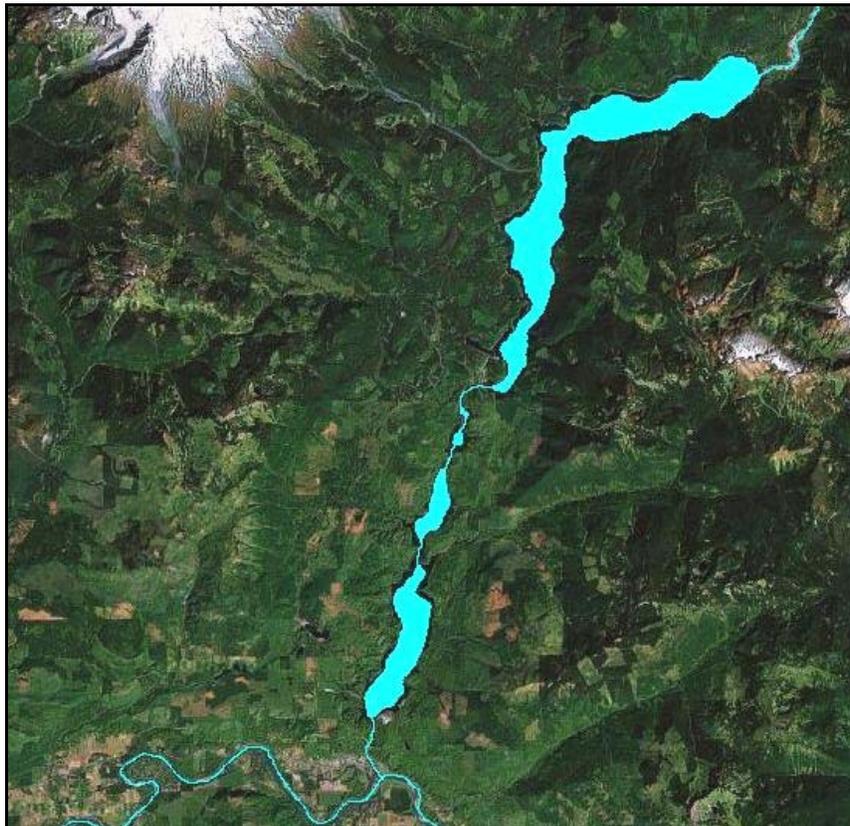


FISH CONNECTIVITY IMPLEMENTATION PLAN

SETTLEMENT AGREEMENT ARTICLE 104

BAKER RIVER HYDROELECTRIC PROJECT FERC No. 2150



October 2011



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Acronyms and Abbreviations

This abbreviation, acronym, or short name	Refers to
ARG	Aquatic Resource Group
DNA	Deoxyribonucleic acid
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FCIP	Fish Connectivity Implementation Plan
FERC	Federal Energy Regulatory Commission
FR	Federal Register
FSC	Floating surface collector
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NMFS	National Marine Fisheries Service
O&M	Operation and maintenance
PIT	Passive integrated transponder
PSE	Puget Sound Energy, Inc.
QA/QC	Quality assurance/quality control
RM	River mile
SA	Settlement agreement article
SA 103	Settlement agreement article 103: Upstream Fish Passage Implementation Plan
SA 104	Settlement agreement article 104: Connectivity between Lake Shannon and Baker Lake
SA 105	Settlement agreement article 105: Downstream Fish Passage Implementation Plan
SA 601	Settlement Agreement Article 601: Baker River Coordinating Committee
UFT	Upstream fish trap
USACE	United States Army Corps of Engineers
USFWS	United States Fish & Wildlife Service
WDFW	Washington State Department of Fish and Wildlife

1.0 Executive Summary

This Fish Connectivity Implementation Plan (FCIP) has been prepared for the Baker River Hydroelectric Project pursuant to the *Order on Offer of Settlement, Issuing New License and Dismissing Amendment Application as Moot* (the license) dated October 17, 2008. In Appendix A of the license, settlement agreement article 104 (SA 104), “Connectivity Between Lake Shannon and Baker Lake,” provides for the establishment of a fishway between Lake Shannon and Baker Lake for native char and other native species that become isolated by the project.

The Baker River basin supports populations of bull trout (*Salvelinus confluentus*), which are native char listed as threatened under the Endangered Species Act. Downstream passage facilities provide for downstream fish movements at Upper and Lower Baker dams, and the Lower Baker upstream fish trap provides for upstream movements from below Lower Baker Dam. However, the lack of an upstream fish passage facility below Upper Baker Dam can restrict movements among local bull trout populations.

In response to SA 104, Puget Sound Energy (PSE) initiated studies with regard to the type of fishway, its location and timing, and the species and numbers of fish to be collected and transported from Lake Shannon to Baker Lake. In general, preferred fishway alternatives provide for continuous volitional movement of fish without human intervention. However, other alternatives may provide the most viable option at a particular site due to dam height, water temperature issues, upstream reservoir level fluctuations, the behavioral characteristics of a local population, or other site-specific considerations. Although other native fish species (e.g., mountain whitefish and sculpin) inhabit the Baker River basin, in conjunction with federal and state agencies and other members of the Aquatic Resource Group, bull trout became the species of interest for SA 104. Bull trout are the only native char species in the Baker River basin and “native char” in this document refers to bull trout.

Investigations into the genetic origins of native char encountered throughout the Baker River basin were instrumental in evaluating the type of fishway to provide connectivity for native char as part of SA 104. Prior to 2008, all native char that entered the Lower Baker upstream fish trap were transported to Baker Lake and released. Genetic analysis of native char collected in the upstream fish trap indicates that the majority of the native char originated outside of the Baker River basin. The location of the Lower Baker upstream fish trap near the confluence with the Skagit River makes it likely that native char from other local populations stray into the upstream trap during foraging movements. Despite years of forced co-mingling of native char populations, genetic analysis revealed that native char populations in both Lake Shannon and Baker Lake have maintained high levels of genetic integrity with little evidence of mixed ancestry.

Sulphur Creek enters Lake Shannon immediately downstream of Upper Baker Dam and supports the only known spawning population of native char in Lake Shannon. Rather than facilitate genetic flow from Lake Shannon to Baker Lake with a structural fishway, current native char management objectives supported development of an SA 104 collection and transportation protocol that preserves reproductive potential for

genetically unique native char populations specific to each basin. These objectives are structured around the reproductive benefits of stock segregation rather than forced comingling, and aim to keep native char of Sulphur Creek origin in Lake Shannon, transport native char of out-of-basin origin to the Skagit River, and transport native char of Upper Baker origin to Baker Lake, while providing all native char the opportunity to migrate to downstream habitats through the downstream fish passage facilities.

Instead of a structural facility, the FCIP currently involves the active collection, sampling, tagging, and transport of native char. The intent of this activity is to relocate recaptured char as appropriate after genetic analysis has been conducted to determine their population of origin. All adult and subadult native char captured by active collection and by Baker fish passage facilities will be subject to tissue sampling and analysis to determine their genetic origins, and receive passive integrated transducer (PIT) tags to enable the management of individual fish. Through active collection (e.g. angling) and transport efforts in Lake Shannon and collecting and transport of native char at the Baker fish passage facilities, native char in the Baker River basin can be managed to ensure the genetic integrity and health of local native char populations.

Any changes to the active collection and transport protocols will be considered in consultation with the USFWS, NOAA Fisheries, WDFW and other ARG members, and reported to the Federal Energy Regulatory Commission (FERC) as part of the annual reporting process. If the current programmatic approach implemented in response to SA 104 does not appropriately achieve fish species connectivity, PSE will develop an alternative plan in consultation with the USFWS, NOAA Fisheries, WDFW, and other ARG members. If necessary, alternatives under future consideration could include expansion of the active collection effort; modification of the genetic analysis and transportation procedures; design, construction, and operation of structural options; and more. If future plan modifications require the design, construction, and operation of a Lake Shannon upstream fish passage facility, PSE will develop construction and design plans, an operation and maintenance plan, and an emergency response plan in consultation with the USFWS, WDFW, NOAA Fisheries, and other ARG members, and then submit them to the FERC for approval.

2.0 Introduction

This Fish Connectivity Implementation Plan (FCIP) has been prepared for the Baker River Hydroelectric Project (the project) pursuant to the *Order on Offer of Settlement, Issuing New License and Dismissing Amendment Application as Moot* dated October 17, 2008 (the license). Within the license, settlement agreement article 104 (SA 104), “Connectivity Between Lake Shannon and Baker Lake,” provides for the establishment of a fishway between Lake Shannon and Baker Lake for native char and other native species that become isolated by the project.

The Baker River Project is owned and operated by Puget Sound Energy (PSE) and consists of the Lower Baker Development completed in 1925, and the Upper Baker Development completed in 1959 (figure 1). The Baker River Project includes facilities located on and adjacent to the Baker River, occupying about 5,200 acres of land within the Mt. Baker-Snoqualmie Forest. The Lower Baker Dam forms Lake Shannon and is located near Concrete, Washington, near the confluence of the Baker and Skagit rivers. Lake Shannon is approximately seven miles long and covers about 2,278 acres at full

pool. The Upper Baker Dam forms Baker Lake, located in Whatcom County near the border with Skagit County. Baker Lake is approximately nine miles long and covers about 4,980 acres at full pool. The two existing hydroelectric facilities have a combined capacity of approximately 170 megawatts.

The Baker River basin supports populations of bull trout (*Salvelinus confluentus*), which are native char listed as threatened under the Endangered Species Act. In this document, “native char” refers to bull trout. Although downstream passage facilities provide for downstream fish movements at Upper and Lower Baker dams, and the Lower Baker upstream fish trap provides for upstream movements from below Lower Baker Dam, the lack of an upstream fish passage facility below Upper Baker Dam can restrict movements among local native char populations.

In response to SA 104, PSE initiated studies with regard to the type of fishway, its location and timing, and the species and numbers of fish to be collected and transported from Lake Shannon to Baker Lake. Fishways provided by SA 104 may range from collect-and-haul operations, a temporary weir, up to a more permanent trap-and-haul facility below Upper Baker Dam. In general, preferred fishway alternatives provide for continuous volitional movement without human intervention. However, other alternatives may provide the most viable option at a particular site due to dam height, water temperature issues, upstream reservoir level fluctuations, the behavioral characteristics of a local population, or other site-specific considerations.

Investigations into the genetic origins of native char encountered throughout the Baker River basin were instrumental in evaluating the type of fishway to provide connectivity for native char as part of SA 104. Despite years of forced co-mingling of native char populations, genetic analysis reveals that native char populations in both Lake Shannon and Baker Lake have maintained high levels of genetic integrity with little evidence of mixed ancestry. Sulphur Creek, which enters Lake Shannon immediately downstream of Upper Baker Dam, supports the only known spawning population of native char in Lake Shannon. Protection of this local spawning population of native char became an important consideration in evaluating alternate fishways.

This FCIP describes the results of the investigations, proposed future activities, relevant project features, the programmatic approach to providing connectivity, and PSE’s commitments. It also addresses requirements for fishway construction and design, operation and maintenance, quality assurance/quality control, and emergency response. PSE will implement this FCIP under the terms of the license and the settlement agreement.

This document was prepared in consultation with the U.S. Fish and Wildlife Service (USFWS), the Washington Department of Fish & Wildlife (WDFW), and other members of the Aquatic Resource Group (ARG), which is comprised of representatives of the signatories to the settlement agreement and other interested parties.

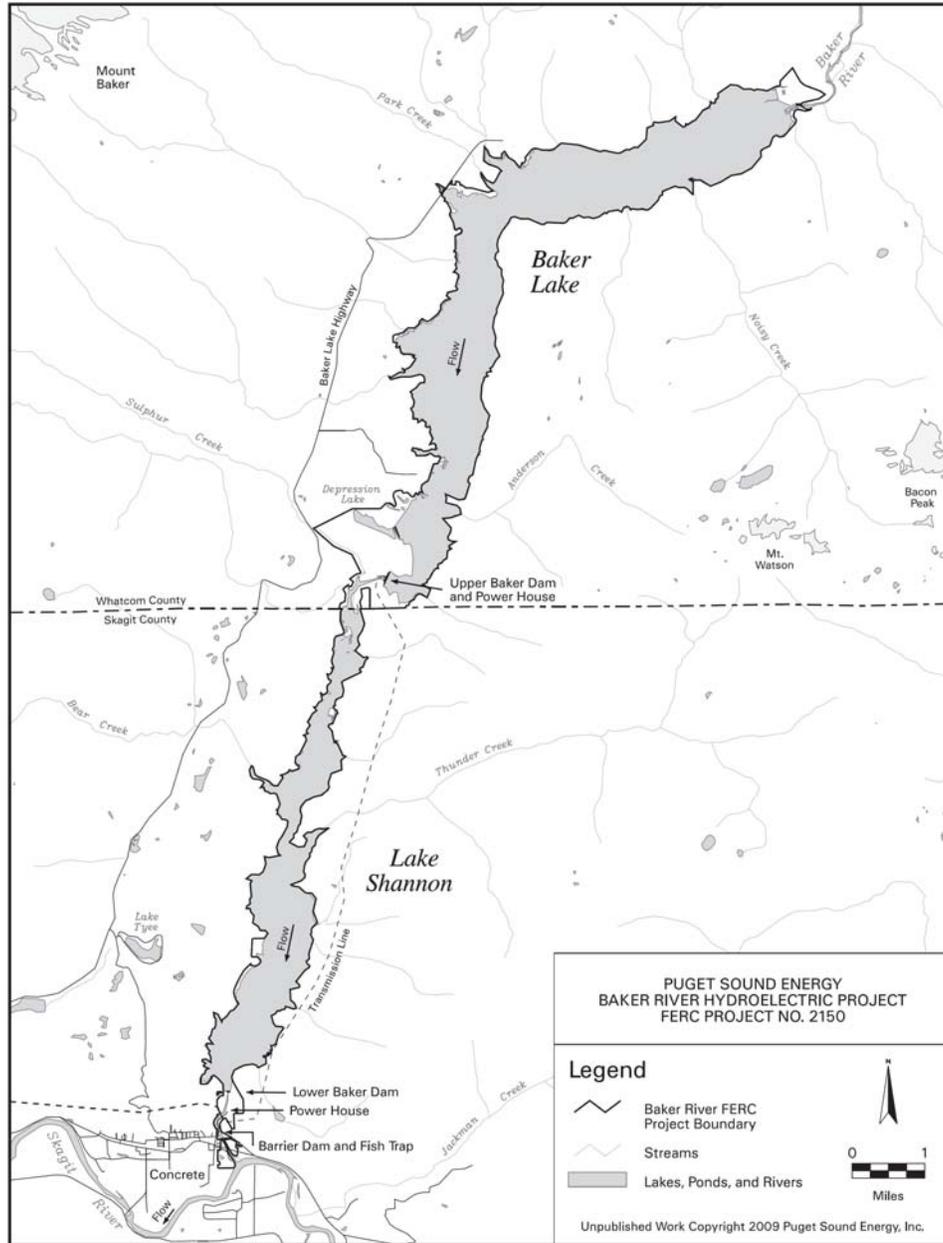


Figure 1. Baker River Hydroelectric Project, Concrete, Washington.

