DAM INFORMATIONAL OVERVIEW

JOHN DAY DAM

July 2009

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

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SECTION 1: GENERAL

1.1 Project Description

Stream: Columbia River (R.M. 215.6)
Location: Rufus, Oregon
Owner: U.S. Army Corps of Engineer, Portland District
Project Authorization: PL 81-516, 1950
Authorized Purpose: Flood Control, Power, Navigation
Other Uses: Fishery, Recreation, Irrigation, Water Quality
Type of Project: Storage
Date established: July 1968

John Day Dam is a hydroelectric dam spanning the Columbia River in the northwestern United States. The dam features a navigation lock plus fish ladders on both sides. The reservoir impounded by the dam is Lake Umatilla, and it runs 76.4 miles (123 kilometers) up the river channel to the foot of the McNary Dam. John Day Dam is part of the Columbia River Basin system of dams.

John Day Dam is located 28 miles (45 km) east of the city of The Dalles, Oregon, and just below the mouth of the John Day River. The closest town on the Washington side is Goldendale, 20 miles (32 km) north. It joins Sherman County, Oregon with Klickitat County, Washington, 216 miles (348 kilometers) upriver from the mouth of the Columbia near Astoria, Oregon.

1.2 Status - History

The initial project with units 1 through 16 was completed in 1971. The additional units 17 through 20 are authorized but have been deferred at this time.

SECTION 2: REGULATION

2-1 Water Surface Elevation (ft)

Max. flood pool (Q = 2,250,000 cfs) .....276.5’
Max. controlled flood pool / Full Pool(Q = 1,800,000 cfs) ...268.0'
Max. regulated pool (Q = 1,644,000 cfs).....265.0'
Normal operating range .....Upper.....Lower
July 1 - October 1 .....268.0.....265.0
November 1 - June 1 ..... 265.0.....260.0[(2)]
Min. pool.....257.0’
Max. flood tailwater (Q = 2,250,000 cfs) .....205.0’
Max. controlled flood

tailwater (Q = 1,644,000 cfs) .....193.5’
Standard project flood
tailwater (Q = 700,000 cfs) .....173.5'
Minimum tailwater .....155.0’
Usable storage (268.0 to 257.0) ..... 534,000 AF

Flood control evacuation requirement

Forecasted Stage at Vancouver	Maximum Elevation
12	265.0
14	262.8
16	260.5
18	258.2
19	257.0

2.2 Discharge

Minimum
December-February 12,500
March-November 50,000
Maximum rate of change per hour ..... 200,000[(1)]

2.3 Storage in Forebay

Maximum Storage ……...…. 25.0 KSFD/ 1.0 ft

2.4 Power Plant

Number of units 16
Nameplate capacity.....2,160.0 MW
Overload capacity .....2,485 MW
Nameplate capacity per unit
Units 1-16.....135.0 MW
Hydraulic capacity (1% Max).....322,000 cfs
Maximum H/K coefficient …….7.7 MW/KCFS
Minimum H/K coefficient ……..7.3 MW/KCFS

2.5 Powerhouse

Turbine type.....Kaplan
Number of Units 16
Turbine capacity.....16 @ 212,400 hp at 94 ft. head
Normal Maximum Head.....105’
Length .....1,975’
Width (U/S face of intake to D/S face of draft tube).....243.25’

Spacing of units.....90’
Number of hydro-generating units.....16 – 135,000 kW
Total rated capacity .....2,160 MW
Units 1 – 16 Kaplan type turbines.....212,400 hp @ 94.0' head
Discharges/turbine at rated head and full gate output.....19,800 cfs
Units 1 – 16 Runner diameters.....312"

