

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form*. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. **Place additional certification comments, entries, and narrative items on continuation sheets if needed (NPS Form 10-900a).**

1. Name of Property

historic name BOUNDARY HYDROELECTRIC PROJECT
other names/site number FERC Project No. 2144-038

2. Location

street & number 1198 Boundary Dam Access Road not for publication
city or town Metaline vicinity
state Washington code WA county Pend Oreille code 051 zip code 99152

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,
I hereby certify that this X nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

 national X statewide local

Applicable National Register Criteria

 X A B X C D

Signature of certifying official/Title _____ Date _____

WASHINGTON STATE SHPO
State or Federal agency/bureau or Tribal Government

In my opinion, the property meets does not meet the National Register criteria.

Signature of commenting official _____ Date _____

Title _____ State or Federal agency/bureau or Tribal Government

4. National Park Service Certification

I hereby certify that this property is:

- entered in the National Register determined eligible for the National Register
- determined not eligible for the National Register removed from the National Register
- other (explain:) _____

Signature of the Keeper _____ Date of Action _____

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5. Classification

Ownership of Property
(Check as many boxes as apply.)

Category of Property
(Check only **one** box.)

Number of Resources within Property
(Do not include previously listed resources in the count.)

<input type="checkbox"/>	private
<input checked="" type="checkbox"/>	public - Local
<input type="checkbox"/>	public - State
<input type="checkbox"/>	public - Federal

<input type="checkbox"/>	building(s)
<input checked="" type="checkbox"/>	district
<input type="checkbox"/>	site
<input type="checkbox"/>	structure
<input type="checkbox"/>	object

Contributing	Noncontributing	
		buildings
		district
		site
		structure
		object
9	7	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing)

N/A

Number of contributing resources previously listed in the National Register

None

6. Function or Use

Historic Functions

(Enter categories from instructions.)

Industry: Energy Facility: Hydroelectric Dam

Industry: Energy Facility: Power Plant

Recreation: General

Current Functions

(Enter categories from instructions.)

Industry: Energy Facility: Hydroelectric Dam

Industry: Energy Facility: Power Plant

Recreation: General

7. Description

Architectural Classification

(Enter categories from instructions.)

Other: Industrial/Utilitarian

Modern Period:

Materials

(Enter categories from instructions.)

foundation: Concrete

walls: Concrete

Stone

roof:

other:

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Narrative Description

(Describe the historic and current physical appearance of the property. Explain contributing and noncontributing resources if necessary. Begin with a **summary paragraph** that briefly describes the general characteristics of the property, such as its location, setting, size, and significant features.)

The 1,040-megawatt Boundary Hydroelectric Project (Boundary Project) impounds the Pend Oreille River in a rural canyon north of Metaline Falls, in Pend Oreille County (pronounced Pon-deh-RAY), Washington, and is owned and operated by Seattle City Light (City Light) under Federal Energy Regulatory Commission (FERC) License No. 2144. Completed with four generation units in 1967, the multi-component facility was built between 1963 and 1967 and consists of a concrete variable-radius, double curvature, thin arch dam, an underground powerhouse, the Vista House, and other support and recreation-related built resources as were developed during the original construction period. The overall nominated district covers 167 acres, all located within the larger boundary for the FERC license.

The Boundary Project is located at river mile 17 on the Pend Oreille River in a narrow canyon in the Selkirk Mountains, in northeastern Washington, about ten miles north of the Town of Metaline Falls and one mile south of the U.S.-Canada border. Boundary is a multi-component project occupying 167-acres within the larger licensed area, and is operated by Seattle City Light under FERC License No. 2144.¹ The individual resources of the Boundary Project were designed by multiple engineering firms and architectural firms as detailed below, under the direction of Herbert V. Standberg, City Light's project engineer, with Cr. Hoidal and Robert L. Skone providing, respectively, civil and electrical engineering oversight.

The Boundary Project is documented as a "district" which includes the dam, forebay, powerhouse, transmission line, Vista House, and related recreational and support structures, tied together by the original looped road system from the controlled access point at the end of Boundary Road (County Road No. 62), as individually described below.

1. **VISTA HOUSE** (1965) *Historic Contributing*

Designed by the Spokane-based Walker & McGough Architects and built under City Light Specification No. 1891 by S. G. Morin & Sons, also of Spokane, the Vista House is a single-story concrete and wood-framed structure built on the eastern rim of the Pend Oreille River canyon, overlooking the Boundary Dam site. The building was constructed to provide visitors to the project a safe viewing point of the construction below. Rising from a concrete slab foundation, unfinished tapered concrete stem walls form the lower exterior of an octagonally shaped viewing room overlooking the canyon with a rectilinear wing to the east that includes entry, service, and storage areas. A large oversized roof system with broadly projecting eaves is supported by a heavy timbered frame, much of which is exposed on the interior, portions of which are supported by a mammoth concrete column at the center of the viewing room. The interior of the viewing room offers a near-panoramic view of the canyon and the Boundary Project dam, tailrace, and reservoir, with exhibits on local natural resources and the history and development of the project.

Related elements included in the Vista House, all constructed as part of the original development, include the simply detailed parking area to the east, accessed via State Route 31 and the Eastside Access Road,² and an original outdoor patio with wood slat seating consistent with the design. A trail leads down the canyon rim to a cantilevered viewing deck with decorative wood planking and canted wood railing, also designed by Walker & McGough.

¹ The entire FERC project boundary encloses approximately 2,720 acres, of which 609.24 acres are federal land managed by the U.S. Department of Agriculture (Forest Service) within the Colville National Forest, 329.35 acres are federal land managed by the U.S. Bureau of Land Management, and 1,781.41 acres are owned by City Light and state, city, county, and private entities.

² Vista House can also be accessed by a staff-only roadway across the crest of the dam and up the east side of the canyon.

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2. **FOREBAY RECREATION AREA** (1987-1990s, as subsequently modified) Non-Historic, Non-Contributing

This area, southwest of the dam, was used as a spoils disposal site for excavated materials during construction of the Boundary Project, with plans for its later recreational use conceived as part of the original project development (see, for example, Figures 6 and 7). Although a plan for the area was created in 1967, minimal development of the area occurred. By 1969 there was an unpaved access road and parking, along with a launching area. A restroom was built in 1972. Formal planning for the area did not resume until 1987. Much of the park in its most recent form was constructed in the mid-1990s. In 2017, redevelopment of the campground was initiated to fulfill a requirement of the Boundary Project FERC license. The 1972 restroom was removed as part of this project. A log miner's cabin is located on the site, but due to compromised integrity and a lack of historic information, it was formally determined not eligible in 2007-2008.

3. **BOUNDARY DAM** (1965-1967) *Historic Contributing*

Boundary Dam is a 340-foot-high, 740-foot-long concrete variable-radius, double-curvature, thin-arch structure that rises from the bedrock of the Pend Oreille River and impounds an upstream 1,794-acre reservoir at a normal full pool elevation of 1,994 feet above sea level.³ The dam's 740-foot-long structure includes two 50-foot-wide, 45-foot-tall spillways fitted with radial gates, one on each of the left and right abutments.⁴ A 26-foot-wide, 9-foot-tall hinged leaf-skimmer gate, designed to pass surface debris that would collect in front of the intake structure, is located just adjacent to the left spillway. At the base of the dam face, seven 21-foot-high, 17-foot-wide, vertical sluice gates allow for drainage, and there is a 35-foot-wide, 57-foot-tall sluice maintenance gate on the upstream face. The thin arch dam curves in both horizontal and vertical planes, between the left and right abutments and, from bottom to top, with the crest jutting downstream from the base. In section, Boundary Dam tapers from 32-feet wide at the base, widening to 34-feet at the sluiceways, and then tapering to just 8-feet wide at its crest,⁵ which doubles as an internal-only vehicular access route across the river, protected on both the upstream and downstream face by a 4-foot tall parapet. The roadway allows internal access across the river, connecting the powerhouse and service area with the Vista House.⁶

The conceptual design of Boundary Dam, along with most of the project except as noted, was originally conceived by J. L. Savage, consulting engineer, and then refined and finalized by Seattle City Light staff. The construction documents were prepared by Bechtel, Leeds, Hill & Jewett, of San Francisco, who are considered the engineers of record. Mannix-SGS Construction, of Calgary, Alberta, in association with two other firms, was the primary contractor.⁷

4. **FOREBAY, INTAKE TUNNEL/GATES AND PENSTOCKS** (1964-1967) *Historic Contributing*

Located to the south of the left abutment of the dam, the approximately 800-foot-long, 300-foot-wide forebay is where reservoir water pools before entering the powerhouse intake tunnels. A trash rack structure across the entrance to the forebay prevents water-borne debris from entering the forebay. The forebay is a water impoundment approximately 800-foot-long, 300-foot-wide, from which water enters six 30-foot-wide, 34-foot-tall horseshoe-shaped tunnels carved out of solid rock that individually lead to

³ All elevations in this report are based on the North American Vertical Datum of 1988.

⁴ As used at the Boundary Project, left and right are based on the side of the river channel as looking from the south, or upstream of the dam.

⁵ Seattle City Light. *Power System Engineering Handbook*. Seattle, WA: Seattle City Light, 2011.

⁶ Schnabel Engineering. Boundary Hydroelectric Project, 2015 FERC Part 12D Dam Safety Inspection Report, Prepared for Seattle City Light, December 8, 2015.

⁷ The four-firm "combine" awarded the \$28m contract for the main construction of the project were Mannix Construction and SGS Contractors Inc., both of Calgary; Frontier Construction, of Toronto, Ontario; and McLaughlin Inc., of Great Falls, MT. (*Spokane - Review*, 30-April-1964, found in Seattle Municipal Archives, City Light Clipping File).

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six intake gates, controlling water flow into six penstocks. Each penstock is 165-foot-long, beginning with a 24-foot-wide, 34-foot-high section that reduces to a 26-foot-diameter concrete-lined section and then, finally, to a 150-foot-long, 26- to 20-foot-diameter steel-lined section before water enters the turbines.

5. **POWERHOUSE** (1964-1967, 1986) *Historic Contributing*

The Boundary Powerhouse is an underground cavern excavated of solid rock that consists of multiple components including the Machine Hall, the Service Bay, and the two access tunnels that provide entry into the powerhouse at different levels. Exclusive of the tunnels, the main portion of the powerhouse (the Machine Hall and the Service Bay) is 477-feet long and 76-feet wide. The powerhouse and access tunnels were excavated from the solid limestone formation on the left bank of the river and are located approximately 300 feet below the surface of the rock formation that forms the dam's left abutment.

The Machine Hall occupies the eastern 410 feet (+/-) of the powerhouse and on multiple levels contains the generation equipment above the turbines and penstocks. The Service Bay, which is located to the west of the Machine Hall and occupies the remaining length of the powerhouse (63 feet, +/-), consists of seven floor levels including a heating and ventilating loft located below an arched roof. These seven levels, from floor elevation 1725' to 1796.5', include building services, storage, shops, and other support functions. The Control Room, at elevation 1759' (fourth floor), provides visual access to the generator floor. Offices are located at elevation 1771.5' (fifth floor). A lobby area and Visitors' Gallery are located at elevation 1784' (sixth floor) and look down onto the main floor of the Machine Hall (see Figure 9).

The Machine Hall includes all vertical floor levels from the main floor at elevation 1759' (fourth floor) down to the draft tube gallery. The interior of the main floor of the Machine Hall, the most visible space in the Machine Hall, is industrial in character, with terra cotta tile over a concrete floor dominated by the tops of the six generator enclosures. Natural stone walls remain visible behind the steel beam and column reinforcement that supports two 250-ton bridge cranes that can travel the length and breadth of the space for equipment maintenance and repair. The ceiling height from the main floor of the Machine Hall to the steel-reinforced top of the Machine Hall is approximately 50 feet.⁸ Originally installed with four General Electric generation units (designated as Units 51-54) with a total capacity of 551 megawatts, the Machine Hall was constructed with space for two additional units (Units 55 and 56, manufactured by Toshiba) that were energized in 1986, adding an additional 399 megawatts.⁹

The Visitors' Gallery provides information on electrical power generation and the Boundary Project and is accessed via a 22' diameter horseshoe-shaped tunnel at elevation 1784' (first floor). This space is notable for its modern design and materials, including aluminum and glass, with an arched cast concrete entry portal and other detailing. Finishes in this space are of painted and stucco concrete with terra cotta tile floors. The second access tunnel, another 22' diameter horseshoe-shaped tunnel, provides entry to the fourth floor of the powerhouse. This tunnel was purposefully sized to allow for maintenance access into the Machine Hall and, as part of the original planning, the later installation of Units 55 and 56. Both access tunnels are framed by arched cast concrete hoods, or "bonnets," that project from the native rock walls.

Water exiting the turbines below the Machine Hall moves through six draft tubes, reinforced tunnels in the rock abutment, that discharge water from the turbines into the tailrace immediately downstream of the dam, and back into the main channel of the Pend Oreille River. Draft tube gates provide a means of isolating the draft tubes for maintenance. Six transformer bays, also carved from solid rock, hold six

⁸ The top rail supporting the gantry cranes is at 1784 feet, or 25' above the main floor. The arch of the ceiling rises roughly another 25 feet above that, at its highest point.

⁹ Subsequent upgrades to the generation units bring the current total rated generating capacity of the powerhouse to 1,040 MW at peak output.

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step-up transformers at an elevation of 1791'. Six 230-kv transmission lines exit the transformer bays beneath hooded concrete openings (bonnets) above the tailrace, and rise approximately 60-feet up the vertical face of the left abutment, before meeting the "pickle forks" as described in Item 6 below, and continuing approximately 2,850 feet to the Bonneville Power Administration substation.

6. TRANSMISSION LINE (1967) *Historic Contributing*

Six three-phase 230-kilovolt transmission lines exit the transformer bays above the tailrace and rise approximately 60-feet vertically to six steel latticework horizontal towers that project at an approximate 20-degree angle from the crest of the left abutment rock formation to assure clearance. Because of their design, these horizontal towers are known as "the pickle forks," since they have a similar appearance to that serving implement. Conductors continue to the southwest, within a maintained corridor for approximately 2,850 feet to six City Light-owned steel latticework transmission towers before bridging over into the Boundary Substation, owned and operated by the Bonneville Power Administration (BPA). The six City Light-owned steel transmission towers mark the boundary of the nominated area. At the BPA substation, Boundary Project-generated power enters the BPA transmission system, where it is transmitted throughout that network to meet demand.¹⁰

7. TAILRACE RECREATION AREA (1967) *Historic Contributing*

The location of a portion of the construction camp and occupied by contractor sheds and staging areas during the excavation of the powerhouse and construction of the dam, this area along the west side of the Pend Oreille River downstream of the dam was subsequently developed as a public amenity following the completion of the project. Grass-planted lawns, parking, picnic tables, barbeque-grills and custom-fabricated metal tube and metal gable roofed shelters provided for public day-use within the project. Use of the Tailrace Recreation Area has been significantly limited by security concerns post-9/11 but it remains largely as originally developed and maintained.

The following resources are all located to the north of the dam and powerhouse area in the Operations and Maintenance Service Area, a cluster of shop, office, and service buildings that support City Light's operation of the facility. This area was originally developed to house the construction office, with a wood-framed City Light project office (no longer extant), and includes a mixture of original and later-constructed warehouses as well as a laydown/materials storage area, gravel pits, and other uses. The northernmost portions of the Service Area, included within the nominated area, are less than 1,000 feet from the US-Canadian border.

8. OIL STORAGE WAREHOUSE (Building A) (1967) *Historic Contributing*

Approximately 25'x50' in size and built of poured-in-place exposed concrete with a character-defining large cantilever roof projecting away from the main volume, the Oil Storage Warehouse is located at the southern entry to the Service Area, at its intersection with the access road and fronts on a large poured concrete pad parking or loading area. A secondary 20'x20' component with a large roll-up garage door is located to the southwest and remains essentially as built and completed by Fall 1967.¹¹

¹⁰ While outside the nominated area, separately owned and operated, and not formally evaluated here, BPA's Boundary Substation, designed and built in 1967 as part of the Boundary development, is likely eligible for listing on the National Register under the *Bonneville Power Administration [BPA] Pacific Northwest Transmission System Multiple Property Submittal*, as approved by National Park Service in August 2012.

¹¹ See, for example, Seattle Municipal Archives, Item No. 186266 (18-August-1967).

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9. **MAINTENANCE GARAGE (Building B)** (1963) *Historic Contributing*

Roughly 60-feet wide and 160-feet long, the Maintenance Garage was built under City Light Specification 1758 for a Prefabricated Metal Warehouse to be erected on a concrete pad at the Boundary Project site. The building was to have vinyl flooring, gypsum board walls, metal roofing and sidings. Bidders were instructed to provide a structure of 60'x160' nominal dimension, "...as manufactured by the Aluminum Company of America or Reynolds Metal Company. Galvanized steel roofing and siding shall be manufactured by the United States Steel Corp..."¹² The Maintenance Garage was fabricated and constructed by the Soule Steel Building Company (SSBC), based in Redmond, Washington. SSBC was one of the thirteen charter members and founders of the Metal Building Manufacture Association and George Cobb, of the Soulé Company, was the third president of the Association.¹³

The Maintenance Garage is a large metal sided, metal roofed, gable structure with an open interior beneath a series of engineered steel frames. A large roll-up garage door is located on the south-facing gable end, with two additional garage doors located facing east. Four galvanized ventilators highlight the gable ridge. Doors are of solid core with plain surfaces and windows, which appear original, and include both horizontal mill-finish aluminum sliders. Some windows have been modified by exterior mounted air-conditioning units. A small rear shed addition is located at the extreme northwest corner, expanding the original volume. Both gable ends at the ridge retain their original "Soule" red on white marker. The building siding is currently cream colored, with green corner board and ridge detail, a non-original modification to the assumed original galvanized finish.

10. **OLD SHIPPING AND RECEIVING BUILDING (Building C)** (1997-1998) Non-Historic, Non-Contributing

This large (60'x160') premanufactured metal framed and sided gable structure was built after the period of significance. Originally serving as the Boundary Project's shipping and receiving building, it was converted to offices, meeting rooms, and warehouse space following construction of the new Shipping and Receiving building in c. 2011 (see below). While generally compatible with the earlier support structures, it is not considered historic.

11. **SERVICE AREA PUMP HOUSE (Building D)** (2004) Non-Historic, Non-Contributing

This small (16' x 23'-4") gable building is constructed from reinforced concrete block on a concrete slab foundation with a standing seam metal roof and gable ends. The building was designed by City Light staff and constructed in 2004 to house pump equipment as part of the Boundary Project water system. While generally compatible with the basic character of the service area, it is not considered historic.

12. **SHIPPING AND RECEIVING BUILDING (Building E)** (2010) Non-Historic, Non-Contributing.

This 50'x100' premanufactured metal-framed and -sided warehouse was built at the Forebay Recreation Area in 2010 to enclose a maintenance project on the dam's sluice gate maintenance gate. Following completion of the sluice gate maintenance gate project, the building was disassembled and relocated to its present location, where it serves as the Boundary Project's shipping and receiving building. While generally compatible with the earlier support structures, it is not considered historic.

¹² Seattle City Light, Specification No. 1758, Prefabricated Metal Warehouse and Garage Building, 1963:55.

¹³ Metal Building Manufacturers Association. *50th Anniversary Collector's Edition, A Supplement to Metal Construction News and Metal Architecture*, July 2006 (found at www.mnba.com, visited 14-September-2017).

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13. WAREHOUSE AND PAINT BUILDING (Building F) (1965) *Historic Contributing*

The Warehouse and Paint Building is an 80'x185' steel frame structure located at the extreme northern end of the Service Area. Its northern wall is about 800-feet from the US-Canadian border. The structure was constructed under City Light Specifications 1857 and 1878, as issued in 1965, the first for the concrete pad and the second for the construction of a prefabricated Metal Storage Building, with 13'-6" tall walls and 4/12 pitch roof. "The building shall be of the highest quality permanent building constructed by Soule' Steel Company, Butler Manufacturing Company, Armco Steel Corporation, Strand Steel Company or other manufacturer regularly engaged in the design, fabrication, and erected of prefabricated metals buildings, and in accordance with the standards of the Metal Building Manufacturers Association."¹⁴

The original length of the Warehouse and Paint Building was approximately 360'. In 1987-88, the northern 150-foot section of the building was disassembled and relocated to City Light's Skagit Project where it continues to be used for storage.¹⁵ The northern gable end of the building at Boundary was enclosed with compatible steel siding material and a large roll-up door now opens onto the remaining concrete pad of the original, larger, structure. A small, non-historic, metal storage shed is located to the northeast rear of the building. The Warehouse and Paint Building, rather ironically, is the only shop building in the Service Area to retain its original galvanized exterior character.

14. SUPPORT BUILDING G (n.d.) Non-Historic, Non-Contributing

Used as staff office space, Support Building G is a single-wide manufactured building located on a raised, metal-skirted foundation and below a free-standing wood-framed, metal roofed, gable protective canopy. Undated, this temporary structure post-dates the period of significance and is considered non-historic.

15. SUPPORT BUILDING H (n.d.) Non-Historic, Non-Contributing

Used as staff office space, Support Building H is a single-wide manufactured building located on a raised, metal-skirted foundation and below a free-standing wood-framed, metal roofed, gable protective canopy. Undated, this temporary structure post-dates the period of significance and is considered non-historic.

16. VEHICLES, VESSELS, AND HEAVY EQUIPMENT GARAGE (Building I) (2006) Non-Historic, Non-Contributing

Built following the removal of the original ell-shaped, "Ranch" style City Light construction office, this single-slope roofed metal frame building provides for six enclosed and four open vehicle storage bays to support project operations. Overall size is approximately 40'x140' with a slightly wider section at the north. While somewhat compatible with the earlier support structures, it is not considered historic.

¹⁴ Seattle City Light. Specification 1857 for Prefabricated Metal Storage Building for Boundary Project, 13-January-1965:43.