3.0 Basis for the Plan

SA 104 was developed to provide for connectivity between Lake Shannon and Baker Lake for native char. This FCIP has been prepared in response to SA 104, which is provided in its entirety in section 3.1.

3.1 SA 104 - Fish Connectivity

SA 104 provides as follows:

Licensee shall provide a fishway between Lake Shannon and Baker Lake for native char and other native fish species that become isolated by the Project. No later than three years after license issuance, the licensee shall conduct an investigation, in

consultation with the ARG, and specifically with NOAA Fisheries, USFWS, WDFW, the Upper Skagit Indian Tribe, the Sauk-Suiattle Indian Tribe, and the Swinomish Indian Tribal Community, to develop and initiate studies with regard to the type of fishway, its location and timing, and the species and numbers of fish to be collected and transported upstream of Upper Baker Dam, following approval from NOAA Fisheries and USFWS. The investigation may include tagging, radio-tagging or other methods.

Fishways provided according to this article may range from, but may not necessarily be limited to, collect and haul operations, a temporary weir and trap on Sulphur Creek or a similar facility installed below Upper Baker Dam, up to a more permanent trap and haul facility below Upper Baker Dam. The facility shall include design accommodations for other aquatic species that do not compromise the primary design focus on native char and may be significantly lesser in scope and complexity than the adult fish trap downstream of Lower Baker Dam. Investigation is necessary to narrow the range of prospective fishway alternatives within this range.

If testing demonstrates that the approved prototype fishway does not appropriately achieve fish species connectivity, licensee shall propose an alternative plan to the ARG for approval by USFWS and NOAA Fisheries.

Licensee shall develop, submit to NOAA Fisheries and USFWS for approval, and file with the Commission for approval, a Fish Connectivity Implementation Plan (FCIP). The licensee shall develop the FCIP in consultation with the ARG and specifically with NOAA Fisheries, USFWS, WDFW, the Upper Skagit Indian Tribe, the Sauk-Suiattle Indian Tribe, and the Swinomish Indian Tribal Community.

The licensee shall develop and submit the FCIP in phases, according to the schedule that follows, or on an alternative schedule submitted to the Commission for approval by licensee within six months of license issuance:

- FCIP – Fish Connectivity Construction & Design. No less than 60 days before initiation of construction and no later than 3 years after license issuance, the licensee shall file with the Commission its complete plans, specifications, and schedule for construction of facilities and/or operations for attraction, capture, and transport of upstream migrating fish from Lake Shannon to Baker Lake.
- FCIP – Fish Connectivity Operation & Maintenance (O&M). No less than 60 days before initiation of operation, the licensee shall file with the Commission its complete plans and specifications for O&M of upstream passage facilities. The O&M plan shall include at least the following elements: a) fish handling, b) hauling frequencies, c) frequency and magnitude of attraction flows, d) species protocol, e) trap operational flows, f) a schedule, g) the method for providing annual updates, and h) trap reporting requirements.
- FCIP – Fish Connectivity Quality Assurance/Quality Control. No less than 60 days before initiation of operation, licensee shall file with the Commission for approval a quality assurance/quality control plan for the upstream passage connectivity facilities and/or operations to confirm the approved plans will be constructed and/or operated as approved.
- FCIP – Fish Connectivity Emergency Response Plan. No less than 120 days prior to the initiation of operation of any of the fish passage facilities required by this article, licensee shall file with the Commission a preliminary response plan

addressing operational contingencies and emergencies, and shall file a final plan with the Commission within 120 days from startup testing.

- FCIP – Fish Connectivity Annual Reporting. Licensee shall file with the Commission an annual report describing the operation of the upstream fish passage connectivity facilities for the past year at the Upper Baker and Lower Baker Developments, pursuant to Article 102. The report shall include the numbers and species of fish captured in the trap and the associated disposition of those fish. The report shall include a description of problems and associated remedies for such problems, any modifications of the facilities implemented in the prior year, and audit and report operational compliance.

The licensee shall provide a minimum of 30 days for the consulted parties to comment and to make recommendations before filing each of the above plan components with the Commission. The licensee shall include with each of the plan components and reports required by this article, documentation of consultation and copies of comments and recommendations on the completed plan component after it has been prepared and provided to the consulted parties, documentation of the approval of USFWS and NOAA Fisheries or documentation of the status of the review by the USFWS and NOAA Fisheries, and specific descriptions of how the other consulted parties' comments are accommodated by the plan. If the licensee does not accept a recommendation, the filing shall include the licensee's reasons, based on Project-specific information.

3.2 Relationship to Other Articles of the License and Settlement Agreement

The FERC license and settlement agreement refer to the FCIP in several other articles. Under settlement agreement article 102 (SA 102), "Aquatics Reporting," PSE must submit an annual report by August 31 of each year that includes a description of how PSE, agencies, and tribes coordinated implementation of SA 104. Activities conducted during the previous 12 months (June 1 to May 31) and the status of development or implementation of measures will be summarized in each annual report.

Under SA 103, "Upstream Fish Passage Implementation Plan," PSE must "provide safe and effective upstream passage at the Baker River Project by using trapping, sorting, holding, and hauling facilities on the lower Baker River." The new upstream fish trap became operational in June 2010.

Under SA 105, "Downstream Fish Passage Implementation Plan," PSE must "provide safe and effective downstream passage at the Baker River Project by using attraction, guidance, trapping, sorting, holding, and hauling facilities located on the Project reservoirs." The Upper Baker floating surface collector (FSC) became operational in spring 2008, and the Lower Baker FSC will be operational by spring 2013.

Consultation and decision-making procedures and protocols are governed by implementation of SA 601, "Baker River Coordinating Committee."

4.0 Goals

The goal of the FCIP is to provide native char population connectivity between Lake Shannon and Baker Lake consistent with SA 104. By facilitating fish migrations, implementation of SA 104 supports USFWS-, WDFW-, and ARG-directed management objectives for ensuring the genetic integrity and health of native char populations.

4.1 Key Elements of SA 104

Under SA 104, PSE will implement this FCIP, and file for FERC approval the FCIP document that includes:

- The results of studies developed in consultation with the ARG with regard to the type of fishway, its location and timing, and the species and numbers of fish to be collected and transported.
- Plans and schedules for facilities or operations to attract, capture, and transport upstream-migrating fish from Lake Shannon to Baker Lake.
- O&M activities such as fish handling, hauling frequencies, frequency and magnitude of attraction flows, species protocol, trap operational flows, schedule, the method for providing annual updates, and trap reporting requirements.
- Quality assurance/quality control measures for the upstream passage connectivity facilities and/or operations.
- Preliminary and final emergency response procedures addressing operational contingencies and emergencies.
- Annual reporting procedures describing upstream fish passage connectivity operations at the Upper Baker and Lower Baker Developments pursuant to SA 102.

A minimum of 30 days will be provided for the USFWS and other ARG members to comment and to make recommendations before PSE files the FCIP with the FERC.

The plan will include:

- Documentation of consultation and copies of comments and recommendations on the completed plan components.
- Documentation of the approval of USFWS and NOAA Fisheries or documentation of the status of the review by the USFWS and NOAA Fisheries.
- Specific descriptions of how the other consulted parties' comments are accommodated by the plan.

If PSE does not accept a recommendation, the filing shall include PSE's reasons, based on project-specific information.

5.0 Regulatory Reference and Definitions

The FCIP has been developed and will be implemented in a manner consistent with applicable local, state, and federal laws and regulations. If conflicts exist between the objectives or management guidelines of the FCIP and any applicable law or regulation, the objectives and guidelines will be followed to the extent possible while still complying with the law or regulation.

5.1 Federal Authority and Reference

The FCIP is prepared according to the directives of the license and is consistent with the biological opinions of the USFWS and NOAA Fisheries. The license incorporates U.S. Department of Interior, USFWS, and NOAA Fisheries conditions under section 7 of the ESA.

5.2 Washington State Authority and Reference

The License incorporates requirements by the Washington Department of Ecology (Ecology) and recommendations by the WDFW.

6.0 Plan Implementation

This section outlines specific components of the FCIP as defined in SA 104.

6.1 Plan Area

The Baker River watershed, U.S. Geological Survey Hydrologic Unit Code 17110005 (Upper Skagit), encompasses the plan area for SA 104. The plan area includes Baker Lake and its tributaries, Lake Shannon and its tributaries, and the lower Baker River from Lake Shannon downstream to the Skagit River.

6.2 Rationale

In response to SA 104, PSE initiated studies with regard to the type of fishway, its location and timing, and the species and numbers of fish to be collected and transported from Lake Shannon to Baker Lake. Upstream connectivity for anadromous fish is provided to Baker Lake from the upstream fish trap on the lower Baker River. Salmon and steelhead are bypassed around Lake Shannon in response to stock management decisions, and also because Sulphur Creek is the only tributary to Lake Shannon with significant spawning habitat for anadromous fish. In contrast, Baker Lake has several suitable spawning tributaries, including the mainstem upper Baker River. Downstream passage of juvenile fish is accomplished with the Baker Lake FSC, and in the near future the Lake Shannon FSC. The National Marine Fisheries service (NMFS) has indicated that “fish passage for our [jurisdictional anadromous] species in the Baker River sub-basin will be served by the fishways developed under license Articles 103 (upstream fish passage) and 105 (downstream fish passage) for the foreseeable future... The plan Puget has developed pursuant to license article 104 appears to serve the needs of native char, but NMFS defers to USFWS on this account.” (See section 9.5, figure 6).

Settlement agreement article 104 indicates that the species of fish to be collected in Lake Shannon and transported upstream of Upper Baker Dam was to be determined in

consultation with the ARG, and specifically with the NOAA, USFWS, WDFW, and the Tribes after an investigation to develop and initiate related studies. Unlike anadromous fishes, riverine and resident species do not require a migratory pathway to marine waters to complete their life cycle. However, some riverine and resident species exhibit migratory behavior between rearing and feeding areas. Depending on habitat availability and biological needs, passage barriers could also separate some species from habitats critical to their population (e.g., spawning areas). The resident and riverine native fish populations in Lake Shannon include mountain whitefish, rainbow trout, cutthroat trout, kokanee, sculpin, stickleback, sucker, and cyprinids. In consultation with the USFWS, emphasis was placed on bull trout to address upstream passage between Lake Shannon and Baker Lake to provide connectivity. To date, no other native species have indicated disruption of migratory behavior that could be addressed by a fishway envisioned by SA 104. Nevertheless, as such behavior is identified this plan is adaptable to include additional species.

PSE had conducted native char investigations in the Baker River basin as part of pre-licensing activities, including snorkel and electrofishing surveys of Baker Lake and Lake Shannon tributaries (see appendix A). The results of these surveys indicated that adult native char could be readily observed in Sulphur Creek. Sulphur Creek is a spring-fed tributary entering Lake Shannon immediately below Upper Baker Dam, and there was concern that Upper Baker-origin native char passing downstream through Upper Baker Dam could be entering Sulphur Creek. In other Pacific Northwest reservoir systems, bull trout passing downstream through a dam without upstream passage facilities may congregate below the dam or hold in coldwater tributaries immediately below the dam (Scholz et al., 2005).

