NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number _____ **Page** _____

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 88002739 **Date Listed:** 12/15/88

Lake Chelan Hydroelectric Power Plant | Chelan | WA
Property Name | **County** | **State**

Hydroelectric Power Plants of Washington State, 1890-1938 MPS
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

for Patrick Andrus — 12/15/88
Signature of the Keeper — **Date of Action**

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Amended Items in Nomination:

List of contributing resources listed in section 3 of the nomination is correct. The 5 contributing structures are the dam, surge tank, intake tubes, power tunnel, and the penstocks and branches (penstocks and branches counted as one structure). The latter three structures are collectively referred to as the water conveyance system. The powerhouse is the only contributing building. This information was provided by Leonard Garfield of the Washington SHPO office during a telephone conversation.

DISTRIBUTION:
National Register property file
Nominating Authority (without nomination attachment)

NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

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NATIONAL REGISTER

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name: Lake Chelan Hydroelectric Power Plant
other names/site number: N/A

2. Location

street & number: Lake Chelan ☐ not for publication
city, town: Chelan ☒ vicinity
state: Washington code: WA county: Chelan code: 007 zip code: 98816

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property	
		Contributing	Noncontributing
☐ private	☐ building(s)	1	buildings
☒ public-local	☒ district		sites
☐ public-State	☐ site	5	structures
☐ public-Federal	☐ structure		objects
	☐ object	6	0 Total

Name of related multiple property listing:
Hydroelectric Power Plants in Washington State

Number of contributing resources previously listed in the National Register: 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ☒ 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 ☒ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of certifying official — Date: October 12, 1988

Washington State Office of Archaeology & Historic Preservation
State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

☑ entered in the National Register. Patrick Andrus 12/15/88
☐ See continuation sheet.
☐ determined eligible for the National Register. ☐ See continuation sheet.
☐ determined not eligible for the National Register.

☐ removed from the National Register.
☐ other, (explain:) _____

for Signature of the Keeper — Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
INDUSTRY/energy facility	INDUSTRY/energy facility

7. Description

Architectural Classification (enter categories from instructions)	Materials (enter categories from instructions)
Other/concrete gravity diversion dam	foundation concrete
Other/industrial vernacular	walls concrete, brick
	roof
	other

Describe present and historic physical appearance.

The Lake Chelan Hydroelectric Power Plant is located on the Chelan River near the City of Chelan in the foothills of the North Cascade Mountains. The plant includes a concrete gravity diversion dam and a concrete and brick powerhouse. The constituent elements are described below:

HEADWORKS:

Dam (1927): concrete gravity diversion dam, built to raise the level of Lake Chelan, located on the Chelan River one-half mile below the outlet of the lake on the outskirts of the town. Rising of the lake level added about 640,000 acre feet of storage and required clearing timber and brush from 1,100 acres and 125 miles of lakeshore.

To secure a suitable dam foundation, it was necessary to pave the river bed with a heavy concrete base which extends 125 feet upstream and 200 feet downstream from the diversion structure. The lining of the riverbanks with concrete increased the efficiency of the section and protected it against scouring action.

The dam rises 39 feet above the foundation slab. From river bottom to the maximum operating level is 30 feet. Diversion structure has a total length of 490 feet. Spillway is 202 feet long; the north section consists of eight sluices, each 20 feet wide. Each sluice is controlled by a 20 by 14 foot steel tainter gate which is operated by a movable hoist. A main cut-off wall extends the full length of the dam and 27 feet below the original river bed.

WATER CONVEYANCE SYSTEM:

Intake (1927): The intake section is located at the south end of the dam and contains two Wahlman intake tubes. The tube for the first tunnel is 153 feet long and has an inside diameter of 14 feet. The second tunnel is 237 feet long and has an inside diameter of 17 feet. The Wahlman intake serves as the gathering tube which allows uniform entry of water through a selected length of the intake, providing uniform water velocity as it passes through the trash racks. Engineering journals claimed that the Wahlman design and patent of the intake tube was an outstanding design element. Very few of these structures have been used in the United States.

Diversion Tunnel (1927): Driven through clay and granite, the diversion tunnel is 10,694 feet long, 14 feet in diameter, and concrete-lined. The tunnel has slope of 3.14 feet per 1000 feet.