¹⁵ The relocated portion of the Boundary Paint Shop (Warehouse F) is known as the "Sickler Building" and is located in Newhalem, on what was formerly known as Gorge Street (see Seattle City Light Drawing D-25318).

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KNOWN MODIFICATIONS:

In addition to the changes mentioned above, there have been relatively few significant modifications or additions to the Boundary Project since its completion and the beginning of commercial service in 1967.

The major modification at the Boundary Project was the installation of Units 55 and 56 in 1986, which completed the original six-unit design planned for the project from the start. City Light filed for a FERC license amendment in 1981 to accomplish this work and the two additional units were energized in 1986. Various changes to the Service Area, the former construction yard, have been generally compatible with the historic features, although the original project office was removed and replaced with new work. Various modifications to the dam for improved safety and operations do not seriously impact historic character. While not entirely clear, portions of the Visitors' Galley, overlooking the main floor of the Machine Hall, may not have been finished until after the project went into operation.

Multiple changes to the Forebay Recreation Area have occurred after 1986. This area, as described above, was originally conceived as part of the Boundary Project but was only minimally developed for recreation purposes until the mid-1990s.

City Light has routinely implemented maintenance and upgrade activities to address decades of continuous use and improve the operational efficiency of the Boundary Project's generating equipment. The four Nyquist and Holm AB turbines (Units 51-54) that were installed as part of the original construction were replaced with DSD Noell units between 1999 and 2002. The two Toshiba turbine runners for Units 55 and 56, as installed in 1986, were replaced in 2014 by new Weir American Hydro runners. As is typical for a functioning hydroelectric facility, all six generators have been upgraded and rewound on a regular basis throughout the project's history. The generators in Units 55, 53, and 56 were most recently rewound in 2013, 2014, and 2015, respectively, with rewinds for the other three generators planned to occur between 2019-2022. The step-up transformer for Unit 55 was replaced in 2017; work to replace the step-up transformer for Unit 56 will be completed in 2018, with replacements of the step-up transformers for Units 51, 52, and 54 scheduled to occur concurrently with those units' generator rewinds, and Unit 53 at the conclusion.¹⁶ In the early 2000s, the sixth floor tunnel entrance leading to the Visitors' Gallery and transformer bays was extended by 120'.

Changes to Boundary Dam itself have generally been limited. In 2014 City Light modified Spillway 2, on the right abutment, via the addition of nine steel and concrete roughness elements applied to the lower third of the spillway apron with the goal of reducing levels of total dissolved gas in spill flows. Spillway 1, on the left abutment, was modified in 2016 for the same purpose, with the addition of four stainless steel roughness elements, and the removal of the last four feet of the spillway apron.

SUMMARY:

There are fifteen (15) individual resources identified that comprise the Boundary Project, located on the Pend Oreille River, in northeastern Washington, nine (9) of which are considered significant and date from the original period of construction, between 1963 and 1967. The six non-historic resources consist of the Forebay Recreation Area and the largely compatible warehouse and support structures located in the original construction yard.

The Boundary Dam, Powerhouse, Vista House, and related facilities remain largely "as built" with very high integrity in all aspects of evaluation, continuing to effectively relate their historic design, functions, and the associations for which the Boundary Project is considered significant.

¹⁶ Aronowitz, Michael (City Light), communication with the author, 26-October-2017.

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The following table summarizes the resources that comprise the Boundary Project, their date of construction and historic significance within the Boundary Project district.

Resource Name	Historic Contributing	Non-Historic, Non-Contributing
Vista House (1965)	X	
Forebay Recreation Area (1987-1990s, modified)		X
Boundary Dam (1965-1967)	X	
Forebay, Intake Tunnel/Gates, and Penstocks (1964-1967)	X	
Powerhouse (1964-1967, 1986)	X	
Transmission Line (1967)	X	
Tailrace Recreation Area (1967)	X	
Oil Storage Warehouse (1967)	X	
Maintenance Garage (1963)	X	
Old Shipping and Receiving Building (1997-1998)		X
Service Area Pump House (2004)		X
Shipping and Receiving Building (2010)		X
Warehouse and Paint Building (1965)	X	
Support Building G (n.d.)		X
Support Building H (n.d.)		X
Vehicles, Vessels, and Heavy Equipment Garage (2006)		X
TOTALS	9	7

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8. Statement of Significance

Applicable National Register Criteria

(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- B Property is associated with the lives of persons significant in our past.
- C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations

(Mark "x" in all the boxes that apply.)

Property is:

- A Owned by a religious institution or used for religious purposes.
- B removed from its original location.
- C a birthplace or grave.
- D a cemetery.
- E a reconstructed building, object, or structure.
- F a commemorative property.
- G less than 50 years old or achieving significance within the past 50 years.

Areas of Significance

(Enter categories from instructions.)

Industry

Engineering

Architecture

Period of Significance

1963-1967

Significant Dates

29-September-1967 (Dedication)

Significant Person

(Complete only if Criterion B is marked above.)

Cultural Affiliation

Architect/Builder

Bechtel-Leeds-Hill-Jewett (Designers of Record)

J. L. Savage, Seattle City Light (Engineers)

Mannix SGS (Builders)

Walker & McGough, (Architects, Vista House)

S. G. Morin & Sons, (Builder, Vista House)

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Narrative Statement of Significance

(Provide at least **one** paragraph for each area of significance.)

The Boundary Hydroelectric Project, located in Pend Oreille County, Washington, is historically significant under criteria A for its direct connection to the broad pattern of post WWII hydro-electric development. Completed in 1967 by Seattle City Light, the dam was a major element of the city's power generation response to the increased growth of the region during the post-World War II era. Seattle City Light is one of the largest public power providers in the United States and the Boundary Project was the last major hydroelectric project completed by the utility. The hydro project has had lasting impact on the history and development of Pend Oreille County and the communities of Metaline and Metaline Falls.

The Boundary Hydroelectric project is also historically significant under Criterion C as a resource that embodies the distinctive characteristics of its type and period of construction. Boundary dam, with a crest height of 360 feet, is the second tallest arch dam in the state. Such arch designs, with its variable-radius and double curvature, account for less than 3% of known dams in Washington State. Additionally the Boundary projects underground powerhouse is one of the largest, if not the largest example in the United States.

The hydro project is significant at the statewide level due to its unique relationship of a public entity owning, building, and operating a large industrial facility on two sides of the state. The period of significance begins in 1963, the date of completion of some of the first buildings on site, and ends in 1967, the year that the project came on-line.

SETTING:

The Boundary Project is located on the Pend Oreille River, about 100 miles north of Spokane, one mile south of the US-Canadian border, and 15 miles from Idaho, in the extreme northeastern corner of Washington state. The Pend Oreille, a tributary to the Columbia River, originates at Lake Pend Oreille in northern Idaho and flows for 130 miles through Idaho and northeastern Washington. At Boundary Dam the river runs northerly toward its confluence with the Columbia River in British Columbia, Canada. Nestled within the Selkirk Mountains, the canyon flanking the Pend Oreille is characterized by large limestone outcroppings and timbered hillsides. The nearest communities to the Boundary Project are Metaline and Metaline Falls, two small incorporated cities with a total population of about 500 persons in 2015. The two adjacent settlements are sometimes collectively termed "the Metalines." Crawford State Park, a 49-acre forested day-use preserve that includes Gardner Cave, is located to the west of Boundary Dam. The Colville National Forest is located to both the east and west of the project site.

The Boundary Project lies within the traditional territory of speakers of the Interior Salish language, and in particular, the Kalispel Tribe of Indians. The fur trade and gold prospecting brought the first Euro-Americans to the area in early- to mid-19th century, but the first permanent settlement in the Metalines region did not occur until the 1880s when sizable quantities of lead and zinc ore deposits were identified. It was not until the arrival of the Idaho and Washington Northern Railroad in the early 20th century, later absorbed into the Chicago, Milwaukee & St. Paul Railroad, that the area saw any significant development, including the area's first large-scale mines. Lewis Larsen arrived in the area in 1909 and established the Inland Portland Cement Company (later the LeHigh Cement Company), which became the "economic building block on which the town of Metaline Falls would grow."¹⁷ Larsen, a successful mining engineer, laid out an entirely new city, Metaline Falls, and promoted it as a model industrial community, to some national attention.¹⁸ Metaline Falls was incorporated in 1911, just two weeks before Pend Oreille County, the last of the state's 39 counties, was formed by partition from Stevens County.

¹⁷ Nordstrand, John. *Metaline Falls – Thumbnail History*. Found at www.historylink.org, visited 22-August-2017 (HistoryLink.org Essay 9216).

¹⁸ "Building New Model Town in Washington," *Trenton (NJ) Sunday Advertiser*, 18-Sept-1910, 32:6.

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Metaline Falls prospered during the 1920s and 1930s, with a population growing to more than 800 persons. In 1937 Larsen built a hydroelectric project to power his companies, as well as the town, using a tunnel that diverted Pend Oreille River water through solid rock to a powerhouse.¹⁹ By the late 1960s, as the mines played out and nearby timber declined, so too did the city. "The successful industrial haven envisioned by the founders and developers of Metaline Falls and the north Pend Oreille Valley began to fade."²⁰ The railroad ceased operation of the branch line in 1977; however, a small local line, the Pend Oreille Valley Railroad, continues to operate through the area on a limited basis.

SEATTLE CITY LIGHT

The Boundary Project was designed and built by City Light, the municipal utility that provides power to Washington's largest city. Public ownership of the electrical power system in Seattle first became an issue in the final decade of the 19th century, when anti-corporate, anti-monopoly sentiments that characterized the Progressive movement came to the fore.²¹ Seattle City Engineer R. H. Thomson (1856-1949) was a key figure in the development of the city and had played an important role in its design, from shaping its landscape by leveling hills, to the creation of the city's municipal water utility.²² Thomson foresaw the value of municipally-owned electrical generation plants to challenge what was seen as a monopoly controlled by investors. He saw the Cedar River, located forty miles southeast of Seattle, as the best potential source to generate hydroelectric power, and became a leading advocate of a bond measure proposed in 1902 to determine whether the city would build a municipally-owned power plant there. The bond measure passed in 1904, and on October 14, 1904, the city's first generators were started at the Cedar Falls Hydroelectric Project.

Thomson, however, didn't have any background in how to build and run an electric utility.²³ Luckily, in March 1902, just after the bond was approved, James Delmage (J.D.) Ross (1872-1939), a self-trained engineer, offered to design and oversee the construction of the new Cedar Falls plant. In 1903 Ross officially joined the city's staff as Thomson's assistant and "chief electrical engineer." Construction at Cedar Falls began from Ross's designs and its first generated power was transmitted to Seattle in January 1905. Voters approved bonds to expand the municipal generation system in 1906 and again in 1908.²⁴ "By 1908, Cedar Falls was producing four times the power envisioned in the original design, and Seattle consumers and businesses wanted more."²⁵ Cedar Falls is significant as the first power project in the United States to be financed by public general obligation bonds and is among the earliest, if not the first, large scale hydroelectric developments to be developed by a municipally-owned utility.²⁶

In 1905 Thomson moved all the city's electric operations and related staff, including Ross, into a new Department of Light and Power, creating what is today's Seattle City Light, an element of Seattle's municipal government, with responsibility for electric supply and distribution. City Light continued to compete for customers with investor-owned electric companies in the Seattle-area for the next half century, especially the Seattle Electric Company (later Puget Sound Power and Light), which was under the control of Stone and Webster, a nationally significant electric engineering firm and utility holding company. Stone and Webster, which controlled the development at Snoqualmie Falls and had a large share of the industrial market in the Seattle area, saw City Light as a threat and created challenges to the municipal operation. City Light strove to ensure its ability to supply adequate and reliable power, and continually sought ways to develop its own sources of generation, such as at Cedar Falls.

¹⁹ Perrin, Natalie K., and Heather Lee Miller. Pend Oreille Mines & Metals Company, Power Project, DAHP Level II Mitigation Documentation, prepared for Seattle City Light, December 2015.

²⁰ Nostrand, op cit.

²¹ Johnson, Larry E. Skagit River and Nehalem Creek Hydroelectric Projects, National Register Documentation, prepared for Seattle City Light, August 2010.

²² Wilson, William H. Shaper of Seattle: Reginald Heber Thomson's Pacific Northwest. Pullman, WA: WSU Press, 2009:1.

²³ Ibid.

²⁴ Crowley, Walt. *City Light's Birth and Seattle's Early Power Struggles, 1886-1950*. Found at www.historylink.org, visited 1-November-2017 (HistoryLink.org Essay 2318).

²⁵ Wilma, op cit, 2010:27.

²⁶ Cedar Falls Hydroelectric Project (<http://www.seattleasce.org/committees/hh/cedarfalls.pdf>, visited 1-Nov-2017).

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In 1911 J. D. Ross became the Superintendent of Lighting, a position he would occupy almost continuously until his death 28 years later. As early as 1912, Ross, looking for new sources to augment Cedar Falls, saw the potential of the Skagit River, in the North Cascade Mountains approximately 100 miles to the northeast of Seattle, to solve Seattle's growing demands for power. After Stone and Webster, the east-coast investors that owned City Light's major competitor, failed to utilize the construction permits they held for development on the Skagit River, City Light filed for that right.²⁷ After a protracted fight, in December 1918, City Light secured construction permits from the federal government to build a hydroelectric facility in the Skagit gorge.²⁸ The Skagit Hydroelectric Project would eventually include three power developments – Gorge, Diablo, and Ross – and provide much of City Light's electric power needs through the mid-20th century. City Light's pursuit of municipally owned and controlled generation, starting at Cedar Falls and then continued at the Skagit, demonstrates the utility's approach to providing the bulk of its own demand and ensuring its independence from investor owned utilities that might impact or restrict its operations.

Under J. D. Ross, City Light grew into one of the largest municipally owned electric utilities in the nation, notable for generating its own power and providing low-cost, reliable, electric power. Ross himself, considered the "Father of City Seattle City Light," became a nationally known leader in the public power movement of the early 20th century, and, based on City Light's success, was a widely recognized proponent of the value of public versus private, investor-owned power. Ross came to the attention of President Franklin D. Roosevelt and in 1935 he was appointed to the Securities and Exchange Commission, where he served alongside pro-investor power Chairman Joseph P. Kennedy.²⁹ "As an outspoken advocate of public ownership of power facilities, his interpretation of the law is hardly likely to be friendly to the Commission's new wards."³⁰ Ross was also a proponent of a regional electric transmission grid that could transmit power as far from the Pacific Northwest as Chicago, and of the development of "inter-connections," where competing utilities, both public and private, could share generation between systems to ensure reliable power across their service areas. In 1937 Roosevelt named Ross the first administrator of the Bonneville Power Administration (BPA), where he would play a key role in establishing that agency as the primary electrical transmission and distribution network in the Pacific Northwest, a role BPA continues to play today.

With the creation of the BPA, City Light, along with other public and private utilities in the Pacific Northwest, became a player in the Northwest Power Pool, which was established to rationalize and maintain critical power needs throughout the region during World War II. During the war, the BPA built its Master Grid transmission network to distribute the massive federal generation capacity of the Bonneville and Grand Coulee dams. City Light, while maintaining its own generation facilities on the Skagit and elsewhere, was bolstered by the federal generation from those dams, to augment its own facilities.

After World War II, as the region faced large population increases and continued industrial development, City Light, like most other area utilities, looked for new sources of generation to address power shortages and meet the growing demand.³¹ Improvements and expansion of its Skagit River project, including the expansion of Gorge Powerhouse in 1951 and the completion of Ross Powerhouse in 1952, resulted in increased power for City Light, but even those developments were not enough to meet its projected long-term needs. To meet that

²⁷ Stone and Webster, according to Ross, filed on numerous hydroelectric sites simply to inhibit any competitor from doing so.

²⁸ Wilma, David. *Upper Skagit River Hydroelectric Project*. Found at www.historylink.org, visited 1-November-2017 (HistoryLink.org Essay 5347)

²⁹ Stein, Alan. *Ross, James Delmage*. Found at www.historylink.org, visited 23-August-2017 (HistoryLink.org Essay 2557). The investment strategy of investor owned utilities, particularly those under the control of Samuel Insull, are frequently cited as a major cause of the collapse of the stock market in 1929 and the beginning of the Great Depression. Ross's public power expertise was a key factor in his appointment to the SEC.

³⁰ *Ironwood (MI) Daily Globe*, 29-August-1935, 8:1-2.

³¹ This was at least partially exacerbated by changes in federal policy that limited federal investment in new generation sources and encouraged local, investor-owned, utilities to develop their own, new sources of power following the election of Dwight Eisenhower in 1954.

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demand, City Light undertook a comprehensive study of other remaining generation options throughout Washington state. "Though there was still some hydropower potential on the Skagit River, City Light in 1950 began looking to tap the energy of the Pend Oreille River in the far northeast corner of Washington, 300 miles away."³² Seattle Times reported in 1953 that:

"City Light, in search of future hydroelectric sites, may develop a dam on the Pend Oreille River in northeastern Washington.... [Superintendent E. R.] Hoffman said that although the site is several hundred miles from Seattle, it should be possible to make transmission line connections with the Bonneville Power Administration..."³³

BOUNDARY PROJECT PLANNING 1953-1963

As early as 1906 the U.S. Army Corps of Engineers (Army Corps) had identified the Pend Oreille River canyon as a likely hydropower site. By 1917 Col. Hugh Lincoln Cooper, formerly of the Army Corps, had acquired rights in the area. Cooper, whom the local paper described as "...the world's foremost hydroelectric engineer," spent an estimated \$300,000 of his own money on permits and preliminary engineering for a hydroelectric project on the Pend Oreille, with the intention of completing a planned \$22 million project.³⁴ The location Cooper proposed for his project was Z Canyon, located on the Pend Oreille River approximately one mile upstream from the future Boundary Dam site. "Cooper had been an engineer very active in the development of potential hydroelectric sites in the northeastern part of the state."³⁵ Cooper's project, despite considerable planning and investment, failed to materialize. In 1947 the Army Corps proposed a "high dam" on the future Boundary site, more than 400 feet tall, but this concept was met with massive local opposition and dropped from consideration due to its potential impacts on local mining. In 1952, long after Cooper's death, the State of Washington canceled Cooper's still undeveloped water rights on the Pend Oreille River. The following year, in March 1953, the Pend Oreille Public Utility District (PUD) purchased the land Cooper owned in the region. They filed for the development of the Box Canyon Hydroelectric Project, which was completed in 1956.³⁶ Box Canyon Dam is located at the upstream end of what would later become the Boundary reservoir.

While Seattle City Light may have had some interest in the Pend Oreille River during the early 20th century, it was not until the 1950s that they made any serious effort to develop the river for power generation. In 1951 City Light commissioned a study of potential hydropower sites throughout Washington to provide additional generation capacity and, in 1953-1954, they filed for a license with the Federal Power Commission (FPC), predecessor to FERC, to investigate power sites on the Pend Oreille River. This filing was the "official" beginning of what would become the Boundary Project.³⁷

City Light, in search of future hydroelectric power sources, may develop a site for a dam on the Pend Oreille River, in northeastern Washington....the type of license sought would give City Light the right to make extensive technical studies preparatory to possible development.³⁸

³² Wilma, op cit., 2010:77.

³³ *Seattle Daily Times*, 28-October-1953, 1:6.

³⁴ *Seattle Daily Times*, 28-January-1917, 2nd, 26:1 and 24-Nov-1929, 1:5. See also "Obstacles Never Dismayed Famed Builder of Big Dams," unidentified newspaper clipping dated 31-Jan-1937, Seattle City Light files.

³⁵ Billington, Ken. *People, Politics and Public Power*. Seattle, WA: Washington Public Utility District's Association, 1988:432. Col. Hugh Cooper (1865-1937) was a noted civil engineer with a long background in the US Army Corps of Engineers before establishing a consulting firm that worked throughout the world. Among his most notable projects, Cooper served as the supervising engineer for the Wilson Dam, in Muscle Shoals, Alabama, a key element in what would eventually become the Tennessee Valley Authority (see *Florence (AL) Times*, 25-January-1937, 1:3).

³⁶ "Box Canyon Dam," www.fwee.org, visited 28-August-2017. The Box Canyon Dam, a gravity-type run-of-the-river project, has a current generation capacity of 77MW and is located on the Pend Oreille about 17.5 miles upstream of Boundary Dam.

³⁷ <http://www.seattle.gov/light/Boundary/cultural.asp> (visited 24-August-2017), Wilma, op cit., 2010:77.

³⁸ *Seattle Daily Times*, 25-October-1953, 1:6.

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City Light's proposed power project in Pend Oreille County, 300 miles from Seattle, was almost immediately controversial. The Pend Oreille PUD, planning its Box Canyon project and developing plans to build additional plants, was concerned that a City Light project would be detrimental to its existing and future operations.

Having acquired all the Cooper properties and right on the Pend Oreille River between Box Canyon and the U.S.-Canadian boundary on March 31, 1953, the PUD was bitterly opposed to Seattle's 1954 application for a preliminary permit to construct a power project...³⁹

The PUD felt that Cooper's lands gave them control of hydroelectric development along that stretch of the Pend Oreille River, including the rights to use the water in the river for the development of a powerhouse and dam in Z Canyon. Perhaps more importantly, they felt that the Pend Oreille was "their" river, in their county, and that they should be the ones to develop it. Since the sparsely populated area could not possibly use all the power available, the PUD intended to market the generation and create local income. To argue their position the PUD hired lawyer Clarence C. Dill to represent its interests. Dill, a former U. S. Senator, promoter of Grand Coulee, and something of a legendary figure, had returned to private law practice after leaving Congress.

