DAM INFORMATIONAL OVERVIEW

THE DALLES DAM

July 2009

Water Quality Unit
Reservoir Control Center, Columbia Basin Water Management Division
U. S. Army Corps of Engineers Northwestern Division
Portland, Oregon

Table of Contents

SECTION 1: GENERAL

1.1 Project Description

Stream: Columbia River (R.M. 191.5)
Location: The Dalles, Oregon
Owner: U.S. Army Corps of Engineers, Portland District
Project Authorization: PL 81-516, 1950
Authorized Purpose: Power, Navigation
Other Uses: Fishery, Recreation, Irrigation, Water Quality
Type of Project: Run-of-river
Date established: May 1957

The Dalles Dam is a hydroelectric dam spanning the Columbia River, two-miles east of the city of The Dalles, Oregon, United States. It joins Wasco County, Oregon with Klickitat County, Washington, 192 miles (309 km) upriver from the mouth of the Columbia near Astoria, Oregon. The closest towns on the Washington side are Lyle and Wishram.

Slackwater created by the dam submerged Celilo Falls, the economic and cultural hub of Native Americans in the region and the oldest continuously inhabited settlement in North America. On March 10, 1957, hundreds of observers looked on as the rising waters rapidly silenced the falls, submerged fishing platforms, and consumed the village of Celilo. The reservoir behind the dam is named Lake Celilo and runs 24 miles (39 km) up the river channel, to the foot of John Day Dam.

The dam is operated by the U.S. Army Corps of Engineers (USACE), and the power is marketed by the Bonneville Power Administration (BPA). It is part of an extensive system of dams on the Columbia and Snake Rivers. The Dalles Dam Visitor Center is located at Seufert Park on the Oregon shore, and was built in 1981. Visitors can ride a tour train. The Columbia Hills State Park is nearby.

1.2 Status - History

The project authorized by House Document 531, 1950.The initial project with units 1 through 14 was completed in1960. The additional units, 15 through 22 were completed in 1973.

SECTION 2: regulation

2.1 Water Surface Elevation (ft)

Max. flood pool (Q = 2,290,000 cfs) .....182.3'
Full pool.....160’

Max. controlled flood pool (Q = 1,700,000 cfs) .....90'
Max. spillway design operating pool .....82.5'
Max. regulated pool .....77'
Normal operating range .....155' to 160'
Min. pool .....155'
Max. flood tailwater (Q = 2,290,000 cfs) .....132.0'
Max. controlled flood tailwater (Q = 1,700,000 cfs).....65'
Standard project flood tailwater (Q = 850,000 cfs) .....45'
Minimum tailwater .....69.5'

2.2 Discharge

Minimum
- December-February 12,500
- March-November 50,000

Maximum change per hour ..... 150,000[(1)]

2.3 Storage in Forebay

Maximum Storage …….5.0 KSFD/ 1.0 ft

2.4 Power Plant

Number of main units ……22
Nameplate capacity (14 @ 72 MW, 8 @ 86 MW) ..... 1,780 MW
Overload capacity (14 @ 90 MW, 8 @ 99 MW) ..... 2,052 MW
Fishwater units (2 @ 14 MW) .....28 MW
Stations service units (2 @ 3 MW) .....6 MW
Hydraulic capacity .....375,000 cfs
Maximum H/K coefficient …….6.3 MW/KCFS
Minimum H/K coefficient ……..5.5 MW/KCFS

2.5 Powerhouse

Turbine type

Units 1-22	Kaplan automatic-adjustable blades
Units F 1&2	Kaplan automatic-adjustable blades
Units SS 1&2	Francis

Number of Units 26
Turbine capacity.....14 @ 123,000 hp at 81’ ft. head 8 @ 136,000 hp at 78 ft. head
Normal Maximum Head .....85’
Length .....2,089'

Width (U/S face of intake to D/S face of draft tube) ....._____
Spacing of units
- Units 1-22 .....86’
- Units F 1&2 .....40’
- Units SS 1&2.....27’

