

## **EXHIBIT A: PROJECT DESCRIPTION**

### **1 Contents and Purpose of This Exhibit**

The Boundary Hydroelectric Project (Project) is licensed by the Federal Energy Regulatory Commission (FERC) as FERC Project No. 2144. The current FERC license expires on September 30, 2011.

Exhibit A describes the existing Project under the current FERC license, including details about Project structures, the impoundment, turbines and generators, transmission lines and any additional equipment appurtenant to the Project. In addition, this Exhibit summarizes proposed modifications and enhancements to Project facilities.

### **2 General Project Description**

The Project, owned and operated by the City of Seattle, Seattle City Light Department (SCL), is its largest generation facility supplying 35 to 45 percent (depending on water conditions) of Seattle's power requirements. Total dependable plant capability is approximately 1,040 megawatts (MW) at the existing maximum water surface elevation (1,994 feet North American Vertical Datum [NAVD] 88<sup>1</sup> at the forebay). It is a reliable, renewable resource and SCL's most economical generation resource.

### **3 Project Area and Vicinity**

The Project is located on the Pend Oreille River in northeastern Washington, one of eleven hydroelectric and storage projects in the Clark Fork - Pend Oreille River basin. The dam is located 1 mile south of the Canadian border, 16 miles west of the Idaho border, 107 miles north of Spokane, and 10 miles north of Metaline Falls, in Pend Oreille County. The dam is at Project river mile (PRM) 17.0 on the Pend Oreille River, in the NE ¼ of Section 10, Township 40N, Range 43E, Willamette Meridian. The upstream end of Boundary Reservoir is located immediately downstream of the Box Canyon Dam, at PRM 34.5, in the NE ¼ of Section 19 of Township 38N, Range 43E. The surrounding geographic features and land ownership are shown on the location maps in Figures A.3-1 and A.3-2. Figure A.3-2 shows the location of the existing Project boundary. For the location of the proposed boundary, see Exhibit G of this License Application.

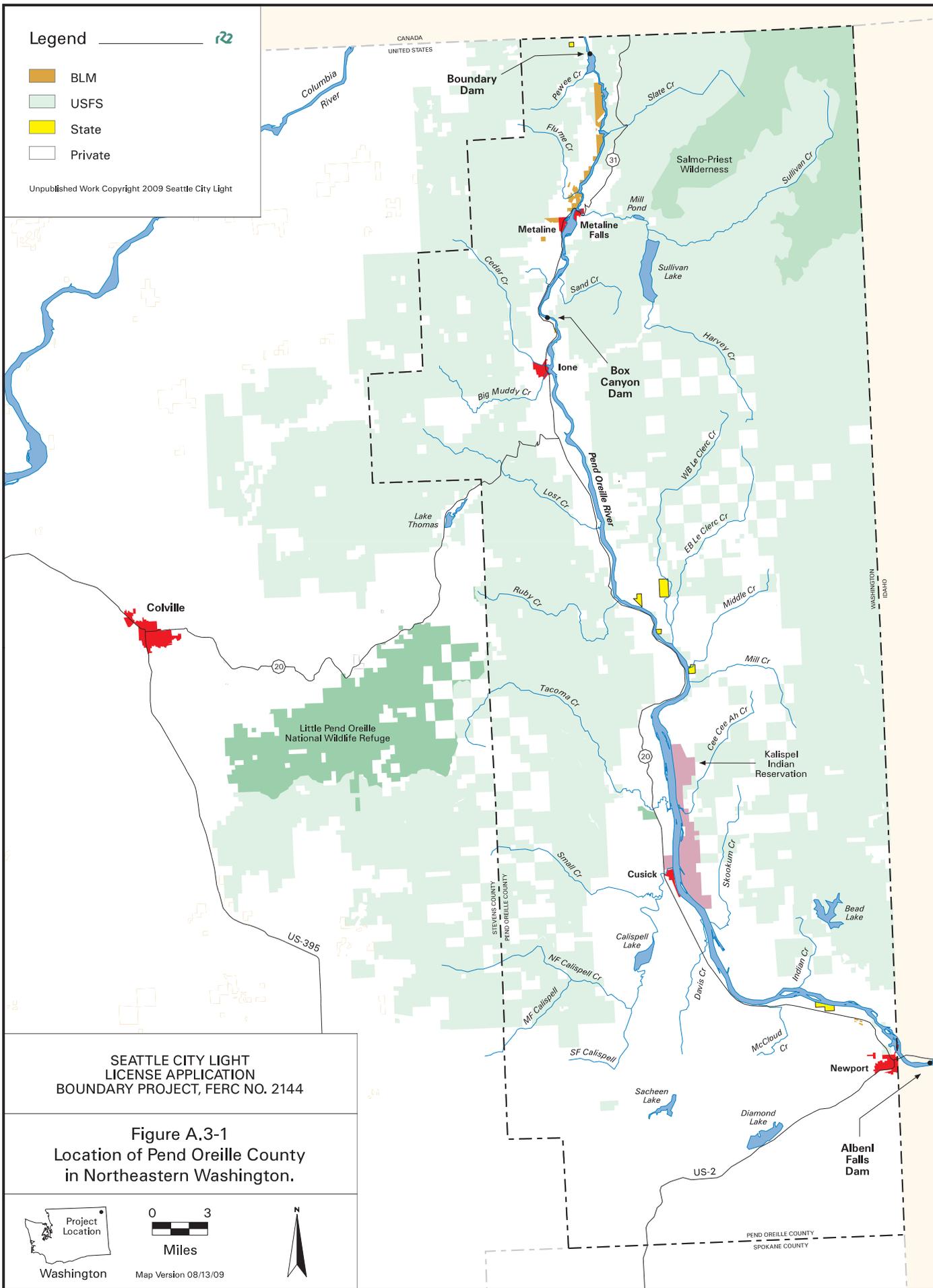
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<sup>1</sup> Elevation values are in datum NAVD 88 unless otherwise noted.

Legend

- BLM
- USFS
- State
- Private

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Figure A.3-1  
Location of Pend Oreille County  
in Northeastern Washington.



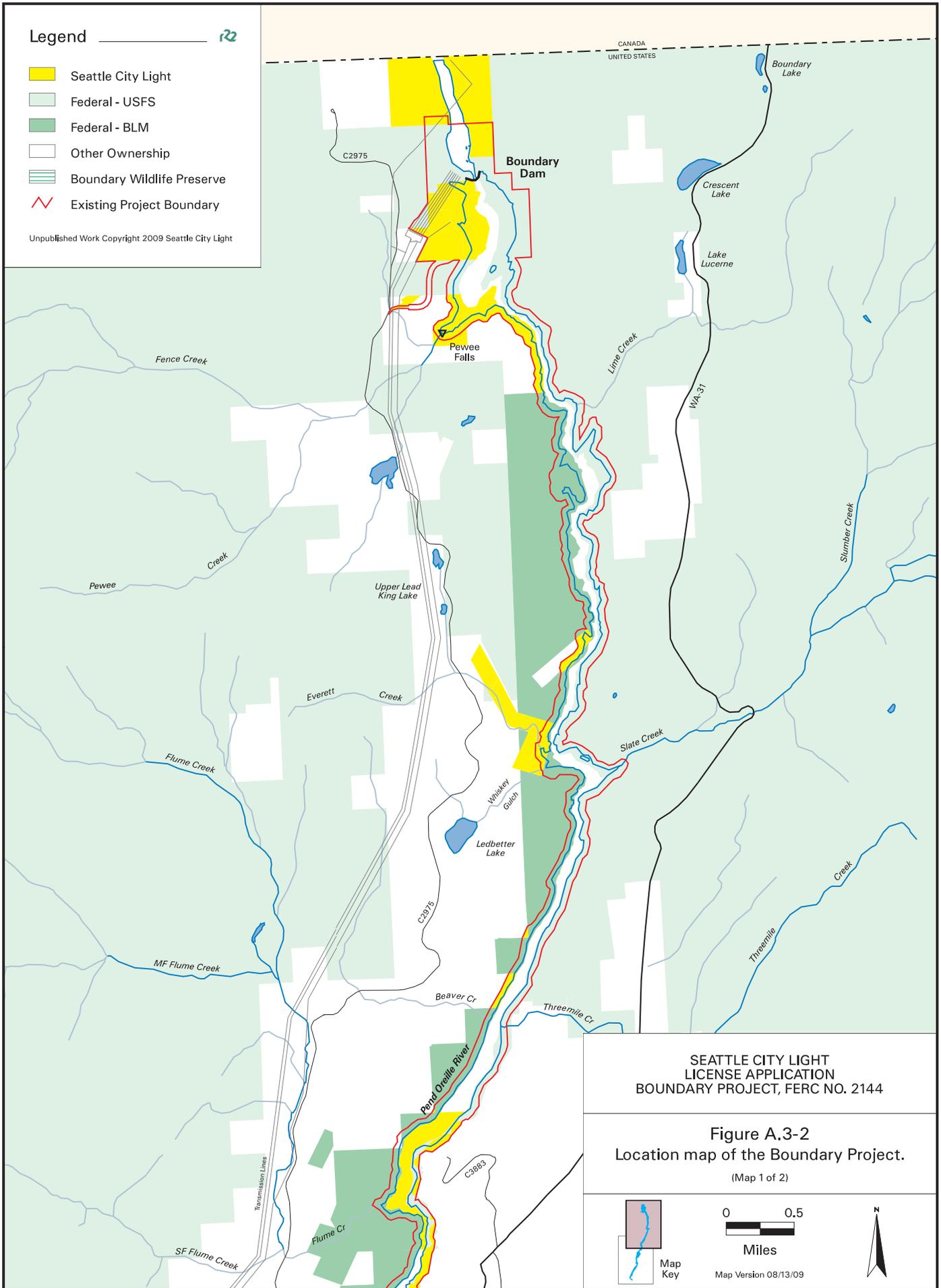
Map Version 08/13/09

Legend



- Seattle City Light
- Federal - USFS
- Federal - BLM
- Other Ownership
- Boundary Wildlife Preserve
- Existing Project Boundary

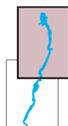
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Figure A.3-2  
 Location map of the Boundary Project.