The points of contention between City Light and the Pend Oreille PUD were many, ranging from the right to develop the river, the cost of the land the PUD had purchased from Cooper, the amount of generation from any dam that City Light should have to sell to the PUD, and the value of that power, among others. At one point the PUD suggested that it and City Light develop the project jointly, with each retaining a 50% ownership, and there seems to have been some discussion about jointly developing the site. This discussion led to the PUD expectation that it would control a portion of the Boundary Project along with City Light, while City Light eventually took the approach of offering a permanent agreement to sell a portion of the generation to the PUD at cost. The PUD's increasing opposition did little to make a long-term partnership seem workable. According to at least one contemporary source, the multiple lawsuits and the contentiousness was at least in part due to the PUD's attorney, Clarence Dill. "Seattle kept winning at every point. In the meantime, the legal procedures were quite drawn out, with substantial fees for the attorney involved, Senator Dill."⁴⁰ Richard S. White, who served as City Light's special counsel for the Boundary Project, wrote frequent memoranda regarding his increasing frustration with Dill's tactics. Typical is a memorandum from 1961, regarding a meeting with Dill and Lloyd Ek, both PUD attorneys. White wrote:

*"Mr. Dill said that if the City grants the PUD ownership, the PUD would cooperate fully in seeing that the Boundary project got on the line as soon as possible. I told Mr. Dill that the City was not interested in joint ownership, that the city had gotten beyond any talk of joint ownership, and that it would be a waste of time to pursue it any further."*⁴¹

In addition to concerns from the PUD, private mining interests along the Pend Oreille, which had made the region one of the nation's largest producers of lead and zinc, saw the inundation of the canyon as a threat to their livelihoods. The Pend Oreille Mines and Metals Company, which operated one of the largest zinc mines in the world, was based out of Metaline Falls, and had played a historically significant role in the area's development history.⁴² "Mining operators in the Metaline Falls area today voiced opposition to the proposed dam at the Boundary site..."⁴³

In August 1954, over the formal objections of both the Pend Oreille PUD and several mining firms, the FPC approved City Light's license application for engineering studies. "Paul J. Raver, superintendent of City Light, said the project would be planned with needs of the area's extensive lead and zinc mining interests kept in

³⁹ [Pend Oreille PUD]. *The History of the Pend Oreille Public Utility District* (at www.pendoreilleheritage.com, visited 24-August-2017).

⁴⁰ Billington, op cit., 1988:433.

⁴¹ White, Richard S. Memorandum to City Light, 6-November-1961 (in Seattle Municipal Archives, City Light, Box 1206-7, Box 5, Legal Records).

⁴² *Seattle Daily Times*, 21-May-1950, 16:4.

⁴³ *Seattle Daily Times*, 29-October-1953, 20:2-3.

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mind throughout the survey.⁴⁴ Two years later, still faced with mining opposition, Raver announced a plan that would including boring twin tunnels, each more than two miles long, on either side of the river to reduce impacts on downstream mining, but this concept did little to overcome the mining objections. Karl W. Jasper, the president of the Northwest Mining Association, said that "...some screw-ballish ideas have been suggested," but vowed to fight any effort to build the Boundary Project with "all the resources" of the group.⁴⁵ In late 1957 seven area mining companies combined and formally petitioned the FPC to deny City Light's application to build the Boundary Project. Construction of the dam, the companies stated, would raise the Pend Oreille River to a level that "...would endanger the most extensive and valuable mineral deposits of zinc and lead on the North American continent."⁴⁶ In January 1959, City Light was finally able to present its plan for Boundary to the FPC and was awaiting its hearing, already postponed twice. Paul Raver expected the FPC hearings to take at least three months.⁴⁷

The FPC hearing was immediately complicated by City Light's use of J. L. Savage, a consulting engineering firm based in Seattle and, more specifically, that firm's reliance on I. A. Winter to design hydraulic elements of the powerhouse. Winter was an employee of the Denver office of the Bureau of Reclamation, and worked for Savage as a part-time consultant.⁴⁸ The attorneys for the Pend Oreille PUD challenged this arrangement, arguing that Winter's dual status as a federal employee and consultant was inappropriate.⁴⁹ "An embarrassed City Light Superintendent Paul Raver telephoned Seattle and ordered his own engineers to come up with another design."⁵⁰ Savage remained involved and the result was the final, variable-radius, double-curvature, thin-arch, concrete Boundary Dam, as well as the underground powerhouse. It is not clear if Winter remained involved or not.

The hearings on the project ended in late February 1959 after 128 days of hearings, with the Pend Oreille PUD still offering a competing application for its own dams and the area mining interests opposing any dam construction. In late August 1960, the FPC announced its decision to support the City Light proposal over that of the PUD.⁵¹ The Department the Interior, which initially opposed the project due to mining impacts, retracted its objections and City Light's case headed to the FPC for final review in November 1960. After more than seven years of debate, it appeared City Light would finally gain a license to build the Boundary Project.

Seattle has been seeking Federal Power Commission approval for this development since 1953. After more than a year of hearings, resulting in 17,228 pages of testimony and the entry of some 500 exhibits, the city merits a decision from the FPC examiner.⁵²

In March 1961, the FPC examiner recommended the City Light application be approved and in July 1961 the FPC granted the project final approval. C. C. Dill and the Pend Oreille PUD again appealed and requested a re-hearing, although the FPC denied their request. In April 1962, more than a year later, the PUD, presumably

⁴⁴ *Seattle Daily Times*, 1-September-1954, 17:1.

⁴⁵ *Tacoma News-Tribune*, 1-December-1956, 14:5.

⁴⁶ *Seattle Times*, 8-October-1957, 10:1.

⁴⁷ *Seattle Times*, 15-January-1959, 3rd, 1:3. 21-January-1959, 42:7.

⁴⁸ John Lucian Savage (1879-1967) also had strong connections to Reclamation, having served as the Bureau's chief designing engineer and playing a major role in the design and construction of the Grand Coulee Dam before establishing his own firm in 1945. (Downs, L. Vaughn. *The Mightiest of Them All: Memories of Grand Coulee Dam* (revised ed.). New York, NY: ASCE Press, 1993:20). Savage supervised designs for dozens of major dams built by Reclamation, including Hoover and Shasta dams, in addition to Grand Coulee. Ireal A. Winter (1894-1968) was a noted hydraulic equipment designer, co-inventor of the Winter-Kennedy piezometer, and served as chief of the Hydraulic Machinery department for the Reclamation's Denver office. His involvement with the Boundary Dam project set off an investigation into Bureau of Reclamation staffing, led by Rep. Ben F. Jones (R-Iowa), on the House Appropriations Committee, and revealed that more than 200 Bureau employees had been paid by private interests over a 14-year period (*Provo (UT) Daily Herald*, 29-May-1959, 2:1-2).

⁴⁹ *Seattle Times*, 22-January-1958, 2:2, 2-March-1958, 2nd 1:3.

⁵⁰ Wilma, et al, op cit., 2010:79.

⁵¹ *Seattle Times*, 1-September-1960, 7:3.

⁵² *Seattle Times*, 9-January-1961, 10-1-2.

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encouraged by the irrepressible Dill, challenged the FPC decision in the US Court of Appeals, which denied the appeal.

Meanwhile, the PUD and Dill pursued another legal angle, related to City Light's ability to condemn property owned by the Pend Oreille PUD for power generation use, an action which was generally prohibited under State of Washington law. In this case, however, the Washington courts, including the state Supreme Court, ruled that existing laws did not apply to properties not being used for generation activities, which the PUD's were not, since they had failed in their application to the FPC. Predictably, the PUD and Dill appealed that ruling in federal court. In 1962, the US Supreme Court denied the PUD's Writ of Certiorari and allowed the Appeal's Court for the District of Columbia ruling to stand, upholding the FPC approval of the Boundary Project.⁵³ Finally, in February 1963, the US Supreme Court, addressing the Boundary license issue *for the second time*, refused to hear an appeal of the state court ruling that granted City Light the power to condemn property owned by the Pend Oreille PUD that was needed for construction. While two suits pertaining to City of Seattle funding still remained to be resolved at the local level in King County, Washington, and while the PUD continued to seek an injunction from the Washington Supreme Court and lower courts on a variety of other legal issues, the US Supreme Court ruling was greeted by City Light as the final hurdle in its long battle to initiate construction of the \$100 million-dollar project.⁵⁴

In April 1964 City Light awarded what was reported as the largest single municipal contract in Seattle's history for the construction of the Boundary Project. The contract for the major construction elements was awarded to a collective of four construction firms, headed by Mannix Construction, Inc., and S.G.S. Contractors, Inc., both of Calgary, Alberta, Canada. Mannix-SGS presented a joint venture bid that totaled over \$28 million dollars.⁵⁵ In January 1965, after work on the dam had finally started, *The Seattle Times* wrote that "the story of City Light's Boundary Dam, now rising on the Pend Oreille River, is one of overcoming unrelenting local opposition..."⁵⁶

CONSTRUCTION AND LOCAL IMPACT 1963-1967

City Light, acting somewhat tentatively during the protracted legal disputes surrounding the license, completed the planning for the Boundary Project. "Exploration and other preliminary work at the Boundary project site has progressed sufficiently by early 1963 to permit award of the first major construction contracts."⁵⁷ Orders for the plant equipment, which could take years to procure, included over \$3 million for the four General Electric 145-kva generation units, over \$3 million for the four Nyqvist and Holm AB turbines, \$869 thousand for four ASEA step-up transformers, \$230 thousand to Westinghouse (for buses), and \$300 thousand to Ederer, Inc., for the huge gantry cranes.

Driven by the parameters of the its FPC license, which anticipated the powerhouse in operation by October 1, 1967, City Light pushed the construction pace against the weather and fluctuations of the river, building a diversion dam to allow excavation of the forebay and the beginnings of the foundation for the dam itself in an effort to stay on schedule.

Paul J. Raver, born in 1884, a former BPA administrator who had become City' Light superintendent in January 1954, was among the driving forces to expand the utility's generation capacity and led the drive to develop the Pend Oreille. A near-legend in public power circles, Raver fell ill in late 1962 and died somewhat unexpectedly in April 1963, just a few weeks before the contract for Boundary construction was finally awarded to the

⁵³ US Supreme Court, Docket No. 611, PUD No. 1 v. FPC, et al, October 1962. Interestingly, in April 1960, Malcolm Richard Wiley, Assistant Attorney General of the United States, reported to Jerome Kuykendall, Chairman of the Federal Power Commission, that an investigation by the FBI relative to allegations of criminal statues raised by the use of off-duty Bureau of Reclamation employees on the Boundary project would did not indicate any factual basis for criminal prosecution.

⁵⁴ *Seattle Times*, 19-February-1963, 2:3.

⁵⁵ *Seattle Times*, 29-April-1964, 4:3-4, *Newport Miner*, 13-Jun-1963.

⁵⁶ *Seattle Times*, 31-January-1965, 70:1-6.

⁵⁷ Seattle City Light Annual Report -1963:11.

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Mannix-SGS group.⁵⁸ Raver was succeeded by John M. Nelson, a longtime assistant, as superintendent. In November 1965, as the “first bucket” of concrete was placed at the dam, an event attended by a group of dignitaries that included the mayors of Metaline and nearby lone, Pend Oreille County commissioners Earl and Bockman, and the superintendent of the Selkirk School District, Mrs. Raver was invited as a special guest and was given the honor of “...placing medals, possessions of Dr. Raver, into the first bucket of concrete to be placed in Boundary Dam.”⁵⁹

Work on the powerhouse, the access tunnels, and underground work continued through the winter. “Excavation of a million cubic yards of solid rock to form the forebay for the underground power plant was begun in 1964...and essentially completed in 1965.”⁶⁰ By the end of that year, the dam was within 20-feet of the minimum height needed to be reached before the 1966 spring run-off but cold weather in December 1965 stopped construction of the spillways.

The powerhouse excavation, including the Machine Hall, tunnels, gate shafts, and the penstock and draft tube cavities, was completed in February 1965 after 14 months of work and three months ahead of schedule. “By this time, the general contractor was preparing to begin the underground construction work by erecting the machine hall’s permanent traveling (gantry) cranes...which greatly facilitated the assembling of the steel draft tube liners, stationary turbine parts and other equipment items which were to be embedded in concrete.”⁶¹

By July 1966, construction was entering its final phase and the \$3.5 million “completion” contract was let to install the turbines, generators, governors, and other electrical equipment necessary to make the facility operational. The main construction of the dam, forebay, and other elements was nearly completed, with the dam reaching its final height and the penstocks being lined in concrete and steel prior to pressure-testing. “Fitting of corrugated metal ceiling panels has progressed for more than half the length of the Machine Hall.”⁶²

While the Pend Oreille PUD and the local mining operations were likely disappointed by City Light’s legal victories that cleared the way for construction, there was no disputing that the Boundary Project was going to be a huge boon to the north Pend Oreille County economy. With total project costs estimated at \$100 million and hundreds of construction and permanent jobs, the Boundary Project offered a stable replacement to the dwindling concrete plant and other area industry.

Construction of the project had other local benefits as well. “City Light development plans includes the creating of a 5-acre picnicking area upstream from the dam [“The Forebay Recreation Area”] and the installation of boat-launching facilities.”⁶³ Another picnic area downstream of the dam, the “Tailrace Recreation Area,” also gave visitors a place to queue up for tours of the plant and the Visitors’ Galley, where they could look out onto the underground powerhouse. After the project was completed, City Light advertised the Boundary reservoir in Seattle-area papers as an ideal spot for boating and camping.⁶⁴

City Light made a decision to work with the Metalines to integrate its operation into the area from the beginning of construction. Metaline Falls functioned as the “rail head” for equipment deliveries to the project and the utility built a warehouse to support that function in town:

City Light did something else different at Boundary. Instead of building a separate community to service the construction and operation of the dam, it moved workers and employees into the

⁵⁸ *Seattle Times*, 6-April-1963, 1:5-6, see also Wilma, Dave, “Paul Raver Becomes Superintendent of Seattle City Light on January 15, 1954,” HistoryLink.org Essay 3619, (www.historylink.org/File/3619, visited 19-September-2017).

⁵⁹ Seattle City Light Image BPM #573, 11-November-1965 (see Figure 18).

⁶⁰ Seattle City Light Annual Report, 1965:14.

⁶¹ Ibid.

⁶² Seattle City Light. *Boundary Project Progress Report*, July 31, 1966:1.

⁶³ *Seattle Times*, 29-September-1967, 6:1.

⁶⁴ *Seattle Times*, 14-April-1974, 43:2.

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town of Metaline Falls, 12 miles away....it helped bond the dam operators to the community, which benefitted directly from the increased payrolls.⁶⁵

Due to the increased burden the project would put on the local school system, both during construction and its subsequent operation, City Light almost immediately agreed to a cooperative investment in the Selkirk School District No. 70. City Light agreed to pay the entire costs of a new school bus to transport children and further to pay the district an annual fee for students brought to the area by dam construction activities. Finally, City Light agreed to pay the majority of the costs for the construction of an entirely new high school, with athletic fields and other facilities, to be erected immediately. "It is the feeling of both the board of directors and the City of Seattle that the facilities will be a credit to three communities [Metaline, Metaline Falls, and Lone, Washington] served and to the City..."⁶⁶ City light committed \$600,000 of the total estimated \$700,000 cost of the new school, which was designed by James, Hicks and Stebbins architects, of Spokane.⁶⁷

The company purchased a five-bedroom house in town from a local doctor and used it during the construction and the project testing period. They agreed to sell the house back to its original owner for \$43,000 "...because the sale will enable the community, which includes City Light employees, to have the services of a physician."⁶⁸

The construction of the Boundary Project, which took over three years to complete, saw at the height of construction more than 1,300 construction workers, and more than 2,000 persons, including family members, come to the area. Others drove daily from Spokane.⁶⁹ In addition to funding the new high school, City Light helped pay for improvements to the local hospital and area roads. City Light also built and improved the route to the project site, as well as its field office, project warehouses, and other facilities needed for construction.

In April 1967 City Light closed the 40-foot diameter diversion tunnel that had shifted water around the project during construction and the reservoir behind the dam began to fill. The generation units underwent their final tests. Units 51 and 52 were completed in August and placed into commercial operation on September 1, two months ahead of schedule. Unit 53 went into commercial operation on September 16, and Unit 54, completed in October, was placed into operation on December 1. Combined, the four Boundary units produced 551,000 kilowatts, nearly doubling Seattle City Light's total generation capacity at the time.

The dedication ceremony to mark the formal completion of the project, planning for which had begun thirteen years earlier, was scheduled for 1:00 PM on September 29, 1967. "John Nelson, City Light superintendent, said that [Seattle] Mayor Braman and Council President Massart will be guests."⁷⁰ Other speakers at the event included Nelson, Clifford Bockman, of the Pend Oreille County Board of Commissioners, and Henry R. Richmond, the acting administrator of the BPA, which would transmit Boundary's output throughout the western United States.

IMPACT ON SEATTLE

In 1950, at the end of World War II, when City Light began to look for additional generation sites to augment its existing Skagit and other sources, Seattle's population was 467,591 persons, a growth rate of 27% since 1940. The city grew by almost 100,000 by 1960, a growth rate of 19%.⁷¹ City Light's system requirements, its average load, grew even faster than the population, as post-war America grew increasingly reliant of "modern" electric powered conveniences. Between 1950 and 1955, City Light's average load rose from 154K kilowatt hours to 381K, more than doubling. By 1960, still three years before construction at Boundary would even

⁶⁵ Wilma, et al, op cit. 2010:80-81.

⁶⁶ *Newport Miner*, 4-July-1963 (Seattle Archives, City Light Clipping File).

⁶⁷ *Daily Journal of Commerce*, 18-Sept-1963 (Seattle Archives, City Light Clipping File).

⁶⁸ *Seattle Times*, 19-March-1971, 5:2-3.

⁶⁹ *Seattle Times*, 14-May-1967, 5th Section, 1:1-8.

⁷⁰ *Seattle Times*, 11-September-1967, 49:6.

⁷¹ City of Seattle Strategic Planning Office. *Decennial Population – City of Seattle, 1900-2000*. (www.seattle.gov, visited 19-Sept-2017).

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begin, average load grew to 528K kilowatt hours and, by 1967, when the first four units of the Boundary project finally went online, average load was nearly 700K with peak load at more than 1.2 *million* kilowatt hours.⁷² System demand for City Light in 1966 set an all-time high, only to rise 2.6 percent in 1967 but, with the added capacity of the Boundary Project, City Light energy purchases actually dropped more than 31% during the year. City Light's lengthy legal battles and decade-long persistence in securing the license to develop the Boundary Project were a continuation of the dogged effort by J. D. Ross and the early proponents of municipal power in Seattle to overcome opposition from investor-owned utilities that sought to eliminate it. City Light's continued self-reliance on its own, and later BPA, power to assure its ratepayers reliable, plentiful, and low-cost electricity represent a continuing legacy of Ross and Seattle's history of locally-owned and operated power generation.

The substantial completion and first operation of the 600,000-kilowatt Boundary hydroelectric project...was the climax of 65 years of almost continuous effort to develop water-power resources with which to satisfy Seattle's electric energy needs abundantly and cheaply.⁷³

Even with the expense of Boundary's construction, an on-going effort to install underground lines to reduce visual impacts on the city, and the growth of its service demand, the cost of City Light's residential power again declined. Its rates then and now remain among some of the lowest in the United States, in continued fulfillment of the public power ideal begun by J.D. Ross.

Boundary was the last and the largest of Seattle's huge hydro projects. Its completion marked the end of an epoch in the history of public power in Seattle and the Northwest. There would be no more spectacular public works projects to dam rivers for cheap power.⁷⁴

City Light, a pioneer in the nation's public power movement and the brain child of two of the most influential leaders of that movement, Ross and Raver, continued to strive for "energy independence," producing nearly two-thirds of requirements as late as 1982. "Mayor Charles Royce says there is no official city policy guiding the utility toward self-sufficiency, but it always has been an institutional goal of City Light."⁷⁵

Still the largest hydroelectric generation project in the City Light system, and a major element of not only Seattle's public power utility but a significant economic element in the modern history of Pend Oreille County, 300 miles to the east, *the Boundary Project has significant association under eligibility Criterion A for its role in the history of Washington state, of Pend Oreille County, and the cities of Seattle, Metaline Falls and Metaline.*

RADIAL ARCHED DAMS

Broadly, dams that retain water can be grouped into two categories: *gravity dams* rely on their own mass or bulk, be it of timber, stone, earth, or concrete, to hold back the weight of the water impoundment, whereas *structural dams* rely on mechanical force and the dam's design to offset the weight and pressure of the water. An arched dam, like Boundary Dam, is a type of a structural dam. It functions like a plug wedged between two immovable objects – in this case the solid rock walls of the Pend Oreille River canyon, where the force of the water pushes the dam against the rock constriction and keeps it place. Arch dams are more complicated than gravity dams to design, and require not only complex planning but careful construction to assure their success. As a result, they are significantly less common than other forms of dams. The National Inventory of Dams (NID), as maintained by the Army Corps, is the Congressionally-authorized database of all regulated dams in the US and its territories. Of the 100,000 plus dams listed in the NID, just 352 are categorized as "arch" dams.⁷⁶

⁷² Seattle City Light Annual Report, 1967:33.

⁷³ Ibid., 1967:3.

⁷⁴ Wilma et al, op cit., 2010:81

⁷⁵ Lane, Bob. "Independence – Seattle Acts to Supply Own Energy Needs. *Seattle Times*, 2-May-1982, A23:1-8.

⁷⁶ National Inventory of Dams (www.nid.usace.army.mil), visited 19-September-2017.

