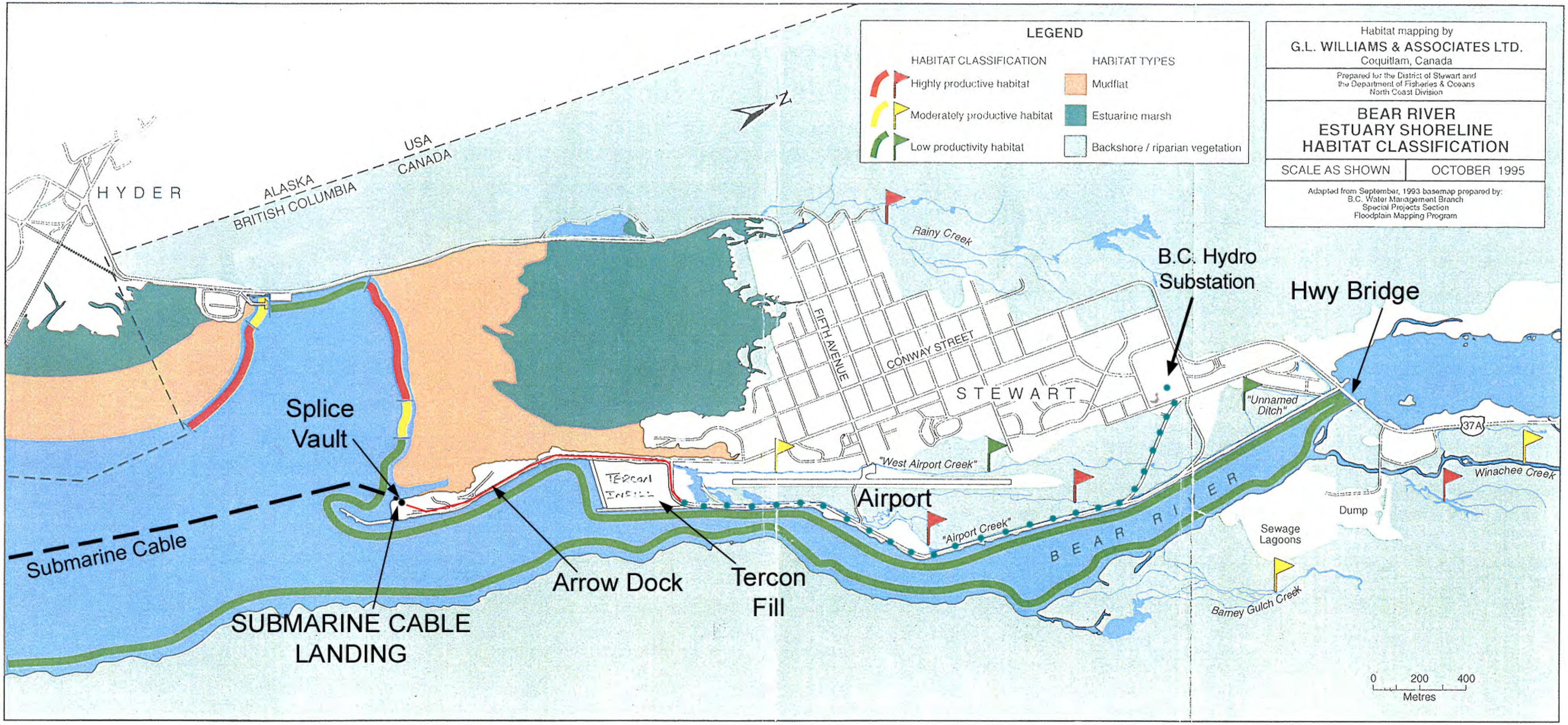
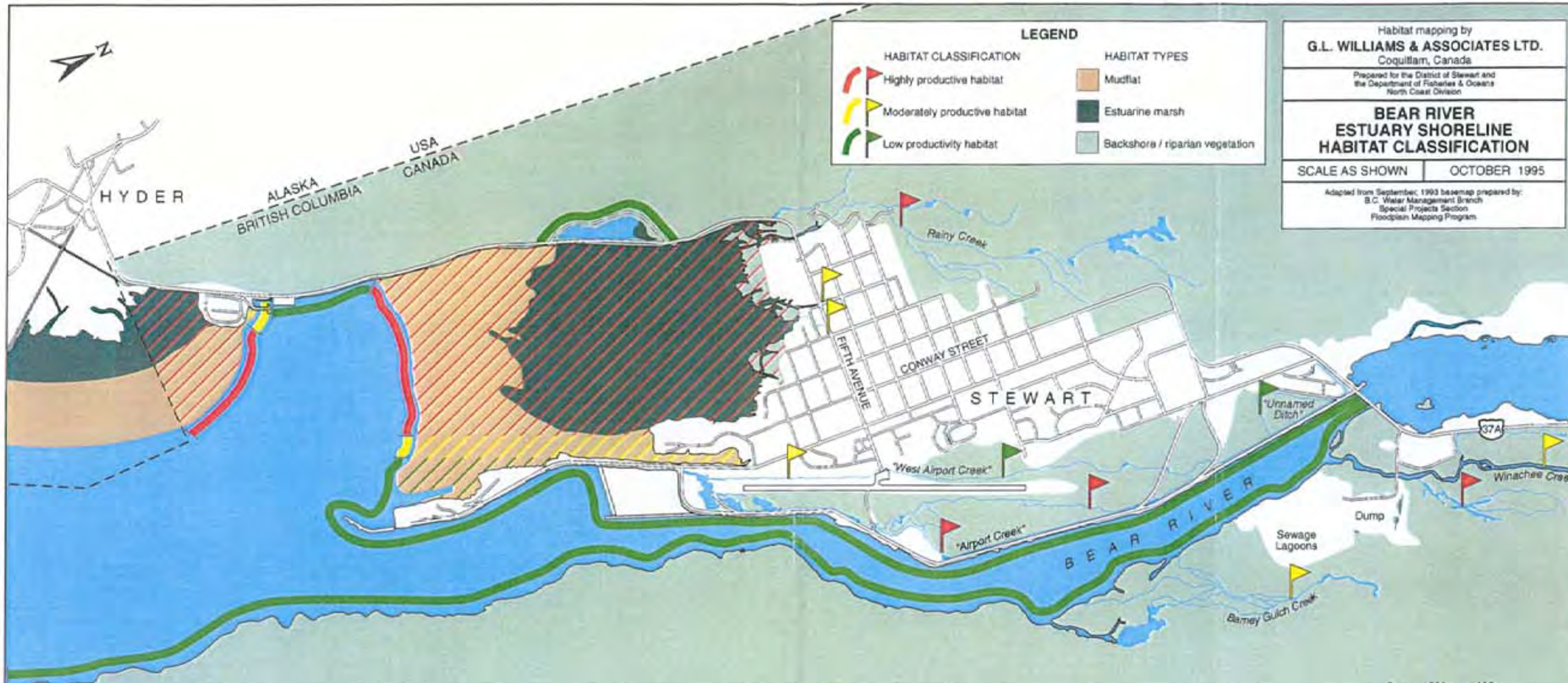


LEGEND

- - - - Submarine Cable Route
—— Buried Transmission Line
• • • • Overhead Transmission Line

SOULE RIVER HYDROELECTRIC PROJECT
FERC PROJECT NO. 13528 & 12615

Submarine Cable Landing
Aquatic Habitat Classifications



Bear River estuary habitat classification.

HABITAT ECOLOGY OF THE BEAR RIVER ESTUARY

The Bear River estuary provides productive habitats for fish, waterfowl and wildlife. Fish stocks include chum and coho salmon from the Bear River and Rainey Creek, as well as the Salmon River in Alaska. Pacific herring, aulachon and Dungeness crabs are other fisheries species that use the estuary during part of their life cycle. Wildlife which may use the estuary include small mammals such as raccoon, mink, otter, and larger animals such as black and grizzley bears. Important waterfowl include ducks (e.g. mallards and red-breasted mergansers), Canada geese, and trumpeter swans. The following summaries provide a brief description of the habitats in the Bear River estuary and their ecological importance.

MARSH

The intertidal marshes found in the Bear River estuary above mean sea level are dominated by sedge (*Carex lyngbyei*), specialized grasses that are able to withstand daily submergence during high tides. These intertidal marshes are one of the most productive natural habitats in North America. They produce large amounts of plant material whcih provide the basis for a complex food chain that includes numerous species of invertebrates that colonize the marsh or sediments. Peak production in the marsh occurs in late summer and the plants spend the cold winter months as over-wintering shoots which remain dormant until warmer temperatures arrive in the spring.

Typical species which depend on the marsh or the nutrients it provides as the organic matter is decomposed include several species of worms that live in the soil, insect larvae, smails, clams, and numerous small crustaceans (e.g. harpacticoid copepods). The latter are important food for juvenile chum salmon. Larger animals include crabs, clams and numerous species of fish other than salmon (e.g. starry flounder, sculpins, and threespine stickleback). Of particular importants to fish are the tidal channels which retain water during low tides. The tidal channels also serve as arteries to the marsh, channeling fresh, oxygenated water into the marsh and concentrating fish food organisms and nutrients during falling tides.

MUDFLAT

The large expanses of unvegetated mud in the Bear River estuary located below mean sea level to the low water line are termed mudflats. The fine mud sediments and frequent inputs of nutrients from the marsh during falling tides and marine waters during flood tides make mudflats very productive habitats as well. Important animal residents include many burrowing invertebrates such as numerous worms, clams, insect larvae and other animals that provide food for fish and waterfowl. The surface of the mudflat also supports a film of algae and diatoms which in turn provides food for other animals such as harpacticoid copepods and insects. As with marshes, these animals are preyed upon by fish and waterfowl. Generally the mudflats are located at too low an elevation to support marsh plants, although patches of ditch grass (*Rupple*) do colonize the mudflat.

RIPARIAN AND BACKSHORE VEGETATION

The trees and shrubs growing along the banks of streams are termed riparian vegetation. When growing along the beach or adjacent marine waters, they are referred to as backshore vegetation. The dominant tree and shrubs along the lower Bear River within the estuary are cottonwood, red alder, willow, sweet gale(?) and Sitka spruce. Within the Bear River estuary, backshore vegetation includes shrubs such as sweet gale and red-otier dogwood, and several species of grass and large herbs such as cow parsnip.

Upland vegetation is important because it provides shelter and cover for juvenile fish, especially juvenile coho and chum salmon. Trees and shrubs provide an effective buffer between human upland activities and natural wildlife habitats. The leaves from trees and shrubs provide organic inputs to the water, as well as insects. These inputs provide nutrients and food for fish and fish food invertebrates living along the shoreline.

Upland vegetation also provides cover for animals (e.g. beaver, otters, raccoons) and birds. Small birds such as songbirds may nest along stream-side shrubs and trees, whilc larger trees may provide nesting sites for birds of prey such as eagles, as well as other birds such as woodpeckers and great blue herons.

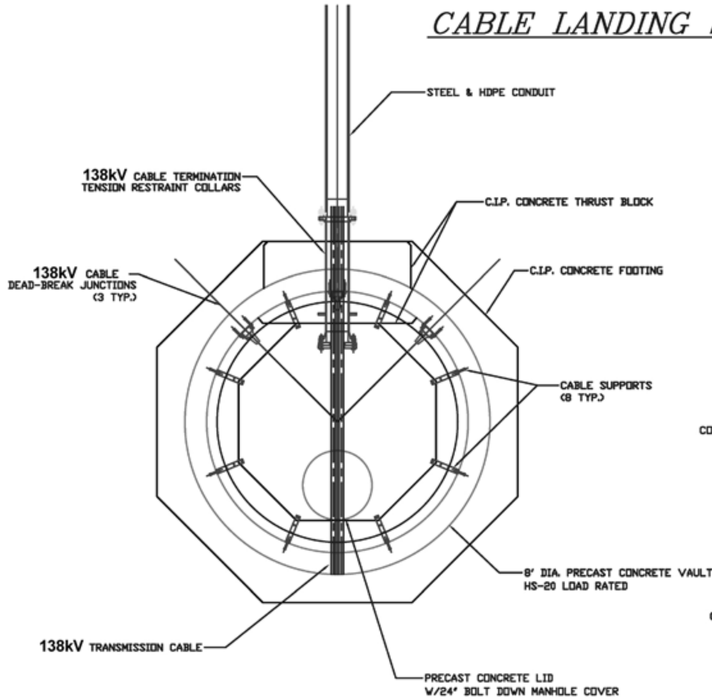
SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

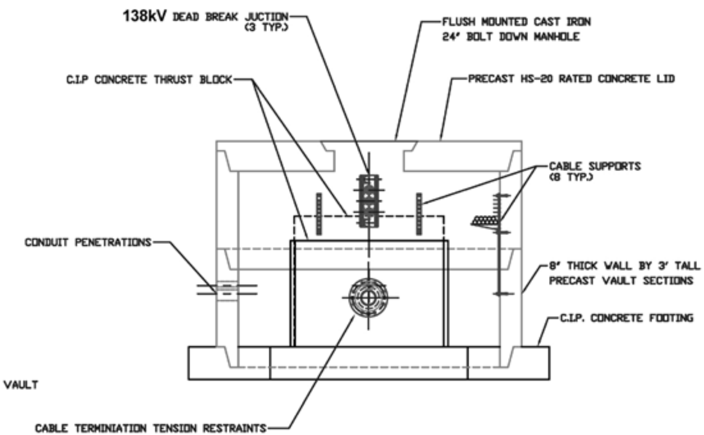
APPENDIX F

CABLE SPLICE-VAULT DIAGRAM

CABLE LANDING SPLICE VAULTS



CABLE VAULT PLAN VIEW



CABLE VAULT SECTION VIEW

FIGURE : CABLE SPLICE VAULTS

REV	DESCRIPTION	AUTH	REV BY	DATE
A	DOT PERMIT APPLICATION	MER		30Apr98

NOTICE

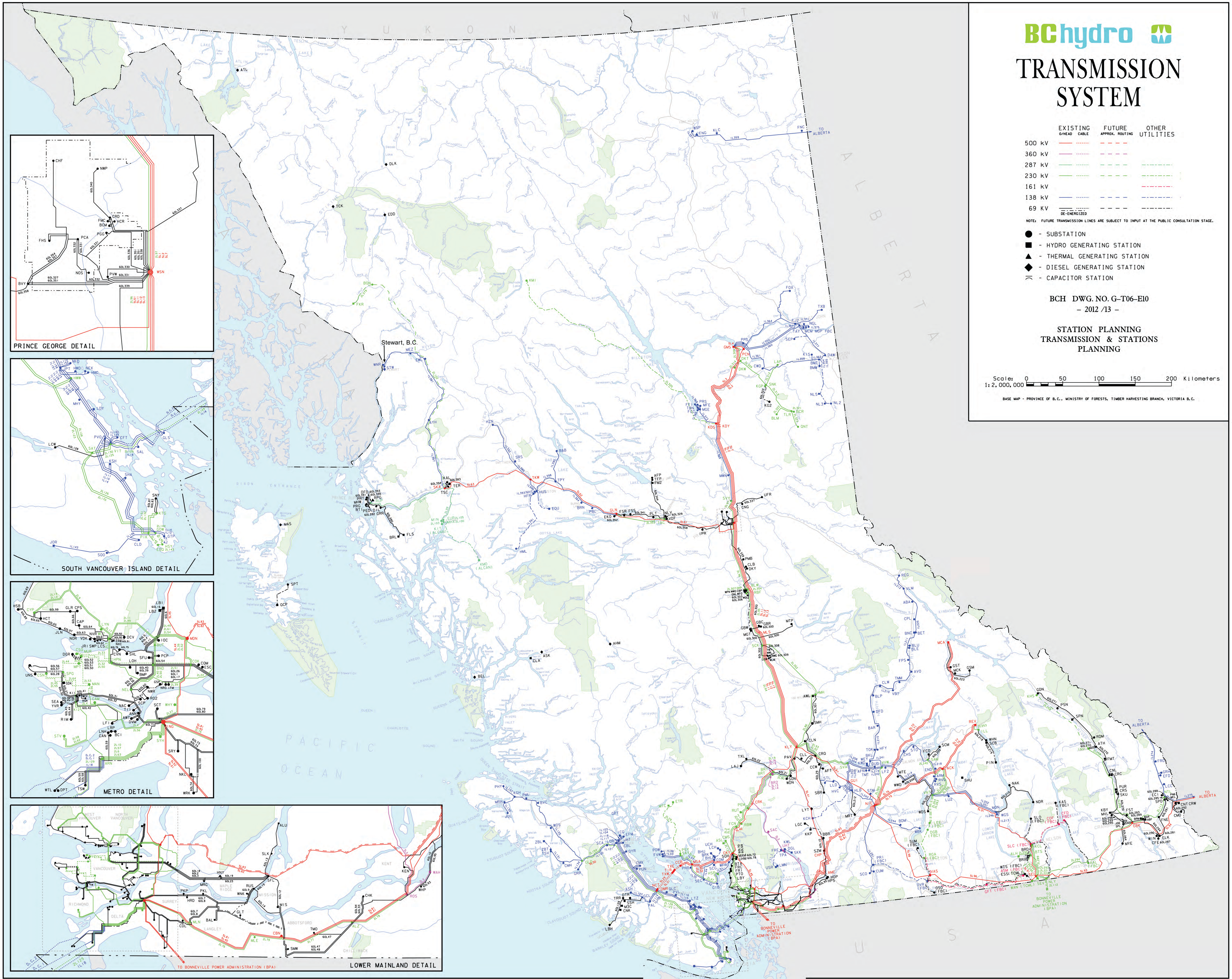
ENGINEER		DESCRIPTION: OUTLINE DIAGRAM GENERAL LANDFALL CABLE VAULT INSTALLATION PLAN	JOB DWG. NO. FIGURE 9
DRAWN			SH1/2
CHECKED		PROJECT: SUBMARINE CABLE PROJECT	FILE NO.
RECORDED			
SCALE			

SOULE RIVER HYDROELECTRIC PROJECT

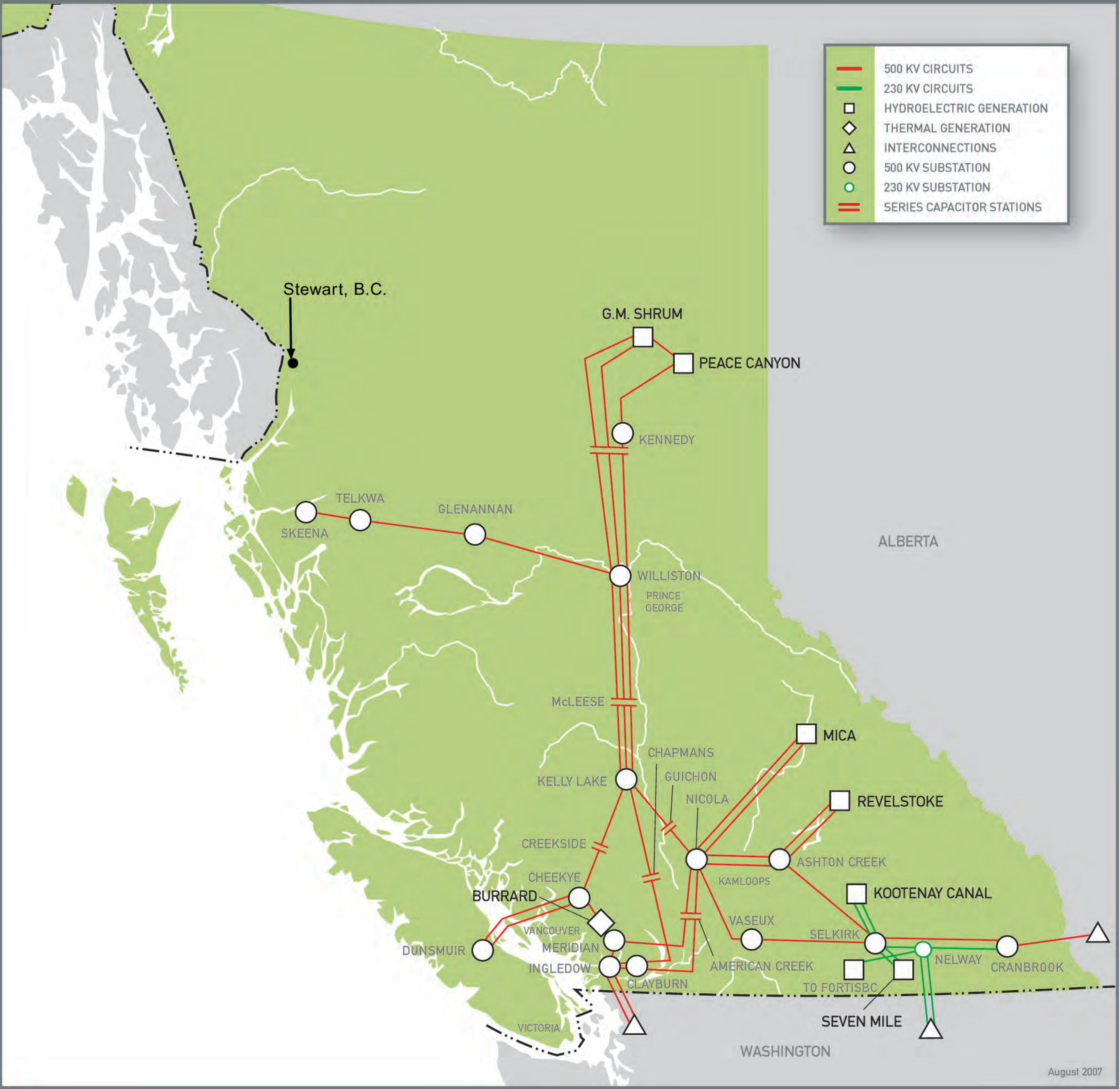
PRESIDENTIAL PERMIT APPLICATION

APPENDIX G

BC HYDRO
TRANSMISSION SYSTEM MAPS


BChydro
TRANSMISSION SYSTEM
EXISTING O/HEAD CABLE
FUTURE APPROX. ROUTING
OTHER UTILITIES
500 kV
360 kV
287 kV
230 kV
161 kV
138 kV
69 KV
DE-ENERGIZED
NOTE: FUTURE TRANSMISSION LINES ARE SUBJECT TO INPUT AT THE PUBLIC CONSULTATION STAGE.
- SUBSTATION
- HYDRO GENERATING STATION
- THERMAL GENERATING STATION
- DIESEL GENERATING STATION
- CAPACITOR STATION
BCH DWG. NO. G-T06-E10
– 2012 /13 –
STATION PLANNING
TRANSMISSION & STATIONS
PLANNING
Scale: 1: 2,000,000
0 50 100 150 200 Kilometers
BASE MAP - PROVINCE OF B.C., MINISTRY OF FORESTS, TIMBER HARVESTING BRANCH, VICTORIA B.C.
Y U K O N
N W T
A L B E R T A
U S A
PACIFIC OCEAN
Stewart, B.C.
PRINCE GEORGE DETAIL
SOUTH VANCOUVER ISLAND DETAIL
METRO DETAIL
LOWER MAINLAND DETAIL
TO BONNEVILLE POWER ADMINISTRATION (BPA)
TO ALBERTA

BC Bulk Transmission System



BC HYDRO - Northern Region Transmission

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX H

BCTC TRANSMISSION FEASIBILITY ANALYSIS

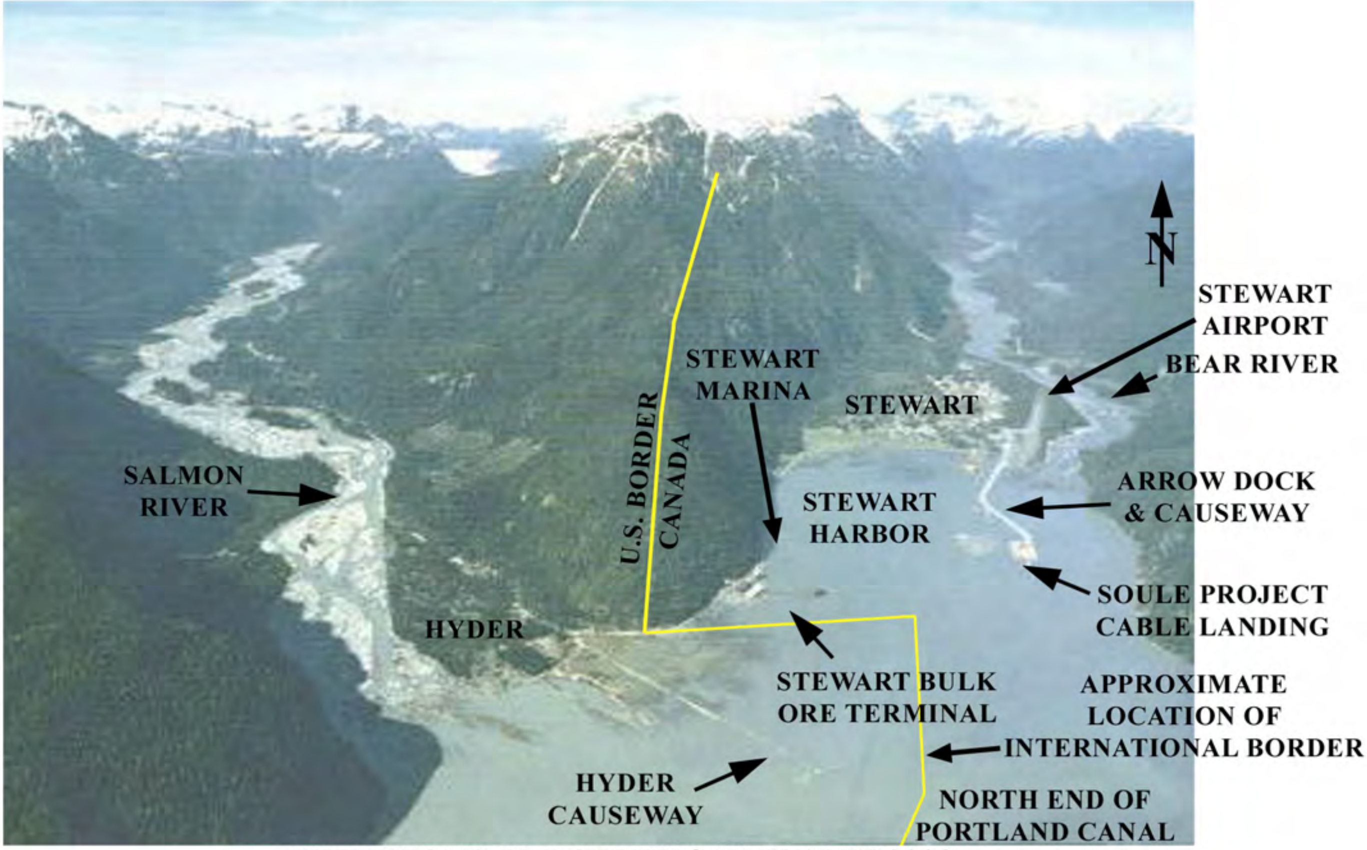
INFORMATION IS PROPRIETARY

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

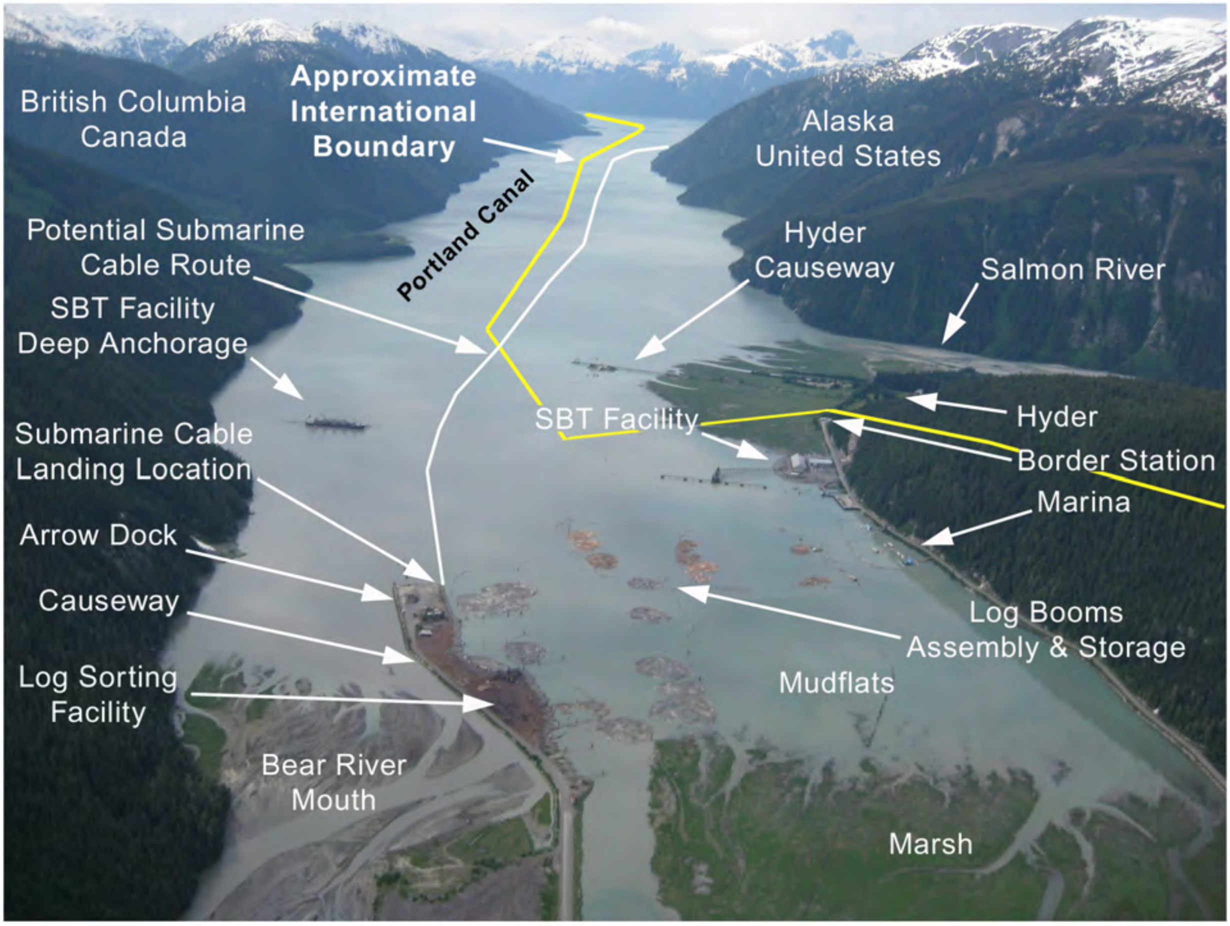
APPENDIX I

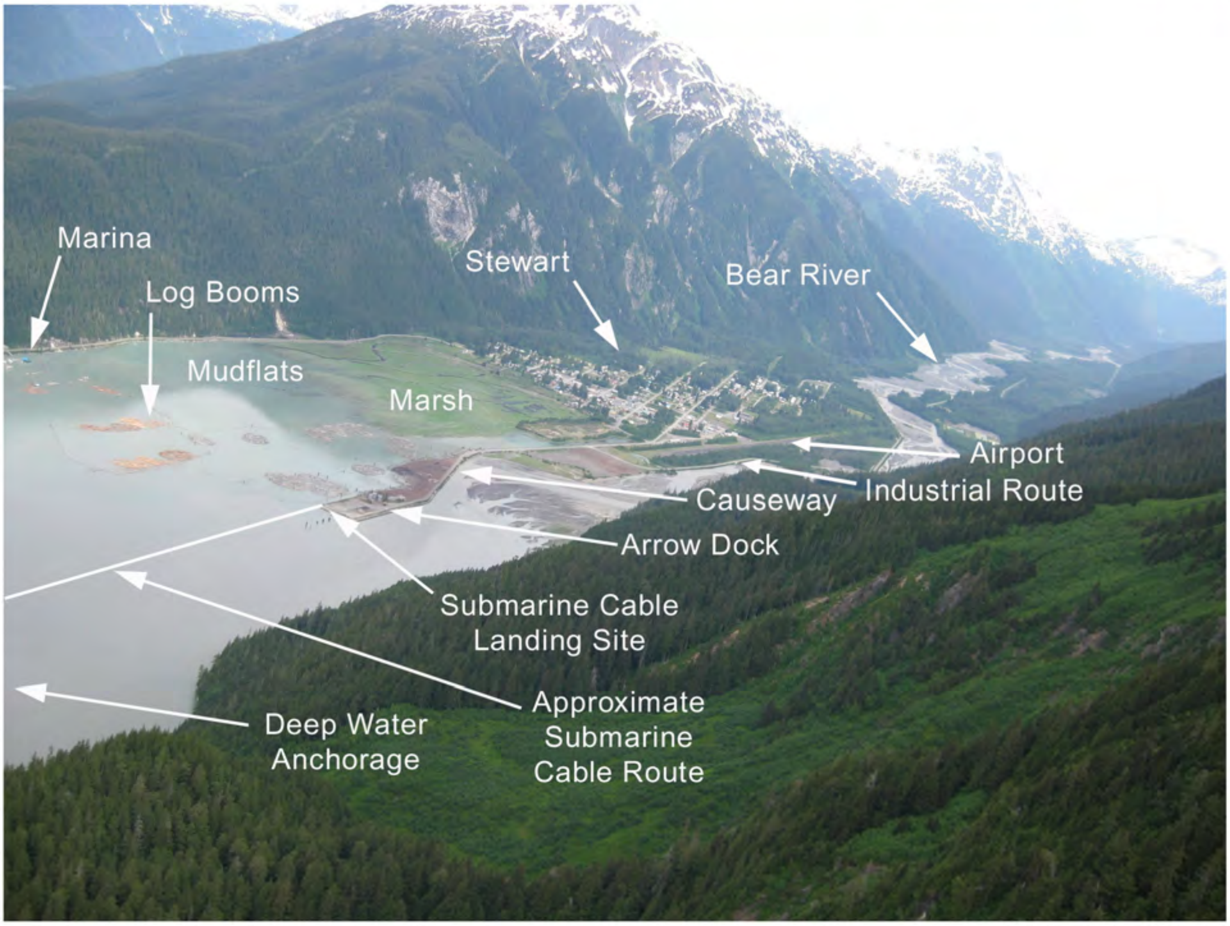
PHOTOS OF THE PORT OF STEWART AND TRANSMISSION ROUTE



THE PHOTO BELOW WAS TAKEN IN 2008

VIEW OF STEWART CAUSEWAY & LOG SORTING FACILITY IN FOREGROUND;
BEAR RIVER IS AT RIGHT & STEWART HARBOR IS AT LEFT


British Columbia
Canada
Approximate
International
Boundary
Portland Canal
Alaska
United States
Potential Submarine
Cable Route
Hyder
Causeway
Salmon River
SBT Facility
Deep Anchorage
SBT Facility
Hyder
Submarine Cable
Landing Location
Border Station
Marina
Arrow Dock
Causeway
Log Booms
Assembly & Storage
Log Sorting
Facility
Mudflats
Bear River
Mouth
Marsh


Marina
Log Booms
Stewart
Bear River
Mudflats
Marsh
Airport
Industrial Route
Causeway
Arrow Dock
Submarine Cable
Landing Site
Approximate
Submarine
Cable Route
Deep Water
Anchorage


U.S.A
CANADA
INTERCONNECT WITH THE
BC HYDRO SUBSTATION
Stewart
MARSH
HYDER
MUDFLATS
BEAR RIVER
STEWART CAUSEWAY
LOG TRANSFER
FACILITY
LOG BOOMS
TRANSITION TO OVERHEAD
TRANSMISSION LINE FOLLOWING
THE "INDUSTRIAL ROUTE" WHERE AN
EXISTING OVERHEAD LINE IS LOCATED
CABLE SPLICE VAULT
SUBMARINE CABLE
COMBINATION OF BURIED AND
OVERHEAD TRANSMISSION LINE
NORTH
END
PORTLAND
CANAL
ARROW DOCK
Image © 2011 DigitalGlobe
© 2011 Europa Technologies
© 2011 Google
©2010 Google
Imagery Date: Jul 1, 2006
55°56'02.19" N 129°59'15.82" W elev 39 ft
Eye alt 11946 ft

SOULE RIVER HYDROELECTRIC PROJECT

PRESIDENTIAL PERMIT APPLICATION

APPENDIX J

DRAFT LICENSE APPLICATION AND PRELIMINARY DRAFT EA

Nisga'a
Lisims
Government

PO BOX 231
NEW AIYANSH, BC
V0J 1A0

PHONE 250-633-3000
FAX 250-633-2367

TOLL FREE
1-866-633-0888

May 6, 2011

Soule Hydro, LLC
c/o Alaska Power & Telephone Company
P.O. Box 3222
Port Townsend, WA 98368

Attention: Glen D. Martin, Project Manager

Federal Energy Regulatory Commission
Office of Hydropower Licensing – Room 6H-10
888 First Street, N.E.
Washington, DC 20426

Dear Sirs / Mesdames:

Re: Soule River Hydroelectric Project P-12615-001 – Alaska & P-13528-000 – Alaska Draft License Application and Preliminary Draft Environmental Assessment

We write in response to a letter dated February 1, 2011, received by Nisga'a Lisims Government on February 14, 2011 from Mr. Glen D. Martin, in respect of the Soule River Hydroelectric Project (the "Proposed Project") being proposed by Alaska Power & Telephone Company (the "Proponent").

Nisga'a Lisims Government represents the Nisga'a Nation, a self-governing nation under the Nisga'a Final Agreement. Because of the Nisga'a Final Agreement, the Nisga'a Nation stands in a unique position with respect to any proposed project that may affect Nisga'a interests. The Nisga'a Final Agreement sets out the constitutionally protected Treaty rights of the Nisga'a Nation.

We have had a chance to review the Preliminary Draft Environmental Assessment (the "PDEA") and the Draft License Application (the "DLA") in respect of the Proposed Project, and provide you with our preliminary comments.

<u>Preliminary Comments</u>

While the Proposed Project is located outside of the Nass Area, as defined in the Nisga'a Final Agreement, we note that the Soule River flows into the Portland Canal, part of which falls within the Nass Area. Therefore, it is our preliminary view that the Proposed Project may reasonably be expected to have adverse environmental effects on at least the following Nisga'a interests:

- Fish, fish habitat and fish management in the Nass Area;
- Migratory Birds and habitat in the Nass Area;
- Heritage and Cultural values.

In general, we feel that the materials provided to us contain insufficient baseline information on the marine resources of Portland Inlet that may be affected by the Proposed Project. Discharge from the Soule River extends one-quarter of the way into Portland Inlet, and animals that move between Canadian and US waters may be affected by the Proposed Project. In particular, we note that the Proposed Project has the potential to adversely affect Nisg̱a'a Treaty interests in the following ways:

1. loss of intertidal habitat utilized by chum salmon and other species at the mouth of the Soule River, with insufficient mitigation plans;

2. potential fuel spills or other deleterious materials entering Portland Canal, including by way of the use of herbicides for the eradication of Sowthistle in the Soule River delta.

In order to properly assess these impacts, however, further information, as outlined below is required.

Based on the information with which we have been provided to date in respect of the Proposed Project, we have the following questions, comments, and suggestions for consideration by the Federal Energy Regulatory Commission and the Proponent:

- We note that the Proponent has indicated in the PDEA that there will be a loss of up to 30 percent of chum salmon foraging habitat at the mouth of the Soule River. The Proponent further indicates that it will address this issue, at least in part, by using riprap to line project features. Nisg̱a'a Lisims Government does not view the creation of riprap as suitable compensation for loss of marine vegetated habitat for chum salmon. For this reason, we suggest that the Proponent be required to create vegetated habitat at 2:1 for the losses resulting from the Proposed Project. Area 3 chum salmon stocks are currently in a critical state, and there is a very real possibility that Canadian chum salmon would use the Soule River delta for foraging. Therefore, we feel that additional steps are required to preserve existing salmon habitat in the Soule River delta.

- We note that the Proponent is proposing to use *Garlon 3A* and several other types of herbicides to control invasive Sowthistle in the Soule River delta. The PDEA does not adequately address the potential harmful effects of these chemicals on the natural delta vegetation and marine life inhabiting the intertidal and sub tidal portions of the Soule River delta. In addition, we are advised that some of the herbicides proposed for use by the Proponent are known to kill native species. We, therefore, request that no herbicides be used with respect to the Proposed Project unless they are proven to be benign to natural vegetation and marine organisms.

- We were unable to find any discussion in the information provided on the potential for fuel spills or release of other hazardous materials into the Portland Canal during the construction and operation of the Proposed Project. In addition, we note that the information provided makes no mention of spill response measures that will be taken by the Proponent. We therefore request that the Proponent provide a spill response plan with respect to the Proposed Project. We also request clarification as to what types of boats, vessels, barges, machinery, crew, etc., will be traveling to and from the site of the Proposed Project.

- In our opinion, the Proponent has not provided sufficient evidence to demonstrate that there will be no impact to fisheries from the laying of the submarine cable for the Proposed Project. We request that the Proponent conduct marine studies of the presence and distribution of marine fish or invertebrates. If such studies have been conducted, we request that this information be provided to us.

- We further note that the marine mammal section of the PDEA appears to be brief and dismissive of potential impacts of the Proposed Project on marine mammals. From our review of the PDEA, it appears that the field study conducted with respect to the Proposed Project did not include any systematic examination of the cable route for marine mammals. As well, there is no mention of the potential for underwater construction noise impacts on marine mammals. Given that construction in the marine environment has been included as a component of the Proposed Project, we request that an assessment of the underwater noise and entanglement issues as they pertain to marine mammals be undertaken. Any such assessment should take into consideration the extent to which the underwater noise from the Proposed Project will propagate to the surrounding marine environment at levels known or suspected to pose adverse effects to marine mammals.

- Also lacking from the materials provided to us is an assessment of the potential impacts of the Proposed Project on migratory birds, including, for example, the Vancouver subspecies of Canada Goose. Nisga'a Lisims Government requests that such assessments be conducted. If such assessments have been conducted, we request that this information be provided to us.

We look forward to receiving the information referred to above. As we learn more about the Proposed Project, we will be in a better position to assess the potential impacts of the Proposed Project on the Nisga'a Nation and Nisga'a Treaty interests.

Sincerely,

NISGA'A LISIMS GOVERNMENT

Fred Tolmie
Chief Executive Officer

cc: H. Mitchell Stevens, President
Kevin McKay, Chairperson
Edmond Wright, Secretary-Treasurer
Collier Azak, Director of Lands and Resources
Harry Nyce, Director of Fisheries and Wildlife

APPLICATION FOR LICENSE

SOULÉ RIVER HYDROELECTRIC PROJECT

FERC NO. P-13528 & P-12615

VOLUME 1 OF 3

DRAFT LICENSE APPLICATION

(Exhibits A, B, C, D, F, G, and H)

Prepared by:

SOULÉ HYDRO, LLC

JANUARY 2011

UNITIED STATES OF AMERICA
BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE
FOR MAJOR NEW WATER PROJECT

18 CFR §5.5(b):

(1) The potential applicant or existing licensee's name and address.

Soulé Hydro, LLC
Subsidiary of: Alaska Power & Telephone Company
193 Otto Street
P.O. Box 3222
Port Townsend, WA 98368
Telephone Number (360) 385-1733
E-Mail Address bob.g@aptalaska.com

(2) The project number, if any.

FERC No. P-13528-000 & P-12615-001--Alaska

(3) The license expiration date, if any.

Not applicable. This application is for an original license.

(4) An unequivocal statement of the potential applicant's intention to *file an application for an original license, or, in the case of an existing licensee,* to *file or not* to *file an application for a new or subsequent license.*

Soule Hydro, LLC intends to file an application for an original license for the Soulé River Hydroelectric Project (Project).

(5) The type of principal project works licensed, if any, such as dam and reservoir, powerhouse, or transmission lines.

There are no existing Project works already licensed. All Project features proposed herein would be constructed after the license application has been issued and all permits have been received.

(6) The location of the project by state, county, and stream, and, when appropriate, by city or nearby city.

The Project is located in Southeast Alaska, approximately 70 miles east of Ketchikan and 9 miles southwest of Hyder, Alaska, on Portland Canal and

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will utilize the waters of the Soulé River basin which drains into the west side of the Canal.

(7) The installed plant capaci1ty,ij any.

The generating capacity of the Project will be approximately 77.4 megawatts (MW).

(8) *The names and mailing addresses of:*

(i) Every county in which any part of the project is *located, and in which any Federal facility that* is *used or to be used by the project* is *located;*

Alaska does not have counties, but does have Boroughs. The Project is not in any Borough. No Federal facility will be used as none exist near the Project.

(ii) Every city, town, or similar political subdivision;

(A) In which any part of the project is or is to be located and any Federal facility that is *or is to be used by the project is located, or*

The Project is not located in any city, town, or similar political subdivision. No Federal facilities will be involved.

(B) That has ·a population of 5,*000 or more people and* is *located within 15 miles of the existing or proposed project dam;*

There is no community within the United States that is within 15 miles of the Project that has a population of 5,000 or more people. The closest community, Hyder, has a population of 100 (Census 2002). The nearest community with >5,000 people is Ketchikan (14,000), which is approximately 70 miles west.

(iii) Every irrigation district, drainage district, or similar special purpose political subdivision:

(A) In which any part of the project is or is proposed to *be located and any Federal facility that is or is proposed* to *be used by the project is located; or*

There are no special purpose political, or otherwise, subdivisions in the project boundary. Hyder is unincorporated.

(B) That owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to *be used by the project;*

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None of the Project facilities proposed are owned, operated, or maintained by an irrigation district, drainage district or special purpose political subdivision.

(iv) Every other political subdivision in the general area of the project or proposed project that there is reason to *believe would be likely* to *be interested in, or affected by, the notification; and*

Stewart, B.C. Canada is 2 miles northeast of Hyder, Alaska, and would likely be interested in the project.

Angela Brand-Donuser
Mayor
City of Stewart
P.O. Box 460
Stewart, B.C. V0T 1W0

(v) Affected Indian tribes.

Norman Arriola, Tribal President
Ketchikan Indian Community
2960 Tongass Ave.
Ketchikan, AK 99901

Lee Wallace, Tribal President
Organized Village of Saxman
Route 2, Box 2
Ketchikan, Alaska 99901

Wilma Stokes, Tribal President
Wrangell Cooperative Association
P.O. Box 1198
Wrangell, AK 99929

Karl Cook, Mayor
Metlakatla Indian Community
P.O. Box 8
Metlakatla, AK 99926

Nelson Leeson, President
Nisga’a Lisims Government
PO Box 231
2000 Lisims Drive
New Aiyansh, BC VOJ 1A0

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UNITIED STATES OF AMERICA
BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE
FOR MAJOR NEW WATER PROJECT

18 CFR, CH. I, SUBCHAPTER B, PART 4, SUBPART E, 4.40

INITIAL STATEMENT

1. Soulé Hydro, LLC, hereafter referred to as "Applicant", applies to the Federal Energy Regulatory Commission (FERC) for a license for the Soulé River Hydroelectric Project, FERC Project No. P-13528 and P-12615, hereafter referred to as "Project" as described in the attached exhibits. The existing preliminary permit (P-13528) for the Project was issued September 22, 2009, which expires on August 31, 2012.

2. The location of the Project is:

State:	Alaska
County:	No County; nor is it in a borough
Nearest Town:	Hyder
River:	Soulé River

3. The exact name, address, and telephone number of the Applicant are:

Company:	Soulé Hydro, LLC c/o Alaska Power & Telephone Company
Address:	P.O. Box 3222 Port Townsend, WA 98368
Telephone:	(360)385-1733 x120
Fax:	(360)385-7538
E-mail:	bob.g@aptalaska.com

4. The exact name, address, and telephone number of each person authorized to act as agent for the Applicant in this application are:

Name:	Bob Grimm
Company:	Soulé River, LLC. c/o Alaska Power & Telephone Company
Address:	P.O. Box 3222 Port Townsend, WA 98368
Telephone:	(360)385-1733 x120
Fax:	(360)385-7538
E-mail:	bob.g@aptalaska.com

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5. Soulé Hydro, LLC is a limited liability company, organized and existing in the State of Delaware. The Applicant is making no claim to preference under Section 7(a) of the Federal Power Act.

6. Statutory or regulatory requirements

(i) The statutory or regulatory requirements of the State of Alaska in which the project would be located and that affected the project as proposed, with respect to bed and banks and to the appropriation, diversion and use of water for power purposes, and with respect to the right to engage in the business necessary to accomplish the purposes of the license under the Federal Power Act are:

<u>Water Right Permit</u>
Alaska Department of Natural Resources, Division of Mining, Land, and Water (AS 46.15)

<u>Special Use Authorization</u>
Forest Service. 2008. Tongass National Forest land and resource management plan. Department of Agriculture, Ketchikan, Alaska. January 2008.

<u>404 Permit</u>
Federal Clean Water Act (Section 404). For construction within waters of the United States, issued by the US Army Corps of Engineers.

<u>401 Certification</u>
In the State of Alaska, certification is carried out via the US Army COE permitting process, unless FERC is not involved.

<u>Fish Habitat Permit</u>
Alaska Department of Fish & Game for protection of fish habitat.

<u>Essential Fish Habitat</u>
National Marine Fisheries Service – NOAA has jurisdiction over essential fish habitat.

<u>Alaska Coastal Management Program Consistency Review</u>
Alaska Department of Natural Resources. Department of Ocean and Coastal Management: ACMP Handbook of Statutes and Regulations, as amended June 2, 2005. 11 AAC 112.230. Energy facilities & 11 AAC 112.240. Utility routes and facilities.

(ii) The steps which the Applicant has taken or plans to take to comply with each of the laws cited above are:

<u>Water Rights Permit</u>
Water rights have been applied for but are not issued until after the project starts using water.

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Special Use Authorization
Application will be submitted close to license issuance.

404 Permit
A permit application will be submitted to the COE at the same time as the final license application to the Commission.

401 Certification
A letter to DEC for 401 Certification will be submitted concurrently with the final license application, however, DEC will have the COE permitting process cover their statutory requirements via an MOA that exists between the two agencies.

ACMP Consistency Review
Application will be submitted at the same time as the final license application to the Commission.

7. Brief description of the Project:

(1) a Main Dam 265-feet-tall by 903-feet-long; (2) a Saddle Dam approximately 2,024 feet long adjacent to the Main Dam; (3) an intake structure just north of Main Dam; (4) a reservoir with a surface area of approximately 1,072 acres and approximately 102,300 acre-feet of storage; (5) an 16-foot-diameter by 11,400-foot-long water conduit tunnel; (6) a 3.1-mile-long access road; (7) a 120-foot-long single lane bridge to cross the river; (8) a 80-foot-wide by 160-foot-long powerhouse; a tailrace that will discharge into the river mouth; (9) a three 138 kilo-volt (kV) transformer substation next to the powerhouse; (10) marine access facilities that include a staging platform, boat ramp with 2-3 dolpins for landing craft, barge basin for offloading barges, and float for small watercraft to dock; (11) temporary log transfer facility; (12) a 10-mile-long, 138 kilo-volt (kV) submarine cable to Stewart, B.C. (approximately 2 miles will be in Canadian waters).

8. Lands of the United States affected (shown on Exhibit G):

The Soulé River Hydroelectric Project will occupy 1,257 acres of Federal land administered by the Tongass National Forest, U.S. Forest Service (USFS or Forest Service). The proposed project boundary is currently unsurveyed, and therefore, is described by township, range, and section. The estimated acreage is based on:

- Reservoir boundary = 585 foot contour
- Power Tunnel = 50 feet each side of centerline
- Access Roads = 100 feet each side of the centerline
- Other Features = Approximately 50 feet beyond area of disturbance

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Table I-1 Lands of the United States[1]			
Township and Range	Section	Project Features	Acres
T69S, R99E	23	Reservoir	206
T69S, R99E	24	Reservoir	48
T69S, R99E	25	Reservoir	245
T69S, R99E	26	Reservoir	34
T69S, R99E	35	Reservoir	145
T69S, R99E	36	Reservoir	207
T70S, R99E	1	Reservoir, access road, power tunnel	43
T70S, R99E	2	Reservoir, access road, dams, intake	277
T70S, R99E	12	Access road	10
T70S, R100E	6	Power tunnel	3
T70S, R99E	7	Access road, power tunnel, powerhouse, marine access facilities, transmission line	39
Total			1,257

Transmission line lands (submarine cable; submerged lands with a 25-foot-wide corridor) that are State of Alaska submerged lands and total approximately 24 acres are:

		Table I-2 State Submerged Lands	
Township	Range	Section	Acres
T70S	R100E	3, 4, 7, 8, 9	4
T69S	R100E	34,26,27,23,13,14,12,1	19.5
T68S	R100E	31	0.5

The remaining transmission line lands are across the International Boundary with Canada for a submarine cable landing at Stewart, B.C.

[1] The proposed project would be located within an area of the Tongass National Forest designated as Remote Recreation Land Use Designation (Remote Recreation LUD) in the 2008 Tongass National Forest Land and Resource Management Plan. A Remote Recreation LUD has very restrictive standards and guidelines for human development; therefore, a project alternative that would be consistent with a Remote Recreation LUD would be considerably different than the applicant's preferred project configuration. In our September 10, 2010, filing, we note that the Forest Service requested an evaluation of a project that would be consistent with the Remote Recreation LUD in the EA. For these reasons, the EA includes an analysis of the environmental effects and developmental costs of such an alternative project configuration.

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Based on previous rulings by the Commission, lands outside the U.S. that projects extend into are not under the Commissions jurisdiction, only the lands within the U.S.[2] Thus, the portion of the submarine cable that extends into Canada to land at Stewart, B.C. and the associated infrastructure for the landing and the overhead transmission line to the substation will be outside the Commissions jurisdiction and not be a part of this license.

9. There are no existing project features. Construction is expected to start within two years of license issuance.

This ____________________ is executed in the State of Washington, County of Jefferson by: Robert S. Grimm, 193 Otto Street, P.O. Box 3222, Port Townsend, WA 98368, who, being duly sworn, depose(s) and say(s) that the contents of this ____________________ are true to the best of (his or her) knowledge or belief. The undersigned applicant(s) has (have) signed the ________________ this ___ day of _____________ 2011.

____
(Applicant(s))

By: Robert S. Grimm

State of Washington)
Ss
County of Jefferson)

DRAFT

[2] In a finding during a rehearing for the Homestake Mining Company Docket Nos. UL00-3-002 and UL00-4-002, Issued March 1, 2002, the Commission stated, "*It is well established that if a project comes within the terms of FPA Section 23(b)(1) but some of the project works are beyond the Commission's jurisdiction, the Commission can license those project works over which it has jurisdiction.*

The Commission used as a reference the following: "*See Lake Ontario Land Development and Beach Protection Ass'n v. Federal Power Commission, 212 F.2d 227 (D.C. Cir. 1954), cert. denied, 347 U.S. 1015 (Commission licenses the U.S.-side works of project spanning international boundary line); County of Arapahoe and Town of Parker, Colo., 69 FERC ¶ 61,024 (1994) (Commission licenses those project works not located in Reclamation project where Commission jurisdiction has been withdrawn); and Georgia-Pacific Corp., 78 FERC ¶ 61,223 (1997) (Commission licenses those project works not covered by a valid pre-1920 permit).*"

In an order issuing a license for the Cominco American Incorporated Project No. 2103-002, on December 7, 2001, the Commission found: "*The project is required to be licensed pursuant to Section 23(b)(1) of the Federal Power Act, 16 U.S.C. § 816(b)(1), because it is located in part on federal lands. That parts of the hydropower project are in Canada and thus outside the Commission's jurisdiction is not a bar to the Commission's licensing of the parts over which it has jurisdiction. See Lake Ontario Land Development v. Federal Power Commission, 212 F.2d 227 (D.C. Cir. 1954).*"

On this ______ day of ___________________, 2011, before me, a Notary Public, in and for the State of Washington, personally appeared _________________________ personally known to me (or proved to me on the basis of satisfactory evidence) to be the person who executed this instrument. Sworn to and subscribed before me this ______ day of ______________________, 2011.

____

Patsy Caldwell
Notary Public
State of Washington
My commission expires: December 8, 2014

(seal)

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OTHER INFORMATION

There are no federal, state, local political entities and facilities identified, or Indian tribes affected by this Project. Notices issued in local newspapers and their proof of publication for this licensing can be found in the Appendix V: *Agency Consultation*.

I hereby certify that electronic copies of this License Application were made available to the following parties:

a. FERC – Washington D.C.

b. FERC – Portland Regional Office

c. U.S. Forest Service – Ketchikan Ranger District

d. National Marine Fisheries Service

e. U.S. Fish & Wildlife Service

f. U.S. Environmental Protection Agency

g. U.S. Army Corp of Engineers

h. U.S. National Park Service

i. Alaska Department of Fish & Game

j. Alaska Department of Natural Resources – Mining, Land, and Water

k. Alaska Department of Environmental Conservation

l. Alaska Department of Natural Resources – State Historical Preservation Officer

m. Alaska Department of Coastal and Ocean Management

DRAFT

On this ______ day of ___________________, 2011, before me, a Notary Public, in and for the State of Washington, personally appeared _________________________ personally known to me (or proved to me on the basis of satisfactory evidence) to be the person who executed this instrument. Sworn to and subscribed before me this ______ day of ______________________, 2011.

____

Patsy Caldwell
Notary Public
State of Washington
My commission expires: December 8, 2014

(seal)

SOULÉ HYDRO, LLC
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)

EXECUTIVE SUMMARY

Soulé River, LLC proposes to construct the 77.4 megawatt (MW) Soulé River Hydroelectric Project (Project) located on the Soulé River, on Portland Canal, 9 miles Southwest of Hyder, in Southeast Alaska. The Project would occupy federal land administered by the Ketchikan Misty Fjords Ranger District of the U.S. Forest Service (Forest Service). Other lands involved are State of Alaska submerged land (submarine cable and other in-water structures) and public and private lands in Canada.

PROPOSED ACTION

The Applicant proposes to construct a 77.4-megawatt (MW) hydroelectric project on the Soulé River, which drains into Portland Canal and is approximately 9 miles southwest of the community of Hyder in Southeast Alaska. The Project would include:

- A 265-foot-tall by 903-foot-long asphalt-cored rockfill Main Dam;
- A 65-foot-tall by 2,024-foot-long asphalt-cored rockfill Saddle Dam;
- A spillway with a gated control structure, partially-lined chute, and plunge pool stilling basin;
- A reservoir with a surface area of 1,072 acres and a gross storage capacity of 102,300 acre-feet;
- A reservoir outlet works, including an intake, modified diversion tunnel, and 60-inch discharge valve;
- A concrete intake tower;
- A partially-lined 16-foot-diameter by 11,400-foot-long power tunnel;
- A 3.1-mile-long by single-lane access road, with bridges over Dolly Varden Creek, the Soulé River, the spillway chute, and to the intake tower;
- An 80-foot-wide by 160-foot-long powerhouse containing three vertical-axis generating units each rated at 25.8 MW;
- A switchyard adjacent to the powerhouse;
- Marine access facilities that include a staging area, barge basin, boat ramp, and dock;
- A 138 kV transmission line as a submarine cable approximately 8 miles long in U.S. waters and 2 miles long in Canadian waters with approximately 2.5 miles of overhead or buried line in Canada; the transmission line will connect to the Stewart Substation near Stewart, B.C.

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The Project would be operated as a storage project to meet load either in British Columbia or in the Western United States. The Project is capable of generating 215 GWh of firm power annually; average annual generation is estimated at 283 GWh. In addition to the Applicant's proposal (Applicant's Alternative**)**, the Exhibit E – *Environmental Assessment* evaluates two other alternatives: (1) Land Use Alternative – an alternative that would be consistent with the current land use policies of the Tongass National Forest;[3] and (2) No Action – the project would not be constructed and there would be no effects on environmental resources.

Before filing this Application, the Applicant conducted pre-filing consultation under the Alternative Licensing Process (ALP) to initiate public involvement early in the Project planning process and to encourage citizens, governmental entities, Indian Tribes, and other interested parties to identify issues and concerns, as well as propose means of resolving them. The Applicant conducted Initial Consultation, Study Planning, and Scoping to determine what issues and alternatives should be addressed. Two Scoping Documents (SD1 and SD2) were distributed to interested parties on May 13, 2008, and November 12, 2008, respectively. Scoping meetings were held in Juneau and Hyder on June 17, 2008, and June 19, 2008, respectively.

Through consultation, the Applicant determined that the primary issues associated with licensing the Project were:

- Aesthetic effects as viewed from Portland Canal
- Effects on human use of Glacier Bay, just north of the river delta (recreation and subsistence)
- Potential use of the project area by anadromous salmonids and corresponding potential effects of the project on fish and aquatic habitat in the lower Soulé River and delta.
- Effects of the project on the existing Remote Recreation LUD, and whether a hydropower project would be feasible under the standards and guidelines of a Remote Recreation LUD as set forth in the Tongass National Forest Land and Resource Management Plan.

CONCLUSIONS

The most significant impacts from the Applicants Alternative would be:

1. Permanently flooding the North Fork and associated wetlands; including beaver dams and ponds (the wetlands exist only because of the beaver dams)
2. Significantly reduced flows in the Main Stem of the river during summer months
3. Clearing right-of-way for access road and project features, which will allow greater movement for wildlife and recreation/subsistence users into the Soulé

[3] Please read footnote 1 on Page viii above.

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River Watershed that presently doesn’t exist (easier only as far as the 1,900 foot access road tunnel ~0.8 miles in from the shoreline)

4. Visual impact of man-made features in an otherwise natural setting
5. Impacts to the present Remote Recreation LUD and the Roadless Rule because roads for construction and operation would be built as well as permanent project features. This project would impact the Remote Recreation LUD by:
    - Reducing the amount of unmodified natural setting for primitive types of recreation
    - Reducing opportunities for independence, closeness to nature, and self-reliance
    - Reducing the quality of the high Scenic Inventory Objective (SIO) for this location

To meet this LUD, the project would have to be downsizes to the point of being uneconomical; and even then it would not fully meet this LUD. To resolve this inconsistency, the Applicant is in discussions with the Forest Service to find a resolution. One option is to change the LUD for only the project boundary to a less restrictive LUD, thereby leaving the surrounding Remote Recreation LUD in place, which will protect the vast majority of the watershed. This reduces impacts to the Forest Management Plan and land use in the immediate area while allowing a renewable resource to be developed.

The Applicant requests that the Commission requests preliminary 4(e) conditions from the Forest Service, because of the submittal of this Preliminary Draft EA, so that the Ketchikan Ranger District can inform the Department of Agriculture in D.C. to set a timeline to accomplish this. The preliminary 4(e) conditions are necessary for the final license application so that project design and comments can address the conditions.

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SOULÉ HYDRO, LLC.
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)

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EXHIBIT A
PROJECT DESCRIPTION

SOULÉ HYDRO, LLC.
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)

EXHIBIT A
PROJECT DESCRIPTION

Table A-1

Project Location	9 miles south of Hyder, Alaska Lat. N 55°50’, Long. W 130°11’	
Marine Access Facilities		
Barge basin	Size:	150’x250’, bottom at El -10.5
Channel	Size:	90’x350’, bottom at El -10.5
Boat ramp	Size:	20’ min. width, 200’ length, 15% slope
Dock	Size:	8’x100’ with 4’x60’ gangway
Staging area	Size:	250’x280’, top at El 19.5
Access Roads		
Main road	Type:	Single lane with turnouts, gravel surface
	Length:	3.1 miles
	Grade:	16% max. except 2 short sections at 20%
	Tunnels:	1; 20’ HS diameter-by-1900’ long
	Bridges:	3 or 4 (120’ over Soulé River, 66’ over spillway chute, 120’ to intake tower
	Culverts:	1 12’ bottomless at Dolly Varden Creek (could also be a 40’-50’ bridge); others as required (2’ min. diameter)
Spillway access road	Type:	Single lane, gravel surface
	Length:	0.70 miles (mostly on dam crests)
	Grade	0%
Construction roads	Type:	Single lane with turnouts, gravel surface
	Length:	0.5-1.0 miles total (estimated)
	Grade	20% max.
Dams		
Main dam	Type:	Asphalt-core zoned rockfill
	Height:	265 feet above downstream toe
	Length:	903’ along crest
	Crest:	25’ wide, top at El 585
	Face slopes:	1.5H:1V
	Volume:	900,000 cy (including 50,000 cy
Saddle dam	cofferdam)	
	Type:	Asphalt-core zoned rockfill
	Height:	75’ max, 45’ avg above downstream toe
	Length:	2,024’ along crest
	Crest:	25’ wide, top at El 585
	Face slopes:	1.5H:1V
West Fork weir	Volume:	300,000 cy

	Type:	Dumped large rockfill
	Height:	50’ approx. above downstream toe
	Length:	903’ along crest
	Crest:	25’ wide, top at El 450
	Face slopes:	2.0H:1V approx.
	Volume:	20,000 cy
Dams (Continued)		
Spillway	Location:	North end of Saddle Dam
Crest	Capacity:	30,000 cfs
Chute	Gates:	3, 10’ high x 32’ wide
Stilling basin	Type:	Partially concrete lined w/ concrete flip
Diversion tunnel	bucket	
	Type:	Plunge pool, 30’ deep, 300’ long
Outlet works	Location:	Right abutment of Main Dam
	Size:	20’ wide x 15’ high x 1150’ long
	Location:	In diversion tunnel
	Conduit:	9’ diam. x 800’ long
	Valve:	60” fixed cone (or other suitable type)
Reservoir		
Normal maximum pool	Elevation:	575 feet
	Area:	1,072 acres
	Capacity:	102,300 acre-feet
Normal minimum pool	Elevation:	450 feet
	Area:	377 acres
	Capacity:	10,500 acre-feet at El 450
Usable capacity		91,800 acre-feet
Power Tunnel		
Intake	Location:	In quarry in left abutment of Main Dam
	Height:	___ feet
	Trashracks:	3, 12’ wide x 28’ high
	Service gate:	12’ wide x 18’ high fixed wheel gate
Tunnel	Bulkhead gates:	3, 12’ wide x 28’ total high
	Diameter:	16’ (TBM excavation assumed)
	Length:	11,400 feet total (8,300 unlined)
	Lined diameter:	14’
	Lined lengths:	2,600’ concrete lining, 500’ steel lining
Power Plant		
Powerhouse	Location:	Adjacent to Soulé River delta and river
	mouth	
	Dimensions:	80’x160’x 55’ height above ground level
	Type:	Concrete substructure, pre-engineered
	metal	building superstructure with craneway
Generating equipment	Crane:	60 ton with 10 ton auxiliary
Turbines	# of units:	3 identical units
	Type:	Francis, vertical axis
	Rated power:	36,000 HP (27,000 kW)

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	Rated head:	500 feet
	Rated flow:	667 cfs
Generators	Speed:	450 rpm
	Type:	Synchronous, vertical umbrella
	Rated capacity:	25,800 kW (77,400 kW total capacity)
	Voltage:	13.8 kV
Tailrace	Power factor:	0.80
	Type:	Closed conduits discharging into channel
	Conduits:	12’ diameter; 95’, 129’, and 167’ long
Switchyard	Channel:	64 feet wide, 1.5H:1V sides, approx. 300’ long
	Location:	Adjacent to powerhouse
	Transformers:	3, 138kV/13.8kV, 33/25 MVA
	Circ. switchers:	3, 145 kV, 420A
	Circ. breaker:	1, SF_6 type, 145 kV, 1200A
	Aux. generator:	100 kW diesel
Transmission Line	Voltage:	138 kV
In United States	Segment 1:	700’ buried cable (across Soulé delta)
	Segment 2:	8 miles approx. (in Portland Canal)
In Canada	Segment 3:	2 miles approx. (in Portland Canal)
	Segment 4:	2,500’ buried cable (around Stewart airport)
	Segment 5:	2 miles overhead (to Stewart Substation)

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(1) PROJECT FEATURES

(i) Marine Access Facilities

The Soulé River site is not currently accessible by roads, and construction of an access road from the nearest road system (in Hyder) is not considered feasible due to the extremely steep terrain and the visual impacts of such a road. Therefore, the Applicant proposes to access the site for both construction and operation primarily by water, with occasional access by air. The large delta area at the mouth of the Soulé River provides a convenient location for construction of marine access facilities, as follows:

- A basin excavated into the delta deposits approximately 250 feet long perpendicular to the shore and 150 feet wide. A 350 feet long and 90 feet wide channel will be dredged to connect the basin with tidewater. The bottom of the basin and channel will be at El -10.5 to provide access at nearly all tide levels (the normal tide range is El -5 to El 15). Berms on the northwest and southeast sides of the basin will be constructed from the excavated materials, with the top at El 19.5. The sloping sides of the basin will be lined with riprap for erosion protection; riprap rock will be obtained from the powerhouse and power tunnel portal excavations. A retaining wall will be built at the southwest end of the basin to provide a suitable landing for loading and unloading ramp-type barges; the retaining wall be constructed from sheet pile or mechanically-stabilized embankment (MSE). Five mooring dolphins consisting of groups of steel piles will be installed to guide and secure barges.

- A boat dock for berthing a landing craft and crew boats. The dock will be 100 feet long and 8 feet wide, with a 60 feet long gangway to provide pedestrian access to the shore. The dock will float with the tide, guided by five steel piles.
- A boat ramp for loading and unloading a landing craft. The ramp will have a minimum width of 20 feet, a slope of 15%, and an articulated precast concrete surface.
- A staging area formed by dumping and grading the spoils from the barge basin excavation. Because of the high silt content of the spoils, the staging area will be capped by filter fabric and approximately 12" of rockfill. The rockfill will be obtained from the powerhouse and power tunnel portal excavations.

(ii) Access Roads

There will be one main access road for the project. The main road will be 3.1 miles long from the powerhouse/delta area to the dam/intake area. It will be a single lane gravel road with turnouts, similar to a logging road. The subgrade width will be 20 feet to provide for the large construction machinery necessary for the dam construction. The subgrade will be surfaced with a minimum of 6 inches of gravel obtained from the power tunnel construction (TBM spoils). The maximum grade has generally been limited to 16%, but two short sections will have 20% grades due to topographic limitations.

From the powerhouse/delta area, the road will climb at an average grade of 10% for 0.80 miles. The grade will vary from 1% to 20%, with the 20% grade for a length of only 400 feet above the powerhouse where the road will be most visible and must climb between two natural benches in the topography.

The road will then utilize a tunnel 1900 feet long (0.36 miles) at a -5.5% grade to avoid benching along a very steep section of the valley. After the tunnel, the road will be nearly level on terrace deposits along the east side of the Soulé River valley for a length of about 0.70 miles, with one 40'-50' long bridge or long-span (bottomless) culvert over Dolly Varden Creek and a 120' long bridge over the Soulé River. The road tunnel spoils will be used for embankment construction between the tunnel portal and the Soulé River bridge.

After crossing the river, the road will follow the west side of the river valley for 0.50 miles at a nearly level grade to near the base of the spillway, including a curve around an environmentally-sensitive pond. It will then climb at an average grade of 14% for 0.30 miles to a bridge over the spillway chute, with one switchback. There will be one section of 20% grade 300 feet long. From the bridge, the road will extend to the intersection of the Main Dam and the canyon rim at a nearly level grade for 0.15 miles, then extend up the face of the dam to

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the east abutment at a 16% grade for 500 feet on an MSE embankment. From the east abutment, a 400-feet long section of the road will provide access to the intake structure (including a 120- feet long bridge). A second section 0.70 miles long will provide access to the spillway crest and the Saddle Dam; most of this length is on the crest of the Main Dam and Saddle Dam.

Additional roads will be built for construction access to the diversion tunnel, quarries, and West Fork weir. These construction roads will generally be in the reservoir area and will have maximum grades of 20%. The upper half of the road to the diversion tunnel will also provide maintenance access to the top of the diversion inlet structure at low reservoir levels.

(iii) Main Dam

The Main Dam will be an asphalt core rockfill dam with a height of 265 feet (above the downstream toe) and a crest length of 903 feet. The crest will be at El 585 feet and the normal water surface will be at El 575 feet. The asphalt core will be 24 inches wide, and will be founded on a concrete plinth poured along the abutment bedrock contact. The foundation bedrock will be grouted as necessary; foundation explorations indicate only a small amount of grouting will be required for the Main Dam.

Filter zones of 2” minus gravel 4 feet wide will be placed integrally on both sides of the asphalt core. Adjacent to the filters will be zones of graded rockfill (8” minus), random rockfill (30” minus), and an outer shell of select riprap. The face slope will be 1.5H:1V both upstream and downstream. The crest width will be 25 feet. The total volume of the Main Dam is estimated to be 900,000 cy.

During construction, the river will be diverted through a tunnel in the right abutment. The tunnel will be excavated by drill-and-blast techniques to a 20’ wide by 15’ high horseshoe shape, and will be approximately 1,150 feet long. The Main Dam work area will be isolated by upstream and downstream random-fill cofferdams, which will also form the upstream and downstream toes of the dam embankment.

(iv) Saddle Dam

The Saddle Dam will also be an asphalt-core rockfill dam with the crest at El 585. The crest length will be 2,024 feet. The maximum height (near the south end) will be 75 feet; the average height will be about 45 feet. The fill zones will be the same as with the Main Dam except that the asphalt core will be 20 inches wide. The total volume of the Saddle Dam is estimated to be 300,000 cy.

Foundation explorations have determined that the material under the Saddle Dam is moderately consolidated glacial sediments (till and outwash) over bedrock. The sediments fill a U-shaped valley and may be as much as 200 feet thick. Analysis has determined that the material will be stable under reservoir loading conditions if it is adequately grouted. A grout curtain penetrating into the bedrock is proposed.

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(v) Spillway

The spillway will be located at the north end of the Saddle Dam where it abuts a bedrock knob. The spillway will consist of the following:

- A gated crest structure founded on an excavation into the bedrock knob, with three pneumatically-operated gates each 32 feet long and 10 feet high aligned along a circular arc. The spillway will pass the Probable Maximum Flood (PMF) with the maximum water surface at El 584.4 (0.6 feet below the dam crest) with only the spillway operating (no outlet works or power plant discharge).
- A chute down the face of the rock knob, terminating in a concrete flip bucket. The chute will have concrete retaining wall sides and concrete lining of the floor only where required to prevent erosion. At the upper end of the chute the walls will converge on circular arcs to the minimum chute width of 64 feet. Depth to rock is not known along the chute, but is expected to be relatively shallow. Additional geotechnical investigations during final design will determine bedrock conditions along the chute.
- The flip bucket will discharge spillways flows into a plunge pool excavated into alluvial deposits west of the river channel. These deposits will be mined and processed for aggregate to create the plunge pool. Additional geotechnical investigations during final design will confirm ground conditions in the plunge pool area.
- Air compressors and control equipment for the spillway gates will be located in a building to the north of the spillway on the plateau formed by excavation of the rock knob described previously. The building will also provide storage for maintenance equipment and vehicles.

(vi) West Fork Weir

The West Fork Weir will be a dumped porous rockfill structure across the West Fork Soulé River upstream of the main dam. It will have a crest at El 450 (the minimum reservoir pool level) and a crest width of about 25 feet, with face slopes of about 2H:1V. The rockfill volume is estimated to be 20,000 cy. Its purpose is to retain bedload generated by the Soulé Glacier. Geotechnical investigations have determined that existing low gradient areas of the West Fork below the glacier terminus are currently retaining much of the bedload, however, continued recession of the glacier may result in an increase in bedload that would be problematic for the power intake and reservoir outlet works if allowed to reach the toe of the main dam.

(vii) Quarries

Rockfill for the dams will come from the various excavations and from two quarries. One quarry will be on a bedrock knob that forms the west abutment of the Main Dam and north abutment of the Saddle Dam. The in-place volume from this quarry is 400,000 cy when excavated to a plateau at El 590. The rockfill for the Saddle Dam will come primarily from this first quarry. The second quarry

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will be the excavation in the east abutment of the Main Dam for the intake to the power tunnel. This second quarry can be expanded as necessary to the northeast to provide the necessary volume; the in-place volume of the excavation as shown in Exhibit F is 600,000 cy.

Additional geotechnical investigations during final design may determine that alluvial and glacial deposits to the west of the main dam in the reservoir area may be another source of rockfill.

(viii) Reservoir Outlet Works

At the end of dam construction, the diversion tunnel will be converted to a reservoir outlet works. The outlet works have been sized to allow drawdown of the reservoir from maximum pool to minimum pool in 30 days when operated in conjunction with the generation facilities and with average summer inflow conditions. The outlet works will consist of the following:

- A concrete intake structure at the upstream portal, with provisions for installing trashracks and bulkhead gates. The lower portions of this intake structure will be built prior to diverting through the tunnel.
- A tunnel plug under the dam crest, with an inlet to the pressure conduit.
- 800 feet of 9’ diameter steel pipe (i.e. the pressure conduit) on concrete saddles from the inlet to the tunnel portal.
- A single 60” diameter hooded fixed cone valve (or other suitable valve) discharging into the spillway plunge pool.

(ix) Power Intake

The power intake will be a concrete tower structure founded against the southern slope of the quarry on the left abutment of the Main Dam. The intake will include:

- A trashrack with three sections, each 12 feet wide by 28 feet high.
- One 12’ wide by 18’ high roller gate designed for gravity closure.
- Three bulkhead gates, each 12 feet wide by 28 feet high, designed for closure by gravity under balanced head conditions.
- A transition to the 16’ diameter power tunnel.
- A 3’ diameter vent pipe to the tunnel crown.
- Hoists for the roller and bulkhead gates.

(x) Power Tunnel

The power tunnel will have a length of 11,400 feet from portal to portal. The tunnel will be either machine-bored or excavated by drill-and-blast techniques. This application is based on use of a tunnel boring machine (TBM) because of its environmental and technical advantages. The final decision on excavation

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method will be made at the time of construction based on contractor bids on each option.

The TBM tunnel diameter will be 16 feet and the spoil volume will be approximately 85,000 cy. The tunnel will be excavated from a single heading from the lower portal near the powerhouse, and the spoils will be used for surfacing the access roads and staging areas. Rock quality is expected to be very good, therefore it is expected that the tunnel will be mostly unlined. The alignment has been selected to minimize the length of lined tunnel and provide a convenient location for future construction of a surge tank if that becomes warranted. The tunnel will be lined where there is insufficient rock cover to withstand the internal pressure; lining is planned as 500 feet of 14' diameter steel liner with concrete backfill and 2,600 feet of 14' diameter reinforced concrete lining.

(xi) Powerhouse

The powerhouse structure will be a pre-engineered metal building (PEMB) with a reinforced concrete substructure. The powerhouse will be 160 feet long and 80 feet wide, with the PEMB superstructure rising 55 feet above the foundation at El 20 feet (generator floor level), and the concrete substructure extending down to El -27 feet. The powerhouse will set on an excavation into the bedrock hillside. The powerhouse will include three generator bays and one service bay.

(xii) Tailrace

The tailrace will consist of three 12-feet diameter buried conduits, a gate structure, and an excavated channel. The buried conduits will convey the turbine draft tube discharge under the switchyard on the downstream side of the powerhouse, and will be 95, 129, and to 167 feet long. The gate structure will be located at the end of the conduits, with the conduit invert at El 2.0 feet and the top of the structure at El 19.5 feet. The gate structure will include slots for stop logs to allow isolation of the tailrace conduits and turbines. The tailrace channel from the gate structure to its outlet on the Soulé River near its tidewater confluence will be about 230 feet long with a base width of 63 feet, and a depth varying from 0 to 20 feet. Nearly all of the tailrace channel will be excavated through delta deposits containing a high percentage of silty material. Therefore, the tailrace channel will be lined with riprap derived from the powerhouse excavation where subject to high velocity flows and/or turbulence.

(xiii) Switchyard

The switchyard will be located adjacent to the powerhouse on fill over the draft tubes and tailrace conduits. This location has been selected to allow screening by existing vegetation to the maximum extent possible. The switchyard will include the following equipment:

- Three 33/25 MVA 13.8-138 kV transformers, with concrete basin foundations.

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- Roof assemblies over the transformers to protect them from show shedding off the powerhouse roof.
- Three 145 kV circuit switchers for disconnect and isolation of the main power transformers.
- One 145 kV SF_6 circuit breaker.
- Three pair of manual disconnect switches for isolating the circuit breaker.
- Interconnection with the submarine transmission cable
- Associated buswork and metering transformers
- 100 kW diesel generator for providing station service when the plant is not operating, including a double-walled fuel storage tank.
- Oil-water separator

1.2 RESERVOIR

The reservoir created by the Main Dam and Saddle Dam will have the following characteristics:

- Normal maximum water level ....575 feet msl
- Surface area at normal maximum water level.......................1,072 acres
- Storage capacity at normal maximum water level...............102,300 acre-feet
- Normal minimum water level ....450 feet msl
- Surface area at normal minimum water level ....377 acres
- Storage capacity at normal minimum water level................10,500 acre-feet
- Active storage capacity ....91,800 acre-feet
- Maximum water level (PMF)...584.4 feet msl
- Storage capacity at PMF water level ....112,600 acre-feet

1.3 GENERATING UNITS

(xiv) Turbines and generators

The powerhouse will contain three generating units with the following characteristics:

- Turbine type ....Francis, vertical axis
- Turbine rated head ....500 feet
- Turbine rated flow..667 cfs
- Turbine rated power ....36,000 HP
- Turbine speed...450 rpm
- Generator type..Umbrella

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- Generator voltage..13.8 kV
- Generated rated capacity...25,800 kW

1.4 PRIMARY TRANSMISSION LINE

The primary transmission line will include 700 feet of buried power cable across the Soulé River delta, 10 miles of 138 kV submarine cable in Portland Canal from the delta to a landing near Stewart, B.C., and 2.5 miles of transmission line from the cable landing to the existing BCTC Stewart Substation. It is the Applicant's understanding that only that portion of the submarine cable located in the United States will be subject to FERC licensing.

To maximize stability of the submarine cable, it will be placed in the deepest part of Portland Canal, which is also approximately where the U.S.-Canadian border is located. Exhibit G-1 shows approximately 8 miles of the submarine cable in the United States and the remainder in Canada. The actual length in the United States will need to be determined after the cable is laid.

1.5 APPURTENANT EQUIPMENT

1.5.1 Accessory Mechanical and Electrical Equipment

The powerhouse will contain the following accessory mechanical and electrical equipment:

- 72" butterfly-type turbine shutoff valves (per generating unit)
- 60 Ton bridge crane with 10 ton auxiliary hook
- Hydraulic power units (per generating unit)
- Electronic governors (per generating unit)
- Static exciters (per generating unit)
- 125 VDC station battery
- 13.8 V switchgear (per generating unit)
- Electronic control system for remote automatic operation

1.5.2 Plant Switchyard

The switchyard at the Soulé power plant will include:

- Three 33/25 MVA 13.8-138 kV transformers
- Three 145 kV circuit switchers
- One 145 kV SF6 circuit breaker
- Associated buswork, metering transformers, fencing, and containment systems
- 100 kW emergency diesel generator.

1.5.3 O&M Equipment

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Because the project area will only be accessible by boat and helicopter, for operation and maintenance of the project the Applicant will assign to the project a landing craft for moving large equipment and materials and two boats for moving personnel and small cargo. Other O&M equipment on site will include a backhoe, snowcat, and snow removal equipment.

(2) LANDS OF THE UNITED STATES

All project features except the transmission line will be located on lands of the United States (Tongass National Forest). The transmission line will occupy a small portion of the Tongass National Forest (above the mean high tide level), State of Alaska lands (for the portion of the submarine cable in the United States), and Canadian land.

The project boundary shown on Exhibit G encompasses 1,257 acres of Tongass National Forest land, as indicated in the table below. The project boundary has been determined as follows:

- For the reservoir, the 585 foot contour,
- For the power tunnel, 50 feet each side of the centerline,
- For the access roads, 100 feet each side of the centerline,
- For other features, a boundary approximately 50 feet beyond the expected area of disturbance.

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Table A-2 Lands of the United States			
Township and Range	Section	Project Features	Acres
T69S, R99E	23	Reservoir	206
T69S, R99E	24	Reservoir	48
T69S, R99E	25	Reservoir	245
T69S, R99E	26	Reservoir	34
T69S, R99E	35	Reservoir	145
T69S, R99E	36	Reservoir	207
T70S, R99E	1	Reservoir, access road, power tunnel	43
T70S, R99E	2	Reservoir, access road, dams, intake	277
T70S, R99E	12	Access road	10
T70S, R100E	6	Power tunnel	3
T70S, R99E	7	Access road, power tunnel, powerhouse, marine access facilities, transmission line	39
Total			1,257

Total amount of State of Alaska submerged land would be approximately 24 acres and approximately 7 acres of Canadian submerged land.

		Table A-3 State Submerged Lands	

Township	Range	Section	Acres
T70S	R100E	3, 4, 7, 8, 9	4
T69S	R100E	34,26,27,23,13,14,12,1	19.5
T68S	R100E	31	0.5

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EXHIBIT B

PROJECT OPERATION &
RESOURCE UTILIZATION

SOULÉ HYDRO, LLC.

SOULÉ RIVER HYDROELECTRIC PROJECT

(FERC NO. P-13528 & P-12615)

EXHIBIT B

PROJECT OPERATION AND RESOURCE UTILIZATION

(1) ALTERNATIVE SITES

(i) Alternative Sites in the Hyder Area

In 2006, the Applicant was issued preliminary permit P-12614 for investigation of a run-of-river development on the Salmon River north of Hyder (the Nine Mile Hydroelectric Project). This permit was surrendered in 2007 after initial investigations determined significant technical, environmental, and economic constraints with the site.

In response to a request by the USFS, in 2009 the Applicant reviewed 17 other suggested sites in the Salmon River basin. None of the sites were determined to be superior to the Soulé River site, or even worthy of additional investigation. A letter summarizing the Applicant's review is included in Appendix A of Exhibit E.

(ii) Alternative Sites in the Soulé River Basin

The proposed dam site is obviously the superior site in the Soulé River basin for development of a storage dam and reservoir due to the narrow gorge just below the confluence of the two main forks of the river, with a relatively broad and flat valley upstream. A storage project is necessary to efficiently and economically utilize the Soulé River resource because of the highly variable streamflows. Nevertheless, the Applicant has identified and considered two run-of-river alternatives in the Soulé River basin, as described below.

The Soulé River drops about 200 feet through a steep narrow 0.6-mile long gorge just above tidewater. The first alternative would be a run-of-river project with a capacity of about 25-30 MW could be developed by construction of a diversion dam, tunnel, and power plant at tidewater on the western portion of the delta. This could be a first stage development, with construction of the storage dam, reservoir, and second power plant in a subsequent second stage. This alternative plan was not selected because: 1) generation would only be possible during about 6 months of the year when the value of power is lowest, and 2) the entire cost of the transmission line for the full development would need to be borne by the first stage, which makes the first stage cost of power very high.

The second run-of-river alternative is a very small installation that might be possible to build under the current Forest Service land use designation for the area (Remote Recreation). This alternative would have the diversion at the same location as above (0.6 miles upstream from tidewater), but the 550 kW powerhouse would be located in the river gorge 1000 feet above tidewater as required by the Remote Recreation LUD, with only trail access. This alternative is not proposed because of the extremely high cost of power; it has been developed and evaluated at the request of the Forest Service as an alternative to be evaluated by the Environmental Assessment (Exhibit E). Details of this alternative may be found in Exhibit E.

(2) ALTERNATIVE DESIGNS AND OPERATIONS

(i) Alternative Reservoir Capacities and Power Plant Hydraulic Capacities

The generation by the Project will be determined primarily by two characteristics: 1) the reservoir capacity, and 2) the power plant hydraulic capacity. Other factors (such as the tunnel diameter or number of generating units) will also influence the generation, but to a much lesser extent than the reservoir capacity and the power plant hydraulic capacity. The Applicant conducted an economic analysis to determine the values for these two main characteristics as proposed in this application (maximum reservoir at El 575, hydraulic capacity of 2000 cfs). The economic analysis was based on the assumptions described in Exhibit D. Alternative maximum reservoir levels at 525 feet, 550 feet, 575 feet, and 600 feet were evaluated, as were alternative hydraulic capacities of 1500 cfs, 1800 cfs, and 2000 cfs.

This economic analysis indicates the optimum project would have a reservoir level between El 550 and El 575 with a hydraulic capacity between 1800 cfs and 2000 cfs. However, the analysis is quite sensitive to the assumptions used for the financing conditions - - low interest and discount rates favor higher values for the reservoir level and hydraulic capacity, and vice versa. The actual financing conditions cannot be accurately determined at this stage of development. Since it would be much easier to decrease the size of the project once the license is issued than to increase it, the Applicant has elected to propose in this application a project with the reservoir size and hydraulic capacity at the upper end of the feasible range.

(ii) Alternative Dam Types

The proposed dam type is an asphalt-core rockfill (ACR). This type of dam has to the Applicant's knowledge not been used in the United States, although it is common elsewhere in the world (particularly in Norway). Hydro Quebec constructed a small ACR dam in 2008 as part of its Eastmain 1-A project to gain experience with ACR, since they are considering using it for future large developments.

Other dam types considered for the site include roller-compacted concrete (RCC) and concrete-faced rockfill (CFR). An RCC dam would have about 35% of the volume of the ACR dam, and a CFR dam would utilize methods typical for the United States. Nevertheless, an ACR dam is proposed because for the following reasons:

- Precipitation in the area is very high, which can adversely affect concrete placement for either and RCC or CFR dam. The asphalt core of an ACR dam is not affected by precipitation because the placement method includes a preheat process that evaporates any surface moisture.
- The site is very remote, and thus imported materials (such as cement for RCC) are comparatively very expensive. Even though asphalt will need to be imported like cement, its position in the center of the dam minimizes its volume compared to the concrete on the face of a CFR dam.

- The asphalt core is in an ideal protected environment in the mass of the dam and thus not subject to weathering like concrete.

(iii) Alternative Power Conduit Arrangements

The proposed power conduit arrangement is a partially-lined bored tunnel without a surge tank. Alternative power conduit arrangements that have been considered include: 1) addition of a surge tank to allow load-following operation, and 2) construction of the tunnel by drill-and-blast techniques. These alternatives are discussed in the following paragraphs.

Surge Tank: Due to the length of the tunnel, the water starting time is about 7.5 seconds, which is too long for the project as proposed to be used to follow load. The selected tunnel alignment allows for excavation of a surge chamber in bedrock about 3200 feet above the powerhouse, which would decrease the water starting time to about 2.5 seconds. Access to the top of the surge chamber would be by a 1,500-foot long road, much of which would be visible from Portland Canal. A surge tank is not proposed because: 1) it is not expected that the project will be required to follow load, and 2) adverse environmental impacts of the access road. If there is sufficient future incentive for load-following operation, a surge chamber could be added after amending the license.

Drill-and-Blast Tunnel: The power tunnel could be constructed with conventional drill-and-blast techniques, and it would be possible to use multiple headings. A bored tunnel has the following advantages over a tunnel excavated by drill-and-blast techniques: 1) the diameter can be smaller because of the smoother rock surface, which results in less spoil volume; 2) blasting operations generally loosen more material, resulting in greater support requirements; 3) bored-tunnel spoils are uniform and make excellent surfacing material for roads, whereas drill-and-blast tunnels spoils are more random in size with limited value, and; 4) the single heading of a bored tunnel minimizes adverse environmental impacts from multiple headings. However, a bored tunnel is more affected by unexpected adverse rock conditions than a drill-and-blast tunnel. Bored tunnels are generally more economical with longer lengths, and the length of the Project tunnel is in the "grey area" where neither type is definite. The decision on tunnel type will need to be made at the time of bidding, with contractors offered the option of either type.

(iv) Alternative Access Road Alignments

The proposed access road alignment has been selected based on cost, functionality, and environmental impact criteria. One primary objective is to minimize visibility of the road corridor from Portland Canal; to accomplish this, the road is aligned behind a ridge in the foreground as much as possible. An alternative of routing the road up the Soulé River canyon was briefly considered but was abandoned as it would require several bridges across the river, and would not appreciably decrease the road's visibility.

The selected alignment includes one 1900-foot-long tunnel to avoid benching along a very steep hillside. The bench alternative would likely be less expensive than the tunnel, but it would not be a reliable method of access to the dam except in the summer, due to the very high snowfall accumulations in the Soulé River canyon.

The selected alignment climbs from the river bottom to the dams near the spillway, traversing the alluvial deposits that form the foundation of the Saddle Dam. Two alternatives for this steep section of road have been considered. One would climb the rock mass forming the west abutment of the Main Dam, the other would climb the valley wall from the west end of the Soulé River bridge to the south end of the Saddle Dam. The former alternative was not selected because it would require several tight turns that would be difficult for the large equipment required for the dam construction, and would complicate the arrangement of the diversion tunnel and outlet works. The latter alternative was not selected because of the steepness of the valley wall at that location and the presence of several snow chutes.

(v) Alternative Power Plant Locations

Initially, the Applicant planned to locate the power plant on the north side of the delta, discharging into Glacier Bay, as that location provided the shortest length of power conduit. The selected location was subsequently chosen because; 1) it minimizes potential impacts to Glacier Bay by discharging back to the Soulé River channel at tidewater, and 2) it allows partial screening of the power plant by existing forest.

(vi) Alternative Transmission Line Types and Alignments

Topography between the Soulé River delta and the Hyder/Stewart interconnection is extremely steep and rugged on the American side of Portland Canal, less so on the Canadian side. Construction of a conventional overhead transmission line was early on judged to be out of the question because of costs and environmental impacts. The Applicant briefly considered routing the transmission line on the Canadian side of Portland Canal, but abandoned that idea due to the likely jurisdictional complications.

The proposed project terminates the primary transmission line at the existing BCTC Stewart Substation, with only part of the submarine under FERC jurisdiction. An alternative was considered that would have the submarine cable terminate at a new substation in Hyder, AK, with an overhead line to the Stewart Substation and a feeder to the Hyder distribution system. That arrangement would provide an easier jurisdictional framework, since all of the submarine cable would be under FERC jurisdiction; only the overhead line from the new Hyder substation to the Stewart Substation would be outside of FERC's jurisdiction. However, reconnaissance of the overhead line route in Canada has determined that the route would be very problematic due to snowslides, poor foundation conditions, and limited room.

(3) PROPOSED OPERATION

(i) Operation Mode

The project will normally operate under automatic control, with manual control as a selectable option.

(ii) Annual Plant Factor

The estimated plant factor is 42% (annual generation of 283 GWh and an installed capacity of 77.4 MW).

(iii) Operation During Adverse, Mean, and High Water Years

The project will be operated to provide firm power according to a schedule determined by the utility receiving the power. For the purposes of this application, the Applicant has assumed a delivery schedule to maximize revenue from power sales based on the 2009 Clean Power Call by BC Hydro. This schedule assumes peaking operation during winter months when flows are very low and run-of-river operation when the reservoir is full during the summer months. The Applicant's modeling of the project operation has determined the delivery schedule shown in Table B-1 is near optimum.

During adverse water years, the Project will be able to generate little more than the firm energy schedule during the winter, and the reservoir will be drawn down to near minimum levels by late April or early May. The reservoir will refill during the summer, and any surplus water will be released for non-firm generation at a rate to maximize efficiency and revenue.

During mean water years, there may be somewhat more water available during the winter months than in adverse years. Nevertheless, the Project will be operated to provide only the required firm power delivery, and the reservoir will not draw down as far as in adverse water years. Once the reservoir refills in the summer, there will be more water available for non-firm generation. There may be some brief periods during the summer when the inflows are so high that additional water must be released through the spillway or the outlet works.

During high water years, the operation will be similar to that during mean water years, except there will be longer periods of non-firm generation and spill.

Figure 4 shows reservoir levels during typical adverse (1978), mean (1987), and high (1981) water years.

(4) ESTIMATED GENERATION

(i) Energy Production

The firm power production is estimated to be 210 GWh/year and the average annual generation is estimated to be 283 GWh/year. Monthly dependable capacities are the values shown in the first column of Table B-1 (Super-Peak Firm Generation). These energy production values have been determined by numerical modeling of the operation as described above using the hydrology and machine characteristics described below.

(ii) Hydrology

In 2007, the Applicant contracted for the USGS to establish and maintain a stream gage on the Soulé River just below the dam site (Gage 15009000). The gage began recording on August 1, 2007, and three full water years of approved data are currently available. Statistics from these three years of data are shown in Table B-2.

Three years does not provide a sufficient basis for determining the project generation, as that short period may not include a wide variety of flow conditions. Therefore, the Applicant undertook additional studies to extend the flow record. Unfortunately, there are no gages on nearby streams with similar characteristics and long periods of record. The most suitable gages are considered to be:

- Fish Creek near Ketchikan (USGS 15072000), 32.1 mi^2 drainage area, 50 miles distant, no glaciers, low elevation basin

- Stikine River near Wrangell (USGS 15024800), 19,920 mi^2 drainage area, 96 miles distant, significant glaciated
- Mendenhall River near Juneau (USGS 15052500), 85.1 mi^2 drainage area, 244 miles distant, significant % glaciated

For comparison, the Soulé River has a drainage area of 77.33 mi^2, of which about 40% is glacier.

The Applicant correlated average daily flows between the Soulé River gage record and the records of each of these three gages. Correlation with Fish Creek was poor, but fair-to-good with the Stikine River and the Mendenhall River. The Applicant's analysis has determined that the preferred method of extending the gage record is to correlate with the Mendenhall River on a month-by-month basis. There is no record for the Mendenhall River for WY 1995-96; for those two years the record was extended by an annual correlation with the Stikine record. Statistics from the extended record are also shown in Table B-2. The Applicant will review the method of data extension as more approved data from the Soulé River gage becomes available.

There is no appreciable drainage area between the USGS gage on the Soulé River and the power intake, therefore, no adjustment for drainage area has been made.

The Applicant's numerical model includes an adjustment for leakage that varies with the reservoir water level. As a basic leakage rate, the Applicant has used a value of 6 cfs with the reservoir at El 550, based on an analysis of potential leakage through the proposed grout curtain under the Saddle Dam.

No allowance has been made for evaporation. The climate in the Soulé River basin is very cool and wet, and evaporation is unlikely to be significant.

No fish with commercial or recreational value utilize the Soulé River below the proposed dam. A population of Dolly Varden char utilize one tributary (Dolly Varden Creek, aka Zapus Creek) below the dam site, and may at times utilize the Soulé River channel. Because of the absence of highly-valued fish species, the Applicant does not propose to release instream flows from the dam, and the numerical modeling of the project operation does not include any adjustment for instream flows. The Applicant believes the population of Dolly Varden in Dolly Varden Creek will not be adversely affected by project operation, and may be benefited because of the lower velocities in the Soulé River channel.

Mininum, mean, and maximum average daily flows for the extended record are shown in Figure B-1. Flow duration curves for both the recorded and extended records are shown in Figure B-2. Monthly dependable capacities are based on the following years: 1978 for February-April, 2008 for May, and 1985-86 for June-January.

(iii) Reservoir Characteristics

An area-capacity curve for the reservoir is shown in Figure B-3. As described above, the project will not be operated on a rule curve, but rather on a firm energy delivery schedule. Therefore, a rule curve is not provided. Figure B-4 shows reservoir elevations during the adverse, mean, and high water years based on the assumed firm energy delivery schedule.

(iv) Turbine and Generator Characteristics

Turbine characteristics have been estimated from USBR Monograph 20 (Selecting Hydraulic Reaction Turbines) for a power plant hydraulic capacity of 2000 cfs at full gate and a net head of 500 feet (three units at 667 cfs). Estimated flows, efficiencies, and generator output at rated, maximum, and minimum heads are shown in Table B-3 below.

(v) Tailwater Rating Curve

A tailwater rating curve is shown in Figure B-5 for low tide conditions. Tide level will influence the tailwater curve whenever the tide is higher than the normal depth in the channel at the confluence.

(vi) Power Plant Capability

Power plant capability vs. head curves are shown in Figure B-6, with separate curves for capability with one, two, and three units in operation. Heads and capacities at normal, minimum, and maximum reservoir levels are indicated on each curve.

(5) GENERATION UTILIZATION

(i) Power Needs

The project will be interconnected with BC Hydro through the BCTC transmission system. Theoretically, generation could be utilized by any utility in the western United States or Canada. For the analyses for this application, the Applicant has assumed that the generation would be sold to BC Hydro. BC Hydro documents indicated they expect a firm energy deficit of 600 GWh in 2013, growing to 5300 GWh in 2019. These values include the effects of demand side management (i.e. conservation and rate design programs). BC Hydro has initiated several programs to acquire additional firm generation, but expects there will be “an energy shortfall of 700 to 1,400 GWh during the F2018-20 which will be exacerbated with the need to acquire insurance volumes on or before the mandated 2020 timeframe”. This is exactly the timeframe when the project generation could be available (see Exhibit C).

Puget Sound Energy is also a potential power purchaser. Their 2010 All Source IFP indicates a capacity need of 676 MW in 2013, growing to 4,239 MW by 2029. Its renewable energy need is estimated to be about 3,600 GWh (410 aMW) in 2020, growing to 4,300 GWh (485 aMW) by 2029 (based on a 15% renewable standard).

(ii) Power Sales

The Applicant expects to sell all of the project generation to an area utility, such as BC Hydro or Puget Sound Energy. Energy use on-site will be insignificant.

(6) PLANS FOR FUTURE DEVELOPMENTS

The Applicant does not plan any future development in the Soulé River basin.

Table B-1 Assumed Firm Energy Schedule (MW)			
Month	Super-Peak Firm Generation (1)	Peak Period Firm Generation (2)	Off-Peak Period Firm Generation (3)
January	61.0	26.5	0
February	58.1	0	0
March	53.8	0	0
April	51.5	0	0
May	51.9	0	0
June	58.1	58.1	58.1
July	59.0	59.0	59.0
August	66.0	66.0	66.0
September	65.8	65.8	0
October	70.0	0	0
November	71.8	0	0
December	67.1	26.3	0

(1) The super-peak period is Monday-Saturday, 4-8 PM (24 hrs/week)
(2) The peak period is Monday-Saturday, 6 AM – 4 PM and 8-10 PM (72 hrs/week)
(3) The off-peak period is all other times (72 hrs/week)

Table B-2
Minimum, Mean, and Maximum Daily Average Stream Flows
Soulé River at Dam Site

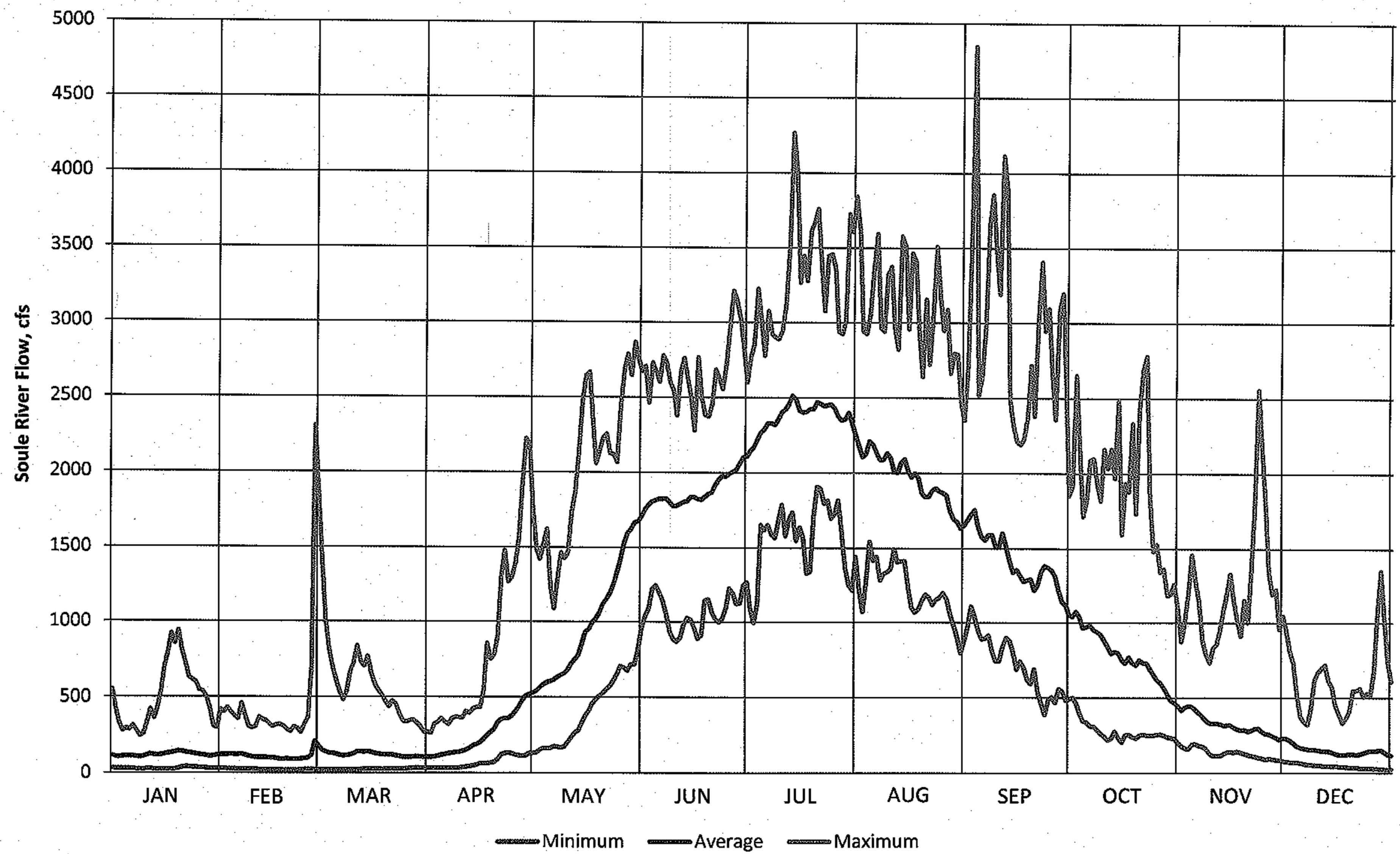
	Recorded Flows, cfs (1)			Extended Flows, cfs (2)		
Month	Min.	Mean	Max.	Min.	Mean	Max.
January	39	91	273	24	120	942
February	41	79	153	19	110	2,309
March	34	89	166	21	121	1,422
April	40	196	906	33	259	2,223
May	297	1,064	2,790	136	1,014	2,869
June	1,050	1,831	2,680	868	1,880	3,212
July	995	2,161	3,100	995	2,374	4,267
August	795	1,948	3,520	795	1,963	3,621
September	387	1,562	4,850	387	1,412	4,850
October	204	686	2,490	201	773	2,783
November	85	246	1,010	80	319	2,558
December	44	88	326	25	146	1,356
Annual	34	893	4,850	19	879	4,850

(1) October 1, 2007 – September 30, 2010

(2) October 1, 1976 – September 30, 2010; data prior to October 1, 2007 estimated by correlation with the Stikine and Mendenhall Rivers.

Table B-3 Turbine and Generator Characteristics									
	Half Gate			Best Gate			Full Gate		
# of Units Operating	1	2	3	1	2	3	1	2	3
Minimum Reservoir									
Elevation, feet	450	450	450	450	450	450	450	450	450
Flow, cfs	376	747	1,109	511	1,012	1,496	615	1,210	1,769
Net head, feet	440	435	427	438	430	417	437	425	407
Turbine efficiency	87.4%	87.3%	87.1%	91.6%	91.5%	91.3%	87.3%	87.0%	86.1%
Turbine output, HP	16,400	32,200	46,800	23,200	45,100	64,500	26,600	50,700	70,400
Generator efficiency	97.3%	97.3%	97.3%	97.7%	97.6%	97.6%	97.8%	97.8%	97.7%
Generator output, kW	11,900	23,300	34,000	16,900	32,900	47,000	19,400	37,000	51,300
Average Reservoir									
Elevation, feet	550	550	550	550	550	550	550	550	550
Flow, cfs	425	844	1,253	529	1,056	1,581	696	1,367	1,996
Net head, feet	539	533	524	538	529	514	536	520	498
Turbine efficiency	89.2%	89.1%	89.1%	92.2%	92.2%	92.2%	89.2%	89.0%	88.8%
Turbine output, HP	23,200	45,500	66,300	23,200	45,500	66,300	37,700	71,900	100,200
Generator efficiency	97.7%	97.7%	97.6%	97.9%	97.9%	97.9%	98.0%	98.0%	98.0%
Generator output, kW	16,900	33,100	48,300	21,700	42,600	62,000	27,600	52,500	73,200
Maximum Reservoir									
Elevation, feet	575	575	575	575	575	575	575	575	575
Flow, cfs	437	867	1,267	533	1,062	1,587	716	1,407	2,052
Net head, feet	564	558	548	563	553	539	560	544	521
Turbine efficiency	89.2%	89.2%	89.2%	92.0%	92.1%	92.2%	89.2%	89.2%	89.1%
Turbine output, HP	24,900	48,900	71,300	31,300	61,400	89,400	40,600	77,500	108,000
Generator efficiency	97.7%	97.7%	97.7%	97.9%	97.9%	97.9%	98.0%	98.0%	98.0%
Generator output, kW	18,200	35,700	52,000	22,900	44,800	65,300	29,700	56,600	78,900

Figure B-1
Minimum, Mean, and Maximum Average Daily Flows for Extended Soule River Gage Record



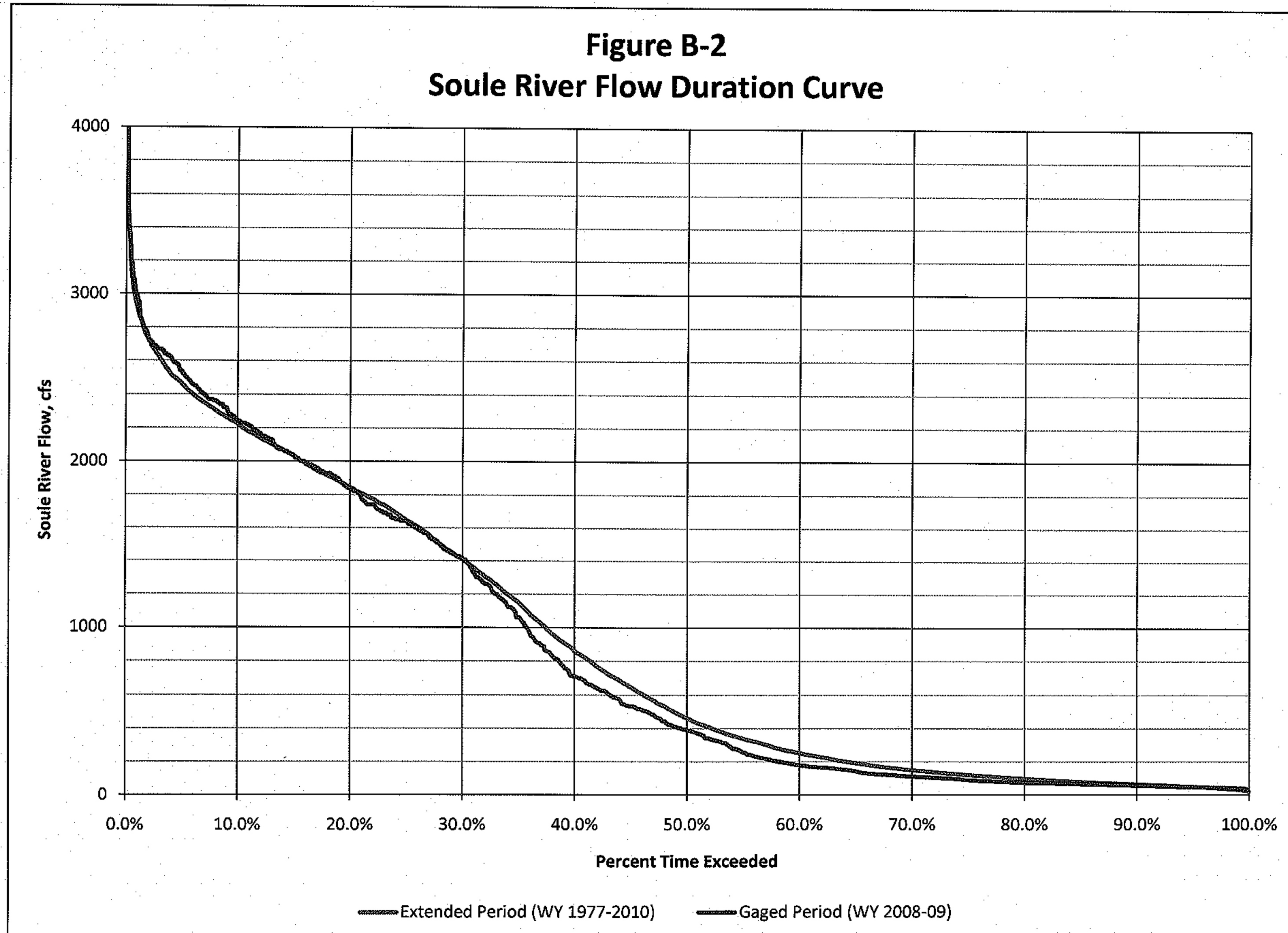


Figure B-2
Soule River Flow Duration Curve
Soule River Flow, cfs
4000
3000
2000
1000
0
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
70.0%
80.0%
90.0%
100.0%
Percent Time Exceeded
Extended Period (WY 1977-2010)
Gaged Period (WY 2008-09)

Figure B-3
Soule Reservoir Area-Capacity Curves

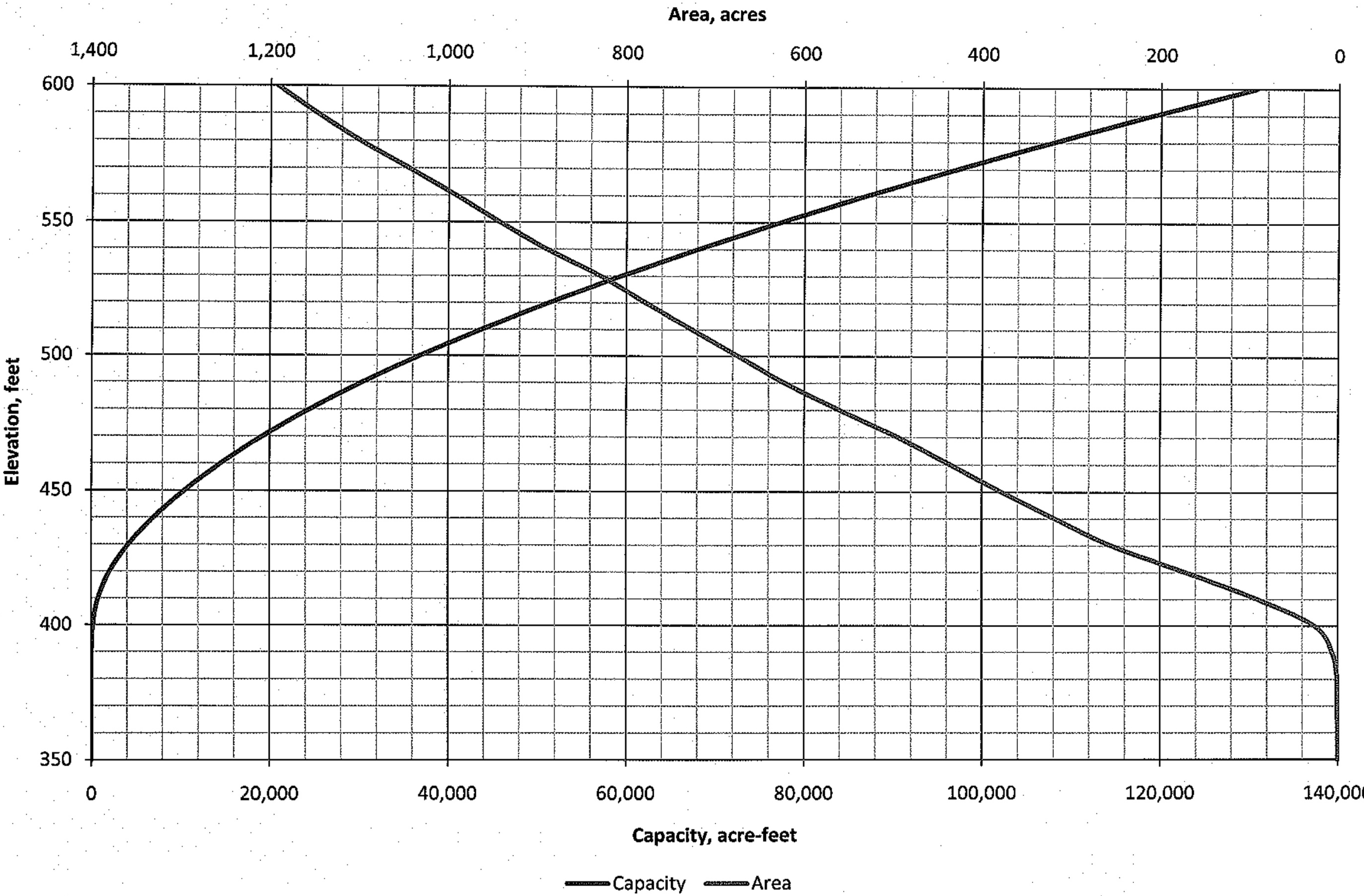


Figure B-4
Reservoir Level During Adverse, Mean, and High Water Years

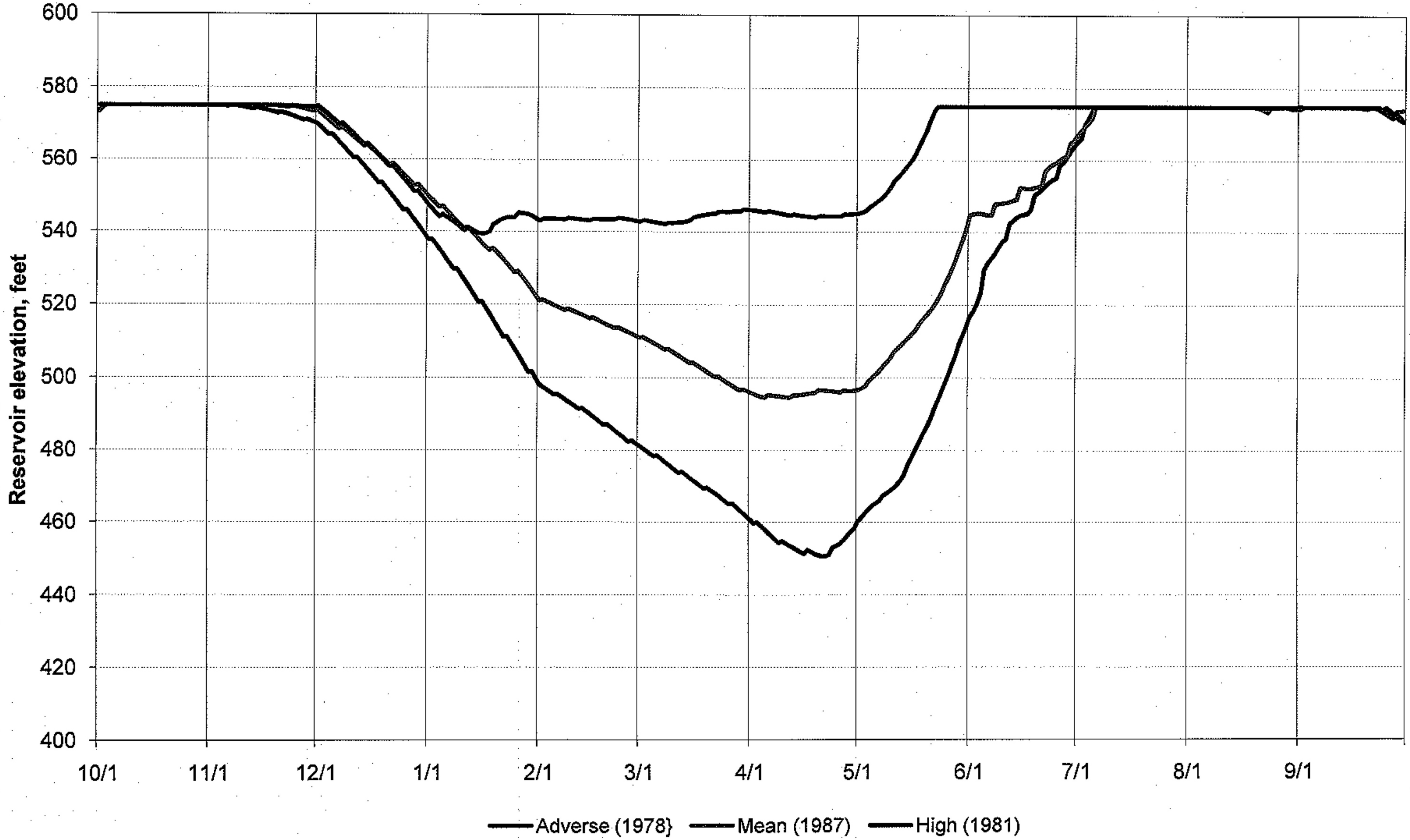


Figure B-5
Tailwater Rating Curve

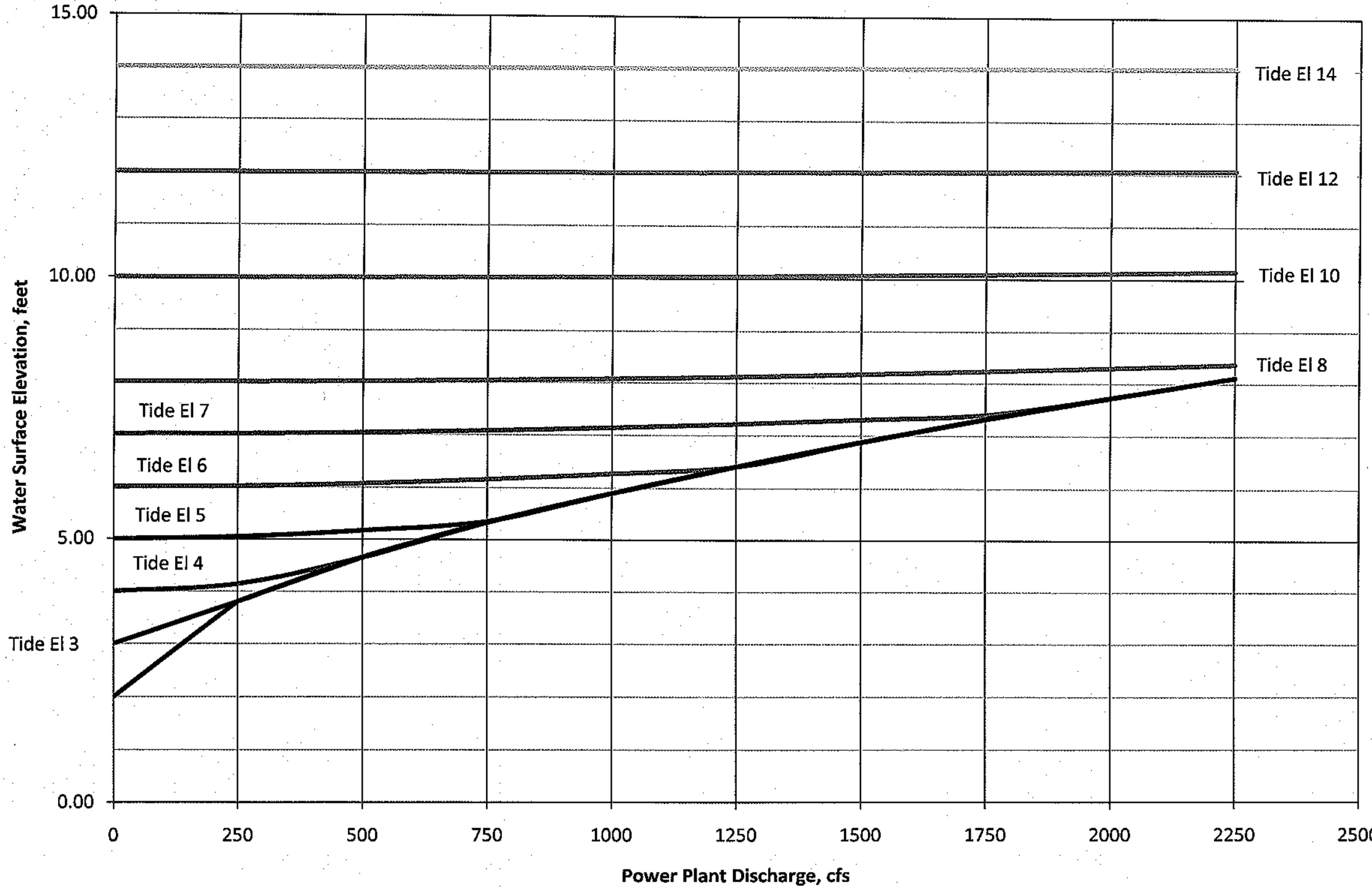


Figure B-6
Power Plant Capability vs. Head

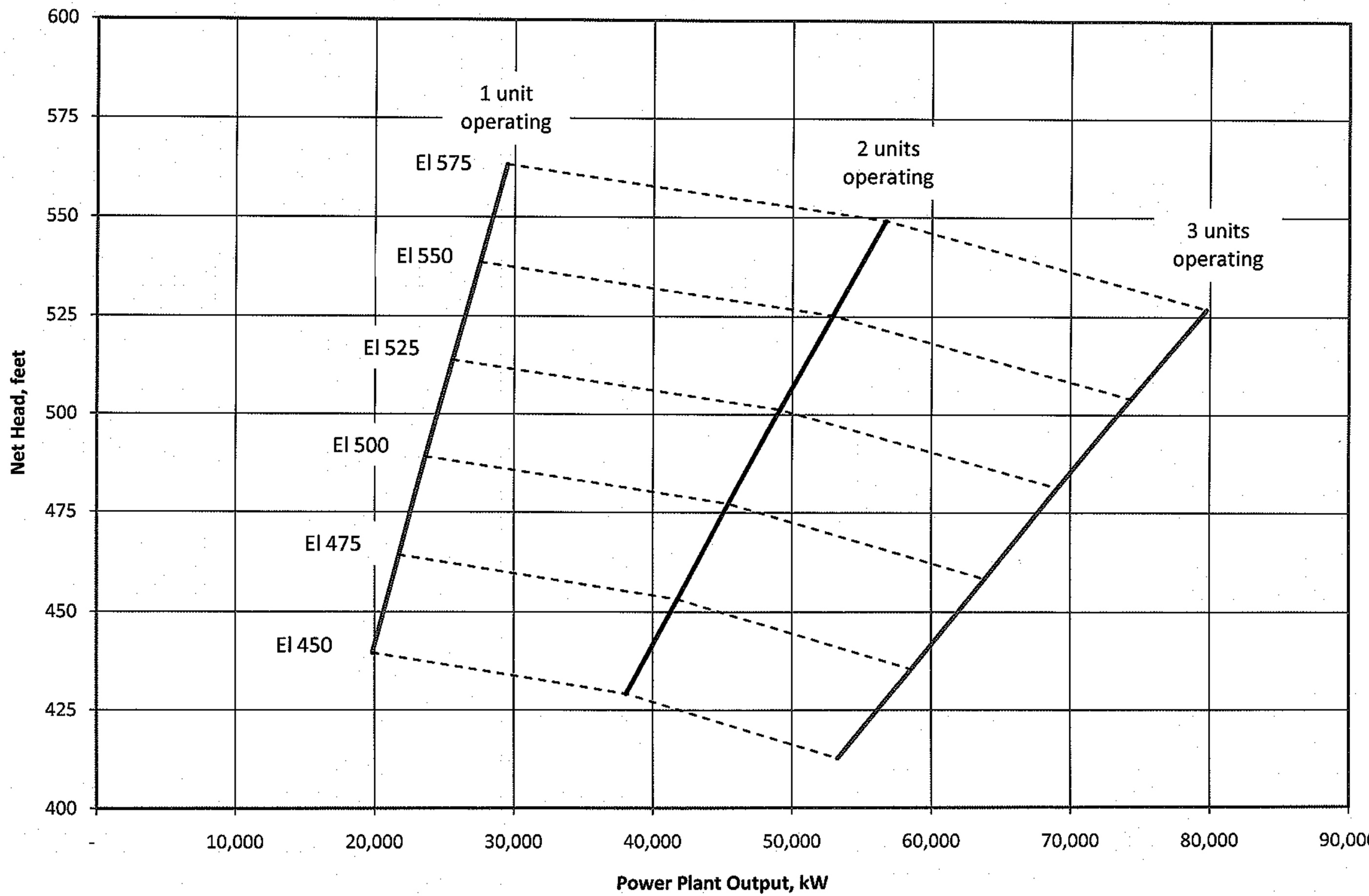


EXHIBIT C

CONSTRUCTION HISTORY & PROPOSED CONSTRUCTION SCHEDULE

SOULÉ HYDRO, LLC.

