LITTLE GOOSE DAM

INFORMATIONAL OVERVIEW

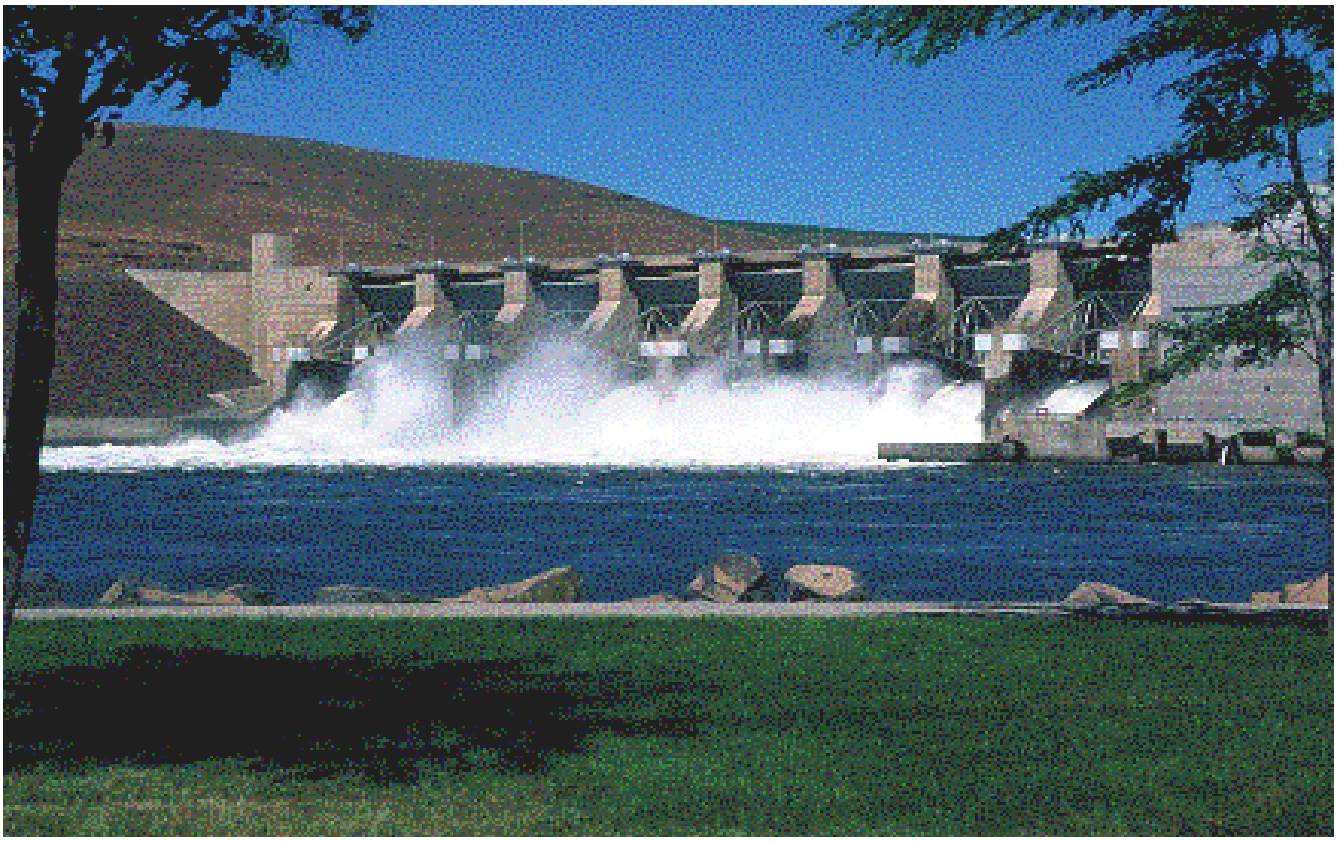

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Table of Contents

Table of Contents **2**
SECTION 1: General Information **3**
1.1 Project Description 3
1.2 Status - History 3
SECTION 2: Dam Design **3**
2.1 Operating Range 3
2.2 Water Surface Elevation (ft) 3
2.3 Discharge 4
2.4 Storage in Forebay 4
2.5 Powerhouse 4
2.6 Navigation Lock 4
2.7 Stilling Basin 5
2.8 Spillway 5
SECTION 3: Water Quality **5**
3.1 Flow Deflectors 5
3.2 Water Quality Monitoring Stations 6
A) Active Gauges 6
B) Obsolete Gauges 8
SECTION 4: Fish Facilities **9**
4.1 Fish Passage 9
A) Juvenile Fish Passage 9
B) Adult Fish Passage 9
4.2 Temporary Spillway Weir (TSW) 10
4.3 General Fish Facilities Information 10
Appendix A: Project Schematics **12**
Appendix B: Notes **13**
Appendix C: Glossary **13**