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Arch dams, made of concrete and gracefully arched between two points, were first developed in the early 19th century. Arch dams offer advantages in the reduction in material they require, an important factor for often rugged and inaccessible construction locations, and the speed with which they can be erected, when compared to gravity dams. The first successful arch dam constructed in the United States was the 64-foot tall Bear Valley Dam, completed in southern California in 1884. It boasted a maximum thickness of just 20 feet.⁷⁷

Arch dams may appear similar to curved gravity dams, but they are much thinner than their massive counterparts....The curve of the upstream face is a critical aspect of an arch dam design; the arch transfers the hydrostatic pressure acting on the upstream face of the dam to the canyon walls on both sides.⁷⁸

The design of concrete arch dams, especially thin section examples (defined as those with a base-to-height ratio of <2.0), such as at Boundary, are the result of mathematical calculations and the "Trial Load" method, developed by C. H. Howell and A. C. Jaquith in 1929. It is worth noting that both those men worked for the Bureau of Reclamation's Denver office, under the supervision of J. L. Savage, who was at least in part responsible for the design of Boundary Dam. The Trial Load method allowed engineers to factor in both horizontal arches and vertical cantilevers in dam performance. This method resulted in dams that curved from side to side as well as from top to bottom, creating the strongest possible shape for the given canyon configuration and allowing ever thinner arched walls. Computation for the Trial Method was a difficult mathematical process, particularly in the era of the slide rule. Howell and Jaquith authored the definitive study on the Trial Method for arch dam construction, published as a bulletin by the American Society of Civil Engineers in 1929.⁷⁹ "By considering a series of cantilevers, rather than one cantilever only at the centerline of the dam, Reclamation engineers created an immensely complex procedure that took the entire 266-page bulletin to explain, without even going into any numerical calculations."⁸⁰

In the forty years after the Trial Load method was developed, arch dam design had progressed significantly, but as planning for Boundary Dam was being developed, the mathematics involved in arch dam design remained a daunting endeavor. By the late-1950s, however, computers were becoming capable of helping engineers with that process, and Boundary Dam, one of the first variable radius thin-arch dams built in the Pacific Northwest, was designed using the "latest in dam building technology."

The engineers used a new tool, the electronic computer, to check the structural adequacy of the dam design under all critical conditions of loading and foundation support, and to determine all of the dimensions necessary to construct the dam.⁸¹

Of the 784 dams listed in the National Inventory of Dams in Washington state, twenty-two (22) are all or in part identified as "arch" dams. Given the cost and complexity of arch dam construction, it is unsurprising that nearly half of those (10) are used for hydroelectric generation and owned by public utilities or local government. Boundary Dam, with a 360-foot crest height, is the second tallest arch dam in the state, surpassed only by City Light's own Ross Dam (540'), on the Skagit River.⁸²

Even within the universe of radial arch dams, Boundary Dam is unusual as a variable radius, *double curvature*, example, being a dam that is curved in both plan and elevation. A double-curvature arch dam curves both horizontally and vertically, creating an overhang at the crest, which projects downstream from the foundation.

⁷⁷ Billington, Daniel P., Donald C. Jackson and Martin V. Melosi. *The History of Large Federal Dams: Planning, Design and Construction in the Era of Big Dams*. Denver, CO: Bureau of Reclamation, 2005:60.

⁷⁸ Jackson, Donald C. *Great American Bridges and Dams*. Washington, DC: The Preservation Press, 1988:48.

⁷⁹ Howell, C. H. and A. C. Jaquith. "Analysis of Arch Dams by the Trial Load Method." *Transactions of the American Society of Civil Engineers*, 93 (1929), 1191-1316.

⁸⁰ Billington, Daniel P., op cit., 2005:74.

⁸¹ Seattle City Light. *The Boundary Project – A New Energy Source by Seattle City Light*. Seattle, WA: Seattle City Light, 1967.

⁸² National Inventory of Dams (www.nid.usace.army.mil), visited 19-September-2017.

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The US Bureau of Reclamation, the organization most associated with the evolution of thin radial arch dam design, identifies thirty (30) double-curvature radial arch dams in the world.⁸³

Boundary Dam, a 360-foot tall variable-radius, double-curvature, concrete thin arch radial structure, is additionally significant under Criterion C as a large example of the comparatively rare arch dam type within the State of Washington.

UNDERGROUND POWERHOUSES

At the time of its construction the Boundary Powerhouse was reported as the largest underground powerhouse in the United States, although it is unclear if this status is based on generation capacity or the size of the cavern itself, nor can it be conclusively verified. The 447' x 76' powerhouse, carved out of solid rock, is certainly a large example, and a continuation of a method of hydroelectric development that began in Washington state. The Snoqualmie Falls Hydroelectric Plant, in King County, Washington, currently owned by Puget Sound Energy, was the world's first completely underground power station when its first phase was completed in 1899.⁸⁴

Although the original planning for a hydroelectric project at the future Boundary site by Col. Cooper in the early 20th century, and even the first plans by City Light, had focused on one (and at times two) *above ground* powerhouses, and even an earthen dam, there was early consideration given to an underground design as well.⁸⁵ In December 1956, J. L. Savage provided designs for an above ground powerhouse but noted the potential for an underground powerhouse to Paul Raver and recommended it be considered. He stated:

"I believe the underground plant when designed to full advantage of this type of construction can be made competitive with outdoor construction when related features can contribute to a reduction in overall costs."⁸⁶

Underground powerhouses, built below the level of the water, are created by excavating a machine hall, penstocks, and draft tubes into the tailrace from solid rock. Where the geology of the site allows, this sort of construction has multiple advantages, beginning with reduced cost and lower maintenance, through the avoidance of typical, built, above ground structures. Solid rock powerhouses do not require repainting, re-roofing, or other similar upkeep that is required of free-standing buildings, especially ones such as powerhouses that are typically located in harsh environments.

In the years after World War II, underground construction was considered to be more secure from air-attack or other potential damage. More recently, underground powerhouses are considered more environmentally friendly, since they typically reduce impact on the area's scenic value. While the construction and planning for underground powerhouses can be lengthy, they have become more common since the 1970s, with multiple examples in Asia and Africa. Other underground powerhouses in the United States include the Haas Powerhouse and the Edward Hyatt Power Plant, both in California, and the Racoon Mountain Plant, in Chattanooga, Tennessee. The largest underground powerhouse in the world is the Robert-Bourassa Generating Station, in Canada, which was completed in 1981.⁸⁷

⁸³ U.S. Bureau of Reclamation. *In-Progress: Design of Double-Curvature Arch Dams, Planning, Appraisal, Feasibility Level* (Technical Memorandum No. EM36-86-68110), 19-October-2012 (found at www.usbr.gov, visited 6-Nov-2017).

⁸⁴ www.revolv.com, visited 23-August-2017. Plant 1 at Snoqualmie was listed on the National Register in April 1979 and has subsequently been designated a Historic Civil Engineering Landmark by the American Society of Civil Engineers (NRIS #76001895).

⁸⁵ Earlier plans for Boundary, as documented in the Seattle City Light's Annual Reports, show a more typical above-ground powerhouse options for the project (see *Seattle City Light, Annual Report* 1957:4 and 1959:14).

⁸⁶ Savage, J. L., Letter to Paul J. Raver, December 17, 1956 (Seattle Municipal Archives, City Light Box 1206-07, File 9).

⁸⁷ https://en.wikipedia.org/wiki/Robert-Bourassa_generating_station, visited 29-August-2017. See also "Powerhouse Inside Mountain has Six-Mile Waterfall," *Popular Mechanics*, March 1959:101.

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The Boundary Powerhouse is significant as one of, if not the, largest examples of an underground powerhouse in the United States and is additionally among the earlier examples of this construction world-wide, where most similar structures were completed in the 1970s or later. In terms of generation capacity, the generation capacity of the Boundary Powerhouse makes the Boundary Project the sixth largest hydroelectric project in the state of Washington.

The comparatively unusual design and construction of the Boundary Powerhouse, hollowed out of solid limestone and accessible only via two long tunnels, is not only unusual from that standpoint of powerhouse design, but visually striking. The juxtaposition of a major industrial project in an otherwise largely intact natural setting, coupled with the clean modernistic concrete lines of the “bonnets” and other visible elements at the entry points, creates a notable character. As one architectural history of Washington state noted, the powerhouse “[C]ould be from a James Bond movie. A tunnel 76-feet wide and 477-long penetrates the solid rock of a towering cliff and, below, a glassed-in display area, six throbbing turbines drive generators.”⁸⁸

The Boundary Powerhouse, including its machine hall, access tunnels, penstocks, and related elements, is additionally significant under Criterion C as a comparatively rare example of an underground powerhouse that is among the largest examples ever built in the United States.

VISTA HOUSE

The Vista House, designed by Robert J. Nixon, of Walker & McGough Architects of Spokane, was built during the early construction phases of the Boundary Project to provide a public viewing opportunity of the project from a safe location. The well-designed, modern structure was completed in 1965. “The Vista House will be used by sightseers [and] will contain extensive data about the dam and will command a panoramic view of that rugged area⁸⁹...” The design of Vista House was nationally recognized for its excellence, receiving the first “Honor Award” of the American Public Power Association in 1975.⁹⁰

Walker & McGough, founded by Bruce Walker and John McGough, was a significant firm in the Spokane area, established in 1953. Walker was educated at Harvard, studying under Walter Gropius. “Walker and McGough received rare national awards for design excellence from the American Institute of Architects in 1959 and 1969.”⁹¹ Robert J. Nixon, Vista House’s designer, was educated at the University of Idaho, joined Walker & McGough in 1959, and was placed in charge of the firm’s Seattle office from 1963 until its closure in 1968.⁹²

The Vista House at the Boundary Project, including the original outdoor seating area, illuminated trail and cantilevered viewing deck, is additionally significant under Criterion C for its architecture and design, as an important example of mid-century recreational/visitor design.

SUMMARY STATEMENT

The Boundary Project, located in Pend Oreille County, Washington, was completed in 1967 by Seattle City Light, the municipal electric utility in Washington’s largest city and one of the largest public power providers in the United States. The Boundary Project, which took over a decade of planning and legal review, was a primary element of City Light’s effort to serve the significant population and energy demand that

⁸⁸ Kirk, Ruth and Carmela Alexander. Exploring Washington’s Past: A Road Guide to History (Revised Ed.). Seattle, WA: University of Washington Press, 1990:26.

⁸⁹ *Seattle Daily Times*, 1-April-1965, 53:4-5.

⁹⁰ *Seattle Daily Times*, 21-May-1975, 37:1. The Boundary Dam project as a whole was also recognized by the association.

⁹¹ Davis, Glenn Warren. “McClure & Addison + Walker & McGough: Architects of a Modern Vision, 1947-1969,” at www.spokanemidcentury.com, visited 13-Sept-2017.

⁹² *Seattle Daily Times*, 12-April-1970, 38:1. Nixon later joined the Seattle firm of Royal A. McClure. He retired in 2003 (see Houser, Michael C. “Nixon, Robert J., 1930-,” at www.docomomo.org, visited 13-Sept-2017).

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characterized Seattle during the post-World War II era. The Boundary Project, including multiple built resources and documented as a district, is significant at the statewide level under eligibility Criterion A, for its association with the history and development of Seattle and City Light, as well as for its significant role in the history of Pend Oreille County.

Individual elements of the Boundary Project are additionally significant under eligibility Criterion C, for their engineering, architecture and design. These elements include Boundary Dam, a comparatively rare example of a concrete, variable radius, thin arch dam that is among the largest of its type in Washington state; the Boundary Powerhouse, the largest identified underground powerhouse in the United States at the time of its completion; and the Vista House, an award-winning example of modern design, that provides an overlook and recreational facility developed by City Light during the original construction period.

The Boundary Project, as defined in this National Register nomination, retains very high integrity to its original design, and effectively and accurately relates the associations that make it significant.

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9. Major Bibliographical References

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Wilson, William H. *Shaper of Seattle: Reginald Heber Thomson's Pacific Northwest*. Pullman, WA: WSU Press, 2009:1.

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Previous documentation on file (NPS):

- preliminary determination of individual listing (36 CFR 67 has been requested)
- previously listed in the National Register
- previously determined eligible by the National Register
- designated a National Historic Landmark
- recorded by Historic American Buildings Survey # _____
- recorded by Historic American Engineering Record # _____
- recorded by Historic American Landscape Survey # _____

Primary location of additional data:

- State Historic Preservation Office
 - Other State agency
 - Federal agency
 - Local government
 - University
 - Other
- Name of repository: Seattle Municipal Archives/City Light Coll.

Historic Resources Survey Number (if assigned): _____

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10. Geographical Data

Acreage of Property 167 acres
 (Do not include previously listed resource acreage.)

UTM References NAD 1927 or NAD 1983

(Place additional UTM references on a continuation sheet.)

1	<u> </u> Zone	<u> </u> Easting	<u> </u> Northing	3	<u> </u> Zone	<u> </u> Easting	<u> </u> Northing
2	<u> </u> Zone	<u> </u> Easting	<u> </u> Northing	4	<u> </u> Zone	<u> </u> Easting	<u> </u> Northing

Or Latitude/Longitude Coordinates
 (enter coordinates to 6 decimal places)

1	<u>48°59'59.172"N</u> Latitude	<u>117°21'18.231"W</u> Longitude	3	<u>48°58'56.331"N</u> Latitude	<u>117°21'1.811"W</u> Longitude
2	<u>48°59'24.214"N</u> Latitude	<u>117°20'41.735"W</u> Longitude	4	<u>48°58'55.689"N</u> Latitude	<u>117°21'32.552"W</u> Longitude

Verbal Boundary Description (Describe the boundaries of the property.)

The nominated area is an irregular polygon within the larger FERC License No. 2144 area that encompasses, running generally from north to south, the Operations and Maintenance Service Area, the Tailrace Recreation Area, the Vista House, the Boundary Powerhouse, Boundary Dam, the forebay and trash racks, the Forebay Recreation Area, and the transmission line, as shown on Figure 3 and as follows: Beginning at a designated point (1) on the FERC boundary north of the Service Area, and then continuing east, along that line, to the western edge of the main channel of the Pend Oreille River, then southerly following along that edge to a point opposite the parking area, then across the tailrace to a point mid-channel, then northeasterly across the river and then continuing to the northeast, around the Vista House site, to a designated point (2) on the FERC boundary east of the Vista House parking area, then southerly along that FERC boundary to a point south of the Vista House, then southwesterly, across the river channel, to a point upstream of the forebay and the northerly end of the Forebay Recreation Area, then, southwesterly along an irregular polygon to a designated point (3) at the southwestern corner of the recreation area, then northwesterly to a point on the Boundary Dam Access Road near the NE corner of the transmission line, then southwesterly to the southeast corner of the Transmission Line, immediately adjacent to the BPA Boundary Substation, then northwesterly along a line between the transmission line and the BPA substation to a designated point (4) at the southwest corner of the transmission line, then northeasterly along the transmission line to the intersection with the Boundary Dam Access Road, then northerly along the west side of the roadway to the designated point of beginning, the intent being to contain all of the described historic resources associated with the original construction period.

Boundary Justification (Explain why the boundaries were selected.)

The nominated area includes all the historic resources and area of development that was associated with the Boundary Project as originally developed and completed during the Period of Significance, 1963-1967, excluding non-historic resources on adjacent lands or those owned and operated by entities other than Seattle City Light.

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11. Form Prepared By

name/title George Kramer, M.S., HP (EDITED BY DAHP STAFF)
organization Kramer & Company, for Seattle City Light date February 2018
street & number 386 North Laurel Street telephone 541-482-9504
city or town Ashland state OR zip code 97520
e-mail george@preserveoregon.com

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** (7.5 or 15-minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.

- **Continuation Sheets**
- **Additional items:** (Check with the SHPO or FPO for any additional items.)

Photographs:

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map.

Name of Property: Boundary Hydroelectric Project

City or Vicinity: Metaline (vicinity)

County: Pend Oreille **State:** Washington

Photographers: "K" George Kramer, M.S., HP, Kramer & Company (Ashland, OR)
"A" Michael Aronowitz, Seattle City Light (Seattle, WA)

Date Photographed: August 2017

Description of Photograph(s) and number:

Photo 1 of 25: (WA_PendOreille_BoundaryDam_001)
Boundary Dam, Vista House to Left, Powerhouse to right, camera facing S, from Access Rd (A)

Photo 2 of 25: (WA_PendOreille_BoundaryDam__002)
Boundary Dam, Vista House in center, camera facing North, from Forebay area (A)

Photo 3 of 25: (WA_PendOreille_BoundaryDam__003)
Boundary Dam, Forebay, Towers, camera facing NW, from Forebay Area (A)

Photo 4 of 25: (WA_PendOreille_BoundaryDam__004)
Boundary Powerhouse, Transformer Bays (Bonnetts) and Picklefork Towers, camera facing SE from Tailrace (A)

Photo 5 of 25: (WA_PendOreille_BoundaryDam__005)
Boundary Dam, Reservoir, Forebay, Transformer Bays (Powerhouse), overview, camera facing SW, from Vista House Overlook (A)

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- Photo 6 of 25: (WA_PendOreille_BoundaryDam_006)
Boundary Dam, Left Spillway, Sluice Gates on downstream face, camera facing SW from dam crest at right abutment (A)
- Photo 7 of 25: (WA_PendOreille_BoundaryDam__007)
Boundary Dam, Elevator Tower, Left Spillway, Skimmer Gate, Transmission Line, Powerhouse formation, camera-looking West, from Vista House Overlook (A)
- Photo 8 of 25: (WA_PendOreille_BoundaryDam__008)
Boundary Dam, Powerhouse formation (Left Abutment), showing Transformer Bays, Transmission Line, camera facing West, from Vista House Overlook (A)
- Photo 9 of 25: (WA_PendOreille_BoundaryDam__009)
Boundary Dam, downstream face showing sluice gates, cantilever roadway, camera looking SW from Right Abutment at roadway level (K)
- Photo 10 of 25: (WA_PendOreille_BoundaryDam__0010)
Boundary Dam, Dam Crest, camera looking W, toward Forebay (K)
- Photo 11 of 25: (WA_PendOreille_BoundaryDam_011)
Boundary Dam, Powerhouse Access Tunnels with "Bonnets," camera looking SW from Tailrace Recreation Area/Access Road (K)
- Photo 12 of 25: (WA_PendOreille_BoundaryDam__012)
INTERIOR: Dam Access Tunnel, camera looking SE from near entry (K)
- Photo 13 of 25: (WA_PendOreille_BoundaryDam__013)
INTERIOR: Visitors' Gallery Entryway, from Powerhouse Access Tunnel, camera looking W (K)
- Photo 14 of 25: (WA_PendOreille_BoundaryDam__014)
INTERIOR: Boundary Powerhouse/Machine Hall, camera looking E from Visitor Gallery (K)
- Photo 15 of 25: (WA_PendOreille_BoundaryDam__015)
INTERIOR: Boundary Powerhouse/Machine Hall, Units 54, 55 and 56, camera looking E (K)
- Photo 16 of 25: (WA_PendOreille_BoundaryDam__016)
INTERIOR: Boundary Powerhouse Control Room, camera-looking E, toward main floor of the Machine Hall (K)
- Photo 17 of 25: (WA_PendOreille_BoundaryDam__017)
Boundary Dam Tailrace Recreation Area, camera looking N (K)
- Photo 18 of 25: (WA_PendOreille_BoundaryDam__018)
Vista House and Overlook Platform, camera looking NE from Forebay Recreation Area (A)
- Photo 19 of 25: (WA_PendOreille_BoundaryDam__019)
Vista House, camera looking N from trailhead (A)
- Photo 20 of 25: (WA_PendOreille_BoundaryDam__020)
INTERIOR: Vista House, camera looking W (A)
- Photo 21 of 25: (WA_PendOreille_BoundaryDam__021)
Vista House Overlook platform, camera looking W (K)
- Photo 22 of 25: (WA_PendOreille_BoundaryDam__022)
Boundary Dam Transmission Line, camera looking N from Forebay (K)

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Photo 23 of 25: (WA_PendOreille_BoundaryDam__023)
Boundary Dam Transmission Line, Pickleforks, camera looking NW from dam crest (A)

Photo 24 of 25: (WA_PendOreille_BoundaryDam__024)
Boundary Dam Transmission Line and project overview, camera looking NE from BPA Boundary Substation, toward dam and powerhouse (K)

Photo 25 of 25: (WA_PendOreille_BoundaryDam__025)
Boundary Dam Operations and Maintenance Service Area, General View, camera looking N from Access Road (K)

Property Owner: (Complete this item at the request of the SHPO or FPO.)

name Seattle City Light (attn Michael Aronowitz, Sr. Environmental Analyst)
street & number 700 5th Avenue (PO Box 34023) telephone 206-233-2631
city or town Seattle state WA zip code 98124-4023

Paperwork Reduction Act Statement: This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C.460 et seq.).

Estimated Burden Statement: Public reporting burden for this form is estimated to average 18 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Office of Planning and Performance Management, U.S. Dept. of the Interior, 1849 C. Street, NW, Washington, DC.