Obtaining a basic understanding of the genetic origins of native char in the Baker River basin was considered a necessary first step in developing meaningful protocols for establishing connectivity between Lake Shannon and Baker Lake. Since 2002, tissue samples from adult, sub-adult, and juvenile char have been collected at both upstream and downstream fish collection facilities as well as from Sulphur Creek and six separate reaches of the Upper Baker River and its tributaries. PSE contracted with the WDFW to analyze the tissue samples, and genetic assignments were used to distinguish between fish with ancestry in Sulphur Creek, upper Baker River basin, and out-of-basin populations (such as Illabot Creek, the Sauk River, and Diablo Lake). The results of the analyses indicate that despite years of mixing these populations, the genetic integrity of Baker River basin populations remains high with little evidence of mixed ancestry in either reservoir (Small et al., 2009; Small et al., 2011). Analysis of juvenile native char collected in Sulphur Creek indicated that few fish from populations other than Sulphur Creek had spawned in Sulphur Creek. In addition, many of the native char captured below Upper Baker Dam were of Sulphur Creek origin.

In response to SA 104, PSE investigated potential fishway alternatives between Lake Shannon and Baker Lake. In general, preferred fishway alternatives allow for continuous volitional movement of fish without human intervention (NMFS 2008). However, other alternatives may provide the best viable option at a particular site due to dam height, water temperature issues, upstream reservoir pool level fluctuations, behavioral characteristics of a local population, or other site-specific considerations.

Fish ladders are generally deemed to provide volitional fish movement. A fish ladder consists of a series of pools constructed in steps around the barrier, with water flowing from pool to pool. Fish ascend the ladder by jumping or swimming upstream from pool to pool. Fish ladders are commonly used for barriers less than 100 feet high, and where the water level at upstream and downstream facility entrances can be controlled. Upper Baker Dam is over 300 feet high, and because the Upper Baker Development alternately stores and releases water during the flood control season, the upstream pool level fluctuates.

Trap-and-haul facilities commonly employ a short fish ladder leading to a collection facility where the fish are captured and transported upstream. Trap-and-haul facilities are generally less desirable than fish ladders because of handling and non-volitional fish movement, but are used where site constraints discourage the use of a fish ladder. Trap-and-haul facilities have proven successful in Washington state at the Lower Baker Development since 1926, Mud Mountain Dam on the White River since 1948, and Sunset Falls on the South Fork Skykomish River since the mid-1950s. A primary requirement of successful trap-and-haul operations is the ability to attract target fish into the trap entrance (Clay, 1995). Native char may be difficult to attract into a trap where there are competing flow releases. As evidenced by the number of out-of-basin and juvenile native char collected at the Lower Baker trap-and-haul upstream fish passage facility (see appendix A), native char may also enter a trap-and-haul facility as part of foraging or other non-spawning migration behavior. Transporting such fish upstream may be counterproductive to management objectives.

Investigations into the genetic origins of native char encountered throughout the Baker River basin were instrumental in evaluating the type of fishway to provide connectivity for native char as part of SA 104. Genetic analysis revealed that native char populations in both Lake Shannon and Baker Lake have maintained high levels of genetic integrity with little evidence of mixed ancestry. Construction of a structural weir or trap in Sulphur Creek would enable the collection of adult native char, but could hinder movement of the local population to the only known tributary supporting native char spawning in Lake Shannon. Construction of a structural weir or trap immediately below Upper Baker Dam would also capture Sulphur-Creek-origin fish, and there is little evidence of Upper Baker-origin fish concentrating below Upper Baker Dam. Rather than facilitate genetic flow from Lake Shannon to Baker Lake with a structural fishway, current native char management objectives support development of a program that includes the active collection of native char; DNA sampling to determine geographic origins; and transport of Sulphur Creek, Upper Baker, and out-of-basin populations to their appropriate subbasin. To preserve reproductive potential for genetically unique native char populations specific to each basin, this program aims to:

- Keep native char of Sulphur Creek origin in Lake Shannon.
- Transport native char of out-of-basin origin to the Skagit River.
- Transport native char of Upper Baker origin to Baker Lake.
- Provide all native char the opportunity to migrate to downstream habitats through the downstream fish passage facilities.

Some recaptured bull trout have incomplete or inconclusive genetic analyses. Thus, transport of unknown-origin char allows some level of natural gene flow. However, the

objective of the FCIP is not to have complete genetic separation, but to return reproductive potential to the various natal populations. The current native char protocols reflect these objectives, and the FCIP incorporates these protocols into a long-term operational plan.

Upstream and downstream fish passage at the project is provided by an upstream trap-and-haul facility below Lower Baker Dam and downstream fish passage facilities in Lake Shannon and Baker Lake. By spring 2012, each of the fish passage facilities will have been redesigned, enlarged, and constructed in consistence with the new license and specifically SA 103 and SA 105. Each of the facilities were designed in consultation with the USFWS and NOAA Fisheries, and include an extensive fish monitoring station where every native char captured in the facilities can be individually sorted, handled, sampled, and tagged before release. The ability to handle and manage every native char that enters a Baker fish passage facility provides opportunities for native char management not commonly found at other hydropower projects. Some native char may migrate downstream during spill events or through the power generation turbines, providing the potential exchange of genetic material between local populations. However, the majority of native char passing through Upper and Lower Baker dams can be counted and tagged, contributing to an ongoing database of Baker River native char.

The active collection and transport of native char in Lake Shannon to be conducted under the FCIP is consistent with native char management protocols developed in consultation with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG. The initiation of active collection and transport procedures in Lake Shannon, when combined with the transport of char from the upstream trap, the Lake Shannon downstream fish passage facility, and the Upper Baker FSC, constitutes a programmatic fishway that provides genetic-specific connectivity throughout the Baker River basin.

6.3 Funding

PSE will fund implementation of the FCIP as specified by conditions in SA 104.

6.4 Development and Modification of the Fish Connectivity Implementation Plan

PSE has prepared the FCIP in consultation with USFWS, NOAA Fisheries, WDFW, and other members of the ARG. Consulted parties and other members of the ARG were provided a minimum of 30 days to comment and to make recommendations before this FCIP was filed with the Commission. Documentation of consultation and copies of comments and recommendations on the FCIP after it was prepared and provided to the consulted parties and other members of the ARG are included in the FCIP, along with specific descriptions of how the comments are accommodated by the plan. PSE will identify any such recommendations not adopted in the plan, and will provide the reasons for not adopting them.

Modifications to the FERC-approved plan may be warranted during performance of the FCIP. If material modifications to the FCIP are required in the future, such changes will be made following the decision-making process outlined in SA 601, “Baker River Coordinating Committee.” PSE shall summarize any decision-making activities regarding the FCIP in the annual report. Modifications to the FCIP will be presented to the ARG, and after approval by the USFWS and NOAA Fisheries submitted to the

FERC. Modifications and related consultation will be reported in the annual report for the period in which they occur.

6.5 Procedures, Standards, and Criteria

The FCIP will be implemented to meet SA 104 objectives in a manner that minimizes detrimental effects on other environmental resources. Near-term implementation activities consist of active fish collection and transport that includes collecting tissue samples and PIT-tagging native char in Lake Shannon to enable recaptured native char to be transported upstream or downstream or returned to the collection site according to established protocols. If future plan modifications are deemed necessary and require design, construction, and operation of structural fishway facilities, these facilities will be constructed using best management practices and according to guidelines identified through the permitting process and through consultation with the ARG.

Standards and criteria will be reviewed in consultation with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG as part of an annual protocol meeting held each spring. This process will allow procedures, standards, and criteria to be modified through adaptive management as additional information is developed or if local conditions change. Procedures, standards, and criteria for SA 104 will be described in the annual report and may include the following.

6.5.1 FCIP – Fish Connectivity Construction & Design

Pursuant to consultation with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG, implementation of SA 104 does not involve construction of an upstream fish passage facility in Lake Shannon below Upper Baker Dam. If future plan modifications require the design, construction, and operation of a Lake Shannon upstream fish passage facility, a fish connectivity, construction and design document will be prepared and submitted for approval.

6.5.2 FCIP – Fish Connectivity Operation and Maintenance (O&M)

Under SA 104, the operation and maintenance (O&M) plan shall include at least the following elements: a) fish handling, b) hauling frequencies, c) frequency and magnitude of attraction flows, d) species protocol, e) trap operational flows, f) a schedule, g) the method for providing annual updates, and h) trap reporting requirements. Elements c, e, and h are not applicable, since implementation does not currently include a structural facility; however, those elements will be addressed if structural facilities are deemed necessary in the future.

Implementation of the FCIP currently involves the active collection of native char in Lake Shannon and the subsequent handling and transport of adult and subadult native char to their appropriate natal area of origin (i.e., Lake Shannon, Baker Lake, out-of-basin) or below Lower Baker Dam to downstream habitats depending on time of year. Native char management objectives support the development of transport protocols that preserve the reproductive potential of each basin's genetically unique native char populations. This approach is intended to keep native char of Sulphur Creek origin in Lake Shannon, transport native char of out-of-basin origin to the Skagit River, and transport native char of Upper Baker origin to Baker Lake, while providing all native char the opportunity to migrate to downstream habitats through the downstream fish

passage facilities. The current native char handling procedures and transport protocols reflect these objectives, and are attached to the annual SA 104 report. Every year, the results of the previous 12 months of FCIP activities and the activities proposed for the next 12 months will be presented and discussed as part of an annual protocol meeting with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG. Consultations will include an annual FCIP meeting to discuss any potential changes to protocols or sampling procedures. This meeting is to be held each spring prior to initiating active collection activities.

The native char procedures and protocols for discussion and potential modification include:

- Active collection and handling procedures.
- Native char handling at fish passage facilities.
- PIT-tagging procedures.
- DNA tissue collection procedures.
- Hauling and transportation procedures.
- The native char active collection schedule.
- Native char transportation protocols.

Collection, handling, and transportation procedures and protocols will be evaluated annually based on catch-per-effort from prior efforts and the genetic origins of captured native char. The goal will be to maximize the capture and transport of Upper Baker and out-of-basin origin char from Lake Shannon while retaining char with Sulphur Creek origin. Any modifications to the active collection, handling, and transport procedures will be reviewed during the annual spring protocol meeting and documented in the annual SA 104 report.

6.5.3 FCIP – Fish Connectivity Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) procedures will be subject to review in consultation with the USFWS, NOAA Fisheries, WDFW, and other interested members of the ARG, and will be attached to the annual SA 104 report. QA/QC procedures may include:

- Project organization and responsibilities.
- Personnel qualifications and training.
- Personnel safety.
- Calibration procedures for field and laboratory.
- Data analysis and reporting.
- Data assessment and oversight.
- Potential problems and corrective actions.
- Data validation and limitations.

The FCIP collection and transport program includes genetic analysis of tissues collected from captured native char. QA/QC procedures addressing tissue sample analyses are maintained by the molecular genetics laboratory contracted by PSE to process the samples. In addition to the collection and transport of native char captured in Lake Shannon as part of SA 104, native char are captured and transported at the Baker

upstream and downstream fish passage facilities constructed and operated in response to SA 103 and SA 105. QA/QC procedures addressing the handling and transport of native char captured at the Baker upstream and downstream fish passage facilities will be described in documents specific to each facility.

6.5.4 FCIP – Fish Connectivity Emergency Response Plan

The proposed implementation of SA 104 does not involve construction of a structural fish passage facility and does not require development of an emergency response plan (ERP). Should future modifications require the design, construction, and operation of a Lake Shannon upstream fish passage facility, PSE will file a preliminary ERP with the FERC addressing operational contingencies and emergencies no less than 120 days prior to the initiation of operation. Following construction of the facility, PSE will file a final plan with the FERC within 120 days from startup testing.

In response to emergencies associated with capture, handling, and transport of native char at the existing Baker upstream and downstream fish passage facilities, PSE will follow operational contingencies described in the ERPs being developed for each facility. These ERPs identify procedures to protect and ensure human health and safety, fish health, and protection of property. The ERPs developed for those fish passage facilities address emergency situations and responses, general mechanical, structural, electrical or water supply failures and potential emergencies and failures associated with the transportation of fish. While human health and safety is paramount, the ERPs are designed to avoid or minimize potential injury and mortality of fish, including native char, during operation of the fish passage facilities.

6.5.5 FCIP – Fish Connectivity Annual Reporting

PSE will file an annual report with the FERC describing the operation of SA 104 connectivity efforts for the past year, pursuant to SA 102. Details of the fish connectivity annual report are provided in section 7.

6.6 Schedule

Specific actions within the FCIP will be implemented according to a schedule developed in consultation with the USFWS, NOAA Fisheries, WDFW, and other ARG members following FERC approval of the FCIP. PSE will submit a proposed schedule of activities for the next 12 months during each annual spring native char protocol meeting. The results of consultations will be recorded in the annual SA 104 report and submitted to the ARG for a minimum 30 day review.

6.7 Monitoring, Maintenance, and Management

Monitoring, maintenance, and management details associated with implementation of SA 104 will be developed in consultation with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG, as part of ongoing consultation and annual reporting (see section 7.0). Implementation of this FCIP includes active collection, sampling, genetic analysis, and PIT-tagging of native char. Fish that are recaptured by active collection or at the fish passage facilities will be transported upstream or downstream or returned to the collection site according to established procedures and protocols. Modification of

procedures and protocols allows for adaptive management in response to new information or changing conditions.

The intent of the FCIP is to provide population connectivity through capturing, sampling, genetically analysis, and tagging a large proportion of native char in Lake Shannon without harming Sulphur Creek origin fish. If the proportion of out-of-basin and Baker Lake origin native char decreases in Lake Shannon, the need for supplemental Lake Shannon active collection efforts (i.e., angling) may decrease. Any changes to the active collection efforts in Lake Shannon will be considered in consultation with USFWS, NOAA Fisheries, WDFW and other ARG members and submitted to the FERC as part of the annual reporting process.