SECTION 1: General Information

1.1 Project Description

Stream: Snake River (R.M. 70.3)
Location: Starbuck, Washington
Owner: U.S. Army Corps of Engineers, Walla Walla District
Project Authorization: PL 79-14, 1945
Authorized Purpose: Power, Navigation
Other Uses: Fishery, Recreation, Irrigation, Water Quality
Type of Project: Run-of-river
Date established: May 1970

Little Goose Lock and Dam is a hydroelectric, concrete, gravity dam in Columbia and Whitman counties in the state of Washington, on the Snake River. The dam is located nine miles (14 km) northeast of the town of Starbuck, and 25 miles (40 km) north of Dayton. Generating capacity is 810 megawatts, with an overload capacity of 932 MW. The spillway has eight gates and is 512 feet (156 m) long.

Little Goose Dam is part of the Columbia River Basin system of dams. Lake Bryan, named for Doctor Enoch A. Bryan, is formed behind the dam. The lake stretches to the base of Lower Granite Dam, 37 miles (60 km) upstream. Lake Herbert G. West, formed from Lower Monumental Dam runs 28 miles (45 km) downstream from the base of the dam.

1.2 Status - History

Construction began in June 1963. The initial project with units 1 through 3 was completed in 1970. The additional units 4 through 6 were completed in 1978.

SECTION 2: Dam Design

2.1 Operating Range

Normal operating range .....633.0’-638.0’

2.2 Water Surface Elevation (ft)

Maximum pool 646.5
Full pool ..... 638.0[(1)]
Minimum pool ..... 633.0[(1)]

2.3 Discharge

Minimum
- December-February ..... Zero
- March-November 11,500

Maximum rate of change per hour .....70,000[2]

2.4 Storage in Forebay

Maximum Storage …….5.0 KSFD/ 1.0 ft
Minimum Storage …….....…… ---

2.5 Powerhouse

Turbine type .....Kaplan automatic-adjustable blades
Number of Units 6
Turbine capacity.....6 @ 212,400 hp at 93 ft. head
Normal Maximum Head .....98’
Length .....656’
Spacing of units.....90’
- Units 1-5 .....90’
- Unit 6 .....96’
- Erection & Service Bay .....110’

Elevation centerline turbine distributor .....501 fmsl
Number of hydro-generating units.....6 – 135,000 kW
Total rated capacity .....810 MW
Units 1 – 6 Kaplan type turbines.....212,400 hp @ 94.0' head
Units 1 – 6 Runner diameters.....312"

2.6 Navigation Lock

Type .....Single lift
Net clear length, lock chamber, feet 668
Net clear width, lock chamber, feet 86
Operating water surface elevations in chamber, feet.....537 to 638
Maximum operating lock lift, feet 101
Lower lock sill elevation, feet.....522
Upper lock sill elevation, feet 618
Maximum depth over sills, feet 20
Minimum depth over sills, feet 15
Flow through lock …..…….. 1500 cfs
Normal fill time……..11 minutes
Normal emptying time……13 minutes

2.7 Stilling Basin

Stilling basin length, feet 118
Stilling basin elevation, feet msl.....466.5
Maximum design capacity, cfs 850,000

2.8 Spillway

Type .....Concrete gravity, gate controlled
Length (overall) .....512'
Number of bays……...8
Gates type.....tainter gate
Gates size .....50' X 60’
Gates Method of operation.....operated by crane
Crest elevations .....581’
Deck elevation .....651’
Design discharge, (cfs) 850,000