SOULÉ RIVER HYDROELECTRIC PROJECT

(FERC NO. P-13528 & P-12615)

EXHIBIT C

PROPOSED CONSTRUCTION SCHEDULE

(1) COMMENCEMENT AND COMPLETION DATES

A preliminary construction schedule is shown in Figure C-1, based on the following assumptions:

- License issued in mid-2014, with commencement of construction required before mid-2016 and completion of construction required before mid-2022.
- License does not include articles that make the project infeasible.
- Final design initiated soon after the license issued.

Based on these assumptions, the Applicant expects that construction would start in early 2015 and be complete by mid-2019.

The critical path construction tasks are:

- Access road to the dam site and upper diversion tunnel portal
- Diversion tunnel, including inlet structure
- Main dam
- Installation of equipment in the intake structure
- Reservoir filling to minimum pool
- Start-up and testing of generation and control equipment

The access road tunnel (Sta 46+00 to Sta 65+00) will be supported by helicopter in order to expedite the access road construction.

(2) COMMENCEMENT OF COMMERCIAL OPERATION

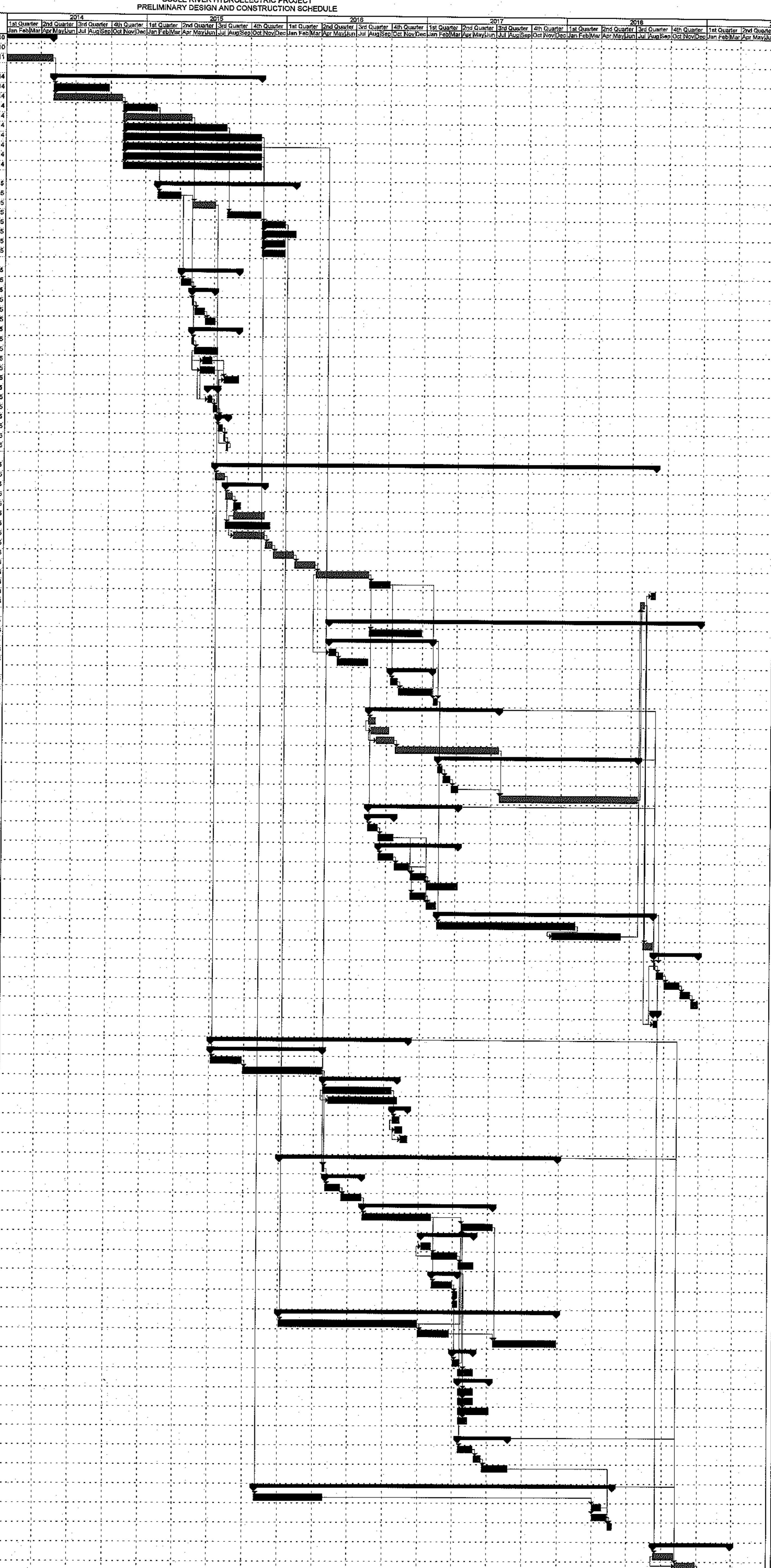
Based on the schedule described above, the Applicant expects that full commercial operation of the Project would be in mid-2019. The generation and control systems are expected to be installed by early 2019, and sufficient water can be stored prior to the spring runoff to allow testing. Reservoir filling will take about 2 months once the runoff begins in late spring 2019. It is expected that all generating units will become operational at the same time.

(3) EXISTING STRUCTURES AND FACILITIES

There are no existing structures and facilities at the site.

FIGURE C-1
SOULE RIVER HYDROELECTRIC PROJECT
PRELIMINARY DESIGN AND CONSTRUCTION SCHEDULE

ID		Task Name	Duration	Start
1		**LICENSING**	178.6 wks	Wed 12/1/10
2		Prepare FERC application	108 days	Wed 12/1/10
3		Application processing	157 wks	Mon 5/2/11
4				
5		**DESIGN**	78 wks	Mon 5/5/14
6		Geotechnical explorations	21 wks	Mon 5/5/14
7		Concept optimization	26 wks	Mon 5/5/14
8		Marine Access and Access Roads	13 wks	Mon 11/3/14
9		Power Tunnel	26 wks	Mon 11/3/14
10		Dams and Reservoir	39 wks	Mon 11/3/14
11		Generating Equipment	52 wks	Mon 11/3/14
12		Powerhouse and Tailrace	52 wks	Mon 11/3/14
13		Switchyard and Substation	52 wks	Mon 11/3/14
14		Transmission Line	52 wks	Mon 11/3/14
15				
16		**CONTRACT BID AND AWARD**	52 wks	Mon 2/2/15
17		Marine Access and Access Roads	9 wks	Mon 2/2/15
18		Power Tunnel	9 wks	Mon 5/4/15
19		Dams and Reservoir	13 wks	Mon 8/3/15
20		Generating Equipment	9 wks	Mon 11/2/15
21		Powerhouse and Tailrace	13 wks	Mon 11/2/15
22		Switchyard and Substation	9 wks	Mon 11/2/15
23		Transmission Line	9 wks	Mon 11/2/15
24				
25		**MARINE ACCESS**	22 wks	Mon 4/6/15
26		Mobilization	4 wks	Mon 4/6/15
27		**Tunnel portal excavation**	9 wks	Mon 5/4/15
28		Clearing	1 wk	Mon 5/4/15
29		Open excavation	4 wks	Mon 5/11/15
30		Starter tunnel excavation	4 wks	Mon 6/8/15
31		**Barge basin and staging area**	18 wks	Mon 5/4/15
32		Cofferdam	1 wk	Mon 5/4/15
33		Pit excavation	9 wks	Mon 5/11/15
34		Slope protection	4 wks	Mon 6/1/15
35		Retaining wall	6 wks	Mon 5/25/15
36		Excavation from barge	6 wks	Mon 7/27/15
37		**Dock**	4 wks	Mon 6/15/15
38		Pile installation	2 wks	Mon 6/15/15
39		Dock installation	2 wks	Mon 6/29/15
40		**Ramp**	4 wks	Mon 7/13/15
41		Retaining wall	2 wks	Mon 7/13/15
42		Fill	1 wk	Mon 7/27/15
43		Concrete surfacing	1 wk	Mon 8/3/15
44				
45		**ACCESS ROADS**	165 wks	Mon 7/6/15
46		Mobilization	4 wks	Mon 7/6/15
47		**Tunnel**	15 wks	Mon 8/3/15
48		Portal at Sta 66+00	3 wks	Mon 8/3/15
49		Portal at Sta 47+00	3 wks	Mon 8/24/15
50		Tunnel excavation and support	12 wks	Mon 8/24/15
51		Main road Sta 5+00 to 47+00	17 wks	Mon 8/3/15
52		Main road Sta 66+00 to 87+00	12 wks	Mon 8/24/15
53		DV creek culvert (Sta 87+00 to Sta 88+00)	3 wks	Mon 11/16/15
54		Main road Sta 88+00 to 101+00	8 wks	Mon 12/7/15
55		Bridge (Sta 101+00 to Sta 103+00)	8 wks	Mon 2/1/16
56		Main road Sta 103+00 to 150+00	20 wks	Mon 3/28/16
57		Construction road to diversion portal	8 wks	Mon 8/15/16
58		Construction road to West Fork weir	2 wks	Mon 8/20/18
59		Main road and bridge to intake	2 wks	Mon 7/23/18
60				
61		**DAM AND RESERVOIR**	139 wks	Mon 5/2/16
62		Reservoir clearing	20 wks	Mon 8/15/16
63		**Diversion tunnel**	39 wks	Mon 5/2/16
64		Lower portal	3 wks	Mon 5/2/16
65		Tunnel	12 wks	Mon 5/23/16
66		**Upper portal**	16 wks	Mon 10/10/16
67		Excavation	3 wks	Mon 10/10/16
68		Concrete	13 wks	Mon 10/31/16
69		Cofferdam	2 wks	Mon 1/30/17
70		**Saddle dam**	49 wks	Mon 8/15/16
71		Foundation excavation	3 wks	Mon 8/15/16
72		Concrete plinth	7 wks	Mon 8/22/16
73		Foundation grouting	7 wks	Mon 9/5/16
74		Embankment	39 wks	Mon 10/24/16
75		**Main dam**	75 wks	Mon 2/13/17
76		Foundation excavation	2 wks	Mon 2/13/17
77		Concrete plinth	3 wks	Mon 2/27/17
78		Foundation grouting	3 wks	Mon 3/20/17
79		Embankment	52 wks	Mon 7/24/17
80		**Spillway**	34 wks	Mon 8/15/16
81		**Excavation**	10 wks	Mon 8/15/16
82		Crest	4 wks	Mon 8/15/16
83		Chute	6 wks	Mon 9/12/16
84		**Concrete**	30 wks	Mon 9/12/16
85		Crest walls	6 wks	Mon 9/12/16
86		Gate base and piers	6 wks	Mon 10/24/16
87		Flip bucket	6 wks	Mon 12/5/16
88		Chute walls	12 wks	Mon 1/16/17
89		Crest gate installation	6 wks	Mon 12/5/16
90		Bridges over spillway	4 wks	Mon 1/16/17
91		**Intake structure**	81 wks	Mon 2/13/17
92		Excavation	52 wks	Mon 2/13/17
93		Concrete	26 wks	Mon 12/11/17
94		Equipment installation	4 wks	Mon 8/6/18
95		**Outlet works**	17 wks	Mon 9/3/18
96		Diversion closure	1 wk	Mon 9/3/18
97		Inlet	3 wks	Mon 9/10/18
98		Pipe	6 wks	Mon 10/1/18
99		Valve house	4 wks	Mon 11/12/18
100		Valve installation	3 wks	Mon 12/10/18
101		**West Fork weir**	2 wks	Mon 9/3/18
102		Fill	2 wks	Mon 9/3/18
103				
104		**POWER TUNNEL**	74 wks	Mon 7/6/15
105		**Tunnel**	42 wks	Mon 7/6/15
106		TBM mobilization and setup	12 wks	Mon 7/6/15
107		Excavation	30 wks	Mon 9/28/15
108		**Concrete lining (2,600 ft)**	28 wks	Mon 4/25/16
109		Concrete	26 wks	Mon 4/25/16
110		Grout	26 wks	Mon 5/9/16
111		**Steel liner (500 ft)**	6 wks	Mon 10/24/16
112		Pipe	3 wks	Mon 10/24/16
113		Concrete	3 wks	Mon 10/31/16
114		Grout	3 wks	Mon 11/14/16
115				
116		**POWERHOUSE AND TAILRACE**	104 wks	Mon 1/4/16
117		Cofferdam	1 wk	Mon 4/25/16
118		**Powerhouse excavation**	14 wks	Mon 5/2/16
119		Common	6 wks	Mon 5/2/16
120		Rock	8 wks	Mon 6/13/16
121		**Powerhouse Concrete**	49 wks	Mon 8/8/16
122		Substructure	26 wks	Mon 8/8/16
123		Turbine embedment	12 wks	Mon 4/24/17
124		**Tailrace**	20 wks	Mon 1/9/17
125		Excavation	4 wks	Mon 1/9/17
126		Conduit installation and backfill	10 wks	Mon 2/6/17
127		Concrete	6 wks	Mon 4/17/17
128		**Superstructure**	10 wks	Mon 2/6/17
129		PEMB	8 wks	Mon 2/6/17
130		Door and windows	2 wks	Mon 4/3/17
131		Insulation	2 wks	Mon 4/3/17
132		**Generating units**	104 wks	Mon 1/4/16
133		Procurement - embedded parts	52 wks	Mon 1/4/16
134		Procurement - balance	12 wks	Mon 1/2/17
135		Installation - balance	24 wks	Mon 7/17/17
136		**Miscellaneous mechanical**	8 wks	Mon 4/3/17
137		Bridge crane	3 wks	Mon 4/3/17
138		Other	6 wks	Mon 4/17/17
139		**Electrical**	12 wks	Mon 4/17/17
140		Switchgear	6 wks	Mon 4/17/17
141		Station battery	6 wks	Mon 4/17/17
142		Control system	12 wks	Mon 4/17/17
143		Power and lighting	4 wks	Mon 4/17/17
144				
145		**SWITCHYARD AND SUBSTATION**	19 wks	Mon 4/17/17
146		Concrete foundations	6 wks	Mon 4/17/17
147		Grading and fencing	3 wks	Mon 5/29/17
148		Equipment installation	10 wks	Mon 6/19/17
149				
150		**TRANSMISSION LINE**	134 wks	Mon 11/2/15
151		Materials procurement	26 wks	Mon 11/2/15
152		Submarine cable installation	4 wks	Mon 4/2/18
153		Overhead/buried cable to Stewart substation	6 wks	Mon 4/2/18
154		Interconnections	2 wks	Mon 5/14/18
155				
156		**COMPLETION**	29 wks	Mon 9/10/18
157		Reservoir filling	2 mons	Mon 9/10/18
158		Testing and start-up	8 wks	Mon 11/5/18
159		Cleanup and demobilization	13 wks	Mon 12/31/18



Task | Critical Task | Milestone | Rolled Up Task | Rolled Up Milestone | Split | Project Summary | Deadline
Task Progress | Critical Task Progress | Summary | Rolled Up Critical Task | Rolled Up Progress | External Tasks | Group By Summary

EXHIBIT D

STATEMENT OF PROJECT COST & FINANCING

SOULÉ HYDRO, LLC.
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)
EXHIBIT D
PROJECT COSTS AND FINANCING

(1) COSTS OF NEW CONSTRUCTION

(i) Cost of Land and Water Rights

The Project will occupy lands of the United States (Tongass National Forest) and the State of Alaska. The Applicant does not expect any capital costs associated with the Federal and State lands.

(ii) Cost of Major Project Works

The construction cost estimate for the Project is summarized in Table D-1. The total direct construction cost is estimated at $211,000,000 (2010 bid level, 2014 on-line), which includes a contingency allowance of 15%.

The construction cost has been determined by applying unit costs to construction quantities. The quantities have been calculated from the preliminary layout of the project structures as shown in Exhibit F, and the unit costs have been determined from published data, preliminary equipment and materials quotations, and the Applicant's experience with construction of projects in Southeast Alaska.

Escalation of prices has been assumed at 3.0% per year from 2010 to the estimated midpoint of the construction period (5 years of escalation). Escalation has in recent years been less than 3.0%, but the Applicant expects the rate will increase moderately in the next few years. The total direct construction cost for the expected mid-2019 on-line date is estimated to be $244,000,000.

(iii) Indirect Construction Costs

Indirect construction costs are estimated to be 10% of the direct construction costs, including:

- Licensing and permitting ....1.0% of direct construction cost
- Design engineering ....4.5% of direct construction cost
- Construction management ....4.0% of direct construction cost
- Administrative and legal costs.....0.5% of direct construction cost

(iv) Interest During Construction

Interest during construction is estimated to be 16.2% of the direct construction cost, based on a preliminary cash flow projection for a 4.5 year construction period and an interest rate of 8.0%. The sum of the direct construction costs, indirect construction costs, and interest during construction is termed the total investment cost, and amounts to $295,000,000.

(v) Other Costs

Additional capital costs are estimated as follows:

- Financing costs............................1.5% of total investment cost
- Reserve fund ....9.0% of total investment cost

The reserve fund is assumed to be a financing requirement. Interest earned on the reserve fund is estimated at 6% per year.

The sum of the total investment cost, financing costs, and reserve fund is termed the total capital requirement, and amounts to $334,000,000.

(2) ORIGINAL COST OF EXISTING STRUCTURES AND FACILITIES

Not applicable, as there are no existing structures and facilities.

(3) AMOUNT PAYABLE PURSUANT TO FPA SECTION 14

The Applicant is applying for an original license, not a new license. Therefore, an estimate of the amount payable if the Project were taken over pursuant to Section 14 of the Federal Power Act is not applicable.

(4) AVERAGE ANNUAL PROJECT COSTS

(i) Cost of Capital

There are no instruments in place yet for financing the construction cost, nor can there be until after the license is issued and a power sales agreement is in place. Therefore, the calculation of the cost of capital must be based on assumptions regarding the financing terms. For the purposes of this application, the financing has been assumed to 100% by debt with an interest rate of 8% and a term of 30 years.

The Applicant will prepare a plan of finance for review and approval by the Commission prior to the start of construction.

(ii) Taxes and Fees

Based on current policies, the Applicant expects the taxes and fees to be incurred directly by the Project are ADNR water rights and submerged land fees and FERC annual charges. For this application, the total of these fees has been assumed as 0.1% of the total investment cost, or $307,000/yr.

(iii) Operation and Maintenance

Annual operating costs are estimated to be as follows (2020 cost level):

- $775,000 operations and maintenance cost (labor and expenses)
- Administrative and general costs equal to 40% of the O&M cost
- Insurance cost equal to 0.1% of the total investment cost

- Interim replacements cost of $500,000/year.
- Earnings on reserve fund of 6% per year.

Based on these assumptions, the first-year cost of power at a 2020 cost level is estimated to be as follows:

Debt service	$29,632,000
Taxes and fees	$307,000
Operating costs	$1,892,000
Earnings on reserve fund	-$1,320,000
Total annual cost	$30,511,000

(5) VALUE OF PROJECT POWER

Power generated by the Soule River Project will be sold to a yet-to-be-determined utility (or utilities) in western North America. Because the Project will be interconnected to the BCTC transmission system (which is part of the WECC system), the power can theoretically be sold to and utilized by any utility connected to the WECC system. In order to avoid transmission losses and/or wheeling costs, it would make the most sense to sell the power to the closest utilities (BC Hydro in British Columbia, Canada or Puget Sound Energy in western Washington, USA). Both of those utilities are actively looking for new sources of renewable energy:

- In June 2008, BC Hydro requested proposals for energy from independent sources through a "Clean Power Call", and in August 2010 announced a list of 25 successful proposers with a combined firm energy volume of 3,266 GWh.
- Puget Sound Energy (PSE) in late 2009 requested bids for energy from independent sources; bids were due in February 2010, but no results have yet been released.

California utilities may also be potential purchaser, as California has recently announced an increase in their renewable energy goal from 20% to 33% by 2020.

The Applicant expects to enter into a power purchase agreement with an area utility for the long-term sale of the project generation, but it would be premature to begin negotiations before receipt of the FERC license, since the license provisions can significantly affect the marketability of the power. Nevertheless, the provisions of the recent BC Hydro and PSE solicitations provide a reasonable basis for determining the economic value of the project generation, as described in the following.

(i) BC Hydro

In order to compare the power prices from the various sources bidding into the 2009 Clean Power Call, BC Hydro used the procedure summarized below. See also Appendix D-1.

- Proposers provide bid prices for firm energy at a 2009 price level and select escalation factors; escalation of prices limited to a maximum of 50% of the CPI.
- Proposers elect to price non-firm energy on a fixed price schedule or on average spot market prices.
- Multipliers are applied to the bid prices for firm energy depending on the delivery schedule (time-of-day, day-of-week, and month-of-year). These multipliers

ranged from 0.69 for off-peak energy during the spring freshet when lots of run-of-river power is available, to 1.42 for super-peak energy in the winter.

- Adjustments are made for upgrades required to interconnect the projects to the transmission system, for delivery of the energy to the loads, and for transmission losses.
- Levelized prices were calculated to a 2009 price level with an 8% discount rate.

Prices for the 23 announced successful bidders for hydro projects are summarized below:

BC Hydro Clean Power Call Energy Prices (1)			
	Minimum	Weighted Average	Maximum
Bid price (plant gate)	95.0	139.9	156.0
Levelized plant gate price (firm energy)	83.1	130.7	118.0
Levelized adjusted firm energy price	105.4	123.0	133.8
Levelized plant gate price (total energy)	76.2	101.7	118.5

(1) All prices in $Cdn/MWh, 2009 level.

(ii) Puget Sound Energy (PSE)

PSE received proposals for hydro projects in response to a 2008 All Source RFP with levelized total energy prices ranging from $79/MWh to $164/MWh.

PSE recently requested additional proposals in a 2010 All Source RFP, which indicates a growing need for capacity and renewable energy. No results from this RFP have yet been published, however, the RFP included a schedule of estimated avoided cost to give a general indication of electricity prices (Mid-Columbia Market). The 2010 monthly prices range from $33.78/MWh to $48.75/MWh; the 2029 monthly prices range from $106.82/MWh to $131.16/MWh

(iii) Estimated Revenue

The Applicant has estimated the revenue from the sale of project power based on the following assumptions:

- Firm energy valued at $100/MWh (2010 cost level). This price is for energy delivered to the BCTC substation in Stewart BC, and is less than the average price from the BC Hydro Clean Power Call to account for the transmission upgrades and/or losses involved in delivery the power to the loads. The price also includes an adjustment from $Cdn to $US.

- Firm energy value adjusted for super-peak, peak, and off-peak delivery according to the BC Hydro Clean Power Call.

- Firm energy price escalated at the general escalation rate (3.0%) to the estimated on-line date (2019).

- Non-firm energy valued at estimated prices for energy delivered to the Mid-Columbia market (Mid-C); this was one of the options allowed by the BC Hydro Clean Power Call. An estimate of these prices by month for the 2010-2029 period were provided in the PSE 2010 All Source RFP. A close approximation of these prices was assumed for this evaluation ($50/MWh in 2010, with monthly factors applied to that value varying from 0.89 to 1.09, and escalation at 3.75% per year. The assumed price includes an adjustment for wheeling costs or losses in delivering the energy to the Mid-C market.

The Applicant has modeled the project operation and generation for a 32-year period of streamflows, as described in Exhibit B of this application. The calculated generation and revenue for the first year of operation are as follows (2010 cost level).

	Generation, GWh	Revenue, $2010	Revenue, $2020
Firm energy	218.4	$22,761,000	$31,048,000
Non-firm energy	64.1	$3,043,000	$4,562,000
Total	282.5	$25,804,000	$35,610,000

(iv) Levelized Net Annual Benefits

Based on the estimated power sales revenue and annual costs described above, the first year net annual benefit will be $5,099,000 (2020 cost level). The revenue will increase with time as the power sales rate escalates, but the annual costs will increase at a slower rate since most of the cost is fixed debt service. To account for this and to provide a more complete measure of the project benefits, the Applicant has calculated a levelized net annual benefit according to the following assumptions:

- 2020 first full year of operation
- The assumed non-firm energy price of $50/MWh escalates at 3.75% per year to 2029 in accordance with the forecast Mid-C Market prices, and at 3.0% thereafter.
- The assumed firm energy price of $100/MWh escalates at 3.0% per year to 2019 and at 1.5% thereafter.
- Operating costs escalate at 3.0% per year
- 30-year term of analysis
- 8.0% discount rate (to 2019)

Based on these assumptions, the 30-year levelized annual revenue, costs, and net benefits will be as follows (2019 cost level):

Levelized annual revenue $17,139,000
Levelized annual costs $12,676,000
Levelized net annual benefits..................$4,463,000

(6) ELECTRIC ENERGY ALTERNATIVES

(i) Fossil-Fueled Power Plants

The Applicant does not consider fossil-fueled power plants (i.e., coal, natural gas, oil, or nuclear) to be legitimate alternatives to the Project, even though the cost of power from such sources may be less than the cost of power from the Project. Utilities are facing mandates to obtain an increasing amount of power from renewable sources, regardless of cost, and therefore the Applicant believes that the only legitimate alternatives are other renewable energy sources. Accordingly, no description of fossil-fueled alternatives is provided in this Exhibit.

(ii) Other Hydroelectric Power Plants

Hydroelectric projects in the Lower 48 states of a comparable size as the Project are extremely rare, possibly non-existent. There are certainly other potential hydroelectric projects in Alaska and British Columbia that could be comparable in size, although most of projects currently under consideration are run-of-river projects. The Soule Project is unusual in that it is a storage project, and unique in that it is an Alaska project that can be easily interconnected to the WECC transmission system. Because of these characteristics, the Applicant expects that the Project will be very competitive in future power solicitations against other Alaska and British Columbia hydroelectric projects.

The Applicant does not consider pumped storage hydroelectric to be a legitimate alternative to the Project. Pumped storage is valuable for utilizing excess baseload generation and for allowing integration of intermittent generation, such as generation by wind and solar projects. There is a significant loss of energy involved with pumped storage. The Project is a primarily a direct substitute for fossil-fueled generation. With its significant amount of storage, the Project could also be used to some degree for integration of intermittent generation, without the energy loss associated with pumped storage.

(iii) Other Renewable Power Plants

The Applicant expects to compete with developers of other types of renewable generation (primarily wind, biomass, and solar) for power sales contracts. The Applicant’s analysis, as summarized in this Exhibit, indicates that the Project should be very competitive. Due to regulatory mandates to increase the use of renewable energy sources, the Applicant believes there will be a ready market for all types of price-competitive renewable generation.

(7) CONSEQUENCES OF LICENSE APPLICATION DENIAL

If the license application is denied, then the renewable energy that could be generated by the Project would not be available to displace generation by fossil fuels. The Project generation is equivalent to the following:

TABLE OF POLLUTANTS & GREENHOUSE GASES	
Based on 77.4 MW = Average Annual Generation of 283 GWh	
Equivalent Gallons-Fossil Fuel Offset	**Equivalent Lbs CO^2 Offset**
27,000,000 / gal.	540,000,000 / lbs

If the Project is not constructed, then the Applicant speculates that the site would retain its existing wilderness character for the near future. However, the Applicant believes that the value of renewable energy is so great that if the license application by the Applicant is denied, some other party will pursue development of the hydropower potential of the site in the relatively near future (unless of course the site is withdrawn from potential development, such as by designation as a wilderness area).

(8) SOURCES AND EXTENT OF FINANCING

The Project is a large investment that is beyond the capability of the Applicant to finance through either equity or debt. Therefore, the Applicant anticipates some form of partnership in order to finance the construction and operation of the Project. This partnership could be of many types. For example, the Applicant could enter into a joint venture with a project developer, with the joint venture providing all or most of the financing. Another potential joint venture partner would be the electric utility that purchases the Project output. The Applicant's analysis, as summarized in this Exhibit, indicates that the value of the Project exceeds the cost by a significant amount so that it should be an attractive investment.

Table D-1

Estimated Construction Costs and Capital Requirements

Description		Amount
Land and Land Rights		(1)
Mobilization	$	5,000,000
Logistics	$	5,110,000
Marine Access Facilities	$	1,590,000
Access Roads	$	6,850,000
Dams and Reservoir	$	95,670,000
Tunnel and Penstock	$	22,510,000
Powerhouse and Tailrace	$	20,590,000
Transmission and Switchyard/Substation	$	26,000,000
Subtotal	$	183,320,000
Contingencies (15%)	$	27,500,000
Subtotal	$	210,820,000
Escalation (5 years at 3%)	$	33,580,000
Direct Construction Cost (Bid 2015, on-line 2019)	$	244,400,000
Indirect Costs (2)	$	23,000,000
Interest During Construction (3)	$	39,590,000
Total Investment Cost	$	307,990,000
Financing Costs (1.5%)	$	4,600,000
Reserve Fund (4)	$	22,000,000
Total Capital Requirements (Bid 2015, on-line 2019)	$	333,590,000

(1) Land and land rights costs included in annual costs as taxes and fees.
(2) Indirect costs include licensing, engineering, construction management and administration.
(3) Based on 4.5 year construction period and 8% interest rate.
(4) Approx. one year of debt service.

EXHIBIT F: GENERAL DESIGN DRAWINGS

(Drawings are CEII (Critical Energy Infrastructure Information)

Due to new National security measures, if an agency desires to see a particular drawing, they must make a request to the Licensee/Applicant and fill out a 'None Disclosure Agreement.'

Exhibit F: General Design Drawings

F-1	General Plan
F-2	Power Tunnel and Access Road – Profiles
F-3	Tunnels and Roads - Sections
F-4	Dams and Spillway - Site Plan
F-5	Dams and Spillway - Sections
F-6	Powerhouse and Marine Access - Site Plan
F-7	Powerhouse – Plans and Sections – Sheet 1 of 3
F-8	Powerhouse – Plans and Sections – Sheet 2 of 3
F-9	Powerhouse – Plans and Sections – Sheet 3 of 3
F-10	Powerhouse – Elevations
F-11	One-Line Diagram

EXHIBIT G: PROJECT BOUNDARY MAPS

G-1: Project Boundary – Sheet 1 of 3
G-2: Project Boundary – Sheet 2 of 3
G-3: Project Boundary – Sheet 3 of 3

DRAFT APPLICATION COMMENTS

<u>SOURCE</u> **<u>DATE OF LETTER</u>**

<u>(Agency name) Comments:</u>

1.

2.

3.

<u>(Agency name) Comments:</u>

1.

2.

3.

GLOSSARY AND ACRONYMS

Term	*Definition*
ADF&G	Alaska Department of Fish & Game
BMP	Best Management Practices
C	Celcius
cfs	cubic feet per second
DNR	Department of Natural Resources
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FERC Project Boundary	The area surrounding Project facilities and features as delineated in Exhibit F or G of the FERC license.
Forebay	A reservoir upstream from the powerhouse, from which water is drawn into a tunnel or penstock for delivery to the powerhouse.
FPA	Federal Power Act
Ft	feet
GIS	Geographic Information System
Generator	A machine powered by a turbine that produces electric current.
GWh	gigawatt hour (equals one million kilowatt hours)
Hp	horsepower
hr.	hour
ICD	Initial Consultation Document
in.	inch
KGNHP	Klondike Gold Rush National Historical Park
kW	kilowatts: 1,000 watts
kWh	kilowatts-hour: 1,000 watt hours
Licensee	Alaska Power & Telephone Company
m	meter
mi.	mile
mm	millimeters
MW	megawatt
MWh	megawatt-hours
NEPA	National Environmental Policy Act
NOAA	National Oceanic Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
NWI	National Wetlands Inventory
Peaking	Operation of generating facilities to meet maximum instantaneous electrical demands.
Penstock	An inclined pressurized pipe through which water flows from a forebay or tunnel to the powerhouse turbine.
pf	power factor
PH	Powerhouse
Project	Licensee's Dewey Lakes Hydroelectric Project, FERC No. 1051
Project Area	Zone of potential, reasonably direct impact. It usually extends 0 to 100 feet from Project features.
Project Vicinity	The area extending to about 10 miles out from Project features.
PURPA	Public Utilities Regulatory Policies Act

ramping	The act of increasing or decreasing stream flows from a powerhouse dam, or diversion structure.
re-licensing	The process of acquiring a new license for aproject that has an existing license from FERC.
Riparian	Relating to the bank of a natural course of water.
rpm	revolutions per minute
Run-of-River	A hydro project that uses the flow of a stream with little or no reservoir capacity for storing water.
SCADA	Supervisory Control And Data Acquisition system
SCORP	State Comprehensive Outdoor Recreation Plan
SHPO	State Historical Preservation Officer
Spillway	A passage for releasing surplus water from a reservoir.
sq. ft.	square foot
sq. mi.	square mile
State	State of Alaska
Study Area	Geographic area covered by a specific study
SUP	Special-Use Permit issued by the Forest Service
Tailrace	Channel through which water is discharged from the powerhouse turbines.
Turbine	A machine that converts the energy of a stream of water into the mechanical energy of rotation. This energy is then used to turn an electrical generator or other device. Also called a "water wheel."
USBLM	U.S. Department of Interior, Bureau of Land Management
USCOE	U.S. Department of Army, Corps of Engineers
USF&WS	U.S. Department of Interior, U.S. Fish & Wildlife Service
USFS	U.S. Department of Agriculture, Forest Service
USGS	U.S. Department of Interior, Geological Survey
VQO	Visual Quality Objectives, a USFS System
W	watts

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5. Hazardous Substance Plan
6. Spoil Disposal Plan
7. Solid Waste and Waste Water Plan
8. Wildlife Mitigation and Monitoring Plan
9. Bear Safety Plan
10. Scenery Management Plan
11. Heritage Resource Protection Plan

Literature Cited

See Literature Cited in the Preliminary Draft Environmental Assessment.

APPLICATION FOR LICENSE

SOULÉ RIVER
HYDROELECTRIC PROJECT

FERC NO. P-13528-000 & P-12615-001

VOLUME 2 OF 3

DRAFT LICENSE APPLICATION

Exhibit E – Preliminary Draft Environmental Assessment

Prepared by:

SOULÉ HYDRO, LLC

JANUARY 2011

SOULÉ HYDRO, LLC.
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)

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ACRONYMS AND TERMINOLOGY

ACY	acre-feet per year
ADCA	Alaska Division of Community Advocacy
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
ADFG	Alaska Department of Fish and Game
AEA	Alaska Energy Authority
BCTC	British Columbia Transmission Corporation
BD	*Batrachochytrium dendrobatidis*
CFL	commercial forest land
Cfs	cubic feet per second
DV	Dolly Varden
EIS	environmental impact statement
ESCP	erosion & sedimentation control plan
GIS	geographical information system
GWh	gigawatt-hour (1,000 megawatt-hours)

KWh	kilowatt-hour (1,000 watt-hours)
MHW	mean high water
mg/L	milligrams per liter
MIS	management indicator species
MAF	marine access facility
MWh	megawatt-hour (1,000 kilowatt-hours)
NRCS	National Resource Conservation Service
POG	productive old growth
ppm	parts per million
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VPR	Visual Priority Route

EXHIBIT E

PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

SOULÉ RIVER HYDROELECTRIC PROJECT

SOULÉ HYDRO, LLC.
SOULÉ RIVER HYDROELECTRIC PROJECT
(FERC NO. P-13528 & P-12615)

EXHIBIT E
PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

EXECUTIVE SUMMARY

Soulé Hydro, LLC proposes to construct the 77.4 megawatt (MW) Soulé River Hydroelectric Project (Project) located on the Soulé River, on Portland Canal, 9 miles Southwest of Hyder, in Southeast Alaska. The Project would occupy federal land administered by the Ketchikan Misty Fjords Ranger District of the U.S. Forest Service (Forest Service). Other lands involved are State of Alaska submerged land (submarine cable and other in-water structures) at the Soulé River, Portland Canal, and the Stewart, B.C. waterfront. Although private land in Stewart may be involved, City of Stewart and Crown lands are also involved for the cable landing and right-of-way (ROW) for the overhead transmission line to the British Columbia Transmission Corporation (BCTC) substation on the northeast side of Stewart.

Based on previous rulings by the Commission, lands outside the U.S. that projects extend into are not under the Commissions jurisdiction, only the lands within the U.S.[1] Thus, the portion of the submarine cable that extends into Canada to land at Stewart, B.C. and the associated infrastructure for the landing and the overhead transmission line to the substation will be outside the Commissions jurisdiction and not be a part of this license. Permitting for that portion of the project will be through the District of Stewart, the Crown, and Fisheries and Oceans Canada.

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[1] In a finding during a rehearing for the Homestake Mining Company Docket Nos. UL00-3-002 and UL00-4-002, Issued March 1, 2002, the Commission stated, "*It is well established that if a project comes within the terms of FPA Section 23(b)(1) but some of the project works are beyond the Commission's jurisdiction, the Commission can license those project works over which it has jurisdiction.*

The Commission used as a reference the following: "*See Lake Ontario Land Development and Beach Protection Ass'n v. Federal Power Commission, 212 F.2d 227 (D.C. Cir. 1954), cert. denied, 347 U.S. 1015 (Commission licenses the U.S.-side works of project spanning international boundary line); County of Arapahoe and Town of Parker, Colo., 69 FERC ¶ 61,024 (1994) (Commission licenses those project works not located in Reclamation project where Commission jurisdiction has been withdrawn); and Georgia-Pacific Corp., 78 FERC ¶ 61,223 (1997) (Commission licenses those project works not covered by a valid pre-1920 permit).*"

In an order issuing a license for the Cominco American Incorporated Project No. 2103-002, on December 7, 2001, the Commission found: "*The project is required to be licensed pursuant to Section 23(b)(1) of the Federal Power Act, 16 U.S.C. § 816(b)(1), because it is located in part on federal lands. That parts of the hydropower project are in Canada and thus outside the Commission's jurisdiction is not a bar to the Commission's licensing of the parts over which it has jurisdiction. See Lake Ontario Land Development v. Federal Power Commission, 212 F.2d 227 (D.C. Cir. 1954).*"

PROPOSED ACTION

The Applicants proposed 77.4-megawatt (MW) hydroelectric project would include:

(1) a Main Dam 265-feet-tall by 903-feet-long; (2) a Saddle Dam approximately 2,024 feet long adjacent to the Main Dam; (3) an intake structure just north of Main Dam; (4) a reservoir with a surface area of approximately 1,072 acres and approximately 102,300 acre-feet of storage; (5) an 16-foot-diameter by 11,400-foot-long water conduit tunnel; (6) a 3.1-mile-long access road; (7) a 120-foot-long single lane bridge to cross the river; (8) a 80-foot-wide by 160-foot-long powerhouse; a tailrace that will discharge into the river mouth; (9) a three 138 kilo-volt (kV) transformer substation next to the powerhouse; (10) marine access facilities that include a staging area, boat ramp with 2-3 dolpins for landing craft, barge basin for offloading barges, and float for small watercraft to dock; (11) temporary log transfer facility; (12) a 10-mile-long, 138 kilo-volt (kV)[2] submarine cable to Stewart, B.C. (approximately 2 miles will be in Canadian waters) to connect with a BC Hydro substation.

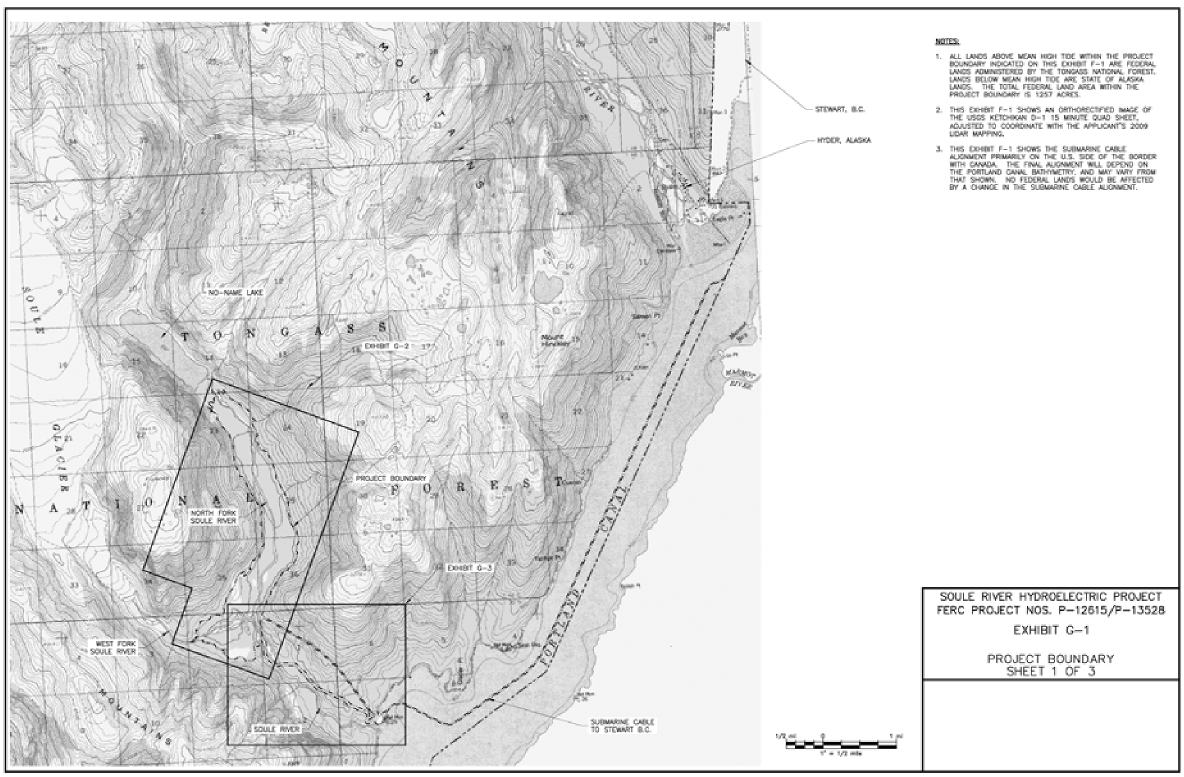


Figure 1 – Project Layout and Topography

The Project is described in more detail in Section 2.2. The Project, as proposed, would be operated as a storage project. The Applicant proposes measures for the protection and enhancement of environmental resources:

[2] Must be 138—kilovolt to interconnect with the BC Hydro substation and grid.

- Measures to prevent soil erosion and sedimentation during construction;
- Measures to reduce the projects footprint to reduce environmental impacts;
- Measures to avoid potential mountain goat habitat on ridges around project;
- Measures to avoid existing (not necessarily active) bald eagle nests above and below the project on Portland Canal;
- Re-vegetation, landscaping as needed;
- Measures to reduce the visual impact of project features
- Measures to eliminate an invasive species on the river delta.

These measures are described in detail in section 2.2.4.

ALTERNATIVES CONSIDERED

The preliminary draft Environmental Assessment (PDEA) analyzes the effects of constructing and operating a project and recommends environmental measures for an original license for the project. In addition to the Applicant's proposal (Applicant's Alternative**)**, the PDEA evaluates two other alternatives: (1) Land Use Alternative—an alternative that would be consistent with the current land use designations and roadless area policies for the Tongass National Forest;[3] and (2) No Action—the project would not be constructed and there would be no effects on environmental resources.

Under the Land Use Alternative, the project would be restricted to a run-of-river project with a capacity of 550 kilowatts. The diversion structure would consist of a 27-foot-high low-head diversion dam, and the project would be constructed without roads and would generally be visually screened to avoid any adverse effects on the natural setting of the project area. All construction materials and personnel would, by necessity, be transported into the project area either by helicopter, or potentially by mule or horseback via an access trail.

As each baseline environmental resource is described below, all three alternatives will be analyzed in relation to that resource.

[3] The proposed project would be located within an area of the Tongass National Forest designated as Remote Recreation Land Use Designation (Remote Recreation LUD) in the 2008 Tongass National Forest Land and Resource Management Plan. A Remote Recreation LUD has very restrictive standards and guidelines for human development; therefore, a project alternative that would be consistent with a Remote Recreation LUD would be considerably different than the applicant's preferred project configuration. In our September 10, 2010, filing, we note that the Forest Service requested an evaluation of a project that would be consistent with the Remote Recreation LUD in the PDEA. For these reasons, the PDEA includes an analysis of the environmental effects and developmental costs of such an alternative project configuration.

PUBLIC INVOLVEMENT and AREAS of CONCERN

Before filing this Application, the Applicant conducted pre-filing consultation under the Alternative Licensing Process (ALP) to initiate public involvement early in the Project planning process and to encourage citizens, governmental entities, Indian Tribes, and other interested parties to identify issues and concerns, as well as propose means of resolving them. The Applicant conducted Initial Consultation, Study Planning, and Scoping to determine what issues and alternatives should be addressed. Two Scoping Documents (SD1 and SD2) were distributed to interested parties on May 13, 2008, and November 12, 2008, respectively. Scoping meetings were held in Juneau and Hyder on June 17, 2008, and June 19, 2008, respectively.

Through consultation, the Applicant determined that the primary issues associated with licensing the Project were:

- Aesthetic effects as viewed from the Visual Priority Route (VPR) in Portland Canal
- Effects on human use of Glacier Bay, just north of the river delta (recreation and subsistence)
- Potential use of the project area by anadromous salmonids and corresponding potential effects of the project on fish and aquatic habitat in the lower Soulé River and delta.
- Effects of the project on the existing Remote Recreation LUD, and whether a hydropower project would be feasible under the standards and guidelines of a Remote Recreation LUD as set forth in the Tongass National Forest Land and Resource Management Plan.

PROJECT EFFECTS

Under the No-Action Alternative, environmental conditions would remain the same and there would be no effects to environmental resources.

A general description of project effects on environmental resources under the action alternatives is provided below.

Aquatic Resources

Under the Applicant’s Alternative, the reservoir would inundate most of the North Fork of the Soulé River, including adjacent wetlands, off-channel habitats, and beaver dam complexes. Approximately ¾ mile of the West Fork would be inundated by the reservoir, covering wetlands and off-channel habitats. The project would significantly dewater the Main Stem of the Soulé River for most of the year, however, no salmon use the river and Dolly Varden using Dolly Varden Creek are in a self sustaining system that also will provide flow to the Main Stem. With 30+ feet of snow in this watershed annually, plus rain, there is significant runoff in the river to provide flow for Dolly

Varden to swim up to the Upper Gorge and the foot of the Main Dam. The Upper Gorge is a natural anadromous barrier, so the dam is not changing the habitat range for Dolly Varden. Reduced flow may enable Dolly Varden to use more of the Main Stem rather than being washed out of the river during the summer/fall high flows. Dolly Varden washed out of the North Fork in the past may not have this occur as frequently with the dams in place and infrequent spills, which may alter recruitment for Dolly Varden Creek. Boreal toads located in wetlands along the Main Stem downstream of the dam should continue to receive runoff from the surrounding watershed, but impacts are uncertain. In addition, the project may adversely affect sediment transport from the upper Soulé watershed to the Soulé River delta, although project discharge will occur into the river mouth.

Under the Land Use Alternative, run-of-river operations and a low-head diversion dam would lead to a very limited decrease in minimum flow releases to the Main Stem Soulé River throughout the year. At a point 2,900 feet upstream from the river mouth, the Soulé River separates into two channels. One channel, termed herein as the "minor channel" appears to have appreciable flow only during high flow periods, and forms a V shape in plan view. A 27-foot-high diversion dam would be placed in this small channel, resulting in a small reservoir footprint within the channel with no inundation of the Main Stem. Wetlands, boreal toads, and beaver dam complexes would not be affected under the Land Use Alternative.

Terrestrial Resources

Under the Applicant's Alternative, the following effects to terrestrial resources would occur:

1. The approximate average gross MBF of timber per acre is 17.59 (17,590 board feet), which includes a mix of black cottonwood, Mt. Hemlock, Sitka Spruce, and subalpine fir. These would be lost for the Project reservoir, access road, dams, powerhouse, and substation.
2. Habitat for a small number of black bears (2-4) will be impacted by construction and operation due to loss of forest and riverine habitat between No-Name Lake and the dam site because of flooding by the reservoir; beaver habitat will also be lost by this flooding; however approximately 0.3 mile of habitat between the lake and the full reservoir will remain and can function as a passage corridor as well as will retain some beaver habitat.
3. Potential loss of delta habitat use in the spring in the vicinity of the powerhouse and substation, and marine access facilities. Bears occupy the delta for parts of April and most of May before moving out of the area. As many as 2-3 bears can be seen using the delta during those months.
4. Access into the river basin for mammals would be improved because of clearing made for project features in otherwise almost impenetrable brushy understory.

Under the Land Use Alternative, terrestrial effects would be small clearings made from forested slopes for the diversion structure construction, which would require a small 100x150 foot clearing; and for two power tunnel portals, where space would be needed to operate the drill and/or to remove rock to stockpile; and clearing for a powerhouse and tailrace 1,000 feet from the beach fringe, which would require a clearing of about 100x150 feet with the tailrace discharging back into the river at the powerhouse location. These features would be reached by a trail system approximately 2,900 feet long to reach the powerhouse from the north delta and a suspension bridge to cross the river to the power tunnel and to the diversion. No roads would be constructed. The trail system could be expected to be used for recreational access to the Lower Gorge. Impacts to terrestrial resources would generally be limited to flora with only noise from construction disturbing the small amount of fauna in the area.

Threatened and Endangered Species

No threatened and endangered species are known to occur in the project area; none were observed during 123 field observation days for project studies. Therefore, there would be no effects to threatened and endangered species under either action alternative.

Recreation and Land Use

Under the Applicants' Alternative, the project would potentially affect recreation and subsistence hunting activity just north of the river delta (Glacier Bay) where crabbing is an ongoing activity during the spring and summer and bear hunting that occasionally occurs in the area. The project would potentially increase recreational opportunities in the river basin because project features would create cleared corridors, making access marginally[4] easier for hunting and fishing. The project as proposed by the applicant would also be constructed and operated in a manner that would be inconsistent with the Remote Recreation LUD and current Forest Service roadless area policy, thereby substantially affecting the Forest Service's land use designations of the project area.

Under the Land Use Alternative, the project would have a small effect on recreation to the area via a trail made through the forest to the powerhouse (access across the suspension bridge may not be available to the public), which will allow easier access into the Lower Gorge only. Noise from construction may keep wildlife away for short periods of time. This alternative also impacts the Remote Recreation LUD and current Forest Service roadless area policy.

Cultural Resources

[4] Marginally because the access road would only go 0.8 miles before using a 1,900-foot-tunnel that would be gated to keep humans and animals out for safety, thus forcing those interested in going further into the watershed to bushwhack this distance before reaching an open road again. Access to No-Name Lake will also require bushwhacking because there will be no road around the reservoir, a distance of 3+ miles.

No heritage resources were found within the Project boundary or very close to the Project boundary; therefore, no impacts to heritage resources would occur under either action alternative.

Visual Resources

Under the Applicant's Alternative, the Project has the potential to moderately impact the visual quality of Upper Portland Canal. The visual impact will primarily come from the infrastructure placed on the north delta and the access road traversing the hillside behind the delta. Though these may be obvious visual impacts, they will be confined to a narrow area of view. From the Visual Priority Route (VPR) in the middle of Portland Canal, the Marine Access Facilities on the delta will present a low profile of rock and the access road will be partially screened by the forest, helping to reduce their impact. The rest of the project will be behind the shoreline ridge, including most of the Access Road and the powerhouse and substation will be behind the shoreline trees to screen them from view.

Under the Land Use Alternative, all aspects of the project would be visually screened to minimize any adverse effects on the visual character of the project area other than temporary trenching through the delta for the submarine cable and a short 750-foot-long, 12 kV aerial transmission line on single wood poles in the Lower Gorge that would probably not be visible to the casual observer.

CONCLUSIONS

The most significant impacts from the Applicants Alternative would be:

1. Permanently flooding the North Fork and associated wetlands; including beaver dams and ponds (the wetlands exist only because of the beaver dams)
2. Significantly reduced flows in the Main Stem of the river during summer months
3. Clearing right-of-way for access road and project features, which will allow greater movement for wildlife and recreation/subsistence users into the Soulé River Watershed that presently doesn't exist (easier only as far as the 1,900 foot access road tunnel ~0.8 miles in from the shoreline)
4. Visual impact of man-made features in an otherwise natural setting
5. Impacts to the present Remote Recreation LUD and the Roadless Rule because roads for construction and operation would be built as well as permanent project features. This project would impact the Remote Recreation LUD by:
    - Reducing the amount of unmodified natural setting for primitive types of recreation
    - Reducing opportunities for independence, closeness to nature, and self-reliance
    - Reducing the quality of the high Scenic Inventory Objective (SIO) for this location

To meet this LUD, the project would have to be downsizes to the point of being uneconomical; and even then it would not fully meet this LUD. To resolve this inconsistency, the Applicant is in discussions with the Forest Service to find a resolution. One option is to change the LUD for only the project boundary to a less restrictive LUD, thereby leaving the surrounding Remote Recreation LUD in place, which will protect the vast majority of the watershed. This reduces impacts to the Forest Management Plan and land use in the immediate area while allowing a renewable resource to be developed.

The Applicant requests that the Commission requests preliminary 4(e) conditions from the Forest Service, because of the submittal of this Preliminary Draft EA, so that the Ketchikan Ranger District can inform the Department of Agriculture in D.C. to set a timeline to accomplish this. The preliminary 4(e) conditions are necessary for the final license application so that project design and comments can address the conditions.

The Applicant recommends that an amendment or administrative change to the Tongass National Forest Plan be made to change only the project lands to another Land Use Designation (possibly a Transportation and Utility Systems (TUS) LUD) other than the current Remote Recreation LUD. A less restrictive LUD is needed for this project to be constructed, while leaving the current LUD around the project will continue to provide the existing more restrictive guidelines of Remote Recreation. This will reduce impacts to the area by keeping restrictions in place for the majority of the watershed while allowing a narrow corridor to be developed that will have limited impacts to environmental resources (based on the field studies conducted and the project design), but will also offset Green House Gases (GHG) produced by fossil fuels over the life of the project. On an annual basis it is estimated that fossil fuel use would be offset by at least 27,000,000 gallons on an annual basis; which equates to 540,000,000 lbs of CO^2 air emissions being eliminated annually.

Under the Land Use Alternative, the most significant impacts would be:

1. Waste rock disposal from power tunnel excavation
2. Waste rock disposal from powerhouse excavation

DEVELOPMENTAL ANALYSIS

As described in Exhibit D, based on the estimated power sales revenue and annual costs described above, the first year net annual benefit will be $5,099,000 (2020 cost level). The revenue will increase with time as the power sales rate escalates, but the annual costs will increase at a slower rate since most of the cost is fixed debt service.

Based on these assumptions, the 30-year levelized annual revenue, costs, and net benefits will be as follows (2019 cost level):

- Levelized annual revenue $17,139,000
- Levelized annual costs $12,676,000
- Levelized net annual benefits...................$4,463,000

PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

SOULÉ RIVER HYDROELECTRIC PROJECT
FERC No. P-13528-000 & P-12615-001

SOULÉ HYDRO, LLC

January 2011

APPLICATION

Soulé Hydro, LLC (Applicant) applies to the Federal Energy Regulatory Commission (FERC or Commission) for an initial license for the Soulé River Hydroelectric Project (Project), as described in this document and accompanying Exhibits. This license application is filed pursuant to Commission regulations and conditions of successive Preliminary Permits (P-12615 and P-13528) issued July 13, 2006, and September 22, 2009, respectively. The Project will occupy land administered by the U.S. Forest Service, submerged lands administered by the State of Alaska, and submerged land administered by Fisheries and Oceans Canada.[5]

1.0 PURPOSE OF ACTION and NEED FOR POWER

1.1 PURPOSE OF ACTION

Soulé Hydro, LLC proposes to build a storage facility on the Soulé River to provide renewable electric power through the North American electric grid to offset fossil fuel power generation in the US and to increase the amount of renewable energy generation in the US, reducing the US dependency on fossil fuels.

The Commission must decide whether to issue a license to the Applicant for the Project and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to any applicable comprehensive plan for improving or developing a waterway. In Section 5.0, Conclusions and Recommendations, the only comprehensive plan identified where there is a conflict is the *2008 Tongass Land and Resource Management Plan*. In addition to the power and developmental purposes for which licenses are issued (e.g. flood control, irrigation and water supply), the Commission must give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

[5] Lands on the Canadian side of the border are not considered a part of this license application, but details when presented are meant to provide as complete a picture as possible of the project.

Issuing a license for the Project would allow the Applicant to generate electricity at the Project for the term of the license, making renewable electric power available to offset fossil fuels somewhere else. This Preliminary Draft Environmental Assessment (PDEA) assesses the effects associated with construction and operation of the Project, alternatives to the proposed Project, and presents recommendations as proposed by the Applicant and state and federal resource agencies and other Stakeholders during the license application process to the Commission on whether to issue a new license. We also consider the effects of the No-Action alternative. Important issues addressed include those associated with whether anadromous salmonids use the Soulé River and how the Project would impact the Remote Recreation Land Use Designation (LUD) and the Roadless Rule.

1.2 NEED FOR POWER

The Project would have an installed capacity of 77.4 MW with an average annual generation of 283 gigawatt-hours (GWh) of electricity; firm power would be 215 GWh. Power generation will occur year round, but due to the relatively small reservoir size during winter months, the project will operate during peak periods only. During the summer months, after the reservoir fills, the project will operate more or less on a run-of-river basis, often at full capacity. Hydroelectric development of the Soulé River is proposed at this time because there is an increasing demand for hydroelectric generation in British Columbia and the western United States. The demand is due to 1) increasing electrical usage, and 2) a shift to using more renewable energy (such as hydroelectric generation). BC Hydro supplies electricity to both Upper Portland Canal communities.

Increasing electrical usage

In October 2009, the Western Electricity Coordinating Council (WECC) published its 2009 Power Supply Assessment. WECC is the organization responsible for coordinating generation and transmission in Alberta, British Columbia, the northern portion of Baja California, and all or portions of the 14 western US states. Due to the economic downturn, what was stated in the WECC 2008 Power Supply Assessment that concluded that the total supply deficit in the region in 2010 would be about 1,120 MW, by 2012 the deficit would increase to 6,500 MW, and by 2017 (the end of the study period) the supply deficit would reach 22,500 MW, is inaccurate. The WECC 2009 report states that there is a surplus until 2013, when insufficient resource capacity and the effect of a transmission constraint on exports from the Northwest will cause the Basin subregion to create a deficit in electrical energy. By 2016, all southern subregions — Basin, Desert Southwest, and Southern California/Mexico — will be deficit. The total deficit in all of the subregions in 2015 is approximately 2,900 MW and the deficit grows by approximately 3,000 MW per year. The deficit is approximately 12,000 MW by 2018.

Although the report changed from 2008 to 2009 due to the economic downturn, this is not expected to persist, and eventually the load demand will grow as the economy recovers, requiring additional electricity beyond what is forecast. We conclude that power from the Soulé River Hydroelectric Project would help meet a need for power in the WECC region in both the short and long-term. The project provides low-cost, renewable power that displaces nonrenewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities will avoid some power plant emissions and creates an environmental benefit. At least 27,000,000 gallons of fossil fuel (diesel) will be displaced on an annual basis by this project, which is equivalent to 540,000,000 lbs of CO^2.

Demand for renewable energy

Utilities and system planners are also facing a resource shift due to concerns associated with climate change and the resultant worldwide and national policy to reduce the amount of green house gases (GHG) released into to the atmosphere. These GHG's are primarily associated with our civilization's dependency upon fossil fuels for our energy needs. Consequently, there is a concerted effort underway to shift to other fuels and technologies that reduce or eliminate GHG emissions. The United States Congress is in the process of adopting legislation to require reductions in carbon emissions. On December 9, 2009, President Obama attended the United Nations summit on climate change in Copenhagen and announced the goal of the United States is to reduce its GHG emissions by 17% by 2020.

President Barack Obama announced on January 29, 2010, that the Federal Government will reduce its greenhouse gas (GHG) pollution by 28 percent by 2020. Reducing and reporting GHG pollution, as called for in Executive Order 13514 on Federal Sustainability, will ensure that the Federal Government leads by example in building the clean energy economy. Actions taken under this Executive Order will spur clean energy investments that create new private-sector jobs, drive long-term savings, build local market capacity, and foster innovation and entrepreneurship in clean energy industries.

"*As the largest energy consumer in the United States, we have a responsibility to American citizens to reduce our energy use and become more efficient," said President Obama. "Our goal is to lower costs, reduce pollution, and shift Federal energy expenses away from oil and towards local, clean energy*."

Obama Administration officials stated that the US would pledge a 17% cut in emissions from 2005 levels by 2020, 30% by 2025, 42% by 2030, and 83% by 2050.

"*Each of us has a part to play in a new future that will benefit all of us. As we recover from this recession, the transition to clean energy has the potential to grow our economy and create millions of jobs -– but only if we accelerate that transition. Only if we seize the moment. And only if we rally together and act as one nation –- workers and entrepreneurs; scientists and citizens; the public and private sectors*."

-PRESIDENT OBAMA, JUNE 15, 2010

Many individual states have gone further by requiring the utilities within their jurisdiction to increase the use of renewable energy to meaningful levels (i.e., renewable portfolio standards). As a result of these initiatives it is expected that additional costs of operation will be placed upon activities that create carbon emissions. The anticipated additional costs, coupled with tax incentives that encourage renewable energy, are driving a shift away from coal to other forms with less emission intensity (or zero emissions, in the case of renewable energy).

Why does this matter? The power supply deficits facing the systems in Western North America are not only caused by increased demand for power but exacerbated further by the retirement of coal-fueled power generating facilities. Coal fired generation is the single largest block of power generation in the United States and many believe it is unrealistic that civilization will be able to shut them all down. The cleanest and most cost effective coal plants will continue to operate for many years, but as the WECC 2008 Power supply assessment shows, many coal-fired power generation facilities are being retired and replaced with power generation facilities using natural gas and renewable energy.

On January 10, 2007 Keith Collins, Chief Economist US Department of Agriculture made a statement before the US Senate Committee on Agriculture, Nutrition and Forestry giving an overview of national energy markets:

"The Energy Information Administration (EIA) AEO Reference case projections released in December 2006 place US energy consumption at 101 quadrillion BTUs (quads) in 2006, eight times the level at the beginning of the last century. Renewable energy consumption in 2006, including hydropower, is estimated at about 6.4 quads, less than four times the level at the start of the last century. US energy use is projected to increase 30 percent by 2030; from 101 to 131 quads. This means renewable energy production must also increase by 30 percent over the period simply to maintain its current small share of total energy use. The expected growth in energy demand represents a significant challenge if our nation is to reduce its dependence on fossil fuels. However, this growth in total US energy demand also represents an enormous potential for renewable energy, including renewable fuels, with critical implications for agriculture, forestry, and rural America"

Hydropower has been the primary source of renewable energy in the United States and the world for many decades. It is often at odds with the environmental community because of detrimental environmental effects of some large projects that have been built in the past. However, there will be increasing demand for projects where environmental effects are small. The Soulé River Project is in this category, since anadromous fish cannot access the river due to velocity and fall's barriers starting at the river mouth, wildlife usage of the area is light, and human usage is practically non-existent, which is also due to the dense brush, partially caused by the crushing weight of 30+ feet of annual snow. This project can market its power to the WECC to offset the current use of fossil fuels mandated by many of the western states.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Soulé River Project is subject to numerous requirements under the Federal Power Act and other applicable statutes. The major regulatory and statutory requirements are summarized in Table 1 and described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the Federal Power Act states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the Interior. At this time no fishways prescriptions have been made.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. At this time the Forest Service has not filed draft conditions pursuant to section 4(e) of the Federal Power Act.

The 4(e) conditions that the Forest Service will prescribe will be described under Section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*.

Table 1

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	USF&WS, NMFS	To be determined.
Section 4(e) of the FPA (land management conditions)	Forest Service	Forest Service to determine what 4(e) conditions ______________
Section 10(j) of the FPA	ADF&G, USF&WS, NMFS	These agencies will provide section 10(j) recommendations ________
Clean Water Act—water quality certification	Alaska DEC	Historically waives their jurisdiction because FERC and COE are involved.
Endangered Species Act Consultation	NMFS	May issue biological opinion
Coastal Zone Management Act Consistency	Alaska DCOM	Will apply for Consistency Certification with final license application Action by DCOM due about date of license issuance.
Wild and Scenic Rivers Act	National Park Service	N/A

Table 1 – Major Statutory and Regulatory Requirements for the Soulé River Project

1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. At this time the NMFS, USF&WS, and ADF&G have not filed any recommendations under section 10(j). In Section 5.5, we will discuss how we address the agency recommendations and comply with section 10(j), once they are submitted.

1.3.1.4 Section 30(c) Fish and Wildlife Conditions

Under section 30(c) of the FPA, where project applicants are seeking Public Utility Regulatory Policies Act (PURPA) benefits for constructing a new dam or diversion, the project is subject to mandatory conditions provided by federal and state fish and wildlife agencies for the protection of fish and wildlife resources. The Project is not seeking PURPA benefits, so this condition is not applicable.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. The Alaska Department of Environmental Conservation (ADEC) historically waives this certification if FERC is involved. ADEC then allows the COE to handle 401 certification through the 404 Certification process. An application will be submitted to the ADEC for 401 certification at the same time of the final license application (i.e. April-May 2011).

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. There is no TES critical habitat at the project site. However, all practical methods of reducing impacts to the environment will be implemented during construction. Our analyses of project impacts on threatened and endangered species is presented in Section 3.9, *Threatened and Endangered Species*, and our recommendations in Section 5.1, *Recommended Alternative*.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. ∋ 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification. The Applicant will apply for certification at the time of the final license application submittal in May 2011. At that time the Applicant will request that DCOM review the Project for consistency with the Alaska Coastal Management Plan (ACMP). DCOM typically will certify about the time the Commission is preparing to issue a license.

1.3.5 National Historic Preservation Act

Section 106 requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

In response to the Applicant's May 5, 2008, request, the Commission designated the Applicant as a non-federal representative for the purposes of conducting Section 106 consultation under the NHPA on May 13, 2008. Pursuant to Section 106, and as the Commission’s designated non-federal representative, the Applicant consulted with the SHPO and affected Indian tribes to locate, determine National Register eligibility, and assess potential adverse effects to historic properties associated with the project. The Applicant also hired an archaeologist to conduct a heritage resource survey of the project site, which occurred during the summer of 2009. The archaeologist also consulted with SHPO, USFS, FERC, and local Indian tribes.

1.3.6 Wild and Scenic Rivers Act

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to make a determination as to whether the operation of the project under a new license would invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the designated river corridor. The Soulé River has not been designated a Wild and Scenic River nor is it currently proposed to be considered (to the Applicant’s knowledge).

1.3.7 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with NOAA Fisheries on all actions that may adversely affect Essential Fish Habitat (EFH).

Evidence to date may support there being EFH at the Soulé River delta, but not the river because numerous anadromous barriers, both velocity and falls, exist from the rivers mouth up to the proposed dam site. There is habitat around the fringe of the river delta for out-migrant smolt from the Salmon River (Fish Creek chum) at the head of Portland Canal who appear to use the delta for foraging, avoiding predation, and weather conditions in the canal. Glacier Bay, just north of the river delta, is considered to provide forage habitat for these out-migrating juvenile populations of salmonids. There is otherwise little if any habitat at the river mouth.

To minimize impacts to possible EFH at the delta, the Applicant needs to minimize sedimentation during construction and mitigate potential impacts, i.e. loss of delta area, by adding habitat diversity through ripraping project features on the delta (will provide foraging habitat as well as protection from predators because of the nooks and crannies that do not presently exist on the delta). This is discussed under Aquatic Resources of this document.

1.3.8 Other Regulatory Requirements

Alaska National Interests Lands Conservation Act (ANILCA)

This Act, (16 USC 410hh-3233, 43 USC 1602-1784) Public Law 96-487, approved December 2, 1980, (94 Stat. 2371) designated certain public lands in Alaska as units of the National Park, National Wildlife Refuge, Wild and Scenic Rivers, National Wilderness Preservation and National Forest Systems, resulting in general expansion of all systems.

Subsistence Resources

ANILCA created a preference for rural Alaska residents who use subsistence resources on federal public lands. Within the Soulé River Project area, the USFS, ADF&G and USFWS regulate various aspects of subsistence hunting, fishing and gathering, depending upon the resource and location. The USFS controls subsistence hunts on its lands and is the only federal land manager involved in the project area. The Alaska Department of Fish and Game (ADF&G) controls hunting by urban, non-resident, and other non-rural hunters on these same lands and on any other land where hunting is allowed.

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 requires an evaluation of effects to subsistence hunting, fishing, and gathering resources and the subsistence lifestyle for any project that uses federal public lands. Subsistence uses in the Project area include hunting, fishing, and taking of crab. However, these activities predominantly occur along the shoreline at the Soulé River Delta due to the impenetrable forest in this area (dense alder thicket understory) as well as along Portland Canal. Hunting for deer, according to anecdotal information, takes place near the mouth of Portland Canal on Fillmore Island, approximately 48 miles south of the Project, or else in British Columbia, Canada; fishing also primarily takes place further down the canal from the Project, although there is some salmon and halibut fishing off the delta area in the spring and otherwise king salmon fishing at Hyder in the winter.

Alaska Native Claims Settlement Act

Enacted in 1971, the Alaska Native Claims Settlement Act (ANCSA) created twelve Native-owned regional corporations, granted 962 million dollars in seed money, and authorized the Native corporations to select 44 million acres of federal lands in Alaska.

None of the Project lands are within any ANCSA lands.

U.S. Forest Service (Forest Service) Forest-wide Standards and Guidelines

The Forest Service has indicated the following standards and guidelines will need to be followed and should be included in the evaluation of this project.

BEACH AND ESTUARY
To meet the Beach and Estuary Standard and Guidelines facilities should be located 1000 feet away from the beach fringe. Docks, floats, or boat ramps are not allowed on the beach fringe, except for recreational uses. As currently proposed, the project has the potential to effect beach and estuary due to ground disturbance required by marine landing facilities, the powerhouse, and due to potential decrease in beach size if sediment is retained in the reservoir.

FISH
To meet the Fish Standard and Guidelines, facilities should protect fish habitat as much as possible and maintain and restore fish habitat, as needed.

WETLANDS
To meet the Wetlands Standard and Guidelines, avoid alteration or new construction on wetlands wherever there is a practicable environmentally preferred alternative.

Under both action alternatives, the project would be designed to accommodate these Forest-wide standards and guidelines to the extent practicable.

1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 CFR, Section 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1. Scoping

Before preparing this preliminary draft EA, the Applicant conducted scoping to determine what issues and alternatives should be addressed. A scoping document (SD1) was distributed to interested agencies and others on May 13, 2008. It was noticed in the Federal Register on May 15, 2008. Two scoping meetings, both advertised in the Ketchikan Daily News, were held on June 17, 2008, in Juneau, Alaska, and June 19, 2008, in Hyder, Alaska, to request oral comments about the project. A court reporter recorded all comments and statements made at the scoping meetings and these are part of the Commission's public record for the Project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entities	Date Filed
U.S. Fish & Wildlife Service	July 17, 2008
U.S. Forest Service	July 17, 2008
U.S. Environmental Protection Agency	July 21, 2008
Alaska Department of Fish & Game	July 21, 2008

A revised Scoping Document 2 (SD2) was issued addressing the agency comments on November 12, 2008. In addition, consultation took place with the agencies to develop a study plan with the result being a Final Study Plan distributed on April 24, 2009.

2. Interventions

The U.S. Forest Service was the only intervener (August 10, 2009) for the preliminary permit issued September 22, 2009 (P-13528).

Once the Applicant has filed the final license application and draft EA with the Commission (expected in May 2011) for the Soulé River Project, the Commission will issue an acceptance notice and request comments and interventions. At that time the field below can be filled out regarding any motions to intervene in this licensing process.

Intervenors	Date Filed

3. Comments on the Application

This preliminary draft EA is requesting preliminary conditions and recommendations to be sent to the Applicant by May 1, 2011 (90 day period).

Commenting agencies and other entities	Date filed

The Applicant will incorporate those comments into the final license application and draft EA by the filing date of approximately May 16, 2011.

4. Comments on Draft EA

This preliminary draft EA is requesting preliminary conditions and recommendations to be sent to the Applicant by May 1, 2011 (90 day period).

Commenting agencies and other entities	Date filed

The Applicant will incorporate those comments into the final license application and draft EA by the filing date of approximately May 16, 2011. Appendix 'W' will summarizes the comments that were filed during the 90-day review period, and include our responses to those comments, and indicates where we made modifications to the draft EA.

2.0 PROPOSED ACTION AND ALTERNATIVES

The purpose of this section is to explain: (1) the proposed project--the facilities and how they will operate, including any proposed environmental and mitigation measures; (2) action alternatives to the proposal; and (3) the no-action alternative.

2.1 No-action Alternative

The No-Action Alternative is license denial. Under the No-Action Alternative, the project would not be built and environmental resources in the project area would not be affected.

2.2 Applicants (Preferred) Alternative

2.2.1 Project Facilities

The Applicant proposes to construct a new hydroelectric project in the Soulé River Watershed. The Project would have a capacity of 77.4 MW. The Project would operate as a storage project, allowing for the banking of water until electricity is needed; peaking in the winter, run-of-river in summer. Generation will be throughout the year. The Project encloses approximately 1,257 acres administered by the U.S. Forest Service. Approximately 24 acres are submerged lands of the State of Alaska (submarine cable) and approximately 7 acres of submerged lands managed by Fisheries and Oceans Canada.

The project facilities described herein are based on the results of data collected during the 2007–2009 field study seasons and represent the optimum degree of resource development. It took two preliminary permits to have adequate time to collect the data disclosed herein. The second preliminary permit, P-13528, differed from the first preliminary permit, P-12615, by:

1. Selecting a storage project as the mode of operation over a run-of-river mode due to a better understand of project feasibility and economics
2. Eliminating the power plant at the instream release point at the dam site, which was eliminated because of the lack of salmon in the river
3. Providing the potential for an above ground penstock as part of the analysis rather than just a power tunnel for the penstock.

The proposed project boundary encloses the project dams and intake structure, upper staging area, spillway, reservoir, access road, bridge, power tunnel, helipads, cable crossing (over river), powerhouse, tailrace, substation, transmission line (submarine cable), and marine access facility.

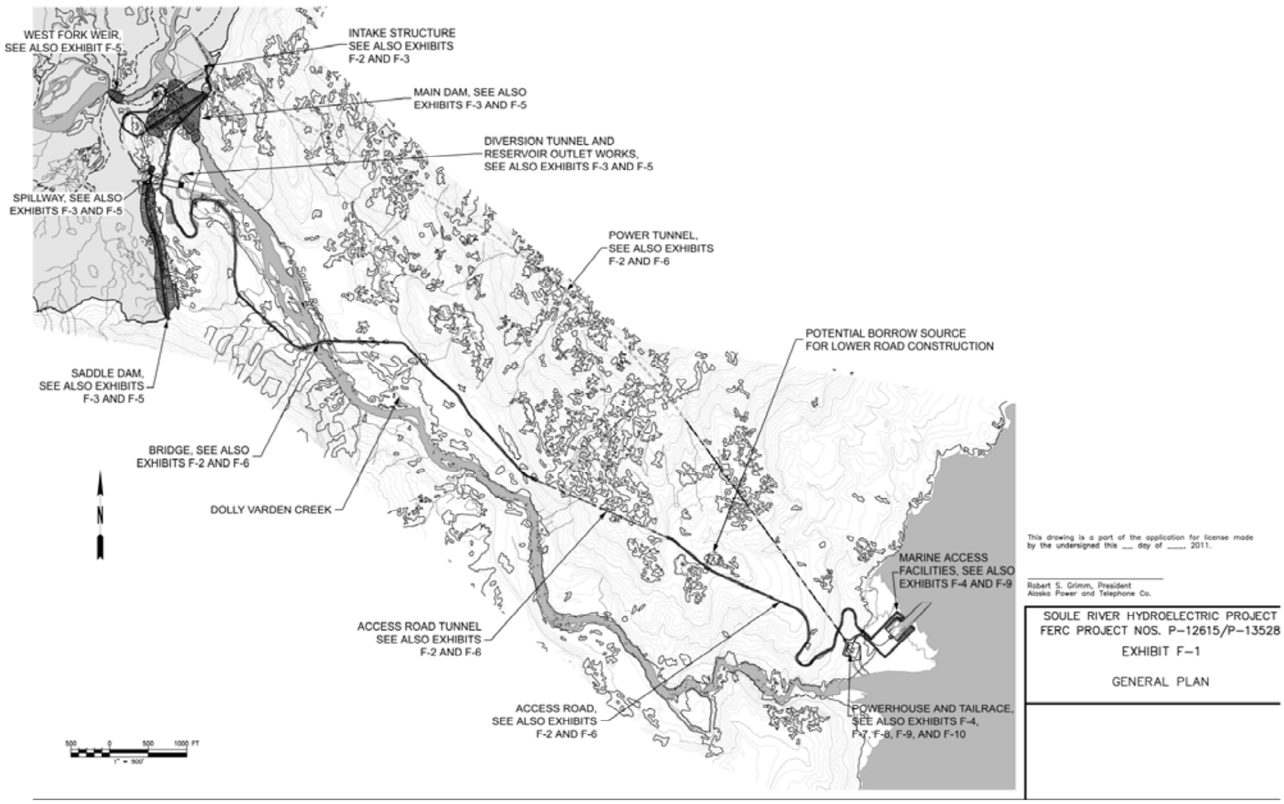


Figure 2 – Project Features (see full size drawing in Exhibit F)

The proposed project features are described in more detail below:

(1) PROJECT STRUCTURES

(i) Marine Access Facilities

The Soulé River site is not currently accessible by roads, and construction of an access road from the nearest road system (in Hyder) is not considered feasible due too the extremely steep and rugged terrain and the visual impacts of such a road. Therefore, the Applicant proposes to access the site for both construction and operation primarily by water, with occasional access by air (floatplane and helicopter). The large delta area at the mouth of the Soulé River provides a convenient location for construction of marine access facilities, as follows:

- A basin excavated into the delta deposits approximately 250 feet long perpendicular to the shore and 150 feet wide. A 350 feet long and 90 feet wide channel will be dredged to connect the basin with tidewater. The bottom of the basin and channel will be at El -10.5 to provide access at nearly all tide levels (the normal tide range is El -5 to El 15). Berms on the northwest and southeast sides of the basin will be constructed from the excavated materials, with the top at El 19.5. The sloping sides of the basin will be lined with riprap for erosion protection; riprap rock will be obtained from the powerhouse and power tunnel portal excavations. A retaining wall will be built at the southwest end of the basin to provide a suitable landing for loading and unloading ramp-type barges; the retaining wall be constructed from sheet pile or mechanically-stabilized embankment (MSE). Five mooring dolphins consisting of groups of steel piles will be installed to guide and secure barges.

- A boat dock for berthing a landing craft and crew boats. The dock will be 100 feet long and 8 feet wide, with a 60 feet long gangway to provide pedestrian access to the shore. The dock will float with the tide, guided by five steel piles.
- A boat ramp for loading and unloading a landing craft. The ramp will have a minimum width of 20 feet, a slope of 15%, and an articulated precast concrete surface.
- A staging area formed by dumping and grading the spoils from the barge basin excavation. Because of the high silt content of the spoils, the staging area will be capped by filter fabric and approximately 12" of rockfill. The rockfill will be obtained from the powerhouse and power tunnel portal excavations.

(ii) Access Roads

There will be one main access road for the project. The main road will be 3.1 miles long from the powerhouse/delta area to the dam/intake area. It will be a single lane gravel road with turnouts, similar to a logging road. The subgrade width will be 20 feet to provide for the large construction machinery necessary for the dam construction. The subgrade will be surfaced with a minimum of 6 inches of gravel obtained from the power tunnel construction (TBM spoils). The maximum grade has generally been limited to 16%, but two short sections will have 20% grades due to topographic limitations.

From the powerhouse/delta area, the road will climb at an average grade of 10% for 0.80 miles. The grade will vary from 1% to 20%, with the 20% grade for a length of only 400 feet above the powerhouse where the road will be most visible and must climb between two natural benches in the topography.

The road will then utilize a tunnel 1,900 feet long (0.36 miles) at a -5.5% grade to avoid benching along a very steep section of the valley. After the tunnel, the road will be nearly level on terrace deposits along the east side of the Soulé River valley for a length of about 0.70 miles, with one 40'-50' long bridge or long-span (bottomless) culvert over Dolly Varden Creek and a 120' long bridge over the Soulé River. The road tunnel spoils will be used for embankment construction between the tunnel portal and the Soulé River bridge.

After crossing the river, the road will follow the west side of the river valley for 0.50 miles at a nearly level grade to near the base of the spillway, including a curve around an environmentally-sensitive pond. It will then climb at an average grade of 14% for 0.30 miles to a bridge over the spillway chute, with one switchback. There will be one section of 20% grade 300 feet long. From the bridge, the road will extend to the intersection of the Main Dam and the canyon rim at a nearly level grade for 0.15 miles, then extend up the face of the dam to the east abutment at a 16% grade for 500 feet on an MSE embankment. From the east abutment, a 400-feet long section of the road will provide access to the intake structure (including a 120- feet long bridge). A second section 0.70 miles long will provide access to the spillway crest and the Saddle Dam; most of this length is on the crest of the Main Dam and Saddle Dam.

Additional roads will be built for construction access to the diversion tunnel, quarries, and West Fork weir. These construction roads will generally be in the reservoir area and will have maximum grades of 20%. The upper half of the road to the diversion tunnel will also provide maintenance access to the top of the diversion inlet structure at low reservoir levels.

(iii) Main Dam

The Main Dam will be an asphalt core rockfill dam with a height of 265 feet (above the downstream toe) and a crest length of 903 feet. The crest will be at El 585 feet and the normal water surface will be at El 575 feet. The asphalt core will be 24 inches wide, and will be founded on a concrete plinth poured along the abutment bedrock contact. The foundation bedrock will be grouted as necessary; foundation explorations indicate only a small amount of grouting will be required for the Main Dam.

Filter zones of 2” minus gravel 4 feet wide will be placed integrally on both sides of the asphalt core. Adjacent to the filters will be zones of graded rockfill (8” minus), random rockfill (30” minus), and an outer shell of select riprap. The face slope will be 1.5H:1V both upstream and downstream. The crest width will be 25 feet. The total volume of the Main Dam is estimated to be 900,000 cy.

During construction, the river will be diverted through a tunnel in the right abutment. The tunnel will be excavated by drill-and-blast techniques to a 20’ wide by 15’ high horseshoe shape, and will be approximately 1,150 feet long. The Main Dam work area will be isolated by upstream and downstream random-fill cofferdams, which will also form the upstream and downstream toes of the dam embankment.

(iv) Saddle Dam

The Saddle Dam will also be an asphalt-core rockfill dam with the crest at El 585. The crest length will be 2,024 feet. The maximum height (near the south end) will be 75 feet; the average height will be about 45 feet. The fill zones will be the same as with the Main Dam except that the asphalt core will be 20 inches wide. The total volume of the Saddle Dam is estimated to be 300,000 cy.

Foundation explorations have determined that the material under the Saddle Dam is moderately consolidated glacial sediments (till and outwash) over bedrock. The sediments fill a U-shaped valley and may be as much as 200 feet thick. Analysis has determined that the material will be stable under reservoir loading conditions if it is adequately grouted. A grout curtain penetrating into the bedrock is proposed.

(v) Spillway

The spillway will be located at the north end of the Saddle Dam where it abuts a bedrock knob. The spillway will consist of the following:

- A gated crest structure founded on an excavation into the bedrock knob, with three pneumatically-operated gates each 32 feet long and 10 feet high aligned along a circular arc. The spillway will pass the Probable Maximum Flood (PMF) with the maximum water surface at El 584.4 (0.6 feet below the dam crest) with only the spillway operating (no outlet works or power plant discharge).
- A chute down the face of the rock knob, terminating in a concrete flip bucket. The chute will have concrete retaining wall sides and concrete lining of the floor only where required to prevent erosion. At the upper end of the chute the walls will converge on circular arcs to the minimum chute width of 64 feet. Depth to rock is not known along the chute, but is expected to be relatively shallow. Additional geotechnical investigations during final design will determine bedrock conditions along the chute.
- The flip bucket will discharge spillways flows into a plunge pool excavated into alluvial deposits west of the river channel. These deposits will be mined and processed for aggregate to create the plunge pool. Additional geotechnical investigations during final design will confirm ground conditions in the plunge pool area.
- Air compressors and control equipment for the spillway gates will be located in a building to the north of the spillway on the plateau formed by excavation of the rock knob described previously. The building will also provide storage for maintenance equipment and vehicles.

(vi) West Fork Weir

The West Fork Weir will be a dumped porous rockfill structure across the West Fork Soule River upstream of the main dam. It will have a crest at El 450 (the minimum reservoir pool level) and a crest width of about 25 feet, with face slopes of about 2H:1V. The rockfill volume is estimated to be 20,000 cy. Its purpose is to retain bedload generated by the Soule Glacier. Geotechnical investigations have determined that existing low gradient areas of the West Fork below the glacier terminus are currently retaining much of the bedload, however, continued recession of the glacier may result in an increase in bedload that would be problematic for the power intake and reservoir outlet works if allowed to reach the toe of the main dam.

(vii) Quarries

Rockfill for the dams will come from the various excavations and from two quarries. One quarry will be on a bedrock knob that forms the west abutment of the Main Dam and north abutment of the Saddle Dam. The in-place volume from this quarry is 400,000 cy when excavated to a plateau at El 590. The rockfill for the Saddle Dam will come primarily from this first quarry. The second quarry will be the excavation in the east abutment of the Main Dam for the intake to the power tunnel. This second quarry can be expanded as necessary to the northeast to provide the necessary volume; the in-place volume of the excavation as shown in Exhibit F is 600,000 cy.

Additional geotechnical investigations during final design may determine that alluvial and glacial deposits to the west of the main dam in the reservoir area may be another source of rockfill.

(viii) Reservoir Outlet Works

At the end of dam construction, the diversion tunnel will be converted to a reservoir outlet works. The outlet works have been sized to allow drawdown of the reservoir from maximum pool to minimum pool in 30 days when operated in conjunction with the generation facilities and with average summer inflow conditions. The outlet works will consist of the following:

- A concrete intake structure at the upstream portal, with provisions for installing trashracks and bulkhead gates. The lower portions of this intake structure will be built prior to diverting through the tunnel.
- A tunnel plug under the dam crest, with an inlet to the pressure conduit.
- 800 feet of 9' diameter steel pipe (i.e. the pressure conduit) on concrete saddles from the inlet to the tunnel portal.
- A single 60" diameter hooded fixed cone valve (or other suitable valve) discharging into the spillway plunge pool.

(ix) Power Intake

The power intake will be a concrete tower structure founded against the southern slope of the quarry on the left abutment of the Main Dam. The intake will include:

- A trashrack with three sections, each 12 feet wide by 28 feet high.
- One 12' wide by 18' high roller gate designed for gravity closure.
- Three bulkhead gates, each 12 feet wide by 28 feet high, designed for closure by gravity under balanced head conditions.
- A transition to the 16' diameter power tunnel.
- A 3' diameter vent pipe to the tunnel crown.
- Hoists for the roller and bulkhead gates.

(x) Power Tunnel

The power tunnel will have a length of 11,400 feet from portal to portal. The tunnel will be either machine-bored or excavated by drill-and-blast techniques. This application is based on use of a tunnel boring machine (TBM) because of its environmental and technical advantages. The final decision on excavation method will be made at the time of construction based on contractor bids on each option.

The TBM tunnel diameter will be 16 feet and the spoil volume will be approximately 85,000 cy. The tunnel will be excavated from a single heading from the lower portal near the powerhouse, and the spoils will be used for surfacing the access roads and staging areas. Rock quality is expected to be very good, therefore it is expected that the tunnel will be mostly unlined. The alignment has been selected to minimize the length of lined tunnel and provide a convenient location for future construction of a surge tank if that becomes warranted. The tunnel will be lined where there is insufficient rock cover to withstand the internal pressure; lining is planned as 500 feet of 14' diameter steel liner with concrete backfill and 2,600 feet of 14' diameter reinforced concrete lining.

(xi) Powerhouse

The powerhouse structure will be a pre-engineered metal building (PEMB) with a reinforced concrete substructure. The powerhouse will be 160 feet long and 80 feet wide, with the PEMB superstructure rising 55 feet above the foundation at El 20 feet (generator floor level), and the concrete substructure extending down to El -27 feet. The powerhouse will set on an excavation into the bedrock hillside. The powerhouse will include three generator bays and one service bay.

(xii) Tailrace

The tailrace will consist of three 12-feet diameter buried conduits, a gate structure, and an excavated channel. The buried conduits will convey the turbine draft tube discharge under the switchyard on the downstream side of the powerhouse, and will be 95, 129, and to 167 feet long. The gate structure will be located at the end of the conduits, with the conduit invert at El 2.0 feet and the top of the structure at El 19.5 feet. The gate structure will include slots for stop logs to allow isolation of the tailrace conduits and turbines. The tailrace channel from the gate structure to its outlet on the Soulé River near its tidewater confluence will be about 230 feet long with a base width of 63 feet, and a depth varying from 0 to 20 feet. Nearly all of the tailrace channel will be excavated through delta deposits containing a high percentage of silty material. Therefore, the tailrace channel will be lined with riprap derived from the powerhouse excavation where subject to high velocity flows and/or turbulence.

(xiii) Switchyard

The switchyard will be located adjacent to the powerhouse on fill over the draft tubes and tailrace conduits. This location has been selected to allow screening by existing vegetation to the maximum extent possible. The switchyard will include the following equipment:

- Three 33/25 MVA 13.8-138 kV transformers, with concrete basin foundations.

- Roof assemblies over the transformers to protect them from snow shedding off the powerhouse roof.
- Three 145 kV circuit switchers for disconnect and isolation of the main power transformers.
- One 145 kV SF_6 circuit breaker.
- Three pair of manual disconnect switches for isolating the circuit breaker.
- Interconnection with the submarine transmission cable
- Associated buswork and metering transformers
- 100 kW diesel generator for providing station service when the plant is not operating, including a double-walled fuel storage tank.
- Oil-water separator

(2) RESERVOIR

The reservoir created by the main dam and saddle dam will have the following characteristics:

- Normal maximum water level ....575 feet msl
- Surface area at normal maximum water level...........1,072 acres
- Storage capacity at normal maximum water level.....102,300 acre-feet
- Normal minimum water level...................................450 feet msl
- Surface area at normal minimum water level ....377 acres
- Storage capacity at normal minimum water level......10,500 acre-feet
- Active storage capacity...91,800 acre-feet
- Maximum water level (PMF)....................................584.4 feet msl
- Storage capacity at PMF water level ....112,600 acre-feet

(3) GENERATING UNITS

(i) Turbines and generators

The powerhouse will contain three generating units with the following characteristics:

- Turbine type..Francis, vertical axis
- Turbine rated head ....500 feet
- Turbine rated flow...667 cfs
- Turbine rated power..36,000 HP
- Turbine speed..450 rpm
- Generator type...Umbrella

- Generator voltage..13.8 kV
- Generated rated capacity..25,800 kW

(4) PRIMARY TRANSMISSION LINE

The primary transmission line will include 700 feet of buried power cable across the Soulé River delta, 10 miles of 138 kV submarine cable in Portland Canal from the delta to a cable landing at Stewart, B.C. where a log transfer dock exists on their waterfront[6]. From their waterfront an additional 2.5 miles of overhead power cable would be constructed to a the BC Hydro substation on the northeast side of Stewart. It is the Applicant's understanding that only that portion of the submarine cable located in the United States will be subject to FERC licensing.

Bringing the 138 kV submarine cable into Stewart, B.C. will require about 2 miles of submerged lands within Canadian waters to the Stewart log transfer pier. From the pier an overhead transmission line would utilize an existing paved truck bypass route that runs between the existing airport runway and the Bear River, bypassing the streets of Stewart by going around the east side to the BC Hydro substation.

To maximize stability of the submarine cable, it will be placed in the deepest part of Portland Canal, which is also approximately where the U.S.-Canadian border is located. Exhibit G-1 shows approximately 8 miles of the submarine cable in the United States and the remainder in Canada. The actual length in the United States will need to be determined after the cable is laid.

(5) APPURTENANT EQUIPMENT

(i) Accessory Mechanical and Electrical Equipment

The powerhouse will contain the following accessory mechanical and electrical equipment:

- 72" butterfly-type turbine shutoff valves (per generating unit)
- 60 Ton bridge crane with 10 ton auxiliary hook
- Hydraulic power units (per generating unit)
- Electronic governors (per generating unit)
- Static exciters (per generating unit)
- 125 VDC station battery
- 13.8 V switchgear (per generating unit)
- Electronic control system for remote automatic operation

(ii) Plant Switchyard

[6] Partially owned by the City of Stewart and the Crown.

The switchyard at the Soulé power plant will include:

- Three 33/25 MVA 13.8-138 kV transformers
- Three 145 kV circuit switchers
- One 145 kV SF6 circuit breaker
- Associated buswork, metering transformers, fencing, and containment systems
- 100 kW emergency diesel generator.

(iii) O&M Equipment

Because the project area will only be accessible by boat and helicopter, for operation and maintenance of the project the Applicant will assign to the project a landing craft for moving large equipment and materials and two boats for moving personnel and small cargo. Other O&M equipment on site will include a backhoe, snowcat, and snow removal equipment. During snow-free periods they will be stored in a garage near the Saddle Dam spillway. During winter months they will be stored in the Powerhouse.

2.2.2 Proposed Project Operation

The proposed project would operate in storage mode. Excess water would spill through the spillway on the south southwest side of the dam through a spillway in the Saddle Dam. During most months it is anticipated that no water will reach the bypass reach below the dam except for possibly during summer thaws once the dam is full. Water from the dam will go through the Power Tunnel to the Powerhouse and discharge through a tailrace into the Soulé River mouth as it passes between the north and south deltas.

PROPOSED OPERATION

(i) Operation Mode

The project will normally operate under automatic control, with manual control as a selectable option.

(ii) Annual Plant Factor

The estimated plant factor is 42% (annual generation of 283 GWh and an installed capacity of 77.4 MW).

(iii) Operation During Adverse, Mean, and High Water Years

The project will be operated to provide firm power according to a schedule determined by the utility receiving the power. For the purposes of this application, the Applicant has assumed a delivery schedule to maximize revenue from power sales based on the 2009 Clean Power Call by BC Hydro. This schedule assumes peaking operation during winter months when flows are very low and run-of-river operation when the reservoir is full during the summer months. The Applicant's modeling of the project operation has determined the delivery schedule shown in Table B-1 in Exhibit B is near optimum.

During adverse water years, the Project will be able to generate little more than the firm energy schedule during the winter, and the reservoir will be drawn down to near minimum levels by late April or early May. The reservoir will refill during the summer, and any surplus water will be released for non-firm generation at a rate to maximize efficiency and revenue.

During mean water years, there may be somewhat more water available during the winter months than in adverse years. Nevertheless, the Project will be operated to provide only the required firm power delivery, and the reservoir will not draw down as far as in adverse water years. Once the reservoir refills in the summer, there will be more water available for non-firm generation. There may be some brief periods during the summer when the inflows are so high that additional water must be released through the spillway or the outlet works.

During high water years, the operation will be similar to that during mean water years, except there will be longer periods of non-firm generation and spill. Figure 4 in Exhibit B shows reservoir levels during typical adverse (1978), mean (1987), and high (1981) water years.

2.2.3 Proposed Environmental Measures

The Applicants proposed environmental measures are:

(1) Limit clearing for the project to as small a physical footprint as possible to minimize impacts to vegetation

(2) Implement an Erosion & Sedimentation Control Plan to prevent erosion and control runoff to prevent sedimentation

(3) Conduct sediment transport survey of river delta every 3-5 years for twenty years after project construction is complete to ensure the delta is not shrinking

(4) If mountain goats are observed near the Project during construction or operations, aircraft (i.e. helicopter or plane) will keep a 1,500 foot vertical and/or horizontal distance, unless the alternative is unsafe

(5) Color exteriors of buildings (dark green) to blend in with the surrounding forest.

(6) Implement a Bear Safety Plan for the construction and operation phase of the project

(7) Implement a Scenery Management Plan to preserve visual quality

(8) Conduct invasive species monitoring and eradication for 3 years after construction in the project corridor and then monitor the delta for the remainder of the project license to make sure the *sow thistle* does not become reestablished, if eliminated. Sow thistle is currently established on both the north and south river deltas and should be eradicated, or at least controlled so that the plant doesn't spread.

2.2.4 Proposed Mitigation Measures

1. Avoidance
   a. Visual
      i. Powerhouse behind existing tree screen
      ii. Power tunnel conduit transport of water from the dam to the powerhouse with no above ground disturbance clearing
      iii. Switchyard set in woods behind existing tree screen
      iv. Earthtone color schemes for buildings
      v. Road alignment to maximize screening effect of trees and natural slopes
      vi. Road tunnel to minimize high elevation road visibility
      vii. Project tailrace discharge confined to main river channel
      viii. Tailrace outfall partially screened by main river channel
      ix. Delta shore limited to modification of only 150 ft length within Glacier Bay.
2. Environmental
      i. Tailrace designed to direct its energy into the river main channel by paralleling the flow to avoid eroding the south delta, which will help protect boreal toad spawning habitat on the south delta
      ii. Road alignment altered to preserve beaver pond complex known to support boreal toad breeding on the Main Stem below USGS gage
      iii. Powerhouse and substation sited within tree line to avoid blocking bear movement patterns along shoreline
      iv. Wildlife crossing provided over part of the tailrace at edge of powerhouse compound to reduce potential barriers made by project features
      v. Natural high elevation landscape preserved by road tunnel and power tunnel to avoid impacts to mountain goats, to avoid blocking wildlife movement, and to protect wetlands and slope stability
      vi. Public access to road infrastructure blocked at tunnel and lack of surface clearing for water conduit will preserve some of the isolation and wilderness character of region
      vii. Annual sow thistle eradication program to minimize and/or eliminate this invasive species from the Soulé River delta
      viii. Avoidance of primary spawning and rearing area for lake population of Dolly Varden.

ix. Avoidance of altering Dolly Varden Creek and associated drainage area, where a subpopulation of Dolly Varden exists on the Main Stem of the Soulé River

2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions

This section will include a description of mandatory conditions provided under sections 18, 4(e), or 30(c) of the FPA and under section 401 of the Clean Water Act once they have been requested by the Commission.

2.2.6 Components of the Applicant's Alternative Considered but Eliminated from Detailed Study

We considered a number of alternative project components under the Applicant's Alternative that were ultimately judged not to be reasonable under the circumstances of this project. After this determination, we eliminated the following components from detailed study.

Powerhouse Location

One alternative configuration was to locate the powerhouse north of the river delta on Glacier Bay, which had the project discharging into the bay. However, moving the powerhouse to the north side of the river mouth (south side of delta) to discharge into the river channel will maintain the sediment flow from the river mouth around the delta. Moving the powerhouse and discharge out of Glacier Bay also eliminates any concern for the crab population that occurs there, used by Upper Portland Canal residents for recreation and subsistence by eliminating the placement of marine access structures in the bay itself, rather than as in the Applicants Alternative by placing the features on the delta. This also eliminates any concern about discharging directly into the bay and potential consequences to the crab habitat.

Another option considered was placing the powerhouse on the south side of the river mouth, however, bringing the penstock down the south side of the river would be difficult and costly because of the steep and rugged terrain, crossing a major avalanche area with numerous winter snow slides, and would have more environmental impacts because the road cut would need to be wider because of the steep terrain and issues with stabilization of the slope under those conditions.

Penstock Location

Taken into consideration along with placement of the powerhouse was the alignment of the penstock. Placing the powerhouse on the north side of the north delta would have required some above ground penstock after leaving a power tunnel, requiring more surface clearing and excavation, causing more environmental and visual impacts.

Placing the powerhouse on the south side of the river mouth would also require significant penstock excavation in bedrock and the potential for avalanches, which occur annually on the west side. This could also erode the overburden placed on the penstock.

Because an access road would also be needed along the penstock route, there would be an avalanche hazard to anyone using the road during winter and spring months and an annual concern about erosion of the cleared right-of-way.

Transmission Line Route

An overland route was considered from the Project to Hyder, however, the expense and potential environmental and major visual impacts were considered too significant to warrant this option. Two routes were considered, (1) along Portland Canal north to Hyder; (2) over the Lincoln Mountain Range north of the project into the Salmon River watershed and then to Hyder. Along Portland Canal would have the greatest visual impact, but fewer concerns about snow load on the transmission infrastructure. Option 2, to go over the Lincoln Mountain Range would also create a visual linear feature, have issues with extreme snow load on the infrastructure, and potentially impact mountain goats and habitat in the Salmon River watershed.

2.3 Land Use Alternative – Run-of-the-River (550 kW) power generation project – consistent with the Tongass National Forest Land and Resource Management Plan

The proposed project would be located within an area of the Tongass National Forest designated as Remote Recreation Land Use Designation (Remote Recreation LUD or LUD) in the 2008 Tongass National Forest Land and Resource Management Plan. A Remote Recreation LUD has very restrictive standards and guidelines for human development; therefore, a project alternative that would be consistent with a Remote Recreation LUD would be considerably different than the applicant's preferred project configuration.

FERC, in their May 19, 2010, letter to the Applicant requested that within 120 days the Forest Service and Applicant discuss options, which may include a project alternative that meets the standards, and file a report that provides a description of how the Applicant and Forest Service intend to resolve the land use issues. In compliance with this directive, on August 13, 2010, the Applicant and Forest Service held a teleconference to discuss options. As part of those discussions, the Forest Service specifically requested that the preliminary draft EA include two alternatives, (1) the Applicants Alternative; and, (2) a Land Use Alternative that works with the existing LUD for the project site.

In a September 9, 2010, letter the Forest Service stated they would not furnish draft 4(e) conditions until requested to do so by FERC after the draft license application (DLA) and preliminary draft environmental assessment (PDEA) were submitted to the resource agencies for the 90-day review, triggering the FERC review process and timelines. In response to the FERC timelines and their request for preliminary 4(e) conditions, the Tongass National Forest staff will brief the Forest Service Washington Office staff and request approval to submit preliminary 4(e) conditions that might address activities in inventoried roadless areas for which the Secretary has decision making authority. On September 10, the Applicant submitted the Forest Service letter to FERC to meet the 120 deadline.

For these reasons stated above, the PDEA includes an analysis of the environmental effects and developmental costs of a Land Use Alternative that would configure the project to meet the existing LUD (at least as closely as possible).

According to the 2008 Forest Plan, the goal of the Remote Recreation LUD is "*to provide extensive, unmodified natural settings for primitive types of recreation and tourism*" as well as "*opportunities for self reliance and closeness to nature in environments offering a high degree of challenge and risk.*" In addition, "*effects of human uses are to be minimized so there are no permanent or long lasting evidence, and facilities are to be minimal and rustic in nature*."

Areas in the Remote Recreation LUD are characterized by extensive, unmodified natural environments. Ecological processes and natural conditions are not noticeably affected by past or current human uses or activities. Users have the opportunity to experience independence, closeness to nature, solitude and remoteness, and may pursue activities requiring self-reliance in an environment that offers a high degree of challenge and risk. Interactions between users are infrequent. Motorized access is limited to traditional means: boats, aircraft, and snowmachines. Facilities and structures are minimal and rustic in appearance.

The standards and guidelines for a Remote Recreation LUD would make hydropower development difficult in an environment as remote as the Soulé River project site. Construction materials would need to be either flown to construction areas by helicopter or hauled on trails by pack animals. The capacity of the project would, therefore, likely be restricted by the small size of pipe that could be hauled without roads; preliminary analysis suggests that the maximum allowable size would be 550 kW (less than 1% of the proposed capacity of the applicant alternative 77.4-MW project).

Under the Land Use Alternative, a 550-kW project would also include the following proposed project facilities and operations:

A project under this land use would have a small diversion structure that would operate in a run-of-river mode with excess water spilling over the diversions spillway. In this mode of operation, this type of structure does not impound water as there is almost no storage, so that excess flow during operations that exceed the project maximum of about 90 cfs would spill; natural occurring discharges can be as high as 2,500-3,000 cfs in the Main Stem of the river. This natural channel, approximately 2,900 feet upstream of the river mouth, forks off the Main Stem for about 0.25 mile before returning to the Main Stem at the 30-foot falls at the top of the Lower Gorge. This project would only operate when the river is in high flow (summer), which is when this minor channel experiences flow. Water from the diversion will go through a combination of power tunnel/access trail that would contain a 36-inch penstock to the powerhouse. The penstock would cross the river to the opposite bank to the powerhouse supported by a suspension bridge that would also allow foot traffic to reach the diversion. The powerhouse would be approximately 1,000 feet from the beach fringe. A 12 kV, 750-foot-long aerial transmission line on single wood poles would go down to near the river mouth where it would then be buried in the trail which would go down to the delta where the transmission line would be trenched through the delta before dropping down into Portland Canal and going approximately 10 miles to Stewart, B.C., just as the preferred alternative would. A more detailed description is below.

Marine Access Facilities

Marine access facilities would be limited to landing a boat and/or landing craft on the delta to offload equipment, materials, and pack animals without creating any temporary or permanent structure on the delta.