7.0 Reporting

7.1 Annual Report Schedule

For the purposes of SA 104, the annual reporting period for the FCIP will be June 1 through May 31 as defined in SA 102. An annual report will be prepared describing activities accomplished as part of SA 104 in the prior twelve months. The report will be submitted to the ARG for review and comment in accordance with SA 102.

7.2 Annual Report Content

The annual report shall include a summary description of activities conducted in support of each key element during the preceding June 1 through May 31 12-month reporting period, including:

- A summary description of the FCIP, including any proposed plan modifications.
- A list of char management and monitoring activities conducted during the reporting period.
- Supporting documentation of procedures and protocols pertaining to the capture, sampling, and transport of native char under SA 104 activities, including:
 - Active collection and handling procedure;
 - Fish passage facility handling procedure;
 - PIT tagging procedure;
 - DNA tissue collection procedure;
 - Hauling and transportation procedure;
 - Native char active collection schedule;
 - QA/QC procedures; and
 - Native char transportation protocols.
- The number and species of native char captured at the fish passage facilities and the associated disposition of those fish.
- A summary of the annual spring consultation meeting with the USFWS, NOAA Fisheries, WDFW, and interested ARG members; consultations with the USFWS, NOAA Fisheries, and WDFW at Fish Passage Technical Working Group meetings; SA 104 updates and consultations at ARG meetings; and consultations with USFWS and WDFW staff regarding the results of native char genetic analyses.

- A description of any problems encountered, associated remedies for such problems, and any modifications implemented in the prior year
- A discussion of operational compliance during the reporting period.

PSE will provide the annual report to the ARG per the schedule in SA 102 for 30-day review. Comments and recommendations by the ARG will be included in the annual report submitted to the FERC, along with specific descriptions of how comments are accommodated in the report. If recommendations are not adopted, the filing will include PSE's explanations based on project-specific information.

8.0 References and Literature Cited

- Clay, C. 1995. Design of Fishways and Other Fish Facilities. 2nd ed., Lewis Publishers.
- NMFS (National Marine Fisheries Service). 2008. Anadromous salmonid passage facility design. NMFS, Northwest Region, Portland, Oregon.
- Puget Sound Energy. 2005. Application for new license, major project-existing dam. Revised applicant-prepared preliminary draft environmental assessment, Volume II, Part 1 of 2, Baker River Hydroelectric Project, FERC No. 2150, 18 CFR, Part 4, Subpart F, Section 4.51. Puget Sound Energy, Inc. Bellevue, Washington.
- Scholz, A.T., H.J. McLellan, D.R. Geist and R.S. Brown. 2005a. Investigations of migratory bull trout (*Salvelinus confluentus*) in relation to fish passage at Albeni Falls Dam. Eastern Washington University, Department of Biology, Fisheries Research Center, Cheney, Washington and Battelle Pacific Northwest Division, Richland, Washington. Final report prepared for United States Army Corps of Engineers, Seattle District, Seattle, Washington. Contract No. DACW68-02-D-001, Delivery Order EC01. Report No. PNDW-3521.
- Small, M.P., W.A. Ardren, P.J. Hilgert, and J.F. Von Bargaen. 2008. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final Report dated December 23, 2008. Prepared for Puget Sound Energy, Bellevue, Washington.
- Small, M., P. J. Hilgert, W.A. Ardren, and J.F. Von Bargaen. 2009. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Analysis of 2006-2008 tissue samples. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final report dated December 10, 2009. Prepared for Puget Sound Energy, Bellevue, Washington.
- Small, M.P., N. Overman, P. J. Hilgert, and E. Martinez. 2011. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Analysis of 2009-2010 tissue samples. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final report dated February 25, 2011. Prepared for Puget Sound Energy, Bellevue, Washington.
- U.S. Fish and Wildlife Service. 2004. Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*). Volume I (of II) Puget Sound Management Unit. Portland, Oregon.

U.S. Fish and Wildlife Service. 2007. Biological Opinion for the Federal Energy Regulatory Commission and U.S. Army Corps of Engineers Relicensing of the Baker River Hydroelectric Project FERC No. P-2150. Western Washington Fish and Wildlife Office, Lacey, Washington.

9.0 Review Comments and Responses

On August 16, 2011, PSE sent, by certified mail, the document review cover letter and draft Fish Connectivity Implementation Plan to the Settlement Parties (table 1). For reference purposes, the document review cover letter (figure 2) is provided in this section.

9.1 Distribution List

Table 1. Parties that were mailed the draft Fish Connectivity Implementation Plan as part of the formal review process.

Name	Organization	Email or Mailing Address
Brock Applegate	WA Dept of Fish & Wildlife	brock.Applegate@dfw.wa.gov
Len Barson	The Nature Conservancy	lbarson@tnc.org
Rick Cisar	Town of Concrete	rickc@concretewa.gov
Chuck Ebel	U.S. Army Corps of Engineers	charles.j.ebel@usace.army.mil
Lorna Ellestad	Skagit County	lornae@co.skagit.wa.us
Robert Franklin	Sauk-Suiattle Indian Tribe	rfranklin@sauk-suiattle.com
Steve Fransen	NMFS	steven.m.fransen@noaa.gov
JoAnn Gustafson	WA Dept of Natural Resources	joann.gustafson@dnr.wa.gov
Bob Helton	Skagit County Citizen	21032 Little Mountain Road Mount Vernon, WA 98274
Lou Ellyn Jones	US Fish & Wildlife Service	louellyn_jones@fws.gov
Monika Kannadaguli		mkan461@ecy.wa.gov
Sue Madsen	Skagit Fisheries Enhancement Group	smadsen@skagitfisheries.org
Greta Movassaghi	USDA Forest Service	gmovassaghi@fs.fed.us
Ashley Rawhouser	National Park Service	Ashley_Rawhouser@nps.gov
Scott Schuyler	Upper Skagit Indian Tribe	sschuyler@upperskagit.com
Tom Van Gelder	The WA Council of Trout Unlimited	thevangelders@comcast.net
Stan Walsh	Swinomish Indian Tribe	swalsh@skagitcoop.org

9.2 Cover Message

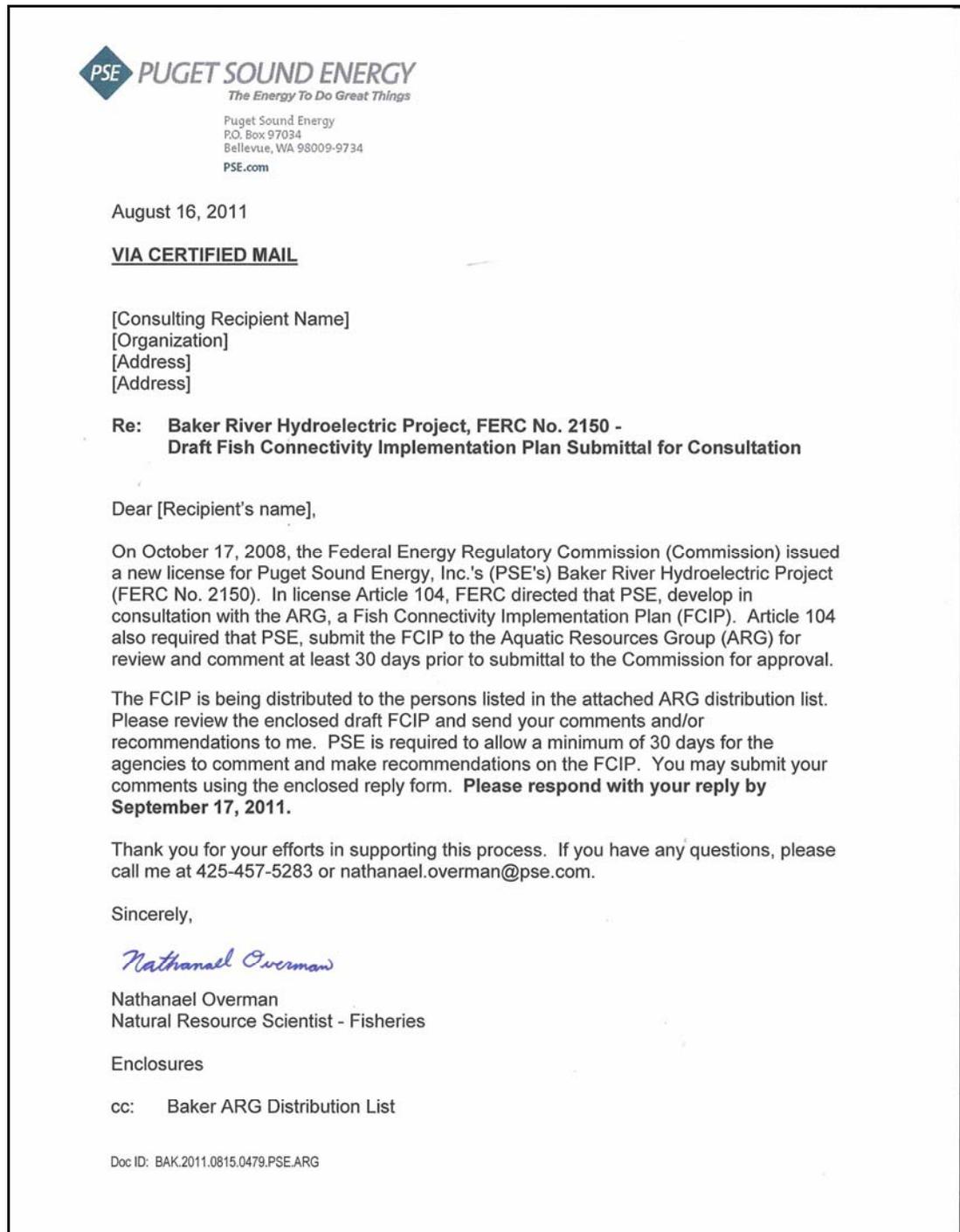


Figure 2. Cover letter from PSE accompanying the draft SA 104 Fish Connectivity Implementation Plan.

9.3 Summary of Reviewer Replies

The following reviewers sent comments to PSE (see section 9.4 for details).

- Lou Ellyn Jones, U.S. Fish and Wildlife Service
- Brock Applegate, Washington Department of Fish and Wildlife

9.4 Reviewer Comments and PSE Responses

Table 2. Comments following formal review of the draft SA 104 Fish Connectivity Implementation Plan.

Comment	Puget Sound Energy Response
USFWS – Lou Ellyn Jones August 18, 2011 (via e-mail)	
<p>On page 12, paragraph 2, under 6.5.2 FCIP the first sentence should read:</p> <p>"Implementation of the FCIP currently involves the active collection of native char in Lake Shannon, and the subsequent handling and transport of adult and subadult native char to their appropriate natal area of origin (i.e., Lake Shannon, Baker Lake, out-of-basin) or below Lower Baker Dam to downstream habitats depending on time of year."</p>	<p>The text in section 6.5.2 has been revised as suggested.</p>
<p>Under 6.7 Monitoring, maintenance, and management, second paragraph,</p> <p>The second sentence says that ...the need for supplemental Lake Shannon active collection efforts (i.e., angling) may decrease.</p> <p>Our comment: "Nathanael, this raises a good point which I'm not sure is explicitly stated earlier, but maybe implied. The objective of the FCIP is not to have 100% separation/sorting of populations from this effort, which is of course not our intent, but I don't think this is ever really pointed out. In fact, we are incapable of doing this level of separation as you know. You might want to add a short discussion pointing out that our objective is not only to return reproductive potential to the various natal populations, but to still allow some level of natural gene flow. I think this would help set the overall expectation of the collection and transport effort."</p>	<p>Text has been added to section 6.2 to clarify this objective.</p> <p>"Some recaptured bull trout have incomplete or inconclusive genetic analyses. Thus, transport of unknown-origin char allows some level of natural gene flow. However, the objective of the FCIP is not to have complete genetic separation, but to return reproductive potential to the various natal populations. The current native char protocols reflect these objectives, and the FCIP incorporates these protocols into a long-term operational plan."</p>
WDFW – Brock Applegate, received September 16, 2011 (via e-mail)	