SECTION 3: Water Quality

3.1 Flow Deflectors

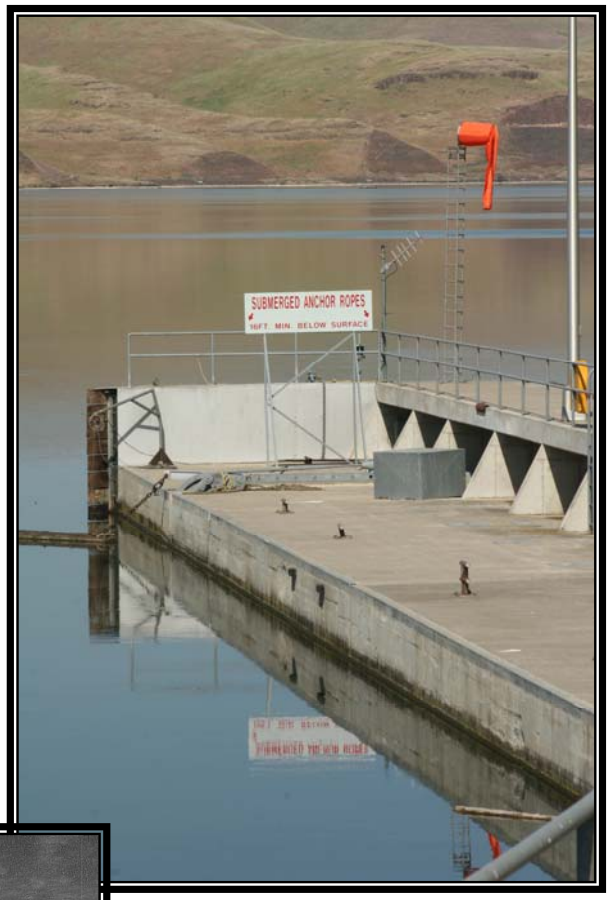
Total number of Bays.....8
Total number of deflectors.....8
Bays with no deflectors.....0
Elevation of deflector (ft).....532
Depth of deflector (ft) 6.6
Length of deflector (ft).....8
Toe of deflector (ft).....0

3.2 Water Quality Monitoring Stations

The following is an overview of the active and obsolete gages.

A) Active Gauges

A1- <u>Little Goose Forebay TDG Monitoring Station (LGSA)</u>



Gage Elevation: Variable (15 m depth)
Latitude: 46° 34’ 58.8” N
Longitude: 118° 01’ 29.2” W
Datum: NAD-83
River: Snake
River Mile: 70.4
USGS-ID: 13343855
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1-Sept. 15
Years of Operation: 2005 – Present.
River Conditions: Forebay Monitor.
Location: This gauge is located in the forebay of Little Goose Dam at the upstream end of the navigation lock guidewall.

Comments: This gauge was established in April 2005 to replace the previous Little Goose Forebay gauge (LGS) that was located on the face of the dam at a depth of about 5 meters.

A2. Little Goose Tailwater (LGSW)

Gage Elevation: Fixed
Latitude: 46° 35’ 00.5” N
Longitude: 118° 02’ 37.4” W
Datum: NAD-83
River: Snake
River Mile: 69.6
USGS-ID: 13343860
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.
Location: This gauge is located on the northern shore of the Snake River approximately 0.7 miles downstream of Little Goose Dam
Parameters Measured: Barometric Pressure, Total Gas Pressure, and Temperature.