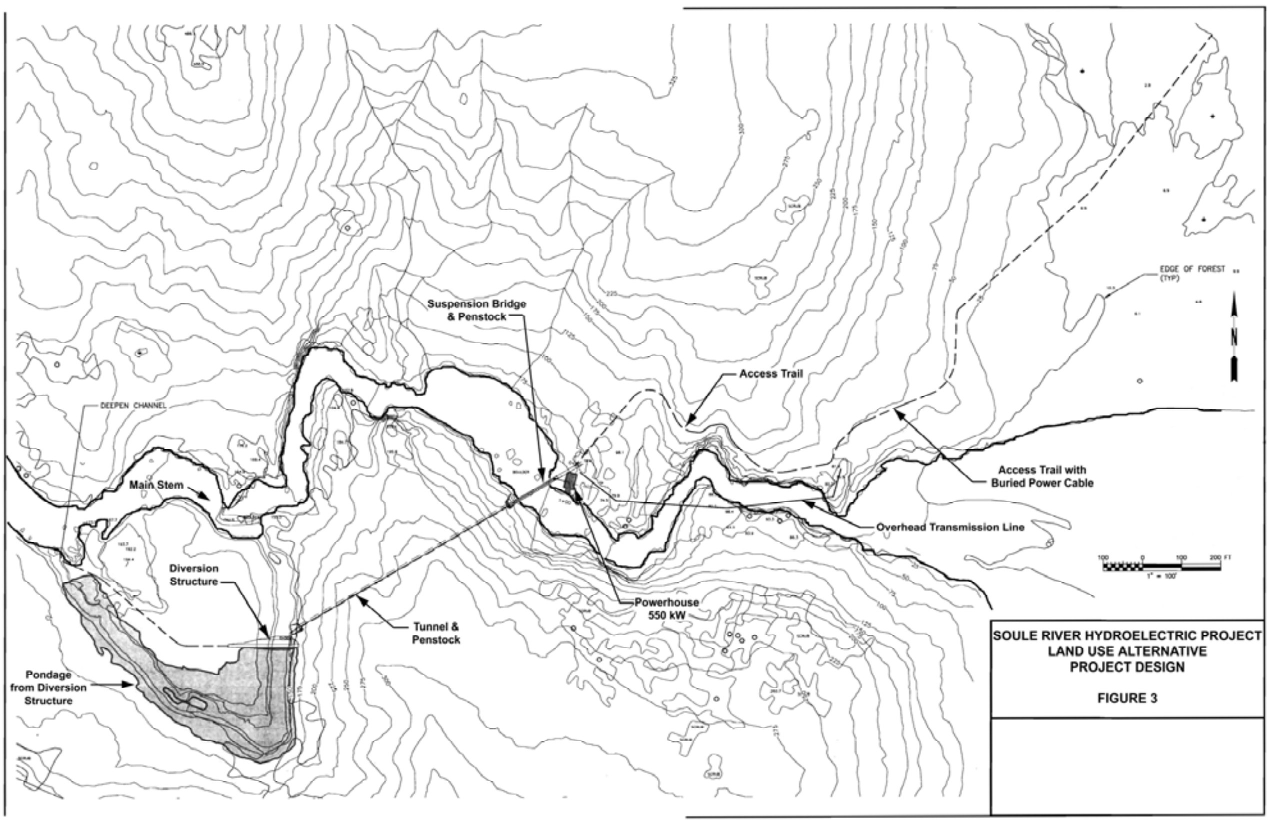


Figure 3 – Project Features for Land Use Alternative

Access Trails

The access trail would be constructed to a width of four feet to allow use by pack animals; some sections may need to be boardwalk to protect wetlands. It would start at an unimproved boat landing on the Glacier Bay side of the delta, then proceed in a southwesterly direction for about 1,200 feet across the delta and into the forest until near the Soulé River gorge. The trail would then turn more westward and parallel the river for about 1,200 feet, climbing and winding as necessary to avoid the steepest terrain. Nevertheless, about 300 feet of this upper section would be very difficult to build and maintain because of the steepness of the hillside. From the powerhouse area, the trail would cross the suspension bridge and proceed through the tunnel to the diversion structure area. The total length of trail, excluding the bridge and tunnel sections, is estimated to be 2,900 feet.

Access trails between project features would be constructed rather than an access road. Materials could be moved by pack animal to the powerhouse site. Equipment and materials too large to move in this way would be flown in by helicopter to each project feature. Some equipment may have to be disassembled before flying out to the site where they would be reassembled. Clearing would be needed for small staging areas at each project feature. Staging areas of 100x150 feet at each feature would not be unreasonable. This includes space for helipads. According to the Remote Recreation LUD guidelines, under Transportation, paths no larger than 50-inches are allowed and can be permanent, thus allowing these trails.

Powerhouse

The only suitable location for the powerhouse is approximately 1,200 feet upstream from the mouth, where there is a relatively flat bench of bedrock at the head of a long reach of rapids. Coincidentally, this location is about 1000 feet from the beach fringe, and is hidden from view from Portland Canal. Unfortunately, the bench is on the opposite side of the river than the diversion, therefore the power conduit would need to cross the river to deliver water to the powerhouse (see Figure 3 above and description below). The powerhouse would be a semi-underground structure, with most of the equipment located in a chamber excavated into the bedrock bench. A corrugated steel arch structure would span over the equipment chamber to provide protection from the elements; snow appears to accumulate very deeply at this location. The powerhouse would contain a single horizontal-axis Francis turbine rated at 91 feet head and 90 cfs flow, direct-connected to a 550 kW/600 rpm synchronous generator. A long draft tube would allow utilization of some of the head in the long reach of rapids at the site. Most of the installed equipment would need to be airlifted to the powerhouse site.

Generation from the Land Use Alternative would be on a run-of-river basis, and is estimated to amount to 4.6 GWh per year. Because the hydraulic capacity would be low compared to the average river flow, it would operate at a very high plant factor (94%).

A clearing for the building plus staging of materials and a helipad would require an area approximately 100 feet by 150 feet in size. Trees cleared would have to be flown out immediately to make room for construction. Excavated material, rather than removed from site, could be used to re-contour a staging area after construction to allow some revegetation to fill in part of this area, if there is room. At this time it is unknown how much material would need to be excavated for the powerhouse and staging area.

Tunnel Portals / Penstock

Power conduit: The power conduit would be a 36” pipe approximately 850 feet long. Pipe material would be PVC because of its relatively light weight, nevertheless, its weight would still be enough (approximately 1,580 lbs per 20’ length) to require delivery to the site by helicopter. To minimize the length of the power conduit and to avoid the clearing necessary for a surface penstock, 640 feet (75%) of the power conduit would be in a 7’x7’ tunnel. The tunnel would lead from directly below the diversion structure to the stream bank opposite the powerhouse site. A small suspension bridge 130 feet long would carry the power conduit over the river. The bridge would not be visible from Portland Canal.

Clearing would be necessary for the tunnel boring equipment or drill for drill and shooting the bedrock. Storage of spoils from boring or blasting the tunnel would be necessary unless allowed to deposit waste rock into the river, which has no fish and is full of glacial flour. The rock spoils would have to be left on site and/or used because they would not be moveable without a road to the shoreline (helicopter removal would be cost prohibitive).

Diversion Structure

At a point 2,900 feet upstream from the mouth, the Soulé River separates into two channels, probably as a result of faults or other discontinuities in the bedrock structure. One channel, termed herein as the “minor channel” appears to have appreciable flow only during high flow periods, and forms a ‘V’ shape in plan view as it leaves and then returns to the Main Stem. The Main Stem cuts across the ‘V’ formed by the minor channel with its much steeper gradient. A 30-foot-high falls (beginning of Lower Gorge) occurs just below the confluence of the Main Stem and minor channel. Diversion of the stream for power generation would be accomplished by two improvements: 1) excavation or deepening of the streambed at the divergence of the two channels so that flow can occur into the minor channel at all river stages, and 2) a small diversion structure located near the apex of the ‘V’ of the minor channel. The diversion structure would be about 27 feet high (above the existing streambed) by approximately 175 feet long, and would raise the water surface to El 160. It would be constructed of cyclopean masonry concrete (large mortared rock), with the rock excavated from a quarry in the pond area. A gated and screen intake would be located in the body of the diversion dam near the right abutment. The streambed at the diversion structure location is likely to be fractured, therefore grouting will be required to prevent excessive leakage.

The diversion structure would require clearing on both sides of the minor channel for construction purposes and excavation of part of the channel. A helipad would be necessary on the west side of the diversion along with enough space for equipment and material storage. The clearing on the west side may be approximately 100 feet by 150 feet with a smaller area on the east side for footing the diversion. These features would all require some vegetation clearing, including timber and excavation of rock. Helicopters would haul equipment and materials to the diversion site. Construction of the diversion may occur in late fall or early winter when flows are low. Material needing to be removed, i.e. timber, rock, soil, slash, would have to be removed via helicopter also, unless allowed to remain on site.

Transmission line

The transmission line would be problematic. Most of the line (10 miles) would need to be submarine cable in Portland Canal from the Soulé delta to Stewart, B.C. Because of the depth of Portland Canal, the cable size would be determined by strength requirements rather than electrical capacity (i.e., the cable would be much larger than necessary to carry the electrical current). For the section of transmission line between the powerhouse and the delta, the selected arrangement includes 750 feet of 12 kV overhead line down the river valley, and 1,500 feet of buried cable along the lower portion of the access trail. The overhead line would use single wooden poles, and would be similar to a typical distribution line. The route for an overhead line would be over bare rock and scrub; no trees would be cut. However, a small portion of the overhead line would be visible from Portland Canal, although they would probably not be detected by a casual observer. It is not considered possible to use buried cable the entire length because of the shallow soils to bedrock and steep terrain along the upper section of the access trail.

Construction Considerations

The Land Use Alternative has been based on guidance from the U.S. Forest Service as to what kinds of activities and structures would be allowable and/or preferable under the terms of the Remote Recreation LUD. The following assumptions have been made regarding the construction activities:

- Construction personnel would be housed in Hyder or Stewart and would be moved to the site each day, i.e. no construction camp. Personnel would either boat to the delta and hike up the trail or would be flown in by helicopter.

- Electric generators and small construction equipment would be used for construction of the diversion structure, tunnel, bridge, and power plant. The trail would be constructed with tools and equipment consistent with normal practices on the TNF.

- Construction equipment, the installed generating equipment, and heavy construction materials would be airlifted to the construction areas by helicopter. At least three concentrated uses of a heavy-lift helicopter would be necessary, once near the start of construction to move construction equipment to the site, once to move the generating equipment to the site, and once to remove the construction equipment at the end of construction.

- The power plant and tunnel excavation will require a substantial amount of rock excavation (approximately 1,400 cy). The spoils will be used as much as possible for fill around the powerhouse, but most will need to be disposed of. There is no area available for a spoil pile, therefore, the assumed disposal method will be to dump the clean rock spoils into the river. Normally, this would not be an acceptable practice, but in this particular case it is preferred, because 1) there are no fish in this section of river that would be harmed, and 2) the river carries a very high natural sediment load.

- Temporary access across the river from the powerhouse site, prior to bridge construction, would be by a cableway similar to that installed in 2009 for site explorations.

Environmental Impacts:
Environmental effects are reduced with this scaled down alternative. Clearing of trees, shrubs, topsoil, and bedrock will still be necessary at the diversion, tunnel portals (possibly), helipads, powerhouse, tailrace, transmission line, and access trail but this is a significant change without the access road and reservoir features. Blasting may be necessary to breakup bedrock at any of these locations. Wetlands may be impacted by excavation and fill in placing project features, but this will be limited to <1.0 acres and mostly directed at work in the minor channel.

Impacts to aquatic habitat would be insignificant with no salmon using the river and the diversion well below Dolly Varden Creek.

Terrestrial habitat would be insignificantly impacted because there are few species using this watershed. Connecting corridors would consist of a trail maintained to walk from project feature to project feature, including from the shoreline.

Although the site was surveyed for heritage resources and none were found, moving the project features back from the shoreline 1,000 feet significantly reduces any chance to impact any undiscovered artifacts; although it is unlikely any exist due to the difficulty to access the site, i.e. to penetrate the forest.

The aesthetics of the area would not be impacted because of the small footprint of the project features and their being 1,000 feet from the shoreline. They would most likely be hidden from the marine travel route in the middle of Portland Canal.

Recreational resources may be only slightly improved for the area because of the trail use to reach the project features, which would be short, but would take people to the Lower Gorge for possibly spectacular views.

Throughout the pre-filing consultation process the Forest Service suggested that it may consider amending the LUD of the project area within the 2008 Forest Plan for the purpose of assisting with hydropower development in the project area. As a component of the Forest Service's feasibility analysis for potentially amending the LUD in the 2008 Forest Plan, it requested an analysis of the other potential hydropower sites in the upper Portland Canal area. We include the Forest Service's requested analysis as Appendix A of the PDEA.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental and mitigation measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Our conclusions and recommended measures and alternative will be discussed in section 5.1, *Recommended Alternative.*

3.1 General Description of the Soulé River Basin

The Applicant proposes to construct a new hydroelectric project on the Soulé[7] River, which is located in the extreme southeast corner of Southeast Alaska, approximately 9 miles southwest of the community of Hyder and approximately 70 air miles east of the city of Ketchikan (Figure 4).

Figure 4

Figure 4 – Regional project location map for the Soulé River Hydroelectric Project.

The Soulé River is a part of the coastal mountain ecosystem. This river is fed primarily by the Soulé Glacier and the ice field that exists on the eastern boundary of Misty Fjords National Monument. The Soulé River Valley is bordered to the south by the Seward Mountains, which is also a boundary for the Misty Fjords National Monument, and bordered to the north by the Lincoln Mountains, and to the east by Portland Canal and British Columbia, Canada.

Portland Canal is an arm of the Portland Inlet, one of the principal inlets of the British Columbia Coast. Portland Canal forms part of the border between southeastern Alaska and British Columbia, at about 55°-56° North 130°' West. Despite its name, it is a completely natural geographic feature and extends 114.6 km (70 miles) northward from the Portland Inlet at Pearse Island, British Columbia,

[7] **Pronunciation**: Soulé is pronounced by Ketchikaners and Hyderites as "**Sue**-lee."

to Stewart, British Columbia and Hyder, Alaska.

The climate of the Project area is maritime, typified by cool summers, relatively mild winters, and heavy precipitation. In nearby Hyder, summer temperatures range from 41°F to 57°F; winter temperatures range from 25°F to 43°F. Temperature extremes have been measured from -18°F to 89°F. Rainfall averages 78 inches annually, with an annual mean snowfall of 162 inches. The project drainage includes peaks above 6,500 feet, glaciers, and ice fields with snow in the watershed of approximately 360 inches annually.

The Soulé River drainage is in the Tongass National Forest and is classified with a Remote Recreation Land Use Designation (LUD), as shown in Figure 5. Northeast towards Hyder, the next drainage over, is a Semi-Remote Recreation LUD. The mountain ranges around the Soulé River basin include peaks in excess of 6,500 feet and the drainage exhibits both glacial valley features and geologic fault features. The northern portion of the drainage is covered by the Soulé River glacier and ice field, a portion of which lies in the Misty fiords National Monument. Glaciers and ice field comprise 1/3rd of the total watershed. Over the three years of field studies, the watershed accumulated approximately 30-feet of snow annually. The Soulé River Watershed is approximately 81 square miles in size with 7.8 miles of active riverbed divided into 3 major segments. The Soulé River North Fork and Main Stem flow in a southerly direction before the Main Stem turns east near its confluence with Portland Canal. The West Fork flows east from the Soulé Glacier to a confluence with the North Fork where they form the Main Stem. The Applicant proposes to construct and operate the Project pursuant to the information provided in the second preliminary permit application (P-13528) and as contained within this application under the Applicant Alternative, which is the preferred alternative; although an above ground penstock was investigated, a power tunnel arrangement is the preferred option. The proposed Project would have an estimated average annual energy production of 283 gigawatt-hours (GWh).

The Main Stem of the Soulé River is approximately 2 ½ miles long, while the West and North forks are an additional 1.7 and 3.6 miles long, respectively. The higher elevations of the watershed consist of glaciers and ice fields, which total approximately 33 square miles. A total of 47.5 square miles of the watershed are not covered by glacier or ice. A total of 44.4 square miles of the drainage would lie above the dam built for the storage reservoir. Glacial meltwater enters the Soulé River through the West Fork, primarily from April through October. The low river flow period extends from November through March. The Soulé River exhibits major seasonal fluctuations in flow primarily driven by the glacier meltwater. The West Fork accounts for approximately 80% or more of the total river flow in the summer, but less than 20% in the winter. Summer river flows are estimated to be in excess of 3000 cfs, while winter flows are in the range of 50-500 cfs.

This river is heavily laden with glacial flour that predominantly comes from the West Fork, which is directly fed by the glacier. The flow from this fork is fast over a cobble and boulder substrate. Rocks in the West Fork were observed with a thick coat of >1/4-inch of silt from the glacier. Similarly, at the river mouth there is a thick coat of glacial flour covering the delta, forming a hard-packed armor.

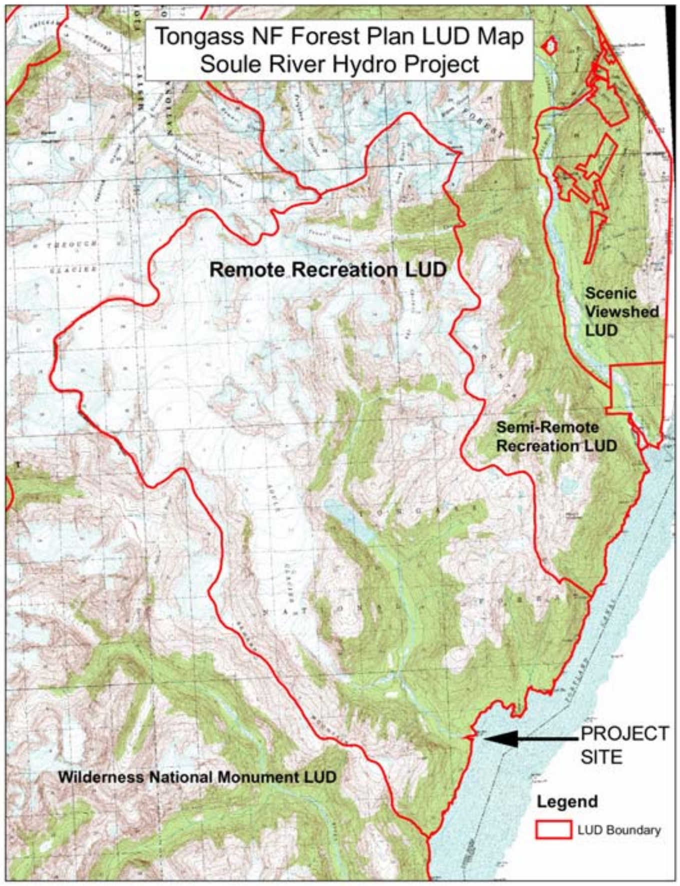


Figure 5 – Forest Service Land Use Designations for the Project area (Map courtesy of the USFS)

The North Fork comes from an unnamed lake at the head of a five-mile long valley, which has been named "No-Name Lake" for the purposes of this application. No-Name Lake is a glacially carved deepwater lake lying at the head of the North Fork of the Soulé River Valley. The North Fork of the Soulé River flows out of the south end of the lake (Figures 6 & 7). An unnamed stream flows into the northeast corner of the lake that has a barrier falls approximately 20 feet high located in a gorge immediately above the streams delta. The lake is approximately 1.43 miles long and 0.38 mile wide, with a surface area of approximately 300 acres. The south end of the lake is a terminal moraine only a few feet higher than the lake that extends across the valley. The lake elevation is approximately 601 ft above sea level. A bathymetric survey of No-Name Lake was conducted on August 3, 2008; results can be found in the *2008 Environmental Report* in Appendix Q of the Appendices, but is also shown in Figure 6.

The North Fork river bottom is not as steep as the West Fork and contains a number of yazoo channels with pools that are formed by beaver dams on both sides of the river. The North Fork valley is filled by quaternary alluvium, with trees less than 200 years old and well drained soils. Water from the North Fork is relatively clear and more sedate than the

West Fork. Habitat characteristics of the North Fork in general consisted of runs and rapids, with a few small pools at river bends. The river was typically 70-80 feet wide with well defined brushy banks.

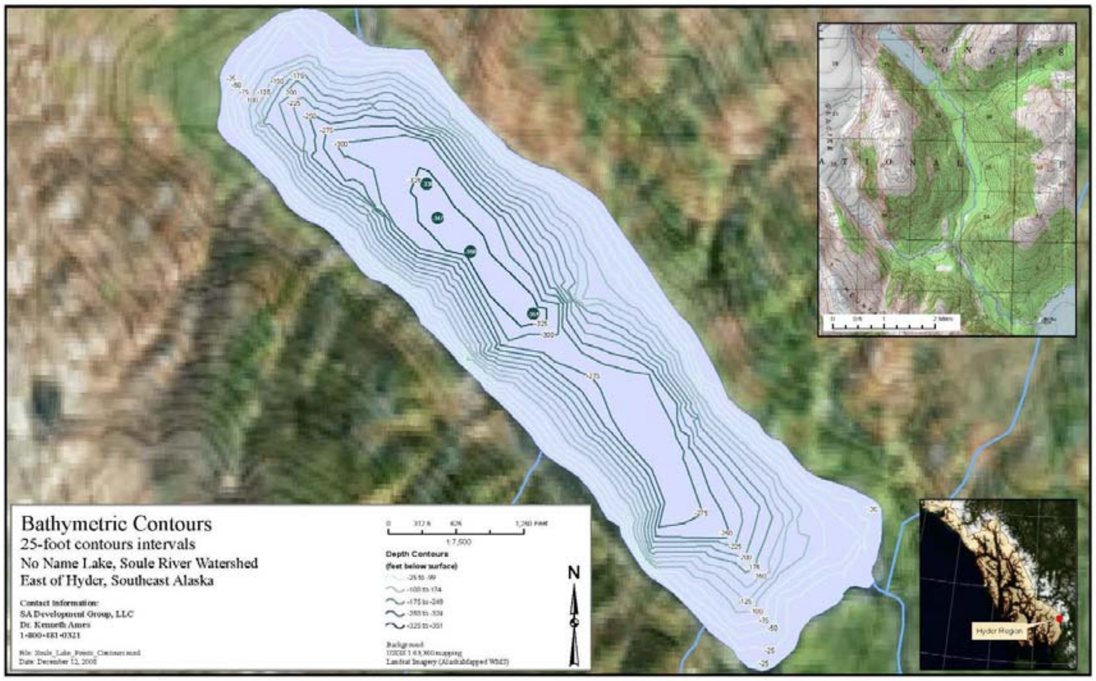


Figure 6 – Bathymetric Map of No-Name Lake; Maximum Measured Depth was 351 feet

The river basin had no observable game trails, in part due to dense brush and heavy snows of approximately 30+ feet, and little in the way of wildlife, either avian or mammalian. Bear and deer sign were most prominent along the shoreline of Portland Canal. Beaver have dens along the North Fork and upper Main Stem. Dolly Varden are the only fish in the system, using No-Name Lake as their primary habitat with spawning occurring at the outlet stream, which is the beginning of the North Fork.[8] Dolly Varden is also found in a stream that enters from the east side of the Main Stem of the river, between the Upper and Lower gorges, most likely comprised of those washed down river from the North Fork and No-Name Lake; meaning they are also most likely comprised of the same genetic material. Dolly Varden in general are not able to move about the river and the two forks because of falls and velocity barriers and high flows that flush them down to Portland Canal each summer. During low flow periods Dolly Varden are able to use part of the Main Stem, allowing them to leave Dolly Varden Creek (also known as Zapus Creek in field notes) for limited periods of time, or get washed down to Portland Canal. Dolly Varden Creek does offer habitat for all life stages of Dolly Varden.

Extensive ecological field investigations and vertebrate surveys were conducted in the Soulé River Watershed from 2007 to 2009. Most vertebrate observations were

[8] Spawning may also occur at the main inlet stream at the north end of the lake.

opportunistic while collecting a wide variety of ecological data throughout the watershed and its delta in Portland Canal.

The major landscapes were: North Fork, West Fork, and the Main Stem of the Soulé River; No-Name Lake, Soulé River Delta, and Portland Canal in the vicinity of the Soulé Delta (Figure 7 below).

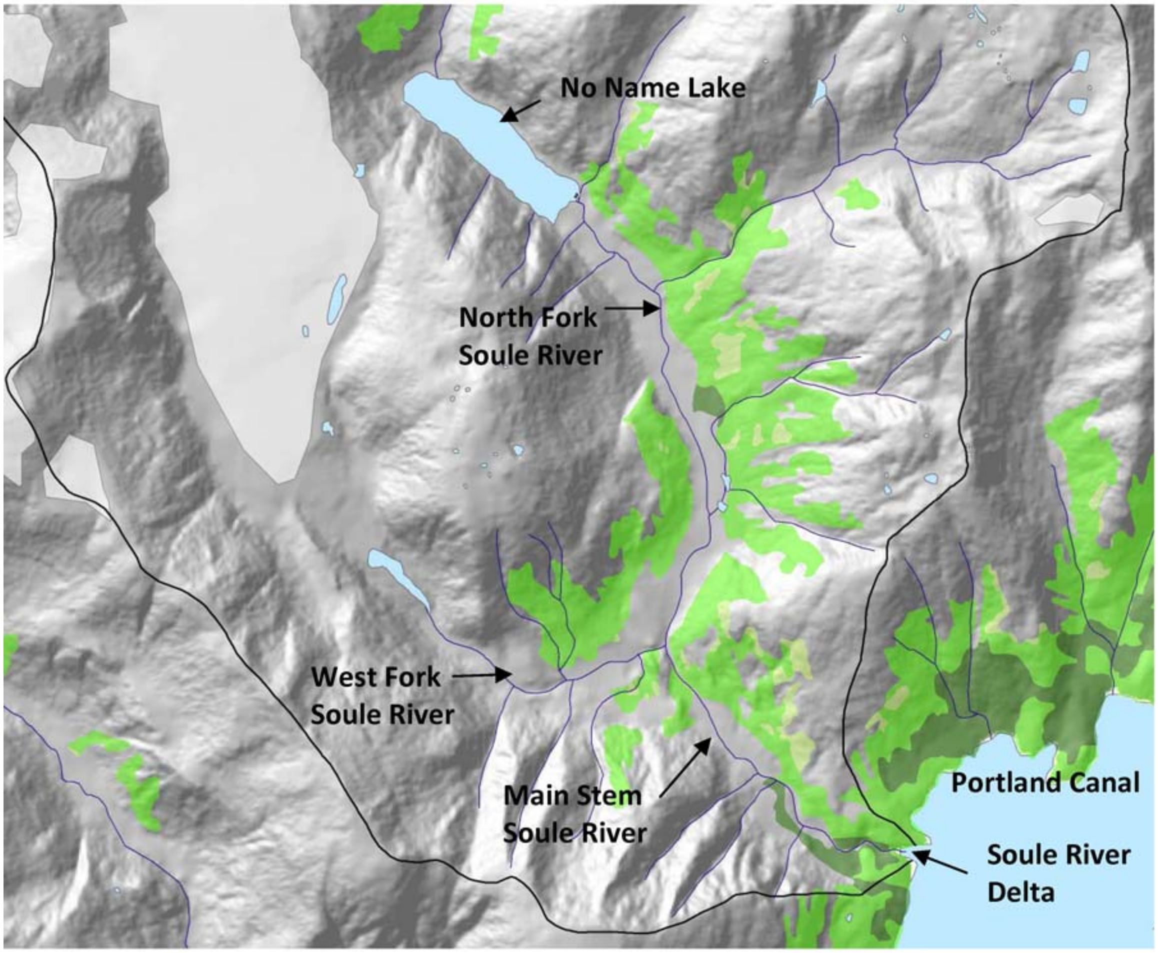


Figure 7 – Major Landscape Features within the Soulé River Drainage

Habitats covered during field time in the Soulé River Watershed included:

- ✓ Monotone conifer forest
- ✓ Subalpine and alpine zones
- ✓ Glacier-alpine area
- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridges
- ✓ Riverine and lacustrine riparian
- ✓ River channels and small streams
- ✓ Waterfalls
- ✓ River floodplains

- ✓ Fen wetlands complexes, seeps, muskeg, sphagnum and peat bogs
- ✓ Extensive beaver pond complexes
- ✓ River delta brackish marsh
- ✓ Mud flats and intertidal zone
- ✓ Sandy and rocky fiord shorelines
- ✓ Estuarine-fiord
- ✓ Lake

General Overview and methods for survey

Vertebrate documentations were opportunistic while in the field collecting a wide variety of ecological data. An intensive Goshawk calling survey was conducted throughout the Soulé Watershed and on the Portland Canal shoreline in the vicinity of the Soulé Delta. Goshawks were not seen or heard in the Soulé Watershed at any time in the entire duration of the study. The complete Goshawk survey report can be found in the Appendices. Intense amphibian searches were conducted in all years at ponds, wetlands, and riparian habitats, but especially July 14-19, 2009, when a survey for amphibian chytrid fungus was conducted. Chytrid fungus infections have been implicated worldwide in amphibian population declines. A thorough report in the Appendices covers the amphibian surveys and the results of the chytrid fungus investigation.

A great deal of time was spent looking for birds and large mammals, and listening for bird territorial singing. This included extensive scanning with binoculars observing:

- ✓ Mountain slopes
- ✓ Ridges, boulder outcrops
- ✓ Talus slopes
- ✓ Forest canopies
- ✓ Wetlands
- ✓ Beaver ponds
- ✓ Muskeg
- ✓ Subalpine and alpine zones
- ✓ River and lake shores and habitat edges

Total field efforts are presented below in Table 2. The entire field efforts in 2007 and summer 2008 were conducted while camping in the field. This dramatically increased the early morning, evening, and nighttime observations. A total of 123 field observation days were spent in the field between 2007 and 2009:

Table 2

Year	Dates in the Field	Field Days	Total Observers	Observer Effort
2007	8-14 September	7	3	21
2008	14-16 May	3	2	6
2008	21 July – 5	16	3	48

	August			
2009	14-21 July 14-29 July	8 & 16	2 & 2	48
TOTAL		49	12	**123**

Table 2 – Total Field Effort at Soulé River Watershed, 2007-2009. Most observations were opportunistic while collecting a wide variety of ecological data and searching for wildlife.

Survey times are heavily biased for the summer. Although the spring survey season was short and the weather was poor, a number of migratory bird species and even nesting species were documented. The major time for singing territorial male birds is late May through June, however, the majority of this activity for this species was missed. Nevertheless, most of the breeding birds of the watershed were documented.

Field personnel (resumes can be found in Appendices) were as follows:

- Koren Bosworth, Juneau, AK
  July 14-21, 2009
- Richard Carstensen, Juneau, AK
  July 14-21, 2009
- Tony Krzysik, Prescott, AZ
  September 8-14, 2007
  May 14-16, 2008
  July 21 – August 5, 2008
  July 14-29, 2009
- Paul Rusanowski, Salt Lake City, UT
  September 8-14, 2007
  May 14-16, 2008
  July 21 – August 5, 2008
  July 14-29, 2009
- Shawn Williams, Klawock, AK
  September 8-14, 2007
  July 21 – August 5, 2008

Fall 2007, September 8-14:
South shore of No-Name Lake, September 8-12
Surveys covered southern No-Name Lake and the Upper North Fork. Habitats included:

- ✓ Riverine and lacustrine riparian
- ✓ Montane conifer forest,
- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridges
- ✓ River channels and small streams
- ✓ Waterfall, and seeps.

Soulé Delta, September 12-14
Surveys covered Soulé Delta, upper forest above Delta, and a small section of Lower West Fork. Habitats included:

- ✓ Montane conifer forest
- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridges
- ✓ Riverine riparian
- ✓ River delta brackish marsh

- ✓ Mud flats
- ✓ Intertidal zone
- ✓ Estuarine-fiord

Spring 2008, May 14-16:
Habitats covered were on Portland Canal and on the Soulé Delta. Daily travels were on a small boat between Hyder and the Delta. The weather was cloudy, windy, and rainy the first two days. Precipitation was particularly heavy and continuous all day on May 14. May 16 was mainly partly cloudy and sunny.

Summer 2008, July 21 – August 5:
Lower North Fork River, July 21 – August 2
Surveys covered the Lower North Fork and a small portion of Lower West Fork.
Habitats included:

- ✓ Montane conifer forest
- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridges
- ✓ Riverine riparian and floodplains
- ✓ Extensive beaver pond complexes
- ✓ Fen wetlands complexes
- ✓ Seeps
- ✓ Muskeg
- ✓ Sphagnum and peat bogs
- ✓ River channels and small streams
- ✓ Waterfall

Northeast shore of No-Name Lake, August 2-5
Habitats included:

- ✓ Lacustrine riparian
- ✓ Moraine mixed forest
- ✓ Montane conifer forest
- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridge

Summer 2009, July 14-29:
The entire Soulé River Watershed was surveyed using daily trips and watershed movements with a helicopter. Therefore, surveys were very efficient and a great deal of the area was covered. The major landscapes were: North Fork, West Fork, and the Main Stem of the Soulé River; No-Name Lake, Soulé River Delta, and Portland Canal in the vicinity of the Soulé Delta.

Habitats included:

- ✓ Montane conifer forest

- ✓ Steep cliffs and escarpments
- ✓ Boulder and rocky ridges
- ✓ Riverine and lacustrine riparian
- ✓ River floodplains
- ✓ Extensive beaver pond complexes
- ✓ Fen wetlands complexes
- ✓ Seeps
- ✓ Muskeg
- ✓ Sphagnum and peat bogs
- ✓ River channels and small streams
- ✓ Waterfalls
- ✓ River delta brackish marsh
- ✓ Mud flats
- ✓ Intertidal zone
- ✓ Sandy and rocky fiord shorelines
- ✓ Estuarine-fiord
- ✓ subalpine and alpine zone
- ✓ Sand glacier-alpine area.

3.2 Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's regulations for implementing NEPA (40 CFR, section 1508.7), cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Although there was only one cumulative effect identified by any resource agency, Fish Creek chum salmon, the Forest Service previously asked us to conduct an analysis of other potential hydroelectric sites in the Salmon River drainage near Hyder, which was done and shared with them, but is included here to show how unlikely these other potential sites are to ever be developed, which reduces the cumulative impact of this project to this area. The Applicant also identified recreation and subsistence as a potential cumulative effect to be analyzed in the application. With the mining history of the Salmon River drainage, it is possible that this project could make power rates and availability more attractive to the mining industry. That could stimulate some of the marginal prospects moving towards commercialization based on increases in metals commodity prices. The proximity of this project to these mining prospects would make energy costs seasonally more attractive.

Cumulative Effects Analysis on Salmon River (Fish Creek) Chum

Fish Creek is a tributary on the Salmon River and therefore the scope of the cumulative effects analysis will be from Fish Creek (from here on collectively referred to as the Salmon River) to the Soulé River where the juveniles pass by on their migration to the ocean.

The USFS in their July 17, 2008, SD1 comment letter stated the following:

"*Cumulative effects to the population of Fish Creek chum salmon which feed in the Soule River estuary includes effects that have occurred, or may occur in the future from the activities in the Hyder and Stewart areas. The Fish Creek chum salmon are listed by the Forest Service as a Sensitive Species. They are recognized for growing to large sizes, and viewing these salmon provides a major attraction for tourists in the Hyder/Stewart area*." By letter dated June 9, 2009, the USFS informed the Applicant that the Fish Creek chum were no longer on their list of Sensitive Species.

"*Past, present and future projects in the Hyder/Stewart vicinity which may affect the Fish Creek chum salmon include*:"[9]

- *Stewart, B.C. – Past Solid causeway construction caused collapse of Bear River chum run*
- *Stewart, B.C. – Past, present, & future Log rafts in Portland Canal support the local mill and impacts the Portland Canal substrate*
- *Marx's Creek – 2008 Forest Service reconstruction of the spawning channel located 5 miles upstream of the Salmon River estuary*
- *Hyder Causeway located in Portland Canal– 2011 Replacement of trestle and reconstruction of causeway will improve access to dock and increase the size the island where the dock is located*
- *Hyder Main Street – 2009 Paving Salmon River Road from the causeway to the Fish Creek bear viewing site, approximately 7 miles. The road runs adjacent to the Salmon River*
- *Hyder Dike – Unknown future timeframe Maintenance of Hyder Townsite dike. This dike is the responsibility of the State of Alaska and is on the Federal List of Dikes and Levees in need of repair. AK DOT inspected this dike in May of 2008*
- *Two additional dikes located along the Salmon River were installed for protection of spawning habitat from the yearly jokulhaups (glacial lake outburst floods). Each has received maintenance in the past 10 years and continued maintenance is expected*
- *State Road to the Canadian mining areas has sloughed above Salmon River and will cost $6 million (2008 dollars) to repair. This road washes out repeatedly due to the jokulhlaups. In the past 10 years, AK DOT has had several reconstruction*

[9] As listed by Forest Service Letter of July 17, 2008.

- *efforts. The upgrade scheduled for 2009 may raise the elevation of the road at the 9 Mile location and rip-rap the bank in several vulnerable locations*
- *Mining activities in the Hyder area and Canada. Past, present and future. Possible effects to Salmon River water quality*
- *Rock and gravel sources located on Salmon River Road. Past, present and future. Possible effects to Salmon River water quality*

Though the activities for the Hyder area listed above could have an impact on juvenile chum from the Fish Creek on the Salmon River, most appear to be state or Forest Service projects, many of which are periodic maintenance activities, and therefore follow guidelines to protect the environment by constructing quality structures and using erosion and sedimentation control practices that will limit impacts to the juvenile chum. Being that this is the case for most of the above list, the potential for cumulative impacts is not significant. Even other potential hydroelectric projects for the Hyder area are not likely to be constructed; previously analyzed in this document. In addition, Portland Canal is over 70 miles long and at the Project site is 2.0 miles wide and approximately 900 feet deep. The Soulé River, while providing peaks of over 3,000 cfs during summer months, is in scale a small contributor to Portland Canal who has many rivers and drainages flowing into it. The Soulé River totals about 7.8 miles of actual river and only about 4 miles of river from the glacier, so that the water contained in the river is very cold, averaging about 1-2ºC during the summer months, even at the river mouth.

The Soulé River delta is the first major shallow water delta below Hyder on Portland Canal on the US side of the border from the Salmon and Bear River deltas. The total intertidal essential fish habitat on the Soulé delta and in Glacier Bay is approximately 85 acres. This is used as critical feeding habitat during out-migration down Portland Canal. Approximately 1.25 intertidal acres will be modified by project infrastructure and may have slightly reduced value as essential fish habitat during juvenile salmon migration, however, the riprap will provide more diverse habitat than presently exists. The riprap for project features on the delta will trap sediment that comes from the Soulé River and may eventually allow some growth of various Focus and perhaps Fucoid plants and sedges in addition to providing niches for juveniles to escape predators. The remaining approximately 5.5 acres of project infrastructure on the delta will be in the supra-tidal or uplands.

However, below the Applicant analyzes the potential for the Project to cumulatively impact the Salmon River chum in two ways:

1. Erosion from clearing and other construction activity leading to sediment getting into Portland Canal
2. Naturally occurring sediment transport in the Soulé River is interrupted so that the river delta experiences changes from lack of deposits to maintain its size; erosion of the delta could ensue if sufficient load doesn’t continue to come down the river to sustain its size and/or growth.

Hyder can eventually expect growth in population and its economy, which may include more activity along the waterfront and possibly along the Salmon and Bear rivers as infrastructure is updated and expanded (as described in the Forest Service letter of July 17, 2008) and as tourism grows. It is perhaps unavoidable that some instances of sedimentation, whether from bank erosion or construction activities, will continue along these rivers into the future, particularly with annual jokulhaups on the Salmon River. Sediment has been coming down the Salmon River at least since the last Ice Age that occurred approximately 10,000 years ago and started its retreat approximately 4,000-8,000 years ago. The Soulé Glacier also began its retreat about the same time, forming the Soulé River basin and forming the delta that we see at its mouth today. The Soulé River delta began forming thousands of years ago and is layered with glacial flour that easily compacts and hardens into a strong armor that may not easily erode. The floor of Portland Canal is also most likely thickly covered in sediment and glacial flour from this time period to present.

The Soulé River has its own glacial flour that primarily comes from the West Fork which drains from the Soulé Glacier and contributes to the Upper Portland Canals cloudy or chalky color. The Salmon River has a drainage area of 94.1 square miles to the USGS gage, which is 295 feet above sea level. The Soulé River has a drainage area of approximately 81 square miles to the USGS gage, which is 450 feet above sea level. However, approximately 52.5 square miles of the Soulé River drainage is under ice, and as mentioned above, there is only about 7.8 miles of active river channel for the Soulé River.

The Soulé River delta is an intertidal wetland approximately 65-70 acres in size above the zero tidal datum. It extends along approximately ½ mile of the shoreline, and up to a ¼ mile offshore. About 1/3rd of the wetland lies to the south of the Soulé River and appears truncated by deep water (greater than 600 ft deep), while the north side appears to be building towards Glacier Point. The Soulé River cuts a well defined channel across the delta that has shifted slightly to the southwest in recent years, as evidenced by an old channel on the northeast side that is filling in with sediment.[10]

The delta is an important forage area for migrating juvenile salmon from rivers further up Portland Canal (Salmon and Bear rivers). Migrating juvenile salmonids could use the delta habitat from late February through July of each year, although peak use would occur predominantly from late March through May, prior to major discharges from the Soulé River. Changes in the sediment transport and mass movement of water can positively or negatively affect the physical processes occurring on the delta and cause it to grow or shrink in size. The physical processes that have formed the delta need to be understood in order to understand the possibility of any potential risks to migrating juvenile salmonids from changes in these processes.

The marine environmental studies were designed to provide information on:

- sedimentation and erosion naturally occurring on the delta

[10] Rusanowski, P. The Shipley Group. *Marine Environment Report. February 2010.* See Appendix J.

- local current patterns under differing tidal conditions that transport sediments in the vicinity of the delta, and
- the influence of local topography on water circulation patterns in the vicinity of the delta

A tide gage was established to provide a local record of water levels in order to establish the mean high tide level on the delta. The sediment transport report for the delta substantiates that the main mixing area for Soulé River waters is Glacier Bay and the immediate vicinity of the delta; see Appendix M – *Substrates and Sediment Transport Report*.

To address the potential for erosion, the Project can be constructed using methodology that is well proven over the years at numerous construction projects to prevent erosion, i.e. limit clearing as much as possible, don't disturb vegetation roots unless necessary, riprap slopes, and use jute netting, silt fencing, geotextile fabric, mulches, seeding, and plantings, to name a few of the common methods.

If erosion does occur, methods to trap sediments before they enter a waterbody would include straw/hay bale or sandbag barriers, silt fencing, silt traps, cofferdams, other methods of keeping sediments from entering a waterbody. The Applicant believes the Project can be constructed while retaining water quality so that juvenile Salmon River chum and other salmonids are not impacted by sediment as they migrate to sea past the Soulé River mouth. This is the most important factor, whether this Project would impact water quality, regardless of activity in the Hyder/Stewart area in the future.

Another factor for juvenile chum is the naturally occurring sediment and glacial flour that comes down the Soulé River, primarily forming the river delta on the north side of the river mouth (as a smaller delta also exists on the south side; sometimes referred to as the west side[11]). The delta provides foraging habitat for the juveniles as they head down Portland Canal to the ocean. The Project study area for marine environmental studies is shown in Figure 8. This study area includes approximately one mile of shoreline stretching from the southwest edge of the Soulé River Delta to Glacier Point northeast of the delta. Powerhouse water discharges would occur seasonally into the river mouth. Water that is not stored in the reservoir would spill and continue to flow through the Soulé River, but only for limited times when peak runoff and/or precipitation occur. Other flow in the Main Stem would consist of the 30+ feet of snow melt from either side and from drainages such as Dolly Varden Creek.

The Applicant is studying the movement of sediment on and around the delta to determine what is naturally occurring there and how Project operations could impact the movement and amount of sediment and glacial flour deposition to the delta. This survey, intended to be multi-year, was only conducted in 2009 for this DLA and PDEA. The

[11] In the field studies the deltas are sometimes referred to as the east and west deltas, which is because the river transitions from a north/south orientation to an east/west orientation, creating some confusion. At the river mouth the river is flowing east, so the deltas should be considered on the north and south sides.

results from the 2009 survey are included in Section E.2 – Water Quantity and Quality. The first year survey established four transects across the delta to monitor natural processes of change occurring prior to construction. A bathymetric survey and current surveys were also conducted to map the movement of water and sediment from the river and its relation to the existing delta dimensions. The sediment survey shows that the Soulé River silt laden water circulates around the north delta and into Glacier Bay where it mainly gyros back toward the south in a counterclockwise rotation within the bay.

Because the project will discharge glacial flour laden water back into the river mouth via the project tailrace, maintenance of the natural inflow of sediment to Portland Canal and the delta will continue. Also, in some years, the project will flush silt from behind the dam during high flows in the summer. This would provide sediment to the Main Stem as well as to the deltas. This would have little impact to the juvenile chum because their migration to the ocean occurs during the spring, which peaks March through May. Maintaining the river delta will provide important forage habitat during the annual migration of Salmon River chum.

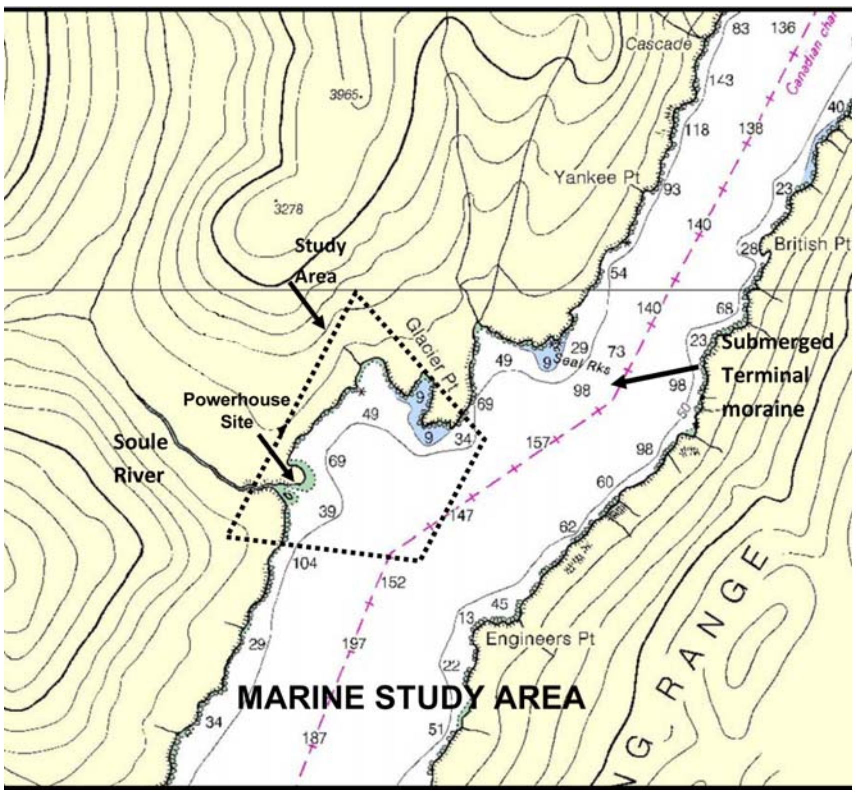


Figure 8 – Marine Environmental Study Area

<u>Cumulative Affects Analysis on Recreation and Subsistence at the Soulé River</u>

The delta and Glacier Bay just north of the Soulé River mouth are used for recreation and subsistence by locals in Hyder, Alaska and Stewart, B.C., Canada as well as sight-seeing companies and a hunting guide in Ketchikan. The Applicant conducted a recreation and subsistence survey for the site by mailing a questionnaire on June 19, 2009, to the residents that have a mail box in Hyder and to the plane and helicopter companies in Ketchikan that may conduct aerial tours of Southeast Alaska. They had until November 30, 2009, to respond and 8 of >60 questionnaires were returned.

The survey showed that at least one guide from Ketchikan brings hunters to Portland Canal for black and brown bear and reported that they had taken both types of bear at the Soulé River Delta and vicinity, including Glacier Bay. Residents of Upper Portland Canal hunt, fish, shrimp, and crab along the canals shoreline, both for subsistence and recreation. A couple of the respondents expressed that they would rather not see development at the Soulé River and the rest provided information on their use of the area.

The Project could have a temporary impact on subsistence and recreation activities during construction along the shoreline of the Soulé River Delta and Glacier Bay. The movement of bear and deer along the shoreline, as they go up and down Portland Canal, could be interrupted by construction activity until activity stops in the evening through early morning hours, at which time movement would probably occur. This would have a temporary impact to hunting at the Soulé River Delta and Glacier Bay as well as a lesser temporary impact on crabbing in Glacier Bay.

Signs may be posted on the delta after construction to warn hunters of the powerhouse and substation locations behind the treeline. In this way, project structures would reduce the available hunting area available for recreation or subsistence (appears to be primarily of recreation at his location). Bears are still likely to use the delta for foraging, even with project features, because this is part of their migration corridor along the canal, but approximately 25%-30% of the delta will be impacted by project features. Bear hunting also occurs on the south delta, as witnessed by our field biologists. Foraging habit of up to 0.8 miles into the watershed will be opened up by the access road, which bear are likely to use, being opportunistic. Although the project features will cover 25%-30% of the north delta (% of land above the +5 tidal datum), only a portion of that includes good forage for bear. However, mitigation offered later in the EA may eliminate or balance loss of forage habitat. Cumulatively, this project may marginally reduce opportunities for recreational bear hunting potential in Upper Portland Canal.[12]

With the access road allowing wildlife easier access into the Soulé River Valley, possibly creating foraging habitat that previously didn't exist, people who participate in subsistence and recreation activities may also take advantage of this new opportunity to explore the valley and the unique features of the two gorges as well as hunt the game that moves into the valley. Although the Project reservoir is likely to attract people who participate in subsistence and recreation in the area, who want to fish for Dolly Varden in No-Name Lake and also the reservoir as Dolly Varden begin using it as habitat, access to both will require bushwhacking due to the access road having a 1,900-foot-long tunnel,

[12] Excerpted from the Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. P. 78. "*A few years ago a resident reported a possible **Sitka deer** out the road a ways. People got pretty excited and went out with their rifles. That's how rare deer are in Hyder. Ron (Hyder hotel owner) says you don't see them much in Portland Canal until you get all the way down to Fillmore Island. (Check out the snow map at end of journal; only at Fillmore do you leave the very deep and deep snow zones.)*"

which would be closed off for safety. To reach the lake would also require bushwhacking around the reservoir through steep, rugged, brushy slopes to reach it, a distance of approximately 3+ miles as no roads will extend into the project reservoir during construction, except for access to the foot of the two dams and access to the West Fork weir dam, all of which will be covered by water when the reservoir fills. No access is anticipated for getting around the reservoir.

The Project has the potential to marginally increase recreational opportunities for Upper Portland Canal residents as well as tours from Ketchikan for fishing and hunting. As stated above, access will only be partially improved into the watershed, requiring bushwhacking to reach the reservoir and No-Name Lake. Thus opportunities will remain somewhat limited because the watershed will still be fairly isolated from a recreation standpoint, particularly with the natural barriers that will still exist, i.e. thick understory, steep slopes, tunnels for project features rather than clearings, and 30+ feet of snow that only opens this valley up to access by late June / early July. Crabbing, shrimping, and fishing off the delta should not be impacted during construction activity. Overall, the Project may have a small net gain in expanded subsistence and recreation opportunities for the Upper Portland Canal area with access into the river basin where previously none existed due to the dense Sitka alder understory.[13] Wildlife, i.e. bear and deer, will still choose to use the shoreline as their migration corridor up and down the canal, requiring the Applicant to take this into account in the project design to ensure passage is not prevented.

3.3 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary.

For Salmon River Chum, at the Forest Service request, the Applicant needs to consider the cumulative effects on foraging habitat around the Soulé River Delta and how that could affect the Chum and other juveniles out-migrating along Portland Canal. This geographic scope is used because juvenile salmon migrate to the ocean from the Salmon River moving along Portland Canal's shoreline and may use the bay (locally named Glacier Bay because it is near Glacier Point) just north of the Soulé River Delta that offers protection from strong currents, waves, and predation and offers temporary foraging habitat. The Forest Service informed the Applicant on June 10, 2009, that Fish Creek chum were being removed from their sensitive species list, however, we continued to use Fish Creek chum as an environmental indicator species for juvenile fish forage habitat at the river delta.

For recreation and subsistence use, the Applicant needs to consider the cumulative effects of Project construction and operations and these uses in the Project vicinity and up to

[13] The understory is bent over by heavy snow, making travel very difficult through it once the snow is gone.

Hyder.[14] This geographic scope is used because the Soulé River Delta is used to recreationally hunt bear and Glacier Bay is used to trap crab both recreationally and presumably for subsistence by residents of Hyder and Stewart at the top of Portland Canal. A tour guide from Ketchikan takes people to the Soulé River delta and along Portland Canal to recreationally hunt bear. Deer are hunted approximately 48 miles south of the project at Fillmore Island.[15] Deer and bear hunting otherwise occur in Canada for residents of Upper Portland Canal; the US border with Canada is only 1.5 miles from downtown Hyder, making access by road to recreational and subsistence activity in Canada much easier and less weather dependent than going down the canal.

3.4 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on Salmon River chum, and recreational and subsistence resources. Based on the term of the proposed license, we will look 30 to 50 years into the future, concentrating on the effects on Upper Portland Canal juvenile salmon and recreational/subsistence activity of the Upper Portland Canal residents from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the agency comments to Scoping Documents 1 and 2 and study plans, a public recreation and subsistence use survey, comprehensive plans and the field studies the Applicant conducted between 2007 and 2009 (123 Field-Observation-Days).

3.5 Proposed Action and Action Alternatives

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, have been addressed in detail in this EA. Based on this, we have determined that aquatic, recreation, and subsistence resources may be affected by the proposed action and action alternatives. We have not identified any substantive issues related to:

- cultural, a heritage resource consultation and field survey was conducted by a certified archaeologist and no artifacts were found within the project boundary
- socioeconomics, this project will not have a negative impact on socioeconomics of Upper Portland Canal because, (1) it will provide some temporary [would need 100-200 construction workers at different times] and an unknown number of permanent jobs; (2) use of local suppliers and services; and, (3) may provide a limited increase in sportsman and recreationist opportunities for the area.

[14] Hyder, Alaska and Stewart, B.C. being the only communities on Portland Canal.
[15] Anecdotal information from a conversation a biologist had with hotel/restaurant owner of Hyder in 2009.

For these reasons, the above resources are not assessed in depth in the EA. The Applicant presents their recommendations in section 5.1, *Recommended Alternative* section.

3.6 Geologic and Soil Resources

<u>Affected Environment</u>

The Soulé River watershed is within the Coast Range and part of the Coast Range batholiths – a monolithic Tertiary-Eocene intrusive of granite and granodiorite – a relatively low-diversity, low-productivity area in terms of plants and wildlife. The Soulé Ice sheet, which caps the southern southeast Alaska/Misty Fjord part of the Coast Range, feeds the Soulé Glacier, which is part of the watershed at the head of the West Fork of the Soulé River. The valley walls are steep with numerous avalanche tracks and the valley bottoms are alluvial with reworked outwash and floodplain material overlain in areas on the sides by alluvial fans and colluvium.[16]

The soils in the Project area fall into two general categories, young (Inceptisols) and old (Spodosols and Histosols). The soils of the North Fork valley and much of the West Fork valley are alluvial and reworked outwash materials, course and well-drained with little organic material (because the West Fork is still glacial and is very silty, there are more silt deposits in the West Fork and the Main Stem than in the North Fork). The avalanche bases and alluvial fans that are relatively common along the steep valley walls are also relatively young and composed mostly of course alluvial and colluvial material. In some of these alluvial areas where the water table is kept high by snow melt from the avalanche chute and drainage from above, a layer, or more commonly many layers, of organic muck develops over the saturated alluvial sands and gravels. The many beaver ponds produce a similar type of soil that may or may not disappear after the dam is abandoned and the pond dries up.

Older soils are found up out of the floodplain. The terraced bogs and fens that are above the confluence to the north and to the west, and in a small valley east of the Main Stem, have *Sphagnum* and sedge peats. There are several small toe-of-slope fens along the east terrace of the Main Stem and at the base of a large avalanche on the west side. These fens have sedge peats.

[16] Rusanowski, P. 2009. *Soule River Watershed Environmental Report for 2008*. The Shipley Group, Utah.

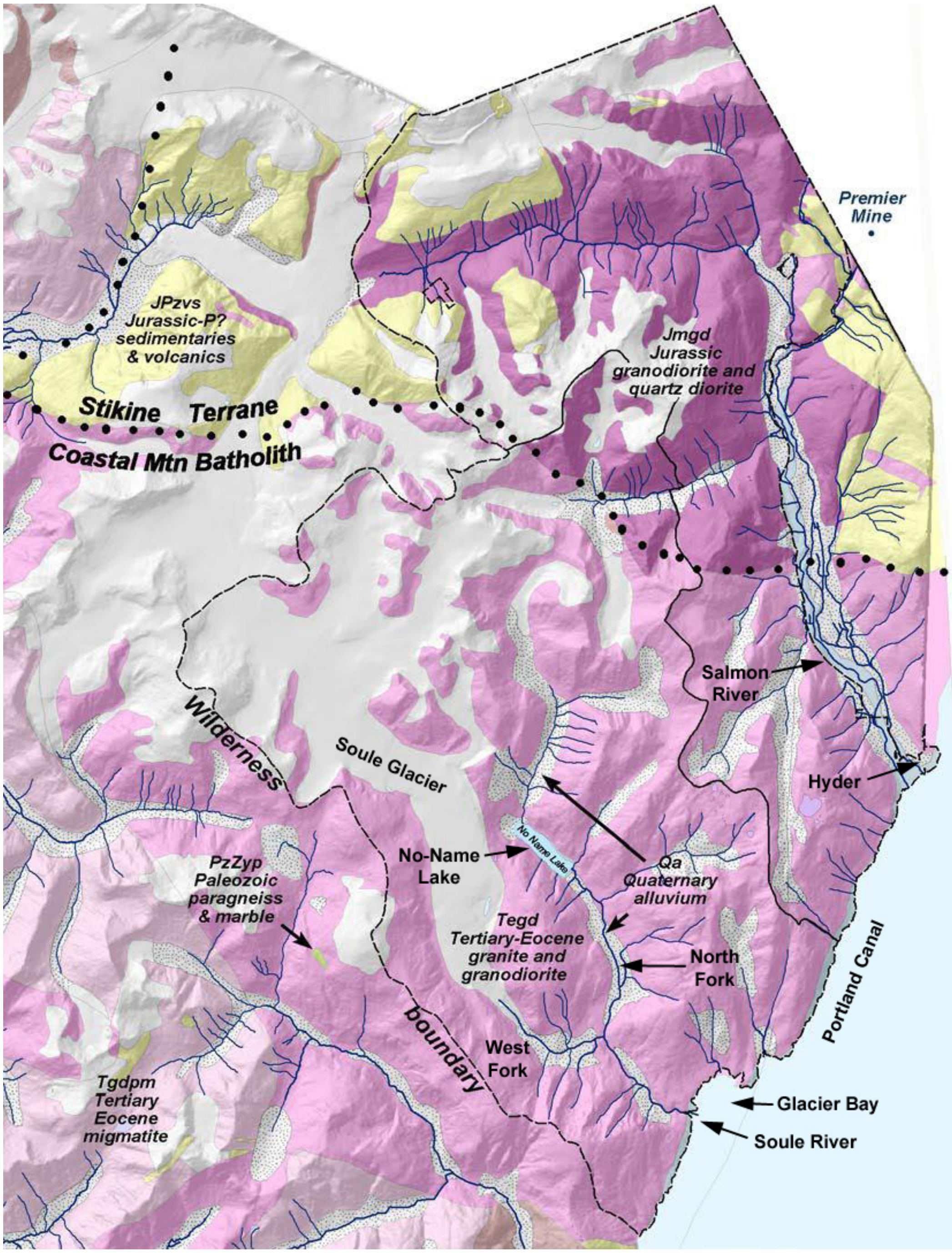


Figure 9 – Geology Map of the Southern Coastal Mountain Batholith including the Soulé Watershed

The intertidal wetlands on the Soulé Delta have a gleyed silt soil.

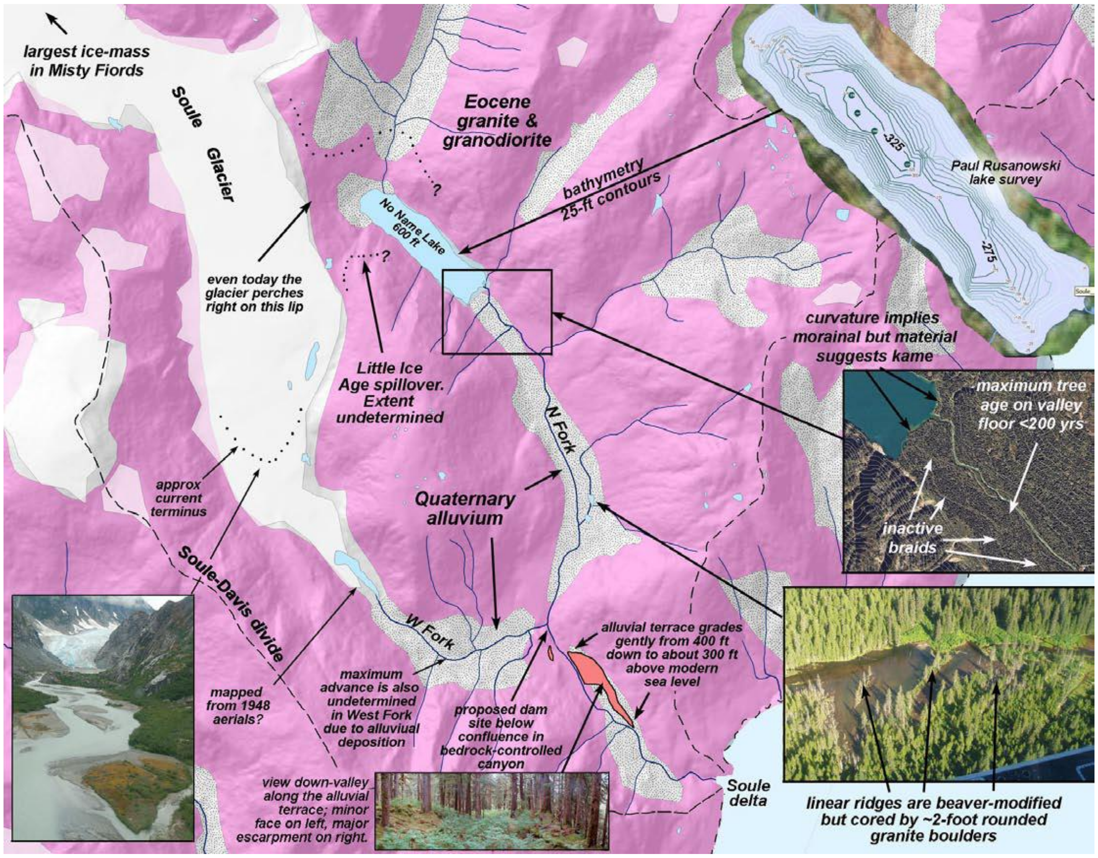


Figure 10 – Close-up, Annotated Geology Map of the Soulé Watershed

During Scoping the Applicant found reference to a mining claim above and on the southwest side of No-Name Lake in a USGS report. According to the 1999 report, no activity has occurred here, which is listed as a mineral resource of “Cu and Mo?” The claim appears to have originated in 1977. The subsequent investigation of BLM Plat Maps does not show any claims, but does show the two preliminary permits the Applicant obtained for this project (see Figure 11 below), which was last updated in November 2009.

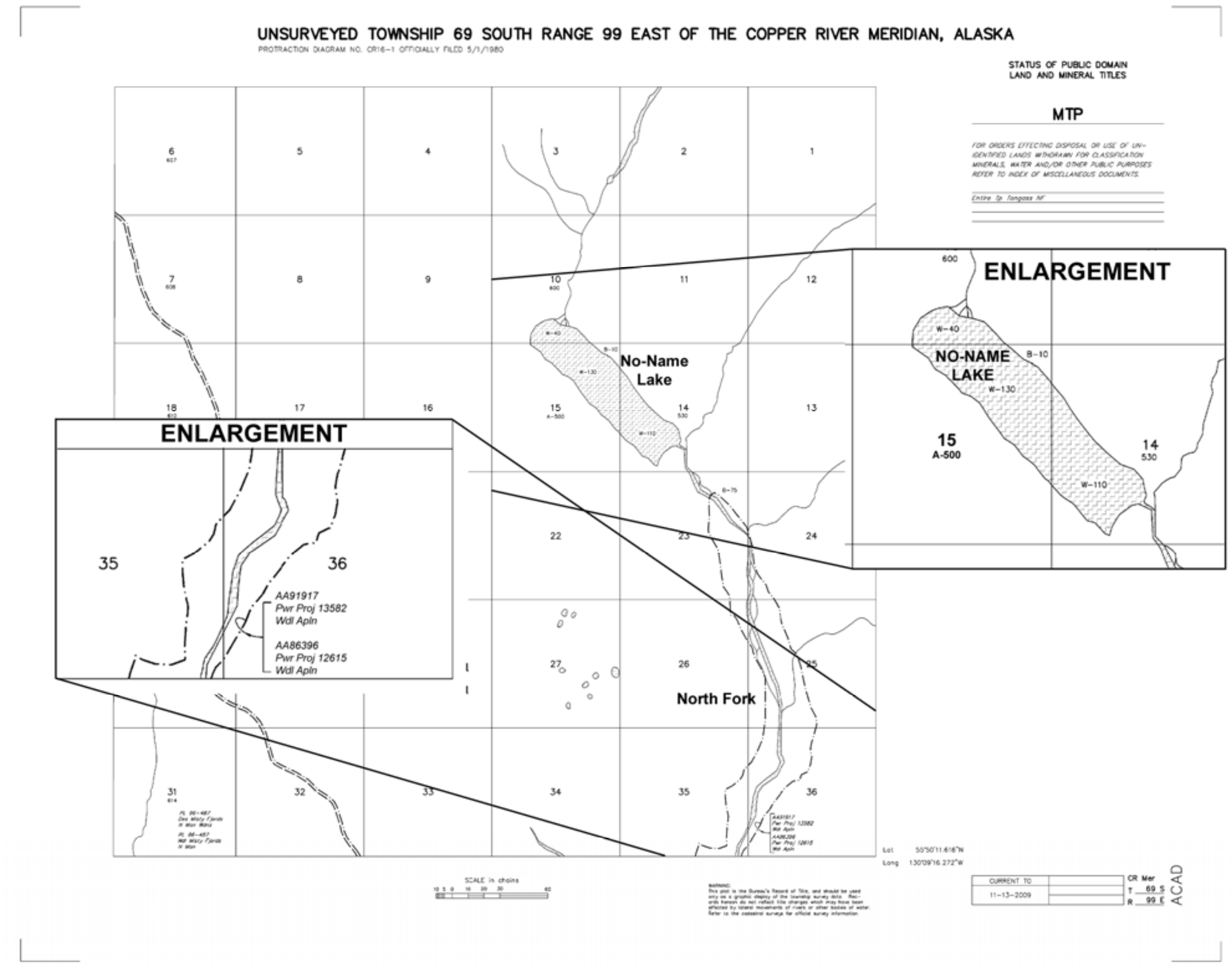


Figure 11 – BLM Plat Map for Area around No-Name Lake (clearly shows project numbers for this project but no other activity)

Environmental Effects

Sediment and Erosion Control

Under both action alternatives the Applicant would implement its Erosion and Sediment Control Plan (*Appendix Y: Draft License Plans*) to address concerns over erosion and sedimentation during project construction and operation.

Our Analysis

Applicant Alternative

Under the Applicant's Alternative, construction of the dams, intake structure, possible clearing for reservoir, spillway, access road, tunnel portals, single-lane bridge, powerhouse, tailrace, substation, marine access facility, helipads, and staging areas would result in a disturbance of approximately 1,257 surface acres of topsoil and rock along with the removal of vegetation within the right-of-way (ROW). Disturbance of vegetation and soils on some of the steep slopes around the Project could lead to erosion and eventual sedimentation within the Soulé River.

The Erosion and Sediment Control Plan includes the following measures:

Marine Access Facility:

- Filter fabric on top of each layer of fill placed for the staging area and barge basin between tides to prevent sedimentation at high tide. Filter fabric would wrap over sides and be anchored by a number of well placed rocks; placed on top of the delta, the rock and filter fabric for the staging area will also keep invasive species from coming up through the fill; even if the fill has the invasive species
- Riprap with filter fabric on perimeter of construction to prevent extreme high tide erosion of project features; this will ensure that high tide doesn't meet disturbed soil; implemented only if needed, i.e. if fill area or area of activity is not already being riprapped along with filter fabric, such as the staging and barge basin areas
- Any removed topsoil at the delta may contain the invasive weed, sow thistle, which is why it will only be used as fill within the staging area and barge basin where it will be covered in filter fabric and rock
- Stored spoils, including soil, rock and timber, will be stored away from tidal action, near tree line, and surrounded by filter fabric, or if necessary covered with an impermeable material; until staging area is available
- Sedimentation control pond may be used, if necessary and if there is uplands it can be placed on, to collect runoff from access road leaving the delta
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Access Road:

- Silt fencing will be used to stop the movement of sediment in roadside ditches
- Straw or hay bales will be used to capture sediment before entering culverts
- Riprap will be used to stabilize slopes
- Check dams will be installed to slow down runoff and trap sediments
- Jute netting may be used to stabilize slopes
- Hydroseeding (possibly with bonder) may be used to stabilize slopes
- Sediment catch basins may be used below culverts

Dams (main dam, saddle dam, West Fork weir)

- Sediment catch basins will be used to drain wetlands in areas to be excavated
- Berms or dikes of rock with filter fabric may be made to direct runoff to catch basins

- Cofferdam will direct river flow away from diversion tunnel portal construction, then a cofferdam will be placed across river at foot of proposed Main Dam to direct flow through diversion tunnel to allow construction of the Main Dam
- Quarries and spoil sites will have silt fencing placed on slopes where runoff could occur for preventing sedimentation
- Sediment ponds will be used to trap excess runoff from storm events, as needed
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Powerhouse (including substation)

- Initial silt fencing on downslope sides of construction areas
- Riprap with filter fabric on perimeter of construction to prevent extreme high tide erosion of project features (if needed)
- Removed topsoil at the powerhouse site will be stored at an upland location for later restoration, and will be monitored for sow thistle during the storage and restoration phases. Control of sow thistle would be by herbicide and by hand when in flower; the powerhouse site is not currently in the sow thistle infestation area (as of 2009 survey)
- Stored spoils, including soil, rock and timber, will be stored away from tidal action, near tree line, and surrounded by filter fabric, and if necessary, covered with an impermeable material (rock will be used as fill and riprap for the marine access facilities)
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Power Tunnel

Rock will be removed from both tunnel portals, although primarily from the lower portal, one at the intake structure and one at the powerhouse. To address the potential for sediment, a catch basin may be used to collect runoff and filter out fines. Any surface water drainages that cross either portal will be diverted, filtered, and allowed to settle in these catch basins before going into any waterbody. If located on bedrock, straw/hay bales may be used around the perimeter instead to capture and filter runoff. Excavated rock will be stored at staging areas and then trucked to points of use at project features.

<u>Land Use Alternative</u>

Under the Land Use Alternative, project construction activities would be limited to a much smaller footprint and there would be no road development activities. The smaller project footprint would result in a disturbance of approximately 3.8 surface acres of topsoil and rock. The power tunnel and powerhouse excavation will result in approximately 1,400 cubic yards of rock spoils.

The Erosion and Sediment Control Plan would include the following measures:

Marine Access Facility:

There would be no marine access facilities other than an unimproved boat landing on the Glacier Bay side of the delta. No sediment would be generated from this feature.

Access Trails:
The access trail would be constructed to a width of four feet[17] to allow use by pack animals; some sections may need to be boardwalk to protect wetlands. It would start at an unimproved boat landing on the Glacier Bay side of the delta, then proceed in a southwesterly direction for about 1,200 feet across the delta and into the forest until near the Soulé River gorge. The trail would then turn more westward and parallel the river for about 1,200 feet, climbing and winding as necessary to avoid the steepest terrain. Nevertheless, about 300 feet of this upper section would be very difficult to build and maintain because of the steepness of the hillside. From the power plant area, the trail would cross the suspension bridge and proceed through the tunnel to the diversion structure area. The total length of trail, excluding the bridge and tunnel sections, is estimated to be 2,900 feet.

Access trails will require clearing down to root level and made permanent. If pack animals disturb soils significantly, silt fencing would be placed down slope to catch runoff.

Diversion Structure

- Silt fencing around construction area to capture any runoff and trap sediment
- Filter fabric on top of ground before laying rock pad for features including the staging area, unless on bedrock
- Stored spoils, including soil, rock and timber, would be removed or used during or after construction to mitigate construction impacts; prefer to leave on site
- Sedimentation control pond may be used, if necessary
- Soil spoils would be covered by impervious material (tarp) to prevent their eroding
- Cement waste would be used to grout around diversion rather than haul offsite

Powerhouse (including substation and aerial and buried transmission line)

- Silt fencing around construction area, if needed (may be on bedrock)
- Stored spoils, including soil, rock and timber, will be removed or used after construction to mitigate construction impacts; prefer to leave on site
- Sedimentation control pond may be used, if necessary
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Power Tunnel

[17] 2008 Forest Plan – **TRANSPORTATION –** No new permanent roads are to be constructed. On National Forest Lands the definition of "a road" is defined in 36 CFR 212.1 (definitions) as a motor vehicle route over 50 inches wide. Materials would have to be moved on a trail, which could be made permanent.

Rock will be removed from both tunnel portals, one at the diversion structure and one across from the powerhouse (primary extraction point may be from diversion end). Catch basin may be needed to filter out fines from drilling or blasting this tunnel and silt fencing down slope from cuttings disposal piles to catch fines; if even possible. Surface water is not likely to be a concern at the tunnel portals as it will be bedrock. However, if surface water is an issue because it crosses either portal, the water will be diverted, filtered, and allowed to settle in a catch basin before going into any waterbody; may not be room at downslope portal.

Analysis of Questions Brought Up During Scoping

Soulé River West Fork and Glacier Sediment Load

Under existing conditions, the West Fork Soulé River drains the Soulé Glacier which deposits significant amounts of sediment and glacial flour to the West Fork and Main Stem Soulé River and delta during the summer months.

Under the Applicants Alternative, construction of a dam and reservoir could have the potential to substantially alter the timing and quantity of sediment discharged to the lower Soulé River and delta.

Our Analysis

Applicant Alternative

The West Fork of the Soulé River reaches its peak discharge during the summer months. This discharge is glacial water and full of glacial flour. Much of the sediment load from the glacial flour will pass through the power tunnel, turbine, and tailrace back into the river at the river mouth (point of discharge). Periodically, sediment deposited behind the dam will be flushed out during high flows (summer), if determined this is necessary, but not on an annual basis because sediment will still be transported as described above, through the tailrace. This periodic flushing flow would occur through the outlet works (formerly diversion tunnel for construction) which has an inlet near the base of the dam. Flow transporting glacial flour would also periodically come from the Saddle Dam spillway. With the continued transport of sediment to the river delta via the projects tailrace, the continued movement of sediment to contribute to the delta should continue.

However, to ensure that the movement of sediment to the delta continues in adequate amounts, the Applicant will conduct sediment transport studies, similar in design to what was started in 2009, every 3-5 years for 20 years after project operations start. If it is found that operations are having an eroding affect on the delta due to lack of transported material, the project will evaluate adaptive methods, i.e. more frequent flushing of sediment from behind the dam, to replenish the delta.

The Main Stem consists of a lower section, approximately one mile long, of a single channel, boulder and cobble lined river course, with many sections of the shoreline defined by bedrock and large boulders; and an upper section of similar length that is less confined, with multiple channels, river bars, and islands that is predominantly composed of cobble and small boulder substrate with very little exposed bedrock. Where bedrock occurs it is mostly on the east side of the river. The Main Stem bed shows a low quantity of finds, whereas the riverbank does have some armoring of sediment. The Main Stem is low quality habitat and should not require continuous sediment recruitment because most fines are normally washed out to Portland Canal.

Land Use Alternative

The diversion would be in a "Minor" channel rather than the Main Stem where 99.9% of the sediment load will continue downriver. This alternative would not have an impact on the movement of glacial flour downriver to continue to support and build the river deltas. Annual flushing through a sluice gate in the diversion may be necessary for operational purposes only.

Acid Rock Drainage

Project road, quarry, power tunnel, and dam excavations have the potential to generate acid rock drainage. Acid Rock Drainage (ARD), also referred to as Acid Mine Drainage (AMD), is the outflow of acidic water from mining operations including waste rock, tailings, and exposed surfaces in open pits and underground workings. ARD forms as a result of the dissolution of sulphides, mainly pyrite (FeS2) and pyrrhotite (FeS) under oxidizing conditions in air and water if the rock contains sulphides. This oxidation releases H+ ions and lowers the surrounding pH to acidic levels. Acidic drainage will subsequently leach additional metal ions from the adjacent rocks and deposit them. The resulting drainage can become very acidic and contain a number of harmful constituents. In some cases, elements from the rock can leach out into contact water without acidification and result in water contamination – this is known as metal leaching (ML). In either case, polluted water drains away from the exposed rock and can have significant impacts on surrounding water bodies (rivers, lakes, coastal areas, groundwater) and the wildlife or people who come in contact with these sources.

Our Analysis

Applicant Alternative

Under the Applicant Alternative, the potential for acid rock was addressed by having a geologist analyze the rock. The geologist's report is included in the Appendix F – *Acid Rock Drainage Analysis*, but in general, based on the type of rock present he found that the ARD potential from road construction through these materials is extremely low.[18]

Land Use Alternative

[18] Myers, B., **M.S. Hydrogeologist. 2010. The Shipley Group.**

Under the Land Use Alternative, project construction activities would be limited to a much smaller footprint, significantly reducing opportunities for ARD. The smaller project footprint would result in a disturbance of approximately 3.8 surface acres of topsoil and rock. The power tunnel and powerhouse excavation will result in approximately 1,400 cu. yds. of rock spoils.

Because the potential for ARD is extremely low for the Applicants Alternative, the smaller land use alternative is even less likely to have ARD.

Slope Stability and Landslide Potential

Under both alternatives for Project construction and operation, the Applicant would implement its soil stabilization methods described in the Erosion and Sedimentation Control Plan (Appendix Y – *Draft License Plans*) to address concerns over slope stability. Project features would also be designed for placement where they would have the least effect on slope stability.

Our Analysis

Applicants Alternative

Under the Applicant Alternative, the potential for landslides and avalanches, or adverse effects to the project by natural landslides and avalanches, are addressed by examples of the placement of project features. For example, the penstock will be a power tunnel through bedrock to remove it from the surface; the access road will have a 1,900-foot-long tunnel to avoid steep, rugged terrain that also includes wetlands. Both project designs are to avoid steep slopes, which are areas that landslides and potentially avalanches could occur. However, all existing avalanche chutes are on the west side of the river, greatly reducing this potential problem with the access road placed on the east side, only crossing to the west side once pasted the avalanche area.

Measures to address slope stability other than the above mentioned use of tunnels, include the use of:

- Gabion walls, which allow for deeper cuts into slopes while stabilizing the slope
- Riprap slopes, which covers slopes from the elements and prevents erosion
- Jute netting, when laid across a slope will hold soils reducing chances for mass wasting, which could be combined with chipping of wood waste to be placed on top of the jute; this will also protect topsoil and the wood chips will provide organic matter to support plant growth
- Revegetation, which can include planting shrubs and trees, to seeding grass for stabilize slopes; hydroseeding can also facilitate spreading grass seed over a large area; combining hydroseeding with a binder puts an impervious barrier over soil that allows water in but keeps soil in place until the growing season when the seed germinates, thus protecting the soil until this occurs.

The engineering design, as mentioned above, also takes measures to avoid or stabilize slopes as necessary.

Land Use Alternative

Under the Land Use Alternative, project construction activities would be limited to a much smaller footprint and because of this there would little opportunity to make slopes unstable and measures to address slope stability would be much smaller. The smaller project footprint would result in a disturbance of approximately 3.8 surface acres of topsoil and rock. The power tunnel and powerhouse excavation will result in approximately 1,400 cu. yds. of rock spoils.

Measures to control slope stability and landslide potential would choose from the same methods as listed in the Applicants Alternative above.

Unavoidable Adverse Impacts

The unavoidable impacts to Geologic and Soil resources will occur due to the removal of rock and soils as a result of clearing and grading for project features. A good Erosion & Sedimentation Control Plan will minimize impacts from potential soil movement into waterbodies within the project boundary and minimize or eliminate any adverse impacts.

Cumulative Effect

Under both action alternatives, geologic and soil resources would have little cumulative effects in Upper Portland Canal because project site erosion and sedimentation can be controlled through adequately implemented procedures to eliminate or minimize the potential impacts. The area is also highly granitic with shallow soils, meaning that the main element to be dealt with during construction will be bedrock and shallow deposits of alluvium and colluvium, reducing opportunities for erosion and sedimentation. The Applicant must assume that other projects mentioned by the Forest Service in the Salmon River and Hyder areas will also follow similar guidelines to prevent erosion and sedimentation as many of those activities are maintenance by federal and state agencies. Acts of Nature, i.e. jökulhlaups and other naturally occurring forms of sedimentation, cannot be predicted nor should they be considered in the cumulative effects analysis.

3.7 Aquatic Resources

Affected Environment

The Soulé River watershed is approximately 81 square miles in size with 7.8 miles of active riverbed divided into 3 major segments. The Main Stem of the Soulé River is approximately 2.5 miles long, while the West and North Forks are 1.7 and 3.6 miles long, respectively. Both forks converge at the top or beginning of the Main Stem. The higher elevations of the watershed consist of glaciers and ice fields, which total approximately 33 square miles. A total of 47.5 square miles of the watershed are not covered by glacier or ice. A total of 44.4 square miles of the drainage would lie above the dam built for the storage reservoir. Glacial meltwater enters the Soulé River through the West Fork, primarily from April through October. The low river flow period extends from

November through March. The Soulé River exhibits major seasonal fluctuations in flow primarily driven by glacier meltwater. The West Fork accounts for approximately 80% or more of the total river flow in the summer, but less than 20% in the winter, while the North Fork seasonally accounts for 20% and 80% respectively. Total summer river flows can be in excess of 3000 cfs, while low winter flows are in the range of 50-500 cfs.

A U. S. Geological Survey (USGS), Water Resources Division stream gauging station 15009000 (Station 15009000) was installed in 2007 to measure flow within the Main Stem of the Soulé River, just south of the confluence of the West and North Forks at the emergence of the Upper Gorge into the Main Stem.

There are a total of five bodies of water potentially affected by this project, three of which are segments of the Soulé River:

1. No-Name Lake
2. North Fork Soulé River
3. West Fork Soulé River
4. Main Stem Soulé River, and
5. Portland Canal.

Two of these waterbodies, No-Name Lake and Portland Canal are not likely to be significantly impacted. No-Name Lake is above the proposed "full" elevation of the project reservoir and Portland Canal is a large waterbody that is 70-miles-long. Off the Soulé River mouth, the canal is 2-miles-wide by 900-feet-deep. The Soulé River contributes a large amount of glacial flour to Portland Canal. The upper canal is highly turbid near the surface due to this glacial flour not only from the Soulé River, but also from the Bear and Salmon Rivers at Hyder and the Davis River which is less than 4 miles south of the Soulé, plus other smaller drainages on the opposite side of the canal. The contribution of glacial flour from the Soulé River will not be significantly altered by the project. The canal is tidally influenced, which reduces impacts associated with man-made activity by naturally cleansing itself, much like a river can if the point of pollution is limited and of short duration. The Applicant believes this project will have limited aquatic impacts and most will be of short duration.

The other three waterbodies, segments of the Soulé River, are more directly influenced by this project. The North Fork drains from No-Name Lake (mostly snow and rain fed) and the West Fork drains from the Soulé Glacier (mostly glacially fed). The North and West forks have a confluence at the top of the Upper Gorge, a bedrock ridge with a fracture or gorge through it that the river flows through. This gorge is considered both a falls and velocity barrier to anadromous fish. The vertical bedrock walls of this gorge are 100-200 feet in height. The Main Stem flows from the Upper Gorge through the Lower Gorge, which is another bedrock ridge, where the river drops precipitously through falls and velocity barriers to anadromous fish movement before entering Portland Canal. The vertical bedrock walls of the Lower Gorge have heights of approximately 60-100 feet.

A Tier II Habitat Survey of the Main Stem of the river showed the substrate throughout the river was similar consisting of oval to round boulders, cobble and gravels. There was a notable absence of angular particles. Small pockets of medium to fine gravel, sands and silts occasionally occurred in the river. However, a majority of the larger particles were lying on top of each other with no significant embedment by fines such as sands and silts. This was in contrast to the higher shoreline areas where a majority of particles showed some embeddedness by fines (Shipley Group. 2010). Quantitative sediment samples from the area showed that fines smaller than sands comprise from 5-20% of the samples by weight. Regardless of methodology, 50% of the particles measured in Wolman pebble counts were greater than 90.5 mm. Approximately 23% were less than 32 mm.

The east side of the river had considerable exposed bedrock which decreased with distance below the upper gorge. However, there was exposed bedrock below Dolly Varden Creek[19] on the east bank as well. In general the forest extended down to the river edge except where bedrock occurred on the east bank. The west bank consists of a broad floodplain of alder shrub adjacent to the steeper slopes. Most of these slopes show numerous avalanche chutes. The most extensive avalanche area is on the west side opposite Dolly Varden Creek. Vegetation on the east side of the river is also affected by this avalanche activity. The vegetation in this active avalanche area on both sides of the river is dominated by alders. The forest follows the edge of the floodplain rather than the river course on the west side.

Figure 12 – Soulé River Delta; North and larger Delta is at right; Lower Gorge is behind river mouth

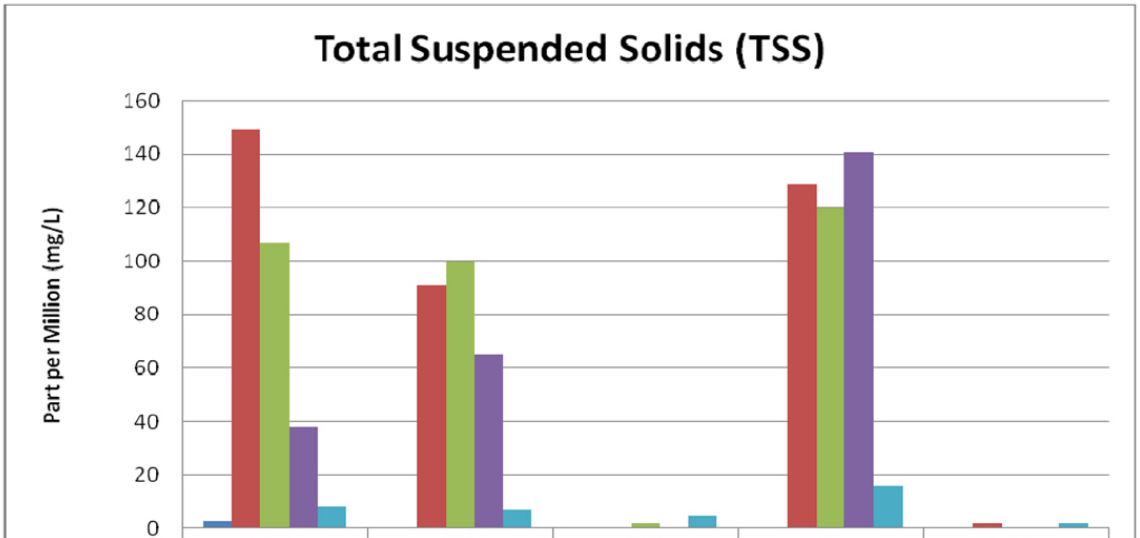
[19] Referred to as both Dolly Varden Creek and Zapus Creek in field reports; the EA will use Dolly Varden Creek because it is more descriptive.

The Soulé River Delta extends about a ¼ mile out into Portland Canal. The north river delta extends from the tree line approximately 1,000 ft offshore to the mid-littoral zone at approximately +5 ft elevation above the zero tidal datum. The delta runs approximately 1,500 ft to the northeast before terminating in a steep rocky shoreline in Glacier Bay. The Powerhouse site lies at the river mouth on the south side of the north delta in the treeline in Figure 12. The substrate on the delta is composed of gravel, cobble, boulder, and glacial silts and sands.

Water Quality:
Water samples were collected in the spring and continued through early fall (April-October) of 2009. Grab samples were collected for a standard suite of water quality parameters as well as selected trace metals. Field measurements were taken for dissolved oxygen, pH, salinity/conductivity, and temperature. Preserved and unpreserved samples were unfiltered and submitted to Pace Analytical Laboratories in Seattle through a chain of custody for analyses of water quality constituents. Specific sample dates included: April 9, 2009, July 16, 2009, July 27, 2009, August 23, 2009, and October 28, 2009. Sampling locations were consistent with those from previous years and included No-Name Lake (NNL), North Fork Soulé River (NF), West Fork Soulé River (WF), Soulé River gage below the forks(SRG), Soulé River mouth (SRM), and limited water quality parameters from an intertidal pond on the south delta where tadpoles were found (TP). The water quality in the tadpole pond can be found in the *2009 Ecological Field Investigations Report* in the Appendix C, page 116. As shown in the report, it is a brackish water pond that is subject to periodic flooding during spring tidal periods.

Total suspended solids within the drainage primarily reflects source waters in the drainage (Figure 13). No-Name Lake and the North Fork of the Soulé River show very low levels of suspended solids and are clear water systems with little if any glacial meltwater present. Suspended sediments in these two connected water bodies range from zero to 5 mg/L. The West Fork and the Main Stem Soulé River all contain high levels of suspended solids, all of which originates from Soulé Glacier meltwater flowing into the West Fork. Suspended sediment loads in the summer range from 120 – 141 mg/L in the West Fork.

When ambient temperatures decrease in the fall, and water flows decrease, the suspended solids drop to 16 mg/L or less. When the two forks of the Soulé River come together, there is a decrease in the concentration of suspended solids due to dilution by the clear water North Fork tributary. This reduction is variable but amounts to about a 1/3 decrease in suspended solids. As the water moves to the mouth of the river it picks up more sediments from the stream course so that the suspended sediments at the mouth are higher than at the juncture of the two forks. This appears to be related to the volume of water moving down the river. During high and peak flow periods, sediments are scoured from the Main Stem of the river, while during moderate flow periods it is being deposited within the Main Stem of the river.



	SRM	SRG	NF	WF	NNL
9-Apr-10	3	0	0	0	0
16-Jul-10	149	91	0	129	2
27-Jul-10	107	100	2	120	0
23-Aug-10	38	65	0	141	0
28-Oct-10	8	7	5	16	2

Figure 13 – Suspended Sediment Data from the Soulé River Watershed collected in 2009

Dissolved oxygen levels and water temperatures in the Soulé River drainage are summarized in Figures 14 – 16. During the summer all waters sampled showed saturated levels of oxygen, with the exception of the tadpole pond on the delta. In the fall, the pattern was similar except that No-Name Lake and the North Fork were slightly lower than the other water bodies. This may reflect the fact that the other streams were all measured in areas of rapids or just below rapids. In general, dissolved oxygen concentrations above 80% are indicative of good water quality, concentrations below 60% saturation are considered poor quality. The Soulé River drainage is characterized as good water quality based on dissolved oxygen.

Water temperatures in the West Fork and Main Stem of the Soulé River were similar and generally less than 34° F throughout the summer. Temperatures in the fall were slightly higher and ranged from 34-35°F. In the North Fork and No-Name Lake water temperatures ranged between 41-43°F in the summer, while in the fall temperatures dropped to 36-37°F. The warmer waters from the North Fork had little effect on temperatures in the Main Stem of the Soulé River originating from the Soulé Glacier.

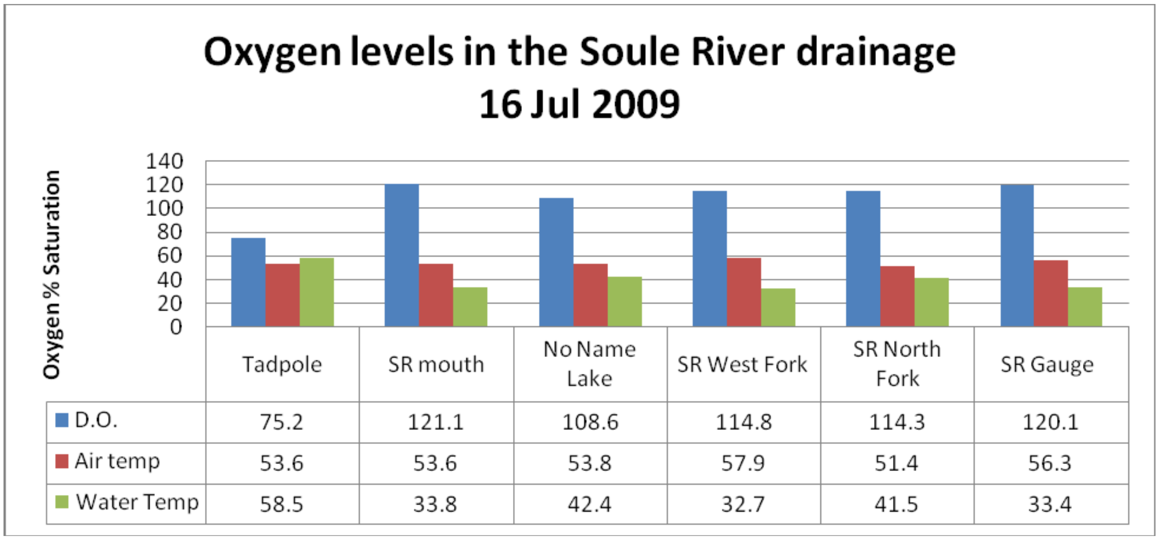
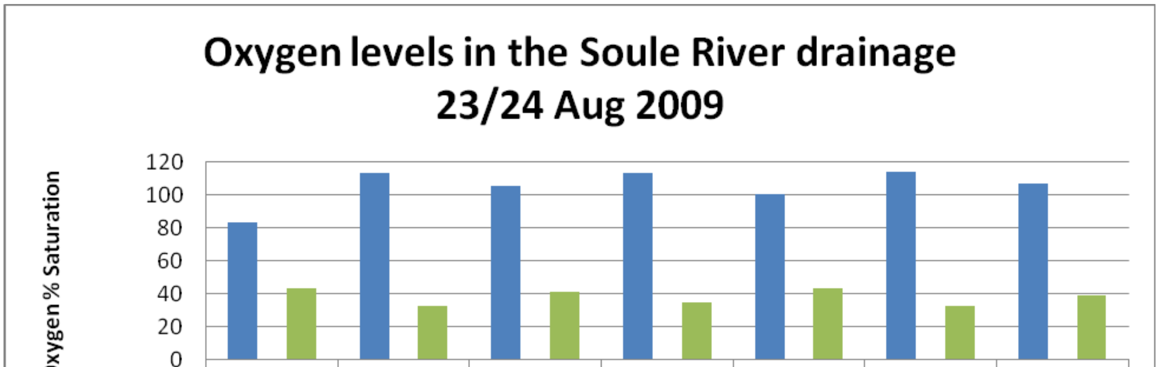


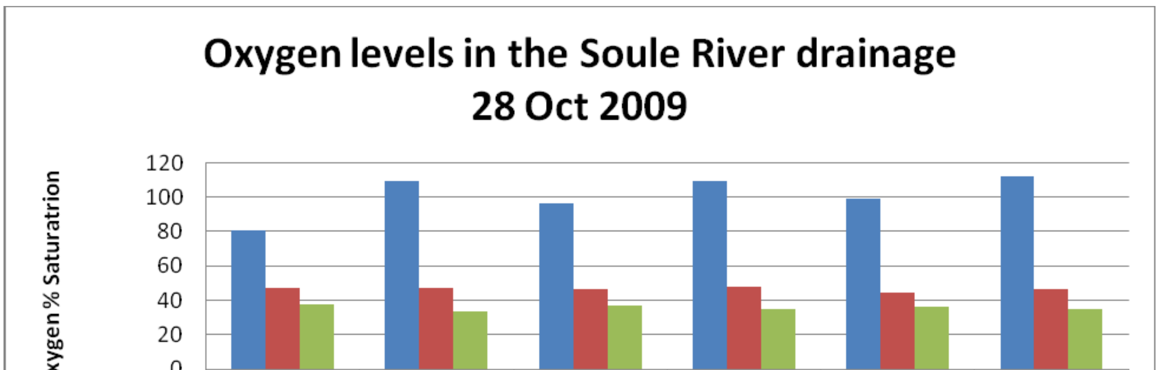
Figure 14 – Dissolved Oxygen Levels in the Soulé River drainage July 16, 2009

Water quality and trace metals data are summarized in Table 3 for the Soulé River drainage in 2009. The water quality is generally reflective of an oligotrophic system dominated by turbid glacial flows in the summer. Turbidity is typically less than 2 NTU in the North Fork and No-Name Lake throughout the year. In the West Fork turbidity is typically above 30 NTU. In the summer the Soulé River varies from 8 to 53 NTU. Metals were sampled in 2008 and 2009. However, the only metal detected in 2008 was manganese in the North and West Forks of the Soulé River. Concentrations of manganese in 2008 ranged from 5.15 to 21.8 ug/L; while in 2009 concentrations were higher ranging from 12.3 to 94.9 ug/L. In 2009, the only metal detected in No-Name Lake and the North Fork was iron. The flow from Beaver Creek (a yazoo tributary) also shows substantial iron precipitation on gravels which was documented in the 2008 annual report. Both the West Fork and the Main Stem below the forks contained measurable amounts of aluminum (up to 4.62 mg/L), iron (up to 3.55 mg/L), manganese (up to 94.9 ug/L), magnesium (up to 1.8 mg/L), potassium (up to 1.52 mg/L), and sodium (up to 1.1 mg/L). In addition, barium, chromium, nickel, molybdenum, and lead showed up in trace amounts in water samples collected at the mouth of the Soulé River, but not upstream near the forks. Barium was present in the highest concentration ranging from 11-84 ug/L, while the rest were all below 2.3 ug/L. These data indicate that there may be some mineralized water flows in the Main Stem of the Soulé River below the forks of sufficient size to be detectable in the trace metal water quality data.



	Tadpole	SR mouth	No Name Lake	SR West Fork	SR North Fork	SR Gauge	SR Delta
D.O.	83.5	113	105	113.5	100.4	113.6	106.5
Air temp							
Water Temp	43.7	32.7	41.4	34.7	43.2	32.7	39.4

Figure 15 – Dissolved Oxygen Levels in the Soulé River drainage August 23-24, 2009



	Tadpole	SR mouth	No Name Lake	SR West Fork	SR North Fork	SR Gauge
D.O.	80.5	109.7	96.5	109.7	99.3	112
Air temp	46.9	46.9	46.2	47.7	44.6	46.8
Water Temp	37.9	33.4	37.2	35.1	36	34.9

Figure 16 – Dissolved Oxygen Levels in the Soulé River drainage October 28, 2009

The water samples collected generally show similar characteristics that are indicative of a surface water system with limited inputs from groundwater. All water samples have a low conductivity and hardness (Table 3) and would be considered soft water (Hem, 1992). The alkalinity is fairly low and given the near neutral pH observed in all samples is likely primarily comprised of bicarbonate species; the pH in the sample collected from No-Name Lake (6.6) is just slightly acidic and may have resulted from the accumulation of organic acids in the lacustrine environment.

Biological oxygen demand (BOD) was not detected in any of the samples collected and the low concentrations of nitrogen and phosphorus that were detected in a limited number of samples (Table 3) suggest <u>limited microbial activity</u> in the system.

All of the above represents a high-energy alluvial system that is capable of transporting large amounts of medium- to courser-grained sediments, which do not result in elevated concentrations of dissolved chemical constituents or promote a highly active microbial environment.

Table 3

Table 35. Summary of water quality data collected in 2009 from the Soule river watershed.

	9 Apr 09			16 July 09					27 July 09					23 Aug 09					28 Oct 09				
Parameters	SRM	SRG	NF	SRM	SRG	NF	WF	NNL	SRM	SRG	NF	WF	NNL	SRM	SRG	NF	WF	NNL	SRM	SRG	NF	WF	NNL
Conductivity (umhos/cm)	800	ns	19	9.0	8.4	9.7	8.2	10.2	8.0	7.6	9.3	7.0	9.3	7.8	7.5	9.0	6.9	8.3	17.3	16.6	14.2	20.1	10.9
Hardness (mg/L)	ND	ns	ND	3.7	9.5	3.9	12.1	3.8	10.6	7.8	3.5	9.4	3.7	9.5	10.4	3.7	14.0	3.8	7.6	7.1	5.4	9.3	5.1
Alkalinity (as CaCO3)	11	ns	9.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	7.1	ns	7.6	7.0	6.8	6.8	7.0	7.2	6.4	6.5	6.4	6.5	6.5	7.2	7.0	6.7	6.8	6.7	6.8	7.9	7.0	6.9	6.8
TDS (mg/L)	430	ns	13	ND	ND	ND	ND	ND	19.0	ND	11	ND	ND	ND	ND	ND	10.0	ND	ND	ND	ND	ND	ND
TSS (mg/L)	3	ns	ND	149	91.0	ND	129	2.0	107	100	2.0	120	ND	38.0	65.0	ND	141	ND	8.0	7.0	5.0	16.0	2.0
Turbidity (NTU)	2.2	ns	0.22	10	9.1	0.51	13.7	0.44	50.5	53.0	0.70	37.0	2.3	24.3	11.9	1.2	32.2	1.2	7.7	8.5	0.60	26.7	0.90
Settleable Solids (mg/L)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns		ns	ns	ns
Nitrogen, Ammonia (mg/L)	ND	ns	ND	0.10	0.18	0.11	0.081	0.14	0.14	0.15	0.15	0.15	0.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Nitrate/Nitrite (mg/L)	0.11	ns	0.11	ND	ND	0.056	ND	ND	ND	ND	0.055	ND	0.052	ND	ND	0.050	ND	ND	0.075	0.068	0.068	0.062	0.060
BOD (mg/L)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Total Phosphorus (mg/L)	ND	ND	ND	0.18	0.12	ND	0.13	ND	0.13	0.11	ND	0.18	ND	ND	ND	ND	0.022	0.010	0.014	ND	ND	0.036	ND
Aluminum (ug/L)	ND	ND	ND	ND	2620	ND	3880	ND	3230	ns	ND	2750	1440	3160	3400	ND	4620	ND	536	ND	ND	794	ND
Iron (ug/L)	ND	ND	ND	ND	2000	ND	3070	ND	2480	ns	ND	2150	59.3	2130	2410	65.8	3550	82.0	443	397	72.2	668	260
Lead (ug/L)	ND	ns	ns	2.2	ns	ns	ns	ns	1.2	ns	ns	ns	ns	1.1	ns	ns	ns	ns	0.23	ns	ns	ns	ns
Magnesium (ug/L)	ND	ND	ND	ND	990	ND	1400	ND	1130	ns	ND	986	ND	1080	1200	ND	1800	ND	ND	ND	ND	ND	ND
Manganese (ug/L)	ND	ND	ND	ND	63.7	ND	94.9	ND	78.8	ns	ND	71.8	ND	68.8	74	ND	113	ND	14.3	12.3	ND	21.1	ND
Molybdenum (ugL)	2.3	ns	ns	0.50	ns	ns	ns	ns	0.51	ns	ns	ns	ns	0.64	ns	ns	ns	ns	1.2	ns	ns	ns	ns
Nickel (ug/L)	ND	ns	ns	1.3	ns	ns	ns	ns	ND	ns	ns	ns	ns	0.56	ns	ns	ns	ns	ND	ns	ns	ns	ns
Potassium (ug/L)	ND	ND	ND	ND	1300	ND	1420	ND	1160	ns	ND	1080	ND	1130	1160	ND	1520	ND	517	ND	ND	792	ND
Silver (ug/L)	ND	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns
Sodium (ug/L)	ND	ND	ND	ND	732	ND	876	ND	864	ns	ND	564	ND	977	933	ND	1100	ND	ND	ND	ND	ND	ND
Antimony (ug/L)	ND	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns
Arsenic (ug/L)	ND	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns
Barium (ug/L)	11.4	ns	ns	84.2	ns	ns	ns	ns	53.2	ns	ns	ns	ns	49.1	ns	ns	ns	ns	16.4	ns	ns	ns	ns
Beryllium (ug/L)	ND	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns
Cadmium (ug/L)	ND	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns	ND	ns	ns	ns	ns
Chromium (ug/L)	ND	ns	ns	0.75	ns	ns	ns	ns	0.88	ns	ns	ns	ns	0.73	ns	ns	ns	ns	ND	ns	ns	ns	ns

SRM= Soule river mouth, SRG= Soule river gauge station, NF= North fork of Soule river, WF= West fork of Soule river, NNL=No name lake above Soule River ND=not detectable-below instrument detection limit, ns=not measure, mg/L= parts per million, ug/L=part per billion.

Table 3 – Summary of Water Quality Data Collected in 2009 from the Soulé River Watershed

Sediment Transport Modeling

Hydrologic Analysis

The discharge in the Main Stem of the Soulé River varies significantly from values below approximately 40 cubic feet per second (cfs) to more than 2,500 cfs, with discharge measurements generally below 350 cfs for most of the year (Figure 17). Discharge increases significantly in the summer months, with rising temperatures, from glacial run-off that originates from the Soulé Glacier and flows down the West Fork of the Soulé River. Thus, the most significant effect on the overall flow regime for the Site is glacial melt and run-off, rather than the order of magnitude smaller variations observed for large rain and/or rain-on-snow events. As a result, any hydrologic model that focuses on storm events is limited. However, such storm event evaluations can still prove useful for the prediction of, for example, bed-load transport, given that ultimately a model be produced for the Site that incorporates the glacial influences, as well, which can best be modeled through continued observations at the existing USGS gauging station.

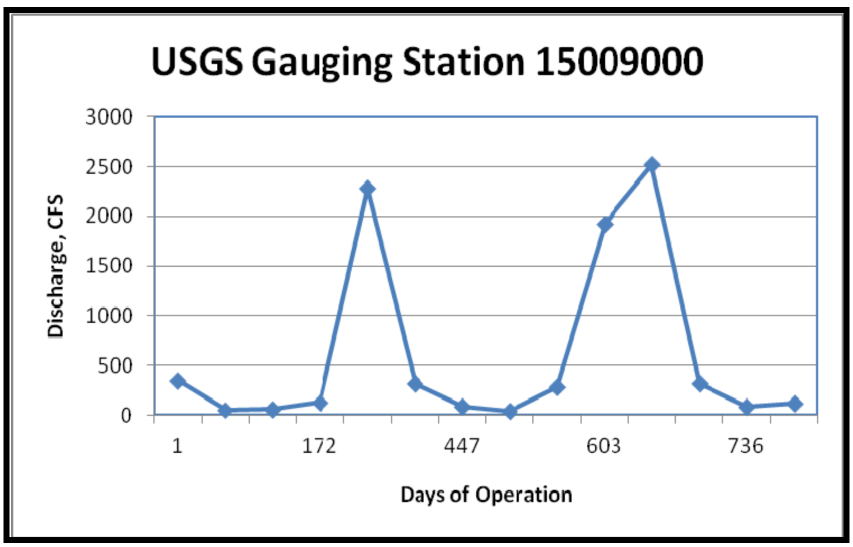


Figure 17 – Discharge vs. Days of Operation (start date 11/01/2007)

The USDA, National Resources Conservation Service (NRCS) curve number method was used to calculate the stormwater runoff discharge for 2-, 5-, 10-, 25-, and 50-year, 24 hour precipitation events (Table 4). The Win-TR20 version 1.11, updated in March of 2009, software program developed for the USDA was used to complete the calculations. The storm data used were 4-, 5-, 6-, 7-, and 8-inches, respectively for the events listed above, with a Type II distribution for the Outer Ketchikan County (Borough), Alaska (source used NRCS). A summary of the results for this model are given below and full model results are given in Appendix IV of the "*Soulé River Watershed Substrate and Sediment Transport*" Report, a complete copy of which is in Appendix M.

The discharge values given in Table 4 are for non-glacially influenced periods of the year (September through May, typically). As a result, the highest recorded flow event of 2,520 CFS was used in model calculations to give some prediction for sediment transport during glacially influenced period of the year.

Table 4

Storm Event	Peak Discharge (CFS)	Peak Flow Time (Hours)
2 Year	241	12.63
5 Year	546	12.56
10 Year	936	12.51
25 Year	1,392	12.51
50 Year	1,886	12.53

CFS – Cubic Feet per Second; Hydrologic Soil Group B
Curve Number 55 (Forested Areas); Time of Concentration - .97 hours

Table 4 – Stormwater Runoff Results for Main Stem of Soulé River

Bed-Load Sediment Transport Analysis

Based on these considerations, two methods were used to determine the potential for bed-load sediment transport or movement under different flow regimes, which include the use of maximum stream velocity and the Hjulstrom diagram (Figure 18), as well as the use of incipient motion analysis.

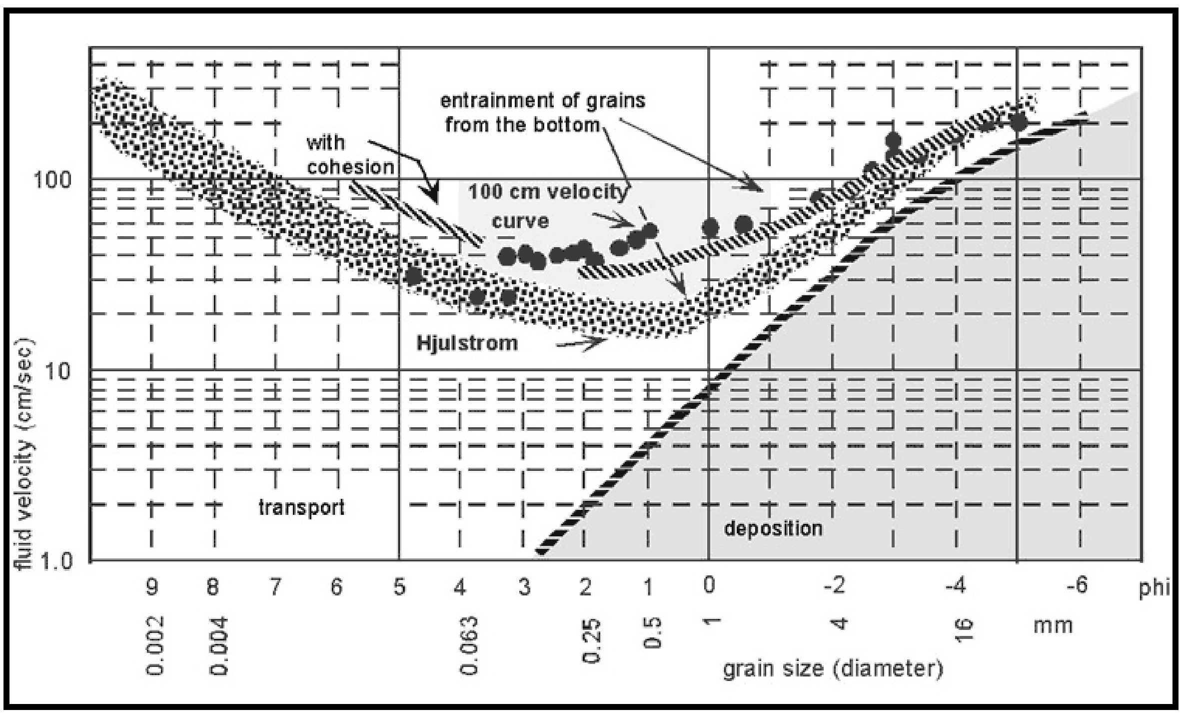


Figure 18 – Hjulstrom Diagram for Sediment Transport

To use the Hjulstrom diagram, a relationship between observed discharge and velocity values in the Main Stem of the Soulé River was established, which resulted in the non-linear regression curve shown in Figure 19. Original field data were obtained for Station 15009000 from the USGS Juneau, Alaska field office (Randy Host, USGS, Written Communication 2010) so that maximum velocities observed across the cross section during each gauging event could be used to develop equation (1). Equation 1 was then used to determine maximum velocity under different flow regimes, including those listed in Table 4 and, hence, the diameter of bed-load particle that could be transported in this environment (Table 5).

$$\text{Velocity} = 0.1019 * (\text{Discharge})^{0.514} \text{ (Eq. 1)}$$

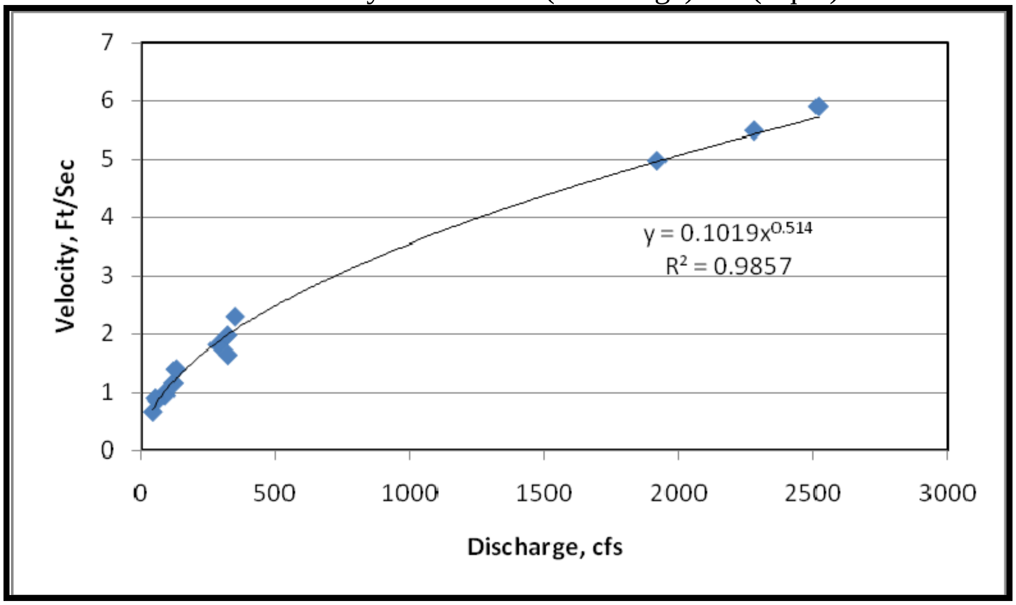


Figure 19 – Non-Linear Regression Relationship between Maximum Velocity and Stream Discharge at Station 15009000

Table 5

Storm/Observed Event	Discharge (CFS)	Velocity (Ft./Sec)	Particle Diameter (in.)
2 Year	241	1.7	0.24
5 Year	546	2.6	0.47
10 Year	936	3.4	0.63
25 Year	1,392	4.2	0.94
50 Year	1,886	4.9	1.26
July 8, 2009	2,520	5.7* 5.9ᵗ	1.57* 1.73ᵗ

CFS – Cubic Feet per Second
Ft./Sec – Feet per Second
in. - inches
*Predicted Velocity
ᵗObserved Velocity for USGS Station 15009000.

Table 5 – Bed-Load Sediment Transport Using Hjulstrom Diagram

Based on the results shown in Table 5, the size of bed-load material that can be transported through the reach of the Main Stem of the Soulé River in and around Station 15009000 for non-glacial induced flow regimes is gravel and pebbles. Likewise, course gravels and pebbles can be transported along the streambed during glacially induced flows in the summer months and it is likely that cobble-sized sediment can be transported during periods of extreme glacial melt that would result in discharge values greater than approximately 4,000 cfs.

The incipient motion method was used to predict bed-load sediment movement in the Main Stem of the Soulé River. Incipient motion, in the context of sediment transport in rivers, is the critical point when bed-load sediment begins to move. Thus, if the fluid forces are below that required for the motion of a particle, there will not be any movement. If they are greater than that required for motion, then there will be movement. The boundary between the two may be described as incipient motion (that is, the particle is about to move). To calculate the particle size of sediment that may be mobilized under different flow regimes, a transformed version of the shields equation was used as shown in equation (2).

$$D_s = \frac{t^0 g}{(p_s - p_w)\, g\, t^*} \qquad \text{(Eq. 2)}$$

Where:
D_s = diameter of sediment in Feet
t^0 = channel bed shear – lbs/ft^2
g = gravity – 32 ft/sec^2
p_s = density of solids – 165 lbs/ft^3
p_w = density of water – 62.4 lbs/ft^3
t^* = dimensionless Shield's parameter – 0.03

To determine t^0 values for the Main Stem of the Soulé River, equation (3) was used.

$$t^0 = p_w\, g\, R_h\, S_o \qquad \text{(Eq. 3)}$$

Where:
R_h = hydraulic radius – ft.
S_0 = bed slope – 0.02.

A non-linear regression analysis was performed to establish a relationship between hydraulic radius of the cross section at Station 15009000 and discharge, so that incipient motion sediment diameter values for the Main Stem of the Soulé River could be determined for the storm events and the observed event given in Table 5. The trend line for the non-linear regression analysis is shown in Figure 20, with equation (4), which when placed in equation (2) resulted in equation (5) that was used to ultimately determine the diameter particle that may be put into motion under various flow regimes (Table 6).

$$R_h = (1.1698 * \ln(Q)) - 4.4474 \qquad \text{(Eq. 4)}$$

$$D_s = 0.41 * ((1.1698 * \ln(Q)) - 4.4474) \quad \text{(Eq. 5)}$$

Where:
Q = Discharge – cfs.