Comment	Puget Sound Energy Response
<p>Executive Summary, 3rd paragraph, 3rd sentence and/or 6.2 Rationale, 1st paragraph, 2nd sentence. Settlement Agreement (SA) Article and License Article 104 says, "Licensee shall provide a fishway between Lake Shannon and Baker Lake for native char and other native fish species that become isolated by the project...." Please include a summary on the selection process for just bull trout (<i>Salvelinus confluentus</i>) connectivity. In consideration of addressing the license article, please list the biological and habitat discussions on other native fish and their upstream connectivity between the reservoirs.</p>	<p>Text has been added to section 6.2 to include the requested information.</p> <p>"Upstream connectivity for anadromous fish is provided to Baker Lake from the upstream fish trap on the lower Baker River. Salmon and steelhead are bypassed around Lake Shannon in response to stock management decisions, and also because Sulphur Creek is the only tributary to Lake Shannon with significant spawning habitat for anadromous fish. In contrast, Baker Lake has several suitable spawning tributaries, including the mainstem upper Baker River. Downstream passage of juvenile fish is accomplished with the Baker Lake FSC, and in the near future the Lake Shannon FSC. The National Marine Fisheries Service (NMFS) has indicated that "fish passage for our [jurisdictional anadromous] species in the Baker River sub-basin will be served by the fishways developed under license Articles 103 (upstream fish passage) and 105 (downstream fish passage) for the foreseeable future... The plan Puget has developed pursuant to license article 104 appears to serve the needs of native char, but NMFS defers to USFWS on this account." (See section 9.5, figure 6).</p> <p>Settlement agreement article 104 indicates that the species of fish to be collected in Lake Shannon and transported upstream of Upper Baker Dam was to be determined in consultation with the ARG, and specifically with the NOAA, USFWS, WDFW, and the Tribes after an investigation to develop and initiate related studies. Unlike anadromous fishes, riverine and resident species do not require a migratory pathway to marine waters to complete their life cycle. However, some riverine and resident species exhibit migratory behavior between rearing and feeding areas. Depending on habitat availability and biological needs, passage barriers could also separate some species from habitats critical to their population (e.g., spawning areas). The resident and riverine native fish populations in Lake Shannon include mountain whitefish, rainbow trout, cutthroat trout, kokanee, sculpin, stickleback, sucker, and cyprinids. In consultation with the USFWS, emphasis was placed on bull trout to address upstream passage between Lake Shannon and Baker Lake to provide connectivity. To date, no other native species have indicated disruption of migratory behavior that could be addressed by a fishway envisioned by SA 104. Nevertheless, as such behavior is identified this plan is adaptable to include additional species."</p>

Comment	Puget Sound Energy Response
<p>Rationale, 7th paragraph, 4th sentence. Please list the evidence or study supporting the lack of concentration of bull trout below the Upper Baker Dam. Please show the statistical significance of the sample size.</p>	<p>Adult char were reported to concentrate below the Upper Baker Dam during the spring months, presumably to feed on juvenile fish passed downstream of the dam (K. Kurras-WDFW, pers. comm. 2002). Angling surveys below the Upper Baker Dam were subsequently conducted in the summer and fall in association with temporary shutdowns of flow releases to enhance angling success. Low water clarity in this reach precludes using snorkel surveys to identify bull trout abundance; however, angling surveys conducted in the Upper Baker Dam tailrace reach by WDFW, PSE, and R2 fishery biologists in the spring and fall of 2003 and 2004 were used to assess bull trout numbers in the area. These surveys resulted in 0-4 four bull trout caught per 4-hour fishing time by crews of two to five anglers. In comparison, angling efforts in the summer and fall of 2010 and 2011 below the Upper Baker Dam (upstream of the Depression Lake outflow) resulted in 4 bull trout caught in 18.3 angler-hours. PSE and WDFW biologist were unable to confirm concentrations of bull trout immediately below Upper Baker Dam.</p> <p>Comment noted. No revisions to plan.</p>

9.5 Comment Correspondence

From: LouEllyn_Jones@fws.gov [mailto:LouEllyn_Jones@fws.gov]
Sent: Thursday, August 18, 2011 9:33 AM
To: Overman, Nathanael
Cc: Jeffrey_Chan@fws.gov
Subject: Comments on Fish Connectivity Implementation Plan RReview Draft August 2011

Hi Nathanael. Here are our comments

On page 12, paragraph 2, under 6.5.2 FCIP the first sentence should read:

"Implementation of the FCIP currently involves the active collection of native char in Lake Shannon, and the subsequent handling and transport of adult and subadult native char to their appropriate natal area of origin (i.e., Lake Shannon, Baker Lake, out-of-basin) or below Lower Baker Dam to downstream habitats depending on time of year."

Under 6.7 Monitoring, maintenance, and management, second paragraph,

The second sentence says that ...the need for supplemental Lake Shannon active collection efforts (i.e., angling) may decrease.

Our comment: "Nathanael, this raises a good point which I'm not sure is explicitly stated earlier, but maybe implied. The objective of the FCIP is not to have 100% separation/sorting of populations from this effort, which is of course not our intent, but I don't think this is ever really pointed out. In fact, we are incapable of doing this level of separation as you know. You might want to add a short discussion pointing out that our objective is not only to return reproductive potential to the various natal populations, but to still allow some level of natural gene flow. I think this would help set the overall expectation of the collection and transport effort."

That's all. Thanks for your effort.

"People from a planet without flowers would think we must be mad with joy the whole time to have such things about us."

- Iris Murdoch

Lou Ellyn Jones, Fish and Wildlife Biologist
Division of Conservation and Hydropower Planning
Western Washington Fish and Wildlife Office
U.S. Fish and Wildlife Service
510 Desmond Dr.
Lacey, WA 98503

telephone: 360-753-5822
fax: 360-753-9518
Louellyn_jones@fws.gov

Figure 3. Reply from Lou Ellyn Jones, U.S. Fish and Wildlife Service.



State of Washington
Department of Fish and Wildlife

P.O. Box 1100, 111 Sherman St. (physical address), La Conner, Washington 98257-9612

September 16, 2011

Nathanael C. Overman, Resource Scientist - Fisheries
 Puget Sound Energy - Resource Sciences
 P.O. Box 97034, PSE-09S
 Bellevue, WA 98009

Subject: Baker River Hydroelectric Project, Federal Energy Regulatory Commission No. 2150—
 Settlement Agreement Article 104 Connectivity Between Lake Shannon and Baker Lake Fish
 Connectivity Implementation Plan

Dear Mr. Overman:

The Washington Department of Fish and Wildlife (WDFW) has reviewed the Article 104 Connectivity Between Lake Shannon and Baker Lake Fish Connectivity Implementation Plan. We have the following comments for the plan below. WDFW has participated in continuous consultation with Puget Sound Energy (PSE) for many years on the Baker River Hydroelectric Project. WDFW appreciates PSE's willingness to collaborate with WDFW on their many license implementation activities.

1.0 Executive Summary, 3rd paragraph, 3rd sentence and/or 6.2 Rationale, 1st paragraph, 2nd sentence. Settlement Agreement (SA) Article and License Article 104 says, "Licensee shall provide a fishway between Lake Shannon and Baker Lake for native char and other native fish species that become isolated by the project...." Please include a summary on the selection process for just bull trout (*Salvelinus confluentus*) connectivity. In consideration of addressing the license article, please list the biological and habitat discussions on other native fish and their upstream connectivity between the reservoirs.

6.2 Rationale, 7th paragraph, 4th sentence. Please list the evidence or study supporting the lack of concentration of bull trout below the Upper Baker Dam. Please show the statistical significance of the sample size.

WDFW welcomes the opportunity to work with PSE on future projects. We value our working relationship with PSE and encourage future dialog. If you have any questions or need more

Figure 4. Reply from Brock Applegate, Washington Department of Fish and Wildlife.

Mr. Nathanael C. Overman
September 16, 2010
Page 2 of 2

information or clarification to comments from the WDFW, please feel free to call me at (360)
466-4345 x254.

Sincerely,



Brock Applegate
Fish and Wildlife Biologist

Cc: Brett Barkdull, WDFW La Conner
David Brock, WDFW Mill Creek
Wendy Cole, WDFW La Conner
Jenni Dykstra, WDFW Olympia
Bob Everitt, WDFW Mill Creek
Annette Hoffmann, WDFW Mill Creek
Travis Nelson, WDFW Olympia

Figure 4, continued.

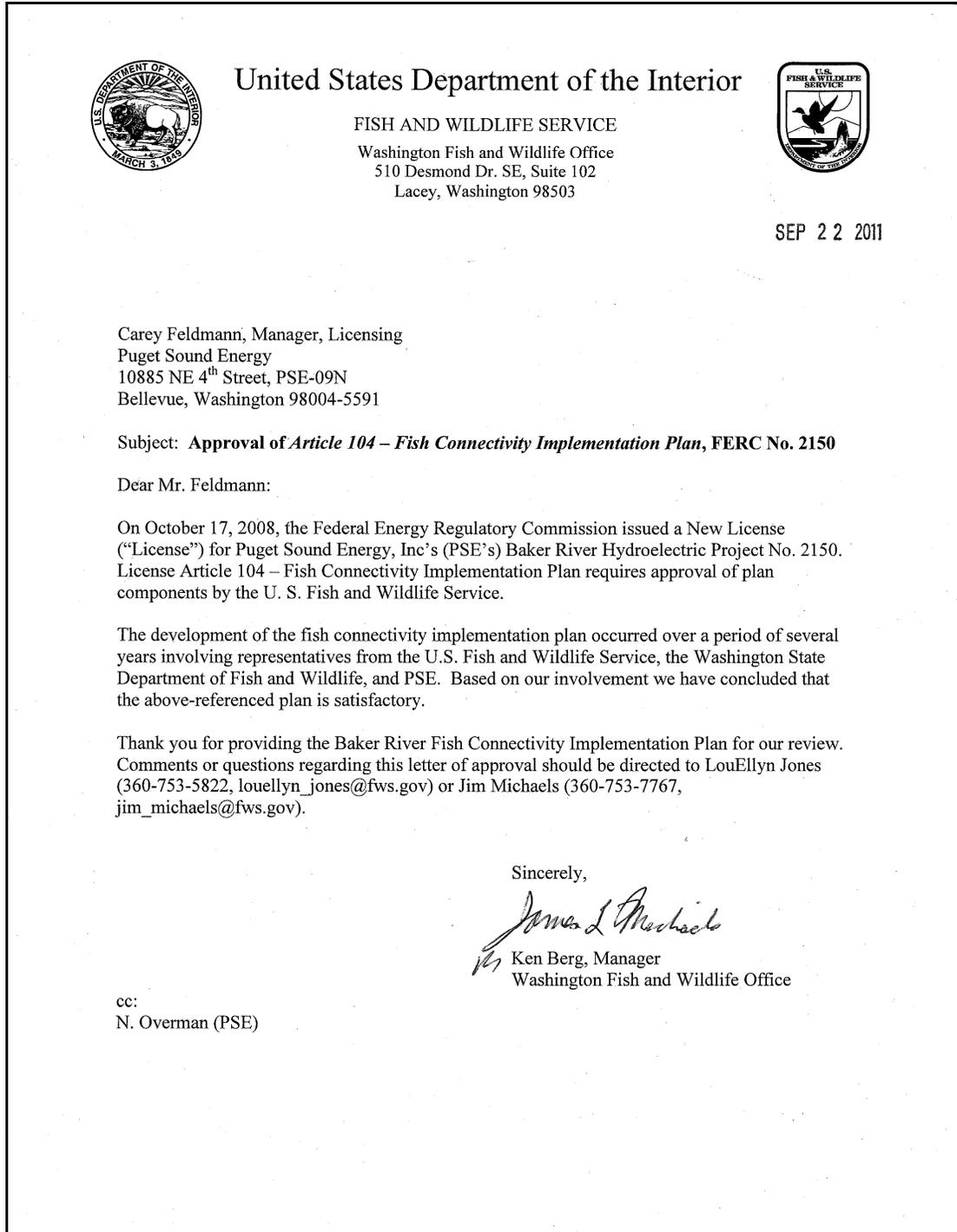


Figure 5. Letter documenting USFWS approval for the SA 104 Fish Connectivity Implementation Plan.

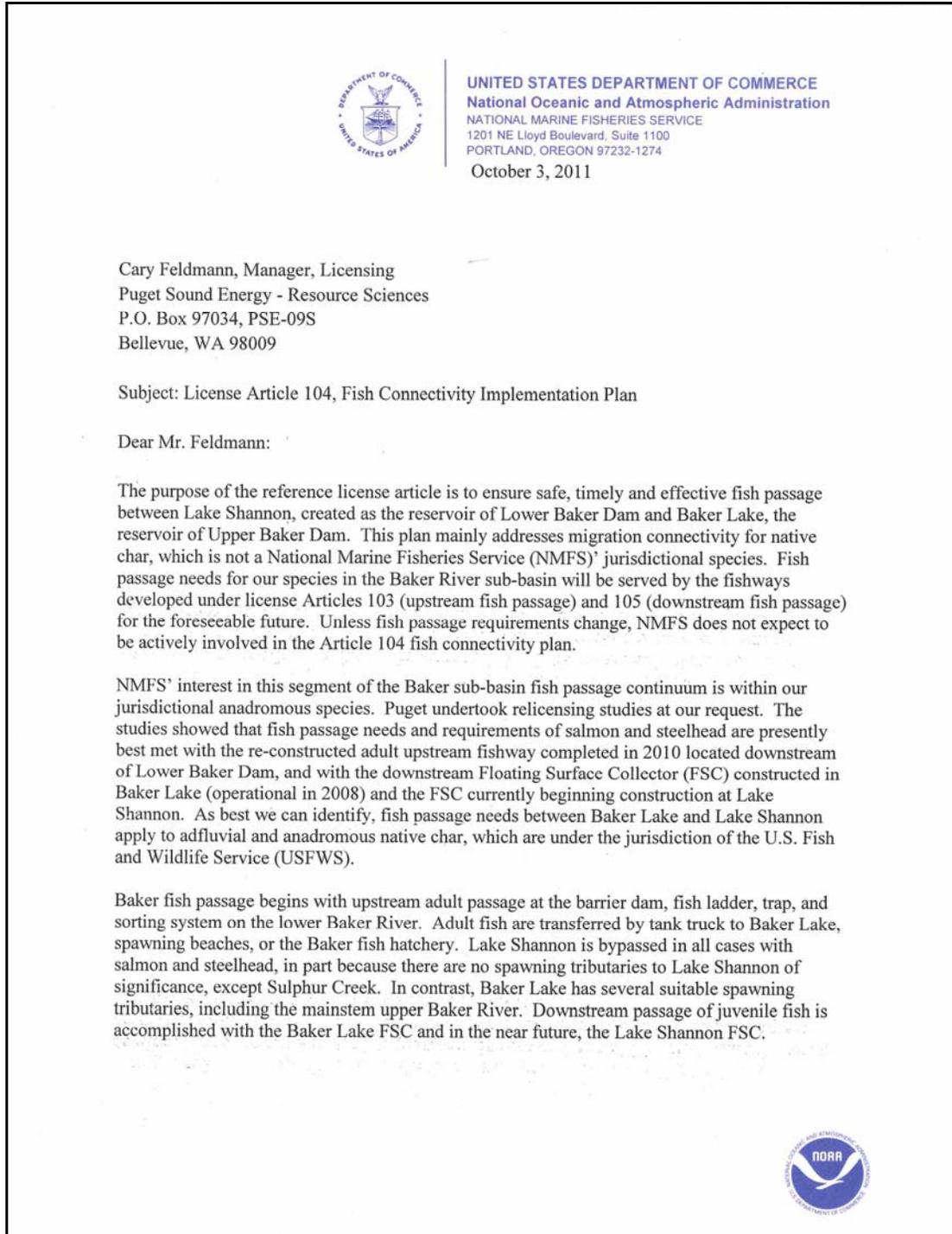


Figure 6. Letter documenting NOAA Fisheries approval for the SA 104 Fish Connectivity Implementation Plan.