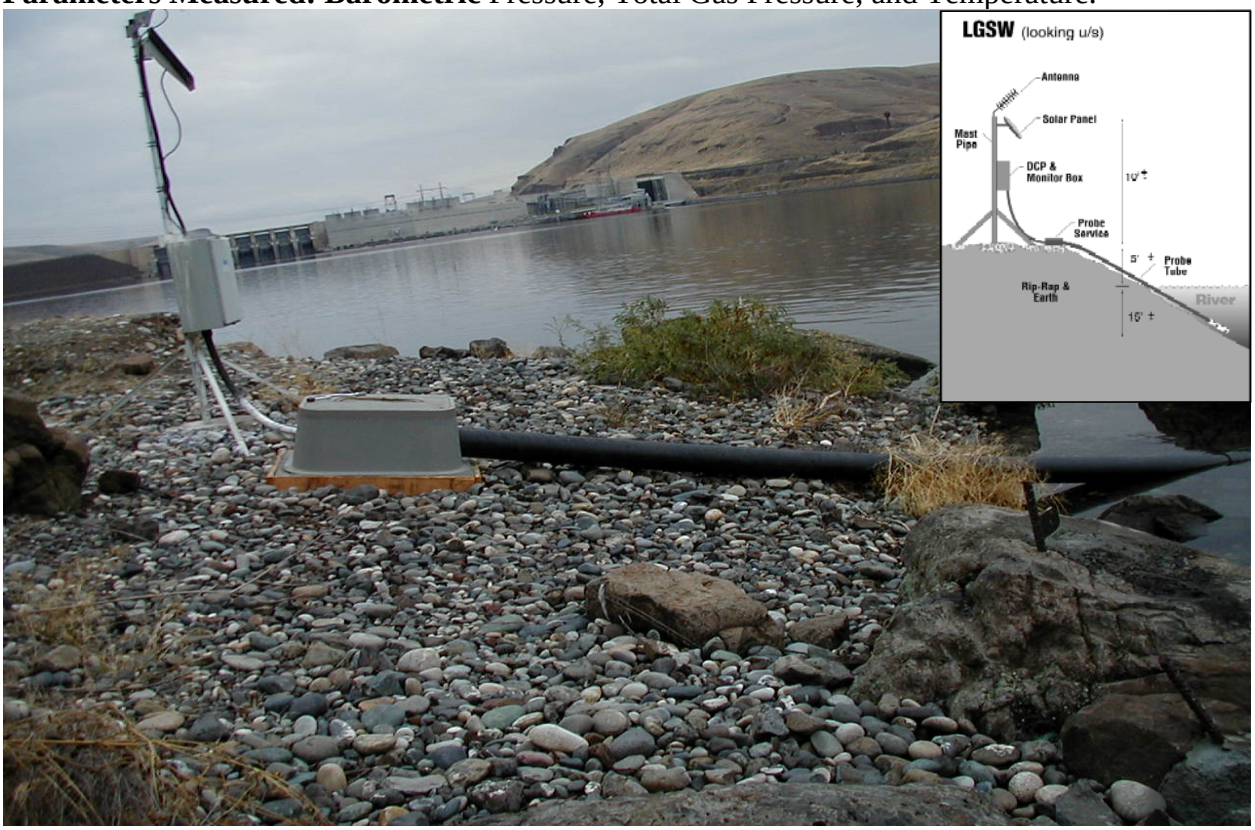


Figure 1: TDG Fixed Monitoring Station at Little Goose Lock and Dam tailwater.

