BAKER R. FISH PASSAGE FACILITIES DESIGN
FISH PASSAGE TECHNICAL DESIGN TEAM

9:00 a.m. - 3:00 p.m.
January 20, 2004

AGENDA

Objective: Continue engineering design development of Upper Baker Guide Net and FSC system.

9:00 - 9:10	Review agenda and handouts (Verretto)
9:10 - 9:15	Review minutes & action items (Verretto)
	Downstream Passage
9:15 - 10:30	FSC design development (Eldridge) • structure • hydraulics • naval architecture • pump station • controls • electrical
10:30 - 10:40	Break
10:40 - 11:45	FSC design development (Eldridge)
11:45 - 12:15	Lunch (provided)
12:15 - 12:45	Stress-relief ponds (Eldridge)
12:45 - 2:45	Guide net design development, schedule (Verretto)
2:45 - 2:50	Other Issues (Verretto)
2:50 - 2:55	Evaluate meeting & review assignments (Verretto)
2:55 - 3:00	Long-term schedule, agenda, facilitation (Verretto)

PSE PUGET SOUND ENERGY

Baker River Project Relicense

Red Lion SeaTac Hotel 206-246-5535

DRAFT MEETING MINUTES
BAKER RIVER FISH PASSAGE FACIILITIES DESIGN
FISH PASSAGE DESIGN TEAM

Mission Statement: To develop an efficient fish passage design for the Baker River Project.

Project: Baker River Project
FERC No. 2150

Written By: Nick Verretto, PSE

Meeting Date: January 20, 2004

Location: Red Lion SeaTac Hotel

Attendees:

Arnie Aspelund, PSE	Steve Fransen, NMFS
Ken Bates, FPP&D	Frank Hella, PSE
Ed Cassady, PSE	Gary Sprague, WDFW
Ray Eldridge, MWH	Jim Stow, USFWS
Cary Feldmann, PSE	Nick Verretto, PSE

Purpose: Continue engineering design development of Upper Baker FSC and guidance net system.

Future Meeting Dates:

Mar 8, 2004	*9-3 technical design mtg at Baker Lodge.*
Mar 9, 2004	*9-3 passage design mtg at Baker Lodge.*
Apr. 13, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*
Apr. 14, 2004	*9-3 passage design mtg at Red Lion SeaTac Hotel.*
June 01, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*
June 02, 2004	*9-3 biological evaluation development mtg at Red Lion SeaTac Hotel.*
July 13, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*

See handout for additional meeting dates.

New Action Items

Eldridge - Review pond design at Cowlitz, ODF&W, and Umatilla for methods of forcing fish out of the ponds without inducing jumping, injury or avoidance for incorporation into Baker stress-relief ponds.

No other new action items were noted. Design development will continue based on today's discussion.

Technical Memos/Reports Distributed

The items distributed and reviewed at the meeting were: 01/20/04 and 01/21/04 agendas (PSE), long-term planning schedule (PSE), updated team list (PSE), minutes of 12/03/03 and 12/04/03 meetings (PSE), FSC design drawings (MWH), FSC hydraulics & pumping plans for 500 and 1000 cfs units (MWH), guide net and transition structure designs (MWH), Baker River Draft Proposed Actions, Section 3.2 (Fish Passage Management Implementation Plan) and Appendix (PSE), decision matrix (PSE), evaluation matrix (PSE), stress-relief pond sizing technical memo (MWH).

Review Agenda, Minutes & Action Items

Verretto distributed handouts and reviewed general content of each. Team members noted that Gary, Lyn, Ed, Cary, Gene, Jim and Bruce would not be in attendance in tomorrow's meeting. Because the April 13 and 14

meetings are the last scheduled as two-day (back-to-back) meetings, and because the group assumes that passage settlement resolution will have eliminated the need for a June meeting, the team decided to reserve June 2 as a biological evaluation development day. Further development of the biological evaluation would occur the day after scheduled technical design meetings, as decided by the group at subsequent meetings.

FSC Design Development
Ray distributed the floating surface collector design, pumps and hydraulic information and reviewed it with the group. The FSC technical design memo, scheduled for completion mid-March, will contain the following sections: biological and hydraulics, floatation, structural, mechanical, and electrical. Some of the major design decisions required in the near-term include: construction and launch method, pumps system identification and modeling, and structure size reduction.

- **Structure**

Ray reviewed the structural designs and the suggested launch method, which is a graving dock. The structure 's size is 490 tons dead load plus 500 tons live load (to Whatcom Co. standards), or total 1,000 tons. The extreme live loads reflect the large structural footprint and consequent snow and ice loads. Although the 'Normal migration period' is defined as March 1 to August 15, the facility has to be capable of operating outside of the normal migration window. The facility has to be designed to operate during all seasons, although year-round operation is not intended. Details such as mechanical and structural handling of snow and ice loads must be factored into the design, and push the structure to an enormous size. The design is now focusing on methods to reduce the size, and cost, of the structure while maintaining the hydraulic aspects of the design.

- **Hydraulics**

Ray reviewed hydraulic design information through the screening structure. The bypass design challenge of limited head was again noted. The bypass design alternatives, in order of preference, are: 1) open channel flow with 18" minimum width, 2) non-pressurized pipe of 2' minimum diameter, and 3) pressurized pipe of 2' minimum diameter. Head differential should trip pumps, rather than lift or fail screens.

- **Naval Architecture**

Glosten Associates is the marine engineering firm employed to develop the floatation structure and ensure stability under all operating conditions. It appears that pre-fabricated modular steel barges will not suit the design, so custom units will have to be designed and fabricated.

- **Pump Station**

Flow criteria was clarified for the phased installation as 500 cfs for the phase one FSC and 1000 cfs for the phase two installation. These flows include the bypass flow of 25 cfs, so should be considered the total attraction flow. Screened flows – or pumped flows - would therefore be 475 and 975 cfs for the two phases. Three pump types were reviewed and the preferred one presented. Modeling is being coordinated with the pump manufacturer and ENSR to confirm design assumptions before final selection is made.

- **Controls & Electrical**

A half-day meeting will be held at the MWH office in the near future to define and begin developing the controls and analysis system.

Stress Relief Pond Design / Acclimation Pond Proposal by WDFW
Eldridge led a discussion of the draft TM for the stress relief ponds that would be located near the confluence of the Baker and Skagit Rivers. The facility would consist of three raceways, be sized for 118,000 fish/day, and accommodate holding times of between 48 – 72 hours. Raceways are the recommended containment structure, with accommodation of future expansion as the run exceeds initial capacity. Calculated numbers per the design

team's recommendations produced a maximum of 97,000 sockeye and 20,000 coho per day. At 30 fish/lb., 5,000 lbs. of fish would be loaded into one of three raceways for 48 – 72 hours holding time before being released into the Baker River. Using a Flow Index (F) of 1.5 and a Density Index (DI) of 0.3 (loading density of 0.3 lbs./cu. ft.), each of the three raceways would require a flow of 0.55 cfs and have a volume of 1,200 cu. ft. (approximately 8'W x 50'L x 3'D). The water supply would be configured for ultimate of 3.3 cfs.

The design will identify methods of forcing fish out of the ponds without inducing jumping, injury or avoidance. Facilities to consider include Cowlitz, ODF&W, and Umatilla. Pond operation during high river flows will be considered. Release modes to be considered include backing trucks into pond, release hoses and chutes to avoid free-fall truck release into ponds.

The WDFW's Grandy Creek or Baker River acclimation ponds proposal was presented to the team, as discussed 0114/04 at the MWH office. The WDFW proposes to acclimate up to 334,000 winter steelhead at the refurbished Grandy Creek facility, or at the Baker River (on PSE property) if the Grandy Creek site is ruled unsuitable during EIS review, for release into the lower Skagit River defined as the mainstem downstream of the Baker River confluence). The fish would be raised at the Marblemount hatchery, then placed in the acclimation ponds from October – June 1. January – April is the anticipated adult return period, and 400 fish is the escapement estimate – which would be seen at the Baker adult trap. The proposed facility would consist of two ponds 20'W x 140'L (requiring 10-12 cfs flow), a work trailer and clarification pond, intake and pipeline, and bypass pipeline. The schedule for installation would be within two years, if permits and funding were issued. The screened weir intake would have to be resized, as would the stress-reduction ponds bypass pipeline.

The group had reservations about the proposal, related to impacts to the Baker relicensing schedule and basin management, but were not opposed to it. The group felt that the proposal did not fit within any of the settlement articles, and that it may present some conflicts with some of the directions taken in the basin. Possible conflicts include: adult trap numbers increase, implementation schedule, conflicts with intervenors opposed to hatchery programs, no real Project benefit other than shared intake and outlet, scheduling conflicts regarding outmigrants and coinciding steelhead migration, and construction sequencing and logistics. Fish culture concerns include water temperature, IHN, Lake Shannon turbidity and effluent treatment. The targeted release of 334,000 is over 50% of basin production. Further discussion will have to follow once the EIS is submitted and if it appears that the likely site will at the Baker River.

Guide Net Design Development, Schedule

Nick reviewed the new guide net and transition structure designs. The system is under construction for installation March 2004, and incorporates much of the hydraulic controls discussed during the ongoing FSC design process. Entrance velocity, acceleration and flow continuity will be greatly controlled with the new net transition structure (NTS), which is an aluminum-framed, HDPE-lined inclined channel. The entrance width of the NTS was reduced from 75' to 50' to prevent deceleration as fish encounter the entrance from either side of the guide net panel. This decision was taken after review by MWH of last spring's forebay velocity data. The net design incorporates a huge number of innovations developed over several iterations of the system, as well as continuous design development which began last fall.

Considerations for a future net were discussed. One of these, mentioned briefly in the past and discussed here at length, was making the entire panel inclined to guide fish to the surface and increase the distance from the false attraction of the intake. The entire group decided to remove this for consideration due to the immense complexity, and, therefore, of its likelihood of failure. Design efforts should be toward making the net both simple and "bullet-proof".

Two other areas needing attention are in reducing mesh size of the upper 30' of the net to capture fry. Mesh size should be 3/32" in this area, and may require a double-walled construction for strength because of the loads

placed on the upper portions of the net. The 3/32" criteria is one of the preliminary terms and conditions submitted by NMFS to the FERC. The other criteria to focus on is narrowing the vee by moving the anchors upstream. This will move fish away from the confusing attraction flow of the intakes and discharge pumps, reduce the area of searching and milling seen in the 2002 behavioral studies, move the nets away from the spill gates, remove potential for cul-de-sacs, place the nets more in tension (and therefore strengthen them) relative to spill and intake flows, and have a number of other potential benefits. The nets cannot be moved upstream far enough to prevent access to streams or coho rearing areas.

Other Issues
None identified.

Evaluate Meeting
Did not conduct meeting evaluation.

Long-Term Schedule, Agenda, Facilitation

Mar 8, 2004	*9-3 technical design mtg at Baker Lodge.*
Mar 9, 2004	*9-3 passage design mtg at Baker Lodge.*
Apr. 13, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*
Apr. 14, 2004	*9-3 passage design mtg at Red Lion SeaTac Hotel.*
June 01, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*
June 02, 2004	*9-3 biological evaluation development mtg at Red Lion SeaTac Hotel.*
July 13, 2004	*9-3 passage technical design mtg at Red Lion SeaTac Hotel.*

See handout for additional meeting dates.

Monday, Mar. 08, 2004, 9-5 passage technical design mtg at Baker Lodge.
Review agenda and handouts (Verretto)
Review minutes & action items (Verretto)
Guide net design review (Verretto)
Guide net & NTS slide show (Verretto)
Guide net & NTS site visit (Verretto)
Overall passage system development schedule (Brink)
FSC design memo review (Dorratcague)

- Structure
- Hydraulics
- Naval architecture
- Pump station
- Controls
- Electrical

Other Issues (Verretto)
Evaluate meeting & review assignments (Verretto)
Long-term schedule, agenda, facilitation (Verretto)

Facilitation: Will be provided for future passage meetings (not technical design meetings), unless otherwise noted.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

IN REPLY REFER TO
ER03/881

Electronically Filed

January 20, 2004

Ms. Connie Freeland
Puget Sound Energy
P.O. Box 97034 PE-09S
Bellevue, Washington 98009-9734

Dear Ms. Freeland:

Subject: **DRAFT COMMENTS, PRELIMINARY RECOMMENDATIONS, AND DRAFT PRELIMINARY PRESCRIPTIONS –** Notice of Draft License Application and Preliminary Draft Environmental Assessment for the Baker River Hydroelectric Project, Project No. 2150-026, Whatcom and Skagit Counties, Washington

The Department of the Interior (Department) has reviewed the Draft License Application and Preliminary Draft Environmental Assessment (PDEA) for the Baker River Hydroelectric Project, FERC Project No. 2150-026, Whatcom and Skagit Counties, Washington. The Department offers the following comments, recommendation, and terms and conditions.

These comments are preliminary and reflect the status of project planning and information available at this stage of the relicensing process. Likewise, any fish and wildlife recommendation or prescription for fishways referenced in these comments is preliminary and subject to change pending the outcome of the pre-filing consultation process, Commission acceptance of a final license application, and the completion of the Commission's environmental analysis. The Department does not intend to object to the issuance of a new license for the Baker River Project provided our draft recommendations, terms and conditions, and draft preliminary prescriptions are incorporated into the final license application.

GENERAL COMMENTS ON THE APPLICATION

Project Location and Description

The Baker River Hydroelectric Project (Project) is located on the Baker River in Skagit and Whatcom Counties, Washington, north of the town of Concrete. The project consists of two developments: Lower Baker Development and Upper Baker Development.

The Lower Baker Development is located at river mile (RM) 1.2, upstream of the Baker River's confluence with the Skagit River. It was constructed between April 1924 and November 1925. Lower Baker Dam is a 285-foot-high, 550-foot-long concrete gravity arch dam consisting of a non-overflow section at each abutment and a centrally located spillway section. The top of the dam is at elevation 450.62 feet mean sea level (msl).

The other Lower Baker project facilities consist of a 7-mile-long reservoir (Lake Shannon), a power tunnel, a single-unit powerhouse at RM 0.9, a fish barrier dam and trap at RM 0.6, a primary transmission line, and associated facilities. The dam was raised 33 feet in 1927. In 1965, a landslide destroyed the three-unit powerhouse. Turbine generator Units 1 and 2 were abandoned as a result of the slide, and a new powerhouse structure was built for Unit 3, which was refurbished and reinstalled. Unit 3 returned to service in September 1968.

At RM 0.6 on the Baker River, a barrier dam blocks adult fish from continuing upstream and guides them into the fish trap facility. The fish trap facility is a concrete and steel structure consisting of an entrance vestibule, three holding ponds, and a hopper pond. The fish are transferred into the truck via hopper and transported to the Upper Baker reservoir and/or spawning beaches. This is the only upstream fish passage facility currently in operation at the Baker River project.

Downstream migrating fish are collected using a barrier net guidance system, surface collection attraction barge, and a fish trap/sampling facility. Downstream migrants are captured, sampled for biological information, transferred to a tank trailer, and trucked to the mouth of the Baker River where they are released. The guide net has a mesh size of 0.25 inch and extends from shore to shore about 600 feet upstream of the dam. Net sections extend from the reservoir surface to approximately the contour of the reservoir bottom, ranging in depth from 50 feet to 250 feet.

The Upper Baker Development at RM 9.35 was constructed between June 1956 and October 1959. Upper Baker Dam is a concrete gravity dam 312 feet high and 1,200 feet long consisting of spillway, intake, and non-overflow sections. The top of the dam is at elevation 735.77 feet msl. The 93-foot-wide spillway section is an integral part of the main gravity dam. The spillway crest is at elevation 697.77 feet msl. The spillway capacity is 48,000 cubic feet per second (cfs) at the normal full pool elevation of 727.77 feet msl. Other facilities at the Upper Baker development are an earthen dike, a 9-mile-long reservoir, a two-unit powerhouse, and associated facilities.

Baker Lake reservoir is about 9 miles long and 1 mile wide. It has a surface area of 4,980 acres at normal full pool elevation of 727.77 feet msl. The gross storage capacity is 274,202 acre-feet. The minimum generating pool elevation is 677.77 feet msl, which provides usable storage of 180,128 acre-feet.

A 115-foot-high, 1,200-foot-long earth and rock-fill dam, known as West Pass dike, is located in a depression approximately 1,500 feet north of Upper Baker Dam. Depression Lake is situated in a natural depression located on the west side of West Pass dike. Its southern edge is formed by a 3,000-foot-long, 22-foot-high earth-fill dike (Pumping Pond dike). Water enters Depression Lake, in part, as a result of subsurface leakage from Baker Lake, transmitted through native materials. A water-recovery pumping station pumps water from Depression Lake through a pipeline into a discharge channel leading into Baker Lake. When pumps are not in operation, excess water is discharged over the spillway into a drainage channel and conduit system, and back to the Baker River downstream of the Upper Baker powerhouse.

Downstream migrating fish are collected using a barrier net guidance system, barge mounted surface collector and a fish trap/sampling facility. The surface collection facilities attract the downstream-migrating fish with flow created by two 34,000 gallon per minute (gpm) pumps. The fish are guided over a weir into a flume that directs them into a pipe connecting to the fish trap. The fish are placed in hoppers and released into a 400-gallon fish tank-trailer. The fish are then transported downstream and released near the mouth of the Baker River.

Sockeye Spawning Beaches

There are three sockeye salmon spawning beaches located at the northern end of Baker Lake near Channel Creek, and a fourth located adjacent to Sulphur Creek, just west of the Upper Baker Dam. The beaches are lined, shallow ponds filled with graded gravel. Beneath the gravel is a series of diffusion pipes that provide upwelling spring water. Spawning Beach 1 is not functional and has not been used since 1965. Spawning Beach 2 has not operated since 1994. Spawning Beach 3 is operational and measures 50 feet by 100 feet. Spawning Beach 4 at Sulphur Creek was constructed in 1989 to replace the other 3 spawning beaches which were threatened by destruction from a shifting Baker River channel.

RESOURCE DESCRIPTION

Fisheries Resources

<u>Anadromous Fish</u>

Seven species of anadromous salmonids occur in the Baker River Project area. These include: sockeye *(Oncorhynchus nerka)*, coho *(Oncorhynchus kisutch)*, Chinook *(Oncorhynchus tshawytscha)*, pink *(Oncorhynchus gorbuscha)*, and chum *(Oncorhynchus keta)* salmon; winter- and summer-run steelhead trout *(Oncorhynchus mykiss,)*; and sea-run cutthroat trout *(Oncorhynchus clarki clarki)*.

Coho and sockeye salmon are the most abundant stocks in the basin. The remaining species comprise only about 7 percent of the total Baker River trap returns. A few chinook, pink, and chum salmon are collected in the trap each year. These fish are thought to be strays from the Skagit and other river systems. Dolly Varden *(Salvelinus malma)* and/or bull trout *(Salvelinus confluentus)* both occur sympatrically in the Skagit River drainage and are also occasionally captured in the Baker River trap (McPhail and Taylor, 1995).

Coho Salmon. Coho salmon are of major importance to Western Washington and are native to the Skagit River drainage. Annual escapement to the Baker River (based on trap counts, 1926-2000) has ranged from a minimum of 187 to a maximum of 26,549, with a mean of 6,061. The Baker River stock adults are smaller in size than most other populations of coho, averaging about 3 to 4 pounds. The Baker stock historically migrated earlier as adults than most coho populations in Washington – typically August through September. Outside stocks were introduced by resource management agencies and run timing has shifted to its present period of September through December, peaking in October.

Sockeye Salmon. The Baker River sockeye stock has long been a focus of resource management interest. Annual sockeye salmon escapement to the Baker River from 1926 to 2000 ranged from a minimum of 99 to a maximum of 15,991, with a mean of 3,078. Sockeye adults migrate into the Baker River from June through August. These adults are collected at the adult trap and transported to artificial spawning beaches. Fish in excess of beach capacity are stocked in an auxiliary beach or released directly into Baker Lake to seek suitable spawning habitat. The native stock historically spawned in the Baker River and its tributaries, and along the shoreline of Baker Lake in areas with adequate intergravel flow from submerged springs or currents. Historically, most of the Baker River sockeye stock had this shore spawning characteristic.

Emergent fry are enumerated and collected at the beach outlets, then transported and released into Baker Lake. Washington Department of Fish and Wildlife (WDFW) estimates that some spend as much as 36 months in Baker Lake. Outmigration occurs from the end of March through July, peaking from mid-May to mid-June.

Chinook Salmon. Current Chinook salmon management practices in the Baker River system are based on the determination that the original Baker River stock of fall chinook was extirpated. WDFW determined that Chinook entering the Baker trap were mostly strays from the Skagit and other river systems, and decided that these fish would have higher reproduction potential if they were returned to the Skagit River. Because of this determination, WDFW modified the procedure for handling Chinook at the Baker trap beginning in 1995, and reduced the number of Chinook transported into the Baker River system. To address concerns regarding the ecological impacts of removing Chinook from the Baker River system, the WDFW began introducing Spring Chinook into the Baker watershed in 1999.

Steelhead/Rainbow Trout. Anadromous steelhead in the Baker River system return as both winter-run and summer-run races. Historically, few adult steelhead ascended the Baker River as far as Baker Lake. Limited spawning was noted in Swift Creek and in the mainstem of the river below Baker Lake.

Peak migration in the Skagit River occurs from mid-November to April. The WDFW now manages the Baker River system for winter-run steelhead (returning from November 1 to May 31). Until recently, all fish entering the adult trap were transported and released into Baker Lake. After the introduction of a net pen rearing program in Lake Shannon by the Skagit System Cooperative (SSC), the steelhead transport policy was modified to transport only wild fish to Baker Lake due to stock dilution concerns. The transport policy was again modified in 1999 to exclude all summer-run fish, as well as hatchery stocks, which are released back into the Skagit River.

Pink Salmon. The Baker River system does not support a self-sustaining population of pink salmon, although adult fish are occasionally collected in the Baker River trap. Adult pink salmon are captured in the Baker trap from August through November, with the peak occurring in October. Current agency management policy is to return all pink salmon collected in the Baker River trap to the Skagit River.

Chum Salmon. Migration of small numbers of adult chum salmon into the Baker River trap sometimes occurs from late September through December, peaking in November. Fish are transported and released into Baker Lake under current fisheries management policy.

Sea-run Coastal Cutthroat Trout. Sea-run (anadromous) coastal cutthroat trout migrate into the Baker River system sporadically throughout the year, but primarily in October and November. A small number of juvenile coastal cutthroat trout have been sampled at the Upper Baker River juvenile outmigrant trap.

Resident Fish

Fourteen species of resident fish have been confirmed in the Baker River system. The native fish in the Baker River include kokanee, rainbow trout, cutthroat, native char, and mountain whitefish. Baker Lake historically supported a large population of mountain whitefish *(Prosopium williamsoni)*. These fish have been extensively observed during habitat surveys of the Noisy Creek drainage, and are believed to be present throughout the system. A resident stock of kokanee is also present. Other native resident fish species observed in the Baker River system include three-spine stickleback *(Gasterosteus aculeatus)*, torrent sculpin *(Cottus rhotheus)*, prickly sculpin *(Cottus asper)*, coastrange sculpin *(Cottus aleuticus)*, and largescale sucker *(Catostomus macrocheilus)*. The non-native fish include brook trout, brown trout, pumpkinseed, and possibly lake trout.

Bull trout

Bull trout and Dolly Varden, two closely related species of char, are assumed to occur in the Baker River system. Adult native char (Dolly Varden and/or bull trout) have been observed at night feeding on migrating salmon smolts in the entrance channel to the Upper Baker fish attraction barge. The U.S. Fish Commission observed large numbers of Dolly Varden in Baker Lake as early as 1901, many feeding on salmon fry. The U.S. Fish Commission pursued a program aimed at eradication of the stock, but was unsuccessful.

Although the Baker River bull trout stock status is classified as "unknown" by the WDFW, the lower Skagit River supports the largest population of native char in Puget Sound. Because Dolly Varden and bull trout are difficult to differentiate, the WDFW currently manages both species together under the categorization of "native char."

The Baker River Project provides limited opportunity for movement of native char between the Baker River, the Skagit River, and Puget Sound via upstream and downstream fish passage facilities. The number of adult native char that entered the Baker River trap and were hauled upstream of Upper Baker Dam (based on 1995-2000 trap counts) ranged from a minimum of 9 to a maximum of 40 with a mean of 20. The number of adult native char captured at the Baker Project was not recorded prior to 1995. These observations confirm the movement of adult native char into the upper Baker River watershed. However, there is no information regarding genetic composition of these fish (e.g., relative composition of Dolly Varden and bull trout) because no sampling of genetic information has been conducted specific to the Baker River. Genetic analysis done throughout other parts of the Skagit River system indicate that the native char found below anadromous fish barriers in the main stem are bull trout, and those above barriers are Dolly Varden. Therefore, the USFWS believes that the Baker River native char are bull trout and should be addressed as such in the current relicensing proceeding.

A few juvenile native char are captured annually at the Baker Project downstream fish passage facilities. Juvenile native char collected at the upper Baker River Project and hauled below Lower Baker Dam (based on 1994-2001 trap counts), ranged from a minimum of 0 to a maximum of 20 with a mean of 6.4. The number of juvenile bull trout captured at the Lake Shannon fish trap ranged from 0 to 14 with a mean of 5.3. This indicates that there is the possibility of spawning in tributaries to both reservoirs. These juveniles are managed as downstream migrants although the life history of Baker River bull trout is not well known.

Many tributaries to Lake Shannon are relatively warm, but juvenile char have been observed in Bear Creek and Sulphur Creek that feed into the lower reservoir. U.S. Forest Service (USFS) biologists conducting surveys in Sulphur Creek, a major tributary to Lake Shannon, identified five char redds in the stream channel up to the barrier to migration at RM 1.0. Native char adults were also observed in Sulphur Creek during data collection for the A38 native char study.

In comparison to Lake Shannon tributaries, several Baker Lake tributaries have cold, glacial origins and support apparently robust native char populations. Researchers conducting electrofishing and snorkel surveys in Park Creek found coho, Chinook, rainbow trout, and native char in the lower reaches. On occasion, native char were the predominant species observed in the mile of stream channel immediately below a waterfall that represents a barrier to upstream migration.

Native char have been observed spawning in late October and November in the Upper Baker River and tributaries, up to nine miles above Baker Lake. During 2001 and 2002 snorkel surveys, R2 and Puget Sound Energy (PSE) biologists observed large (up to 75-cm total length) native char in the Upper Baker River and tributaries. These large, robust char were assumed to be adfluvial fish that migrated from Baker Lake to spawn in low gradient stream habitats. National Park Service biologists have conducted spawner surveys from Sulphide Creek

downstream to RM 1.9 and observed native char holding in mainstem habitats at the mouths of major tributaries, presumably holding before moving up these tributaries to spawn.

The Coastal/Puget Sound Distinct Population Segment (DPS) of bull trout was listed as threatened pursuant to the Endangered Species Act on November 1, 1999 (64 Federal Register 58910). Dolly Varden were not listed by the USFWS, but may be listed in the future based on similarity of appearance provisions of the Endangered Species Act (64 Federal Register 58910).

Pacific lamprey

Pacific lamprey (*Entosphenus tridentata*) is a species of concern to the USFWS. Very little information is known about the Baker River population. These fish are anadromous and enter freshwater in the late spring and early summer to spawn. Spawning in other Washington rivers takes place in June and July. Eggs hatch into a juvenile larval stage (ammocoetes) from two to three weeks after spawning. These ammocoetes spend up to 6 years in fresh water as filter feeders before migrating to the ocean.

PROJECT IMPACTS TO FISH

The Baker River Project may be a factor in the decline of several fish species of commercial, recreational, and cultural significance, and may have contributed to the listing of Puget Sound Chinook salmon in the Baker River Basin and adjacent Skagit River as threatened under the ESA.

Even with the best available protection, mitigation and enhancement measures, the operation of this hydroelectric facility will continue to impact fish and fish habitat through the term of the next license. These continuing impacts will include:

- Stress from handling and transport of juvenile and adult fish at the project fish passage facilities.

- Mortality of all fish species from spill during high flow events at both developments.

- Reduced production capability of the Baker River system due to project-related barriers, false attraction, entrainment in intakes, and other impediments to fish migration.

- Reduced wild fish populations through hatchery fish interactions with wild fish by increased predation, competition for food and competition for rearing and spawning space.

- Impacts to both resident and anadromous fish from increased sedimentation and destabilized edge habitat caused by seasonal fluctuations in reservoir levels.

- Effects of the reservoir fluctuation creating impassable barriers at tributary deltas entering the reservoirs.

- Stranding of juvenile fish and desiccation of salmonid redds from project-related flow fluctuations.

- Impacts to resident and anadromous fishes downstream of the dams caused by project-related flow-dependent habitat changes.

- Increased predation caused by changes in habitat type and the dynamics of fish-predator interactions.

- Changes in water quality (e.g., temperature, dissolved gases, suspended sediment, pollutants) which can impact fish and wildlife.

- Reduced large woody debris (LWD) to downstream reaches due to the transport interruption.

- Interruption of the transport of gravel and nutrients from upstream to downstream reaches.

- Residualization of salmon and trout in Lake Shannon and Baker Lake due to lake size and physical characteristics.

- Potential genetic introversion caused by the isolation of resident fish, especially bull trout, in the Lake Shannon watershed.