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The plan Puget has developed pursuant to license Article 104 appears to serve the needs of native char, but NMFS defers to USFWS on this account. NMFS maintains an interest in, and reserves the right to require anadromous fish passage between Lake Shannon and Baker Lake.

Therefore, the Fish Connectivity Implementation Plan developed by Puget under Article 104 appears to satisfy the purpose and intent of the settlement agreement and project license. For further discussion of this subject, please contact Steve Fransen at 360-753-6038 or steven.m.fransen@noaa.gov.

Sincerely,



for Keith Kirkendall, Branch Chief
FERC and Water Diversions Branch
Hydropower Division

Figure 6, continued.

APPENDIX A: SUMMARY OF BAKER RIVER BASIN BULL TROUT STUDIES, 2002-2011

1.0 Introduction

The Baker River Hydroelectric Project is owned and operated by Puget Sound Energy (PSE) and consists of the Lower Baker Development completed in 1925 and the Upper Baker Development completed in 1959 (figure A1). In association with construction of the Upper Baker Development, PSE was issued a federal license in 1956 that combined the operations of both developments. The Baker River Project's federal license expired in 2006. PSE filed a notice of intent to relicense the Baker project in April 2001, and began relicensing activities that included studies to evaluate the effects of Baker River Project operations on aquatic resources. On November 30, 2004, a settlement agreement was filed with the Federal Energy Regulatory Commission (FERC). On October 17, 2008, the FERC issued its *Order on Offer of Settlement, Issuing New License and Dismissing Amendment Application as Moot*, licensing PSE to continue operating the Baker River Project.

The Baker River basin supports populations of bull trout (*Salvelinus confluentus*) which are listed as threatened under the Endangered Species Act (ESA) (64 FR 58910). Bull trout are members of the char group of the family Salmonidae, and are native to most of the interior and some coastal drainages of the Pacific Northwest (63 FR 31693). The decline of bull trout in the Puget Sound region has been attributed to habitat degradation, migration barriers, interactions with introduced species, and past management practices. Critical habitat for the Coastal/Puget Sound Distinct Population Segment (DPS) was designated on November 17, 2010 (75 FR 63898) and includes the Baker River, Lake Shannon, Baker Lake, and lower reaches of Sulphur Creek, Park Creek, and tributaries to the upper Baker River.

PSE initiated bull trout studies in the Baker River basin in 2002, and since 2008 has conducted bull trout studies in response to settlement agreement article 104 (SA 104) "Connectivity Between Lake Shannon and Baker Lake," of the 2008 FERC license. This memo summarizes bull trout studies conducted by PSE between 2002 and 2011. Additional information pertaining to bull trout study criteria, procedures and protocols, and numbers and disposition of bull trout captured at the Baker River Project fish passage facilities are presented in annual reports (PSE, 2010; 2011) developed in consultation with the US Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, the Washington Department of Fish and Wildlife (WDFW), and interested members of the Baker River Project Aquatic Resource Group (ARG).

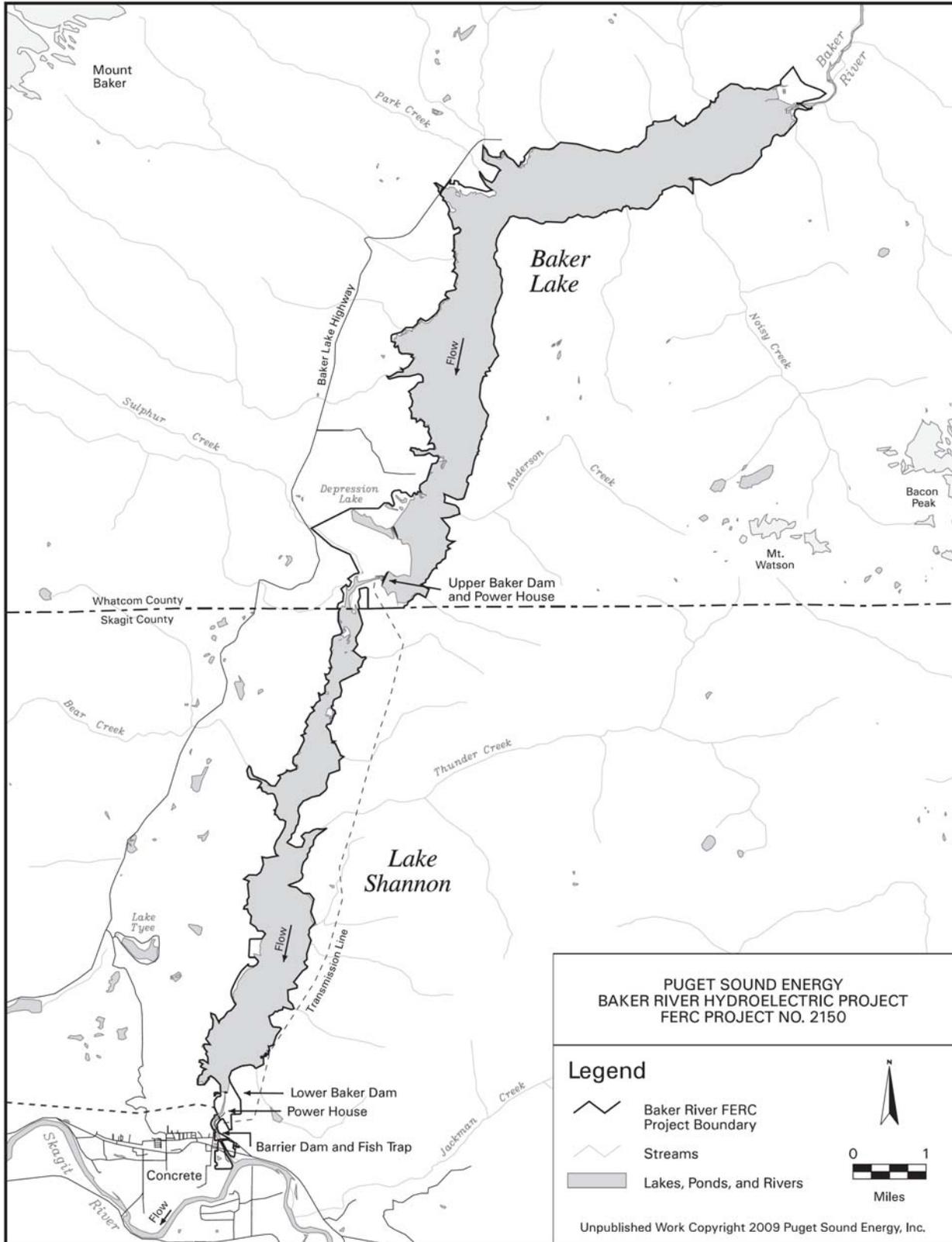


Figure A1. Baker River Hydroelectric Project, Concrete, Washington.

2.0 Background

The Baker River Project includes facilities located on and adjacent to the Baker River, occupying about 5,200 acres of land within the Mt. Baker-Snoqualmie Forest. The Lower Baker Dam forms Lake Shannon and is located near Concrete, Washington, approximately 1.2 miles from the confluence of the Baker and Skagit rivers. Lake Shannon is approximately seven miles long and covers about 2,278 acres at full pool. The Upper Baker Dam forms Baker Lake, located in Whatcom County near the border with Skagit County. Baker Lake is approximately nine miles long and covers about 4,980 acres at full pool. The two hydroelectric facilities have a combined capacity of approximately 170 megawatts.

Bull trout in the Baker River basin are part of the lower Skagit River subpopulation, which is the largest population of bull trout in Puget Sound. The lower Skagit River bull trout subpopulation is the only one in the Puget Sound analysis area considered “strong” by the USFWS, based on the large number of spawning adults and high overall abundance (64 FR 58910). Dolly Varden (*Salvelinus malma*) is another native char species that is proposed for listing under the ESA based on its similarity of appearance to bull trout. Within the Puget Sound region, Dolly Varden populations tend to be located in tributaries above natural barriers, while bull trout are found below the barriers. Dolly Varden have not been confirmed in the lower Skagit core area (USFWS, 2004); and analysis of over 590 native char tissue samples collected since 2002 have not identified Dolly Varden in the Baker River basin.

The lower Skagit River bull trout subpopulation exhibits anadromous, amphidromous, adfluvial, and riverine life history strategies, and there is considerable geographical overlap between bull trout exhibiting different life history patterns. Populations often have multiple life history expressions, and one fish may change between resident and migratory behavior. Unlike anadromous salmon, bull trout can survive to spawn year after year. Since many populations of bull trout migrate from their natal tributary streams to larger water bodies such as rivers, lakes, and saltwater, bull trout require upstream and downstream passage for repeat spawning as well as foraging. Also unlike anadromous salmon, only a few fish in the bull trout population may exhibit anadromy.

Lower Baker Dam was completed in 1925 at river mile 1.2, and blocked fish movement from the Skagit River upstream to historic Baker Lake at river mile 15. A fish ladder was constructed at Lower Baker Dam and there was trapping and hauling of fish into Lake Shannon (HRA 2000). Upper Baker Dam, completed in 1959, inundated and enlarged Baker Lake. A barrier dam was constructed at river mile 0.6 below Lower Baker Dam to guide fish into a trap, where they are collected and transported upstream to Baker Lake or to other locations depending on management protocols. Prior to 1995, upstream trap-and-haul operations would have included the upstream transport and release of bull trout into Baker Lake as incidental fish to the predominant sockeye salmon (*Oncorhynchus nerka*) and coho salmon (*O. kisutch*) runs. Between 1995 and 2007, an average of 21 bull trout entered the upstream fish trap each year, and were counted, measured, and released into Baker Lake.

Prior to the construction of the Upper Baker Dam, migratory fish exited Lake Shannon through Lower Baker Dam’s spillway and turbines. Surface fish collectors were installed in Lake Shannon in 1958 and in Baker Lake in 1959, and barrier nets were subsequently

deployed to enhance fish guidance to the downstream fish passage facilities (HRA 2000). Between 1994 and 2010, an average of eleven juvenile bull trout were collected each year at the Upper Baker downstream fish passage facility, and an average of three juvenile bull trout were collected at the Lower Baker facility. Juvenile bull trout collected at the downstream fish passage facilities are hauled downstream via transport trucks and released into the Skagit River. These counts do not include bull trout that may have passed downstream through the turbines or over the dam spillways.

There appear to be at least three local populations (spawning groups) encompassed by the Baker River basin. Sulphur Creek is a spring-fed tributary supporting the only known bull trout spawning habitat within Lake Shannon; Sulphur Creek bull trout are genetically distinct from bull trout in the upper Baker River basin (Small et al., 2009). Bull trout in Baker Lake spawn and rear in a complex of tributaries to the lake, with the primary spawning and rearing occurring in the upper Baker River and its tributaries; some spawning may also occur in the lake's smaller tributaries, such as Swift and Park creeks. Based on genetic analysis, bull trout in Baker Lake and its tributaries have been differentiated into at least two local populations (Small et al., 2009).

The Lower and Upper Baker dams restrict movement among local bull trout populations and may hinder access of bull trout with anadromous life history forms to other freshwater and marine habitats (USFWS, 2007). Prior to 2008, all adult bull trout that entered the Lower Baker upstream fish passage facility were transported and released into Baker Lake. Genetic analysis of bull trout collected in the upstream fish trap indicated that the majority of the bull trout originated outside of the Baker River basin. The location of the Lower Baker upstream fish passage facility near the confluence with the Skagit River makes it likely that bull trout from other local populations stray into the Lower Baker upstream trap during foraging movements. Despite years of mixing these populations, genetic integrity among Baker River basin populations remains high with little evidence of mixed ancestry in either reservoir (Small et al., 2008; 2009; 2011). Ongoing management measures are intended to reduce the transport of out-of-basin bull trout into Baker Lake.