Elevation centerline turbine distributor ..... _____ fmsl
Number of hydro-generating units..... 14 – 82,105 kva
Number of hydro-generating units..... 8 – 90,500 kva
Number of hydro-generating units..... 2 – 14,210 kva
Number of hydro-generating units..... 2 – 3,750 kva
Total rated capacity ..... 1,814 MW
Overload capacity ..... 2,086 MW
Units 1 – 14 Kaplan type turbines 123,000 hp @ 81.0' head
Units 15 – 22 Kaplan type turbines 136,000 hp @ 73.0' head
Units F 1&2 Kaplan type turbines 18,800 hp @ 74.0' head
Units SS 1&2 Francis type turbines 4,500 hp @ 81.0' head
Units 1-14 Discharges/turbine at rated head and full gate output..... 11,400 cfs
Units 15-22 Discharges/turbine at rated head and full gate output..... 14,700 cfs
Units F 1&2 Discharges/turbine at rated head and full gate output..... 11,400 cfs
Units SS 1&2 Discharges/turbine at rated head and full gate output ..... 14,700 cfs
Units 1 – 14 Runner diameters..... 280"
Units 15 – 22 Runner diameters..... 300"
Units Units F 1&2 Runner diameters..... 120"
Units SS 1&2 Runner diameters..... 63.5"

2.6 Navigation Lock

Type .....Single lift Normal lift 87.5' Max. lift 90.5' Inside clearance 86 x 675 feet Min. depth over lower sill 15' Depth over upper sill (pool e. 160') 20'
Flow through lock …..…….. 1500 cfs

2.7 Stilling Basin

No info

2.8 East Non-Overflow Dam (powerhouse to closure dam)

Length .....452'
Max Elevation.....295’

SECTION 3: Fish

3.1 Fish Facilities

A) Fish Ladders

North:

- Length .....1,761’
- Width.....24’
- Number of weirs.....90
- Weir height.....6’
- Orifices (2 in each weir).....1’11” X1’00”
- Slope.....1 on 16
- Top of ladder, invert elevation (msl).....147’
- Bottom of ladder, invert elevation (msl).....60’
- Number of entrance gates.....3
- Width of entrance gates.....15’
- Fishway flow (from forebay) .....150 cfs / 74 cfs?(from Excel sht)
- Auxiliary attraction water supply.....490-2,050 cfs

South:

- Length.....1,801’
- Width.....30’
- Number of weirs.....90
- Weir height.....‘6
- Orifices (2 in each weir).....2’ 01” X 2’ 02”
- Slope.....1 on 16
- Top of ladder, invert elevation (msl).....147’
- Bottom of ladder, invert elevation (msl) .....60’
- Number of entrance gates.....3
  - Width of entrance gates .....8’ 8”
- Fishway flow (from forebay) .....175 cfs /142 cfs?(from Excel sht)
- Auxiliary attraction water supply.....5,000 cfs

Ice and Trash Sluiceway discharge.....270 cfs

B) Fishlock

Diameter…….28’
Locking height, avg .....78’
Approach width.....10’

C) Powerhouse fish collection system

Length 2,064’

Width 17.5’
Fish entrances:
Number equipped with gates 56
Number normally operated 25
Size, (height by width).....2’ X 6’
Floor Elevation (msl).....63.5’

D) Powerhouse Transportation Channel

Length 2,373’
Width 18.5’
Floor elevation (msl).....63.5’

3.2 Removable/Temporary Spillway Weir

None

3.3 The Dalles Bay 8/9 Spillwall

Scheduled Completion Date .....April, 2010
Location .....Between Spillbays 8 & 9
Length. .....829.5’
Height.....25-41’
Width.....10’
Top of Wall Elevation.....93.5-98’

Section 4: Water Quality

4.1 Spillway

Type .....Concrete Gravity, gate controlled
Length (overall) .....1,447'
Gates .....23-50 ft. tainter gates
Crest elevation .....121'
Deck elevation .....185'
Design discharge..... (pool elev. 182.3') 2,290,000 ft/s
Max. discharge to-date.....1,240,000 ft/s (est. total river flow)

4.2 Flow Deflectors

None. The Dallas dam does not have flow deflectors because it was shown in studies that there are hydraulic issues that would cause flow deflectors to be ineffective in reducing TDG levels. There are also concerns that installing deflectors may cause fish guidance issues.