(Map 1 of 2)



Map Key



Miles

Map Version 08/13/09

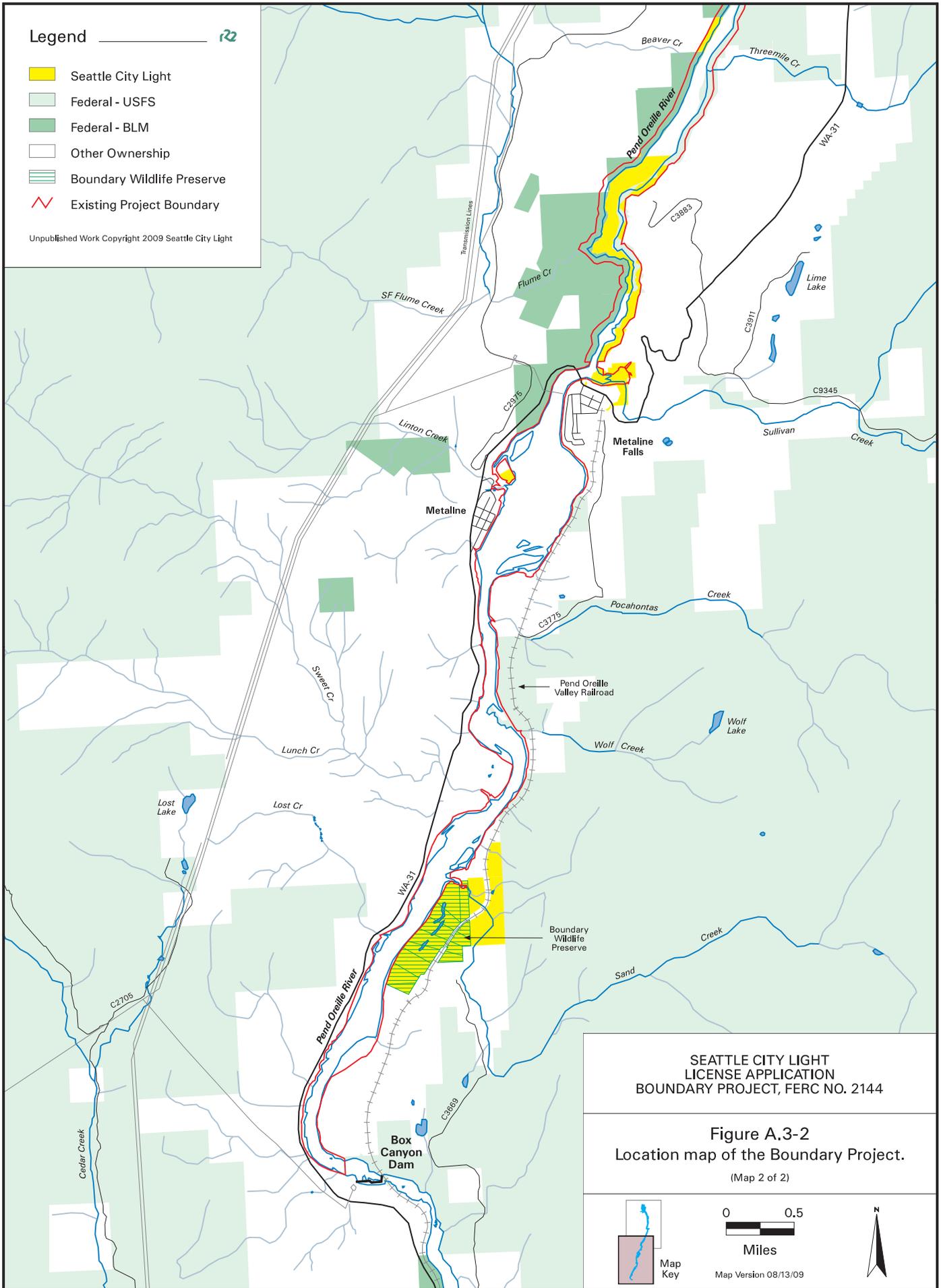


Legend



- Seattle City Light
- Federal - USFS
- Federal - BLM
- Other Ownership
- Boundary Wildlife Preserve
- Existing Project Boundary

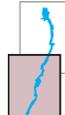
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Figure A.3-2  
 Location map of the Boundary Project.

(Map 2 of 2)



Map Key



Miles

Map Version 08/13/09



## 4 Project Lands

Total land area within the current Project boundary is 2,684.0 acres. The Federal government owns approximately 34 percent of this total. Management of this land is split between the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM). The USFS manages a total of 606.6 acres (22.6 percent). USFS lands are part of the Colville National Forest, which surrounds the Boundary Reservoir. The BLM manages 314.3 acres (11.7 percent) in the Project boundary, with most of the acreage located along the western shoreline of the reservoir and north of the Town of Metaline. Of the remaining land SCL owns 447.1 acres (16.7 percent), the Washington Department of Natural Resources owns 1,310.5 acres (48.8 percent) and 5.5 acres (0.2 percent) is owned by private, City, and County entities (see Exhibit G of this License Application for the current boundary).

Total land area within the proposed Project boundary as being proposed by SCL for the new license term is 3,020.8 acres. Of these lands, SCL owns 787.4 acres (26.1 percent), the USFS owns 602.1 acres (19.9 percent), the BLM owns 313.3 acres (10.4 percent), the Bonneville Power Administration (BPA) owns 1.9 acres (0.1 percent), the Washington Department of Natural Resources owns 1,311.5 acres (43.4 percent) and the remaining 4.6 acres (0.1 percent) is owned by private, City, and County entities (see Exhibit G of this License Application for the proposed boundary).

## 5 License Requirements

### 5.1. License Articles

The initial license was issued subject to a set of standard terms and conditions for unconstructed projects affecting navigable waters and lands of the United States. Articles 1 through 27 were issued on December 15, 1953, as a Form L-6. The Federal Power Commission’s (FPC’s) Order of July 10, 1961, confirmed these conditions, except for articles 9, 15, 16, 17, 23 and 24, which were omitted. Articles 28 through 48 were added on July 10, 1961, through the Order Modifying and Adopting Presiding Examiners Initial Decision Issuing License for Project No. 2144. Article 49 was added upon rehearing by Order dated September 6, 1961. Article 50 was added by Order dated August 15, 1962. Articles 51 through 56 were added by Order Amending License issued April 26, 1982. Article 56 was incorporated by FERC’s Letter Accepting Land-Use Article on July 10, 1980; it was originally numbered 51 and subsequently renumbered 56 on August 20, 1987, for consistency with the existing numbering sequence. The provisions of the license articles currently in effect are summarized in Table A.5-1.

**Table A.5-1.** Description of license article requirements for the Boundary Project.

License Article	Description
Article 1	Makes the Project subject to the provisions, terms and conditions of the license
Article 2	Requires that no substantial changes may be made to the Project plans, maps, specifications and statements in the exhibits until approved by the FPC; a provision is made for emergency modifications, which would be subject to later modifications as directed by the FPC
Article 3	Requires that the Project be in substantial conformity with the approved exhibits

**Table A.5-1, continued...**

<b>License Article</b>	<b>Description</b>
Article 4	Makes the Project and its operation and maintenance subject to inspection by FPC’s regional engineer
Article 5	Requires that the FPC approve any revised maps, plans, and specifications that diverge from any maps, plans, or specifications previously approved by the FPC
Article 6	Requires the Licensee to install and maintain stream flow gages, and meters for measuring the energy generated by the Project
Article 7	Requires that the Licensee provide reasonable, free public access to Project waters and adjacent lands
Article 8	Requires that location of roads, trails, and other land uses associated with the construction and maintenance of the Project shall be subject to the approvals of the appropriate federal department or agency with jurisdiction
Article 9	[Omitted by Order of July 10, 1961]
Article 10	Requires that the Licensee take steps to prevent contact between the Project structures and transmission lines, and any pre-existing transmission lines, telephone lines or other signal wires
Article 11	Requires that the Licensee take steps to prevent inductive interference between the Project structures and transmission lines, and any pre-existing communication facilities or operations
Article 12	Specifies that that Licensee will make use of FPC guidelines on the clearing of transmission right-of-ways
Article 13	Provides for compensating the federal government for cutting, using, or destroying of timber on lands owned by the United States Government
Article 14	Requires the Licensee to assist in the prevention of fires
Articles 15–17	[Omitted by Order of July 10, 1961]
Article 18	Establishes right of the United States to use water in such amount as may be necessary for ensuring navigation on navigable waterways of the United States
Article 19	Requires the Licensee to allow agencies of the United States or its permittees to use water for fire suppression or sanitary purposes on lands impacted by Project
Article 20	Makes the Licensee liable for damage to property and facilities during construction, maintenance, or operation of the Project
Article 21	Requires the Licensee to allow agencies of the United States to construct roads, ditches, or other conduits across Federal lands occupied by the Project
Article 22	Reserves the right of appropriate federal, state, or county agencies to take over, maintain, and supervise the use of any Project road as a public road
Article 23–24	[Omitted by Order of July 10, 1961]
Article 25	Requires FPC approval of any lease that grants use of Project works for generating, distributing, or transmitting power. The FPC may require that all conditions of the license be applied
Article 26	Requires that all future owners of the Project under Section 14 or 15 of the Federal Power Act (FPA) must make good any defect in title or right of occupancy
Article 27	Clarifies that the terms and conditions of the license articles shall not be construed to impair any terms or conditions of the FPA
Article 28	Specifies the date by which the construction on the Project was to begin, which was later extended by order dated October 29, 1962
Article 29	Restricts the Licensee from making any claim against the United States resulting from the use of waters from the Clark Fork or its tributaries for irrigation or other beneficial consumptive uses

Table A.5-1, continued...

License Article	Description
Article 30	Directs the Licensee to cooperate with the USFS in recreation studies for adjacent lands and national forests. Assistance was to be provided to state agencies for studies of lands bordering the reservoir outside of the National Forest
Article 31	Requires the Licensee to cooperate with federal and state resource agencies to assure adequate protection of fish and wildlife resources
Article 32	Directs the Licensee to construct, maintain, and operate protective devices in the interest of fish and wildlife resources to the degree that such devices are consistent with the primary purpose of the Project
Article 33	Requires the Licensee to clear all bottom lands and margins of the reservoir before impounding water
Article 34	Requires the Licensee to negotiate with Washington State University for the purpose of conducting archeological surveys prior to the impounding of the reservoir
Article 35	Requires the Licensee to pay an annual fee to the United States for administrative costs and for the use of its lands; this article has been amended several times (most recently by the FERC Order of November 2, 2007, Amending License and Revising Annual Charges) as units were replaced, added, and refurbished.
Article 36	Reserves the right of the Commission to determine annual charges for use and enjoyment of federal lands at a later date (charges are now assessed annually)
Article 37	Requires the Licensee to file Exhibits (F, J, and K) that show the final Project boundary in accordance to the FPC Rules and Regulations; specifies a buffer area of 200 feet in the vicinity of the dam and powerhouse downstream from Metaline Falls. By order issued August 15, 1962, the Licensee was given until one year after completion of construction to file the revised maps. The Exhibits were filed on January 19 <sup>th</sup> , 1968 and supplemented on September 25, 1968. The Exhibits were approved the Commission's December 30, 1968 Order, which set the Project boundary at 200 feet horizontal measurement from the high water level of the reservoir and approximately 500 feet vertical measurement below the bed of the reservoir, below Metaline Falls
Article 38	Requires the Licensee to file with the FPC for its approval, within six months of license issuance, Exhibits L (General Design Drawings) and M (General Description of Mechanical, Electrical, and Transmission Equipment). The deadline for submission was extended to August 1, 1962. Exhibit M Drawings were filed on July 29 1957, February 8, 1960, and October 10, 1962. The Commission found that revised Exhibit M and Exhibit L drawings conform to the Commission's rules and regulations and approved these Exhibits by order dated May 29, 1963. By Order dated March 10, 1964 the Commission approved Exhibit L Drawing submitted on October 29, 1963. By order issued April 25, 1969, the Commission approved revised "as built" Exhibit L drawings. Exhibit M drawings were later replaced by a new Exhibit M filed on February 8, 1980 (this at a later date was superseded and eliminated from the license).
Article 39	Reserved the right of the Commission to determine at a later date what transmission lines shall be included in the Project
Article 40	Requires that the Licensee, upon Commission request and if economically feasible, install additional units in the power plant
Article 41	Directs that the final design of the spillway be based on model tests
Article 42	Requires the Licensee to relocate or make safe nearby mining facilities that may be impacted by the reservoir
Article 43	Requires that the Licensee ensure the watertightness of the reservoir
Article 44	Requires the Licensee to four low-level sluice gates with the capacity to evacuate the reservoir within specific time limits for various inflow conditions.