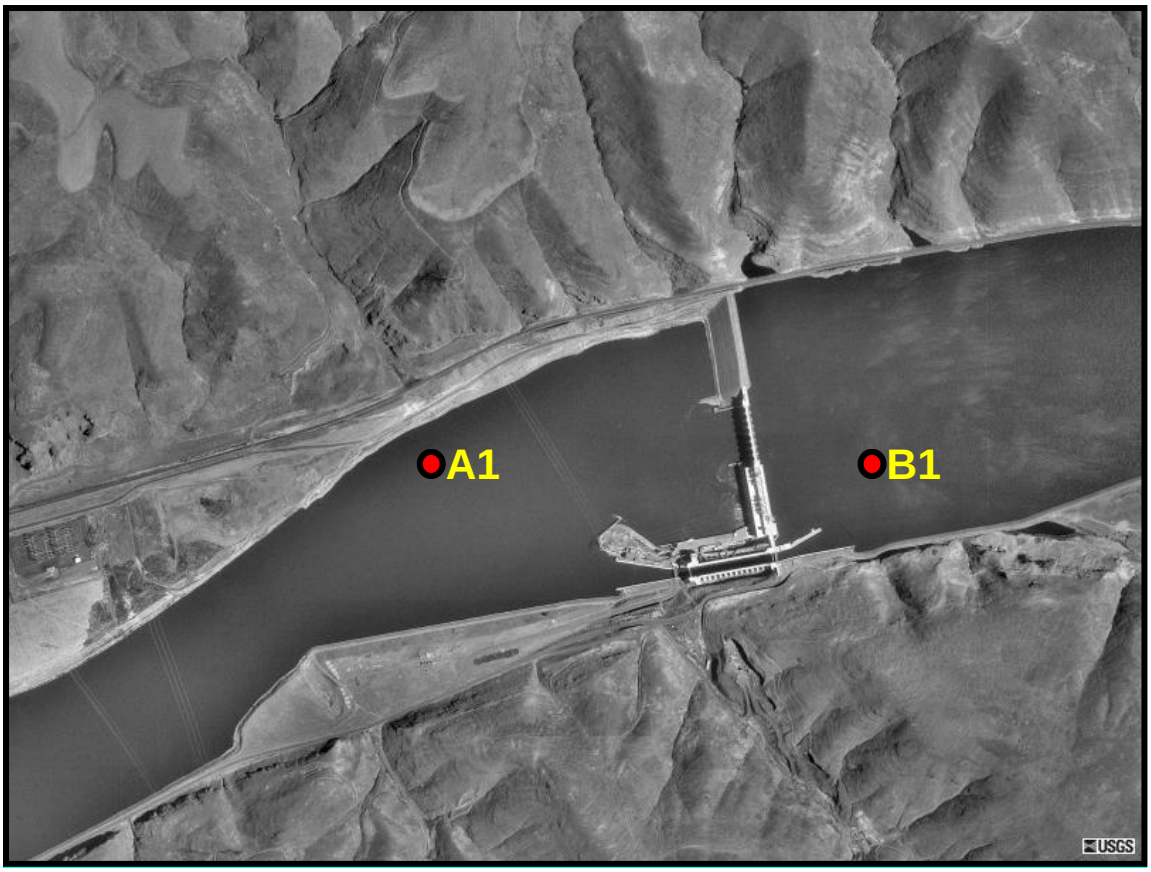


Figure 2: Positions of the forebay and tailwater gauges LGS and LGSW

B) Obsolete Gauges

B1. Little Goose Forebay (LGS)

Gage Elevation: Fixed
Latitude: 46° 34' 58.3" N
Longitude: 118° 01' 33.0" W
Datum: NAD-83
River: Snake
River Mile: 70.3
USGS-ID: 13343855
Owner: U.S. Army Corps of Engineers
Gauge Type: Hydrosonde
Data Transmission: GOES Satellite
Dates of Operation: April 1-Sept. 15
Years of Operation: 1990 – Present.
River Conditions: Forebay Monitor.
Parameters Measured: Barometric Pressure, Total Gas Pressure, Temperature.
Location: This gauge is located in the forebay of Little Goose Dam at the upstream end of the navigation lock guidewall.

Comments: This gauge was established in April 2005 to replace the previous Little Goose Forebay gauge (LGS) that was located on the face of the dam at a depth of about 5 meters. This gauge is inactive.