4.3 Water Quality Monitoring Stations

A) Active Gauges

A1. The Dalles Forebay (TDA)

Gage Elevation: Fixed
Latitude: 45° 37' 11.5" N
Longitude: 121° 07' 16.5" W
Datum: NAD-83
River: Columbia
River Mile: 192.4
USGS-ID: 453712121071200
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1 – Sept. 31
Years of Operation: 1985 - Present
River Conditions: Forebay Monitor
Parameters Measured: Barometric Pressure, Total Gas Pressure, Temperature
Location: This gauge is located within The Dalles Dam forebay near the end of Powerhouse Unit #22.

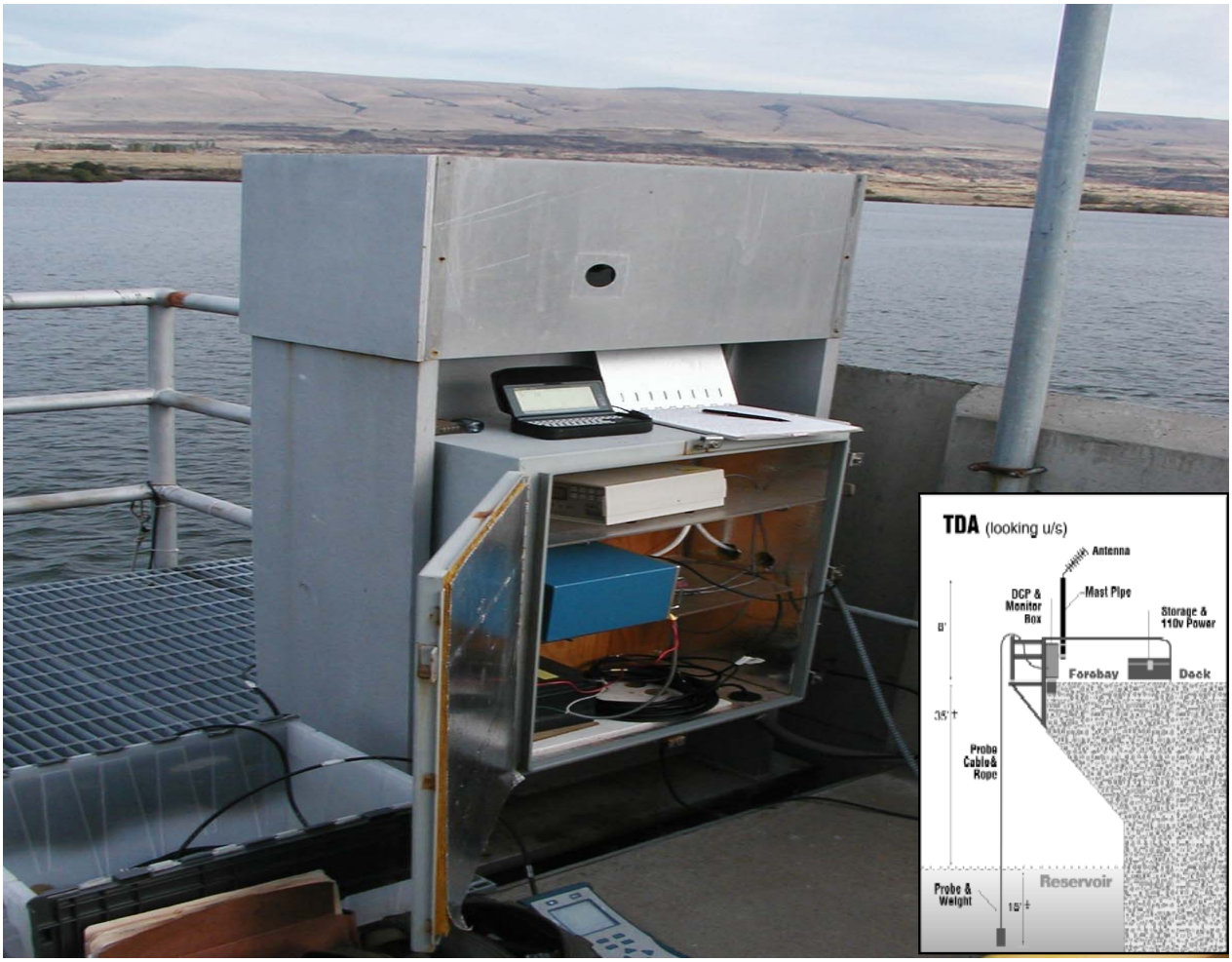

Figure 1: Fixed Monitoring Station at the forebay

A2. The Dalles Tailwater TDG Monitoring Station (TDDO)

Gage Elevation: Fixed (107.6 ft)
Latitude: 45° 36' 29.7" N
Longitude: 121° 11' 23.8" W
Datum: NAD-83
River Mile: 189.1
USGS-ID: 14105700
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1 – Sept. 15
Years of Operation: 1996 - Present
River Conditions: Mixed River Tailwater Monitor
Location: Off Bargeway Road from Webber Street approximately 2.5 miles downstream of The Dalles spillway. Near industrial comp

Comments:

B) Obsolete Gauges

B1. The Dalles Tailwater (TDDO)