Wildlife Resources

The Terrestrial Resource Working Group (TRWG) established a list of 27 terrestrial species for analysis during the Baker River Project relicensing. The rationale in choosing these specific species was that they could be used to evaluate concerns about the project effects on the various habitat types associated with the project. These species are either known to occur in the vicinity of the project or are highly likely to occur. The following are the habitat types of concern and the evaluation species chosen for analysis:

Interior Old Growth Coniferous Forest Species

- Marbled Murrelet
- Northern Spotted Owl
- Johnson's Hairstreak Butterfly
- Northern Goshawk
- Hemphillia glandulosa

Young Deciduous Forest Species

- Red-eyed Vireo
- Olive-sided Flycatcher
- Ruffed Grouse
- Long-legged Myotis

Shrub Species

- Yellow Warbler
- Willow Flycatcher
- MacGillivry's Warbler
- Black-tailed Deer

Wetland/Riparian Species

- Red-legged Frog
- Northwestern Salamander
- Mink
- Yuma Myotis
- Killdeer

Grassland/Meadow

- Savannah Sparrow
- Elk

Cliff/Talus Species

- Big Brown Bat
- Western Red-backed Salamander
- Peregrine Falcon
- Golden Eagle

Snag/Log Dependent

- Pileated Woodpecker
- Tree Swallow
- Townsend's Big-eared Bat
- Wood Duck
- Ensatina
- Black-capped Chickadee

Open Water Species

- Common Loon
- Osprey

Generalist Species

- Bald Eagle
- Grizzly Bear
- Mountain Goat

Information on wildlife occurrence in the project vicinity is largely derived from visual surveys conducted by PSE biologists in proximity to the two reservoirs. Monthly wildlife surveys on the two reservoirs have been conducted by PSE during the months of December through August beginning in 1980, and are still ongoing. Data collected on these surveys include species, number, location, sex/age (where possible) and occasionally habitat use and behavior. This information has been supplemented by incidental observations of wildlife during other field activities, such as fisheries studies and project maintenance activities. Wildlife occurrence in the uplands away from the reservoirs has not been studied to the same level of detail, and it is necessary to rely heavily on information from general sources. Data on the potential occurrence of overall wildlife species have been adapted from Brown (1985), based upon available habitat in the project vicinity.

At least 60 species of mammals potentially inhabit the project area. Many of these species have been observed in the vicinity of the project, and the remaining species are assumed present based on habitat composition and species distribution.

Black-tailed deer *(Odocoileus hemionus)* are the most common large mammals in the project vicinity and are likely to be more common in the southern half of the Baker River basin, due to the greater availability of forage as a result of intense timber management. Rocky Mountain elk *(Cervus elaphus)* in the project vicinity are usually from the South Fork Nooksack River herd, and tend to winter in the lower elevation areas within the Baker River basin. Other large mammals observed in the project vicinity include black bear *(Euarctos americanus)*, mountain lion *(Felis concolor)*, mountain goat *(Oreamnos americanus)* and harbor seal *(Phoca vitulina)* (occasionally observed in the Baker River below the fish barrier dam). Grizzly bears *(Ursus arctos)* and gray wolves *(Canis lupus)* may be occasional visitors in the high elevation areas of the Baker River basin. It is possible that wolverine *(Gulo gulo)* may be occasional visitors in high elevations in the basin. A Canada lynx *(Lynx canadensis)* was observed in the basin in 1991 according to the WDFW Priority Habitat Species (PHS) data base.

Several furbearers use the Baker River, project reservoirs, and associated riparian and forested habitats in the project vicinity. These include river otter *(Lutra canadensis)*, beaver *(Castor canadensis)*, mink *(Mustela vison)*, coyote *(Canis latrans)* and bobcat *(Lynx rufus)*. Small mammals common to the project area include Townsend chipmunk *(Eutamias townsendii)*, northern flying squirrel *(Glaucomys sabrinus)*, Trowbridge shrew *(Sorex trowbridgii)*, deer mouse *(Peromyscus maniculatus)*, and snowshoe hare *(Lepus americanus)*. Bats that may inhabit the project area include the little brown myotis *(Myotis lucifugus)*, long-eared myotis *(Myotis evotis)*, silver-haired bat *(Lasionycteris noctivagans)*, Yuma Myotis *(Myotis yumanensis)*, and potentially Townsend's big-eared bat *(Plecotus townsendii)*.

At least 164 species of birds may inhabit the project vicinity. The project vicinity provides ample habitat for many species of waterfowl. At least 24 species of waterfowl potentially use the reservoirs, river, riparian and wetland habitats within the vicinity of the project. PSE biologists have conducted waterfowl surveys on the reservoirs since 1980, and have documented the presence of most of these species. Several species, such as Canada geese *(Branta canadensis)* and common mergansers *(Mergus merganser)*, breed in the project area.

Twenty-four species of shorebirds and waterbirds may use the project reservoirs including loons, grebes, gulls, sandpipers, herons and other various species. Common loons *(Gavia immer)* are regular visitors to the reservoirs and tend to use them for wintering and for foraging during their annual migrations. There are no records of common loons nesting along the shorelines of the two reservoirs.

Marbled murrelets *(Brachyramphus marmoratus)* have been observed flying up the basin and there are suspected nest sites along the eastern shore of Baker Lake. American dippers *(Cinclus mexicanus)* are very common in riparian areas, as are belted kingfishers *(Ceryle alcyon)*. Ruffed grouse *(Bonasa umbellus)*, can be found in mixed deciduous and conifer forested area and along forest roads. White-tailed ptarmigan *(Lagopus leucurus)* are found in high elevations in the basin, and band-tailed pigeons *(Columba fasciata)* frequent mature forested areas.

Of the 23 species of raptors in the Baker River basin, only the bald eagle *(Haliaeetus leucocephalus)* and osprey *(Pandion haliaetus)* commonly use the project reservoirs. The peregrine falcon may be an uncommon visitor to the Baker River basin, as the project is within its range and suitable habitat is present.

Several of the owl and hawk species utilize the mature and old-growth forests that are present in the upper portion of the Baker River basin, including the northern spotted owl *(Strix occidentalis)* and northern goshawk *(Accipiter gentilis)*. Forest stands of mixed species and age composition provide habitat for the barred owl *(Strix varia)*, great horned owl *(Bubo virginianus)*, and western screech owl *(Otus kennicottii)*.

Open habitats, such as meadows and new clear cuts, are frequented by species such as the red-tailed hawk (Buteo jamaicensis), American kestrel *(Falco sparverius)*, and the short-eared owl *(Asio flammeus)*.

At least 87 species of songbirds and other birds potentially inhabit the project vicinity.

Reptiles and Amphibians

Nineteen species of reptiles and amphibians could potentially be present near the project. During relicensing studies (Terrestrial Study 17 [T17] and other observations), eleven native and one non-native amphibian species were documented in the project vicinity. The most common amphibian found was the Cascades frog, followed by the northwestern salamander and the western toad. The other native species found included the Pacific giant salamander *(Dicamptodon ensatus)*, Ensatina *(Ensatina eschscholtzi)*, roughskin newt (*Taricha granulosa*), Pacific chorus frog *(Hyla regilla)*, tailed frog *(Ascaphus truei)*, northern red-legged frog *(Rana aurora)*, western toad *(Bufo boreas)*, long-toed salamander (*Ambystoma macrodactylum*), and Western redback salamander *(Plethodon vehiculum)*. The non-native bullfrog *(Rana catesbeiana)* was found during the surveys for the Oregon spotted frog *(Rana pretiosa)*. The Oregon spotted frog was not found although all potential habitats in the basin were not surveyed.

While no studies were focused on documenting the presence of reptiles, it is likely that common garter snake *(Thamnophis sertalis)*, Northwestern fence lizard *(Sceloporus occidentalis)*, Northern alligator lizard *(Gerrhonutus coeruleus)*, and Northwestern garter snake *(Thamnophis ordinoides)* are found within the study area.

Threatened and Endangered Species

There are nine wildlife species listed by the Federal government as endangered, threatened, or candidate species that are present or could potentially inhabit the project vicinity. None of the listed mammal species are known to inhabit the project area. However, the project vicinity is within their potential ranges and provides habitat potentially suitable for each species. Although grizzly bear have not been observed in the project vicinity in any recent scientific study, there was one confirmed grizzly bear observation (tracks) near the boundary of the Baker River basin in 1989.

Several listed bird species are known to inhabit the project vicinity. The bald eagle is probably the most commonly observed listed species in the basin, and the marbled murrelet and spotted owl are also found in the project vicinity.

Bald eagles have established two nest territories along the shores of Baker Lake, one near the mouth of the Baker River as it enters Baker Lake and the other near the mouth of Boulder Creek. A pair of eagles uses the Baker River nest nearly every year, while the Boulder Creek nest is active only periodically. Both were active in 2001.

Marbled murrelets have been observed by PSE biologists in the Baker River basin, presumably en route from their feeding areas in Samish or Padilla Bays to nesting locations within the basin. Suitable nesting habitat (stands of trees with old-growth characteristics, including nest trees with large diameter moss-covered branches) is available in the project vicinity along Baker Lake and on Federal forest lands. One or more potential nest sites have been investigated in the vicinity of Anderson Creek in the past several years.

Spotted owls can be found in the larger blocks of old-growth forests in the project vicinity.

The Oregon spotted frog, a candidate for Federal listing could be present in the Baker River basin since there is suitable habitat for this species. Surveys in 2003 did not find the Oregon spotted frog, but the surveys were not completed on all potential habitat in the basin. This amphibian species is also on the State endangered species list.

PROJECT IMPACTS TO WILDLIFE

The construction and resulting impoundment of Lower and Upper Baker dams inundated over 5,400 acres of terrestrial habitat. The project footprint and operations will continue to impact wildlife and wildlife habitat through the term of the next license. The continuing impacts will include:

- Reduction of terrestrial, riparian, and wetland habitats by project reconstruction, inundation, and conversion to roads or project structures.

- Reduced habitat quality by project maintenance, fluctuation of the reservoir level, and transmission right-of-way maintenance.

- Reduced habitat quality and wildlife use by continuing or increasing human activity in the project area through re-construction, operations and maintenance.

- Additional recreational use of the project area that will increase avoidance behavior, reduce habitat quality from trampling, and physical harassment of animals.

- Disruption of wildlife migration or travel patterns that can cause injury or death to animals. Transmission lines can cause mortality to birds, and the reservoirs disrupt or eliminate migration corridors.

- Impacts to fish-eating birds and mammals resulting from impacts to fish.

- Changes in water quality (e.g., suspended sediment, pollutants) which can impact wildlife.

- Migration barriers to amphibians and other small animals by the inundation zone.

- Reduced quality and quantity of denning habitat in the riparian zone caused by reservoir fluctuations.

- Desiccation or scouring of amphibian eggs or larvae due to flow and reservoir level fluctuations.

DRAFT PRELIMINARY SECTION 18 PRESCRIPTIONS FOR FISHWAYS

The restoration of effective fish passage, both upstream and downstream, is an essential component of mitigation for the Baker River project's impacts to fish and wildlife. Effective fish passage means that fish traveling upstream or downstream toward a fish passage facility are nearly completely successful in finding the fishway and passing through it. Both Baker River project dams are deterrents to fish movement and migration and require the installation of effective (safe, timely, convenient) upstream and downstream passage facilities.

The U.S. Fish and Wildlife Service, pursuant to its authority under Section 18 of the FPA, as delegated by the Department of the Interior, will, in all likelihood, prescribe the construction, operation and maintenance of adult and juvenile fishways for the Baker River Project, FERC No. 2051. The USFWS has carefully reviewed these draft preliminary prescriptions, and considers them to be fully within the scope of its section 18 authority. These draft prescriptions are based on the best biological and engineering information available. They have been developed by USFWS biological and engineering staff, in consultation with the applicant, NOAA Fisheries, the Washington Department of Fish and Wildlife, the affected Tribes, and various other interested parties involved in the FERC alternative licensing process and subsequent settlement negotiations.

Mandatory Conditions Review Process

The USFWS preliminary prescriptions for upstream and downstream fishways in this proceeding will be subject to the Department of the Interior's Mandatory Conditions Review Process (MCRP). The USFWS anticipates changes to the aforementioned draft preliminary fishway prescriptions before the final license application is submitted to the Commission and a Notice of Application Ready for Environmental Analysis (REA Notice) is issued. Therefore, we are not requesting comments on these draft preliminary prescriptions. The MCRP is initiated with the issuance of the REA Notice. At that time, the USFWS will provide preliminary section 18 fishway prescriptions, and we will invite public comment consistent with the intent of the MCRP.

Draft Preliminary Prescriptions for Upstream Fish Passage Facilities at the Lower Baker River Development

PSE should provide upstream fish passage facilities by constructing, operating, and maintaining an effective trap and haul facility designed to provide:

- Safe, timely and effective upstream passage of anadromous fish, migrating bull trout and resident fish;
- Access to historic anadromous fish habitat above Lower and Upper Baker dams; and,
- Means of the capture, safe handling, sorting, and selection of broodstock.

PSE should design the upstream fish passage facilities based on input from and in consultation with the BRAC. The designs and plans for the upstream fishways should be developed to comply with NOAA Fisheries standard criteria for velocity, height, size, volume, and attraction flow (NOAA Fisheries 2003). The USFWS has adopted the NOAA fisheries criteria for upstream passage for purposes of this project. Since these criteria and guidelines are general in nature, there may be cases where site constraints or extenuating biological circumstances dictate that certain criteria be waived or modified without delaying or otherwise adversely impacting upstream migrants. Bull trout may behave differently in approaching upstream passage systems and may require modifications to accommodate them. It is the responsibility of PSE to provide compelling evidence in support of any proposed waiver. Where USFWS deems there is a need to provide additional protection for fish, more restrictive site-specific criteria may be added.

USFWS should be provided opportunities at the 30, 60, and 90 percent design stages to review and provide comments on the facility design. PSE should submit final plans to USFWS for approval at least 60 days prior to submission of the final plans to FERC. The final plans should include:

1) Final design drawings;
2) Pertinent hydraulic information related to fish passage and trap operation; and,
3) Written operation and maintenance plans for the completed facility, to be updated periodically as necessary and approved by USFWS.

PSE should complete construction, hydraulic testing and subsequent adjustments to assure that the redesigned trap and haul facility is operational within four years of the effective date of the new license. Initial design input to implement this upstream passage fishway prescription is provided below.

The criteria listed below specify a 1-inch opening (spacing between bars) on many of the trap and haul features such as crowders and brailles. The criteria were developed for anadromous salmon and steelhead which should not be able to pass through this size of opening. There may be sub-adult bull trout or sea run cutthroat that are trying to migrate upstream, but can slip through the 1-inch opening and not be trapped successfully. For this reason, the standard 1-inch opening may need to be modified based on future tests as outline in specific sections below.

Upstream Passage Facility Design Flow Range

PSE should design the trap and haul facility to provide safe, timely and efficient fish passage over the design flow range for the passage facility, defined as the range of streamflows between the mean average stream discharge exceeded 95 percent of the time (low design flow) and the mean average stream discharge exceeded 5 percent of the time (high design flow), when upstream migrating fish are present at the Barrier Dam, located downstream of Lower Baker powerhouse.

Barrier Dam Crest Modifications

PSE should modify the elevation of the crest of the existing barrier dam by raising the crest such that the barrier dam creates a minimum of 10 feet of static head over the entire design flow range of the passage facility to include the backwater effects from the Skagit River, unless otherwise agreed to by USFWS.

Fishway Entrances

PSE should design the fish ladder that leads fish to the trap facility to include a low flow and a high flow entrance positioned below the Barrier Dam. The low flow entrance should discharge fish ladder attraction flow adjacent and parallel to the downstream face of the dam. The high flow entrance should discharge fish ladder attraction flow slightly downstream from the dam and parallel to the shoreline to provide a discernable fishway attraction flow jet under high design flow conditions.

Auxiliary Water System

PSE should design the associated fishway entrance pool(s) to include auxiliary water systems (AWS) to augment ladder flow from the trap holding pools. The AWS should supply additional fishway attraction water in an amount that, when combined with the ladder flow, equals the total minimum instream flow minus any bypass flow required for the juvenile fish screens associated with the supply water intake, unless otherwise agreed to by USFWS.

Gravity Water Supply

PSE should design the upstream passage facility to include an uninterruptible (gravity supply) source of supply water for the holding pools and fish ladder. All supply water (including the AWS prescribed above) should be screened in accordance with current NOAA Fisheries criteria or such alternative criteria acceptable by USFWS.

Entrance Pool Diffusers

PSE should design the AWS such that AWS flow will be introduced into the fishway entrance pools at a maximum velocity of 1 fps through vertical diffusers, or 0.5 fps through horizontal diffusers. The AWS diffusers gratings should have a maximum 1-inch clear opening. The AWS diffusers should be oriented such that fish are lead to the lower fishway pools.

Ladder Type

PSE should design the upstream passage facility to include either a pool, weir and orifice ladder, a vertical slot ladder, or other ladder design as acceptable to USFWS. Vertical slot ladders should have a minimum of 15-inch wide slots. Either type of ladder should have a maximum hydraulic drop of 1 foot between ladder pools. The fishway pools should be configured in a manner acceptable to USFWS. The maximum slope of the fish ladder should not exceed 10 percent.

Fishway Pool Volume

PSE should design the fish ladder to include fishway pools that are at a minimum 6 feet deep, and with sufficient volume to dissipate energy of 4 foot pounds per second per cubic foot (ft^3) of pool volume, unless otherwise approved by USFWS.

Ladder Holding Pools

PSE should design the fish ladder to lead to holding pools of sufficient volume to provide a carrying capacity equal to a projected 1 day peak run of adult fish (approximately 1,200 fish, Montgomery Watson Harza, 2003). Based upon a minimum holding density of 5 ft^3 of volume per fish, the holding pools should contain a minimum volume of 6,000 ft^3 of water at the low design water surface elevation. Flow into the holding pools should be a minimum of 2 gallons per minute (gpm) per adult fish, up to the carrying capacity of the pools, or a minimum of 2,400 gpm (5.4 cfs). A finger weir or V-trap lead should be provided between the ladder and the lower holding pool, and between holding pools such that once fish enter they are not able to fallback downstream.

Fish Lock Crowder and Braille Systems

PSE should design the upstream passage facility to include crowder and braille systems in each holding pool as necessary to move fish from the holding pools to the fish lock. When not in use, the crowder should be stored either against the back wall of the holding pool or out of the water entirely. Likewise, the braille should be stored recessed in the floor of the holding pool when not in service. The braille should be sloped and contoured so that fish are guided toward the entrance of the fish lock. Both the crowder and braille should provide a fish-tight seal (maximum opening of 1 inch) against the walls and floors of the holding pool so that no fish can become trapped behind them. The travel speed of both the crowder and braille should be adjustable up to 3 feet per minute. The maximum clear opening between bars in the crowder or braille should be 1 inch. When the crowder is in use, a removable barrier should be installed across the fish ladder exit into the holding pool to prevent fish from entering the holding pool. Fish should not come into contact with sharp or abrupt edges (including structural supports) anywhere throughout the system.

The maximum clear opening between bars in the crowder or braille may need to be less than 1 inch if sub-adult bull trout or other smaller fish are found to be attempting to enter the trap. The

USFWS anticipates that the smallest upstream migrant of concern will be ≥ 180 mm. At present there is not sufficient information to set spacing distance for this size of fish. Tests will need to be completed at the trap vicinity to determine if there are smaller fish in the vicinity of the trap. The head width of these fish will be measured and a decision as to the permanent spacing of the bars should be determined based on the 50 percent exceedance level . This test should be done in conjunction with testing adult bull trout behavior at the trap entrance. At present it is unknown if the adult bull trout being trapped represent the full extent of upstream migration or if they are only using the trap during certain conditions. Bull trout are difficult to trap and may need other modifications to the trap to increase their capture efficiency.

Fish Lock System

PSE should design the upstream passage facility to include a fish lock with the minimum dimensions of 6 feet wide, 6 feet long and 7 feet deep at the minimum water surface elevation (WSEL) of 161.0 fmsl . Based upon these dimensions and a minimum loading density of 3 cubic feet per fish, the lock should be of sufficient volume to hold approximately 84 fish per cycle.

Fish Lock Braille

PSE should design the fish lock system to include a braille recessed into the floor when not in use. Entrance to the lock should be blocked with a gate during a locking operation so that fish can not become trapped behind the lock braille. Clear opening between the bars of the braille and of the blocking gate should not exceed 1 inch. Both the braille and blocking gate should provide fish-tight seals (maximum opening of 1 inch) with the walls of the lock. The cycle time of the lock should be limited to approximately 11 minutes to move fish out of the lock and into the transport flume. The braille should not begin raising in the lock tower until the water level in the tower has been raised to the uppermost level. The braille should not travel faster than 3 feet per minute and should be manually controlled during the last 4 feet of operation. The braille should be sloped to move fish out of the lock, over the control weir, and into the transport flume.

Fish Lock Water Supply

PSE should design the fish lock system water supply to minimize turbulence in the lock and to introduce flow through a diffuser or series of diffusers located in the floor of the fish lock beneath the braille, designed as described above for the entrance pool diffusers. Overflow from the lock should pass over a control weir at a minimum depth of 6 inches, and through a short, descending slope separator (screen), allowing excess flow to be drained off and adult fish to be routed into a wetted chute (transport flume) for routing to sample tanks, sorting/holding pools, or direct loading to transport truck.

Transport Flume and Raceways

PSE should design the fish lock system to include a open, U-shaped, and smooth-sided transport flume, a minimum of 15 inches wide and 24 inches deep. The transport flume should be of sufficient slope and water supply to keep fish moving along the flume (the specifics are to be determined in consultation with USFWS). The adult separator systems should consist of

downward sloping (10 percent slope), smooth, 1-inch diameter bars (pipe) with 1 inch maximum clear opening at least 2 feet long (length sufficient to dewater the total flow expected from the lock) or alternate design as developed in consultation with USFWS. The clear opening between the separator bars may have to be reduced if smaller fish are expected to use the facility.

The transport flume should include provisions for a PIT tag interrogation system located upstream of any of the diverter gates. Straight alignment of the transport flume should be provided so that an operator can determine species type and select the appropriate gate leading to the appropriate raceway. Provisions should be made to divert fish either to sampling, anesthetic and recovery tanks, or routed to the appropriate raceway. Diversion gates should be of a proven design. The transport flume and diversion gates should be covered with neoprene to prevent injury to the fish. Where the transport flume enters the raceway, the exit should be covered by a neoprene flap such that fish are not attracted to and can not reenter the transport flume once in the raceway. Provisions should be made to allow the direct loading of the fish into the transportation trucks.

Maximum loading density of the raceways can vary depending on expected duration of holding. For short term holding (less than 1 hour) holding density should be limited to 3 ft^3 per fish. Longer term holding (for periods greater than 1 hour) holding density should be limited to 5 ft^3 per fish). Each raceway (and crowding channel) should have a water supply equal to 2 gpm/fish based on the maximum number of fish expected for that raceway. Provisions should be made to guarantee a continuous supply of water to the raceways (such as redundant pumps, backup pumps, emergency generator, etc). Provisions should be made for the emergency release of fish back to the river in extreme emergencies.

Each raceway (and crowding channel) should include a crowder to move fish from the raceway to the crowding channel leading to the transport hopper for truck loading. Maximum clear opening of the crowder should be 1 inch and the crowder should provide a fish-tight seal (maximum opening not to exceed 1 inch) to the floor and walls to prevent fish from getting around the crowder.

Loading density of the transport hopper should be limited to 3 ft^3 per fish. The volume of the transport hopper should be equal to or less than the volume of the transport trucks to reduce the possibly of overloading the transport trucks.

The transport hopper should connect via a water-to-water transfer with the transport trucks or trailers. Maximum loading density of the transport trucks should be limited to 3 ft^3 per fish. Carrying tanks on the transport trucks should be filled with water from the same supply line as the raceways to insure minimal thermal stress or water quality differences. Transport trucks and trailers should have provisions to supply oxygen to the transport water as well as control the water temperature.

A water to water transfer of fish from the transport truck/trailer to the receiving water at the release point should be provided. Provisions should be made to provide a flushing flow through the transport tank during the release process. Provisions should also be made at the release point to acclimate the transported fish to the receiving water.

Sample/Anesthetic/Recovery Tanks

PSE should design the sampling, anesthetic and recovery tanks in consultation with USFWS. The system should include provisions to move fish to the raceways or return fish to the river after they have fully recovered. Provisions should also include the ability to tag fish with PIT tags or other fish tracking devices.

Post Construction Evaluation

PSE should prepare, in consultation with the USFWS, a post-construction evaluation plan for their approval prior to completion of the upstream passage facility. The plan should include hydraulic and biological evaluations to ensure the proper performance of the facilities and that the facility provides safe, timely and effective passage of fish. PSE should implement this plan to evaluate facility performance upon completion of construction of the upstream passage facility. PSE should, upon completion of the evaluation, implement any required changes, reevaluate, and implement such additional changes to the operations or facilities as may be required by USFWS, within a time frame established by the USFWS in consultation with PSE.

Future Modifications

PSE should provide a commitment to update and modify these facilities as necessary based upon changing resource management requirements or as technology advances for the safe, timely and effective passage of fish. It may be necessary to modify certain portions of these facilities (specifically the crowder and braille systems) if fish smaller than 180 mm in length are to use this facility.

The USFWS prefers volitional passage over dams to minimize handling stress, delay and other possible negative effects from trapping and hauling fish. Due to the height of the two Baker River project dams, fish ladders are not considered feasible. There remains the need to collect and move fish around the dams to allow access of fish to historic habitat above the projects. There is also the need to collect brood stock for the sockeye spawning program as well as separating hatchery and wild fish. A trap and haul facility should be designed and constructed to meet the resource needs at this project.

Justification for Upstream Fish Passage Facilities at the Lower Baker River Development

The Baker River project interrupts connectivity of migrating fish species to upstream locations. Under the Federal Power Act (sections 18 and 10) various agencies and organizations will require or recommend conditions for fish passage. The project, therefore, needs to provide means of access to migrating fish for connectivity.

The current trap and haul facility was completed in 1957 and, with the exception of some small modifications, functions as originally designed. Technology and fish migration understanding has improved since that time and we have progressed in our understanding of what conditions are needed for a safe and effective trap and haul system. The effects of fish handling are better

understood and improved. The current facility needs to be updated to incorporate this understanding.

Attraction to the trap facility should make full use of the minimum instream flow to maximize fish attraction to the trap under the widest range of flow conditions. NOAA Fisheries criteria call for the ladder entrance flow to be between 5 percent and 10 percent of the high design river flow for fish passage. The USFWS concurs with these criteria and believes that higher river flows are more likely to attract the complete assemblage of fish attempting to migrate upstream.

Screening the water supply intake (including the AWS water to the ladder) to NOAA Fisheries criteria will provide protection of those juvenile fish migrating out of Lake Shannon that were not captured by the new Floating Surface Collector.

An uninterruptible water supply system for the holding pools and raceways or a redundant supply system is required in the event of an emergency to insure that fish are not killed because of some unforeseen event. Provisions are required to allow for the separation of fish based on factors such as species, hatchery versus wild and destination. Provisions are required to sample fish without having to physically net fish out of the braille pool and to collect brood stock. A rehabilitated trap and haul facility brought up to current fish handling standards will reduce handling, reduce stress to the fish, and provide for a safer operation.

Preliminary Prescription for Upstream Fish Passage Facilities at the Upper Baker River Development

PSE should, in cooperation and consultation with the BRAC, design, construct, operate, maintain, and monitor at its own expense upstream fish passage facilities below Upper Baker Dam. Such fishways should be constructed to be consistent with long term objectives for the recovery and restoration of the Baker River basin's natural production potential. Passage systems should be approved by the USFWS. If anadromous fish are being passed through Lake Shannon, approval by NOAA Fisheries will be required.

No later than one year after license issuance, PSE will conduct a study in consultation with the BRAC to determine ways to address connectivity between Baker Lake and Lake Shannon. The study may include: tagging, radio-tagging or other study methodologies.

Results from the study will be used to determine what facilities or programs are needed to co-mingle isolated groups of fish to provide connectivity. In the event that, in the opinion of the USFWS, the study demonstrates that essential fish passage continuity could be provided through a trap and haul facility, PSE will plan and construct, in consultation with the BRAC and approval by the USFWS, a prototype trap and haul facility for the Upper Baker Development.

The facility will be designed to capture bull trout and other resident fish and allow their transport above Upper Baker Dam. It will include design accommodations for other aquatic species that do not compromise the primary design focus on bull trout. The facility should be able to operate over the range of flows used at the project except for spill events and other emergency actions.

The facility should be operable during all seasons of the year if testing shows that bull trout are migrating year around.

In the event that the test facility above is demonstrated feasible, PSE will, in consultation with the BRAC and approval by the USFWS, plan, construct, and operate permanent trap and haul facilities at this location. Construction, operations, consultation protocols, and other considerations will follow the formats for the upstream passage facilities at the Lower Baker development.

If, in the opinion of the USFWS, the initial facility has not achieved fish species connectivity, PSE will propose an alternative plan to the USFWS to achieve continuity, which may include seining or other capture and release techniques. PSE should make provisions to include a PIT tag interrogation system such that all fish collected at this location can be interrogated prior to transporting those fish. Provisions for tagging via PIT tags or other devices should be included.

