Hungry Horse Dam and Powerplant

Department of Interior

Bureau of Reclamation

Pacific Northwest Region

Grand Coulee Power Office

Hungry Horse Field Office

Dennis Philmon, Manager

Presentation for National Concrete Consortium (NC2), September 11, 2019

A moment of remembrance
World Trades Center
9-11-2001

2,996 lives lost:

Civilians

Firefighters

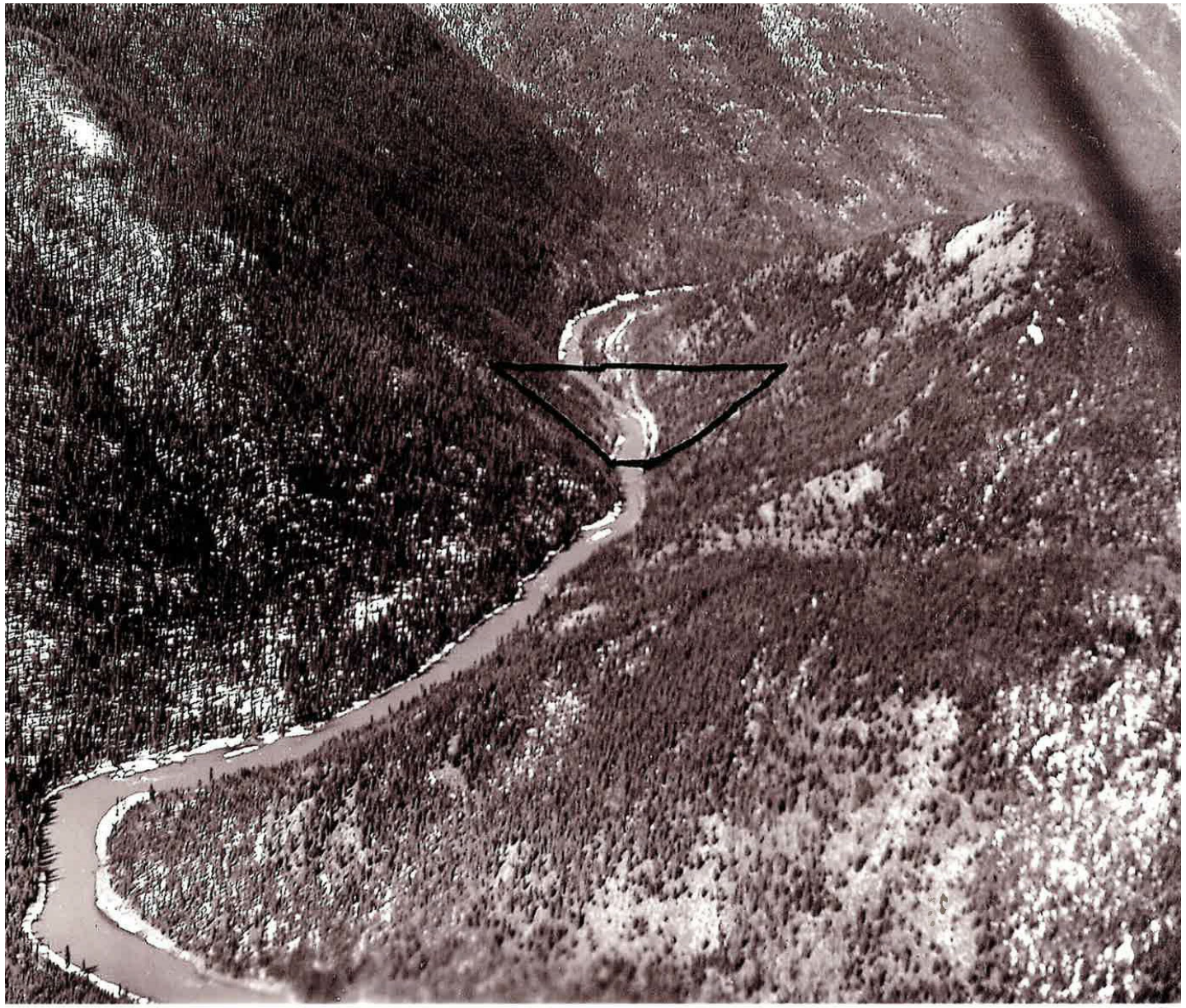
Law Enforcement Officers

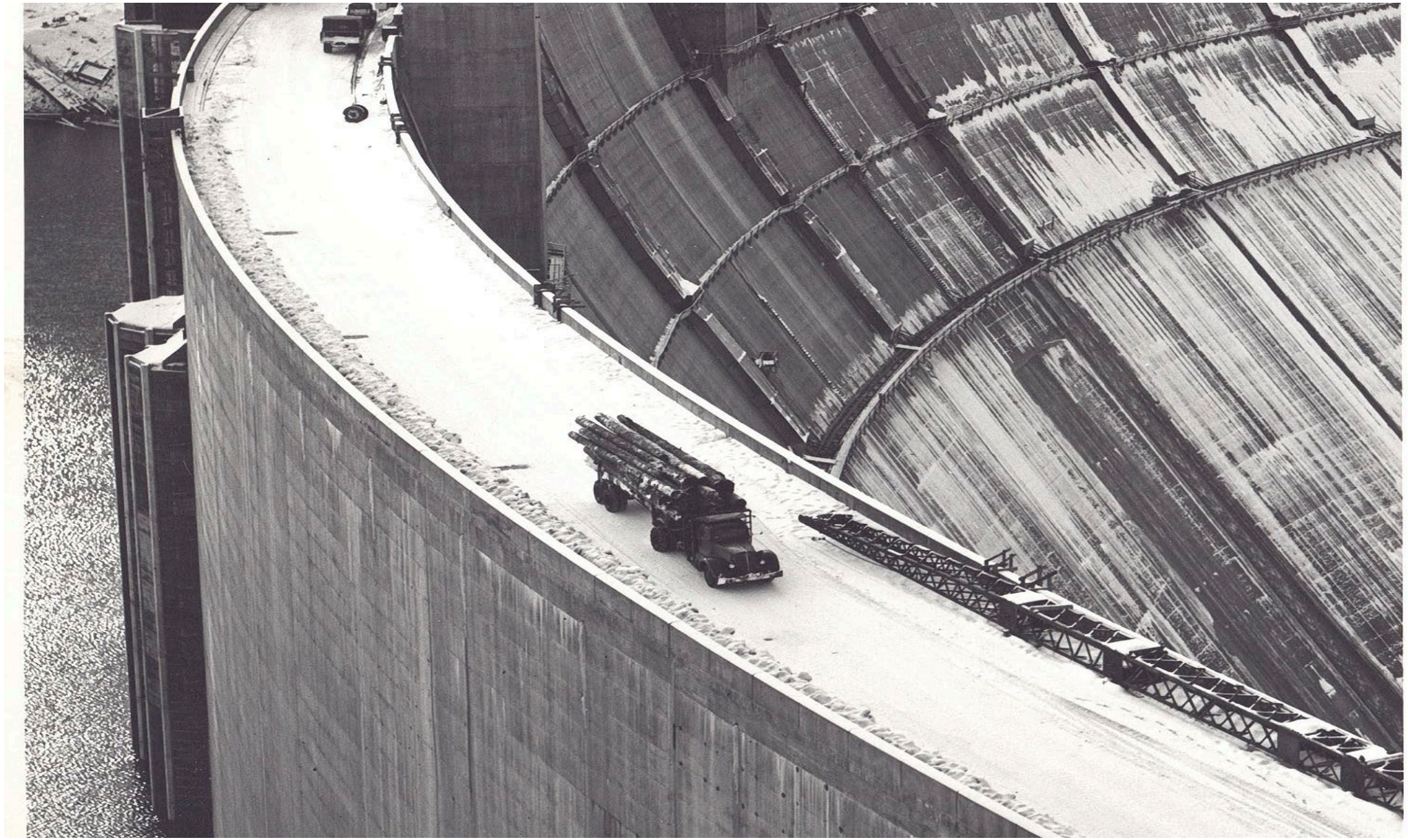
Military Personnel

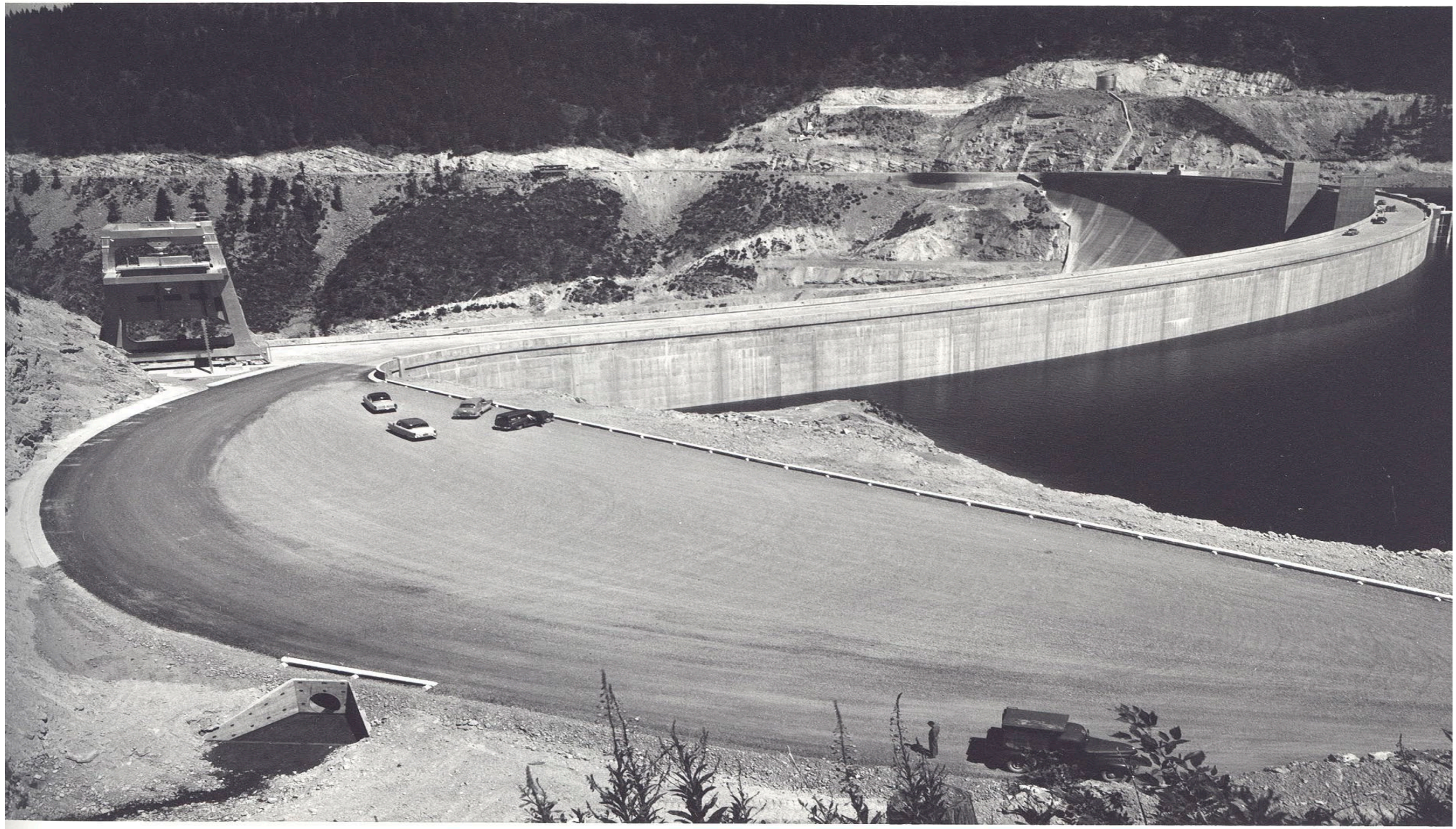
Authorization for Construction

Construction of Hungry Horse Dam was authorized by Congress in June 5, 1944, for purposes of irrigation flood control, navigation, streamflow regulation, hydroelectric generation, and other beneficial uses, such as recreation and fisheries enhancement.

Construction began in 1948 and completed in 1953.







Dam Location

The Dam is located on the lower reach of the South Fork of the Flathead River, within the Flathead National Forest.

Two other forks of the Flathead River, the North Fork and Middle Fork, are unregulated, wild and scenic.

Once the three forks are joined as the “main stem”, the river continues on eventually emptying into Flathead Lake.

Hungry Horse Project

The project includes a dam, outlet works, spillway, powerplant, switchyard and reservoir.

- Minimizing potential effects for flooding in the Flathead Valley.
- Power generation.
- Reservoir stores water during heavy runoff in the spring.
- Release stored water/generate when the natural flow of the river is low.
- Benefits reach downstream throughout the Columbia River system.