Table A.5-1, continued...

License Article	Description
Article 45	[Required the Licensee to make energy available to Pend Oreille Mines and Metals Company to replace existing energy production at Metaline Falls Project No. 1393. The Licensee was discharged from this requirement by FPC Order of May 12, 1967]
Article 46	Requires the Licensee to coordinate its operation with the U.S. Columbia River system and other entities to maximize and share benefits from such coordination
Article 47	Requires the Licensee to install gaging stations in and along the Pend Oreille River to establish water surface profiles for various flow conditions between Box Canyon and the international border
Article 48	Requires the Licensee, within two years, to enter into an agreement with Pend Oreille County Public Utility District (PUD) to compensate the PUD for encroachment on the Box Canyon Project No. 2042
Article 49	Requires the Licensee to assign up to 48,000 kilowatts to the PUD to meet the load requirements of the PUD's customers within its service area. This article was added upon rehearing by order dated September 6, 1961. A dispute between the PUD and SCL regarding Article 49 was resolved through a Settlement Agreement (Agreement) that was approved by FERC on November 5, 1992
Article 50	Requires that the Licensee submit Exhibit K maps within one year of license issuance. The article was added by order dated August 15, 1962
Article 51	Originally required that the Licensee identify sub-impoundments within which to improve habitat for fish spawning and waterfowl nesting. This article was subsequently modified by FERC Order of January 10, 1983, following agreement between SCL and the fisheries management agencies (U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife) that the Boundary Reservoir should be managed for the existing trout populations and that efforts to enhance to largemouth bass fishery should be abandoned. The agencies concurred with SCL's recommendations to construct an artificial slough to increase waterfowl habitat. Because of the difficulty of creating an artificial slough, however, on July 18, 1986, the article was again amended to direct the development of a plan to acquire, preserve, and manage wetland habitat (management plan). This article was amended for the last time on March 20, 1987, to allow SCL to acquire in fee title or sufficient interest to preserve in perpetuity existing wetlands in the vicinity of the Project to satisfy the requirements of this license article. The management plan was approved by FERC on November 10, 1988.
Article 52	Requires the Licensee to design and carry out a cultural resource survey for the designated additional transmission right-of-way
Article 53	Requires the Licensee to consult with state and federal agencies on grass/shrub revegetation goals prior to clearing the transmission line right-of-way
Article 54	Requires the Licensee to commence construction of the Project additions within two years of the effective date of the amendment
Article 55	Requires the submission of Exhibit F and Exhibit A drawings describing the Project as built
Article 56	Gives the Licensee authority to grant permission for certain uses of Project lands and waters and to convey certain interests in Project lands without prior FERC approval

## 5.2. Additional FERC Orders

In addition to license articles and amendments, the following FERC orders establish additional requirements relative to operation of the Project:

- FERC May 17, 1976 Order Granting Change in Land Rights enabled SCL to grant an easement to the Town of Metaline, Washington to construct a recreation area partly on Project lands.
- FERC March 20, 1987 Order Approving Wetland Mitigative Plan resolved ongoing discussion about how to best implement Article 51 as Agencies and SCL worked through resource management priorities and feasibility. This Order provided for the acquisition and preservation of 155 acres<sup>2</sup> of wetland and associated uplands. SCL filed the required wildlife management plan on February 1, 1988, which was approved by FERC Order on November 10, 1988.
- FERC November 5, 1992 Order Approving Settlement Agreement enabled SCL and the Pend Oreille County Public Utility District (PUD) to resolve disputes over the implementation of Article 49. The approved agreement established a procedure for utilizing the PUD's load factor for determining the amount of energy to be delivered from the Project. The agreement also stipulated a methodology for determining annual Project costs.

### 5.3. Other Licenses/Permits

A water right must be obtained from the State of Washington to beneficially use surface water or ground water for power or other purposes. RCW 90.03.205; RCW 90.44.050. SCL holds the water rights described in Table A.5-2. Documentation of SCL's water rights is on file with Ecology's Water Resources Section.

As indicated in Table A.5-2, SCL has applied to Ecology for an additional water right to align the Project's maximum discharge volume with the Project's water rights. Until such time as Ecology issues a permit, SCL will manage the Project to stay within the current water rights, which authorize a discharge volume of 53,700 cubic feet per second (cfs). The water rights reflected in the Table A.5-2 are otherwise sufficient for operation and maintenance of the Project, including all activities related to power generation as well as operation and maintenance of the Forebay Recreation Area and Vista House as proposed in this License Application.

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<sup>2</sup> Due to parcel delineation updates, this summation has been changed to 149 acres.

**Table A.5-2.** Seattle City Light water rights for Project operation and maintenance.

<b>Ecology Certificate (C), Permit (P) or Application (A) #</b>	<b>Purpose of Use</b>	<b>Season of Use</b>	<b>Instantaneous Quantity</b>	<b>Annual Quantity</b>	<b>Place of Use</b>	<b>Source</b>
S3-27415C	Non-consumptive hydropower generation	Continuously	18,700 cubic feet per second (cfs)		NE¼ NE¼ S10 T40N R43EWM	Pend Oreille River
S3-13196C	Electric light and power	Continuously	35,000 cfs		NE¼ NE¼ S10 T40N R43EWM	Pend Oreille River
S3-30594A	Non-consumptive hydropower generation	Continuously	4,400 cfs		NE¼ NE¼ S10 T40N R43EWM	Pend Oreille River
R3-15021C	Power	Continuously		94,500 acre-feet (AF)	NE¼ S10 T40N R43EWM	Pend Oreille River
S3-17825C	Domestic supply; fire protection	Continuously (domestic); As needed (fire protection)	0.1 cfs (domestic); 0.9 cfs (fire protection)	6.7 AF (domestic)	Gov't Lot 2, S10 T40N R43EWM (Powerhouse)	Gardner Creek
S3-30103P	Non-consumptive powerhouse cooling	Continuously	1.5 cfs	1,088 AF	Powerhouse	Gardner Creek
S3-30102P	Seasonal irrigation of 15 acres; fire protection	April 1 to October 1 (irrigation); As needed (fire protection)	0.73 cfs (irrigation); 1.1 cfs (fire protection)	27.5 AF (irrigation)	Forebay recreation area	Pend Oreille River
S3-30101P	Seasonal irrigation of 10.5 acres; fire protection	April 1 to October 1 (irrigation); As needed (fire protection)	0.49 cfs (irrigation); 2.12 cfs (fire protection)	19 AF (irrigation)	Powerhouse and service area within Project boundary in S3 and S10 T40N R43EWM	Pend Oreille River
G3-30099P	Multiple domestic	Continuously	100 gallons per minute (gpm)	2 AF	View point recreation area (Vista House)	One well within S3 T40N R43EWM

**Table A.5-2, continued...**

Ecology Certificate (C), Permit (P) or Application (A) #	Purpose of Use	Season of Use	Instantaneous Quantity	Annual Quantity	Place of Use	Source
G3-30098P <sup>1</sup>	Multiple domestic supply; Power house cooling	Continuously	155 gpm	5 AF (domestic); 245 AF (cooling)	Area served, including administrative areas, powerhouse cooling and Forebay recreation area	Three wells within S3 and S10 T40N R43EWM

Note:

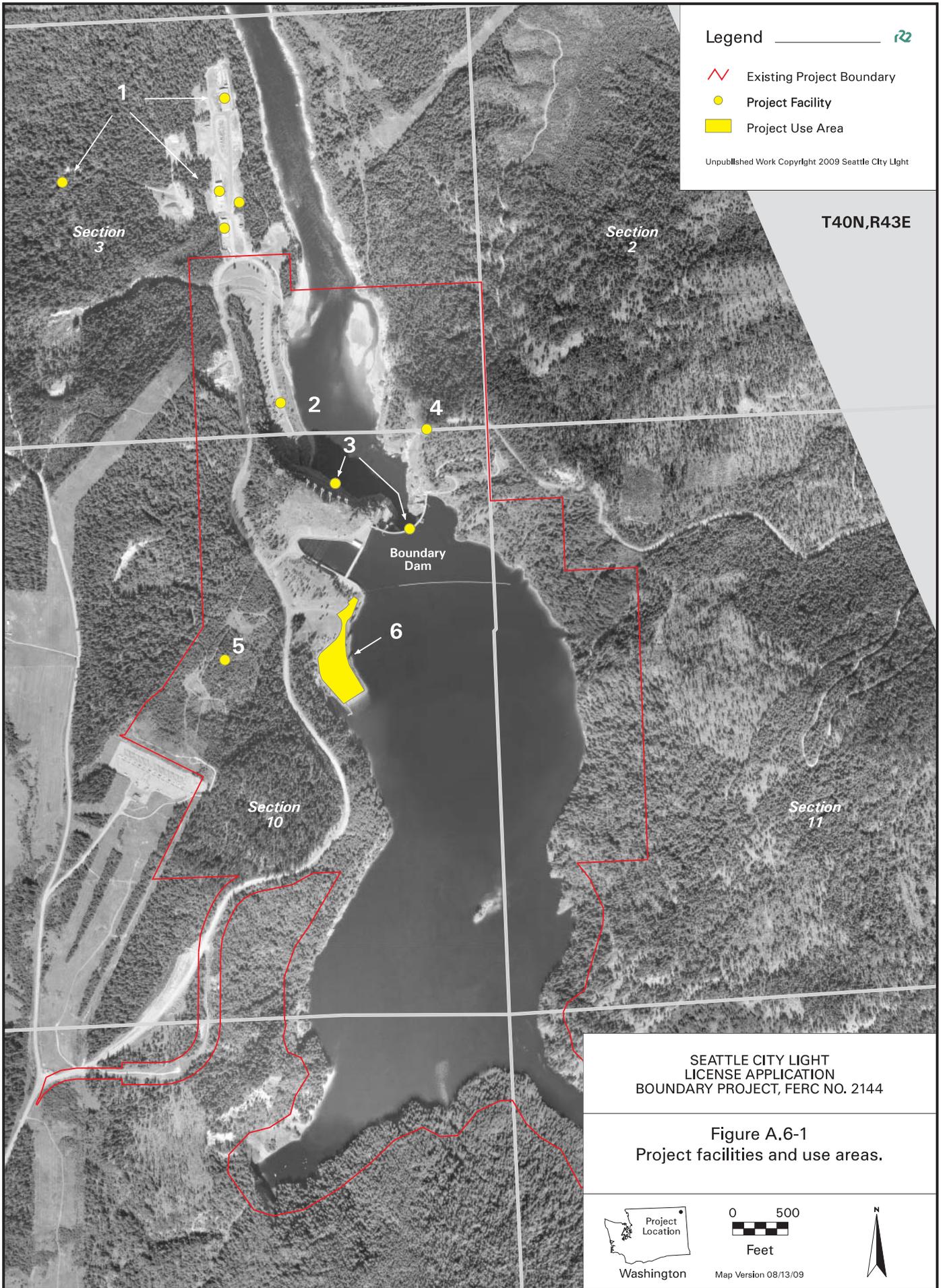
1 The July 2008 report of examination for this right includes the following statement (p. 2): “Ground Water Permit No. G3-30098P was issued as a back-up water supply to the surface water diversion from Gardner Creek under Surface Water Permit No. S3-30103P. The powerhouse cooling portion under this permit is used as an alternate supply to Surface Water Permit No. S3-30103P.”