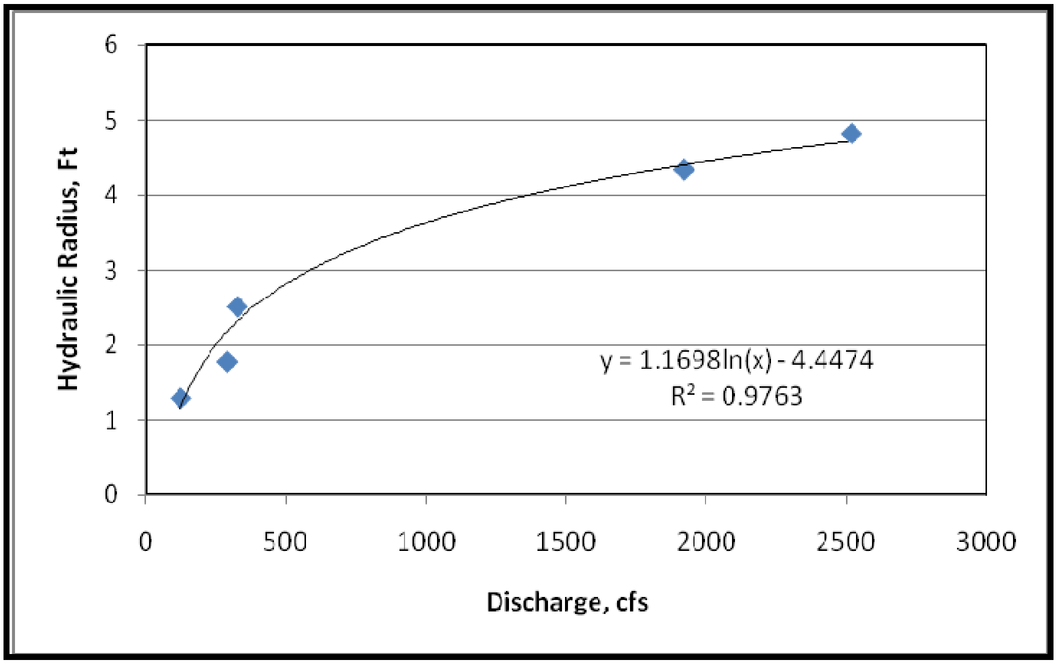


Figure 20 – Non-Linear Regression Relationship between Hydraulic Radius and Stream Discharge at Station 15009000

Table 6

Storm/Observed Event	Discharge (CFS)	R_h (ft.)	Particle Diameter (in.)
2 Year	241	1.97	9.7
5 Year	546	2.93	14.4
10 Year	936	3.56	17.5
25 Year	1,392	4.02	19.8
50 Year	1,886	4.38	21.5
July 8, 2009	2,520	4.71[*] 4.82[t]	23.2[*] 23.7[t]

R_h - Hydraulic Radius
[*] - Predicted
[t] - Observed

Table 6 – Bed-Load Sediment Initial Movement Using Incipient Motion Analysis

It is apparent from Tables 5 and 6 that there is a large difference in the size of particles that may be transported along the streambed compared to the size of particles that may be put into motion under different flow regimes. For example, the diameter of a particle that was predicted to be transported using the Hjulstrom diagram, which is based on stream velocity, at the observed discharge of 2,520 cfs is as much as 1.73 inches. Whereas, the diameter of a particle that may somehow be put into motion, using the incipient motion analysis approach for the same discharge is 23.7 inches. Therefore, it is important to consider that while the majority of bed-load sediment that may be transported under the events described in the previous table may be limited to gravel- and cobble-sized particles, larger, including boulder-sized, particles may be set into some limited motion. Furthermore, riverbeds are comprised of millions of particles, each with a unique size, shape, density, packing, and orientation making them subject to a unique instantaneous flow within the flow field, hence, making some particles more easily moved than others, as well as affecting the potential movement of other particles by their own movement. These are important considerations in the description of the current morphologic setting of the Site and the evolution of the stream channels under different induced environments.

Suspended Sediment Transport Analysis

Water quality samples collected in both the West and North Forks of the Soulé River in July and August of 2008 show at least an order of magnitude difference in the amount of suspended sediment potentially carried in each fork; a maximum concentration for total suspended sediments for a sample collected in the West Fork was 67 milligrams per Liter (mg/L), whereas a maximum concentration for a sample collected in the North Fork was 3 mg/L. Furthermore, as mentioned previously the contribution to the overall discharge in the Main Stem of the Soulé River from the West Fork is significant only in the summer months, during which it may account for 90 percent of the flow in the system. In fact, upon examination of Figure 17 it is apparent that discharge in the Soulé River during the summer months may account for the vast majority of annual flow and, as a result, total suspended sediment transport.

An area under the curve analysis was performed on the data used to prepare Figure 17, with the linear trapezoidal rule (Eq. 6). The use of the linear trapezoidal rule as a method for approximating the area under a concentration-time curve is widely accepted. The accuracy of the approximation to true area under a curve depends on the number of concentration-time points within the time interval under consideration. The formula to calculate the area under the curve is as follows:

$$Q_{Area} = \sum_{i=0}^{n-1}(t_{i+1} - t_i) * (C_i + C_{i+1}) / 2 \quad \text{(Eq. 6)}$$

Where, Q_{Area} = Total Discharge for time 0 to t
t = time values
C = Concentration values, e.g. C_i at time t_i
n = Total nos. of time concentration points
i = Reference index for i^{th} concentration-time value.

For the period of 811 days of record used, commencing November 1, 2007, the total calculated discharge for the system was approximately $1.19*10^6$ acre-feet. Of this total calculated amount about 73% of the total discharge calculated occurred during the summer months in 2008 and 2009, resulting in approximately 868,700 acre-feet. The mean discharge for this period of record was 1,468 acre-feet/day, with a low measured value of 92.88 acre-feet/day and a maximum measured value of 5,433 acre-feet/day; the maximum recorded discharge (based on stage measurements) during this period of record was 7,366 acre-feet/day on September 22, 2009.

Given a suspended sediment concentration of 67 mg/L and a discharge of 2,520 cfs (highest measured discharge), the amount of suspended sediment that could potentially be transported throughout and deposited at various points along the entire system could be as great as 435,440 tons of sediment per day. However, during the majority of the year when glacial influences on the flow regime are minimal, the suspended sediment transported throughout the system would be significantly less. For example, with a suspended concentration of 3 mg/L and discharge of 350 cfs, the suspended sediment load would be 2,850 tons per day, which is more than two-orders-of-magnitude less than glacially-induced events. Based on the area of curve analysis, for the period of record shown in Figure 21 the amount of suspended sediment transported during the summer months of 2008 and 2009 were approximately $6.9*10^7$ tons, whereas the amount of suspended sediment transported during non-glacially-induced periods of flow was approximately $1.21*10^6$ tons.

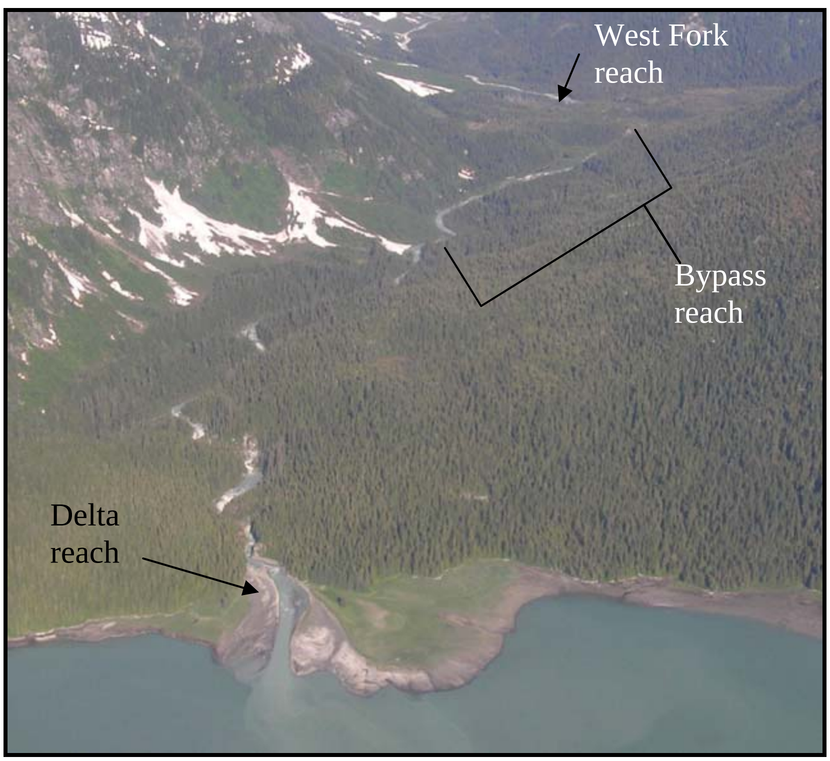


Figure 21 – Area of curve analysis for the period of record; Upstream view of the Soulé River showing the broad U-shaped valley and the spatial relationship of the bypass, West Fork and delta reaches.

As a result, the U. S. Army Corp of Engineers River Analysis System Hec-Ras version 4.0 model released in 2008 is being developed for the Site. The model is being developed from data collected in the 2008, 2009, and subsequent field seasons, coupled with USGS data collected for Station 15009000. It is anticipated that the variations in both discharge and suspended sediment concentrations can be used to create a better model for the Site under current conditions, as well as to model different scenarios that may result from development of the system for hydropower usage.

Water Temperature:

Water temperature was recorded every 4 hours on the North Fork using a Solinst levelogger. A thirteen month temperature record is shown in Figure 22. This record indicates that there are considerable daily and short term fluctuations in water temperatures throughout most of the year. However, from December through February water temperatures are generally less than 2°C; from March through May temperatures fluctuate between 1° and 4°C; and June through October water temperatures are generally above 4°C. In November of 2007 water temperatures were between 2-4°C, while in November 2008 they were between 3° and 5°C. This is likely due to November 2007 being a colder month than November 2008 as reflected in air temperature data collected in the vicinity of the USGS gaging station on the Soulé River (Figure 23). In fact, air temperatures are near zero or below zero from November through March. Water temperatures seem to follow the same pattern as air temperature with the coldest average water temperatures occurring December through February (Figure 23). The coldest water temperature, 0.07°C, was recorded on December 2, 2007. The warmest water temperature, 12.25°C, occurred on August 5, 2008. The average water temperature was above 8°C for the months of August and September, and below 2°C December through March.

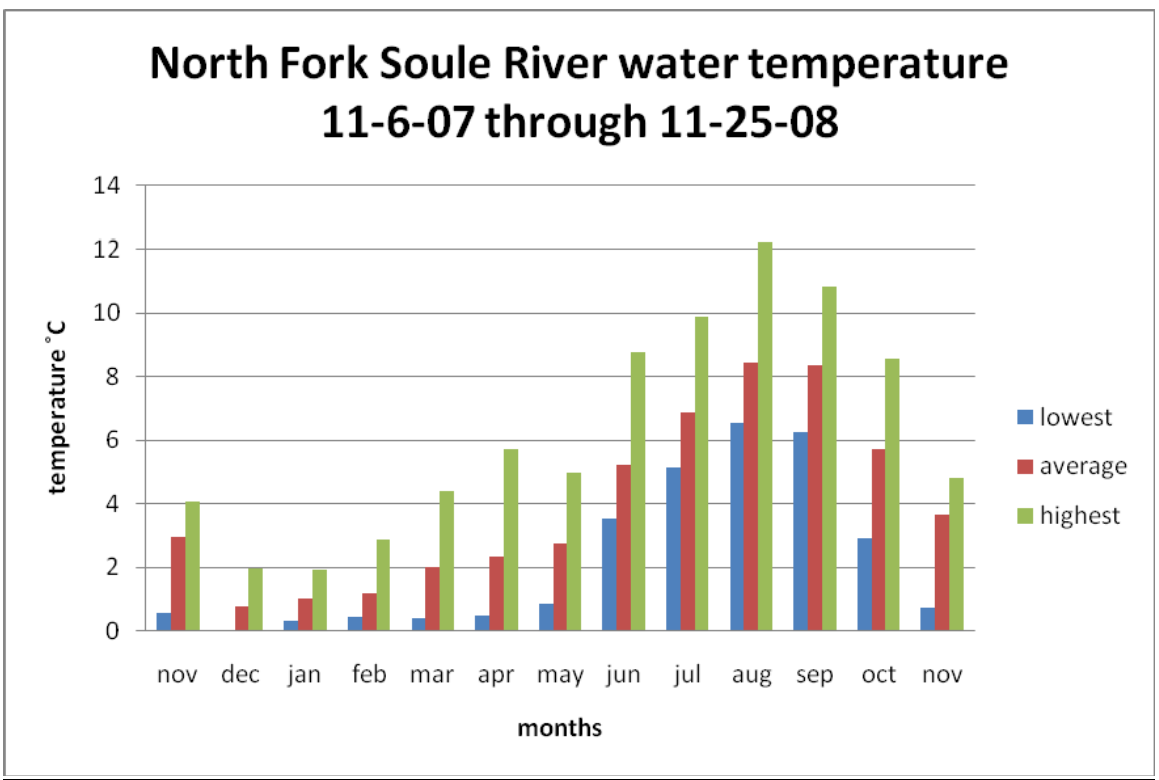
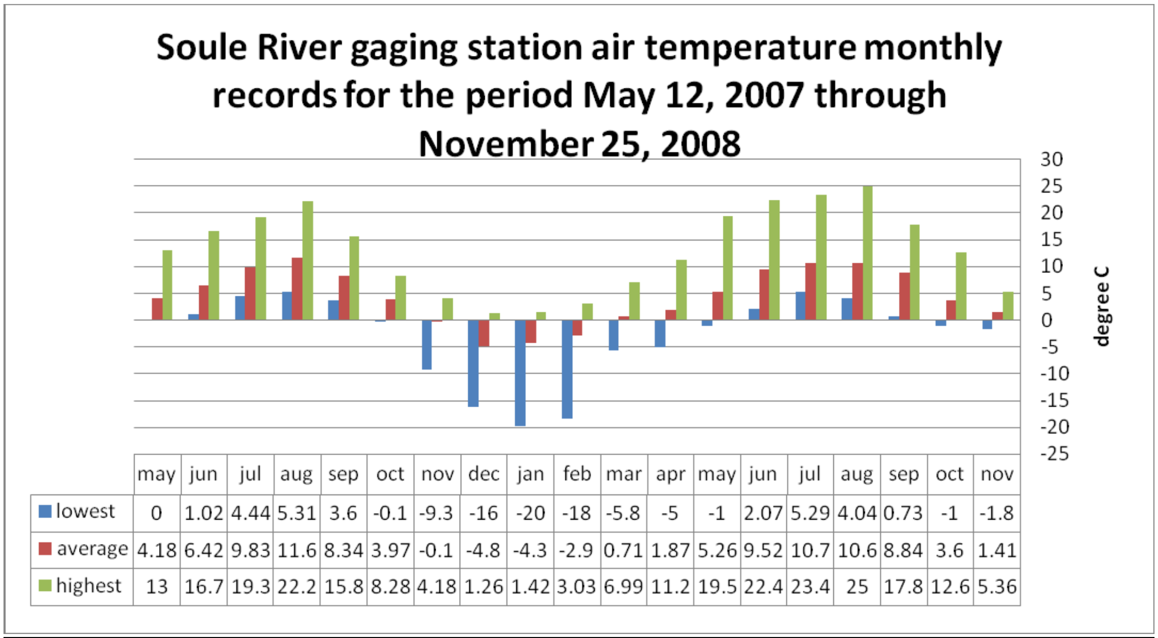


Figure 22 – Monthly Water Temperature Characteristics for the North Fork of the Soulé River



	may	jun	jul	aug	sep	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov
lowest	0	1.02	4.44	5.31	3.6	-0.1	-9.3	-16	-20	-18	-5.8	-5	-1	2.07	5.29	4.04	0.73	-1	-1.8
average	4.18	6.42	9.83	11.6	8.34	3.97	-0.1	-4.8	-4.3	-2.9	0.71	1.87	5.26	9.52	10.7	10.6	8.84	3.6	1.41
highest	13	16.7	19.3	22.2	15.8	8.28	4.18	1.26	1.42	3.03	6.99	11.2	19.5	22.4	23.4	25	17.8	12.6	5.36

Figure 23 – Monthly Air Temperature Summary Data from the vicinity of the USGS Gaging Station

Stream flow:

Stream flows in the Soulé River were monitored in the North Fork at the same location above the juncture of the North and West forks as in 2008. The USGS continued operation of the gage station located in the Soulé River below the forks. The daily discharge record for the Soulé River is shown in Figure 24. Maximum single day flows exceeded 3,000 cfs in both years. In 2009, the peak single daily flow rate (3,410 cfs) occurred on September 22nd. In 2008, the single daily peak flow rate (3,520 cfs) occurred on August 14th. Monthly flow statistics are shown in Figures 25 and 26 for 2009 and 2008, respectively. In general, lowest flows occurred from December through March each year, while highest flows occurred from June through September. Stream flows were highly variable between the two years in May and October. Average winter flows from December through April account for 4-5% of the total river flow. Summer flows between June and September accounted for 81% of the total flow in 2008, and 71% in 2009. Average river flows from May through October were 1,613 and 1,585 cfs in 2008 and 2009, respectively.

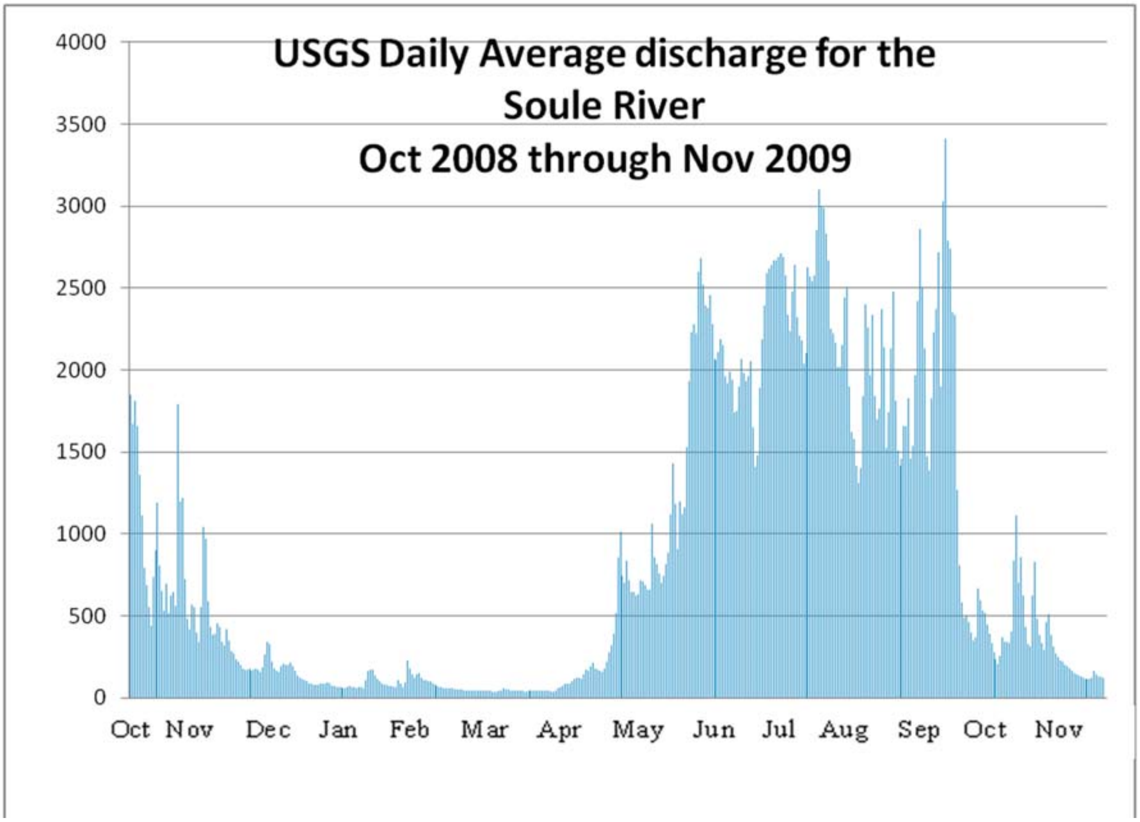
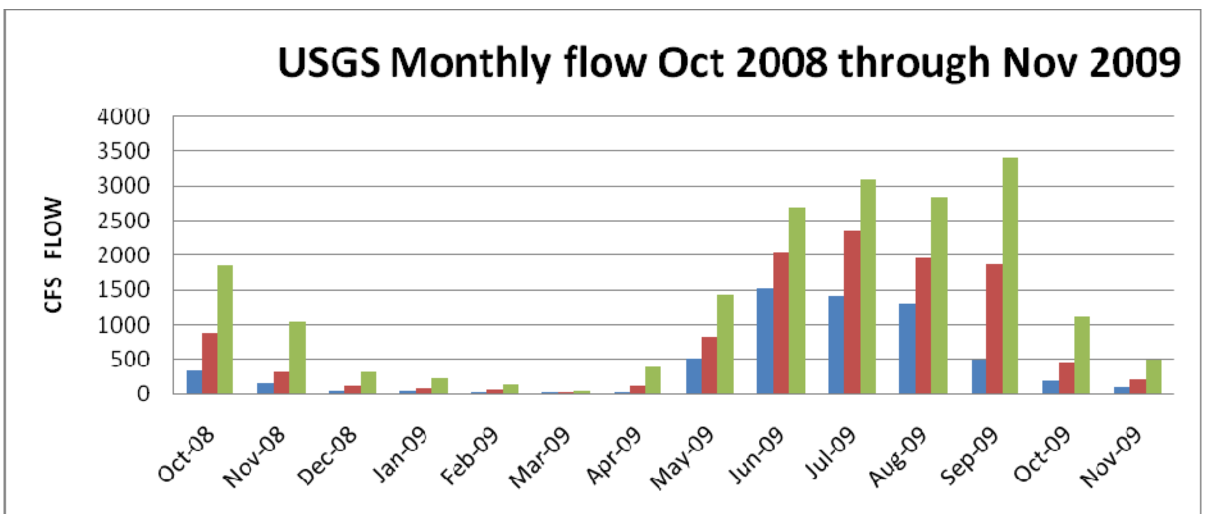
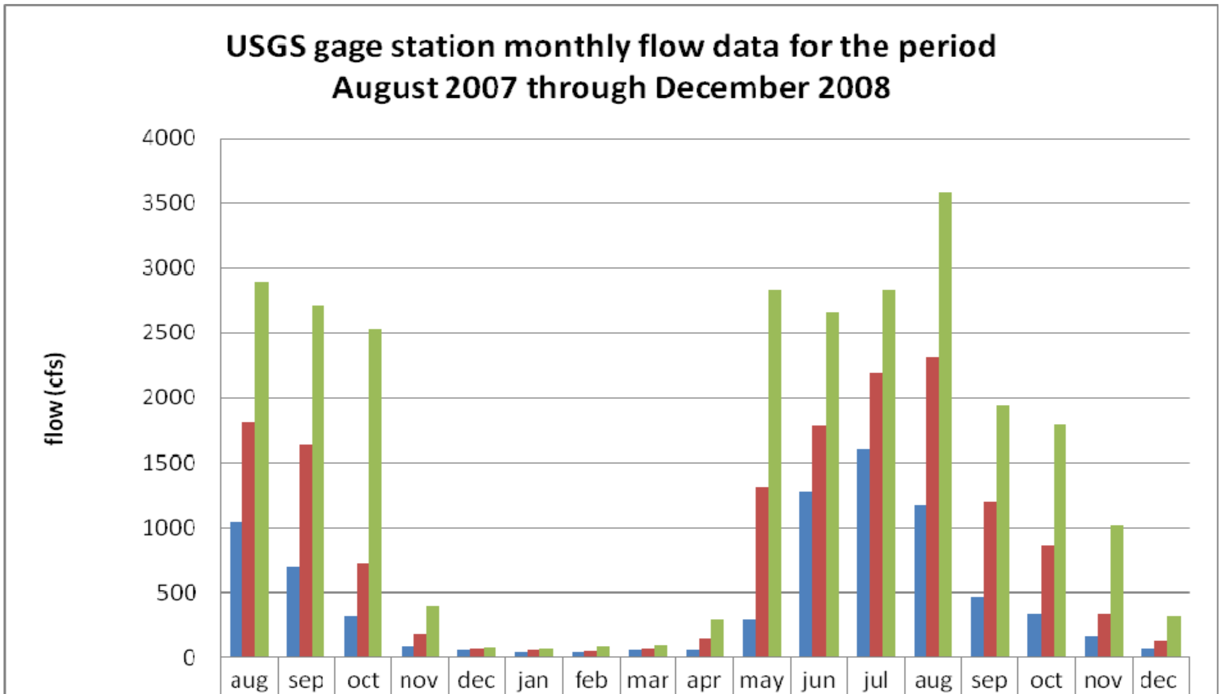


Figure 24 – Average Daily Discharge (cfs) from the Soulé River October 2008 through November 2009



	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09
Minimum	343	159	66	55	41	37	40	516	1530	1410	1310	491	204	113
Average	887	329	133	95	73	43	134	825	2030	2356	1967	1876	456	216
Maximum	1850	1040	326	230	153	57	394	1430	2680	3100	2830	3410	1110	508

Figure 25 – Monthly Flow Statistics for the Soulé River October 2008 through November 2009



	aug	sep	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
low flow	1040	696	320	86	64	46	46	57	56	297	1280	1600	1180	468	332	161	67
average flow	1809	1642	726	181	70	60	55	73	147	1316	1786	2192	2312	1208	861	335	135
high flow	2890	2710	2530	395	82	73	87	96	294	2830	2660	2830	3580	1940	1790	1020	327

Figure 26 – Monthly Flow Statistics for the Soulé River August 2007 through December 2008

A high flow calibration point was added to the calibration curve on July 18, 2009. Stream flow on this date appeared to be near bank full conditions. A flow rate of 1841.6 cfs was measured, with a recorded depth of 4.51 ft at the levelogger location. The new calibration chart is shown in Figure 27 incorporating this data point. The highest velocity measured across the river transect was 10.87 fps. By the time flows drop to 900 cfs the current velocity has dropped to 8 fps.

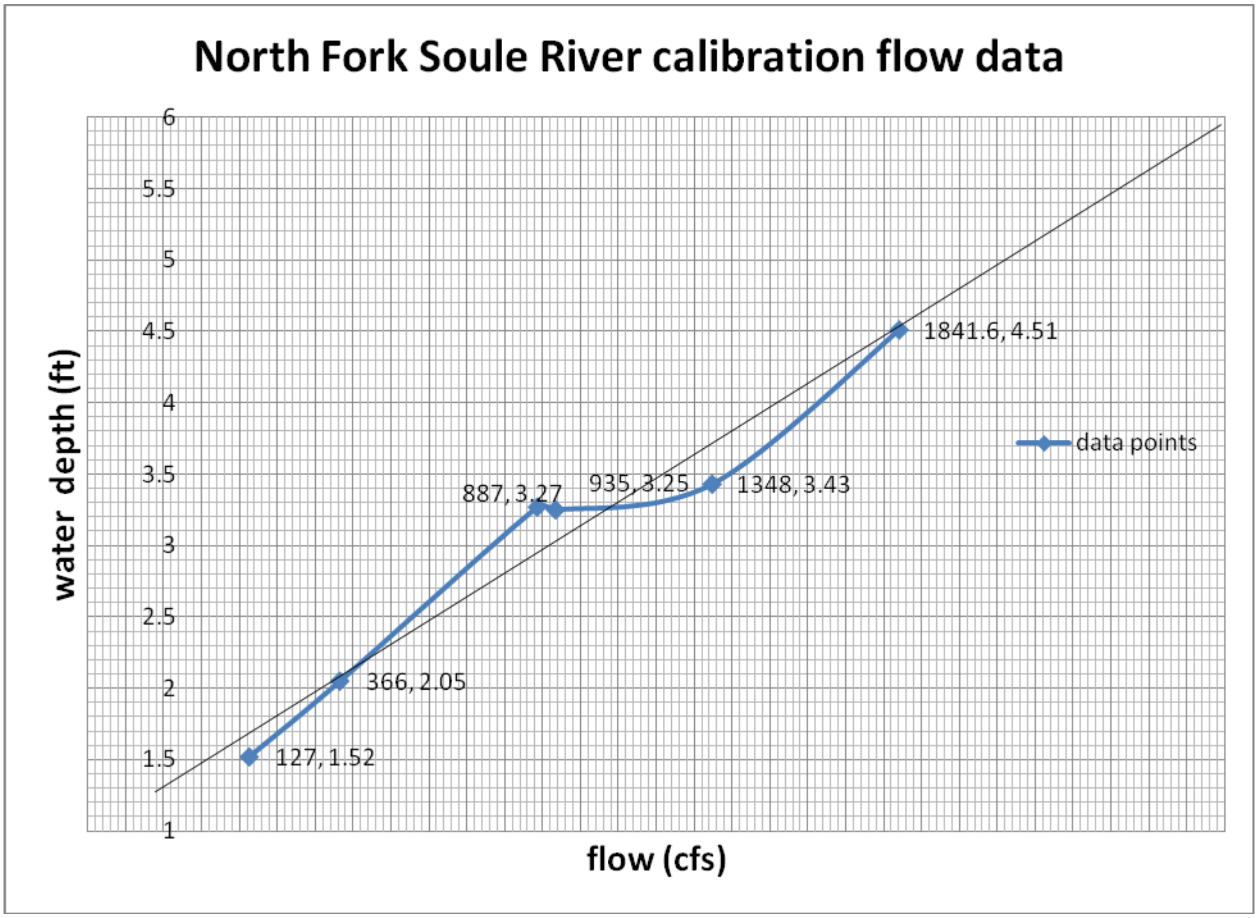


Figure 27 – Calibration Data for the North Fork Soulé River levelogger location

The average daily discharge recorded for the North Fork of the Soulé River is shown in Figure 28. The discharge curve is similar to that recorded in 2008. In both years there is a rapid decline of flow in October, followed by a long period of low flow through the winter, followed by a rapid rise in water flow in April. Summer flows are high and variable. Monthly discharge statistics are shown in Figure 29. Summer maximum flows for the period from May through September in the North Fork were 2239 cfs and 2432 cfs for 2008 and 2009, respectively. Average flows for 2008 and 2009 were 1120 cfs and 1361 cfs, indicating greater average flows occurred in 2009. Winter flows were similar between the two years with low flows less than 25 cfs recorded in both years. On July 18, 2009, what appeared to be a full bank flow condition was measured in the North Fork at 1849 cfs. On the same day the USGS recorded a flow in the Soulé River of 2640 cfs.

On that day the North Fork accounted for 70% of the total river flow, and the West Fork 30%. On August 23, 2009, we recorded a flow of 451 cfs in the North Fork, while the USGS recorded a flow in the Soulé River of 1700 cfs. On that day the North Fork accounted for only 25% of the total river flow, and the West Fork 75%. This was during an extended dry and hot period with temperatures hovering around 100˚F nine miles north in Hyder.

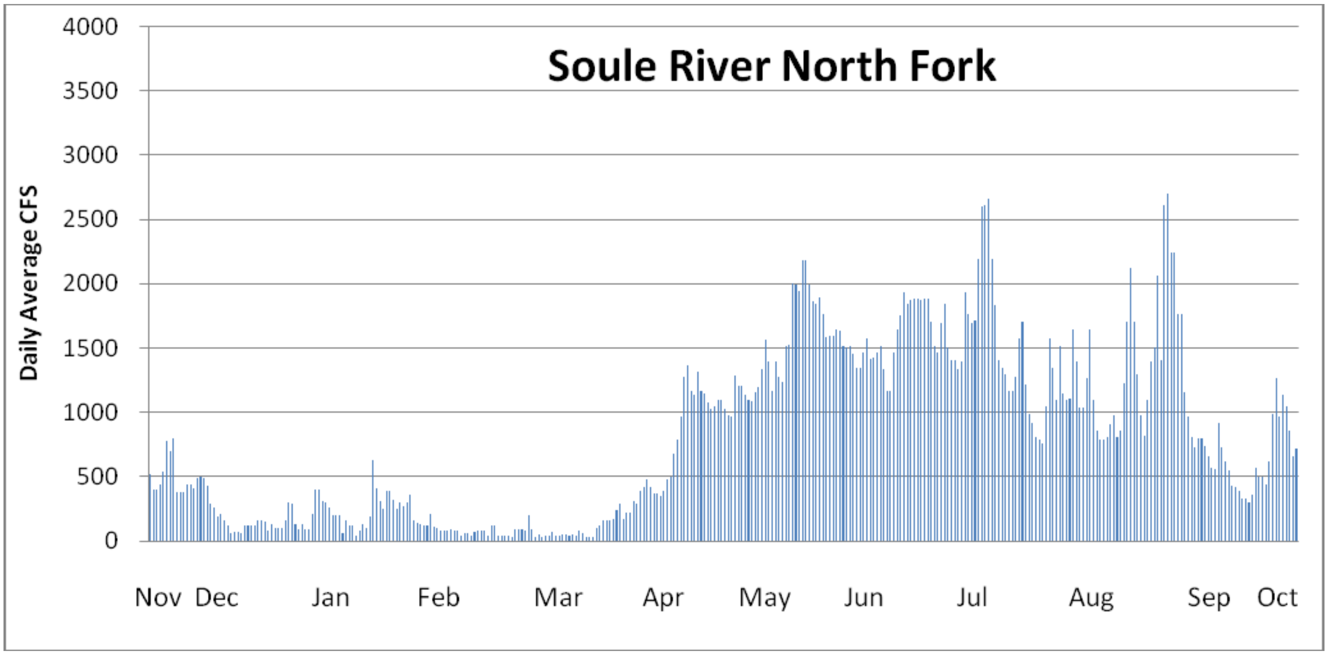
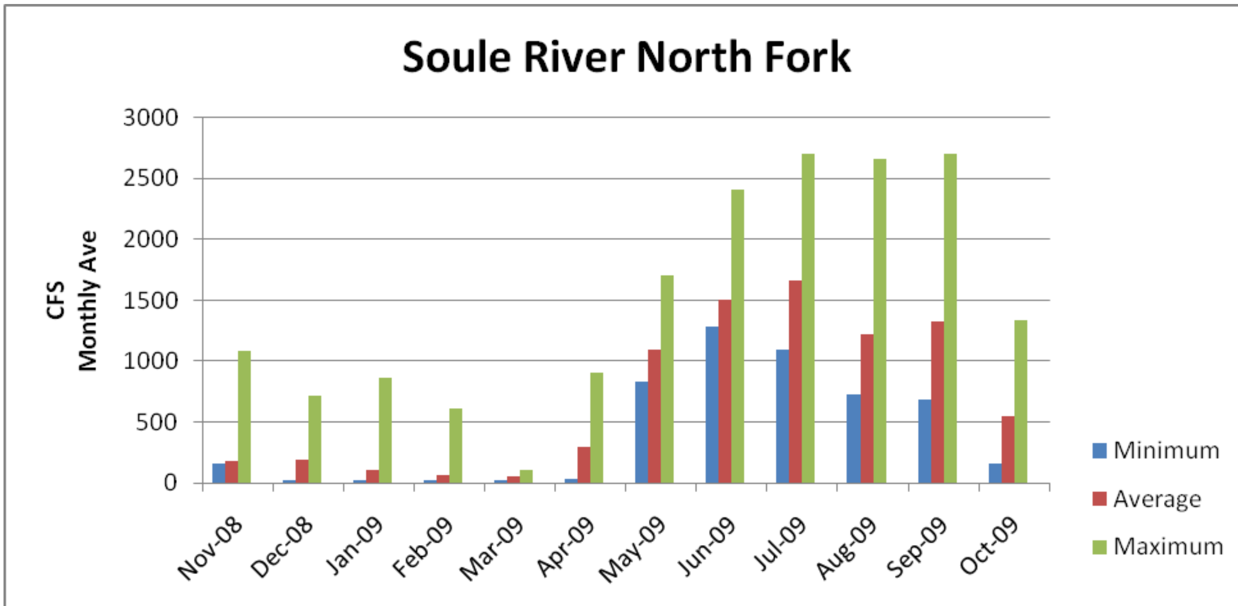


Figure 28 – Average Daily Discharge from the North Fork of the Soulé River Oct. 2008 – Nov. 2009



	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09
Minimum	160	25	25	25	25	35	830	1280	1090	725	680	155
Average	178	190	105	60	50	300	1090	1505	1660	1220	1330	550
Maximum	1080	715	865	610	110	900	1700	2405	2700	2655	2700	1340

Figure 29 – Monthly Flow Statistics for the North Fork of the Soulé River Oct. 2008 – Nov. 2009

West & North Fork habitat characteristics:
The West Fork of the Soulé River is a relatively steep (6.6% slope) and braided, glacially fed tributary to the Soulé River (a mix of GO4 and HC9 channel types). It is approximately 1.7 miles long and joins the Main Stem of the Soulé River at the Upper Gorge (Figure 30). It carries a very high turbidity load from the Soulé Glacier, its primary source of water (Figures 30-32). It is alder and brushed lined along most of its length. Exposed cobbles and boulders are deeply embedded in glacial silts and sands. It flows through a small terminal moraine lake at the base of the glacier (Figure 31), and then through a braided system of channels to the Soulé River. Most of the flow from this tributary enters the Soulé River through a crevasse at the top end of the Upper Gorge, as seen in Figures 30 & 32. The structure of this crevasse would result in a physical barrier to fish movement under low flow winter conditions, and a velocity barrier to fish movement at all other times of the year.

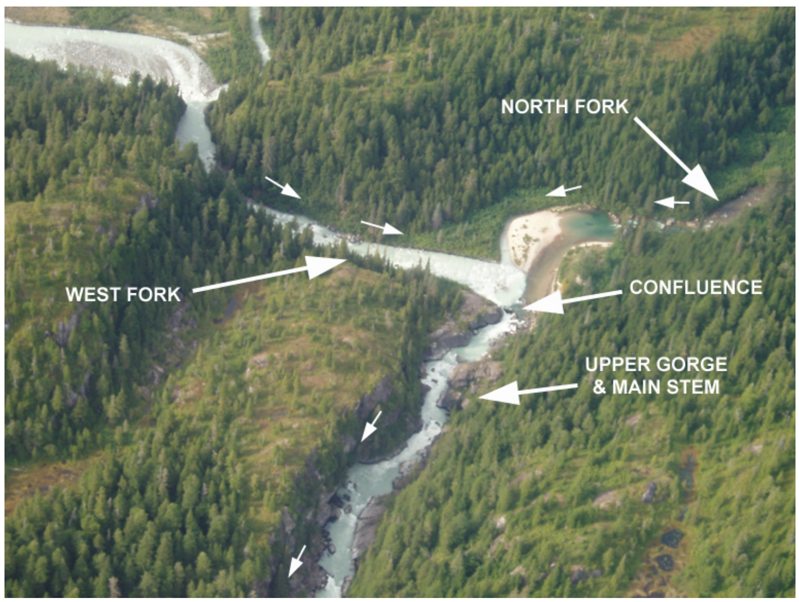


Figure 30 – West and North Fork Confluence at the top of the Upper Gorge; Note the contrast in turbidity between the two forks

Figure 31 – Aerial View of the West Fork of the Soulé River coming out of the Soulé Glacier

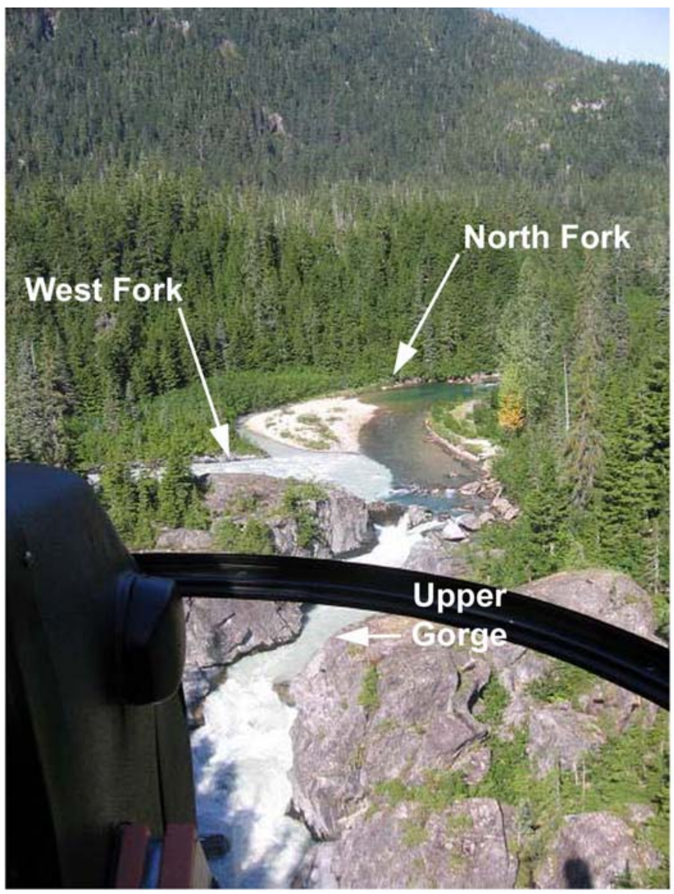


Figure 32 – Barrier Falls at the top end of the Upper Gorge showing three separate flows over the falls. River flows at this time estimated in excess of 3000 cfs. Note glacial flour coming in from left with the West Fork. Photo courtesy of the USGS, Alaska Region

Habitat characteristics of the North Fork were mapped in 2008. In general the North Fork consisted of runs and rapids, with a few small pools at river bends (FP5 channel type). The river was typically 70-80 ft wide with well defined brushy banks. In late July the water was quite high and was near bank-full at the time of the survey. The area surveyed is in an actively moving channel of the river. Mapped river segments are described in detail in the *2008 Environmental Report* and the *2009 Ecological Field Investigations* report, both included in the Appendices.

Most of the tributary streams (yazoo channels) flowing into the North Fork show considerable beaver activity and ponding. This is characteristic throughout the Soulé River drainage. Only one tributary, called Waterfall, which enters the North fork at a 30-40 ft waterfall, showed no evidence of beaver activity. All of the tributaries on the east side of the valley below Waterfall Creek were diverted by beaver activity and flowed through a complex of beaver ponds resulting in the consolidation of these flows into one large stream which the field biologist called Beaver Creek. Below Beaver Creek, another tributary was intercepted by beavers and diverted through a series of beaver ponds to eventually enter the North Fork. All of the tributaries on the west side of the valley below No-Name Lake were diverted through beaver ponds before entering the North Fork. Beaver activity was also observed in the lowermost stretches on the west side of the West Fork, on the west side of the Main Stem of the river below the confluence of the West and North forks, and at the north and south ends of No-Name Lake.

Fisheries:

The Alaska Department of Fish & Game (ADF&G) Fish Distribution Database Atlas for Alaska listed the Soulé River as an anadromous stream (101-15-10390) in the "Catalog of Waters important for the Spawning, Rearing, or Migration of Anadromous Fishers and associated Atlas." A map from the "catalog" indicates that Chum salmon are present throughout the river system, and Pink salmon are present in the Main Stem below the forks (Figure 33). Our investigations indicated that this is not the case.

Mapping of the watershed by Novak and Downey (1975)[20] indicates that both a barrier falls and a potential velocity barrier exist within the Lower Gorge at the mouth of the river which would preclude use of the river by migratory salmonids (below in Figure 34). The Lower Gorge extends from the mouth of the river upstream for a distance of approximately ¼ mile (Figure 35).

[20] A report submitted to the Applicant by the ADF&G.

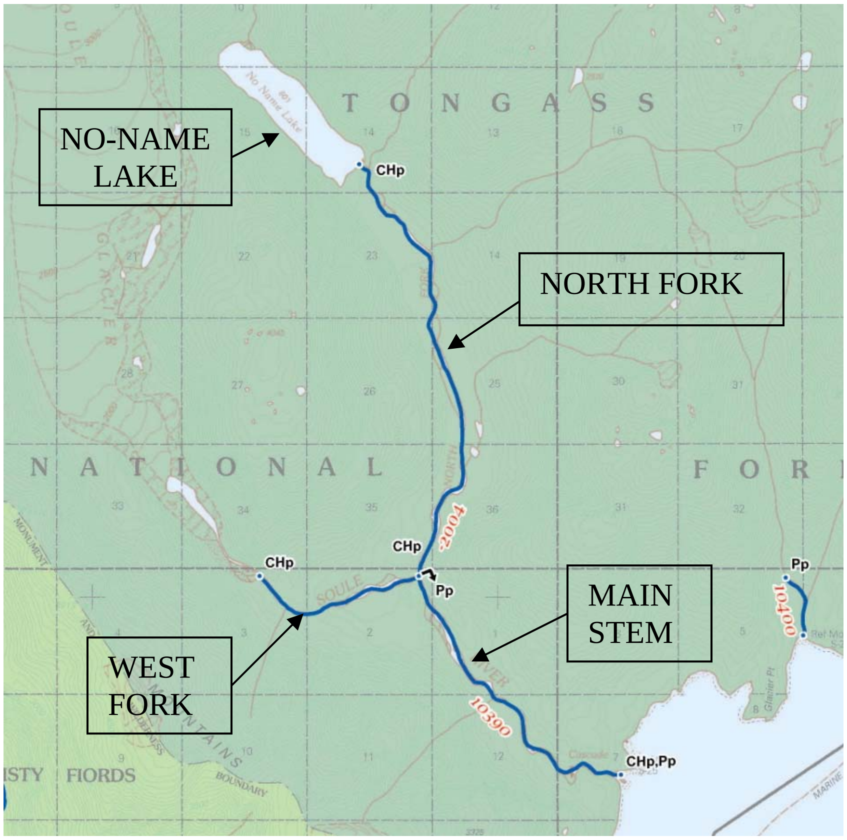


Figure 33 – Map of the Soulé River drainage showing fish distribution data from the ADF&G Fish Distribution Database Atlas. The code Pp = Pink salmon show them present in the Main Stem of the river, while the code CHp = Chum salmon shows them present throughout the river system

For these reasons the Applicant focused studies on determining if barriers existed to anadromous fishes as well as conducting minnow trapping, fly fishing, and observations for fish carcasses or signs of feeding on fish on river banks and at the river mouth delta. Sign of predators, i.e. bear and other mammals or avian species having fed on fish at these locations was also sought. The Lower Gorge contains a vertical falls that is estimated at 30 ft in height (based on a topographic survey), one of several fish barriers in the Lower Gorge. The Upper Gorge has a falls in excess of 12 ft high. Water temperature of the river is on average 1-2°C throughout the summer, too cold for salmon to reproduce in the river or on the delta. These conditions indicate that it is not a suitable stream for salmonids.

Fish Passage and Salmonid Barriers in Soulé River

Efforts in 2008 and 2009 were focused on documenting whether fish passage barriers existed within the Lower Gorge of the Soulé River as described by Novak and Downey that would preclude use of the river by migratory salmonids. Novak and Downey indicated, in their map shown in Figure 34, that there was a 60 foot falls a short distance up the gorge and a potential velocity barrier just below the falls. Figure 35 shows the anadromous barrier locations in the first quarter mile of the river the Applicant has found.

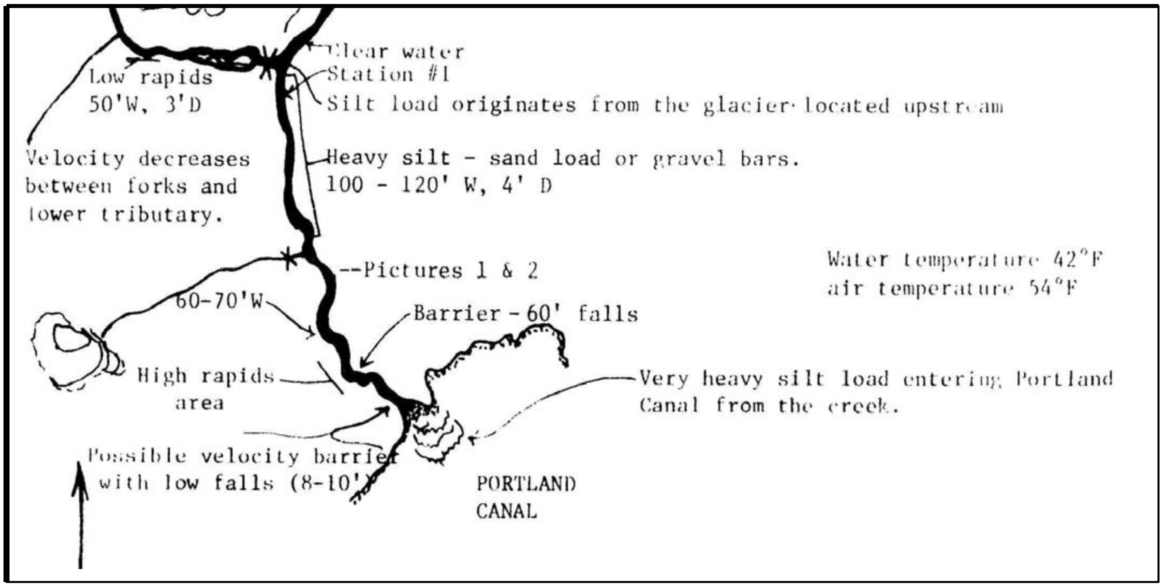


Figure 34 – Map of the Main Stem of the Soulé River from Novak and Downey (1975) indicating locations of a 60 foot falls and potential velocity barrier in the Lower Gorge[21]

Efforts to access the top few hundred feet of the Lower Gorge found that it was accessible only in the fall when low water flows occur and before heavy snowfall accumulates. Efforts in 2008 attempted to enter the gorge at the mouth by boat and then walk up the river to document the lower section of the gorge (Figures 36-39). The gorge is bounded throughout most of its length by vertical walls approximately 55-65 feet high or taller. The mouth of the gorge is shown in Figure 39 in May before high water flows in the river commenced. It was only possible to navigate by boat 50-75 feet into the gorge at low tide. The bottom of the channel was comprised of boulders and cobbles in this area and was not wadeable, even at low flows. Only the first bend could be reached, shown in the background of Figure 36. As a consequence more attempts were made in 2008 and 2009 to document features within the Lower Gorge from aerial pictures supported by helicopter.

[21] Map provided by ADF&G on February 21, 2007, to Applicant. (Map is from a 1975 ADF&G report)

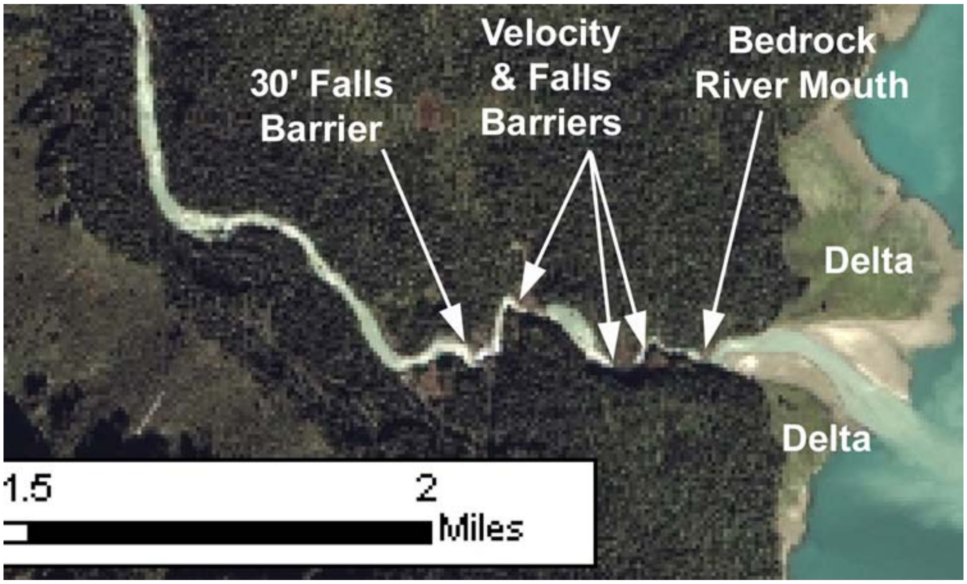


Figure 35 –Soulé River mouth and first ¼ mile of river features, including anadromous barriers

Figure 36 – Soulé River mouth passes through a notch in bedrock ridge with walls ~65' tall

Figure 37 – Aerial View of the Soulé River mouth & gorge with vertical walls of 55-65 feet. The arrow indicates the location of the first falls and potential velocity barrier identified by Novak & Downey

Figure 38 – View from the mouth of the Soulé River at the Lower Gorge during low tide

Figure 39 – Mouth of the Soulé River as it leaves the Lower Gorge at tidewater. This area floods at high tide as seawater moves into the gorge. Arrow in the side box shows approximate water elevation at high tide. Tide is lower and there is less flow in this photo than in Figure 38.

An aerial view of the falls and potential velocity barrier is shown in Figures 40-41. In Figure 40, the location of the falls and potential velocity barrier are indicated by yellow and white arrows, respectively. The falls and potential velocity barrier are shown in closer views and different perspectives in Figures 41 and 42. Based on the height of the vertical walls of the gorge and topographic mapping, this falls is approximately 30 vertical feet. The potential velocity barrier below the falls is a relatively straight run of steep rapids in a confined portion of the gorge that is more than 100-feet-long. Below this major falls and steep rapids is a smaller falls of 8-10 vertical feet that may also represent a velocity barrier, which is also noted by Novak and Downey in their survey of the Soulé River drainage. Between the rapids mentioned above and the 8-10 vertical foot falls is a larger pool with a narrow constriction at its upper end, which is less than 50 feet wide and may represent another velocity barrier under stream flows in the spring and summer.

The 30-foot-vertical falls area was also documented under low flow conditions in November of 2007. Figure 42 shows the falls from a downstream vantage. This photo shows that the river flow falls through a fracture in the rock and that it changes direction 90° as it enters the fracture. There is also a well developed plunge pool at the base of the falls.

Figure 40 – Aerial View of the major falls and potential velocity barrier in the Lower Gorge of the river. The yellow arrow points to the location of the 30 ft falls; while the white arrow points to the 100 ft+, steep run that may be a velocity barrier to anadromous fish

Figure 41 – Closer view of the 30-foot falls in the Lower Gorge.

Figure 42 – Upstream view of the falls in November. A substantial plunge pool is visible at the base of the 30 ft falls. Notice that the water direction changes 90º in passing over the falls

The following conclusions were reached regarding salmon accessing and utilizing the Soulé River:

1. Salmon are unable to get up the Lower Gorge due to velocity and falls barriers
2. No salmon were found in any portions of the river
3. No evidence of salmon carcasses from predation was found along any portion of the river
4. No evidence of salmon were found to use the river mouth for spawning
5. Water temperatures are too cold during the spring and summer (1-2ºC) for salmon to spawn in the river, even at the river mouth (North Fork flow has little influence; in part because the West Fork contributes the majority of summer flow in the Main Stem and also because water coming from the glacier is extremely cold and doesn't travel far enough to warm up so that temperatures at the river mouth are very similar to water temperatures in the West Fork)
6. Sediment transport to the river mouth may be too heavy at the mouth for the survival of any redds, hence no redds were observed nor any spawning activity.

Dolly Varden

General Summary

In 2007, young of the year and juvenile Dolly Varden (*Salvelinus alpinus*), a species of char that is very widespread and abundant in northwestern North America, were found in the North Fork of the Soulé River immediately below No-Name Lake. Dolly Varden was the only fish species found in the Soulé Watershed. The North Fork is a non-glacial tributary to the Soulé River with environmental conditions suitable for the propagation of salmonids. Juvenile Dolly Varden are widely distributed throughout the North Fork, but are uncommon, except in the upper ¾ mile of the river. When No-Name Lake freezes, flow into the North Fork dramatically decreases, and the deep snows add to the loss of habitat and deep pools for over-wintering adult fish. Spin and fly fishing could not produce even a strike throughout much of the Lower and Upper North Forks. Juveniles probably can over-winter in the reduced flows of this habitat. Since discovery of juvenile Dolly Varden in the North Fork, efforts focused on determining where the adult population resides and defining spawning habitat for these fish.

There was a good population of Dolly Varden with large fish up to 24-inches-long in No-Name Lake. The lake is very deep and there are numerous steep cliffs along its shoreline. The fish are located in areas where small streams feed into the lake creating sandy benches and food availability. The best location is at the northeast end of the lake where half a dozen small braided channels feed into the lake from one inlet stream. Fish up to 24 inches were easily caught on spinning and fly tackle. Fish could not be caught at the south beach of the lake (lake outlet) until mid-September 2007. The Dolly Varden spawn in the Upper North Fork at the outlet of No-Name Lake during late October.

Another population of Dolly Varden was found in a creek (Dolly Varden Creek) located on the east side of the Main Stem. Dolly Varden Creek is a small, clear stream in a fen wetlands complex on a ridge above the east side of the Main Stem of the Soulé River.

This stream flows along a fairly steep gradient to enter the Main Stem not far downstream (approximately 4500 feet) from the junction of the two forks. All the fish seen or trapped in Dolly Varden Creek were less than fifteen inches in length. This locality can be colonized by juveniles running upstream from the streams junction with the Main Stem of the Soulé. Juveniles from the Main Stem are probably colonized by the population at No-Name Lake who are washed downstream. Once these fish get below the Upper Gorge, they cannot return to the North Fork or No-Name Lake.

Distribution

In 2008 adult Dolly Varden were found at the north end of No-Name Lake, particularly concentrated near the inlet stream delta. No adult fish were found in the North Fork of the Soulé River that year. And, no adult fish were seen or caught at the outlet of No-Name Lake. Trapping efforts throughout the North Fork indicated that juveniles occupy the entire North Fork, but young of the year are found only in the uppermost section above Waterfall Creek (tributary feeding the North Fork). Multiple age juveniles are also most abundant in this same section of the North Fork.

Figure 43 – Dolly Varden Creek approximately ¾ mile below Upper Gorge where an isolated population of Dolly Varden was found in 2009. Red lines denote areas of observed spawning behavior in the creek in October.

During the wetlands survey work in July 2009 another population of fish was found in a small stream on the Main Stem of the Soulé River (Figure 43). This creek was referred to as Dolly Varden Creek and Zapus Creek in field notes. The creek is approximately 1 km long with a beaver pond/meadow complex at its upper end. It flows into the Soulé River at the head of a deep pool (segment 20, Tier II Stream Survey) approximately 4,400 ft below the USGS gage station (Figure 44).

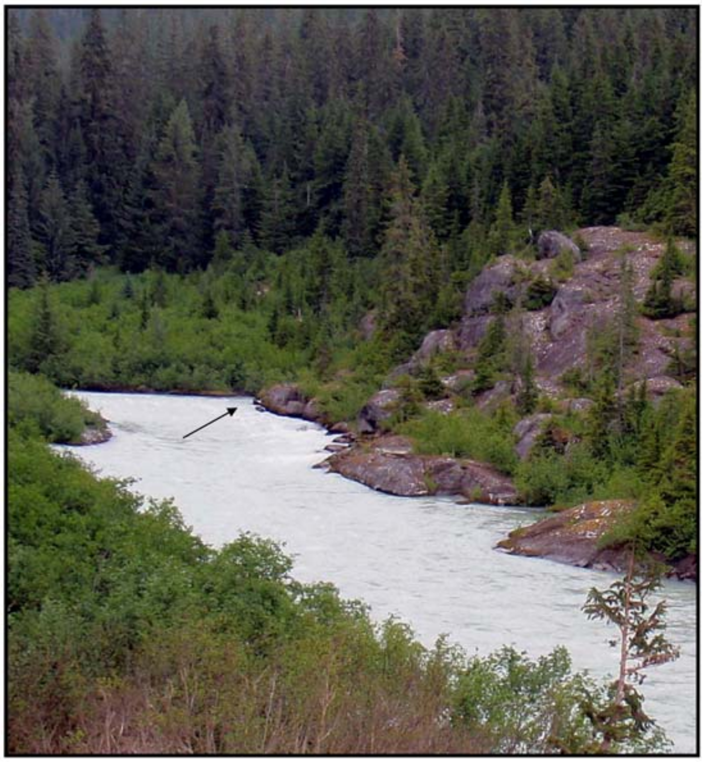


Figure 44 – Mouth of Dolly Varden Creek (arrow) viewed from the west bank of the River July 2009

After discovery of the Dolly Varden Creek fish population by the wetlands field team, 3 small minnow traps were obtained from the Forest Service in Hyder and set out traps baited with chunks of frozen Dolly Varden in the area they reported finding fish. The traps were fished for 1 ½ hours in the main stream flowing into the beaver ponds (Figure 45). A total of 5 fish, identified as Dolly Varden, were caught ranging from 61 to 140 mm and comprising 3 age classes.

All fish were released unharmed. Walking the stream below the beaver dams revealed the presence of two young-of-year fish, but no larger juveniles or adults. Coincidentally, the Soulé River in the vicinity of the mouth of Dolly Varden Creek was fished overnight with 2 small minnow traps baited with salmon roe on May 11-12, 2007, but no fish were caught.

Very little work has been done on isolated small fish populations. However, Richard Carstensen discusses the research conducted by Hastings on Dolly Varden and Cutthroat trout populations in Southeast Alaska (Appendix P, pg 50).[22] This research indicates that there is a 50% chance of survival over a millennium if the stream is more than 1.26 km long, and a 90% chance if the stream is in excess of 5.5 km in length.

Dolly Varden Creek would have less than a 50% chance of maintaining a Dolly Varden population over such timeframes. It is likely that this population is being supplemented with serial reinforcements from the No-Name Lake population.

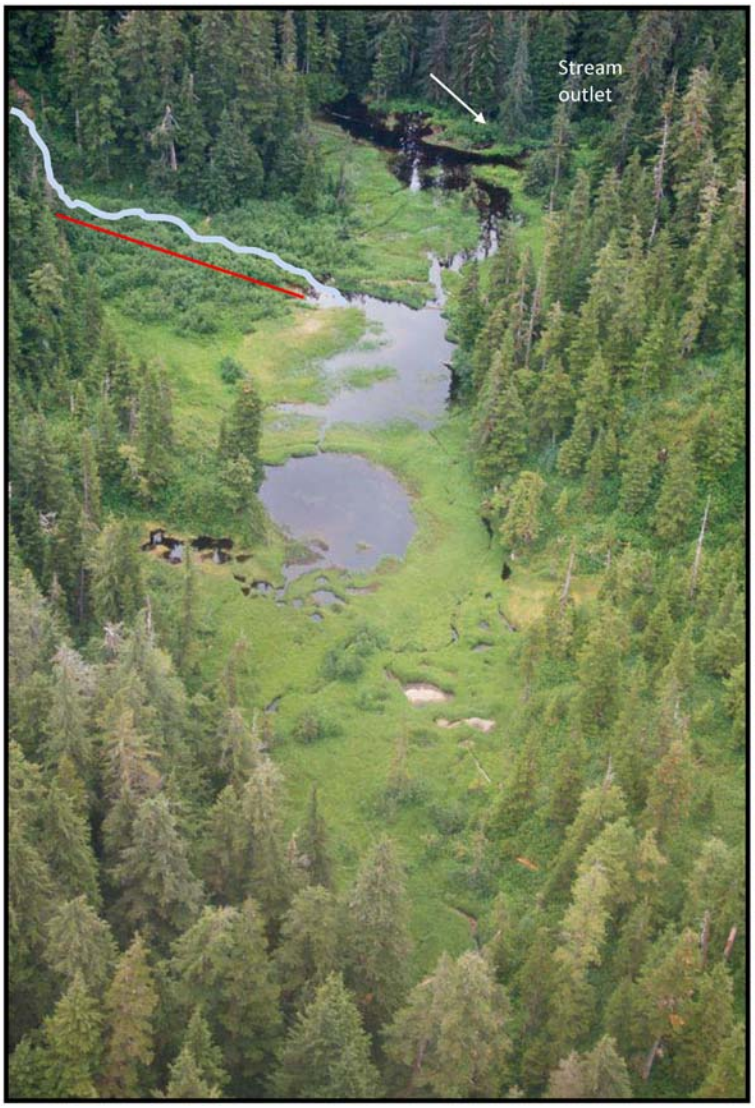


Figure 45 – Zapus meadows area of Dolly Varden Creek looking downstream July 2009. The path of Dolly Varden Creek above the meadow is shown on the left. The red line indicates the area where spawning behavior was observed in October. A fish barrier exists at the upper end of the spawning area.

[22] Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. P. 50. For the Shipley Group.

Spawning habitat

Attempts were made in both 2007 and 2008 to identify spawning habitat for the Dolly Varden which were thought to be at the outlet of No-Name Lake. Both attempts were unsuccessful due to weather conditions that prevented access at the appropriate time. However, in 2009 we were able to complete surveys of the North Fork and Dolly Varden Creek in late October (10-20 and 10-29). At least 30 pair of Dolly Varden, ranging from 18-24 inches in size, was observed in the North Fork at the outlet of No-Name Lake (Figures 46 & 47), as well as many other adult fish in the 15-18 inch size range. Most of the large fish were paired up and defending territories, while the smaller fish were schooled up. Some of the paired fish exhibited redd building activity. On October 29th only four large fish remained in the area. A survey of the streambed showed evidence of the likelihood of at least 63 redds over a stretch of 150 yards (Figure 48). The No-Name Lake sill depth was identified as 3 feet deep and corresponded with the upper end of the spawning reach (Figures 48 & 49). This is the same stretch of river that had the highest concentrations of young of the year fish observed in previous years.

Figure 46 – 20" female Dolly Varden taken in spawning area on the North Fork

Figure 47 – 20" male Dolly Varden taken in spawning area on the North Fork

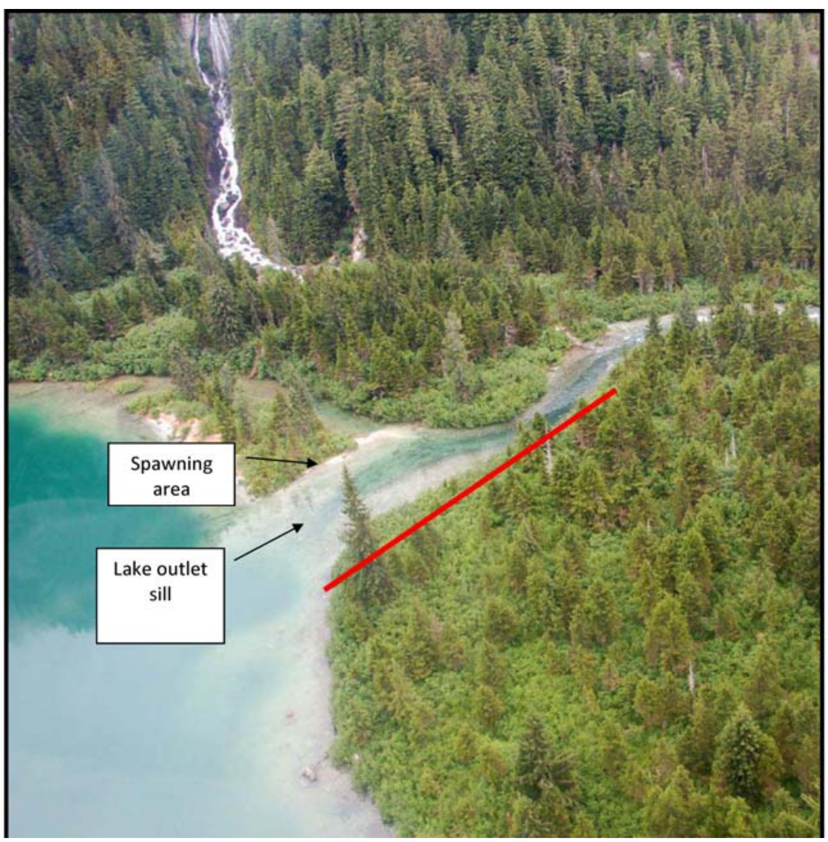


Figure 48 – Dolly Varden spawning area identified at the outlet of No-Name Lake

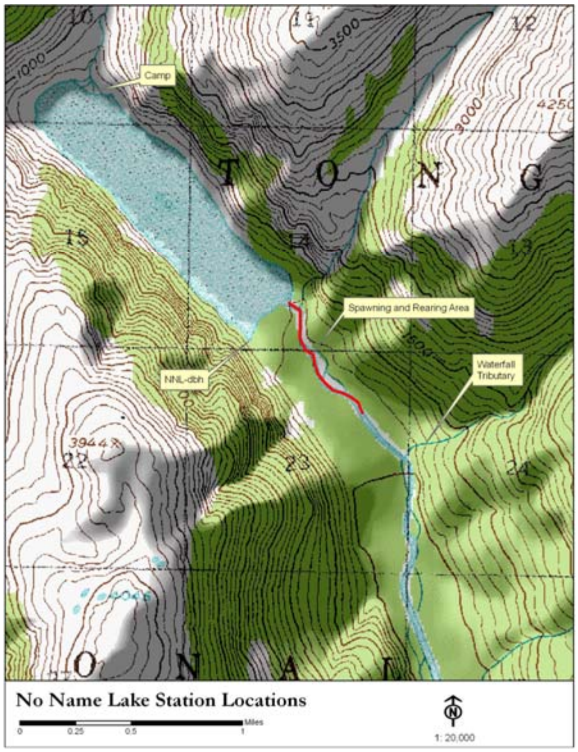


Figure 49 – Topographic map at left of No-Name Lake and upper end of the North Fork showing the spawning and also the young-of-the-year rearing area for Dolly Varden

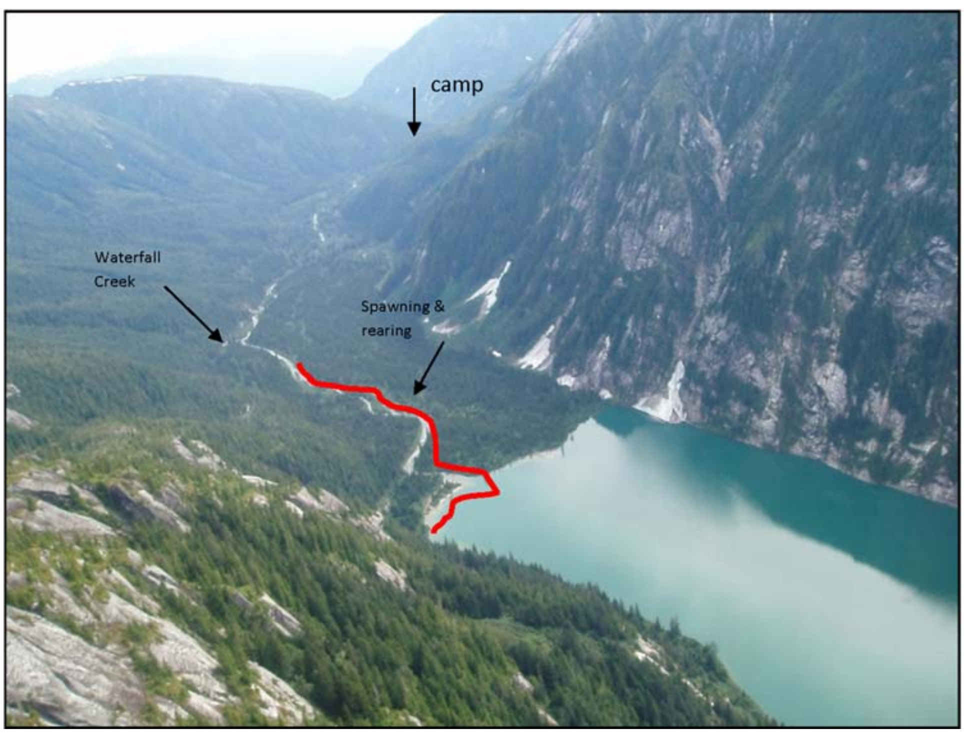


Figure 50 – Downstream aerial view of the lower end of No-Name Lake showing the same features as in Figures 48 & 49

Dolly Varden Creek was surveyed only on October 20th. However, mature Dolly Varden ranging up to 15 inches long were seen in the Creek. Many of the fish were paired up and exhibited territory defense, as well as redd building activity over a considerable stretch of the stream (Figure 45). The largest adult fish were observed below the beaver ponds. The largest fish seen above the beaver dams was approximately 12 inches. The stream above the beaver dams has a fish barrier approximately 60 yards upstream limiting both fish distribution and spawning habitat. There are two other streams flowing into the beaver ponds, but neither supports fish because of fish barriers within a few feet of the wetland/beaver pond complex. Below the beaver dams spawning behavior was seen as far downstream as we surveyed, and might exist throughout the entire stream course.

Figure 51 – Dolly Varden from Dolly Varden Creek, 140mm long

Sampling of Dolly Varden Locations

Fish trapping North Fork

Fish trapping occurred on the lower reaches of the North Fork from July 23 through August 1, 2008. The main river, small beaver ponds and creek, and a major beaver pond/stream complex upstream were fished with small minnow traps. A variety of habitats were fished along the North Fork ranging from large snags, to deep runs with overhanging vegetation, to pocket small pools. Beaver ponds and outlet streams feeding into the North Fork were also fished. In addition the main river was fished with large fish traps where suitable water was found. The large fish traps required about 2 ½ ft of water depth to effectively fish.

The large fish traps were fished for a total of 152 hours with no fish being captured. The small minnow traps were fished for a total of 452 hours and captured 13 fish for an overall CPUE of 0.029. However, the small minnow traps were only fished in the North Fork for 234 hours, producing 4 fish which ranged in size from 75 to 104 mm. This effort produced a CPUE of 0.017. The rest of the time, 180 hours, minnow traps were fished in Beaver Creek (yazoo channel) and captured 9 fish, which ranged in size from 48 to 98 mm. This resulted in a CPUE for Beaver Creek of 0.05. A 48 mm Dolly Varden captured in a minnow trap in Beaver Creek is thought to be a 1+ year old fish that drifted down from the lake outlet. Beaver Creek is a large tributary draining beaver ponds on the east side of the North Fork valley. It is about 0.25-mile-long and had a flow rate of 43 cfs during the survey period. It contains a large amount of large woody debris, as well as an extensive section of overhanging vegetation forming a canopy over the creek. The substrate varies from sand and fine gravel near the mouth to sands, gravels, large gravel and small cobble near the beaver ponds. A small section of the stream midway between the beaver ponds and its mouth contains a boulder and cobble substrate.

Beaver ponds were visually inspected in four different locations with no fish being observed. Two of these four locations were trapped overnight producing no fish. Beaver Creek, described above, produced the most fish. Juvenile fish were also observed in two outlet streams from beaver ponds on the west side of the North fork, but these streams were too shallow to trap.

Sport Fishing No-Name Lake

Fishing at No-Name Lake was conducted in 2008 in a small area along the inlet stream delta at the north end of the lake. This was due to the precipitous shoreline that surrounds the lake except at the north delta and outlet moraine. The outlet moraine had already been fished in 2007 with no success. The north end of No-Name Lake is bowl shaped and glacier carved. The incoming braided stream channels from the inlet creek have deposited sand and gravel and formed a narrow delta at the northeast corner of the lake (Figure 53). Inlet flows varied throughout the day, typically being lowest in the morning and highest in the afternoon, because of overnight freezing temperatures in the snow field feeding the main channel of the stream, which by afternoon, instream flows visibly increased as daytime temperatures and the sun provided more melt water.

Figure 52 – Outlet of No-Name Lake showing the lake outlet with the North Fork

Figure 53 – North end of No-Name Lake showing inlet stream and small braided delta. Arrow indicates location of a barrier falls at least 20 feet high. Adult Dolly Varden were all caught or trapped off this delta.

Figure 54 – No-Name Lake looking West-Northwest with Soulé Glacier visible over the bedrock ridge in the background; Inlet stream delta is visible at upper right of lake.

In contrast to the North Fork, No-Name Lake produced excellent sport fishing along the delta (Figure 56). A total of 9 Dolly Varden were caught on spoons in less than one hour on the first day. Fish caught on the first day ranged in size from approximately 250 to 505 mm (10 to 20 inches) in length. The largest fish caught during 3 days of fishing at the site was measured at 560 mm. A total of 42 fish were caught over the 3 day period, ranging in size from 152 – 560 mm (6 – 22 inches), with the average size being 350 mm (~ 14 inches), for a catch per unit effort of 2.6. The CPUE would have been much higher if only spoons had been used during the fishing effort at the lake camp site. All but 5 of the fish were caught on spoons. The only fly patterns that worked were large sparkly wooly bugger patterns fished with a sinking line. The largest fish were females carrying eggs while smaller fish, close to the average size appeared to be mostly males. Examination of gut contents showed they were feeding on benthic insect larval stages and detritus.

Figure 55 – View looking south across the inlet delta at No-Name Lake and the distant lake outlet

Figure 56 – Some of the 10-12 inch (247-298mm) Dolly Varden caught in No-Name Lake. The clamp in the foreground is 5 ¼ inches long.

Fish Trapping No-Name Lake

Three large fish traps and 3 small minnow traps were paired up and fished on two successive nights at the north end of the lake and in the vicinity of the inlet creek delta (Figure 57). Traps were fished for a total of 14 hours each day for a total effort of 84 hours for each type of gear. Traps were fished in water depths ranging from 20 to 50 ft. Only the traps fished near the delta, and in 20-30 ft of water, captured fish. A total of 5 fish were caught in 84 hours of fishing with each gear type; one in a minnow trap and 4 in the large fish traps. The CPUE for the large fish traps was 0.048, and the minnow traps 0.012. The fish captured in the minnow trap was 98 mm (3.9 inches) long, comparable to the larger fish captured in the North Fork. The fish captured in the large fish trap ranged from 158 – 233 mm (6 – 9 inches), slightly smaller than most of the fish caught on sport tackle.

Figure 57 – Setting one of the large fish traps at the inlet delta of No-Name Lake

Fish in the West Fork

Based on the downstream river structure, this Dolly Varden population is confined to the North Fork of the Soulé River. A fish barrier falls exists at the juncture of the West and North Forks described earlier (top of Upper Gorge). Fish going over that falls would not be able to return to the North Fork. It would be difficult for fish to access the West Fork in the winter due to the configuration of the water flows at low water periods. Fish traveling downstream would be swept over the falls before they could get reoriented to swim upstream into the West Fork. There is a 3 foot drop over a distance of 10 feet leading to the falls in the winter. A similar drop occurs on the West Fork as water flows into the crevasse and falls. Under high water flow conditions fish from the North Fork could access the West Fork. However, at those times the West Fork is carrying a very large sediment load that would be difficult for fish to tolerate compared to the clear waters of the North Fork. Once over the falls the high water flows would carry fish out to Portland Canal. There are no side tributaries in the Main Stem of the Soulé River to support clear water refugia for fish (other than Dolly Varden Creek). While fish could survive in the winter low flow period, any fish present in the Main Stem once glacial meltwater starts flowing would be quickly overwhelmed by the sediment load, cold temperatures, and flushed into Portland Canal.[23]

Delta Fish

A number of ponds occur in the intertidal zone on the south Soulé Delta.[24] These are periodically inundated by high spring tides. These ponds usually held juvenile and adult Threespine Sticklebacks (*Gasterosteus aculeatus*). Salmon parr were also common in these ponds in late spring and summer (ponds are only present on the south delta). A small sculpin was also seen on a single occasion in one of the clear streams running across the delta. In 2007 two sculpins were caught in traps fished in the main channel of the river mouth.

The following conclusions were reached from the fish studies:

1. Dolly Varden rearing and foraging habitat is in No-Name Lake rather than in the North Fork
2. A portion of the juvenile Dolly Varden rear in the North Fork down to "Waterfall Creek", which is about 3500 feet down river from the lake
3. Dolly Varden spawn in the lake outlet, but not below the first 0.3 mile of the outlet stream (primarily closer to the lake sill than further downstream).
4. Dolly Varden are flushed down the river and are unable to return to above the Upper Gorge or above the Lower Gorge on a seasonal basis
5. Dolly Varden have found habitat in a stream (Dolly Varden Creek) that enters from the east side of the Main Stem between both gorges; supports all life stages
6. Salmon are unable to get up the Lower Gorge due to velocity and falls barriers
7. No evidence of salmon was found to use the river mouth for spawning
8. Water temperatures are too cold (1-2ºC) during the spring and summer months in the West Fork and Main Stem of the river and at the river mouth for spawning
9. Sediment load is significant enough to cover redds if spawning were attempted at river mouth.
10. Juvenile fish foraging habitat can be affected if the delta decreases in size from lack of deposition of sediments

[23] Rusanowski, P. 2008. "*Environmental Report 2007*." By the Shipley Group. Page 77.
[24] No ponds were found on the north Delta.

Delta Bathymetry

A bathymetric survey of the river delta was conducted using a fathometer during the spring 2008 survey offshore in Glacier Bay (Figure 58). The results of the bathymetric survey are plotted in Figure 59 relative to the zero tidal datum elevation. There is a shelf of shallow water approximately 40-100 yards wide above the zero tidal datum which is narrow near the delta and increases in width towards the northeast. Below the zero tidal datum the shore drops off steeply, reaching depths of 80-90 ft within 100 yards. Within 200 yards of the tree covered shoreline water depths exceed 125 ft.

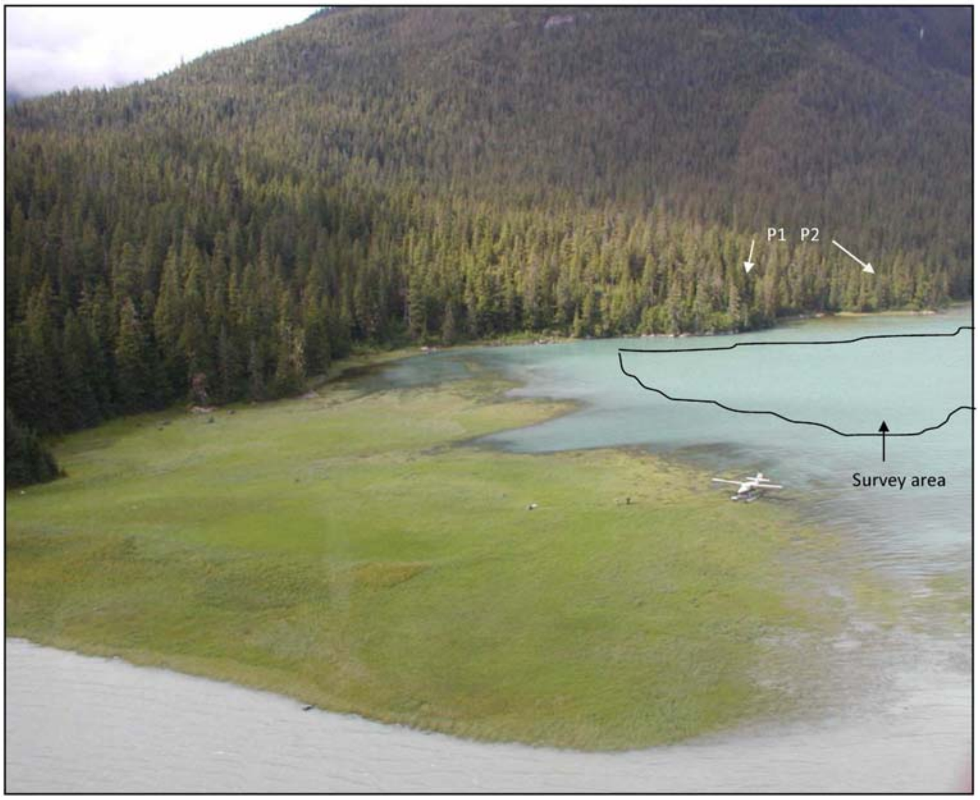


Figure 58 – Aerial view of north side of the Soulé River Delta showing two potential powerhouse locations (later rejected) and the area where the bathymetric survey was conduced

Delta Wetlands

The east side of the Soulé River delta extends from the tree line approximately 1,000 ft offshore to the mid-littoral zone at approximately +5 ft elevation above the zero tidal datum. The delta runs approximately 1,500 ft to the northeast before terminating in a steep rocky shoreline (Figures 58 & 59). The Powerhouse site lies just out of view on the left side of Figure 58 and the marine access facilities would be located approximately where the little cove is just above the plane in Figure 58.

A vegetation survey was completed on the delta during a field survey conducted from May 12 to 17, 2008. The substrate on the delta was composed of gravel, cobble, boulder, and glacial silts and sands (Figure 60). Except in the lower intertidal and the active river channel the substrate was covered by vegetative growth and root mats. There were four distinct habitat zones identified during the wetlands survey (Figure 61). These were an upper high intertidal fringe zone adjacent to the uplands; an upper intertidal zone; a mid intertidal zone and a lower intertidal zone which was generally below the +5 ft tidal datum. This tidal datum is the approximate elevation when fucoid vegetation is no longer dominant algae.

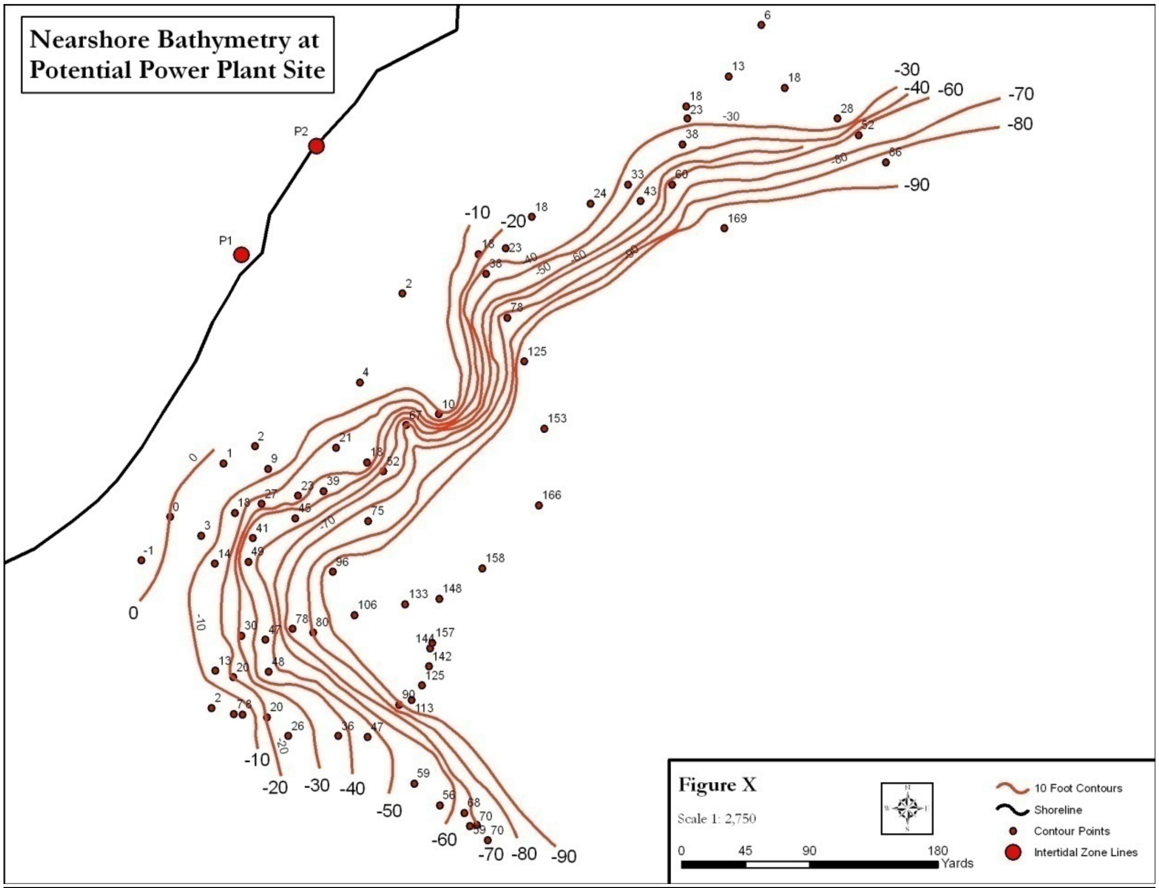


Figure 59 – Bathymetric map of the nearshore area on the northeast side of the Soulé River Delta

The upper fringe wetland zone is dominated by grasses, sedges, rushes, and a few forbs. Boulders and rock outcrops in this upper intertidal fringe zone showed extensive lichen growth and dark algae crusts. Beach Wildrye was a very noticeable dominant grass in this zone. Goose Tongue was a characteristic forb of this zone. Commonly observed plants included Alaska Alkali Grass (*Puccinellia nutkaensis*), Lyngby's Sedge (*Carex lyngbyei*), Creeping Spike-Rush (*Eleocharis palustris*), rushes (*Juncus* sp), Beach Wildrye (*Elymus mollis*), and Goose Tongue (*Plantago maritima*). Higher up the beach and further from the tidal zone grew Meadow Barley (*Hordium brachyantherum*), Tufted Hairgrass (*Deschampsia cespitosa*), and Cow Parsnip (*Heracleum lanatum*). Several of the grasses close to the brushy edge of the upper fringe, especially the beach Wildrye grass, showed grazing from bears. Skunk cabbage (*Lysichiton americanum)*, which occurred in boggy freshwater seep areas of the upper fringe also showed signs of bear grazing. Also present in the upper fringe was large woody debris in the form of logs or stumps washed up by storms and tidal currents.[25]

Figure 60 – Soulé River outlet from the steep canyon at the Delta and at low tide showing the underlying substrate of the delta

Below the upper fringe was a distinct somewhat narrow zone that appeared to be dominated by Lyngby's Sedge with Beach Wildrye now a subdominant. Unique within this zone was the presence of a dwarf Fucus species that occurred as a close growing turf or carpet under the grass and sedge layer. Growth of plants in this upper zone appeared to be slightly delayed from the upper fringe zone at this time of year, with the grasses appearing smaller and sparse in density. Later in the summer this zone may be indistinguishable from the upper fringe except for the occurrence of the fucoid mat under the grasses.

[25] Rusanowski, P. 2009. *Soule River Watershed Environmental Report for 2008*. The Shipley Group, Utah.

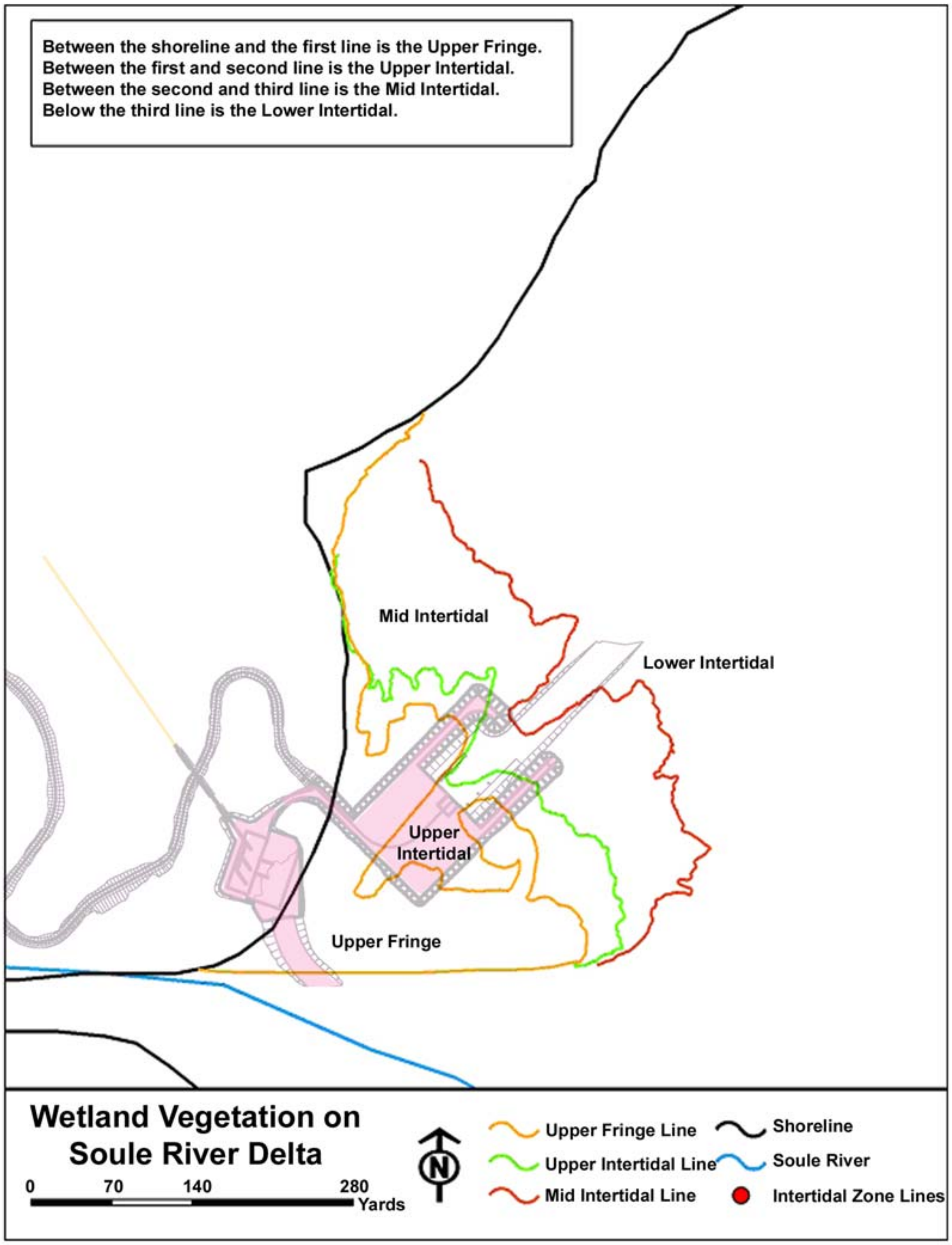


Figure 61 – Map of the Soulé River Delta showing the location of four distinct zones within the delta distinguished by vegetation and substrate. Approximate location of Marine Access Facility, Powerhouse, Substation, Tailrace, and Access Road are shown superimposed on delta.

The mid intertidal zone was dominated by Fucus sp. algae that overlapped with the upper intertidal and lower intertidal zones. The mid intertidal zone was a robust area dominated by extensive coverage of Fucus to the exclusion of other species. However, on close inspection, and particularly on the lower boundary, mussels were common growing on pebbles as well as the bases of the algae. There was not a distinct border between this zone and the upper or lower intertidal zones, but rather a gradation over several feet. The wetland zones tended to converge as they approached the river channel as shown in Figures 61 & 62 where the upper intertidal, mid intertidal and lower intertidal zones can be clearly seen.

The lower intertidal zone is comprised of boulders, glacial silt flats and patches of fucoid vegetation. The boulders lie in a distinct band just below the mid intertidal zone. Most of the lower intertidal is dominated by bare glacial silt flats. Boulders within this zone showed little epizootic or epiphytic attached organisms, but that might change with the seasons. In contrast, boulders that occur in the mid intertidal zone are covered with Fucus, mussels and barnacles. These three zones are clearly shown in Figure 62 below.

Figure 62 – Soulé River Delta showing the upper intertidal zones dominated by grasses and sedges, the mid-intertidal zone dominated by Fucus, and the lower intertidal zone and grassy upper tidal zone dominated by glacial silt flats, boulders, and scattered fucoid vegetation

<u>Environmental Effects</u>

Alteration of Existing Flow Regime

Under the Applicants Alternative the existing flow regimes in the West and North forks and Main Stem of the Soulé River would be altered.

Our Analysis

<u>Applicant Alternative</u>

Under the Applicants current alternative, the North Fork would be flooded except for the uppermost 0.3 mile below No-Name Lake, inundating most of the North Fork valley. The West Fork will be inundated by the reservoir for about ¾ mile of its length from the dam site. The source of flow into both forks will not be changed, nor will they be directed elsewhere. Both forks will however flow into the reservoir, altering their flow in that way. The Main Stem of the river, below the dam will have its flow regime altered by reducing the flow and/or changing the timing of high flow in the river. At times the flow below the dam will consist of only what drains into the river from precipitation, snow and ice melt from the ridges on either side, and a few drainages on both sides of the Main Stem. At other times, i.e. peak summer snow and ice melt and precipitation, water will spill from the Project spillway at the Saddle Dam when the reservoir is full.

This will alter the flow regime of the Main Stem of the Soulé River, however, the river exhibits limited microbial activity, does not support any salmon runs and may reduce the number of Dolly Varden washed out of the system, both from No-Name Lake and from Dolly Varden Creek on the Main Stem. Sediment transport would be partially interrupted by the dam, however, peak flow occurs during the summer and could be used to flush sediment from behind the dam down river, simulating what naturally occurs, but with a greater volume of sediment at one time. However, a significant amount of glacial flour will also be passed through the projects 16-foot-diameter Power Tunnel, and then through the Turbine and Tailrace back into the river mouth during operations, maintaining sediment contributions to the delta. During summer operations, when the highest sediment loads occur, the project would operate in run-of-river mode at full capacity; in this way a significant amount of naturally occurring glacial flour and sediment will be transported to the river mouth.

Land Use Alternative

Under the Land Use Alternative, the existing flow regime of the river would not change as this alternative is situated in a natural side channel where a small amount of the total flow diverts about a quarter mile before spilling back into the Main Stem. This alternative would use a maximum amount of 90 cfs; summer Main Stem flows fluctuate between 1,500 cfs to 3,000 cfs with peaks above this. This alternative will have no impact on the transport of sediment because it is in a "minor" channel off the Main Stem, about 2,900 feet up from the river mouth. At this point in the river the Dolly Varden would be being washed out of the watershed, unaffected by this alternative, which isn't in the Main Stem.

Effects on Water Quality

Under the Applicants Alternative the existing water quality of the Soulé River would not be significantly altered.

Our Analysis

Applicant Alternative

Under the Applicants Alternative, during construction, temperature, total dissolved gas, pH, dissolved oxygen, conductivity, suspended sediment, and turbidity levels would not be significantly impacted with the use of an Erosion and Sedimentation Control Plan. The total dissolved gas, pH, dissolved oxygen, and conductivity will remain basically the same as pre-project conditions. Suspended sediment and turbidity levels may be reduced as the reservoir allows some of these particles to settle out, however, with the projects 16-foot-diameter Power Tunnel a significant amount of sediment should continue to be transported to the river mouth, the point of project discharge. In addition, at some point the buildup of sediment behind the dam will have to be flushed down river, but this is not expected to be necessary on an annual basis. Flushing the sediment buildup from behind the Main Dam would briefly increase suspended sediment and turbidity levels in the Main Stem. Under operational conditions the reservoir may cause a slight increase in water temperature due to residence time in the reservoir and effects of insolation over the large surface area of the reservoir. However, considering that the main source of water is coming from the West Fork during summer periods when the reservoir might spill, with water temps at 1º-2ºC, water temperature is likely to remain relatively cold. Water quality at the river mouth will also be maintained by the project discharging into the mouth, maintaining the majority of the natural sediment load currently found there.

Land Use Alternative

Under the Land Use Alternative, water quality would not be impacted due to the reduced size of the project and its associated land clearing as well as the use of an Erosion and Sedimentation Control Plan. There will be no impacts to the transport of the naturally occurring sediment to the river delta because this alternative would be located in a side channel of the river that receives only an insignificant amount of the river flow and the project would also discharge back into the river at the top of the Lower Gorge.

Avalanches and Jokulhlaups

Under the Applicants alternative, avalanches and jokulhlaups are not expected to significantly impact the reservoir and dams.

Our Analysis

Applicant Alternative

Under the Applicants Alternative, there are currently no lakes of significance at the terminus of the Soulé Glacier that could result in a jokulhlaups. No plans are made for avalanches or jokulhlaups (we presume this is meant in regards to the dam and the possibility it could be overtopped by a wave or surge of water) in the dam design.

Land Use Aternative

Under the Land Use Alternative, avalanches show no sign of occurring at the diversion site. Jokulhlaups, if they should occur from the Soulé Glacier, may be greatly dissipated by the time they get to the diversion site. Impacts would be expected to be minimal, with potential increased flow in the "minor" channel that would not experience the full energy of flooding due to the distance down river and the "L" shape of the channel which would dissipate more of the energy. The Main Stem would bare the brunt of such an event.

Effects to Anadromous Salmonids

Under existing conditions salmon do not use the Soulé River. Dolly Varden use No-Name Lake for rearing and foraging habitat and spawn in the outlet at the head of the North Fork. Dolly Varden Creek on the east side of the Main Stem also provides habitat for all life stages of Dolly Varden, and are probably of the same genetics as those in the lake. Once Dolly Varden get into the Upper Gorge they cannot return to the North Fork or the lake. Once Dolly Varden get into the Lower Gorge, they cannot return to the Main Stem. Annual summer flows in the Soulé River flush Dolly Varden out of the system into Portland Canal.

Under both alternatives, effects to anadromous salmonids would be minimal.

Our Analysis

Applicant Alternative

No salmon occur in the Soulé River. Dolly Varden however are in No-Name Lake as well as in Dolly Varden Creek, which is on the Main Stem. The Project effects on Dolly Varden would be to reduce flow in the Main Stem during most months of the year while the reservoir refills or water is used. This dewatering may have an impact on the Dolly Varden in Dolly Varden Creek by reducing opportunities to be washed out of the river system if flow is reduced, improving their habitat range. Their access to the Main Stem will remain and Dolly Varden Creek is not dependent upon the river, relying on its own flow from the hillside and includes habitat for all life stages; the only potential impact to Dolly Varden in Dolly Varden Creek is the potential loss of future recruitment, at least at levels before the project, from the No-Name Lake population. Fluctuation of flows between 500 cfs to – 3,000+ cfs peak flows will no longer occur on a regular basis; project operations will reduce these fluctuations in the Main Stem, being primarily reliant on snow and ice melt and precipitation from the surrounding ridges and drainages, such as Dolly Varden Creek, and the occasional flushing flow from the projects Main Dam, or spill from the Saddle Dam spillway.

Dolly Varden washed down river from No-Name Lake would have a better chance of returning to the lake because of the reservoir preventing there going down through the Upper Gorge. At the same time it is possible that Dolly Varden ending up in the reservoir may choose not to swim back to the lake and will be affected by reservoir drawdown. If the reservoir creates optimal spawning habitat for Dolly Varden in the old river channels, reservoir drawdown may also impact this by dewatering redds before smolts have emerged. The Project will have no direct effect on No-Name Lake and its Dolly Varden habitat because the reservoir will not reach the lake and all the Dolly Varden spawning habitat that's in the North Fork will remain above the reservoir. The reservoir, when it is full, will cover some of the juvenile rearing habitat that primarily exists in the first 3500 feet of the North Fork. Approximately 1900 feet of the juvenile rearing habitat would be covered by a full reservoir during the months of July through November, leaving approximately 1600 feet of the original North Fork. Lesser amounts would be covered during the months of May, June, December, and January, making that habitat available for rearing. During the months of February through April it is expected that all juvenile rearing habitat in the North Fork would be available.[26] It is also possible that Dolly Varden that have entered the reservoir may be washed downstream over the spillway at the saddle dam during high summer flows.

The Projects' effects on aquatic resources would be to reduce flow in the Main Stem during most months of the year while the reservoir refills and/or water is used for generating power, but this river exhibits limited microbial activity,[27] so the reduced flow may have little environmental effect in terms of supporting fish. Side drainages will provide some flow to the Main Stem, varying with the seasons, when none is coming from above the dam. With about 30+ feet of snow annually that the watershed receives, drainage from either side of the Main Stem may be significant from spring into early-mid summer from the significant snow and ice fields on surrounding ridges.

Because no salmon use the Soulé River, the Projects' effects on salmon species would only occur if project operations affects sustaining the sediment transport to the river delta that is foraging habitat for out-migrating Salmon River juvenile chum. The barge facility is only 150 feet wide paralleling the shoreline, and should not have a significant impact on foraging habitat for juvenile salmonids. The riprap within the barge facility will also act as foraging habitat and provide some protection from predation to juvenile salmonids that otherwise doesn't exist on the delta, as well as add more habitat diversity to the delta as the rock will provide nooks and crannies for foraging and hiding.

<u>Land Use Alternative</u>

Under the Land Use Alternative, the diversion would be placed 2,900 feet up river from the river mouth and would have no effects on salmonids because the project would be out of the Main Stem. This location is at the top of the Lower Gorge and at this point in the river, Dolly Varden are being washed downriver through the Gorge to Portland Canal with no chance to return. The Land Use alternative designs tailrace will discharge into the Lower Gorge and be inaccessible to fish being washed down the gorge.

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[26] The primary juvenile rearing habitat in the North Fork exists from the lake down to "Waterfall Creek."
[27] The Shipley Group. 2008. *Soule River Watershed Environmental Data Report for 2008*. Page 59.

Impacts on Delta Fisheries and Aquatic Resources

Under existing conditions juvenile chum salmon use the Soulé River delta for foraging habitat as they move down Portland Canal to the ocean each spring. Under the Applicants Alternative, effects to juvenile chum salmon would be minimal as some habitat would be lost due to project Marine Access features, but would also add habitat diversity by the same project features (riprap instead of delta intertidal zones with grasses, sedges, forbs, and fucoid vegetation). A significant amount of the natural vegetation and shoreline will remain after construction is complete, including freshwater drainages at the northern edge of the north delta and others around Glacier Bay. The south delta will remain untouched by project features or construction.

Our Analysis

Applicant Alternative

The Applicants Alternative would place the marine access facilities, road, staging area, and a small part of the tailrace on the north delta with the substation, powerhouse, and majority of the tailrace within the treeline. Loss of delta fringe for juvenile chum foraging would occur mostly at the marine access facility meant for barges, landing craft, and a dock for small watercraft, which cuts into the edge of the delta. This would change between 25%-30% of the north delta fringe habitat from grasses, sedges, forbs, and fucoid vegetation to riprap. The tailrace will be in an area of marginal foraging habitat because of the river channel and flow and will use little of the delta. This will leave approximately 70%-75% of the total delta natural fringe habitat available for foraging fish. The marine access features and staging area will create more diverse habitat, allowing juveniles to find protection as well as foraging habitat because project features will be lined with riprap. This may add better hiding from predation than what currently exists. Loss of delta aquatic resources are relatively small and are balanced, in part, by adding the riprap habitat.

Land Use Alternative

Under the Land Use Alternative, there would not be any project features placed on the delta other than trenching through the delta to bury the transmission line and therefore no impacts to fisheries or aquatic resources at the delta.

Submarine Cable impacts to Fisheries and Aquatic Resources

Under existing conditions no submarine cable exists in Portland Canal. Several species of salmon use Portland Canal as well as marine mammals. Under both land use alternatives, effects to fisheries and aquatic species would be minimal.

Our Analysis

Both alternatives would use a three-phase submarine cable. When more than one phase is present, the electromagnetic field that each phase generates is cancelled by each other. If only one phase was present there would be an electromagnetic field, and depending on the voltage, would be large or small.[28] In addition, the cable will be buried in the canals' sediment, which would also reduce any electromagnetic field. The cable will continue to have sediment build up over it as time passes, further creating a barrier to any possible electromagnetic field. The cable will have no significant impact to fisheries or aquatic resources.

Riverine Habitat Inundation with Reservoir Fluctuations

Under existing conditions, Dolly Varden do not use the West Fork. No-Name Lake provides for all life stages for Dolly Varden and the North Fork headwaters provide additional (probably primary) spawning habitat for them. Only small numbers of Dolly Varden juveniles were found in the North Fork below the spawning habitat, but it is believed they use the first 3500 feet of the river for rearing; down to Waterfall Creek.

Under the Applicants Alternative, flooding of both the West and North fork riverine habitat would have negligible impact on the sustainability of Dolly Varden.

Our Analysis

<u>Applicant Alternative</u>

Under the Applicants Alternative, the reservoir would inundate the riverine habitat of the North Fork to within 1/3 of a mile below No-Name Lake, as shown in Figure 63. This area that would not be inundated is the spawning habitat used by Dolly Varden, most of which occurs very close to the lake outlet, well above the full reservoir. Fish studies show that adult fish reside in the lake, doing most of their rearing within the lake rather than in the North Fork, where no adult fish were ever found (other than at the lake confluence for spawning); some very large Dolly Varden were caught in the lake (up to 560mm). Few Dolly Varden were found below the spawning habitat in the North Fork, and they were all juveniles. Due to the suspended sediment load of the West Fork, which is considerable and intolerable to fish, and the flow velocity and sharp turn at the two Forks confluence that Dolly Varden would have to take to get into the West Fork, it is unlikely that Dolly Varden use this fork for any type of habitat. Reservoir fluctuations could affect Dolly Varden if they have found favorable spawning habitat along the

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[28] In example: A similar scenario is that during WWII the British discovered that their steel hulls had an electromagnetic field that attracted German magnetic mines. The solution was to put electric wires into the hull and by running electricity through the wires they created another electromagnetic field, which cancelled out the electromagnetic the field steel hulls generated, thus eliminating those mines as a threat. Having more than one electric cable together has the same effect of cancelling out the others electromagnetic field.

reservoir banks, potentially exposing redds before smolt have emerged. Because this would potentially be additional habitat for Dolly Varden, it is doubtful that any impacts from reservoir elevation fluctuation will have any impact to the sustainability of this Dolly Varden population in No-Name Lake. Existing spawning habitat will remain outside of the reservoir and the reservoir will likely reduce the numbers of Dolly Varden washed down river to Portland Canal. However, a full reservoir may take away some of the juvenile rearing habitat found in the first 3500 feet of the reservoir by up to 1900 feet. However, this alternative is not expected to have any significant impacts to the sustainability of Dolly Varden.

Land Use Alternative

Under the Land Use Alternative, no impacts would occur to resident fish species and their migration, spawning, and rearing habitats in the North Fork Soulé River, No-Name Lake, and Dolly Varden Creek because this alternative only has a small diversion structure off the Main Stem in a “minor” channel that only receives flow during the summer high flow near the beginning of the Lower Gorge, well below any habitat. This alternative would have no impacts on the sustainability of Dolly Varden in the watershed.

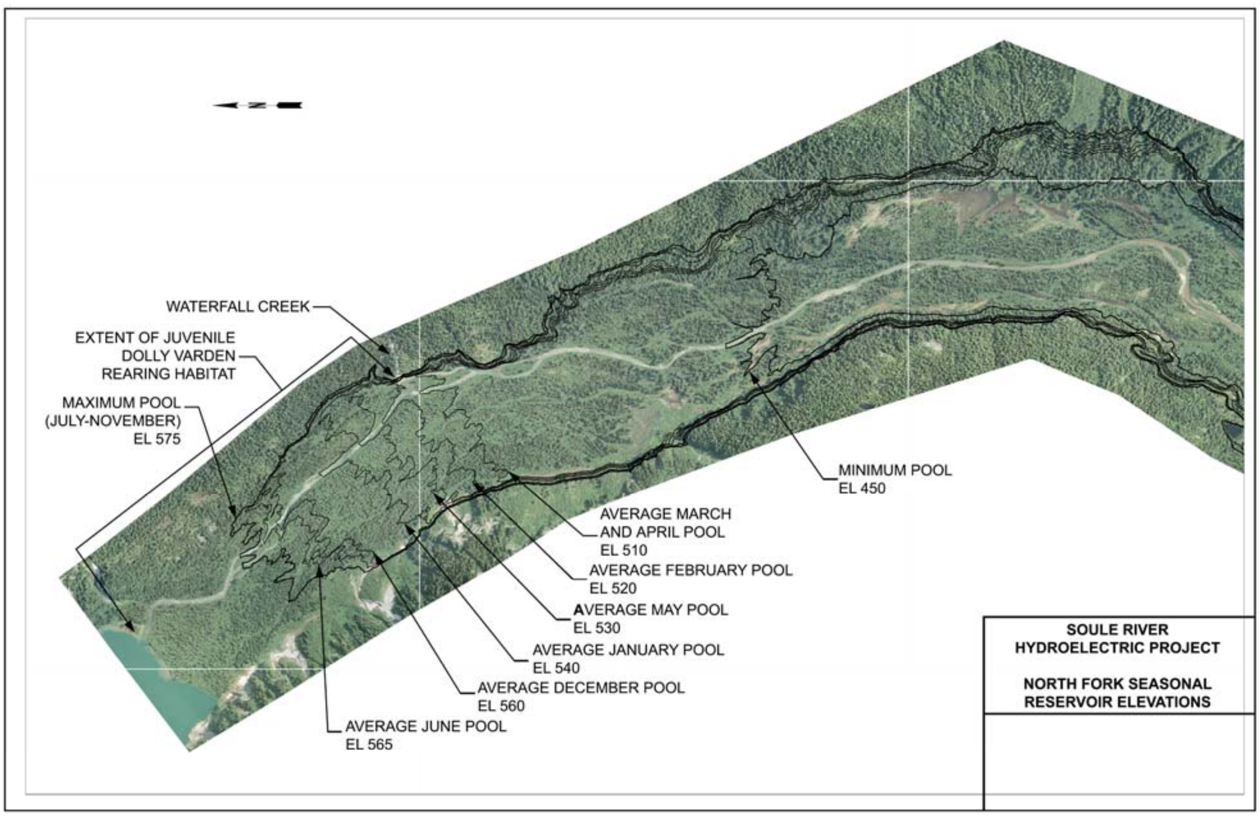

Figure 63 – Seasonal Reservoir Elevations in the North Fork Valley

Unavoidable Adverse Impacts

Unavoidable adverse impacts to aquatic resources would include:

- The occasional recruitment of Dolly Varden to Dolly Varden Creek may be interrupted if fewer Dolly Varden are washed down river because of the influence of having a dam at the Upper Gorge.
- Loss of wetland habitat (Yazoo channels) along the North Fork that would be flooded by the reservoir.
- Loss of beaver habitat to within 0.3 miles of the reservoir along the North Fork; although beaver habitat will remain above the reservoir to the lake and other beaver habitat exists around the project. It is unknown whether beaver habitat will be created by the reservoir, either by the undulation of the reservoir to the topography and/or with drainages flowing into the reservoir.

Cumulative Effects

Fish cannot access the Soulé River nor is their habitat available below the lowest anadromous barrier near the river mouth. Due to these anadromous barriers outlined above, i.e. falls and velocity barriers, and a mostly cobbled river bottom and water temps around 1-2ºC during the summer along with a heavy glacial flour load, fish cannot get up into the river to find what little habitat there is. Even the Dolly Varden in No-Name Lake, once flushed down river, only have the opportunity of surviving within the rivershed if they can find Dolly Varden Creek on the east side of the Main Stem, otherwise they will eventually end up in Portland Canal when the summer high flow occurs.

Whatever environmental effects projects by ADOT and the USFS may have on drainages in the Hyder and Stewart area along with jokulhlaups, the Soulé River Project only has the potential to affect juvenile chum (and other juvenile salmonids) during their out-migration if the sediment load transported by operations does not sustain the existing river delta. This potential cumulative effect can be countered, if necessary, by flushing sediment down river on an as needed basis during the period of naturally occurring high flows when high sediment load also naturally occurs. The Project has a vested interest in maintaining the delta as well for the continued integrity of project features on the delta. The Applicant proposes to conduct sediment transfer studies of the river delta, as was started in 2009, every 3-5 years for 20 years to follow what happens with the delta. Even though the project will be discharging into the river mouth supplying glacial flower back to its point of origin for Portland Canal, if significant changes occur to the delta during operations such that the delta is eroding, adaptive management will be used to find a solution; which would basically be working out a schedule for sluicing sediment down river from the dam annually to mimic natural sediment transfer.

There will be little or insignificant impacts to Dolly Varden because their rearing habitat is No-Name Lake, although juvenile Dolly Varden also use the first 3500 feet of the North Fork. Approximately 1900 feet of the North Fork juvenile rearing habitat will experience reservoir fluctuations, but overall the population should be unaffected by the Project, thus making cumulative impacts to fish stocks in the area insignificant. Impacts to Dolly Varden in Dolly Varden Creek will not be significant in that reduced flow in the Main Stem may provide greater opportunity for recruitment from fish flushed down river from the No-Name Lake population; although this may occur less often with reduced flow coming from above the dam and so less opportunity for fish from the lake to get flushed down to the Main Stem for recruitment to the creek. The reduced velocity may mean that for certain periods fish will have greater use of the Main Stem rather than being flushed out to Portland Canal as frequently. Because Dolly Varden Creek is sustained by its own flow off the hillside and has habitat for all life stages of Dolly Varden, it is not dependent upon the Main Stem except for occasional recruitment of Dolly Varden washed down river.

3.8 Terrestrial Resources

Affected Environment

Habitat Description
Wildlife surveys were conducted during the three years (2007-2009) of field investigations at the Soulé River Watershed. Evidence of wildlife was rare according to biologist conducting the field studies (Field Notes by Richard Carstensen; can be found in *Appendix P: Habitat Surveys Field Journal*). Similar comments by other biologist conducting surveys at the Soulé River Watershed occur in the *2008 Environmental Survey* and *Ecological Field Investigations 2009* reports.[29]

The Soulé River Watershed is within the Coast Range and part of the Coast Range batholith – a monolithic Tertiary-Eocene intrusive of granite and granodiorite - a relatively low-diversity, low-productivity area in terms of plants and wildlife. The Soulé Ice sheet, which caps the southern southeast Alaska/Misty Fjord part of the Coast Range, feeds the Soulé glacier, which is part of the watershed at the head of the West Fork of the Soulé River. The valley walls of the project area are steep with lots of avalanche tracks and the valley bottoms are alluvial with reworked outwash and floodplain material overlain in areas on the sides by alluvial fans and colluvium.

The watershed has two forks: the West or glacial fork is approximately 1.5 miles long, is glacial in origin, has active outwash in the upper part of the valley beyond the study area and is heavily silted and braided, characterized by rounded cobble and boulders and almost continuous rapids. The North or lake fork which is approximately 3.5 miles long, comes out of No-Name Lake and though the system was obviously once glacial it is now a clear stream. Most of the avalanche paths and alluvial fans have small drainages coming down them and when they reach the valley floodplain they coalesce and form

[29] The Shipley Group. 2009. *2008 Environmental Report*., and ; *Ecological Field Investigations 2009.* See Appendices.

yazoo channels[30] (Figures 64-66) along the outer edges of the valley floor. Almost all of these channels have beaver dams, active and inactive, along most of their length.