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2. USGS "Boundary Dam" 7.5 Min Topographic Map (2017)
3. Boundary Hydroelectric Project Nominated Area (Seattle City Light, 2017)
4. Boundary Hydroelectric Project, Nominated Resource Identification (Seattle City Light, 2017)
5. Boundary Hydroelectric Project, General Plan Map (Seattle City Light Drawing D-19085)
6. Boundary Hydroelectric Project, Artist's Rendering (Seattle City Light, c1964)
7. Boundary Dam and Power Plant General Project Map (Seattle City Light, c1964)
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9. Historic Plan, Machine Hall General Arrangement and Transverse Section, 1964 (Seattle City Light Drawing D-23156)
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11. Historic Photo, Machine Hall Construction August 1, 1966, Unit 51 in Foreground (Seattle Municipal Archives, Image No. 184611)
12. Historic Photo, Machine Hall Construction 1967 (Seattle Municipal Archives, Image No. 117807)
13. Historic Photo, Machine Hall Construction January 24, 1968, showing Units 51-54, with cavity for later expansion in distance (Seattle Municipal Archives, Image No. 183480)
14. Historic Photo, Transformer Bays, Draft Tubes and Tailrace Construction, February 20, 1967 (Seattle Municipal Archives, Image No. 185539)
15. Historic Photo. Powerhouse Access Tunnel, View to the Visitors' Gallery, November 10, 1967 (Seattle Municipal Archives, Image No. 184608)
16. Historic Photo, Boundary Dam Visitors' Gallery Entryway, October 10, 1969 (Seattle City Light Image)
17. Historic Plan, Boundary Dam, 1964 (Seattle City Light Drawing D-23073)
18. Historic Photo, Boundary Dam Construction, First Bucket of Concrete, November 11, 1965 (Seattle Municipal Archives, Image No. 184605)
19. Historic Photo, Boundary Dam Construction, Mrs. Paul Raver Placing Medals, Possessions of Dr. Raver, into the First Bucket of Concrete, November 11, 1965 (Seattle Municipal Archives, Image No. 184604)
20. Historic Photo: Boundary Dam Construction, Looking Upstream from Left Bank, June 27, 1967 (Seattle Municipal Archives, Image No. 185538)

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21. Historic Photo, Boundary Dam Construction, Looking Upstream from Left Bank, July 12, 1967 (Seattle Municipal Archives, Image No. 185537)
22. Historic Photo, Boundary Dam Construction, Looking Downstream, April 18, 1967 (Seattle Municipal Archives, Image No. 184610)
23. Historic Photo, Boundary Dam Construction, Looking Downstream as reservoir fills, July 31, 1967 (Seattle Municipal Archives, Image No. 109396)
24. Historic Photo, Boundary Dam Vista House Rendering, Walker & McGough, Architects, c1965 (Washington Department of Archaeology and Historic Preservation Collection)
25. Historic Plans, Vista House Floorplan, Building Section and Details, 1965 (Seattle City Light Drawing D-19119)
26. Historic Photo, Boundary Dam Vista House, looking South, July 13, 1967 (Seattle Municipal Archives, Image No. 184607)
27. Historic Photo, Boundary Dam Transmission Line, "Picklefork" Cantilevered Towers, Looking SE, June 21, 1967 (Seattle Municipal Archives, Image No. 182751)
28. Historic Photo, Boundary Dam, Construction Camp Aerial View, Looking NW, July 13, 1967 (Seattle Municipal Archives, Image No. 184606)
29. Historic Photo, Boundary Dam, Construction Camp Progress, Looking North, October 30, 1963 (Seattle Municipal Archives, Image No. 184603)
30. Historic Photo, Boundary Dam Spilling, Looking South, October 25, 1999 (Seattle Municipal Archives, Image No. 100327)
31. Historic Photo, Boundary Dan Spilling, with Vista House Overlook, October 12, 1999 (Seattle Municipal Archives, Image No. 100259)
32. PHOTO LOCATION KEY, SHEET A, Images 1-12
33. PHOTO LOCATION KEY, SHEET B, Images 13-16
34. PHOTO LOCATION KEY, SHEET C, Images 17-25

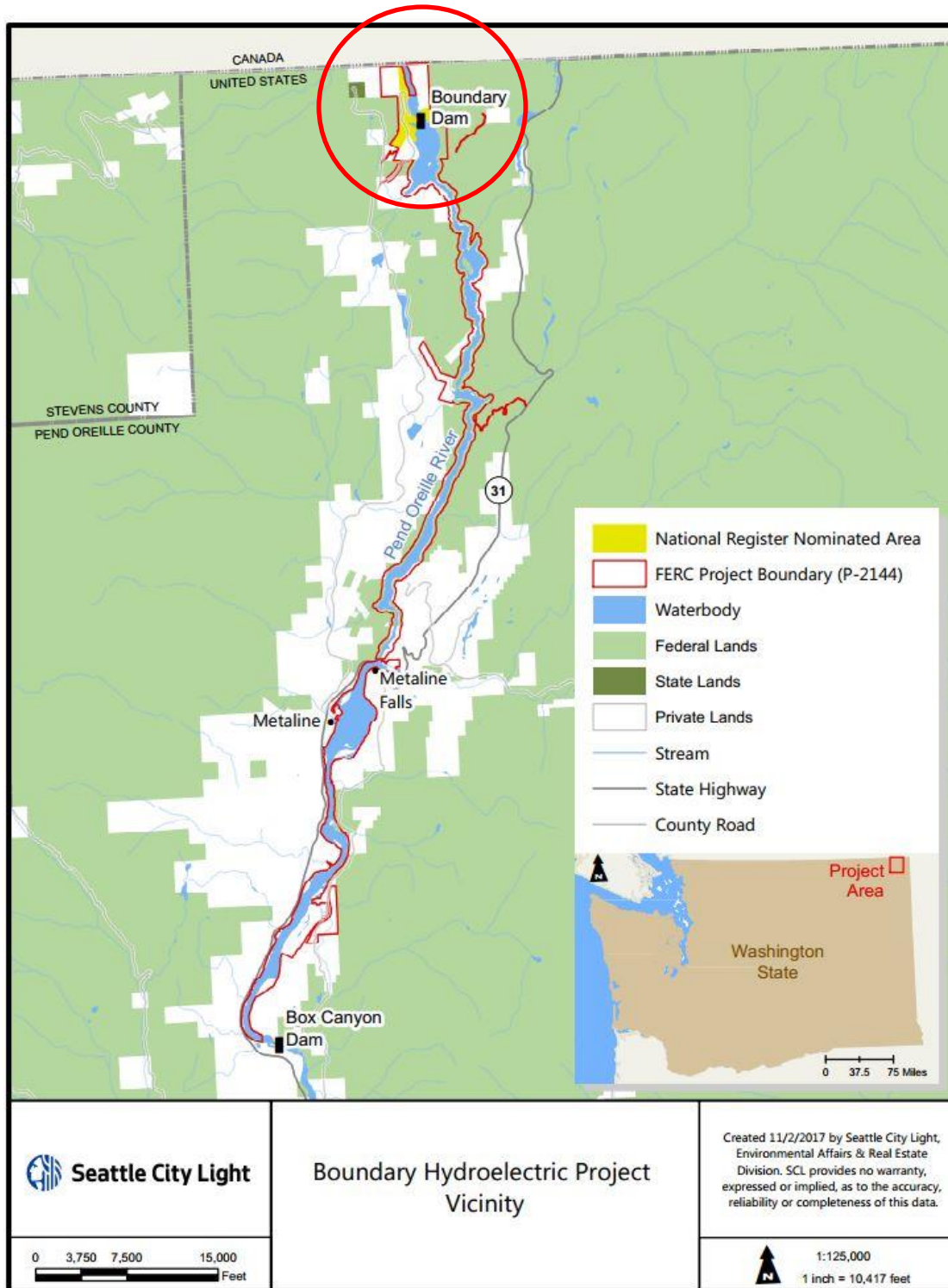
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FIGURE 1. General Location Map (Seattle City Light, 2017)



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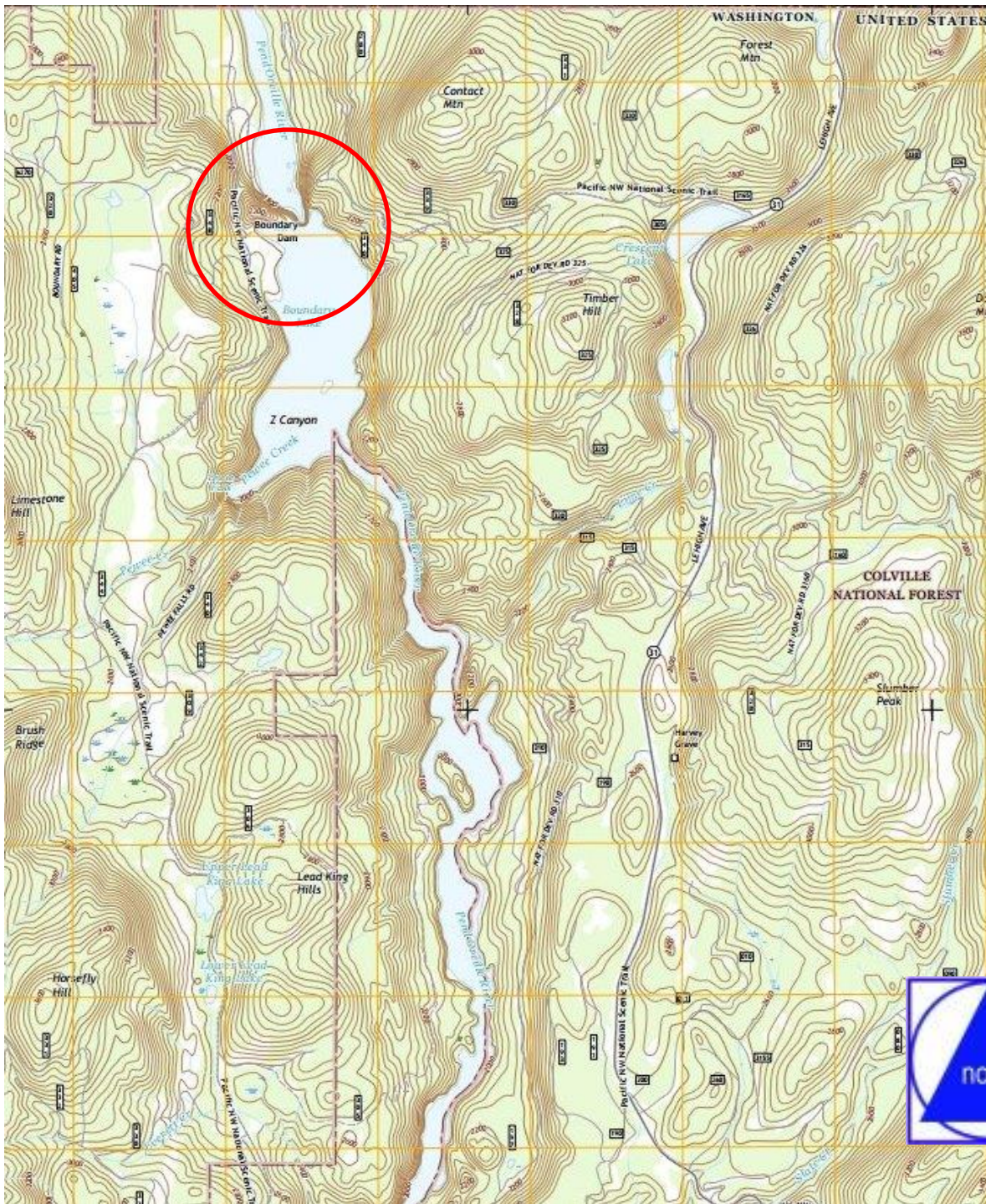
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FIGURE 2. USGS 'Boundary Dam' 7.5 Min Topographic Map (2017)



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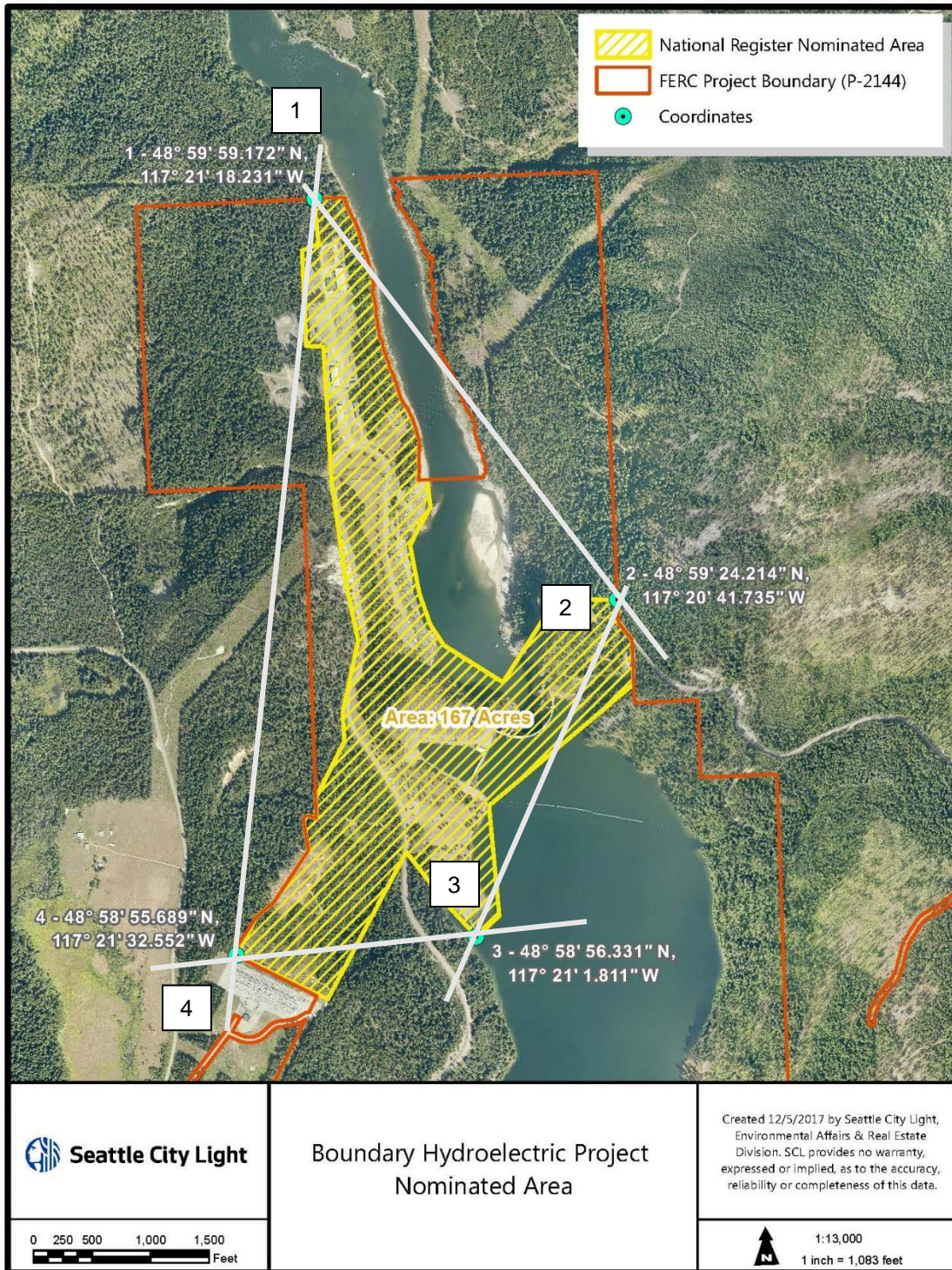
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FIGURE 3. Boundary Hydroelectric Project, Nominated Area (Seattle City Light, 2017)



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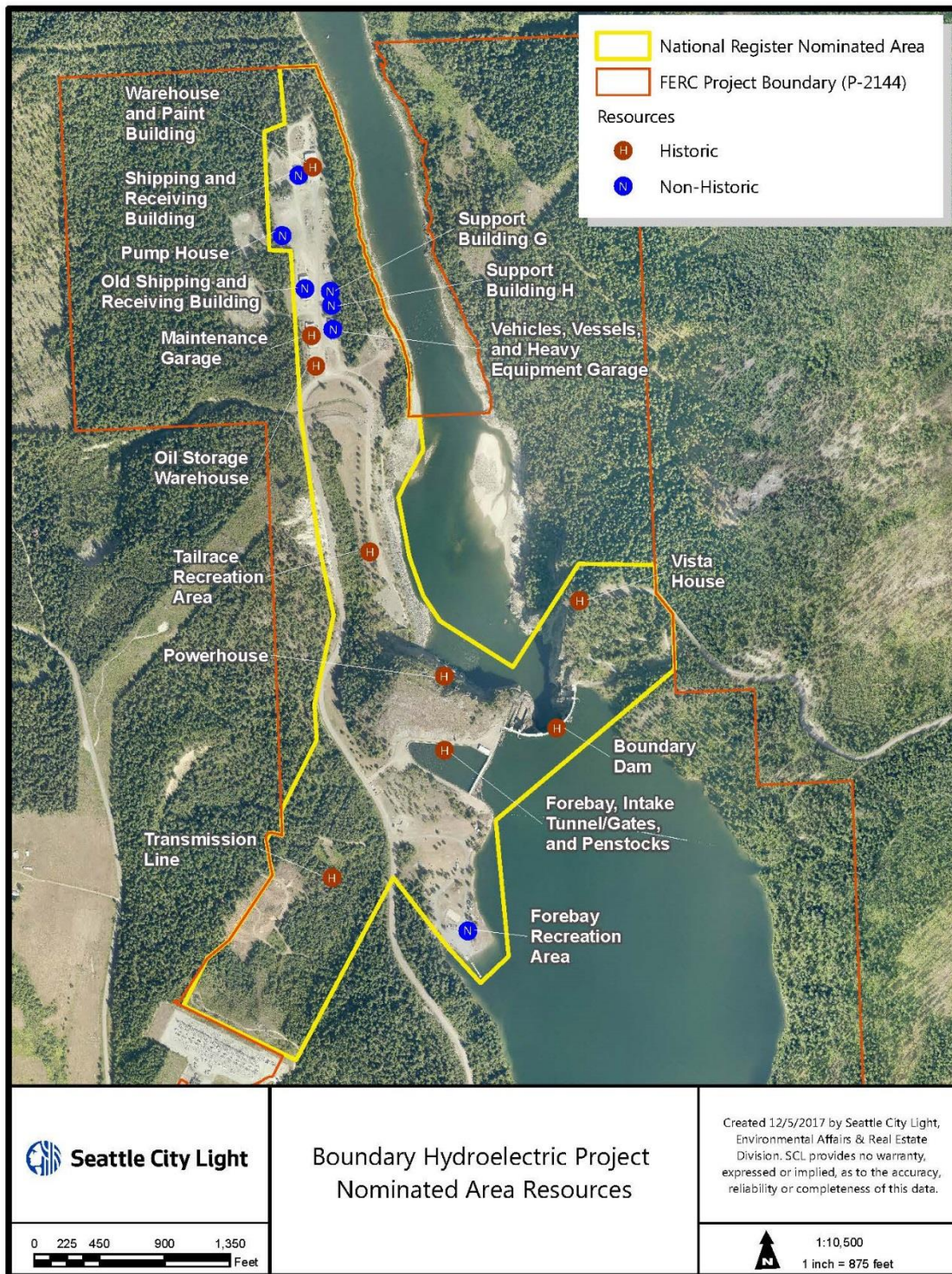
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FIGURE 4. Boundary Hydroelectric Project, Nominated Resource Identification, (Seattle City Light, 2017)



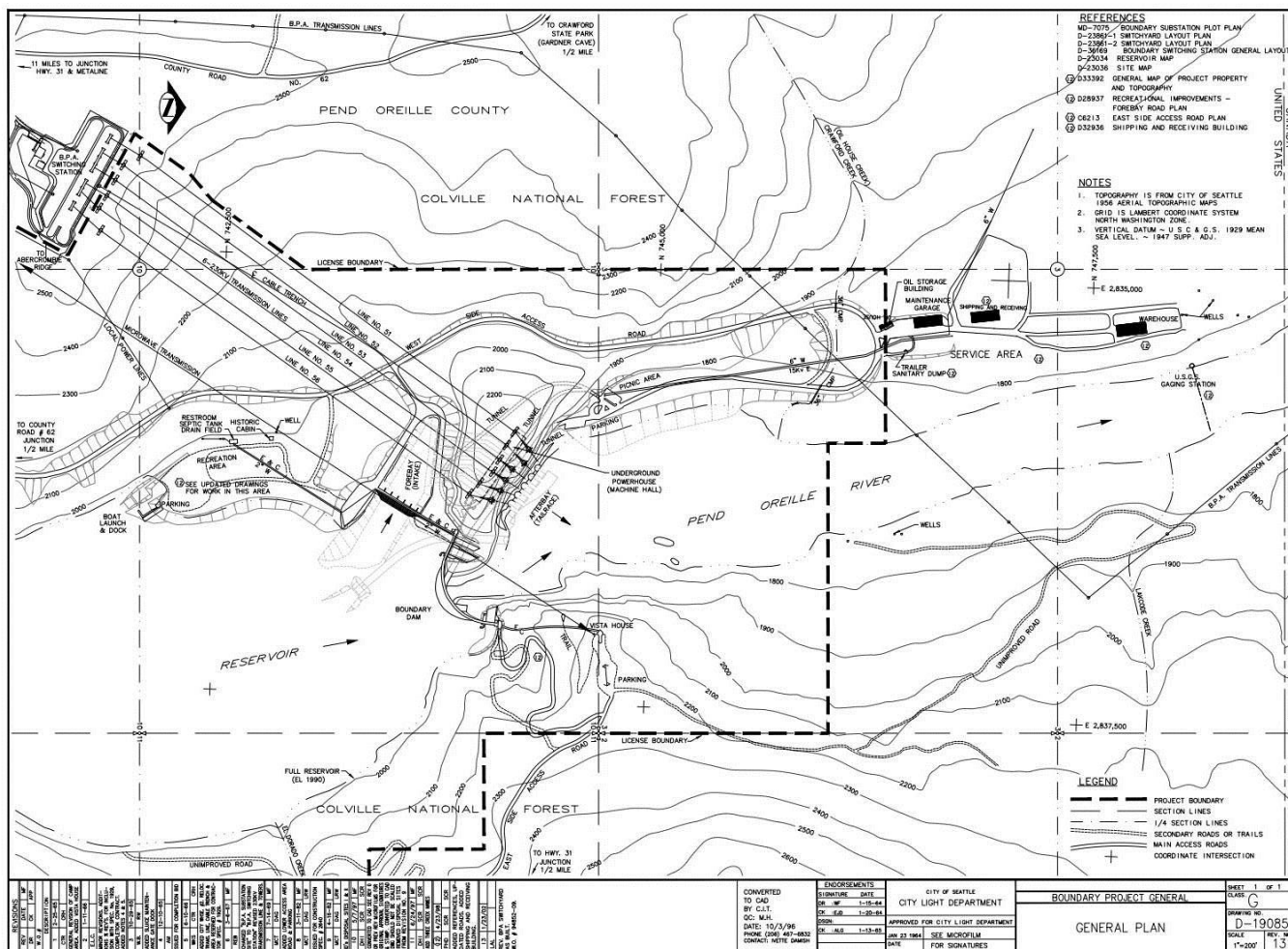
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FIGURE 5. Boundary Hydroelectric Project, General Plan Map (Seattle City Light Drawing D-19085)



