HENRY M. JACKSON HYDROELECTRIC PROJECT

FERC No. 2157

APPLICATION for NEW LICENSE
MAJOR PROJECT - EXISTING DAM

18 CFR, PARTS 4 AND 5, SUBPART F, SECTION 4.51

VOLUME I, PART 1 of 2

EXHIBITS A, B, C, D, F, G, and H

**Public Utility District No. 1
of Snohomish County**

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT No. 1

May 29, 2009

Meridian Environmental
Biota Pacific
R2 Resource Consultants
CH2M HILL
EDAW
Historical Research Associates
Van Ness Feldman

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY

HENRY M. JACKSON HYDROELECTRIC PROJECT
FERC Project No. 2157

APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT
EXISTING DAM

18 CFR, PARTS 4 AND 5

INITIAL STATEMENT

(a)(1) Proprietary Right to Construct, Operate, and Maintain the Project

Public Utility District No. 1 of Snohomish County (District) submits its Final License Application as the sole applicant for a new license for the Henry M. Jackson Hydroelectric Project (Project). The District holds all proprietary rights necessary to construct, operate and maintain the Project over the term of a new license. The individuals knowledgeable of the Project and the matters set forth in this application are:

Public Utility District No. 1 of Snohomish County
Steven J. Klein, General Manager
2320 California Street
P.O. Box 1107
Everett, WA 98206-1107

Public Utility District No. 1 of Snohomish County
Kim Moore, Assistant General Manager
2320 California Street
P.O. Box 1107
Everett, WA 98206-1107

The current license for the Project expires on May 31, 2011.

The following Project information is provided pursuant to 18 C.F.R. § 5.18(a).

(a)(2) *<u>Counties, Towns, Political Subdivisions or Federal Facilities Occupied by Project</u>*

(i) The Project does not use any federal facilities. County contact information is:

Snohomish County
3000 Rockefeller
Everett, Washington 98201

(ii) The City of Everett annexed several parcels of land encompassing its municipal water supply at Lake Chaplain into the City's boundary. These are isolated parcels located approximately 25 miles to the east of the City, Several Sultan River access sites serving multiple uses (mining, recreation, boating) cross or are located on these City parcels, as discussed in Exhibit E of the Final License Application. These parcels are not included in the Project boundary, nor are they related to Project facilities or Project operation.

There are four cities and towns located within a 15-mile radius of the Project with only one, Monroe, exceeding a population of 5,000 (15,480 in 2004). The City of Sultan, several miles south of the Project had a population in 2004 of 4,135. No Project facilities or Federal facilities that would be used by the Project are located in these cities or towns.

(iii) No Project facilities are located in or proposed for location in an irrigation district, drainage district, or similar special purpose political subdivision, nor does any federal facility use or operate any Project facilities.

(iv) Political subdivisions in the area of the Project likely to be interested in the relicensing of the Project include:

City of Sultan
319 Main
Sultan, WA 98294

City of Everett
2930 Wetmore, Suite 10A
Everett, WA 98201

City of Monroe
806 West Main Street
Monroe, WA 98272

(v) Indian Tribes affected by the Jackson Project and participating in the relicensing process are:

The Tulalip Tribes of Washington
6700 Totem Beach Road
Tulalip, WA 98271

Snoqualmie Tribal Organization
P.O. Box 670
Fall City, WA 98024

Stillaguamish Tribe of Indians
P.O. Box 277
Arlington, WA 98223

(a)(3) Statement of License Application Notification

As required by 18 C.F.R.§ 5.18(a)(3)(i), and concurrent with the filing of this Initial Statement and the Final License Application, Public Utility District No. 1 of Snohomish County is serving a copy of the Final License Application and those exhibits and attachments containing non-Critical Engineering Infrastructure Information upon the appropriate federal, state, and interstate resource agencies, Indian tribes, local governments, and members of the public identified as interested or active participants, in the relicensing proceedings for the Project, including the entities listed in (a)(2) of this Initial Statement.

(a)(4) Verification of Facts

This application is executed in the

State of Washington

County of Snohomish

By: Steven J. Klein

(Name): Public Utility District No. 1 of Snohomish County

(Address): 2320 California Street, PO Box 1107, Everett, WA 98206

Being duly sworn, deposes and says that the contents of this application are true to the best of his knowledge or belief. The undersigned applicant has signed this 27th day of May, 2009.

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY

By: Steven J Klein

Steven J. Klein
General Manager
Public Utility District No. 1 of Snohomish County

Subscribed and sworn to before me, a Notary Public this 27th day

of May, 2009.