None

Appendix A: Project Schematics

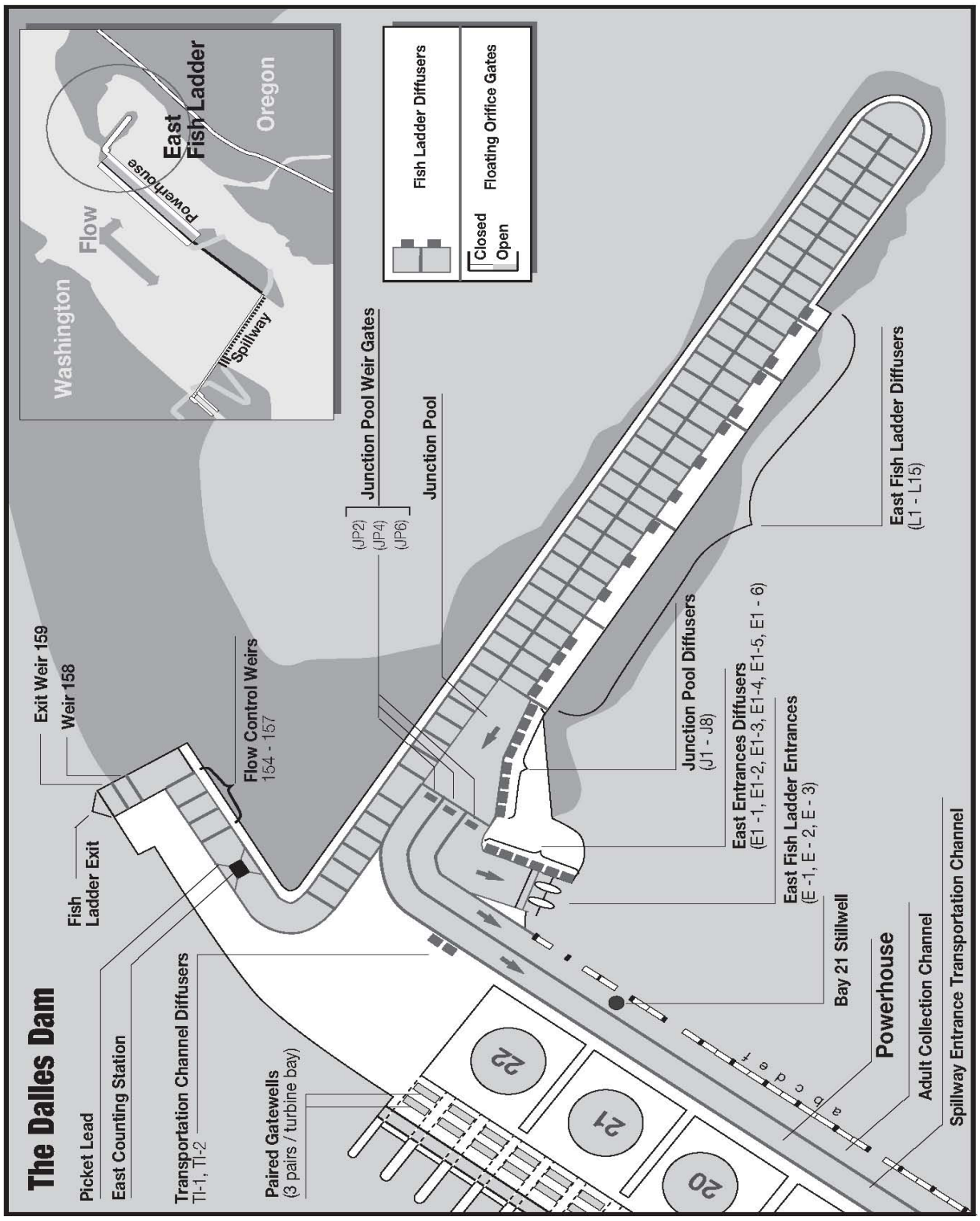

Figure 5: The Dalles Dam east fish ladder.