**6 Project Facilities**

The Project facilities included under the existing license are described below. The general layout of the Project is shown in Figure A.6-1/Table A.6-1 and Figure A.6-2. Specific facility characteristics are listed in Tables A.6-2 through A.6-8. Individual facility drawings are provided in Exhibit F and locations of facilities are shown in Exhibit G of this License Application. Proposed new facilities or modifications to existing facilities are described under the respective sections.

**Table A.6-1.** Project facilities and use areas.

Site #	Project Facility/Use Area
1	Operations and maintenance support area. Includes: Shipping and Receiving building; Paint Shop/warehouse; spring water source and storage (stores water for cooling generator); maintenance shop; storage yards/staging areas (e.g., storage of aggregate); other miscellaneous functions.
2	Tailrace Recreation Area – SCL-maintained day use and picnic area leading to the Machine Hall Visitors’ Gallery.
3	Dam and power plant complex
4	Vista House – Viewpoint building, parking area, trail and viewing platform used by visitors to view the dam. Housing for SCL communications equipment inside building.
5	Transmission line right-of-away (ROW) (includes station service and associated underground utilities)
6	Forebay Recreation Area – SCL-maintained campground, boat ramp/float, picnic sites, and restrooms.



Legend 

-  Existing Project Boundary
-  Project Facility
-  Project Use Area

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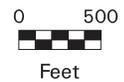
T40N,R43E

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Figure A.6-1  
 Project facilities and use areas.



Washington



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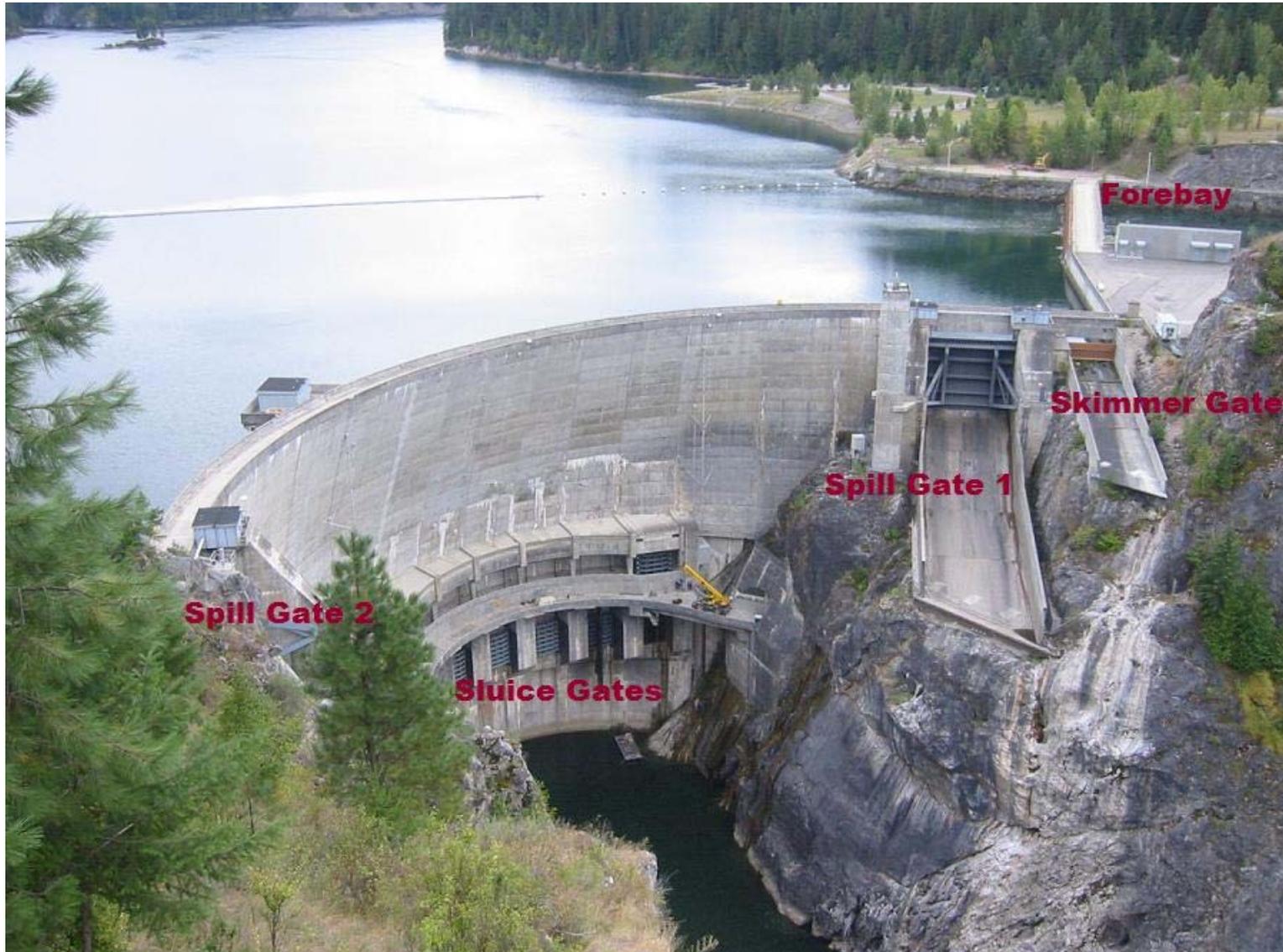


Figure A.6-2. Aerial view of Boundary Dam and associated facilities.

## 6.1. Dam and Spillways

### 6.1.1. Boundary Dam

Boundary Dam, situated in a narrow canyon and founded on interbedded limestone and dolomite of the Metaline Limestone formation, is a variable-radius concrete arch dam with a total height of 360 feet above the lowest part of the foundation and a structural height of 340 feet. It is a relatively thin structure, varying in thickness from 8 feet at the crest to 32 feet at the base. The dam has a crest length of 508 feet and a total length, including the spillways, of 740 feet. The dam impounds the Pend Oreille River to a normal maximum water surface elevation of 1,994 feet NAVD 88, as measured in the forebay (see Exhibit G, Figure G-1 for location).

The average elevation of the river surface below the dam is approximately 1,731 feet NAVD 88, and the impoundment provides approximately 263 feet of gross head for energy production (normal [rated] net head of 250 feet). Instruments embedded in the dam and abutments, which are monitored according to a regular schedule, include thermometers, strainmeters, deformation meters, deflection targets, crack movement points, tiltmeters, inverted plumb lines, piezometers, and extensometers.

A plan and vertical section of the dam are shown in Exhibit F, Sheets 2 and 3. Specific characteristics of the dam are summarized in Table A.6-2.

**Table A.6-2.** Dam characteristics, Boundary Project.

Structural height of dam	340 feet
Length of crest, arch dam only	508 feet
Total length of dam, including spillways	740 feet
Dam thickness at base	32 feet
Dam thickness at crest	8 feet
Elevation at crest of dam (roadway)	2,004 feet NAVD 88
Deepest foundation elevation	1,644 feet NAVD 88
Concrete volume:	
Arch dam	120,000 cubic yards
Spillways	20,000 cubic yards

### 6.1.2. Spillways, Sluiceways, and Skimmer

The Project has two spillways fitted with radial gates, one on each abutment. Each spillway is 50 feet wide and controlled by a radial gate 45 feet high. The two radial gate spillways have a combined total maximum discharge capacity of 108,000 cfs at forebay elevation 1,994 feet NAVD 88. The spillways are equipped with air bubbler systems to prevent the formation of ice at the gates. Each gate is controlled by an electricity-driven wire rope hoist. A typical section through the spillway bays is shown in Exhibit F, Sheet 2.

Seven low-level sluices through the dam under a head of 190 feet provide an additional 252,000 cfs of the total 360,000 cfs discharge capacity of the dam at forebay elevation 1,994 feet NAVD 88. The configuration of the sluice gates is shown in Exhibit F, Sheet 2. The sluices are steel-plate lined, including the entrance transitions that incorporate a surface against which the maintenance bulkhead seals. Electric seal heaters are located on the downstream fixed seal surfaces against which the operating gates seat.

Seals are hydraulically inflated using anti-freeze fluid supplied from an elevated tank and deflated by bleeding the fluid and pumping it back to storage. The sluice gates are vertical fixed-wheel gates, 17 feet wide by 21 feet high, operated by electric wire rope hoists located on a hoist deck along the downstream face of the dam at elevation 1,864 feet NAVD 88. A sluice maintenance gate, 35 feet wide by 57 feet high, can be moved into position on the upstream face of the dam over a sluice entrance and used for dewatering the sluiceways for maintenance purposes. In addition, there is one bascule-type (hinged-leaf) skimmer gate, 26 feet wide by 9 feet high, adjacent to the left spillway that used to provide, but no longer provides, passage of surface debris from the reservoir.

Table A.6-3 summarizes the specific dimensions and other characteristics of the spillways, sluiceways, and skimmer.

**Table A.6-3.** Spillway, sluiceway and, skimmer characteristics, Boundary Project.

Spillway gates:	
Number of gates	Two (2)
Type of gate	Radial
Dimensions of gates (each)	50 feet wide by 45 feet high
Spillway ogee crest elevation	1,950 feet NAVD 88
Maximum spillway capacity (at forebay elevation 1,994 feet NAVD 88)	108,000 cfs
Sluice gates:	
Number of gates	Seven (7)
Type of gate	Fixed wheel
Dimensions of each gate	21 feet high by 17 feet wide
Sluice crest elevation	1,795.5 feet NAVD 88
Sluiceway total discharge (at forebay elevation 1,994 feet NAVD 88)	252,000 cfs
Combined discharge of spillway and sluiceways (at forebay elevation 1,994 feet NAVD 88)	360,000 cfs
Skimmer gate:	
Type of gate	Bascule (hinged-leaf, or flap)
Dimensions of gate	26 feet wide by 9 feet high
Skimmer crest elevation	1,986 feet NAVD 88

During the new license term, SCL proposes to evaluate and implement as appropriate three measures designed to attain total dissolved gas (TDG) compliance at the Project: throttle sluice gates, which involves operation of sluice gates in partially open positions; roughen sluice flow, which entails modification of the sluice gate outlets to break up and spread flow; and spillway flow splitter/aerator, which entails modifying the spillways to aerate, break up, and spread flow. The three gate alternatives all involve spilling flow through existing outlets (the seven sluice gates and two spillway gates) into the tailwater plunge pool and rely on reduction in TDG production by spreading the flow and limiting plunging effects of the confined water jets. Section 4.5.2 of Exhibits E of this License Application provides additional information on TDG abatement measures proposed for the Project.