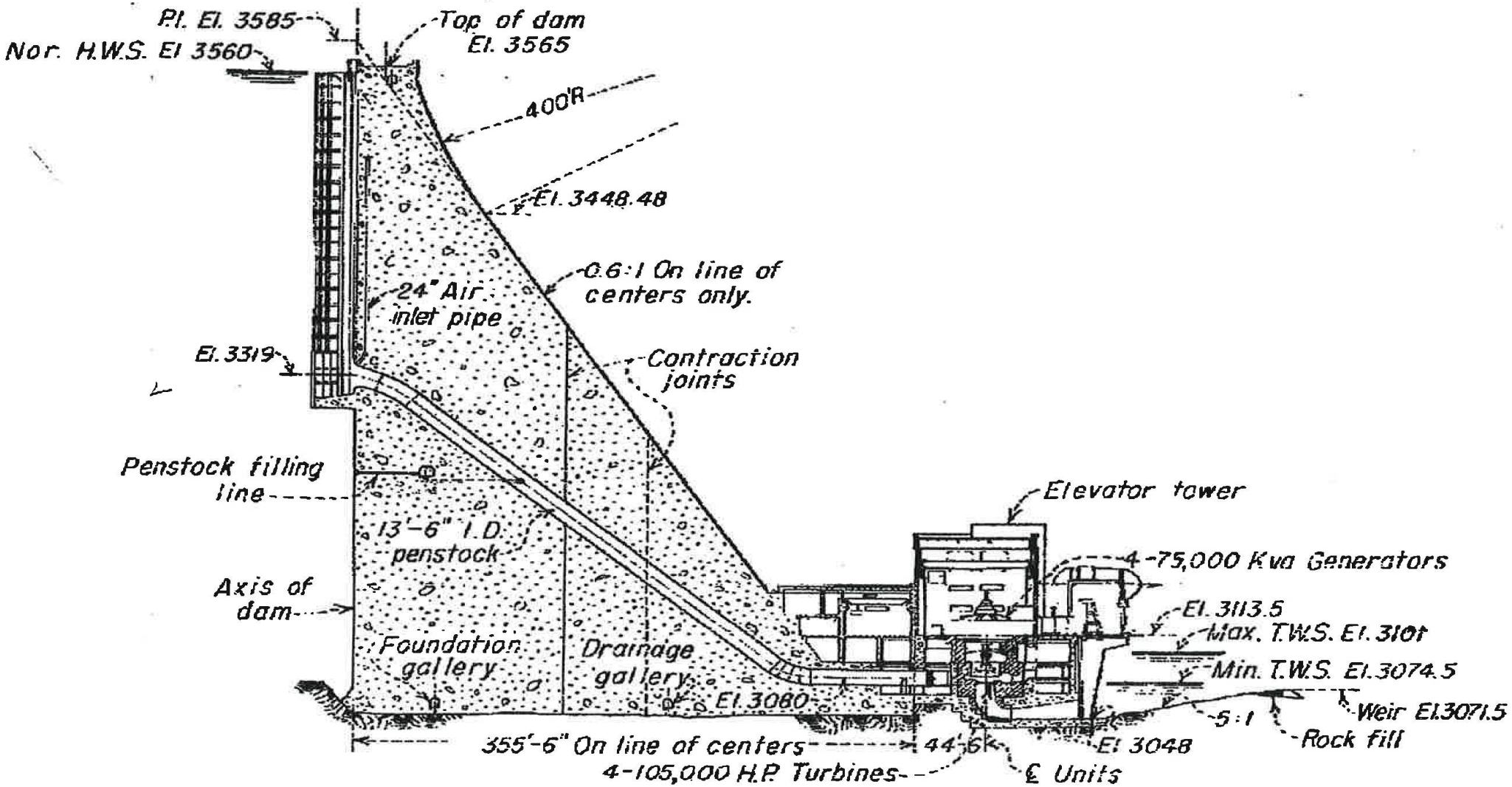
Dam

Structural height 564-feet.

Variable-thickness concrete arch.

Crest length 2,115 ft.

Crest Width 39 ft.