3.0 Baker Bull Trout Relicensing Studies

Increased attention to Baker River basin bull trout management issues came about during studies conducted as part of project FERC relicensing efforts. In response to a 2002 relicensing aquatic study request, A-38 "Bull Trout Population Assessment and Risk Analysis," PSE initiated:

- Snorkel surveys of bull trout spawning reaches in Sulphur Creek and the upper Baker River, collection of bull trout tissue samples for genetic analysis, external tagging of adult bull trout to monitor movements, monitoring of water temperatures at select Baker River basin tributaries, and electrofishing surveys of spring-fed or glacially-fed tributaries to identify potential bull trout rearing areas (R2, 2005a).
- A basin-wide assessment of tributary habitat conditions (R2, 2003).
- Evaluation of potential salmonid redd survival in the portion of the upper Baker River delta exposed to reservoir pool level fluctuations (R2, 2005b).

In addition to biological studies, evaluations of the upstream and downstream fish passage facilities were conducted as part of relicensing activities. In accordance with

settlement agreement article 105 (SA 105), “Downstream Fish Passage Implementation Plan,” the Upper Baker and Lower Baker downstream fish passage facilities were redesigned to include guide nets, floating surface collectors (FSCs), transfer facilities, hauling vehicles, and stress-relief ponds. In addition, each facility was constructed with an extensive sampling and monitoring station that allows every fish entering the facility to be counted and examined. The Upper Baker FSC became operational in spring 2008, and the Lower Baker FSC will be operational by spring 2013. The new facilities will provide safe and effective downstream fish passage at the Upper Baker and Lower Baker developments. The new guide nets and increased range of operational conditions will reduce downstream entrainment of bull trout through the turbines or spillways and allow for tagging and sampling of all bull trout that enter the facilities. Bull trout that pass downstream through spill that exceeds the guide net capacity (i.e., greater than 15,000 cfs) will not be tagged and sampled; therefore, the potential exchange of genetic material between populations will persist.

The upstream fish passage facility located in the lower Baker River at river mile 0.6 was also evaluated as part of relicensing activities. New trapping, sorting, holding, and hauling facilities were completed in accordance with settlement agreement article 103 (SA 103), “Upstream Fish Passage Implementation Plan.” The new facilities became operational in June 2010 and provide safe and effective upstream fish passage. The new sorting facilities allow for tagging and sampling of all bull trout that enter the facility. Tagging and analyzing the genetic origin of bull trout entering the upstream trap will reduce the introduction of out-of-basin bull trout into Baker Lake.

4.0 Baker Bull Trout SA 104 Studies

Baker River basin bull trout studies continued after license issuance in 2008 in response to SA 104 and the USFWS biological opinion (USFWS, 2007). Bull trout connectivity within the Baker River basin is complicated by the tendency for bull trout to exhibit both resident and migratory behavior, and to move among basins. Bull trout collected at the Lower Baker upstream fish trap might be returning to spawn, or might be members of other Skagit basin subpopulations entering the lower Baker River to forage. Upstream transport could benefit bull trout belonging to a Baker River basin population as they return to spawn, but transporting out-of-basin bull trout from the Lower Baker upstream fish trap into Baker Lake may not be consistent with federal and state management goals. Bull trout collected at the downstream fish passage facilities might be out-of-basin fish previously introduced into Baker Lake that are now attempting to return to their river basin of origin, or they might be members of a local population migrating downstream to marine areas or freshwater habitats as part of foraging strategies .

Obtaining a basic understanding of the genetic origins of bull trout in the Baker River basin was considered a necessary first step in developing meaningful protocols for establishing connectivity between Lake Shannon and Baker Lake. Since 2002, tissue samples from adult, sub-adult, and juvenile char have been collected at both upstream and downstream fish collection facilities as well as from Sulphur Creek (a tributary to Lake Shannon) and six separate reaches of the Upper Baker River and its tributaries. PSE contracted with the WDFW to analyze the tissue samples, and genetic assignments were used to distinguish between fish with ancestry in Sulphur Creek, the upper Baker

River basin, and out-of-basin populations (i.e., Illabot Creek, the Sauk River, and Diablo Lake). Bull trout can live for 10–12 years, and out-of-basin fish that were released into Baker Lake can survive for 8 years or more after release. Results of this analysis were intended to provide a framework for implementing SA 104 (Small et al., 2008; 2009; 2011).

Tissue samples from 626 char were submitted for genetic analysis in 2008 through 2010; of these, 533 native char and 35 brook trout (*Salvelinus fontinalis*) samples had sufficient genotypic data for analysis. Brook trout are a char species native to eastern North America and were introduced into Washington State. Brook trout have a negative effect on bull trout populations through competition and hybridization. Tissue samples collected from brook trout in the Baker River basin were analyzed to confirm field species identifications and to identify possible brook trout-bull trout hybrids. The results of these analyses (Small et al., 2009; 2011) included the following.

- Between 2002 and 2010, 158 bull trout entered the Lower Baker upstream fish trap and were transported upstream and released into Baker Lake; the majority of bull trout transported from the Lower Baker upstream trap and released into Baker Lake originated outside the Baker River basin (figure A2). Tissue samples for genetic analysis were not collected from bull trout captured prior to 2002.
- Despite years of mixing these populations, genetic integrity among Baker River basin populations remains high, with little evidence of interbreeding in either reservoir.
- GeneClass analysis of juvenile bull trout collected in Sulphur Creek and the upper Baker River indicated that few fish from populations other than Sulphur Creek had spawned in Sulphur Creek, and an even smaller proportion of fish from populations outside the upper Baker River had spawned in the upper Baker River, the largest tributary to Baker Lake.
- Some out-of-basin bull trout and Baker Lake fish were captured in Lake Shannon; however, Sulphur Creek juveniles show little sign of genetic introgression.
- Tissue samples from juvenile bull trout collected from Sulphur Creek and upper Baker River tributaries can be used as a Baker River basin bull trout genetic baseline.
- A portion of the Baker River basin bull trout populations continue to express downstream migratory behavior.

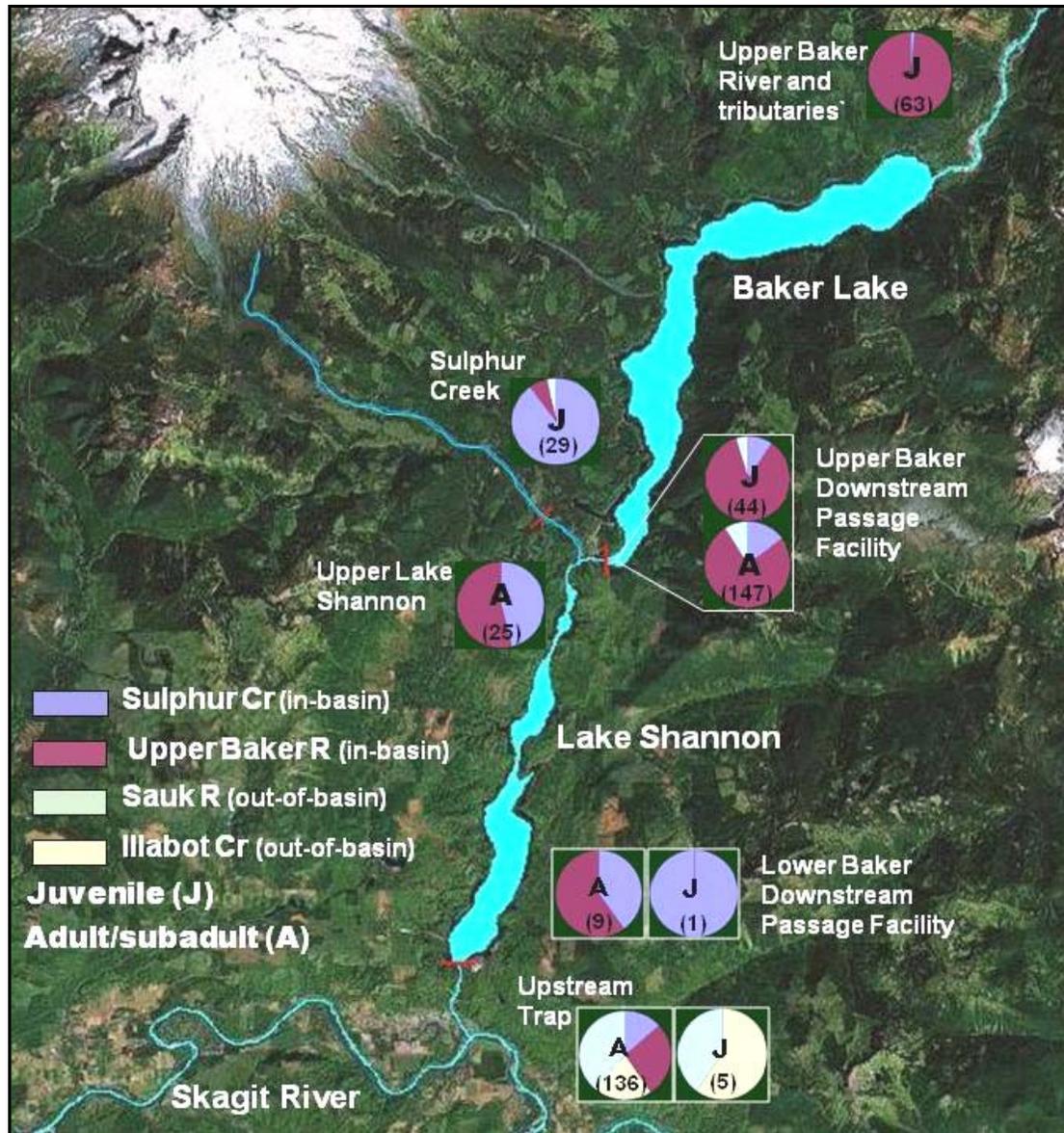


Figure A2. Genetic assignment of adult/subadult (≥ 150 mm) and juvenile (< 150 mm) bull trout captured in 2002–2010 in the Baker River basin. GeneClass assignments determined by the WDFW Molecular Genetics Lab. (Google Earth background adapted from a March 31, 2006 image.)

In response to SA 104 and the terms and conditions of the USFWS biological opinion for FERC licensing of the project (USFWS, 2007), PSE began other study efforts to support the evaluation of fishway alternatives.

- Consultation with the USFWS and WDFW.** In addition to monthly consultation with the ARG, consultation with the USFWS and WDFW has occurred periodically to help guide study direction, develop bull trout handling protocols, and monitor the progress of genetic analysis. Records of consultation are provided in annual reports on SA 104 activities (PSE, 2010; 2011).

- **Snorkel surveys.** Fall snorkel surveys to count bull trout in index reaches of the upper Baker River and in Sulphur Creek had been conducted from 2000–2006 in support of FERC relicensing. PSE resumed the surveys in 2009.

All reaches of Sulphur Creek below the 21-foot waterfall at RM 1.0 were surveyed. Biological surveys of the mainstem upper Baker River and other tributaries in the Baker River watershed included electrofishing, snorkel, and spawning surveys conducted by staff from the Tribes, the USFS, the National Park Service, the USFWS, PSE, and private consultants. A summary of habitat conditions and fish distribution data on tributaries to Baker Lake was prepared in support of relicensing of the Baker project (R2 2003). Based on an analysis of bull trout distribution and in consultation with USFWS, the mainstem upper Baker River was selected to monitor major changes in bull trout abundance.

Biological surveys were conducted in the mainstem upper Baker River in 2000-2001, 2003-2006, and 2009-2011. The upper Baker River was divided into four reaches from the confluence of Bald Eagle Creek (RM 26.9) downstream to Baker Lake (RM 20.0). The uppermost reach (Reach 4), extends downstream 2.1 miles from the confluence of Bald Eagle Creek, and due to access constraints was surveyed on an irregular basis. The majority of char observed in the upper Baker River were consistently observed in Reaches 3 and 2 between RM 24.8 and 21.2. Reach 1 of the upper Baker River has a gradient, and major portions can be inundated by Upper Baker Dam flood control operations. The variation in river channel length inhibits survey consistency, and Reach 1 typically had low char counts. For these reasons, in consultation with the USFWS and other interested parties, surveys of Reaches 2 and 3 were selected as index reaches to assess char migration timing and relative abundance.

- **Bull trout tagging.** During relicensing studies, PSE used external Floy tags to track the movement of bull trout captured at the upstream fish passage facility. Starting in 2008, PSE began inserting passive integrated transponder (PIT) tags into all bull trout at least 125 mm long captured in the Baker River basin. Information on length, weight, age, tissue samples for genetic analysis, and capture and release sites enabled tracking of bull trout movements.
- **Lake Shannon native char collection and genetic analysis program.** Active collection of bull trout in Lake Shannon was initiated in 2009, targeting likely areas of holding or feeding bull trout (figure A3). One objective of the angling effort was to obtain bull trout tissue samples to determine the genetic origin of bull trout in Lake Shannon and to increase the number of PIT-tagged bull trout of known origin in Lake Shannon.
- **Baker Lake downstream fish passage predation study.** Angling conducted as part of the biological evaluation of bull trout predation at the Upper Baker FSC (SA 105) increased the number of PIT-tagged bull trout of known origin in Baker Lake. A byproduct of the Baker Lake predation study was the return of recaptured bull trout to their basin of origin.
- **Annual reporting.** A report prepared and distributed annually describes SA 104 implementation activities including consultation, snorkel surveys, collection and

genetic analysis of native char, and the Lake Shannon native char capture, genetic identification and translocation program (PSE, 2010; 2011).