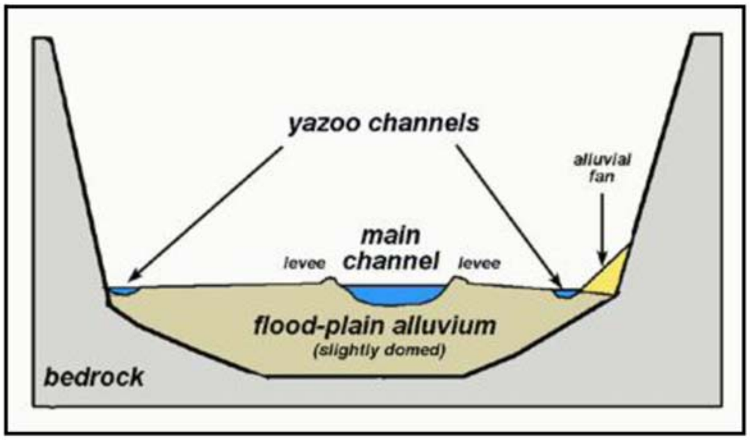

Figure 64 – Yazoo Channel Schematic

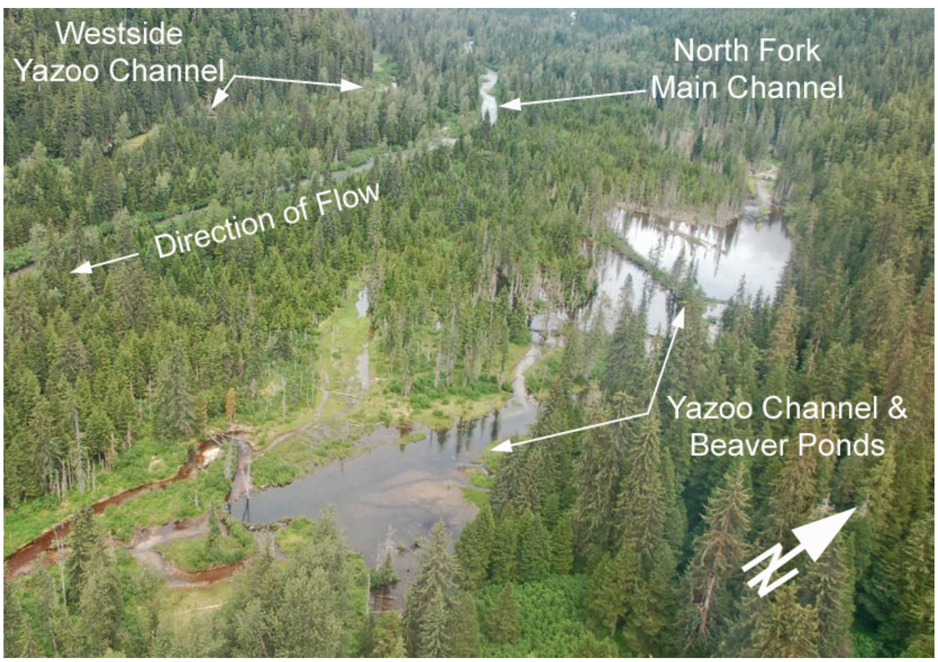

Figure 65 – East side of North Fork with beaver pond, yazoo channels, main channel, and west side yazoo channels in background

Because the valley bottoms are all course, well-drained, alluvial material, the beaver dams, both the active and the recently dewatered, are the only wetlands found on the valley floor. Ninety percent of the yazoo channel beaver ponds in the North Fork and

[30] A **yazoo stream** is a hydrologic term for any tributary stream that runs parallel to, and within the floodplain of, a larger river which the stream eventually joins. The name comes from the **Yazoo River**, which runs parallel to the Mississippi River for 280 km (175 miles) before converging, constrained from doing so by the river's levees.

lower West Fork valley's were inspected and the remainder were mapped from high resolution aerial photography. The beaver and these beaver ponds are transitional and may change from year to year.

Figure 66 – The above image clearly shows yazoo channels on both sides of the North Fork

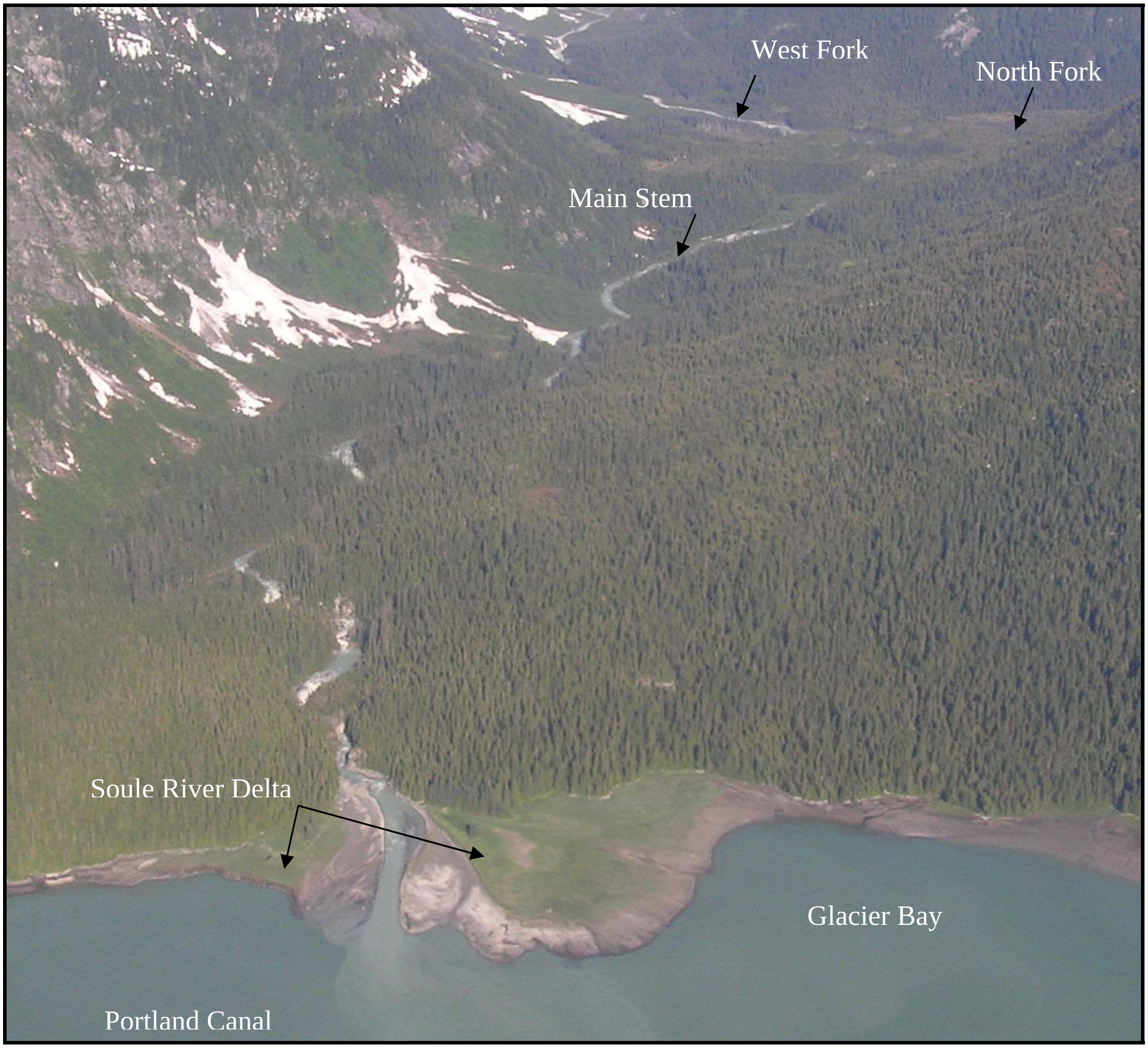

Figure 67 – Upstream view of the Soulé River showing the broad U-shaped valley and the spatial relationship between the West Fork, North Fork, Main Stem, and river delta

The fairly recent active avalanche run-out zones in the lower valley of the West Fork and a similar one on the west side of the Main Stem of the Soulé are just now being colonized by beaver and will probably have more dams in the near future. Because of the drainage patterns and the almost perennial snow pack just above these large avalanche path bases, it is almost all wetland already so the beaver activity will not change the status or overall wetland acreage, just the character of the wetland.

The confluence of the two forks is approximately 2.2 miles up from the river mouth and delta. The Soulé River at and below the confluence is partly bedrock-controlled (Upper Gorge) and flows through several inaccessible gorges with waterfalls in sections just at and below the confluence as well as at the mouth of the river (Lower Gorge), just above the delta where similar bedrock features are present. In between these sections is an area where an inactive alluvial terrace grades down from 400 feet above sea level to 300 feet above sea level. In this alluvial section there are a few yazoo channel beaver dams similar to those in the North Fork valley.

The river delta is broad and flat and composed primarily of glacial silts, with sand and larger gravels, cobbles, and boulders along the banks of the river mouth, see Figure 67 above. More than two-thirds of the delta is intertidal under most tidal conditions, and virtually all of it is indirectly affected by the tide.

Terrestrial Resource Surveys

For the 2007 field season the following studies were conducted:

- General habitat field survey of river delta, Main Stem, and North Fork;
- Examination of probable anadromous barriers at Upper Gorge and Lower Gorge;
- Fish surveys to determine presence/absence and species type in Main Stem; and
- Literature search of available information on Southeast Alaska in general and the Soulé River Watershed specifically;

For the 2008 field season the following studies were conducted:

- Delta survey of the powerhouse site and vicinity (bathymetry, wildlife, eagle nesting survey by boat, rare and endangered species, and dominant habitat types in the vicinity of the powerhouse);
- Habitat and wildlife evaluation of the lower ends of the West and North fork valleys;
- Forest Quantitative Metrics survey
- Assessment of North Fork fisheries, wildlife, habitat, and wetlands within the North Fork valley floor;
- No-Name Lake fisheries assessment; and
- North Fork spawning habitat survey.

For the 2009 field season the following studies were conducted:

- Water quantity and quality surveys of the North and West forks and river mouth;
- Tier II aquatic stream habitat survey
- Substrates and sediment transport survey
- Tidal gauge
- Wetland delineation;
- Bald eagle nesting survey (by helicopter)(year 2 survey);
- Amphibian survey;
- Goshawk survey;
- Mountain goat survey (both by consultants and by ADF&G);
- Habitat survey of West Fork and dam site;

• Spawning survey at No-Name Lake outlet;

• Recreation and subsistence survey of Hyder residents and Ketchikan Air Services and guides;

• Timber inventory; and

• Heritage resource survey.

Summary Ecological Field Investigations

The vertebrate fauna of the Soulé River Watershed is depauparate. This is due to a number of interacting factors:

- Extremely rugged topography and landscapes,
- Unusually deep annual winter snows (possibly over 30 foot depths),
- Relatively recent regional glaciation with an active glacier still present and providing much of the in-stream flows,
- Lack of significant species source areas,
- Isolation by significant mountain and glacial barriers for non-flying species

These factors are particularly important in the case of amphibians and mammals. The one to three mile wide Portland Canal (a marine fiord) and steep coastal British Columbia mountains form an effective barrier to the east. Extensive mountains and glaciers form the major northern, western, and southern barriers from the Pacific Coast, and the maritime coast itself is highly fragmented with islands and peninsulas. The Salmon River valley lies over the mountains and alpine habitats to the east and north. The Soulé River Watershed is essentially surrounded by high mountains and glaciers, and its waters empty into a wide marine fiord. The West Fork and approximately half of the Main Stem are from glacier melt water, and are therefore close to freezing temperatures and extremely cloudy with glacial flour (pulverized bedrock). The North Fork is the outflow of No-Name Lake, a very deep and unproductive lake that is the remains of a melted glacier. Although very clear, the North Fork is only several degrees warmer than the West Fork, and has very low primary and invertebrate productivity, because of both low temperatures and nutrients.

The North Fork appears as high quality habitat for trout and salmon. However, except for widespread but uncommon juvenile Dolly Varden, large fish are absent, because of very poor over-wintering habitat and instream flows and probably low food availability. Two populations of Dolly Varden represent the only fish in the Soulé Watershed. A small but health population is at No-Name Lake, and breeds in the Upper North Fork. The other is a small population with stunted individuals in a small stream fen wetlands complex on a ridge above the Main Stem of the Soulé River.

No amphibian species were previously reported for the Soulé River Watershed. In this study, two amphibian species were documented. The Boreal Toad is relatively rare, but widespread in the watershed. It was primarily associated with beaver ponds and fen wetland complexes, but was also found along the river in riparian and conifer forest habitats. Tadpoles and metamorphs were also found on the south Delta. The tadpole pond on the south Delta was near Portland Canal and is inundated completely by spring tides. Boreal Toad adults are tolerant of brackish water and even some exposure to ocean saltwater, but the water flooding the pond was very fresh because of the strong influence of the glacier melt-water of the Soulé River. Tadpoles were only found in a single other location, despite intensive searches. Two separate groups of tadpoles were found in a large fen wetlands complex above the Main Stem on the west side.

Northern Roughskin Newts were found in fen wetlands complexes at only two locations in the entire Soulé River Watershed: lower West Fork, north side, just north of the confluence; and in a extensive fen wetlands area above the Middle Stem, on the east side. They appeared to be relatively abundant at these sites.

An unknown frog species was briefly seen on at least five occasions that readily avoided capture in dense litter or grass. The frog was widely distributed from the Lower North Fork, Main Stem, and the Delta marsh. The general appearance and behavior suggested a Wood Frog, but based on its general geographical distribution it could have been the Columbia Spotted Frog. These two species of frog and two salamander species are potentially occurring amphibians in the Soulé watershed. Three other frog species were classified as unlikely to be found in the Soulé.

The extreme rugged topography, mountain and alpine barriers, marine environments, and habitat complexity and fragmentation of Southeast Alaska's landscape and their habitat elements, present significant obstacles and challenges to local amphibian populations and their dispersal potential. Amphibians are very limited in their dispersal ability under the best of circumstances, but mountains and marine or brackish water barriers are particularly significant. Boreal Toads are very unusual in their tolerance of marine conditions. Apparently, Roughskin Newts must also be good colonizers in Southeast Alaska, because its maritime coast and numerous coastal islands are well colonized by this species.

Reptiles have never been documented anywhere in Alaska, with the exception of occasional carcasses or living sea turtles washed up on coastal beaches.

The mammal fauna of Soulé River Watershed is also depauparate.[31] The Soulé River Watershed was particularly notable by the scarcity of mammal observations and their signs throughout the watershed. Mammal tracks were almost non-existent in the widely available sandy and muddy substrates around rivers, streams, beaver ponds, wetlands, the Soulé Delta, and Portland Canal beaches. Scats were also scarce, with some notable exceptions. Rodent burrows and grass runways for voles are typically easily documented

[31] de·pau·pe·rate; adjective
1. lacking species variety: lacking or depleted in the variety of plant or animal species
2. not fully grown: less than fully grown or developed
[Mid-19th century. < medieval Latin depauperatus, past participle of depauperare "impoverish" < Latin pauper (see pauper)]

and may even be abundant when rodents are present. This was not the case in the Soulé Watershed, and even our campsites at four different and widely separated locations failed to attract a single rodent, even though food opportunities were presented for them. Bats are easily observed foraging in the evening hours, and we did not see any even when camping. Flying insects were occasionally very abundant.

The most notable mammal in the watershed was the American Beaver. It was very rarely seen, but its hydrologic engineering was apparent everywhere in the watershed. Red Squirrels were the next most notable mammal, and they were heard throughout the watershed. They were not particularly abundant, and were closely associated with Sitka Spruce, a species also scattered, but not particularly abundant in the watershed. Black Bears were present and there were significant food items available for this omnivore in the Soulé Watershed. Their scats, scrapes, feeding on vegetation, and occasional tracks were noticeable on a daily basis, but not particularly abundant.

Carnivores were very scarce, apparently because of prey availability. A few American Otters were seen along the North Fork, and they probably fed on juvenile beavers, fish, and birds. Otter sightings were more common in Portland Canal at the Delta where more fish and marine invertebrates were available. A single Mink track was seen on the Delta. Harbor Seals were common in Portland Canal. A pod of six Dall's Porpoises, resembling small Orcas, tracked our boat for a short distance in Portland Canal. They are only known in deep waters of the North Pacific, typically on the continental shelf. They are not recognized in Portland Canal, and would be unusual in this habitat.

A small herd of Mountain Goats was present in the subalpine and alpine mountains overlooking the Soulé forks. Sitka Black-tailed Deer are only found in forested slopes near Portland Canal and the Delta. They are presumable limited to areas that do not accumulate very deep snowfall.

Six jumping mice were seen in the watershed. There are two potential species in this area. The species is probably the Western Jumping Mouse, based on both visual appearance and previous museum records. The overall lack of rodents was unexpected. But the lack of burrows, runways, and both mammal and avian rodent predators was very apparent.

Although birds were not particularly numerous visually or vocally in the Soulé Watershed, they were the predominant vertebrate class. Mountain, aquatic, and habitat fragmentation barriers are not a serious concern for birds. We were surprised to document 35 potentially breeding species that we found in the watershed, and another 12 that breed in the adjacent Salmon River Valley. Small songbirds are the most readily heard species on the forest slopes and in riparian zones: Oregon Junco, four thrushes (Swainson's, Hermit, Varied, Robin), and three warblers (Yellow, Yellow-rumped, Wilson's). Flycatchers should be common, but only two were documented (Pacific-slope, Alder). Other important bird faunal elements were four species of woodpeckers, two kinglets, two sparrows, a chickadee, Steller's Jay, Winter Wren, and American Dipper.

An important breeding species in the watershed was the Vancouver Canada Goose, the largest subspecies. Although they were not abundant, goose sign (scats, tracks, and feeding on vegetation) was common and widespread in the watershed. This subspecies breeds as isolated pairs with well-hidden nests in the forest. At least single pairs of Spotted Sandpipers, Common Mergansers, and Harlequin Ducks nested. Pairs of Marbled Murrelets were relatively common in Portland Canal in the spring and summer. Presumably, they were nesting in the high subalpine and alpine landscapes of the Soulé and adjacent watersheds.

Swallows and swifts were not observed in the Soulé Watershed. Aerial insects were at times very abundant. Insects were diverse and abundant in the Soulé River Watershed. Mosquitoes, blackflies (Simulidae), and biting midges (Ceratopogonidae) were notable as pests, particularly in Muskeg or along Portland Canal. A large biting horse (deer) fly (Tabanidae) was at times a major pest. Possibly, insects are not a reliable and persistent resource. The aquatic habitats at the Soulé Watershed are probably not productive enough for the high forage demands of these species.

Raptors and Owls were notable by their absence in the Soulé River Watershed. Detailed Goshawk calling surveys were conducted throughout the Soulé Watershed, the Delta, and the nearby beaches of Portland Canal. The data from this survey is in a detailed separate report that can be found in Appendix H. Goshawks were not seen or heard during this survey or at any other time in the watershed. Adult and juvenile Bald Eagles were occasionally seen in the watershed, but were more typically seen along Portland Canal, where they feed on fish and nest in the adjacent forest slopes. Owls would have been detected in the evenings when the field biologists were camping, but they were never heard or seen. The lack of these taxa is another indicator of the lack of rodents and other small mammals, even birds in the case of Goshawks.

Our fieldwork was primarily conducted during July. This is the summer period after the avian peak of breeding activity. Bird activity, especially vocalization, decreases dramatically after breeding, but both adults and juveniles remain in their nesting habitats or switch to other habitats for foraging before migration. Some species during this time frame, especially Alaskan shore birds, would already be on their way to over-wintering grounds far south of Alaska. However, the forests of Southeast Alaska are not habitat to the high diversity and population abundances of the tundra nesting shore birds. Late May through June bird surveys would be optimal to document singing territorial males on their breeding grounds; this is particularly true for warblers, flycatchers, thrushes, and sparrows.

Mammals

The documentation of mammal species in the Soulé River Watershed is based on 123 Field-Observation-Days in 2007-2009, while conducting a wide variety of ecological field investigations throughout the watershed, the delta, and Portland Canal (Table 7). Most of these observations were opportunistic (General Overview and methods for survey).

Table 7 – Small Mammals Documented & Potentially Present in the Soulé River Watershed

Species	[1]Documented at Soule	[2]Southern SE-AK	[3]Presence at Soule
Large Rodents			
Northern Flying Squirrel (*Glaucomys sabrinus*)	NO	9	Probably
Hoary Marmot (*Marmota caligata*)	YES	2	Alpine
Red Squirrel (*Tamiasciurus hudsonicus*)	YES	>10	Uncommon
American Beaver (*Castor canadensis*)	YES	5	Common
Common Muskrat (*Ondatra zibethicus*)	NO	4	Unknown
Small Rodents			
Meadow Jumping Mouse (*Zapus hudsonicus*)	Unknown*	2	Unknown*
Western Jumping Mouse (*Zapus princeps*)	Probably*	10	Probably*
Long-tailed Vole (*Microtus longicaudus*)	Possibly[4]	>10	Probably
Southern Red-backed Vole (*Myodes gapperi*)	Possibly[4]	>10	Probably
Meadow Vole (*Microtus pennsylvanicus*)	NO	4	Unlikely
Bushy-tailed Woodrat (*Neotoma cinerea*)	NO	1	Unknown
Northwestern Deer Mouse (*Peromyscus keeni*)	NO	>10	Probably
Western Heather Vole (*Phenacomys intermedius*)	NO	1	Unknown
Northern Bog Lemming (*Synaptomys borealis*)	NO	>10	Probably
House Mouse (*Mus musculus*) I	NO	1	No (urban)
Norway Rat (*Rattus norvegicus*) I	NO	2	No (urban)
Insectivores			
Masked Shrew (*Sorex cinereus*)	NO	>10	Probably
Dusky Shrew (*Sorex monticolus*)	NO	>10	Probably
American Water Shrew (*Sorex palustris*)	NO	5	Probably
Bats			
Little Brown Myotis (*Myotis lucifugus*)	NO	>10	Probably
Keen's Myotis (*Myotis keenii*)	NO	2	Probably
Long-legged Myotis (*Myotis volans*)	NO	1	Probably
California Myotis (*Myotis californicus*)	NO	0	Unknown
Silver-haired Bat (*Lasionycteris noctivagans*)	NO	2	Probably

Table 7. Small Mammals Documented and Potentially Present at Soule River Watershed and adjacent Portland Canal.

I = Introduced, non-native species.
[1]Species documented based on 2007-2009 field work.
[2]Presence and distribution based on specimens documented in MacDonald and Cook 2007. Numbers refer to specimen records in southern Southeast Alaska, south of Stikine River, not including Prince of Wales Island.
[3]Potential Presence at Soule River Watershed based on available habitat, and distribution in Southeast Alaska.
[4]Vole diggings found; 15 July 2009; Carstensen 2009.

*Six jumping mice were seen in the Soule Watershed that appeared to be the Western Jumping Mouse, but skull measurements are required for positive identification.

Potential mammal species in the watershed are based on museum specimens and species documentations for Southeast Alaska from MacDonald and Cook (2007). Potential Soulé Watershed mammal species occurrences are from MacDonald and Cook, specifically referring to verified specimen records from southern Southeast Alaska, south of Stikine

River, but not including Prince of Wales Island. The geographic distribution of British Columbia small mammals was also examined, and is based on Nagorsen (2002).

The mammals of Southeast Alaska are not well known or documented. This is particularly true for interior southern Southeast Alaska. Outside of coastal areas and associated islands, and developed areas or settlements such as Ketchikan and Hyder, there are very few museum records. Hyder has surprisingly few mammal records. The Soulé River Watershed and the much greater area surrounding it have not been surveyed for mammals, and of course there are no museum records. Most of the specimen records in MacDonald and Cook were obtained where there was reasonable access or in the vicinity of settlements. Fifty-three percent of mammal species documented in Southeast Alaska by MacDonald and Cook (2007) are based on less than ten specimens.

Tongass National Forest Wildlife Management Indicator Species:

Mammal Indicator Species

1. Brown bear
2. Black bear
3. Sitka black-tailed deer
4. Mountain Goat
5. Gray wolf
6. Marten
7. Red squirrel
8. River otter

Avian Indicator Species

1. Bald Eagle
2. Red-breasted sapsucker
3. Hairy Woodpecker
4. Brown Creeper
5. Vancouver Canada goose

The mammals documented during the Applicants fieldwork, and potential mammals based on MacDonald and Cook (2007) is presented in Table 7 and 8. The tables list 48 species of mammals with the possibility of being present in the Soulé River Watershed and adjacent Portland Canal.

Very little wildlife has been observed in the Soulé River Watershed during the 2007-2009 field surveys (123 Field-Observation-Days were spent by biologist in the Soulé River Watershed and Portland Canal in 2007 to 2009). In 2007, wildlife observations consisted of a river otter on the river delta in the spring and juvenile boreal toads in the fall. During the spring 2008 survey, bear scat and sign of grazing was abundant around the edge of the river delta. One black bear was observed on the beach about 0.5 mile northeast of the delta. The only other land mammal observed was a single red squirrel. A small pod of Dall's porpoise was observed offshore and traveled in the bow wake of the boat for a short time. One harbor seal was observed offshore of the delta during the survey.

Table 8 – Large Mammals Documented & Potentially Present in the Soulé River Watershed

Species	[1]Documented at Soule	[2]Southern SE-AK	[3]Presence at Soule
Porcupine (*Erethizon dorsatum*)	Possibly[5]	4	Unknown
Carnivores			
Cougar (*Puma concolor*)	NO	2	Unlikely
Canadian Lynx (*Lynx Canadensis*)	NO	0	Unlikely[6]
Coyote (*Canis latrans*)	NO	0	Unlikely[7]
Gray Wolf (*Canis lupus*)	YES[8]	>10	Transient
Black Bear (*Ursus americanus*)	YES	>10	Uncommon
Brown Bear (*Ursus arctos*)	YES[9]	2	Transient
Wolverine (*Gulo gulo*)	NO	3	Unlikely
River Otter (*Lontra Canadensis*)	YES	8	Present
American Martin (*Martes Americana*)	NO	>10	Unknown
Ermine (*Mustela erminea*)	NO	>10	Unknown
American Mink (*Neovison vison*)	YES[10]	>10	Rare
Raccoon (*Procyon lotor*) I	NO	0	NO
	[1]Documented at Soule	[2]Southern SE-AK	[3]Presence at Soule
Ungulates			
Moose (*Alces americanus*)	NO	0	NO
Elk (*Cervus Canadensis*) I	NO	0	NO
Sitka Black-tailed Deer (*Odocoileus hemionus sitkensis*)	YES[11]	9	Delta Forest
Mountain Goat (*Oreamnos americanus*)	YES	2	Alpine
Marine			
Steller's Sea Lion (*Eumetopias jubatus*)	NO	1	NO
California Sea Lion (*Zalophus californianus*)	NO	0	NO
Northern Elephant Seal (*Mirounga angustirostris*)	NO	0	NO
Harbor Seal (*Phoca vitulina*)	YES	>10	Common, Port. Canal & at Delta
Sea Otter (*Enhydra lutris*)	NO	0	NO
Harbor Porpoise (*Phocoena phocoena*)	NO	0	Unknown
Dall's Porpoise (*Phocoenoides dalli*)	YES	0	Portland Canal

Table 8. Large Mammals Documented and Potentially Present at Soule River Watershed and adjacent Portland Canal.

I = Introduced, non-native species.
[1]Species documented based on 2007-2009 field work.
[2]Presence and distribution based on specimens documented in MacDonald and Cook 2007. Numbers refer to specimen records in southern Southeast Alaska, south of Stikine River, not including Prince of Wales Island.
[3]Potential Presence at Soule River Watershed based on available habitat, and distribution in Southeast Alaska.
[5]Scat; porcupine; Main Stem Soule, east side, 19 July 2009; Carstensen 2009.
[6]Reported near Hyder, AK.
[7]Documented at Stewart, BC.
[8]Tracks: two sets of single tracks observed half-mile apart, west bank of Soule Main Stem, early December 2009. Scat with beaver hair; bottom of West Fork, south side; 14 July 2009; Carstensen 2009.
[9]Large Scat; No Name lake, south shore; 12-14 September 2007.
[10]Mink track; Delta, at mouth of Soule River; 20 July 2009; Carstensen 2009.
[11]Numerous deer sign: scats, tracks, feeding on vegetation; hemlock forest slopes, above and south of Delta; 12-14 September 2007.

During the 2009 surveys, it was noted that birds and mammals were relatively uncommon in the Soulé River Watershed. This assessment was based on visual, vocal, and sign observations. Sign observations included: tracks in muddy or sandy substrates, scats, feeding evidence, burrows, nests, and activity (e.g., beaver dams and ponds). Carstensen

(2009), a field naturalist and ecologist with extensive experience in Southeast Alaska, also reported on the scarcity of birds and mammals in the Soulé River Watershed. The most common mammals, ranked by decreasing abundance, were: Red Squirrels, American Beavers, River Otters, and Black Bears.

Documented Mammal Species

Out of the 13 documented species in the Soulé Watershed, two were transients, and the jumping mouse was not identified to species. The two transients were identified with their sign: tracks for Grey Wolf and scat for Brown Bear.

Eight species of mammals were visually documented in the field: Red Squirrel, American Beaver, jumping mouse (probably Western Jumping Mouse), Black Bear, River Otter, Mountain Goat, Harbor Seal, and Dall's Porpoise.

In actuality, the vast majority of documentations for three species were not visual. Red Squirrels were mostly vocal identifications, and Beavers and Black Bear were from their signs. Beavers were almost never seen, but their sign was obvious, abundant, and widespread. The Hoary Marmot was vocally documented from its whistle. The Grey Wolf and Mink were documented with their tracks, and the Brown Bear with scat. The Sitka Black-tailed Deer had three signs: scats, tracks, and feeding on vegetation.

The two "Possibly" occurring species are the Porcupine and a vole species. A possible Porcupine scat was found. Shallow surface disturbances appeared similar to vole diggings. Both Long-tailed Voles and Southern Red-backed Voles are potential species in the Soulé Watershed, so these species were classified as "Possibly" present.

Red Squirrels were not as common and obvious as they typically are in northern conifer forests. The preferred food of Red Squirrels is spruce seeds, and a good chance to see or hear one was at a large Sitka Spruce. Sitka Spruce, although widely scattered in the watershed, was not abundant. The most abundant tree was Western Hemlock, which has unusually small cones, and therefore, not as attractive to Red Squirrels. Beaver sign was usually present along the river floodplain, although actual beavers were rarely observed. Otters were rarely seen, especially inland, with most sightings at the river delta. Black Bear sign was fairly common, considering the landscape density of bears, which is low for this watershed. A large female with two cubs was seen (2008), and another bear was heard (2009).[32] Sign (track) of one mountain goat and one bear near the Soulé Glacier terminus were also observed. The helicopter pilot for the field studies in 2009 found mountain goats on three occasions within the Soulé River drainage. A group of 8 was observed on the west ridge near Portland Canal; about half were kids. Another group of four animals was seen on the west ridge above No-Name Lake bedded down on the ice field. Finally another group of 2 was seen on the west slope near the Soulé Glacier. A few Marmots were heard on the tundra slopes near the glacier.

[32] The Shipley Group. 2009. *Goshawk Survey of Soule River Watershed Southeast Alaska July 26-28, 2009*. p. 19-23.

Except for a few jumping mice, small rodents, their burrows, and their runways were not observed in the Soulé Watershed, even with extensive camping at four different sites in the watershed for field studies, *Peromyscus* species certainly should have showed up, but there never was a sign of rodent activity; the absence of small rodents was very apparent. However, a few jumping mice were observed in 2009. There are two species in Southeast Alaska, the Meadow Jumping Mouse (*Zapus hudsonicus*) and Western Jumping Mouse (*Zapus princeps*) (MacDonald and Cook 2007). The latter has been documented in coastal southern Southeast Alaska, including at Hyder. Most museum records for the former are in northern Southeastern Alaska, especially the Skagway region, and there are only two records for the south at Revillagigedo Island. Richard Carstensen, one of the survey biologist, got a good look at the dorsal pelage of a jumping mouse, and on this basis it appeared to be a Western Jumping Mouse (Carstensen 2009)(photo can be found in his report). The museum records also suggest this species, but detailed skull measurements are required for positive identification.

Although aerial insects were present, and there were occasional periods of very high densities of flying insects, foraging bats were never observed in the field; when bats are present they are usually seen foraging in the evening hours.

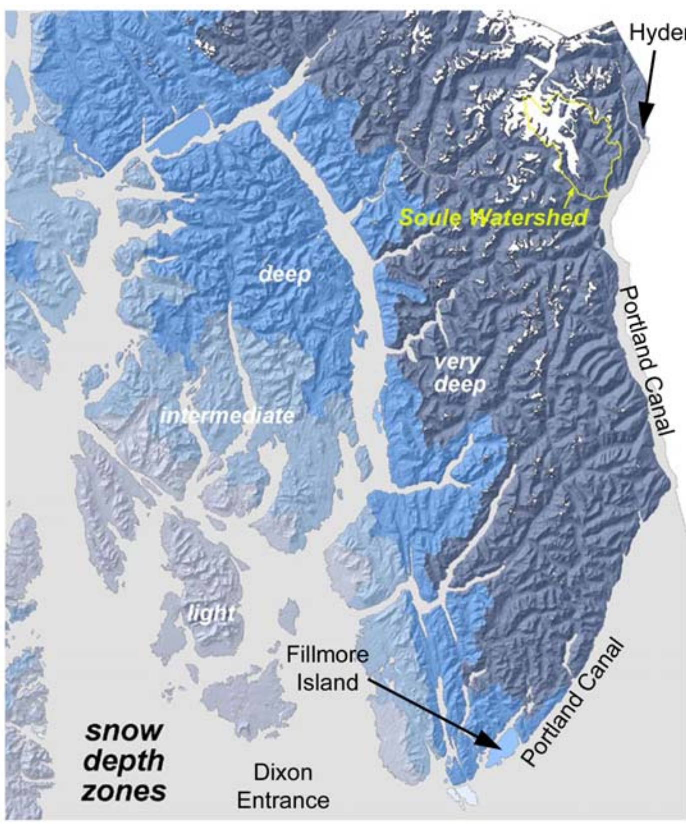

Figure 68 – Snow Depth Zones: Prevent many species from inhabiting the Soulé River Valley

Four potentially common carnivorous were not seen. Three of these species are never abundant even in preferred habitat, are very secretive, and typically very difficult to observe in the field: Martens, Ermines, and Minks. Gray Wolfs are organized into social groups, and are also not readily seen. However, they often vocalize and call, revealing their presence. Wolf calls were never heard by field biologists. Two surprises to the field biologists were the sighting of at least six Dall's Porpoises pacing them on both sides of their 12-foot boat in Portland Canal on the way down to the Soulé River from Hyder, and the lack of sighting of any Sitka Black-tailed Deer. Black-tailed Deer are widespread and abundant in Southeast Alaska. It could be that very deep winter snows, the lack of suitable south-facing slopes for foraging, coupled with very rugged and steep terrain, severely limit their range and or abundance in the Soulé River Watershed. Hyder residents go down Portland Canal to Fillmore Island before finding much deer to hunt.[33] Fillmore Island is located at the entrance to Portland Canal at Dixon Entrance, approximately 48 miles south of the Soulé River, as seen in Figure 68 above.

Red Squirrel *(Tamiasciurus hudsonicus)* (Tongass Indicator Species)
The most common mammal documented (heard but not seen) in the Soulé River Watershed was the Red Squirrel, although they are not particularly abundant. Their scolding chatter was often heard, but they were much more difficult to visually observe. They are widespread in the watershed, and particularly associated with Sitka spruce. Red squirrels feed primarily on spruce seeds, and are abundant in spruce forests, or where there are large stands of dominant spruce (e.g., Sitka spruce). Sitka spruce was also widespread in the Soulé Watershed, but there were no large dominant stands of this species. Sitka spruce represented only 2.7% (20/746) of the tree diameters measured at 19 representative forest stands in the Soulé Watershed. Red squirrels also feed on subalpine fir and mountain hemlock seeds. Western hemlocks were the most abundant trees in the watershed (338/746, 45%), and although larger than mountain hemlocks, they possess much smaller cones, and are not favored by red squirrels. Red squirrels also feed on berries and the cambium and sapwood of conifers. Although the red squirrel was the most common mammal documented, it was classified as "Uncommon" in Tables 7 & 8, because this species typically occurs at much higher landscape densities in more optimal habitat (i.e., spruce forests).

American Beaver (*Castor canadensis*)
The American beaver, although rarely seen, verified its dominance in the landscape by the large number of Black Cottonwoods that were felled or chewed on, and extensive dam building and beaver ponds on both east and west banks of the North Fork. The beaver ponds possessed clear water, where the bottoms were densely covered with beaver scats. A significant number of cottonwood saplings were densely sprouting because of extensive beaver grazing. Parts of open river banks were characterized by patches of low cottonwood shrubs. Beaver gnawing of cottonwood boles clearly demonstrated the presence of deep snow. Frequent snow storms provided fresh surfaces for gnawing (Figure 69). One beaver was seen over a period of 2 days at a field camp at the north end of No-Name Lake. Because the valley bottoms are all course, well-drained, alluvial material, the beaver dams, both the active and the recently dewatered, are the only wetlands found on the valley floor. Extensive beaver ponds and dam building was

[33] Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. July 2009. p. 78. For the Shipley Group.

evident throughout the Soulé Watershed along all river segments, North and West Forks, and the Main Stem (Carstensen 2009). Field studies by The Shipley Group visited 90% of the yazoo channel beaver ponds in the North Fork and lower West Fork Valley's and mapped the others from high resolution aerial photography. The beaver and these beaver ponds are transitional and may change from year to year. Beavers were considered "Common", because their landscape engineering was very evident in most of the watershed.

Figure 69 – Multiple attempts by beavers to harvest a black cottonwood tree repeatedly thwarted by heavy snowfalls

Hoary Marmot (*Marmota caligata*)
On two occasions in July 2009, marmot whistles were heard in the subalpine zone of the watershed, near the glacier at the head of the West Fork of Soulé River.

River Otter *(Lontra canadensis)* (Tongass Indicator Species)
River otters were seen on four occasions. Otters are mostly nocturnal and typically difficult to observe. However, they are sometimes active during the day, especially in overcast conditions, and may be crepuscular (active early or late in the day). Therefore, their relative abundance is very difficult to assess. In a given area, they can be either much more abundant or much more rare than believed.

In 2008, an otter was observed on the west bank of the lower North Fork, and four otters (including juveniles) were very briefly observed along the east bank of the upper North Fork at the waterfall located just downstream from No-Name Lake (August 2).[34] In 2009, six otters (male, female, 4 juveniles) were seen in Portland Canal at the Soulé Delta (July 22); and three adults were seen in Portland Canal just north of the Soulé Delta (July 26).

[34] The Shipley Group. 2009. *2008 Environmental Report*. p. 195.

Otters are carnivores that feed on a wide variety of prey. Juvenile beavers, birds, and fish would be their major prey in the Soulé River Watershed.

Black Bear *(Ursus americanus)* (Tongass Indicator Species)
A large female black bear with two second-year cinnamon cubs was seen in the Muskeg above the West Fork of the Soulé River (July 26, 2008). A black bear was disturbed and hid nearby in a brush thicket, when field biologist were taking forestry measurements along the interior Ridge Top Trail, east of the Soulé Main Stem (July 20, 2009). The bear could be heard occasionally grumbling the entire time the biologist were there, and there was a large excavation where the bear was digging into the roots of a large tree at the edge of a steep ravine. Black bear signs: such as scats, scrapes, diggings, tracks, and feeding on grass, forbs, and young skunk cabbage could be found in all habitats throughout the Soulé Watershed. We often had to make trails through the almost impenetrable Sitka alder thickets, and we often found very fresh black bear scats later along these trails. Apparently, even bears find travel difficult in these dense thickets. Much of the sign we saw was fresh, but we rarely saw or heard bear individuals. We felt that they were clearly avoiding us, including the attractive and copious odors emanating from our campsites. On occasions, black bear sign was relatively common. However, there were many attractive areas where bear sign was completely absent, and their tracks should have been more numerous in the many mud and sandy flats in wetlands.

Scrapes of torn sphagnum moss and snags were common in Muskeg, where bears were searching for adult and larval insects, especially grubs and maggots. Bear diggings into tree roots, rotting boles, and red squirrel caches were also observed. Black bears feeding on grasses and skunk cabbage (spring), and occasional scats were observed at pond margins along the North Fork (July 2008), and at the forest fringe on the beaches at the Soulé Delta and along Portland Canal (May 2008). A great deal of black bear sign for both adult and juvenile individuals was present in the forested slopes between the Soulé River Delta and the West Fork in September 2007. These slopes possessed extensive blueberry thickets. A large black bear was seen on a west beach of the Portland Canal fjord, just north of the Soulé Delta (May 14, 2008).

Black bears are omnivores and would find a great deal of food in the Soulé River Watershed: berries, insects and their larvae, roots and tubers, and fresh grass and forbs, including skunk cabbage.

Brown Bear *(Ursus arctos)* (Tongass Indicator Species)
Brown bears were not seen in the Soulé River Watershed. However, a single very large scat belonging to this species, was observed at the south end of No-Name Lake in September 2007. This species is very common and a reliable visitor during the salmon spawning runs at Salmon River and Fish Creek, west of Hyder. This is the adjacent watershed to the north and east of the Soulé Watershed. This species is expected to be a "Transient" in the Soulé River Watershed, because of the lack of suitable prey, especially salmon.

Gray Wolf *(Canis lupus)* (Tongass Indicator Species)
Tracks in the snow of a single gray wolf were seen on two occasions, approximately half-mile apart on the west bank of the Main Stem of the Soulé River in early December of 2009. This represents a transient individual. A scat with beaver hair was also seen at the bottom of the West Fork on the south side, July 14, 2009. At least one wolf pack is present, and often seen along the Salmon River and Fish Creek, and in the area of Hyder, especially during the salmon spawning run and in the winter. This is the adjacent watershed to the north of the Soulé Watershed. If a wolf pack was resident in the Soulé Watershed over the summer, the field biologist would have heard their calls, as well as seen tracks in mud or sand as they hunted beaver along the Soulé River. This species is also expected to be a "Transient" in the Soulé River Watershed, because of the lack of suitable big game prey and salmon. Mountain goats are relatively safe from wolf predation in their rugged habitat. Wolfs would occasionally be attracted by the availability of higher than normal beaver populations.

Marten (*Martes americana*) (Tongass Indicator Species)
The American **marten** is a carnivorous, furbearing member of the weasel family. Although similar in color, size, and shape to mink, martens are usually found in the uplands while mink are more associated with streams and coastal areas. In Southeast Alaska, martens naturally occurred on only the mainland and a few adjacent islands. Subsequently, martens were transplanted to the remainder of the larger islands. Through recent studies, the martens on Admiralty and Kuiu islands appear to belong to a unique genetic type which some believe is a separate species (Pacific marten *Martes caurina*). American martens are found from Southeast Alaska all the way up to the northern and western portions of the state where the last trees disappear and the true arctic tundra begins.

For food, Martens primarily depend on meadow voles and red-backed voles or mice over much of Alaska. Fluctuations in food availability often create corresponding variations in marten populations. Probably the second most critical food source is berries, especially blueberries, followed by small birds, eggs, and vegetation. The marten is a voracious and opportunistic feeder. Carrion such as the remains of wolf kills or salmon carcasses are eaten in many areas. It has been reported that red squirrels are a major food source for martens, but this does not seem to be the case in Alaska. In fact, the two seem to get along quite well. Martens commonly use red squirrel middens as resting places.

The marten or American sable is Alaska's most widely trapped animal and at current prices brings into the state an estimated $1-2 million each year. A trapper may take from 100 to 400 martens per season, but most average 20 to 30. Martens are widespread and abundant in Alaska; over harvesting is not a management problem in most areas because of the amount of refugia, or inaccessible areas. Season lengths are set to reduce the opportunity for overexploitation. Extensive roading and habitat loss resulting from logging is a concern in some areas.

Marten are not known to be in the Hyder area. Their preferred food is not available or is rare in the Soulé Watershed. None were observed, nor were signs found for marten in the Soulé River Watershed.

American Mink *(Neovison vison)*
Tracks of a mink were observed on the Delta at the mouth of the Soulé River, July 20, 2009 (Carstensen 2009). Mink are never abundant even in preferred habitat, are very secretive, and typically very difficult to observe in the field. Rodents, birds, squirrels, rabbits, reptiles, fish, and insects make up the major diet of these carnivores. Rabbits and reptiles are not found in the Soulé, squirrels are uncommon, rodents are apparently rare, fish are also rare, and birds are not particularly abundant as well. Prey may be the limiting factor in the Soulé River Watershed for small carnivores. Mink may be primarily limited to the Delta area or the shores of Portland Canal, because of prey availability and possibly the deep snows in this watershed.

Mountain Goat *(Oreamnos americanus)* (Tongass Indicator Species)
Mountain goats are mountain species that forage in subalpine and tundra habitats, and descend into the shade of conifer forests when the temperature and sun become too unbearable. They live and forage in the landscape's most rugged, steep, and rocky habitats. Their powerful legs, suction-cup hooves, and incredible balance, allow them to traverse with ease and feed on slopes and even cliff faces that appear beyond their ability to access. This is a great advantage in predator escape and acquiring unexploited forage.

Mountain Goats in their summer range require productive subalpine meadows to forage in with associated steep terrain for escape, and nearby shade to escape excessive heat; while during the winter they require closed canopy conifer forests on steep slopes (O'Clair et al. 1997, Carstensen 2009). Mountain Goats are not typically associated with granitic mountains (like the Soulé), but prefer sedimentary or metamorphic geology with their more productive soils (Carstensen 2009).

The helicopter pilot for the field studies in 2009[35] spotted two groups of mountain goats, of eight and four individuals respectively, high on the mountain tundra above the West Fork of the Soulé River and two individuals were also seen on the slopes above the Soulé Glacier on one occasion. On July 28, 2009, field biologist spent two hours (0830-1030 a.m.) and carefully surveyed from a helicopter with three observers all of the mountain tundra in the entire Soulé River Watershed. No mountain goats were observed, although this was during a hot spell, where daily high temperatures for Hyder, Alaska and Stewart, BC were in the high 90s Fahrenheit; mountain goats may have sought shade in hemlock forest or boulder outcrops, making them difficult to spot. Tracks of a mountain goat were also sighted near the toe of the Soulé glacier, July 20, 2009 (Carstensen 2009).

The Soulé Watershed may possess reasonably high quality Mountain Goat habitat, since occasional small herds are present. The helicopter pilot observations were significant because of the lack of any other observations made while searching the slopes via helicopter and by glassing with binoculars from within the watershed in 2007-2009.

[35] July 27, 2009, the helicopter pilot "Brandon" spotted two groups of Mountain Goats on his own.

Typically, Mountain Goats, when they are present, are readily observed foraging on open subalpine montane slopes.

The ADF&G conducted a fly-over mountain goat survey in 2009 of the ridges surrounding the Soulé River Watershed and found no mountain goats. "*We flew a Soule River goat survey on Wednesday morning (7/30/09)… hoping to beat some of the heat by arriving at the location around 5am…goats were laying low and very difficult to find… The ice above this area is not a barrier like I initially thought it might be. There are enough breaks in the snow fields to allow goats to move freely over the top. And after seeing your map of the proposed high water the break between the new lake and No Name Lake provides another movement corridor for animals…Boyd*"[36]

Sitka Black-tailed Deer *(Odocoileus hemionus sitkensis)* (Tongass Indicator Species)
Sitka black-tailed deer scats, tracks, and signs of feeding were seen occasionally in the forested western slopes above the lower Soulé River and its delta in September 2007. There was no evidence of Sitka black-tailed deer, their scats, or tracks in the central or upper reaches of the Soulé Watershed. The lack of sighting Sitka black-tailed deer was surprising. Black-tailed deer are widespread and abundant in Southeast Alaska. It could be that very deep winter snows, the lack of suitable south-facing slopes for foraging, coupled with very rugged and steep terrain, severely limit their access into the Soulé River Watershed. Deer are probably occasional along the Portland Canal where the climate is more maritime with less deep snowfall.

Western Jumping Mouse (*Zapus princeps*)
On at least six occasions jumping mice were observed at the Soulé River Watershed in July 2009. Three were seen in a fen wetlands complex on a terrace above the Main Stem Soulé on the east side, July 19, 2009. Three others were seen in the high grass at the Soulé Delta, and July 20 and 26, 2009. A burrow that appeared to be a jumping mouse was seen at the south end of No-Name Lake, July 14, 2009. This species is known to hibernate in a burrow in well-drained soil, often in an elevated bank, usually close to water; which fits the location of this burrow very well. Locations of where this mouse has been found are shown in Figure 70 below. [37]

There are two species in Southeast Alaska, the western jumping mouse, and the meadow jumping mouse (*Zapus hudsonicus*) (Tables 7 & 8). The former has been documented in coastal southern Southeast Alaska, including at Hyder. Most museum records for the later are in northern Southeastern Alaska, especially the Skagway region, and there are only two records for the south at Revillagigedo Island. Richard Carstensen, one of the field biologists, got a good look at the dorsal pelage of a jumping mouse, and on this basis it appeared to be a western jumping mouse (Carstensen 2009). The museum records also suggest this species, but detailed skull measurements are required for positive identification.

[36] Porter, B. ADF&G. 2009. E-Mail regarding Mountain Goat survey they conducted July 30, 2009.
[37] Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. July 2009. Page 10. For the Shipley Group.

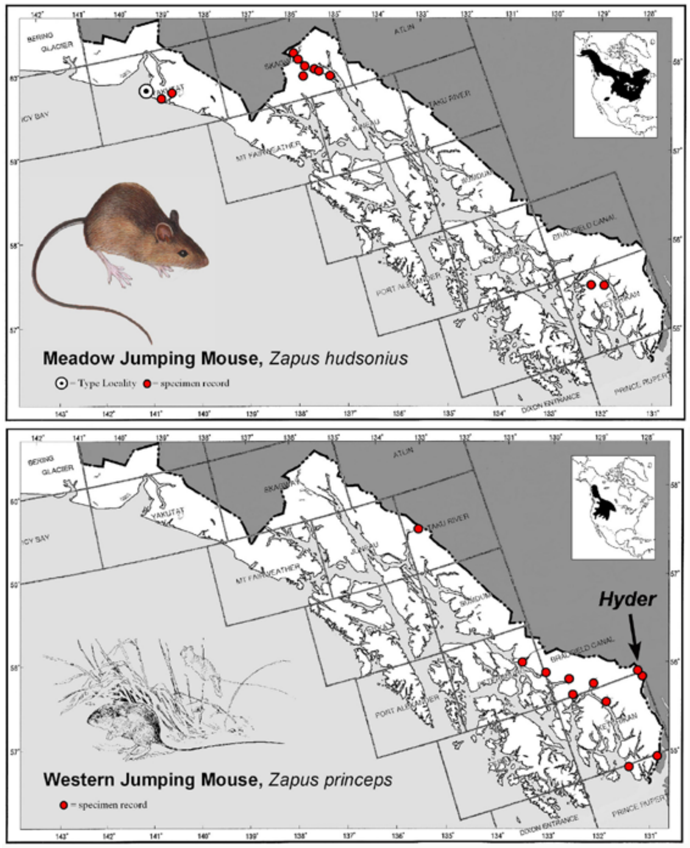

Figure 70 – Comparison of Ranges for Meadow and Western Jumping Mice, from MacDonald & Cook 2007

Potential Mammal Species Summary

Flying Squirrels are very difficult to document, because they are nocturnal and very secretive. Possibly food resources are limited in the Soulé Watershed. Flying squirrels are omnivorous and consume a broad range of food items: mushrooms and truffles, lichens, nuts, seeds, fruits and berries, tree buds (including early spruce buds), insects, nestling birds and eggs, and even some carrion. In Alaska, the diet was mainly fresh fungi in spring, summer, and fall; and lichen in the winter (Mowry 1994). Food items should be available in the Soulé River Watershed.

All small rodents are extremely difficult to document in the field without resorting to snap-traps or live-trapping, because they are nocturnal and secretive. Deer mice may come into camp and forage on scraps, but this was not observed. Voles and lemmings are very secretive, but their runway tunnels are often easily seen in grassy vegetation, but this was not observed. Food for both omnivore and herbivore rodent species is abundant in the habitat. Four species of small rodents are particularly common in southern Southeast Alaska and would be expected to occur in the Soulé River Watershed: northwestern deer mouse, long-tailed vole, southern red-backed vole, and northern bog lemming. Vole diggings were found in a fen wetlands complex on a terrace just north of the junction of the two forks of the Soulé, on the west side of the North Fork, July 15 (Carstensen 2009).

The diggings were similar to that of Long-tailed Voles. Exceptionally deep or persistent snowfall may make it difficult for these rodent species to survive over the winter.

What appeared to be a Porcupine scat was found above the Main Stem of the Soulé on the east side, July 19, 2009 (Carstensen 2009).[38] The scats were old and disintegrating and could not be positively identified. Typically, Porcupine presence is easily observed by their feeding on the cambium layer of trees and thus stripping off large areas of bark, feeding on spruce branches, and scats at the base of trees. None of these signs have been observed. Possibly this species is a transient or rare in the Soulé Watershed.

Shrews are even more secretive and difficult to document than small rodents, because traditional trapping methods are ineffective. Shrews are typically surveyed with pitfall traps baited with meat or fish. The use of canned sardines where the cans are punched with holes is effective and convenient. Three species of shrews are expected to occur in the Soulé River Watershed: masked, dusky and water shrews. Insectivorous prey are reasonably abundant. However, as is the case for small rodents, exceptionally deep or persistent snowfall may make it difficult for these species to survive over the winter. This may particularly be a problem for shrews, because their very high metabolic rate dictates that they cannot survive even brief periods without food, probably even a single day.

Four species of bats, especially little brown myotis and silver-haired bats, are probably found at the Soulé River Watershed. Bats, when they are present, are usually seen foraging in the evening hours. Foraging bats were never observed in the field. Aerial insects were present, and there were occasional periods of very high densities of flying insects. Bats are particularly fond of riparian habitats, because of their high abundance of insect prey and surface water for drinking. It was puzzling that bats were not observed.

Three widespread and fairly common carnivores were not seen: American Marten, Ermine, and American Mink. Mink tracks were observed on a single occasion (see Documented Mammal Species). These species are never abundant even in preferred habitat, are very secretive, and typically very difficult to observe in the field. Rodents, birds, squirrels, rabbits, reptiles, fish, and insects make up the major diet of these small carnivores. Rabbits and reptiles are not found in the Soulé, squirrels are uncommon, rodents are apparently rare, fish are also rare, and birds are not particularly abundant as well. Prey may be the limiting factor in the Soulé River Watershed for small carnivores.

Wolverines occupy an extraordinary wide geographical distribution in the North Country of both the New and Old Worlds, but they are rare in the landscape, possessing very large home ranges, 100-300 square miles. They occur in all available habitats, but would be mainly found in mountainous boreal forests, subalpine, alpine, and tundra. The

[38] None of the other biologist during any field studies had seen porcupine sign in the watershed. The B&B host for the field biologists in Hyder, who has lived for decades in Hyder, says “porkies” used to be more common on the Salmon River drainage but have recently declined. Porcupines generally leave tell-tail signs of their presence via debarked hemlocks, spruce nip-twigs, droppings at tree bases, etc. If this was porcupine scat, it may have just been passing through.

wolverine is a medium-sized carnivore that is capable of bringing down prey several times its weight, such as juvenile caribou and deer. However, it feeds primarily on rodents, birds, bird eggs, and carrion. Wolverines often feed on the scraps of big game left by wolf and bear kills. Wolverines may be occasional transients in the Soulé River Watershed, because of the absence of big game populations.

Cougars are strongly associated with deer, their preferred prey. Canadian lynx are closely tied to snowshoe hare populations, but they also feed on a variety of rodents and birds. Once again, these species are unlikely to persist in the Soulé River Watershed, because of the absence of appropriate prey populations.

Marine Mammals

Harbor Seal (*Phoca vitulina*)
Harbor seals were commonly observed in Portland Canal, including the vicinity of the Soulé Delta. Examples include: September 2007, periodically at least one individual; July 20, 2009, 4 seals; July 21 , periodic sighting of at least one individual; July 25, over 20 seals with young, rock outcrop, just north of Glacier Bay at Seal Rocks, where they were commonly seen hauled out.

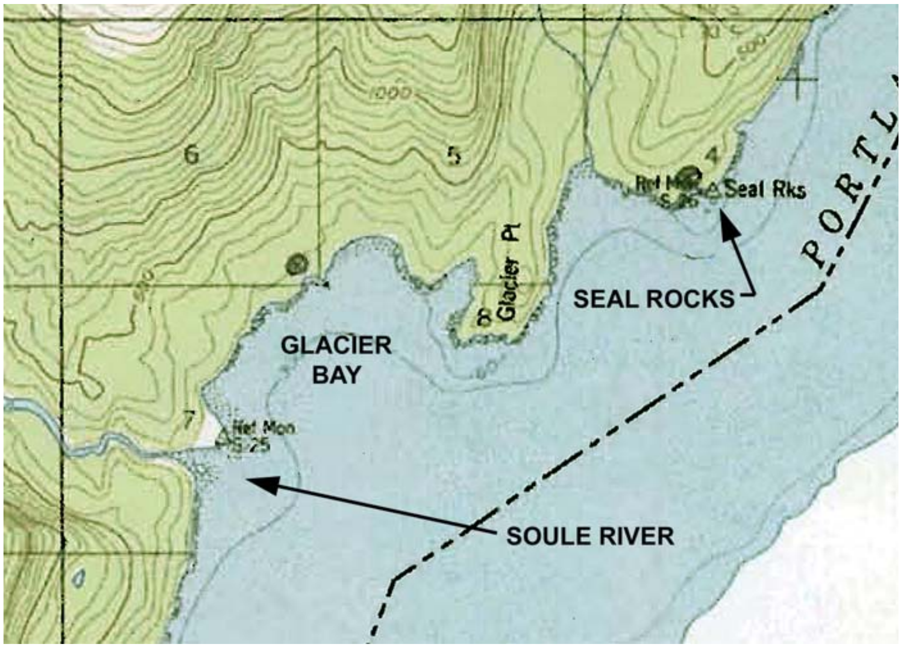

Figure 71 – Seal Rocks North of the Soulé River on Portland Canal

Dall's Porpoise (*Phocoenoides dalli*)
A pod of Dall's porpoises with at least six individuals, actively swam along both sides of our 12-foot boat and accompanied the field biologists for a short distance in Portland Canal, May 15, 2008. They resembled small Orcas.

Avifauna (Birds)

The bird communities of the Soulé River watershed and surrounding areas are not well known. However, the USFS has developed a checklist of birds seen in the lower Salmon River drainage near Hyder. The Soulé watershed is in the interior southern portion of Southeast Alaska, one of the six recognized biogeographic provinces of Alaska based on vegetation. The province classification was useful for an earlier assessment of the distribution of Alaska birds (Kessel and Gibson 1978). The Southeast Alaska province is a temperate rain forest with vegetation dominated by Western and Mountain Hemlock and Sitka Spruce.

This is a rugged landscape mosaic of mountain terrain, steep river and stream valleys with cliffs and talus, riparian and narrow floodplain communities with ponds and sloughs adjacent to rivers and streams, glacier lakes, wet meadows, boulder fields; and importantly, marine fiords and estuaries with brackish meadows. Despite this internal complexity the overall landscape is similar throughout Southeast Alaska. Therefore, the bird communities and their specific habitat associations in the Soulé Watershed were assumed to be similar to the province of Southeast Alaska. House Sparrow and Rock Dove (Common Pigeon) were not included because they are only associated with urban development. However, the European Starling, also a species that is closely associated with humans, occasionally can be found nesting and foraging in natural habitats. All three are exotic species to the new world.

Armstrong (2008) and Johnson et al. (2008) were the primary sources of information for the seasonal distribution, relative abundances, and breeding status of Southeast Alaska bird species. These geographical data were backed up with other species distribution and habitat data from: Kessel and Gibson (1978), Godfrey (1986), Heine and Canterbury (1992), Kaufman (2000), National Geographic (2003), Sibley (2003), Dunn and Alderfer (2006), Juneau Audubon Society (2007), and Vuilleumier (2009). The data in Armstrong were very robust with respect to the other references. Appendix A of the "*2008 Environmental Report*," which can be found in the Appendices, has the complete documentation on the 327 bird species of Southeast Alaska that potentially can occur in the vicinity of the Soulé River and its Delta.

Although birds were much more visible, vocal, and obvious than mammals at the Soulé River Watershed, they were not particularly abundant (123 Field-Observation-Days were spent by biologist in the Soulé River Watershed and Portland Canal in 2007-2009). Food was in abundance for birds that feed on arthropods or conifer seeds. Insects were diverse and abundant in the Soulé River Watershed. Mosquitoes, blackflies (Simulidae), and biting midges (Ceratopogonidae) were notable as pests, particularly in Muskeg, and a large biting horse (deer) fly (Tabanidae) became more abundant the longer field biologists camped at No-Name Lake.

Most bird documentations, both visual and vocal, were opportunistic while in the field collecting a wide variety of ecological data. Nevertheless, a great deal of time was spent looking for birds and listening for their songs. This included extensive binocular scanning of:

- ✓ Ridges
- ✓ Boulder outcrops
- ✓ Talus slopes
- ✓ Forest canopies
- ✓ Wetlands
- ✓ Beaver pond
- ✓ Muskeg
- ✓ Subalpine and alpine zones
- ✓ River and lake shores
- ✓ Habitat edges

This was particularly the case when camping in the field and on the Soulé Delta. This analysis of avian species is the result of four time periods in the field:

- o Spring 2008
- o Summer 2008
- o Summer 2009
- o Fall 2007
- o Fall 2009.

See the report, *Ecological Field Investigations 2009* in Appendix C, for a complete overview and methods for the surveys for avian species including, field dates, field sites in the watershed, habitats surveyed, and identities of field observers.

The Goshawk had an intense specialized calling survey conducted throughout the Soulé River Watershed and in Portland Canal near the Soulé Delta in the summer 2009, but was never seen or heard.

Bird seasonal status and relative abundances based on Armstrong are as follows:

- ✓ Spring = March through May
- ✓ Summer = June and July
- ✓ Fall = August through November
- ✓ Winter = December through February

Table 9 summarizes bird species breeding status in the Salmon River, and compares them to species found and not found in the Soulé River Watershed. The Salmon River bird species are based on the data from Johnson et al. (2008). The Soulé River Watershed bird species are based on the 2007-2009 field observations. The sum of confirmed and probable breeders is a good estimate of actual breeding species, because positive confirmation of nesting is very difficult for most species of birds, especially small cryptic or secretive species. Exactly half of the Salmon River breeding species were also found in the Soulé River Watershed.

Table 9

Bird Species Breeding Status in the Salmon River*	Number of Bird Species Found in Soulé River Watershed	Number of Bird Species NOT Found in Soulé River Watershed
Confirmed	8	12
Probable	20	16
Possible	6	16
Observed (not breeding)	3	17
Confirmed + Probable	**28**	**28**
Absent Species	18	--------
Total Bird Species Found in Soule River Watershed and Portland Canal =		**55**

Table 9 – A Comparison of Bird Species Breeding Status in the Salmon River, and their Presence or Absence in the Soulé River Watershed. Confirmed + Probable suggests breeding species. Soulé River Watershed and Portland Canal data collected 2007-2009.
***based on Johnson et al. (2008)**

Table 10 presents the potential breeding bird fauna of the Soulé River Watershed. There are 35 species listed. Only a single nest with 4 eggs was actually documented for any bird species; this was an Oregon Junco (Carstensen 2009). Juveniles of Common Mergansers, Canada Geese, Marbled Murrelets, Bald Eagles, Pine Grosbeaks, and Red-breasted Sapsuckers were observed. Pairs of Spotted Sandpipers exhibited the behavior of nearby nests. Most of the breeding status determinations were from singing males on presumed territories during the breeding season.

Table 10

Breeding Birds of Soule River Watershed (N=35)

Vancouver Canada Goose	Steller's Jay
Harlequin Duck	Chestnut-backed Chickadee
Common Merganser	Winter Wren
Rock Ptarmigan	American Dipper
Great Blue Heron	Golden-crowned Kinglet
Bald Eagle	Ruby-crowned Kinglet
Spotted Sandpiper	Swainson's Thrush
Marbled Murrelet	Hermit Thrush
Rufous Hummingbird	Varied Thrush
Belted Kingfisher	American Robin
Red-breasted Sapsucker	Yellow Warbler
Northern Flicker (Red-shafted)	Yellow-rumped Warbler
Hairy Woodpecker	Wilson's Warbler
Downy Woodpecker	Savannah Sparrow
Alder Flycatcher	Song Sparrow
Pacific-slope Flycatcher	Oregon Junco
Common Raven	Pine Grosbeak
Northwestern Crow	

Table 10 – Breeding Birds of Soulé River Watershed. This tabulation of probable breeding bird species was based on the birds documented in the Soulé River Watershed, in conjunction with all the data and information presented above for regional species distributions and their breeding status.

Eighteen bird species observed in the Soulé River Watershed were not seen at the Salmon River during the breeding bird surveys by Johnson et al. (2008). Additionally, Johnson et al. did not record Pigeon Guillemots and Rock Ptarmigans at any of the 11 major rivers they surveyed. Eight of the Soulé species were seen in the spring and were probably migrants, six ducks, Pigeon Guillemot, and American Pipit. Rock Ptarmigan scat was observed in the Glacier Alpine habitat at the Soulé. The Common Loon was mainly seen in the spring, but also in the summer. Surf and White-winged Scooters, especially the former, were seen in the summer, and these species are probably more fiord than riverine species. Marbled Murrelets were common in the spring and summer in Portland Canal, and apparently were breeding in the mountains of the Soulé Watershed.

At the 11 major rivers in Johnson et al. surveys, only two were rated as “possible” breeding sites for murrelets. Semipalmated Plovers were possible or confirmed breeders at eight of the 11 major rivers, but not the Salmon River. The Osprey is considered rare in the Soulé area; one was observed flying along the shoreline in June 2008 and another responded to the Goshawk audio survey in July 2009, but was otherwise not observed. Three Greater Yellowlegs were also seen in the summer of 2009. Great Blue Herons were seen during spring and summers in the watershed, Portland Canal, and at Hyder. It is notable that this species is missing in both the Salmon River and Hyder species lists. Johnson et al. list Great Blue Herons as possible (one probable) breeders at six of the 11 major rivers they surveyed. Another interested species distribution is for Northwestern Crows, which occur in the Soulé Watershed and nine out of 11 Johnson et al. rivers, but not in the Salmon River or at Hyder. The American Crow was not observed in the Soulé Watershed, but it occurs at Hyder, and in two of Johnson et al. rivers, including the Salmon River.

On the basis of Johnson et al. (2008) surveys on the nearby Salmon River and their assessment of confirmed and probable breeding species, and habitat present in the Soulé River Watershed, there are another 14 potentially breeding species in the Soulé River Watershed (Table 11). However, two of these are unlikely to occur in the Soulé Watershed, and are identified by an asterisk in the table. Out of these 12 additional species six are considered common, five uncommon and one is rare, based on their occurrences in Southeast Alaska according to Armstrong (2008). All 12 of these species, particularly the six common ones, are highly likely candidates for additional breeding species in the Soulé River Watershed, based on the habitats present in the watershed. Therefore, 47 species of birds may breed in the Soulé River Watershed.

Table 11

Additional Potential Breeding Birds of Soule River Watershed (N=14)

Hammond's Flycatcher . U	Townsend's Warbler . C
*Cassin's Vireo . Casual	Northern Waterthrush . U
Red-breasted Nuthatch . U	Macgillivray's Warbler . U
Brown Creeper . U	Fox Sparrow . C
*Mountain Bluebird . Rare	Lincoln's Sparrow . C

Tennessee Warbler . Rare	Red Crossbill . C
Orange-crowned Warbler . C	Pine Siskin . C

Table 11 – Additional Potential Breeding Birds of Soulé River Watershed. These species are based on Johnson et al. (2008) surveys on the nearby Salmon River and their assessment of confirmed and probable breeding species, and habitat present in the Soulé River Watershed.
C = Common U = Uncommon Rare Casual
This classification is based on occurrences in Southeast Alaska from Armstrong (2008), and common, uncommon, and rare species are confirmed breeders in Southeast Alaska.
*** emphasizes that the breeding status in the Soulé Watershed is probably unlikely**

The primary method to verify the breeding status of most of the species in Tables 10 and 11 is to verify the territorial singing of male birds in the late spring to early summer, late May through June.

The other bird species observed in the Soulé River Watershed and at Portland Canal are listed in Table 12. Fourteen of these are considered migratory species, two vagrants or casuals, and the status of five species are unknown. Any of these five species could potentially breed in the Soulé Watershed, or somewhere in the Portland Canal area. All five of these were seen during July 2009, and Herring Gulls were particularly common in May, July, and September at the Soulé Delta.

Table 12

Other Birds of Soulé River Watershed	
Migrants (N=14)	**Vagrants (N=2)**
Common Loon	Osprey
Red-throated Loon	Greater Yellowlegs
American Wigeon	
Mallard	**Unknowns (N=5)**
Northern Shoveler	Semipalmited Plover
Northern Pintail	Herring Gull
Green-winged Teal	Bonaparte's Gull
Scaup (unidentified species)	Mew Gull
Surf Scooter	Arctic Tern
White-winged Scooter	
Bufflehead	
Barrow's Goldeneye	
Pigeon Guillemot	
Water Pipit	

Table 12 – Other Birds of Soulé River Watershed and Portland Canal. These bird species were documented in the Soulé River Watershed and Portland Canal, and although their actual breeding status in the Soulé Watershed of all these species is unknown, the Migrants and Vagrants are probably not breeding species. The breeding status in the Soulé Watershed of the species classified as Unknowns is unknown.

Table 13 presents bird species that occur in Hyder, but were not observed in the Soulé River Watershed. The Sooty Grouse is classified as a “probable” breeder in ten of the eleven major mainland rivers that Johnson et al. (2008) surveyed in Southeast Alaska, including the Salmon River. This species was not observed in the Soulé River Watershed. Possibly it is rare or relatively inactive when we were present. Based on DNA analysis, the Blue Grouse was split into two full species, the Sooty Grouse (*Dendragapus fuliginosus*) found in coastal habitats, and the Dusky Grouse (*D. obscurus*) found more inland (CLO 2009).

Table 13

Breeding Birds at Hyder but Not Observed in Soulé Watershed (N=7)	
Sooty Grouse American Crow Tree Swallow Barn Swallow	Cliff Swallow European Starling (non-native) Brown-headed Cowbird

Table 13 – Breeding Birds at Hyder, Alaska, but not observed in the Soulé River Watershed. The occurrence and breeding status of these species in the Soulé Watershed is unknown. See Discussion for more details.

Crows represent an interesting distribution. We found Northwestern Crows at the Soulé Watershed, and Johnson et al (2008) classified them as “probable” breeders in nine of the eleven major mainland rivers they surveyed in Southeast Alaska. We found American Crows in Hyder, while Johnson et al. found them in the remaining two mainland rivers they surveyed. They were confirmed breeding in the Salmon River, and “observed” (but not breeding) in the Chickamin River. Mulligan’s (2003) bird checklist for Hyder notes American Crows as common, but Northwestern Crows are absent from the list. According to Armstrong (2008), Northwestern Crows are considered “common” breeders, and American Crows “rare” breeders in Southeast Alaska. Apparently, American Crows have invaded Hyder and the Salmon River from Stewart, British Columbia, and probably other interior parts of British Columbia and Canada, and displaced the more coastal and maritime species the Northwestern Crow.

Swallows and swifts were surprisingly absent in the Soulé River Watershed. These taxa are easily seen as they forage on flying insects. Common source of insects for these species are: aquatic habitats, riparian vegetation, and wetlands. Certainly, these habitats were present in the Soulé Watershed. The West Fork and to almost the same extent the Main Stem of the Soulé River consisted of glacial melt water. Therefore, the water was close to freezing and highly milky in color from glacial flour (pulverized bedrock). The North Fork was very clear, but was only several degrees warmer in temperature. The North Fork possessed very few aquatic insects and other invertebrates associated with its gravelly and rocky substrates. Nevertheless, on warm sunny days, significant and occasionally dense swarms of insects could be observed flying over the North Fork. The muskeg and peat wetlands may be too acidic for significant aquatic insects. However, beaver pond fen wetlands should provide aquatic insects. The deep marine waters of

Portland Canal are not conducive to large insect populations. Relatively few species of aquatic insects live in brackish water, and they would not be abundant. Perhaps aerial insects are unreliable or unpredictable in the Soulé River Watershed. At least three species of swallows were common to abundant in Hyder. Johnson et al. (2008) found six species of swallows on the major mainland rivers, and Tree Swallows were confirmed breeders on all 11 rivers. Tree Swallows are cavity nesters, while Barn and Cliff Swallows build mud nests typically associated with cliffs or escarpments. Finding nesting habitat should not be a problem for any species of swallow. Vaux's and Black Swifts were found in ten of eleven Johnson et al. rivers surveyed, including Salmon River, but these species are limited to large mainland rivers. Unlike swallows, these species are usually uncommon, local, and nest in small groups. Vaux's nest in large hollow trees, and Black Swifts prefer wet maritime cliffs or cliff ledges behind waterfalls.

European Starlings are typically associated with human settlements, so they can be expected to occur from Stewart to Hyder. This species is also often associated with large riparian riverine habitat and nest in dead cottonwood cavities. Johnson et al (2008) found them in five of eleven mainland rivers, including the Salmon River.

Brown-headed Cowbirds are brood parasites of breeding birds, and often occur when there are many nesting birds. We were in the field past the major singing and nesting season, and did not hear any cowbirds in the Soulé Watershed. Perhaps, several pairs were there earlier in the peak of the breeding season. Nevertheless, it was our experience that avian visual and acoustical activities in both May and July were much higher in Hyder than in the Soulé River forests or along the rivers.

Probably the most common species was the Oregon Junco. Thrushes as a group were particularly characteristic of many areas. Varied Thrushes were widespread and could be heard in most parts of the watershed, especially on the scraggly brushy slopes of sparse Mountain Hemlock. Swainson's and Hermit Thrushes were also common. Other small birds were: Pacific Slope Flycatcher, Winter Wren, Kinglets, and American Dipper. Small flocks of Vancouver Canada Geese (*Branta canadensis fulva*) were seen throughout the watershed on sandy banks of the Soulé River, at beaver ponds, or at No-Name Lake, and occasionally on the Soulé Delta. Actually, much more commonly observed were their signs: scats, tracks, foraging clippings, and feathers; which are readily apparent when geese are present. This is the largest of the recognized subspecies. A pair of Spotted Sandpipers nested at a stream inlet on the northeast end of No-Name Lake in 2008 and 2009.

The most reliable and consistent sightings of birds were at the Soulé Delta, where most of the time there were 8-20 Herring Gulls. Many species of waterfowl were also abundant in May, but not during the summer. Summer species were predominantly Harlequin Ducks and Marbled Murrelets. Occasionally, Great Blue Herons and Belted Kingfishers, bald eagles, and ravens were observed.

Bald Eagle *(Haliaeetus leucocephalus)* (Tongass Indicator Species)
Two **Bald Eagle** surveys took place in 2008-2009. In 2008, approximately 5 miles of the shoreline of the west side of Portland Canal was surveyed on May 15 by boat. The survey extended from Glacier Point, 2 miles north of the Soulé River Delta, to the mouth of the Davis River, 3 miles south of the Soulé River Delta. There are two reported nests in the vicinity of the Soulé River, one almost a mile to the north and the other a mile to the south; see Figure 72 below. During the three days of the field survey a total of 4 adults and one juvenile bird were seen between the Davis River and Hyder.

One adult was seen sitting in a tree at the mouth of the Soulé River during the eagle survey. Two more adult, and one juvenile, eagles were seen between the Soulé River and the Davis River during the eagle survey, again sitting in trees. All were south of the eagle nest location between the Soulé and Davis rivers. One lone adult was seen about 3-4 miles north of the Soulé River outside of the survey area later in the week. No eagles were seen in the vicinity of the two eagle nests near the Soulé River. In addition, an adult osprey was seen flying over the delta during a reconnaissance trip made on June 19, 2008.

The 2009 eagle survey took place on July 15, 2009, in which a helicopter was used to search for eagles. The same area was searched as in 2008, noted in Figure 72.

Bald eagle observations from each field study period:

Fall 2007 – None

Spring 2008 – 3 adults, 1 immature

Summer 2008 – Two juvenile Bald Eagles were observed soaring high and together along the Lower North Fork, July 22

Summer 2009 – Present

Adult: Portland Canal, near Hyder, 7/14
Portland Canal, near Hyder, 7/17
2 – Portland Canal, Delta, 7/25

Immature: Boat Dock, Hyder, 7/23
Portland Canal, Delta, 7/25

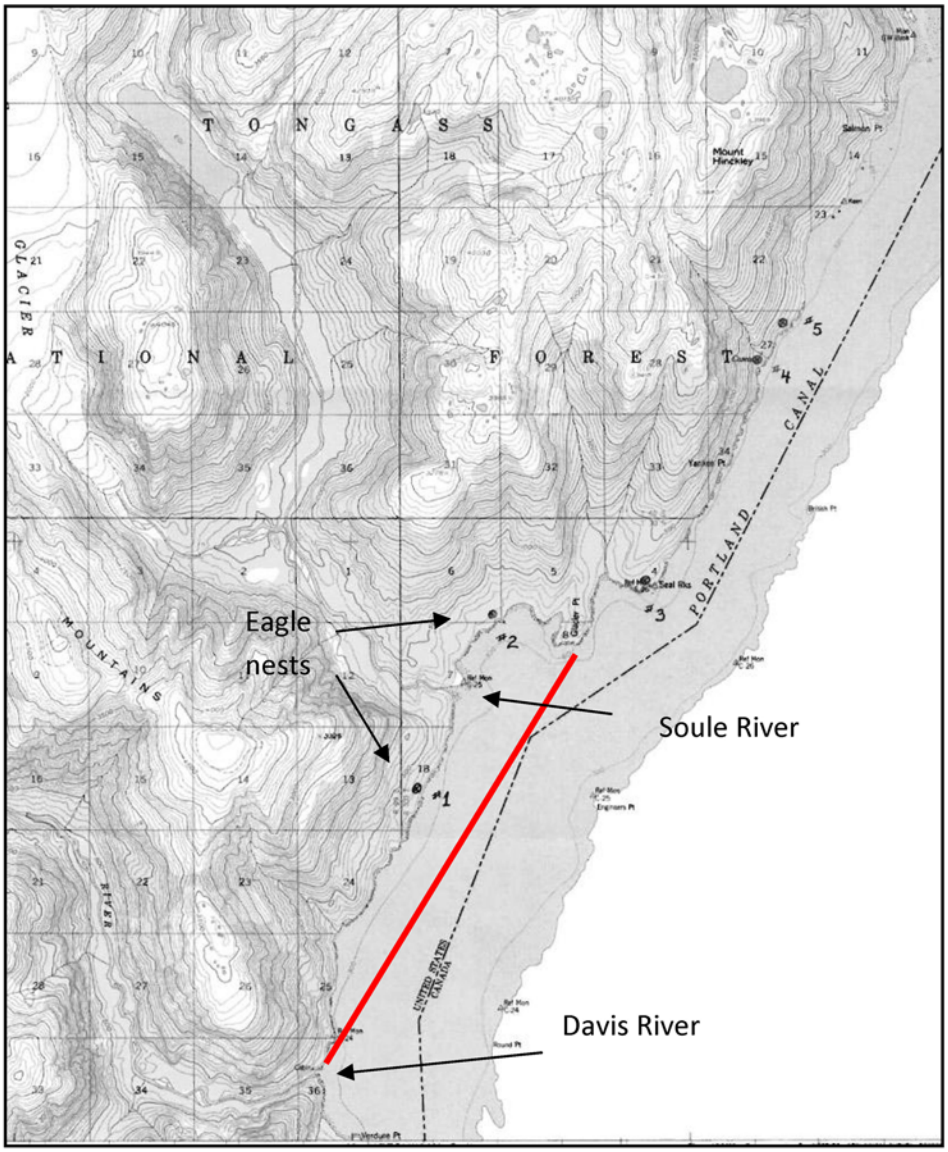

Figure 72 – Shoreline Eagle survey area marked in red in Portland Canal, May 2008. Map showing eagle nests furnished by USF&WS

Northern Goshawk (*Accipiter gentilis*)

Habitat use of Goshawks varies widely among individual goshawks, but is typically medium and high-volume forests for foraging and other activities. They avoid non-forested, clear-cut, and alpine areas. Mature second growth and low-productivity forests are used in proportion to their availability, suggesting neither preference nor avoidance. North American Goshawks are traditionally associated with remote and wilderness areas.

Goshawks only initiate nesting when prey availability is high. Prey species are more limited in southern Southeast Alaska than in its northern portion. Correspondingly, Goshawk occupancy rates on breeding habitats are lower and they fluctuate more with Red Squirrel density, which in turn fluctuate with the productivity of conifer cone crops. Nests are typically located in tall trees, within high-volume forest stands with relatively high canopy cover. During the breeding season males use an average of approximately 15,000 acres, while females average approximately 11,000 acres.

The predominant prey of Goshawks in Southeast Alaska is Sooty Grouse and Red Squirrels. Red Squirrels are the most noticeable mammal in the Soulé Watershed, but are not particularly abundant, as discussed above. Sooty or Spruce Grouse were never seen or heard in the watershed in our 2007-2009 field studies that consisted of 123 Field-Observation-Days. Sooty Grouse are considered common in Southeast Alaska, while Spruce Grouse are rare (Armstrong 2008). The avian prey species found in the Soulé Watershed were: Steller's Jay, Varied Thrush, Northwestern Crow, American Robin, Swainson's Thrush, Hermit Thrush, and American Dipper. The three species of thrushes were considered common. The two birds not seen in the Soulé Watershed were Ptarmigans and Gray-cheeked Thrush. This thrush is rare in Southeast Alaska (Armstrong 2008). Rock and White-tailed Ptarmigans occur on upland tundra and mountain ridges. The former species is common, while the latter is uncommon in Southeast Alaska. They occur in unfavorable habitat for Goshawks, and places we did not conduct field work. Willow Ptarmigan are uncommon in Southeast Alaska, and occur in willow thickets in tundra and muskeg, habitat that we worked in.

Goshawk Survey

The Goshawk survey data for Soulé River Watershed is presented in Table 1 of the Goshawk survey report, which can be found in Appendix H.[39] The entire watershed was covered with a strong sampling bias for potential nesting Goshawk habitat: forest beach fringe, riparian habitats, and openings near old growth patches. All data were collected July 26-28, 2009. The weather was clear, warm, and calm, with no precipitation for all three days of the surveys. Goshawks were not seen or heard at any of the 40 survey sites. Over the entire time of the survey only three Bald Eagles, an Osprey, and two Ravens responded to or opportunistically flew into the area of Goshawk juvenile calling.

Field biologist spent 123 Field-Observation-Days in the Soulé River Watershed and Portland Canal in 2007 to 2009. They gathered field data and conducted a wide range of ecological studies during this time, including camping in the watershed. An important component of these investigations was the documentation of all vertebrate species in the watershed. This effort consisted of both active searches and opportunistic opportunities to document vertebrate species by the following methods: visually, with binocular searches, acoustically, tracks, scats, and specific foraging signs. Goshawks were never seen or heard during all this field time, despite concentrated efforts to document all raptors, especially Goshawks.

[39] Goshawk survey report, July 26-28, 2009. Page 15.

Table 14 – Goshawk Prey Species

Prey Species	Goshawk Prey Rank	Soulé Watershed Documented	Birds Category 10 sp + 5 classes	Goshawk Prey Numbers	Soulé Watershed Documented
Sooty Grouse	1	no	Marbled Murrelet	11	present
Red Squirrel	2	uncommon	Goshawk	2	no
Steller's Jay*	3	yes	Spotted Sandpiper	2	yes
Varied Thrush*	4	common	Downy Woodpeck.	2	yes, rare
NW Crow	7	yes	Hairy Woodpeck.	2	yes, rare
Ptarmigans	8	no	Pigeon Guillemot	1	yes
Amer. Robin*	9	yes	N. Pygmy Owl	1	no
Spruce Grouse	12	no	Belted Kingfisher	1	yes
			Red-breasted Sapsuck.	1	yes
			Amer. Dipper	1	yes
Unknown Passerines, includes below & *	5	------			
Swainson's Thrush	------	common			
Hermit Thrush	------	common			
Grey-cheeked T.	------	no			
American Dipper	------	yes			

Ten identified avian species were infrequent in the diet of Goshawks. Eight of these species were documented in the Soulé Watershed; see Table 14. Marbled Murrelets were available as prey, but not particularly abundant and probably never abundant enough anywhere to represent important prey for Goshawks. This was verified by the Lewis et al. (2006) study, where their coastal and island habitats were more optimal for Marbled Murrelets, yet they were a minor prey item. Therefore, "present" was a more suitable designation than "yes", which sometimes indicated very few sightings.

Except for a few jumping mice, small rodents, their burrows, and their runways were not observed in the Soulé Watershed. *Peromyscus* species certainly should have showed up in our extensive camping at four different sites in the watershed, but there never was a sign of rodent activity. Voles (*Microtus*, *Myodes*) are herbivorous and typically not expected at campsites, but nevertheless, they also are often attracted. A few Marmots were heard on the tundra slopes near the glacier.

We can conclude that the absence, or at least rarity, of breeding Goshawks in the Soulé River Watershed is the combination of low avian and mammal prey abundance, unsuitability of the large avian taxa that are present, and possibly poor habitat quality.

Lewis et al. (2006) concluded that the reason even a single Goshawk nest exhibits persistent failure on Prince of Wales Island is inadequate prey.

Northern goshawk observations from each field study period: (specific surveys conducted, but NOT seen or heard)

Fall 2007 – None

Spring 2008 – None

Summer 2008 – None

Summer 2009 – None

Red-breasted sapsucker *(Sphyrapicus ruber)* (Tongass Indicator Species)
The red-breasted sapsucker is well distributed throughout Southeast Alaska during the spring, summer, and early fall seasons, and occurs in lower elevations during the late fall and winter seasons. They use a wide variety of forested habitats but require the presence of snags during the breeding season and are indicative of low volume *productive old growth* (POG) (SD4H[40] category) (size density volume class 4 on hydric soils). They are weak excavators and therefore require rotted or soft substrates in order to create cavities for nesting and roosting. There are about 9.9 million acres of forested land (includes all age classes and types of conifer forests) within occupied red-breasted sapsucker habitat on the Tongass National Forest of which approximately 980,000 acres are in the SD4H category. Old-growth forests provide the best snag habitat over the long-term; stands with higher densities of snags receive more use.

The red-breasted sapsucker was selected as a *management indicator species* (MIS) as a representative primary cavity excavator. Their general habitat is often associated with mature stands, especially hemlock and/or spruce in Pacific Northwest and Southeastern Alaska, but may not be an obligate old-growth species.

A single Red-breasted Sapsucker (juvenile) was observed along the North Fork July 24, 2008. The Soulé River Watershed does have stands of snags that are primarily trees killed by the backup of water from Beaver dams, but the size density volume is low. Whether the red-breasted sapsucker uses and breeds in this watershed is unknown.

Red-breasted Sapsucker observations from each field study period:

Fall 2007 – None

[40] Low productive older forests associated with wet, poorly drained land types (e.g., muskegs, fens, rolling hills, broken mountain slopes, plateaus, glacial outwash zones). Canopy closure is variable. Trees are small, old, and defective. Stand volume is low. Low densities (SDI < 280) of small diameter trees (QMD < 17 inches). Tree size distribution and spacing is variable and patchy. Tree diameters greater than 40 inches are generally not present.

Spring 2008 – Present; Common in Hyder

Summer 2008 – 1, Lower North Fork, July 24

Summer 2009 – Present in watershed; Common in Hyder

Hairy Woodpecker *(Picoides villosus)* (Tongass Indicator Species)
The hairy woodpecker is considered an uncommon, permanent resident throughout Southeast Alaska. Hairy woodpeckers use old-growth forest habitats with snags and dying trees for foraging and nesting. Like the red-breasted sapsucker, hairy woodpeckers are primary cavity excavators for other cavity-using wildlife species. Their winter habitat may be their most limiting. There are about 9.9 million acres of forested land (including all age classes and types of conifer forests) within occupied hairy woodpecker habitat on the Forest. High-volume old-growth forests provide the best long-term snag habitat, with large diameter old-growth trees (particularly SD5S, SD5N, and SD67 categories) receiving more use than stands with smaller diameter trees. There are approximately 2 million acres of old growth in the SD5S, SD5N, and SD67 categories; optimum habitat use is believed to occur when patches of preferred habitat are greater than 500 acres.

The hairy woodpecker was also selected as an MIS as a representative primary cavity excavator. The Project only has *195 MBF (195,000 board feet)* of commercial grade timber with only small stands of old growth. All of the timber on the North Fork and West Fork are <200 years old. If the hairy woodpecker uses this watershed, no significant impacts should occur but a small loss of timber.

Hairy Woodpecker observations from each field study period:

Fall 2007 – None

Spring 2008 – Present; Common in Hyder

Summer 2008 – None

Summer 2009 – Present in watershed; Common in Hyder

Brown Creeper *(Certhia americana)* (Tongass Indicator Species)
The brown creeper is considered an uncommon, permanent resident throughout Southeast Alaska. Brown creepers are likely more common than usually acknowledged, but detectability of this species is relatively low, resulting in abundance estimates that are biased low. This species was selected as an MIS because of its close association with large diameter old-growth trees (particularly SD5S, SD5N, and SD67 categories). As noted above, there are approximately 2 million acres of the SD5S, SD5N, and SD67 category old growth on the Forest. The factor most cited as limiting brown creeper populations is the availability of old-growth and mature woodlands as nesting and foraging sites and research has shown that creepers abandon sites that have been subjected to even light (e.g., partial-cut) logging activity because such activity is typically

focused on large, mature trees (Wiggins 2005). In a study of the effects of buffer width on breeding bird communities in the Tongass, a majority (83 percent) of all brown creeper observations occurred in undisturbed control plots (Kissling 2003). Optimum habitat use is believed to occur when patches of preferred habitat are greater than 15 acres (USDA Forest Service 2003).

The Brown creeper was not observed in the Soulé River Watershed during the 123 Field-Observation-Days from 2007-2009. It is difficult to observe but is confirmed to breed on the Salmon River, 9-miles north of the Soulé Watershed.

Vancouver Canada goose *(Branta canadensis fulva)* (Tongass Indicator Species)
Vancouver Canada geese are distributed throughout the Alexander Archipelago of Southeast Alaska, with an estimated resident population of 10,000 birds. This population is relatively non-migratory, with the majority of birds moving only locally between nesting, brood rearing, molting, and winter concentration areas. Vancouver Canada geese were selected as an MIS because of their association with wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the Forest. Vancouver Canada geese are highly mobile and are found throughout the islands of Southeast Alaska.

Nesting and brood-rearing habitats are potentially affected by various forest management activities, though timber harvest in these areas has generally been minimal because these sites are fairly unproductive. Additionally, Riparian and Wetland standards and guidelines in place under the current Forest Plan, which include the use of various Best Management Practices (BMPs), are designed to minimize impacts to and maintain the function of these habitats. Effects of timber harvest and recreation on winter habitats have not been assessed but may result in increased human disturbance to wintering flocks or their habitats. Waterfowl census surveys conducted by the USF&WS are the best source of demographic information for Vancouver Canada geese; however, population data are insufficient to indicate a Forest-wide trend in the population, and thus no clear relationship has been established between population numbers and trends in habitat change.

Vancouver Canada Goose observations from each field study period:

Fall 2007 – Soulé River Delta, Portland Canal, September 12-14
At least 2 individuals were commonly observed at the mouth of the Soulé River

Spring 2008 – Common, up to 12 geese seen at a time

Summer 2008 – Canada goose sign was very widespread and abundant along the North Fork and at No-Name Lake. Open sandbars, gravel flats, and exposed shorelines were typically covered with goose scats. The grassy and gravelly banks surrounding the large waterfall flowing into the upper end of the North Fork, just below No-Name Lake, was liberally covered with goose scats. A small flock of Canada Geese, with up to seven individuals, was frequently observed at No-Name Lake. The subspecies that occurs in this area, Vancouver or Giant Canada Goose (*Branta canadensis fulva*), is the largest subspecies and dark in color. It is considered a "Common" breeder and permanent resident of Southeast Alaska, and unlike most Canada Geese this subspecies does not nest in large flocks. This subspecies nests as isolated pairs in forest habitats, and the nests are well-hidden.

Summer 2009 – Canada goose sign was very widespread and abundant throughout the Soulé River Watershed: North Fork, West Fork, Main Stem, No-Name Lake, and Delta. Open sandbars, gravel flats, and exposed shorelines were typically covered with goose scats. Goose feeding, tracks, and scats were frequently seen, often abundant, at beaver ponds and wetland complexes.

Amphibians and Reptiles

Documentation of amphibian species in the Soulé River Watershed is based on 123 Field-Observation-Days in 2007-2009, while conducting a wide variety of ecological field investigations at the watershed, the delta, and Portland Canal. Most of these observations were opportunistic (*Amphibian Data Report 2009* in Appendix I). Potential amphibian species in the watershed are based on museum specimens and species documentations for Southeast Alaska from MacDonald and Cook (2007). Amphibians from MacDonald and Cook refer to verified specimen records in southern Southeast Alaska, south of Stikine River, but not including Prince of Wales Island. Additional amphibian distribution data are from Nussbaum et al. (1983), Green and Campbell (1984), Stebbins (1985, 2003), Corkran and Thoms (1996), and MacDonald (2003). English and scientific nomenclature is from the Center for North American Herpetology CNAH (2010).

Vertebrate documentations were opportunistic while in the field collecting a wide variety of ecological data. Nevertheless, several more intensive vertebrate surveys were conducted. Intense amphibian searches were conducted in all years at ponds, wetlands, and riparian habitats, but especially July 14-19, 2009, when we conducted a survey for amphibian chytrid fungus. Chytrid fungus infections have been implicated worldwide in amphibian population declines.

Documented Amphibians

Boreal Toad
Northern Roughskin Newt
Unidentified Frog: Has the appearance and behavior of wood frogs, but Columbia spotted frogs are more likely, based on the geographical distribution of the limited specimens from MacDonald and Cook (2007).

Unknown Potential Amphibians

Wood Frog
Columbia Spotted Frog
Northwestern Salamander

Eastern Long-toed Salamander

Unlikely Amphibians

Northern Red-legged Frog
Pacific Chorus Frog
Pacific Tailed Frog

Boreal Toad *(Anaxyrus boreas boreas)*

<u>Local Range</u>: British Columbia; Southeast Alaska; disjunctive and coastal northward MacDonald and Cook (2007): >10; well distributed south of Skagway, mainly coastal and islands.

<u>Elevation Range</u>: Sea level to 2250m

The Boreal Toad (*Anaxyrus boreas boreas*) has a very extensive distribution, ranging from all of Southeast Alaska, all of British Columbia, and western Alberta in the north; south to northern California, most of Nevada north of the Mojave Desert, and the mountains of Utah; and east to western Montana, western and southern Wyoming, the Rocky Mountains of Colorado, and extending into the northern extreme of New Mexico. The two subspecies intergrade in northern California. The Boreal Toad is commonly referred to as the Western Toad in much of the literature. Nevertheless, the correct and taxonomically accepted nomenclature is that the Western Toad refers to both subspecies of *Anaxyrus boreas.*

Habitat:
A terrestrial and wetlands species found in humid open forests with moderate to dense undergrowth, including old fields and meadows, often near surface water. Boreal toads breed in permanent or temporary quiet pools of streams and sloughs, wetlands, lakes and ponds; including brackish pools. The use of at least occasional brackish pools for breeding is very unusual for North American frogs and toads. The species tolerance for brackish, and even sea water, have enabled it to disperse widely in Southeast Alaska, including the colonization of islands.

Boreal Toads are widespread in Southeast Alaska, and range northward along the coast to Prince William Sound, including Montague and Hawkins Islands; with the edge of their range a short distance north to the Tasnuna River (a tributary of the Copper River) and west to the Columbia Glacier (MacDonald 2003).

MacDonald (2003) reported that Boreal Toads "are common and widespread on the mainland and islands of Southeast Alaska." Boreal Toad records are certainly widely distributed throughout Southeast Alaska (MacDonald 2003, MacDonald and Cook 2007). There are 70 museum specimen records in Southeast Alaska documented by geographic location (usually including latitude and longitude) and a distribution map in MacDonald and Cook (2007, pages 127-128). The records are particularly prevalent along the coast and near settlements. Records near the British Columbia border and interior, especially in the southeastern portion of Southeast Alaska are absent, because of the lack of surveys.

Soulé River Watershed Survey for Anurans (Boreal Toad, Wood Frog) and Chytrid Fungus (Batrachochytrium dendrobatidis) (BD)

Observations of Boreal Toads in 2007 and 2008 were opportunistic while searching for wildlife and collecting a wide variety of ecological data. The collecting of ecological data in the field consisted of: forestry and river measurements, fisheries and big game assessments, documentation of plant communities, avian surveys, and opportunistic wildlife and amphibian surveys.

Over 30 Boreal Toad metamorphs (< 2 cm) were observed during September 12-14, 2007, on the south delta of the Soulé River. These juveniles transformed from tadpoles during the summer (July – August), and were observed on the south delta in tall dense grass, especially in the association of several large Sitka spruce with well developed litter. All metamorphs were very similar in size and in the same location, suggesting that they were from a single egg deposition. The Delta has tidal flooding and numerous pools develop at the mouth of the Soulé River along with brackish marsh habitat.

Field studies were conducted with three personnel from July 21 – August 5, 2008, in the Soulé River Watershed. Habitats where ecological data were collected included: montane conifer forest, North and West Forks of the Soulé River, riverine and lacustrine riparian, ponds and wetlands complexes, seeps, and muskeg. Pond habitats consisted of beaver ponds, backwaters of the river, or pools at the base of steep slopes that filled with snow melt and groundwater seepage. Intense searches were made for amphibians when ponds and wetlands were encountered.

The only amphibian species observed in the watershed in 2008 was the Boreal Toad. Boreal Toads blend in well with their habitat and are difficult to see, especially if they do not move. Adults were seen opportunistically on three different occasions along the North Fork River. All three toads appeared to be active and healthy. They did not have any traces of ventral or dorsal skin lesions, or ventral skin reddening. Careful searching for amphibians in what appeared to be good habitat failed to find any specimens of adults or tadpoles. Considering the large amount of time spent in the field, we concluded that amphibians are very rare in the North Fork and No-Name Lake area of the Soulé Watershed.

Figure 73 – Boreal Toad at Soulé River

Figure 74 – Boreal Toad at Soulé River

After Boreal toads were found in 2007-2008, the resource agencies requested a survey to look specifically for amphibians. A field investigation for amphibians was conducted in the Soulé River Watershed July 14-29, 2009. The most intense amphibian surveys were conducted from July 14-19, 2009 (Figures 73 and 74). The amphibian survey work was a component of a much more extensive ecological assessment conducted with four researchers that covered montane conifer forest, wetlands, riparian, river, estuary, brackish marsh, fisheries, wildlife, and goshawk surveys. Active searches for amphibians were conducted in the following habitats: montane conifer forest and forest litter, riverine and lacustrine riparian, ponds and wetlands complexes, seeps, muskeg, river channels and small streams, and river delta brackish marsh. However, most of the search time for amphibians during this time period was opportunistic, and occurred when other ecological metrics were being collected in the field.[41]

Captured amphibians were swabbed for chytrid fungus, *Batrachochytrium dendrobatidis* (BD), using currently established protocol (Brem et al. 2007, Brede et al. 2009). The samples were sent to Pisces Molecular, Boulder, Colorado, for detection of BD by PCR analysis. Pisces Molecular procedures are in Appendix A of the *Soulé River Watershed Amphibian Data Report 2009*. Habitat and toad pictures were also from Carstensen (2009).

Locations for Boreal Toads:

3 adults, July 2008: lower North Fork, east bank, riparian/floodplain

1 adult, July 14, 2009: middle North Fork, west side, fen wetlands complex

1 adult, July 15, 2009: lower West Fork, south side, near junction, fen wetlands complex

[41] The Shipley Group. 2010. *Soulé River Watershed Amphibian Data Report 2009*. p. 9-10. April 2010.

1 adult, July 15, 2009: middle Main Stem, west side, mature hemlock forest, above beaver ponds

2 adults, July 18, 2009: middle Main Stem, west side, fen wetlands complex, downstream of above

1 adult, July 18, 2009: upper Main Stem, west side, fen wetlands complex

1 metamorph clump, September 12-14, 2007: south Soulé Delta, interior uplift, high grass and under spruce canopy.

1 tadpole clump, July 14-29, 2009: south Soulé Delta, small pond, close to Portland Canal, completely flooded over during spring high tides 50-100 individuals, the tadpoles are slowly growing in size, but decreasing in number over the observation period. (Figure 75)

2 tadpole clumps, July 18, 2009: upper Main Stem, west side, fen wetlands complex, two different clutches at distant ends of wetlands complex, 50-100 individuals in one clump, over 200 individuals in second clump, and tadpoles twice as large.

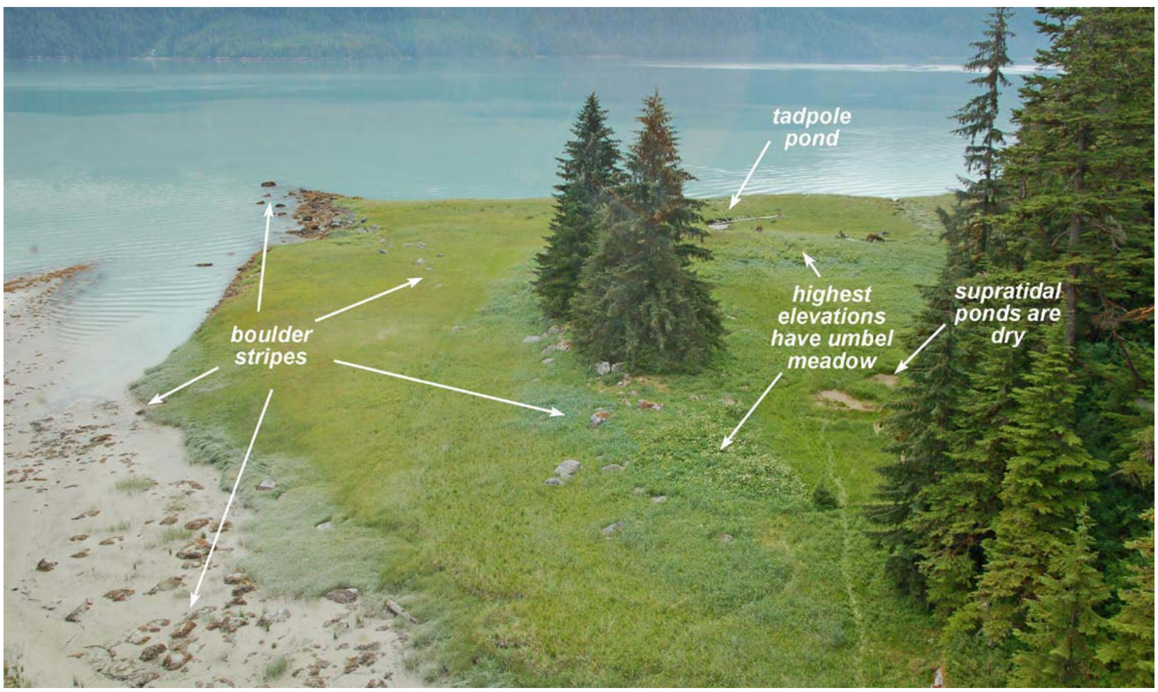

Figure 75 – Location of tadpole pond on south delta; river mouth at left

Over the three years of field work in a very wide range of habitats throughout the Soulé River Watershed, 13 Boreal Toad observations were made at an effort of 123 Field-Observation-Days. That translates to 8.7 observer-days for each adult Boreal Toad, tadpole or metamorph cluster observation in the Soulé River Watershed. Many intense searches were conducted in excellent Boreal Toad habitat, including ponds and wetlands for tadpoles. This represents an extremely low encounter rate for Boreal Toads, indeed any amphibian species. Amphibian surveys were particularly intense July 14-19, 2009, when individuals were swabbed for chytrid fungus. Even during this time period, when a great deal of search efforts were in a variety of wetlands, including beaver ponds, fens, brackish marsh, and riparian habitats, the encounter rate was still poor at 2.7 observer-days for each adult Boreal Toad or tadpole cluster observation. The searched wetlands, beaver ponds, and fens represented excellent amphibian habitats (O'Clair et al.1997, Carstensen 2009).

The absence of observable pathology in BD infected Boreal Toads in the Soulé Watershed is consistent with all the other amphibian surveys in Alaska and western Canada. Additionally, Soulé Watershed toads had the same infection rate as the large regional sample (see Table 8 in the *Amphibian Data Report 2009*, Appendix I). Interestingly, out of the six toads tested for BD, the two that were infected were the individuals that were the farthest separated in the Soulé Watershed landscape. All of the 19 metamorphs from the Soulé delta pond tested negative for BD. This is also comparable to other studies, where metamorphs and larvae anurans typically have much lower BD infection rates than adults.

The Soulé Watershed is considered remote wilderness and not visited by humans. BD has been documented in remote, wilderness, and pristine landscapes in Alaska and western Canada. However, BD infection rates were much lower in these remote and inaccessible settings when compared to developed areas and road accessible sites. Reeves et al. (2008) found that road accessible sites in Alaskan National Wildlife Refuges positively correlated with skeletal abnormalities in Wood Frogs. Some of the highest reported abnormality rates in published literature.

Other Amphibians

The scarcity of Boreal Toads parallels the scarcity of other amphibians and mammals in the Soulé Watershed. The evidence of rarity is based on visual sightings, the lack of tracks in muddy or sandy soils, and the lack of other signs of presence.

Northern Roughskin Newt (*Taricha granulosa granulosa*)

Local Range: Coastal British Columbia; Southeast Alaska, as far north as Juneau MacDonald and Cook (2007): >10; well distributed south of Juneau, coastal and islands

Elevation Range: Sea level to 1900m

Habitat:
Humid coastal forests to high mountain lakes; found in and around ponds, lakes, and stream backwaters; where there is an abundance of aquatic plants. All of the records in MacDonald and Cook (2007) are coastal and on islands. One is at Stikine River.

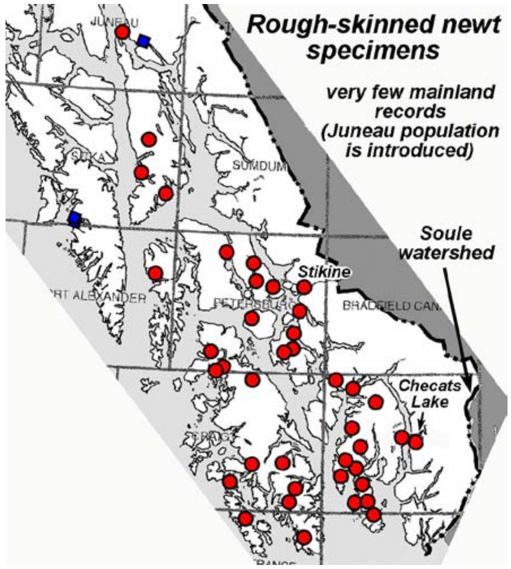

Figure 76[42] – New Location for Rough-skinned Newt's

Soulé River Watershed

At least 20 roughskin newts were seen in July 2009. The newts were closely associated with clear water ponds, typically with an abundance of buckbean (*Menyanthes trifoliata*) emergents. The ponds were typically in fen wetland complexes. One tannin stained pond was associated with a series of pools on a rocky boulder ridge above the Main Stem of the Soulé, not far downstream from the junction of the two forks on the eastern side. Our records for Northern Roughskin Newts in the Soulé River Watershed are the first reported for the southeastern interior area of Southeast Alaska.

Figure 77 – Rough-skinned Newt at Soulé River Watershed

[42] Figure courtesy of: Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. Page 20.

Locations for Northern Roughskin Newts:

- 5 adults, July 15, 2009: lower West Fork, north side, just north of confluence, ponds in fen wetlands complex.
- 15 adults, July 15-29, 2009: middle Main Stem, east side, ponds in extensive fen wetlands complexes.

The steep and very rugged habitat, deep winter snows, up to 30 feet deep covering the landscape, and relatively recent retreat from glacial influences, may explain the general lack of amphibians and mammals. Because of the deep winter snowfall, the Figure 76 – "Rough-skin Newt" snow-free season may be short in the deep valleys of the Soulé Watershed. Anuran adults or metamorphs could have poor survivorship or dispersal potential in this landscape. The short snow-free season may be particularly difficult for recently transformed metamorphs that do not have sufficient time to grow and accumulate body fat for their extensive winter hibernation.

Unidentified Frog

Frogs were seen on at least five occasions. The individuals rapidly disappeared into dense litter or grass and could not be located, despite significant efforts. The general color and litter-disappearing behavior strongly suggested wood frogs. The habitats where the frogs were observed included: lower North Fork, east side, riparian floodplain, a boulder-rocky ridge on the east side of the middle Main Stem where there are small pockets of water, and the south Soulé Delta grassy marsh. There are at least six wood frog museum records for the Stikine River drainage area, the southernmost documented locality for this species in Southeast Alaska (MacDonald and Cook 2007).

The Soulé Watershed is over 100 miles southeast of this locality. The only other potential frog in the Soulé Watershed is the Columbia Spotted Frog. We have found this species to be easily observed and captured in pond and river habitats in the northwestern United States, so we thought it unlikely that our unknown frog was this species. There are four records for this species at Hyder, two at Salmon River and two at Fish Creek (MacDonald and Cook 2007). There is also a record of two at Unuk River, approximately 40 miles west of Hyder. These records are also the southernmost localities for this species. The lack of museum records for these two frog species in southern Southeast Alaska appears to represent an actual absence or rarity, because both boreal toads and roughskin newts are clearly documented on islands and south coastal areas of Southeast Alaska, clearly indicating field surveys in these areas (MacDonald and Cook 2007). Nevertheless, the interior eastern boundary of Southeast Alaska, outside of the Hyder area, lacks museum records for all amphibian species. The unknown frog remains a mystery, acting like a wood frog, but closer in range to a documented Columbia spotted frog locality.

Amphibians with Unknown Status

Wood Frog (Lithobates sylvaticus)

Local Range: Widespread in interior Alaska; Southeast Alaska north of Stikine River. The Wood Frog is North America's only amphibian or reptile found in the Arctic Circle, MacDonald and Cook (2007): 4; all at Stikine River.

Elevation Range: Sea level to 2140m

Habitat:
Wood frogs occur in a wide variety of habitats: open forests, meadows, riparian, muskeg, and tundra. They are exceptionally cold-tolerant and active at near freezing temperatures, and they are also drought and dehydration tolerant. Wood frogs breed unusually early in the season throughout their range in permanent or temporary shallow pools. They hibernate or are dormant during drought under forest, meadow, or tundra litter.

Soulé River Watershed:
Unknown – see above section discussing unidentified frog

Columbia Spotted Frog *(Rana luteiventris)*

Local Range: British Columbia; Southeast Alaska south of Taku River, MacDonald and Cook (2007): 7; 3 at Stikine River, 3 in vicinity of Hyder

Elevation Range: Sea level to 2440m

Habitat:
This is a riparian species that is closely associated with permanent water: lakes, beaver and muskeg ponds, rivers, streams, and fluvial backwaters. Foraging, breeding, and hibernation all take place in these habitats.

Soulé River Watershed:
Unknown – see above section discussing unidentified frog

Northwestern Salamander *(Ambystoma gracile)*

Local Range: Coastal British Columbia; 2 records for Southeast Alaska, MacDonald and Cook (2007): 1; Mary Island, southeast of Ketchikan

Elevation Range: Sea level to 2000m

Habitat:
Moist forests or open woods; breeding in usually permanent water, but also temporary pools, including beaver ponds and stream backwaters; breeds in early to mid-spring. Highly fossorial, and are primarily active nocturnally and after heavy precipitation.

Soulé River Watershed:
Unknown

Eastern Long-toed Salamander *(Ambystoma macrodactylum columbianum)*

Local Range: British Columbia; 4 records for Southeast Alaska, MacDonald and Cook (2007): 3; 2 Stikine River

Elevation Range: Sea level to 2500m

Habitat:
Moist forests, open woods, and grasslands; broad habitat tolerance; breeding in permanent or temporary quiet pools, including beaver ponds, stream backwaters, and wet meadows; breeds in winter to early spring. Highly fossorial and are primarily active nocturnally and after heavy precipitation.

Soulé River Watershed:
Unknown

Unlikely Amphibians

Northern Red-legged Frog *(Rana aurora)*

Local Range: Coastal southwestern British Columbia, MacDonald and Cook (2007): None; Northeast Chichagof Island, Pavlof Bay drainage, Introduced?

Elevation Range: Sea level to 920m

Habitat:
This is a species of riparian zones of lakes, ponds, and streams, and marshes. It can also be found in nearby forests, woodlands, and meadows, especially in wet weather. It prefers dense ground cover, aquatic vegetation, and vegetation hanging over water. For breeding, it prefers deep permanent pools of quiet or slow-flowing water.

Soulé River Watershed:
Unlikely

Pacific Chorus Frog *(Pseudacris regilla)*

Local Range: Southern British Columbia; Introduced to Queen Charlotte Islands, MacDonald and Cook (2007): 2; Introduced to a muskeg pond near Ward Lake, Revillagigedo Island.

Elevation Range: Sea level to 2440m

Habitat:
This species inhabits a wide variety of habitats: forests, open woodlands, dense meadows, shrub-lands, even oasis in desert scrub. It prefers high ground cover and is usually close to permanent water: lakes, muskeg ponds, streams, springs and oasis.

Soulé River Watershed:
Unlikely

Pacific Tailed Frog *(Ascaphus truei)*

Local Range: Coastal British Columbia, MacDonald and Cook (2007): None; A "watch for" species in southeastern Alaska. This species has not been documented in Alaska, found in coastal British Columbia close to the Alaska border.

Elevation Range: Sea level to 2140m

Habitat:
This is a species adapted to living adjacent to and breeding in fast running mountain streams. Their tadpoles have a sucker mouth to live and feed in stream rapids.

Soulé River Watershed:
Unlikely

In summary, most amphibians are unlikely to be in the Soulé River Watershed. The Boreal toad and Northern Roughskin Newt may be impacted by this project because of changes to wetlands and natural water flow. However, their habitat (locations where they were found) can be avoided to minimize impacts. Amphibians found on the south delta are unlikely to be impacted as no activity is expected to occur on that delta in relation to this project. The fen wetland on the upper west side of the Main Stem where tadpole clumps were found will also be avoided by project features.

Botanical Resources

All of the valley bottoms of the North Fork and the West Fork of the Soulé watershed are relatively young, early successional forests, thickets and lichen/moss terraces.

The granitically-derived landscape of the Soulé bottomlands may provide a more structurally diverse mosaic of microhabitats than you'd find on more productive parent material, where forest cover is more uniform. Diversity and productivity do not go hand-in-hand. In some cases, they may even be inversely related. However, in the week of wetland mapping by field biologists, an impressive array of microhabitats was traversed: xeric d1 lichen turf on cobble/gravel outwash; thick-scrub spastic mountain hemlock woodland; majestic, closed, 30"- dbh subalpine fir forest; dewatered beaver flats with stochastic meadow assemblages; pecker-drilled snag swamps on toes of avalanche fans; newt fens and toad wallows; 90-foot cottonwoods; ancient, thin-peat sphagnum bogs; and plain old small-tree blueberry old growth.

USFS sensitive species are defined as "*Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density or b)* *significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution*" (USDA Forest Service 1991). Regional Foresters are delegated the authority to designate sensitive plant species based on the definition above.

The only plant federally listed or proposed by the U.S. Fish and Wildlife Service in Alaska is the Aleutian shield fern *(Polystichum aleuticum)* C. Christensen, which is endangered. It is only known from Adak Island, Alaska, and is not expected to occur in the project area. The only lichen listed as sensitive by the Forest Service is Lichen (no common name) *(Lobaria amplissima)*. This is a rare lichen that does not reproduce in Alaska, but is transported via fragmentation by birds, slugs, and voles. Regarding the nineteen vascular plants designated as sensitive by the Forest Service, they are evaluated in the Threatened, Endangered, and Sensitive Species section of this application, below.

Habitats Within the Project Area

Below is listed the area, habitat, and dominant types of plants typically found in each.

1) North Fork Valley

i) Wetlands and Waters of the US

Active pond shallows – *Scirpus microcarpus, Carex stichensis, Carex kelloggii, Juncus ensifolius, Potentilla palustris*

Inactive beaver pond (with stream going through old pond) – willow seedlings and saplings (*Salix sitchensis* and *barclayi), Carex kelloggii, Juncus mertensianus, Saxifraga ferruginea, Juncus ensifolius*

Main North Fork of the Soulé River channel - no vegetation in cobble bottomed channel. Yazoo channels - usually only vegetated on the edges and then only if slow moving.

ii) Uplands

Valley wall hemlock forest - *Tsuga heterophylla and mertensiana, Picea sitchensis, Abies lasiocarpa, Vaccinium ovalifolium/alaskanse, Streptopus roseus, Clintonia uniflora*.

Avalanche slope Sitka alder/salmonberry thicket - *Alnus sinuata, Rubus spectabilis, Oplopanax horridus, Athyrium felix-femina*.

Valley floor Mountain hemlock forest – *Tsuga mertensiana, Salix sitchensis, Vaccinium ovalifolium, Streptopus roseus*.

Valley floor young Sitka spruce/cottonwood/devils club forest(4) – *Picea sitchensis, Populus balsamifera, Tsuga mertensiana, Oplopanax horridus, Rubus spectabilis, Tiarella trifoliata, Dryopteris dilatata.*

Floodplain Sitka alder/spiny woodfern thicket - *Alnus sinuata, Dryopteris expansa, Athyrium felix-femina*.

River floodplain lichen terrace – seedlings and saplings of *Abies lasiocarpa, Populus balsamifera, Picea sitchensis, Salix sitchensis* and assorted species of *Cladina and Cladonia* lichens and *Racomitrium canescens* moss, all adapted to excessively-drained areas.

2) Lower West Fork and Confluence

ii) Wetlands

Terraced *Sphagnum* Bogs **–** *Sphagnum spp., Trichophorum cespitosum, Carex pauciflora, Eriophorum angustifolium, Kalmia polifolia, Drosera rotundifolia and anglica, Vaccinium uliginosum, Lycopodiella inundatum, Coptis trifoliata*.

Fens **–** *Carex sitchensis, Vaccinium uliginosum, Menyanthes trifoliata.*

Beaver ponds **–***Salix sitchensis, Salix barclayi, Carex kelloggii, Calamagrostis canadensis.*

Avalanche/Alluvial fan willow and alder/skunk cabbage fen **–** *Alnus sinuata*, *Salix sitchensis, Lysichiton americanum, Rubus spectabilis, Calamagrostis canadensis*.

iii) Uplands

River floodplain lichen terraces - seedlings and saplings of *Abies lasiocarpa*, *Populus balsamifera, Picea sitchensis, Salix sitchensis* and assorted species of *Cladina and Cladonia* lichens and *Racomitrium canescens* moss, all adapted to well-drained areas.