Justification for Upstream Fish Passage Facilities at the Upper Baker River Development

The Baker River project interrupts connectivity of aquatic species within the Baker system and isolates streams tributary to Lake Shannon reservoir and the Lower Baker River and the Skagit River. Spill events at Upper Baker Dam cause downstream movement of both juvenile and adult bull trout. At present these fish have no means to migrate upstream. Large native char are reported to congregate immediately below Upper Baker Dam during the spring. These fish may be attempting to migrate upstream to spawn in their natal streams. PSE needs to provide means of access to fish for connectivity.

The Fish Passage Technical Working Group (FPTWG), composed of experts in the field of fish passage, extensively reviewed a wide range of volitional and assisted passage options. The trap and haul option selected for upstream migration bypasses Lake Shannon and, therefore, may isolate species desiring to migrate upstream past the Upper Baker Development or into Lake Shannon.

Bull trout exhibit migratory behavior in all of their various life histories, but especially in adfluvial and anadromous population. In addition to seasonal migrations between spawning and rearing habitat, movement between foraging areas is quite common and may encompass several hundred kilometers.

The need for connectivity between segregated populations is important to the recovery of bull trout. Without the genetic analysis needed to establish the viability of the local Lake Shannon bull trout, it is necessary to provide for both upstream and downstream passage for bull trout at Upper Baker Dam. Connectivity to co-mingle these populations may be achieved in a variety of ways but the objective will be to provide passage during all seasons of the year that bull trout or other resident fish are attempting to migrate. Sequential development of programs and or facilities constitutes a reasonable and prudent approach and will be pursued using the results of various studies now underway. Any actions proposed that affect bull trout should be compatible with and support the Recovery Plan for the Puget Sound bull trout DPS.

Preliminary Prescription for Downstream Passage at the Upper Baker (Baker Lake) and Lower Baker (Lake Shannon) Developments

PSE should, in cooperation and consultation with the BRAC, design, construct, operate, maintain, and monitor at its own expense, downstream fish passage facilities at the Upper Baker and Lower Baker Developments. These facilities should include a floating surface collector, an entrance module and/or a transition structure, a guide net, a transportation pipeline, a floating fish trap, transfer facilities, hauling vehicles, and stress-relief ponds.

The facilities should be designed to trap bull trout juveniles and adults, in addition to salmon and steelhead, and to operate at all flows and all seasons with the exception of flood events as determined by the rule curve. Bull trout behavior in floating surface collector (FSC) systems is not known; therefore, downstream passage may require additional modifications beyond those required to pass other anadromous salmonids.

PSE should provide USFWS with the opportunity to review and provide comments on the facility design at the 30, 60, and 90 percent design stages. PSE should submit final plans to USFWS for approval at least 60 days prior to submission of the final plans to FERC. The final plans should include:

1) Final design drawings;
2) Pertinent hydraulic information related to fish passage and facility operation; and,
3) Written operation and maintenance plans for the completed facility, to be updated periodically (if necessary) as approved by USFWS.

PSE should complete the installation of downstream fish passage facilities at Upper Baker within 2 years and at Lower Baker within 4 years of the effective date of the new license. PSE should complete the testing and adjustments, and ensure that the juvenile fish passage facilities are operational at Upper Baker within 8 years and at Lower Baker within 10 years of the effective date of the new license.

The facilities should be designed to accommodate short-term evaluation as well as long-term monitoring needs.

Operational Period

The respective downstream passage facilities should be operational over the entire range of forebay levels expected year round, unless otherwise agreed to by the USFWS, for both the Upper Baker and Lower Baker facilities, except for periods of high flow when it is necessary to spill. If it is determined that bull trout movement is limited to a specific season, year around operation may be eliminated for purposes of capturing and transporting bull trout.

Debris and Trash Management

Floating log booms should be installed in the forebay of each facility upstream of the barrier nets in order to provide protection to the fish passage facilities.

Barrier Net

PSE should design and install a barrier net in the forebay of each reservoir. The net should extend from shoreline to shoreline and from surface to bottom of the reservoir. The barrier net in the upper 30 feet of the water column should be made of a knotless mesh net with mesh size not to exceed 3/32 of an inch clear opening and resistant to rot and ultraviolet degradation. The barrier net below the upper 30 feet of the water column should be made of a knotless mesh net with mesh size not to exceed 1/4 of an inch clear opening and resistant to rot and ultraviolet degradation. The barrier net should form a "V" shape in the lake (plan view) with the apex of the net terminating at the net transition structure. There should not be any gaps in the barrier net or any points where the top of the net is allowed to submerge beneath the water surface. The barrier net should also ramp up from the bottom of the reservoir to the entrance to the net transition structure. The barrier net system should be designed in consultation with USFWS. The net transition structure and floating surface collector should be free to move with the surface of the reservoir but the barrier net must form a fish tight seal with the net transition structure.

Net Transition Structure

PSE should design the net transition structure (NTS) as a modular unit to provide a transition from the barrier net to the floating surface collector. Maximum velocity into the NTS should not exceed a0.1 fps. The NTS should be at least 50 feet deep. Maximum acceleration through the NTS is limited to 0.1 fps per foot. It may be necessary in the future to try various configurations of this NTS to increase juvenile collection efficiencies.

Floating Surface Collector

PSE should design the FSC and associated bypass in consultation with USFWS for passage based upon an inflow of 500 cfs. The USFWS has verified that the use of NOAA Fisheries screening criteria is appropriate to use for juvenile bull trout, therefore the NOAA Fisheries screening criteria for downstream passage should be used.

The velocity into and through the screen structure and bypass should remain constant or accelerate slightly at a maximum of 0.1fps per foot. The configuration of the bypass should create a capture velocity area where the centerline water velocities are in excess of 8 fps. This capture velocity area should be a minimum of 3 feet wide and 3 feet deep. Downstream of the capture velocity area, the deceleration of the water velocity will be designed in consultation with USFWS to reduce juvenile delay in this area.

In high velocity areas (where the water velocity is greater than 3 fps), screen cleaners should be removed from the water column when not in use or when traveling upstream or should be located behind the screen face so that fish may not come into contact with the equipment.

The FSC should have the capability to increase the inflow to 1000 cfs for test purposes. Should the decision be made to permanently increase the FSC capacity to 1000 cfs, then additional

screen area and associated equipment (porosity control, screen cleaners, etc.) should be installed sufficient to meet juvenile fish passage criteria for fry passage.

Provisions for flow control should be made to adjust the bypass flow from the FSC.

PSE should make provisions to inspect the bypass transport pipe/flume on a regular basis (once per day - more often during periods of high debris loading and less often during low debris periods) and remove any debris found. Velocities in the bypass transport pipe/flume should be between 5 fps and 10 fps. The bypass pipe/flume should meet NOAA Fisheries juvenile fish passage criteria.
PSE should make provisions to include a PIT tag interrogation system such that all fish (juvenile and adult) collected by the FSC can be interrogated prior to those fish entering the raceways.

Dewatering and Separation of Adults and Debris from Juveniles

PSE should design the bypass flow to separate the flow and associated juveniles, adults and debris from the FSC to be routed to the floating raceways. Prior to entering the raceways, provisions should be made to reduce the bypass flow to a level that can be accepted by the raceways. The dewatering screens should meet NOAA Fisheries Juvenile Fish Screening Criteria, including the requirement for cleaning. After dewatering, the larger fish (i.e. steelhead kelts and adult bull trout, etc.) and debris should be separated from the smaller outmigrants.

The adult and debris separator systems should consist of downward sloping (10 percent slope), smooth 1 inch diameter bars (pipe) with 1 inch maximum clear opening at least 8 feet long. Each bar/pipe will have smooth, 1/8 inch holes diameter holes drilled into the top every 6 inches. The bars/pipe should be pressurized with water such that each hole creates a small fountain of water approximately 8 inches high which will serve to keep the separator bars wet and align juvenile fish to fall through the slots between the tubes. Larger fish and debris should be routed off the downstream end of the separator bars to a separate raceway from the juveniles. Juvenile fish should be routed via an open channel flume to the raceways. If required, an alternate separating system can be developed in consultation with USFWS.

To insure that adults and juveniles are not stranded on the separator bars, or that the debris on the separator bars does not impede their passage, PSE should provide an automated cleaning system, or the facility should be manned around the clock when adult and debris separation is taking place.

Raceways

PSE should design the transport flumes and raceways for the safe and timely passage of fish. The transport flumes emptying into the raceways should transition to a rubber or neoprene tube extending beneath the water surface in the raceways (to reduce juveniles from leaping at the inflow). Crowders should be provided for each raceway to crowd fish into the transport hopper. The crowders should create fish-tight seals along the walls and floor of the raceway so that it is not possible for fish to inadvertently get behind the crowder. Crowders should not interfere with fish entering the raceway and should either be removed from the flow when not in use or parked

out of the way along the back wall of the raceway. Maximum clear opening on the mesh used for the crowder should not exceed 3/32 of an inch if perforated plate or woven mesh is used for the crowder material. Maximum loading density of the raceways for juveniles as well as minimum flow in the raceways should be developed in consultation the USFWS.

Maximum loading density of the raceways for fish may vary depending on the expected duration of holding. For short term holding (less than 1 hour), holding density should be a minimum of 3 ft^3 per fish. Longer term holding (for periods greater than 1 hour) density should be a minimum of 5 ft^3 per fish). Each raceway (and crowding channel) should have a minimum water supply equal to 2 gpm/fish based on the maximum number of fish expected for that raceway. Provisions should be made to guarantee a continuous supply of water to the raceways (such as redundant pumps, backup pumps, emergency generator, etc). Provisions should be made for the emergency release of fish should conditions dictate.

Transport Hopper

PSE should design the transport hopper to provide water to water transfer as fish are being loaded into the hopper and as they are being transferred to the transport trucks. Maximum loading density should be developed in consultation with the USFWS.

Transport Trucks/Trailers

PSE should provide transportation trucks or trailers acceptable to the USFWS for the transportation of juveniles and adults from the collection facilities to the stress relief ponds. The trucks or trailers should include provision to supply oxygen to the holding water as well as controlling the temperature of the holding water. Filling the tanks should be done with the same water supply as the raceways to reduce the possibility for adverse reactions. Water to water transfer of fish at the release site is the preferred method of release. The fish should be acclimatized to the receiving water prior to their release from the transport trucks.

Stress Relief Ponds

PSE should transport collected fish to the stress relief ponds for a holding period of 48 hours before their release to the Baker River or other designated release sites. The ponds should be sized to hold the 1 day maximum expected collection of fish from both Upper and Lower Baker facilities. Maximum holding density and minimum water supply needs to be developed in consultation with USFWS. The initial pond size may be smaller; however provisions should be made to expand the capabilities of the ponds as necessary. Ponds should provide for volitional egress but should also include provisions to drain and flush the fish out of the ponds as necessary (or other methods as acceptable to USFWS).

Prior to completion of the construction of the juvenile fish passage facility, PSE, in consultation with the BRAC, should prepare a post-construction evaluation plan for approval by the USFWS. The plan should include hydraulic and biological evaluation to ensure proper performance of the facilities, as established. Upon completion of construction, PSE should implement this plan to evaluate the performance of the collections system. Upon completion of the evaluation, PSE

should implement any required changes, reevaluate, and implement such additional changes to the operations or facilities, as may be required by USFWS, within a time frame established by the agencies in consultation with PSE.

Justification for Preliminary Section 18 Downstream Passage Prescriptions for the Baker River Hydroelectric Project

The Baker River project interrupts connectivity of migrating fish species to downstream locations. The project needs to provide a safe and efficient means of egress to migrating fish for connectivity.

Screens or other exclusionary devices are necessary to keep fish out of turbines and prevent injury and mortality to migrating fish, particularly smolts. Entrainment into turbines is a large source of mortality for fish in streams with hydroelectric projects. If anadromous fish are to continue to sustain their populations upstream of these dams, then safe passage around or through dams is needed for juvenile fish (smolts) migrating to the sea from areas where they were spawned.

Conventional passage technology, well suited for rivers with flowing water, is not readily applicable to fluctuating deepwater reservoirs. It is not known whether conventional passage technology will even successfully work in a deep reservoir with fluctuating levels and intermittent operation, much less work better than existing technology. The floating surface collector was selected as the downstream fish passage facility after extensive review of a wide range of volitional and assisted options by the Fish Passage Technical Working Group, composed of experts in the field of fish passage.

Recent migratory investigations indicate that existing attraction barge facilities at Upper Baker Reservoir are effective at inducing fish to approach a passage facility, and past evaluations indicate that upwards of 50 to 75 percent are routinely caught and transported. However, the existing technology is over 50 years old, and major advances in understanding and technical capability have been developed in the ensuing years.

Improvements in the technology are clearly available to address many of the concerns with the existing fish passage facilities. Existing knowledge and successful technology will be combined with the potential benefits of prototype facility investigation to develop passage technology that is appropriate for deep reservoir migration patterns and consistent with other resource uses.

Steelhead, sea-run cutthroat trout, coho, sockeye and spring chinook salmon populations were found through out the Baker River basin historically. The lower reach and waters inundated by the project were likely the major spawning and rearing areas for fall chinook salmon. Chum and pink salmon may have used the lower distributaries before the project. The absence of effective fish passage and the changes in hydrology caused by the project have reduced the natural production of these fish throughout the Baker River. It is assumed that the Baker River fall chinook stock was extirpated.

There are over 90 miles of potential anadromous fish habitat (< 8% gradient) above the project that are underutilized by the historic assemblage of anadromous and resident fish. The production capability of this habitat is significant and is being lost or under-utilized. To re-establish a self sustaining population of all historic assemblages of salmon, steelhead and other native fish species in the Upper Baker River, the potential habitat in the upper river above the dams must be fully utilized. Improved fish passage both upstream and downstream will be critical to reach this objective.

Bull trout were distributed throughout the system and included fluvial, adfluvial and anadromous life histories. Resident fish species have been prevented from free movement throughout the basin with possible deleterious effects to the genetic diversity of each species. The Pacific lamprey, (*Lampetra tridentata*) and river lamprey, *(Lampetra ayresi*), the two migratory lamprey have been prevented from using any part of the Baker system above the fish trap barrier dam. Technology to capture and move lamprey above, through and below high head dams is not available at this time but may become so in the future.

Baker River Aquatic Committee

The Baker River Aquatic Committee should oversee all aspects of standards development, evaluation methodologies, and programmatic implementation of downstream fish passage. The BRAC should:

1. Establish the protocol(s) and methodologies to determine whether or not the survival standards and collection efficiency are being achieved. The standard for downstream passage survival through collection facilities should be 98 percent with a goal of 99.5 percent. The standard for downstream passage collection efficiency should be 95 percent or better, of the smolts that migrate to the dam forebay;
2. Determine whether goals can be achieved;
3. Approve all studies prior to implementation and review study results, determine their applicability, and develop a list of common understandings based on the studies;
4. Oversee a PIT tag recapture study with control groups to define handling mortality not associated with transport. A similar study will be conducted at each facility; and,
5. Recommend actions to improve survival if standards are not being met.

Reservoir survival describes a lifestage that cannot be reliably measured at this time. In the event that during the license period, reservoir survival can be reliably measured, PSE should conduct a study in consultation with the BRAC to measure survival. The goal is to achieve at least an 80 percent reservoir survival.

Reservation of Authority to Prescribe Fishways Pursuant to Section 18 of the Federal Power Act

The USFWS has prepared these draft preliminary prescriptions for fishways in response to the draft action proposed by PSE in this proceeding for the proposed re-licensing of the Baker River

Hydroelectric Project, FERC Project No. 2051. If this proposed action is modified because of on-going or post-licensing study results, then the USFWS will require adequate opportunity to reconsider each prescription and make modifications it deems appropriate and necessary for submittal to the Commission. The USFWS will, in all likelihood, request that the Commission include the following condition in any license it may issue for the Baker River project:

> Authority is reserved for the USFWS, as delegated through the Department of the Interior, to prescribe the construction, operation, and maintenance of fishways at the Baker River Hydroelectric Project, FERC Project No. 2051, as appropriate, including measures to determine, ensure, or improve the effectiveness of such fishways, pursuant to section 18 of the Federal Power Act, as amended. This reservation includes, but is not limited to, authority to prescribe fishways for bull trout, rainbow trout, cutthroat trout, or any other fish to be managed, enhanced, protected, or restored to the Skagit River basin during the term of the license. Furthermore, authority is reserved for the U.S. Fish and Wildlife Service to modify these Prescriptions for Fishways at any time before license issuance, as well as any time during the term of any license issued, after review of new information or for other pertinent reasons.

PRELIMINARY SECTION 10(J) FISH AND WILDLIFE RECOMMENDATIONS

Pursuant to Section 10(j) of the Federal Power Act (16 U.S.C. §§ 791 *et seq.*), and to carry out the purposes of the Fish and Wildlife Coordination Act (16 U.S.C. §§ 661 *et seq.*) and other authorities mandating USFWS actions regarding the conservation and development of fish and wildlife resources, the USFWS recommends the following preliminary terms and conditions for the protection, mitigation of damages to, and enhancement of fish and wildlife resources affected by the proposed relicensing of the Baker River Hydroelectric Project FERC Project No. 2051.

Some of these terms and conditions follow the protection, mitigation, and enhancement (PME) measures that have been developed by the various resource working groups during the relicensing process. Others are new or are the USFWS's revisions of those presented in the DLA by PSE. These new or revised terms and conditions are provided to address the USFWS concerns and to mitigate for the ongoing effects of the project on fish and wildlife resources. These terms and conditions should be included in their entirely in the final license application.

WILDLIFE RESOURCE MEASURES

The Lower Baker dam, the original part of the project, was constructed in the mid 1920s and Upper Baker the second phase of the project was constructed in the late 1950s. The Lower Shannon development inundated approximately 300 acres of floodplain habitat and natural river channel, and approximately 1,800 acres of terrestrial habitat. When the Upper Baker Development was constructed another 4,800 acres of habitat were inundated. Of this total, approximately 1,200 acres were floodplain, natural river channel, or lake habitat from the original Baker Lake, and 3,600 acres were terrestrial habitat. There habitats were lost to future use by terrestrial species. Neither development, which removed over 5,400 acres of wildlife habitat, included any wildlife mitigation measures.

The Commission believes that existing conditions are the baseline upon which to base mitigation measures. We do not agree that this is an appropriate standard to measure the overall effects of the project due to the lack of any terrestrial mitigation for original project impacts. Nor do we agree that the project's ongoing impacts can be adequately addressed by the actions proposed in the PDEA. Our preliminary wildlife mitigation and enhancement measures, listed below, are deemed necessary to address the project's continuing impacts on terrestrial resources.

1. Wildlife Management Plan

For the protection of, mitigation of damages to, and enhancement of wildlife resources, and concurrent with the issuance of any new license for the project, we recommend that PSE developed and implement a wildlife management plan. This plan should set out resource goals and objectives, methods for management, and monitoring criteria for lands owned, acquired or controlled by PSE for the purposes of wildlife management. A Baker River Terrestrial Committee (BRTC) consisting of a least PSE, USFWS, USFS, WDFW, and affected Tribes should be established to consult and cooperate in the development of this plan. Management objectives for the acquired lands should be included as part of this management plan. Implementation of the measures within the management plan should be funded by PSE. Annual expenditures for implementation may vary depending on the priorities established by the BRTC. The following specific actions have been identified by the Terrestrial Resources Working Group, (TRWG) as appropriate protection, mitigation, and enhancement measures (PMEs) for the new license and should be included in the wildlife management plan:

A. Provide Nest Structures for Osprey at Lake Shannon

For the protection of, mitigation of damages to, and enhancement of wildlife resources, and concurrent with the issuance of any new license for the project, PSE should provide structures for safe nesting by up to 10 pairs of osprey at Lake Shannon. The PSE currently maintains nine man-made nesting platforms on the reservoir. One additional platform should be erected, and all 10 should be periodically inspected and maintained to ensure their availability to nesting osprey. To promote the eventual conversion to nesting on natural platforms, PSE should also modify 10 existing trees/snags along the shoreline of Lake Shannon to make them suitable for osprey nesting. The PSE should monitor osprey nesting and productivity annually on both Lake Shannon and Baker Lake.

Justification. Lake Shannon supports a relatively stable population of osprey that relies on artificial nesting platforms due to the limited availability of natural nest structures. The persistence of the osprey population at Lake Shannon will depend on the presence of natural or man-made structures, which will require at least some level of active management. The first priority for management will be the protection of snags and trees that currently support safe nests. Where snags are scarce but large trees are available, selected trees could be killed and topped to create nest sites. Where there are no large snags or trees available for nesting, man-made nesting structures could continue to be used as substitutes, but they would require regular monitoring and periodic maintenance or replacement.

Currently, PSE maintains 9 man-made nesting structures on Lake Shannon, with several of them being used annually. There are also three natural osprey nests on Lake Shannon, but rarely are they all used in any given year. A limited number of additional natural structures are suitable for osprey nesting at this time along the reservoir. Many trees are tall enough, but lack dead or broken tops suitable for nest construction, and there are few suitable snags. Maintaining 10 man-made nest platforms for the license period will allow for adequate nesting opportunities while natural nest trees and snags develop. Maintenance (at 2-year intervals) of the platforms will be necessary to ensure their availability to nesting osprey.

Modifying an additional 10 trees will begin the process of osprey eventually switching from artificial platforms to using natural nest platforms. On PSE managed property, 10 trees in suitable nesting locations should be modified to provide for natural osprey nesting opportunities.

The project area currently supports six to eight active osprey nests (seven during the 2002 nesting season). Prior to 1980, most osprey nests in Lake Shannon were located on large snags created by the initial inundation of the reservoir. As the large snags deteriorated and fell, ospreys were forced to nest on short snags and stumps that were vulnerable to harassment by boaters and flooding from reservoir level fluctuations. Few large trees or snags suitable for osprey nesting existed in uplands adjacent to Lake Shannon in the mid-1980s due to past state and private timber management, so PSE replaced the deteriorated nest snags with pole-mounted platforms. The ospreys readily accepted the man-made structures, and the majority of the nests in Lake Shannon are now on these platforms. The man-made platforms will continue to be important until sufficient numbers of large trees along the reservoir develop osprey nest tree characteristics to replace them.

B. Provide Floating Nest Platforms for Common Loons

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should install and maintain 3 loon nest platforms each on Lake Shannon and Upper Baker reservoirs. If successful nesting occurs on one or more of the platforms, the number of platforms should be increased by 3 on each reservoir for a total of 12. To protect the nest platforms from human disturbance, PSE should construct and place a log boom or boundary buoys to protect each nest platform. Specifications of the log boom or buoys (length, number, buffer distance from nest) should be determined once the sites are identified. The PSE should work with the BRTC to develop boat use restrictions in the areas identified as loon nest sites. The nest platforms and protection log booms and/or buoys should be in place by April 1 and removed by July 31 each year, to coincide with the loon nesting season. The nest structures should be monitored twice per month during the nesting season to determine whether they are being used by loons, and if any changes to the program are warranted due to human disturbance.

Because the potential for success of this measure is unknown, PSE should implement the program and monitor its success for 15 years. If, during the 15-year period, loons have either successfully bred or are making attempts to breed using the platforms, the program should continue for the remainder of the license period. If there are no attempts at nesting on the platforms during this period, the value of the platforms on other lakes in Skagit, Whatcom and

Snohomish counties will be evaluated. If suitable locations are found, the platforms will be made available for use by other entities.

Justification. Common loons are present on the project reservoirs throughout the year, but they have never been observed nesting. Possible explanations for the absence of loon nesting are the lack of suitable nest sites along the reservoir shorelines and the high levels of human activity on the reservoirs during the nesting season. Common loons are often prevented from nesting by fluctuations in lake water levels and human disturbance. Floating platforms have been used successfully throughout the range of the species to provide stable, secure nest sites. The common loon is a Washington State Sensitive Species. If this measure is successful, it could increase the small population of breeding pairs in the North Cascades.

C. Provide Habitat for Cavity Dwelling/Nesting Species

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should develop and implement a snag management plan for all lands associated with the project. PSE should consult with the USFS regarding the implementation of an approved snag management program on USFS lands adjacent to Upper Baker Lake. The program should consider the needs of all native cavity nesters/roosters (as indicated by the analysis species) and include measures for meeting those needs. The needs of small species could be met by maintaining existing forest habitat, and by actively promoting the development of cavities (e.g., killing or infecting live trees) where natural rates of cavity development are not sufficient.

Until such time that the riparian forest around Lake Shannon is able to meet the cavity nesting needs of the analysis species (wood duck and tree swallow), PSE should provide and maintain 10 wood duck nest boxes and 2 tree swallow nest boxes. Long-term snag habitat around Lake Shannon should be increased by managing riparian forest stands to provide natural cavities for the full compliment of native riparian cavity dwellers over the term of the new license.

Justification. Snags are one of the most important habitat components of forested habitats. Several native wildlife species are dependent on large trees, snags, and logs for nesting, roosting, or feeding. Primary excavators such as woodpeckers typically create additional cavities as part of their mating ritual. These additional cavities are then used by a wide variety of other species throughout the life of the snag. Historic forest management practices significantly reduced the number of large trees, snags and logs throughout North America, and caused concern for the viability of some species dependent on these types of habitat. Green tree, snag and log retention are now requirements under Washington Forest Practices Rules, and “legacy wood” management programs are common elements of commercial and public forest landscape management plans. Snags and logs are important habitat elements to a number of analysis species, including woodpeckers, some salamander species, chickadees and the Northern spotted owl. Comprehensive cavity management programs are common elements of commercial and public forest landscape management plans. Creation of cavities in live trees and snags (by various methods) and augmentation of cavities with nest boxes have been shown to be effective in numerous instances where landscapes are deficient in natural snags.

D. Support the Development of Bald Eagle Management Plans

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should develop management plans for any bald eagle nest or roost sites known to occur on lands within the project boundary. Within one year after discovering new bald eagle nest sites, PSE should develop management plans for those sites. All plans should be consistent with recommendations contained in the Pacific Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1986), Washington State Bald Eagle Protection Rules (WAC 232-12-292) and WDFW management recommendations for the bald eagle (Watson and Rodrick 2001), or any subsequent updates or revisions to these plans, rules and recommendations that may become available during the term of the license. PSE should provide drafts of all management plans to the BRTC for a 30-day review and comment period. Final plans should be filed with the Commission. Within one year of any change in the state or Federal status of the bald eagle, PSE, in consultation with the WDFW and USFWS, should review all plans prepared under this action and determine whether the plans need to be continued, modified or terminated.

As part of the development of bald eagle management plans, PSE should survey for bald eagle night roosts and winter roosts on utility owned lands and should amend the plans to protect any roosts found. The potential for bald eagle winter and night roosts should be one of the criteria when lands are being acquired for other PMEs.

Justification. The project has affected bald eagles by altering the amount and timing of their primary food (salmon); by displacing them from potential nest, roost and perch habitat beneath the reservoirs; and by increasing human activity in and near existing suitable habitat. The bald eagle is currently listed as a threatened species in Washington State by the USFWS and WDFW. It is proposed for delisting at the Federal level, but such delisting is with the assumption that habitat for the species will be maintained without the regulatory protection of the Endangered Species Act. Even under current state and Federal protection, management plans often do not address all the habitat needs of the species. Additional habitat protection provided by this measure will have positive effects on the population of bald eagles in the basin.

E. Develop and Implement a Noxious Weed Management Plan

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should work with other members of the BRTC to develop a site-specific and species-specific management plan for noxious weed prevention, control or eradication; site revegetation; and treatment effectiveness monitoring in and around the project area. Once developed, PSE should fund and implement the plan in designated areas. Activities on Federal lands should be conducted in consultation with the USFS. All activities should be conducted in coordination with Skagit and Whatcom County weed boards. PSE's current vegetation management program at the Baker River project should be modified to support these new management procedures.

The goals of the noxious weed management plan should be as follows: 1) prevent the introduction of new noxious weeds in the project area; 2) control the spread of existing or newly

discovered Class A, B, and C noxious weeds within the area affected by the project; 3) eradicate existing or newly discovered Class A and "B designate" weeds within the area affected by the project, according to methods approved by the USFS; and 4) evaluate other invasive species periodically to determine if control and/or eradication is warranted.

The program should be designed to eradicate specified invasive non-native plants and noxious weeds from the project area on a 5-year cycle of treatment and monitoring, and prevent their return for the remainder of the new license term. During these periods, designated portions of the project area should be re-surveyed and treatment methods re-evaluated. Options for control of the spread of existing weeds should be evaluated and implemented during each 5-year cycle. Current county and Federal weed control policies, as well as noxious weed lists, should be used as guidelines for control, and should be updated for each management cycle.

Prevention should be accomplished via implementation the specific measures listed in the USFS's Forest Plan Amendment #14: Best Management Practices (BMP) for Prevention of Noxious Weeds (Appendix C in: Potash, L. 1999. Forest-Wide Environmental Assessment for Noxious Weed Management on the Mt. Baker-Snoqualmie National Forest, USDA Forest Service, Mountlake Terrace, WA). Any updates of BMPs on National forest lands should be provided to PSE and implemented upon receipt.

Active restoration measures should be implemented to decrease "weed-friendly" habitat. All revegetation on USFS lands should follow USFS policy regarding native plant movement guidelines. Use of desirable non-native species should follow the recommendations in the Mt. Baker-Snoqualmie National Forest, Native Plant Notebook (Potash and Aubry 1997).