[x] See continuation sheet

Penstocks (1927): Riveted steel penstock joins concrete-lined tunnel at a point directly above the powerhouse where the ground drops abruptly. Main penstock is 986 feet long; it is 14 feet in diameter at the diversion tunnel joint and tapers to 12 and one-half feet in diameter at the Wye branch. At the wye, two steel branches, each 116 feet long and 8 feet 10 inches in diameter, carry water to the turbine casings.

Surge Tanks (1927): At a point 741 feet above the turbines, a 13 foot diameter steel riser extends 118 feet above the penstocks, rising vertically through solid rock. Above the riser pipe is a Johnson differential surge tank, 111 feet high, 45 feet in diameter.

POWERHOUSE AND EQUIPMENT:

Powerhouse (1927): located on the west bank of the Chelan River about one-half mile downstream from Chelan Falls. The plant is constructed of reinforced concrete and brick; is rectangular in plan; and measures 51 feet wide by 133 feet long. The structure has a maximum height of 1309 feet. A reinforced concrete substructure rests on a rock foundation. Equipped with a 117 ton electric trowelling crane and a 25-ton auxiliary hoist.

Generator Units (1927): Originally operated under a head of 377 feet. An additional 15 feet of effective head was subsequently obtained when the excavation of the tailrace was completed. Two identical 34,000 hp Francis inward flow vertical reaction turbines manufactured by I.P. Morris and Company are direct connected to two vertical shaft synchronimous General Electric generators (originally 24,000 KW; rewound to 34,000 KW; type ATB-24-30000m-300 r.p.m., 11,000 volts, 1,575 amp., 60 cycle). These generators are the first to be installed with a closed air-cooling system, using surface-type air coolers. It was necessary to install this type of system on the generators because of the large amount of dust in the atmosphere surrounding the plant.

Exciters (1927): Shaft connected; each generator has 140 KW, 250 volt exciter mounted directly on its shaft above the generator.

Governor (1927, 1979): Each unit is controlled by an electrically driven Pelton-Morris governor, equipped to shot down the unit automatically in case of a failure of the electric drive on the governor or in case of run-away.

TRANSMISSION SYSTEM: Most of the original switching and transformer equipment no longer exists. Originally, the transformer yard and outdoor switching area contained Westinghouse equipment which included four 10,000 KVA water-cooled transformers and high tension oil switches. A 110,000 volt transmission line running eastward from Chelan connects with the transmission system of the company.

Contributing Structures:

Dam
Water Conveyance System (inc. intake tubes, power tunnel, penstocks, and branches)
Surge Tank

Contributing Buildings:

Powerhouse

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:
☐ nationally ☒ statewide ☐ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
Engineering	1926-1938	1927
Industry		

Cultural Affiliation: N/A

Significant Person: N/A

Architect/Builder: Washington Water Power Company

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Lake Chelan Hydroelectric Power Plant is a significant example of state-of-the-art hydroelectric technology from the 1920s. Some of the system's design element, including the Wahlman intake tubes, the long power tunnel, and the generators equipped with a closed air cooling system, extended the limits of hydroelectric technology in Washington. The property meets the registration requirements as established by the Hydroelectric Power Plants in Washington State multiple property documentation form.

Historical Background: In 1926, the Washington Water Power Company began construction of a 68,000 hp power plant on the Chelan River immediately below the river's outlet to Lake Chelan. Over the years several efforts had been made to develop the site. In the early 20th century, the Great Northern Railroad proposed use of the site to generate power for their transcontinental railroad system. Those plans never materialize, and only a small plant, constructed sometime prior to 1905, was built to pump water and supply electricity to the town of Chelan. This small facility operated until 1927 when the Washington Water Power plant was completed.

The Chelan site was ideal for large scale power development. In a four mile stretch above the powerhouse site, the Chelan River dropped 425 feet. The river originates in Lake Chelan, an enormous natural reservoir which served to equalize the river's wide flow fluctuations. The lake, which was 45 miles long and one-half to three miles wide, had a maximum depth of 1,419 feet, and its 125 miles of shoreline enclosed 30,476 acres of water.

The Washington Water Power project included construction of a 490 foot long concrete diversion dam across the Chelan River, one-half mile below the lake outlet. In order to formulate and test the design of the apron and baffle structures, a model dam, one-twentieth the size of the proposed dam, was constructed at the control works of the Upper Falls power station on the Spokane River. An engineering journal claimed that the studies and experiments undertaken in the construction of the model "took the place of ordinary empirical apron and baffle designs which ...are haphazard in application. It was necessary that the waters of the Chelan River should pass over the spillway and return to the old river bed at approximately the normal steam velocity, thus preventing scouring action and possible undermining at the end of the downstream apron. The apron and baffles chosen from this study obtain such a result."