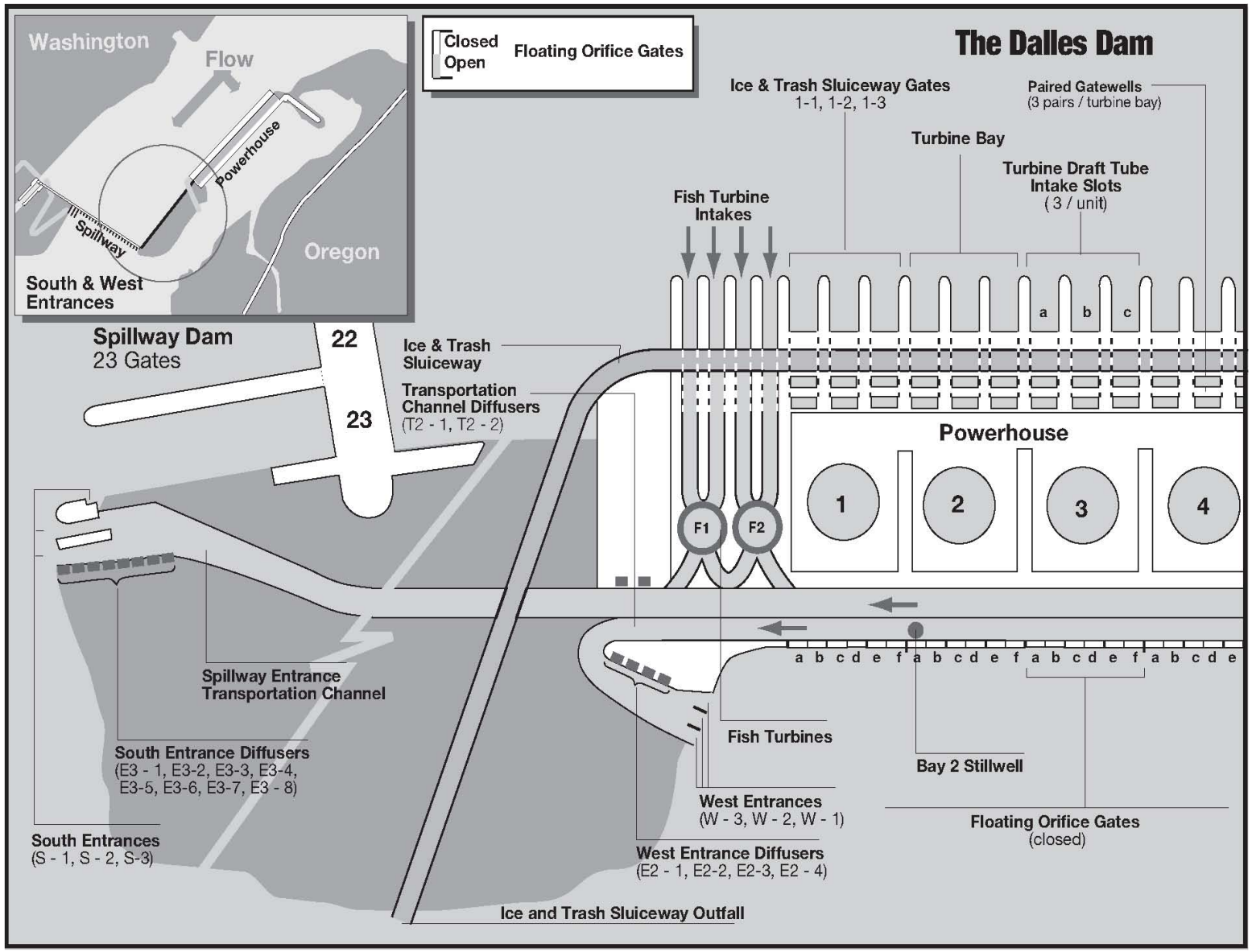

Figure 6: The Dalles Dam south and west fish ladder enterences.