2.6 Navigation Lock

Type .....Single Lift
Net clear length, feet.....369
Net clear width, feet.....86
Min. water depth over sills, feet.....15
Max. upper water surf. elev. in chamber 268
Top of lock walls, elevation.....273
Min. water surf. elev. in chamber 155
Upstream sill block elevation.....242
Downstream sill block elevation.....140
Upstream gate .....86' x 27' submersible lift
Downstream gate .....86' x 113' lift
Max. lift, feet.....113
Avg. lift, feet.....105
Min. lift, feet 97
Flow through lock …..…….. 1800 cfs

2.7 Stilling Basin

Type .....Horizontal-floor, hydraulic-jump
Width, perpendicular to flow, feet .....1,228’
Length, parallel to flow, feet.....182
Floor Elevation, feet msl.....114
Height of continuous end sill, feet 13
Sill type .....Sloping (1-on-1) upstream face
Maximum design capacity, cfs 2,250,000

SECTION 3: Fish

3.1 Fish Facilities

Number of fish ladders..... 2
Slope:
North Shore……..1V on 10H
South Shore……..1V on 10H
Number of weirs
(including orifice-control section).....113
Overflow weirs:
Number 93
Height .....6 feet
Orifice size .....18 x 18 inches
Exit of ladders, invert elevation, feet msl 250.5
Entrance of ladder, invert elevation, feet msl 150
Normal fishway flow, forebay to each ladder:
North Shore, kcfs…… 0.1
South Shore, kcfs……. 0.1
Ladder, clear width:
North Shore, feet 24
South Shore, feet 24
Normal fishway flow (from forebay):
With 3 orifices 12” head.....96 cfs
With 2 orifices 12” head.....82 cfs
With 3 orifices 10” head.....88 cfs
With 2 orifices 10” head.....75 cfs
South shore turbine pumps (per turbine).....65 cfs
Number of auxiliary attraction water pumps:
North.....6
South.....3
Discharge per pump:
North.....300 cfs
South.....1,390 cfs
Fishway entrances (all 12 feet wide):
North shore.....3
South shore.....1
Powerhouse fish collection system:
Number of orifice entrances (6’ X2’).....38
Number of overflow-weir entrances (6’ wide).....3
Length of channel.....1,975’
Width of channel .....17.5’

3.2 Temporary Spillway Weir (TSW)

Number of TSWs…….....Two
TSW Location…….....Spill Bay 15 and 16
TSW Flow …….. .....7-11 kcfs
Training Flow……...Spilling 30-40% Total Inflow

Section 4: Water Quality

4.1 Spillway

Type ……...Ogee, concrete gravity, gate controlled
Length…….1,252’
Gates……...20 - 50' X 58.5’ tainter gates
Crest elevations.…….210 ‘
Deck elevation……281’
Design discharge, (cfs) 2,250,000

4.2 Flow Deflectors

Total number of Bays.....20
Total number of deflectors.....18
Bays with no deflectors.....Bay 1 and Bay 20
Elevation of deflector (ft).....148
Depth of deflector (ft).....14.5
Length of deflector (ft).....12.5
Toe of deflector (ft).....15

4.3 Water Quality Monitoring Stations

A) Active Gauges

A1. John Day Forebay (JDY)

Gage Elevation: Variable
Latitude: 45° 43' 15.4" N
Longitude: 120° 41' 34.7" W
Datum: NAD-83
River: Columbia
River Mile: 215.6
USGS-ID: 453439122223900

Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1 – Sept. 15
Years of Operation: 2004 - Present
River Conditions: Forebay Monitor
Parameters Measured: Barometric Pressure, Total Gas Pressure, Temperature.
Location: This gauge was located on the face of John Day Dam between generating units #16 and #17.