ZEDA WILLIAMS
COMMISSION EXPIRES
NOTARY
PUBLIC
7-01-2012
STATE OF WASHINGTON

Zeda Williams
residing in Snohomish
County, Everett, WA

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Acronyms and Abbreviations

7DADMax	7-day average of the daily maximum temperatures
APE	Area of Potential Effects
ARC	Aquatics Resource Committee
BPA	Bonneville Power Administration
BIBI	Benthic Invertebrate Index of Biological Integrity
°C	Degrees Celsius
cfs	cubic feet per second
City	City of Everett
CWA	Clean Water Act
$C0_2$	Carbon Dioxide
CWD	Coarse Woody Debris
DAHP	Washington Department of Archaeology and Historic Preservation
DBH	Diameter at Breast Height
DC	direct current
District	Public Utility District No. 1 of Snohomish County, Washington
DNR	Washington Department of Natural Resources
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
FLA	Final License Application
Forest Service	U.S. Department of Agriculture, U.S. Forest Service
FPA	Forest Practices Act
FR	Forest Road
Ha	Hectares
HP	horsepower
Hz	hertz
HCP	Habitat Conservation Plan
HEP	Habitat Evaluation Procedure
HGMP	Hatchery Genetic Management Plan
HPMP	Historic Properties Management Plan
HSI	Habitat Suitability Index
HSRG	Hatchery Scientific Review Group
I-5	Interstate 5

I&E	Interpretation and Education
IHA/RVA	Indicators of Hydrologic Alteration/Range of Variability
ILP	Integrated Licensing Procedure
ISR	Initial Study Report
Joint Agencies	Washington Department of Fish and Wildlife, National Marine Fisheries Service, and Tulalip Tribes
kV	kilovolt
kW	kilowatt
kWh	Kilowatt hours
LWD	Large Woody Debris
mgd	million gallons per day
Mg/L	Milligrams per Liter
mm	Millimeters
MMHPP	Marbled Murrelet Habitat Protection Plan
MOCA	Mapped Owl Conservation Area
MPC	Main Plant Controller
msl	mean sea level
MVA	megavolt amperes
MW	Megawatt
MWa	Megawatt average
MWh	Megawatt hour
National Register	National Register of Historic Places
NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NR	National Register
NRCA	Natural Resources Conservation Area
NTU	nephelometric turbidity units
NWMP	Noxious Weed Management Plan
OHV	Off-Highway Vehicle
OR	Operational Reach
PAD	Pre-Application Document
PCE	Primary Constituent Element
PFR	Process Flow Release
PLC	Programmable Logic Controller
PLP	Preliminary License Proposal
PM&E	Protection, mitigation and enhancement
PNCA	Pacific Northwest Coordination Agreement
PR	Process Reach
Project	Henry M. Jackson Hydroelectric Project, FERC No. 2157
PSP	Proposed Study Plan

PUD	Public Utility District
Qbf	bankful flow
REA	Ready for environmental analysis
RM	River Mile
RMAP	Road Maintenance and Abandonment Plan
RMP	revolutions per minute
ROW	Right-of-Way
RRMP	Recreation Resources Management Plan
RSP	Revised Study Plan
SCADA	Supervisory Control and Data Acquisition
SCE	side channel enhancement
SD	Scoping Document
SHPO	State Historic Preservation Officer
SLFP	Spada Lake Fishery Plan
TCP	Traditional Cultural Properties
TRMP	Terrestrial Resource Management Plan
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDG	Washington Department of Game
WHMP	Wildlife Habitat Management Plan
WNHP	Washington’s Natural Heritage Program
WQPP	Water Quality Protection Plan
WR Plan	Whitewater Recreation Plan
WUA	Weighted Usable Area

Exhibit A – Description of Project

A.1 GENERAL DESCRIPTION AND LOCATION OF THE HENRY M. JACKSON HYDROELECTRIC PROJECT

Public Utility District No. 1 of Snohomish County (District) and the City of Everett (City), as co-licensees of the 111.8-megawatt (MW) Henry M. Jackson Hydroelectric Project (Project) under the current license, filed with the Federal Energy Regulatory Commission (FERC) on December 1, 2005, their Notice of Intent to seek a new license for the continued operation of the Project. The current FERC license expires on May 31, 2011. By Declaratory Order issued on December 20, 2007, the FERC responded to a November 1, 2007, petition filed by the District and the City to find that the District has sufficient rights to use the City's properties and facilities that are necessary for Project purposes and that the City need not be a co-applicant for a new license after the current license expires in 2011.