## 6.2. Power Intakes and Penstocks

The power intake facilities consist of a forebay (approximately 300 feet wide and 800 feet long with an invert at elevation 1,904 feet NAVD 88) excavated in the left abutment area, a trashrack structure across the entrance to the forebay, and the portal face with six 30-foot-wide by 34-foot-high horseshoe-shaped tunnels extending to fixed-wheel intake gate chambers.

A penstock leads from each intake gate to one of the turbine-generator units in the power plant (six penstocks total). Following a transition section of reinforced concrete in the upper part of the vertical elbow downstream of each intake gate, each penstock consists of a circular conduit of reinforced concrete down to elevation 1,822 feet NAVD 88 and a steel-lined conduit below elevation 1,822 feet NAVD 88. The concrete-lined section (which has a diameter of 24 feet by 34 feet, reducing to a 26-foot diameter) is 165 feet long, and the steel-lined section (with a diameter varying from 26 feet to 20 feet) is 150 feet long. The forebay and trashrack are located just upriver of the dam on the left bank as shown in Figure A.6-3.



**Figure A.6-3.** Aerial view of forebay and trashrack, Boundary Project.

Drawings of the power intake facilities and penstocks are provided in Exhibit F, Sheet 1. Specific dimensions and other characteristics of these facilities are summarized in Table A.6-4.

**Table A.6-4.** Power intake and penstock characteristics, Boundary Project.

Forebay:	
Elevation of invert	Approximately 1,904 feet NAVD 88
Width of invert at trash racks	190 feet
Length	500 feet
Excavation volume	Approximately 1,000,000 cubic yards
Trashrack structure:	
Total length at roadway	290 feet
Total height	100 feet
Total weight of structural steel	700,000 pounds
Clear opening between bars	5-1/2 inches
Gross screen area at forebay elevation 1,994 feet NAVD 88	19,000 square feet
Intake tunnels:	
Number of intakes	Six (6)
Tunnel dimensions	30 feet wide by 34 feet high (horseshoe-shaped in cross section)
Size of intake gates	24 feet wide by 34 feet high
Invert elevation	1,907 feet NAVD 88
Hoist deck elevation	2,044 feet NAVD 88
Penstocks:	
Number	Six (6)
Length of concrete-lined section (gate slot to steel liner)	165 feet
Length of steel-lined section	150 feet
Dimensions of concrete-lined section	24 feet by 34 feet, decreasing to 26-foot diameter
Diameter of steel-lined section	26 feet to 20 feet
Diameter at turbine inlet	20 feet
Penstock centerline elevation at turbine inlet	1,714 feet NAVD 88
Total weight of steel	4,000,000 pounds

### 6.3. Impoundment

At its normal maximum water surface elevation (1,994 feet NAVD 88 at the forebay), the 17.5-mile-long Boundary Reservoir has a surface area of approximately 1,794 acres, a shoreline length of roughly 47 miles and maximum depth in the forebay of approximately 270 feet (depths in the upper section of the reservoir, above Metaline Falls, are much shallower, on the order of approximately 20 feet). Its gross storage capacity is approximately 87,913 acre-feet (elevation 1,744 NAVD 88 to elevation 1,994 NAVD 88), and under the current license its nominal usable storage capacity is approximately 40,843 acre-feet (elevation 1,954 feet NAVD 88 to elevation 1,994 feet NAVD 88). Because of the large amount of water flowing through the system and the

limited amount of storage capacity in Boundary Reservoir, the residence time of the reservoir is very short. Maximum residence time is less than four days, but more typically the residence time is less than two days (Pickett 2004).

A summary of reservoir data is provided in Table A.6-5.

**Table A.6-5.** Boundary Reservoir data (SCL 2008).

Reservoir dimensions	Length 17.5 miles Depth 270 feet (maximum)
Normal maximum water surface area	1,794 acres
Normal maximum water surface elevation	1,994 feet NAVD 88 (at the forebay)
Gross storage capacity	87,913 acre-feet
Usable storage capacity	40,843 acre-feet

### 6.4. Power Plant

The Project power plant comprises an underground machine hall, six turbine-generator units, draft tubes, and transformer bays. The machine hall was excavated within the massive rock forming the left abutment of the dam. The machine hall is 76 feet wide, 172 feet in height, and 477 feet in length. Power plant generating Units 51 and 53 each have a turbine rated at 204,506 hp (153,379.50 kilowatts [kW]) connected to a generator rated at 158,400 kW, Units 52 and 54 each have a turbine rated at 204,506 hp (153,379.50 kW) connected to a generator rated at 161,500 kW, and Units 55 and 56 each have a turbine rated at 259,823 hp (194,867.25 kW) and connected to a generator rated at 200,000 kW for a total authorized installed capacity of 1,003,253 kW based on current turbine ratings and total generating installed capacity of approximately 1,039,800 kW (1,040 MW)(FERC 2007). Figure A.6-4 shows the machine hall from the Visitors’ Gallery inside the power plant (see Exhibit G, Figure G-1 for location).



**Figure A.6-4.** Machine hall inside power plant, Boundary Project.

The draft tubes discharge through individual short tunnels at the base of the tailrace cliff. Transformer bays branch off the dam access gallery and daylight at the face of the cliff above the tailwater. The power plant also includes a 21.3-foot-wide by 20.7-foot-high bay that houses an emergency generator.

Plans and vertical sections of the power plant and machine hall are provided in Exhibit F, Sheets 4 and 5. Data for the Project power plant facilities are summarized in Table A.6-6.

**Table A.6-6.** Power plant physical and equipment characteristics, Boundary Project.

Total power plant capability	Approximately 1,040 MW
Annual capacity factor	Approximately 45 percent, on average
Normal maximum water surface elevation (at the forebay)	1,994 feet NAVD 88
Normal tailwater water surface elevation	1,744 feet NAVD 88 (approximate)
Normal (rated) net head	250 feet
Machine hall (including service bay):	
Total length	477 feet
Total height	172 feet
Total width	76 feet

**Table A.6-6, continued...**

Turbines: Turbine type Number of units Ratings: Units 51 through 54 (four [4] units) Units 55 and 56 (two [2] units)	Francis Six (6) 204,506 horsepower (hp) at 250 feet net head, 120 rotations per minute (RPM) 259,823 hp at 250 feet net head, 120 RPM
Generators: Type Installed (rated) capacity: Units 51 and 53 Units 52 and 54 Units 55 and 56 Power factor Continuous overload capacity	Umbrella 158.4 MW 161.5 MW 200 MW 0.95 15 percent
Draft tubes: Size at portal Type of draft tube gates Size of draft tube gates (each) Diameter at distributor	40 feet by 48 feet Bulkhead 14.5 feet by 28.5 feet 17 feet
Transformer bays: Size at portal Diameter at distributor Number of bays Size at portal Cross section at back of hood	40 feet by 48 feet 17 feet Six (6) 40 feet by 48 feet 36.0 feet wide by 34.5 feet high (horseshoe shaped in cross section)

Under the new license term, SCL proposes to install new high efficiency turbines in Units 55 and 56. The turbine runner upgrades will increase efficiency, i.e., they will use the same flow to produce a greater amount of energy and will have a higher total generation capacity. The turbine runner efficiency upgrades will be performed concurrently with planned electrical generator rewinds and step-up transformer replacements, which are scheduled for Years 1 and 2 after license issuance. As part of the turbine runner efficiency upgrades, wicket gate and stay vanes may be replaced or reshaped, depending on the turbine runner designer. All other components are planned to be retained, with the exceptions of seals and bushings, which are normally replaced during turbine runner overhauls.

SCL also plans to rewind the generators, replace the turbine runners and transformers for Units 51 through 54 within 20 years of the new license term.

Exhibits B, D and E of this License Application provide additional information on the refurbishments and upgrades proposed for the Project.

## 6.5. Tailrace

Flows through the power plant release into the tailrace downstream of Boundary Dam. BC Hydro's Seven Mile Project, located 11 river miles downstream of Boundary Dam, extends its reservoir upstream to Boundary Dam, and periodically backs water up (encroaches) to the base of Boundary Dam. The normal maximum water surface elevation of the Seven Mile Reservoir is at approximately elevation 1,734 feet NAVD 88 (528.5 meters) (BC Hydro 2003).

## 6.6. Primary Transmission Lines

Power is transmitted by six individual three-phase, 230-kV transmission lines up the vertical face of the left abutment of the dam to six pairs of transmission towers on top of the abutment. From there, each transmission line runs approximately 3,000 feet to a tower located adjacent to the BPA Substation (Figure A.6-5). Station one-line transmission diagrams are provided in Exhibit F, Sheets 6 and 7.



**Figure A.6-5.** Photograph showing the Project transmission line and towers (including “pickle fork” towers) to the BPA Substation.

## 6.7. Specifications of Appurtenant Facilities

Accessory electrical equipment at the Project includes an isolated phase bus, six generator step-up transformers, station service (including an emergency generator), and a distributed control

system. Specific characteristics of accessory electrical equipment at the Project are summarized below in Table A.6-7.

**Table A.6-7.** Accessory electrical equipment characteristics, Boundary Project.

Transformers (six [6]):	
Type	Forced oil, air cooled
Rating	170,000 kVA
Phase	Three
Voltage	14.75/242 kV
B.I.L.	750 kV
Generator loads:	
Type	Sealed isolated phase
Rating	7,000 A
Length	155 feet

The Project also includes an array of accessory equipment used in day-to-day operation of the power plant, including bridge cranes, drainage and dewatering pumps, elevators, wastewater treatment facilities, and an emergency generator system. Miscellaneous equipment at the Project power plant and service area is listed in Table A.6-8, along with corresponding data on specific characteristics for the equipment.