According to the 2009 bull trout management protocols, untagged bull trout collected in the Lower Baker upstream trap were PIT-tagged and then released back downstream into the Skagit River. Tagged bull trout that were recaptured in the upstream fish trap were released into Baker Lake, or were released into Lake Shannon if they were of Sulphur Creek origin. With the exception of char 40 mm or less that were returned to the reservoir from which they were collected, char collected in the downstream fish passage facilities at least 125 mm in length were PIT-tagged and released downstream in the Skagit River. These protocols for transporting fish did not provide direct upstream connectivity from Lake Shannon to Baker Lake.

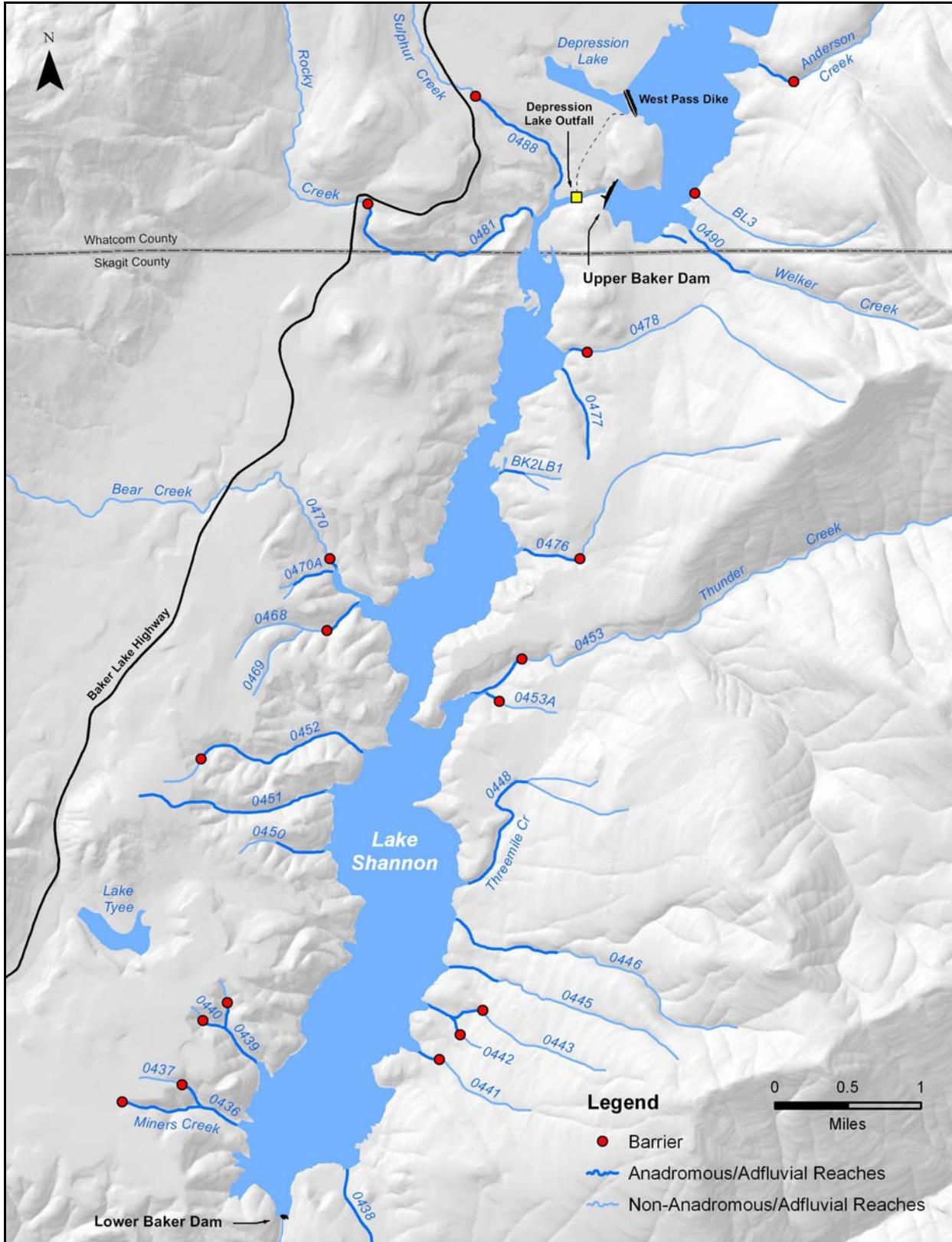


Figure A3. Lake Shannon native char active collection (angling) locations including Upper Baker tailrace, Depression Lake outfall, Rocky Creek and other tributaries.

Bull trout management protocols for 2010 continued genetic analysis of all bull trout over 40 mm in length and PIT-tagging all bull trout at least 125 mm in length. Char known to be of out-of-basin genetic origin were always released in the Skagit River. Upstream transport from the upstream fish trap was provided for all other PIT-tagged char. Char of Sulphur Creek origin were transported to Lake Shannon, and char of Upper Baker origin, as well as PIT-tagged char whose genetic analysis had not been completed, were transported to Baker Lake. Char encountered in the Lake Shannon downstream fish passage facility and Upper Baker FSC were released into the Skagit River, with the exception of Sulphur Creek origin char that were captured in the Upper Baker FSC; these were released into Lake Shannon. Bull trout of out-of-basin origin that were captured by angling in Baker Lake or Lake Shannon were released into the Skagit River. For char captured by angling in Lake Shannon, those of Sulphur Creek origin were returned to the lake, and those of Baker Lake origin were released into the Skagit River if caught from December through May or into Baker Lake if captured from June through November.

Protocols for 2011 remained the same as for 2010 with two exceptions. For 2010, char were assigned to a likely population of origin using a 90 percent likelihood value threshold applied to data from the GeneClass analysis. Those with less than 90 percent likelihood values were classified as char of unknown origin. For 2011, char will be managed using the population of origin with the highest likelihood value, even if below the 90 percent threshold for positive assignment. In addition, the boat launch at the confluence of the Baker River was made the priority site for char released to the Skagit River.

These protocols provided for direct upstream connectivity from Lake Shannon to Baker Lake during the late summer and fall months when upstream migrations to natal spawning areas are most likely to occur. These protocols reduce the forced movement of out-of-basin bull trout into the Baker River basin, and will gradually increase the proportion of the bull trout population carrying PIT tags.

All bull trout at least 125 mm in length migrating downstream through the fish passage facilities are PIT-tagged. Because not all bull trout exhibit downstream migration behavior, active collection allows bull trout that exhibit adfluvial behavior or otherwise inhabit reservoir habitats to be tagged and analyzed. It is possible that management protocols may be modified in the future as more bull trout of known origin are recaptured.

Investigations into the genetic origins of bull trout encountered throughout the Baker River basin were instrumental in evaluating the type of fishway to provide connectivity for native char as part of SA 104. Genetic analysis revealed that bull trout populations in both Lake Shannon and Baker Lake have maintained high levels of genetic integrity, with little evidence of mixed ancestry. Rather than facilitate genetic flow from Lake Shannon to Baker Lake with a structural fishway, current native char management objectives support development of a protocol that preserves each genetically unique bull trout populations' reproductive potential. This model is structured around the reproductive benefits of stock segregation rather than forced co-mingling and aims to: 1) keep bull trout of Sulphur Creek origin in Lake Shannon, 2) transport bull trout of out-of-basin origin to the Skagit River, and 3) transport bull trout of Upper Baker origin to Baker Lake, while providing all bull trout with the opportunity to migrate downstream through

the fish passage facilities. Native char protocols reflecting these objectives have been incorporated into a long-term operational plan.

Upstream and downstream fish passage at the project is provided by an upstream trap-and-haul facility below Lower Baker Dam and downstream fish passage facilities in Lake Shannon and Baker Lake. By spring 2013, each of the fish passage facilities will have been redesigned, enlarged, and constructed in response to the FERC license and specifically SA 103 and SA 105. Each of the facilities were designed in consultation with USFWS and NOAA Fisheries, and include an extensive fish monitoring station whereby every bull trout captured in the facilities can be individually sorted, handled, sampled, and tagged before release. The ability to handle and manage every bull trout that enters a Baker fish passage facility provides opportunities for bull trout management not commonly found at other hydropower projects. Some bull trout may migrate downstream during spill events or through the power generation turbines, providing the potential exchange of genetic material between local populations. However, the majority of bull trout passing through Upper and Lower Baker dams can be counted and tagged, contributing to an ongoing database of Baker native char.

The directive for native char management, after consultations with the USFWS, NOAA Fisheries, WDFW, and other members of the ARG, has been to relocate recaptured char as appropriate after genetic analysis has been conducted to determine their population of origin. All adult and subadult bull trout captured at Baker River fish passage facilities will receive PIT tags and DNA sampling to determine genetic origins. Capture of bull trout at the Baker fish passage facilities will be supplemented by tagging and sampling of bull trout captured through the active collection and transport of bull trout in Lake Shannon conducted as part of SA 104. The initiation of an active collection program in Lake Shannon, combined with char captured and transported from the upstream trap, the Lake Shannon downstream fish passage facility, and the Upper Baker FSC, constitutes a programmatic or operational fishway that provides genetic-specific connectivity throughout the Baker River basin. The protocols will be annually reviewed by the USFWS, NOAA Fisheries, WDFW, and other members of the ARG. This approach will be subject to modification through adaptive management as additional information is developed.

The intent of the SA 104 program is to allow management of individual fish after genetic analysis has been conducted to determine their population of origin. By collecting, sampling, genetically analyzing, and PIT-tagging native char at the Baker fish passage facilities, supplemented by directed angling efforts in Lake Shannon, native char in the Baker River basin can be managed to ensure the genetic integrity and health of local native char populations.

5.0 References and Literature Cited

- Clay, C. 1995. *Design of Fishways and Other Fish Facilities*. 2nd ed., Lewis Publishers.
- HRA (Historical Research Associates, Inc.). 2000. *Salmon on the Baker River: A history of fisheries management at Puget Sound Energy's Baker River Project*. Prepared for Puget Sound Energy, Bellevue, Washington. Historical Research Associates, Inc., Seattle, Washington.

- NMFS (National Marine Fisheries Service). 2008. Anadromous salmonid passage facility design. NMFS, Northwest Region, Portland, Oregon.
- Puget Sound Energy. 2005. Application for new license, major project-existing dam. Revised applicant-prepared preliminary draft environmental assessment, Volume II, Part 1 of 2, Baker River Hydroelectric Project, FERC No. 2150, 18 CFR, Part 4, Subpart F, Section 4.51, Puget Sound Energy, Inc. Bellevue, Washington.
- Puget Sound Energy. 2010. 2009 annual report, settlement agreement article 104, Connectivity between Lake Shannon and Baker Lake. Reporting period June 1, 2009 – May 31, 2010 and interim period October 17, 2008 – May 31, 2009. Prepared by Puget Sound Energy, Inc. Bellevue, Washington.
- Puget Sound Energy. 2011. 1010 annual report, settlement agreement article 104, Connectivity between Lake Shannon and Baker Lake. Reporting period June 1, 2010 – May 31, 2011. Prepared by Puget Sound Energy, Inc. Bellevue, Washington.
- R2 (Resource Consultants, Inc.). 2003. Habitat conditions of tributary reaches accessible to anadromous and adfluvial salmonids and estimated salmonid production potential: Baker River Basin, Baker River Hydroelectric Project Relicensing, FERC No. 2150. Draft dated October 2003. Prepared by R2 Resource Consultants, Inc., Redmond, Washington, for Puget Sound Energy, Inc., Bellevue, Washington.
- R2. 2005a. Native char investigations. Aquatic Resources Working Group Study A-38. Baker River Hydroelectric Project Relicensing, FERC No. 2150. Prepared by R2 Resource Consultants, Inc., Redmond, Washington, for Puget Sound Energy, Inc., Bellevue, Washington.
- R2. 2005b. Upper Baker delta scour assessment and spawning evaluation. Aquatic Resources Working Group Study A-15. Baker River Hydroelectric Project Relicensing, FERC No. 2150. Final Draft report dated January 2005. Prepared by R2 Resource Consultants, Inc., Redmond, Washington, for Puget Sound Energy, Bellevue, Washington.
- Small, M.P., W.A. Ardren, P.J. Hilgert, and J.F. Von Bargaen. 2008. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final Report dated December 23, 2008. prepared for Puget Sound Energy, Bellevue, Washington.
- Small, M., P. J. Hilgert, W.A. Ardren, and J.F. Von Bargaen. 2009. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Analysis of 2006-2008 tissue samples. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final report dated December 10, 2009. prepared for Puget Sound Energy, Bellevue, Washington.
- Small, M.P., N. Overman, P. J. Hilgert, and E. Martinez. 2011. Genetic Analysis of Bull Trout in the Baker River Basin, Washington. Analysis of 2009-2010 tissue samples. Prepared by Washington Department of Fish and Wildlife, Olympia Washington. Final report dated February 25, 2011. Prepared for Puget Sound Energy, Bellevue, Washington.

- U.S. Fish and Wildlife Service. 2004. Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*). Volume I (of II) Puget Sound management Unit. Portland, Oregon.
- U.S. Fish and Wildlife Service. 2007. Biological Opinion for the Federal Energy Regulatory Commission and U.S. Army Corps of Engineers Relicensing of the Baker River Hydroelectric Project FERC No. P-2150. Western Washington Fish and Wildlife Office, Lacey, Washington.