Justification. Noxious weeds have negative effects on native plant and animal communities. Local, state and Federal policies require the control of noxious weeds. The project area has been invaded by a number of noxious weeds. For at least some of these weeds, the project is a contributing factor to their presence and spread in the Baker River Basin. The effective implementation of noxious weed control plans for the project area would reduce or avoid negative impacts to native communities, and would be consistent with control policies.

The Noxious Weed Study, (T6) was conducted in the summer of 2003. It is an assessment of the current status of noxious weeds in the project area. When finalized, it will include recommendations for future control. The study determined the current distributions of noxious weeds in and around the project area, and identified potential vectors for the introduction and spread of noxious weeds. The study report will also discuss feasible eradication options and the potential long-term effects (positive and negative) of eradication efforts.

F. Compensatory Wildlife Mitigation

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should acquire lands of several habitat types to address the continuing impacts of the project. Each habitat type that should be acquired and the acres needed to compensate for the ongoing impacts of the project are listed below:

1. Provide Young Deciduous Forest, Mixed Forest, Forested Wetland, Shrub Dominated Riparian, Shrub Wetland and Wet Meadow

PSE should acquire fee title or control of 3,769 acres of specified forest and wetland habitat types as shown in Table 1, beginning no later than 5 years after issuance of the new license. All of the habitat should be located within the Baker-Skagit drainage. All of the habitat should be owned or controlled by PSE, and the locations of individual habitat patches should remain constant over the term of the new license. Where the habitat provided under this PME action item meets or exceeds the requirements for one or more of the species-specific PME action items, the habitat provided under this action item may count toward satisfying the requirements of those species-specific action items.

Table 1. Forest and wetland habitat types to be provided by PSE.

Type of Habitat	Amount of Habitat (acres)
Young Deciduous Forest	526 (includes 365 in active floodplain)
Mixed Coniferous/Deciduous Forest	2,874 (includes 2,007 in active floodplain)
Forested Wetlands	81
Shrub Dominated Riparian and Shrub Wetland	267
Wet Meadow	21
TOTAL	**3,769**

Justification. The objective of this action is to provide habitat of the types that might occur in the project area if the new license were not issued. An analysis performed under the direction of the Terrestrial Resources Working Group (TRWG) (Study T7-B) showed that a number of different habitat types could re-appear in the project area. Some of these habitats are abundant in the Baker River basin, while others are in relatively short supply. This action is intended to provide habitats of the types in short supply (deciduous forest, forested wetland, shrub wetland, riparian shrub and wet meadow), as well as mixed coniferous/deciduous forest.

The amount of each habitat type that could occur in the project area in the future would vary depending on the assumptions made about future management. The T7-B study analyzed six different management scenarios, each with its own set of assumptions. The acreage shown in the table is a 1.8 multiple of the amount of habitat predicted under T7-B Scenario 1 (operation of Upper Baker dam for flood control, with run-of-river and complete re-vegetation of the reservoir area outside the flood control season). The 1.8 multiplier was derived from an average of the ratio of project effects to wildlife mitigation lands required by recent project licenses approved by the Commission, and is useful in quantifying the needed mitigation lands. Simply purchasing lands without improving the habitat through management may do little to improve existing wildlife value. Therefore, we are recommending acquisition and management of these lands so that the net value of the lands to wildlife will be approximately what would be available if there were no project.

Deciduous forest, forested wetland, shrub wetland, shrub riparian and wet meadow are all relatively uncommon in the steep coniferous forest landscape of the Baker River Basin. Management to protect or improve these habitat types in the basin would be expected to benefit a number of plant and animal species. At least seven of the analysis species studied for the Baker relicensing proceeding (red-eyed vireo, ruffed grouse, yellow warbler, willow flycatcher, black-tailed deer, savannah sparrow and elk) use one or more of the habitats that would be provided by this action. As suggested by the TRWG, any one or more of these seven analysis species could be used as an indicator species for management of the habitat. The specific habitat requirements of one or more of these species could be set as management objectives for the lands included under this action.

2. Reduce Edge Effects to Old-growth Forest

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should fund pre-commercial thinning adjacent to old-growth forest within USFS lands to reduce edge effects. Land acquisition or a conservation easement on industrial forest lands adjacent to the south edge of the Baker Late Successional Reserve (LSR) to defer harvest adjacent to old-growth forest could be used in conjunction with the thinning to achieve the reduce edge effects.

Justification. The goal of this action is to reduce the potential risk of predation on the northern spotted owl (*Strix occidentalis caurina*) and the marbled murrelet (*Brachyramphus marmoratus*) in the Baker River watershed by accelerating the development of late-seral, coniferous forest conditions in stands of young forest adjacent to late-seral forest.

Upper Baker Reservoir creates an abrupt edge with old growth and mature forest within the Baker LSR. This modified edge may increase the risk of predation by great horned owls (*Bubo virginianus*), goshawks (*Accipiter gentillis*), and corvids (ravens, crows and jays). Predation accounts for more than 2/3 of dispersing spotted owl mortality and more than 80 percent of the mortality is due to avian predators (Forsman *et al.* 2002). Great horned owls are the primary predator of spotted owls (Forsman *et al.* 2002, Franklin *et al.* 2000, Johnson 1992), but are probably not effective predators inside old growth forests (Forsman 2002). Edges, along with artificial food sources supplied by recreationists, also increase the abundance of jays and crows, which are known to be effective predators of marbled murrelets. Relicensing the project will maintain these abrupt edges resulting in higher predation rates and lower quality mature and old-growth forest habitat quality over the license period.

3. Provide Foraging Habitat for Elk

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should acquire land or establish conservation easements to provide 5,028 acres of elk foraging habitat within the identified range of the Nooksack Elk Herd, of which at least 50 percent should be located within the Baker River basin. Criteria for the patch size, proximity to roads and cover, and vegetative production of the foraging habitats should be established collaboratively by the BRTC. A percentage of the habitat should be provided in "permanent" forage patches, where "permanent"

is defined as being available for at least 10 consecutive years in the same location. The remaining forage habitat may be provided in "temporary" forage patches, where "temporary" is defined as being available for at least 1 year but less than 10 consecutive years in the same location. The percentage of "permanent forage" should be set by the BRTC and may vary over time. Lands should be sampled annually to ensure that they meet or exceed targets for the production (pounds per acre, dry weight) of known elk forage plants. All forage habitats should be located away from areas where agricultural damage may be a concern. Motorized access should be controlled to the extent necessary to provide sufficient benefit for elk. PSE should maintain road closure structures and manage vegetation to maintain the elk forage value over the term of the license.

Justification. The Baker River project has affected elk in two ways. First, the project occupies land that might otherwise provide potential habitat for elk. Second, human activity associated with the project can disturb elk and displace them (temporarily or permanently) from otherwise suitable habitats surrounding the project. This proposed action addresses both potential effects of the project.

The Nooksack Elk Herd is an important resource in the project vicinity. It has been managed to provide recreational, aesthetic,4 and spiritual opportunities to the public. The size of the herd has decreased considerably over the past 15 years, and the reason(s) for the decline are the subject of a number of studies. While foraging habitat may not be a limiting resource for the herd currently, the future availability of forage is a concern because of planned and potential changes in land management. The recent cessation of commercial timber harvest on most Federal lands within the range of the herd has decreased the amount of early-seral forest, which is an important source of forage for elk in western Washington. While non-federal lands in the range continue to be clearcut harvested at regular intervals, there is no future certainty as to the management of these lands. Ensuring the availability of elk forage over the term of the new license will make a significant contribution to the long-term sustainability of the herd. This action will contribute significantly to the long-term maintenance of the Nooksack Elk Herd by ensuring a stable source of foraging habitat.

The spatial distribution of elk foraging habitat is also important. If land acquisition was limited to onsite habitat there would be two large blocks where the reservoirs now exist. In order to use these habitats, elk would have to concentrate in those areas, a behavior they normally exhibit only during the fall and winter. Consequently, local elk would not be able to make optimal use of the habitat during the spring and summer. Hiding cover (dense brush and/or trees taller than elk) would also be limited due to the large sizes of forage patches, so portions of the patches would go unused even during the fall and winter. This action item will allow for foraging habitat to be located throughout the Baker River and Nooksack River basins, in locations and patch sizes designed for optimal utilization by elk.

The quality of the foraging habitat is a major concern for providing adequate forage on these acquired lands. One of the management actions will be to set specific requirements for the production of elk forage plants to ensure the quality of the habitat. Fertilization, tilling, shrub pruning, and planting additional forage plants may be needed to insure high quality forage.

4. Provide Spring Foraging Habitat for Grizzly Bears

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should acquire or protect by road closures, 796 acres of spring grizzly bear foraging habitat that currently provide little value. All of the area should be within the Baker Bear Management Unit (BMU). The location of the habitat within the Baker BMU may change during the term of the new license, but at least 50 percent will remain available in the same location(s) for at least 10 consecutive years, or until the end of the new license term, whichever occurs first. Motorized access should be controlled to the extent necessary to provide at least 55 percent of the acres at a distance of at least 500 meters from a motorized road or trail, or high use trail. PSE should maintain road closure structures to provide forage value over the term of the license. Core area spring foraging habitat should have no motorized or non-motorized high intensity use of roads or trails within 0.3 mile from April 1 through June 15. Roads and trails should be gated or otherwise blocked as necessary to ensure against human use during this period. Human access issues related to grizzly bear spring forage should also be incorporated into comprehensive access management plans for the project.

Justification. The Baker River project area is within the Baker Bear Management Unit (Baker BMU) of the North Cascades Grizzly Bear Recovery Area. Grizzly bears are not currently known to inhabit the Baker BMU, but sporadic sightings of tracks over the past several decades suggest they occasionally enter the area. Recent analyses of habitat in the Baker BMU show that preferred habitats in core areas for both seasons (early and late) are within ranges believed necessary to support occupied habitat with low mortality risk to bears. It is therefore unlikely that current habitat conditions are preventing or interfering with grizzly bear recovery in the Baker BMU.

The Baker BMU currently does not meet optimum conditions for habitat due primarily to high levels of human activity in the basin. Of particular concern for long-term conservation planning, is the effect of human activity on the availability of core area spring forage at low elevations around Baker Lake. In order for foraging habitat to qualify as core area, it must be more than 0.3 mile (approximately 500 meters) from accessible roads, trails, and campgrounds. The high concentration of roads, trails, and campgrounds in the Baker basin precludes much of the foraging habitat from qualifying as core habitat. The USFWS and the USFS have identified a specific interest in increasing the amount of core area spring foraging habitat in the Baker BMU to enhance the potential for recovery of the grizzly bear.

5. Provide Summer Habitat for Mountain Goats

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should fund 100 percent of the planning costs of habitat improvement in mountain hemlock forest adjacent to occupied mountain goat summer range. PSE should fully fund the implementation of 194 acres of forest canopy modification to improve summer range habitat within the Baker River watershed. PSE should provide the USFS with funding for habitat improvements in mountain hemlock forest adjacent to occupied mountain goat summer range on Federal lands within the Baker River watershed, according to the following conditions:

- PSE should fund 23 percent of the cost incurred by the USFS in planning and environmental review;
- PSE should fund 100 percent of the cost incurred by the USFS in implementation on the first 194 acres; and
- PSE should fund 100 percent of the cost incurred by the USFS in monitoring during the first two years after implementation on the first 194 acres.

Justification. Data collected by the USFS indicates that the mountain goat population in the Baker River watershed is depressed, and a shortage of usable summer habitat has been proposed as a contributing factor. The USFS estimates that the total area of suitable summer habitat (subalpine shrubs and grasses) has decreased over the past 100 years due to encroachment by closed-canopy mountain hemlock forest, and believes that goats are being prevented from using portions of the remaining habitat by the presence of hikers. The enhancement program proposed by the USFS would provide additional summer forage habitat away from established hiking trails and areas of heavy off-trail use by humans.

The USFS estimates the total area of mountain goat summer range in the Baker River watershed impacted by recreational use to be 844 acres, and that PSE is responsible for 23 percent of that impact through project-induced recreation. Given the difficulties in verifying and quantifying the link between the project and recreational impacts to mountain goat summer range, the TRWG has agreed to base the PME on the USFS proposal of 23 percent.

6. Provide Breeding Habitat for Amphibians

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should acquire land or establish conservation easements to protect 1,287 acres of amphibian reproductive habitats and their buffers. Priority should be given to lands that are at risk of removal or adverse modification. Some of these acres may be satisfied by wetlands within other land acquisitions, but at least 180 acres of specific amphibian reproductive habitats should be acquired. Preference should be for on-site (i.e., within the Baker River Basin) measures to reduce the risk to amphibians associated with reservoir operation. Previously altered and degraded wetlands should be restored and enhanced. Wetland restoration is defined as re-establishing historic functions in a wetland where they have been lost, and wetland enhancement is defined as improving functions of a degraded wetland. Specific goals and objectives should be established for each wetland community.

Justification. Surveys of potentially suitable amphibian breeding habitat in the spring of 2002 found that a significant amount of amphibian reproduction occurs within the draw down zone of both reservoirs. Surveys of 9 water bodies above full pool and 10 below full pool found that all of the reproductive effort of red-legged frog and long-toed salamander, and 70 and 85 percent of the reproductive effort of cascades frog and northwest salamander, respectively, occurred within the draw down zone. Although the short survey period in 2002 does not account for all amphibian reproduction, it likely is representative of the reservoirs' impact to cascade frog, which generally reproduces en mass in a one week period.

Amphibians may be attracted to the shallow, unshaded ponds in the draw down zone due to higher water temperatures compared to deeper, stable water level wetlands above full pool. Blaustein *et al.* (1995) cite several references reporting that Cascade frogs tend to lay eggs in areas that are thermally optimal for greatest embryonic growth. When the reservoir fills with cold water, egg masses and larvae may die due to the decreased temperature.

During reservoir filling, water temperature in the temporary pools decreased 5 degrees C from 11 to 6 degrees C. Water temperatures of 6 degrees C are at the lower tolerance level for cascade frogs. In addition to direct mortality of eggs resulting from low temperatures, cooler water slows larval and embryonic development. Skelly *et al.* (2002) attribute a 5 degree C temperature increase as the primary factor for a near doubling of larval growth rates in two frogs. They cite five other studies that report temperature having a strong effect on tadpole growth and development rates, two of which demonstrated a doubling of larval growth rate with a 5 degree C increase in temperature. In 2002, inundation of reproductive sites had occurred by April 15, when reservoir fill had covered study sites in the draw down zone.

Reservoir filling also allows fish and invertebrates to prey on amphibian larva. Increased time to metamorphosis increases the time that larva are vulnerable to predation. Predation on amphibian larva can be very high.

Egg masses and larvae are subject to mortality due to dessication during drawdown. Drying of egg masses was documented in the spring 2002 surveys. Cascade frog egg masses may be particularly susceptible to drying because they are laid along pond edges.

Richter and Azous (1995) report significantly lower amphibian species diversity with water level fluctuations of 60 cm or more. During the spring of 2002, water level fluctuations at the project exceeded 122 cm. Changing water levels can have significant impacts on amphibian reproduction, eliminating all of the annual reproduction effort. Consistent breeding of amphibians at locations that produce no offspring surviving to adults has been previously reported. Adults breeding at these sites are supplied by nearby reproductive sites.

During the reservoir drawdown, isolated ponds within the drawdown zone provide attractive reproductive habitat for a wide variety of amphibians. Lack of suitable habitat in the project vicinity may encourage significant migrations to the reservoirs and these isolated ponds. It has been reported that radio tagged spotted frogs move more than one kilometer from breeding sites. Red-legged frogs are often found 200-300 meters from reproductive ponds. Semlitsch (2000) reports that most pond-breeding amphibian species usually live within 200 meters of reproductive sites. For six species of amphibians, adults were found an average of 125 meters and a maximum of 625 meters from the edge of aquatic habitats.

G. Provide a Terrestrial Enhancement and Research Fund (TERF)

For the protection of, mitigation of damages to, and enhancement of wildlife resources, concurrent with the issuance of any new license for the project, PSE should create a Terrestrial Enhancement and Research Fund (TERF), an annual discretionary fund to be administered by the

BRTC. The purpose of the fund is to provide a firm commitment and resource pool to address ongoing needs relative to terrestrial species and their habitats during the license period. The fund is discretionary in use and additive to firm operational costs and other financial commitments called out in the new license. An initial fund of $500,000 should be established in year 5 of the new license with $50,000 added to the fund on each fifth year anniversary of the new license through the term of the new license.

Justification. The effects to terrestrial resources of a hydroelectric project and its associated facilities are complex and in some cases difficult to quantify. The effects of the project that can be identified have been addressed above in our recommendations for PME measures. Those effects that can not be mitigated or are not quantifiable at this time are to be addressed with expenditures from the TERF. New information about the effects of hydroelectric projects on terrestrial species and new information about management of those species can also be addressed through this fund. The TERF is intended to be used to support a range of proposals to study and implement enhancements to terrestrial resources as compared to existing conditions during the period of the license.

H. Wildlife Habitat Monitoring

PSE should develop a monitoring plan in cooperation with the USFWS, USFS, WDFW, and affected Tribes to ensure the success of the measures implemented to protect, mitigate damages to, and enhance wildlife resources, and to determine measures to ameliorate unforeseen impacts. The monitoring plan should include, but not be limited to, the following measures:

1. Provide for cover typing and habitat evaluation of each land acquisition within 3 years of acquiring control or fee title. The USFWS recommends that a Habitat Evaluation Procedure (HEP) or equally detailed analysis be completed for each acquisition. In year 17 (or midway through the new license) another HEP should be completed by PSE on their lands. This midterm HEP would document changes on these lands and help revise standards and methods for enhancements as needed to meet the expectations and objectives in place at that time. A HEP should be completed in year 34 (or 5 years prior to the expiration of the new license) as the first step in relicensing studies for any future new license;
2. Ensure that the measures included in the wildlife mitigation plan are effective and include an adaptive management process to make changes to the plan as needed;
3. Include methods to determine the efficacy of thinning and other treatments to reduce the abrupt edge effect adjacent to old growth stands;
4. Determine the adequacy of elk nutrition on the lands acquired specifically for elk forage and develop and implement treatments if the forage nutrition and quantity is not meeting expectations;
5. Verify that the road closure program for grizzly bear spring forage is successfully preventing motorized use in this area and develop contingency methods if the closure is not successful;
6. Develop methods to measure the summer range enhancement provided to mountain goats and if this method is meeting the assumptions and expectations for the project;

7. Monitor the effects of the improved fish passage facilities on terrestrial species and the nutrient cycling of the additional fish biomass on the terrestrial ecosystem;
8. Require at least 10 years monitoring of the mitigation wetland sites to evaluate if the desired function and value has been protected, mitigated or enhanced. Monitor amphibian use and population dynamics on those wetlands specifically acquired to enhance amphibian habitat;
9. Ensure that the noxious weed control program is effective and is meeting the desired results; and
10. Require an annual report on the management activities associated with the acquired wildlife lands. This report should include, at a minimum, the management activities completed for the previous year, anticipated management for the next year, and plans for future years. It should include meeting notes from all meetings and any other associated communications.

Justification. Monitoring PME measures during the term of the new license is necessary for several reasons. Due to the complexity of project operations, it is possible that wildlife resource measures may get overlooked as part of the implementation needed to be in compliance with new license articles. Measures that are implemented need to be monitored to insure not only compliance but also effectiveness. The proposed recommended wildlife PME measures presented above reflect our understanding of the best management tools available at this time. Adequate monitoring of the effects of past and current management tools will identify data gaps and provide the basis for additional wildlife research to provide better management tools in the future.

Due to the length of FERC licenses, it is doubtful that personnel associated with the project during this relicensing process will be available to provide their institutional memory over the term of the new license. A consistent and specific monitoring plan provides long term continuity for wildlife resources into the future.

Annual discussions between the parties and a report of activities are necessary to assess the effectiveness of the plan and determine if the objectives are being met. The report will be used by the Commission to monitor the wildlife settlement agreement and by the parties to the agreement to adjust management activities as needed.

FISHERIES RESOURCE MEASURES

Lower Baker Dam was constructed in the mid 1920s and Upper Baker dam, the second phase of the project, was constructed in the late 1950s. The Lower Shannon development inundated over 300 acres of floodplain and over 7 miles of riverine habitat. Another portion of the lower Baker River was removed from fisheries production with the installation of the barrier dam to operate the fish trap. When the Upper Baker Development was constructed, another 1,200 acres of floodplain and over 9 miles of river habitat were lost to inundation. Mitigation for these developments consisted of a fish trap below the project for adult salmonids and evolving collection facilities for downstream migrants. PSE has been responsive to the needs of downstream migrants and has continually worked to increase the efficiency of the collection facilities. Our understanding of the effects of hydroelectric projects on aquatic resources has

increased since the construction of these developments. Several effects of the projects have not been adequately mitigated or cause effects that make it difficult to reach the objectives for the Baker River aquatic resources. Our recommended fishery mitigation measures, listed below, will be necessary to address the effects of the project.

Some of these terms and conditions follow the PME measures that have been developed by the various resource working groups during the relicensing process. Others are new or are the USFWS revisions of those presented in the DLA by PSE. These new or revised terms and conditions are provided to address USFWS concerns, and to mitigate for the ongoing effects of the project on fish and wildlife resources. These terms and conditions should be included in their entirely in the final license application.

2. Aquatic Resource Management Plan

For the protection of, mitigation of damages to, and enhancement of aquatic resources, concurrent with the issuance of any new license for the project, PSE should develop an aquatic resource management plan. This plan should set out resource objectives for management and enhancement, and monitoring criteria for all PSE-owned or operated fishery facilities. Management on any lands owned, acquired or controlled by PSE for the purposes of fisheries management should be included in this plan. A Baker River Aquatic Committee (BRAC) consisting of, at a minimum, PSE, USFWS, NOAA Fisheries, USFS, WDFW, WDOE, and affected Tribes, should be established to consult and cooperate in the development of this plan. The implementation of the plan's PMEs should be funded by PSE. Annual expenditures for implementation may vary depending on the priorities established by the BRTC. Many of the following specific actions have been identified by the Aquatic Resources Working Group, (ARWG) as appropriate PMEs for the new license and should be included in the aquatic management plan:

A. <u>Aquatic Habitat Acquisition, Restoration, and Enhancement Plan</u>

For the protection of, mitigation of damages to, and enhancement of anadromous fish resources, concurrent with the issuance of any new license for the project, PSE should, in consultation with the BRAC, develop and fund a riparian and aquatic habitat protection and restoration plan. The plan should identify and implement specific opportunities to restore or acquire fish habitat. After a draft plan has been prepared, it should be provided to the agencies for comment. PSE should allow a minimum of 60 days for the agencies to comment and make recommendations prior to filing a final plan with the Commission. PSE should include with the final plan, documentation of consultation with the agencies and copies of agency comments and recommendations, and specific descriptions of how the final plan accommodates all agency comments and recommendations. If PSE does not adopt an agency recommendation, the filing should include PSE's reasons, based on project-specific information. The plan must be completed no later than one year from the issuance of the license. PSE should begin implementation of this plan according to the schedule in the plan but no later than 6 months after approval of the plan by the Commission, including capital developments, maintenance, and operation.

The selection of sites for this program will be made on a priority basis by balancing geographic preference against overall biological benefit. The geographic priority will be:

1. Within the Baker basin;
2. Within the Middle Skagit immediately downstream of the Baker River;
3. In the lower Skagit River/estuary; and,
4. Elsewhere in the Skagit River basin.

The BRAC may elect to utilize program funds to:

- Restore currently degraded habitat.
- Purchase, lease, obtain easements or otherwise encumber lands containing habitats for restoration and protection.
- Provide fish passage at locations that would increase the amount of habitat available to migratory species of fish.
- Acquire control of low-gradient, side-channel habitat within the Skagit Basin for subsequent rehabilitation.
- Maintenance, modification, or restoration of previously improved site.
- Protect tributaries and their watersheds where a significant part of the watershed is in climax vegetation but is not protected or where new protection and restoration could link streams with protected parts of a watershed.
- Assess the need for nutrient enhancement and transport clean salmon carcasses into the upper Baker River basin if needed.
- Develop a schedule for implementation and maintenance.
- Develop a monitoring and adaptive management plan that includes a description of the objectives, measurable criteria to determine if the objectives are being met and whether remedial actions are needed.

Projects selected by the BRAC will take into consideration and be coordinated with other aquatic conservation plans or programs. The BRAC should coordinate aquatic enhancements or acquisitions with similar actions related to terrestrial ecology. Whenever feasible, the BRAC will cost-share with other programs, seek matching funds, and "piggy-back" programs onto other habitat efforts.

Justification. Construction and operation of the Baker River project has caused major adverse impacts to anadromous and resident fish and their habitat. Impacts are both direct and indirect. Connectivity between freshwater spawning and rearing habitat to marine habitat has been reduced. Riverine habitat has been inundated by the reservoirs and provides poor habitat for most life stages and species of anadromous salmonids.

Project operations alter peak flood flows, including the channel forming flows, thus impacting downstream reaches. The existence of the project has encouraged and facilitated land use changes, such as floodplain development, which are detrimental to salmonid habitat and the natural processes influencing aquatic habitat.

Due to the project reducing upstream passage for adult salmonids, a significant source of nutrients and trace elements was reduced. The dying salmon provided a nutrient base for a wide variety of organisms. These ranged from eagles and bears, to macroinvertebrates, and down to microbes which broke the carcasses down into components such as nitrogen. Marine trace elements imported into the fresh water systems by salmon are important components in maintaining diverse aquatic and riparian zone ecosystems (NRC, 1996). With the reduction of these carcasses, part of the aquatic nutrient cycling was removed, resulting in lower productivity in the entire upper Baker River basin.

Habitat degradation is significant both below and above the project. Flood control levees, loss of riparian zones, bank erosion, and significant loss of LWD within the channel have all reduced habitat capability. Over 90 miles of fish habitat with less than 8 percent gradient were inundated and are not available for fish production (draft Study A37). Habitat restoration and protection is needed to compensate for habitat loss associated with the project and to compensate for the inability to achieve compensatory production from hatcheries. Protection and restoration of riparian habitat as well as aquatic habitat will benefit fish and will make upper basin fish restoration efforts more likely to succeed.

Critical downstream side-channel habitat should be acquired and managed to optimize habitat. Intact riparian zones should also be protected by acquisition, conservation easement, or partnerships available to PSE.

B. Instream Flows

For the protection of, mitigation of damages to, and enhancement of anadromous fish resources, concurrent with the issuance of any new license for the project, PSE should provide an instantaneous minimum instream flow of 300 cfs throughout the year downstream of Lower Baker Dam, except as superceded by any change indicated in the Section 401 Water Quality Certification issued by the Washington Department of Ecology. The 300 cfs minimum instream flow is also superceded by seasonal minimum flows necessary to supply egg incubation water to redds spawned in the Skagit River at spawning flows influenced by Baker project discharges during the respective fish species spawning seasons.

Justification. Operation of the project under the proposed action would alter flow within the lower Baker River and several miles of the Skagit River below the project. The proposed action would modify the timing and duration of most hydraulic and hydrologic relationships downstream of the lower Baker Dam. Flow alterations resulting from project operations include alteration of the stream's channel forming flows and changes in typical flows. In turn, these altered flows would affect physical habitat and food production for all aquatic species both directly and indirectly. Riparian dependent species may also be affected by disruption in the stream edge interface, the splash zone community, and the availability of water.

Pacific salmonids are adapted to natural hydrologic regimes and require suitable stream flows for all life stages and life histories. The Baker River project is capable of hydraulic modifications that are adverse to these species. Currently, Lower Baker generation is frequently shut down as part of usual peaking energy operations. The minimum instream flow in the Baker River is then

reduced to 60 to 80 cfs from leakage at Lower Baker Dam and from the water supply to the adult fishway. This is inadequate to the biological needs of fish for migration, adult holding, and juvenile rearing. Reduced stream flows are a major limiting factor for stream fish. Setting preferred instream flows maximizes the benefit to the life stage that is flow limited for each fish species.

C. Ramping Rates

PSE should, for the protection, mitigation of damages to, and enhancement of fish resources, utilize the ramping rates described by Hunter (1992) and recorded below for all stream flows. If a critical flow can be established for the project in consultation with the BRAC, the USFWS may reconsider these ramping rate restrictions based on appropriate information. We will also consider alternative methods for achieving the desired results of minimizing stranding below the project if those alternative methods can be shown to provide greater protection from stranding to fish downstream of the project without other negative effects.

Recommended Ramp Rate Restrictions

Season	**Daylight Rates**	**Night Rates**
February 16 - June 15	0 inches / hour	2 inches / hour
June 16 - October 31	1 inch / hour	1 inch / hour
November 1 - February 15	2 inches / hour	2 inches / hour

Justification. Rapid reductions in streamflow downstream of regulating structures, such as hydropower dams, have a well-documented history of causing direct and indirect mortality to juvenile fish. This artificial manipulation of flows is called ramping. Downramping regulation and minimization of flow fluctuation amplitude avoid and minimize the resultant mortality and loss to the public fishery resource. Deviations from the guidelines should not exceed natural, i.e. non-project downramp, rates, or must be the result of emergencies for which PSE must account.