**Table A.6-8.** Miscellaneous equipment at power plant and service area, Boundary Project.

Bridge cranes (two [2]):	
Main hook capacity	200 tons
Auxiliary hook capacity	25 tons
Bridge speed	100 feet per minute (fpm)
Maximum lift main hook	73 feet
Maximum lift auxiliary hook	118 feet
Elevator:	
Capacity	5,000 pounds (exclusive of car, cables and ropes)
Use	Passengers
Travel	60 feet (approximately)
Waste treatment plant:	
Capacity	3,000 gallons per day
Type	Extended aeration
Upper building drainage pumps (two [2]):	
Type	Vertical turbine with shaft
Rated capacity	3,600 gallons per minute (gpm)
Motor	Exposed

**Table A.6-8, continued...**

Lower building drainage pumps (two [2]): Type Rated capacity Motor	Vertical turbine with shaft 5,500 gpm Exposed
Lower building dewatering pumps (five [5]): Type Rated capacity Motor	Vertical submersible 6,000 gpm Submersible
Generator fire protection (main and reserve bank): Type Number of cylinders per bank Cylinder capacity at 70°F	Carbon dioxide 52 75 pounds
Unit penstock fill line valve: Number Type Size	Six (6; one per unit) Butterfly 24-inch
Tailwater level sensor: Type Size	Purge system – Mercury-filled tube 60-inch
Emergency generator set: Rated capacity Type Fuel	750 kW Gas turbine Diesel
Fueling station: Diesel tank capacity Unleaded tank capacity	1,000 gallons 2,500 gallons
Service area oil/fuel storage and purification facilities: Lube oil storage tanks (two [2]): Size Capacity	6 feet 4 inch diameter by 17.0 feet long 4,000 gallons
Garage: Vehicle lift Cincinnati Metal Shear Chicago Metal Break Miller B40G welder/generator Enerpac Hydraulic Press	12,000-pound capacity 10 foot 8 foot 400 amp 100 ton

**Table A.6-8, continued...**

Auxiliary buildings	
Shipping/receiving	(for spares storage)
Warehouse	
Vehicle storage	(7) bays, including (5) with doors
Domestic water building	(2) Gould Aguavar pump controllers for 15 and 7.5 hp pumps

**6.8. Access Roads and Tunnels**

The Project is accessible by paved highway. The main Project access road, which is part of the licensed Project, is referred to as the West Side Access Road (turnoff at approximately 11.5 miles on Gardner Caves / Crawford State Park county road); this road provides access to the entrances of the machine hall and dam access tunnels. In addition, a multiple purpose National Forest road also provides access to the crest of the dam from the east side of the river. SCL proposes a Project boundary adjustment to include the full extent of the West Side Access Road and a small portion of the National Forest road (3165-350) not already contained within the existing Project boundary (see Exhibit G, Figure G-1 for location).

A dam access tunnel (Figure A.6-6) extends behind the transformer bay to the downstream face of the dam at the sluice gate bridge deck level. This tunnel also provides access to the draft tube gates. A service elevator on the left abutment of the dam connects this tunnel with the top of the dam. The machine hall tunnel provides access to the machine hall, control room, and mucking tunnel. The original construction mucking tunnel, which was paved in June 2000, is used to access the lower level of the power plant and for storage.



**Figure A.6-6.** Photograph of the dam access tunnel, Boundary Project.

## 6.9. Operations and Maintenance Support Area

Northwest of the dam is an operations and maintenance support area that is needed to support key operations functions and is not currently fully contained within the current Project boundary. The area includes a shipping and receiving building, a paint shop/warehouse, spring water source and storage (stores water for cooling generator), maintenance shop, storage yards/staging areas (e.g., storage of aggregate) and other miscellaneous functions. An adjustment to the boundary is proposed to include the entire area (see Exhibit G, Figure G-1 for location).

## 6.10. Recreation Facilities

Three SCL-owned and managed recreation areas are within the Project boundary; these include the Forebay Recreation Area, the Tailrace Recreation Area/Machine Hall Visitors' Gallery, and the Vista House. The Forebay Recreation Area is located on the western shoreline of Boundary Reservoir immediately upstream of the Project dam. Facilities at this site include approximately 20 parking spaces, seven picnic tables, a two-lane concrete boat ramp with an L-shaped boarding dock, a restroom, and 11 campsites.

The Tailrace Recreation Area/Machine Hall Visitors' Gallery is located immediately downstream of the dam on the western bank of the Pend Oreille River. Facilities at this site include an asphalt parking area with approximately 36 single-vehicle spaces, two bus spaces, and six van/vehicle with trailer spaces; three covered picnic tables; and a visitors' gallery inside the machine hall entrance. Also located at this recreation facility is a gravel boat launch providing access to the Pend Oreille River below Boundary Dam; however, this boat launch is generally not used by the public because it is less than 1 mile from the U.S.-Canada border, and boaters are not permitted to cross the border.

The Vista House is located immediately downstream of Boundary Dam on a promontory along the eastern bank of the Pend Oreille River. Together with the Tailrace Recreation Area/Machine Hall Visitors' Gallery, the Vista House offers visitors unique interpretation and education opportunities to learn about the Project and its operation, and vantage points from which to observe Project features.

In the new license term, SCL is proposing improvements to the three existing Project recreation sites as well as to the Metaline Waterfront Park Boat Launch. SCL also proposes to develop a new accessible trail and trailhead in the vicinity of the Vista House access road to a viewpoint of Peewee Falls and a new portage trail in the vicinity of Metaline Falls and to make improvements at six designated dispersed shoreline recreation sites. SCL proposes a Project boundary adjustment to include the Metaline Falls Portage Trail facility and will propose boundary adjustments for the other facilities once their locations and designs are finalized. The locations of existing and proposed recreational facilities are shown in Exhibit G, Figure(s) G-1, G-2, G-3, G-5, G-6, and G-7. Exhibit E of this License Application provides additional information on the proposed recreational facility improvements and development.

### 6.11. Boundary Wildlife Preserve

In 1988, SCL purchased wildlife mitigation lands along the eastern shoreline of the reservoir south of Metaline Falls, meeting the requirements of Article 51 of the current FERC license. The Boundary Wildlife Preserve (BWP) encompasses approximately 149 acres<sup>3</sup> of slough/wetland, riparian, and upland forest habitats. SCL developed a Wildlife Management Plan for the BWP, which was submitted to FERC in 1988. The primary management goal of this plan is to protect the area from development and thereby maintain populations of native terrestrial and aquatic wildlife species and the riparian and wetland communities on the BWP. At the time the BWP was established, the FERC Project boundary was not modified to incorporate the BWP.

In 1994, after consultation with the USFS and Washington Department of Fish and Wildlife (WDFW), SCL purchased 89 acres<sup>4</sup> of land adjacent to the BWP in an effort to protect the existing resources on the BWP. This purchase was made as a planned mitigation measure for the new license. The 89-acre parcel was slated to be logged, and SCL was concerned about impacts to its holdings potentially resulting from the logging activity.

SCL proposes to incorporate the BWP and the additional 89 acres of adjacent land into the Project boundary and manage these lands for biodiversity goals (see Exhibit G, Figure G-8 for location).

### 6.12. Upstream Fish Passage Trap-and-Haul Facility

Because it is not equipped with any fish passage facilities, Boundary Dam prevents upstream movement of fish. During the new license term, SCL proposes to develop a trap-and-haul facility to provide upstream passage for native salmonids 3.9 inches (100 millimeters) and larger. Phase I will result in the design and construction of a temporary floating trap-and-haul facility and generate biological information that will be used to determine alternative locations and periods for deploying the temporary facility. Phase II will consist of deploying the temporary facility at the locations and during the periods identified as part of Phase I and identifying the best location(s) for deploying a potential permanent trap-and-haul facility. Phase III will involve operation of a permanent trap-and-haul facility at a fixed location or a long-term temporary trap-and-haul facility that could be deployed on a seasonal basis and operated at various locations. Section 4.5.3 of Exhibits E of this License Application provides additional information on the upstream fish passage measure proposed for the Project.

## 7 Lands of the United States

Lands of the U.S. Government under use by the Project as shown on the Exhibit G Project boundary drawings are tabulated below (Table A.7-1).

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<sup>3</sup> Due to parcel delineation updates, this summation has been changed from the previously cited value of 155 acres.

<sup>4</sup> The size of the adjoining SCL-owned parcels is 89 acres, not 88 acres as previously reported.

**Table A.7-1.** Tabulation of federal lands within the existing and proposed Project boundaries, by township, range, and section.

Location	Owner / Agency	Current Acreage	Proposed Acreage	Exhibit G Figure No.
T40N, R43E, Section 2	USFS	--	0.01	G-1
T40N, R43E, Section 3	USFS	25.92	25.92	G-1
T40N, R43E, Section 10	BPA	--	1.87	G-1
T40N, R43E, Section 10	USFS	104.51	110.37	G-1
T40N, R43E, Section 11	USFS	109.86	110.12	G-1
T40N, R43E, Section 14	BLM	17.82	17.64	G-2
T40N, R43E, Section 14	USFS	58.20	53.16	G-1 and G-2
T40N, R43E, Section 23	BLM	85.90	83.80	G-2 and G-3
T40N, R43E, Section 23	USFS	81.35	85.02	G-2 and G-3
T40N, R43E, Section 26	BLM	37.83	40.75	G-3
T40N, R43E, Section 26	USFS	49.59	46.45	G-3
T40N, R43E, Section 35	BLM	45.59	42.08	G-3 and G-4
T40N, R43E, Section 35	USFS	69.55	68.73	G-3 and G-4
T39N, R43E, Section 2	BLM	29.25	31.83	G-4
T39N, R43E, Section 2	USFS	37.29	32.44	G-4
T39N, R43E, Section 3	BLM	8.94	9.76	G-4
T39N, R43E, Section 3	USFS	0.73	0.73	G-4
T39N, R43E, Section 10	BLM	27.59	28.10	G-4 and G-5
T39N, R43E, Section 10	USFS	40.78	39.65	G-4 and G-5
T39N, R43E, Section 11	USFS	0.35	0.47	G-4
T39N, R43E, Section 15	BLM	19.43	18.90	G-5
T39N, R43E, Section 15	USFS	27.59	28.13	G-5
T39N, R43E, Section 16	BLM	26.39	25.26	G-5
T39N, R43E, Section 21	BLM	11.10	10.95	G-5 and G-6
T39N, R43E, Section 22	BLM	4.44	4.22	G-5
T39N, R43E, Section 22	USFS	0.87	0.87	G-5
	<b>Total Acreages:</b>	<b>920.87</b>	<b>917.23</b>	

## 8 Proposed Modifications and Enhancements

Descriptions of proposed modifications and enhancements to Project facilities are included with the description of the existing Project in Sections 6.1 through 6.12 of this Exhibit. Details regarding proposed modification to Project operations under the new license are provided in Exhibits B and E of this License Application. A full summary of all measures being proposed by SCL for the new license is provided in Attachment A-1.

## 9 References

- B. C. Hydro. 2003. Seven Mile River Consultative Report and Water Use Plan, Executive Summary. Prepared by B.C. Hydro Project Team. January 2003. Available online at [http://www.bchydro.com/wup/completed/seven\\_mile/seven\\_mile\\_exec\\_sum\\_cc.pdf](http://www.bchydro.com/wup/completed/seven_mile/seven_mile_exec_sum_cc.pdf).
- Ecology. 2008. Change Report of Examination, Ground Water Permit G3-30098P. Ecology Eastern Regional Office. July 15, 2008.
- FERC (Federal Energy Regulatory Commission). 2007. Order Amending License and Revising Annual Charges. November 11, 2007.
- Pickett, P.J. 2004. Quality Assurance Project Plan: Pend Oreille River temperature total maximum daily load technical study. Washington State Department of Ecology Environmental Assessment Program, Olympia.
- SCL (Seattle City Light). 2008. Compilation of Project hydrologic data: preparation of hydrologic database and hydrologic statistics in support of relicensing studies, Boundary Hydroelectric Project (FERC No. 2144). Prepared by R2 Resource Consultants, Inc, Redmond, Washington. March 2008.