MAXIMUM SECTION THRU PENSTOCK AND POWERPLANT

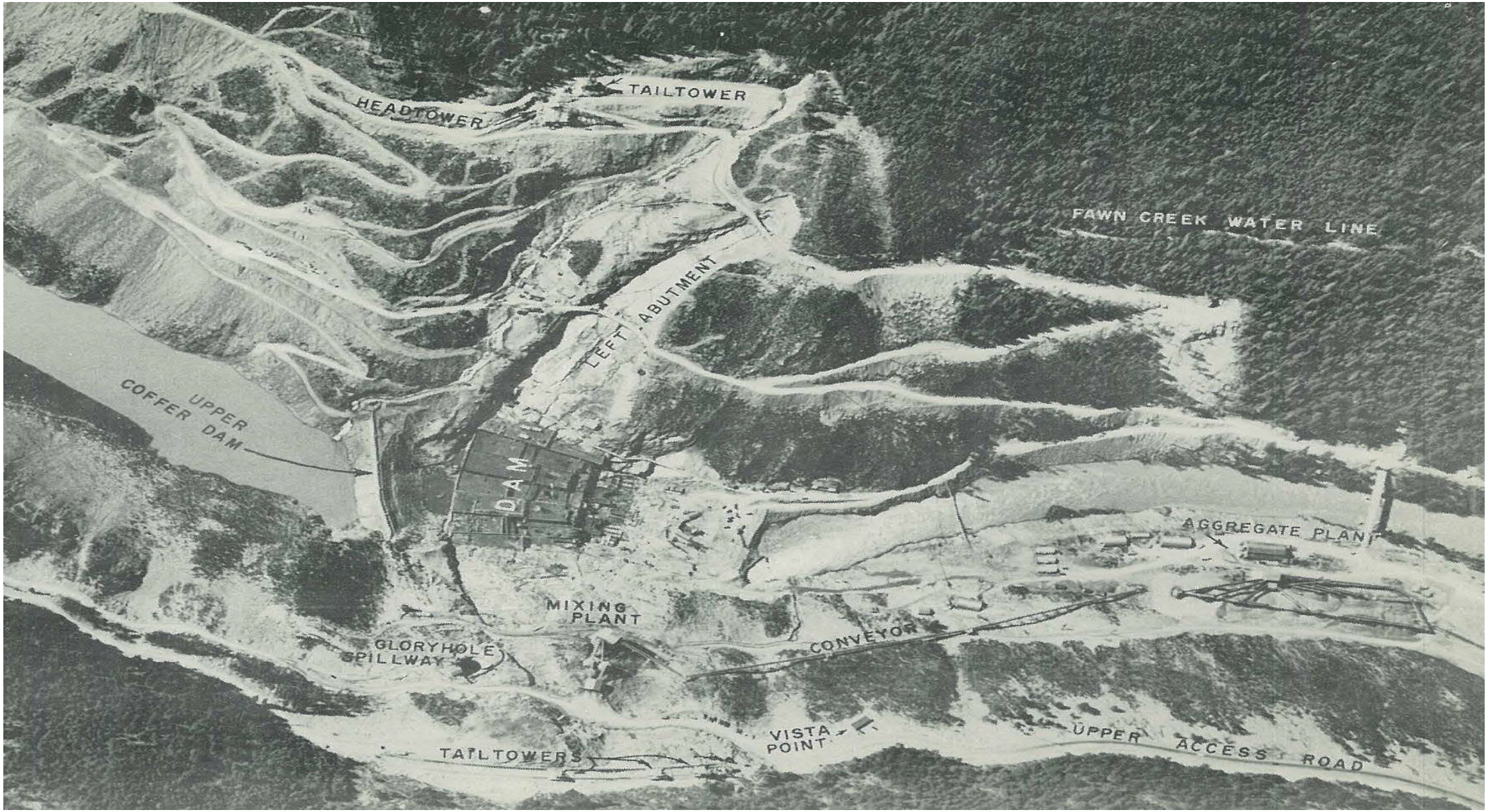
Concrete (ah…, finally…)

The dam contains approximately 3,086,200 cubic yards of concrete.

Refer to "Handout for Misc. Concrete History".

Concrete Mix:

- Aggregate per cubic yard	2,816 lbs.	
- Cement per cubic yard	188 lbs.	
- Pozzolan (fly ash) per cubic yard		90 lbs.
- Sand	846 lbs.	
- Water & protex	200 lbs.	
Weight per cubic yard	**4,140 lbs.**	


HEADTOWER
TAILTOWER
FAWN CREEK WATER LINE
LEFT ABUTMENT
UPPER COFFER DAM
DAM
AGGREGATE PLANT
MIXING PLANT
CONVEYOR
GLORYHOLE SPILLWAY
VISTA POINT
TAILTOWERS
UPPER ACCESS ROAD

Spillway Morning Glory

Spillway (morning-glory)
64 ft dia. ring gate.

Maximum lift 12 ft.

Capacity 50,000 cfs
at reservoir pool
El. 3565 ft.

Outlet Works

Outlet Works, 3 – 9 ft dia. tubes/hollow jet valve regulated.

Capacity 4,600 cfs each, 13,800 cfs total.

Outlet Works in Operation

Approximately 8,000 cfs discharge.

Reservoir

Reservoir capacity 3,468,000 acre-feet at pool El. 3560 ft. (Top of Active Conservation Pool).

Drainage area 1640 square miles.

Selective Withdrawal System

Adapted to penstock intakes.

Used to increase temperature of discharged water for the purpose of reducing/eliminating thermal shock to downstream fisheries (Bull and West Slope Cutthroat trout), and to increase aquatic insect communities for fish growth and reproduction.

- RTD array mounted/submerged on forebay collecting reservoir temperatures.

- Operators monitor discharged downstream river temperature via USGS data.

- Operators adjust “submergence” of Control Gate to skim off top layer of warmer reservoir water to attain desired optimum downstream temperature.

- Water surface temperature during summer is approximately 14.3 C (58 F).

- Water at depth of 175-feet (as an example) year around is approximately 4.5 C (40 F).