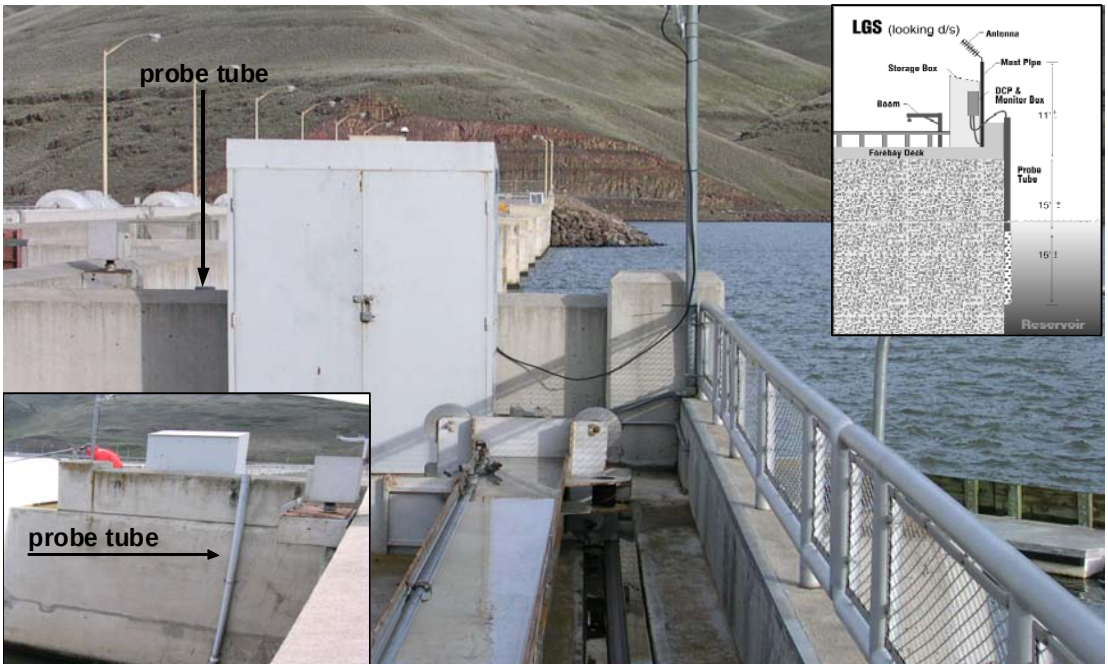


Figure 3: TDG Fixed Monitoring Station at Little Goose Lock and Dam Forebay

SECTION 4: Fish Facilities

4.1 Fish Passage

A) Juvenile Fish Passage

The Little Goose juvenile facilities consist of a bypass system and juvenile transportation facilities. The bypass system contains extended length submersible bar screens with flow vanes, vertical barrier screens, thirty five 12" and one 14” gatewell orifices, a bypass channel running the length of the powerhouse, a metal flume mounted on the face of the dam and the upper end of the fish ladder, a dewatering structure to eliminate excess water, two emergency bypass systems, and a corrugated metal flume to transport the fish to either the transportation facilities or to the river. The transportation facilities include a separator structure, raceways for holding fish, a distribution system for distributing the fish among the raceways, a sampling and marking building, truck and barge loading facilities, and PIT tag detection and diversion systems.

B) Adult Fish Passage

The adult fish passage facilities at Little Goose are comprised of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with

a transportation channel underneath the spillway to the powerhouse collection system, and auxiliary water supply system. The powerhouse collection system is comprised of two downstream entrances and one side entrance into the spillway basin on the north end of the powerhouse, and a common transportation channel. The north shore entrances are made up of two downstream facing entrances and a side entrance into the spillway basin with the two downstream entrances operated. The auxiliary water is supplied by three turbine-driven pumps that pump water from the tailrace into the distribution system for the diffusers. Additional water is supplied to the auxiliary water supply system from the juvenile fish facilities primary dewatering structure.

4.2 Temporary Spillway Weir (TSW)

Year of Installation…….2009
Number of TSWs…… .....One
TSW Location…….....Spill Bay 1
TSW Flow …….....7 or 11 kcfs
Training Flow……Varies with crest position. To know the training flow amount, see spillbay two on tables LSG-10 and LGS-11 of the Fish Passage Plan.

The Little Goose TSW has the ability to spill at two different levels: high crest and low crest. High crest results in a spill of 11 kcfs and low crest results in a spill of 7 kcfs. The high crest is used when flows are below 75 kcfs for three consecutive days and low crest is used when flows are above 75 kcfs.

4.3 General Fish Facilities Information

Upstream migrants fish ladder:
- Number of fish ladders.....1
- Slope .....1V on 10H
- Ladder clear width, feet.....20
- Design capacity, cfs.....75

Exit Channel:
- Location Between weir 637 and pool in non-overflow section
- Top of trashrack elevation.....632
- Invert elevation.....627
- Width.....6 feet

Normal operating range:
- Pool elevations .....633 to 638
- Tailwater elevations .....537 to 544
- Riverflow.....0 to 225,000 cfs

Maximum operating range:

Pool elevations 632 to 639
Tailwater elevations 537 to 547.5
Riverflow 0 to 340,000 cfs

Pumps for fish attraction water:
- Number 3
- Rated capacity, cfs 2,550

Downstream migrants:
- Traveling fish screens 18
- Fingerling collection gallery 1
- Fingerling transportation pipe.....1
- Fingerling handling facility.....1

Fingerling transportation facilities:
- Truck loading facility 1
- Barge loading facility 1
- Design pool range .....633 to 638