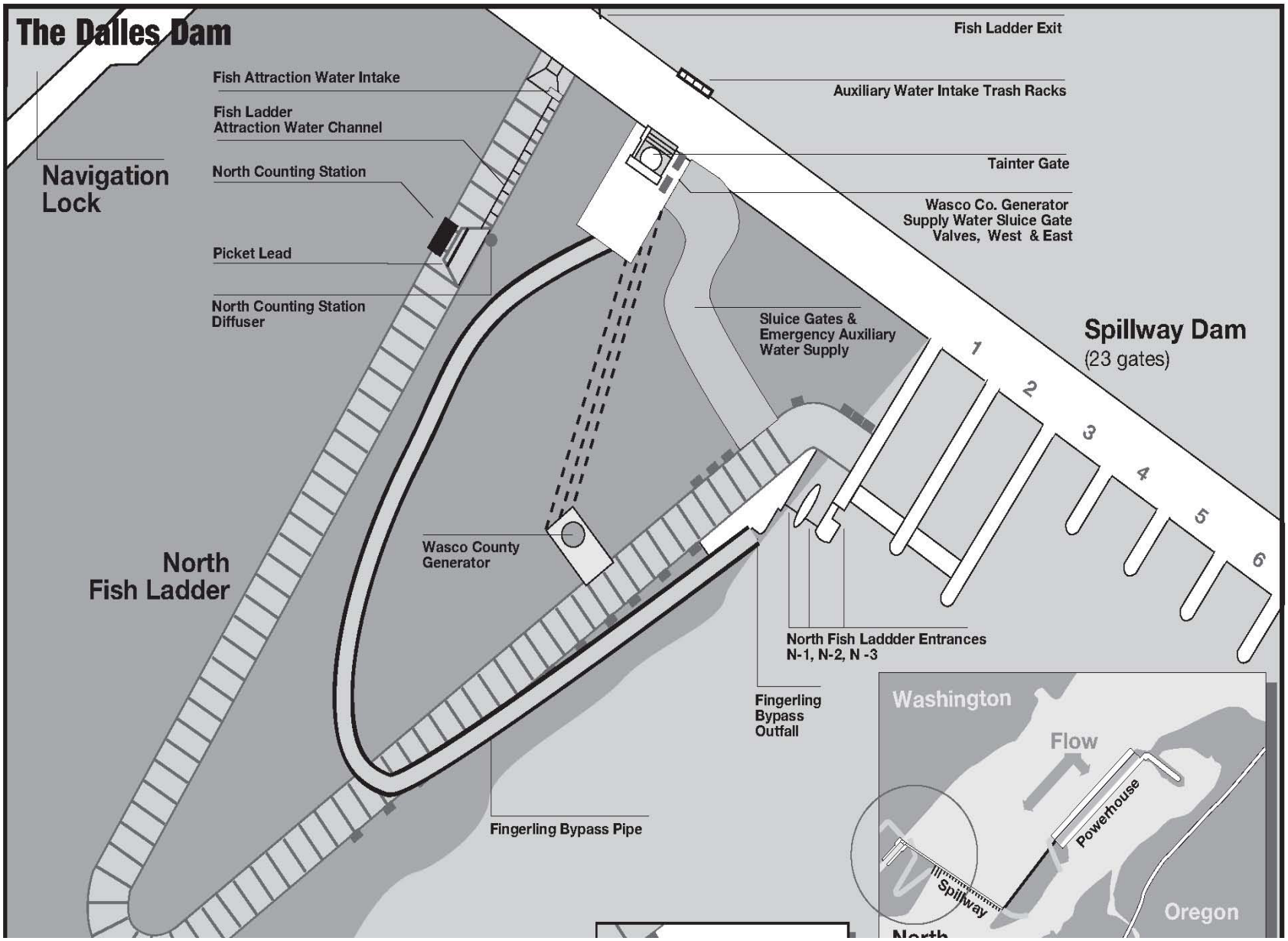

Figure 7: The Dalles Dam north fish ladder and spillway.

Appendix B: Notes

Lake elevation limits established to optimize project operation.
NPP Operating Plan.

Discharge limits established to project operation.
The dam and navigation lock at optimize The Dalles were located so as to provide average heads of 77 to 81.9 feet, for varying upstream conditions and the installed power generating units.

The project was not designed for flood control.

(1) Based on maximum tailwater change of 3 feet per hour.

Appendix C: Glossary

Forebay - The water upstream of / behind the dam.

Tailwater / Tailraise – It is the water surface immediately downstream from a dam or hydroelectric power plant.

Power Plant – It is a place where electricity is generated.

Powerhouse - The part of a hydroelectric dam where the turbine-generators are housed and where power is produced by the action of the water on the turbine blades.

Navigation Lock - A device used for raising and lowering boats between stretches of water of different levels on river and canal waterways.

Stilling Basin - A basin constructed to dissipate the energy of fast-flowing water, eg, from a spillway or bottom outlet, and to protect the river bed from erosion.

Fish Ladder - Structures on or around artificial barriers (such as dams and weirs) built to facilitate diadromous fishes' natural migration. Most fish ladders enable fish to pass around the barriers by swimming and leaping up a series of relatively low steps (hence the term ladder) into the waters on the other side.

Ice and Trash Sluiceway (IST) – It is a channel through which debris, such as ice and trash, which has collected in the dam forebay, is released into the tailraise. Juvenile fish also use this outlet to travel downstream during the spring and summer seasons.

Removable Spillway Weir (RSW) - A removable steel structure that is attached to the forebay of an existing spill bay, creating a raised overflow weir above and upstream of the existing spillway crest.

Spillway - A structure that allows release of excess water from a dam or other hydraulic structure.

Flow Deflector – It is a structure found below the spillway tiers and above the stilling basin of a dam. Its purpose is to deflect off the flow of the spill water at an angle such that the spilling water skims on the surface of the existing water elevation instead of plunging deep into the tailraise. Spill water plunging into the tailraise will increase Total Dissolved Gas (TDG) levels; the deflector serves to reduce the TDG. The flow deflector will not be as effective during high spill periods as the water will spill clear of the deflector.