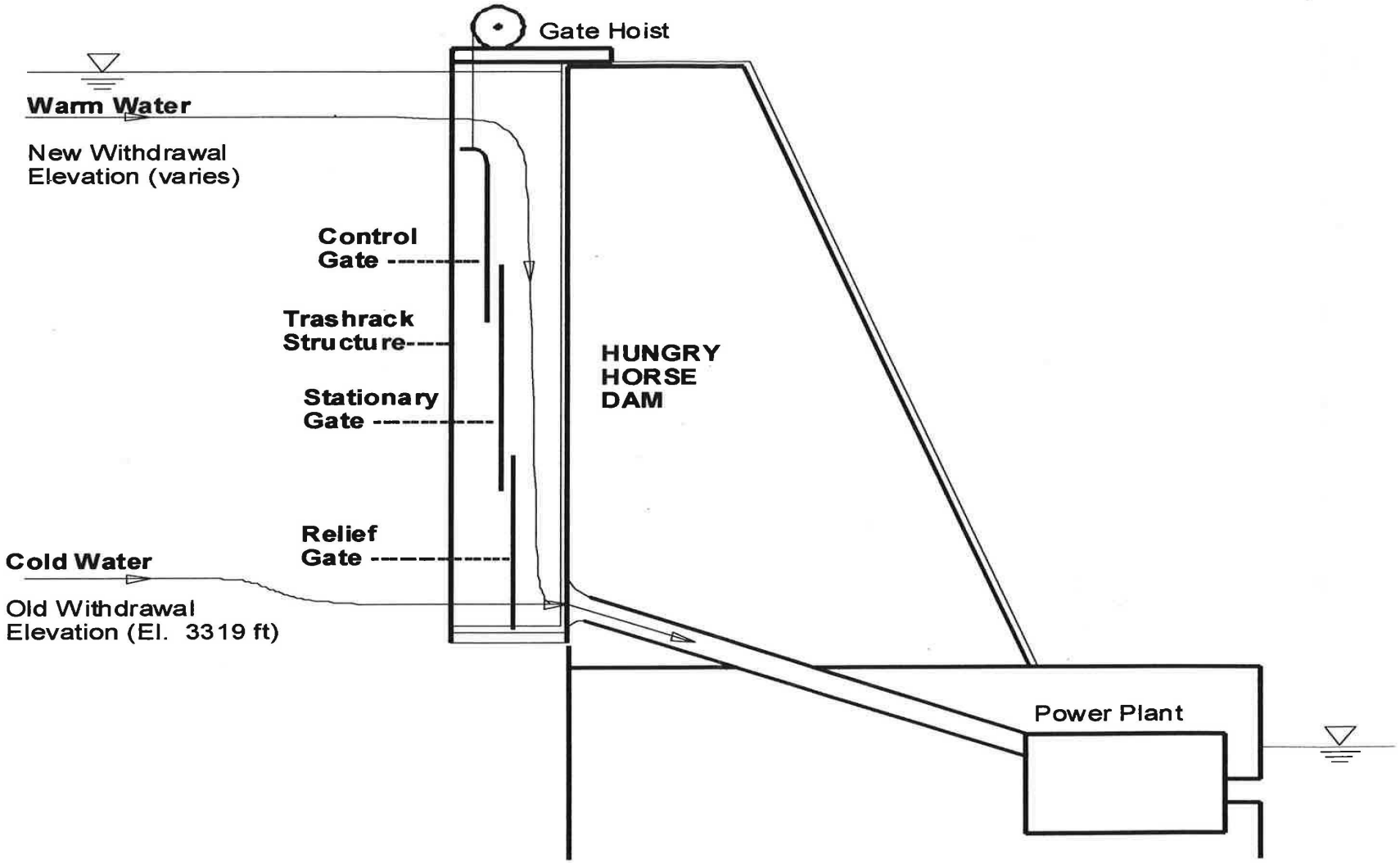


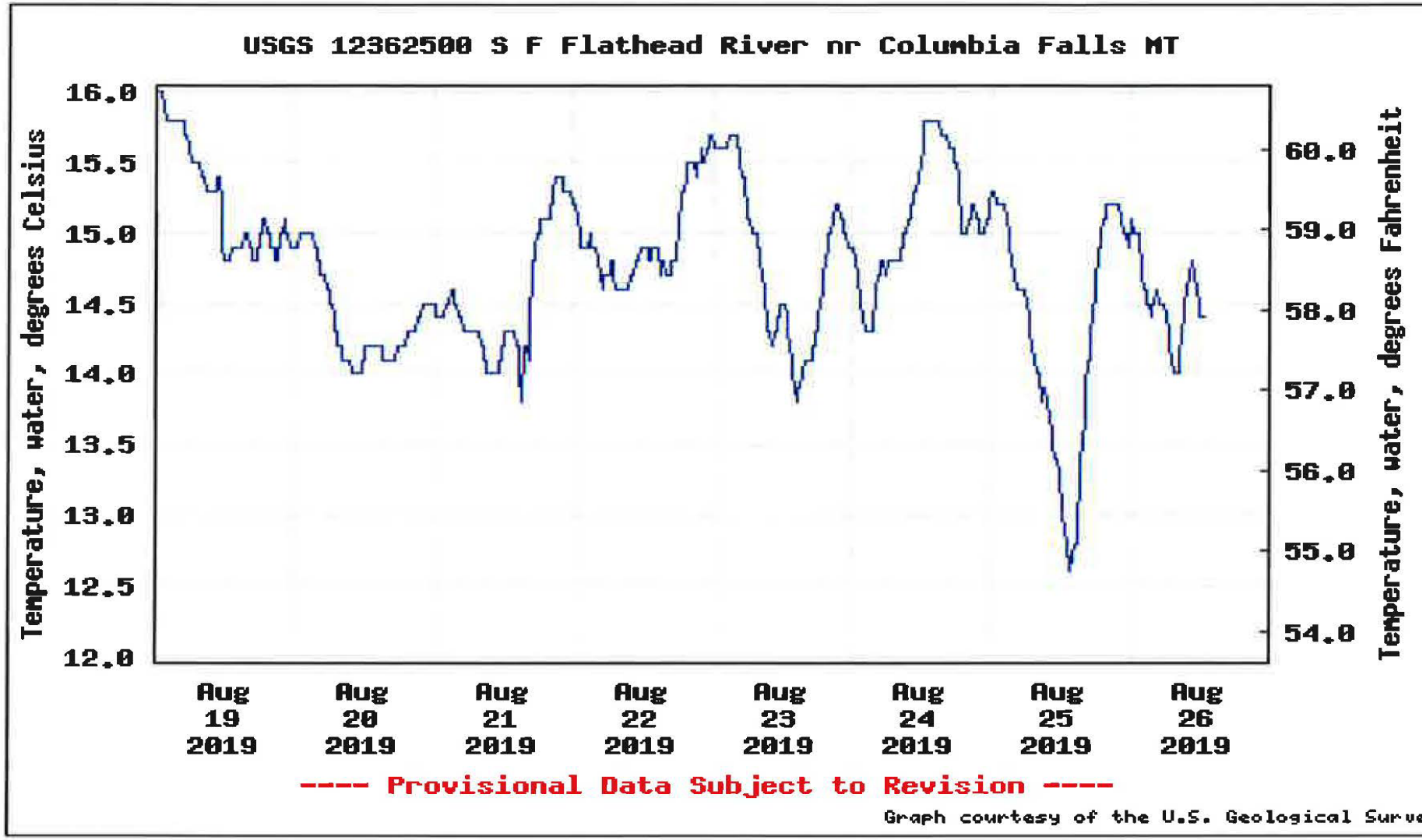
Figure 2. A sectional view of the selective withdrawal system installed at Hungry Horse Dam in 1995.

Selective Withdrawal Temperature Table - Sample

Developed in collaboration with Montana Fish, Wildlife and Parks

FOR OFFICIAL USE ONLY

	Degree C			Degree F		
DAY	MIN	OPTIM	MAX	MIN	OPTIM	MAX
25-Aug	12.4	14.4	16.4	54.32	57.92	61.52
26-Aug	12.3	14.3	16.3	54.14	57.74	61.34
27-Aug	12.2	14.2	16.2	53.96	57.56	61.16
28-Aug	12.2	14.2	16.2	53.96	57.56	61.16
29-Aug	12.1	14.1	16.1	53.78	57.38	60.98
30-Aug	12	14	16	53.6	57.2	60.8
31-Aug	11.9	13.9	15.9	53.42	57.02	60.62
1-Sep	11.8	13.8	15.8	53.24	56.84	60.44
2-Sep	11.7	13.7	15.7	53.06	56.66	60.26
3-Sep	11.6	13.6	15.6	52.88	56.48	60.08
4-Sep	11.5	13.5	15.5	52.7	56.3	59.9
5-Sep	11.5	13.5	15.5	52.7	56.3	59.9
6-Sep	11.4	13.4	15.4	52.52	56.12	59.72
7-Sep	11.3	13.3	15.3	52.34	55.94	59.54
8-Sep	11.2	13.2	15.2	52.16	55.76	59.36


USGS 12362500 S F Flathead River nr Columbia Falls MT
Temperature, water, degrees Celsius
16.0
15.5
15.0
14.5
14.0
13.5
13.0
12.5
12.0
Temperature, water, degrees Fahrenheit
60.0
59.0
58.0
57.0
56.0
55.0
54.0
Aug 19 2019
Aug 20 2019
Aug 21 2019
Aug 22 2019
Aug 23 2019
Aug 24 2019
Aug 25 2019
Aug 26 2019
---- Provisional Data Subject to Revision ----
Graph courtesy of the U.S. Geological Surve

Powerplant

Generator capacity 4 -107 mega-watt (MW), total plant 428 MW.