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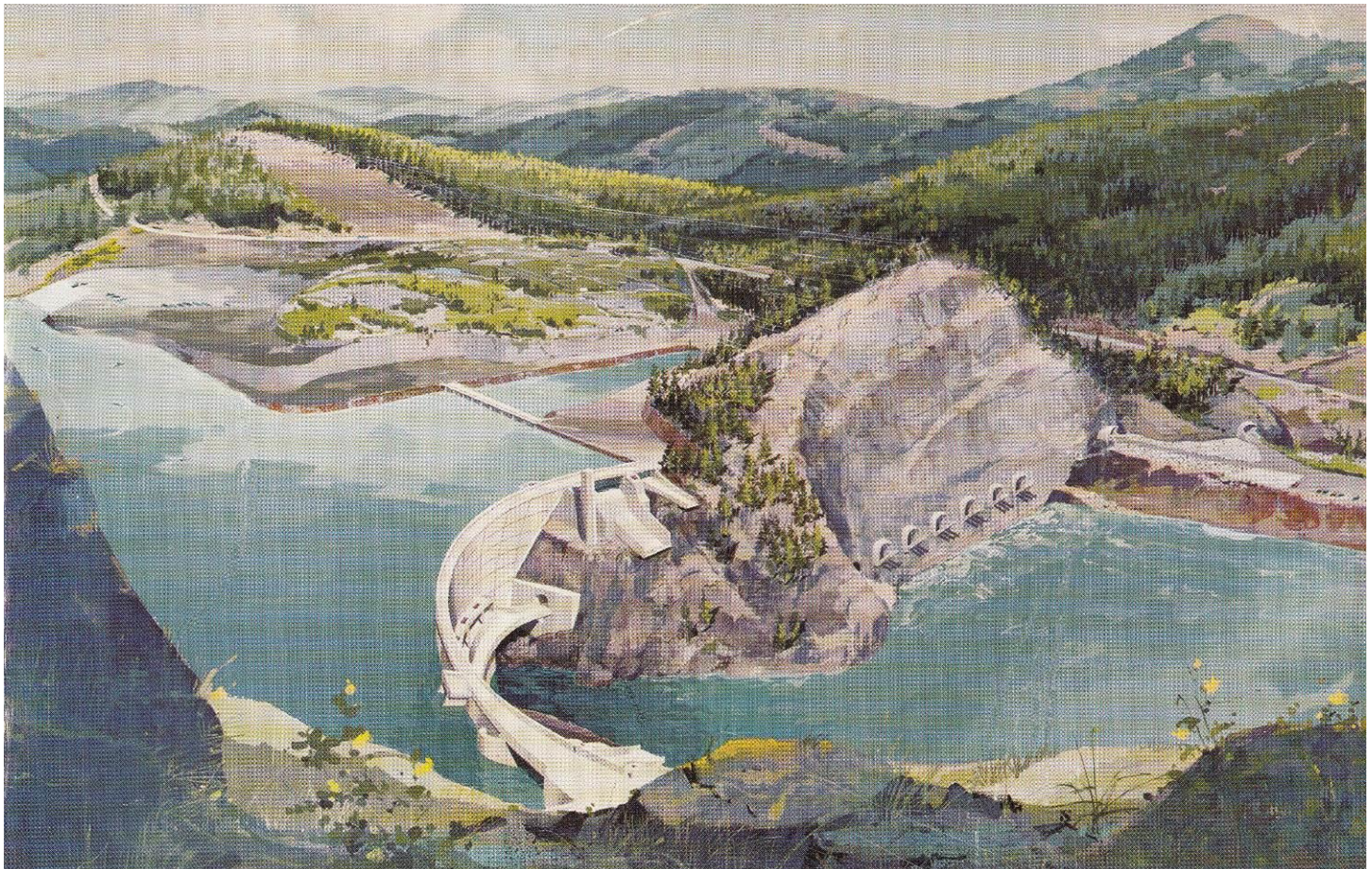
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FIGURE 6. Boundary Hydroelectric Project, Artist's Rendering (Seattle City Light, c1964)



THE BOUNDARY PROJECT

A new energy source by
Seattle City Light

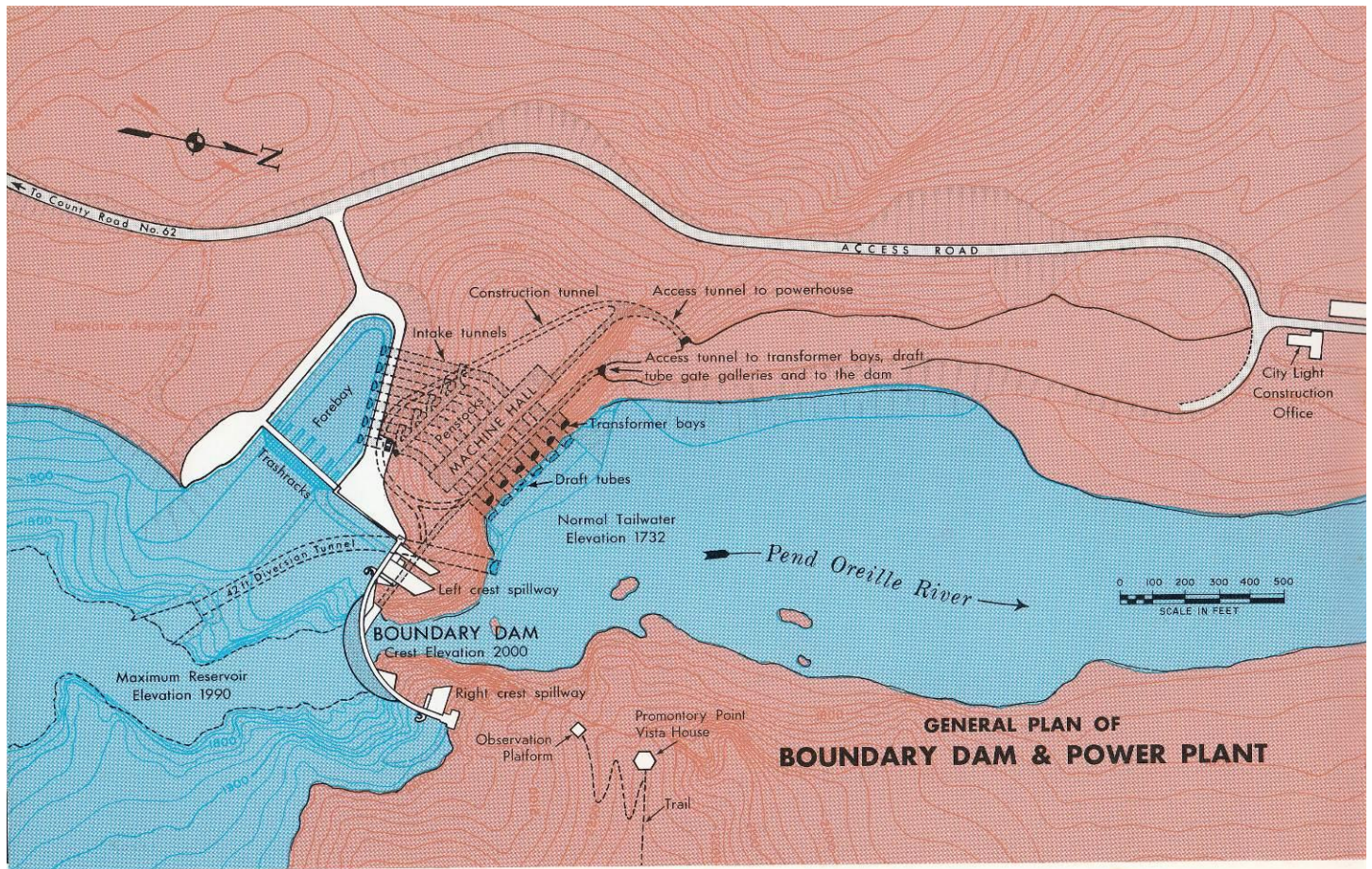
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FIGURE 7. Boundary Dam and Power Plant General Project Map (Seattle City Light, c1964)



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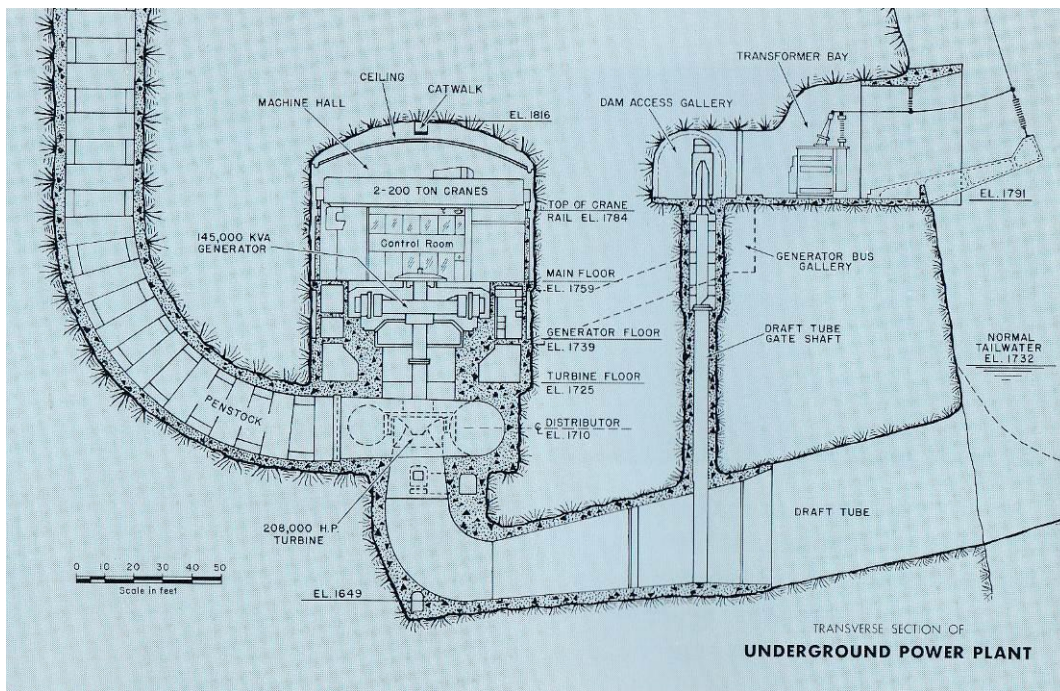
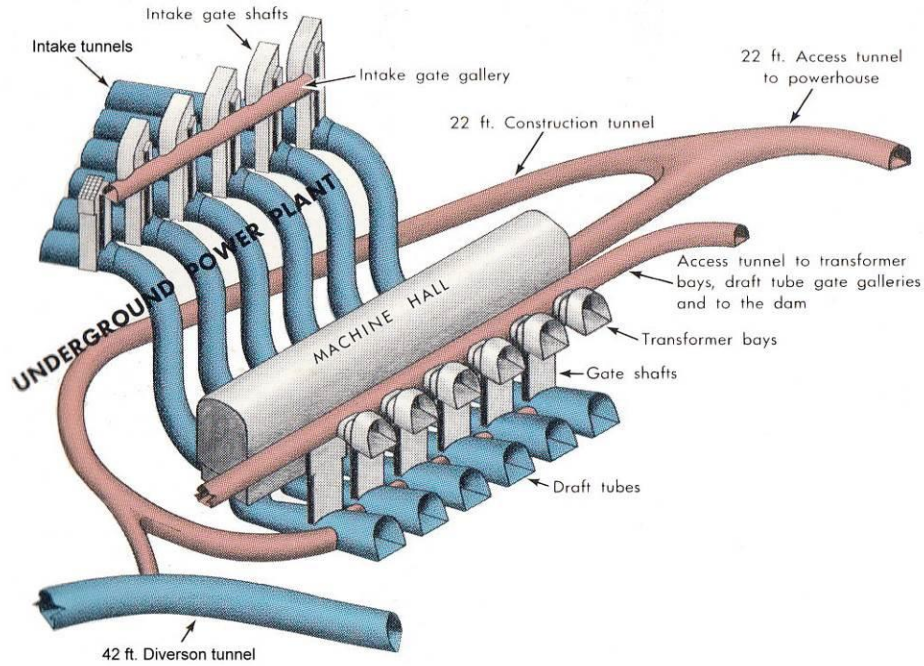
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FIGURE 8. Boundary Underground Power Plant, Cut-Away and Section Views (Seattle City Light, c1964)



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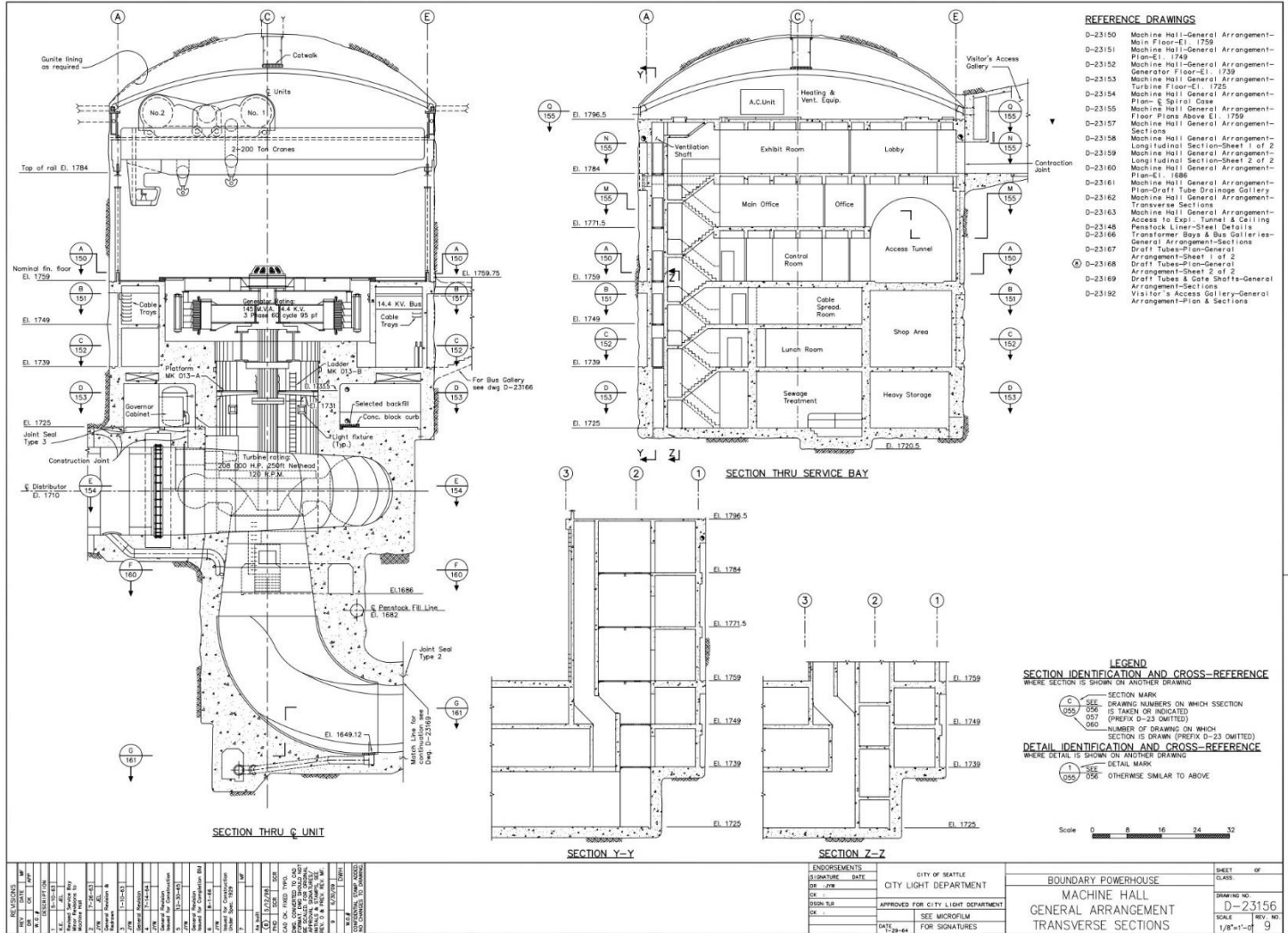
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FIGURE 9. Historic Plan, Machine Hall General Arrangement and Transverse Section, 1964 (Seattle City Light Drawing D-23156)



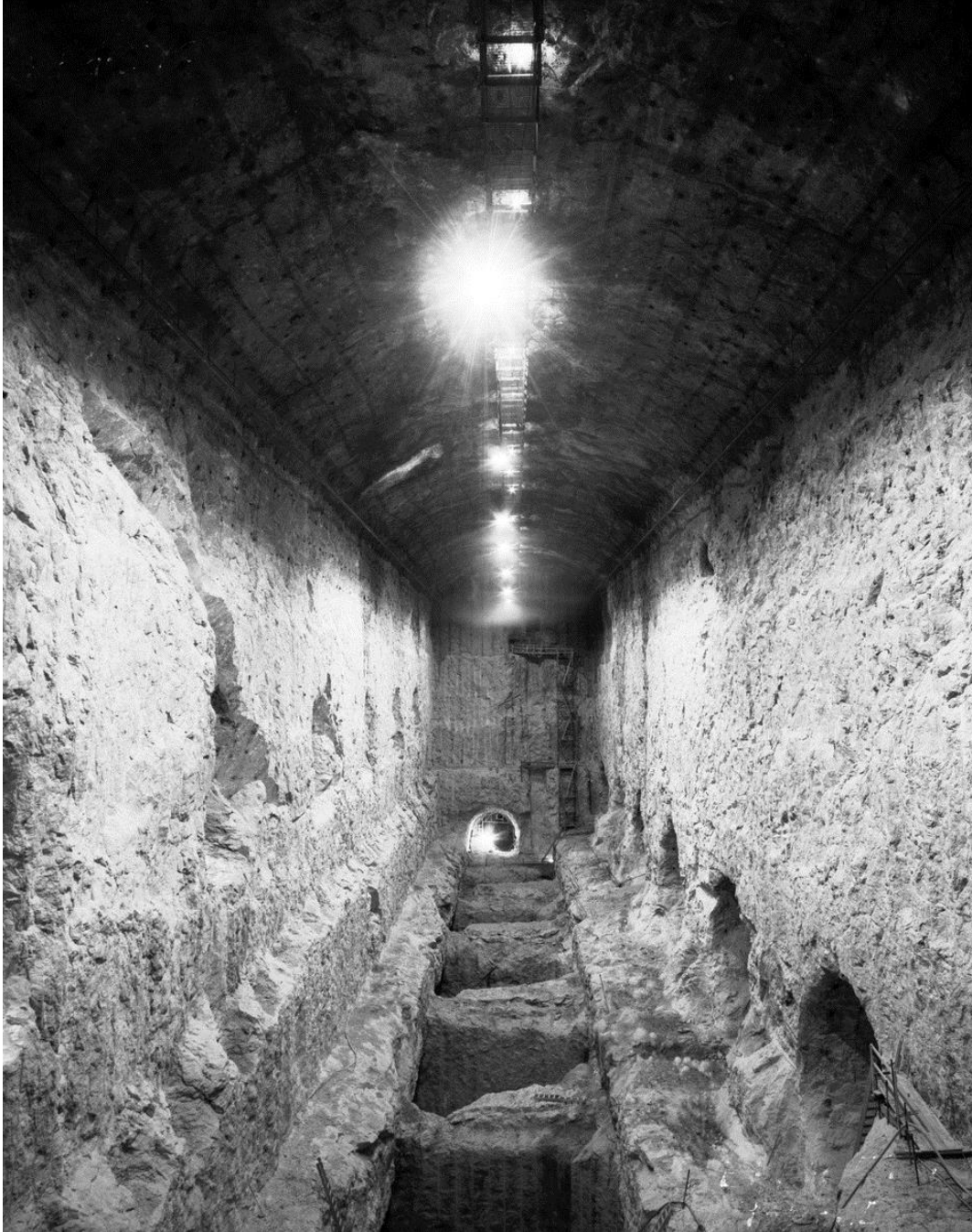
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FIGURE 10. Historic Photo, Powerhouse Construction January 9, 1965 (Seattle Municipal Archives, Image No. 183940)



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FIGURE 11. Historic Photo, Machine Hall Construction August 1, 1966, Unit 51 in Foreground (Seattle Municipal Archives, Image No. 184611)



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FIGURE 12. Historic Photo, Machine Hall Construction 1967 (Seattle Municipal Archives, Image No. 117807)



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FIGURE 13. Historic Photo, Machine Hall Construction January 24, 1968, showing Units 51-54, with cavity for later expansion in distance (Seattle Municipal Archives, Image No. 183480)



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FIGURE 14. Historic Photo, Transformer Bays, Draft Tubes, and Tailrace Construction, February 20, 1967 (Seattle Municipal Archives, Image No. 185539)



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FIGURE 15. Historic Photo, Powerhouse Access Tunnel, View to the Visitors' Gallery, November 10, 1967 (Seattle Municipal Archives, Image No. 184608)



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FIGURE 16. Historic Photo, Boundary Dam Visitors' Gallery Entryway, October 10, 1969 (Seattle City Light Image)