Hunter (1992) reviewed the available literature on the effects of hydroelectric project flow fluctuations on salmon and steelhead and found that severe mortality can be inflicted by these flow fluctuations. Downramping can rapidly expose gravel bars and isolate pools causing juvenile fish to become stranded. Stranding may cause immediate mortality to a salmonid fry and juveniles, and desiccate or freeze eggs and alevins. Stranding also exposes juvenile fish and eggs to predation by birds and other scavengers.

Streambed morphology, bar slope, side channels, time of day, season, and size and species of fish are all factors that influence the stranding of fish. In addition to direct impacts to fish, Hunter (1992) found significant disruptions to the aquatic invertebrate community, which indirectly impact fish production. Peaking can also result in detrimental flow fluctuations, as demonstrated by Bauersfeld (1978) for the Cowlitz River project. The implementation of these restrictions, by regulating the rate and amplitude of project caused flow fluctuations, will help avoid and minimize the loss of fishery resources.

There may be reason to believe that bull trout are more susceptible to stranding in uneven channel morphology due to their close association with the substrate and the tendency for them to burrow into the interstitial spaces to hide. This behavior pattern makes them more likely to attempt to escape into the substrate during periods of rapid decrease in water depth.

D. Amplitude

PSE should limit the amplitude of daily operations at Lower Baker Dam to 50 percent, or less, of the daily maximum flow. For example, when the maximum daily flow is 4,000 cfs, the downramp for that 24 hour cycle is concluded when discharge is reduced to 2,000 cfs.

Justification. Amplitude is a significant factor correlated with fish stranding during downramp events, independent of downramping rate restrictions. The ramping rate restriction, without a corresponding amplitude restriction, permits uninterrupted reduction in streamflow until the minimum discharge is reached. This assumes that fish have an unlimited ability and willingness to migrate into an ever-shrinking stream channel. Evidence from fry stranding studies and other observations of natural streamflow recessions indicate that fish are either unable or unwilling, or both, to always follow the receding waterline. Large amplitude flow fluctuations cause massive reductions in stream channel wetted perimeter that move suitable habitat a large horizontal distance, leaving both juvenile and adult fish stranded in potholes and side channels that subsequently drain.

E. Flow Continuation

PSE should, for the protection, mitigation of damages to, and enhancement of fish and wildlife resources, provide for the installation and operation of an energy dissipating flow continuation valve or turbine deflectors to maintain flow from the powerhouse when units go off line.

Justification. Lower Baker Dam powerhouse has an effective generating discharge capacity range from 3,200 cfs to over 4,000 cfs, and is currently unable to provide operational and discharge control to conform to downramping needs, amplitude needs, and minimum flow needs. The installation and operation of an energy dissipating flow continuation valve or turbine deflectors would allow the controlled reduction in flow necessary for compliance with the instream flow, ramping rate, and amplitude recommendations outlined above.

F. Monitor Response of Fish Population to Instream Flows

For the protection of, mitigation of damages to, and enhancement of anadromous fishery resources, concurrent with the issuance of any new license for the project, PSE should prepare a fish population response monitoring plan, after consultation with the BRAC. The purpose of the monitoring is to evaluate the effectiveness of instream flows in protecting fish and fish habitat. After a draft plan has been prepared, it should be provided to the agencies for comment. PSE should allow a minimum of 60 days for the agencies to comment and make recommendations prior to filing a final plan with the Commission. PSE should include with the final plan documentation of consultation with the agencies, copies of agency comments and recommendations, and specific descriptions of how the final plan accommodates all agency

comments and recommendations. If PSE does not adopt an agency recommendation, the filing should include PSE's reasons based on project-specific information.

PSE should conduct annual monitoring of fish populations in the downstream reach following the plan. Monitoring should continue through at least five years of project operation and every 5th year thereafter for the term of the license. Monitoring results should be provided to the BRAC for review. Redd counts for fall-winter instream flow determinations may be used as part of the fish population monitoring. Information on the emergence timing for all wild salmonids is especially critical and will be needed for any determination to allow for specific adjustments to instream flows or other project operations intended to protect, mitigate damages to, and enhance aquatic resources.

Justification. The Baker River Project modifies the timing and duration of most hydraulic and hydrologic relationships downstream of Lower Baker Dam for 56 miles of the Skagit River. The project attenuates flood flows, reduces the magnitude of channel maintenance and forming flows, and releases higher and lower flows than typical unregulated flows. Pacific salmonids are adapted to natural hydrologic regimes, and the project is capable of hydraulic modifications that are adverse to these species. Salmonids require suitable streamflows for upstream and downstream migration, adult holding and maturation, spawning, egg incubation, and juvenile emergence and rearing.

Despite considerable interest and research in the past decade, some uncertainty remains regarding exactly how fish are affected by regulated flow regimes. The knowledge base is improving and monitoring during the license period will insure that desired management goals and objectives are being met. The ability to achieve desired results for fish depends on adaptive management of flows. Monitoring is a key step in adaptive management.

Restoration and recovery of listed species will necessitate adjustments to many of the terms and conditions throughout the new license period. As the wild fish component increases, the uncertainty about life history changes may require significant adjustments. Some of the expected changes to these life history patterns include spawning and emergence timing, smolt size and age at outmigration, and other possibly unforeseen changes.

G. Dissolved Gas Monitoring

For the protection of, mitigation of damages to, and enhancement of fish resources, concurrent with the issuance of any new license for the project, PSE should monitor the powerhouse outfall of Lower and Upper Baker Dams hourly for total dissolved gases (TDG). This monitoring should be carried out for one year after any modification to facilities or operations that could effect TDG. If TDG standards are exceeded, PSE should take steps to insure compliance. Results should be reported in an annual operation report to the Commission, and the BRAC.

Justification. The project has the potential to cause gas supersaturation downstream of the tailraces. As discussed in the PDEA, low flows below Lower Baker Dam result in elevated TDG that are above acceptable levels. Gas bubble disease is caused by fish being exposed to water supersaturated with atmospheric gas. High head dams and the pressurization that can occur in

the penstocks and other downstream water conveyance methods, including spillways, can create this condition. It is a significant cause of mortality to salmonids in the Columbia River system and other systems where hydroelectric dams cause gas supersaturation. Gas supersaturation can kill fish a considerable distance downstream of the source.

Operation and design modification can usually solve or minimize this problem. The monitoring results will be used to accurately assess when or if supersaturation is occurring. This will allow for early correction of any problems.

H. Bedload and Large Woody Debris (LWD) Transport

PSE should, for the protection, mitigation of damages to, and enhancement of fishery resources, develop and implement plans for LWD transport and gravel transport in consultation with the BRAC. The plan should include operating mechanisms to transport bedload, gravel, and LWD and other organic material that accumulates in the project's forebay downstream to the Lower River and beyond. The goal for this measure is to insure gravel supplementation adequate to return the affected reach to its pre-dam fish production potential, and ensure that no net loss of fish habitat occurs due to disruption of bedload transport. It should address degradation and armoring of the bypass and downstream reaches, and any aggradation caused in the lower river by the attenuation of flood flows. Large woody debris supplementation below the project should be proportional to input.

Justification. The natural riverine transport of gravel, LWD, nutrients and macroinvertebrates below the projects' dams are mostly curtailed or drastically reduced by project operation. The continued recruitment of gravels and cobble provides substrate essential to successful salmonid fish spawning, egg incubation, macroinvertebrate production and rearing of juveniles. The recruitment of LWD and other organic matter provides habitat for many species of fish and aquatic invertebrates and is an essential process for the maintenance of a healthy stream ecosystem. Macrophytes colonize this material and provide the initial food source for the aquatic food chain. Large woody debris is also an important element in determining channel shape and sediment deposition and distribution, and in providing habitat for fish and other aquatic life.

Large systems like the Skagit River below the project are not as dependent on LWD for channel forming processes. The main value of LWD in these systems is the cover and substrate provided to fish and aquatic macro-invertebrates. While much of the LWD exists as temporary structure, the value of this material moving through the system can not be over emphasized. Recent information has indicated that LWD plays a critical, but not well understood, role in the marine ecosystem, providing structure and food substrates for many marine organisms, including nesting pelagic bird species.

The effects of the Baker project on gravel recruitment downstream are difficult to determine. The increased bedload caused by management activities on the Skagit above the confluence greatly overwhelm the lack of gravel contribution from the Baker project. This may change in the future. There is some indication that the project has caused the historical alluvial delta at the

mouth of the Baker River to disappear. Discussions in the ARWG, indicated that this delta may have provided significant spawning habitat for salmon species.

3. Bull Trout Investigations

PSE should, for the protection, mitigation of damages to, and enhancement of fishery resources, conduct post-licensing bull trout surveys and monitor resident fish use in the stream reaches tributary to Lake Shannon and Upper Baker Lake to the first all-season impassable fish barrier. PSE should coordinate and develop the methods for these surveys in consultation with the BRAC. These post-licensing surveys should use the presence-absence protocol developed by the American Fisheries Society and reviewed by the USFWS (Peterson *et al.* 2001).

PSE should also continue genetic analysis of native char within the basin to determine if there are bull trout and Dolly Varden within the Baker project area. The genetic analysis would help determine if there are unique genetic bull trout stocks utilizing specific tributaries, and if isolation of the Lake Shannon native char population has caused a deleterious effect to that sub-population.

Justification. Available information on bull trout habitat and use above and within the project area is limited. Studies have been initiated to increase the knowledge about bull trout/Dolly Varden life history, population distribution, abundance and genetic make-up (Bull Trout Aquatic Relicensing Study A38). While this information will be critical to better management of bull trout in the Baker River in the future, the study results are not available to the USFWS at this time. This recommendation is intended to continue the bull trout investigations post-licensing so that the available knowledge will allow the development of specific management plans for the Baker River project that will aid in the recovery of this listed species. Post-licensing surveys will also provide additional information to evaluate the effectiveness of proposed fish passage measures for bull trout.

Bull trout detection has been a subject of intense research in recent years. New studies have shown that night-snorkeling increases the chance of detecting these highly elusive. The USFWS is unaware of any surveys in the Baker River basin that have utilized night-snorkeling or any of the other methods contained in the American Fisheries Society bull trout survey protocol.

Bull trout sub-population persistence requires more than maintaining fish in individual streams; it requires the ability of the fish to migrate. Migratory bull trout ensure interchange of genetic material between populations, thereby ensuring genetic variability. Migratory corridors tie seasonal habitat together for anadromous, adfluvial, and fluvial forms, and allow for dispersal of resident forms for recolonization of recovering habitats. Sub-populations that are extirpated by catastrophic events may also become reestablished in this manner. In the Lewis River, bull trout were extirpated from Pine Creek after the eruption of Mt. Saint Helens. Since the eruption, the stream has been recovering and is being recolonized by a significant number of bull trout from the Rush Creek local population that was not affected by the eruption.

Migratory corridors link seasonal habitats for all bull trout life-history forms. Individuals from different sub-populations interbreed when some stray and spawn in non-natal streams. For

example, in Montana, migratory bull trout make extensive migrations in the Flathead River system and resident bull trout move to overwinter in downstream pools in Bitterroot River tributaries.

Unfortunately, migratory bull trout have been restricted or eliminated from much of their historical habitat due to stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. Dam and reservoir construction and operations have altered major portions of bull trout habitat throughout Puget Sound. Dams without fish passage create barriers to migratory forms of bull trout which isolates populations. The operations of dams and reservoirs alter the natural hydrograph that affects forage, water temperature, and water quality.

4. Erosion and Sediment Control Plan

For the protection of, mitigation of damages to, and enhancement of fish resources, concurrent with the issuance of any new license for the project, PSE should prepare an erosion and sediment control plan (ESCP), after consultation with the BRAC. After a draft plan has been prepared, it should be provided to the agencies for comment. PSE should allow a minimum of 60 days for the agencies to comment and make recommendations prior to filing a final plan with the Commission. PSE should include with the final plan, documentation of consultation with the agencies, copies of agency comments and recommendations, and specific descriptions of how the final plan accommodates all agency comments and recommendations. If PSE does not adopt an agency recommendation, the filing should include PSE's reasons, based on project-specific information. The objective of the plan would be to minimize sediment entry into the stream environment.

Sixty days prior to the start of any new construction, a supplemental ESCP should be provided to agencies giving site-specific details such as the location and design limits of sediment ponds, staging areas, culverts, and other erosion control features. Any new information or proposed changes from the original plan should be included for agency review and comment. If PSE does not adopt an agency recommendation, the filing should include PSE's reasons, based on project-specific information.

An environmental monitor should be present on site during construction. The monitor should, as much as possible, anticipate and prevent erosion problems, and mobilize the response when erosion does occur. This monitor should have the authority to stop construction if the conditions of the ESCP are not being met. Monthly reports should be provided to the agencies describing the progress and any problems encountered.

Justification. Major construction at the project was completed during the first license period. Some additional construction and repair or replacement of project components, including fish culture facilities and a replacement turbine, is anticipated during the term of the new license. These projects must be built in a way that prevents the adverse effects of sedimentation on fish and aquatic habitats.

Sediment entering the stream from any source can cause serious impacts to fish such as gill damage and smothering of eggs and alevins while in the gravel. Filling of the interstitial spaces can cause a reduction of macro-invertebrates, a major food source for juvenile salmonids and other fish species. Indirect problems from excess sediment include a reduction in pool volume and numbers, aggradation and widening of the channel.

5. Fish and Wildlife Agency Personnel Inspections of the Project

PSE should allow representatives of the BRAC to inspect the project site at any reasonable time before and during construction and operation of the Baker River project. At a minimum, an annual operations inspection should be provided to the BRAC. PSE should also maintain and make available to these resource agencies a record of project operations, including the daily fluctuation, the daily spill and the rate of change of flows below the project. PSE should document all unusual occurrences such as load rejections, powerhouse mechanical problems, turbine, intake, and fish screen failures, and sedimentation events. They should bring such occurrences to the immediate attention of the resource agencies and make such documentation available to those agencies.

Justification. Agency personnel bring a different perspective to the operations of the project and its impacts on fish and wildlife resources which can be helpful. The various authorities of the agencies can be used to work with PSE to promote not only better protection for fish and wildlife but also more efficient operations. Adverse impacts are best avoided or minimized by compliance with terms and conditions. Review of operations by the agencies also provides them with a better understanding of the project operations.

Annual monitoring and compliance reports provide early warnings of potential problems with ongoing mitigation activities. It is a useful method for correcting potential problems or changing management when necessary. It can be used as a trigger mechanism in an adaptive management plan for changing the management approach. Avoiding or minimizing adverse impacts by compliance with terms and conditions is easier than correcting problems once they occur. Inspections by participating agencies provide a different perspective to mitigation and help reduce misunderstandings.

6. Monitoring

PSE should, to ensure the success of the measures implemented to protect, mitigate damages to, and enhance fish resources, and to determine measures to ameliorate unforeseen impacts, develop monitoring plans in cooperation with the USFWS, NOAA Fisheries, WDFW, and affected Tribes to:

A. Determine the sediment distribution and quality to ensure bedload passage measures are successful;

B. Ensure that the measures to reduce erosion and sedimentation risk of the projects are correctly implemented and properly maintained;

C. Record stream flows downstream of the tailraces for instream flow, ramping rate, and flow continuation compliance;

D. Determine the adequacy of the minimum instream flows in protecting fishery resources, including, but not limited to, fish population and temperature monitoring;

E. Verify that gas supersaturation does not exceed Washington State Water Quality Standards or 105 percent, whatever is less; and

F. Ensure fish passage facilities are constructed and operated consistent with the approved plans and intended function.

Justification. Validating the assumptions used in the environmental analysis and verifying compliance with the license conditions requires monitoring the projects. Project monitoring is essential to determine the success of the protection, mitigation, and enhancement measures provided in the license and for providing the information needed to make changes to the project's operation, if necessary.

COMMENTS ON THE PRELIMINARY DRAFT ENVIRONMENTAL ASSESMENT

General Comments

The PDEA provides a brief description of the proposed action that was introduced to the relicensing participants in June of 2003. Many of the studies for the relicensing were not completed at that time and the PDEA reflects this lack. The analysis is not consistent throughout the document, with some sections addressing issues in a detailed and complete manner and other sections treating issues under analysis without adequate discussion.

An area in the PDEA that needs to be corrected is the use of terms such as "may" and "could". May or could imply that the action under discussion is a possibility, but does not provide any assurance that the action will occur. It is difficult to complete an accurate analysis of effects of any actions that "could" occur. A commitment by PSE to complete a given action should be indicated by the use of terms such as "will" or "should". The USFWS will assume that any proposed action that could or may occur will not occur when completing its analysis of effects under section 7 of the ESA.

Use of abbreviations and acronyms is a common practice to save time and provide a more concise report. In this document, however, acronyms are used that are not referenced except much earlier in the document or in the definitions at the very beginning. For the reviewer, it is helpful to redefine acronyms frequently or at least at the beginning of new major sections.

The PDEA at present is not suitable for use as a Biological Assessment (BA) for the purposes of section 7 consultation under the ESA. There are specific information requirements that are needed to provide a complete consultation initiation package. Many aspects of the documents analysis are lacking or superficial. In particular, the analysis of the project's effects on bull trout provides no assessment or estimate of incidental take. During the section 7 consultation process,

the USFWS is required to quantify the incidental take of listed species. This task is expedited if the BA contains the necessary information.

For the PDEA to serve as a complete consultation initiation package, we would expect to find a specific section or at least cross references that provides a complete list of the effects of the proposed action on listed species. This includes direct effects, indirect effects, inter-related and interdependent effects, and cumulative effects. The inter-related effects have not been addressed at all. Cumulative effects have been addressed, but not consistently as defined in the ESA, i.e. as "future State, tribal, local or private actions that are reasonably certain to occur…". (See our specific comments below for pg 5-218).

On March 11, 2003, the USFWS corresponded with the Commission and requested additional information to initiate consultation on the interim operation plan proposed by PSE. That letter should have been used as a basis to begin the analysis of project effects. We want to insure that the schedule for relicensing the Baker Hydroelectric project can by met. Meeting this schedule will require a completed formal consultation package (BA) from the Commission, and completion of a Biological Opinion (BO) by the USFWS. If the analysis in the PDEA or the BA is incomplete, then the USFWS will be required to request additional information which may delay the process. We encourage PSE and their consultants to discuss this issued with the USFWS to insure that the PDEA is as complete as possible.

Specific Comments

3.0 Draft Action and Alternatives

Page 3-11. Seventh bullet. Recreation and Aesthetics Resource Measures. PSE proposes to create new trails as part of the draft action. New trails will encourage additional users to the project area and cause increased disturbance to wildlife. Specific trail locations will need to be carefully developed under the oversight of the Baker River Terrestrial Committee (BRTC) to ensure that unacceptable impacts are not incurred.

Page 3-11. Last bullet. Recreation and Aesthetics Resource Measures. The draft action states that PSE will provide funding for a wildlife observation facility. We do not object to this action in concept, but recommend it only be contemplated if there are no unacceptable impacts to wildlife. Disturbance of wildlife species and habitat by recreationists is an increasing concern for wildlife managers. The BRTC should be given oversight on developing a monitoring plan and determining the acceptable level of impacts to wildlife and wildlife habitat associated with this measure.

Page 3-14-18. Project Retirement. This section is an integral part of a complete analysis of ongoing project effects. For that reason, we recommend that this section be broken out into the various resource areas for a more complete analysis. The USFWS has not been an advocate for project removal during the relicensing procedure, but does believe that comparing the relicensed project with the removal alternative gives a more complete picture of the re-commitment of fish and wildlife resources that would be involved if a new license is issued. Many of the issues and

concerns stated by the USFWS in our response to the scoping document could be more easily and completely mitigated by project removal.

Page 3-15. Last Paragraph. Project Retirement. This paragraph contains a brief discussion about the short term adverse effects on the fisheries resources. The only citation used to support this discussion is a 1961 citation by Herbert and Merkens. In the over forty years since this research was published, a large body of intensive material has been developed by numerous researchers about the effects of turbidity and sediment on aquatic organisms. We recommend that this aspect of the PDEA's analysis be re-examine and the most current data available be utilized.

Page 3-16. Fourth Paragraph. Project Retirement. The PDEA asserts, without supporting data, that wintering waterfowl would be reduced, which would therefore reduce the food availability for bald eagles. To support this assertion, the importance of the reservoirs for overwintering waterfowl and their abundance would need to be shown. That these resources provide a better food source than the historical salmon and steelhead availability would also need substantiation. Bald eagles have adapted to using salmon in Western North America from Southeast Alaska to Northern California. The largest overwintering populations of bald eagles in this area (the Chilkoot River in SE Alaska and the Skagit River basin) depend on salmon and steelhead for their basic food resources.

This paragraph also states that food and habitat for other breeding birds and mammals that use the reservoir and shorelines would be reduced. This statement is not supported by any citation or observations and ignores the fluctuating nature of project operations that produce a large inundation zone that is mainly devoid of vegetation and wildlife habitat value. Additional information and analysis is needed in this section to support these conclusions.

Page 3-17. Fourth Paragraph. Project Retirement. We question the statement in this paragraph that concludes that existing campgrounds and recreational facilities would receive little use since they would be located a distance from the water. Facilities that are water dependent such as boat launches and docks would obviously get no use. Other facilities may get less use or a different clientele may choose to use them. Additional analysis is needed to support these conclusions

4.0 Consultation and Compliance

Page 4-3. Second Paragraph. Section 10(j) Recommendations. We understand that the PDEA is written with the Commission as the action agency. The statement that "In section 8.0 we (will) list each of the recommendations subject to section 10(j), and note whether the recommendations are included with the Draft Action" and the next sentence are problematic. We believe that the fish and wildlife agencies' recommendations should be included as written. It is the Commission's responsibility to determine what is or is not within of the scope of section 10(j) of the FPA. This section should be clarified so that it does not appear that the Commission is being given a PDEA with these decisions pre-determined.

5.0 Environmental Analysis

Page 5-1. This section requires clarification. The analysis jumps between the draft action and the no-action alternative, sometimes within the same paragraph. The PDEA should have the proposed action and the comparison to the status quo clearly separated, both in the description of the action and in the analysis of effects. This will make the effects analysis easier to follow and keep the proposed action clearly demarcated from the no action alternative.

Page 5-4. Third Paragraph. The proposed Anderson Creek project, FERC No. 10416 has been dismissed by the Commission

Page 5-37. Third and Fifth Paragraphs. Reservoir Level Management. In the third paragraph, the PDEA states that there is no specific target for Lake Shannon water levels for flood control. However, the fifth paragraph discusses the proposed target for Baker Lake and Lake Shannon in the draft action. This discrepancy should be clarified.

Page 5-56. Table 5-12. Water Quality Standards. This table shows the designated uses as revised by Washington State Department of Ecology (WDOE) in June 2003 for water bodies affected by the project. It should be noted that these standards have not yet been approved by the Environmental Protection Agency (EPA). As such, they have not undergone consultation under section 7 of the ESA for their effects on listed species. The USFWS has been working with the WDOE in the development of these standards, but has not come to agreement as to their ability to adequately protect bull trout. The WDOE has designated water quality standards for Baker Lake and all tributaries to protect char early rearing and spawning; however, WDOE did not identify char foraging and migration as a use, and therefore the areas downstream of the project do not have water quality standards designated to protect those life-stages of char. Until the WDOE criteria are approved by EPA, any discussion in the PDEA should clearly state that while the criteria have been adopted by WDOE, they have not been approved by EPA and they will not be effective until that approval occurs. Any effects analysis based on either these or other WDOE criteria should also be clearly identified.

Page 5-68. Second Paragraph. 5.5.1.5 Total Dissolved Gas. In this discussion about TDG, there is an indication that elevated TDG levels in excess of State standards occurs when Lower Baker River flows are less than 140 cfs. It also is stated that many of the measurements were recorded when the generator was off line. The PDEA should clarify why this happens, and, if the cause(s) are unknown, the PDEA should describe the steps or studies that are proposed to identify the source and correct the problem.

Page 5-78. Section 5.6. Aquatic Resources. This section documents those aquatic resources that are known to occur in the project vicinity or would be affected by the draft proposed action and project operations. One important aquatic resource is ignored in this discussion. Aquatic macro and micro invertebrates are the basis for all aquatic food chains, and yet there is no attempt to characterize this resource in this section. Brief descriptions of project effects on other aquatic resources are scattered throughout later sections. The brevity of these discussions does not adequately present either the present conditions of the invertebrate populations or the changes that may have occurred by the conversion of riverine habitat to reservoir conditions. Ignoring

the existence of a keystone resource because of a lack of understanding does not allow the reader to get a true picture of the complexity and effects of a hydroelectric project with two dams and over 16 miles of reservoir.

Page 5-78. First Paragraph. 5.6.1.1. Aquatic Habitat Conditions. In this discussion, which sets the location for characterizing existing habitat conditions, River Miles 8.2 – 9.35 are not accounted for. The implication is that this river section is between Baker Lake and Lake Shannon, but it is not clear if it is to be included as reservoir or riverine habitat for analysis. In the PDEA, this should be clarified and the analysis adjusted to reflect the updated information.

The importance of LWD and sediment (gravel) in an aquatic ecosystem can not be overstated, but these resources are also not discussed specifically in the PDEA . These importance resources should receive specific attention and analysis in this section.

Page 5-79. Third Paragraph. Upper Baker River. In this discussion of sediment and LWD transport, 182 pieces of LWD are identified as the annual input into Baker Lake. Unfortunately, there is no description of what criteria are used to define LWD. The acronym is defined at the beginning of the document but not subsequently. We found no definition of LWD anywhere in the PDEA, so it is not clear what 182 pieces of LWD entering Baker Lake means in terms of effects on the aquatic ecosystem.

Page 5-93 . Resident Fish Species. Specific comments from the Nature Conservancy about the adequacy of the native species discussion were provided to PSE by letter dated June 3, 2003. We believe that even with these specific comments acknowledged within the PDEA, the treatment of resident fish is inadequate. Without an adequate base of information or identification of information gaps, it is difficult to provide a complete analysis of project effects on resident fish. It is especially problematic that Western Brook Lamprey (*Lampetra Richarsoni)* are only mentioned as possible residents without any discussion of habitat characteristics, life cycle, or population dynamics that could be affected by project operations.

Page 5-94 . Native Char (Bull Trout/Dolly Varden. The discussion in the PDEA for this listed species is also abbreviated. While there is limited site specific data for bull trout within the Baker basin, there is considerable anecdotal and other information sources for native char in the Skagit system that could have been utilized. PSE previously completed a BA for consultation on a proposed interim operations plan that provided the bulk of the information in the PDEA. In addition to the information contained in the BA, the USFWS (2003) outlined specific areas where information was needed in order to complete an adequate assessment of the proposal on bull trout. That additional information was only partially available, but a study designed to specifically answer most of the remaining questions has been initiated and should have been referenced. Biological Opinions for other actions on the Skagit system could have been used as a source of additional information as to the status of bull trout in the Skagit system. A much more complete description of bull trout within the Baker and Skagit systems will be needed in the PDEA to provide a complete package for ESA consultation. Having this information will help to avoid additional information requests that may delay the proceedings.

For the record we note that genetic analysis of bull trout in the Skagit River, Nooksack River, and Southern British Columbia indicated that all of the mainstem native char were bull trout. Dolly Varden were only found above anadromous fish barriers in the upper reaches. All of the more than 30 samples from the Sauk River were bull trout. The USFWS assumes that the Baker River native char are bull trout and expect all effect analyses to do the same.

Page 5-98 . Juvenile Fish Passage. The brief description of the juvenile fish passage system as it exists now provides a limited basis for effects analysis. Although the various pieces are described and some information is given about numbers of fish collected, several important factors are not discussed. While the seasonality of operation is presented, there is no attempt to relate the season of operations with the migratory behavior of the fish species within the basin. It is assumed that this period is broad enough to capture the bulk of outmigrants for anadromous fish, but no evidence is presented to support this assumption. Other fish species such as resident trout or native char are not addressed, nor is an attempt made to identify the information gaps in our understanding of how these two groups of fish may migrate and during what season.

Page 5-99. Third Paragraph. Juvenile Fish Passage. What happens to downstream migrants from July through March? There is a statement that downstream migrants may pass through the project via spill and turbines during this time, but no attempt is made to document when or if this is occurring or to quantify the amount. It is not clear if the guide nets and gulper are removed during this time, which would increase the likelihood of downstream entrainment, or if they are in place and would provide at least some screening effects against downstream movement. There should be a discussion of how information is to be collected to document the quantity of downstream entrainment during non-operation periods. The mortality associated with this entrainment could be significant and needs to be quantified, especially in the case of listed species. Adult bull trout are known to be entrained during spill events during the winter season at the Yale Hydroelectric project (USFWS 2001a). There is no reason to believe that this same situation is not occurring at the Baker project. Adult or sub-adult bull trout likely suffer some level of mortality if they are entrained in the turbines or pass over the spillway during spill events. The PDEA needs to address this issue, and the proposed action needs to identify methods and studies that will be completed to obtain this information.

Page 5-101. The Sulphur Creek Facility and Voluntary Fisheries Programs. We commend PSE for their commitment to fisheries management and a proactive approach to fisheries in the Baker River. In this section, the history and operations of the Sulphur Creek Facility is discussed. However, it is not clear if operation of the Sulphur Creek Facility is proposed to be continued as part of the new license, or if the information is being presented as background and part of the overall fisheries management associated with the Baker River project. It needs to be clear that this important facility is part of the draft proposal and is intended to become part of the new license.