Subalpine fir/Mountain hemlock slope forest **–** *Abies lasiocarpa, Tsuga mertensiana, Vaccinium ovalifolium/alaskanse, Clintonia uniflora*.

Open dwarf tree scrub - *Tsuga mertensiana*, *Vaccinium ovalifolium* and *uliginosum, Cladothamnus pyrolaeflorus*.

3) Soulé River Main Stem

iv) Wetlands

Avalanche/Alluvial fan base poor fen/marsh **–** *Carex sitchensis, Potentilla palustris, Salix barclayi, Carex magellanica, Menyanthes trifoliata, Lysichiton americanum*

Beaver pond/fen/bog complex - *Carex sitchensis, Potentilla palustris, Menyanthes trifoliata, Carex laeveculmis, Lysichiton americanum*

Floodplain beaver ponds **–** *Scirpus microcarpus, Carex sitchensis, Carex kelloggii, Calamagrostis canadensis***.**

Bedrock controlled ponds **–** no vegetation.

String poor fen/bog complex - *Trichophorum cespitosum, Carex magellanica, Drosera anglica, Nuphar polysepalum, Menyanthes trifoliata, Kalmia polifolia*.

v) Uplands

Open dwarf tree scrub - *Tsuga mertensiana, Vaccinium ovalifolium, Vaccinium uliginosum, Menziesia ferriginea, Pteridium aquilinum.*

Hillside W. hemlock/Sitka spruce forest – *Tsuga heterophylla, Picea sitchensis, Vaccinium ovalifolium.*

Floodplain young sub-alpine fir/Sitka alder thicket – *Alnus sinuata, Abies lasiocarpa, Athyrium felix-femina*

Upper river terrace sub-alpine fir/mountain hemlock forest – *Abies lasiocarpa, Tsuga mertensiana, Picea sitchensis, Vaccinium ovalifolium.*

4) Soulé River Delta

vi) Wetland

Upper intertidal – *Potentilla anserina, Triglochin maritima, Sonchus arvensis, Castilleja unalaschcensis, Festuca rubra.*

Mid intertidal – *Carex lyngbyei.*

vii) Upland

Mesic beach meadow – *Heracleum lanatum, Elymus arenarius, Plantago macrocarpa, Achillea borealis, Festuca rubra, Deschampsia beringens,.*

Forest/beach meadow ecotone – *Myrica gale, Malus fusca, Calamagrostis canadensis.*

Determination of Effect

i. Direct and Indirect Effects

Table 15 – Potential Sensitive Species and Their Habitats and Project Impacts and Direct and Indirect Effects of Those Impacts

Species and Habitat Potential	Project Features	Project Impacts	Direct Effects	Indirect Effects
S: Cirsium edule var. macounii (Edible thistle) **H:** Avalanche Slopes	Reservoir	Inundation up to 200' in part of the North and the lower part of West fork	Flooding; reduction in the amount of its preferred habitat, but this habitat is plentiful in this watershed and this species was not found	None
S: same as above (Edible thistle) **H:** Avalanche Slopes	Dams	No impacts because dams avoid avalanche slopes	None; in part because none of this species was found	None
S: same as above (Edible thistle) **H:** Avalanche Slopes	Access Road	The Access Road route will avoid avalanche slopes	None; also, this species was not found	None
S: same as above (Edible thistle) **H:** Beach Meadow	Delta Staging Area, including Barge Basin and beginning of Access Road	Though the meadow will be disturbed, no Edible Thistle were found in this habitat; No Impacts	None; reduction in the amount of preferred habitat, but none were found	None
S: same as above (Edible thistle) **H:** Beach Meadow	Powerhouse, Tailrace, Substation	Powerhouse site - 50'x120'building with construction area, tailrace, and substation will not likely disturb this species as none were found	None, as this species was not found. Powerhouse, etc. will primarily be placed back within the treeline along the edge of the delta	Disturbance could be vector for spread of invasive species, i.e. *Sonchus arvensis* (sow thistle) which is present on the delta but not currently at the powerhouse

S: Cypripedium montanum (Mountain lady's slipper) **H:** Valley wall hemlock forest, Valley floor mountain hemlock forest, Valley floor young Sitka spruce/cottonwood/devils club, outwash/floodplain forest, Subalpine fir/Mountain hemlock slope forest	Reservoir	Inundation up to 200' in part of the North and the lower part of West fork; habitat types will still exist with project in place	Flooding of all habitats; but the same habitats will still exist in the watershed and around the reservoir between No-Name Lake and the highpoint of the reservoir; Impacts are Insignificant	None
S: Cypripedium montanum (Mountain lady's slipper) **H:** same as above	Dams	Insignificant impacts because dams avoid most forested slopes	None; habitat types are abundant in this watershed and this species was not found	None
S: Cypripedium montanum (Mountain lady's slipper) **H:** Main stem - Hillside w. hemlock/Sitka spruce forest, Upper river terrace sub-alpine fir/mountain hemlock forest	Access Road	A 20 ft. wide, 2.95 mile road potential staging areas, additional rock sources, and waste spoil disposal sites would pass through or affect both of these habitats; this species was not found.	Clearing and filling of road corridor and staging areas, waste spoil disposal sites and excavating of rock pits. Redirected drainage may change uplands surrounding road and dewater moist habitat needed for this species.	Disturbance and equipment movement could be vector for spread of invasive species. Potential for acid rock drainage from road fill and waste rock is low because of the type of rock present.
S: Cypripedium montanum (Mountain lady's slipper) **H:** Soule Delta beach meadow and meadow/forest ecotone	Powerhouse, Tailrace, Substation	Although the delta will be disturbed by construction and the placement of project features, this species was not found	Narrow footprint, but impacts to this species are insignificant because it was not found	Possibility of disturbance of soil could be vector for invasive *Sonchus arvensis* (sow thistle)

S: Papaver alboroseum (Pale poppy) **H:** River floodplain lichen terraces	Reservoir	Inundation up to 200’ in part of the North and the lower part of West fork; habitat types will still exist with project in place	Flooding of this habitat – though prime habitat is up the river from flooding – none were found during surveys	None
S: Piperia unalascensis (Lesser round-leaved orchid) **H:** Terraced Sphagnum Bogs, Fens, Avalanche/Alluvial fan willow and alder/skunk cabbage fen	Reservoir	Inundation up to 200’ in part of the North and the lower part of West fork; these habitat types will still exist with project in place	Flooding of lower terraced bogs, fens and avalanche fens; however, this species was not found, so impacts are likely not significant	None
S: Piperia unalascensis (Lesser round-leaved orchid) **H:** same as above	Dams	The bog/fen complex on the south side of the river confluence area will be affected by the Saddle Dam, staging area, and rock source site; these habitat types will still exist with project in place	Clearing and filling of bogs and fens for project features (i.e. saddle dam, access road, staging area); this species was not found during sensitive plant and wetland surveys	Disturbance and equipment movement could be vector for spread of invasive species. Potential for acid rock drainage is low because of the rock type present
S: Piperia unalascensis (Lesser round-leaved orchid) **H:** same as above	Access Road	The Access Road will avoid most or all bog/fen complexs; these habitat types will still exist with project in place	Clearing and filling of road corridor may effect small amounts of bog/fen complex's	Disturbance and equipment movement could be vector for spread of invasive species. Potential for acid rock drainage is low because of the rock type present

S: Platanthera orbiculata (Alaska rein orchid) **H:** Valley wall hemlock forest, Valley floor mountain hemlock forest	Reservoir	Inundation up to 200' in part of the North and the lower part of West fork; these habitat types will still exist with project in place; this species was not found	Flooding of all habitats; but the same habitats will still exist in the watershed and around the reservoir between No-Name Lake and the highpoint of the reservoir; Impacts are Insignificant	None
S: Platanthera orbiculata (Alaska rein orchid) **H:** Main stem - Hillside W. hemlock/Sitka spruce forest, Upper river terrace sub-alpine fir/mountain hemlock forest	Access Road	A 20 ft. wide, 2.95 mile road potential staging areas, additional rock sources, and waste spoil disposal sites would pass through both of these habitats; this species was not found	Clearing and filling of road corridor and staging areas, waste spoil disposal sites and excavating of rock pits, however, there is plenty of this habitat available in and around the watershed.	Disturbance and equipment movement could be vector for spread of invasive species. Potential for acid rock drainage is low because of the rock type present
S: Romanzoffia unalaschcensis (Unalaska mist-maid) **H:** River gorge walls	Dams	In area of dam and spillway construction and inundation; this species was not found	Flooding and dam construction; although species not found	Reduced flow in lower gorge; although this species was not found
S: Sidalcea hendersonii (Henderson's checkermallow) **H:** Beach meadow/forest ecotone	Powerhouse, Tailrace, Substation, Road from tidewater	Although the delta will be disturbed by construction and the placement of project features, this species was not found	Narrow footprint, but impacts to this species are insignificant because it was not found	Possibility of disturbance of soil could be vector for invasive *Sonchus arvensis* (sow thistle)

Wetland Inventory

The Soulé River watershed is within the Coast Range and part of the Coast Range batholith – a monolithic Tertiary-Eocene intrusive of granite and granodiorite - a relatively low-diversity, low-productivity area in terms of plants and wildlife. The Soulé Ice sheet, which caps the southern southeast Alaska/Misty Fjord part of the Coast Range, feeds the Soulé Glacier, which is part of the watershed at the head of the West Fork of the Soulé River. The valley walls are steep with lots of avalanche tracks and the valley bottoms are alluvial with reworked outwash and floodplain material overlain in areas on the sides by alluvial fans and colluvium.

Surveys were conducted by botanists Koren Bosworth of Bosworth Botanical Consulting and Richard Carstensen of Discovery Southeast. They were in the field, in the project area for eight days, eight hours a day, from August 14-21, 2009. Daily survey coverage is shown in Figure 78. There were some areas within the project area that were inaccessible by foot or by helicopter – in almost all cases these spots were not wetland areas. There were some un-vegetated bedrock-controlled ponds in along the Main Stem of the Soulé River that we were unable to visit but could see from above.

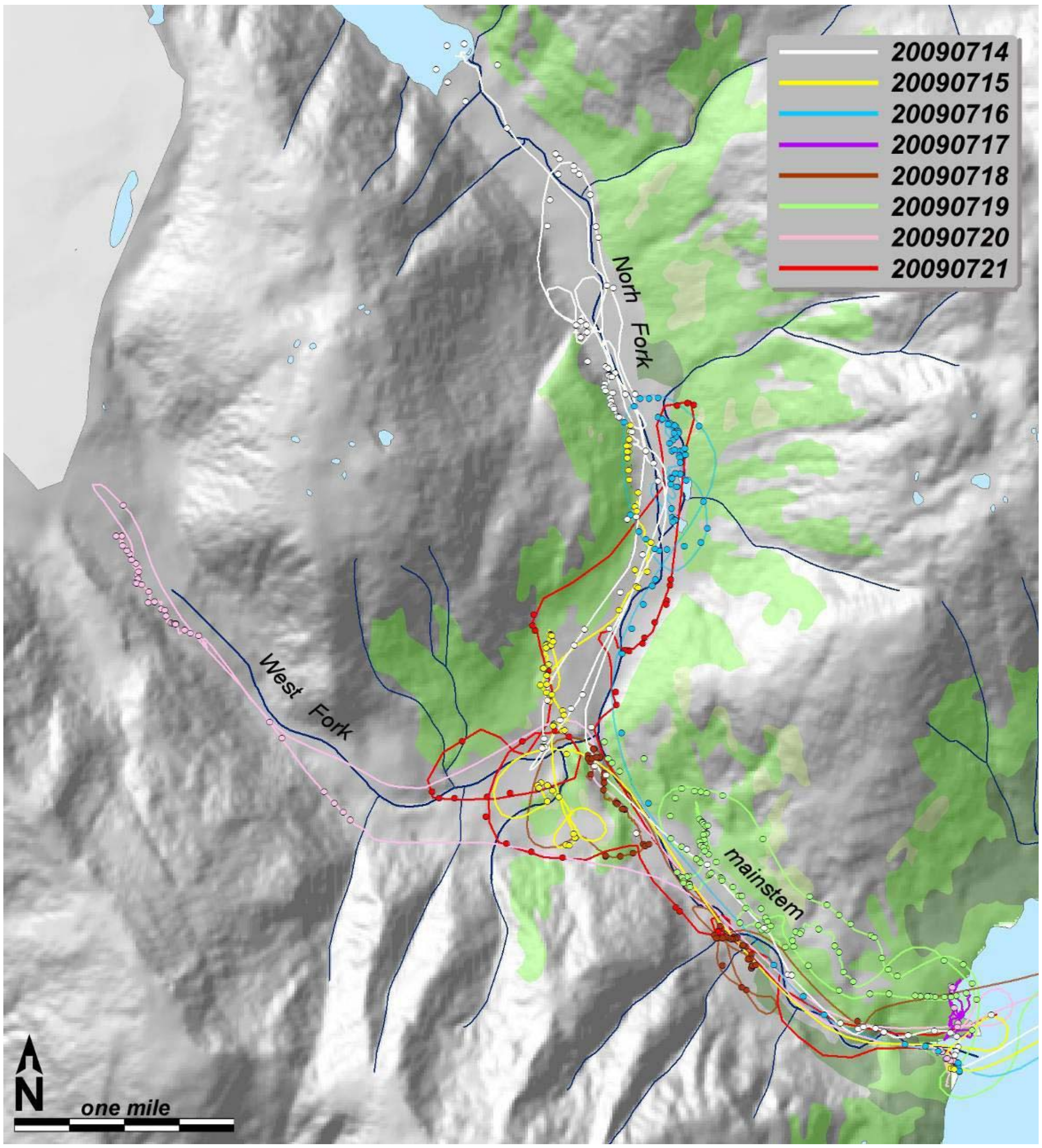

Figure 78 – Daily Survey Areas

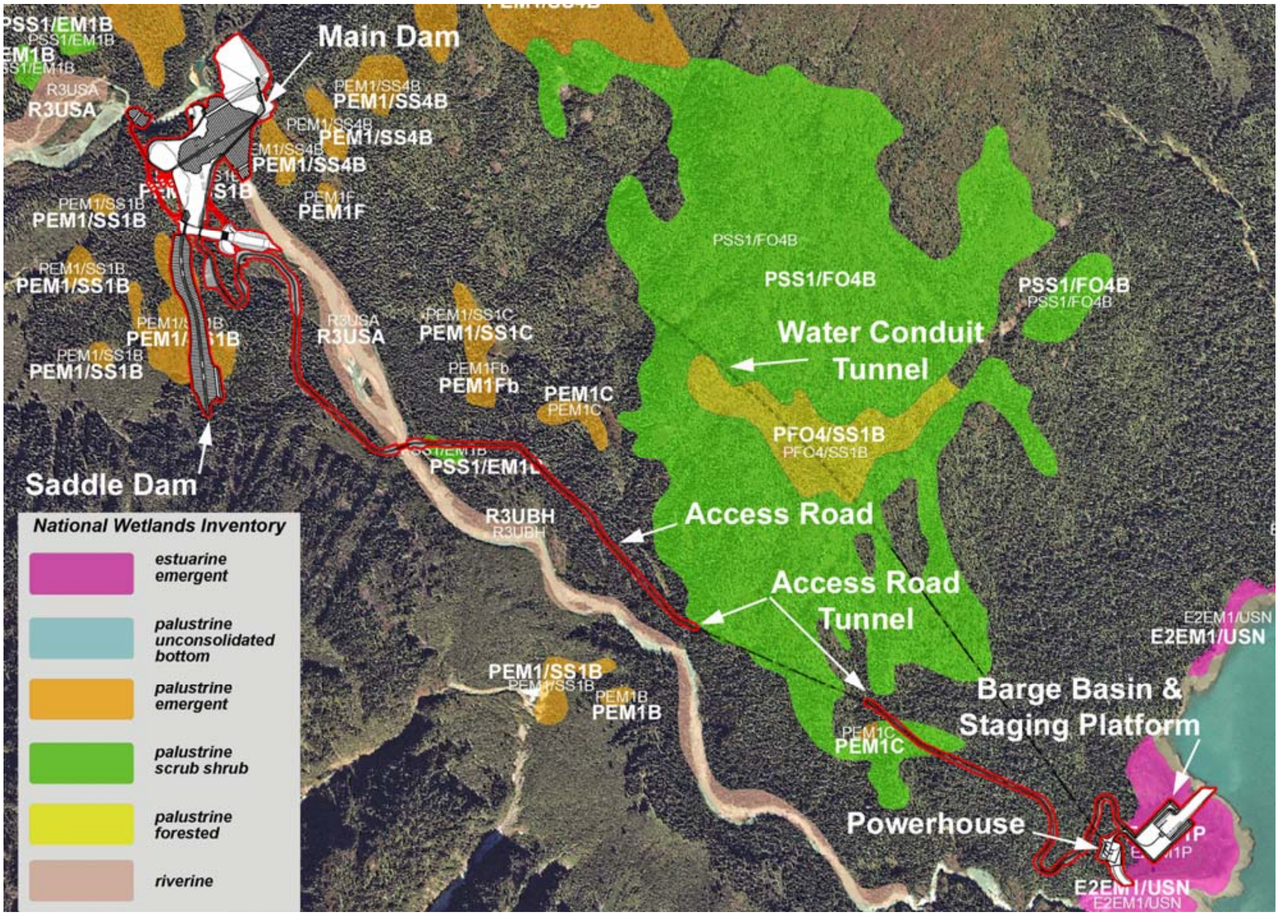

Figure 79 – National Wetlands Inventory Map of project area with project features overlaid

The US Army COE methodology was used, as outlined in the 1987 Corps of Engineers Wetland Delineation Manual, and amended by the, Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region – Oct. 2007.

Vegetation was determined using the prevalence index and the dominance method. Plant species are classified by the US Fish and Wildlife Service, and available on the 1988 National List of Plant Species that Occur in Wetlands".

Hydrology was determined using two methods: visually, if the water table was at or above the surface, or with a soil pit. Soil pits were dug where possible to determine if indicators of hydric soils were present. The spring and summer before the delineation work was done had been very dry, though there was rain during the last part of the field work. This was taken into consideration when hydrology was determined. For each sample site an Alaska Region COE Routine Wetland Determination Data Form was filled out.

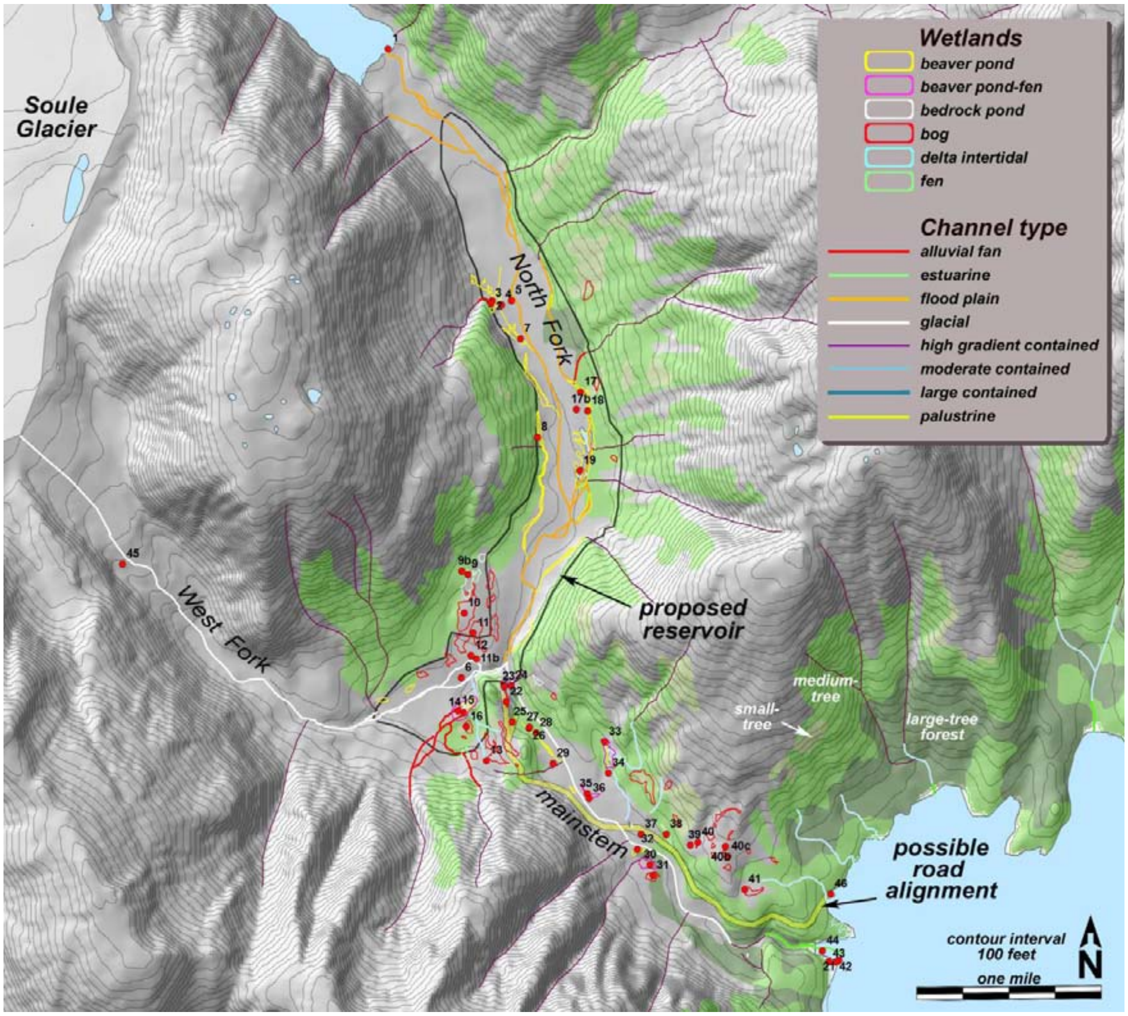

Figure 80 – Master overview map of wetlands in the Soulé River Watershed. Numbered red dots are sample points.

Table 16 – Figure 80 Sampling Point Results

Sample Point	Vegetation and geomorphic type	Wetland Status – NWI Classification
1	Young scrub hemlock/glacial moraine/lake edge	Upland
2	rush /muddy dewatered beaver pond/toe-of-slope	Wetland – PEM1bd
3	Alder/willow thicket/alluvial fan base	Upland
4	Spruce-cottonwood forest/young floodplain/outwash	Upland
5	Alder/spiney woodfern thicket/young floodplain/outwash	Upland
6	Dry moss/lichen river terrace w/ tree seedlings	Upland
7	Rush/sedge/grass /muddy/dewatered beaver dam	Wetland – PEM1bd
8	Sedge marsh/active beaver pond edge – yazoo channel	Wetland – PEM1b
9	Sedge fen/terraced bedrock hillside	Wetland – PEM1Yag

9b	Western hemlock forest/steep hillside	Upland
10	*Trichophorum –Sphagnum* bog/terraced bedrock hillside	Wetland - PEM1Yag
11	Pond lily/bog pond	Wetland - PAB3ag
11b	W. hemlock-subalpine fir forest/steep bedrock hillside	Upland
12	Sphagnum slope bog/hillside	Wetland - PEM1Yag
13	Alder – skunk cabbage thicket/alluvial fan base	Wetland - PSS1
14	Blue joint fen/alluvial fan base	Wetland - PEM1bd
15	Willow-sedge fen/avalanche slope runout base	Wetland - PSS1
16	Sphagnum bog/hillside terrace	Wetland -PEM1Yag
17	Grass/rush/dewatered beaver pond	Upland
17b	Mt. hemlock forest/active floodplain	Upland
18	Scirpus marsh/yazoo channel beaver pond	Wetland – PEM1bd
19	Blue joint/sedge/beaver pond edge	Wetland - PEM1b
20	Silverweed/intertidal-supratidal/silty river delta	Wetland - E2EM1N/P
21	Lyngbi sedge/intertidal/silty river delta	Wetland - E2EM1N
22	Trichophorum –Sphagnum bog/terraced bedrock hillside	Wetland - PEM1Yag
23	Mt. hemlock-blueberry woodland/bedrock slope	Upland
24	Dwarf blueberry scrub/bedrock hilltop	Upland
25	W. hemlock-Sitka spruce forest/steep hillside	Upland
26	Sparse sedge cover/active beaver dam – yazoo channel	Wetland – PEM1Gb
27	Alder-willow thicket/floodplain	Upland
28	Kellogg sedge marsh/inactive beaver pond	Wetland - PEM1bd
29	Subalpine fir-mt. hemlock forest/upper floodplain terrace	Upland
30	Sitka sedge marsh/alluvial fan base	Wetland – PEM1b
31	Sphagnum bog/alluvial fan base	Wetland – PEM1Yag
32	Willow-skunk cabbage fen/alluvial fan base	Wetland – PEM1
33	Sitka spruce-w. hemlock forest/small valley bottom	Upland
34	Sitka spruce-hemlock forest/valley bottom	Upland
35	Sphagnum-sedge fen/toe-of-slope	Wetland - PEM1ab
36	Mt. hemlock forest/old alluvial terrace	Upland
37	Willow-sedge-Sphagnum fen/toe-of-slope alluvial	Wetland – PEM1
38	Sedge/Sphagnum fen/toe-of slope alluvial	Wetland – PEM1
39	Mt. hemlock-blueberry spp./bedrock slope and knob	Upland
40	Sphagnum bog/ steep hillside	Wetland - PEM1ag
40b	Vaccinium thicket/bedrock knob	Upland
40c	Pond lily bedrock pond	Wetland - PAB3ag
41	Sphagnum bog/ steep hillside	Wetland - PEM1ag
42	Silverweed-Plantago/beach meadow/silty delta	Upland
43	Marsh foxtail grass/supratidal shallow pond – silty delta	Wetland – E2EM1P
44	Hairgrass/silty sand bar at river mouth	Wetland – E2EMP
45	Epilobium spp. seep/toe of talus slope/recently	Wetland – PEM1

	deglaciated valley	
46	Steep slope hemlock forest	Upland

Project Impacts

Probable impact areas from the project in **Alternative A** include:

- Powerhouse site (a 80-foot by 160-foot powerhouse containing 3 Francis-type generating units, having a total installed capacity of 77,400 kilowatts (kW)) on the north side of the river in the treeline just in from the north delta along with a substation and a tailrace for water discharge into the Soulé River mouth
- Potentially a temporary construction camp just west of the Saddle Dam[43] (area that will eventually be flooded by reservoir)
- An access road to dam site (just below the confluence of the West Fork and the North Fork of the Soulé River) from the Marine Access Facility and Powerhouse via a 3.1-mile-long, 20-foot-wide access road with a 120-foot-long single lane bridge across the Soulé River; road will include a 1,900-foot-long tunnel bypassing steep terrain
- A 903-foot-long, 265-foot-high concrete-core, riprap-faced dam and dam construction site and support buildings
- A 2,024-foot-long, concrete-core, riprap-faced Saddle Dam with spillway to Main Stem
- Diversion Tunnel and run out of that to the floodplain at the toe of the dam.
- A spur road, approximately 0.5 mile long would provide access to the toe of the dam and the outlet works
- Sites such as rock pits and waste rock dumps - along the road route or at the staging areas both on the delta and at the dam site
- Inundation of the Soulé River Valley above the Upper Gorge, (most of the North Fork and about a third of the West Fork) ; with a 1,072-acre surface area reservoir at a full pool elevation of 575 feet mean sea level (msl)
- West Fork weir that will consist of a dumped porous rockfill structure across the river channel upstream from the main dam. It will have a crest of El 450 (the minimum reservoir pool level) and a crest with of 20 feet for retaining bedload generated by the Soulé Glacier
- Dewatering of the Main Stem of the Soulé River for most months of the year; only flow from runoff from either side of the Main Stem during this period; with 30+ feet of annual snow and wetlands and drainages flowing into the Main Stem below the dam, there will be considerable flow during spring and early summer, but nothing like what occurs with the West Fork flow available.

Conclusions

The ArcGIS GIS statistics function has measured 143 acres of wetlands mapped in and around the project area. Of those, 49 acres are classified as bog (PEM1Yag)), 37 acres

[43] Will depend on economics and logistics to be worked out closer to construction.

are intertidal wetlands (E2EM1N), 35 acres are beaver ponds - active and inactive (PEM1b & PEM1bd), 13 acres are beaver pond/fen complex wetlands (PEM1), six acres are fens (PEM1) and two acres are bedrock-controlled ponds (PAB3).

Within the 1,072 acres impacted by the reservoir, 52 acres of wetland were mapped and 12.5 miles of linear feet of streams (this length includes some double-counting of the beaver pond length). In addition to the wetlands, there is 122.6 acres of riparian habitat. Please see the *Wetland Delineation* report in Appendix E for additional information. The wetland delineation map shown in Figure 79 has the project features overlaid.

The following are the acres of wetlands to be impacted by each project feature:

Reservoir: 174.6 acres (at full capacity; 52 surface acres of wetlands plus 122.6 riparian)
Main Dam: 0.25 acres
Saddle dam and spillway: 0.35 acres
Access Road: 0.15 acres
Spoil storage sites: 0.1 acres
Quarries: 0.2 acres
Powerhouse/tailrace/substation: 0.3 acres
Marine Access Facilities: 1.25 acres
Total Wetlands Impacted: ~177.2 acres

Invasive Species

The USFS defines an **invasive species** as "*an alien plant whose introduction does or is likely to cause economic or environmental harm or harm to human health*" and a **noxious weed** as**, "***one which is designated as such by Federal or State Law, is a plant species that possesses one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and generally non-native.*"

The Alaska Natural Heritage Program (ANHP) has developed an "Invasive Weed Ranking Project" for the present and potential invasive species of Alaska. ANHP created a ranking system that incorporated components from other systems, in which species are ranked by a series of questions in four broad categories: ecosystem impacts, biological attributes, distribution, and control measures (Carlson et al. 2008). Plants are ranked on a scale of 0-100, 100 having the highest invasiveness rank. ANHP has ranked 113 non-native species that have been recorded in the state or are likely to be introduced in the future.

Inventory

Surveys were conducted by botanists Koren Bosworth of Bosworth Botanical Consulting and Richard Carstensen of Discovery Southeast. They were in the field, in the project area for eight days, eight plus hours a day, from August 14-21, 2009. The area covered is shown in Figure 78, above.

Transportation and safety logistics limited the survey intensity in some of the habitats in the project area. The river gorge walls were almost inaccessible for survey. Some of the steep valley wall habitats were surveyed at an intensity level of three or less because of accessibility limits. In the young avalanche and alluvial fan, and floodplain thickets, the density of the shrub vegetation meant that even a fairly intense survey could have missed individual plants or populations of invasive species. The more open and accessible habitats were surveyed more completely.

One invasive species was found - *Sonchus arvensis* (sow thistle) and it was found only on the Soulé River Delta (both north and south deltas).

***Sonchus arvensis* (sow thistle)**

The recent compilation of sighting data for sow thistle shows that in southeast Alaska the species is found most commonly and invasively in beach habitats. Sow thistle has been recorded by USFS botanists on the Salmon River Delta just eight miles north of the Soulé Delta and could possibly occur in other un-surveyed beach habitats south of the Soulé. Visits to the Hyder and Stewart sites in 2009 found sow thistle to be common in the beach meadows and the disturbed beach area roadsides of that area. There are also SE Alaska records for the sow thistle in the Ketchikan and Klawock area and in many large infestations on beach sites in northern SE Alaska, such as Glacier Bay (Strawberry Island, Gustavus), Shelter Island, Juneau (Fritz Cove, Outer Point, Lemon Creek), northern Admiralty Island (Barlow Cove and Symond Point), Haines and Hoonah (village area beaches and roadsides). The USFS has done some pulling on the N. Admiralty sites, the Lemon Creek sites, and some of the Hoonah sites.

The NPS has removed flowering heads on the Strawberry Island site and pulled and dug plants at the Gustavus site. Initially, the NPS controlled by hand-pulling of adults and more recently of seedlings of the perennial sow thistle for several years. The first control efforts were in 2005 when flower heads were removed; most summers since then have seen a focused effort (usually 1-2 days by 2-10 people) to pull entire plants in the concentrated area of distribution.

To find out how there method was working, the Applicant contacted the NPS and they indicated this species is very resistant to manual control methods, stating that at best, they had succeeded in slowing the spread of the species. This infestation is now scheduled for herbicide treatment during the summer of 2011. The NPS said this species is a high priority for the Park and will be monitoring and re-applying herbicide as necessary to achieve complete eradication.[44]

The NPS said they are planning on using the herbicide Milestone (*aminopyralid*) for upland sites, and Habitat (*imazapyr*) for areas close to surface water. *Milestone* and *Habitat* are applied at low application rates (max application rate of *Milestone* = 7 fl.oz/acre, versus *Garlon 3A, Renovate, or AquaMaster* in the quarts/acre range). Though

[44] Personal communication between the Author and Lewis Sharman/NPS-Ecologist. December 6, 2010.

the NPS also said they have not seen great results with foliar applications of triclopyr (*Renovate*), using it on cut/stump applications, yes, but not with foliar.[45]

Sow thistle is well-established in the open upper intertidal (Figures 81 and 82) and supra-tidal habitats on both the north and south Soulé River Delta. In the mesic beach meadow habitat there's between 30 - 50% coverage of the sow thistle. The north delta has 2.64 acres of infested area and the south delta, 0.55 acres (as of summer 2009). Further disturbance of the delta and upstream of the delta in the watershed could function as a vector for the spread of this very invasive species (ANHP invasiveness ranking – 72 out of 100). There is no control work being done on this infestation at this time.

Listing: Noxious weed in 20 states of the United States and 5 Canadian provinces. It is declared federal noxious weed in US and Canada.

It is a prohibited noxious weed in Alaska (Alaska Administrative Code 1987).

Figure 81 – Sow thistle on the Soulé River Delta

[45] Personal communication between the Author and Bonnie Million/NPS-Exotic Plant Management Team. December 7, 2010.

A complete report on Invasive Species can be found in Appendix K – *Invasive Species Survey Report,* including information on the different herbicides that were analyzed for use to treat this infestation. An Invasive Species Elimination and Monitoring Plan is also included in Appendix Y – *Draft License Plans*.

Figure 82 – Sow thistle infestation on the Soulé River Delta outlined in yellow (2009)

Figure 83 – Project features in relation to sow thistle infestation on the Soulé River Delta

Invasive Species Risk Mitigation

Under the Applicants Alternative, Project construction could spread invasive species, particularly *Sonchus arvensis* (sow thistle), which is already present on both Soulé River deltas (north and south). No other invasive species was found nor was it found at any other location around the project site. The sow thistle is also found at the head of Portland Canal, at Hyder and the Salmon River delta. Marine Access Facilities, Substation, Tailrace, Powerhouse, and buried submarine cable will be placed on or adjacent to the north delta.

To prevent spreading the sow thistle, only part of the delta will be disturbed; the Applicant proposes to stay within specific corridors for the project features with equipment or disruption of soil, leaving as much of the delta as possible in its natural condition; and all of the south delta will be avoided. With the projects current boundary, the sow thistle infestation on the North Delta would not be excavated, but covered with rock and fill for the staging area. Excavation for the barge basin is primarily outside the infestation (as of 2009), however, excavated material for the barge basin may be used to fill the staging area, which would be covered by filter fabric and rock, which should prevent any germination from the excavated soil if the sow thistle has spread to this location (which may not happen because this area is mid and lower intertidal. However, using this excavated material as fill on the delta will keep any invasive species isolated to the delta.

The Applicant also proposes, as mitigation for disturbing the delta, to spray the delta with an herbicide to eradicate the weed, preferably starting at least the summer before construction is to begin,[46] and then for the remainder of the construction phase, if needed (depending on the results attained). In addition to spraying the deltas with an herbicide annually during construction, foot inspections to remove sow thistle flowers will also be conducted during their flowering phase. Equipment stored in Hyder before being brought to the project site would have their tracks or wheels brushed and/or washed to remove dirt that may hold seeds from invasive species if transported from Hyder from July through September when seeds from flowering plants could be present. Equipment brought in by contractors will be required to brush or wash their equipment before transporting to the area.

The herbicides evaluated for use at the project site were:

- **AquaMaster** (*Glyphosate*) is an herbicide that is used in Forest Service programs primarily in conifer release, noxious weed control, and site preparation. AquaMaster is an all-inclusive herbicide, meaning it will kill or damage all vegetation it comes in contact with. All commercial formulations of glyphosate that are used in forestry applications contain the isopropylamine salt of glyphosate. The active ingredient inhibits an enzyme found only in plants and microorganisms that is essential to formation of specific amino acids. This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas. Technical grade glyphosate contains an impurity, N-nitrosoglyphosate, but the amount of this impurity in glyphosate has been classified as toxicologically insignificant by the U.S. EPA.

[46] Prior approval from the Forest Service, DNR, DEC, and possibly FERC will be necessary; eradication should start as soon after a license is issued as possible, or sooner if the FS will permit; NEPA review for the use of an herbicide on federal land should occur during licensing.

- **Renovate**, also known as Garlon 3A, (*Tryclopyr*) is an herbicide that mimics auxin, a plant growth hormone, thus disrupting the normal growth and viability of plants. The active ingredient in Renovate is Triethylamine triclopyr. Triclopyr is used in Forest Service programs primarily for wildlife habitat improvement, noxious weed control, conifer or hardwood release, and site preparation, with other minor uses including rights-of-way management, hardwood control, facilities maintenance, and seed orchard protection. Renovate is specifically used for aquatic weed control and specifically targets broadleaved plants, such as sow thistle.

- **Habitat**, (*Imazapyr*) is an herbicide that is used in the control a variety of grasses, broadleaf weeds, vines, and brush species, site preparation and conifer release, and rights-of-way maintenance and can be used in aquatic environments. This pesticide is toxic to vascular plants and should be used strictly in accordance with the drift precautions on the label. The active ingredient in Habitat is isopropylamine salt of imazapyr. Habitat will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline.

- **Milestone** (*Aminopyralid*) is an herbicide specifically for the management of noxious and invasive broadleaf species. The active ingredient in Milestone herbicide is aminopyralid, a new pyridine carboxylic acid herbicide. It provides broad-spectrum broadleaf weed control at very low labeled use rates (4 to 7 fl oz/acre, or 0.06 to 0.1 lb ae/acre), compared to currently registered herbicides with the same mode of action, including 2,4-D, clopyralid, triclopyr, picloram and dicamba. Milestone VM, Milestone VM Plus, and Transline are selective herbicides that do not control grasses and sedges. These desirable plants left to grow and reproduce will competitively exclude thistle species. It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites. Milestone can be used to the waters edge. Do not apply directly to water and take precautions to minimize spray drift onto water.

- **Plateau** (*Imazapic*) is an herbicide used in the control of grasses, broadleaves, and vines, and for turf height suppression in non-cropland areas. The Forest Service will typically use imazapic in noxious weed control and rights-of-way management. Plateau is a formulation containing the ammonium salt of imazapic as the active ingredient.

- **AgriSolutions 2,4-D** (*2,4-dichlorophenoxy*). The Forest Service uses 22 herbicide formulations of 2,4-D in which the compound is available as salts, esters, or combinations of salts and esters, and all but one of the formulations are liquid. The active ingredient in 2,4-D is Acetic acid, (2,4-dichlorophenoxy)-, 2-ethylhexyl ester. The Forest Service has used 13 other herbicide formulations in which 2,4-D is a component. Herbicide mixtures of 2,4-D combined with triclopyr, dicamba, picloram, or glyphosate are all used by the Forest Service. 2,4-D is registered for both ground and aerial applications. Also, several formulations of 2,4-D, including Aqua-Kleen, can be applied directly to water to control noxious weeds. Although 2,4-D is registered for aerial applications, the Forest

- Service does not use this method to apply 2,4-D. Nonetheless, aerial application methods are covered by this risk assessment in case the Forest Service should decide to use 2,4-D in aerial applications. In Forest Service programs, herbicide formulations containing 2,4-D are most commonly used in wildlife opening, rights-of-way maintenance, and noxious weed control.

Applicants Preferred Herbicide for Use on Sow Thistle

Though the NPS chose to use the herbicide *Habitat* for areas near water and *Milestone* for uplands at their Strawberry Island treatment, we would propose to use *Garlon 3A* (Renovate), which is a Tryclopyr, because it targets broadleaved plants such as sow thistle while leaving the native grasses and sedges in place and is approved for aquatic use (EPA #62719-37). Since the infestation at the Soulé River delta is aquatic, this seems like the best option while still using an herbicide that only targets broadleaf plants. This will remove concerns about revegetating as the native species left in place will reclaim any area opened by the elimination of sow thistle. However, in case *Garlon 3A* is not effective, we would propose to have two additional herbicides permitted so that they are available to use if needed. We would propose to be able to use both *Habitat* and *Milestone* as backup herbicides to treat this infestation.

The reason the herbicide *Habitat* isn't the first choice is that it seems to cover a broader spectrum of plants, including grasses, which is why we would prefer not to use it; we prefer to leave more native species in place, eliminating the need to revegetate in a tidally influenced zone. *Milestone* would be available to use in uplands and is also currently under review by the EPA for certification as an aquatic herbicide, making it a likely primary herbicide by the time this project is licensed rather than *Garlon 3A*. The sow thistle infestation on the Soulé River delta is tidally influenced at different times (infestation is in open upper intertidal and supra-tidal habitats). None of the aquatic herbicides would be applied directly to water (tide must have exposed the area of treatment). Preferred treatment time would be within an hour of tide receding from area so that the herbicide can remain on plants as long as possible for absorption before possibly being washed off by a high tide (treatment could also be timed for periods when very high tides are not occurring, which may mean the sow thistle won't be underwater at anytime during its treatment). *Garlon 3A* needs at least 6 hours before emersion in water to be fully effective. The herbicide would also not be applied on days of potential rain, as rain would just wash the herbicide off the sow thistle and make treatment ineffective. Preferred treatment is before flowering or in the fall before frost.

A surfactant, yet to be selected, would be combined with the herbicide to aid in quick absorption into the plant, increasing the effectiveness of the herbicide; unless a surfactant is already combined with the herbicide, which is often the case. Surfactants aren't directly permitted, but through the process of permitting the herbicide the surfactant is taken into consideration.[47]

[47] Permitting under the NPDES permit will be conducted by the Alaska Department of Environmental Conservation (DEC) starting April 10, 2011, and DEC will be taking over all NPDES permitting for the state by the end of 2011. The EPA will no longer be the permitting agency in the State of Alaska.

Post-Construction Treatment Plan

After construction is complete, annual inspections of the delta will occur to check for new infestations and if present, the herbicide *Garlon 3A* (or other permitted herbicides) would be used to eradicate the plant(s). The preferred method of invasive weed eradication post-construction, assuming significant success at eradication occurred before and during construction, would be to continue the use of herbicide, as needed (a small amount would be kept in the powerhouse for occasional use). If the herbicides were unsuccessful in significantly reducing this invasive species on the delta, annual foot inspections to remove flowers would continue. It would be too labor-intensive to physically remove a large number of plants with their root systems and it would pose a problem to dispose of excavated soil as a method to remove the invasive species. In addition, the NPS has found mechanical means to be ineffective at eliminating this species. Herbicides offer the best solution if they are effective against this species in this tidally influenced environment. This procedure would apply to the south delta as well to completely eliminate this species from the project area.

During operations, a photo checklist of potential invasive species could be kept at the Powerhouse to monitor post-construction ingress of invasive species for 3 years. If no invasive species are found along project corridors, no further inspections of the corridors would occur. If individual plants are found vectored into the project corridor, the plant would be dug up and removed, or the herbicide could be used and the location monitored in successive years to ensure success. If they are dug up, they would also be bagged and disposed of offsite or incinerated in a 50 gallon drum on site at the powerhouse. The photo checklist would continue to be used for the delta for the life of the project because the delta would be the likely ingress point for invasive species in the future. The Forest Service list of invasive plant species would be consulted annually to note any changes. The Forest Service would receive an annual report on each years monitoring and/or efforts at eradication.

Summary of Forest Metrics

Four forest metrics were collected at 19 Soulé Watershed study sites: Basal Area, Canopy Cover, Canopy Gaps, and DBH. Basal Area has the unit ft2/acre (or m2/hectare), and estimates tree bole density of the landscape. Canopy Cover estimates the amount of canopy foliar density. Canopy Gaps was estimated at each sampling point as the variance of the four measurements of canopy foliar hits, and is a metric of canopy patchiness. DBH is a metric of tree size, and is the tree diameter at “breast height.” At each site, two to five (mainly four) point samples were taken of the first three metrics. Tree DBH was obtained for 14 to 68 (mean=39) trees at each site. The spatial within-site variability of Canopy Cover, Basal Area, and DBH was estimated as the coefficient of dispersion (CD). All 19 Soulé sites were ranked by each of these seven metrics and displayed as charts for visual inspection.

Basal Area was strongly positively related to Canopy Cover, and strongly negatively to Canopy Gaps and Canopy Cover CD. Canopy Cover was strongly positively related to Basal Area, positively to DBH, and strongly negatively to Canopy Gaps and Canopy Cover CD. DBH was positively related to Canopy Cover, and negatively to Canopy Cover CD; but was not related to either Basal Area or Canopy Gaps. The within-site variability of Canopy Cover (Canopy Cover CD) appeared to be an important indicator metric. Canopy Cover CD was strongly positively correlated with Canopy Gaps, strongly negatively with Canopy Cover and Basal Area, and negatively with DBH. The within-site variability of Basal Area (BACD) or DBH (DBHCD) was not related to any forest metric or variability (CD) metric.

Basal Area, Canopy Cover, and DBH were appropriately transformed by accepted statistical protocols, and analyzed with both parametric and nonparametric statistics. The 19 Soulé sites were classified into groups for each of these three metrics by *Post Hoc* multiple comparisons statistical tests. An extremely large number of these tests are available. Specific multiple comparisons tests were carefully selected, including a Bayesian approach, for their suitability and validity to the data collected, and to represent the appropriate range of conservative (minimizing Type I error) to liberal (minimizing Type II error) statistical inference. Type I error guards against finding statistical significance when it does not exist relative to a null hypothesis. Type II error guards against not finding statistical significance when it does exist. Although there was an overall significant difference among the 19 sites for all three metrics, the sites overlapped a great deal statistically. Therefore, the classification of individual sites into groups based on these metrics was tenuous, and directly dependent on the emphasis one placed on the gradient of conservative to liberal statistical inference. These classifications are presented and discussed in detail.

The 19 Soulé sites were also classified by the within-site variability metrics based on the coefficient of dispersion (CD) of the three forest metrics: Basal Area, Canopy Cover, and DBH. The metric Canopy Gaps was also used in classification. The 19 sites were visually assessed into four classes: Highly Uniform, Uniform, Patchy, and Highly Patchy for Basal Area CD, Canopy Cover CD, and Canopy Gaps. Three classes were identified by tree size variability, based on DBH CD: Least Variable, Intermediate, and Most Variable.

Western and Mountain Hemlocks, comprising 88 percent of all individuals measured for DBH, were by far the most common trees encountered at the 19 Soulé sites. Site occurrences of the two hemlock species were strongly negatively correlated (Spearman Rho: -0.93, $P<0.0001$). There was no statistical relationship between any other species pairs among the other tree species, but sample sizes of the other three species was very low. The largest trees were Sitka Spruce, with six individuals (30%) having a DBH over 90.0 cm. Tree size was next followed by Subalpine Fir and then Western Hemlock with respectively, two (3.0%) individuals and four (1.2%) individuals over 90.0 cm DBH. Only four trees were found that were 100 cm or larger: Sitka Spruce (128, 100 cm), Western Hemlock (112 cm), Subalpine Fir (102 cm). Western Hemlocks were numerically the largest trees in the landscape, because of their high abundance.

Mountain Hemlock was a smaller species. The five largest individuals (1.6%) had DBHs between 69.0 to 60.0. Black Cottonwood was only encountered at one site that was adjacent to the North Fork River, but it was a common and widespread species throughout Soulé Watershed floodplains.

The 19 Soulé sites were readily classified into four groups based on their tree species composition. The tree species present at sites were ultimately determined by physical and chemical factors, such as: topography and geomorphology, soils (composition and depth), litter and humus development, geology, rocks and boulders, hydrology, and drainage. Tree species distributions are often related to elevation, but this was not significant in this study. Four groups of sites were identified: Western Hemlock Dominant (7), Western and Mountain Hemlock Codominant (5), Mountain Hemlock Dominant (5), and Subalpine Fir and Mountain Hemlock Codominant (2). Most of the Western Hemlock sites also ranked high in Basal Area, Canopy Cover and DBH, while the Mountain Hemlock sites typically ranked low in these metrics. Beyond these expected general relationships, there was no clear consistent relationship between the four forest classes with either the three forest metrics (Basal Area, Canopy Cover, DBH) or their variability metrics (BACD, CCCD, DBHCD).

Timber Evaluation Summary

To summarize the findings of a timber evaluation[48]

- ***ROW Acres:*** *Approximately 15 acres commercial forest land (CFL), 20 acres total.*
- ***Species Percent:*** *mountain hemlock 81%; Sitka spruce 19% (see Species By MBF Pie Charts).*[49]
- ***Cruise Volume (Net Sawlog grade without utility):*** *195 MBF (195,000 board feet); Log grades are according to U.S. Forest Service, Region 10 (USFS).*
- ***Timber Value:*** *($155,995)*[50] *Loss.*

The timber cruise sampled the access road and the reservoir (see Figure 84 below). The road and reservoir is an estimated 871 acres. However, only 131 acres is considered commercial forest land (CFL). The timber cruiser did not include the power tunnel ROW because all of it will be underground. The marine access facility (MAF) was not cruised either because its boundary was unknown (at the time) as well.

Only the ROW timber was used as a basis for this valuation. The USFS normally requires removal of all Sawlog grade timber, however, a request to leave Sawlogs beyond a 2-mile radius of the shoreline, similar to what was required for the Swan Lake-Lake

[48] Spigai, D. 2009. *Timber Valuation for the Proposed Soule River Hydroelectric Project.* Greatland Consultants, Alaska. Report can be found in Appendix L – Timber Evaluation Report.
[49] Ibid.
[50] In 2009 dollars.

Tyee Intertie, was made. Trees in the road ROW would be removed, but trees in the reservoir could remain. This would be significantly less expensive than removing all the timber in the North and West Fork valleys. Effectively, this means that only the road ROW would have to be logged and not the reservoir. A decision from the USFS is pending. The USFS is considering the deficit (as well as other factors) that would result from removing the timber.

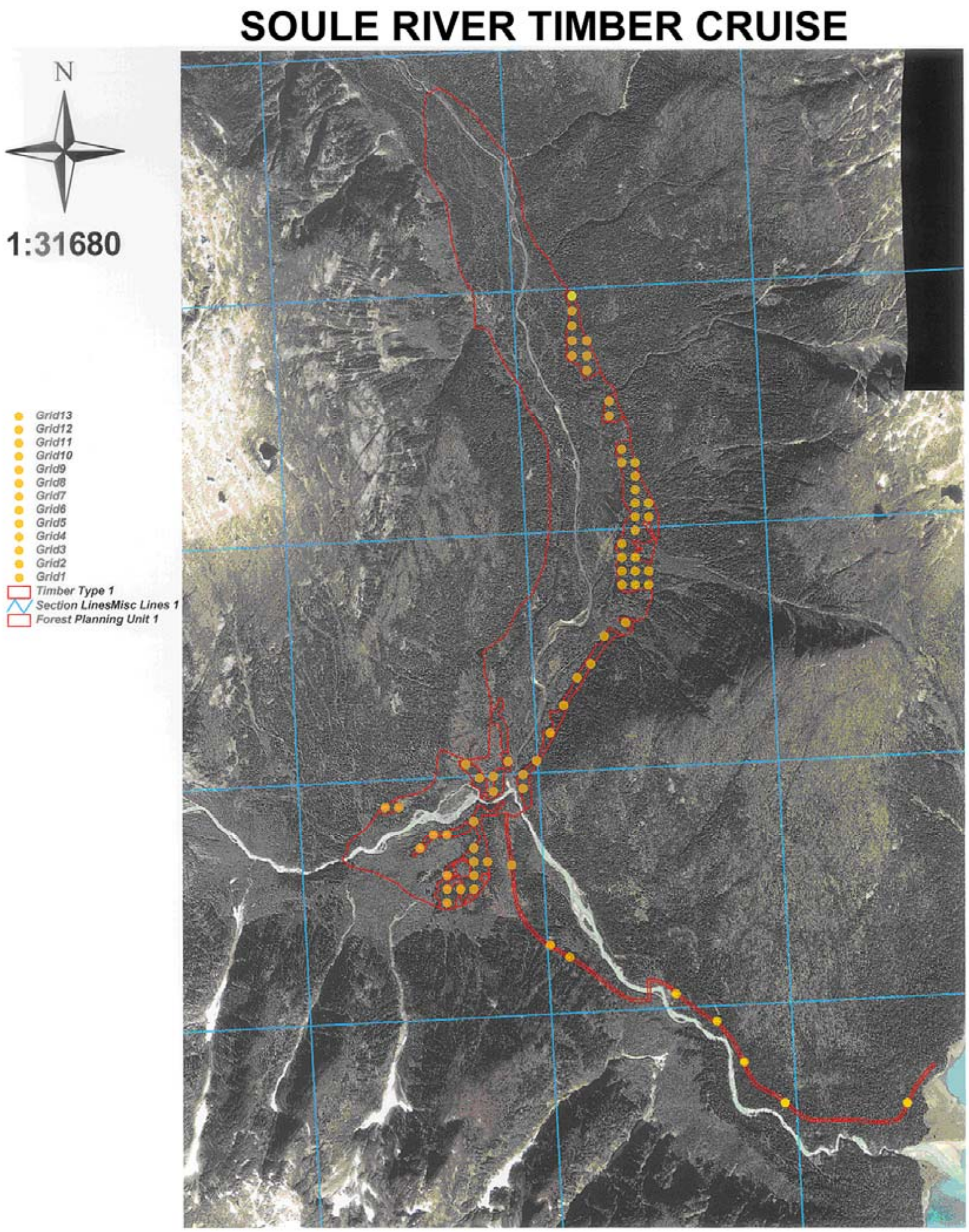

Figure 84 – Timber Cruise

Removing only the ROW logs as opposed to helicopter logging the reservoir (in addition to removing the ROW logs) would result in a substantial savings to the Project. For example, logging all of the 131 acres (about 116 acres by helicopter with no additional road) would cost an estimated $3,000,000. If only the ROW logs are removed the cost is about $156,000, as already stated in the Valuation Summary (see Valuation #1- Road ROW in the Soulé Timber Valuation Report in the Appendices). Even if additional road was built to reduce or eliminate helicopter logging it would still result in a deficit. If logs in the reservoir are floated to the dam for removal, that would be deficit as well.

Environmentally, building roads into the reservoir to remove trees would greatly increase sedimentation and provide a ground disturbance that isn't necessary considering the value of the trees found in the reservoir, which is low (much of the timber is deciduous). From an environmental standpoint, allowing the trees to float to the dam for removal makes more sense. After limbing the downed trees, burning of slash may be the preferred method of removal since roads will not exist to dispose of debris.

Timber Description

A timber cruise is necessary to determine harvestable volumes by tree species, grade, and other factors, and forms a basis for valuing timber. Soulé River Hydro Project (SRHP) is estimated to contain 131 acres of CFL and a net Sawlog volume of 1,745 MBF. The road ROW volume (195 MBF) was extrapolated from the cruise. Average gross MBF (removed from woods without utility grade) per acre is 17.59. Average net MBF (without utility grade) per acre is 13.32. Defect averages about 25% of the gross scale. Conks (a visible fruiting body of a wood-destroying fungus) were more numerous than usual.

Sixty-two plots were placed within the CFL. The statistics that resulted from the 62 plots are as follows: 2 standard deviations (95% probability/confidence) and a sampling error of 18.6% (range +/- of the computed board foot mean). The sampling error target (stated in the cruise design and approved by the USFS on 7-13-09) was 20%. However, the statistics are only valid for the whole cruise or 131 acres. Since the ROW acres and volume were broken out of the whole, the statistics for it are not valid.

Species that were cruised were mountain hemlock (MH, 87%), Sitka spruce (SS, 11%), and subalpine fir (AF, 3%). Species percent is by MBF and rounded to nearest whole number (see Pie Charts in report). All of the subalpine fir sampled occurred on the south and north side of the West Fork of the Soulé River. Hemlock volume includes subalpine fir. MH and AF were lumped together because of the USFS cruise extension program and due to the fact that log grading rules are the same for both species.

The cruise was completed on August 4, 2009.

Tree size
"*This is from John Caouette's layer, based upon Timtyp & NWI. Interesting that almost no commercial forest is mapped on the flood plain. Probably the photointerpreters felt*

the coniferous component was too thin to constitute 8 mbf/acre. Certainly a good portion of the flood-plain is deciduous: alder, willow and cottonwood. (PS: Our field surveys support this non-commercial classification. See also post-trip notes added in blue.) The overall message of this map is how little coniferous forest of respectable size exists in the steep-walled, granitic, Soulé watershed."[51] See Figure 85 below for tree sizes.

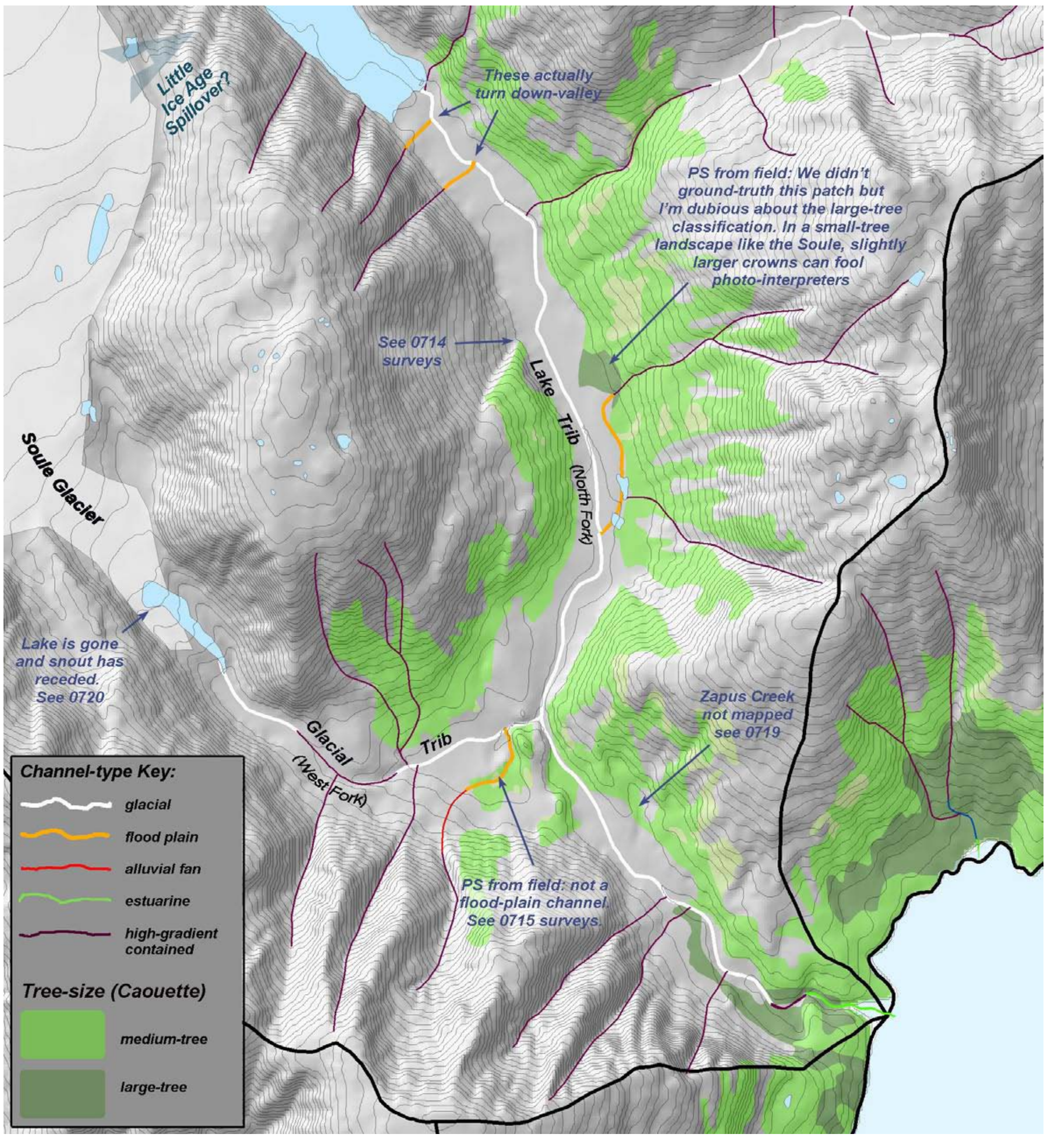

Figure 85 – Tree Sizes (Note: Zapus Creek is considered Dolly Varden Creek in this EA)(from Carstensen Field Journal)

<u>Environmental Effects</u>

"The overwhelming fact about the Soule is GRANITE. Much that is special about our study watershed emerges from the properties of its monolithic foundation. Granitic

[51] Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. Page 7.

bedrock matched with active glaciers means steep, thinly vegetated valley walls, perennial rockslides and snow avalanches, sterile soils with low clay fraction, stressed forests, and–for species important to human subsistence–generally low fish and wildlife values."

"*Granite is to blame for the barrier falls that kept salmon out of the valley ever since falling sea level isolated the No Name dollies. That of course means few bears, mustelids, or avian fish-eaters like gulls, heron or mergansers. Granite is the reason we've so far seen no mountain goats. Granite precludes the large-tree forest that might have given Sitka deer*[52] *half a chance of living through a typical Soule winter–if there were any deer in upper Portland Canal. One could even point out that Misty Fiord granites are the reason for those brutal, deep-snow winters; only this resistant rock–unintimidated by mile-thick Wisconsinage glaciers–could have survived to form the cloud collecting summits that call down today's snow*."[53]

It should be noted that since the above comment, mountain goats were observed on the ice fields above the watershed by the helicopter pilot in two separate herds while providing transportation for the 2009 field surveys.

Quantity and Types of Vegetation to be Affected by Project Construction and Operation

Under the Applicants Alternative, the following amounts of vegetation will be cleared for construction purposes:

Reservoir – 1,076 acres (clear to normal reservoir el 575)
Dam area – 30 acres
Powerhouse area – 3 acres (includes only forested area)
Access road – 16 acres (based on average clearing width of 60 feet)
<u>Total – 1,125 acres of clearing</u>

Our Analysis

<u>Applicant Alternative</u>

Under the Applicants current Alternative, the construction of the powerhouse, tailrace, access road, power tunnel portals, bridge crossing, saddle dam, main dam, intake structure, quarries, and reservoir will require clearing of all types of vegetation (reservoir trees will be cut but left in place to eliminate the need for roads and the ground disturbance that activity would cause; trees would float to the dam and be removed). A

[52] Conversation with resident of Hyder by biologist R. Carstensen during field survey trip – the resident stated: "*A few years ago a resident reported a possible* ***Sitka deer*** *out the road a ways. People got pretty excited and went out with their rifles. That's how rare deer are in Hyder. Ron says you don't see them much in Portland Canal until you get all the way down to Fillmore Island. (Check out the snow map at end of journal; only at Fillmore do you leave the very deep and deep snow zones.)*" Carstensen, R. 2009. *Soule River Habitat Surveys – A Field Journal*. Page 78.
[53] Ibid. Pages 81 and 84.

few are wetlands, and the majority is uplands of timber and brush; as described above under botanical resources. The valley bottom of the North Fork and the West Fork of the Soulé watershed are relatively young, early successional forests, thickets and lichen/moss terraces consisting of mountain hemlock, sitka spruce, sitka alder, subalpine fir, and black cottonwood.

Land Use Alternative

Under the Land Use Alternative, significantly less vegetation would be cleared because of the projects size and lack of access roads between project features. Significantly less clearing would be needed. It is estimated that approximately 3.8 acres would be cleared during the construction of this alternative.

A comparison of habitat that would be impacted by both alternatives:

Table 17: Habitat Impacts by Alternative (habitat types will still exist around Watershed)

Habitat Type	Applicants Alternative	Land Use Alternative
Avalanche Slopes	The Reservoir and Access Road are the only features to potentially be in an avalanche slope. The road will avoid steep slope by tunneling for 1,900 feet. Habitat type will still be abundant in the Watershed	Project features will not cross or be in avalanche slopes
Beach Meadow	Delta Staging Area, including Barge Landing, beginning of Access Road, small part of Tailrace, buried submarine cable; habitat type will be reduced by up to 1/3 for north delta	Only the submarine cable will be on the delta, trenched through and buried; small short term impact
Valley wall hemlock forest, Valley floor mountain hemlock forest, Valley floor young Sitka spruce/cottonwood/devils club, outwash/floodplain forest, Subalpine fir/Mountain hemlock slope forest	The Reservoir, a short section of Access Road, Powerhouse, and Substation would reduce this habitat; the same habitat exists elsewhere in this Watershed, including between the lake and a full reservoir	Little if any impact at the diversion structure with its small catchbasin
Main stem - Hillside w. hemlock/Sitka spruce forest, Upper river terrace sub-alpine fir/mountain hemlock forest	Access Road will result in a small reduction in this type of habitat, but a significant amount of this habitat will still exist in and around this Watershed	Small, insignificant reduction in this habitat at diversion structure and powerhouse
River floodplain lichen terraces	Dams and Reservoir will reduce some of this habitat, but this habitat will still exist around the Watershed	Unlikely to impact this habitat; no significant impacts

Terraced Sphagnum Bogs, Fens, Avalanche/Alluvial fan willow and alder/skunk cabbage fen	Access Road, Dams, Reservoir, quarry will reduce this habitat, but this habitat will still exist around the Watershed	Unlikely to impact this habitat; no significant impacts
River gorge walls	Main Dam will reduce this habitat, but this habitat is also available in the Lower Gorge	Small, insignificant reduction in this habitat at diversion structure and powerhouse

Table 17 – Impacts of Alternatives on Habitat Types

Wetlands and Floodplains would be Impacted by Construction and Operation

Under the Applicants Alternative, most wetlands will be avoided except where necessary to construct project features and to flood the North Fork valley. As shown in Figure 79 the access road traverses the terrain, avoiding wetlands except where the road must cross streams or the river. Crossing Dolly Varden Creek with the access road will either use a bridge or bottomless culvert to avoid impacting the Dolly Varden habitat. The river will be crossed with a 120-foot-long, single-lane bridge. A fen wetland with Boreal toads near the project spillway will have the access road built around it to avoid impacting the wetland.

Our Analysis

<u>Applicant Alternative</u>

Under the Applicants Alternative, wetlands and floodplains will be avoided as much as possible by designing project features to go around these locations. Although some bogs would be filled by road construction near the Saddle Dam, the majority of the access road is outside of mapped wetlands, as shown on Figure 79. Approximately 1,900 feet of the access road will be in a tunnel to avoid steep slopes, thus protecting wetlands and floodplains. The tunnel for the water conduit avoids surface disturbance to wetlands and vegetation, keeping habitat in place without the opportunity for fracturing. Some bogs and fens are purposely being avoided along the access road route and saddle dam spillway to protect Boreal toad habitat. Placement of the dam and filling of the reservoir will also affect beaver dams and ponds in the North Fork valley, impacting approximately 177 acres (beaver ponds [wetlands] and North Fork main stem [riparian]) wetlands. Dolly Varden Creek would be bridged or would use a bottomless culvert or some other method to protect the creek, maintaining the productivity of that habitat. The Reservoir would only fill to within 1,600 feet of the lake to avoid Dolly Varden spawning habitat and juvenile rearing habitat at the beginning of the North Fork. Drainage patterns are not altered in the watershed. The marine access facilities were moved to the delta over being on the west side of Glacier Bay which reduces impacts to the bay and the crab habitat used for subsistence and recreation. Though this will impact wetlands on the delta, the tradeoff protects the crab habitat and juvenile fish are afforded more diverse habitat along the shoreline via the riprap for the project features.

Primary impacts are acreage loss at the delta and in the North Fork valley.

To Minimize impacts to wetlands and floodplains, they will be avoided where they can. To reduce impacts to wetlands and floodplains that project features will directly impact, the following methods would be used:

- Culverts can cross underneath features such as roads to keep wetlands connected
- Silt fencing and/or straw or hay bales will be used to stop the movement of sediment in roadside ditches and to prevent fill from leaching into wetlands and streams
- Straw or hay bales will be used to capture sediment before or after entering culverts and to slow runoff and capture sediment in roadside ditches
- Riprap will be used to stabilize slopes, reduce runoff velocity, and trap sediment
- Jute netting may be used to stabilize slopes
- Sediment catchbasins may be used below culverts
- Filter fabric laid before fill in wetland to reduce impacts
- Check dams to catch sediment along road drainages
- Gabion walls, which allow for deeper cuts into slopes while stabilizing the slope
- Revegetation, which can include planting shrubs and trees, to seeding grass for stabilizing slopes. Hydroseeding can also facilitate spreading grass seed over a large area. Combining hydroseeding with a binder puts an impervious barrier over soil that allows water in but keeps soil in place until the growing season when the seed germinates.
- Tree mulch would be use to stabilize exposed slopes, either by itself or over matting/netting. The tree mulch would come from vegetation cleared from road building that is run through a mulching machine. This would provide an enriched organic layer on exposed surfaces to accelerate vegetation regrowth while disposing of wood waste.

The project will discharge directly into the river mouth to continue transporting sediment to the natural confluence/integration point where mixing of river sediment occurs with Portland Canal and gyros around to the north into Glacier Bay to continue to support the delta structure and wetlands there.

<u>Land Use Alternative</u>

Under the Land Use Alternative, project construction activities would be limited to a much smaller footprint and because of this there would be significantly less opportunities to impact wetlands and floodplains.

To mitigate impacts under this alternative, the following methods would be used:

- Trails rather than roads would connect project features, allowing only foot traffic and pack animals
- The trail would only be cleared to 50-inches wide
- Roots from vegetation would be left in place in cleared trail to stabilize slope
- The trail would avoid steep slopes, wetlands, saturated soils, and seeps
- If unavoidable, wooden walkways could be built to pass over wetlands or saturated soils and seeps
- Catchbasins could be used down slope of the trail to collect runoff sediment from use of the trail; silt fencing would also be common below these trails to control runoff
- Droppings from pack animals may need to be collected to make sure invasive species are not brought to the site; as well as feeding would need to occur in one location to make sure feed doesn't start growing.

Spread of Invasive Species

The only invasive species found at the project site is the sow thistle, which was found on both the north and south river deltas.

"*The fact that there is an established infestation of sow thistle - a USFS - high priority invasive species - on the Soulé Delta increases the risk of spread of the infestation with disturbance, both on the delta and through the undisturbed part of the project area. Control of the present sow thistle infestation is recommended before project construction begins and treated sites should be re-seeded with native species and/or mulched promptly after treatment*."

"Biological, chemical, and mechanical control methods for sow thistle have been used. Mechanical treatment for several years should be done a few times a season to reduce seed production and root reserves. This weed is relatively resistant to many but not all common broadleaf herbicides.

"Mechanical - Tillage can be effective in reducing sow thistle stands, although success is dependent upon the timing and the type of tillage. Tillage breaks the roots into small root fragments and causes new shoot growth. Consequently, tillage effectiveness is dependent upon the amount of root breakage and depth of burial. Tillage at the seven to nine leaf rosette stage does seem to effectively reduce the reproductive capacity of the roots. Mowing would need to be repeated several times during the growing season to control stem growth, prevent flowering, and seed production. Mowing may actually stimulate new plant growth that forms from rhizomes, creating a denser stand of sow thistle.

"Chemical - Several herbicides are available for sow thistle control. The most common herbicides used are 2,4-D, dicamba, glyphosate, clopyralid, and picloram. Herbicides should be applied at the pre-bud or bud stage. Multiple applications of herbicide throughout the same growing season may increase control. Metsulfuron is also effective for sow thistle control. Herbicides should be used when mechanical control options are

not applicable or on rangeland and undisturbed sites. Herbicide control of sow thistle is more effective when combined with other control methods (NDDA, 2003).”[54]

Biological - As a weed management method, biological control offers an environmentally friendly approach that complements conventional methods. It helps meet the need for new weed management strategies since some weeds have become resistant to certain herbicides. Biological control agents target specific weeds. Moreover, this technology is safe for applicators and consumers.

Biological weed control involves using living organisms, such as insects, nematodes, bacteria, or fungi, to reduce weed populations. In nature, plants are controlled biologically by naturally occurring organisms. Plants become pests - and are labeled "weeds" - when they run rampant because their natural enemies become ineffective or are nonexistent. The natural cycle may be interrupted when a plant is introduced into a new environment, or when humans disrupt the ecological system. When we purposefully introduce biological control agents, we are attempting to restore or enhance nature's systems.

Not much has been available regarding bioherbicides to formulate an opinion or action plan, so they are not considered as part of the solution to eliminate and control sow thistle at the Soulé River.

Our Analysis

Applicant Alternative

Under the Applicants Alternative, Project construction could spread invasive species, particularly *Sonchus arvensis* (sow thistle), which is already present on both Soulé River deltas (north and south). This invasive species is also found at the head of Portland Canal, at Hyder and the Salmon River delta. The Marine Access Facilities and a small part of the Tailrace will be placed on the north delta. To prevent spreading invasive species, a mitigation plan is described on page 192 of this EA.

Under the Applicants Alternative, this would be addressed by using both chemical[55] and mechanical means. Chemical means would be the use of any of these herbicides, *Garlon 3A, Habitat, or Milestone,* and mechanical means would be the cutting of the flower.

Land Use Alternative

Under the Land Use Alternative, the only activity on the delta would be boat landing, transmission line burial, and foot traffic and pack animal traffic across the delta to the treeline. The potential is slight but still possible to spread invasive species under the Land Use Alternative. Also, if pack animals are used, their feeding area would have to

[54] Bosworth, K., Carstensen, R. 2009. Risk Assessment for Invasive Species for The Soule River Watershed Hydroelectric Project – Portland Canal, SE Alaska.
[55] Herbicide in Alaska will require EPA, USDA, and State of Alaska approval.

be contained, their waste would have to be collected to prevent the potential spread of invasive species, and if possible, their path across the delta should avoid the infested area.

Fragmentation of Wildlife Habitat

Under both land use alternatives the habitat will have no significant fragmentation because there is little wildlife using the watershed and the project features do not create much fragmentation. However, under the Applicants Alternative there is the greatest potential for fragmentation because of the reservoir.

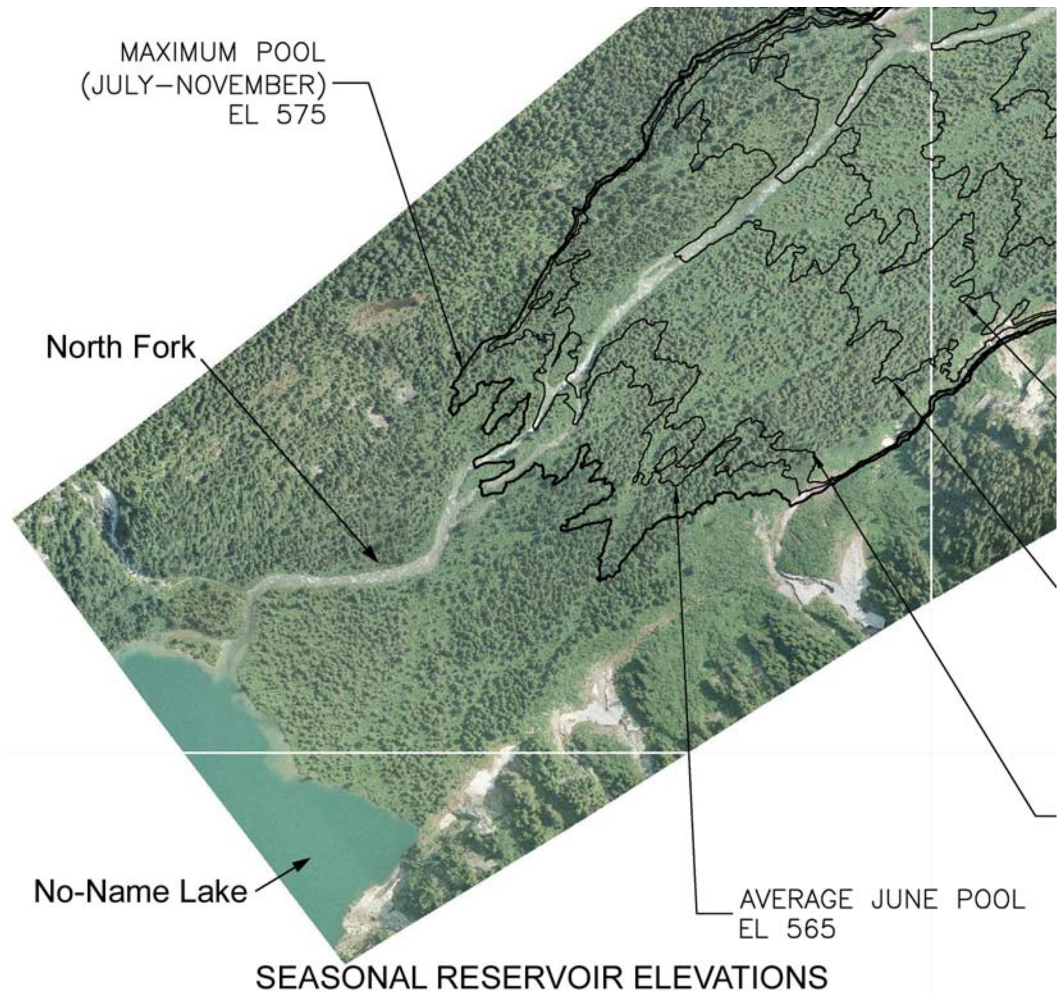

Figure 86 – The full Reservoir would come within 1600 feet of the lake (0.3 mile)

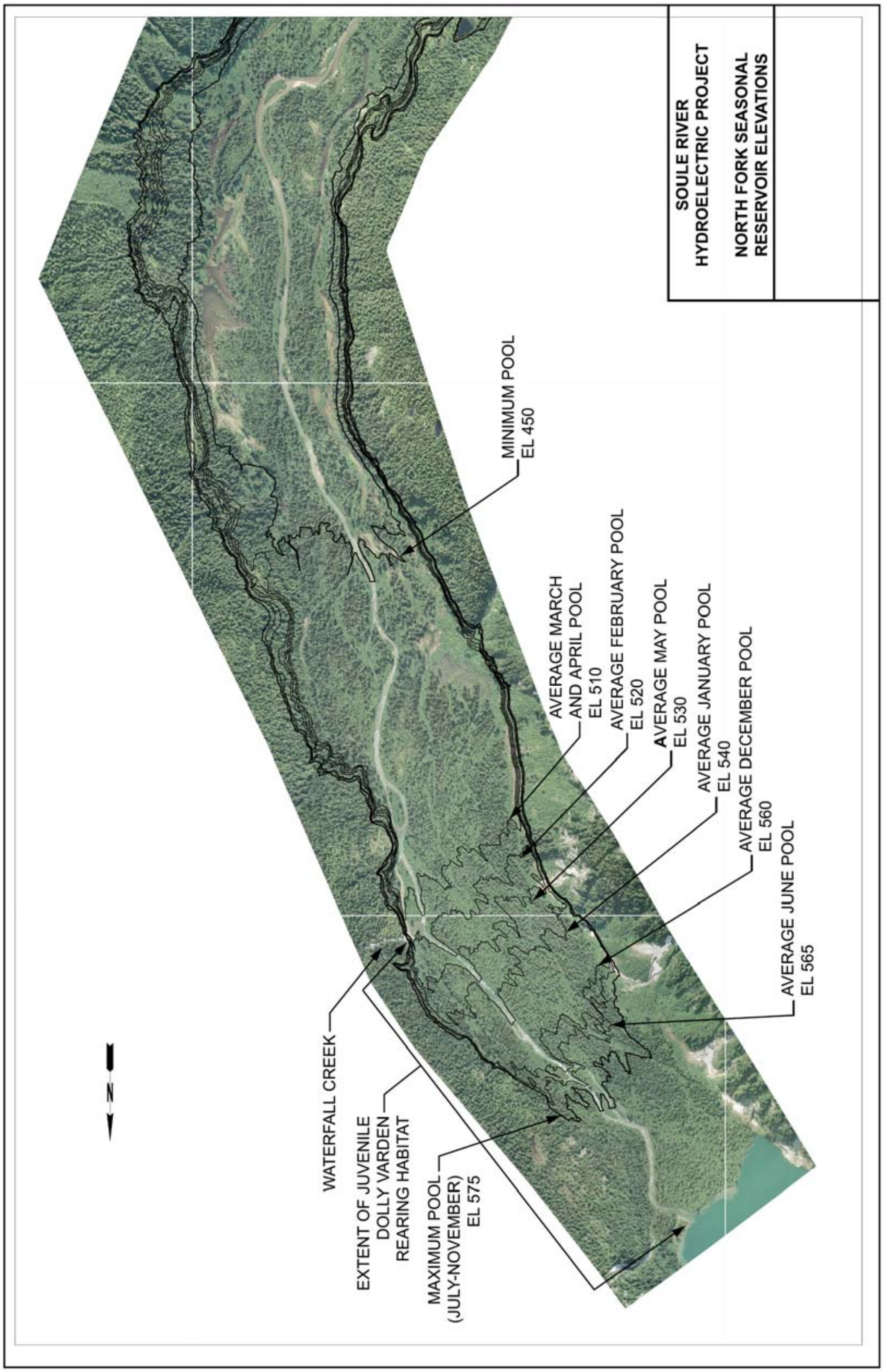

Figure 87 – The Reservoir in the North Fork Soulé River; No-Name Lake is at bottom

Our Analysis

Applicants Alternative

Under the Applicants Alternative, mammals present in this watershed will not have their habitat fragmented, but habitat along the West and North forks will be reduced. There will be a corridor between No-Name Lake and the full project reservoir that will be approximately 0.3 mile wide (1,600 feet) that will continue providing a movement corridor (see Figure 86), thus avoiding fragmentation of the habitat. The Access Road, although it cuts through habitat, will only create temporary fragmentation of wildlife during construction (i.e. due to noise and activity). The road itself will provide a narrow linear clearing that wildlife will tend to use. Habitat loss will be insignificant. Also, impacts to species from construction will be temporary and have little overall effect on their use of the watershed because of the narrow corridor of the project features, providing little if any fragmentation. The 1,900-foot-long tunnel for part of the Access Road will be closed off so that wildlife cannot use it. The power tunnel will go all the way from the intake structure to the powerhouse, avoiding surface impacts or barriers to wildlife. These two tunnels significantly reduce opportunities for fragmentation of habitat.

During the operations phase, habitat fragmentation would not be significant because wildlife will easily be able to cross the narrow corridors cleared for the project, and in the case of deer and bear, they will start using these corridors for access, increasing their presence in this watershed. The Reservoir does create a small barrier, but wildlife can find their way around it by passing through the 0.3 mile wide corridor between No-Name Lake and the reservoir and possibly across the Main Stem when flows are reduced. The Reservoir will eliminate most beaver habitat in the North and West forks and potentially effect beaver habitat in the Main Stem, displacing these populations to some degree, but they are dispersed through the watershed and may adapt to the project, or expand on similar habitat in the Watershed. Beaver habitat will also remain in the 0.3 mile wide corridor between the reservoir and the lake. The types of mammals and their population sizes are small for this watershed, perhaps because of the deep winter snows that remain through June of each year and lack of salmon in the river. Overall, impacts to species listed by the USFS will be insignificant.

Land Use Alternative

Under the Land Use Alternative, the project will be significantly smaller with only pack animal paths for clearings between project features. No fragmentation of wildlife habitat would occur under this alternative.

Because there are few mammal and avian species present and they are not present in abundance, this project will not have a significant impact on those species. No TES or Forest Service sensitive species were found in this watershed and are therefore unlikely to be significantly impacted.

Recommendations:

1. Maintain a corridor between the reservoir and lake that will allow wildlife to continue to pass through the area

2. Maintain a minimum of 1500 feet vertically and/or horizontally from mountain goats when flying if observed near the project

3. Use appropriate erosion and sedimentation control practices to prevent slope destabilization, which could impact wildlife habitat and vegetative communities

4. Minimize ground disturbance to the minimum necessary for project construction to keep as much of the natural setting as possible.

Invasive Species

Management Considerations for Invasive Species

The Applicant proposes to brush or hose clean construction equipment tracks or wheels before bringing the equipment on site. A plan for the eradication of sow thistle on the river delta is proposed by using herbicides and mechanically cutting the flowers. Under the Land Use Alternative, there is no plan for dealing with invasive species.

Unavoidable Adverse Impacts

Unavoidable adverse impacts to terrestrial resources would include:

- Much of the beaver habitat will be lost in the North Fork to within 0.3 mile of the lake
- Approximately 131 acres of commercial timber removed (15 acres from the access road)
- A full reservoir will flood approximately 1,072 acres
- Temporary and insignificant fragmentation of habitat for mammals during construction primarily due to noise and activity

Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing NEPA (50 C.F.R. 1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or persons undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Geographic Scope

The project area is located within the Misty Fiords Granitics Ecological Subsection of Southeast Alaska. The Boundary Ranges Icefields Ecological Subsection is just to the north of the project area and includes the northern end of Portland Canal, the Salmon River drainage and the towns of Hyder, Alaska and Stewart, BC. The geographic scope of analysis for this report and for sensitive plant species will be defined as the northern end of Portland Canal and the associated watersheds.

Impacts

Human activities within this geographic area that may cumulatively affect sensitive plant species include: (1) mining operations upstream of Hyder and Stewart; (2) timber harvest activities; (3) Hyder and Stewart dock and causeway construction (destruction or disturbance of beach meadow and forest ecotone habitats); (4) dike construction and maintenance along the Salmon River bank (protection for Hyder from jokulhlaup events); (5) road construction (in the Hyder and Stewart area or in other parts of northern Portland Canal); (6) global climate change. At present there are no other current or planned hydroelectric projects within this geographic area, nor are other potential hydroelectric project sites in the Hyder area considered environmentally or financially feasible.

This is the first project to be proposed for the Soulé Watershed. The Soulé Delta has a small amount of shoreline hunter use and fishing and crab boats sometimes anchor off the north edge of the delta. Due to the low number of species using this watershed and the low populations of these same species in the watershed, cumulative impacts to these species in Upper Portland Canal cumulative effect zone is not likely to be significant. The greatest potential wildlife impact would be to beaver from loss of habitat, but there is other similar habitat with beaver within the Soulé River watershed, so impacts are not significant.

The biggest human impact to the delta has been the introduction of the invasive plant species, *Sonchus arvensis (*sow thistle). Sow thistle has been recorded by USFS botanists, on the Salmon River Delta just nine miles north of the Soulé Delta and could possibly occur in other un-surveyed beach habitats south of the Soulé. The seeds were probably blown up or down Portland Canal and the species is now well established in the open supra-tidal habitats on the Soulé River delta. In some areas of the delta there is more than 30% coverage of the sow thistle. Further disturbance of the delta and upstream of the delta in the watershed could function as a vector for the spread of this very invasive species (ANHP invasiveness ranking – 72 out of 100).

The recent compilation of sighting data for sow thistle shows that in southeast Alaska the species is found most commonly and invasively in beach habitats. Visits to the Hyder and Stewart sites in 2009 found sow thistle to be common in the beach meadows and the disturbed roadsides of that area. Other than the records from the Hyder and Stewart areas there are records for the sow thistle in the Ketchikan and Prince of Wales Island area and in many beach sites in northern SE Alaska, such as Glacier Bay, Gustavus, Shelter Island, Juneau, northern Admiralty Island and Hoonah.

Degradation of these beach meadow and forest ecotone habitats could affect potential habitat for Henderson's checker-mallow, Mountain lady's slipper orchid and edible thistle and three or four of the other sensitive species found in sandier versions of the beach meadow habitat than are found at the Soulé Delta.

In the modern context, no cumulative risk analysis is complete without reference to global climate change. Conservation biology frequently emphasizes the importance of adaptation, including maintaining resilience in ecosystem function, as a means of sustaining representative plant populations including sensitive plant species. Also, the temperate coastal rainforest is thought to be vulnerable to an increase in catastrophic fire, to the extent that it could replace wind-throw as a determinate of ecosystem structure. Furthermore, a climate-induced northern shift in ecotones is predicted to bring insect infestations at a scale heretofore unknown in the region. A warmer climate would also increase melting of the Soulé Glacier, increasing meltwater in the river, filling the reservoir more quickly and likely more flow would occur in the Main Stem below the dam, and as a consequence, more glacial silt would be deposited in Portland Canal.

3.9 Threatened and Endangered Species

Affected Environment

Over the 123 Field-Observation-Days from 2007-2009 in which field biologist conducted studies for this project, no Threatened, Endangered, or Species of Concern or Forest Service Sensitive species were observed other than fly-bys of two separate osprey, and bald eagles observed along the shoreline on Portland Canal.

T = Threatened, E = Endangered, S = Species of Concern or Sensitive Species

Species listed by the U.S. Forest Service for the Tongass National Forest are as follows:

Listed species for Alaska by the USFS and their status are shown in Table 18 below.

Table 18 – *Listed by USFS – Animals - - 2*

Status	Species/Listing Name
E	Queen Charlotte Goshawk (*Accipiter gentilis laingi*)
S	Kittlitz's murrelet *(Brachyramphus brevirostris)*

Listed species for Alaska by the USF&WS and their status are shown in Table 19 below.

Table 19 – *Listed by USF&WS – Animals - - 14*

Status	Species/Listing Name
E	Albatross, short-tailed (*Phoebastria (=Diomedea) albatrus*)
T	Bear, polar (*Ursus maritimus*)

E	Curlew, Eskimo (*Numenius borealis*)
T	Eider, spectacled (*Somateria fischeri*)
T	Eider, Steller's AK breeding pop. (*Polysticta stelleri*)
T	Otter, Northern Sea southwest Alaska DPS (*Enhydra lutris kenyoni*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea-lion, Steller eastern pop. (*Eumetopias jubatus*)
E	Sea-lion, Steller western pop. (*Eumetopias jubatus*)
E	Whale, blue (*Balaenoptera musculus*)
E	Whale, bowhead (*Balaena mysticetus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, sperm (*Physeter catodon (=macrocephalus)*)

Additional species listed as Threatened, Endangered, or Sensitive by NOAA that don't overlap with USF&WS are listed in Table 20 below:

Table 20 – *Listed by NOAA – Fish and Mammals - - 8*

Status	Species/Listing Name
T	Salmon, Chinook *(O. tshawytscha)*
T	Salmon, Chum *(Oncorhynchus keta)*
T	Salmon, Coho *(Oncorhynchus kisutch)*
E	Salmon, Sockeye *(Oncorhynchus nerka)*
T	Sea turtle, green *(Chelonia mydas)*
T	Sea turtle, loggerhead *(Caretta caretta)*
E	Whale, North Pacific Right (*Eubalaena japonica*)
E	Whale, Sei (*Balaenoptera borealis)*

The species are listed for all lists above in alphabetical order below.

MARINE MAMMALS

Marine mammals will not be impacted by this project, even with Seal Rock two miles away just north of Glacier Bay with its haulout, mainly because there are no salmon using the Soulé River, which would attract them, so there will be no impacts to the seals. With few of the TES marine species occurring in the area of the project, no significant impacts should occur. Although salmon species may pass by this watershed, they too would not be impacted. For this reason, an indepth analysis of these species is not conducted here.

AVIAN

TES avian species listed are also unlikely to occur at the project site because none were observed during the three years biologist spent on site. A thorough goshawk audio and visual survey was conducted, but no responses were heard and none were ever observed during the whole 123 Field-Observation-Days from 2007-2009. However, northern Goshawks have been sighted in the Hyder area along the Salmon River and could occur at the Soulé River watershed as transitory.

MAMMAL

TES mammal species were not present during the whole 123 Field-Observation-Days from 2007-2009. TES mammal species are unlikely to be impacted by this project.

FISH

TES salmon species could use Portland Canal during their rearing phase before returning to Washington State, but they would not be affected by this project because the Soulé Watershed does not support salmon species. Discharging back into the river mouth will also continue to contribute sediment to the river delta's ensuring that rearing habitat continues for juvenile salmonid species around the delta. The placement of riprap for the marine access facilities on the north river delta may provide more habitat diversity with nooks and crannies for protection from predation to juvenile salmon migrating along the shoreline and provide more complexity to this habitat.

Based on the surveys conducted from 2007-2009, the following findings were made supporting our conclusion that there will be no impacts to salmon at the Soulé River:

1. Salmon are unable to get up the Lower Gorge due to velocity and falls barriers
2. No salmon were found in any portions of the river
3. No evidence of salmon were found to use the river mouth for spawning
4. Water temperatures are too cold during the spring and summer (consistently 1-2ºC [because of the short distance to the Soulé Glacier]) for salmon to spawn in the river, even at the river mouth
5. The large sediments showed a high level of particle embedment with glacial silts that constitute poor spawning conditions for salmon at the river mouth
6. No evidence of fish predation, i.e. carcasses, has ever been observed around the river mouth or along any other portion of the river
7. No evidence of predators hanging around looking for salmon runs.

In addition, all the Washington State salmon species listed are not likely to be adversely affected because: (1) they are only transient if in the project area; (2) their critical life cycle stages are not being affected by this project; (3) human-induced impacts from project construction will be minimal and relate to sediment transport into Portland Canal if erosion prevention and sedimentation control methods are not effective; (4) human-induced impacts from project operation should not adversely affect these species; and (5) there will be no impact on population viability of those species.

BOTANICALLY SENSITIVE

Nineteen vascular plants are designated as sensitive in the Alaska Region (Table 21). The following sensitive plants shown in Table 21 are known or suspected to occur in the Ketchikan Ranger District of the Tongass National Forest and will be evaluated in this document section:

Table 21 – Sensitive Plant Species

Scientific Name	***Common Name***	***Habitats***
Botrychium tumux	Moosewort fern	Well-drained sandy beaches and alpine sites
Botrychium yaaxudakiet	Moonwort fern	Maritime sandy beaches
Botrychium spathulatum	Spatulate moonwort	Maritime beach meadows, upper beach meadows, and well-drained open areas
*Cirsium edule var. macounii **	Edible thistle	Forest edges, along glacial streams, wet meadows, avalanche tracks, open forest, upper montaine to lower alpine meadows
*Cypripedium montanum**	Mountain lady's slipper	Open forests, beach meadows
Cypripedium parviflorum var. pubescens	Large yellow lady's slipper	Peatlands, on limestone substrate (on TNF)
Ligusticum calderi	Calder loveage	Subalpine boggy meadows, meadows and forest edges
*Papaver alboroseum**	Pale poppy	Open areas, rock outcrops, sandy, gravelly, well-drained soils, mesic to dry alpine, recently de-glaciated areas. Sea level to ~ 6000'
*Piperia unalascensis**	Alaska rein orchid	Dry open sites, under tall shrubs in riparian zones, mesic meadows, and drier areas in coniferous and mixed evergreen forests from low elevation to subalpine.
*Platanthera orbiculata**	Lesser round-leaved orchid	Wet coniferous forest, damp rich humus in deep shade, low elevation forested wetlands, medium to high volume old growth hemlock forests, slopes between 15-75%, high bryophyte cover, low forb cover, forest edges or near gaps, near open water or boggy areas.

Polystichum kruckebergii	Kruckeburg's swordfern	In sheltered cracks in the dunite rock of ultramafic outcrops.
*Romanzoffia unalaschcensis**	Unalaska mist-maid	Forest edge, streamside, riverbank
*Sidalcea hendersonii**	Henderson's checkermallow	Estuarine habitats at the ecotone of the estuary and forest.
Tanacetum bipinnatum subsp. *huronense*	Dune tansy	Upper beach meadows, coastal dunes

Field Survey for Sensitive Plants

Surveys were conducted by botanists Koren Bosworth of Bosworth Botanical Consulting and Richard Carstensen of Discovery Southeast. They were in the field, in the project area for eight days, eight plus hours a day, from August 14 through August 21, 2009. On page 55 of the *Biological Evaluation for Sensitive Plant Species* report[56] by Bosworth and Carstensen, the habitat, survey intensity, percentage of habitat surveyed, and potential sensitive species are listed.

The following seven species are those listed in Table 21 that has potential habitat within the project area:

Cirsium edule var. *macounii (*Edible thistle*)*
*Cypripedium montanum (*Mountain lady's slipper*)*
*Papaver alboroseum (*Pale poppy*)*
*Piperia unalascensis (*Lesser round-leaved orchid)
*Platanthera orbiculata (*Alaska rein orchid)
*Romanzoffia unalaschcensis (*Unalaska mist-maid*)*
*Sidalcea hendersonii (*Henderson's checkermallow*)*

None of these seven species were found in the project area though edible thistle (*Cirsium edule* var. *macounii*), has been collected in Hyder, Alaska, nine miles northeast of the project area, up Portland Canal. It has also been collected on talus slopes in Misty Fjords National Park, over the ice fields to the west of the project area.

Potential Sensitive Species and Their Habitats and Project Impacts and Direct and Indirect Effects of Those Impacts[57]

No sensitive species were found during sensitive and rare plant surveys conducted during the summer of 2009. This project is not expected to significantly impact any sensitive botanical species because none were found and because other habitat either exists in the watershed outside of the project boundary or elsewhere in the region. Below is an analysis of these species.

[56] Can be found in Appendix D.
[57] Bosworth, K., Carstensen, R. 2009. *Biological Evaluation for Sensitive Species* for The Soule River Watershed Hydroelectric Project – Portland Canal, SE Alaska. August 2009.

***Cirsium edule var. macounii* (Edible thistle)**

The consequences of adverse impacts to *Cirsium edule* var. *macounii* on the North Fork avalanche slopes due to project activities is low because 35% of the habitat was surveyed and no plants were found; this plant is very distinctive and unlikely to be overlooked. This habitat is not preferred habitat for *Cirsium edule* var. *macounii* as it is a very dense thicket with no open talus slopes in the lower part of the slope where the flooding will take place. The consequences of adverse impacts in the mesic beach meadow habitat on the Soulé Delta are low because 95% of this habitat was surveyed and no plants were found. The likelihood of adverse effects in the North Fork Valley is low because no plants were found, even though the flooding is permanent, and is not controllable by seasonal or spatial restrictions. The likelihood of adverse effects on *Cirsium edule* var. *macounii* in the beach meadow habitat on the delta is low because the tailrace and marine access facilities footprints cover only 25%-33% of the north delta. The overall risk to *Cirsium edule* var. *macounii* is low because a large part of the preferred habitat was surveyed without finding any specimens and location is somewhat controllable for some project components.

***Cypripedium montanum* (Mountain lady's slipper)**

Habitat – Valley wall hemlock forest, Valley floor mountain hemlock forest, Valley floor young Sitka spruce/cottonwood/devils club outwash/floodplain forest, Subalpine fir/Mountain hemlock slope forest. The consequences of adverse impacts to *Cypripedium montanum* due to project activities in the North and West Fork/confluence area are low because 15% to 60% of each of the three preferred habitats was surveyed and no plants were found; this is a showy orchid and a considerable number of rare plant surveys have been conducted in Alaska with the plant only being found three times. The likelihood of adverse effects from this project in the North and West Forks/confluence area is low because even though the flooding is permanent, plants were not found growing in this area.

Habitat – Main stem - Hillside w. hemlock/Sitka spruce forest, Upper river terrace sub-alpine fir/mountain hemlock forest. In the Main Stem area the consequences of adverse impacts are low because 25% to 70% of the two preferred habitats were surveyed and no plants were found. The likelihood of adverse effects from this project in the Main Stem area is low because road and rock pit building will only affect ~12 acres of the approximately 1,200 acres[58] of available habitat and is controllable by seasonal and somewhat controllable by spatial restrictions if plants are found on the potential road alignment. Access road fill is unlikely to lead to acid rock drainage because of the existing rock type, but road fill could lead to erosion from cut banks. The overall risk to *Cypripedium montanum* is low because no plants were found and spatially the project will clear a narrow corridor through its preferred habitat, which is a small part of the total available habitat.

Habitat – Soulé Delta beach meadow and meadow/forest ecotone. At the beach meadow area the likelihood of adverse effects from this project is low because only 25%-33% of

[58] Estimate is considered low, but shows the significant difference between impacts and available habitat.

the delta will be disturbed for the marine access facilities, including the staging area, and a small part of the tailrace. The powerhouse, substation, and tailrace will be constructed near the river mouth, within the treeline, with the discharge into the river mouth, having negligible impact to this part of the delta meadow which has marginal habitat quality. No *Cypripedium montanum* were found on the delta. Construction activity could be a vector for invasive species, especially *Sonchus arvensis* (sow thistle). The dam holding glacial sediment could affect deposition to the delta over time.

***Papaver alboroseum* (Pale poppy)**
Habitat – River floodplain lichen terraces. The consequences of adverse impacts to *Papaver alboroseum* in riverbar and river floodplain lichen terrace habitats in the North Fork and lower West Fork areas due to project activities is low because 15% and 75% of these marginal habitats was surveyed for this sensitive plant and no plants were found; potential habitat is available outside the project near the Soulé Glacier outwash area of the West Fork. The likelihood of adverse effects from this project is low because although the flooding of the North Fork is permanent, no plants were found. In addition, not all of this habitat type is being eliminated for this watershed and similar habitat exists throughout Portland Canal in adjacent river systems. The overall risk to *Papaver alboroseum* is low because none were found and habitat exists elsewhere in the watershed as well as in the region.

***Piperia unalascensis (*Lesser round-leaved orchid)**
Habitat – Terraced *Sphagnum* Bogs, Fens, Avalanche/Alluvial fan willow and alder/skunk cabbage fen. The consequences of adverse impacts to *Piperia unalascensis* due to project activities in the preferred habitats of, terraced *Sphagnum* bogs and fens in the lower West Fork and confluence area is low because all of this preferred habitat, of which 80% was surveyed for this species, discovering no plants. The consequences of adverse impacts to *Piperia unalascensis* due to project activities in the habitats of, avalanche base poor fens and string poor fen bog complex in the Main Stem area is low because a 3.1 mile x 20-foot-wide road and associated construction staging areas and rock pits will go through a small part of these preferred habitats; 45% - 80% was surveyed for this species and none were found. The likelihood of adverse effects from this project in the lower West Fork and confluence area is low because of the absence of plants even though the flooding is permanent, and is not controllable by seasonal or spatial restrictions. The likelihood of adverse effects from this project in the Main Stem area is low because the road and rock pit construction is permanent but the location relatively flexible and avoids preferred habitat. The overall risk to *Piperia unalascensis* is low because much of the preferred habitat was surveyed and no plants were found and only a small amount of its preferred habitat will be affected.

***Platanthera orbiculata* (Alaska rein orchid)**
Habitat – Valley wall hemlock forest, Valley floor mountain hemlock forest, Subalpine fir/Mountain hemlock slope forest, River floodplain lichen terraces. The consequences of adverse impacts to *Platanthera orbiculata* due to project activities in the North and West Fork/confluence area are low because 15% to 75% of each of the five preferred habitats was surveyed and no plants were found. The likelihood of adverse effects from this

project in the North and West Forks/confluence area on habitat is low because although the flooding is permanent, no plants have been found in these areas and the preferred habitat will still exist outside project features and along Portland Canal and the region.

Habitat – Main stem - Hillside W. hemlock/Sitka spruce forest, Upper river terrace sub-alpine fir/mountain hemlock forest. In the main stem area the consequences of adverse impacts are low because 25% to 70% of the four preferred habitats were surveyed and no plants were found. The likelihood of adverse effects from this project in the Main Stem area is low because road and rock pit building affects only a small amount of habitat and somewhat controllable by spatial restrictions. Road fill leading to acid rock discharge is considered a low probability because of an analysis of the rock type. Road fill could also be a vector for invasive species, especially *Sonchus arvensis* (sow thistle). The overall risk to *Platanthera orbiculata* is low because none were found and significant preferred habitat will remain unchanged in the watershed, Portland Canal, and the region.

***Romanzoffia unalaschcensis* (Unalaska mist-maid)**

Habitat – River gorge walls. The consequences of adverse impacts to *Romanzoffia unalaschcensis* potential habitat due to project activities is low, even though a dam will be built and flooding will take place in the river gorge. Although the plant is not known to occur in the area, 5% of the preferred habitat was surveyed for sensitive plants without finding any. The likelihood of adverse effects from this project is low due to the absence of plant in the area, and the fact that the Lower Gorge will not be affected by the project other than possible reduction in the amount of spray (depending on flows); hence there remains habitat this species could reside in. The overall risk to *Romanzoffia unalaschcensis* is low because no plants were found, other preferred habitat remains in the watershed, and other habitat is available in Portland Canal and the region.

Sidalcea hendersonii (*Henderson's checkermallow*)

Habitat – Beach meadow / forest ecotone. The consequences of adverse impacts to *Sidalcea hendersonii* due to project activities is low because the powerhouse site and marine access facility footprints are small, covering between 25%-33% of the delta, and 95% of the preferred habitat was surveyed for plants and none were found. The overall risk to *Sidalcea hendersonii* is low because a large portion of the preferred habitat was surveyed without finding any plants.

In addition to the vascular plants listed above, below is one plant listed as Endangered by the USF&WS and one lichen listed as Sensitive by the Forest Service.

Table 22 – Other Sensitive/Endangered Plant Species

Status	Species/Listing Name
E	Fern, Aleutian shield (*Polystichum aleuticum*); by USF&WS
S	Lichen, no common name *(Lobaria amplissima)*; by USFS

Aleutian Shield Fern *(Polystichum aleuticum)* was first listed, as Endangered, February 17, 1988. This species is presently known to occur only on Adak Island, Aleutian Islands, Alaska. The Aleutian shield fern is presently known to occur on steep, rock-outcrop areas on the upper slopes of Mt. Reed, Adak Island. The causes of its rarity are poorly understood and may be natural.

Lichen *(Lobaria amplissima)* was added to the Alaska Regional Sensitive Species List in 2009. This lichen has a limited distribution outside Alaska. In Europe it is very rare and on the European Community Red List. In the Tongass National Forest this lichen has been found in approximately 20 locations, generalized as follows: Mitkof Island, 2 populations (including the Sukoi Islets); Kuiu Island, 7 populations; Baranof Island, 1 population; Misty Fiords National Monument, 2 populations; South Prince of Wales 1 population, Yakutat 1 population, and Coronation and Warren Islands, 5 populations. *L. amplissima* was not detected in the hundreds of lichen community plots generated during the first lichen biomonitoring study in the early 1990s (Geiser *et al*., 1994, 1998), nor in the research conducted on lichens of the *Pinus contorta* peatlands (Derr, 1994). More recently it has been found during lichen research on the forest beach fringe (Dillman 2004) and in air quality monitoring plots at the beach fringe (Dillman *et al*., 2007). It is large, showy, and similar to other *Lobaria* species; therefore, it is very unlikely that it was overlooked in those earlier surveys.

This lichen has a low reproductive rate and sexual reproduction is not common in the Alaska material; therefore, dispersal of propagules is largely limited to fragmentation. Fragments may be dispersed by birds, slugs or rodents. This lichen appears to be habitat specific, found on trunks and main branches of *Picea sitchensis*, *Malus fusca*, and *Tsuga heterophylla* of old-growth beach fringe edges that are exposed to large bodies of ocean (Dillman, 2004). The locations where this lichen is found are isolated from each other by the marine waters and beach fringe forests that are not exposed to the same favorable environmental conditions. Known populations and quality and quantity of existing habitat have a suspected downward trend in Alaska due to stresses associated with natural events and processes such as wind-throw, uplift of beaches, and tsunamis. Stresses from anthropogenic sources include log transfer facilities, recreational uses, localized air pollution, and tree removal in beach fringe habitat for permitted activities such as small salvage operations, subsistence and personal use, thinning for wildlife, and other purposes.

This lichen is not likely to be found at the Project site because the lichen is fragmentary, relying upon birds, slugs, or rodents to spread it. The Project site is also not exposed to a large ocean body. Although air quality is likely very good in Portland Canal, this rare lichen is not wide spread and prefers exposures closer to the ocean. This project should not have a significant impact on this species because the lichen is not self-propagating, is unlikely to be in the Soulé River Watershed do to the natural land form barriers (i.e. mountains with glaciers and icefields, and general isolation of this watershed), and the footprint on the shoreline (its preferred habitat) will be small. None of these lichens were observed along the Soulé River delta during field surveys.

Rare plants

A rare plant on the Tongass National Forest is defined as a plant that:

1. is on the Alaska Natural Heritage Program (ANHP) Rare Vascular Plant Tracking List that are known or suspected to occur on the Tongass (ANHP, 2008), is considered S1 and S2 in State ranking (some S3 are considered), and is not on the sensitive plant list for the Tongass.

2. is proposed upon consultation and agreement among Tongass ecologists, District botanists, and the Region 10 botanist because of rarity on the Tongass (i.e. plants with range edges or disjunct populations on the Tongass but not yet given a state ranking on the ANHP list).

3. has population viability concerns in the Tongass, but is not on the sensitive plant list.

4. has been or is being raised as an issue because of rarity or conservation concerns

Table 23 – Forest Service Rare Plants of Concern for the Project Area (Potential area overlap with project = KRD – *Ketchikan Ranger District***)**

RARE PLANT NAME AND RANKS	HABITAT	DISTRICT OF CONCERN
Abies amabilis*	Montane forest	WRD, TBRD, NKRD
Botrychium lanceolatum ssp. *lanceolatum* *	Upper beach meadows, meadows, alpine meadows	SE Alaska
Botrychium pinnatum *	Upper beach meadows, meadows	SE Alaska
*Brasenia schreberi - G5/S1**	Emergent in pools	KRD, CRD, TBRD
Cardamine angulata - G5/S3	Moist forests and riverbanks in lowlands	CRD, TBRD, KRD
*Chimaphila umbellata - G5T5/S3**	Forest edge	JRD, PRD, WRD, KRD
Cryptogramma sitchensis *	talus slopes, cliff crevices	KRD, CRD
Danthonia spicata - G5/S1	dry meadows, dry subalpine meadows	TRD PRD, KRD, CRD,
Dulichium arundinaceum var. *arundinaceum - G5/S1*	Open wet places, pond margins, marshes	CRD, TBRD, KRD
Enemion savilei	Moist shady cliffs and talus slopes from lowland to alpine	CRD, KRD
Festuca subulata	Open forest	JRD and south
*Geum schofieldii - G2Q/SP**	Wet rock crevices in the lowlands to montane	CRD, KRD
Iris setosa ssp. setosa	Wet meadows, wet beach meadows	KRD, CRD
*Isoetes occidentalis- G4G5/S1S2**	lakes and ponds near shore	SE Alaska
*Isoetes truncata**	lakes and ponds near shore	SE
Isolepis cernua - G5/S1	Beaches, brackish places	CRD, KRD, TBRD
Juncus articulatus - G5/S1	Ditches, lake and stream margins often on carbonates	SE Alaska
Juncus falcatus var. sitchensis	Lakeshores, tideflats, rocky	HRD, JRD, KRD, CRD

	sandy soil	
*Lobelia dortmanna - G4G5/S1**	Emergent in lakes	KRD, CRD, TBRD, WRD
Luzula comosa - G4G5/S1	Meadows, open woods, coniferous forest	KRD, CRD, WRD
Luzula wahlenbergii	Tundra lake shores, alluvial rivers	CRD, KRD
*Piperia unalascensis G5/S2** ***Also on the sensitive species list***	Meadows, bog edges	Tongass, Chugach
Poa x norbergii	Upper beach meadows	SE Alaska
Polystichum kwakiutlii	unknown	
Potamogeton robbinsii G5/S1S2	deep water of ponds and lakes	SE Alaska
Saxifraga nelsoniana spp. *carlottae**	Moist rocks, ledges and streambanks from montane to alpine	CRD, KRD
Schoenoplectus subterminalis G4G5/S1	Lakes and ponds near shore	SRD, ADM, PRD and south.
Sedum divergens - G5/S1	Steep rocky slope near sealevel, rock outcrops, dryer areas?	Tongass
Sidalcea hendersonii - G3/S1* **Also on the sensitive species list**	Upper beach meadows, estuarine areas.	Tongass except YRD
Sinosenecio newcombei	Moist boggy sites and open slopes in lowland to alpine	CRD, KRD
Taxus brevifolia Nuttall - G4G5/S2*	Poorly drained mixed conifer forest	TRB, WRD, KRD
Tiarella trifoliata ssp. *lacinata G5T5/S1S2*	N KRD, CRD, TBRD, WRD	
Triantha occidentalis ssp. *montana*	wet meadows marshes	KRD, CRD
Viola biflora ssp. *carlottae*	Moist rock outcrops and meadows in the lowland to alpine.	CRD, KRD
Woodsia oregana ssp. *oregana*	rocky slopes, granite or volcanic substrate.	KRD, CRD

Field Survey for Rare Plants

Surveys for sensitive and invasive species but not rare plants were conducted by botanists Koren Bosworth of Bosworth Botanical Consulting and Richard Carstensen of Discovery Southeast. They were in the field, in the project area for eight days, eight plus hours a day, from August 14 through August 21, 2009.

No sensitive species and one invasive species were found in the Project area. An after-the-fact review of the rare species list of the Tongass National Forest showed 35 rare species of concern in the Ketchikan Ranger District. Of the 35 listed rare species, 13 of them are distinctive species that the surveyors would have noticed had they been within the survey area and two of them are on the sensitive species list and were surveyed for. That leaves 22 species that may not have been noticed if they were rare occurrences during the survey.

Environmental Effects

Impacts to TES Species

Under both land use alternatives, no TES species are expected to be impacted by this project.

Our Analysis

Field surveys did not find any evidence of use of the area by TES species after 123 Field-Observation-Days from 2007-2009. Studies during 2007-2009 also showed a low number of different mammal and avian species, and those present also had small populations. No TES and Candidate species were found at the Project site. If any visit the site during construction, they are likely transient and will avoid the area when noise and activity occur. During operations it is unlikely that transient TES species would be impacted by this project.

Impacts to USFS Sensitive Species

Under both land use alternatives, no Forest Service sensitive species are expected to be impacted by this project.

Our Analysis

Field surveys conducted during 123 Field-Observation-Days from 2007-2009 only observed two separate sightings (1—2008; 1—2009) of osprey flying by the project (one actually responded to the goshawk audio survey). No goshawks responded to the survey or were ever sighted during field surveys. If any visit the site during construction, they are likely transient and will avoid the area when noise and activity occur. Favorite prey species for Goshawks are also not abundant within the Soulé River drainage. During operations it is unlikely that transient Forest Service sensitive species would be impacted by this project.

Unavoidable Adverse Impacts

Because no TES or Forest Service Sensitive species were found in this watershed, there should be no adverse impacts to those species.

Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing NEPA (50 C.F.R. 1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or persons undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Geographic Scope

The project area is located within the Misty Fiords Granitics Ecological Subsection of Southeast Alaska. The Boundary Ranges Icefields Ecological Subsection is just to the north of the project area and includes the northern end of Portland Canal, the Salmon River drainage and the towns of Hyder, Alaska and Stewart, BC. The geographic scope of analysis for this report and for sensitive plant species will be defined as the northern end of Portland Canal and the associated watersheds.

Impacts

Human activities within this geographic area that may cumulatively affect TES flora and fauna species include: (1) mining operations upstream of Hyder and Stewart; (2) timber harvest activities; (3)Hyder and Stewart dock and causeway construction (destruction or disturbance of beach meadow and forest ecotone habitats); (4) dike construction and maintenance along the Salmon River bank (protection for Hyder from jokulhlaup events); (5) road construction (in the Hyder and Stewart area or in other parts of northern Portland Canal); (6) global climate change. At present there are no other current or planned hydroelectric projects within this geographic area, nor are other potential hydroelectric project sites in the Hyder area considered environmentally or financially feasible.

This is the first project to be proposed for the Soulé Watershed. Hydrologic resources available in the drainage would not support another hydroelectric project. The surveys of the Soulé Watershed found limited species of fauna present. No TES flora or fauna were found at this site during the 2007-2009 field survey seasons. In addition, due to the low number of species using this watershed and their small populations, cumulative impacts to TES and Forest Service sensitive species is not likely to be significant.

In the modern context, no cumulative risk analysis is complete without reference to global climate change. Conservation biology frequently emphasizes the importance of adaptation, including maintaining resilience in ecosystem function, as a means of sustaining representative plant populations including sensitive plant species. Also, the temperate coastal rainforest is thought to be vulnerable to an increase in catastrophic fire, to the extent that it could replace wind-throw as a determinate of ecosystem structure. Furthermore, a climate-induced northern shift in ecotones is predicted to bring insect infestations at a scale heretofore unknown in the region.

With climate change to warmer and dry ecotones, the whole cumulative assessment area could change, but this is beyond the effects of this hydroelectric project, particularly because other hydropower sites in Upper Portland Canal that have been identified are not environmentally or economically feasible.

3.10 Recreation and Land Use

Hyder is nestled at the head of Portland Canal, a 70-mile-long fjord which forms a portion of the U.S./Canadian border. Hyder is also approximately 70 air miles from Ketchikan. It is the only community in southern southeast Alaska accessible by road; the only road into Hyder runs through Stewart, British Columbia, just two miles across the Canadian border. The area encompasses 14.8 sq. miles of land and 0.0 sq. miles of water. Hyder is in the maritime climate zone with warm winters, cool summers and heavy precipitation. Summer temperatures range from 41 to 57; winters range from 25 to 43. Temperature extremes have been measured from -18 to 89. Rainfall averages 78 inches annually, with annual mean snowfall of 162 inches. In contrast, the Soulé River Watershed appears to average approximately 30 feet of snow annually, or 360 inches.