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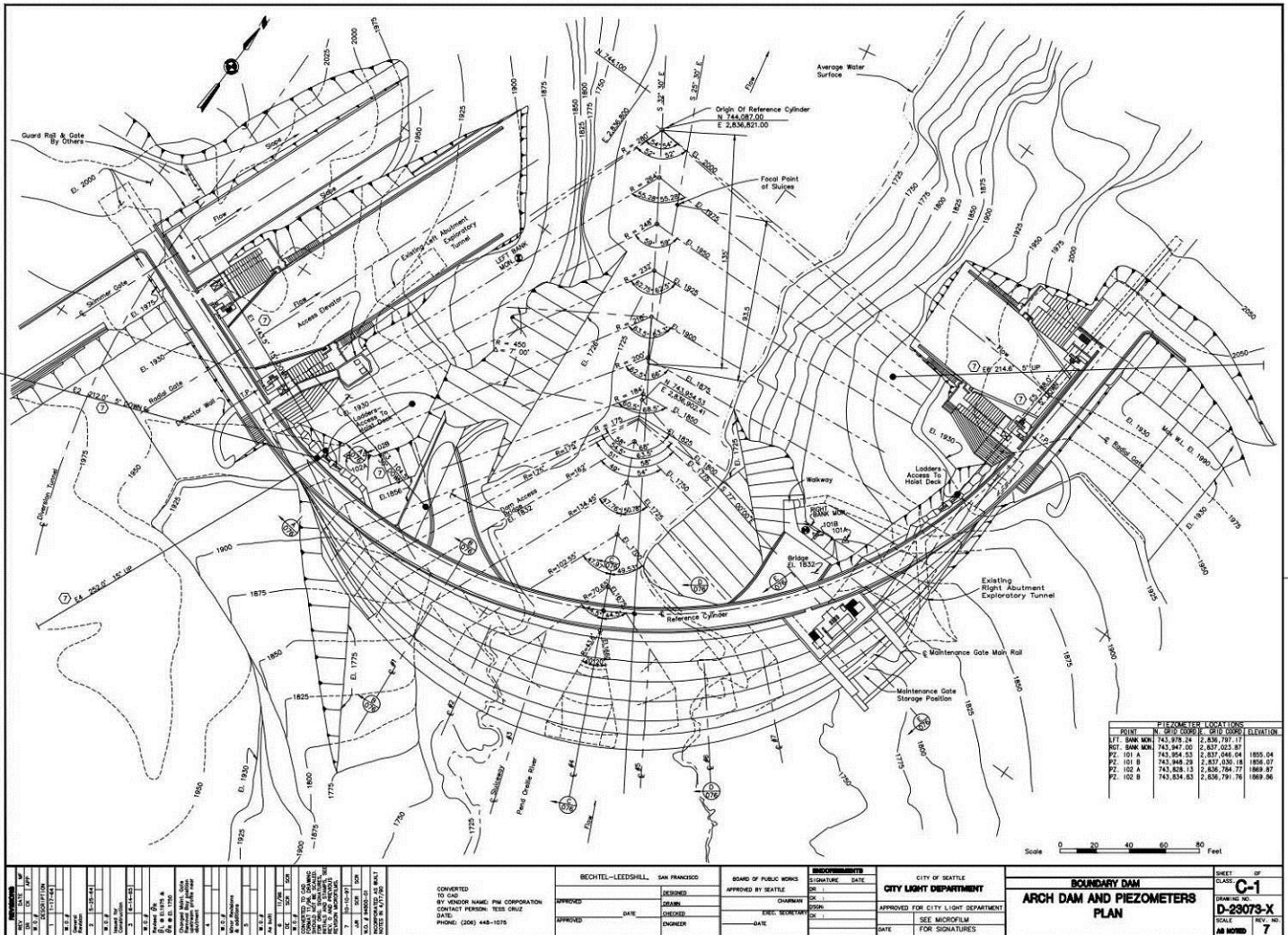
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FIGURE 17. Historic Plan, Boundary Dam, 1964 (Seattle City Light Drawing D-23073)



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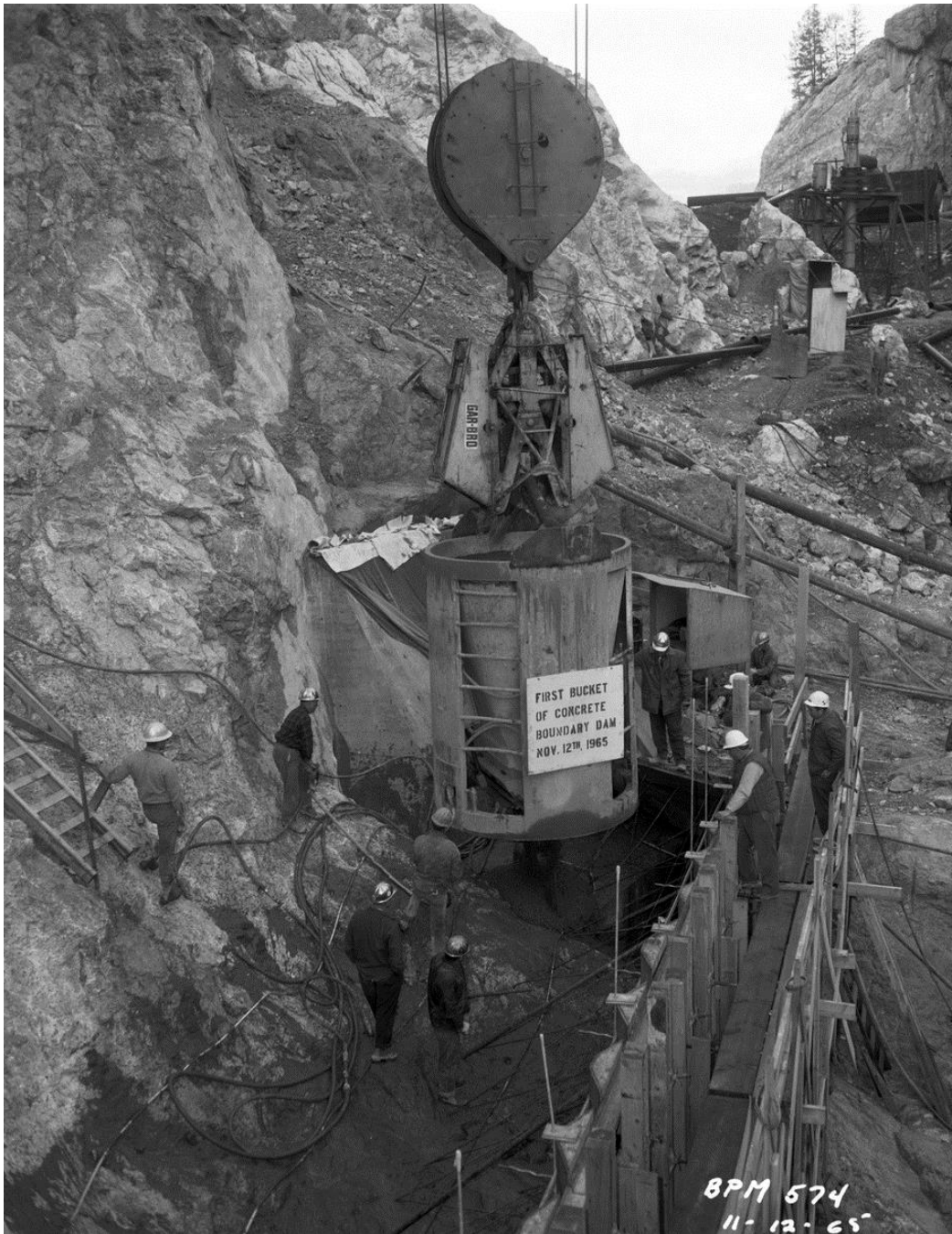
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FIGURE 18. Historic Photo, Boundary Dam Construction, First Bucket of Concrete, November 11, 1965 (Seattle Municipal Archives, Image No. 184605)



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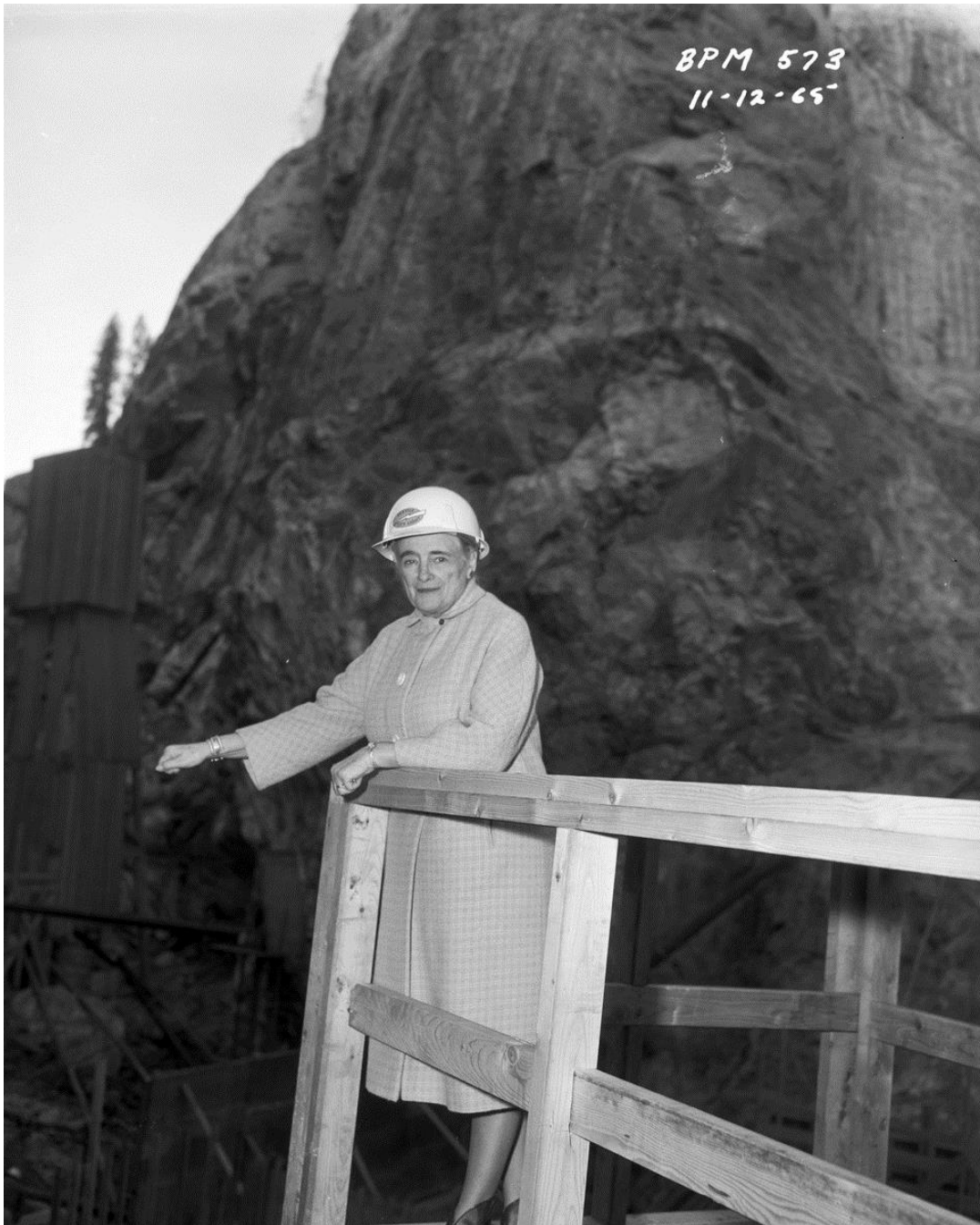
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FIGURE 19. Historic Photo, Boundary Dam Construction, Mrs. Paul Raver Placing Medals, Possessions of Dr. Raver, into the First Bucket of Concrete, November 11, 1965 (Seattle Municipal Archives, Image No. 184604)



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FIGURE 20. Historic Photo, Boundary Dam Construction, Looking Upstream from Left Bank, June 27, 1967 (Seattle Municipal Archives, Image No. 185538)



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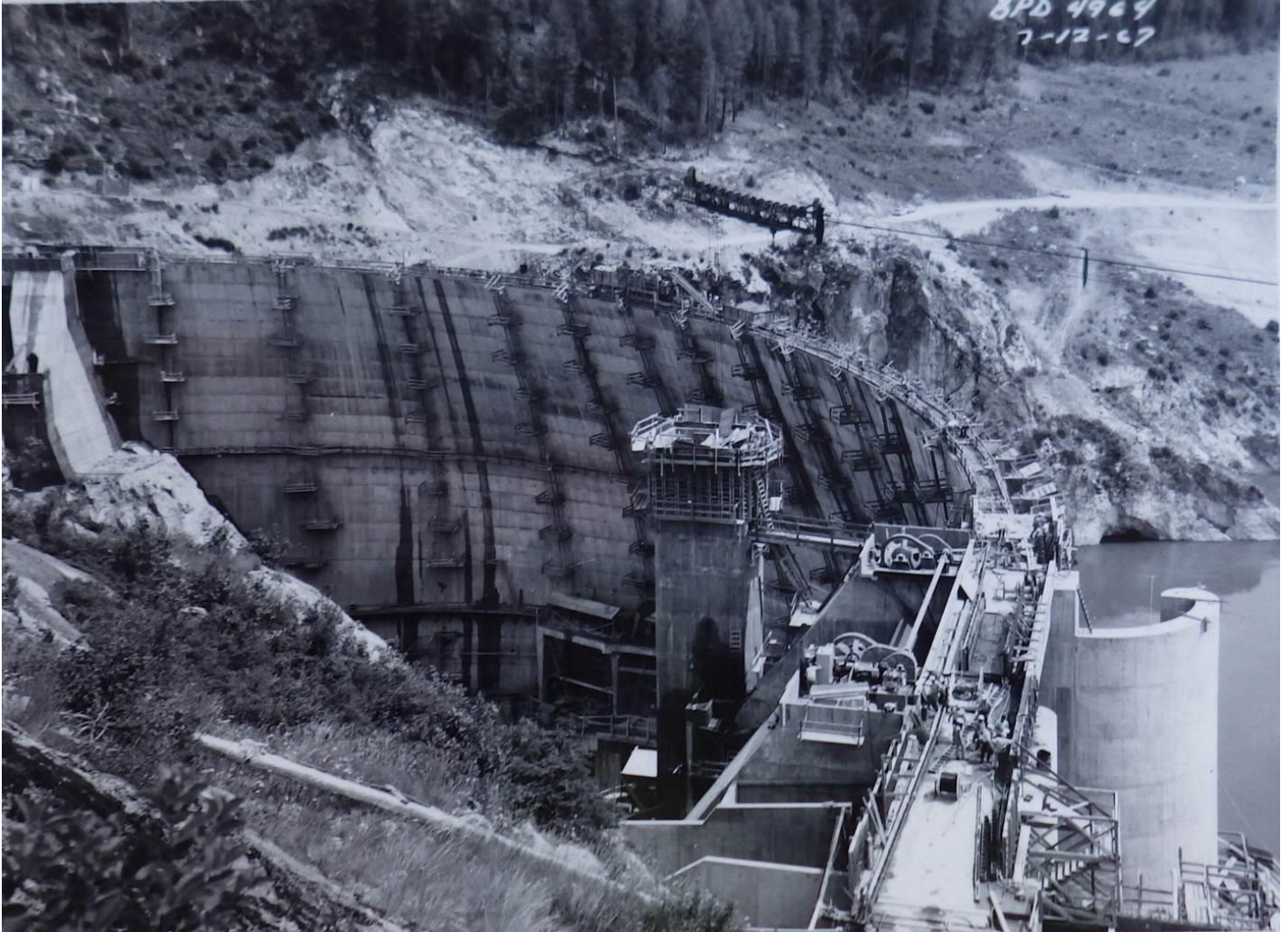
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FIGURE 21. Historic Photo, Boundary Dam Construction, Looking Upstream from Left Bank, July 12, 1967 (Seattle Municipal Archives, Image No. 185537)



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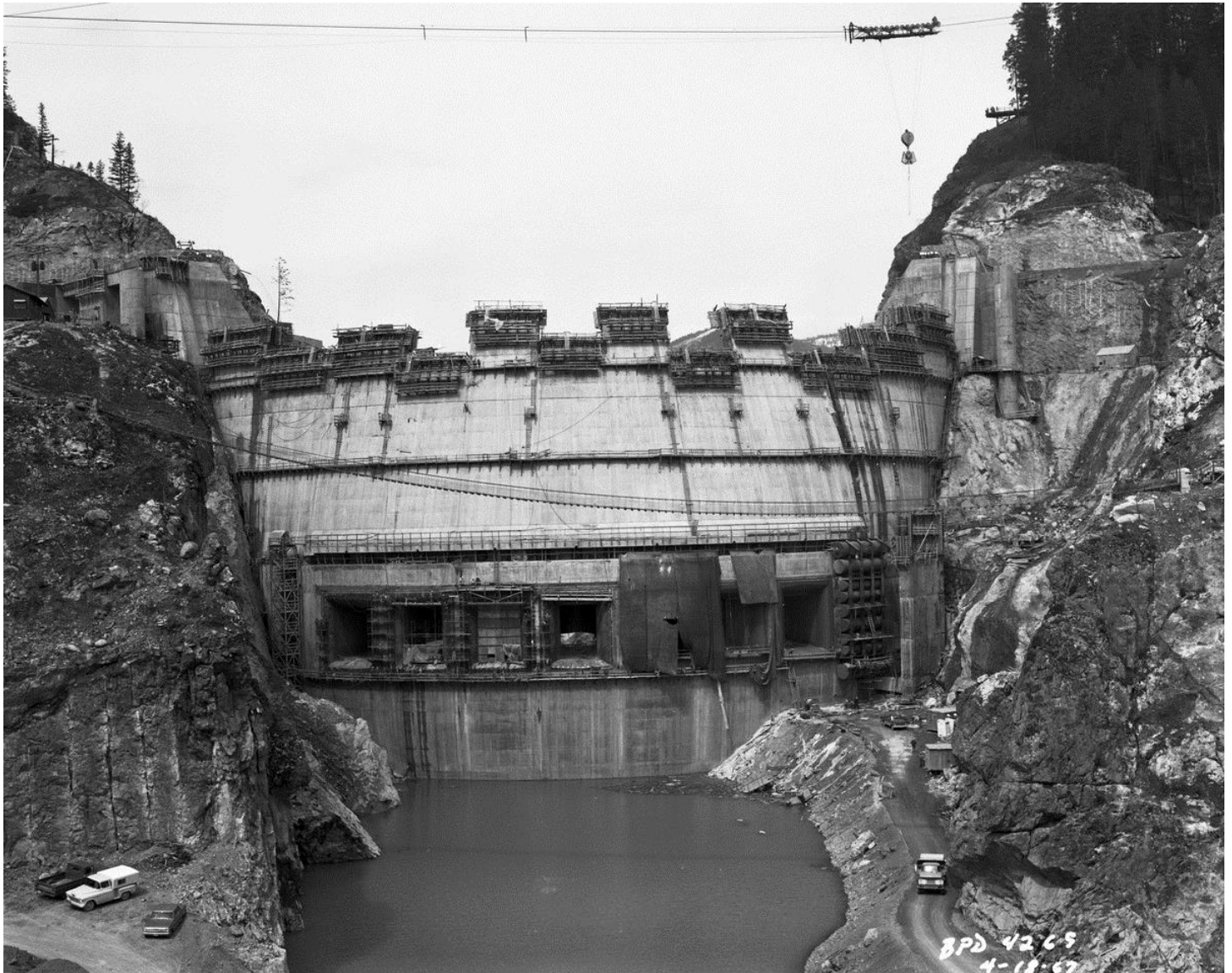
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FIGURE 22. Historic Photo, Boundary Dam Construction, Looking Downstream, April 18, 1967 (Seattle Municipal Archives, Image No. 184610)



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FIGURE 23. Historic Photo, Boundary Dam Construction, Looking Downstream as reservoir fills, 1967 (Seattle Municipal Archives, Image No. 109396)



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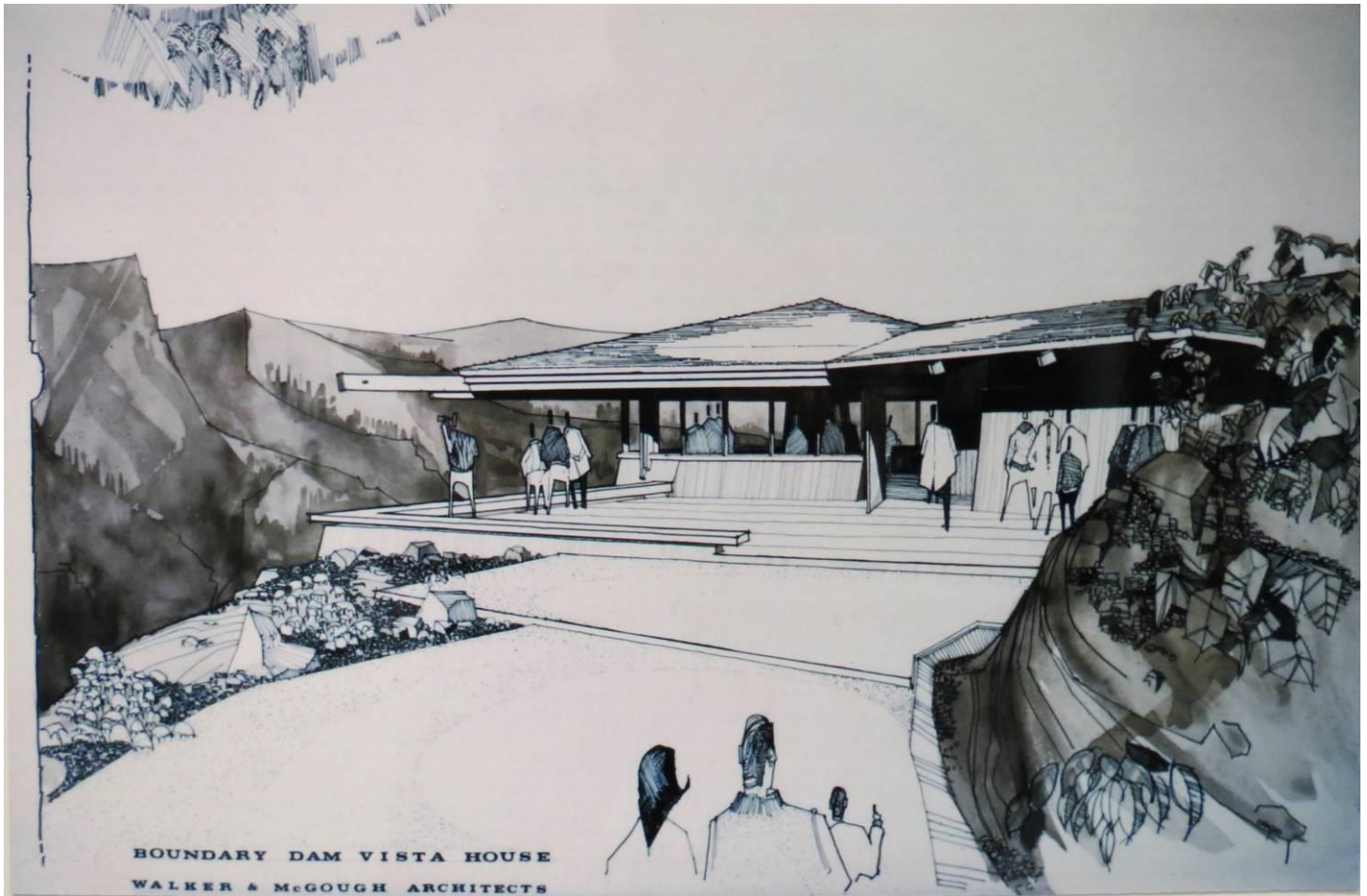
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FIGURE 24. Historic Photo, Boundary Dam Vista House Rendering, Walker & McGough, Architects, c1965 (Washington Department of Archaeology and Historic Preservation Collection)