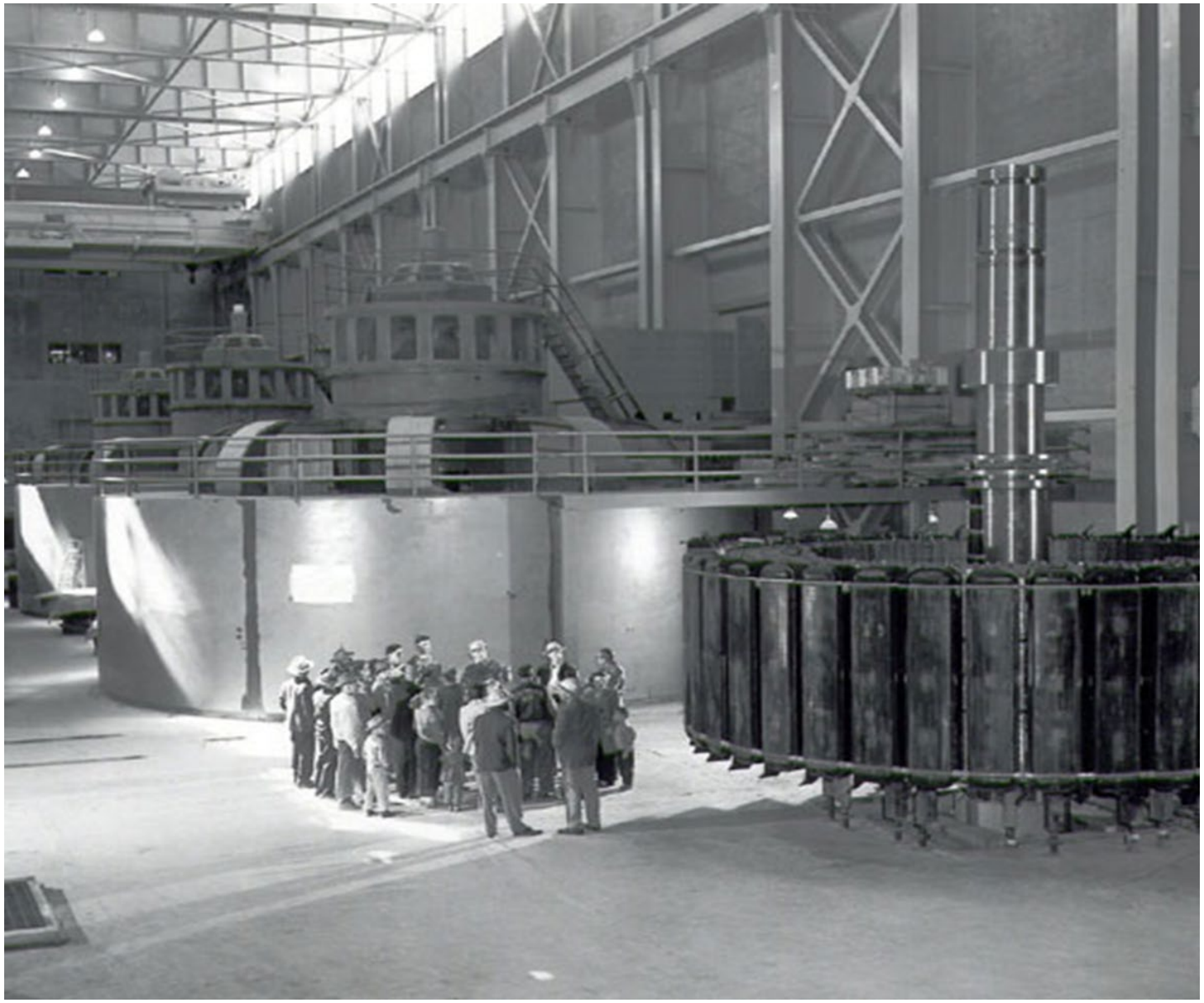
Penstocks 4 – 13.5 ft dia., capacity 2,900 cfs each, 11,600 cfs total.

Francis turbines, 105,000 horsepower, 400 ft rated head, 180 RPM.

Remote operation capability 1994.

Switchyard, 230 kV, connected to BPA transmission grid.

Powerplant average annual net generation 1,400,000 megawatt-hours (MWh).



Escorted Tour

<u>SAFETY and SECURITY</u> are our primary concern.

- Slips, trips, falls.

- Uneven walking surfaces, exposed crane rails.

- Slippery surfaces (oil, water on floor).

Tour – cont.

Attire must include:

- Long pants.
- Closed toed shoes.

No photos inside powerplant. Photos outside are fine…

Questions?

Thank you for your time today.