The population of the community of Hyder consists of 4.1% Alaska Native or part Native. Hyder is largely dependent on tourism from highway visitors. Hyder continues to pay homage to its mining roots and is known as the "Friendliest Ghost Town in Alaska." One tradition carried over from mining days involves nailing currency to the walls of the Glacier Inn Bar. In mining days, it is claimed that miners who went bankrupt could take down their money and buy one last meal before leaving town. Due to its isolation from other Alaskan communities and its close proximity to Stewart, British Columbia (population 500), Hyder has many cultural ties with Canada and also receives electric and telephone service from Canadian companies.

Hyder's economy is based primarily on tourism today; visitors cross the border from Canada. Four of the five largest employers are tourist-related, and visitor services are shared with Stewart, B.C. In 2009, two residents held commercial fishing permits. Recreational fishing and hunting provide food for some families. Deer, salmon, shrimp, and crab are harvested resources.

Affected Environment

The Soulé River watershed is approximately 81 square miles in size with 7.8 miles of active riverbed divided into 3 major segments. The Main Stem of the Soulé River is approximately 2.5 miles long, while the West and North Forks are 1.7 and 3.6 miles long, respectively. The higher elevations of the watershed consist of glaciers and ice fields, which total approximately 33 square miles. A total of 47.5 square miles of the watershed are not covered by glacier or ice.

There are a total of five bodies of water potentially affected by this project, three of which are segments of the Soulé River:

1. No-Name Lake
2. North Fork Soulé River
3. West Fork Soulé River
4. Mainstem Soulé River, and
5. Portland Canal.

Two of these waterbodies, No-Name Lake and Portland Canal are not likely to be significantly impacted. No-Name Lake is above the proposed “full” elevation of the project reservoir by approximately 1/3 mile. Dolly Varden char are in the lake and is basically an unused fishery. Portland Canal is a large waterbody that is 70-miles-long and off the Soulé River mouth is 2-miles-wide by 900-feet-deep. Portland Canal is used by the residents of Hyder and Stewart to harvest shrimp, fish, and crab, and to a lesser degree, hunt deer and bear. Hunting for deer primarily occurs in the interior of British Columbia for the residents of Upper Portland Canal, or an approximately 60 mile boat or floatplane trip to Fillmore Island at the entrance to Portland Canal. Bear are primarily hunted in the British Columbia interior as well as along Portland Canal.

Bear have been hunted at and near the Soulé River Delta. Crab harvesting has also occurred in the bay (Glacier Bay) just north of the north river delta. Fishing also occurs nearby in the canal.

The other three waterbodies, segments of the Soulé River, are more directly impacted by this project. The North Fork drains from No-Name Lake (mostly snow and rain fed) and the West Fork drains from the Soulé Glacier (mostly glacially fed). The North and West forks have a confluence at the top of the Upper Gorge, a bedrock ridge with a fracture or gorge through it that the river flows through. This gorge is considered both a falls and velocity barrier to anadromous fish. The Main Stem flows from the Upper Gorge through the Lower Gorge, which is another bedrock ridge, where the river drops precipitously through falls and velocity barriers to anadromous fish movement before entering Portland Canal.

This river does not support salmon because:

1. Salmon are unable to get up the Lower Gorge due to velocity and falls barriers
2. No salmon were found in any portions of the river
3. No evidence of salmon were found to use the river mouth for spawning
4. Water temperatures are too cold during the spring and summer (consistently 1-2ºC [because of the short distance to the Soulé Glacier]) for salmon to spawn in the river, even at the river mouth
5. The large sediments showed a high level of particle embedment with glacial silts that constitute poor spawning conditions for salmon at the river mouth
6. No evidence of fish predation, i.e. carcasses, has ever been observed around the river mouth or along any other portion of the river
7. No evidence of predators hanging around looking for salmon runs.

For these reasons, with no salmon using this river, carnivores and predators also do not inhabit this watershed; except for a sow and two cubs and transitory visitors. Salmon would attract bear, wolverines, etc. into this watershed along with raptors who would feed on fish as well as those that would feed on other species feeding on the fish. Without game species in this watershed there is little opportunity for recreation and subsistence hunting in the area except along the shoreline.

Below are excerpts from the Stewart – Hyder website regarding recreational opportunities in Upper Portland Canal:

- Fishing – "*There are several lakes and rivers in the area for fishing, boating and water-skiing. Be sure to ask some of the locals where the best spots are. It is even possible to catch crabs and prawns right off the docks!*"

  "*You can find Dolly Varden in Fish Creek. King salmon (up to 50 lb), Coho salmon and Alaska King Crab in Portland Canal. In Meziadin River mouth and the Nass River you can fish for salmon, Dolly Varden and steelhead and Rainbow in Bob Quinn Lake. Area fishing charters are available*."[59]

- Camping – "*Going on holidays is nothing without some fun camping. Stewart and Hyder offer several campgrounds for you to spend the night, roast hotdogs or marshmallows. Sit around the campfire and spend some time with family and friends*."

- Hiking Trails – "*We offer a variety of maintained Hiking Trails. You can find more information available at the Tourist Information Centre*."

  "Below is a list of some of the trails you can experience:

  Sluice Box/Barney Gulch Trail
  United Empire Loyalist Trail
  Fish Creek Wildlife Observation Site
  Titan Trail
  Clements Lake Recreation Site
  Ore Mountain Trail
  American Creek Trail"

As shown in Figure 88, the Forest Service Land Use Designation (LUD) for the project site is **Remote Recreation**. Below is outlined the guidelines for this LUD:

Goals

- To provide extensive, unmodified natural settings for primitive types of recreation and tourism.
- To provide opportunities for independence, closeness to nature, and self-reliance in environments offering a high degree of challenge and risk.
- To minimize the effects of human uses, including subsistence use, so that there is no permanent or long-lasting evidence.

Objectives

- Manage recreation and tourism use and activities to meet the levels of social encounters, on-site developments, methods of access, and visitor impacts indicated for the Primitive Recreation Opportunity Spectrum (ROS) class.

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[59] Extracted from the Hyder website: www.stewart-hyder.com.

♦ Provide trails and primitive facilities that are in harmony with the natural environment and promote primitive recreation experiences.
♦ Apply the High Scenic Integrity Objective.
♦ Fish enhancement projects may occur. Design wildlife habitat improvements to emulate natural conditions and appearance.

Desired Condition
Areas in the Remote Recreation LUD are characterized by extensive, unmodified natural environments. Ecological processes and natural conditions are not noticeably affected by past or current human uses or activities. Users have the opportunity to experience independence, closeness to nature, solitude and remoteness, and may pursue activities requiring self-reliance in an environment that offers a high degree of challenge and risk. Interactions between users are infrequent. Motorized access is limited to traditional means: boats, aircraft, and snowmachines. Facilities and structures are minimal and rustic in appearance.

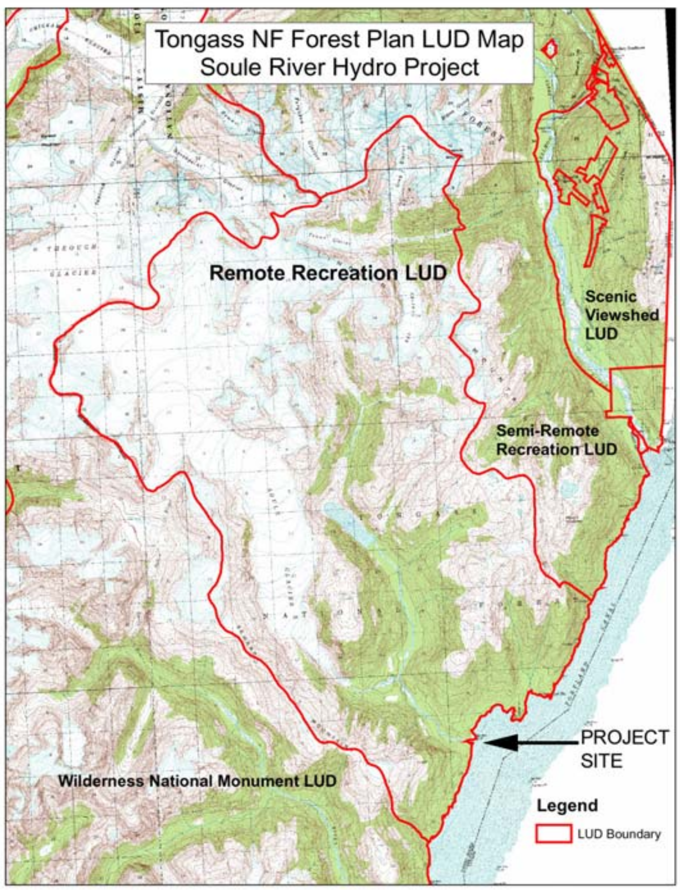

Figure 88 – LUD's for the project area

Meeting the Remote Recreation LUD

The Applicant is currently in discussions with the Forest Service to determine how this project can go forward, even though this LUD would preclude this activity. It is believed the best method would be to modify the LUD for land within the project boundary only, and leave the remaining land in the watershed in the existing LUD.

<u>Environmental Effects</u>

To help determined how this area (the area of cumulative affect) is utilized, the Applicant submitted a questionnaire to all the mailbox holders in Hyder. Some mailbox holders were from nearby Stewart, B.C., Ketchikan, AK, and from the Lower 48. However, the majority of mailbox holders were residence of Hyder.

The following is the cover letter for the survey form sent to the Hyder Post Office mailboxes:

> June 19, 2009
>
> To All Interested Parties:
>
> RE: Soule River Hydroelectric Project
> Recreation / Subsistence Survey Form
>
> AP&T is proposing to build a hydroelectric project on Portland Canal, approximately 9-miles south of Hyder at the Soule River. As part of the analysis that we must conduct for this project we need to try and determine how this project may impact the area as well as benefit the area. As a part of this analysis, enclosed is a survey form for both subsistence and recreational use that takes place in Portland Canal and in the Soule River area. We would like to gather information about how the area around the Soule River in particular is used, either for recreation or subsistence activities, or both if applicable.
>
> There are several ways you can get the form back to us, either by mail, fax, or e-mail your response to each question, using the contact information below. We appreciate your time in completing the survey form. Please respond no later than November 30, 2009, with your comments.
>
> Sincerely,
>
> Glen D. Martin
> Project Manager

A copy of the survey form can be found in the Appendix N. Of the 60+ survey forms mailed, 8 responses were received. With the small number of survey forms returned, evaluating any trend in the results is difficult. However, good information was provided on uses of the area in general and around the Soulé River Delta.

To summarize the results of the survey, the following uses were described in the returned forms:

- Bear hunting for up to 25 miles down Portland Canal, including at the shoreline of the Soulé River Delta
- Conduct shrimping, crabbing, and salmon fishing in Portland Canal
- Boating and exploring in Portland Canal

- Picnicking, hiking, beachcombing are activities conducted in Portland Canal
- Halibut fishing near Soulé River mouth
- Trout and salmon fishing near Soulé River mouth

Results of the survey show one person bear hunts along Portland Canal, including at the Soulé River Delta and four people conduct crabbing along Portland Canal, including in the bay (Glacier Bay) just north of the river delta. Activity appears (as expected due to dense brush) to be limited to the shoreline and waters adjacent to the shoreline.

Comments received with the recreation and subsistence survey form included the following:

- "*Concerned with large projects and their lasting impact upon wild areas. Short term benefits of employment and such may be overshadowed by the long term and permanent impact that such a project with so much potential infrastructure as well as easier access to remote areas will bring*."

- "*Think the dam is an excellent opportunity for our community for jobs in construction. Also excellent recreational opportunity with road access to new area and helpful from a safety standpoint with new dock facility*."

- "*I have lived here 40 years…I did not move here for this…I am not in favor…I like nature and quiet…please do not build*."

Of the eight survey forms returned, two have reservations about the project or would prefer the project not be built. One supports the project as an opportunity for work and increased recreational opportunities for Upper Portland Canal. To address the concerns voiced above, this project during construction will not be heard in Hyder (nine miles away). If equipment and materials are staged on Hyder's or Stewart's waterfront for construction, helicopter activity or movement of heavy equipment may for short periods (a few hours) periodically increase noise in the area.[60] Impacts to the environment to the residents of Upper Portland Canal would be limited to the project corridor in the Soulé River Watershed.

Visible impacts will be limited to shoreline features; the rest of the project will be out of view due to the shoreline terrain, which consists of a bedrock ridge that hides the Soulé River Valley; see Figure 89 below.

To further address the concerns expressed in the returned survey forms, the nature of hydroelectric projects is that from a noise and wildlife movement level, they are fairly benign, once construction is complete.[61] Noise at a hydroelectric project is generally located at the powerhouse from operation of the turbine and generator. The building around the turbine and generator (powerhouse) dampens the noise, reducing its impact to within <100 feet, which is a fraction of the project area. The vast majority of the project then is without noise. Wildlife movement is not hindered because in this case there is a

[60] A helicopter service exists in Stewart, B.C. so that this is a common sound during the summer.
[61] At least as far as Alaskan hydroelectric projects.

power tunnel rather than a surface penstock. The reservoir proposed for this project will still have 0.3 mile of the existing terrain between the lake and reservoir available for wildlife movement around this water feature when at full capacity and for beaver habitat that will remain unchanged. Although it is speculation at this time, reduced flow in the Main Stem of the river during operations may also improve wildlife movement across the river at certain times of the year. Lower flow velocity in the Main Stem may also improve Dolly Varden habitat because they wouldn't be washed out of the system as easily.

Figure 89 – View from middle of Portland Canal looking back at the Soulé River Watershed; river mouth is at left (bedrock notch) and north delta is the strip of light green in middle of photo; Soulé Glacier Valley (West Fork) is in background with snow/ice covered ridge.

This project would partially open up the watershed to easier access for recreation and subsistence uses in an otherwise difficult terrain to navigate; however because the access road includes a gated 1,900-foot-long section of tunnel, much of the watershed will still remain isolated and difficult to access. The Dolly Varden population in No-Name Lake would likely receive increased use if for no other reason than that there is increased awareness of the fish population because of this projects public review process. The reservoir may also eventually provide Dolly Varden fishing as well. This project will not necessarily provide more recreation for Upper Portland Canal because easier access will only be into the watershed for about 0.8 mile before coming to a gated tunnel that would force hikers to bushwhack 1,900 feet to reach the opposite end and the remainder of the surface road. This may be a significant barrier to increased use of this watershed and may be a factor in keeping the majority of the watershed isolated.

Impacts to Misty Fjords National Monument and Wilderness Area

Under both land use alternatives, no impacts would occur to the Misty Fjords National Monument and Wilderness Area.

Our Analysis

Under both land use alternatives, Project construction and operation will not affect the Misty Fjords National Monument and Wilderness Area because all activity will be down in the river valley, well below the Soulé Glacier and ice field. The Soulé Glacier and ice field is an effective buffer/barrier to the Misty Fjords National Monument and Wilderness Area and because the glacier won't be impacted by this project, nor will the National Monument. The ice field prevents most people from accessing the National Monument from the Portland Canal side. Increased access into the river valley is not likely to increase human efforts to cross into the National Monument over this ice field. In addition, because there are few species using the Soulé River Watershed, most likely as a result of the mountain range and glacier/icefields that separate the Fjords from the Soulé River Watershed. Also, because impacts to the species that are present in the Soulé River Watershed are not considered significant, including mountain goats, impacts to the National Monument are also not considered significant.

Impacts to Recreational Resources and Land Uses for the Area

Under both land use alternatives, no significant impacts would occur to recreation for the area, other than increasing accessibility to the Soulé River Watershed. Land use would change as presently nothing but the shoreline is used for hunting and other recreational pursuits.

Our Analysis

Under both land use alternatives, access into this watershed would improve. The Applicants Alternative would provide greater access into the watershed, but the access road will only travel approximately 0.8 mile before going through a gated tunnel for 1,900 feet, which will require people to trail-blaze their own route for part of the way into the dam and reservoir. This could be a significant impediment to increased use of the watershed considering the difficulty of the terrain the project is bypassing with the tunnel.

Project construction itself would not impact remote recreation into this watershed, because currently no one goes into the watershed (dense brush, long lasting deep snow, no salmon, few wildlife species [only occasional or incidental game species]), however, the shoreline uses include crabbing and fishing by boat, and occasional bear hunting. Construction could temporarily interfere with shoreline activities. Potential interference to crabbing during construction will after initial development of the marine access facilities be insignificant as crabbing should be able to take place, even with periodic barge and boat traffic to the project. The same is true for bear, which are likely to avoid the shoreline corridor until activity moves away from the shoreline or ceases for the day. Project features may have an impact on hunting on the delta, perhaps by changing bear behavior. Bear may go into the watershed because of easier access, moving some hunting into the watershed. Loss of some bear forage habitat on the delta will be addressed by seeding the staging area after construction with grass. Construction will not impact recreational use of No-Name Lake, which rarely occurs, and would be beyond project construction zone and is only available by fly-in. Even with the access road corridor and its tunnel, if hikers do get into the reservoir they will still have to trail-blaze 3+ miles around the reservoir to reach No-Name Lake because the shoreline will remain undisturbed and primitive. No-Name Lake will remain a remote destination as will most of the watershed.

This project, by providing an access corridor from the marine shoreline into the watershed for about 0.8 mile will provide new and easier, but limited, access for fishing, hiking, sightseeing, and possibly camping. However, because of the physical barrier the gated access road tunnel will maintain, and the natural dense brush and steep slopes that exist in this watershed, a significant increase in the use of this area is not anticipated. Crabbing opportunities will remain the same and should not be impacted by the project in Glacier Bay because the bathymetry of the bay is steep (as shown in Figure 90 below)[62] and currents (based on current studies)[63] show the river glacial flour circulates counterclockwise through the bay. This glacial flour circulation into the bay shows that if there is sediment related to the project, it should have an insignificant impact on crab habitat. The project is also going to be discharging directly into the river mouth, maintaining the natural point of transference of sediment into Portland Canal that exists pre-project. Land use would likely change from the above mentioned shoreline activity to activity included within the forest. However, at this time, with the current design, it is hard to see if there would be any economic gain for the local economy from recreationist passing through or basing out of Hyder to explore the Soulé River Watershed, or whether there would even be much of an increase in recreational or subsistence use of the watershed.

[62] Rusanowski, P. 2010. *Marine Environmental Report – Glacier Bay, Soulé River Delta and Portland Canal Vicinity*. Page 19. The Shipley Group, Utah.
[63] Ibid. Page 32-72.

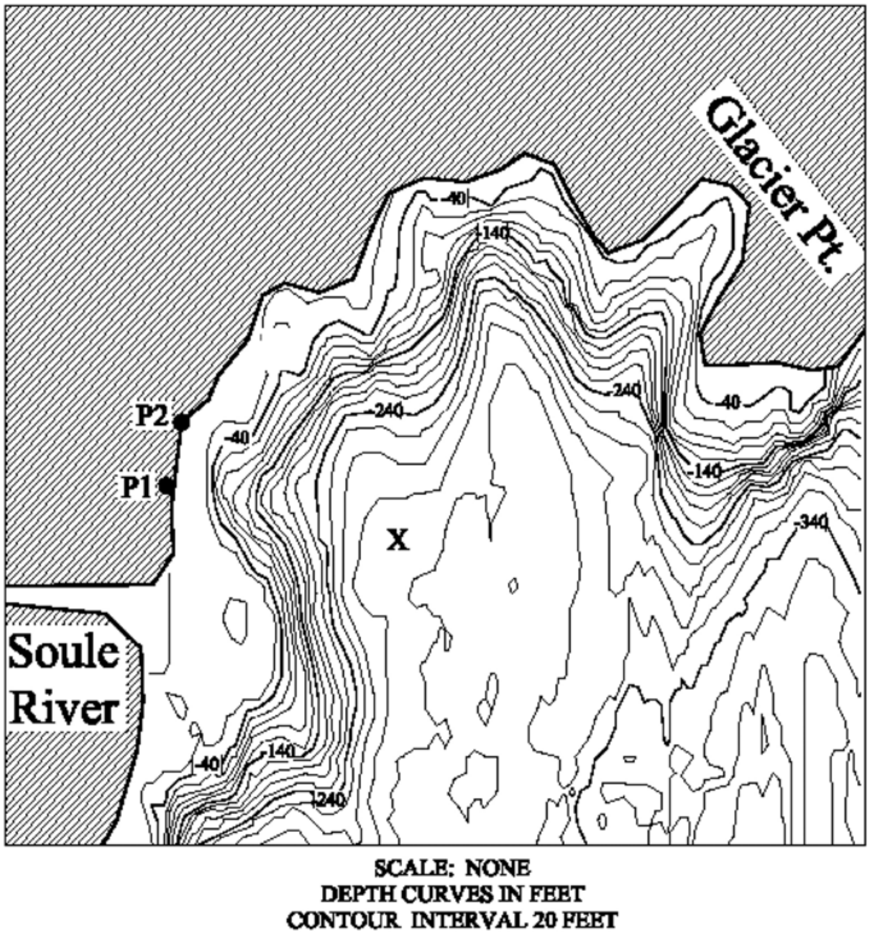

Figure 90 – Bathymetry of Glacier Bay

Impacts to Remote Recreation LUD

Under both land use alternatives, there would be impacts related to this LUD.

Our Analysis

Under both land use alternatives, considering the guidelines listed for the Remote Recreation LUD, a project could not be built in the Soulé River Watershed. Because of this LUD, impacts to the environment by the project features cannot show evidence of human use or impact the "*unmodified natural setting*," nor impact "*opportunities for self-reliance and closeness to nature*." The visual quality for this viewshed is also very restrictive. To meet this LUD, the project would have to be downsizes to the point of being uneconomical; and even then it would not fully meet this LUD.

To resolve this inconsistency, the Applicant is in discussions with the Forest Service to find a resolution. One option is to change the LUD for only the project boundary to a less restrictive LUD, thereby leaving the surrounding Remote Recreation LUD in place, which will protect the vast majority of the watershed. This reduces impacts to the Forest

Management Plan and land use in the immediate area while allowing a renewable resource to be developed to benefit society as a whole by reducing carbon emissions. FERC will need to request the preliminary 4(e) conditions from the Forest Service when this Preliminary Draft EA comes out so that the Ketchikan Ranger District can inform the Department of Agriculture in D.C. to set a timeline to accomplish this. The preliminary 4(e) conditions are necessary for the final license application so that project design and comments can address the conditions.

Impacts to Roadless Area (Hyder-530)

Under both land use alternatives, access corridors would be made. The Applicants Alternative has the greatest impact with a 3.1 mile long road. However, the access road will only travel approximately 0.8 mile before coming to the 1,900-foot-long tunnel that is meant to avoid a steep slope and the significant surface development that would have to take place to make a surface road feasible. In addition, instead of a surface penstock, the Applicants Alternative uses a tunnel to transport water from the reservoir to the powerhouse, thereby preventing surface disruption for approximately 11,400 feet; this significantly reduces impacts to this roadless area and keeps surface disturbance to a narrow corridor that follows the access road.

The Land Use Alternative only has a 2,900-foot-long pack animal trail. Both alternatives create clearings at project features.

Our Analysis

Under both alternatives, although project construction would not connect the project area to any other road system, a road from the marine shoreline to the various project features would be constructed, or as in the case of the Land Use Alternative, a pack animal trail would be constructed. The access road tunnel will be closed off to keep animals and people out for safety. Considering the steep terrain and thick brush, this may be an impenetrable barrier to most people, keeping the remainder of the road and reservoir isolated as far as access. The Applicant believes this will be a significant barrier to those wishing to access the watershed. However, this would be in contradiction to the Roadless Rule which doesn't allow any roads to be built within the National Forest System, at this time. If this project is allowed as proposed, this limited ~3.1 mile road would not connect to any other road system, minimizing impacts to a localized area, keeping environmental impacts to a minimum. With the water conduit being a tunnel rather than a surface penstock, surface impacts are significantly reduced, which keeps surface impacts to the narrow corridor needed for the access road. Environmental impacts can be kept to a narrow corridor, thereby minimizing environmental and visual impacts.

Subsistence Resources

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 created a preference for rural Alaska residents who use subsistence resources on federal public lands. Section 810 of the ANILCA requires an evaluation of effects to subsistence hunting, fishing, and gathering resources and the subsistence lifestyle for any project that uses federal public lands.

Under ANILCA only rural Alaska residents qualify for subsistence hunting and fishing on federal lands. Alaska residents living in urban areas can harvest under sport, personal use, or commercial regulations, but not under subsistence regulations. Following the Alaska Supreme Court's 1989 ruling in McDowell v. State of Alaska, all Alaska residents qualify as subsistence users on state lands with federal lands continuing to be managed under ANILCA.

Subsistence hunting, fishing, trapping, and gathering activities are a major focus of life for many Southeast Alaska residents. Some individuals participate in subsistence activities to supplement personal income and provide needed food. Nearly all rural Alaska communities depend on subsistence resources to meet some portion of their nutritional needs (Wolfe 2000). Others pursue subsistence activities to perpetuate cultural customs and traditions. Still others participate in subsistence activities for reasons unconnected with income or tradition. For all these individuals, subsistence is a lifestyle reflecting deeply held attitudes, values, and beliefs.[64]

Within the context of Southeast Alaska's seasonal and cyclical resource-based employment, subsistence harvest of fish and wildlife resources takes on special importance. The use of these resources may play a major role in supplementing cash incomes during periods when the opportunity to participate in the wage economy is either marginal or nonexistent. Because of high prices of commercial products provided through the retail sector of the cash economy, especially in remote communities, the economic role of locally available fish and game takes on added importance.

Native and non-Native communities both have high subsistence participation rates and rely heavily on wild foods, with approximately 86 percent of rural Alaska households using wild game and 95 percent using fish (Wolfe 2000). The opportunity to participate in subsistence activities reinforces a variety of cultural and related values in both Native and non-Native communities. For example, the distribution of harvested fish and wildlife contributes to the cohesion of kinship groups and community stability through the sharing of resources. Subsistence resources provide the foundation for Native culture, forming the basis for different clans and potlatch ceremonies, as well as reinforcing basic values of respect for the earth and its resources. Participating in subsistence activities contributes to the self reliance, independence, and ability to provide for ones self; values that social surveys indicate are important reasons why many non-Native people emigrate to or remain in Southeast Alaska (USDA Forest Service 1997a).

Access

Road building, a byproduct of timber harvesting and, to a much lesser extent, mining, is an important agent of change in Southeast Alaska. These road networks provide greater access to areas previously unconnected and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the

[64] Tongass Land and Resource Management Plan, Final EIS, Volume I. Page 3-419.

potential for increased competition. On Prince of Wales Island, for example, areas that have become road-connected are now more easily reached through the ferry system, thus providing greater access from Ketchikan, one of the largest cities in the region. While road systems tend to bring more people into an area, they also give subsistence hunters access to previously remote regions and provide a greater opportunity for subsistence harvest.

Southeast Alaska is comprised of isolated islands unconnected by road systems; however, with the transportation means available (floatplanes, ferry systems, automobiles, boats), Southeast Alaska residents are very mobile in their subsistence resource use activities.

Potential Effects by Resource Area - Subsistence
Among the subsistence resources of greatest importance (salmon, other finfish, marine invertebrates, and deer), deer is the only one that is potentially significantly affected by the alternatives.[65] Therefore, the subsistence analysis presented here uses deer as a key indicator for potential subsistence resource consequences concerning the abundance and distribution of the resources. Timber harvest tends to affect deer related subsistence activities in two ways. In the short run, 20-30 years following harvest, deer populations tend to increase in harvested areas. In the long-run, populations tend to decline as the canopy in even-aged forest stands closes, resulting in lower habitat quality.

"*Road construction also affects subsistence by providing subsistence hunters with ready access to areas that may have been previously inaccessible. This effect may be perceived as either positive or negative depending on the parties involved, as increased access may lead to increased competition for resources. Potential effects are likely to vary by community and may be perceived differently by members of the same or neighboring communities.*"[66]

Section 810 Analysis

Hyder Subsistence
Salmon, other finfish, and invertebrate resources account for 80 percent of the total edible pounds of subsistence resources harvested by Hyder households (Kruse and Frazier 1988). Marine resources (fish and marine invertebrates) accounted for the majority (85 percent) of per capita subsistence in Hyder in 1987.

The 1988 TRUCS study found that deer accounted for only a fraction of the total edible pounds of subsistence resources harvested by Hyder households (Kruse and Frazier 1988). Deer accounted for a very small amount of per capita subsistence harvest by Hyder residents in 1987.

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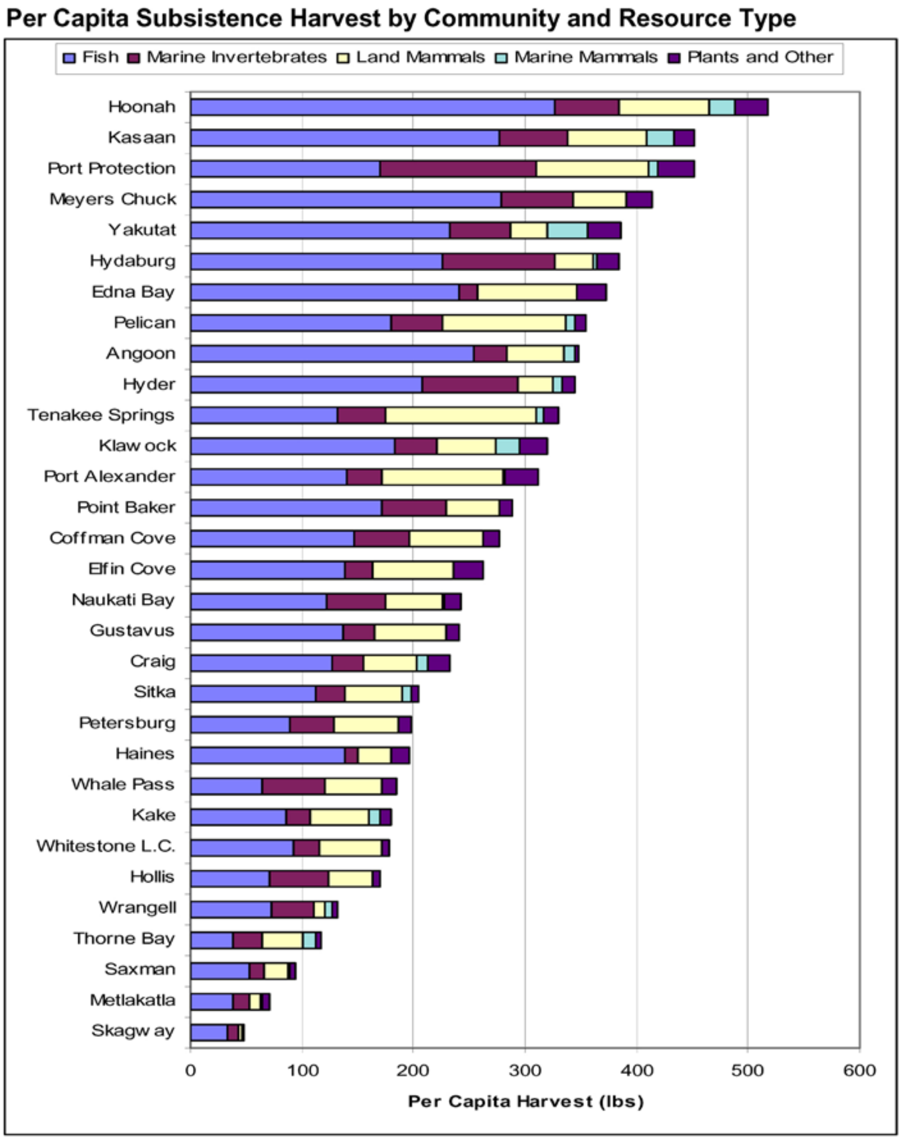
[65] Referencing alternatives in the Tongass Land and Resources Management Plan, Final EIS, which it was extracted from.
[66] Tongass Land and Resources Management Plan, Final EIS. 2008.



Note:
The year these data were collected varies by community, as follows:
1987: Elfin Cove, Gustavus, Hyder, Metlakatla, Meyers Chuck, Pelican, Petersburg, Port Alexander, Saxman, Skagway, Tenakee Springs, and Wrangell
1996: Angoon, Haines, Hoonah, Kake, Point Baker, Port Protection, Sitka, and Whitestone Logging Camp
1997: Craig, Hydaburg, and Klawock
1998: Coffman Cove, Edna Bay, Hollis, Kasaan, Naukati Bay, Thorne Bay, and Whale Pass
2000: Yakutat
Source: ADF&G 2006

Table 24 – Per Capita Harvest (lbs) for communities of Southeast Alaska

Data were not provided for Hyder in the ADF&G deer harvest reports for 1996 to 2002. The majority of deer harvest by Hyder residents likely takes place in GMU 1A. Deer harvest in GMU 1A generally declined from 1997 to 2004, with the number of hunters and hunter effort also decreasing over this period (ADF&G 2005). As noted above, the population of Hyder increased from 1970 through 1990 and has remained fairly constant since. Hyder had an estimated population of 91 residents in 2005.

Soulé River Area Subsistence

Within the Soulé River Project area, the USFS, ADF&G and USF&WS regulate various aspects of subsistence hunting, fishing and gathering, depending upon the resource and location. The USFS controls subsistence hunts on its lands[67] and is the only federal land manager involved in the project area. All lands owned or operated by the federal government in the Soulé River Project area are administered by USFS, Ketchikan Ranger District, Tongass National Forest. The total area of federal public land within the Project Boundary is about 1,257 acres. ADF&G controls hunting by urban, non-resident, and other non-rural hunters on these same lands and on any other land where hunting is allowed.

Subsistence uses in the Project area include hunting, fishing, and taking of crab. Hunting at the Soulé River Delta is for bear and this appears to be primarily recreational activity (hunting guide from Ketchikan uses this and other areas of Portland Canal). Deer hunting primarily takes place further down Portland Canal or in Canada, as does most bear hunting. The recreation and subsistence survey results did not provide much information on subsistence, most indicating it was recreation. However, government statistics show significant subsistence activity by residence of Hyder. Due to the close proximity of Canada, the border being 2 miles away from downtown Hyder, most hunting potentially occurs across the border because of easier access and/or more game.

Evidence of deer was found either at or near the shoreline of the forest at the Soulé River Delta, however, no deer were ever observed during the 123-Field-Observation-Days spent on site by the Applicants biologists. The evidence indicates deer use the shoreline to migrate up and down Portland Canal but did not use the watershed for possibly several reasons, including thick understory, deep winter snows of up to 30 feet, and steep rugged terrain. These reasons have kept the deer population low in the project area, which is why residents of Upper Portland Canal travel to Canada or the Lower Portland Canal area for their deer hunting.

This project will open up corridors into the watershed that previously didn’t exist and these corridors would be maintained for the life of the project rather than becoming reforested as abandoned logging roads would. Deer and bear are likely to opportunistically use this new corridor into this watershed, at least out of curiosity, and to forage. The access road tunnel, which will be closed off, will not allow wildlife to use improved access all the way into the project reservoir, however. Subsistence hunters would also have easier access into this watershed which previously did not provide game species worth penetrating this difficult terrain, but could as mammals use the new access corridors. Over all, in balancing some loss of bear forage habitat on the delta, but improved access into the watershed and some wetlands that may attract bears before the access road tunnel, and the fact that most bear hunting is conducted well south of the project or in Canada, this project should not decrease subsistence opportunities for Upper Portland Canal residents.

[67] Federal public land is land owned by the federal government that is open to the public and unencumbered by overlying selection by the State of Alaska or by Native corporations formed under ANILCA.

Environmental Impacts and Recommendations

Project Impacts

Temporary and periodic impacts to recreation and subsistence crabbing and bear hunting could occur during construction at the river delta and Glacier Bay. The impact would be related to the construction activity keeping recreationist away until the marine access facilities are completed, and a periodic load of equipment or materials is offloaded, etc. on the Glacier Bay side of the delta. Impacts to land use and recreation are limited to these few activities and limited to the activity that will occur on the Glacier Bay side of the delta. Crab habitat will not be impacted because discharge of sediment from excavation of the barge basin will be screened with floating filter fabric barriers and excavation will occur at low tides, above the waterline. Fill will not be placed in Glacier Bay other than some riprap on the delta to extend the barge basin entrance out along the excavated channel, as shown in Exhibit F-1.

An additional impact is that recreational opportunities may be increased for Upper Portland Canal by this project development by improving access into this watershed. How significant an opportunity this will be is unknown because of the gated access road tunnel within 0.8 miles of the shoreline, which may be a limiting factor for a few or for many. Recreational bear hunting on the north delta may be impacted because some of the delta forage will be displaced by project features. The south delta will remain untouched. Bear behavior may change because of changes to the north delta, i.e. they may not linger as long from loss of forage (approximately <1/3 of the north delta will be covered by project features). However, bear may go into the watershed more because of the limited improved access, both from the field study trail that may become semi-permanent if wildlife keeps plant growth down,[68] and from the access road into the road tunnel; there is a bog avoided by the road up near the tunnel portal, which may also provide good bear forage habitat. This may offset bear not lingering as long on the delta should that change in behavior occur. Native grasses preferred by bear could also be seeded on the project staging area after construction is completed to replace the lost forage.

Project impact to the Remote Recreation Land Use Designation would be significant considering that this LUD would not allow this type of development.

Project Recommendations

The Applicant recommends that an amendment or administrative change to the Tongass National Forest Plan be made to change only the project lands to another Land Use Designation other than the current Remote Recreation LUD. A less restrictive LUD is needed for this project to be constructed, while leaving the current LUD around the project will continue to provide the existing more restrictive guidelines of Remote Recreation. This will reduce impacts to the area by keeping restrictions in place for the majority of the watershed while allowing a narrow corridor to be developed that will have limited impacts to environmental resources (based on the field studies conducted and the narrow design of the Applicants Alternative).

[68] Bear, being opportunistic, started using the field study trail almost immediately in 2009.

In addition, the only access corridor the project will create is the access road. However, with a 1,900-foot-long tunnel after going in approximately 0.8 mile into this watershed, this is likely to prevent many from going further. Why…, because the brush in this watershed is very dense and lies at an angle to the ground from the heavy snows it receives each winter, making this very difficult terrain to penetrate. Also, the reason a tunnel is being put here is to avoid wetlands as well as to limit construction on a steep slope. With the watersheds rugged terrain, steep slopes, and dense understory, the tunnel may be long enough to keep this watershed mostly isolated, which makes the decision to keep the surrounding lands as Remote Recreation more logical because most of the watershed will remain unchanged and/or will require self-reliance to penetrate, even with about 2.5 miles of surface road. The lake will not be easy to access, because a hike around the reservoir will still require bushwhacking through rugged and steep terrain with the same dense brush mentioned earlier.

Because of the significant amount of snow this watershed receives (~30+ feet annually), the steep slopes and avalanche chutes would make trail development costly to develop and costly to maintain and is not recommended here. However, the following are recommendations for recreation and land use at the project site:

1. Allow boaters to use project dock in the barge basin on Glacier Bay; which can also be considered for boater safety in Upper Portland Canal if boaters are in distress or caught in bad weather when no other such facilities occur until Hyder, nine miles north (these fjords because of their steep sides and almost linear features under certain weather conditions offer little respite to wait out difficult boating weather)
2. Allow recreationist to use the project access to reach the reservoir, No-Name Lake and other parts of this watershed; bushwhacking will still be required to get to the reservoir and to get around the reservoir to the lake
3. Provide one interpretive kiosk showing project features and natural features of the watershed (at the marine shoreline, i.e. beginning of access road); would need to evaluate need and potential damage by bears, i.e. will it become a scratching-chewing-backrub post.

<u>Unavoidable Adverse Impacts</u>

The unavoidable adverse impacts to recreation and land use from the Applicants Alternative starts with the Land Use Designation and the Roadless Rule that currently guides the Forest Service land management policies. The Applicants Alternative is currently in conflict with both the Roadless Rule and the LUD for this site. However, there is no reason why the Roadless Rule cannot allow site specific modifications to the Rule to allow development, particularly when it comes to renewable energy resources, whose development is a part of our National Energy Policy. Similarly, the LUD should be modified to fit the narrow corridor of the project while maintaining the existing LUD around the project, and thereby only modifying a small portion of the area. This too will allow a renewable energy project to go forward and help offset the U.S. dependence on fossil fuels.

The impacts to land use that would occur from this change are spelled out above, but in short this project would impact the Remote Recreation LUD by:

- Reducing the amount of unmodified natural setting for primitive types of recreation
- Reducing opportunities for independence, closeness to nature, and self-reliance (considering the size of the landscape and the narrow project corridor with limited surface disturbance, it is the Applicants belief that there will be plenty of opportunity for independence, closeness to nature, and self-reliance in this watershed despite the project being there)

Although these impacts would be limited to the project corridor, the project would provide easier access than what is otherwise an undeveloped location that presently requires self-reliance, independence, and a primitive type of recreation.

From an environmental standpoint, there would be the clearing and partial opening up of the watershed to easier foot access, whereas currently only a floatplane would be able to get into the watershed by landing at No-Name Lake. Visual impacts would exist on the north delta where the marine access facilities are located, which would consist of riprap supporting the barge landing and staging area and the access road will show here and there through the trees as it ascends the shoreline ridge. The powerhouse and substation will be behind shoreline trees near the river. The initial access road from the staging area will be a cut in the hillside that traverses a narrow area into the treeline around the shoreline ridge. The rest of the project will be out of site to recreationist or the casual observer along Portland Canal. A visual simulation was made from a vantage point in the middle of Portland Canal (Visual Priority Route) directly out from the river delta to show what visual impacts would occur, which is more thoroughly analyzed in Section 3.12 Aesthetic Resources along with that simulation.

There would be no long term impacts to harvesting crab in Glacier Bay and fishing in Portland Canal would not be impacted. No adverse impacts to crabbing or fishing activities are expected.

Although bear will lose some forage on the north river delta (although the south river delta will remain unchanged) and this combined with the project features may alter their behavior by not lingering on the delta as long, access into the watershed will be improved and possibly provide new forage habitat, offsetting the approximate loss of <1/3 of their north delta forage habitat. Possibly good bear forage habitat may exist before the access road tunnel as there is a *Sphagnum bog* wetlands the road avoids near the tunnel portal as well as a *palustrine scrub shrub* wetlands the road passes through. Hunting may be partially impacted because bear may linger less on the delta, requiring some hunting to occur in the watershed as bear move into it in search of other forage being opportunistic by nature. One method that may help offset the loss of forage is to seed the top of the staging area with native grasses presently found on the delta after construction.

Dolly Varden in No-Name Lake are not likely to be adversely impacted because their habitat will remain largely unchanged with only a portion of the juvenile rearing habitat in the North Fork being flooded by the reservoir; which should not be a significant impact. Increased fishing pressure is not expected to be significant because access will remain fairly difficult with the dense brush and steep, rugged terrain that will remain for hikers to negotiate. Based on the description above, impacts to Dolly Varden will be insignificant and no adverse impacts are expected.

Cumulative Effects

No other potential sites for hydroelectric projects in the Hyder area are considered economically or environmentally feasible; as reviewed in-depth in Section 3.2 Scope of Cumulative Effects Analysis and also thoroughly analyzed in Appendix A. Therefore, the cumulative impacts of this hydroelectric project to the area are not compared to additional hydro projects and their impacts on recreation or land use, or if compared, would find the cumulative impact to not be significant.

Few potential projects (of any kind, or as listed by the Forest Service for the Cumulative Effects Analysis) in this area have the potential to add a recreational resource such as this project could. If one discounts the 1,900 feet of inaccessible access road in steep terrain, this could increase recreational opportunities for the area. The lake fish are basically untapped as it is a fly-in only fishery because of its remoteness. Is this an impact then on fly-in fisheries?[69] It is, but only insignificantly, because anecdotal information indicates there is very little use of this lake as a fishing destination. In addition, because no road or trail will be built to the lake, there would still remain a 3+ mile bushwhacking hike to reach the lake through steep, rugged, and brushy terrain just to get around the reservoir. This lake will then have fishing pressure where currently there is none; however, going from zero pressure to some pressure may have a healthy impact on the Dolly Varden population, i.e. reduced competition for food.

"*Dolly Varden in Southern Southeast Alaska:*

1. *Anglers in SSE take fewer Dolly Varden (about 29% of the catch) than in NSE, but the harvest is still about 10,000 fish annually. The majority of Dolly Varden are taken in the Petersburg-Wrangell area, with the fewest being caught in the Ketchikan area.*
2. *Anglers in SSE take Dolly Varden at only a little over half the rate as in NSE but this is not necessarily an indication of abundance. There is better angling in SSE for other species, such as steelhead, cutthroat, and rainbow trout*."[70]

Game species that currently use the marine shoreline may move into this watershed utilizing corridors created by the project features (bear have started using the field survey trail created into the project site). However, the Applicant would be concerned about hunting within the project boundary out of concern that project features, i.e. buildings, etc., may be damaged by errant bullets. Project features on the delta may have an impact to hunting of bear on the delta, possibly because there is less forage available and project

[69] No data exists, that the Applicant could find, on this lake being recognized as a fly-in fishery.
[70] Schwan, M. *Recreational Fisheries of Southeast Alaska Including Yukatat: An Assessment*. Page 21. Division of Sport Fish. March 1984.

features may cause bears to spend less time on the delta, or some other change in bear behavior related to the project features that could provide fewer opportunities for bear hunters. However, possibly good bear forage habitat may exist before the access road tunnel as there are wetlands the road avoids as well as a *palustrine scrub shrub* wetlands the road passes through and seeding the staging area at the delta with grasses may replace lost forage as well as even increase it.

The cumulative effects on recreation and land use resources of Upper Portland Canal would include the following:

- Impacts on recreation during construction will be temporary and limited to Glacier Bay and the north delta; recreation and subsistence activity that takes place associated with the delta (fishing, crabbing, hunting) also occur in other places along Portland Canal, making these temporary impacts insignificant
- Recreation opportunities will marginally increase for the residents of Upper Portland Canal and visitors with the improved access into the Soulé River Watershed once the project is complete, however, its location is remote and will still require a boat, helicopter, or floatplane to reach. Overall, cumulative impacts to recreational opportunities to Upper Portland Canal will not significantly change with this small improved access to the watershed
- While bear hunting on the north delta may be marginally impacted, it is possible that improved assess into the watershed and seeding the marine access staging area with grass would make impacts insignificant. In addition, because bear are mainly hunted in Canada or near the entrance to Portland Canal, the cumulative impacts of this project on bear hunting in this area are not considered significant.

3.11 Cultural Resources

Affected Environment

The affected environment is the Soulé River Watershed, from shoreline to No-Name Lake. In 2009, a heritage resources field study occurred to assess the potential impacts this project might have.[71]

The following is a report from the archaeologist who conducted the Heritage Resources Survey in 2009:

In 2009, personnel reviewed heritage resource report and site files of the Alaska Heritage Resources Survey (AHRS), housed at the Office of History and Archaeology (OHA), Alaska Division of Parks, Department of Natural Resources, Anchorage, as well as files housed at the Ketchikan-Misty Fiords Ranger District. A total of four heritage resource inventories (Belvin 2008, Grover 2009, Stanford 2008, Stanford and Autrey 2004) have been undertaken in or near parts of the proposed Project Area. The file reviews also resulted in locating information about seven previously recorded sites within one mile of

[71] Survey was conducted by T. Weber Greiser, Associate Archaeologist, Historical Research Associates, Inc. Missoula, MT.

the Project and related features. These sites include two prehistoric or early historic petroglyphs – human or animal figures carved into exposed bedrock or boulders. Both of these sites are considered significant by the Ranger District archaeologist (Stanford 2008), but National Register of Historic Places (National Register) determinations of eligibility have not been completed. The remaining five are historic sites and include the Portland City (as the town before Hyder was called) District, the Hyder Dairy Barn, the Hyder Dock Trestle, the Salmon River Trading Company, and the East Site. The first four of these sites have been determined eligible for listing in the National Register by the Alaska State Historic Preservation Officer (SHPO).

In addition, personnel reviewed copies of documents related to Native use of Southeast Alaska in general and the Project Area in particular. Two published resources that were reviewed are Native Cemetery and Historic Sites of Southeast Alaska (Sealaska 1975) and Haa Aaní, Our Land: Tlingit and Haida Land Rights and Use (Goldschmidt and Haas 1998), and Tongass National Forest Cultural Resource Overview (Arndt et al. 1987), but no sites are reported in or near the APE. The FERC sent consultation letters about the project to the Ketchikan Indian Community, the Organized Village of Saxman, the Metlakatla Indian Community, the Wrangell Cooperative Association, and the Nisga'a Lisims Government in British Columbia, in Government-to-Government consultation. In addition, John Autrey, Tongass National Forest Tribal Government Relations Specialist, supplied several names of local tribal members who might have knowledge of use of the area; calls were made and messages left. In both cases, no responses were received.

The research indicates that the Tsetsaut (or Wetalth) are an Athabaskan-speaking group who inhabited coastal and riverine areas and were primarily concentrated along Portland Canal, southern Behm Canal, the Unuk River, and the mainland between these waterways. They intermarried with the neighboring Sanykwan band of Tlingit. However, feuding between the Tsetsaut and Tlingit reportedly started as early as the 1700's, with the encroachment of Tlingit groups into Behm and Portland canals following the Kaigani Haida invasion of southern Prince of Wales Island. Acrimony gradually escalated and by 1835 most of the Tsetsaut were either killed or enslaved by the Tlingit. The remaining Tsetsaut aggregated in Portland Canal between Hyder and Tombstone Bay, and established new trade relations with the Niska Tsimshian of the Nass River area. Following the discovery of copper and other minerals in the Salmon and Bear River valleys above Hyder, in the late 1800's, the remaining 12 Tsetsaut men, along with their women and children, were forced to join the Niska at Kincolith Mission on the Nass River. Soulé River (Tsukanatle) is mentioned as important to the Tsetsaut as a location for salmon fishing, hunting mountain goat, and the harvesting of berries and fireweed. According to Dangeli, a descendent of the Tsetsaut, a sweat lodge fed by a hot spring was located along the Soulé River and was used by both the Tsetsaut and later by the Niska Tsimshian (Dangeli 1985).

Copies of the Land Status and Use Records and Master Title Plats were obtained from the Alaska State Office of the USDI Bureau of Land Management, through their Spatial Data Management System (SDMS) and their Alaska Case Retrieval Enterprise System (ACRES) website (http://www.sdms.ak.blm.gov/acres/.htm), and reviewed for historic activity. An online search for ship wrecks was conducted at http://www.mms.gov/alaska/ref/ships/shipwr/shiplist.asp; no ship wrecks are indicated in or near the Project.

Following preparation and review of an inventory plan for the Project by the Forest Service and the Alaska SHPO, the inventory was implemented in July 2009. The focus of the field study was to conduct an intensive pedestrian inventory for cultural resources in selected lands within the area of potential effect (APE). Fieldwork was divided between locations in the APE considered to have a high probability of containing heritage resources, referred to as high sensitivity zones. Based on map data it was estimated that there would be approximately 150 acres of high sensitivity areas to inventory along the shoreline. After the prefield meeting with the Forest Service, the acreage was increased to approximately 350 acres. The acreage in high sensitivity zones included the lower river to the inter-tidal zone, where the beginning of an access road, the power plant, a possible construction camp, and marine access facilities, will be located. There were approximately 950 acres in low probability, or low sensitivity, zones in the APE. In addition, an alternative substation is proposed on shore at Hyder.[72] The submarine cable would come on shore in the vicinity of Harbor Island, or the Hyder Dock, and be buried in the existing causeway until reaching the proposed substation.

The cultural resource study was conducted following the predictive model developed by archaeologists on the Tongass National Forest and incorporated into the Second Amended Programmatic Agreement with the Advisory Council on Historic Preservation and the Alaska SHPO (Programmatic Agreement 2002). The field crew inventoried a total of approximately 620 acres that included about 350 acres along the shore and in the adjacent lower elevation areas; about 90 acres along the main river; about 50 acres in open areas along the North Fork, including the proposed dam area; about 20 acres at the inlet of No Name Lake; and about 110 acres in the high elevation alpine areas, where the higher area was about half covered with snow and ice. In Hyder, the area from Harbor Island, or the Hyder Dock, along either side of the existing causeway was previously subjected to intensive heritage resource inventories. In addition, the lead contractor on the project, indicated that if the transmission line comes on shore at Hyder,[73] the plan will be to get permission to bury it in the causeway. Therefore this area was only subjected to heritage resource reconnaissance during fieldwork.

The inventory resulted in the location of one hearth in the alpine area that is likely historic (radiocarbon dated to 80 years +/- 40 years before present); one fish camp with an apparent boat landing south of the mouth of the river, reportedly from the 1980s; a cluster of blazed trees just north of the mouth of the river; and a cluster of springboard stumps further north toward Glacier Point. The crew placed probes regularly in areas where there might be soil development, mainly the shoreline above the intertidal area and in the trees above the shoreline. There was little soil development in the interior along the river, especially where the glacier had recently receded. Probe depths ranged from 40 to 100 cm (16 to 40 in) with mostly duff in the forested areas and silty gray sandy clay to

[72] This was since changed to a submarine cable landing and overhead transmission line at Stewart, B.C.
[73] Ibid.

layers of sand and gray clay on the shoreline flats. None of the located resources are recommended as eligible for the National Register.

While no heritage resources were identified in the Project APE during the inventory, there is always a possibility for unanticipated resources found through ground disturbance. If any prehistoric, historic, or cultural object or site is encountered during work on the project, operations within 100 feet of the area should be suspended and a professional heritage resource person or representative of the Tongass National Forest and/or the Alaska SHPO should be notified. If any burials are encountered during work on the project, operations within 100 feet of the area should be suspended and representatives of the Tongass National Forest and the Alaska SHPO notified. In either circumstance, the notified persons will determine how to proceed.

Unavoidable Adverse Impacts

There are unlikely to be any unavoidable adverse impacts to Heritage Resources because none were found in the project boundary.

Cumulative Effects

This project will not have any cumulative effects on heritage resources of Upper Portland Canal because none were found within the project boundary or immediate vicinity. To adjudicate any potential effect to heritage resources, the Applicant has a *Heritage Resource Protection Plan* in the Appendices to address what to do if artifacts are later discovered.

3.12 Aesthetic Resources

The Forest Service has different Scenic Integrity Objectives (SIO) for each LUD. For the Remote Recreation LUD that the Soulé River Watershed has, the following guidelines exist for maintaining the SIO:

SCENERY

High Scenic Integrity Objective (SIO)

- Design activities to not be visually evident to the casual observer. This objective should be accomplished within 6 months following project completion.

- Log Transfer Facilities are generally not appropriate in this SIO setting.

"*Interpretation: A "casual observer" might be regarded as someone who is not necessarily observing the landscape with a critical eye to discern change in natural characteristics, but viewing the landscape as scenery. Large shoreline landing facilities (such as Log Transfer/Marine Access Facilities) are generally not appropriate in this SIO setting. The appearance of waste rock piles made to appear as natural rock fall could be regarded as "not visually evident". A diversion dam could be constructed to appear natural; coloring the concrete might also be an option. A tunnel would definitely be less obtrusive than an above ground penstock. Any corridor clearing would have to also be considered as an effect. Timing of visual recovery should be a reasonable period. Given the significant design mitigation the project would require, visual recovery would probably only involve vegetation.*

Again, a 100' swath of corridor clearing would not be considered acceptable in terms of meeting the recovery expectations. Any reforestation or revegetation of the site should be expected not to be extensive in scope."[74]

Portland Canal is approximately 70 miles long with only two communities along its length, the community of Hyder, Alaska, and Stewart, B.C. at its northern end,[75] only two miles apart. Very little development has occurred along the canal. However, one industrial installation, the Swamp Point Aggregate Quarry, which is a sand and gravel mining operation, is approximately 31 miles south of Hyder on the east side of Portland Canal; in British Columbia. In Figure 91, an aerial view of the Swamp Point facility is shown. As can be see, significant clearing has occurred, providing a visible signature of development on Portland Canal. In addition, there are fuel storage tanks, a deep water ship loading facility, dock, deep water barge landing facility, generator building, office trailers, etc.

The Soulé River Hydroelectric Project will have much smaller clearings than this and provide a smaller visible footprint from both the Visual Priority Route in Portland Canal and from the air.

Figure 91 – Swamp Point Aggregate Mine

Affected Environment

The affected environment would be from the Visual Priority Route (VPR)(middle of Portland Canal) looking back toward the shoreline from just south of the Soulé River

[74] June 9, 2009, Comment letter on Final Study Plan from the Forest Service.
[75] Hyder is at the mouth of the Salmon River and Stewart is at the mouth of the Bear River, both of which converge at the north end of Portland Canal.

mouth to just north of the delta in Glacier Bay. Figure 92 below shows the 50mm view the VPR analysis requires. Figure 93 shows the area Figure 92 covers.

The affected environment covers the river mouth, delta, and mountain hemlock and sitka spruce forest ridge at the shoreline. Visual impacts to the high SIO will primarily be located at the north river delta because of the marine access facilities, staging area, powerhouse, tailrace, substation, and access road traversing up the slope behind the powerhouse. The powerhouse and substation are being placed behind shoreline trees to screen them from view.

Figure 92 – View from middle of Portland Canal looking back at the Soule River Watershed; river mouth is at left (bedrock notch) and north delta is the strip of light green in middle of photo; for some scale, the bedrock notch at the river mouth is estimated to be about 65 feet high. The riprap for the barge basin and staging area will be ~19 feet high.

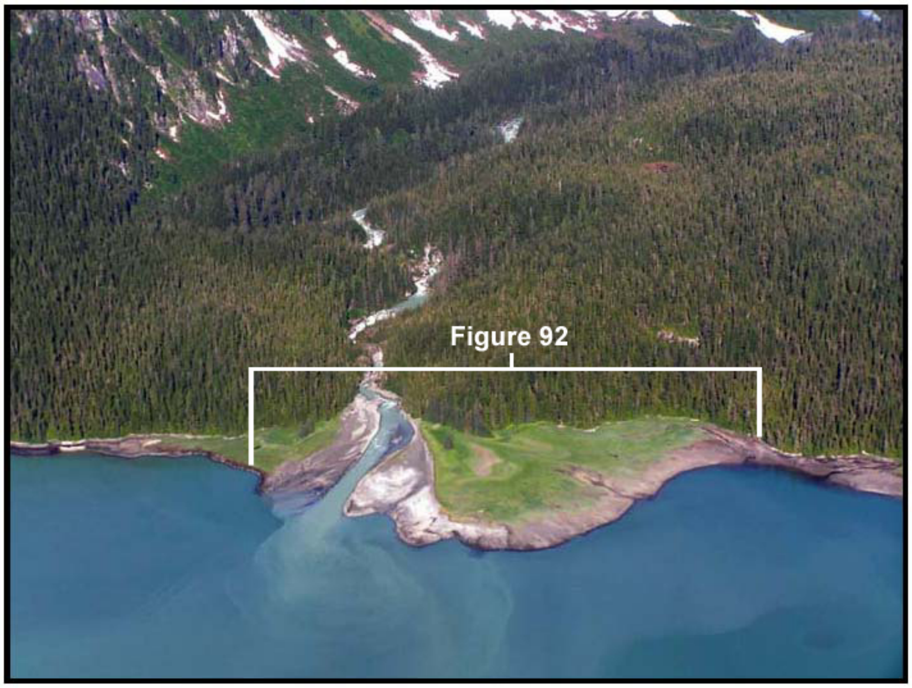


Figure 93 – Area covered of the landscape by Figure 92

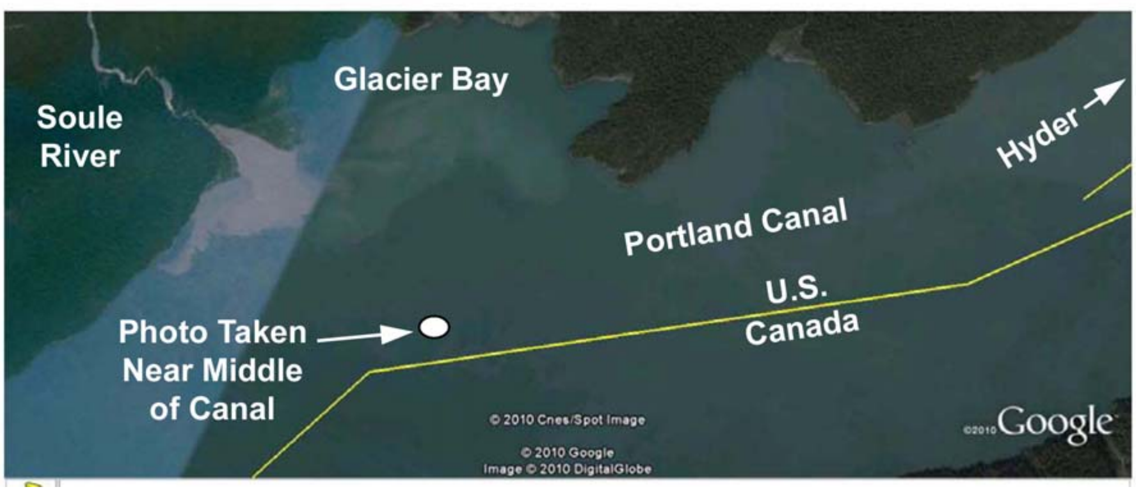


Figure 94 – Aerial view of Visual Priority Travel Route (VPR) (yellow line) and location of photo taken for the visual simulation of the project

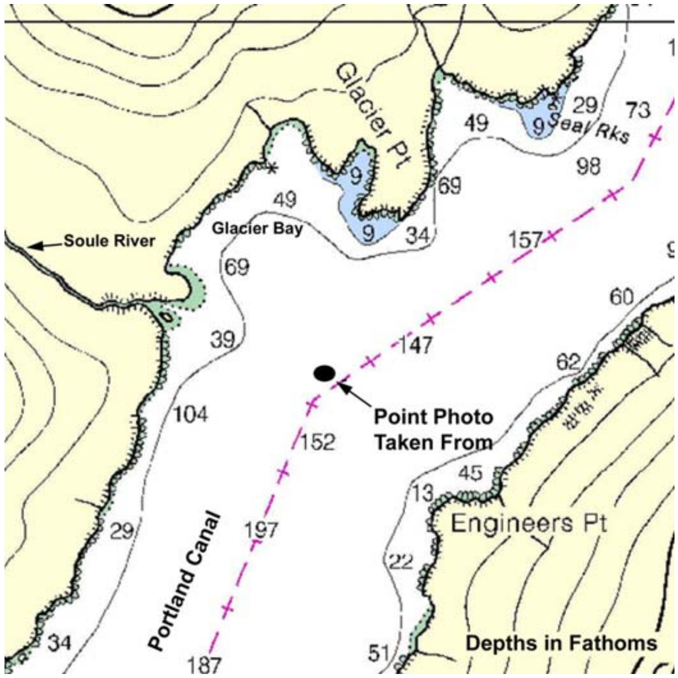


Figure 95 – Map of Visual Priority Route (dashed line in middle of canal) and location of photo taken for the visual simulation of the project

Figure 96 – Simulation of project features visible from the visual priority route of Portland Canal; river mouth is at left (bedrock notch); project features visible from VPR, roof of powerhouse, staging platform and barge basin, part of tailrace emptying into river mouth, access road behind the powerhouse traversing the slope. See Figure 92 for comparison and see Appendix T for larger image.

Environmental Effects

Forest Service Visual Quality Objectives and the Project

Under the Applicants Alternative, visual impacts could be significant for this LUD, which has a high visual retention requirement. Under the Land Use Alternative, because of its small size and not utilizing the delta or shoreline, there would be no significant visual impacts.

Our Analysis

Applicants Alternative

Under the Applicants Alternative, the placement of project features would not be able to meet the current SIO for this LUD. The only way this project can meet an SIO is if a different LUD is chosen for within the project boundary with the current LUD remaining for outside the project boundary, as we propose.

Land Use Alternative

Under the Land Use Alternative there would be no impacts to the visual quality objective because the project would be located almost completely away from the shoreline, except for the trenching of the transmission line through the delta, a short-term and insignificant impact. Very little or none of this alternative would be visible.

Impacts of Overhead Transmission Line in Stewart, B.C. on the Scenic Integrity Objective

The best route to get power to the B.C. Hydro transmission grid[76] has been determined to be the landing of the submarine cable at the Stewart, B.C. log transfer facility which is partially owned by the City of Stewart and the Crown. The reasons this approach was chosen are:

- The poor quality of the soils along the road between Hyder and Stewart
- The existing overhead infrastructure is only within a few feet of the pavement
- The numerous snow slides and rock slides that occur on the stretch of road between Hyder and Stewart, and
- B.C. Hydro may eventually change this section to underground cable, necessitating the project changing its infrastructure as well

All of the above adds up to the potential for considerable maintenance activity. Bringing the submarine cable into Stewart avoids areas of slide activity and avoids going through

[76] The BC Hydro transmission grid was until 2010 the B.C. Transmission Company, or BCTC.

either community as the Project will use a paved truck route around Stewart to the substation, avoiding changes within the community.

Because the overhead transmission line will be in Canada, there will be no impacts to the scenic integrity of Forest Service lands from transmission lines. The transmission line will be typical in appearance of existing overhead structures in the community of Stewart, or it will be buried.

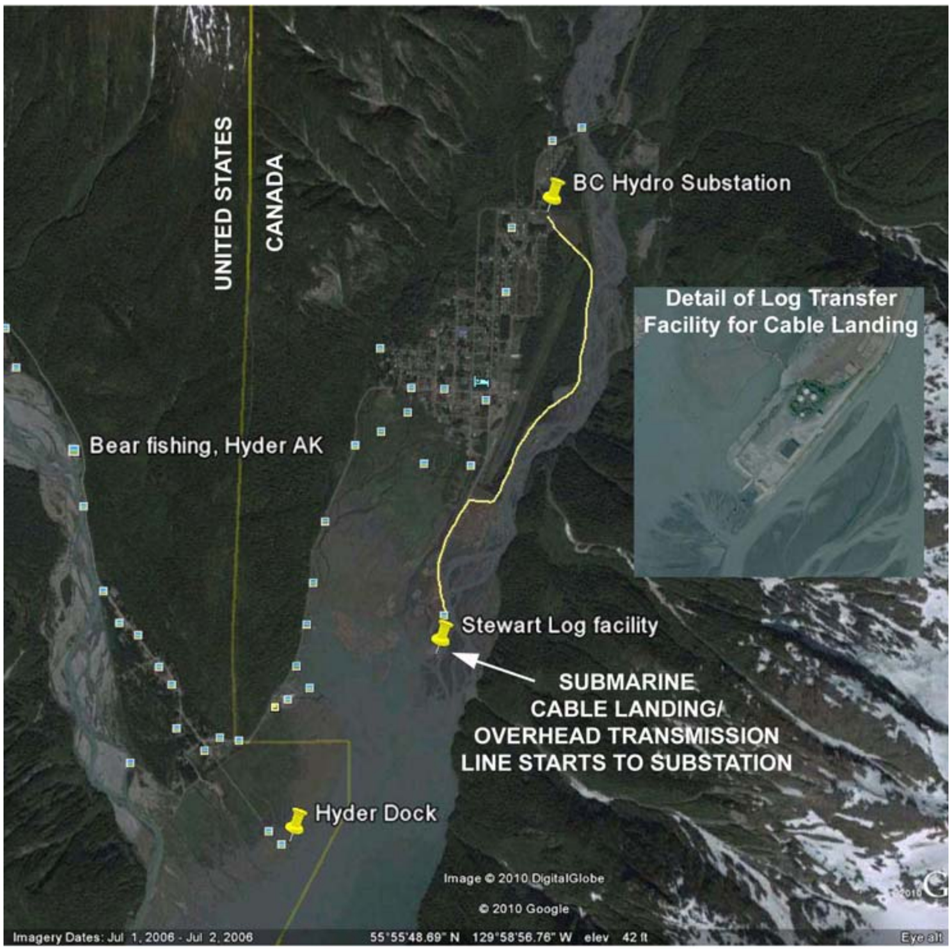


Figure 97 – Location of submarine cable landing and overhead transmission line route at Stewart; image from Google Earth.

Our Analysis

Under both land use alternatives, an overhead transmission line will have no impacts to the SIO of the Hyder community because it will not come into Hyder, but will land in Stewart, B.C. Stewart will not be impacted for the following reasons:

- Overhead transmission facilities are already in existence in both communities
- The existing infrastructure will be the same or similar in appearance, i.e. single wood poles to what the project will use, or will be buried

- Existing corridors, i.e. roads, will be used for placing the conductor
- Is outside the SIO

For these reasons, scenic values for Hyder and Stewart will not be significantly impacted by this project.

<u>Environmental Impacts and Recommendations</u>

Project Impacts

Impacts to the visual quality of the area would be impacted during construction not only because of the features themselves (i.e. marine access facility, clearing for staging area), but also any support barges or boats bringing in equipment and materials. During operations, visual impacts will be limited to project features.

Project impacts to visual quality from the VPR are limited to the shoreline and shoreline ridge (access road traverses the ridge) because the shoreline ridge shields the rest of the drainage from view.

Project Recommendations:

A visual simulation of the project was developed to see how the project may impact visual quality, as shown in Figure 96 above. An 11x17 image is available in Appendix T – *Visual Simulation Analysis*.

Recommendations:

- Project features should be kept to as small a corridor as possible, to reduce the footprint of the project and its visibility.
- Leave vegetation, including timber, in front as well as around project features on or near the delta wherever possible to reduce project visibility.
- During construction, burn slash only when wind is blowing from the north to direct smoke away from the communities at the north end, which will reduce visual impacts to their communities while also maintaining their air quality. Burning slash on the marine access facility staging area may also have the advantage of adding nutrients for revegetation with native grass seed.
- Implement a revegetation plan to reforest post-construction unused portions of the project, where feasible.
- Use colored materials for structures to blend them into the landscape (i.e. dark green, dark gray, etc.).
- Have project tailrace appear as natural as possible as it crosses delta into the river mouth.
- Storage of topsoil removed for clearing will be stored in staging areas for reuse during revegetation and covered with dark impermeable material to prevent erosion while storing; soil from delta should only be used to fill in marine access

facility and be covered by filter fabric and rock because of the potential to spread invasive species (sow thistle) found there.

- Slopes may be terraced after construction to apply slope stabilization techniques and for revegetation, which will help prevent future visual impacts from erosion.
- Project design will utilize natural features to hide project features, i.e. place the access road from the delta staging area behind the trees as much as possible and keep trees in place to screen it and the roadside cuts as it climbs the shoreline ridge behind the powerhouse to minimize its visual impact (placement of the powerhouse and substation behind the shoreline trees is also an example of using the natural features to hide project features).

Unavoidable Adverse Impacts

Evidence of man-made structures on the delta will be visible from the VPR on Portland Canal. The staging area and sides of the barge basin, which will both be made of riprap and of the same elevation above the natural delta, will be the visual evidence of man-made activity. However, the profile will be low from the VPR and over time the riprap will acquire a marine patina associated with water emersion, i.e. algae, seaweed, barnacles, mussels, etc. The staging area could be seeded with grass seed after construction to help blend it in as well. The access road may be visible for a short distance as it leaves the staging area into the forest and cuts made in the slope above the powerhouse to accommodate the road will be visible between trees. These visual impacts are unavoidable but can be mitigated by using methods described under Project Recommendations above.

Cumulative Effects

Most visual impact activity on Portland Canal is located at Hyder, Alaska and Stewart, B.C., the north end of the canal. Other than some cabins along the canal (noted on USGS maps) to the south, the only industrial activity we are aware of is the Swamp Point Aggregate Mine, which is about 21 miles south of the Soulé River. Little development has occurred along this fjord, with the communities at the north end and the mine at Swamp Point being the most significant. Visually, this project can be mitigated with methods described above under Project Recommendations to significantly reduce visual impacts. Keeping corridors narrow and as much vegetation as possible in place will significantly help accomplish the goal of the keeping the visual quality objective in Upper Portland Canal. The use of tunnels will not only prevent visual impacts from the VPR, but will also significantly reduce visual impacts from the air. In addition, the use of a submarine cable, which is more expensive the overhead installation, will significantly reduce the potential for visual impacts. However, in order to meet the SIO, the LUD will need to change, which will also change the SIO. Because of the distance between the activities noted above, and the fact this project will primarily be hidden from view, at this time the cumulative effect of this project should not be considered significant.

3.13 Socioeconomics

Hyder is a community located at the very north end of Portland Canal. Portland Canal is divided by the boundary between the U.S. and Canada and by various estimates is between 70-96 miles long (for our analysis we have gone with 70 miles). A couple miles from Hyder, Alaska, is the community of Stewart, B.C. For the purposes of this analysis, we primarily focus on Hyder.

Hyder (HIGH-dur) has a 2009 estimated population of 87 (not certified).[77] Hyder is unincorporated and is located in an unorganized borough, and currently has no taxing authority.

Affected Environment

In the 2000 Census, Hyder had a total population of 97. This likely represents their year round population, which swells during the summer months from federal and state employees, to shop owners and other businesses that open for the tourist season. The median age of this population is 46.3, with the majority of the population (74.3%) between the ages of 18 and 65. The vast majority of this population (95.9%) considers themselves to be white, according to the Census. Average household size is 2.06 and average family size is 2.81.

Location and Climate

Hyder is nestled at the head of Portland Canal, a 70 mile-long fjord which forms a portion of the U.S./Canadian border. Hyder is also approximately 70 air miles from Ketchikan and is located in the Ketchikan Recording District. It is the only community in southern southeast Alaska accessible by road; the only road into Hyder runs through Stewart, British Columbia, just two miles across the Canadian border. The area encompasses 14.8 sq. miles of land and 0.0 sq. miles of water. Hyder is in the maritime climate zone with warm winters, cool summers and heavy precipitation. Summer temperatures range from 41 to 57; winters range from 25 to 43. Temperature extremes have been measured from -18 to 89. Rainfall averages 78 inches annually, with annual mean snowfall of 162 inches. The community lies at approximately 55.916940° North Latitude and -130.024720° West Longitude. (Sec. 01, T069S, R100E, Copper River Meridian.)

[77] Source: State of Alaska.

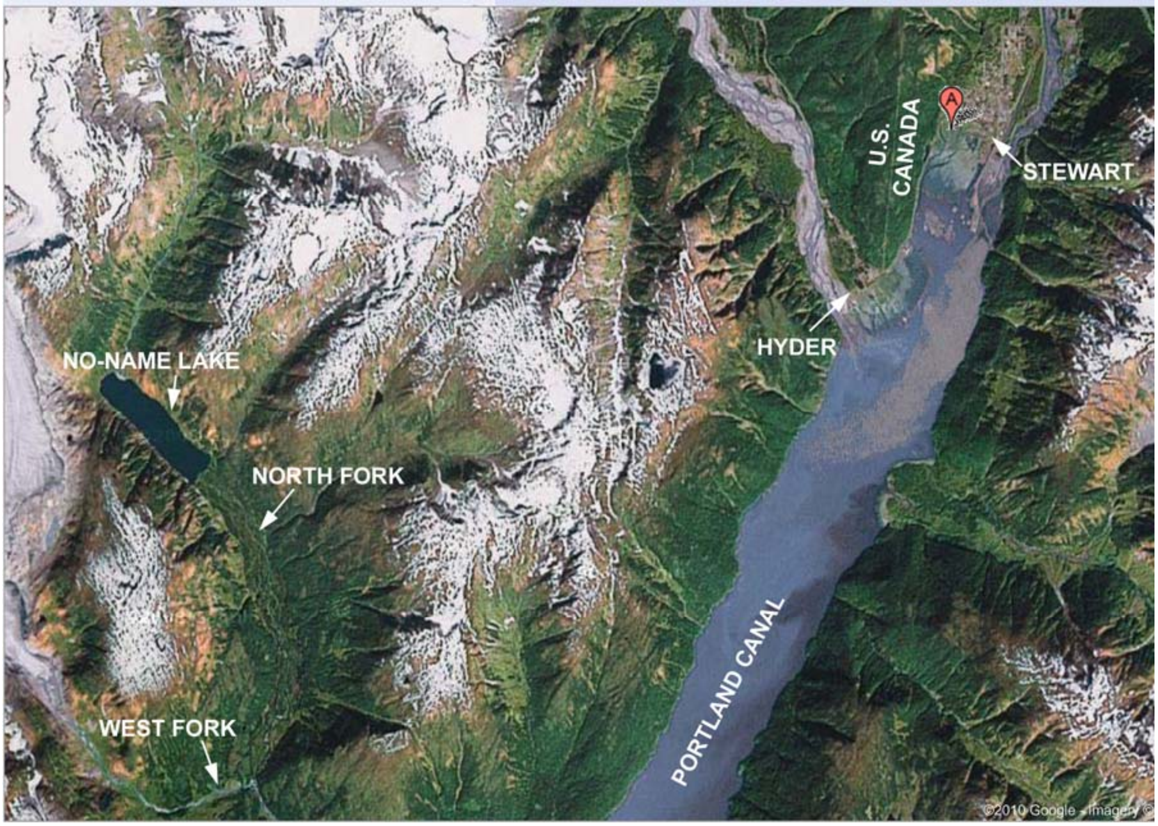


Figure 98 – Google Earth view of the north end of Portland Canal; the middle of the canal is the International Boundary between the U.S. and Canada

History, Culture, and Demographics

The Nisga'a tribe, who live throughout western British Columbia, called the head of Portland Canal "Skam-A-Kounst," meaning "safe place," probably referring to the site as a retreat from the harassment of the neighboring coastal Haidas. The Nisga'a used this area as a seasonal berry-picking and bird-hunting site. In 1896, Capt. D.D. Gaillard of the U.S. Army Corps of Engineers explored Portland Canal. Gold and silver lodes were discovered in this area in the late 1898, mainly on the Canadian side in the upper Salmon River basin. Townships sprung up concurrently on the Alaskan and Canadian sides of the border. On the Alaskan side, the township of Portland City was founded. In 1914, local prospectors applied for a postal permit for the settlement. The request was denied on the basis that too many United States communities shared the name "Portland." The decision was made to name the community after Frederick Hyder, a respected Canadian mining engineer who predicted the area would have a prosperous future in mining. Due to its location along the Portland Canal, Hyder became the access and supply point to Canadian mining. Hyder's boom years occurred between 1920 and 1930, when gold, silver, copper, lead, zinc, and tungsten were extracted from the Riverside Mine on the Alaskan side of the border. The mine operated from 1924 until 1950. In 1928, the Hyder business district was consumed by fire. During the Prohibition era, a small community called "Hyder, BC" was created just across the Canadian border to serve as a legal speakeasy to the Hyder mining community, even housing its own Canadian Customs office. Shortly after Prohibition was repealed, "Hyder, BC" was abandoned. By 1956, all major mining had closed except for the Granduc Copper Mine in Canada, which operated until 1984. Several mining startups near Stewart have come and gone in the past three decades, but no mining activity has occurred on the Alaskan side of the border since the Riverside Mine closed.

Hyder is largely dependent on tourism from highway visitors. Hyder continues to pay homage to its mining roots and is known as the "Friendliest Ghost Town in Alaska." One tradition carried over from mining days involves nailing currency to the walls of the Glacier Inn Bar. In mining days, it is claimed that miners who went bankrupt could take down their money and buy one last meal before leaving town. Due to its isolation from other Alaskan communities and its close proximity to Stewart, British Columbia (population 500), Hyder has many cultural ties with Canada and also receives electric and telephone service from Canadian companies, thus it uses the 250 area code; Hyder is the only community in Alaska not using the 907 area code. Because of its proximity to the border and the lack of banks in Hyder, businesses operate on either U.S. or Canadian currency. During the 2000 U.S. Census, total housing units numbered 72, and vacant housing units numbered 25. Vacant housing units used only seasonally numbered 21. U.S. Census data for Year 2000 showed 24 residents as employed. The unemployment rate at that time was 46.67 percent, although 68.83 percent of all adults were not in the work force. The median household income was $11,719, per capita income was $11,491, and 54.08 percent of residents were living below the poverty level.

Facilities, Utilities, Schools, and Health Care

Nearly all residences have individual wells and septic tanks and are fully plumbed. The remainder haul water and use outhouses. Electricity and telephone services are provided by Stewart, British Columbia, Canada. Hyder operates an unpermitted tidewater landfill, but no refuse collection is provided. Electricity is provided by BC Hydro. There is one school located in the community, attended by 10 students.[78] Local hospitals or health clinics include Stewart Health Clinic, Stewart, BC, Canada. Emergency Services have limited highway, marine, floatplane and helicopter access. Emergency service is provided by 911 Telephone Service and volunteers. Auxiliary health care is provided by SEARHC (907-463-4000) - Public health nurse visits.

Economy and Transportation

Hyder's economy is based primarily on tourism today; visitors cross the border from Canada. Four of the five largest employers are tourist-related, and visitor services are shared with Stewart, B.C. A bottled water business also employs local residents. In 2009, two residents held commercial fishing permits. Recreational fishing and hunting provide food for some families. Deer, salmon, shrimp, and crab are harvested resources.

Hyder has a seaplane base N/S 10,000' by 1,000' that opens in Portland Canal.

[78] Source: State of Alaska

Southeast Alaska Community Statistics

	Population						
	2006	Percent Change 2000 to 2006	Percent Native in 2000	2000 Median Household Income	Percent of Households Below Poverty Line in 2000	Percent of Labor Force Unemployed in 2000	Subsistence Use (lbs per capita)[1]
Angoon	482	-16	82	29,861	27	13	349
Coffman Cove	162	-19	3	43,750	7	10	276
Craig	1,105	-21	22	45,298	8	9	232
Edna Bay	41	-16	0	44,583	15	0	373
Elfin Cove	25	-22	0	33,750	0	23	263
Gustavus	441	3	44	34,766	10	14	241
Haines	1,492	-18	15	39,926	6	14	196
Hollis	156	12	5	43,750	6	3	169
Hoonah	829	-4	61	39,028	14	21	518
Hydaburg	352	-8	85	31,625	21	31	384
Hyder	92	-5	0	11,719	44	47	345
Juneau	30,650	0	11	62,034	4	5	NA
Kake	536	-25	67	39,643	13	25	179
Kasaan	59	51	38	43,500	0	20	452
Ketchikan	7,662	-3	18	45,802	5	8	NA
Klawock	776	-9	51	35,000	14	16	320
Metlakatla	1,377	-5	82	43,516	8	21	70
Meyers Chuck	11	-48	0	64,375	0	0	414
Naukati Bay	129	-4	10	NA	NA	NA	241
Pelican	106	-35	21	48,750	0	0	355
Petersburg	3,129	-3	7	49,028	3	3	198
Point Baker	16	-54	3	28,000	0	0	289
Port Alexander	64	-21	5	31,563	25	25	312
Port Protection	59	-6	0	10,938	44	44	451
Saxman	422	-2	66	44,375	7	7	94
Sitka	8,833	0	19	51,901	4	4	205
Skagway	854	-1	3	49,375	1	1	48
Tenakee Springs	109	5	3	33,125	9	9	330
Thorne Bay	482	-13	3	45,625	6	6	118
Whale Pass	61	5	2	62,083	0	0	185
Wrangell	1,911	-17	16	43,250	7	7	132
Yakutat	609	-10	47	47,054	12	12	385

Notes:
NA = not available
[1] The year these data were collected varies by community, as follows:
1987: Elfin Cove, Gustavus, Hyder, Metlakatla, Meyers Chuck, Pelican, Petersburg, Port Alexander, Saxman, Skagway, Tenakee Springs, and Wrangell;
1996: Angoon, Haines, Hoonah, Kake, Point Baker, Port Protection, Sitka, and Whitestone Logging Camp.
1997: Craig, Hydaburg, and Klawock
1998: Coffman Cove, Edna Bay, Hollis, Kasaan, Naukati Bay, Thorne Bay, and Whale Pass.
2000: Yakutat
Source: USDA Forest Service 2003b (Table 3.4-35); ADF&G 2006; Alaska DOL 2007a

Table 25 – Southeast Alaska Community Statistics

There are fewer tourist visiting Hyder over the last two years, particularly from Europe, with tour business down about 50%.[79] There is some exploration work going on at Hyder's Riverside Mine that is employing 5 locals, but it is not known how long this may go on.

Premier Power is going ahead at Long Lake on the BC side with a hydroelectric project

[79] Information from the Hyder Board of Trade (2010).

for the mine, which is going to be extracting 85,000 cu yd from the US side so there will probably be some loading and trucking jobs in 2011, for which the road work has already started. Still lots of mineral exploration going on in the Hyder area on the BC side; Granduc Mines (at the other end of the Hyder road) started 2 diamond drills in August 2010. BC Hydro is also preparing to run a high voltage transmission line north to Bob Quinn Lake, which will improve the ability for the Soulé River Hydroelectric Projects generated power to get to British Columbia and the Western United States.

Organizations with Local Offices

Chamber of Commerce - Stewart and Hyder International Chamber of Commerce
Community Non-Profit - Hyder Community Association, Inc.
Electric Utility - BC Hydro
Regional Development - Southeast Conference

Additional 2000 Census characteristics of this population:

- residents that are 25 years of age or older = 56
- residents that are high school graduates = 42
- residents in the labor force = 45
- unemployed = 21 (27.3%)
- employed = 24 (31.2%)
- class of worker:
    - private wage and salary = 17 (70.8%)
    - government = 5 (20.8%)
    - self-employed = 2 (8.3%)
- household incomes below $15,000/yr = 68.8%
- median household income = $11,719
- per capita income = $11,491
- families below poverty level = 8
- individuals below poverty level = 53 (54.6%)
- enrolled in school (pop. 3 yrs and over enrolled in school) = 18 (100%)
- heat house with wood = 52.1%

Environmental Effects

This project during construction would provide local employment as well as potentially bring a temporary need for housing that would fill local B&B's, hotels, and lodges.[80] Thirteen places of lodging are listed on the Hyder/Stewart website[81] and 10 restaurants are listed to help accommodate an influx of construction workers. There could be approximately 100-200 people working at the site at one time, which will rise and fall by season and activity. This could also bring more motor vehicles into this community,

[80] Will be decided closer to construction as to whether having a camp on site or boarding in Hyder and Stewart is more practical and economical.
[81] http://www.stewart-hyder.com/business.html

purchasing gas and getting repairs. The temporary economic stimulus from more people in Hyder and Stewart over a period of 3-4 years will help these small communities continue to make a go of it. The isolation of Hyder during these hard economic times is probably felt more due to their reliance on tourism each summer, which has fallen off in recent years.

The area (Hyder and Stewart) also has five construction firms that may receive some business from the construction of this project. There are numerous gift stores, two grocery stores, two Laundromats, two post offices, one bank, five churches, four campgrounds, transportation services that may provide support for construction, and bars and liquor stores that will see an increase in revenue.

Hyder does not have a city government and the associated services such as emergency and civic services, but does have a school and public library. Hyder relies on Stewart to provide emergency services. Project construction with the influx of workers may provide more pressure on these services, but is not expected to be significant because generally they don't move their families to these short-term projects, and they will generally prefer to get their healthcare from their home community. Housing could be on site rather than in Hyder, but this is yet to be determined.

For operations, a small number of permanent jobs would be created to be filled by locals or others brought in to live in Hyder or Stewart, depending on the local skills available. Operations would provide some economic stimulus to the two communities because of steady incomes to an unknown number of locals. If permanent employees are brought into the area because of their skills, they could bring family and the need for the school system, but the increase in the number of students is not likely to be large, and considering the size of the community, having more children in the school system may be a healthy situation. The project may also be a source of tax revenue for Hyder in the future, once they become a borough.

Environmental Impacts and Recommendations

Project Impacts

This project will bring a short term, 3-4 year, economic stimulus to the Upper Portland Canal communities. If the world economy has a slow recovery, the economic stimulus this project will provide through lodging (potentially), food, materials and supplies, storage, entertainment, transportation services, fuel, and employment will be a boon for these businesses during the construction phase.

Once construction is completed, most workers employed for that purpose will leave, causing a potential downturn in the economy. However, there will be the potential for an unknown number of well paid positions available for the operation and maintenance of the hydro project. This could either be local hire, people brought in from outside, or a combination of both. This would provide some long term economic benefit to the area in addition to a potential source of tax revenue.

Recommendations

If the world economy has recovered enough before construction starts that the availability of lodging, etc, during the summer is at a premium, housing could be brought in by the Applicant, including other commodities, such as food, fuel to cook with, etc. This would prevent the project from being a burden to the communities and still bring in a boost to the local economy for other services, including the rental of space for the housing. Or, housing could primarily be at the project site.

Hire as many local people as possible for all phases of construction and operation, which as always is dependent upon experience and in some situations, education. This would provide additional economic benefit to the community to help those already living in this area remain here as well as possibly attract higher skilled labor, increasing the brain trust of the community.

Environmental Justice

This project would not have a disproportionately high or adverse impact on the human health or environment of minority populations and low-income populations for the following reasons:

1. With 100-200 construction workers needed, minorities and low-income populations may find employment
2. The environmental impacts will be focused on this unused watershed, the Soulé River, that does not presently support large game or salmon runs for human consumption; for these reasons the project does not adversely affect minority populations and low-income populations
3. The project is likely to partially open up the watershed to not only large game (as evidenced by bear already using the field studies trail) but may also open up the watershed in a limited way to recreational and subsistence fishing for Dolly Varden in No-Name Lake and hunting as game moves in (which will still require extensive bushwhacking to accomplish).

Analysis

Projects such as the Soulé River Hydroelectric Project are likely to have more positive impacts to Socioeconomics than negative impacts, because they bring in jobs, increase sales and the need for support services, construction help (i.e. employment, materials, equipment), lodging, etc. These services may also hire additional people to help meet this 3-4 year need. Much of the materials for construction may be barged into the project site with possibly some staging on the Hyder waterfront. Some equipment and materials may be trucked into Hyder to then be barged down to the project. An increase in the use of the road system will occur, but would be intermittent and for short periods of time. Construction takes place 9 miles down the canal from Hyder, so that no direct physical impacts should be felt by the community other than those stated above, and the potential to have a construction camp placed on available land in either community.

Conclusion

This project should have a positive socioeconomic impact to the communities of Upper Portland Canal.

Unavoidable Adverse Impacts

There should be no unavoidable adverse impacts to the socioeconomics of Upper Portland Canal considering their current economic needs. Noise from helicopter activity, potentially lifting material from the Hyder waterfront or the Stewart Airport for delivery to the project site will be of short duration and intermittent.

Cumulative Effects

The socioeconomic effects would likely occur in both Hyder and Stewart. Other activity mentioned above, such as the development of mines and a hydroelectric project (Long Lake) for the mine, and mining exploration will occur before, during, and after the construction of the Soulé River Hydroelectric Project. This combination of activities may put some strain on local services and infrastructure, although construction of the mines and the Long Lake hydroelectric project may have their own camps with lodging, food, etc. because of their distance from Hyder. However, based on conversations with residents in Hyder, economic activity of any kind would be welcomed, even if there is significant overlap by the activities. The District of Stewart has also expressed interest in this project and how it might help their community. In general, this project should have a positive, short term (3-4 years) cumulative effect on the communities of Hyder, Alaska, and Stewart, B.C. and a long term cumulative effect of a small number of permanent jobs and activities related to operating and maintaining the project, including boats moored in Hyder or Stewart, occasional helicopter use, and local purchases of materials for repairs and maintenance.

3.14 No-action Alternative

For the No-Action Alternative no changes would occur to the Forest Service LUD, to the Soulé River Watershed, to fish or wildlife, to the visual quality of the watershed, or to the community of Hyder or Stewart. Everything would remain as they currently exist, and neither community would experience any economic benefits.

This alternative would not be available to provide a renewable energy resource to reduce greenhouse gases produced by coal fired and diesel generation plants that exist in the Lower 48.[82] The No-Action alternative would not help get North America off of fossil fuels. This project is expected to offset 27,000,000 gallons of diesel fuel or equivalent, which equates to 540,000,000 lbs of CO^2 emitted into the air. Since the market for the power could end up providing power to one of the mines in B.C., which would otherwise

[82] More coal-fired power plants are proposed and currently being constructed in the Lower 48 because of cheap coal.

rely on diesel generation, this project would offset greenhouse gases wherever the power is ultimately used.

4.0 DEVELOPMENTAL ANALYSIS

4.1 Power and Economic Benefits of the Project

4.1.1 Power Market

Power generated by the Soulé River Project will be sold to a yet-to-be-determined utility in western North America. Because the Project will be interconnected to the BCTC transmission system (which is part of the WECC system), the power can theoretically be sold to and utilized by any utility connected to the WECC system. In order to avoid transmission losses and/or wheeling costs, it would make the most sense to sell the power to the closest utilities (BC Hydro in British Columbia, Canada or Puget Sound Energy in western Washington, USA). Both of those utilities are actively looking for new sources of renewable energy:

- In June 2008, BC Hydro requested proposals for energy from independent sources through a "Clean Power Call", and in August 2010 announced a list of 25 successful proposals with a combined firm energy volume of 3,266 GWh.
- Puget Sound Energy (PSE) in late 2009 requested bids for energy from independent sources; bids were due in February 2010, but no results have yet been released.

California utilities may also be a potential purchaser, as California has recently announced an increase in their renewable energy goal from 20% to 33% by 2020.

4.1.2 Value of Power

The Applicant expects to enter into a power purchase agreement with an area utility for the long-term sale of the project generation, but it would be premature to begin negotiations before receipt of the FERC license, since the license provisions can significantly affect the marketability of the power. Nevertheless, the provisions of the recent BC Hydro and PSE solicitations provide a reasonable basis for determining the economic value of the project generation, as described in the following.

4.1.2.1 BC Hydro

In order to compare the power prices from the various sources bidding into the 2009 Clean Power Call, BC Hydro used the procedure summarized below.

- Proposals provide bid prices for firm energy at a 2009 price level and select escalation factors; escalation of prices limited to a maximum of 50% of the CPI.
- Proposals elect to price non-firm energy on a fixed price schedule or on average spot market prices.
- Multipliers are applied to the bid prices for firm energy depending on the delivery schedule (time-of-day, day-of-week, and month-of-year). These multipliers ranged from 0.69 for off-peak energy during the

- spring freshet when lots of run-of-river power is available, to 1.42 for super-peak energy in the winter.
- Adjustments are made for upgrades required to interconnect the projects to the transmission system, for delivery of the energy to the loads, and for transmission losses.
- Levelized prices were calculated to a 2009 price level with an 8% discount rate.

Prices for the 2009 announced successful bidders for hydro projects are summarized below:

BC Hydro Clean Power Call Energy Prices (1)			
	Minimum	Weighted Average	Maximum
Bid price (plant gate)	95.0	139.9	156.0
Levelized plant gate price (firm energy)	83.1	130.7	118.0
Levelized adjusted firm energy price	105.4	123.0	133.8
Levelized plant gate price (total energy)	76.2	101.7	118.5

(1) All prices in 2009 $Cdn/MWh

4.1.2.2 Puget Sound Energy (PSE)

PSE received proposals for hydro projects in response to a 2008 All Source RFP with levelized total energy prices ranging from $79/MWh to $164/MWh.

PSE recently requested additional proposals in a 2010 All Source RFP, which indicates a growing need for capacity and renewable energy. No results from this RFP have yet been published, however, the RFP included a schedule of estimated avoided cost to give a general indication of electricity prices (Mid-Columbia Market). The 2010 monthly prices range from $33.78/MWh to $48.75/MWh; the 2029 monthly prices range from $106.82/MWh to $131.16/MWh.

4.1.2.3 Estimated Revenue

The Applicant has estimated the revenue from the sale of project power based on the following assumptions:

- Firm energy valued at $100/MWh (2010 cost level). This price is for energy delivered to the BCTC substation in Stewart BC, and is less than the average price from the BC Hydro Clean Power Call to account for the transmission upgrades and/or losses involved in delivery the power to the loads. The price also includes an adjustment from $Cdn to $US.

- Firm energy value adjusted for super-peak, peak, and off-peak delivery according to the BC Hydro Clean Power Call.
- Firm energy price escalated at the general escalation rate (3.0%) to the estimated on-line date (2019).
- Non-firm energy valued at estimated prices for energy delivered to the Mid-Columbia market (Mid-C); this was one of the options allowed by the BC Hydro Clean Power Call. An estimate of these prices by month for the 2010-2029 period were provided in the PSE 2010 All Source RFP. A close approximation of these prices was assumed for this evaluation ($50/MWh in 2010, with monthly factors applied to that value varying from 0.89 to 1.09, and escalation at 3.75% per year. The assumed price includes an adjustment for wheeling costs or losses in delivering the energy to the Mid-C market.

The Applicant has modeled the project operation and generation for a 32-year period of streamflows, as described in Exhibit B of this application. The calculated generation and revenue for the first year of operation are as follows (2010 cost level).

	Generation, GWh	Revenue, $2010	Revenue, $2020
Firm energy	218.4	$22,761,000	$31,048,000
Non-firm energy	64.1	$3,043,000	$4,562,000
Total	282.5	$25,804,000	$35,610,000

4.1.3 Cost of Power

The construction cost estimate for the Project is summarized in Exhibit D, Table D-1. The total direct construction cost is estimated at $211,000,000 (2010 bid level, 2014 on-line), which includes a contingency allowance of 15%.

The construction cost has been determined by applying unit costs to construction quantities. The quantities have been calculated from the preliminary layout of the project structures as shown in Exhibit F-1, and the unit costs have been determined from published data, preliminary equipment and materials quotations, and the Applicant's experience with construction of projects in Southeast Alaska.

Escalation of prices has been assumed at 3.0% per year from 2010 to the estimated midpoint of the construction period (5 years of escalation). Escalation has in recent years been less than 3.0%, but the Applicant expects the rate will increase moderately in the next few years. The total direct construction cost for the expected mid-2019 on-line date is estimated to be $244,000,000.

Indirect Construction Costs

Indirect construction costs are estimated to be 10% of the direct construction costs, including:

- Licensing and permitting ....1.0% of direct construction cost
- Design engineering ....4.5% of direct construction cost
- Construction management ....4.0% of direct construction cost
- Administrative and legal costs.....0.5% of direct construction cost

Interest During Construction

Interest during construction is estimated to be 16.2% of the direct construction cost, based on a preliminary cash flow projection for a 4.5 year construction period and an interest rate of 8.0%. The sum of the direct construction costs, indirect construction costs, and interest during construction is termed the total investment cost, and amounts to $295,000,000.

4.1.3.3 Other Costs

Additional capital costs are estimated as follows:

- Financing costs.............................1.5% of total investment cost
- Reserve fund ....9.0% of total investment cost

The reserve fund is assumed to be a financing requirement. Interest earned on the reserve fund is estimated at 6% per year.

The sum of the total investment cost, financing costs, and reserve fund is termed the total capital requirement, and amounts to $334,000,000.

4.1.4 AVERAGE ANNUAL PROJECT COSTS

4.1.4.1 Cost of Capital

There are no instruments in place yet for financing the construction cost, nor can there be until after the license is issued and a power sales agreement is in place. Therefore, the calculation of the cost of capital must be based on assumptions regarding the financing terms. For the purposes of this application, the financing has been assumed to 100% by debt with an interest rate of 8% and a term of 30 years.

The Applicant will prepare a plan of finance for review and approval by the Commission prior to the start of construction.

Taxes and Fees

Based on current policies, the Applicant expects the taxes and fees to be incurred directly by the Project are ADNR water rights and submerged land fees and FERC annual charges. For this application, the total of these fees has been assumed as 0.1% of the total investment cost, or $307,000/yr.

Operation and Maintenance

Annual operating costs are estimated to be as follows (2020 cost level):

- $775,000 operations and maintenance cost (labor and expenses)
- Administrative and general costs equal to 40% of the O&M cost
- Insurance cost equal to 0.1% of the total investment cost
- Interim replacements cost of $500,000/year.
- Earnings on reserve fund of 6% per year.

Based on these assumptions, the first-year cost of power at a 2020 cost level is estimated to be as follows:

Debt service	$29,632,000
Taxes and fees	$307,000
Operating costs	$1,892,000
Earnings on reserve fund	-$1,320,000
Total annual cost	$30,511,000

4.1.5 Levelized Net Annual Benefits

Based on the estimated power sales revenue and annual costs described above, the first year net annual benefit will be $5,099,000 (2020 cost level). The revenue will increase with time as the power sales rate escalates, but the annual costs will increase at a slower rate since most of the cost is fixed debt service. To account for this and to provide a more complete measure of the project benefits, the Applicant has calculated a levelized net annual benefit according to the following assumptions:

- 2020 first full year of operation
- The assumed non-firm energy price of $50/MWh escalates at 3.75% per year to 2029 in accordance with the forecast Mid-C Market prices, and at 3.0% thereafter.
- The assumed firm energy price of $100/MWh escalates at 3.0% per year to 2019 and at 1.5% thereafter.
- Operating costs escalate at 3.0% per year
- 30-year term of analysis
- 8.0% discount rate (to 2019)

Based on these assumptions, the 30-year levelized annual revenue, costs, and net benefits will be as follows (2019 cost level):

Levelized annual revenue	$17,139,000
Levelized annual costs	$12,676,000
Levelized net annual benefits	$4,463,000

4.2 Comparison of Alternatives

Table 26 summarizes the levelized annual cost, levelized annual revenue, and levelized annual net benefits for the three alternatives considered in the PDEA: No-Action, Applicant's Alternative, and Land Use Alternative. These values have been calculated for the Land Use Alternative by the same procedure as described above for the Applicant's Alternative. There are of course no costs and benefits with the No-Action Alternative.

Table 26 – Summary of the annual costs, power benefits and annual net benefits for three alternatives for the Soulé River Project.

	No Action	Applicant's Alternative	Land Use Alternative
Installed Capacity	0	77.4 MW	550 kW
Annual generation	0	283 GWh	4.6 GWh
Levelized annual power revenue	$0	$17,139,000	
Levelized annual cost	$0	$12,676,000	
Levelized annual net benefit	$0	$4,463,000	

4.3 Cost of Environmental Measures

Table 27 provides the cost for each of the environmental enhancement measure considered in our analysis. We have converted all costs to levelized annual costs over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 27 – Costs of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the Soulé River Project.

Enhancement/Mitigation Measure	Alternative	Capital Cost Land Use (**L**) Applicant (**A**)	Annual Cost	Levelized Annual Cost
Transport all construction materials into project area by helicopter	Land use	**L** = $	**L** = $	**L** = $
Transport all construction materials into project area by pack-animal	Land use	**L** = $	**L** = $	**L** = $
Develop and implement visual resources	Land use	**L** = Minimal	**L** = Minimal	**L** = Minimal

protection plan to screen all project features and protect the visual quality objectives established in the Remote Recreation LUD				
Color exterior of project buildings to blend in with surroundings	Applicant	**A** = $	**A** = $	**A** = $
Implement a Scenery Management Plan	Applicant	**A** = $	**A** = $	**A** = $
Implement an erosion and sediment control plan	Land use, Applicant	**L** = $25,000 **A** = $250,000	**L** = $ **A** = $	**L** = $ **A** = $
Conduct sediment transport survey at 3-5 year intervals for 20 years following construction to ensure adequate sediment delivery to delta	Applicant	**A** = $91,000	**A** = $4,550 for 20 yrs	**A** = $
Maintain 1,500-foot vertical buffer to protect mountain goats during construction	Land use, Applicant	**L** = Minimal **A** = Minimal	**L** = Minimal **A** = Minimal	**L** = Minimal **A** = Minimal
Develop and implement a bear safety plan	Land use, Applicant	**L** = $2,500 **A** = $7,500	**L** = $250 **A** = $500	
Monitor invasive species throughout project for 3-years following project construction	Land Use, Applicant	**L** = $15,000 **A** = $150,000	**L** = $300 for 50 yr license **A** = $3,000 for 50 yr license	
Monitor and manage invasive species for term of license to ensure minimal human impacts on project area	Applicant	**A** = $125,000	**A** = $2,500 for 50 yr license	

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Recommended Alternative

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, the applicant's recommendation for licensing the Soulé River Project. We weigh the costs and benefits of the Applicant's Alternative against the Land Use Alternative.

Applicant's Alternative

We recommend that the Commission adopt the Applicant's Alternative in any license issued for the Soulé River Hydroelectric Project. The Applicant's Alternative includes:

PROJECT STRUCTURES

Marine Access Facilities

The large delta area at the mouth of the Soulé River provides a convenient location for construction of marine access facilities that would consist of a staging area and barge basin that will include within it a boat dock, bulkhead for barge offloading, and boat ramp for landing craft placed within the basin.

Environmental Measures:

- The core of the staging area and sides of barge basin will be a random fill zone derived from excavations from the barge basin and rock from the powerhouse and access road. The core will be encapsulated by woven geotextile fabric and two layers of armor rock. The outer rock layer will be 5' thick with an approximate stone dimension of 30 inches. The underlayer of stone will be 2.5 feet thick with an approximate stone dimension of 14 inches. The sides of the staging area and barge basin will be placed with a slope of 1.5H:1V, except near the end of the barge basin where the slope will be 2H:1V. The staging area core will be placed by end dumping. The armor layer stones will be placed by trackhoe. The filter fabric will prevent sedimentation from the fill.
- To prevent the spread of the invasive species found on the delta, measures identified earlier in this EA to treat the delta would be applied before installing project features (except for the barge basin, recommend not excavating the delta, but instead cover with fill, then geotextile fabric, and then armor rock for the staging area because it will have been previously treated with an herbicide and covering will also inhibit growth)

- If removing topsoil from delta (specifically in area mapped with the invasive plant, sow thistle; Figure 82, p. 188), area should have already been treated with herbicide a minimum of 2 weeks in advance if area of infestation. Soil excavated from the delta should be used as fill in the staging area and covered with geotextile fabric and a thick layer of rock to ensure sow thistle roots are not spread. Spoils from the delta should not be used elsewhere at the project because of the potential to spread invasive species.
- Stored spoils, including soil, rock and timber, will be stored away from tidal action and surrounded by filter fabric, and covered with an impermeable material, if needed; once the staging area is completed, spoils can be placed on it
- Sedimentation control pond may be used, if necessary to collect runoff from the hillside and access road leaving the delta
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding
- In-water work will not occur between April 1 and June 15 to protect migrating juvenile salmon, but as long as activity is a foot above tide level, not matter the tide, work such as fill and riprap can occur. Silt curtains would be used for this near water work to trap any runoff, should this occur.

Access Roads

There will be one main single-lane, 20-foot-wide access road for the project that will be approximately 3.1 miles long from the powerhouse/delta area to the dam/intake area. Approximately 0.8 mile in from the beginning of the road will be a 1,900-foot-long tunnel that will be gated to prevent unauthorized human and animal access (for safety). The tunnel will help the project avoid cutting into a steep slope, eliminating concerns over erosion, landslides, cut slopes, impacts to wetlands, and other issues related to construction and maintenance on steep slopes.

Environmental Measures:

- Silt fencing will be used to stop the movement of sediment in roadside ditches
- Straw or hay bales will be used to trap sediment before entering culverts and in roadside ditches by providing filtration
- Riprap will be used to stabilize slopes, to slow surface water down, and to trap sediment
- Jute netting may be used to stabilize slopes
- Wood chips may be made from waste wood to cover slopes, including combining with such materials as jute netting; wood waste can add organics to increase revegetation speed as well as stabilize soils by providing some armoring against precipitation
- Hydroseeding with bonder may be used to stabilize slopes; would be combined with USFS preferred seed mix to prevent introduction of invasive or non-Alaskan species

- Sediment catchbasins may be used below culvert discharges
- Instead of cutting into a steep slope, a 1,900-foot-long tunnel will be made along the access road to minimize environmental impacts

Main Dam

The Main Dam will be an asphalt core rockfill dam with a height of 265 feet (above the downstream toe) and a crest length of 903 feet.

Environmental Measures:

- Sediment catchbasins will be used to drain wetlands in areas to be excavated
- Berms or dikes of rock with filter fabric may be made to direct runoff to catchbasins
- Cofferdam will direct river flow away diversion tunnel portal construction, then a cofferdam will be placed across river at foot of proposed main dam to direct flow through diversion tunnel to allow construction of the main dam
- Quarries and spoil sites will have silt fencing placed on slopes were runoff could occur to prevent sedimentation
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Saddle Dam

The Saddle Dam will also be an asphalt-core rockfill dam.

Environmental Measures:

- Sediment catchbasins will be used to drain wetlands in areas to be excavated
- Berms or dikes of rock with filter fabric may be made to direct runoff to catchbasins
- Quarries and spoil sites will have silt fencing placed on slopes were runoff could occur to prevent sedimentation
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Spillway

The spillway will be located at the north end of the Saddle Dam where it abuts a bedrock knob.

Environmental Measures:

- Sediment catchbasins will be used to drain wetlands in areas to be excavated
- Berms or dikes of rock with filter fabric may be made to direct runoff to catchbasins
- Quarries and spoil sites will have silt fencing placed on slopes were runoff could occur for preventing sedimentation
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

- Will avoid Boreal toad ponds near river as much as possible

West Fork Weir

The West Fork Weir will be a dumped porous rockfill structure across the West Fork Soulé River upstream of the main dam. Its purpose is to retain bedload generated by the Soulé Glacier. Environmental measures for the Main Dam will address this feature.

Quarries

Rockfill for the dams will come from two main quarries on either side of the main dam, one on the left abutment and one on the right.

Environmental Measures:

- Sediment catchbasins will be used to drain wetlands in areas to be excavated
- Berms or dikes of rock with filter fabric may be made to direct runoff to catchbasins
- Quarries and spoil sites will have silt fencing placed on slopes were runoff could occur to prevent sedimentation
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Reservoir Outlet Works

At the end of dam construction, the diversion tunnel will be converted to a reservoir outlet works for draining the reservoir and/or for flushing out sediment.

Power Intake

The power intake will be a concrete structure founded against the slope of the quarry on the left (north) abutment of the Main Dam.

Power Tunnel

The power tunnel will have a length of 11,400 feet from portal to portal with no surface features.

Environmental Measures:

- Silt fencing and/or straw/hay bales will be used to control any runoff at tunnel portals, which may be directed either into catchbasins or through riprap filter culverts'

Powerhouse

The powerhouse structure will be a pre-engineered metal building (PEMB) with a reinforced concrete substructure.

Environmental Measures:

- Inspection of site prior to construction to make sure the invasive weed found on the delta is not present; if it is, measures described for the marine access facilities would be followed
- Initial silt fencing around construction area
- Stored spoils, including soil, rock and timber, will be stored away from tidal action, and surrounded by filter fabric, or if necessary an impermeable material
- Sedimentation control pond may be used, if necessary
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding
- Place powerhouse behind trees to screen from VPR

Tailrace

The tailrace will be an excavated channel between the powerhouse and the Soulé River near its tidewater confluence.

Environmental Measures

- Riprap with filter fabric underneath on banks of tailrace will prevent erosion and sedimentation
- Excavate the confluence with river last to reduce opportunities for sedimentation, and/or to coincide with low flow and low tide
- Stored spoils, including soil, rock and timber, will be stored away from tidal action, and surrounded by filter fabric, or if necessary an impermeable material
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding

Temporary Construction Camp

A temporary construction camp may be placed in a cleared area west of the Saddle Dam to house workers for construction of the dam and its appurtenances. The camp would consist of separate portable buildings for sleeping, cooking, and washing. Porta-Potty's would be placed at the powerhouse and marine access construction sites as well as at the dam construction site and construction camp.

Environmental Measures:

- Silt fencing would be placed around the area of clearing
- A rock pad may be placed over the ground before structures are placed to minimize the potential for sedimentation
- Porta-Potty's would receive weekly or more frequent service, as needed
- Sedimentation control pond may be used, if necessary
- Soil spoils will be covered by impervious material (tarp) to prevent their eroding
- Fencing to keep wildlife away may be installed for the construction phase around the camp

The Applicants other proposed environmental measures are:

(1) Limit clearing for the project to as small a physical footprint as possible to minimize impacts to vegetation and soils

(2) Implement an Erosion & Sedimentation Control Plan to prevent erosion and control runoff to prevent sedimentation

(3) Conduct sediment transport survey of river delta every 3-5 years for 20 years after project construction is complete to ensure the delta is not shrinking

(4) If mountain goats are observed near the Project during construction or operations, aircraft (i.e. helicopter or plane) will keep a 1,500 foot vertical and/or horizontal distance, unless the alternative is unsafe

(5) Color exteriors of buildings (dark green, dark gray) to blend in with the surrounding forest

(6) Implement a Bear Safety Plan for the construction and operation phase of the project

(7) Implement a Scenery Management Plan to preserve visual quality

(8) The invasive species, sow thistle, is currently established on both the north and south river deltas. As mentioned previously, three herbicides would be permitted for use, (1) *Garlon 3A, (2) Milestone, and (3) Habitat* to attempt to eradicate this invasive species. In addition to spraying the deltas with herbicide annually during construction, foot inspections to remove sow thistle flowers will also be conducted periodically during their flowering phase.

An analysis of Herbicides along with supporting information is available in Appendix K as part of the Invasive Species Survey Report. To permit the use of an herbicide at the project site, an NPDES pesticide permit from the State of Alaska Department of Environmental Conservation will be required.[83] Authorization from the Forest Service for the uplands portion of the delta infested with sow thistle may also be required to apply an herbicide, if there is an uplands there.

Equipment stored in Hyder before being brought to the project site would have their tracks or wheels brushed and/or washed to remove dirt that may hold seeds from invasive species if transported from Hyder from July through September when seeds would be present. During operations a photo checklist of potential invasive species (taken from the Forest Service list) could be kept at the Powerhouse to monitor post-construction ingress of invasive species for 3 years. If no invasive species are found along project corridors, no further inspections of the corridors would occur. If invasive species were found, they would either be removed along with their root system and bagged to be disposed of offsite or incinerated in a 50 gallon drum on site, or treated with herbicide and then checked over several years to make sure it was eradicated.

[83] As of April 10, 2011, the State will take over from the EPA for NPDES permitting for pesticide use.

> This photo checklist would also be used at the delta on an annual basis for the lifetime of the project because this would be the likely ingress point for invasive plant species in the future; as long as sow thistle is at other locations on Portland Canal, reinfestation could occur. The Forest Service list of invasive plant species would be consulted annually to note any changes. The Forest Service would receive an annual report on each years monitoring and/or efforts at eradication.

The Applicant's Alternative includes environmental measures that would adequately protect and enhance the environmental resources of the Soulé River watershed while providing 77.4 MW of non-fossil-fuel fired energy generation. We estimate that the annualized net benefit of constructing and operating the project under the Applicant's Alternative would be $$4,463,000, and conclude that the Applicant's proposed project would be best adapted to a comprehensive plan for developing the Soulé River waterway.

5.2 Land Use Alternative

We do not recommend that the Commission adopt the Land Use Alternative in any license issued for the project. The Land Use Alternative would require the applicant to construct a project that would be restricted to a run-of-river mode of operation with a capacity of about 550 kilowatts. The project would consist of the following features:

- Diversion structure
- Power tunnel
- Penstock
- Powerhouse
- Tailrace
- Transmission line
- Access Trail
- Suspension bridge

The **diversion structure** would consist of a 27-foot-high, by ~175-foot-long low-head diversion on a minor channel off the Main Stem that would have a pool elevation of about 160 feet above MSL. The project would operate in a run-of-river mode with a maximum capacity of approximately 90 cfs. The diversion would be constructed of cyclopean masonry concrete (large mortared rock), with the rock excavated from a quarry in the pond area. A gated and screen intake would be located in the body of the diversion dam near the right abutment. The streambed at the diversion structure location is likely to be fractured, therefore, grouting will be required to prevent excessive leakage.

Environmental Measures:

- No roads would be constructed to the diversion structure
- Equipment would be disassembled and flown into the site by helicopter for reassembly before use because no roads would be used
- Other construction materials may be packed in by pack animal along an access trail from the beach to eliminate the need for roads

- Helicopters would also be used to transport materials, equipment, and personnel to the site
- Material cleared for the site would either be reused, i.e. terraced with rock and topsoil, or flown out by helicopter, i.e. brush and timber and rock if necessary
- Erosion & Sedimentation Control methods, such as silt fencing, riprap, catchbasin and revegetation would be used

A **power tunnel** would be used instead of a surface penstock. The tunnel would be 7'x7'x640' with a 36" pipe approximately 850 feet long passing through it. The tunnel would also be part of the access trail to the diversion site. The tunnel would lead from directly below the diversion to the stream bank opposite the powerhouse site on the Main Stem. A small suspension bridge 130 feet long would carry the pipe across the river, which would also be the access trail across the river.

Environmental Measures:

- No roads would be constructed to the upper or lower tunnel portals, requiring excavated rock to either be disposed of on site or flown out by helicopter
- Equipment would be disassembled and flown into the site by helicopter for reassembly before use because no roads would be used
- Other construction materials may be packed in by pack animal from the beach via the access trail to eliminate the need for roads, but in turn reducing the size of materials to manageable weights, lengths, and diameters
- Helicopters would also be used to transport materials and personnel to the site
- Material cleared for the site would either be reused, i.e. terraced with rock and topsoil, or flown out by helicopter, i.e. brush and timber and rock if necessary, but the preferred method would be to leave on site
- Erosion & Sedimentation Control methods, such as silt fencing, riprap, catchbasin and revegetation would be used

The **powerhouse** would be located approximately 1,000 feet upstream from the river mouth, where there is a relatively flat bench of bedrock at the head of a long reach of rapids. Coincidentally, this location is about 1000 feet from the beach fringe, and is hidden from view from Portland Canal. The powerhouse would be a semi-underground structure, with most of the equipment located in a chamber excavated into the bedrock bench. A corrugated steel arch structure would span over the equipment chamber to provide protection from the elements; snow appears to accumulate very deeply at this location. The powerhouse would contain a single horizontal-axis Francis turbine rated at 91 feet head and 90 cfs flow, direct-connected to a 550 kW/600 rpm synchronous generator. A long draft tube would allow utilization of some of the head in the long reach of rapids at the site. Most of the installed equipment would need to be airlifted to the powerhouse site.

A clearing for the building plus staging of materials and a helipad would require an area approximately 100 feet by 150 feet in size. Trees cleared would have to be flown out immediately to make room for construction. Excavated material, rather than removed from site, could be used to re-contour a staging area after construction to allow some revegetation to fill in part of this area, if there is room. At this time it is unknown how much material would need to be excavated for the powerhouse and staging area. The preferred method of rock disposal for this alternative is directly into the river because fish do not use it and there is a heavy glacial flour load.