Appendix A: Project Schematics

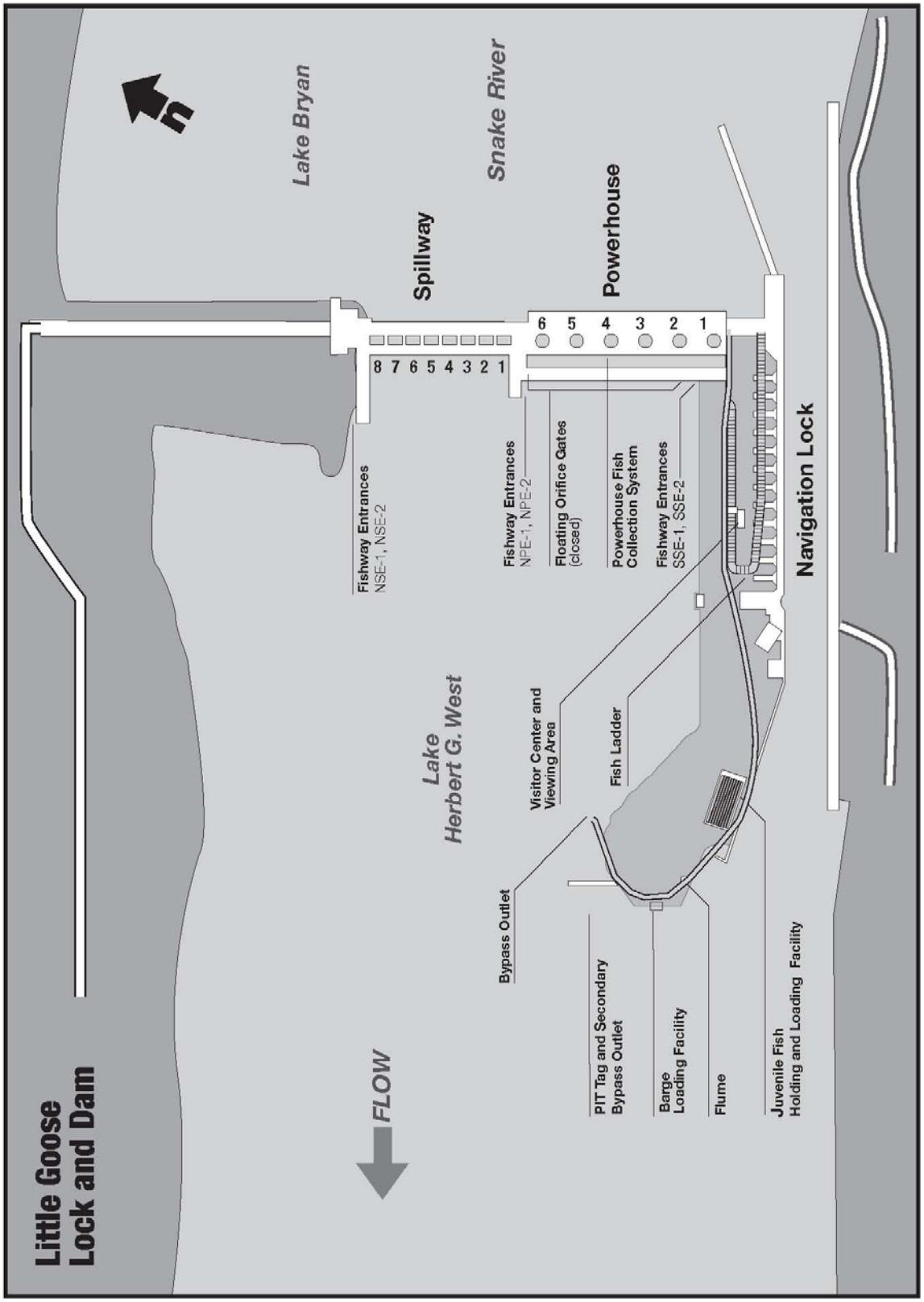


Figure 4: Ice Harbor Lock and Dam general site plan.

Appendix B: Notes

Lake Elevation: Established for flood control and power generation and recreation.
House Document 704, 75th Congress, 1945.

Discharge: Fisheries consideration.

Rate of change: Based on 1.5 feet per hour.

Powerhouse Release for overload output with full pool and no spill.
GDM 2, Vol. 3, Power Studies, plant 20 October 1961.

(1) Project Engineer can authorize lake to fill to elevation 638.5 or draft to elevation 632.5 to allow for unexpected events.

(2) Based on 1.5 ft/hour change.

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.