## **Attachment A-1. Summary of Proposed PM&E Measures**



**Summary of Proposed PM&E Measures**

Proposed PM&E	Anticipated Timeframe
<b>PROJECT OPERATIONAL MEASURES</b>	
<ul style="list-style-type: none"> <li>• Modify Boundary Reservoir operations according to the following constraints:                             <ul style="list-style-type: none"> <li>○ Formalize the voluntary measure of restricting forebay water surface elevations during the summer recreation season</li> <li>○ Formalize the voluntary measure to operate Units 55 and 56 above 125 MW and sequence their startup and shutdown so that they are the last units to be brought on line and the first units to be shut down in order to reduce total dissolved gas (TDG) under normal, non-spill operations <sup>1</sup></li> </ul> </li> </ul>	Implement Starting Year 2 After License Issuance
<b>GEOLOGY AND SOILS</b>	
<ul style="list-style-type: none"> <li>• Implement a Terrestrial Resources Management Plan (TRMP). Programs included under the plan include:                             <ul style="list-style-type: none"> <li>○ Erosion Program</li> <li>○ Habitat Protection and Enhancement Program</li> <li>○ Integrated Weed Management Program</li> <li>○ Rare, Threatened and Endangered (RTE) Plant Species Program</li> <li>○ Wildlife Program</li> <li>○ Shoreline Management Program</li> <li>○ Travel and Public Access Management Program</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance

<sup>1</sup> When the proposed upgrades of Units 55 and 56 are completed, SCL will re-evaluate the need for the unit sequencing and adjust the approach to, or eliminate, the sequencing restrictions as appropriate.

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Implement an Erosion Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Erosion control measures at the Forebay Recreation Area, Bureau of Land Management (BLM) Boundary Recreation Area, and the Dispersed Recreation Day Use/Overnight Campsite on BLM-Managed Land</li> <li>○ Long-term erosion monitoring for lands adjacent to the Project reservoir</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Implement Consistent with Schedule and Design of Recreation Improvements at Each Site (see Recreation Resources below, i.e., Complete by Year 7)</p> <p>Starting Year 3 After License Issuance and Every 10 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Provide off-site mitigation for continuing erosion effects (through incorporation of an 89-acre<sup>2</sup> parcel of land located adjacent to the BWP into the Project boundary and management for biodiversity) (also identified under Botanical Resources and Wildlife Resources)</li> </ul>	<p>Implement Starting Year 1 After License Issuance</p>
<b>WATER RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Acquire flood easements from private landowners in Metaline and Metaline Falls to compensate for Project-related contributions to flooding upstream of Metaline Falls and restrict future development in easement areas<sup>3</sup></li> </ul>	<p>Complete Within 5 Years of License Issuance</p>
<ul style="list-style-type: none"> <li>• Implement a Total Dissolved Gas (TDG) Attainment Plan. Components under the plan include:                             <ul style="list-style-type: none"> <li>○ Study, develop engineering designs, and prototype some combination of throttling sluice gates, roughening sluice flow and installing a spillway splitter(s)/aerator(s) to develop a structural and operational modifications to improve TDG performance</li> <li>○ Reporting and consultation with the Washington Department of Ecology</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Complete Within 10 Years of License Issuance</p> <p>Annually Years 1 through 10 After License Issuance</p>

<sup>2</sup> The size of the adjoining SCL-owned parcels is 89 acres, not 88 acres as previously reported.

<sup>3</sup> Because these easements are unnecessary for normal Project operations, SCL does not propose to include any provisions relating to these easements in the new License.

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Implement a DO Attainment Plan. Components under the plan include:                             <ul style="list-style-type: none"> <li>○ Develop a Quality Assurances Project Plan (QAPP)</li> <li>○ DO monitoring</li> <li>○ Reporting and consultation with the Washington Department of Ecology</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Complete Within 1 Year of License Issuance</p> <p>Annually Years 2 through 6 After License Issuance</p> <p>Annually Years 2 through 6 After License Issuance</p>
<ul style="list-style-type: none"> <li>• Implement an Aquatic Invasive Species Control and Prevention Plan (AISCPP). Components under the plan include:                             <ul style="list-style-type: none"> <li>○ Install and replace bottom barriers for macrophyte suppression</li> <li>○ Monitor effectiveness of bottom barriers</li> <li>○ Monitor for invasive mollusk species</li> <li>○ Conduct lab analysis if invasive mollusks species found</li> <li>○ Reporting and consultation with the Washington Department of Ecology and Water Quality Workgroup (WQWG)</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Starting Year 1 After License Issuance and Every 5 Years Thereafter</p> <p>Annually Throughout the Life of the License</p> <p>Annually Throughout the Life of the License</p> <p>As necessary</p> <p>Annually Throughout the Life of the License</p>
<ul style="list-style-type: none"> <li>• Implement aquatic habitat enhancement measures as provided in Fish and Aquatics Management Plan (i.e., riparian plantings, stream channel modifications, large wood supplementation, bank improvement, and culvert replacement in tributaries) to help meet temperature improvement goals</li> </ul>	<p>See Fish and Aquatics Resources below</p>

Proposed PM&E	Anticipated Timeframe
<b>FISH AND AQUATICS RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Implement a Fish and Aquatics Management Plan that encompasses all fish and aquatics-related PM&amp;E measures:                             <ul style="list-style-type: none"> <li>○ Reporting and consultation with the Fish and Aquatics Workgroup (FAWG)</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Every Other Month Through Year 2; Quarterly For Years 3 Through 5 After License Issuance; and Annually Starting Year 6 for the Life of the License
<b>Fish Passage</b>	
<ul style="list-style-type: none"> <li>• Develop an upstream fish passage trap-and-haul facility:                             <ul style="list-style-type: none"> <li>○ Phase I monitoring</li> <li>○ Phase I temporary trap-and-haul facility installation</li> <li>○ Phase II temporary trap-and-haul facility monitoring</li> <li>○ Phase III permanent trap-and-haul facility installation</li> <li>○ Phase III permanent trap-and-haul facility monitoring</li> </ul> </li> </ul>	Annually Years 1 Through 7 After License Issuance  Complete Between Years 6 And 7 After License Issuance  Annually Years 8 Through 17 After License Issuance  Complete Between Years 16 And 17 After License Issuance  Annually Years 18 Through 50 After License Issuance

Proposed PM&E	Anticipated Timeframe
<b>Fish Habitat</b>	
<ul style="list-style-type: none"> <li>• Implement gravel augmentation below Box Canyon Dam (initial placement and periodic replacement):                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial Placement:</u> Between Years 1 and 5 After License Issuance</p> <p><u>Replacement:</u> Every 5 Years Thereafter</p> <p>Starting Year 6 After License Issuance and 2 Years Out of Every 5 Years Thereafter</p> <p>Starting Year 9 After License Issuance and Every 5 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Implement channel modifications for mainstem trapping pools at Project river mile (PRM) 30.3 (initial and replacement):                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial:</u> Between Years 1 and 5 After License Issuance</p> <p><u>Replacement/repair:</u> Every 10 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p> <p>Starting Year 9 After License Issuance and Every 5 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Implement placement and replacement of mainstem engineering large woody debris (LWD) at tributary deltas:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial Placement:</u> Between Years 1 and 5 After License Issuance</p> <p><u>Replacement:</u> Every 7 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p>

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Boundary Reservoir fish community monitoring</li> </ul>	<p>Years 2 and 3 After License Issuance and Starting Year 5, Every 5 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Implement habitat protection in Sullivan Creek river mile (RM) 0.00 to RM 0.54:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial:</u> Between Years 1 and 5 After License Issuance  <u>Replacement/repair:</u> Every 7 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p> <p>Starting Year 9 After License Issuance and Every 5 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Implement LWD and riparian planting in Sullivan Creek RM 0.00 to RM 0.54:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Annually Years 6 Through 8</p>
<ul style="list-style-type: none"> <li>• Implement riparian buffer protection in Sullivan Creek RM 0.00 to RM 0.54:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Year 6</p>
<ul style="list-style-type: none"> <li>• Implement riparian, streambank, and channel improvements in Sullivan Creek RM 2.30 to RM 3.93:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial:</u> Between Years 1 and 5 After License Issuance  <u>Replacement/repair:</u> Every 7 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p> <p>Starting Year 9 After License Issuance and Every 5 Years Thereafter</p>

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Implement culvert replacements in Slate Creek tributaries Slumber Creek at RM 0.20 and Styx Creek at RM 0.10:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Annually Years 6 Through 8</p>
<ul style="list-style-type: none"> <li>• Implement riparian planting in Linton Creek RM 0.00 to RM 0.20:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Annually Years 6 Through 8</p>
<ul style="list-style-type: none"> <li>• Implement channel improvements in Sweet Creek RM 0.40 to RM 0.50:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p><u>Initial:</u> Between Years 1 and 5 After License Issuance</p> <p><u>Replacement/repair:</u> Every 7 Years Thereafter</p> <p>Starting Year 6 After License Issuance and Every 5 Years Thereafter</p> <p>Starting Year 9 After License Issuance and Every 5 Years Thereafter</p>
<ul style="list-style-type: none"> <li>• Implement riparian planting in Sweet Creek RM 0.00 to RM 0.50:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Annually Years 6 Through 8</p>
<ul style="list-style-type: none"> <li>• Implement riparian buffer protection in Sweet Creek RM 0.00 to RM 0.50:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 5 After License Issuance</p> <p>Year 6</p>
<ul style="list-style-type: none"> <li>• Implement tributary non-native trout suppression:                             <ul style="list-style-type: none"> <li>○ Compliance monitoring</li> <li>○ Effectiveness monitoring</li> </ul> </li> </ul>	<p>Between Years 1 and 4 After License Issuance</p> <p>Annually Starting Year 20 After License Issuance</p> <p>Starting Year 14 After License Issuance and Every 5 Years Thereafter</p>

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Construct a native trout supplementation facility</li> </ul>	<p>Complete Within 7 Years of License Issuance</p>
<b>BOTANICAL RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Incorporate the 89-acre adjacent parcel of land into the Project boundary and management of both it and the BWP for biodiversity (also identified under Geology/Soils and Wildlife Resources)</li> </ul>	<p>Implement Starting Year 1 After License Issuance</p>
<ul style="list-style-type: none"> <li>• Implement an Integrated Weed Management Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Initial inventory to document the location and extent of weed populations</li> <li>○ Periodic inventories to identify any new infestations of noxious weeds</li> <li>○ Control and effectiveness monitoring of Class A and Class B-designate weed species on SCL lands within the Project boundary and along roads and at recreation areas</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Complete Within 2 Years of License Issuance</p> <p>Starting Year 5 of License Issuance and Every 3 Years Thereafter</p> <p>As Needed Starting Year 2 After License Issuance</p>
<ul style="list-style-type: none"> <li>• Implement RTE Plant Species Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Qualitative periodic surveys to evaluate RTE species distribution and population trends for widespread species in the Project area</li> <li>○ Conduct a census to evaluate distribution and population trends for RTE plant species with limited distribution in the Project area</li> <li>○ Conduct comprehensive RTE plant survey if a catastrophic event occurs in the Project area</li> </ul> </li> </ul>	<p>Implement Starting Year 1 After License Issuance</p> <p>Starting Year 2 After License Issuance and Every 6 Years Thereafter</p> <p>Starting Year 3 After License Issuance and Every 3 Years Thereafter</p> <p>As needed</p>