Page 5-106. First full Paragraph. Project Releases. The draft action would set the minimum instream flows downstream of Lower Baker Dam at 300cfs. Our understanding is that this is only possible by installing an additional turbine and generator that is capable of operating at these lower flows. We assume that this new turbine would be more efficient and therefore pose less potential for elevated TDG levels in the Lower Baker River. These assumptions need to be

verified post installation, and provisions made for correcting any flows that cause the TDG levels to be out of compliance. It is not clear, either here or elsewhere in the PDEA, what will occur during low flow conditions using the original equipment. Earlier in the PDEA, it was discussed that TDG became elevated above state standards during low flow conditions or periods of non-generation. The PDEA should state whether this effect would be eliminated or minimized by the draft action and the additional 300 cfs minimum instream flow.

Page 5-109. Stranding. The discussion about the effects of flow fluctuations and the resulting potential for stranding depends heavily on the Skagit River study by Beck and Associates (1989). Many of the PDEA's conclusions seem to be contradictory to other accepted studies on stranding. Hunter (1992) presents the most comprehensive review of hydroelectric project effects including stranding, and should be the basis for comparisons of these effects. For example, the channel morphology discussion (page 5-110) concluded, based on Beck and Associates (1989), that the incidence of stranding was independent of the rate of stage decrease. This is contradictory to the review in Hunter. Channel morphology does play a part in the incidence of stranding, but the suggested state criteria in the Hunter review are based on the relationship between rate of decrease and the increase of stranding incidents.

On page 5-111, under the ramping rate sub-section, Beck and Associates (1989) is used again to promote the idea that stranding is independent of ramping rates. It is implied that other studies did not find this same correlation. The other studies are not identified so independent verification is not possible. Again we recommend reference to Hunter (1992) for a more comprehensive review of hydroelectric project effects, including flow fluctuations and ramping rates.

There may be reason to believe that bull trout are more susceptible to stranding than other salmonids due to their close association with the substrate and the tendency for them to burrow into the interstitial spaces to hide. This behavior pattern makes them much more likely to attempt to escape into the substrate during periods of rapid decrease in water depth.

Page 5-116. Aquatic Insects. As discussed previously, the USFWS believes that the discussion on aquatic invertebrates is inadequate. This section attempts to discuss the draft action's effects on aquatic insects, but the entire focus is on the flow fluctuations below the project. The effects of the conversion of the Baker River from riverine habitat to reservoir are ignored. Aquatic insect life cycles consist of varying periods of time up to several years in the aquatic environment. Most riverine insects have adapted to flowing water with reduce gills and streamlined morphology. Dispersal and colonization of most stream insects consists of a general drift downstream by the juvenile form of the insect and upstream flight by the adults to breed and deposit eggs in the upper reaches of a riverine system. This migratory pattern for juvenile aquatic insects is blocked by the reservoirs. Upstream migration is severely reduced for adults due the height of the dams and the distance over which these adults must fly to reach suitable breeding and rearing habitats. No studies have been included in the relicensing process to address this issue. Designing a study to address these project effects would be difficult. Even so, the potential effects of the project on the primary food resource for most fish species should be acknowledged in the PDEA.

Page 5-116. Upstream Fish Passage. The discussion presented in this section was based on the draft action proposed by PSE in June of 2003. The fish passage technical group has continued to refine the fish passage proposal and is close to agreement. For that reason, the USFWS has provided the aforementioned draft preliminary section 18 prescriptions for upstream fish passage.

Page 5-118. Connectivity between Baker Lake and Lake Shannon. The lack of understanding of bull trout life histories in the Baker/Skagit system make quantifying the effect of the project on connectivity difficult to measure. Part of the listing package for bull trout in 1999 documents several leading causes for the decline of bull trout populations and the need for ESA protection. The lack of connectivity between and within local populations of bull trout was one of the major reasons given. The lack of connectivity was primarily focused on dams, although degraded habitat and water quality also plays a part. For this reason, the PDEA's recommendation for an investigation to determine the need for fish passage facilities at Upper Baker Dam is not adequate. The aforementioned USFWS draft preliminary upstream and downstream fishway prescriptions outline the steps necessary to provide proper connectivity to help recover bull trout in the Baker River. We agree that investigations into the proper facilities are needed.

Little fish passage work has been done that focuses on the special behavior patterns of bull trout. The need for a facility that is designed for bull trout, and not simply adapted from salmon management, cannot be ignored. The past history of fish ladders, trap and haul facilities, and other fish passage devices provide a basis to begin these studies. The genetic studies that are being completed as part of the relicensing effort may give us some insight on population dynamics and whether the isolation of Lake Shannon from the rest of the basin has caused unacceptable genetic drift in the local bull trout population.

Page 5-119. First Paragraph. Downstream Passage Continuity for Migratory Fish Species. This discussion states that the present facilities capture 50-75 percent of the juvenile outmigrants. What is not discussed is that this capture rate is only for specific species and that the lack of successful capture of other species may have lead to their extirpation from the upper basin. The NOAA Fisheries criteria have been proposed for the standard for downstream collection efficiency in the working groups since June. Those criteria are acceptable to the USFWS and will be included in our preliminary section 18 fishway prescriptions.

The fish passage technical group has continued to work on downstream fish passage and collection facilities and the design and approach has changed considerably from that presented in the PDEA. For that reason, the USFWS has provided the aforementioned draft preliminary section 18 prescriptions for upstream fish passage.

Page 5-120. First Paragraph. Effects Analysis. This paragraph states that downstream migrating fish (both adults and juveniles) are able to pass project facilities through turbines and spillways. It does not discuss what percentage of fish or what species pass through these two egress points rather than through the fish collection facility. It also does not discuss the survival rates for the entrained fish. Since the collection facilities are only operated a small fraction of the year, we are concerned that a large number of fish of all species may be entrained through spill or the

turbines with an unacceptable mortality during the non-operational season. This issue should be expanded in the PEDA and addressed in the final fish passage design.

Page 5-120. First Paragraph. Effects Analysis. The assertion in this paragraph is that bull trout mortality rates for fish collected at the Upper Baker FSC are less that 0.5 percent. While this may be true, there is no documentation of how this number was derived. No citations are given and there are no studies that we are aware of that test the long-term survival of fish captured and transported downstream. The data or observations that support this assertion should be provided.

Page 5-125. Second and Third Paragraph. Large Woody Debris**.** This part of the draft action is specific to the project effects on the blockage of LWD through the system. The PEDA proposes to study the existing LWD conditions downstream of the project and stockpile LWD, which would be provided to entities for use in restoration projects. While this partially addresses the project's effects, the lack of wood moving randomly downstream of the Baker project is not addressed or provided for.

Page 5-125. First Paragraph. Large Woody Debris. This discussion focuses on the assumed lessor value of LWD in large river systems. It is acknowledged that historically, large channel spanning log jams existed in the lower Skagit River. We believe that understanding the effects of LWD in large river systems is far from definitive. Early settlement along large river systems resulted in large clearing and snagging projects to provide for navigation and to use the wood as fuel and building material. Mass removals of LWD on large systems would make it very difficult for an accumulation that would approach historical levels. We agree that the value of these historical log jams is hard to measure. Given that anadromous salmonids and their associated ecosystems evolved with these large log jams throughout the Pacific Northwest, we believe that the value of this large wood was significant. Recent research has also shown a connection between LWD moving out of river systems and their value to marine organisms.

Page 5-140. Terrestrial Resource. It would be helpful if this section used common and scientific names consistently throughout. The initial use should provide both names and use common names throughout the remainder of the write up unless both names should be used for clarity.

Page 5-191. Habitat for Riparian Cavity Dwellers. This section discusses the habitat value of snags that have remained in the inundation zone in Lake Shannon. These snags have been used by swallows and osprey for nesting, but are being lost steadily as rot and wind cause them to fall. The terrestrial working group has continued to work on the need for snags and also dead and down Coarse Woody Debris (CWD) in all habitat types. Snags, cavities and down wood are basic components of all terrestrial habitat types. A snag - CWD management and implementation plan is being developed for all proposed habitat types associated with the project. These measures and plans should be documented in the PDEA.

Page 5-192. Ongoing Terrestrial Resource Needs. The draft action described here is that PSE would establish a TERF. No definition is provided for this acronym

Page 5-194. Other Recreational Measures. This list of proposed recreational measures may have significant effects on terrestrial resources, yet the analysis is superficial and describes the use of

constraint mapping for siting new recreational developments. There is no description of how this constraint mapping process would be used. It is assumed that the process would "promote avoidance" of effects where feasible. We are concerned that this wording indicates a lack of a firm commitment to avoid effects to wildlife. We can not agree to this approach without more assurance that the BRTC would have oversight and approval over the location of future recreational developments.

Page 5-195. Aquatic Measures. This list of proposed aquatic measures provides a brief description of their potential effects on terrestrial resources. There is no discussion of the possible benefit of increasing fish production above the project. Increased fish production will provide additional direct food resources for those species that eat fish and the marine derived nutrients will increase the primary productivity and provide benefits to the entire food chain.

Page 5-198. Federally Listed Threatened and Endangered Species and Essential Fish Habitat. This section provides an overview of the Federal Threatened and Endangered (T&E) species present or potentially present within the project vicinity. The USFWS provides species lists to action agencies (or their designated representative) for use in analysis of project effects on the indicated species. These lists are only current for 6 months, at which time an update or another species list should be requested from the USFWS.

Page 5-201. Bull Trout. 5.8.1.2. This section as written is not adequate for use as a BA for consultation under the ESA.

Page 5-202. Bull Trout. 5.8.1.2. This paragraph directs the reader to section 5.6.1.3 for more detail on bull trout. Unfortunately, that section is not sufficiently detailed to add substance to the discussion of this listed species. The BA that was referenced in that section did provide more detail on bull trout in the Skagit system and specifics on the Baker River bull trout population. That additional information was not fully utilized in the PDEA's analysis. The relicensing study A-38 should increase the knowledge about bull trout in the Baker River significantly. That study is underway, but it is doubtful whether it can be completed in time to be useful in the final license application (FLA). Any draft information that has been compiled up until the FLA is completed should be used to provide a more complete assessment of bull trout population dynamics for use as part of the formal consultation package.

Page 5-205. First Paragraph Bald Eagle**.** This paragraph states that part of the recovery of bald eagles in Washington is due to the construction of reservoirs and the introduction of warm water fishes. This statement was referring to the reservoirs in the arid east side of Washington State where the additional water and warm water fish provided a substantial increase in the available habitat for bald eagles. As written, the reader could infer that the construction of western Washington reservoirs was beneficial for bald eagle and actually provided an increase in winter food resources. As discussed previously, the winter use of salmon resources by bald eagles is well established. It is doubtful if the increased waterfowl availability in the reservoirs could provide the same nutritional value or amount as the historic production of anadromous salmonids within the basin.

Page 5-208. First complete Paragraph. This paragraph states that the USFWS produced the final recovery plan for the northern spotted owl in 1992 and set up DCA WD-21 to protect spotted owls. For most readers, the acronym DCA WD-21 will be meaningless and should be defined to provide a clear discussion of protection measures contained in the recovery plan.

Page 5-209 and 210. Gray Wolf. The introductory paragraph of this discussion correctly outlines the evolution of the listing process for gray wolf in the contiguous United States. It also correctly shows that the gray wolf was reclassified as threatened in the Western DPS which includes Washington State. The last statement is erroneous as it states that gray wolves are currently listed as endangered in the state of Washington. The gray wolf is classified as endangered by the state of Washington which may have been the intent of this statement. It is confusing, however, and should be removed. State listings and Federal listings should be discussed in separate sections in the document to avoid potential confusion.

Page 5-217. First Paragraph. Direct Effects. Bull Trout. This section discusses the effects of handling on adult and juvenile bull trout at the project. The assertion presented is that adult mortality from handling is low and that juvenile mortality is thought to be minimal under existing conditions and the draft action. This may be a correct assessment of the effects of handling on bull trout at the fish passage facilities. However, there is no data to substantiate this assertion, and the remaining discussion is not sufficient to provide assurance that the direct effects of the draft action are minimal.

Page 5-218. Cumulative Effects. Cumulative effects assessments under ESA require a different approach that does the cumulative effects analysis required under NEPA. For this reason, referencing a previous discussion of cumulative effects is not sufficient as part of a BA. The USFWS is required to consider cumulative effects in formulating their Biological Opinions (50 CFR §402.14(g)(3) and (4). For Biological Opinions, cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Assessment. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The PDEA should provide a cumulative effect analysis of the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area to be considered in the Biological Opinion.

Page 5-218. Effects Determination. The statement that stranding in the Lower Baker and Skagit rivers are unavoidable adverse effects is incorrect and misleading. It may be true that the stranding is unavoidable if the draft action is implemented in the new license. However, PSE can choose to operate the project in a manner that the project would not be responsible for any stranding downstream of the Lower Baker Dam. PSE has not proposed to operate the project in this manner in the draft action, so the effects are likely to be as stated, but the conclusion (that the stranding is unavoidable) is incorrect.

Page 5-218. Take Analysis. See our previous comments on the assumptions about handling mortality. The PDEA cites the USFWS (2001b) to support its conclusion that the de-watering of bull trout redds in the Upper Baker delta is minimal. That study was not definitive with respect to assessing the effects of drawdown on bull trout spawning. The study was conducted at the

request of the U.S. Army Corps of Engineers (COE) to provide some estimation of the spawning potential for bull trout in the fluctuation zone associated with the Upper Baker River delta. The study was completed in November after drawdown was underway and much of the areas of concern were no longer under flowing water. The November surveys were also completed after the peak of bull trout spawning and may have missed the spawning run entirely. This section of the PDEA should be clarified accordingly.

Page 5-220. Cumulative Effects. This discussion states that the natural resources constraints process used to site new recreation developments away from wetland habitats. This statement indicates a firm commitment by PSE, but is contradictory with more ambiguous language presented earlier in the document (See our comments above on Page 5-194. Other Recreational Measures). Until this apparent discrepancy is resolved, we are concerned that the analysis of effects is not accurate and may be misconstrued by the reader.

Page 5-221. First Paragraph. Direct Effects. Bald Eagle. The last sentence in this paragraph states that any effects from modifying the Lower Baker powerhouse would be temporary and would affect a localized portion of the available foraging and perching habitat, and would not likely adversely effect individuals or populations of bald eagles. A more correct statement would be that the action may effect but is unlikely to adversely affect bald eagles.

Page 5-222. First Paragraph. Direct Effects. Marbled Murrelet. With two known occupancy sites located within 0.25 mile of the project boundary, we are concerned that increased disturbance from recreational use in dispersed sites could have an adverse effect. The PDEA should provide additional information to allow a more complete analysis about project effects, especially for habitats where marbled murrelets were or may be found in relation to dispersed recreation sites.

Page 5-223. Third Paragraph. Direct Effects. We have the same concern about this discussion as we have previously documented in our comments on the constraints process (Page 5-220) and the increased disturbance from recreation.

Page 5-224. Conservation Measures. The draft action will have several features that may provide protection to marbled murrelets and their habitat. However, as indicated previously, we are not convinced that the natural resources constraint process provides adequate assurances that recreational development will not be an adverse effect. As we have discussed previously, the access management process provides inadequate assurances that this process can control future effects.

Page 5-224. Determination of Effect. The discussion in this section states that the draft action would not be expected to have significant adverse effects on marbled murrelets. This statement is not clear and needs more definition. "Not expected to have a significant effect" implies that there is at least some effect expected, just not a significant one. Significant is a subjective word and should not be used to describe an effect to a listed species. If there may be an effect but it is not likely to be adverse, then the correct determination is "may effect not likely to adversely effect". To make a determination of no effect (which may be the intent of the determination in the PDEA), the draft action has to have no effect on a listed species.

SUMMARY COMMENTS

The PDEA does not adequately present basic background information and analysis regarding the environmental effects of the proposed alternatives. Many of the documents conclusions are based on broad generalizations and lack sufficient collaborative support.

The PDEA's description and analysis of rare, threatened, and endangered species, found in various sections throughout the document, is too limited to adequately describe possible effects to federally listed species. The species list from the USFWS should be updated in order provide the current status of all federally listed, proposed, and candidate species. An updated species list would also provide information about any designated critical habitat within the project area. The species list used for the PDEA can be updated by contacting the US Fish and Wildlife Service, Western Washington Fish and Wildlife Office in Lacey, Washington at 360-753-9440.

The Department appreciates the opportunity to comment on this PDEA and draft license application. We do not intend to object to issuance of a new license for the Baker River Project provided our draft section 10(j) fish and wildlife recommendations and draft preliminary section 18 fish passage prescriptions are incorporated into the final license application. The opportunity to amend, modify or add to these recommendations and prescriptions is reserved if resource conditions change, project plans are altered, or new information is developed. We encourage the Commission and PSE to continue consultation and coordination with USFWS staff regarding means and measures to ameliorate the project's effects on fish and wildlife and other environmental values. Questions regarding any of the fish and wildlife recommendations contained herein should be directed to Mr. Ken Berg, Project Leader, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, 510 Desmond Dr. SE, Suite 102, Lacey, Washington 98503, telephone (360) 753-4126.

Sincerely,

Preston A. Sleeger
Regional Environmental Officer

cc: FERC Washington, DC (M. Salas)
OEPC, Washington, DC (T. Martin)
SOL, Portland, OR (N. Shishido)
FWS, Washington, DC (S. Damiani)
FWS, Portland, OR (E. Mead)
FWS, Lacey, WA (G. Stagner)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
525 NE Oregon Street
PORTLAND, OREGON 97232-2737

F/NWR5

ORIGINAL

December 22, 2003

Magalie Roman Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: NOAA Fisheries' Section 10(j) Terms and Conditions, and Section 18 Prescriptions for the Proposed Licensing of the Baker River Hydroelectric Project, FERC No. 2150.

Dear Secretary Salas:

In accordance with Federal Energy Regulatory Commission's (FERC) regulations, the National Marine Fisheries Service (NOAA Fisheries) submits its preliminary recommended terms, conditions, and fishway prescriptions in response to the Draft License Application and Preliminary Draft Environmental Assessment dated October 1, 2003, and FERC's October 2, 2003, Notice of Draft License Application and Preliminary Draft Environmental Assessment and Request for Preliminary Terms and Conditions.

Puget Sound Energy, Inc. (PSE), a private corporation of the State of Washington, filed a notice of intent with FERC on April 30, 2000, to submit an application for a new license to operate the Baker River Hydroelectric Project (FERC No. 2150). The original license expires May 1, 2006. N0OAA Fisheries provides the following draft terms, conditions, and fishway prescriptions pursuant to Sections 10(j) and 18 of the Federal Power Act, the Magnuson-Stevens Fishery Conservation and Management Act, and other laws governing NOAA Fisheries' jurisdiction and authority for anadromous and marine fish resources affected by hydropower development. NOAA Fisheries will continue to evaluate available information, including information obtained through ongoing consultation and settlement discussions. NOAA Fisheries may amend these terms, conditions, and prescriptions consistent with the outcome of formal consultation provided for by Section 7 of the Endangered Species Act.

NOAA Fisheries does not object to the issuance of a new license for the Baker River Hydropower Project, provided its Section 10(j) recommendations to protect, mitigate, and enhance fish resources and Section 18 fish passage prescriptions are incorporated into the license. However, should FERC determine that conditions for upstream and downstream fish passage cannot be incorporated in the license as prescribed, NOAA Fisheries recommends that a license not be issued.

NOAA Fisheries intends that these terms, conditions, and prescriptions will serve to inform continuing discussions among the participants in the alternative relicensing process, and clarify those issues that will need to be addressed to fulfill NOAA Fisheries' statutory obligations, by means of a negotiated offer of settlement. We believe significant progress has already been achieved toward reaching a consensus-based agreement, and these recommendations and prescriptions reflect that collaborative effort. NOAA Fisheries remains committed to the goal of a comprehensive settlement of Baker River relicensing issues, involving all parties whose interests will be significantly affected by project relicensing. Our preliminary Section 10(j) recommended terms and conditions and Section 18 fishway prescriptions may be modified as we progress toward a negotiated settlement agreement.

Comments and questions regarding these preliminary terms and conditions and prescriptions can be directed to Steve Fransen of my staff at 360-753-6038, or email steven.m.fransen@noaa.gov.

Sincerely,

Brian J. Brown

Brian J. Brown
Assistant Regional Administrator
Hydropower Division

cc. Original & 8 copies to the Secretary
Service List

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Puget Sound Energy, Inc.	)	Project No. 2150
	)	(Baker River Hydroelectric Project)
Application for Major New License	)	
	)	

NOAA FISHERIES' MOTION TO INTERVENE, COMMENTS, RECOMMENDED TERMS AND CONDITIONS, AND PRELIMINARY FISHWAY PRESCRIPTIONS

I. INTRODUCTION

The U.S. Department of the Commerce, National Marine Fisheries Service (NOAA Fisheries) has reviewed the application for relicensing of the above-referenced Baker River Hydroelectric Project, FERC No. 2150 (the Project), located in both Whatcom and Skagit Counties of Washington State. Puget Sound Energy, Inc. (PSE) filed an application for a major new license to continue to operate and maintain the existing project on October 1, 2003. The existing license for the Project expires on May 1, 2006.

NOAA Fisheries hereby submits its Motion to Intervene, Comments, Recommended Terms and Conditions, and Preliminary Fishway Prescriptions in response to the Federal Energy Regulatory Commission's (FERC) "Notice of Draft License Application and Preliminary Draft Environmental Assessment and Request for Preliminary Terms and Conditions" (Notice) issued October 2, 2003. The Notice established a January 2, 2004, deadline for filing comments.

NOAA Fisheries is filing preliminary fishway prescriptions and a schedule, pursuant to 18 CFR 4.34(b)(1)(I).

II. BACKGROUND AND PROJECT DESCRIPTION

The Baker River is a major tributary of the Skagit River, itself the largest tributary to Puget Sound. The Baker River Hydroelectric Project is located within the Baker River watershed in northwestern Washington State, in Skagit and Whatcom Counties. The watershed covers 297 square miles and ranges in elevation from the summit of Mount Baker (10,775 ft mean sea level [fmsl]) to the confluence of the Baker and Skagit Rivers near Concrete, Washington (elevation 170 fmsl). The basin, which is largely uninhabited, is located within a relatively mountainous region west of the crest of the Cascade Mountains. The watershed is generally very steep, with slopes from 20% to 40% over most of its area, with the exception of the valley bottom along the Baker River and some of its major tributary streams.

Three dams, starting with a fish barrier dam at about river mile (RM) 0.6, block anadromous fish passage into the upper basin. Lower Baker Dam, at RM 1.2, was completed in 1925 and is a 285-ft-tall concrete gravity arch dam. Upper Baker Dam, at RM 9.35 and 312 ft high, is a concrete gravity dam, and is the third dam upstream from the mouth. It was completed in 1959. Upper Baker Dam forms a nine-mile-long reservoir called Baker Lake, which floods 4,980 acres at full pool and 727.8 fmsl (NAVD 88). Gross storage at Baker Lake is 274,202 acre-feet, with a minimum generating pool elevation of 677.8 fmsl that provides 180,128 acre-feet of usable storage. Lower Baker Dam forms a reservoir called Lake Shannon, which is about seven miles long with a surface area of 2,278 acres at full pool and 442.3 fmsl (NAVD 88). The

minimum generating pool elevation is 373.7 fmsl (NAVD 88) which provides usable storage of 116,770 acre-feet.

The Project includes upstream and downstream fish passage facilities. The upstream passage fishway is a trap and haul facility. The barrier dams prevent further upstream migration, and a short fish ladder leads migrating fish into a series of two holding ponds, a brail, and a hopper for loading fish into a transport truck. Adult fish are driven to unloading locations either at the Baker sockeye salmon spawning beaches or Baker Lake.

Downstream passage at the two reservoirs is affected by floating surface collectors originally developed at Merwin Reservoir on the Lewis River in southwest Washington. The collection efficiency of the collectors is aided by small mesh guide, or barrier, nets that reach from the reservoir surface to the bottom and are strung from bank to bank. Nonetheless, collection efficiency is modest at Upper Baker and poor at Lower Baker. Smolts collected at each reservoir are trucked to the Lower Baker River for release.

Other Project facilities to maintain and enhance the subbasin fishery include artificial spawning beaches for the Baker sockeye salmon. Old beaches 2 and 3 began operation in about 1962. Beach 4 was developed in 1989 to replace beaches 2 and 3. Beach 2 has not been used since 1994, but beach 3 continues to be used for fewer spawners than previously. Raceways and circular ponds are used at the Sulphur Creek station where beach 4 is located. Floating net pens and associated facilities are located near the forebay of Lower Baker Dam. Coho salmon and rainbow trout are reared as part of the fisheries program.

III. JURISDICTION AND AUTHORITY

NOAA Fisheries is a Federal agency with jurisdiction over anadromous fish resources affected by the licensing, operation, and maintenance of the Baker River Hydropower Project. Reorganization Plan No. 4 of 1970, 84 Stat. 2090; Federal Power Act (FPA), 16 USC 791(a) et seq.; Fish and Wildlife Coordination Act (FWCA), 16 USC 661 et seq.; Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1801 et seq.; Pacific Northwest Electric Power Planning and Conservation Act (PNEPPCA), 16 USC 839 et seq.; and the Pacific Salmon Treaty Act of 1985, 16 USC 3631-3644. The effects of the Project on passage and flow conditions, habitat, water quality, and other effects on anadromous fish relate directly to NOAA Fisheries' responsibilities pursuant to the above statutory authorities.

NOAA Fisheries also has jurisdiction over anadromous species affected by the Project under the Endangered Species Act, (ESA), 16 USC 1531 et seq. Available information indicates that listed Puget Sound chinook salmon *(Oncorhynchus tshawytscha)* are present in the Project area.

Pursuant to the authorities listed above, NOAA Fisheries has a Federal statutory responsibility for the protection, mitigation, and enhancement of anadromous fish that will be directly affected by issuance of the license. The FPA and FWCA confer upon NOAA Fisheries a specific right to participate in this proceeding. The interests of NOAA Fisheries as a Federal agency with jurisdictional responsibility for the protection, mitigation, and enhancement of affected anadromous fish are not adequately represented by any other party in this proceeding. By carrying out its statutory responsibilities under the FPA, FWCA, and other authorities listed

above, NOAA Fisheries acts in the public interest. In addition, NOAA Fisheries is obligated to satisfy its fiduciary trust responsibility in the exercise of its statutory authorities that affect treaty tribe interests.

IV. MANDATORY CONDITIONS REVIEW PROCESS

On January 19, 2001, NOAA Fisheries and the Department of the Interior adopted a joint policy, the Mandatory Conditions Review Process (MCRP), to provide for public review and comment on mandatory conditions and prescriptions developed for inclusion in hydropower licenses issued by FERC.

Pursuant to the MCRP, NOAA Fisheries invites interested stakeholders to provide new information and comments, along with supporting information, within 60 days following submission of these prescriptions on January 2, 2004. All comments on NOAA Fisheries's preliminary fishway prescriptions should be specifically identified as such, noting the FERC project number (FERC No. 2150), and including supporting information. In determining whether to modify its preliminary prescriptions, NOAA Fisheries will consider all comments and supporting documents received, new information, comments provided in response to FERC's draft National Environmental Policy Act (NEPA) document, and information in the draft NEPA document. In addition, NOAA Fisheries will consider such modifications as may be necessary and appropriate to conform to a final settlement agreement (following public review pursuant to FERC's Offer of Settlement approval procedures at 18 CFR §385.602). Although one other time to provide comments will be available during FERC's NEPA comment period, NOAA Fisheries strongly encourages comments within 60 days of submittal of these preliminary conditions to

allow more time for consideration of the comments and information. Within 60 days following close of FERC's NEPA comment period, NOAA Fisheries expects to submit modified Section 18 prescriptions, as needed, and respond to comments on its prescriptions, as explained in the schedule below. New information and comments regarding the preliminary prescription should be sent to:

Brian J. Brown
Assistant Regional Administrator, Hydropower Division
NOAA Fisheries/National Marine Fisheries Service
525 NE Oregon St, Suite 500
Portland, OR 97232

Jane Hannuksela
NOAA Office of General Counsel, Northwest Region
7600 Sand Point Way NE
Seattle, WA 98115

Steve Fransen
NOAA Fisheries/National Marine Fisheries Service
510 Desmond SE, Suite 103
Lacey, WA 98503

V. SCHEDULE FOR FILING MODIFIED FISHWAY PRESCRIPTIONS AND RECOMMENDED CONDITIONS

NOAA Fisheries will submit modified Section 18 fishway prescriptions and recommended conditions, and will respond to comments within 60 days after close of FERC's NEPA comment period, unless substantial or new information is provided during the NEPA comment period requiring additional time for consideration. Additionally, if settlement negotiations are at such a point that it would be more appropriate to wait until negotiations are

complete, then NOAA Fisheries may submit modified conditions once the settlement is completed.

VI. COMMENTS ON APPLICATION FOR MAJOR NEW LICENSE

Procedural Considerations and Reservation of Rights

NOAA Fisheries, together with other parties involved in the Baker River relicensing proceeding, has been engaged in a process of mediated settlement negotiations with the goal of resolving all issues related to the protection of resources affected by continued Project operations and maintenance, currently and under a new major license. As mentioned above, these negotiations are continuing, but will not be completed before the FERC comment deadline of January 2, 2004. Therefore, while we are confident that a Settlement Agreement will be executed in the near future, we are providing preliminary prescriptions for fishways pursuant to Section 18 of the FPA. In addition, we are providing NOAA Fisheries's comments and recommendations for the protection, mitigation of damages to, and enhancement of fish and wildlife resources pursuant to the FWCA, as amended, and Section 10(j) of the FPA.