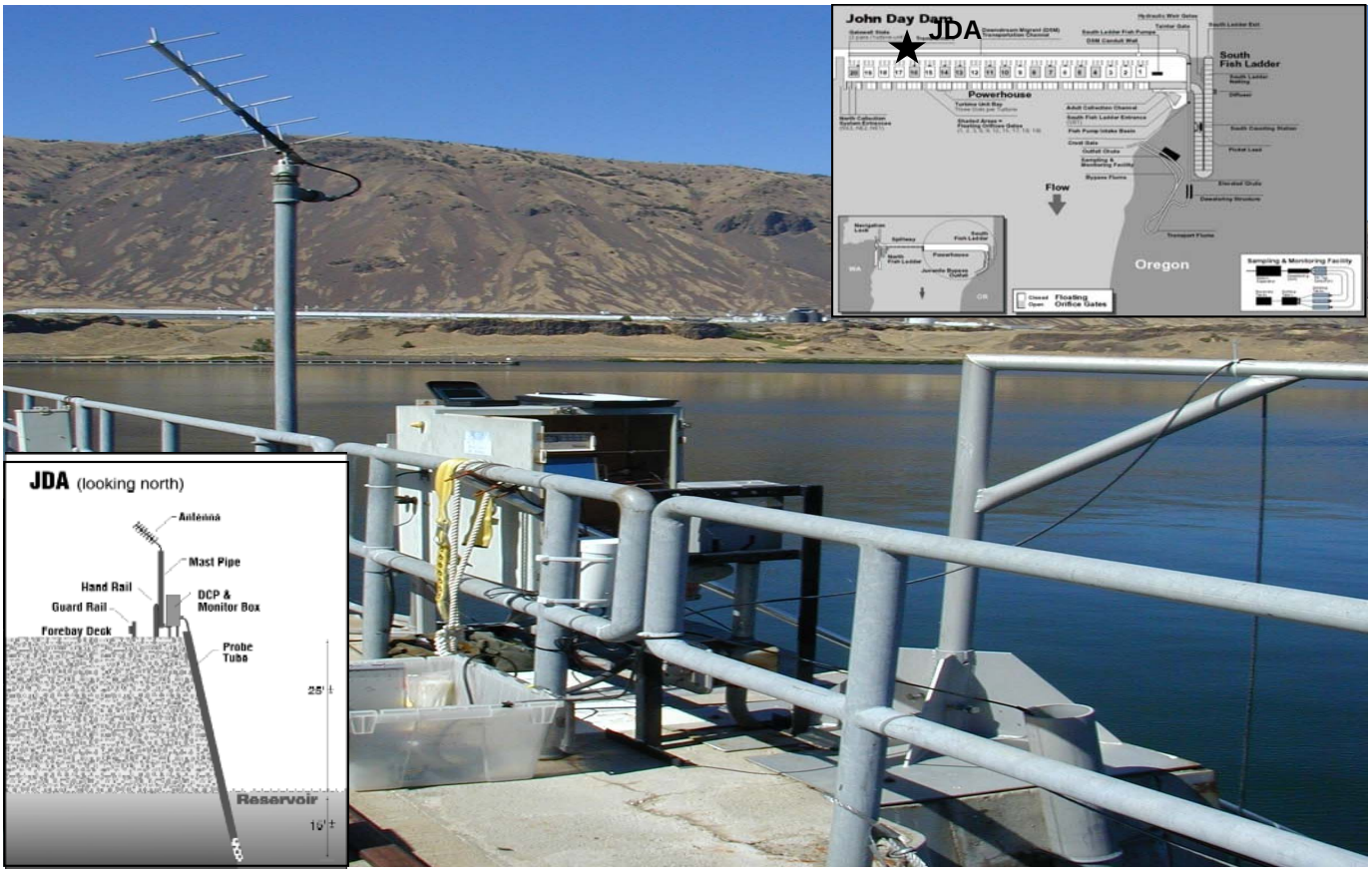

Figure 1: TDG Fixed Monitoring Station at John Day forebay (JDY)

A2. John Day Tailwater (JHAW)

Gage Elevation: Fixed
Latitude: 45° 42' 48.3" N
Longitude: 120° 42' 39.2" W
Datum: NAD-83
River: Columbia
River Mile: 214.8
USGS-ID: 454249120423500
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1 – Sept. 15
Years of Operation: 1995 – Present
River Conditions: Tailwater Monitor
Parameters Measured: Barometric Pressure, Total Gas Pressure
Location: This gauge is located about 0.8 miles downstream of the dam on the Washington shore.