Proposed PM&E	Anticipated Timeframe
<b>WILDLIFE RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Implement Wildlife Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Monitor bald eagle nest use and productivity within the Project boundary</li> <li>○ Monitor RTE wildlife species, specifically for the peregrine falcon, bank swallow, and osprey</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Annually Starting Year 3 After License Issuance  Annually Starting Year 3 After License Issuance
<ul style="list-style-type: none"> <li>• Implement Habitat Enhancement Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Vehicle access control (in coordination with the Travel and Public Access Management Program)</li> <li>○ Implement selective habitat enhancement measures on SCL-owned lands in the Project boundary (includes the incorporation of the 89-acre adjacent parcel of land into the boundary and management of both it and the BWP for biodiversity; also identified under Geology/Soils and Botanical Resources)</li> <li>○ Protect Canada goose nests on Metaline Island and Rat Island from human disturbance and limit recreational use at other sites along the reservoir to protect ecological values</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Annually Starting Year 1 After License Issuance  Starting Year 1 After License Issuance  Annually Starting Year 3 After License Issuance
<b>THREATENED AND ENDANGERED SPECIES</b>	
<ul style="list-style-type: none"> <li>• Addressed by Wildlife and Fish and Aquatics measures</li> </ul>	See Wildlife and Fish and Aquatics resource areas
<b>AESTHETICS/VISUAL RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Implement aesthetic/visual resource management guidelines for future Project recreation facilities (to be included in the Recreation Resources Management Plan [RRMP])</li> </ul>	See Recreation Resources
<b>CULTURAL RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Implement an HPMP:                             <ul style="list-style-type: none"> <li>○ Reporting and consultation with Cultural Resources Work Group (CRWG)</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Annually Throughout the Life of the License

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Appointment and training of a staff HPMP Coordinator in historic properties management and current regulations to direct the implementation of this plan during the term of the new license; training by the Coordinator of Project employees</li> </ul>	<p style="text-align: center;"><u>Coordinator Appointment/Training:</u> Complete Within 1 Year of License Issuance</p> <p style="text-align: center;"><u>Employee Training:</u> Annually Throughout the Life of the License</p>
<ul style="list-style-type: none"> <li>• Historic properties treatment of three National Register of Historic Places (NRHP)-eligible properties (the Josephine Mine Historic Mining District, the Pend Oreille Mines and Metals Company [POMMC] Powerhouse Historic District and the Carl Harvey Homestead) through the integrated Interpretation and Education (I&amp;E) Program (a component of the RRMP)</li> </ul>	See Recreation Resources Section
<ul style="list-style-type: none"> <li>• HABS/HAER documentation of POMMC Powerhouse</li> </ul>	Complete Within 5 Years of License Issuance
<ul style="list-style-type: none"> <li>• If Project effects associated with activities proposed during the term of the new license are anticipated to extend beyond the current Area of Potential Effect (APE) as defined in the HPMP, SCL will consult with the CRWG to amend the definition of the APE, and will initiate appropriate measures to inventory, assess, and evaluate cultural resources within the modified APE</li> </ul>	As Needed
<ul style="list-style-type: none"> <li>• Monitoring of the historic archeological sites identified above and two prehistoric archaeological sites (45PO581 and 45PO583)</li> </ul>	Starting Year 1 After License Issuance and Every 5 Years Thereafter
<ul style="list-style-type: none"> <li>• Monitoring following extreme high-water events if erosion is known to occur in the vicinity of the pre-historic sites (depends on flow conditions and the Cultural Resources Workgroup decisions following license issuance)</li> </ul>	As Needed
<ul style="list-style-type: none"> <li>• Evaluate the Project for National Register of Historic Places (NRHP) eligibility when 50 years old (i.e., 2016)</li> </ul>	Complete in 2017
<b>RECREATION RESOURCES AND LAND USE</b>	
<ul style="list-style-type: none"> <li>• Finalize a Recreation Resources Management Plan (RRMP) that encompasses all recreation-related PM&amp;E measures:</li> </ul>	Complete Within 1 Year of License Issuance
<ul style="list-style-type: none"> <li>• Implement a RRMP:                             <ul style="list-style-type: none"> <li>○ Reporting and consultation with the Recreation Resources Workgroup (RRWG)</li> </ul> </li> </ul>	Implement Starting Year 2 After License Issuance  Annually Starting Year 2 After License Issuance

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Improve recreational facilities at developed recreation sites. Proposed measures include:                             <ul style="list-style-type: none"> <li>○ <u>Boundary Forebay Recreation Area</u> – Enhance campground facilities and day-use picnic areas, extend an existing boat ramp lane, provide additional I&amp;E signage, and provide ADA-accessible facilities</li> <li>○ <u>Boundary Vista House Recreation Area</u> – Add I&amp;E signage, provide ADA-accessible facilities</li> <li>○ <u>Boundary Tailrace Recreation Area/Machine Hall Visitors’ Gallery</u> – Update I&amp;E signage and displays at the Machine Hall Visitors Gallery and provide ADA-accessible facilities</li> <li>○ <u>Metaline Waterfront Park Boat Launch</u> – Replace the existing boat launch, extend a boat ramp lane, provide adequate gravel roadway access to the boat ramp, improve parking, provide an accessible dual vault restroom in the vicinity of the boat launch parking area and provide ADA-accessible facilities</li> </ul> </li> </ul>	<p>Complete Within 3 to 5 Years of License Issuance</p> <p>Complete Within 8 to 10 Years of License Issuance</p> <p>Complete Within 8 to 10 Years of License Issuance</p> <p>Complete Within 3 to 5 Years of License Issuance</p>
<ul style="list-style-type: none"> <li>• Development of new recreation sites. Proposed measures include:                             <ul style="list-style-type: none"> <li>○ <u>Peewee Falls Viewpoint and Trail</u> – Develop a new accessible trail and trailhead in the vicinity of the Vista House access road to a viewpoint of Peewee Falls, develop appropriate support facilities, including parking, vault toilet, and signage</li> <li>○ <u>Metaline Falls Portage Trail</u> – Develop a new portage trail in the vicinity of Metaline Falls and provide I&amp;E signage</li> <li>○ <u>Designated Dispersed Shoreline Recreation Sites</u> – Enhance six shoreline recreation sites (3 BLM and 3 USFS) to accommodate boat-in camping and day use</li> </ul> </li> </ul>	<p>Complete Within 6 to 7 Years of License Issuance</p> <p>Complete Within 6 to 7 Years of License Issuance</p> <p>Complete Within 6 to 7 Years of License Issuance</p>
<ul style="list-style-type: none"> <li>• Over the term of the license, replace and/or significantly repair various recreation site facilities, infrastructure, and amenities, based on periodic monitoring</li> </ul>	<p>As Needed Between 30 to 50 Years from License Issuance</p>
<ul style="list-style-type: none"> <li>• Implement a Shoreline Dispersed Recreation Management Program (a component of the RRMP)</li> </ul>	<p>See New Recreation Sites above and Operations and Maintenance Program below</p>
<ul style="list-style-type: none"> <li>• Implement an Operations and Maintenance Program (a component of the RRMP):                             <ul style="list-style-type: none"> <li>○ Covering all SCL-managed recreation sites and use areas (developed and dispersed)</li> <li>○ Providing annual maintenance at the boat launch at Metaline Waterfront Park</li> <li>○ Periodically re-assessing the public access and security policies and needs at the Tailrace Recreation Area and Machine Halls Visitors Gallery</li> </ul> </li> </ul>	<p>Annually Throughout the Life of the License</p>

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Implement a Recreation Monitoring Program (a component of the RRMP)</li> </ul>	<p>Annually or Every 6 Years Throughout the Life of the License (depending on the monitoring indicator)</p>
<ul style="list-style-type: none"> <li>• Develop and implement a multi-resource I&amp;E Program (a component of the RRMP) <sup>4</sup></li> </ul>	<p><u>Develop Program:</u> Complete Within 3 Years of License Issuance</p> <p><u>Implement Enhancements:</u> Complete Between Years 4 and 13 After License Issuance</p>
<ul style="list-style-type: none"> <li>• Participate in the development of regional water trail program on the Pend Oreille River</li> </ul>	<p>As Needed</p>
<ul style="list-style-type: none"> <li>• Implement Shoreline Management Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Define and map Project shoreline land use designations, allowed uses, and required approvals; and apply these designations to Project lands and waters</li> <li>○ Develop, implement and monitor use of guidelines for private shoreline facilities along the Boundary Reservoir shoreline</li> <li>○ Periodically remove shoreline debris</li> <li>○ Develop and implement a Project public safety and education program</li> </ul> </li> </ul>	<p>Implement Starting Year 1 of License Issuance</p> <p>Complete and Implement Within 2 Years of License Issuance</p> <p>Starting Year 3 After License Issuance and Every 2 Years Thereafter</p> <p>As Needed</p> <p>Complete and Implement Within 2 Years of License Issuance</p>

<sup>4</sup> This program addresses I&E needs for recreation resources, aesthetics/visual resources, geology and soils, engineering, fish and aquatics resources, cultural resources, botanical resources and wildlife resources.

Proposed PM&E	Anticipated Timeframe
<ul style="list-style-type: none"> <li>• Implement Travel and Public Access Management Program (a component of the TRMP):                             <ul style="list-style-type: none"> <li>○ Provide adequate operational access to Project hydroelectric facilities and operations areas</li> <li>○ Restrict and manage public access at or near certain Project facilities and hazardous operational areas for security and safety reasons</li> <li>○ Provide adequate public access to Project recreation facilities and use areas</li> <li>○ Provide compatible access to the Boundary Wildlife Preserve, Metaline Island and Rat Island and manage public use</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Annually Throughout the Life of the License  Annually Throughout the Life of the License  Annually Starting Year 3 After License Issuance  Annually Starting Year 3 After License Issuance
<ul style="list-style-type: none"> <li>• Implement a Road Decommissioning Plan:                             <ul style="list-style-type: none"> <li>○ Decommission well heads and associated roads</li> <li>○ Monitor to ensure adequate vegetation recovery</li> </ul> </li> </ul>	Implement Starting Year 1 After License Issuance  Complete Within 2 Years of License Issuance  Annually Years 3 and 4 After License Issuance
<ul style="list-style-type: none"> <li>• Implement ongoing road maintenance</li> </ul>	Annually Starting Year 1 After License Issuance
<ul style="list-style-type: none"> <li>• Adjustments to the current FERC Project boundary to include Project-related facilities, lands and roads that are currently outside of the Project boundary (changes are detailed in Exhibit G)</li> </ul>	Implement Starting Year 1 After License Issuance
<b>SOCIOECONOMICS RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Addressed by measures of other resource areas</li> </ul>	See above
<b>TRIBAL RESOURCES</b>	
<ul style="list-style-type: none"> <li>• Addressed by measures of other resource areas</li> </ul>	See above

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