An important goal of NOAA Fisheries is to ensure that the processes of negotiation, and public and environmental review will result in decisions that provide for full and adequate protection, mitigation, and enhancement of anadromous fish and other resources affected by the Project, in accordance with its statutory obligations under the FPA, the ESA, and other relevant jurisdictional authorities.

NOAA Fisheries recommends that FERC determine that the proposed major new license constitutes a major Federal action affecting the quality of the human environment and, consistent

with FERC's Notice dated April 30, 1996 (FERC No. 1927-008), prepare a draft and final Environmental Impact Statement (EIS) pursuant to the NEPA, 42, USC 4321 et seq., and implementing regulations promulgated by the Council on Environmental Quality at 40 CFR Part 1500. NOAA Fisheries recommends that the draft EIS include the range of alternatives previously identified through the NEPA scoping process, updated to reflect the full range of reasonable alternatives and issues identified: 1) as an Offer of Settlement that may be subsequently filed in this proceeding based on the pending negotiations, and 2) in comments received in response to FERC's Ready for Environmental Assessment Notice and any future Notice soliciting comments on a subsequent Offer of Settlement. In addition, NOAA Fisheries respectfully requests that FERC, in its draft EIS, analyze an alternative that fully incorporates, without material modification, the preliminary fishway prescriptions and recommended terms and conditions, set forth herein. In the event that an Offer of Settlement is subsequently filed, to which NOAA Fisheries is a party, we intend to submit comments and make such modifications, pursuant to our following reservation of rights, as may be necessary and appropriate to ensure that FERC's preferred alternative and NOAA Fisheries's fishway prescriptions and recommendations are consistent with such final settlement agreement. A key assumption underlying NOAA Fisheries' preliminary prescriptions and recommendations is that the term of a new license will be for no more than 30 years.

NOAA Fisheries reserves the right to modify these preliminary fishway prescriptions and recommended terms and conditions in any comments we file responding to a subsequent Notice of Offer of Settlement issued by FERC. In addition, NOAA Fisheries reserves the right to

modify its preliminary fishway prescriptions and its recommended terms and conditions, based on the results of new information and conclusions developed during FERC's NEPA analysis, comments received as a result of public or agency review, or in connection with the fulfillment of other statutory consultation and review requirements, including consultation under Section 7 of the ESA (16 USC 1536), or Section 305(b) of the Magnuson-Stevens Act, (16 U.S.C. 1855), regarding essential fish habitat. Also, to the extent that our preliminary prescriptions and recommendations reflect our present confidence and expectation that a final settlement will be reached, drawing to some extent on information and issues discussed in the context of settlement negotiations, we anticipate that modifications may be warranted, based on the above reservation of rights, in the event that these circumstances change prior to the completion of the licensing process.

Finally, NOAA Fisheries expressly reserves the right to revise its fishway prescriptions and recommended terms and conditions prior to a final licensing decision based upon significant new information or modifications to FERC's proposed licensing alternative following FERC's completion of an EIS, upon rehearing of FERC's licensing order.

Affected Fish Resources

Eight species of anadromous salmonids occur in the Baker River Project area. These include: sockeye salmon *(Oncorhynchus nerka)*, coho salmon *(O. kisutch)*, chinook salmon (*O.tshawytscha*), pink salmon *(O. gorbuscha)*, chum salmon *(O. keta)* salmon, winter- and summer-run steelhead trout (*O. mykiss*), sea-run cutthroat trout *(O. Clarki clarki)*, and bull trout *(Salvelinus confluentis)*. Cutthroat trout and bull trout are not jurisdictional species of NOAA

Fisheries. Coho salmon and sockeye salmon are the most abundant stocks in the basin, with the remaining species comprising only about 7% of the total Baker River trap returns (based on Baker River trap counts 1926-2000).

The Project affects Puget Sound chinook salmon (part of the Puget Sound ESU), which was listed as threatened under the ESA on March 24, 1999 (64 FR 14308).

VII. PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

The Preliminary Draft Environmental Assessment (PDEA) is a broad and mostly general examination and analysis of project alternatives. It is important to note that the proposed draft action is a reflection of the status of discussions between the Licensee and agencies and stakeholder parties as of July 2003. NOAA Fisheries believes that the preferred alternative has been modified significantly since that time.

Of course, we disagree that the no-action alternative consists of continuing operations under the terms and conditions of the existing license, as that is also a Federal action. We allege that the no-action alternative consists of not issuing a FERC license to operate the Baker River Hydroelectric Project. NOAA Fisheries anticipated that the without project, or project retirement, alternative would be a brief analysis, but this section, 3.3.3, is disappointing in its brevity and lack of analysis. Specific comments on this section follow:

Page 3-8, sec. 3.2.1, Project Facilities: The draft action includes an additional generating unit at Lower Baker powerhouse with a 12.5 MW and 680 cfs capacity. We are concerned that this unit, combined with the existing single unit of 4,100 cfs capacity and limited operational range, will continue to create and exacerbate spawning and incubation related flow problems, and

juvenile fish rearing and stranding problems, in the Skagit River downstream of its confluence with the Baker River. We believe this proposal requires further discussion and analysis to achieve the desired effect of significantly reducing, if not avoiding, project effects on salmon and steelhead habitat in the Skagit River.

Page 3-16, 2nd paragraph: The PDEA indicates that lake habitat would be degraded without describing how so. The natural lake would be smaller than the present reservoir, but it is not at all clear to us that it would be degraded. Neither is it clear that sockeye salmon spawning habitat would be more limited than at present, unless both natural and artificial spawning habitats are included. This section should describe what is meant and attempt to make a meaningful contrast between the present and prospective conditions.

Page 3-16, 3rd paragraph: The PDEA indicates that . . . "fall low flows could no longer be moderated from Project storage, which could adversely affect salmon redds." A more comprehensive description and analysis would compare what presently occurs with the probable prospective condition. Present actions increase spawning flows above the without project condition and subsequently reduce incubation flows, which dewaters redds. This is not so much a function of project storage as it is a function of project peaking operations. Without project flows would have far less daily fluctuation and less daily or seasonal redd dewatering.

NOAA Fisheries recommends that this section be enhanced to include a comparison and contrast between the types, quantities, and relative qualities of aquatic fish habitat under the baseline and prospective project retirement alternative. The analysis would illustrate the conversion of reservoir habitat types to riverine, with estimated lineal distances of mainstem and

tributary habitat types of each gradient zone. The purpose of this analysis is to provide us with a more informed estimate of the prospective aquatic and fishery benefits and losses associated with the respective alternatives.

Page 4-3, sec. 4.7: (this also applies to the discussion in sec. 5.8) NOAA Fisheries recommends that the next draft - DEA - contrast the proposed action with a subbasin alternative that satisfies the habitat condition of Properly Functioning Condition (PFC). This is the baseline for comparison in the subsequent ESA Section 7 consultation with FERC. Formulating the alternative this way will facilitate the consultation and help clarify the sometimes confusing distinctions between definitions of baseline under the FERC regulations, NEPA, and ESA. We will be available to discuss this with the Licensee, the Licensee's consultant, and FERC prior to initiating consultation.

Page 5-6, sec. 5.2.1.3: The PDEA is disingenuous when it states, ". . . flow regimes in both the Baker and Skagit Rivers *may potentially* (emphasis added) affect anadromous fish populations,"
when there is abundant evidence that both projects have caused fish mortality. This phrase is repeated in this and subsequent subsections, devaluing its otherwise informative content.

Page 5-106, Project Releases, under the heading of sec. 5.6.2.1 Effects of Project Operations: The PDEA indicates under the proposed action that prospective flow fluctuations be restricted to 6 inches per hour and daily amplitude to 2 feet, as measured at the Skagit River gage at Concrete. The earlier discussion of the Project description mentions that flow fluctuations from Lower Baker powerhouse result in flow changes from 4,100 cfs to 80 cfs, with a gage

height reduction of up to slightly more than 1 foot at the Skagit River gage at Concrete. The gage height discrepancy should be reconciled because favors both more restrictive downramping rates and daily amplitude, depending on the extent of the effect of project discharge on the Skagit River gage.

Instream flow studies and their several analyses are in progress at this time. NOAA Fisheries may provide additional comments as those studies move toward completion, as they are very likely to influence our final Section 10(j) recommended terms and conditions regarding instream flows, downramping rates, and daily amplitude restrictions.

Page 5-115, 1st paragraph regarding redd dewatering: The PDEA states that ". . . it is not currently known to what degree the Baker Project potentially influences redd dewatering . . ." and then concludes two sentences later that, "Therefore, the Skagit Project likely influences redd dewatering to a greater extent than does the Baker Project." The latter statement is not supported, nor does it necessarily follow from the preceding sentence regarding relative contribution to the combined average annual water budgets, and it directly conflicts with the previous sentence we quoted.

Page 5-119, sec. 5.6.2.4 Downstream Passage: The draft action proposal does not conform to the designs presently being considered by the Baker relicensing fish passage work group, nor does it conform to NOAA Fisheries' preliminary Section 18 downstream fish passage prescription. We intend to continue working with the Licensee, consultants, other agencies, and tribes to complete a new downstream fishway design.

Page 5-127, sec. 5.6.2.6 Fish Propagation and Enhancement: The proposed draft action closely resembles our preliminary Section 10(j) recommended terms and conditions for fish propagation and enhancement. We have recommended small modifications to the coho salmon program, and expanded the sockeye salmon program.

Baker River subbasin chinook salmon are either extirpated, or nearly so. Many of the adult chinook that return to the Baker adult fish trap have been found to be strays from other river basins. We have included a chinook salmon program to test and explore the feasibility of restoring chinook salmon to the Baker River subbasin as part of the larger Puget Sound chinook salmon recovery under the ESA.

Our fish propagation and enhancement recommendations are intended to achieve a Baker subbasin anadromous fish production and capacity, although not diversity, as a without project condition.

VIII. SECTION 10(J) PRELIMINARY TERMS AND CONDITIONS

NOAA Fisheries has determined that the following terms and conditions are necessary to protect, mitigate damage to, and enhance anadromous fish resources affected by the Baker River Hydroelectric Project. NOAA Fisheries recommends that the following terms and conditions be incorporated into any license issued for the Project, pursuant to Section 10(j) of the FPA, 16 USC §803(j).

Baker River Coordinating Committee

PSE will establish a Baker River Coordinating Committee (BRCC) that includes NOAA Fisheries as a full member, to implement fish protection, mitigation, and enhancement measures contained in the new operating license.

Rationale

License articles are more likely than not to include measures that require decision making among fishery resource managers and coordination among the managers and the Licensee. Further, the implementation measures contemplated by the parties are likely to be modified over the license term through the process of adaptive management.

Instream Flows

Minimum Flows

For the protection of, mitigation of damages to, and enhancement of anadromous fish resources, concurrent with the issuance of any new license for the Project, the Licensee must provide the following instantaneous minimum instream flows downstream of Lower Baker Dam, except as superceded by any change indicated in the Section 401 Water Quality Certification by the Washington Department of Ecology (WDOE). Monthly minimum instream flows are also superceded by seasonal minimum flows necessary to supply egg incubation water to redds spawned in the Skagit River at spawning flows influenced by Baker Project discharges during the respective fish species spawning seasons. Minimum flows must be monitored at the Baker River gage (U.S. Geological Survey [USGS] No.12193500).

Flows must be released as follows:

January	300 cfs
February	300
March	300
April	300
May	300
June	300
July	300
August	300
September	300
October	300
November	300
December	300

Rationale

Currently, Lower Baker generation is frequently shut down as part of usual peaking energy operations. The minimum instream flow in the Baker River is then reduced to 60 to 80 cfs from leakage at Lower Baker Dam and from the water supply to the adult fishway. This is inadequate to the biological needs of fish for migration, adult holding, and juvenile rearing.

Maximum Flows

PSE must limit the maximum discharge from Lower Baker Dam such that the Project does not create spawning flows in the Skagit River downstream from the Baker-Skagit confluence in excess of subsequent flows the subbasin can sustain for successful egg incubation through the fry emergence cycle of each fish species respectively (chinook salmon, pink salmon, chum salmon, steelhead). The sustainable flow should be calculated based on water in live storage in the two reservoirs plus the 95% probable prospective runoff during the incubation

period. The exception to this condition is when the Project is out of PSE's hydraulic control due to flooding. Maximum flows must be monitored at the Baker River gage (USGS No.2193500).

Rationale

The maximum project discharge from Lower Baker Dam is greater than 4,000 cfs, and its present minimum generating discharge is 3,200 cfs. Lower Baker is operated within this range, or generation is shut down, with a residual stream discharge between 60 and 80 cfs. The operational range of the Project exceeds the Baker River's mean annual flow of about 2,648 cfs. Consequently, Baker Project operations significantly increase spawning flows in the Skagit River during periods of generation, which influences the river elevations where salmon and steelhead choose to locate their spawning redds. A problem arises when PSE reduces Baker River discharge by shutting down generation. Not only does the cessation of generation result in redd dewatering and fish stranding, the operational discharge from the Baker Project is so high that there is not sufficient water produced in the subbasin to sustain flows necessary for egg incubation through the fry emergence cycle.

Spawning Flows

PSE must not contribute to Skagit River spawning flows beyond the capacity of the Baker River subbasin to sustain subsequent incubation flows through fry emergence for each species (chinook, pink, and chum salmon, and steelhead trout. Spawning flows must be monitored at the Baker River gage (USGS No.12193500) and the Skagit River gage at Concrete (USGS No.12194000)

Rationale

The Project has a hydraulic capacity in excess of 4,000 cfs discharge, while the Baker subbasin has an average annual flow of 2,648 cfs. It is possible for the Project, while operating in a peaking power mode, to create artificially high spawning flows in the Skagit River that exceed the Baker subbasin's natural supply of water to sustain subsequent incubation through fry emergence. The Project effect is to cause fish to spawn at elevations that become dewatered when PSE reduces project discharge. Further, the Project effect can create such a high contribution to Skagit River spawning flows (when the Skagit is below average flow) that the Baker Project would run out of water trying to sustain an adequate contribution to Skagit River incubation flows. Therefore, the Baker Project should operate within the supply of water statistically available during a critical low water year so that project-proportionate amounts of incubation flow will be available from spawning through incubation. Exceptions are when the Project is out of hydraulic control due to flood conditions, and when the flows in the Skagit River downstream of the Baker-Skagit confluence obviate the need for Baker inflow.

Incubation Flows

PSE must provide continuous incubation flows to the Skagit River proportionate to the Baker Project's contribution to Skagit River spawning flows. An exception occurs when Skagit flows upstream of the Baker confluence are sufficient to obviate the need for such supplemental flow. Instream flow analyses are presently in development. Until new information is available, NOAA Fisheries' recommendation is that Baker incubation flows equivalent to 60% of the Baker contribution to Skagit spawning flows be required by FERC. Incubation flows from the Baker

are generally not required when the Skagit is at a stage of 8,500 cfs or greater at the gage near Concrete.

Rationale

The Baker River contributes to incubation conditions in the Skagit River downstream from the Baker-Skagit confluence. PSE discharges from the Baker Project augment spawning flows in the Skagit River. Flow reductions at Baker affect fish by redd dewatering and fish stranding in the Skagit River. The Baker Project needs to mitigate this effect by contributing a proportionate share to the Skagit River incubation environment.

Flow Continuation Valve

PSE must equip Lower Baker Dam with a flow continuation valve to control downramping rates, amplitude, and the various minimum instream flows.

Rationale

Lower Baker Dam powerhouse has an effective generating discharge capacity range from 3,200 cfs to more than 4,000 cfs and is unable to provide operational and discharge control to conform to downramping needs, amplitude needs, and minimum flow needs.

Monitoring Instream Flows

Instream flows must be monitored at the USGS gage (Station No.12193500) below Lower Baker Dam or via other approved means. Supplemental monitoring of Baker instream flow effects on the Skagit River must be monitored at the USGS gage (Station No.12194000) near Concrete. Results of monitoring must be available to FERC or resource agency staff upon request from the USGS or as otherwise approved. The minimum release required may be

reduced, in consultation with NOAA Fisheries and the BRCC, when such reduction can be shown not to impact downstream salmonid redds. Flows may be temporarily modified if required by operating emergencies beyond the control of the Licensee that threaten the safety and stability of Project facilities, and for short periods upon agreement between the Licensee and the WDOE. If the flow is so modified, the Licensee must notify FERC and the WDOE as soon as practicable, but no later than 10 days after each such incident.

Within 1 year of license issuance, the Licensee must develop and submit a monitoring plan to evaluate the effects of the instream flow requirements upon the fish of the Baker and Skagit Rivers, in consultation with the U.S. Fish and Wildlife Service (UWFWS), NOAA Fisheries, Washington Department of Fish and Wildlife (WDFW), and WDOE. When a draft plan has been prepared, it must be provided to all affected agencies and tribes for 30-day review and comment. The Licensee must include with the final plan documentation of consultation and copies of comments and recommendations, and specific descriptions of how the final plan accommodates all comments and recommendations. If the Licensee does not adopt a recommendation, the filing must include the Licensee's reasons, based on Project-specific information. Upon filing, the Licensee must implement the plan to the extent that such implementation is not contrary to FERC order or regulation and is in conformity with the Clean Water Act Section 401 water quality certification. FERC and WDOE reserve the right to require changes to the plan. Upon FERC and WDOE approval, the Licensee must fully implement the plan, including any changes required by FERC or WDOE. Following FERC and WDOE approval, the plan becomes a requirement of the license, enforceable by FERC and WDOE. If

monitoring indicates that instream flows are inadequate, FERC and WDOE separately reserve the right to require modifications to the flow regime, either on their own motion or upon request of State or Federal resource agencies.

Rationale

The Baker Project modifies the timing and duration of most hydraulic and hydrologic relationships downstream of Lower Baker Dam for 56 miles of the Skagit River. The Project attenuates flood flows, reduces the magnitude of channel maintenance and forming flows, and releases higher and lower flows than typical unregulated flows. Pacific salmonids are adapted to natural hydrologic regimes, and the Project is capable of hydraulic modifications that are adverse to these species. Salmonids require suitable streamflows for upstream and downstream migration, adult holding and maturation, spawning, egg incubation, and juvenile emergence and rearing.

Ramping rates

For the protection of, mitigation of damages to, and enhancement of anadromous fishery resources, concurrent with the issuance of any new license for the Project, the Licensee must provide the downramping rates described by Hunter (1992) in Hydropower Flow Fluctuations and Salmonids: A Review of the Biological Effects, Mechanical Causes, and Options for Mitigation.

Time of Year	Daylight Rates*	Night Rates**
February 16 to June 15	No Ramping	2 inches per hour
June 16 to October 31	1 inch per hour	1 inch per hour
November 1 to February 15	2 inches per hour	2 inches per hour

*Daylight will be defined as one hour before sunrise to one hour after sunset. This is for the protection of salmon fry.
**Night will be defined as one hour after sunset to one hour before sunrise. This is for the protection of trout and steelhead fry.
These time restrictions should account for the lag time it takes for the fluctuation to pass through all affected fish habitat downstream to the Highway 9 bridge. Ramping rates must be monitored at the Skagit River gage at Concrete (USGS No.12194000).

Rationale

Rapid reductions in streamflow downstream of flow regulating structures, such as hydropower dams, have a well documented history of causing direct mortality to juvenile salmon and steelhead. Downramping regulation and minimization of flow fluctuation amplitude avoid and minimize the resultant mortality and loss to the public fishery resource. The above table describes the downramp rates recommended by WDFW guidelines. Deviations from the guidelines must not exceed natural, i.e., nonproject downramp rates, or must be the result of emergencies for which the licensee must account.

Amplitude

PSE must limit the amplitude of daily operations at Lower Baker Dam to 50%, or less, of the daily maximum flow. For example, when the maximum daily flow is 4,000 cfs, the downramp for that 24-hour cycle is concluded when discharge is reduced to 2,000 cfs. Amplitude must be monitored at the Baker River gage (USGS No.12193500).

Rationale

Amplitude is a significant factor correlated with fish stranding during downramp events, independent of downramping rate restrictions. The ramping rate restriction, without a corresponding amplitude restriction, permits uninterrupted reduction in streamflow until the minimum discharge is reached. This assumes that fish have an unlimited ability and willingness to migrate into an ever-shrinking stream channel. Evidence from fry stranding studies and other observations of natural streamflow recessions indicate that fish are either, or both, unable or unwilling to always follow the receding waterline. Large amplitude flow fluctuations cause massive reductions in stream channel wetted perimeter that move suitable habitat a large horizontal distance, leaving both juvenile and adult fish stranded in potholes and side channels that subsequently drain.

Gravel Augmentation

PSE must supplement, on an as needed basis, that quantity and quality of gravel and sediments deemed necessary by the Baker River Coordinating Committee to offset the adverse effects of the lack of gravel recruitment to the Lower Baker River occasioned by the presence of Lower Baker Dam.

Rationale

Both Upper and Lower Baker Dams block the movement of sediment through the Baker River system. The river channels downstream of each dam are armored with cobbles and boulders, with most gravel having been swept away. The Lower Baker River is unlikely to become a primary spawning area for any species, but the lack of gravel reduces its suitability as

juvenile salmonid habitat. Supplementing the gravel supply will significantly improve the Lower Baker River as habitat.

Large Woody Debris

PSE must transport large woody debris (LWD) that recruits to Baker Lake either to the Lower Baker River or other sites in conformance with the LWD management plan developed and provided to the Licensee and relicensing parties by the U.S. Forest Service. The plan describes the numbers and sizes and timing of pieces to be collected, transported, and placed.

Rationale

Both Upper and Lower Baker Dams block the movement of LWD through the Baker River system. The lack of LWD reduces the suitability of the Lower Baker River as juvenile salmonid habitat. Restoring a significant part of the transport of the LWD supply will significantly improve the quality of the Lower Baker River as fish habitat.

Water Quality

Dissolved Gas Monitoring.

For the protection of, mitigation of damages to, and enhancement of fish resources, concurrent with the issuance of any new license for the Project, the Licensee must monitor the powerhouse outfall of Upper and Lower Baker Dams hourly for total dissolved gases (TDG). This monitoring must be carried out for the first year of the new license and for 1 year after any modification to facilities or operations that could affect TDG. If TDG standards are exceeded, the Licensee must implement measures to achieve compliance. Results should be reported in an annual operation report to FERC, USFWS, NOAA Fisheries, WDFW, and WDOE.

Rationale

Gas bubble disease is caused by fish being exposed to water supersaturated with atmospheric gas. High head dams and the pressurization that can occur in the penstocks and other downstream water conveyance methods, including spillways, can create this condition. It is a significant cause of mortality to salmonids in the Columbia River system and other systems where hydroelectric dams cause gas supersaturation. Gas supersaturation can kill fish a considerable distance downstream of the source.

Operation and design modification can usually solve or minimize this problem. The monitoring results will be used to accurately assess when or if supersaturation is occurring. This will allow for early correction of any problems.

Inspections

Annual Operations Inspections of the Project

PSE must schedule an annual operations inspection for fish resource agencies to ensure that fish protection measures are functioning as expected.

Rationale

Annual monitoring and compliance reports provide early warnings of potential problems with ongoing mitigation activities. It is a useful method for correcting potential problems or changing management when necessary. It can be used as a trigger mechanism in an adaptive management plan for changing the management approach. Avoiding or minimizing adverse impacts by compliance with terms and conditions is easier than correcting problems once they

occur. Inspections by participating agencies provide a different perspective to mitigation and help reduce misunderstandings.

Fish and Wildlife Agency Personnel Inspections of the Project

PSE must allow representatives of the USFWS, NOAA Fisheries, WDFW, and WDOE to inspect the project site at any reasonable time before and during construction activities and operation of the Baker Project. The Licensee must also maintain and make available to these resource agencies a record of project operations, including the daily fluctuation, the daily spill and the rate of change of flows below the Project. The Licensee must document all unusual occurrences such as load rejections; powerhouse mechanical problems; turbine, intake, and fish screen failures; and sedimentation events. They must bring such occurrences to the immediate attention of the resource agencies and make such documentation available to those agencies.

Rationale

Inspections are a monitoring tool that assures fish resource protection measures are operating as expected and achieving their intended objectives.

Fish Propagation & Enhancement

Sockeye salmon spawning beaches

PSE must continue to fund the operation of the sockeye salmon spawning beach known as Beach 4. Beach 4 must be modified for improved functionality and productivity by: a) isolating the water supply and drains to each of the existing four segments, b) installing concrete walls between the segments, and c) improving the alarm systems.

PSE must provide with 6 months of the completed modifications a complete manual of operations for the spawning beach. The manual must include:

- A flow distribution schematic and plan.
- An emergency response plan.
- Call out procedures.
- A security plan.
- Management.
- Reporting procedures.
- Operations plan.
- Equipment list and supplier.
- Fish distribution plan.
- Spill containment plan.
- Hygiene plan for disease control.

PSE must restore and decommission the old Beaches 2 and 3:

- Configure the channel to natural meander and optimize coho salmon usage.
- Remove all structures and restore landscaping.
- Initiate returns to site with a temporary supplementation program (capacity to be determined later).
- Develop pilot nutritional enhancement in Channel Creek to increase rearing capacity for coho.

Fish supplementation programs.

PSE must fund the development and operations, in consultation with the BRCC, of the following supplementation programs:

- Improve artificial incubation and rearing facilities at the Sulphur Creek station to support up to 20,000 pounds instantaneous rearing capacity.
- Coho Salmon: Rear and release coho salmon smolts supplemental to natural production to achieve an average annual adult escapement to the Baker River adult trap of 4,000 adults for the term of the license. The estimated range of smolt production is 25,000 - 45,000 at 15 smolts/pound per year.
- Steelhead: Rear and release 25,000 steelhead smolts at 6 smolts/pound per year for the term of the license.
- Chinook Salmon: Develop and operate a restoration/recovery program to rear and release 25,000 spring chinook smolts at 15 smolts/pound per year for the term of the license or unless and until an alternative action is developed by the Licensee and NOAA Fisheries.
- Sockeye Salmon: Spawn and incubate up to 10,000,000 sockeye salmon eggs annually to seed Baker and Shannon Reservoirs.
- Develop and operate a fertilization program to improve Baker Lake productivity and capacity for juvenile sockeye salmon in consultation the BRCC.

Rationale

Lower and Upper Baker Dams are complete blocks to upstream and downstream anadromous fish migration. Upstream passage facilities are reasonably effective at facilitating the upstream migration of adult fish. The downstream passage facilities have been materially less effective than would occur in a without project condition. New passage facilities are expected to provide major, yet imperfect, upstream and downstream access to habitat. Further, the Project creates a modified habitat in a subbasin that once was riverine and is now primarily characterized by the reservoirs. Except for the sockeye salmon and coho salmon runs, the Project has extirpated, or nearly extirpated, Baker subbasin runs of the remaining anadromous stocks of steelhead and cutthroat trout, chinook salmon, pink salmon, chum salmon, and bull trout. These recommended fish supplementation and enhancement programs are expected to mitigate continuing project impacts over the term of the license.

IX. SECTION 18 PRELIMINARY PRESCRIPTION

Pursuant to Section 18 of the FPA, as amended, the Department of Commerce exercises its authority therein by reserving its authority to prescribe, through NOAA Fisheries, the construction, operation, and maintenance of fishways at the Baker River Project, as deemed necessary by NOAA Fisheries, including measures to evaluate the need for fishways, and to determine, ensure, or improve the effectiveness of such fishways. This reservation includes authority to prescribe fishways for existing riverine fish species, and any fish species to be managed, enhanced, protected, or restored in the basin during the term of the license. Furthermore, authority is reserved for NOAA Fisheries to modify the prescriptions for fishways

at any time before license issuance, as well as any time during the term of any license issued, after review of new information, or for other pertinent reasons.

The Licensee must, in consultation with NOAA Fisheries, the USFWS, and the WDFW, design, construct, operate, maintain, and monitor at its own expense, facilities for the effective downstream passage of juvenile anadromous fish at Upper and Lower Baker Dams. Modification or new construction activities for downstream passage must be completed within 3 years of license issuance. While planning and construction are being completed, operations to move wild juvenile fish downstream will continue under the current program.

The Licensee must, in consultation with NOAA Fisheries, the USFWS, and the WDFW, design, construct, operate, maintain, and monitor at its own expense, facilities for the effective upstream passage of adult anadromous fish at the barrier dam at RM 0.6 on the Baker River. Reconstruction of the adult passage fishway must be completed within 4 years of license issuance. While planning and construction are being completed, operations to transport adult fish upstream will continue under the current program.

Prescription for Upstream Fish Passage Facilities at the Baker River Projects

The Licensee must provide upstream fish passage facilities by constructing, operating, and maintaining an effective trap and haul facility designed to provide:

1. Safe, timely and effective upstream passage of anadromous fish.
2. Access to historic anadromous fish habitat above Lower and Upper Baker Dams.
3. The capture, holding, safe handling, sorting, and selection of broodstock.