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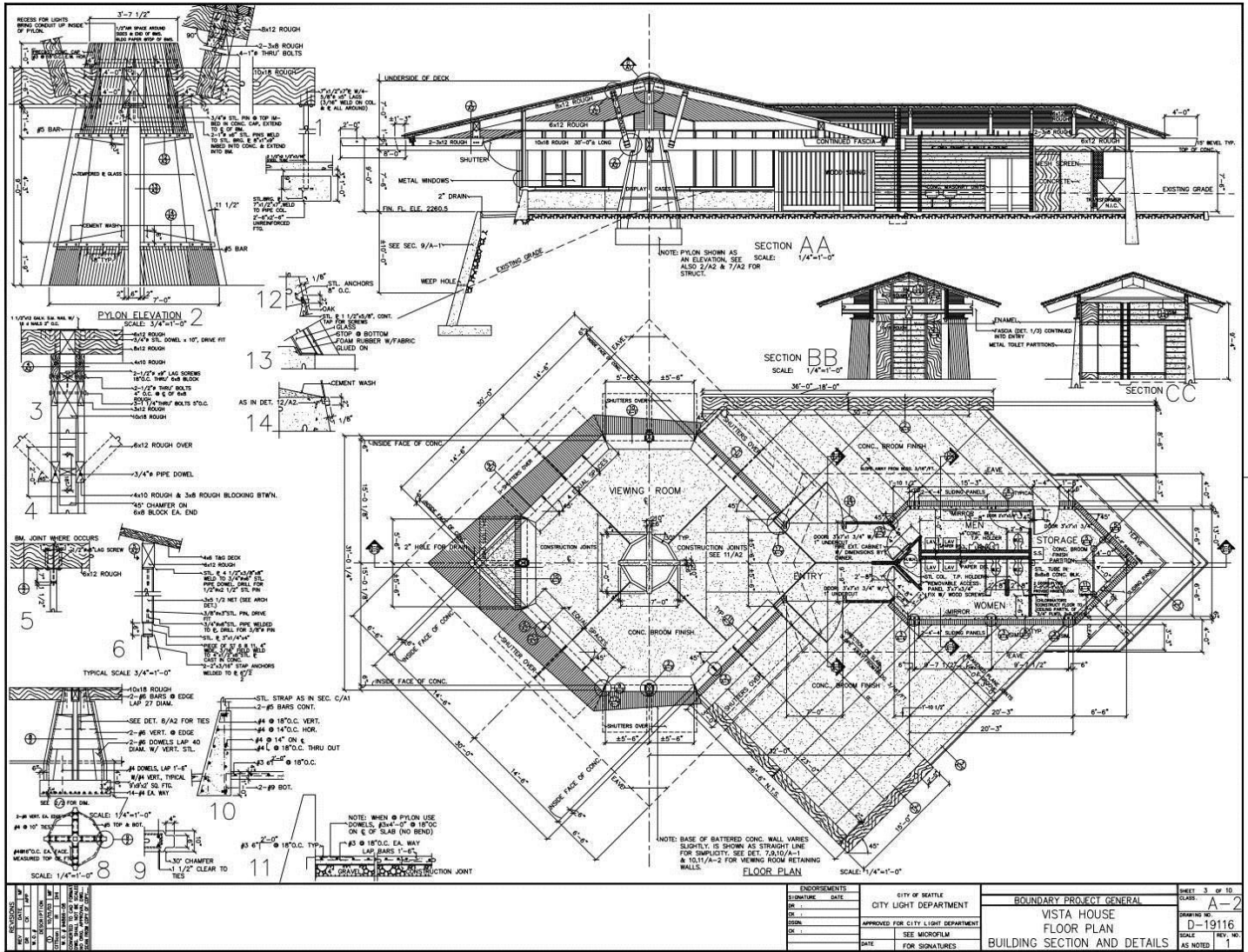
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FIGURE 25. Historic Plan, Vista House Floorplan, Building Section and Details, 1965 (Seattle City Light Drawing D-19119)



ENDORSEMENTS DRAWING: DATE DESIGNED: DATE CHECKED: DATE DATE	CITY OF SEATTLE CITY LIGHT DEPARTMENT APPROVED FOR CITY LIGHT DEPARTMENT SEE MICROFILM FOR SIGNATURES	BOUNDARY PROJECT GENERAL VISTA HOUSE FLOOR PLAN BUILDING SECTION AND DETAILS	SHEET 3 OF 10 SCALE: A-2 DRAWING NO. D-19116 SCALE: REV. NO. AS NOTED 1
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FIGURE 26. Historic Photo, Boundary Dam Vista House, looking South, July 13, 1967 (Seattle Municipal Archives, Image No. 184607)



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FIGURE 27. Historic Photo, Boundary Dam Transmission Line, "Picklefork" Cantilevered Towers, Looking SE, June 21, 1967 (Seattle Municipal Archives, Image No. 182751)



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FIGURE 28. Historic Photo, Boundary Dam, Construction Camp Aerial View, Looking NW, July 13, 1967 (Seattle Municipal Archives, Image No. 184606)



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FIGURE 29. Historic Photo, Boundary Dam, Construction Camp Progress, Looking North, October 30, 1963 (Seattle Municipal Archives, Image No. 184603)



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FIGURE 30. Historic Photo, Boundary Dam Spilling, Looking South, October 25, 1999 (Seattle Municipal Archives, Image No. 100327)



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FIGURE 31. Historic Photo, Boundary Dan Spilling, with Vista House Overlook, October 12, 1999 (Seattle Municipal Archives, Image No. 100259)



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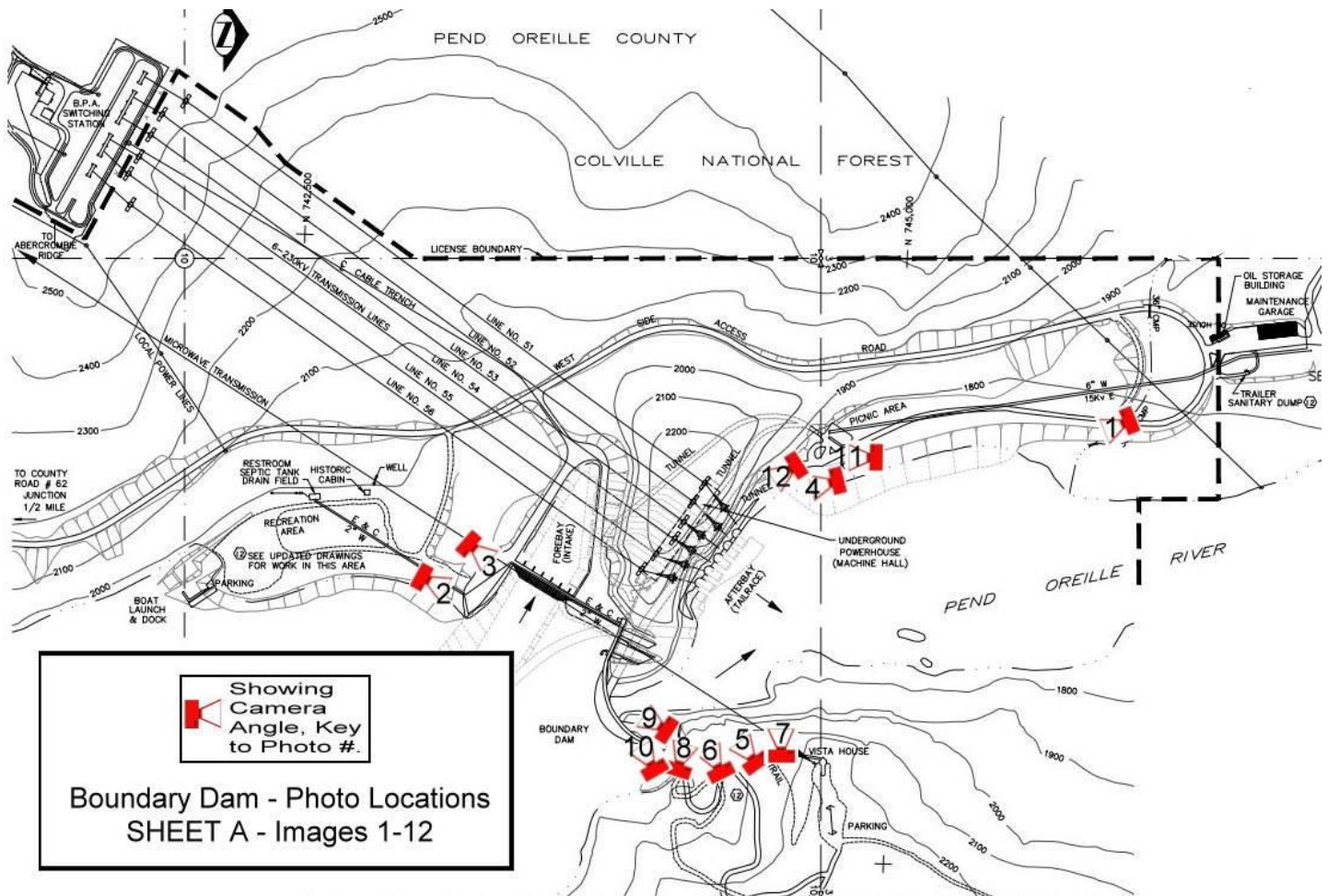
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FIGURE 32. PHOTO LOCATION KEY, SHEET A, Images 1-12



Boundary Dam - Photo Locations
SHEET A - Images 1-12

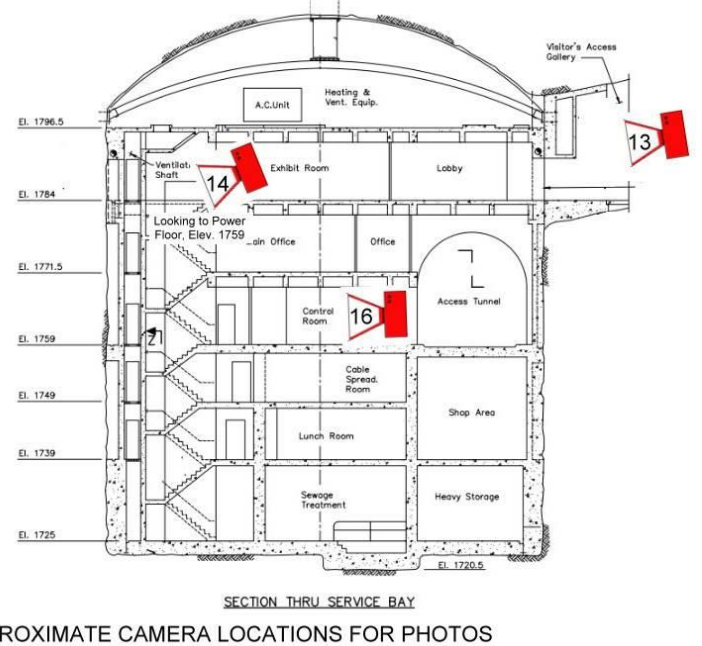
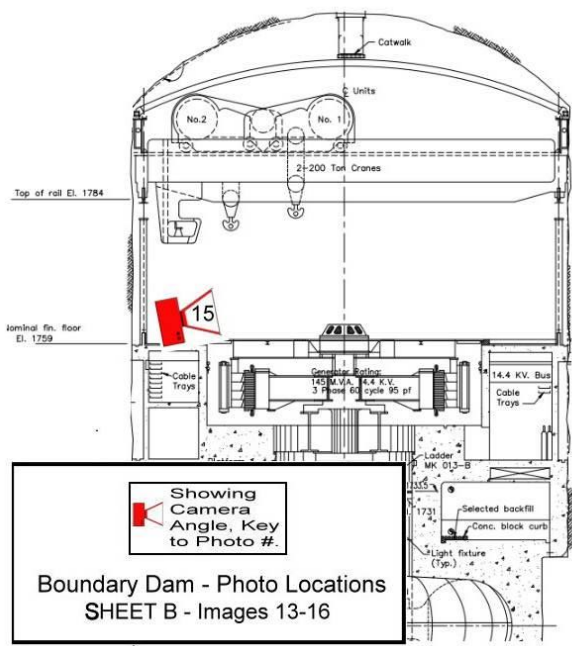
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FIGURE 33. PHOTO LOCATION KEY, SHEET B, Images 13-16



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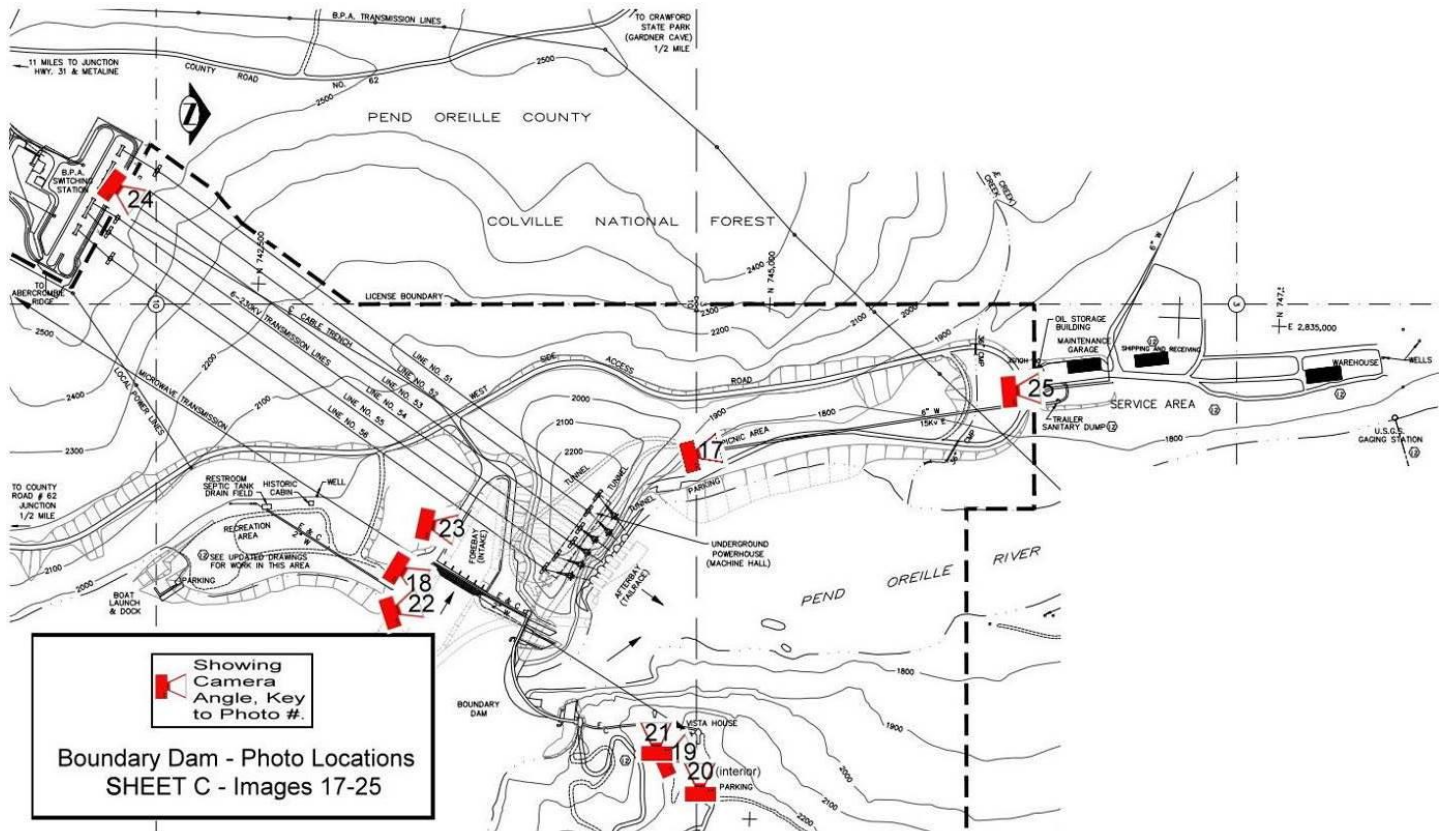
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FIGURE 34. PHOTO LOCATION KEY, SHEET C, Images 17-25



Photograph Identification List

Photo 1 of 25: (WA_PendOreille_BoundaryDam_001)

Boundary Dam, Vista House to Left, Powerhouse to right, camera facing S, from Access Rd (A)



Photo 2 of 25: (WA_PendOreille_BoundaryDam__002)
Boundary Dam, Vista House in center, camera facing North, from Forebay area (A)



Photo 3 of 25: (WA_PendOreille_BoundaryDam__003)
Boundary Dam, Forebay, Towers, camera facing NW, from Forebay Area (A)



Photo 4 of 25: (WA_PendOreille_BoundaryDam_004)
Boundary Powerhouse, Transformer Bays (Bonnets) and Picklefork Towers, camera
facing SE from Tailrace (A)



Photo 5 of 25: (WA_PendOreille_BoundaryDam__005)
Boundary Dam, Reservoir, Forebay, Transformer Bays (Powerhouse), overview, camera facing SW, from Vista House Overlook (A)



Photo 6 of 25: (WA_PendOreille_BoundaryDam_006)
Boundary Dam, Left Spillway, Sluice Gates on downstream face, camera facing SW from
dam crest at right abutment (A)



Photo 7 of 25: (WA_PendOreille_BoundaryDam__007)
Boundary Dam, Elevator Tower, Left Spillway, Skimmer Gate, Transmission Line,
Powerhouse formation, camera-looking West, from Vista House Overlook (A)



Photo 8 of 25: (WA_PendOreille_BoundaryDam__008)
Boundary Dam, Powerhouse formation (Left Abutment), showing Transformer Bays,
Transmission Line, camera facing West, from Vista House Overlook (A)



Photo 9 of 25: (WA_PendOreille_BoundaryDam__009)
Boundary Dam, downstream face showing sluice gates, cantilever roadway, camera
looking SW from Right Abutment at roadway level (K)



Photo 10 of 25: (WA_PendOreille_BoundaryDam__0010)
Boundary Dam, Dam Crest, camera looking W, toward Forebay (K)



Photo 11 of 25: (WA_PendOreille_BoundaryDam_011)
Boundary Dam, Powerhouse Access Tunnels with "Bonnets," camera looking SW from
Tailrace Recreation Area/ Access Road (K)



Photo 12 of 25: (WA_PendOreille_BoundaryDam__012)
INTERIOR: Dam Access Tunnel, camera looking SE from near entry (K)



Photo 13 of 25: (WA_PendOreille_BoundaryDam__013)
INTERIOR: Visitors' Gallery Entryway, from Powerhouse Access Tunnel, camera
looking W (K)



Photo 14 of 25: (WA_PendOreille_BoundaryDam_014)
INTERIOR: Boundary Powerhouse/Machine Hall, camera looking E from Visitor
Gallery (K)



Photo 15 of 25: (WA_PendOreille_BoundaryDam__015)
INTERIOR: Boundary Powerhouse/Machine Hall, Units 54, 55 and 56, camera looking E
(K)



Photo 16 of 25: (WA_PendOreille_BoundaryDam__016)
INTERIOR: Boundary Powerhouse Control Room, camera-looking E, toward main floor
of the Machine Hall (K)



Photo 17 of 25: (WA_PendOreille_BoundaryDam__017)
Boundary Dam Tailrace Recreation Area, camera looking N (K)



Photo 18 of 25: (WA_PendOreille_BoundaryDam__018)
Vista House and Overlook Platform, camera looking NE from Forebay Recreation Area
(A)



Photo 19 of 25: (WA_PendOreille_BoundaryDam__019)
Vista House, camera looking N from trailhead (A)



Photo 20 of 25: (WA_PendOreille_BoundaryDam__020)
INTERIOR: Vista House, camera looking W (A)



Photo 21 of 25: (WA_PendOreille_BoundaryDam__021)
Vista House Overlook platform, camera looking W (K)



Photo 22 of 25: (WA_PendOreille_BoundaryDam__022)
Boundary Dam Transmission Line, camera looking N from Forebay (K)



Photo 23 of 25: (WA_PendOreille_BoundaryDam__023)
Boundary Dam Transmission Line, Pickleforks, camera looking NW from dam crest (A)



Photo 24 of 25: (WA_PendOreille_BoundaryDam__024)
Boundary Dam Transmission Line and project overview, camera looking NE from BPA
Boundary Substation, toward dam and powerhouse (K)



Photo 25 of 25: (WA_PendOreille_BoundaryDam__025)
Boundary Dam Operations and Maintenance Service Area, General View, camera
looking N from Access Road (K)