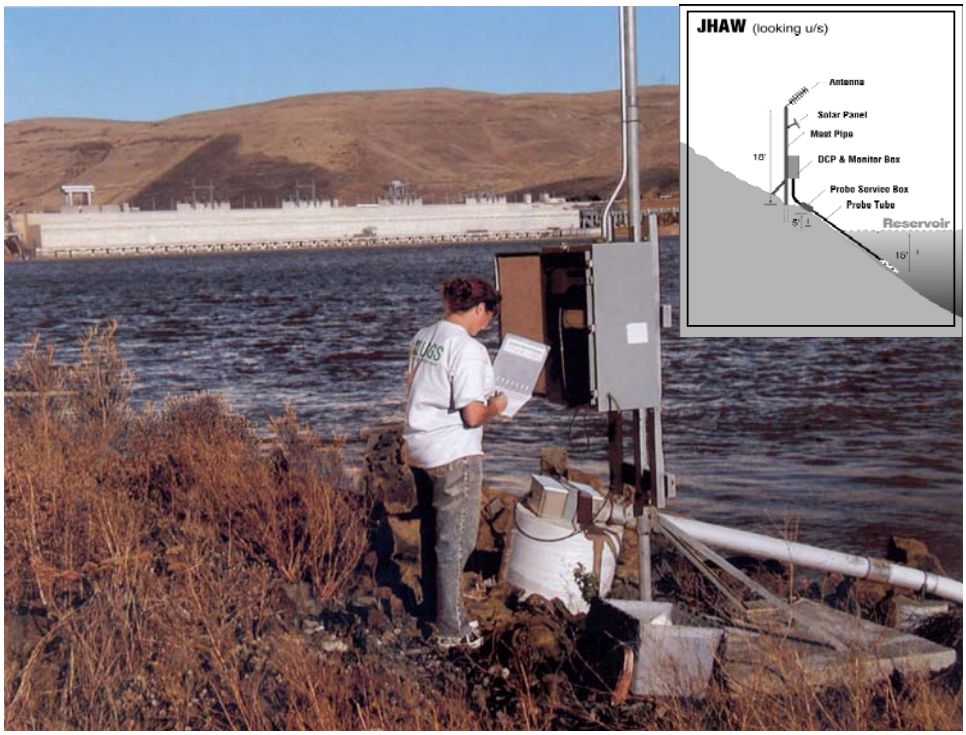

Figure 2: TDG Fixed Monitoring Station at John Day tailwater (JHAW).

Figure 3: John Day Dam with locations of the forebay (1) and tailwater (2) fixed monitoring stations.

B) Obsolete Gauges

B1. John Day Forebay (JDA)

Gage Elevation: Variable
Latitude: 45° 43' 12" N
Longitude: 120° 42' 0" W
Datum: NAD-83
River: Columbia
River Mile: 215
USGS-ID:
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1 – Sept. 15
Years of Operation: 1985-2003
River Conditions: Forebay Monitor
Parameters Measured: Barometric Pressure, Total Gas Pressure, Temperature.
Location: face of the dam.
Comment: This forebay gauge was relocated from its new location called JDY.