The Licensee must design the upstream fish passage facilities based on input from and in consultation with NOAA Fisheries, USFWS, WDFW, and tribes. The current draft of NOAA Fisheries' Anadromous Salmonid Passage Facility Guidelines and Criteria contains more detailed information on facility design and must be used for general design guidance. This document is located on our website at: http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf, or hard copies are available upon request. As updates to this working document become available, NOAA Fisheries will provide additional input as appropriate to the Licensee. Since these criteria and guidelines are general in nature, there may be cases where site constraints or extenuating biological circumstances dictate that certain criteria be waived or modified without delaying or otherwise adversely impacting upstream migrants. It is the responsibility of the Applicant to provide compelling evidence in support of any proposed waiver. Conversely, where NOAA Fisheries deems there is a need to provide additional protection for fish, more restrictive site-specific criteria may be added. These circumstances will be considered by NOAA Fisheries on a project-by-project basis.

NOAA Fisheries must be provided opportunities at the 30%, 60%, and 90% design stages to review and provide comments on the facility design. The Licensee must submit final plans to NOAA Fisheries for approval at least 60 days prior to submission of the final plans to FERC. The final plans must include:

1. Final design drawings.
2. Pertinent hydraulic information related to fish passage and trap operation.

3. Written operation and maintenance plans for the completed facility, to be updated periodically (if necessary) as approved by NOAA Fisheries.

The Licensee must complete construction, hydraulic testing, and subsequent adjustments to assure that the redesigned trap and haul facility is operational within 4 years of the effective date of the new license. Initial design input to carry out this upstream passage fishway prescription is provided below.

Upstream Passage Facility Design Flow Range

The Licensee must design the trap and haul facility to provide safe, timely, and efficient fish passage over the design flow range for the passage facility, defined as the range of streamflows between the mean average stream discharge exceeded 95% of the time (low design flow) and the mean average stream discharge exceeded 5% of the time (high design flow), when upstream migrating fish are normally present at the barrier dam, located downstream of Lower Baker powerhouse.

Barrier Dam Crest Modifications

The Licensee must modify the elevation of the crest of the existing barrier dam by raising the crest such that the barrier dam creates a minimum of 10 ft of static head over the entire design flow range of the passage facility to include the backwater effects from the Skagit River, unless otherwise agreed to by NOAA Fisheries.

Fishway Entrances

The Licensee must design the fish ladder that leads fish to the trap facility to include a low flow and a high flow entrance positioned below the barrier dam. The low flow entrance should discharge fish ladder attraction flow adjacent and parallel to the downstream face of the dam. The high flow entrance should discharge fish ladder attraction flow slightly downstream from the dam and parallel to the shoreline, to provide a discernable fishway attraction flow jet under high design flow conditions. Current NOAA Fisheries criteria states that entrance gates to the ladder must provide a minimum width of 4 ft and a minimum water depth of 6 ft, unless otherwise agreed to by NOAA Fisheries.

Auxiliary Water System

The Licensee must design the associated fishway entrance pool(s) to include auxiliary water systems (AWS) to augment ladder flow from the trap holding pools. The AWS must supply additional fishway attraction water in an amount that, when combined with the ladder flow, equals the total minimum instream flow minus any bypass flow required for the juvenile fish screens associated with the supply water intake, unless otherwise agreed to by NOAA Fisheries. Current NOAA Fisheries guidelines states that the attraction flow from the fishway entrance should be between 5% and 10% of the high design passage flows.

Gravity Water Supply

The Licensee must design the upstream passage facility to include an uninterruptible (gravity supply) source of supply water for the holding pools and fish ladder. All supply water

(including the AWS prescribed above) must be screened in accordance with current NOAA Fisheries criteria, or such alternative criteria acceptable by NOAA Fisheries.

Entrance Pool Diffusers

The Licensee must design the AWS such that AWS flow will be introduced into the fishway entrance pools at a maximum velocity of 1 fps through vertical diffusers, or 0.5 fps through horizontal diffusers. The AWS diffusers gratings must have a maximum 1 inch clear opening. The AWS diffusers must be oriented such that fish are led to the lower fishway pools.

Ladder Type

The Licensee must design the upstream passage facility to include either a pool, weir and orifice ladder, or a vertical slot ladder or other ladder design as acceptable to NOAA Fisheries. Vertical slot ladders must have a minimum of 15-inch-wide slots. Either type of ladder will have a maximum hydraulic drop of 1 ft between ladder pools. The fishway pools must be configured in a manner acceptable to NOAA Fisheries. The maximum slope of the fish ladder should not exceed 10%.

Fishway Pool Volume

The Licensee must design the fish ladder to include fishway pools that are at a minimum 6 ft deep, and must have sufficient volume to dissipate energy of 4 ft pounds per second per cubic foot (ft^3) of pool volume, unless otherwise approved by NOAA Fisheries.

Ladder Holding Pools

The Licensee must design the fish ladder to lead to holding pools of sufficient volume to provide a carrying capacity equal to a projected 1 day peak run of fish (about 1200 fish,

Montgomery Watson Harza 2003). Based upon a minimum holding density of 5 ft^3 of volume per fish, the holding pools will contain a minimum volume of 6,000 ft^3 of water at the low design water surface elevation. Flow into the holding pools must be a minimum of 2 gallons per minute (gpm) per adult fish, up to the carrying capacity of the pools, or a minimum of 2400 gpm (5.4 cfs). A finger weir or V-trap lead must be provided between the ladder and the lower holding pool, and between holding pools such that once fish enter they are not able to fallback downstream.

Fish Lock Crowder and Braille Systems

The Licensee must design the upstream passage facility to include crowder and braille system in each holding pool as necessary to move fish from the holding pools to the fish lock. When not in use, the crowder should be stored either against the back wall of the holding pool or out of the water entirely. Likewise, the braille should be stored recessed in the floor of the holding pool when not in service. The braille must be sloped and contoured so that fish are guided toward the entrance to the fish lock. Both the crowder and braille must provide fish tight seals (maximum opening of 1 inch) against the walls and floors of the holding pool so that no fish can become trapped behind them. The travel speed of both the crowder and braille should be adjustable up to 3 ft per minute. Maximum clear opening between bars in the crowder or braille must be 1 inch. When the crowder is in use, a removable barrier will be installed across the fish ladder exit into the holding pool to prevent fish from entering the holding pool. Fish should not come into contact with sharp or abrupt edges (including structural supports) anywhere throughout the system.

The maximum clear opening between bars in the crowder or braille may need to be less than 1 inch if sub-adult bull trout or other smaller fish are found to be attempting to enter the trap. Tests will need to be completed at the trap vicinity to determine if there are smaller fish in the vicinity of the trap. The head width of these fish will be measured and a decision as to the permanent spacing of the bars should be determined based on the 50% exceedance level. This test should be done in conjunction with testing adult bull trout behavior at the trap entrance. At present, it is unknown if the adult bull trout being trapped represent the full extent of upstream migration or if they are only using the trap during certain conditions. Bull trout are difficult to trap and may need modifications to the trap to increase their capture efficiency.

Fish Lock System

The Licensee must design the upstream passage facility to include a fish lock with the minimum dimensions of 6 ft wide, 6 ft long and 7 ft deep at the minimum water surface elevation (WSEL) of 161.0 fmsl (Montgomery Watson Harza 2003). Based upon these dimensions and a minimum loading density of 3 cubic ft per fish, the lock will be of sufficient volume to hold about 84 fish per cycle.

Fish Lock Braille

The Licensee must design the fish lock system to include a braille recessed into the floor when not in use. Entrance to the lock must be blocked with a gate during a locking operation so that fish cannot become trapped behind the lock braille. Clear opening between the bars of the braille and of the blocking gate must not exceed 1 inch. Both the braille and blocking gate must provide fish tight seals (maximum opening of 1 inch) with the walls of the lock. The cycle time

of the lock should be limited to about 11 minutes (Montgomery Watson Harza 2003) to move fish out of the lock and into the transport flume. The braille should not begin raising in the lock tower until the water level in the tower has been raised to the uppermost level. The braille should not travel faster than 3 ft per minute and must be manually controlled during the last 4 ft of operation. The braille must be sloped to move fish out of the lock, over the control weir, and into the transport flume.

Fish Lock Water Supply

The Licensee must design the fish lock system water supply to the lock to minimize turbulence in the lock and to introduce flow through a diffuser or series of diffusers located in the floor of the fish lock beneath the braille, designed as described above for the entrance pool diffusers. Overflow from the lock must pass over a control weir at a minimum depth of 6 inches and through a short, descending slope separator (screen), allowing excess flow to be drained off and adult fish to be routed into a wetted chute (transport flume) for routing to sample tanks, sorting/holding pools, or direct loading to transport truck.

Transport Flume and Raceways

The Licensee must design the fish lock system to include an open, U-shaped, and smooth-sided transport flume, a minimum of 15 inches wide and 24 inches deep. The transport flume must be of sufficient slope and water supply to keep fish moving along the flume (the specifics are to be determined in consultation with NOAA Fisheries). The adult separator systems must consist of downward sloping (10% slope), smooth 1 inch diameter bars (pipe) with 1 inch maximum clear opening at least 2 ft long (length sufficient to dewater the total flow expected

from the lock)or alternate design as developed in consultation with NOAA Fisheries. The clear opening between the separator bars may have to be reduced if smaller fish are expected to use the facility.

The transport flume should include provisions for a PIT tag interrogation system located upstream of any of the diverter gates. Straight alignment of the transport flume should be provided so that an operator can determine species type and select the appropriate gate leading to the appropriate raceway. Provisions must be made to divert fish to either sampling, anesthetic, disease treatment, and recovery tanks, or routed to the appropriate raceway. Diversion gates must be of a proven design. The transport flume and diversion gates should be covered with neoprene to prevent injury to the fish. Where the transport flume enters the raceway, the exit must be covered by a neoprene flap such that fish are not attracted to and cannot reenter the transport flume once in the raceway. Provisions must be made to allow the direct loading of the fish into the transportation trucks.

Maximum loading density of the raceways can vary depending on expected duration of holding. For short-term holding (less than 1 hour) holding density will be limited to 3 ft^3 per fish. Longer term holding (for periods greater than 1 hour) holding density will be limited to 5 ft^3 per fish). Each raceway (and crowding channel) will have a water supply equal to 2 gpm/fish based on the maximum number of fish expected for that raceway. Provisions should be made to guarantee a continuous supply of water to the raceways (such as redundant pumps, backup pumps, emergency generator, etc.). Provisions should be made for the emergency release of fish back to the river in emergencies.

Each raceway (and crowding channel) must include a crowder to move fish from the raceway to the crowding channel leading to the transport hopper for truck loading. Maximum clear opening of the crowder must be 1 inch and the crowder must provide a fish tight seal (maximum opening not to exceed 1 inch) to the floor and walls to prevent fish from getting around the crowder. In the event of a power outage, provisions should be made for manual crowding of fish from the raceways and from the crowding channel.

Loading density of the transport hopper must be limited to 3 ft^3 per fish. The volume of the transport hopper should be equal or less than the volume of the transport trucks (to reduce the possibly of overloading the transport trucks)

The transport hopper should connect via a water to water transfer with the transport trucks or trailers. Maximum loading density of the transport trucks must be limited to 3 ft^3 per fish. Carrying tanks on the transport trucks must be filled with water from the same supply line as the raceways to insure minimal thermal stress or water quality differences. Transport trucks and trailers must have provisions to supply oxygen to the transport water as well as control the water temperature.

A water to water transfer of fish from the transport truck or trailer to the receiving water at the release point must be provided. Provisions must be made to provide a flushing flow through the transport tank during the release process. Provisions should also be made at the release point to acclimate the transported fish to the receiving water.

Sample/Anesthetic/Recovery Tanks

The Licensee must design the sampling, anesthetic, and recovery tanks in consultation with NOAA Fisheries. The system must include provisions to move fish to the raceways or return fish to the river after they have fully recovered.

Post Construction Evaluation

The Licensee must prepare, in consultation with NOAA Fisheries, a postconstruction evaluation plan for approval by NOAA Fisheries prior to completion of the upstream passage facility. The plan must include hydraulic and biological evaluations to ensure the proper performance of the facilities and that the facility provides safe, timely, and effective passage of fish. The Licensee must carry out this plan to evaluate facility performance upon completion of construction of the upstream passage facility. The Licensee should upon completion of the evaluation, implement any required changes, reevaluate, and implement such additional changes to the operations or facilities as may be required by NOAA Fisheries, within a time frame established by NOAA Fisheries in consultation with the Licensee.

Future Modifications

The Licensee must provide a commitment to update and modify these facilities as necessary based upon changing resource management requirements or as technology advances for the safe, timely, and effective passage of fish. Additionally, it may be necessary to modify certain portions of these facilities (specifically the crowder and braille systems) if fish smaller than 15 inches in length are to use this facility.

Inspections

The Licensee must provide access to the upstream passage facilities for immediate inspection of fishway operation and maintenance conditions, upon request by any fishery agency.

Rationale - Upstream Passage

In general, NOAA Fisheries prefers volitional ladders for upstream passage when site conditions and operation allow, as stated in NOAA Fisheries' Draft Anadromous Salmonid Passage Facility Guidelines and Criteria.

In general, NOAA Fisheries requires volitional passage, as opposed to trap and haul, for all passage facilities. This is primarily due to the risks associated with the handling and transport of migrant salmonids, in combination with the long-term uncertainty of funding, maintenance and operation of the trap and haul program. However, there are instances in which trap and haul may be the only viable option for upstream and downstream fish passage at a particular site.

After extensive studies and evaluations, NOAA Fisheries concluded that volitional ladders are not a practical alternative for fish passage at either Upper or Lower Baker Dams for the following reasons.

Lower Baker Development: The extreme height of Lower Baker Dam (284 ft with a rated net head of 243 ft), combined with the normal range of pool fluctuation (about 48.6 ft) associated with flood control and power generation operations, combined with the physical conditions at the site (the dam is located in a relatively narrow canyon and areas downstream of the dam are prone to landslides) create conditions which are not suitable for conventional ladders. Additionally,

while rearing habitat is abundant in Lake Shannon, there is relatively scarce spawning habitat available either in Lake Shannon or in the tributaries to the lake. Volitional passage was determined not to be a feasible alternative for passage around Lower Baker Dam.

Upper Baker Development: The extreme height of Upper Baker Dam (312 ft with a net hydraulic head of 297 ft), combined with the normal range of pool fluctuation (about 50 ft) associated with flood control and power generation operations, combined with the physical conditions at the site (volitional passage would require an extremely long ladder, at least 7 to 10 miles) beginning at the barrier dam and extending to Upper Baker Reservoir. The alignment of the ladder would require crossing a number of side drainages (which would require bridging and potentially going through a number of areas prone to landslides) create conditions which are not suitable for conventional ladders.

However, there remains the need to collect and move fish around the dams to allow access of fish to historic habitat above the projects. There is also the need to collect broodstock for the sockeye salmon spawning program as well as separating hatchery and wild fish. A trap and haul facility can be designed, constructed, and operated to meet the fishery resource needs at this Project.

The current trap and haul facility was completed in 1957 and, with the exception of some small modifications, functions as originally designed. However, times have changed and our understanding of what conditions are needed for a safe and effective trap and haul system have evolved. The need to modify the manner in which fish are handled has changed as well. Consequently, the current facility needs to be updated accordingly.

Attraction to the trap facility should make full use of the minimum instream flow to maximize fish attraction to the trap under the widest range of flow conditions. NOAA Fisheries' criteria call for the ladder entrance flow to be between 5% and 10% of the high design river flow for fish passage.

Screening the water supply intake (including the AWS water to the ladder) to NOAA Fisheries criteria will provide protection of those juvenile fish migrating out of Lake Shannon that are not captured by the new Floating Surface Collector.

An uninterruptible water supply system for the holding pools and raceways or a redundant supply system are required in the event of an emergency to ensure that fish are not killed because of some unforeseen event. Provisions are required to allow for the separation of fish based on such factors as species, hatchery versus wild, destination, etc. Provisions are required to sample fish without having to physically net fish out of the braille pool. Provisions are required to collect broodstock. A renovated trap and haul facility brought up to current fish handling standards will reduce handling, reduce stress to the fish, and provide for a safer operation.

Conditions specified within the facility (holding pools, fish lock, transport flumes, raceways, transport loading system, etc.) will bring the facility in line with the current standards for the safe handling and sorting of fish and are designed to provide for the safe, effective, and timely passage of all fish through the facility.

Downstream Passage Prescription at Upper Baker Lake and Lake Shannon (Lower Baker)

To provide for safe, timely, and effective downstream passage of anadromous fish and to continue to provide access for their populations to areas above both Lower Baker Dam (Lake

Shannon) and Upper Baker Dam (Baker Lake), the Licensee must construct juvenile fish passage facilities which meet the criteria as outlined in NOAA Fisheries' Juvenile Fish Screen Criteria dated February 16, 1995 (or the latest revision such as NOAA Fisheries Draft Anadromous Salmonid Passage Facility Guidelines and Criteria available on our website at http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf as appropriate). These documents contain much more detailed information regarding criteria for fish passage facilities and must be used for general design. As updates to this working document become available, NOAA Fisheries will provide additional input as appropriate to the Licensee. Since these criteria and guidelines are general in nature, there may be cases where site constraints or extenuating biological circumstances dictate that certain criteria be waived or modified without delaying or otherwise adversely impacting upstream migrants. It is the responsibility of the Licensee to provide compelling evidence in support of any proposed waiver. Conversely, where NOAA Fisheries deems there is a need to provide additional protection for fish, more restrictive site-specific criteria may be added. These circumstances will be considered by NOAA Fisheries on a project-by-project basis.

The Licensee must complete the installation of juvenile fish passage facilities at Upper Baker within 1 year and at Lower Baker within 3 years of the effective date of the new license. The Licensee must complete the testing and adjustments, and ensure that the juvenile fish passage facilities are operational at Upper Baker within 2 years and at Lower Baker within 4 years of the effective date of the new license.

The Licensee must design the juvenile fish passage facilities in consultation with NOAA Fisheries, USFWS, WDFW, and the Skagit basin tribes. The Licensee must provided NOAA Fisheries with the opportunity to review and provide comments on the facility design at the 30%, 60%, and 90% design stages. The Licensee must submit final plans to NOAA Fisheries for approval at least 60 days prior to submission of the final plans to FERC. The final plans must include:

1. Final design drawings.
2. Pertinent hydraulic information related to fish passage and facility operation.
3. Written operation and maintenance plans for the completed facility, to be updated periodically (if necessary) as approved by NOAA Fisheries

The facilities must be designed to accommodate short-term evaluation as well as long-term monitoring needs.

Operational Period

The respective downstream passage facilities must be operational over the entire range of forebay levels expected year round, unless otherwise agreed to by NOAA Fisheries, for both the Upper Baker and Lower Baker facilities (except for periods of high flow where it is necessary to spill).

Debris and Trash Management

Floating log booms must be installed in the forebay of each facility upstream of the barrier nets in order to provide protection to the fish passage facilities.

Barrier Net

The Licensee must design and install a barrier net in the forebay of each reservoir. The net should extend from shoreline to shoreline and from surface to bottom of the reservoir. The barrier net in the upper 30 ft of the water column must be made of a knotless mesh net with mesh size not to exceed 3/32 of an inch clear opening and resistant to rot and ultraviolet degradation. The barrier net below the upper 30 ft of the water column must be made of a knotless mesh net with mesh size not to exceed 1/4 of an inch clear opening and resistant to rot and ultraviolet degradation. The barrier net should form a "V" shape in the lake (plan view) with the apex of the net terminating at the net transition structure. There should not be any gaps in the barrier net or any points where the top of the net is allowed to submerge beneath the water surface. The barrier net should also ramp up from the bottom of the reservoir to the entrance to the net transition structure. The barrier net system must be designed in consultation with NOAA Fisheries.

Provisions must be made such that the net transition structure and floating surface collector are free to move with the surface of the reservoir but that the barrier net forms a fish tight seal with the net transition structure.

Net Transition Structure

The Licensee must design the net transition structure (NTS) as a modular unit to provide a transition from the barrier net to the floating surface collector. Maximum velocity into the NTS must not exceed 0.1 fps. The NTS should be at least 50 ft deep. Maximum acceleration through the NTS is limited to 0.1 fps per ft. It may be necessary in the future to try various configurations of this NTS to increase juvenile collection efficiencies.

Floating Surface Collector

The Licensee must design the floating surface collector (FSC) and associated bypass in consultation with NOAA Fisheries to meet NOAA Fisheries' juvenile fish passage criteria (1995 or the latest revision, such as NOAA Fisheries' Draft Anadromous Salmonid Passage Facility Guidelines and Criteria available on our website at http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf) for fry passage based upon an inflow of 500 cfs.

The velocity into and through the screen structure and bypass must remain constant or accelerate slightly at a maximum 0.1fps per ft. The configuration of the bypass must create a capture velocity area where the centerline water velocities are in excess of 8 fps. This capture velocity area must be a minimum of 3 ft wide and 3 ft deep. Downstream of the capture velocity area, the deceleration of the water velocity will be designed in consultation with NOAA Fisheries to reduce juvenile delay in this area

In high velocity areas (where the water velocity is greater than 3 fps), screen cleaners must be removed from the water column when not in use or when traveling upstream or must be located behind the screen face so that fish may not come into contact with the equipment.

The FSC must have the capability to increase the inflow to 1000 cfs for test purposes. Should the decision be made to permanently increase the FSC capacity to 1000 cfs, then additional screen area and associated equipment (porosity control, screen cleaners, etc.) must be installed sufficient to meet NOAA Fisheries' juvenile fish passage criteria for fry passage.

Provisions for flow control will be made on the bypass flow from the FSC. The Licensee will make provisions to inspect the bypass transport pipe/flume on a regular basis (once per day - more often during periods of high debris loading and less often during low debris periods) and remove any debris found. Velocities in the bypass transport pipe/flume should be between 5 fps and 10 fps. The bypass pipe/flume must meet NOAA Fisheries' juvenile fish passage criteria.

The Licensee must make provisions to include a PIT tag interrogation system such that all fish (juvenile and adult) collected by the FSC can be interrogated prior to those fish entering the raceways.

Dewatering and Separation of Adults and Debris from Juveniles

The Licensee must design the bypass flow (and associated juveniles, adults, and debris) from the FSC to be routed to the floating raceways. Prior to entering the raceways, provisions must be made to reduce the bypass flow to a level that can be accepted by the raceways. The dewatering screens must meet NOAA Fisheries' juvenile fish screening criteria, including the need for cleaning. After dewatering, the larger fish (i.e., steelhead kelts and adult bull trout, etc.) and debris will be separated from the smaller outmigrants. The adult and debris separator systems must consist of downward sloping (10% slope), smooth 1 inch diameter bars (pipe) with 1¼ inch maximum clear opening at least 8 ft long. Each bar/pipe will have smooth, 1/8 inch holes diameter holes drilled into the top every 6 inches. The bars/pipe are to be pressurized with water such that each hole creates a small fountain of water about 8 inches high which will serve to keep the separator bars wet as well as aligning juvenile fish to fall through the slots between the tubes. Larger fish and debris will be routed off the downstream end of the separator bars to a

separate raceway from the juveniles. Juveniles will be routed via an open channel flume to the raceways. If required, an alternate separating system can be developed in consultation with NOAA Fisheries.

To ensure that adults and juveniles are not stranded on the separator bars or the debris on the separator bars does not impede their passage, the Licensee must provide an automated cleaning system or the facility will have to be manned around the clock when adult and debris separation is taking place.

Raceways

The Licensee must design the transport flumes and raceways for the safe and timely passage of fish. The transport flumes emptying into the raceways must transition to a rubber or neoprene tube extending beneath the water surface in the raceways (to reduce juveniles from leaping at the inflow). Crowders must be provided for each raceway to crowd fish into the transport hopper. The crowders will create fish tight seals along the walls and floor of the raceway so that it is not possible for fish to inadvertently get behind the crowder. Crowders must not interfere with fish entering the raceway and will be either removed from the flow when not in use or parked out of the way along the back wall of the raceway. Maximum clear opening on the mesh used for the crowder must not exceed 3/32 of an inch if perforated plate or woven mesh is used for the crowder material. Maximum loading density of the raceways for juveniles as well as minimum flow in the raceways will be developed in consultation with NOAA Fisheries.

Maximum loading density of the raceways for adult fish can vary depending on expected duration of holding. For short-term holding (less than 1 hour), holding density will be a

minimum of 3 ft^3 per fish. Longer term holding (for periods greater than 1 hour) holding density will be minium of 5 ft^3 per fish). Each raceway (and crowding channel) will have a minimum water supply equal to 2 gpm/fish based on the maximum number of fish expected for that raceway. Provisions must be made to guarantee a continuous supply of water to the raceways (such as redundant pumps, backup pumps, emergency generator, etc.). Provisions must be made for the emergency release of fish should conditions dictate.

Transport Hopper

The Licensee must design the transport hopper to provide water-to-water transfer as fish are being loaded into the hopper and as they are being transferred to the transport trucks. Maximum loading density will be developed in consultation with NOAA Fisheries.

Transport Trucks/Trailers

The Licensee must provide transportation trucks or trailers acceptable to NOAA Fisheries for the transportation of juveniles from the collection facilities to the stress relief ponds. The trucks or trailers should include provision to supply oxygen to the holding water as well as controlling the temperature of the holding water. Filing the tanks must be done with the same source water as supplies the raceways, to reduce the possibility for adverse reactions. Provisions must be made to acclimate the fish to the receiving water prior to their release from the transport trucks

Stress Relief Ponds

The Licensee must transport collected fish to the stress relief ponds for 48 hours holding before their release to the Baker River. The ponds must be sized to hold the 1-day maximum

expected collection of fish from both Upper and Lower Baker facilities. Maximum holding density and minimum water supply will be developed in consultation with NOAA Fisheries. The initial pond size may be smaller, however, provisions should be made to expand the capabilities of the ponds as necessary. Ponds should provide for volitional egress but must also include provisions to drain and flush the fish out of the ponds as necessary (or other methods as acceptable to NOAA Fisheries).

Prior to completion of the construction of the juvenile fish passage facility, the Licensee, in consultation with NOAA Fisheries, USFWS, WDFW and the tribes, must prepare a postconstruction evaluation plan for approval by NOAA Fisheries. The plan must include hydraulic and biological evaluation to ensure proper performance of the facilities. Upon completion of construction, the Licensee must implement this plan to evaluate the performance of the collection system. Upon completion of the evaluation, the Licensee must implement any required changes, reevaluate, and implement such additional changes to the operations or facilities, as may be required by NOAA Fisheries, within a time frame established by the agencies in consultation with the Licensee.

Rationale - Downstream Passage

Upper Baker and Lower Baker Dams are a barrier to downstream as well as upstream fish migration. The Licensee must provide effective facilities to mitigate this impact. With the continued operation of the trap and haul facilities at the barrier dam, adult salmonids will have access to the areas of Baker Lake and its tributaries. Additionally, juvenile fish will be introduced into both Baker Lake and Lake Shannon for rearing purposes. The progeny of the

fish that spawn upstream of Baker Lake, as well as the fish introduced into the lake for rearing, must negotiate not only the reservoir but the dam and the powerhouse during their outmigration.

In general, given a Project flow of this size (about 4,000 cfs), NOAA Fisheries would prefer to provide juvenile fish screening which meets current criteria to screen the entire flow. However, after extensive study and evaluations it was concluded that full flow criteria screens presented some serious design problems given the wide range of forebay fluctuation (40 to 50 ft) at each site. Even if the forebay fluctuation of the Project levels were reduced to the range where criteria screens could be made to function, there would be a significant portion of time when both projects would be forced to spill. Survival through either spillway is relatively poor. Additionally, there is the engineering challenge of routing the 4,000 cfs of "screened" flow into the existing powerhouse configuration.

Given these constraints, NOAA Fisheries has determined that replacement with a major modification of the existing floating collection systems currently in operation at both Upper and Lower Baker Dams provided the greatest probability for successful juvenile fish passage.

The new system will offer substantial improvement over the existing systems. It will consist of an improved trash boom, improved barrier net, a new net transition structure, a new and substantially larger and improved floating surface collector, holding raceways, transportation trucks and trailers, and new stress relief ponds.

The combination of improved barrier net, new net transition structure, and improved floating surface collector system is expected to substantially improve the guidance and collection of outmigrating fish from the forebay of the reservoir. Properly designed, constructed, and

operated juvenile fish passage facilities at the Project will reduce injury or mortality to juvenile fish during their downstream migration through the Project area. As a secondary benefit, the juvenile fish passage facilities will provide protection against injury and mortality to downstream migrating steelhead kelts.

X. REFERENCES

Montgomery Watson Harza. January 2003, Baker River Hydroelectric Project Upstream Fish Passage Conceptual Design Report.

NOAA Fisheries Draft Anadromous Salmonid Passage Facility Guidelines and Criteria available online at http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf

NOAA Fisheries (National Marine Fisheries Service). 1995. Juvenile Fish Screen Criteria. Developed by National Marine Fisheries Service, Environmental & Technical Services Division, Portland, Oregon. Revised February 16, 1995.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Puget Sound Energy	)	FERC No. 2150
	)	(Baker River Hydroelectric Project)
Application for New Major License	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by first class mail, the National Marine Fisheries Service's Section 10(j) Terms and Conditions, and Section 18 Prescriptions for the Proposed Licensing of the Baker River Hydroelectric Project, cover letter to Magalie R. Salas, Secretary, FERC, and this Certificate of Service upon each person designated on the official service list compiled by the Commission in the above captioned proceeding.

Dated this 30th day of December, 2003.

Elizabeth R. Mitchell