Environmental Measures:

- No roads would be constructed to the powerhouse, requiring excavated rock to either be disposed of on site or flown out by helicopter
- Equipment would be disassembled and flown into the site by helicopter for reassembly before use because of no roads
- Other construction materials may be packed in by pack animal from the beach to eliminate the need for roads
- Helicopters would also be used to transport materials and personnel to the site
- Material cleared for the site would either be reused, i.e. terraced with rock and topsoil, or flown out by helicopter, i.e. brush and timber and rock if necessary
- Erosion & Sedimentation Control methods, such as silt fencing, riprap, catchbasin and revegetation would be used

The **Transmission line** would mostly be a submarine cable (10 miles) to Stewart, B.C. For the section of transmission line between the powerhouse and delta, the selected arrangement includes 750 feet of 12 kV overhead line down the river valley, and 1,500 feet of buried cable along the lower portion of the access trail. The overhead line would use single wooden poles, and would be similar to a typical distribution line. The route for an overhead line would be over bare rock and scrub; no trees would be cut. The transmission line would have to be trenched through the delta.

Environmental Measures:

- Equipment and material for the transmission line would have to be flown in by helicopter due to their weight, as no roads will be constructed
- Other related construction materials may be packed in by pack animal from the beach to also eliminate the need for roads
- Helicopters would also be used to transport materials and personnel to the site
- The transmission line route along the Main Stem through the Lower Gorge would avoid the clearing of any trees, being on bare rock or scrub; wood poles would be used to visually blend in
- Erosion & Sedimentation Control methods, such as silt fencing, riprap, catchbasin and revegetation would be used

The **marine access facility** would be limited to landing boats and landing craft on the delta without any preparation of the ground or structures, either temporary or permanent.

Environmental Measures:

- Avoid using same point of landing as much as possible to limit potential for scaring and potential erosion of one point on the delta
- Helicopters would also be used to transport materials and personnel to the site to help reduce frequency of boat landings
- Staging would not occur on delta to avoid harming wetland and to avoid invasive species present so that it isn't tracked into the watershed
- Erosion & Sedimentation Control methods, such as silt fencing could be used, if needed

An **Access Trail** would be constructed rather than build a road into the project features. The access trail would have a width of up to 50 inches to allow use by pack animals; some sections may need to be boardwalked to protect wetlands. It would start at an unimproved boat landing on the Glacier Bay side of the delta, then proceed in a southwesterly direction for about 1,200 feet across the delta and into the forest until near the Soulé River gorge. The trail would then turn more westward and parallel the river for about 1,200 feet, climbing and winding as necessary to avoid the steepest terrain. Nevertheless, about 300 feet of this upper section would be very difficult to build and maintain because of the steepness of the hillside. From the powerhouse area, the trail would cross the suspension bridge and proceed through the tunnel to the diversion structure area. The total length of trail, excluding the bridge and tunnel sections, is estimated to be 2,900 feet.

Environmental Measures:

- Clearing for trails would be by hand tools, both power and mechanical, or by small bobcat type excavator; as long as it stayed within 50 inches
- Fuel storage for power tools or equipment would be in bermed areas at other project features or stored on daily landing craft trips
- Helicopters and boats would also be used to transport materials and personnel to the site
- Cleared vegetation may have to be flown out of site if not allow to discard along trails

Environmental Impacts:

Environmental effects are reduced with this scaled down alternative. Clearing of trees, shrubs, topsoil, and bedrock will still be necessary at the diversion, tunnel portals (possibly), helipads, powerhouse, tailrace, transmission line, and access trail but this is a significant change without the marine access features, access road, and reservoir features.

Blasting may be necessary to breakup bedrock at any of these locations. Wetlands may be impacted by excavation and fill in placing project features, but this will be limited to <1.0 acre and mostly directed at work in the minor channel off the Main Stem for the diversion.

Impacts to aquatic habitat would be insignificant with no salmon using the river and the diversion well below Dolly Varden Creek as well as not being in the Main Stem.

Terrestrial habitat would be insignificantly impacted because there are few species using this watershed and ground disturbance would be relatively small. Connecting corridors would consist of a trail maintained to walk to the project features from the shoreline, which would be approximately 2,900 feet long.

Although the site was surveyed for heritage resources and none were found, moving the project features back from the shoreline 1,000 feet also significantly reduces any chance to impact any undiscovered artifacts; although it is unlikely any exist due to the difficulty to access the site, i.e. to penetrate the forest and lack of salmon.

The aesthetics of the area would not be impacted because of the small footprint of the project features and their being 1,000 feet from the shoreline. They would be mostly hidden from the marine travel route in the middle of Portland Canal except for 1-3 wood transmission line poles (which would likely not be visible from the Visual Priority Route)(look at Figure 90, and how small the 60-70 foot bedrock notch is at the river mouth; unlikely a few wood poles would be visible).

Recreational resources may be only slightly improved for the area because of the trail use to reach the project features, which would be short, but would take people to the Lower Gorge for potentially spectacular views.

Throughout the pre-filing consultation process the Forest Service suggested that it may consider amending the LUD of the project area within the 2008 Forest Plan for the purpose of assisting with hydropower development in the project area. As a component of the Forest Service's feasibility analysis for potentially amending the LUD in the 2008 Forest Plan, it requested an analysis of the other potential hydropower sites in the upper Portland Canal area. We include the Forest Service's requested analysis as Appendix A of the PDEA.

ECONOMIC UNFEASIBILITY OF LAND USE ALTERNATIVE

ANALYSIS

Why the Land Use Alternative is not economically feasible:

- The construction cost of the project features while avoiding "*evidence of human use*" and impacts to the "*unmodified natural setting*," as well as no impacts to "*opportunities for self-reliance and closeness to nature*," would be extremely high due to the cost of helicopter use (currently about $1000/hr) and/or the cost of labor-intensive construction techniques. As an example, helicopters would have

- to fly in disassembled equipment (i.e. backhoes, excavators, dump trucks, drill rigs) that would be reassembled on site to perform construction and also having to perform this same maneuver from project feature to project feature because of no roads. Then the equipment would have to be disassembled and flown out.
- Moving materials and personnel to the site from Hyder would require the use of helicopters as no marine facilities would exist for offloading and storing material and equipment. The constant use of helicopters would be very expensive.
- Equipment, such as excavators, would have to be disassembled before being lifted to the site and then reassembled before using
- Materials would also have to be moved from project feature to project feature by helicopter or by trail. Cleared material, i.e. timber, brush, soil, and rock would have to be removed from site by helicopter as well if not used in the construction or allowed to remain on site.
- Construction would be very time-consuming due to the very rough terrain and remoteness of the site and means of accessing the site via helicopter only. Clearing constraints would also constrain construction activity due to limited space.
- The cost of the submarine cable would be extremely high. The cost of the cable material might be proportional to the generating capacity, but that is only a small portion of the total cost; the remaining costs (mobilization and laying the cable) are a much larger portion and are not proportional.
- The cost to obtain the FERC license, Special Use Permit, and other state and federal permits would be almost as much for a small project as with a large project.
- Operation and maintenance costs would be proportionally much higher because of less energy for sale, but expensive to reach the site.
- A smaller project means less energy produced and less energy to sell; and the remote location means it is more expensive to get the energy to market. Less energy to sell and increased development costs per MW, means less cost efficiency, making the project uneconomical.

In other words, there are great economies of scale with a larger project such as the 77.4 MW storage project currently proposed that offset costs associated with this remote location.

Even with a smaller scale project the goals and desired conditions of this LUD will be impacted. There will be *evidence of human use* and it would no longer be an *unmodified natural setting*. A trail connecting the project features from shoreline would reduce *self-reliance* and the project features themselves may reduce the feeling of *closeness to nature*. A hydroelectric project would not manage this watershed in a natural condition (SW4).

Unless the Forest Service relaxes the Remote Recreation LUD guidelines significantly, a project cannot be constructed at the Soulé River at a smaller scale than our "preferred alternative" due to the economies of scale.

A run-of-river hydroelectric project (in order to try and meet the Remote Recreation LUD) on the Soulé River would be under utilizing this water resource. Development, if it can be done while protecting the environment, which we believe can be done, should be allowed to its fullest rather than only a partial development because once development occurs the area has been impacted. The impacts between a small project and large project are by degrees, but considering the low use of the watershed by wildlife and no salmon in the river (which is rare), makes this watershed unique and perfect for a hydroelectric project.

Even though a run-of-river project would be smaller in scope, impacting less of the environment, the cost to helicopter all aspects of ingress (movement of equipment, materials, and personnel into the site) and egress (movement of equipment, materials, waste, and personnel from the site) from the project significantly increases the cost of development in proportion to the amount of electricity that would be available for market.

Not having surface corridors, i.e. access road along with marine access facilities complicates the movement of material, including spoils from the site, which would include timber, brush, rock, and soil. Waste from the site in the form of spoils listed above would either need to be left on site or flown out. Flying out any of these spoils would be logistically difficult and cost prohibitive, requiring special helicopters designed for heavy lifting.

Due to the expense of constructing and operating this land use alternative, including the significantly unused water resource, it is not in the publics best interest to approve a license that only partially develops this resource.

5.3 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed the comprehensive plans, listed below, that are applicable to the Soulé River Project. One inconsistency was found, the land use designation for this watershed is Remote Recreation, which the Applicants Alternative does not comply with. An analysis of how this project will comply with the other comprehensive plans comes after the analysis of the Forest Service LUD for this site.

APPLICANTS ALTERNATIVE AND INCONSISTENCIES WITH 2008 FOREST PLAN

ANALYSIS

REMOTE RECREATION LUD GUIDELINES
Goals

To provide extensive, unmodified natural settings for primitive types of recreation and tourism.

To provide opportunities for independence, closeness to nature, and self-reliance in environments offering a high degree of challenge and risk.

To minimize the effects of human uses, including subsistence use, so that there is no permanent or long-lasting evidence.

Desired Condition

Areas in the Remote Recreation LUD are characterized by extensive, unmodified natural environments. Ecological processes and natural conditions are not noticeably affected by past or current human uses or activities. Users have the opportunity to experience independence, closeness to nature, solitude and remoteness, and may pursue activities requiring self-reliance in an environment that offers a high degree of challenge and risk. Interactions between users are infrequent. Motorized access is limited to traditional means: boats, aircraft, and snowmachines. Facilities and structures are minimal and rustic in appearance.

Based on the Remote Recreation LUD guidelines above, a project could not be built in the Soulé River Watershed. Because of the Remote Recreation LUD at this site, project features cannot show evidence of human use and impact the "*unmodified natural setting,*" nor impact "*opportunities for self-reliance and closeness to nature.*" This LUD also essentially prevents construction of a project because nothing can be constructed within 1,000 feet of the shoreline, or be visible, or interfere with opportunities for self-reliance, which any linear feature such as a road, marine access facilities, and dam structures would likely do.

Remote Recreation LUD Management Prescriptions

The standards and guidelines for Recreation and Tourism, Scenery, Soils and Water, and Transportation listed for the area designated as Remote Recreation will strongly influence the layout, design, and operation of a hydropower project. The current proposal does not meet these Standards and Guidelines.

RECREATION AND TOURISM

The goals of the Remote Recreation LUD are to:

- Provide extensive, unmodified natural settings for primitive types of recreation and tourism.
- Provide opportunities for independence, closeness to nature, and self-reliance in environments offering a high degree of challenge and risk.
- Minimize the effects of human uses, including subsistence use, so that there is no permanent or long-lasting evidence" (Forest Plan p.3-45).

Interpretation: The project will move towards meeting this goal when the design is compatible with protecting the beach and estuary fringe as described above; by meeting the Primitive Recreation Opportunity Setting Indicators, by maintaining the High Scenic Integrity Objective, and by retaining the roadless characteristic - all described below.

Primitive Recreation Opportunity Spectrum – Setting Indicators

- Scenic Quality- High Scenic Integrity Objective.
- Access: Non-motorized cross-country travel and travel on non-motorized trails and on waterways is typical. Use of airplanes, helicopters, motorboats, off-highway vehicles, and snowmachines for traditional activities, subsistence, emergency search and rescue, and other authorized resource management activities may occur but is rare.
- Remoteness: No or infrequent sights and sounds of human activity are present. Setting is isolated more than 1.5 hours walking or paddling distance, or 3 miles, from any human developments other than infrequently traveled marine travel ways. Areas are generally greater than 5,000 acres, but may be smaller if contiguous with a Semi-Primitive class.
- Visitor Management: On-site regimentation and controls are very rare. Signing is limited to directional information and safety. There are no on-site interpretive facilities. There is great opportunity for discovery on the part of the users.
- Social Encounters: User meets less than three parties per day during trip. No other parties are within sight or sound of dispersed campsites or cabins.
- Visitor Impacts: Visitor-caused impacts to resources are slight and usually not noticeable the following year. Site hardening is limited to boardwalk trails and necessary boat moorings or bear-proof food caches and rustic public recreation cabins.

Interpretation: Travel will typically be limited to non-motorized. OHV's on a trail might be authorized for infrequent use.

SCENERY

High Scenic Integrity Objective (SIO)

- Design activities to not be visually evident to the casual observer. This objective should be accomplished within 6 months following project completion.
- Log Transfer Facilities are generally not appropriate in this SIO setting.

Interpretation: A "casual observer" might be regarded as someone who is not necessarily observing the landscape with a critical eye to discern change in natural characteristics, but viewing the landscape as scenery. Large shoreline landing facilities (such as Log Transfer/Marine Access Facilities) are generally not appropriate in this SIO setting. The appearance of waste rock piles made to appear as natural rock fall could be regarded as "not visually evident". A diversion dam could be constructed to appear natural; coloring the concrete might also be an option. A tunnel would definitely be less obtrusive than an above ground penstock. Any corridor clearing would have to also be considered as an effect. Timing of visual recovery should be a reasonable period. Given the significant design mitigation the project would require, visual recovery would probably only involve vegetation. Again, a 100' swath of corridor clearing would not be considered acceptable in terms of meeting the recovery expectations. Any reforestation or revegetation of the site should be expected not to be extensive in scope.

SOILS AND WATER

- Watersheds will be managed in a natural condition.

Interpretation: "Natural Conditions" need to be evaluated in terms of retaining instream flows within the range of natural variability. Analysis of this range can be conducted with software titled "Indicator of Hydrological Alteration". The range of variability should be maintained for the full range of flows so their function is retained.

The sediment regime in the watershed should not undergo any extreme changes. Supply of cobbles, gravel, and sand from the West Fork should not be significantly interrupted. Supply of silts and clays from surface erosion and mass-wasting should not be substantially increased. Potential sources of increases in these sediment supplies are ground-disturbing construction and reservoir clearing, and reservoir operations affecting the shoreline in a fluctuation zone.

WILDLIFE

- Wildlife habitats are generally subject to ecological changes only.

Interpretation: Minimizing disturbance and providing mitigation for loss of wildlife habitat needs to be emphasized. Minimizing size of reservoir will minimize change to wildlife habitat.

TRANSPORTATION

- No new permanent roads are to be constructed.

On National Forest Lands the definition of "a road" is defined in 36 CFR 212.1 (definitions) as a motor vehicle route over 50 inches wide. Materials would have to be moved on a trail, which could be made permanent.

LANDS:

- "This LUD represents a Transportation Utility System "Avoidance Area. Transportation and utility sites may be located within this LUD only after "an analysis of potential sites and corridors determines no feasible alternatives exist outside of the Remote Recreation LUD"

"*The Forest examined this Management Direction and found that the Forest does not have the resources to develop and adequately implement an analysis of feasible alternatives for hydropower sites. The Forest will make a site-specific amendment to the Forest Plan to eliminate this requirement for this project. The Management Direction for the Remote Recreation applies.*"[84] The Applicant conducted an analysis of other potential hydro sites in the Hyder area, which is discussed previously in this document,

[84] USDA Forest Service letter, June 9, 2009.

finding no other economically or environmentally feasible projects (also see Appendix A for the analysis).

Applicants Alternative and its Conflict with Existing Land Use Designation

Under the Applicants Alternative, the Applicant proposes to construct a 77.4-megawatt (MW) hydroelectric project on the Soulé River, which drains into Portland Canal. The Project would include a 265-foot-tall by 903-foot-long dam, a reservoir with a surface area of approximately 1,072 acres and approximately 102,300 acre-feet of storage, a 16-foot-diameter by 11,400-foot-long power tunnel from portal to portal with portions of it lined with steel or concrete, a 3.1-mile-long by 20-foot-wide access road, a 120-foot-long bridge to cross the river, a 80-foot-wide by 160-foot-long powerhouse, a substation next to the powerhouse with three 30,000 kVA 13.8-138 kV transformers and switches, an approximately 10-mile-long 138 kV submarine cable (~2 miles of which would be in Canadian waters and therefore not a part of this license), and marine access facilities.

The Marine Access Facilities (MAF) along with the Powerhouse, Tailrace, Substation, and Staging area, would conflict with the existing LUD by reducing or eliminating the unmodified natural setting, including opportunities for independence and self-reliance and having permanent and long-lasting evidence of human use. The MAF would also be visible from the visual priority route (VPR), although the profile would be low and consist of rock, impacting this high scenic integrity objective (SIO) corridor. The powerhouse and substation will be behind shoreline trees to screen them from view.

The Power Tunnel, although below ground, would have excavated material to dispose of and would require the access road to reach its headworks at the Intake Structure. This would also provide evidence of human use and reduce or eliminate the unmodified natural setting.

The Access Road will also impact the SIO for the area as it leaves the delta and traverses up the bedrock, but forested, slope behind the delta. Once over the shoreline ridge, the access road will be out of view, however, it will still impact the unmodified natural setting and self-reliance for recreation of this watershed. The access road will go 0.8 mile before going through a gated 1,900-foot-long tunnel, keeping the reservoir area of the project more isolated than the first 0.8 miles of the project.

The Dams will not impact the SIO because they will be out of site of the Visual Priority Route, but will impact the natural setting, permanently changing the landscape for evidence of human use and reduce self-reliance for primitive types of recreation.

The Reservoir will change the landscape and potentially reduce self-reliance for primitive recreation, but only if persons have a mode to get around on the reservoir, otherwise the reservoir is just another feature in a primitive setting because no roads or trails are proposed to go around the lake either, keeping No-Name Lake remote as well.

While the Applicants Alternative is in conflict with the existing Remote Recreation LUD, constructing a project of this size here would have minimal environmental impacts. There is little reason not to develop this site, other than the existing LUD because:

- No salmon use the river
- Few game species are present, and they are also only present in small numbers and usually only along the shoreline
- All wildlife species present are under represented in this watershed
- Heavy winter snows of 30+ feet with late spring/early-mid summer thaws, which also bends brush and shrubs over to make their thick stands impossible to penetrate when the snow is gone, and
- Dense understory that has prevented animals and humans from penetrating very far.

The Applicants Alternative, as proposed, follows a narrow corridor from the Marine Access Facilities to the Dam site, confining impacts without impacting the whole watershed, and also keeping the shoreline impact to a small area. In fact, the habitat the project does impact is generally an insignificant portion of the same type of habitat available elsewhere within the watershed. The use of a tunnel for 1,900 feet of the access road and a tunnel for transporting water to the powerhouse significantly reduces impacts to the environment and will keep the valley isolating from most people. With the narrow corridor of clearing and the road tunnel, the surrounding landscape in this watershed will still remain impenetrable and retain its wild-land character to enable primitive types of recreation, closeness to nature, and promote self reliance. This is why the LUD for the project boundary should be changed while keeping in place the existing LUD around the project.

Few better sites in the Tongass probably exist for a hydroelectric project. Even a project designed to try and meet the existing LUD would impact the guidelines for the LUD, as pointed out above, i.e. there would be evidence of human use, impacts to the natural setting, and reduced self-reliance for recreationist. If a project is allowed to go ahead here, it should be to get the most benefit from the site while applying environmental mitigations to reduce impacts because a run-of-river hydroelectric project on the Soulé River would be under utilizing this water resource.

Below is a table showing the difference in capital cost and cost per kilowatt of power for both project alternatives.

	Applicant Alternative	Land Use Alternative
Installed Capacity, kW	77,400	550
Total Capital Cost,	$342,500,000	$15,150,000
Capacity Cost, $/kW	4,425	27,550
Annual Generation, MWh	281,300	4,590
Annual Cost (2019) (1)	$31,300,000	$1,560,000
Discounted Annual Net Benefit (2)	$4,016,000	-$408,000

(1) 100% debt financing with 8.00% interest rate and 30 year term.
(2) 8.00% discount rate, 30 year term of analysis.

Although the capital costs are less for the Land Use Alternative, the cost per kilowatt is significantly more expensive because even though the run-of-river project would be smaller in scope, impacting less of the environment, the cost to helicopter all aspects of ingress (movement of equipment, materials, and personnel into the site) and egress (movement of equipment, materials, waste, and personnel from the site) from the project significantly increases the cost of development in proportion to the amount of electricity that will be available for market. **A** submarine cable would be used as well, which also adds significantly to the project costs, regardless of the size of the project.

Project Recommendations

The Applicant recommends that an amendment or administrative change to the Tongass National Forest Plan be made to change only the project lands to another Land Use Designation other than the current Remote Recreation LUD. A less restrictive LUD is needed for this project to be constructed, while leaving the existing LUD around the project will continue to provide the existing more restrictive guidelines of Remote Recreation. This will reduce impacts to the area by keeping restrictions in place for the majority of the watershed while allowing a narrow corridor to be developed that will have limited impacts to environmental resources (based on the field studies conducted and the project design), but will also offset Green House Gases (GHG) produced by fossil fuels over the life of the project. On an annual basis it is estimated that fossil fuel use would be offset by at least 27,000,000 gallons on an annual basis; which equates to 540,000,000 lbs of CO^2 air emissions being eliminated annually.

CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a) (2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. The Forest Service provided a list many of the comprehensive plans shown below.

2008 Tongass National Forest Land & Resource Management Plan Amendment (hereafter referred to as the "Forest Plan"):

The entire project lies within the boundaries of the Tongass National Forest. The project is subject to the decisions made in the Record of Decision for the Forest Plan Amendment.

The Soulé River Hydroelectric Project ("the Project") borders the Misty Fiords National Monument Wilderness as delineated in the Forest Plan, and lies within the land use designation of Remote Recreation.

The Applicant addressed the 2008 Tongass National Forest Land & Resource Management Plan Amendment by making the recommendation above under "***Project Recommendations***.

USDA RESOURCE GOALS & OBJECTIVES:

USDA regulation 9500-4-1 and Forest Service Manual (FSM) 2670.22 directs the Forest Service to manage habitats for all existing native and desired nonnative plants.

The Applicant addressed this USDA regulation by conducting sensitive, rare, and invasive plant surveys. No TES species were found and one invasive species was found on the river deltas only. To mitigate impacts to the environment, the Applicant proposes to:

- Keep the project corridor as narrow as possible
- Keep the clearing of vegetation to a minimum
- Avoid wetlands as much as possible
- Implement an invasive species elimination and monitoring plan

USDA regulation 9500-4-2 and Forest Service Manual (FSM) 2670.32 directs the Forest Service to manage fish and wildlife species in order to maintain at least viable populations of such species and avoid actions which may cause a species to become threatened or endangered.

The Applicant addressed this USDA regulation by conducting fish surveys of the watershed. No salmon were found to use the Soulé River Watershed because of anadromous barriers beginning near the river mouth. Dolly Varden (Salvelinus malma malma) however were found and mainly reside in No-Name Lake at the headwaters of the North Fork and in Dolly Varden Creek, which is a small tributary off the Main Stem (these two locations are separated by additional anadromous barriers). Fish cannot reside in the Main Stem of the river during the summer/fall months due to the river velocity. We believe that Dolly Varden Creek receives recruitment from the No-Name Lake stock that gets washed down river. Neither population should be impacted by the project. Juvenile Chum salmon (O. keta) from Fish Creek on the Salmon River located nine miles north of the project at Hyder, each spring use the Soulé River delta to forage as they head out to the ocean. Riprap used on the sides of project features on the delta will also provide some habitat diversity to the delta by offering protection in nooks and crannies as well as additional forage habitat.

Wildlife species were also addressed by conducting surveys, including a goshawk survey, but species were depauparate and those present were low in numbers. The Applicant addresses wildlife by keeping clearings small and narrow to prevent fragmentation, by using tunnels to reduce surface impacts, and by implementing a Bear Safety Plan, Erosion & Sedimentation Control Plan, and other plans and methods to reduce impacts to the environment.

FSM 2670.32-2 directs the Forest Service to review programs and activities as part of the NEPA process through a biological evaluation to determine their potential effect on sensitive species.

This EA should help the Forest Service conduct a biological evaluation of this project.

FSM 2670.32-4 directs the Forest Service to analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.

The Applicant addressed this FSM regulation by conducting fish, wildlife, plant, and amphibian surveys. The watershed was found to be depauparate for wildlife species as well as having small populations of what does inhabit the watershed. No TES species were heard or observed during 123 Field-Observation-Days between 2007 and 2009. Due to the project keeping clearing to a minimum and only having a narrow corridor, as well as implementing an Erosion & Sedimentation Control Plan to protect the environment, and the use of tunnels for part of the access road and the whole length of the water conduit, no significant impacts to wildlife or habitat is expected.

Forest Plan S&G PLA-1 II A directs staff to consider protection for sensitive plant species. Forest Plan S&G PLA-1 II B directs staff to implement monitoring and evaluation to review effectiveness of conservation action.

The Applicant addressed this Forest Plan by conducting a rare and sensitive plant survey in 2009. No rare or sensitive species were found in all the areas surveyed. Due to the project keeping clearing to a minimum and only having a narrow corridor, as well as implementing an Erosion & Sedimentation Control Plan to protect the environment, avoiding habitat that is best suited to rare and sensitive species, and the use of tunnels for part of the access road and all the water conduit, no significant impacts to sensitive plant species or habitat is expected.

Alaska National Interest Lands Conservation Act (ANILCA) of 1980; Section 810

Section 810 requires Federal agencies to evaluate the effects of their use, occupancy or disposition on subsistence uses and needs.

The Applicant addressed the ANILCA by conducting an analysis of the use of the project site, including the submittal of a subsistence and recreation survey form to all the Post Office boxes at the Hyder P.O. Respondents were giving approximately 5 months to respond. The results showed that use of the project site occurs along the shoreline only. Most bear and deer hunting occur for residence of Upper Portland Canal in Canada or far down the canal from the project. Some bear hunting occurs at the Soulé River delta, as well as elsewhere along the canal, but appears to be for recreational purposes. With project features placed on the delta, several acres that may contain bear forage will be removed. Native grasses could be allowed to grow on top of the staging area to help offset this loss; would likely seed the staging area after construction to expedite this process. Opening the watershed with the access road will also make additional forage habitat available for bears. Fishing occurs up and down the canal and also off the Soulé River delta. Crabbing occurs in Glacier Bay, adjacent to the project marine access features on the delta. Potential impacts to ANILCA is analyzed in Section 3.10 Recreation and Subsistence, above. No significant impacts to ANILCA are expected.

Bald Eagle Protection Act

An Interagency Agreement between the Forest Service and the U.S. Fish and Wildlife Service (USFWS) restricts management activities within 330 feet of an eagle nest site.

The Applicant addressed the Bald Eagle Protection Act by conducting two bald eagle surveys, one each in 2008 and 2009. None of the existing eagle nests, which are located approximately one mile north and south of the river delta, were occupied. Few eagles were observed during any of the surveys. Because no salmon use the Soulé River, the likelihood of their presence is reduced. A final survey will be conducted prior to the startup of construction if startup occurs during the nesting period.

Cave Resource Protection Act of 1988

This Act is intended to protect significant caves on federal lands by identifying their location, regulating their use, requiring permits for removal of their resources, and prohibiting destructive acts. The Act requires that caves be considered in the preparation and implementation of land management plans, and allows for cave location to be kept confidential.

No caves are known to exist within the project boundary and none were found during 123 Field-Observation-Days. With the granitic landscape, caves are not very likely to occur. No impacts to caves are expected.

Clean Air Act of 1970 (as amended)

Emissions from the implementation of any project alternative will be of short duration and are not expected to exceed State of Alaska ambient air quality standards (18 AAC 50).

Even though during project construction there will be short term increases in air emissions from diesel powered machinery, the State of Alaska ambient air quality standards (18 AAC 50) should not be exceeded. This project, once in operation will have a beneficial impact of eventually offsetting fossil fuel air emissions and the use of at least 27,000,000 gallons of fossil fuel on an annual basis; which equates to 540,000,000 lbs of CO^2 air emissions being eliminated annually. No significant impacts to air quality should occur.

Clean Water Act (1977, as amended)

Project activities must meet all applicable State of Alaska Water Quality Standards. Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 addresses Federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person. Compliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution."

The Clean Water Act (Sections 208 and 319) recognized the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as the primary control mechanisms for nonpoint source pollution on National Forest System lands. The EPA supports this perspective in their guidance, "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987).

The Forest Service must apply BMPs that are consistent with the Alaska Forest Resources and Practices Act (AFRPA) to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2000). In 1997, the State approved the BMPs in the Forest Service Soil and Water Conservation Handbook (FSH 2509.22, October 1996) as consistent with AFRPA. This handbook is incorporated into the Forest Plan.

The Clean Water Act (Section 401) requires any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the proposed project will not violate state water quality standards. The authority to certify that point-discharges meet State criteria resides with the State of Alaska.

To address the Clean Water Act, the Applicant will avoid bodies of water as much as possible for project feature placement. No driving through bodies of water will occur. Bridges and culverts will be used to avoid waterbodies, where necessary. An Erosion & Sedimentation Control Plan will be implemented to protect waterbodies in the project area. Revegetation will also protect waterbodies from future erosion and sedimentation. An acid rock analysis was conducted to make sure on site rock would not leach harmful chemicals and minerals into the area waters; ARD has a low probability. Water quality can be maintained with the methods described above and elsewhere in this EA so that impacts should not be significant.

Coastal Zone Management Act (CZMA) of 1972 (as amended)

The Coastal Zone Management Act of 1972, as amended, while specifically excluding Federal lands from the coastal zone, requires that Federal agency activities be consistent with the enforceable policies of the State coastal management program to the maximum extent practicable when the activities affect the coastal zone.

The closest enforceable Coastal Zone Management Policies are of the Ketchikan Gateway Borough (KGB) as the project is in the "Unorganized" Ketchikan Borough. Best Management Practices listed by the KBG that are appropriate are listed below:

CD/BP-10: New development should incorporate existing vegetation or landscaping within and around the property to minimize impacts from potentially conflicting uses.

CD/BP-12: New coastline development should be carried out subject to a site development plan (prior to clearing, dredging, grading, filling, and other site work) that addresses long term use and development of the entire parcel and, when appropriate, neighboring properties.

CD/BP-13: Extensive site grading and rock retaining walls should be minimized in shoreline development in favor of posts or piling construction, where appropriate.

CD/BP-15: Clearing natural vegetation within the beach fringe should be minimized to maintain ecologic diversity and the abundance of plants and animals.

CD/BP-17: The flow of natural creeks and drainage channels should be maintained, thereby preventing erosion and flooding.

H-3 Disturbance of tidelands should be minimized. Operation of machinery and equipment on tidelands should be contained in the smallest area practicable.

H-4 To the maximum extent practicable, fill should be placed on tidelands only when exposed by lowered tides.

H-5 Natural drainage patterns should be maintained, to the maximum extent practicable, without introducing ponding or drying. Appropriate ditching, culverts, and other measures should provide control of drainage.

H-6 Explosives should be discharged in a manner that is not likely to adversely impact wintering herring or other fish inhabiting the area. The Alaska Department of Fish and Game should be contacted for information concerning timing (typically between March 16 through October 1) and operational constraints.

H-8 In-water construction activities involving the dredging and deposition of fill, and pile driving should abide by reasonable timing restrictions set by ADF&G (typically March 1 to June 15).

H-10 Development activities should avoid raptor nesting. The U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game should be contacted for information concerning the known locations of raptor nest sites and appropriate criteria to minimize significant adverse impacts to nest sites and nesting activity.

The Applicant proposes to meet the Coastal Zone Management Plan by the following measures:

- Existing vegetation will be used to screen the powerhouse and substation on the delta and existing terrain will hide the dams and most of the access road
- The water conduit will be underground, eliminating surface impacts
- The licensing/permitting process will address site development

- Riprap will be used for most shoreline development, which will diversify the existing fish habitat and will eventually have a marine patina to blend it in visually
- Grass may also be grown on the staging area after construction to help blend the project in as well as provide wildlife forage habitat lost by project features on the delta
- Clearing on the beach fringe will be limited to a narrow corridor
- Disturbance of tidelands will be limited to a narrow corridor and excavation will be kept to a minimum, relying on riprap over the tidelands
- Fill on the delta will only occur when tides are lower than the fill activity.
- Drainage patterns will not be altered
- ADF&G will be consulted regarding the discharge of explosives.
- In-water construction activity such as pile driving will abide by reasonable time restrictions set by ADF&G. In-water construction of the dam should not need the same restrictions.
- Prior to the start of construction, or at the start of nesting season if construction has already started, a bald eagle nesting survey will be conducted along the shoreline.

Compliance with these coastal district enforceable policies listed above will be followed to avoid and/or minimize impacts. Because the Applicant will follow the above DCOM guidelines, potential impacts should be minimized and no significant impacts to Coastal Management should occur.

Consumers, Civil Rights, Minorities and Women
Effects to the civil rights of individuals or groups, including minorities and women, must be analyzed.

No impacts to the civil rights of individuals, or groups, including minorities and women are anticipated as hiring for construction and operation of the project will depend on experience and ability.

Endangered Species Act (ESA) of 1973 (as amended)
Consultation must take place with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). A biological assessment (BA) and biological evaluation (BE) must be prepared for the project, as required by Section 7 of the Endangered Species Act (ESA), as amended, and the USDA Forest Service Threatened, Endangered and Sensitive Plant and Animal Species Policy (FSM 2670).

The Applicant addressed the Endangered Species Act by conducting studies for fish, wildlife, amphibians, and plants. The mammal fauna of the Soulé River watershed was found to be depauparate, and those species that are present are small in numbers. No salmon use the river, eliminating a significant food source for many species, including those on the TES species list. No TES species were heard or observed at the project site other than one osprey flying by the shoreline and one osprey responding to a goshawk audio survey the following year. Potential impacts to wildlife are mitigated by keeping the project clearing and corridor to a minimum, using a 1,900-foot-long tunnel for part of the access road, using an 11,400-foot-long tunnel for the water conduit, implementing an Erosion & Sedimentation Control Plan, and avoiding wetlands as much as possible. A Bear Safety Plan will address preventing conflicts between construction workers and bears that pass through the shoreline.

Magnuson-Stevens Fishery Conservation and Management Act of 1996
Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act states that all Federal agencies must consult with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for actions or proposed actions that may adversely affect essential fish habitat (EFH). The Act promotes the protection of EFH through review, assessment, and mitigation of activities that may adversely affect these habitats.

The Applicant addressed the Magnuson-Stevens Fishery Conservation and Management Act by conducting fish surveys of the river and its drainages as well as around the river deltas. Based on the surveys conducted, it is believed that there is EFH around the delta fringe for juvenile salmon migrating out to the ocean from the Salmon and Bear rivers at Hyder and Stewart. This habitat appears to be for forage and includes Glacier Bay and around the delta. Approximately 6-7 acres of the delta will be covered by project features sheathed in riprap, some of which is in uplands, supratidal zone, and upper tidal zone, as well as through mid and lower tidal zones. The riprap will provide more habitat diversity for the delta and could provide more protection from predation. Methods of constructing the marine access facility will protect EFH including:

- Including a silt curtain along the shoreline of the activity
- No in water work, but only above the waterline
- The covering of fill material by filter fabric and rock before tides cover the fill, and
- Other methods mentioned in the Erosion & Sedimentation Control Plan;

Overall impacts to EFH are not considered to be significant because only about 25%-30% of the north delta will be covered by the project and none of the south delta. Additionally, a significant portion of the natural habitat will still remain and the riprap will provide additional habitat diversity.

National Forest Management Act (NFMA) of 1976 (as amended)
The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Compliance with Forest Plan direction applies at the project level.

National Historic Preservation Act (NHPA) of 1966 (as amended)
Heritage resource surveys of various intensities must be conducted in the project area, following inventory protocols approved by the Alaska State Historic Preservation Officer. The State Historic Preservation Officer must be consulted, in accordance with Section 106 of the NHPA and 36 CFR Part 800.

Native communities must be contacted and public comment encouraged.

The Applicant addressed the NHPA by consulting with communities, Tribal organizations, the State Historical Preservation Officer (SHPO), the Forest Service, and also hired an archaeologist to conduct Heritage Resource surveying of the site. No comments were received by Tribal organizations and no artifacts or heritage resources were found within the project boundary after an archaeologist survey.

Alaska's Statewide Comprehensive Outdoor Recreation Plan (SCORP)

The 2009-2014 SCORP identifies citizen preferences and suggested actions to address outdoor recreation issues in the state. The goals of SCORP are:

- Provide recreation agencies and communities with a reference to outdoor recreation preferences, use trends, and issues relevant to Alaska through 2014;
- Identify statewide capital investment priorities for acquiring, developing, and protecting outdoor recreation resources;
- Identify the State's priorities, strategies, and actions for the obligation of its LWCF (federal Land and Water Conservation Fund program) apportionment;
- Provide information that agencies and communities need to develop project proposals eligible for LWCF assistance;

The information below was extracted from the 2009-2014 SCORP publication.

Southeast
Most of Alaska's southeast region is encompassed by the Tongass National Forest (17 million acres), administered by the U.S. Forest Service. The National Park Service manages 3.3 million acres and three park units. Alaska State Parks manages about 80,000 acres and 34 park units, including 16 marine parks. The Department of Fish and Game manages two state wildlife refuges, two critical habitat areas, and a wildlife sanctuary in Southeast Alaska. The Alaska Division of Forestry manages 247,000 acres in the Haines State Forest.

Wildland Recreation Facilities
Despite this abundance of high value recreation lands, some wildland recreation opportunities are in short supply. Facilities such as campgrounds, trails, trailheads, cabins, boat launches, and other facilities are often the critical link between users and otherwise "wild" and inaccessible lands, especially along the road system and in the railbelt region. In many parts of the state, facilities, even if primitive or limited in number, make the difference between a potential outdoor experience and a reality.

Much of Alaska's premier wildland recreation resources (particularly in the southeast and rural regions) are accessible only by plane or boat. Additionally, not all uses are allowed in 18 all areas, i.e. agencies have missions to manage for different opportunities and may restrict or prohibit some uses. This places a heavy burden on road accessible and railbelt facilities. They are often filled past capacity. Construction of new or expanded facilities is expensive and often creates more demand, attracting more users. Consequently, facility demand continues to exceed facility supply throughout most of the state.

Despite its relatively small land holding (by Alaska standards), Alaska State Parks is the largest state park system in America. It ranks 38th in visitation, and is the State's largest provider of wildland recreation facilities. In 2007, because of their proximity to roads and urban centers, state park units hosted 2 times the visitation of Alaska's national parks. From the National Association of State Park Directors 2010 report, Alaska State Parks had 4,976,546 visitors. Additionally, state parks and facilities often serve as community recreation areas for residents of the larger urban areas. Forty-six percent of public land campgrounds in the state are owned and managed by Alaska State Parks.

Value of Outdoor Recreation to Alaskans

Alaskans place a high value on the availability and quality of outdoor recreation opportunities: 96 percent of all respondents said parks and outdoor recreation were important or very important to their lifestyle. This has remained consistently high over the years.

	1992	1997	2004	2009
Yes	94.80%	91.60%	97.90%	96.00%
No	4.70%	8.30%	1.90%	2.90%
Don't Know	0.50%	0.10%	0.20%	1.90%

The Alaska Recreation and Park Association recognizes four areas of recreation benefits that enhance quality of life: personal (such as fitness, relaxation, leisure, play); social (including community recreation that builds strong families and communities, promotes healthy social behaviors and ethnic and cultural harmony); economic (investment in recreation positively affects businesses, visitor industry, and a fit populace who then are more productive in the workplace); and environmental (environmental health, protection, and insurance for the future).

Trends identified by SCORP are in the table below.

Public Input on Facility Improvements and Development

TYPE OF DEVELOPMENT	% Support 1997	% Support 2004	% Support 2009
Provide more facilities for the disabled.	86.00%	63.60%	56.20%
Provide more boat launches and ramps.	63.00%	47.00%	41.00%
Establish new parks and recreation areas.	67.00%	69.40%	70.50%
Expand the public use cabin system.	79.00%	77.00%	70.90%
Provide more RV dump stations.	64.00%	43.20%	30.50%

Provide roadside toilets at regular intervals.	74.00%	75.90%	62.10%
Provide more organized recreation programs in parks.	61.00%	34.40%	31.30%
Develop more trailheads along roads and highways for trail activities.	76.00%	75.40%	68.70%
Develop more trails for the legal use of off-road vehicles.	56.00%	47.30%	47.50%
Develop more trails for non-motorized use only	74.00%	71.10%	61.40%
Develop more RV campgrounds.	52.00%	35.40%	29.60%
Upgrade existing park roads.	71.00%	48.90%	49.30%
Develop more visitor centers.	49.00%	29.30%	26.60%
Provide more picnic areas.	68.00%	52.70%	40.80%
Develop tourist resort facilities on park lands.	41.00%	23.80%	30.70%

2004 questions that were phased out:

2004 TYPE OF DEVELOPMENT	% Support
Develop more drive-in campgrounds for tents.	60.80%
Provide flush toilets and drinking water in all campgrounds.	37.30%

New statements for 2009:

2009 TYPE OF DEVELOPMENT	% Support
Maintain Existing Trails	87.70%
Improve maintenance of existing facilities	74.10%
Develop more campgrounds	54.10%
Increase the level of law enforcement	54.00%
Develop new parks and recreation areas (buy new land)	49.00%

Despite strong support for the facilities and improvements mentioned above, when presented with the choice of using limited funds for facility development or maintenance, respondents increasingly favored improving the maintenance of existing facilities.

	1992	**1997**	**2004**	**2009**
Maintain	74.70%	77.30%	78.70%	84.30%
Develop New	23.30%	17.40%	16.09%	11%
Don't Know	2.00%	5.30%	5.20%	4.70%

Respondents were then asked to state if they agree or disagree with a series of statements. Here are the results of those statements as compared to 2004:

Statement	**Agree**	
	2004	2009
Use of park areas should be controlled to protect the environment, if necessary.	88.31%	78.21%
Parks and recreation facilities are often too crowded when I want to use them	40.19%	39.40%
If overcrowding occurs, commercial uses should be limited before personal uses are limited.	82.62%	80.40%
There are enough parks and recreation lands that are convenient and accessible to me.	64.49%	60.30%

The state should increase protection of areas with historical or archaeological value.	66.77%	63.40%
The state should acquire private land when it blocks or restricts access to existing parks and facilities.	68.92%	66%
Trails should accommodate many different types of activities, rather than be designated for a limited number of specific activities.	50.80%	78.20%
Public parks and recreation programs help to reduce crime and juvenile delinquency in my community.	67.77%	64.80%
Parks and recreation lands should be used to promote tourism.	64.12%	65.20%
Existing parks should be expanded to include adjacent land that is important to recreation.	75.47%	67.40%
I seek out recreational places that have historic significance.	38.75%	39.80%
Access to military lands for recreation purposes should be improved.	55.81%	64.40%
Hearing motors or motorized vehicles negatively affects my recreation experience	60.89%	51.90%

Alaskans want better access to outdoor recreation opportunities. Sixty-six percent responded that the state should acquire private land when it blocks or restricts access to existing parks and facilities. Seventy percent responded that the state should develop new parks for existing state land. Forty-nine percent support buying land to develop of new parks.

The only major shift is that almost 28% more stated that they think that the trails should accommodate more types of users. Seventy-eight percent said trails should accommodate different types of activities, rather than be designated for a limited number; 52 percent said hearing motorized vehicles negatively affect their recreation experience. Over 40 percent of households report that facilities are often crowded when they want to use them.

Recreation Provider Survey Results

A total of 165 community and regional outdoor recreation providers throughout the state were asked to rank in order of importance the outdoor recreation needs in their communities and regions. The categories provided were:

- Park land acquisition
- Developed facilities
- Recreation programs
- Disabled access
- Maintenance of existing facilities

Thirty-nine providers (24% percent of those surveyed) responded.

Statewide, maintenance is highest priority need overall; Develop facilities became the second; access to existing facilities ranked as the third highest priority need; need for organized programs and trained staff came in fourth; and land acquisition ranked as the fifth priority.

Facility Needs

Responding providers identified the following specific facility needs (in order of priority):

1. Trails (new, designate existing, signage)
2. Maintenance

(These top 2 categories were identified by the majority of respondents; all other facility needs were less common.)

Barriers to Meeting Outdoor Recreation Needs

Providers were asked to identify the most significant barriers to outdoor recreation in their communities. Consistent with the last survey, common to all and foremost is the chronic lack of funding for outdoor recreation facility development, maintenance and supervised programs. Providers identified access issues to facilities and recreation areas. Also the shortage of land suitable or available for development, and lack of connecting trails, as significant barriers. Respondents also report climate or seasonal conditions as the significant barrier.

Other noted barriers included: accessibility by persons with disabilities, gas prices, safety, closing or restricted use of private or corporation held land, overcrowding of existing facilities, and lack of knowledge about location of facilities.

The Applicant summarizes the above data from SCORP as follows:

Alaskans place a high value (96%) on the availability and quality of outdoor recreation opportunities. The public indicated in the recent SCORP survey that they would like to see new parks and recreation areas as well as expand the public use cabin system, as amongst their highest priority. However, there is also high support for using the limited funds available, when given the choice, for maintenance of existing trails and improved maintenance of existing facilities; recognition of what the priorities need to be under the current economic conditions.

Alaskans want better access to outdoor recreation opportunities and want trails to accommodate more types of users. Statewide, maintenance is the highest priority need overall; develop facilities became the second; access to existing facilities ranked as the third highest priority need; need for organized programs and trained staff came in fourth; and land acquisition ranked as the fifth priority.

The Applicant addressed the SCORP by conducting a recreation and subsistence survey of P.O. box holders at the Hyder PO. Of the 60+ survey forms sent out, only 8 were returned. Based on this survey, in general, the project area is used for recreational bear hunting, and recreational and subsistence crabbing and fishing. The Soulé River

Hydroelectric Project is an isolated location 9 miles south of Hyder on Portland Canal. The project site is only accessible via boat, floatplane, or helicopter as no roads exist to or near the site. As mitigation for developing this remote location, the project will provide a float within the barge basin for recreational boaters to use as a safe haven from stormy weather and for accessing this watershed. Project features will provide a road to access the watershed for 0.8 miles before reaching a tunnel that will be closed to human and wildlife access for safety. This would provide some improved recreation for Upper Portland Canal. To go further into the watershed however, will require bushwhacking approximately 1,900 feet to the opposite end of the tunnel, which may inhibit most recreationist due to the terrain and thick brush encountered. The Applicant is not considering trails for recreationist because of the 30+ feet of snow that occurs at this location each winter, which may make maintenance a cost prohibitive issue. Because little hunting occurs in the project area, subsistence use is not likely to significantly increase with the access this project will provide because the game species just aren't there.

The Soulé River Hydroelectric Project is consistent with the Alaska Coastal Management Program because:

(1) It does not negatively impact the socio-economics of Hyder, Alaska or Stewart, B.C. because it will provide temporary construction jobs for between 100-200 people for approximately 4 years and then a small number of people to permanently operate the project. During construction, lodging, restaurants, grocery stores, gas stations, construction companies, hardware stores, and other services will be needed, which will economically benefit the Upper Portland Canal communities.

(2) Subsistence activity is not impacted, but is slightly enhanced by providing better access into the watershed that is otherwise steep, rugged, terrain with dense brush that lays at a 45 degree angle or more to the ground (due to 30+ feet of snow annually), making hiking difficult. Having a location to dock in the barge basin may also be useful to subsistence activity.

(3) Wildlife populations are depauparate and those present are low in numbers while not containing any TES species in the Project area nor do the Project features provide barriers to their movement

5.4 Unavoidable Adverse Impacts

The unavoidable adverse impacts to recreation and land use for the Applicants Alternative starts with the Land Use Designation and the Roadless Rule that currently guides the Forest Service. This alternative is currently in conflict with both the Roadless Rule and the LUD for this site. However, there is no reason why the Roadless Rule cannot allow site specific modifications to the Rule to allow development, particularly when it comes to renewable energy resources, which is a part of our National Energy Policy. Similarly, the LUD should be modified to fit the narrow corridor of the project while maintaining the existing LUD around the project, and thereby only modifying a small portion of the area. This too will allow a renewable energy project to go forward and help offset the U.S. dependence on fossil fuels.

As mentioned before under **Need for Power**, the Western Electricity Coordinating Council (WECC) published its 2009 Power Supply Assessment, which concluded that there would be a supply deficit in the WECC region after 2013. After 2015 the deficit would be approximately 2,900 MW and the deficit grows by approximately 3,000 MW per year. The deficit is expected to be approximately 12,000 MW by 2018.

We conclude that power from the Soulé River Hydroelectric Project would help meet a need for power in the WECC region in both the short and long-term. The project provides low-cost, renewable power that displaces nonrenewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities will avoid some power plant emissions and creates an environmental benefit. At least 27,000,000 gallons of fossil fuel (diesel) will be displaced on an annual basis by this project, which is equivalent to 540,000,000 lbs of CO^2.

Hydropower has been the primary source of renewable energy in the United States and the world for many decades. It is often at odds with the environmental community because of detrimental environmental effects of some large projects that have been built in the past. However, there will be increasing demand for projects where environmental effects are small. The Soulé River Project is in this category, since anadromous fish cannot access the river due to velocity and fall's barriers starting at the river mouth, wildlife usage of the area is light (depauparate), and human usage is practically non-existent, which is also due to the dense brush, partially caused by the crushing weight of 30+ feet of annual snow. This project can market its power to the WECC to offset the current use of fossil fuels mandated by many of the western states.

The Applicant requests that the Commission requests preliminary 4(e) conditions from the Forest Service, because of the submittal of this Preliminary Draft EA, so that the Ketchikan Ranger District can inform the Department of Agriculture in D.C. to set a timeline to accomplish this. The preliminary 4(e) conditions are necessary for the final license application so that project design and comments can address the conditions.

"*Each of us has a part to play in a new future that will benefit all of us. As we recover from this recession, the transition to clean energy has the potential to grow our economy and create millions of jobs -– but only if we accelerate that transition. Only if we seize the moment. And only if we rally together and act as one nation –- workers and entrepreneurs; scientists and citizens; the public and private sectors*."

-PRESIDENT OBAMA, JUNE 15, 2010

The impacts to land use that would occur from this change were spelled out above in this document, but in short this project would impact the Remote Recreation LUD by:

- Reduce the amount of unmodified natural setting for primitive types of recreation
- Reduce opportunities for independence, closeness to nature, and self-reliance

- Reduce the quality of the high Scenic Inventory Objective (SIO) for this location

Although these impacts would be limited to the project corridor, the project would provide easier access than what is otherwise an undeveloped location that presently requires total self-reliance, independence, and a primitive type of recreation.

From an environmental standpoint, there would be the clearing and opening up of the watershed to easier foot access, whereas currently only a floatplane would be able to get into the watershed by landing at No-Name Lake (although, there is a 1,900-foot-long tunnel section of access road only 0.8 of a mile in from the shoreline that will be closed to public access, forcing those interested to bushwhack around or through the existing natural barrier of rugged, steep, brushy slopes, so easier access is somewhat relative). Visual impacts would exist at the north delta where the marine access facilities are located, which would consist of a barge basin and a staging area, all of which would consist of riprap as far as visibility and offer a low profile from the VPR. The rest of the project should be out of sight to recreationist along Portland Canal. A visual simulation is included in this EA and in Appendix T – *Visual Simulation Analysis* from a vantage point in the middle of Portland Canal (Visual Priority Route) directly out from the river delta to show what visual impacts would occur (see Figure 90); which is more thoroughly analyzed in Section 3.12 Aesthetic Resources.

There would be no long term impacts to harvesting crab in Glacier Bay and fishing in Portland Canal would not be impacted. Bear hunting (which appears to be by recreationist) may have reduced opportunities on the delta if loss of forage from project features means that the bears spend less time at the delta. However, bears would expand their habitat into the watershed as the bears begin utilizing the corridors of clearing, being the opportunists they are, potentially offsetting loss of forage on the delta as they find wetlands before the road tunnel. A form of mitigation would be to seed the staging area after construction with grass seed native to the delta to replace and possibly enhance wildlife forage habitat. Dolly Varden in No-Name Lake are not likely to experience significant increased harvesting, because this will still be a difficult lake to access due to the access road tunnel and having to bushwhack 3+ miles through dense brush on steep, rugged slopes to get around the reservoir to the lake as well. The project should not impact the sustainability of the No-Name Lake Dolly Varden population because all activity but spawning occurs in the lake and the spawning occurs above the propose full reservoir, although some juvenile rearing occurs down to Waterfall Creek, a distance of approximately 3,500 feet from the lake. The reservoir would cover when full approximately 1,900 feet of the juvenile rearing habitat. The reservoir will also provide its own habitat.

The unavoidable adverse impacts associated with this project can be addressed by changing the LUD. No other adverse impacts are expected to occur with the project design, environmental plans, and mitigations proposed.

5.5 RECOMMENDATIONS OF FISH & WILDLIFE AGENCIES

(will be listed here by agency and date received)

6.0 *DRAFT* FINDING OF NO SIGNIFICANT IMPACT (FONSI)

PURPOSE

Soulé Hydro, LLC proposes to build a storage hydroelectric facility on the Soulé River to provide renewable electric power through the North American electric grid to offset fossil fuel power generation in the U.S.

NEED

Hydroelectric development of the Soulé River is proposed at this time because there is an increasing demand for hydroelectric generation in British Columbia and the western United States. The demand is due to 1) increasing electrical usage, and 2) a shift to using more renewable energy sources of power (such as hydroelectric generation). More coal-fired powerplants are being built in the Lower 48 and more are being permitted all the time. Because of cheap coal the U.S. energy sector is heading in the wrong direction with fossil fuels that will continue to emit greenhouse gases (GHG) and particulate matter. This is a short sighted policy.

Meanwhile, the Western Electricity Coordinating Council (WECC) published its 2009 Power Supply Assessment showing that there will be significant power deficits on the power grid in the near future, meaning that more capacity is needed. The Soulé River Hydroelectric Project would help meet a need for power in the WECC region in both the short and long-term. The project provides low-cost, renewable power that displaces nonrenewable, fossil-fired generation and contributes to a diversified generation mix now required by national and state policies. Displacing the operation of fossil-fueled facilities will avoid some power plant emissions and creates an environmental benefit. At least 27,000,000 gallons of fossil fuel will be displaced on an annual basis by this project, which equates to 540,000,000 lbs of CO^2 air emissions.

Utilities and system planners are also facing a resource shift due to concerns associated with climate change. GHG's are primarily associated with our civilization's dependency upon fossil fuels for our energy needs. Consequently, there is a concerted effort underway to shift to other fuels and technologies that reduce or eliminate GHG emissions. The United States Congress is attempting to adopt legislation to require reductions in carbon emissions. President Obama has made GHG reduction a part of his national policy through the January 29, 2010, Executive Order 13514 to spur clean energy investments that create new private-sector jobs, drive long-term savings, build local market capacity, and foster innovation and entrepreneurship in clean energy industries. This project is in line with national policy.

PROPOSED ACTION

The Applicant (Soulé Hydro, LLC) proposes to construct a 77.4-megawatt (MW) hydroelectric project on the Soulé River, which drains into Portland Canal and is approximately 9 miles southwest of the community of Hyder in Southeast Alaska. The Project would occupy federal land administered by the Ketchikan Misty Fjords Ranger District of the U.S. Forest Service (Forest Service). Other lands involved are State of Alaska submerged land (submarine cable and other in-water structures) at the Soulé River, Portland Canal, and Canadian waters at the Stewart, B.C. waterfront. Project features:

- 265-foot-tall by 903-foot-long main dam
- 2,024-foot-long saddle dam
- ~1,072 surface acre reservoir with ~102,300 acre-feet of storage
- 16-foot-diameter by 11,400-foot-long power tunnel from portal to portal
- 3.1-mile-long by 20-foot-wide access road, which includes a 1,900-foot tunnel
- 120-foot-long bridge to cross the river
- 80-foot-wide by 160-foot-long by 55-foot-tall powerhouse
- substation next to the powerhouse with 3 30,000 kVA 13.8-138 kV transformers
- ~10-mile-long 138 kV submarine cable; landing at Stewart, B.C.
- marine access facilities: barge basin, dock, landing craft ramp, staging area
- 2.5 mile long 13.8-138 kV overhead transmission line around Stewart, B.C. to the BC Hydro substation
- Total wetlands impacted: ~177 acres.

Project clearing will require the following:

- Reservoir – 1,076 acres (clear to normal reservoir el 575)
- Dam area – 30 acres
- Powerhouse area – 3 acres (includes only forested area)
- Access road – 16 acres (based on average clearing width of 60 feet)
- Total – 1,125 acres

ENVIRONMENTAL ANALYSIS

Wetlands

The Applicants Alternative will require excavation and fill to occur at wetland locations. Such activities are subject to the regulatory authority of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Wetlands are also protected under Executive Order 11990, *Protection of Wetlands*, which is designed to establish a national policy "*to avoid to the extent possible the long- and short-term impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative*."

The ArcGIS GIS statistics function has measured 143 acres of wetlands mapped in and around the project area. Of those, 49 acres are classified as bog (PEM1Yag)), 37 acres are intertidal wetlands (E2EM1N), 35 acres are beaver ponds - active and inactive(PEM1b & PEM1bd), 13 acres are beaver pond/fen complex wetlands (PEM1), six acres are fens (PEM1) and two acres are bedrock-controlled ponds (PAB3).

Within the 1,072 acres impacted by the reservoir, 52 acres of wetland were mapped and 122.6 acres of riparian habitat, for a total of ~177 acres, as shown below. Please see the *Wetland Delineation* report in the Appendices for additional information. The wetland delineation map is shown in Figure 79 with the project features overlaid.

The following are the acres of wetlands to be impacted by each project feature:

Reservoir: 174.6 acres (at full capacity)

Main Dam: 0.25 acres

Saddle dam and spillway: 0.35 acres

Access Road: 0.15 acres

Spoil storage sites: 0.1 acres

Quarries: 0.2 acres

Powerhouse/tailrace/substation: 0.3 acres

Marine Access Facilities: 1.25 acres

Total Wetlands Impacted: ~177.2 acres

"*Because the valley bottoms are all course, well-drained, alluvial material, the beaver dams, both the active and the recently dewatered, are the only wetlands we found on the valley floor.*"[85] The Reservoir will flood the North Fork valley to within approximately 0.3 mile of No-Name Lake, covering approximately 52 wetland surface acres at full capacity plus the additional riparian wetlands totaling 122.6 acres. Beaver dams, both active and inactive, are responsible for the many pockets of wetlands along both flanks of the North Fork. These wetlands are dynamic in that they change from year to year as the beaver population moves from one location to another. Some abandoned beaver dams show signs of a significant force breaching the dams, possibly related to the approximately 30+ feet of snow received each winter and the result of spring thaw. Covering these wetlands is unavoidable in order to fill the Reservoir and generate 77.4 MW of electricity. Though the project Reservoir will covered these wetlands with water, the wetlands were found to not have sensitive or rare plant species. Also, the habitat type is not unusual for this watershed or the area in general as there is plenty available outside the project. Signs of beaver building dens in other locations below the dam site and above the full Reservoir along the North Fork show they will adapt to loss of habitat in the North Fork and some beaver habitat will remain between the full Reservoir and the lake. The Reservoir will

[85] Wetland Delineation Report – Appendix E.

not significantly impact wetlands in the area because they are not unique in their flora or fauna.

The Saddle Dam and Access Road at the Saddle Dam will likely be in a wetland (PEM1/SS1B), filling in approximately 0.35 surface acres. Filling in this wetland is unavoidable in order to contain the reservoir sized to generate 77.4 MW of electricity. This wetland type is prevalent in the area, outside of the project boundary. No sensitive or rare plants were found in these wetlands. No distinct or special habitat was found in this area, making the available habitat common.

The Access Road will pass through approximately 0.15 acres of wetlands, including PSS1/FO4B and possibly PSS1/EMIB. Due to the terrain, avoidance of these wetlands would be difficult. No sensitive or rare plants were found in these wetlands. No distinct or special habitat was found in this area, making the available habitat common to the watershed and Portland Canal.

The Quarries at the dam site will excavate a PEM1/SS1B wetland to create the southern shoulder for the Main Dam and northern shoulder for the Saddle Dam. The removal of this wetland is unavoidable as part of this project. The Quarry will eventually become a staging area.

The Powerhouse and Substation will be on uplands, avoiding E2EM1P wetlands. The Powerhouse and Substation were moved back from the wetlands to reduce impacts to the delta. The Powerhouse Tailrace will pass through a small part of E2EM1P wetlands and discharge into the river mouth. This is unavoidable because the Tailrace must reach water for the discharge. No sensitive or rare species were found on the delta. An invasive species, sow thistle, was however found on the delta.

The Marine Access Facilities, including the barge basin, landing craft ramp, dock, and staging area and will be in a combination E2EM1P wetlands and uplands at the north river delta. The placement of these project features on the delta is unavoidable, however, more of this wetland habitat is available on the delta than will be removed (~25%-30% of the delta will be covered by project features). The south delta will remain undisturbed. No sensitive or rare species were found on the delta. The invasive species sow thistle was however found on the delta. The Marine Access Facility was moved from further north in Glacier Bay, thus avoiding more significant impacts to crab habitat due to fill. Fill will now occur on the delta rather than into the depths of the bay.

Avoidance, Minimization, and/or Mitigation of Effects:
Most wetlands are avoided by this project. To avoid the placement of the Access Road in wetlands, a 1,900-foot-long tunnel will be constructed, avoiding approximately 1.8 acres of PSS1/FO4B wetlands. A PEM1C wetland will be avoided by routing the Access Road around it. To avoid Dolly Varden Creek, a bridge or large conduit will be used to minimize potential impacts to this wetland habitat, including the maintenance of as much riparian habitat as possible. The Power Tunnel, or water conduit, will be 11,400 feet long and will avoid approximately 15 acres of surface disturbance, 2/3 of which would be in PSS1/FO4B and PFO4/SS1B wetlands if on the surface. The Powerhouse and Substation were moved back from the delta into the trees to avoid approximately 1.3 acres of E2EM1P wetlands and help minimize overall impacts to the delta, including the

maintenance of bear forage habitat. Placement of project features on the delta will cause the loss of approximately 1.25 acres of wetland habitat, but to minimize impacts the project features will be kept to a minimum of clearance as necessary for the construction of these features while avoiding unnecessary impacts to the remaining delta wetlands. Erosion and sedimentation control measures will be used at all project construction locations to control erosion and contain any sedimentation that might occur to avoid impacting wetlands. Because wetlands will primarily be avoided by project features, except for the flooding of the North Fork valley, which will provide additional rearing habitat for juvenile Dolly Varden (which helps mitigate wetland loss), the fact that there is no special habitat supporting TES flora or fauna and the existing habitat is also found outside the project boundary, and with the environmental measures to protect wetlands listed in this analysis, impacts to wetlands have been avoided and minimized as much as practicable and a finding of no significant impacts to wetlands is recommended. In addition, because the Applicant proposes to eliminate the invasive species sow thistle from the deltas, this will improve these wetlands because this invasive plant will no longer force out the native flora species. Seeding of the delta staging area with native grasses currently on the delta will replace and potentially improve forage habitat for bears.

Water Resources

There are numerous surface waterbodies located in the Proposed Action area. Water resources are regulated by a number of laws including the Wild and Scenic Rivers Act (16 USC1271-1287), the Safe Drinking Water Act (SDWA) and, most notably, the Clean Water Act (CWA).

The waterbodies present in the project area are No-Name Lake, the West and North Forks, Main Stem of the Soulé River, and Portland Canal. Other waterbodies are streams, bogs, and fens that are abundant in the area. The project will not impact No-Name Lake as the project Reservoir will not reach it, nor will any roads or construction activity come closer than activity at the foot of the Main Dam and Intake Structure, 3+ miles away. The North Fork will be inundated by the reservoir except for its first 0.3 miles below the lake. About 0.75 miles of the West Fork will be inundated. The Main Stem will see reduced flow for most of the year. Portland Canal as a waterbody will not be impacted. None of these waterbodies will have their drainage patterns altered. In general, waterbodies are avoided. The water used for project operations will be discharged back into the river at its mouth, continuing to transport sediment to the delta from its natural mixing point.

Avoidance, Minimization, and/or Mitigation of Effects:
Bodies of water will be avoided as much as possible for project feature placement. No driving through bodies of water will occur. Bridges and culverts will be used to avoid waterbodies, where necessary. Appropriate erosion and sedimentation control methods will be implemented to prevent sedimentation of any waterbodies in the project area. Revegetation will also protect waterbodies from future erosion and sedimentation. Because local rock has a low probability of causing acid rock drainage, if any imported rock is to be used it needs to have an acid rock analysis conducted prior to depositing on site. Because water quality can be maintained with the methods described above, a finding of no significant impacts to water resources is recommended.

Floodplains

Executive Order 11988 directs Federal agencies to take action to avoid, to the extent possible, the long and short-term adverse effects associated with the occupancy and modification of floodplains.

"*Because the valley bottoms are all course, well-drained, alluvial material, the beaver dams, both the active and the recently dewatered, are the only wetlands we found on the valley floor.*"[86] The North Fork floodplain will be flooded by the reservoir to within 0.3 miles of No-Name Lake. This is an unavoidable impact from this project. However, the available habitat in this floodplain is not unique, is depauparate of both flora and fauna, has no unique habitat or flora or fauna species and does not contain TES species. This habitat type exists elsewhere in this drainage and elsewhere in the Portland Canal area. Additional habitat is created by the reservoir.

Avoidance, Minimization, and/or Mitigation of Effects:
Disturbance within floodplains would be minimized by avoiding impacts to the upper portion of the West Fork, upper 0.3 miles of the North Fork, and Main Stem as much as possible. Though the North Fork will be flooded by the Reservoir, roads will not be constructed into the North Fork for logging, but instead cut trees will be floated out to the dam once the Reservoir fills. Methods to avoid impacting floodplains would be to avoid disturbing wetlands and drainages as much as possible and keeping the project construction corridor as narrow as possible, which will help limit impacts. Use of an Erosion and Sedimentation Control Plan will minimize impacts to floodplains. Best Management Practices will also prevent mass wasting, erosion, and sedimentation during the construction of the project and provide protection to the watershed after construction. The reservoir will provide shoreline and lake habitat in place of the wetlands that were flooded and more rearing habitat is being created by the reservoir for juvenile Dolly Varden. Beaver will still have habitat between the lake and full Reservoir, and elsewhere in the watershed. Discharge from project operations will go back into the river at the river mouth. Because the Reservoir will replace wetlands with other low to high value habitat, and the methods to avoid and minimize impacts to floodplains as previously described, a determination of no significant impacts is recommended.

Air Quality

The Clean Air Act (CAA) of 1970 as amended requires that the State develop a State Implementation Plan (SIP) to outline the State's ambient air quality standards. The State of Alaska Department of Environmental Conservation (ADEC) has the primary responsibility for attainment and maintenance of ambient air quality standards under the provisions of the Clean Air Act. The State of Alaska's SIP (18 AAC 50.700) ensures that any transportation plan, project, or federal action within a non-attainment or maintenance area will not hinder attainment of Nation Ambient Air Quality Standards (NAAQS).

To date, the ADEC has classified the entire Tongass National Forest, including the project area, as a Class II airshed. Class II airsheds do not have specific attainment criteria under the Clean Air Act. A Class II airshed is designated for the purposes of Prevention of Significant Deterioration, this designation allows moderate industrial air pollution concentration increases.

[86] Wetland Delineation Report.

Construction of this project would create limited and short term increases in air emissions from diesel powered machinery to construct the project. Air emissions are not expected to exceed State of Alaska ambient air quality standards (18 AAC 50) because of the short term use of this machinery.

Avoidance, Minimization, and/or Mitigation of Effects:
Even though during project construction there will be short term increases in air emissions from diesel powered machinery, the State of Alaska ambient air quality standards (18 AAC 50) should not be exceeded. This project, once in operation will have a beneficial impact of eventually offsetting fossil fuel air emissions and the use of at least 27,000,000 gallons of fossil fuel on an annual basis; which equates to 540,000,000 lbs of CO^2 air emissions being eliminated annually. No significant impacts to air quality should occur and a finding of no significant impacts is recommended.

BIOLOGICAL ENVIRONMENT

RARE/SENSITIVE PLANTS

Forest Service sensitive species are defined as: "*Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:*

1. *Significant current or predicted downward trends in population numbers or density.*
2. *Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution*" (Forest Service Manual 2670.5.19).

A rare and sensitive plant survey was conducted in 2009 by a botanist and ecologist. Flora in this watershed was found to be depauparate. No rare or sensitive species were found in all the areas surveyed.

Avoidance, Minimization, and/or Mitigation of Effects:
The design of the project and construction considerations for minimizing impacts to rare/sensitive plants and intact habitats include: remaining primarily within the narrow corridors needed for project features, only disturbing land when necessary; avoiding habitat that is best suited to rare and sensitive species as much as possible; using an Erosion and Sedimentation Control Plan to prevent impacts outside the project features; and, use methods to prevent invasive species from spreading into the watershed. Because no rare or sensitive species were found at the project site and because of the methods to avoid, minimize, or mitigate impacts to the environment proposed in this analysis, a finding of no significant impacts to rare or sensitive plant species is recommended.

INVASIVE SPECIES

Activities related to project construction can contribute to the spread of invasive species directly by spreading seeds and/or plant material, or indirectly by disturbing soil and/or removing native vegetation, allowing a more competitive non-native plant to move in. Since this project has the potential to spread invasive species into the Soulé River Watershed, it is subject to Executive Order 13112 which states that all Federal agencies "*prevent the introduction of invasive species; detect and respond rapidly to and control populations of such species,*" and specifically requires that agencies shall *"not authorize,* *fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.*"

An invasive species study was conducted of the project site in 2009. One invasive species, the sow thistle, was found on the north and south river deltas of the Soulé River.

Avoidance, Minimization, and/or Mitigation of Effects:
Construction of the project on the north river delta will make it impossible to avoid the sow thistle. To minimize the potential of spreading sow thistle throughout the site, the Applicant will implement an Invasive Species Elimination and Monitoring Plan with measures to eliminate this invasive species from the two deltas as well as have a plan to prevent the spread of this species into the watershed during construction and a monitoring plan for post-construction. Because invasive species can be contained and the Applicant has a plan for eradication and monitoring, a finding of no significant impacts from invasive species is recommended.

MARINE WILDLIFE

The Marine Mammal Protection Act of 1972 (MMPA) prohibits the "take" of all marine mammal species in U.S. waters. The MMPA requires consultation with National Marine Fisheries Service (NMFS) on projects that may affect marine mammals.

Marine mammals should not be impacted by this project, particularly because salmon do not use the Soulé River, which would be a significant attractant for them.

Avoidance, Minimization, and/or Mitigation of Effects:
The project would have no effect on marine mammals because although they may pass by the site going up and down Portland Canal, there is no attractant for them to the site and none were observed using the site during the 123 Field-Observations-Days that occurred from 2007 through 2009. Because marine mammals do not frequent the project site and due to measures to be implemented to avoid, minimize, or mitigate impacts to the environment, a finding of no significant impacts to marine wildlife is recommended.

FISHERIES RESOURCES

Anadromous fish streams are considered Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act. The Magnuson-Stevens Act requires agencies to consult with the National Marine Fisheries Service (NMFS) on projects that may adversely affect EFH. Fisheries resources are also protected by state authorities under the Anadromous Fish Act (AS 16.05.871) and the Fish Way Act (AS 16.05.841). Resident fish streams are also protected under the Fish Way Act.

No salmon were found to use the Soulé River Watershed. Dolly Varden (Salvelinus malma malma) is the only species to use the watershed, but they are unable to return to the river if washed down stream because of numerous anadromous barriers throughout. The Dolly Varden mainly resides in No-Name Lake at the headwaters of the North Fork and Dolly Varden Creek, which is a small tributary on the Main Stem (these two locations are also separated by anadromous barriers). Juvenile Chum salmon (O. keta) from Fish Creek on the Salmon River located nine miles north of the project at Hyder, each spring use the Soulé River delta to forage as they head out to the ocean. Riprap will be used on the sides of project features on the delta to eliminate or minimize erosion and sedimentation. The riprap will also provide some habitat for foraging juveniles because it will offer protection in nooks and crannies and provide more habitat diversity to the area.

Avoidance, Minimization, and/or Mitigation of Effects:
To avoid impacting the Dolly Varden spawning habitat at the lake outlet, the Reservoir at full stage will not cover the spawning habitat because it will only come within 0.3 mi. of the lake (1,600 feet), well below the spawning habitat reach, most of which occurs at or near the lip of the lake. The project will also avoid flooding most juvenile rearing habitat for the lake population in the upper North Fork, which only extends down to Waterfall Creek (as noted on Figure 63). The Reservoir will also create significantly more juvenile rearing habitat than presently exists. A minimum pool elevation will also be maintained in the Reservoir, reducing chances of stranding any fish that move into the Reservoir. The access road will avoid impacts to Dolly Varden habitat by using a single lane bridge over Dolly Varden Creek or by using a large, and perhaps bottomless, culvert. Project construction will confine ground disturbance to as small an area as possible, which will reduce opportunities for erosion and sedimentation. Erosion and sedimentation control measures will minimize impacts to all waterbodies. Use of on-site rock will help ensure there will be no acid rock drainage; based on the analysis for ARD that was conducted. On site mitigation of juvenile rearing habitat would consist of enhancement of rearing side channels in the upper section of the North Fork. Riprapping the project features on the delta provides more diverse foraging habitat for juvenile salmonids that presently doesn't exist at the delta; with the added benefit of providing some protection for predation because of the nooks and crannies riprap offers. Due to the methods of avoidance, minimization, and mitigation noted here, a finding of no significant impacts to fish habitat is recommended.

TERRESTRIAL WILDLIFE

Few game species were evident at the Soulé River Watershed; depauparate watershed. Sign of deer was present along the shoreline, although not observed, along with sign of both black and brown bear. Some bear sign and sounds were heard in the watershed, but not extensively considering the amount of habitat available. Overall, all species that were present were under represented. No unique or special habitats were observed in this watershed, making the available habitat common.

Avoidance, Minimization, and/or Mitigation of Effects:
Preventing impacts to habitat is the focus of the project design. Project construction will confine ground disturbance to as small an area as possible, which will reduce impacts to wildlife habitat. The upper 1/3 of a mile of the North Fork will be left undisturbed. No roads will be built in the Reservoir, but instead timber will be felled in place and allowed to float out to the dam for later removal. The Access Road will include a 1,900-foot-long tunnel section to avoid steep slopes and wetlands and also avoid the potential to fragment habitat. The Power Tunnel, or water conduit, will be a tunnel from the intake at the Main Dam to the Powerhouse, eliminating surface disturbance for approximately 11,400 feet, or up to 15 acres; avoiding wetlands, potential fragmentation of habitat, fauna movement barrier, potential impacts to undiscovered TES flora species, and avoiding significant visual impacts. A Bear Safety Plan will be implemented for construction and operation to reduce conflicts between bears and humans. Allowing for the continued movement of wildlife over the delta has been considered in the project design to prevent any barriers

by moving the Powerhouse, Substation, and Tailrace into the shoreline forest, reducing the number of structures on the delta, which also helps preserve flora they feed on.

An Erosion and Sedimentation Control Plan will be implemented to protect wildlife habitat. Boreal toad habitat will be avoided on the south delta and below the Main and Saddle dams. Wetlands will be avoided where possible to maintain sedges and forbs wildlife species forage on. No significant impacts will occur to terrestrial wildlife because similar habitat is available elsewhere in the same watershed as well as around Portland Canal; only common habitat was found in this depauparate watershed. A submarine cable will be used from the project to Stewart, B.C. rather than an overhead transmission line, even though overhead lines are less expensive. This is because the Applicant has taken into consideration the potential loss of habitat, habitat fragmentation, and potential conflicts with avian species an overhead line could create. Only a single lane road with pullouts will be used and only a single lane bridge across the river to minimize impacts to terrestrial habitat. On site materials will be used for fill of the dam and other structures rather than bringing rock from offsite with its potential contaminants, i.e. acid rock. No unique habitat is present that would be impacted. Because of project design and the methods listed above to avoid, minimize, or mitigate impacts, a finding of no significant impacts to terrestrial resources is recommended.

MIGRATORY BIRDS

According to the ADF&G, Division of Wildlife Conservation, there are approximately 160 migratory birds that actually nest in Southeast Alaska and many more that travel through Southeast on their migratory path (Schwan, 2005). A variety of migratory birds were observed within the project area, although they were not numerous. Migratory birds are protected under the Migratory Bird Treaty Act (16 USC 703-712), which prohibits the taking of migratory birds.

Migratory birds were few and far between in this watershed, although present, they did not occur in large numbers and do appear to be migratory rather than nesting in the Soulé River Watershed. No avian TES or sensitive species were observed or heard; a goshawk audio survey took place but none were seen or heard. Where some geese have used the wetlands and No-Name Lake, they will be able to use the reservoir and other wetland habitat that will remain around the project as well as continue to use the lake. Though songbirds were found at the site, particularly thrushes, their populations were considered to be small, as were all the avian species that were seen or heard. Avian species were found to have the greatest presence in this watershed, even though their numbers were low.

Avoidance, Minimization, and/or Mitigation of Effects:
To minimize impacts to migratory birds, project corridors will be kept as small as possible to limit the amount of vegetation removed. An 11,400-foot-long tunnel will be used for the water conduit to avoid surface disturbance, and a 1,900-foot-long tunnel will be used for part of the Access Road to avoid steep terrain and wetlands. An Erosion and Sedimentation Control Plan will be implemented to prevent habitat loss. A 10-mile-long submarine cable will be used instead of an overhead transmission line, which will eliminate potential avian conflicts with overhead conductor, even though overhead is less expensive. Due to the lack of migratory birds, project design, and the measures proposed

in this analysis to protect the environment, a finding of no significant impacts to migratory birds is recommended.

BALD AND GOLDEN EAGLES AND OTHER RAPTORS OF CONCERN

Bald eagles are protected under the Bald and Golden Eagle Protection Act of 1940 (16 USC 668-668c) and the Migratory Bird Treaty Act of 1918 (16 USC 703-712). The National Bald Eagle Management Guidelines was developed by the U.S. Fish and Wildlife Service (USFWS) as a tool to provide recommendations on management activities and practices to avoid or minimize adverse impacts to bald eagles; though these recommendations are not law, adhering to the guidelines help avoid violations under the Bald and Golden Eagle Act.

Other raptors of concern include the Southeast Alaska population of the Queen Charlotte goshawk (*Accipiter gentilis laingi*). The Forest Service has also designated the goshawk as a Sensitive Species (USDA Forest Service Alaska Region, 2009). An audio survey for goshawks was conducted during the summer of 2009, but no sightings occurred or responses were heard. An osprey did respond to the audio and another osprey was seen flying along the shoreline, north to south during the summer of 2008. Bald eagle surveys took place in 2008 and 2009. Bald eagles were observed along the shoreline of Portland Canal, but not within the watershed. None of the eagles observed were in pairs. The two bald eagle nests, one north of the project and one south of the project on the canal, did not exhibit nesting activity either in 2008 or 2009.

Avoidance, Minimization, and/or Mitigation of Effects:
Neither existing nest, north and south of the project, is within 330 feet of where construction activity will occur, thus minimizing any potential to impact nesting eagles. Prior to construction starting (if construction starts during nesting season), another eagle nest survey will occur to ensure nothing has changed in this regard. Should an active eagle nest be found closer than 330 feet from construction activity, activity in that area will cease until after any eaglets has left the nest. Due to the lack of eagle nest use, lack of forage species to attract eagles, and the project design and environmental measures proposed in this analysis, a finding of no significant impacts bald eagles or other raptors of concern is recommended.

THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) of 1973 provides for the protection of fish, wildlife and plant species that are listed as threatened or endangered in the United States. The ESA prohibits the "taking" of listed species and, under certain circumstances, regulates activities that impact critical habitat. Federal agencies are required to consult with both Fish and Wildlife Service and the National Marine Fisheries Service under Section 7 of the ESA.

No listed TES species were found using this watershed. On two separate occasions a single osprey flew by the project along the shoreline, including one that responded to the goshawk audio survey, but no listed species were observed in the watershed, nor were they heard, nor was there sign of nesting or foraging activity. Wildlife species were found to be depauparate in this watershed.

Avoidance, Minimization, and/or Mitigation of Effects:

Project construction practices to limit disturbance of the ground and vegetation, including the use of tunnels and a submarine cable, will minimize the potential impacts to wildlife habitat. In addition, the Erosion and Sedimentation Control Plan will also protect habitat. Since no TES species were observed using the watershed it is unlikely they will be impacted by project construction and operation. TES species may migrate by or through the watershed and project construction may temporarily make them avoid the area. Considering that no TES species in 123 Field-Observation-Days (2007-2009) were observed using the watershed, and with the project design and environmental measures proposed in this analysis, a finding of no significant impacts to TES species is recommended.

CULTURAL RESOURCES

The National Historic Preservation Act (NHPA) of 1966 (as amended) outlines policies and procedures regarding "historic properties" included in or eligible for the National Register of Historic Places. Section 106 of NHPA requires that Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

A Cultural Resources survey was conducted with a finding of no cultural resources within the project boundary. Consultation has taken place between the Applicant and the local Alaska Tribes and Canadian First Nations. The archaeologist has also worked with FERC, SHPO, USFS, and communicated with the Alaska Tribes and Canadian First Nations. No one has expressed a concern regarding this project.

Avoidance, Minimization, and/or Mitigation of Effects:
Keeping the project clearing to the minimum necessary to construct the project, including limiting the ground disturbance will facilitate the prevention of disturbing any undiscovered cultural or historic resources. The project design avoids a significant amount of surface disturbance, reducing the opportunity for impacts to undiscovered heritage resources. If heritage resources are discovered in the course of construction, activity in that area would stop and the appropriate authorities would be notified. A Heritage Resource Protection Plan would be developed at that time to address the discovery. Because of the findings described above, a finding of no significant impacts to cultural resources is recommended.

SUBSISTENCE

The Alaska National Interest Lands Conservation Act (ANILCA) recognizes the importance of subsistence resource gathering to the rural communities of Alaska. ANILCA provides for "*the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands.*" It also legislates that "*customary and traditional*" subsistence uses of renewable resources "*shall be the priority consumptive uses of all such resources on the public lands of Alaska*." Federal actions must be evaluated for effects on subsistence, according to ANILCA, Title VIII, Section 810. In addition, Executive Order 12898, Environmental Justice, also directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife.

In the vicinity of the project, residents from both Hyder, Alaska and Stewart, B.C. conduct subsistence activities along Portland Canal, Glacier Bay, on the river delta, and offshore of the river delta. The dominant subsistence activities in the project vicinity are fishing and the taking of crab. Hunting at the Soulé River Delta is for bear and this appears to be primarily a recreational activity (hunting guide from Ketchikan uses this and other areas of Portland Canal). Deer hunting for subsistence primarily takes place further down Portland Canal or in Canada. Canada being so close and connected by road is the more popular location for deer and bear hunting.

Avoidance, Minimization, and/or Mitigation of Effects:
Noise, as well as human activity during construction activities on the delta may cause avoidance by bears during the day. Bears are occasionally hunted for recreation (subsistence?) on the delta. An effort to avoid bears when they are crossing the delta, whether by individuals or by construction equipment movement, will be followed to not disrupt or prevent their migration through the area. Construction is likely to disrupt hunting activity on the delta, at least during week days; should not occur during construction, as would be too dangerous for construction workers. After construction, bear and other wildlife will still be able to migrate up and down the shoreline and use the delta. With project features placed on the delta, consisting of approximately 6-7 acres that may contain some bear forage will be removed. Native grasses could be allowed to grow on top of the staging area to help offset this loss, including seeding the staging area to encourage the native grasses. Opening the watershed with the access road will also make additional forage habitat available for bears. Crabbing may be temporarily or periodically interrupted during construction because of boat activity, but the crabbing may take place far enough out in the bay to not be impacted; Glacier Bay is fairly large at a mile wide. Fishing off the delta should not be impacted at any time. Project design reduces the potential clearing for project features due to the use of tunnels and a submarine cable, helping to maintain habitat continuity. Based on the fact that this watershed has very little in the way of game species, no salmon, dense brush, very heavy snows, and limited use for subsistence, a finding of no significant impacts to subsistence resources is recommended.

RECREATION RESOURCES

Most recreational resources exist in the Hyder area, nine miles north of the project. Most bear hunting occurs in Canada or further down Portland Canal from the project. Deer hunting primarily occurs in Canada but also at the entrance to Portland Canal, about 70 miles away from Hyder. Crabbing in Glacier Bay and fishing in Portland Canal off the delta are also considered recreation by residents of Hyder. Other recreation may be boating or kayaking along the canal and could therefore occur near the river delta.

Avoidance, Minimization, and/or Mitigation of Effects:
Visual impacts will be minimized with the dam out of site of the visual priority route in the middle of Portland Canal. The Powerhouse and Substation will also be placed behind shoreline trees at the delta to hide them from view. The water conduit will be a tunnel so that no surface features will be visible. The features that are unavoidably visible will be riprap on the delta for the staging area and barge basin. The Access Road behind the delta as it leaves the delta and enters the trees and then emerges behind the Powerhouse as it goes over the shoreline ridge will also have some visibility. Recreational activity at

the Soulé River Watershed is not significant, due to the dense understory preventing penetration of the forest, and lack of wildlife and fish resources. The 30+ feet of annual snow also limits access to the watershed for a short summer period. Recreational activities at the project site that currently occur, which are only along the shoreline, are only expected to be temporarily interrupted during construction. Recreational opportunities may slightly increase with improved access into this watershed and a dock at the delta (which will also improve boater safety in the area). The visual quality for recreationists will be slightly impacted from the Visual Priority Route in Portland Canal, but the projects small footprint and low profile will help minimize this impact. For these reasons, a finding of no significant impacts to recreational resources is recommended.

LAND USE

The project is located on approximately 1,257 acres of National Forest Land within the boundaries of the Tongass National Forest, Ketchikan/Misty Fjords Ranger District. Therefore, the Proposed Action is subject to regulation under the National Forest Management Act (NFMA) of 1976 (as amended), which requires projects to be consistent with existing Forest Plans. The Tongass Land and Resource Management Plan (Forest Plan) guides all natural resource management activities and establishes management standards and guidelines for the Tongass National Forest (as amended, 2008).

The Soulé River Watershed is currently in a Remote Recreation LUD. In addition, all National Forest Lands are under the Roadless Rule, which prohibits the construction of new clearings in the forest unless approved by the head of the Department of Agriculture. The project, as designed, is confined to a narrow corridor that roughly parallels the Soulé River. The project, as designed, will use a 1,900-foot-long tunnel for part of the Access Road, a Power Tunnel instead of a surface penstock that is approximately 11,400 feet long, and a 10-mile-long Submarine Cable instead of an overhead transmission line. These three measures reduce the visual and environmental impacts to this area significantly, helping to retain qualities of the existing LUD and limit impacts to the forest, keeping the surface corridor very narrow, limiting environmental impacts, and retaining some of the existing LUD qualities.

Avoidance, Minimization, and/or Mitigation of Effects:
The Applicant proposes that the Forest Service modify the LUD for the lands within the project boundary to a Transportation and Utility Systems (TUS) LUD, or another less restrictive LUD, which will allow modification to the landscape. The Applicant also proposes that the land surrounding the project remain in the current Remote Recreation LUD, minimizing the impacts this project will have to the current land use of the area. In addition, the Applicant proposes that the project be confined to as narrow a corridor as possible to minimize impacts to the environment, which will also reduce the amount of land needed for reclassification to another LUD. The Powerhouse and Substation will be placed behind shoreline trees at the delta to hide them from view. Lastly, the Applicant proposes that they will follow their design to have 1,900 feet of the Access Road, over 11,000 feet of the Power Tunnel (water conduit) under ground, and 10-miles of Submarine Cable to reduce impacts to the environment and the LUD for the area. As the Applicant has made every effort to minimize project surface impacts to this watershed, and if the Forest Service will modify the existing LUD within the project boundary to a

less restrictive LUD, we recommend a finding of no significant impacts to land use for this project.

COASTAL MANAGEMENT

Under the Coastal Zone Management Act, Federal activities that affect any land or water use or any natural resource of the coastal zone must be conducted in a manner that is consistent to the maximum extent practicable with the enforceable policies of the applicable state coastal management program.

The closest enforceable Coastal Zone Management Policies are of the Ketchikan Gateway Borough (KGB) as the project is in the "Unorganized" Ketchikan Borough. Best Management Practices listed by the KBG that are appropriate are listed below:

CD/BP-10: New development should incorporate existing vegetation or landscaping within and around the property to minimize impacts from potentially conflicting uses.

CD/BP-12: New coastline development should be carried out subject to a site development plan (prior to clearing, dredging, grading, filling, and other site work) that addresses long term use and development of the entire parcel and, when appropriate, neighboring properties.

CD/BP-13: Extensive site grading and rock retaining walls should be minimized in shoreline development in favor of posts or piling construction, where appropriate.

CD/BP-15: Clearing natural vegetation within the beach fringe should be minimized to maintain ecologic diversity and the abundance of plants and animals.

CD/BP-17: The flow of natural creeks and drainage channels should be maintained, thereby preventing erosion and flooding.

H-3 Disturbance of tidelands should be minimized. Operation of machinery and equipment on tidelands should be contained in the smallest area practicable.

H-4 To the maximum extent practicable, fill should be placed on tidelands only when exposed by lowered tides.

H-5 Natural drainage patterns should be maintained, to the maximum extent practicable, without introducing ponding or drying. Appropriate ditching, culverts, and other measures should provide control of drainage.

H-6 Explosives should be discharged in a manner that is not likely to adversely impact wintering herring or other fish inhabiting the area. The Alaska Department of Fish and Game should be contacted for information concerning timing (typically between March 16 through October 1) and operational constraints.

H-8 In-water construction activities involving the dredging and deposition of fill, and pile driving should abide by reasonable timing restrictions set by ADF&G (typically March 1 to June 15).

H-10 Development activities should avoid raptor nesting. The U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game should be contacted for information concerning the known locations of raptor nest sites and appropriate criteria to minimize significant adverse impacts to nest sites and nesting activity.

Avoidance, Minimization, and/or Mitigation of Effects:
Existing vegetation will be used to screen the Powerhouse and Substation on the delta. Existing terrain will hide the dams and most of the Access Road. The water conduit will be underground, eliminating surface impacts. The licensing/permitting process will address site development. Riprap will be used for most shoreline development, which will diversify the existing fish habitat and will eventually have a marine patina to blend it in visually. Grass may also be grown on the staging area after construction to help blend the project in as well as provide wildlife forage habitat. Clearing on the beach fringe will be limited to a narrow corridor. Disturbance of tidelands will be limited to a narrow corridor and excavation will be kept to a minimum, relying on riprap over the tidelands. Fill on the delta will only occur when tides are lower than the fill activity. Drainage patterns will not be altered. ADF&G will be consulted regarding the discharge of explosives. In-water construction activity such as pile driving will abide by reasonable time restrictions set by ADF&G. In-water construction of the dam should not need the same restrictions. Prior to the start of construction, or at the start of nesting season if construction has not already started, a bald eagle nesting survey will be conducted along the shoreline. If construction is already occurring when nesting season starts, it is unlikely they will build nests within 330 feet of the activity and existing nests are almost a mile in either direction and should therefore not be impacted. Due to the lack of fish and game species in this watershed, eagles are unlikely to build nests very far inland from the shoreline.

Compliance with these coastal district enforceable policies listed above will be followed to avoid and/or minimize impacts. Because the Applicant will follow the above DCOM guidelines, potential impacts should be minimized and therefore a finding of no significant impacts to Coastal Management is recommended.

CUMULATIVE EFFECTS

This section presents the physical, biological, social and economic cumulative effects that will potentially occur within the project area. Cumulative effects are impacts which result from the incremental consequences of the proposed action when added to other past, present, and reasonably foreseeable actions (40 CFR 1508.7).

SCOPE OF ANALYSIS

For the purposes of this environmental assessment, the temporal scope for this cumulative impacts analysis includes actions occurring in the past 25 years and actions likely to occur within the next 30 years. The spatial scope for this cumulative impacts analysis includes actions that occurred in Upper Portland Canal and specifically Hyder. All foreseeable past and future actions are summarized below in Tables 28 and 29.

PAST AND FUTURE ACTIONS

Table 28 – All previous actions that have occurred in the past 25 years. A brief title of the action, agencies involved and the relevance to this Proposed Action are provided.

Actions	Lead/Supporting Agencies	Relevance
Past Actions		
N/A		No previous actions at this site

Table 29 – All foreseeable actions to occur in the next 30 years. A brief title of the action, agencies involved and the relevance to this Proposed Action are provided.

Actions	Lead/Supporting Agencies	Relevance
Future Actions		
No further actions at this watershed are anticipated in the future after this hydro project is constructed	Forest Service	No further activity will occur
Activity in Hyder will mainly center around road and dike maintenance and ADOT repairing or replacing the causeway	ADOT, Forest Service	Will take place in Upper Portland Canal,

The proposed project would not contribute appreciably to cumulative effects on the following resources: Vegetation/silviculture; rare and sensitive plants; wetlands; invasive species; fisheries and water quality; subsistence; recreation; land use; socioeconomics; cultural resources; air quality; and transportation. The potential secondary and cumulative effects of the proposed project are described below for these resources.

Rare and Sensitive Plants

Rare and sensitive plants were not found at the Soulé River Watershed. Past activities in Upper Portland Canal may have brought in the invasive species, sow thistle, which was only found on the north and south river deltas. Future development in the Upper Portland Canal area may continue to spread this and other invasive species. The Applicant has proposed methods to deal with sow thistle on the deltas. This project would not substantially contribute to actions in a manner that would cumulatively adversely affect rare and sensitive plant populations that may exist in other areas of Upper Portland Canal.

Wetlands

There is a prevalence of wetland habitats in and around the Soulé River Watershed. The small parts of wetlands filled, covered, or removed are well represented around the project and they would not be impacted. Developing the project corridor to avoid wetlands is the preferred method. The Applicant has proposed to do just that, where possible, and has in fact used in the design, tunnels to avoid some of this habitat as well as a road alignment to avoid wetlands. Use of a submarine cable will also avoid impacting wetlands of an overhead transmission line. In addition, the proposed Erosion and Sedimentation Control Plan will prevent and minimize impacts to wetlands along project features. The Applicant also proposes to keep the project corridor as narrow as possible, only disturbing soils and vegetation when necessary for project construction, but not inadvertently out of carelessness.

Future development in Upper Portland Canal may impact wetlands, but it is unknowable how significant this could be (our analysis of future hydropower development in the Hyder area showed sites to be economically and environmentally unfeasible). While the proposed project would contribute to cumulative wetland acreage losses in the project area, design measures such as staying in a narrow corridor, avoiding wetlands, using an effective Erosion and Sedimentation Control Plan, and using tunnels for the Access Road and water conduit, minimizes this action's contribution to adverse wetland impacts. Tradeoffs are also the reservoir providing more juvenile Dolly Varden rearing habitat and riprap on the delta providing more habitat diversity with foraging and protection from predation habitat for juvenile Chum. Therefore, the project would not substantially contribute to the cumulative wetland acreage loss in the project area.

Invasive Species

Past development of transportation corridors in Upper Portland Canal has contributed to the spread of invasive plants. In the past, roadsides were seeded with seed mixtures either containing or contaminated with the seeds of invasive plants. This, along with natural and transportation-related vectors, allowed many invasive species to become well-established in Southeast Alaska. Federal and state regulations now require mitigation and Best Management Practices (BMPs) for projects that may encourage the spread of invasive species. These regulations will help minimize the risk associated with future projects. This includes road development and other land disturbing activities such as timber harvest. The Applicants' *Invasive Species Elimination & Monitoring Plan* for sow thistle will reduce the abundance and spread of sow thistle on the Soulé River delta. With the Applicants proposed methods of dealing with the invasive species sow thistle, the project would not substantially cumulatively increase the Upper Portland Canal area's risk of introducing invasive species; the Applicants plan will reduce the presence of invasive species in the canal into the future, eliminating this site as a future springboard for future infestations throughout the canal. The eradication and monitoring plan proposed by the Applicant will reduce further transport of this invasive species further down the canal, unless this has already occurred.

Water Resources

In the past, construction and levee or road failure around Hyder has contributed to the sedimentation/turbidity of surface water in the area. Nature is a major contributor of sediment to Portland Canal waters as well (i.e. glacial flour from the Salmon River, Bear River, Soulé River, and yearly jokulhaups (glacial lake outburst floods) on the Salmon River. An acid rock analysis showed the project sites rock would not likely contribute to acid rock drainage. The proposed erosion and sedimentation control measures should protect water resources in the project area. The project discharge into the river mouth also will continue existing sediment transport from the river into Glacier Bay and the deltas. The project, if all mitigation measures are implemented appropriately, is unlikely to substantially contribute to cumulative adverse effects resulting from acid rock drainage or sedimentation, and therefore water quality should be retained.

Air Quality

The proposed project would not significantly increase particulate matter or green house gases in Upper Portland Canal during construction. The project would reduce the reliance on fossil fuels, most likely in the Lower 48, where there is a growing reliance on coal-fired powerplants. As an example, the amount of diesel fuel that would be offset by this project would be equivalent to 27,000,000 gallons on an annual basis. This would result in a reduction of a significant amount of CO^2 air emissions by 540,000,000 pounds (or 270,000 tons) annually, which adds up over time. This will result in a beneficial cumulative improvement in the area having its fossil fuel consumption offset.

Fisheries

Past and present activities in Upper Portland Canal have impacted fish habitat in the Salmon and Bear rivers. A past Stewart, B.C. solid causeway construction caused a collapse of a Bear River chum run. Other activities, such as dike repairs, and mining as well as annual jokulhaups may continue to effect fish habitat in Upper Portland Canal. However, the Soulé River does not have a salmon run. Juvenile salmon, including the Fish Creek juvenile chum, do use the Soulé River delta for foraging habitat during their annual out-migration to the ocean. With this projects proposed environmental measures to protect the environment, including discharging into the river mouth, there would be no substantial contribution to the cumulative effects to fisheries in Upper Portland Canal and the Dolly Varden population in the Soulé River watershed.

Terrestrial Wildlife including Migratory Birds and Bald/Golden Eagles

Wildlife habitat in Upper Portland Canal is a mixture of man-made clearing and development that is dominated by a natural and undisturbed environment around the areas of development. Though human activity may have had some impacts on wildlife here, the dominance of the natural landscape around the development suggests that there is plenty of habitat available. Lack of deer and other game species otherwise common in Southeast Alaska could be due to the deep snows this area receives, the surrounding high glacier and icefield covered peaks and ridges biologically isolating the area, and could also be the result of small populations being hunted out in previous years. Growth in the Upper Portland Canal area is likely to continue to reduce the amount of available wildlife habitat. Past and current activities and development have altered and/or reduced the wildlife habitat around the Hyder area; and future activity, such as mining and road building, is likely to continue contributing to these impacts. However, impacts due to past and future activities are regulated through various federal and state regulations, which help to minimize the impacts on wildlife. Due to the spatial scale at which these activities occur (in our analysis, no other hydroelectric project is economically or environmentally feasible in the Hyder area), and the lack of wildlife using the project site (depauparate), the project would not substantially contribute to cumulative adverse affects on wildlife habitat.

Socio-economic

Remote communities such as Hyder often lack supporting infrastructure, including local government, a tax base, and difficulty of access because of their remoteness, which prevents these communities from growing and having productive economies. Past and current activities such as business development can result in an improved economic base, cumulatively contributing to the local economy. Future business development may continue to be advantageous for community development by eventually providing an economic tax base. By providing jobs for construction, the use of local services for lodging, food, materials, storage, etc., and a few permanent jobs for operations, as well as taxes once this area becomes its own Borough, this project would contribute to a cumulatively beneficial impact to the economy.

Land Use

The Forest Plan designates the project area as a Remote Recreation LUD. A Remote Recreation LUD has very restrictive standards and guidelines for human development.

Throughout the pre-filing consultation process the Forest Service suggested that it may consider amending the LUD of the project area within the 2008 Forest Plan for the purpose of assisting with hydropower development in the project area. As a component of the Forest Service's feasibility analysis for potentially amending the LUD in the 2008 Forest Plan, they requested an analysis of the other potential hydropower sites in the upper Portland Canal area. The analysis, (Appendix A) showed that other potential sites around Hyder were either not economically or environmentally feasible, or both. Therefore, cumulative impacts from future hydroelectric development in the area should be considered insignificant. Little is known about specific future development in the Upper Portland Canal area in which to make further analysis; certainly at this time there appears to be little proposed in the way of development on Forest Service lands. Although at present the project is not consistent with the existing LUD, an amendment by the Forest Service to the LUD within the project boundary will allow the project to go forward while leaving the majority of the area under the present LUD, thus maintaining the majority of these lands protected as they are today. With this modification, there should not be a significant cumulative impact to land use on Forest Service lands.

PROJECT ALTERNATIVES CONSIDERED

Alternatives to the Applicants proposal that were considered are: (1) Land Use Alternative—an alternative that would be more consistent with the current land use designation and roadless area policy for the Tongass National Forest; and (2) No Action—the project would not be constructed and there would be no effects on environmental resources.

Under the Land Use Alternative, the project would be restricted to a run-of-river project with a capacity of 550 kilowatts. This alternative would consist of a 27-foot-high low-head diversion dam, powerhouse, power tunnel, suspension bridge, penstock, overhead and buried transmission line, 10-mile submarine cable, staging areas, and a trail instead of roads and would generally be visually screened to avoid any adverse effects on the natural setting of the project area. All construction materials and personnel would, by necessity, be transported into the project area by helicopter and landing craft and potentially the use of mules or horses to pack materials via an access trail from the shoreline to the project features.

The Land Use Alternative is not only uneconomical because of the expense to construct this small project in relation to the amount of energy produced, but would not be in the publics best interest because the project would still impact the current Remote Recreation LUD for the area with little public benefit because the available resource is not fully developed. This watershed is unique in that there are no habitats that would be completely eliminated, being available outside of the project features, and no sensitive species utilize the watershed, and no salmon use the river. The flora and fauna in this watershed is depauparate, and those species that do occur here are in small numbers. Opportunities to find and develop a location like this are rare and the Applicant believes this resource should be developed to its full potential.

Under the No-Action Alternative, the physical environment would not change, the Forest Service would not need to amend the land use designation for the site, and Hyder would not experience any economic benefits from the project, either during construction or in the future as a tax base for an incorporated Hyder Borough.

IMPACTS AND MITIGATION

Impacts are insignificant if the aforementioned methods are used to protect the environment. Through consultation, the Applicant determined that the primary issues associated with licensing the Project were:

- Aesthetic effects as viewed from Portland Canal
- Effects on human use of Glacier Bay, just north of the river delta (recreation and subsistence)
- Potential use of the project area by anadromous salmonids and corresponding potential effects of the project on fish and aquatic habitat in the lower Soule River and delta.
- Effects of the project on the existing Remote Recreation LUD, and whether a hydropower project would be feasible under the standards and guidelines of a Remote Recreation LUD as set forth in the Tongass National Forest Land and Resource Management Plan.

Significant impacts are avoided by the following:

- ✓ Dam locations are out of sight of the Visual Priority Route (middle) of Portland Canal
- ✓ Upper 0.3 miles of the North Fork watershed is left undisturbed as a wildlife corridor and for Dolly Varden spawning and juvenile rearing habitat
- ✓ Water conduit is underground, eliminating visual impacts as well as vegetation removal, impacts to wetlands, and impacts to wildlife movement and habitat
- ✓ Water will be discharged back into the Soulé River main channel, transporting glacial flour back to the river to be dispersed in a natural way into Portland Canal
- ✓ Powerhouse and substation will be screened by existing trees, avoiding visual impacts and impacts to delta wetland habitat, and also significantly reducing blocking a wildlife movement corridor along the shoreline as well as saving wildlife forage habitat
- ✓ Submarine cable to Stewart, B.C. avoids overhead lines along the shoreline, which would impact terrestrial habitat and the visual quality of Upper Portland Canal
- ✓ A tunnel of 1,900 feet will be used for part of the access road to avoid wetlands and steep slopes, also reducing potential habitat fragmentation and visual impacts

Impacts are minimized by the following:

- ✓ Access road alignment will avoid wetlands as much as possible

- ✓ A single lane bridge will be used to cross the river to reduce impacts to the rivers riparian corridor
- ✓ Access road will be limited to a single lane travel surface of 20 feet wide with occasional pullouts to limit the physical impacts to as narrow a corridor as possible
- ✓ Footprint of marine access facilities on the delta will be kept to as minimum a corridor as possible to minimize impacting wetlands
- ✓ Barge landing, staging area, tailrace will be riprapped to minimize or eliminate erosion and sedimentation and will be permanent features that provide more diverse habitat including forage and protection for juvenile chum salmon
- ✓ Project design minimizes blocking bear and deer movement across the delta
- ✓ An Erosion and Sedimentation Control Plan and Storm Water Protection Plan will protect resources and minimize impacts
- ✓ Materials to fill dam will be quarried locally at the project site, reducing the opportunity for acid rock drainage

Mitigation for Impacts

- ✓ Preserved spawning and most rearing habitat for juvenile lake population of Dolly Varden; reservoir will also provide a significant amount of juvenile rearing habitat
- ✓ Will maintain minimum pool in reservoir to protect fish from stranding that move downstream
- ✓ Will enhance rearing side channels in upper section of the North Fork to replace lost juvenile rearing habitat
- ✓ Will implement an invasive weed elimination and monitoring program on the river delta to eradicate or at least control the sow thistle from further spreading; with an emphasis on eradication
- ✓ Will minimize visual effects of project infrastructure from the visual priority route in Portland Canal by using terrain, existing vegetation, coloring, and a small corridor
- ✓ Grass seed may be used on staging area on delta after construction to mitigate loss of wildlife forage habitat
- ✓ Propose land reclassification to a less restrictive LUD to only within the project footprint

RATIONAL FOR DETERMINATION OF FONSI

As a consequence of this analysis, including the low use of the watershed by wildlife and lack of salmon using the river, project design with its narrow corridor and low environmental impact design, including avoidance, minimization, and mitigation measures incorporated herein, the Applicant concludes that the project impacts are not significant and a FONSI is recommended.

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9.0 CONSULTATION RECORD

The following provides a summary of primary consultation over the course of the licensing process to date, including the development and filing of draft and revised study plans, study reports, and associated stakeholder meetings. The complete public record is available at the FERC website, www.ferc.gov. From the pull down menu "Documents and Filings" select eLibrary. Select "General Search" under Search Options, then at top of page change the first date of 'from' to 01/02/2005 and leave the 'To' date set to the present. Then scroll down the page to 'Docket Number' and put in P-12615, then select 'Submit' at bottom of page. This will give you the complete public record up until July 2009. For the rest of the record, go back to the General Search page and put in the Docket Number P-13528. Don't forget to change the 'from' date to June 2009, then select Submit. Copies of correspondence are in the Appendices.

September 26, 2005 – **Preliminary Permit Application**

March 30, 2006 – FERC: **Acceptance of Preliminary Permit Application**

April 5, 2006 – FERC: Public Notice for Motions to Intervene, etc.

April 26, 2006 – USFS: Motion to Intervene

May 3, 2006 – USACE: AP&T Should conduct Wetlands Delineation

May 3, 2006 – BLM to FERC: Established Case File and Included Master Title Plats of Area

May 17, 2006 – Hyder Board of Trade: Interested in Project

May 24, 2006 – Hyder Board of Trade to FERC: Letter of Support for Project

May 31, 2006 – USF&WS to FERC: No Comments to Offer at this Time

June 2, 2006 – USFS to FERC: Issues to Address during Preliminary Permit

July 13, 2006 – FERC: **Order Issuing Preliminary Permit P-12615**

December 28, 2006 – **First Six Month Progress Report**

January 8, 2007 – AP&T to Agencies: Would like to have Meeting in Juneau to discuss Project and Method of Licensing

February 13, 2007 – AP&T to Agencies: Additional info for up coming meeting

February 14, 2007 – USF&WS: Map of Portland Canal Bald Eagle Nest Sites

February 16, 2007 – Draft Initial Consultation Document

February 21, 2007 – Agency Meeting Sign-in Sheet, Summary, and Notes

February 21, 2007 – ADF&G: Map from 1975 Report of Soule River

February 21, 2007 – NMFS: Maps of Soule River from previous survey

February 22, 2007 – AP&T to Agencies: Distribution of Juneau Meeting Sign-in Sheets, Meeting Summary, and Maps sent by NMFS

February 22, 2007 – DNR: Considerations for Issuing Water Permit

February 28, 2007 – AP&T to USFS: Request for Information on Visual Inventory

February 28, 2007 – AP&T to USFS: Noted during Meeting that USFS prefers Integrated Licensing Process, here is why AP&T prefers Alternative Licensing Process

March 9, 2007 – USFS to AP&T: Response Regarding Visual Inventory

March 13, 2007 – AP&T to USFS: Request for Special Use Permit

March 13, 2007 – ADF&G: Reviewed Draft Communication Protocol and recommend changes

March 13, 2007 – USFS: List of Sensitive Plant Species

March 15, 2007 – ADF&G: Signed Signature Page of Communication Protocol

March 21, 1007 – USFS: Questions for Special Use Permit

March 23, 2007 – NMFS: Signed Signature Page of Communication Protocol

April 3, 2007 – USFS: Agree to Communication Protocol (CP)

April 10, 2007 – AP&T to Agencies: Revised CP for Review and Signature

April 23, 2007 – Application to BCTC for Interconnection Review

April 30, 2007 – ADF&G: Preliminary Comments on Wildlife Studies

May 10, 2007 – DNR: Signature Page of CP

May 22, 2007 – Determined that AP&T's Interconnection Request is valid

May 29, 2007 – AP&T to DNR: Water Rights Application Submittal

June 1, 2007 – ADOT: Hyder Causeway Reconstruction Analysis

June 12, 2007 – AP&T to Agencies: Request for Studies for Summer 2007

June 12, 2007 – ADF&G: Response to Study Requests; they plan on conducting a Mt. Goat Survey this August

June 22, 2007 – **Second Six Month Progress Report**

October 25, 2007 – AP&T to USFS: Request for Special Use Permit for studies and to clear a trail and helipads for the study biologist to access the site

December 21, 2007 – **Third Six Month Progress Report**

March 1, 2008 – Public Notice in the Ketchikan Daily News Classified Section for NOI and PAD Available

March 7, 2008 – AP&T to FERC: NOI and PAD submitted

March 11, 2008 – AP&T to Agencies: NOI and PAD

March 26, 2008 – FERC: Procedure to Prepare Alternative License Application

March 31, 2008 – FERC: To Native Associations and Communities seeking their comment

April 1, 2008 – AP&T to Agencies: Coordination of Site Visit

April 4, 2008 – USFS: Ok to use Alternative Licensing Procedures

April 21, 2008 – USF&WS: Comments on Draft Study Plan

April 17, 2008 – EPA to FERC: Request to use Alternative Procedures

May 2, 2008 – USFS: Response to Draft Study Plan

May 5, 2008 – FERC: Alternative Licensing Process Approved

May 13, 2008 – FERC: Notice of Approval of NOI, PAD, and Alternative Licensing Process

May 15, 2008 – FERC: Notice of Scoping Meeting and Alternative Licensing Process

May 19, 2008 – AP&T to Hyder PO: Public Notice Posting

May 21, 2008 – USFS: Special Use Permit Issued for Exploratory Surveys

June 23, 2008 – **Fourth Six Month Progress Report**

July 17, 2008 – USF&WS to FERC: Comments on Scoping Document

July 17, 2008 – USFS to FERC: Comments on Scoping Document

July 21, 2008 – ADF&G to FERC: Comments on Scoping Document

August 26, 2008 – Agency / AP&T Teleconference

August 26, 2008 – USFS: Final Approved Special Use Permit

September 9, 2008 – USFS to FERC: Meeting Notes Clarification RE: the LUD

November 12, 2008 – AP&T to FERC: Scoping Document 2

December 1, 2008 – AP&T to USFS: Requested info on purpose and need for project

December 31, 2008 – **Fifth Six Month Progress Report**

March 2, 2009 – AP&T to USFS: Analysis of other potential hydropower sites in area

April 24, 2009 – AP&T to Agencies: Final Study Plan

May 5, 2009 – USFS to AP&T: We cannot conduct a feasibility analysis

May 18, 2009 – AP&T to USFS: Special Use Permit Application

May 26, 2009 – To Agencies: Delta Sediment Patterns Study Plan

June 19, 2009 – To Agencies: Subsistence and Recreational Use Survey Plan

July 1, 2009 – AP&T to FERC: Application for **New** Preliminary Permit

July 10, 2009 – FERC to AP&T: Acceptance Letter for Preliminary Permit Application

July 13, 2009 – FERC: Notice of Preliminary Permit Application Acceptance; Soliciting Comments, Motions to Intervene and Competing Applications

July 20, 2009 – USFS to AP&T: Regarding Analysis of Proposed Changes to LUD

July 27, 2009 – USFS: Authorization of Special Use Permit for Surveys

July 30, 2009 – ADF&G: Goat Survey, Findings, and Thoughts

August 4, 2009 – USFS: Authorized Amendment 1 to Special Use Permit

August 5, 2009 – AP&T to USFS: Discussion regarding project site LUD

September 10, 2009 – USFS to FERC: Comments on Preliminary Permit Application

September 22, 2009 – **FERC: Issues *New* Preliminary Permit P-13528**

October 29, 2009 – Meeting between USFS and AP&T to discuss Land Use issues (no paper)

December 2, 2009 – AP&T to USFS: follow up information from October 29 meeting

February 11, 2010 – AP&T to USFS: Investigative Permit Application for 2010 Field Season

February 24, 2010 – **First Six Month Progress Report under *New* Permit**

May 17, 2010 – AP&T to USFS: Discussion about LUD and Roadless Rule in regards to Draft License Application and Preliminary Draft EA; request Draft 4(e) Conditions

May 19, 2010 – FERC: Have 120 days to get agreement with USFS on how to move forward with LUD and Roadless Rule

June 10, 2010 – AP&T to DCOM: ACMP Review for USFS Investigative Permit

July 2, 2010 – To Agencies: Copies of Field Study Reports to begin review of information before filing Draft License Application and Preliminary Draft EA

July 30, 2010 – DCOM: No ACMP Review Required for USFS Investigative Permit

August 31, 2010 – **Second Six Month Progress Report under *New* Permit**

September 9, 2010 – USFS: Letter to document August 13, 2010, teleconference between AP&T and USFS to discuss how to move forward in response to FERC's 120 request

September 10, 2010 – AP&T to FERC: Letter from USFS regarding August 31 teleconference

September 10, 2010 – USFS: Decision Notice for Investigative Permit

September 23, 2010 – ADOT to AP&T: Still working on Hyder Causeway EA

September 27, 2010 – ADOT to AP&T: ROW Plans for Hyder Causeway Replacement

November 18, 2010 – AP&T to USFS: Questions about Herbicide use and treating invasive species, particularly sow thistle

November 18, 2010 – AP&T to USFS: Is seed mix for soil stabilization still the same?

November 23, 2010 – USFS to AP&T: Response regarding herbicide use

November 30, 2010 – To Agencies: Update on when the DLA and PDEA will be submitted for 90-day review

November 30, 2010 – DEC to AP&T: Persticide use permit application form

December 6, 2010 – GBNP, NPS to AP&T: Methods of treating sow thistle on Strawberry Island

December 7, 2010 – NPS to AP&T: Which herbicides they are using on sow thistle

APPENDICES

Appendix A – Analysis of Potential Hydropower Development Sites Around Hyder

Appendix B – List of Comprehensive Plans

Appendix C – 2009 Ecological Field Investigations

Appendix D – Biological Assessment of Sensitive Plant Species

Appendix E – Wetland Delineation Survey Report

Appendix F – Acid Rock Drainage Analysis

Appendix G – Rare Plant Species Survey Report

Appendix H – Goshawk Survey Report

Appendix I – Amphibian Survey Report

Appendix J – Marine Environment Survey Report

Appendix K – Invasive Species Survey Report

Appendix L – Timber Evaluation Report

Appendix M – Substrates and Sediment Transport Report

Appendix N – Recreation and Subsistence Survey Results

Appendix O – Tier II Habitat Survey Report

Appendix P – Habitat Surveys Field Journal

Appendix Q – 2008 Environmental Report

Appendix R – 2007 Environmental Report

Appendix S – Contractor Resumés

Appendix T - Visual Simulations Analysis

Appendix U – Hydrology Analysis

Appendix V – Agency Consultation

Appendix W – Agency Comments & Recommendations

Appendix X – Mailing List

Appendix Y – Draft License Plans

1. Environmental Compliance Monitor Plan
2. Erosion & Sedimentation Control Plan
3. Invasive Species Elimination & Monitoring Plan
4. Fire Prevention Plan
5. Hazardous Substance Plan
6. Spoil Disposal Plan
7. Solid Waste and Waste Water Plan
8. Wildlife Mitigation and Monitoring Plan
9. Bear Safety Plan
10. Scenery Management Plan
11. Heritage Resource Protection Plan