Appendix A: Project Schematics

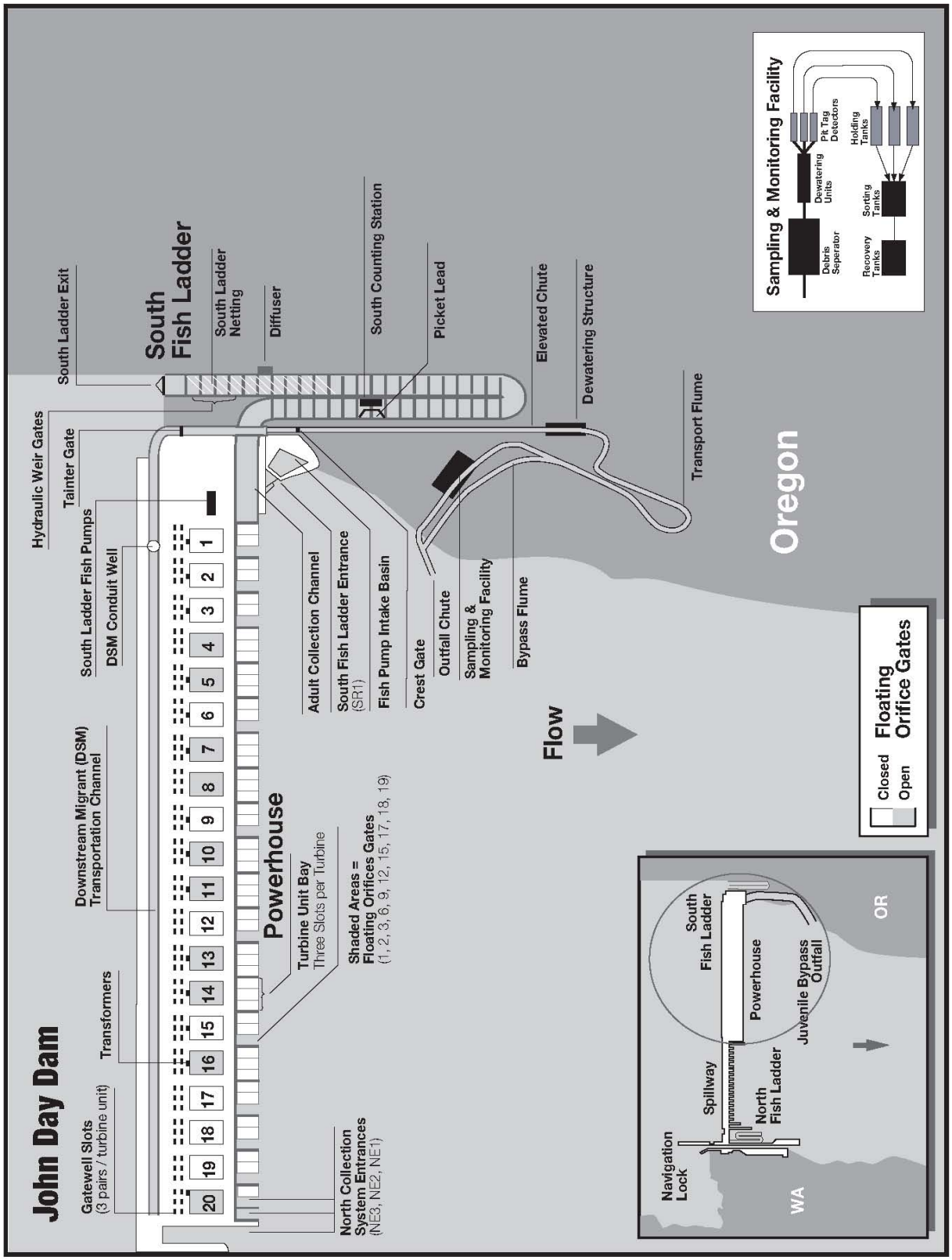

Figure 4: John Day south fish ladder, powerhouse collection system, and juvenile fish bypass system.