☒ See continuation sheet

9. Major Bibliographical References

Collins, E.H. "Chelan Project," Electric West, Volume 61, Number 3, September 1, 1928.
Darwin, A.G. "The Chelan Hydroelectric Project," Western Construction News, January 25, 1928.

☐ See continuation sheet

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 # _____

Primary location of additional data:
- ☐ State historic preservation office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Specify repository: _____

10. Geographical Data

Acreage of property about 20

Quadrangle Name: Chelan Scale: 1:24000

UTM References Northern Section

	Zone	Easting	Northing
A	10	723610	5301970
B	10	723710	5302110
C	10	723740	5301020
D	10	723650	5301940

☒ See continuation sheet

Verbal Boundary Description

The nominated property is a rectangular parcel of land described thusly: beginning at the southwest point of the confluence of Lake Chelan and Chelan River (at the northwest edge of the dam), proceed 250 feet to the northeast edge of the dam, proceed southeast 50 feet to south edge of dam, proceed west to the power tunnel, follow the course of the power tunnel and penstocks approximately 12,000 feet to a point equal to highway 151, proceed 75 feet

☒ See continuation sheet

Boundary Justification

The nominated property includes the headworks, water conveyance system, and powerhouse historically associated with the Lake Chelan hydroelectric project.

☐ See continuation sheet

11. Form Prepared By

name/title Lisa Soderberg
organization Office of Archaeology and Hist. Pres. date October 23, 1986
street & number 111 West 21st Avenue, KL-11 telephone (206) 753-4011
city or town Olympia state Washington zip code 98504

The construction of the model also allowed experimentation with an innovative intake tube rarely used in the United States. The advantage of the Wahlman patent and design was that it furnished a mechanism that provided a uniform velocity to the water as it passed through the trash racks.

During construction of the dam, the river was controlled by building steel sheet and Wakefield wooden sheet piling cofferdams across the northern portion of the river. When the north section of the dam was completed, water was diverted through three of the sluices. This provided dry conditions for the completion of the south section of the dam. Most of the concrete was placed in forms by hand-operated concrete carts. Two large gravel plants and three concrete mixing plants were required to complete the masonry work for the entire project.

The water which operated the turbines was diverted through the intake into a 10,694 foot long, 4 foot diameter, concrete-lined power tunnel. Nine hundred and eighty-six feet above the powerhouse, two steel penstocks are joined to the turbine casings where it operates two identical 34,000 hp Francis inward flow vertical reaction turbines. The turbines drive two 30,000 KW General Electric generators. Originally, the generated current was distributed by two transmission lines--a 110,000 volt line running eastward from Chelan and a 60,000 volt line which extended northward from Chelan into the irrigated Okanogan Valley fruit orchards.

Although construction of the facility represented a significant achievement for the utility, the project provided no mitigation for the serious loss of fish runs, the inundation of wildlife habitat, or the disruption to the tradition cultural and subsistence economy of the Colville, Yakima and Umatilla Confederated Tribes. Any assessment of the historical impact of this plant must recognize the damage inflicted on both the native inhabitants and the natural environment.

[1]E.H. Collins, "Chelan Project," Electrical West, Volume 61, Number 3, September 1, 1928, p. 129.
[2]A.G. Darwin, "The Chelan Hydroelectric Project," Western Construction News, January 25, 1928, p. 36.
[3]Ibid., p. 37
[4]Ibid., p. 38.
[5]Ibid., p. 38.
[6]Ibid., pp. 39-40.

Verbal Boundary Description Continued: northeast, 200 feet southeast, 150 feet southwest, 200 feet northwest, and 75 feet northwest to the power tunnel, follow course of power tunnel to dam, proceed southerly along dam to point of beginning. See attached USGS maps for exact boundaries.

UTM References Continued:

Southern Section Quadrangle Name: Chelan Falls Scale: 1:24000

E 11 275550 5300770
F 11 275880 5299480
G 11 276340 5299280
H 11 276550 5299120
I 11 276450 5299050

Lake Chelan Hydroelectric
Power Plant
Chelan vicinity, Chelan Co., WA
---- = nomination boundaries
All elements contribute ♂ = photo key