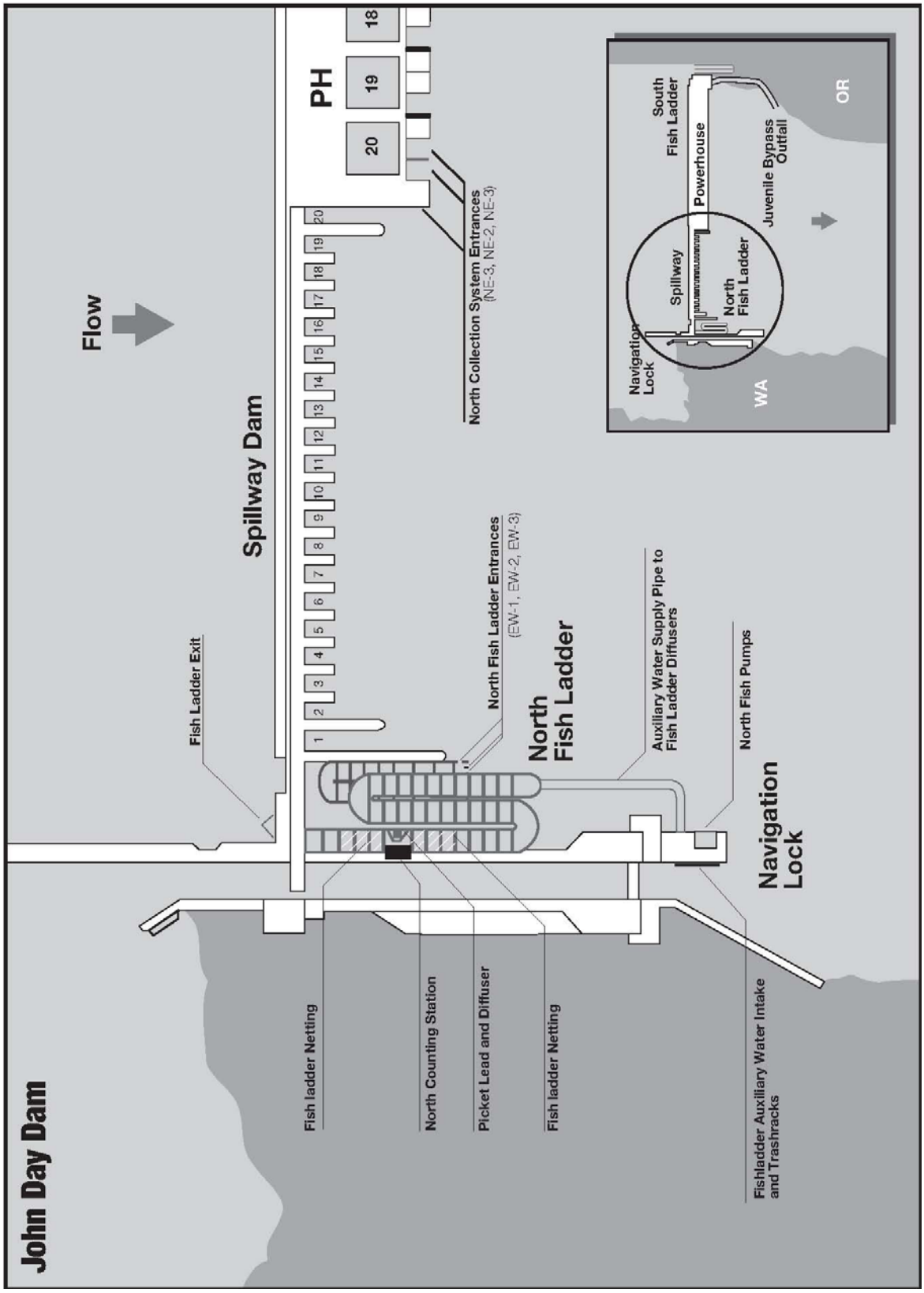

Figure 5: John Day Dam spillway and north fish ladder.

Appendix B: Notes

House Bill 531, 81st Congress Second Session, 1950.

(1) Based on tailwater elevation change of 3.0 feet per hour.

(2) Normal minimum elevation in spring is 262.0 for protection of geese during nesting period 1 March - 15 May (land bridges form below this elevation).

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.