The Project is located in the northwestern section of Washington State, on the western slopes of the Cascade Mountains (Figure A.1-1). The Project facilities are sited on the Sultan River between river mile (RM) 4.3 and RM 16.5, and between elevations 285 and 1,470 feet mean sea level (msl), respectively. The Sultan River flows into the Skykomish River at RM 34.4. The Skykomish and Snoqualmie rivers join at Monroe (RM 20.5) to form the Snohomish River. The Snohomish River watershed has a drainage area of 1,980 square miles and is the second largest river basin draining to Puget Sound (Haring 2002).

In 1930, the City of Everett constructed, at RM 9.7 on the Sultan River, the Diversion Dam that exists today. This dam was used to divert water from the Sultan River, through a pipeline and tunnel, west to Lake Chaplain for municipal water supply storage. In 1965, Stage I of Culmback Dam was built at RM 16.5 for additional storage of municipal water supply; the traditional operation of the Diversion Dam and tunnel to Lake Chaplain were essentially unchanged. The function of the Diversion Dam changed with completion of the Stage II hydroelectric project facilities in 1984. Stage II included a raised Culmback Dam, a power tunnel and pipeline, a Powerhouse and a Lake Chaplain pipeline from the Powerhouse to a diversion structure on the shores of Lake Chaplain. Prior to the completion of Stage II, water flowed west from the Diversion Dam through the tunnel into Lake Chaplain; post-Stage II, water now flows east through the tunnel between Lake Chaplain and the Diversion Dam (Figure A.1-2). Thus, some of the water is diverted from Spada Lake at Culmback Dam and returned to the Sultan River at the Diversion Dam to provide minimum instream flows below that point for fishery protection and enhancement.

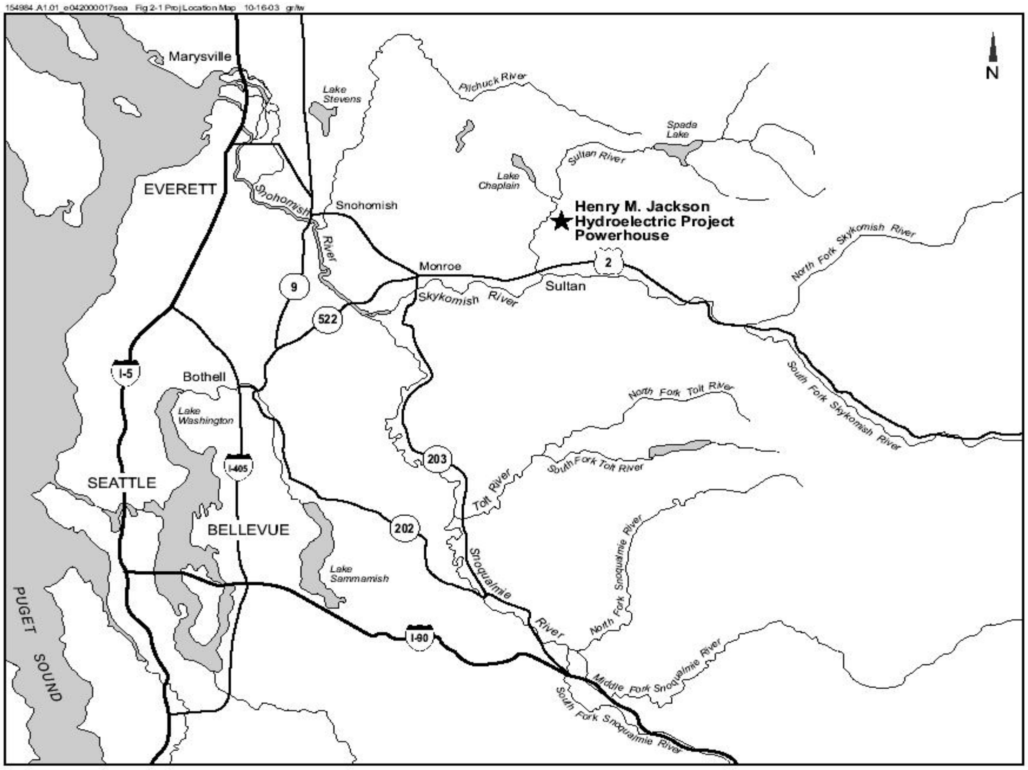

Figure A.1-1 Location map of the Jackson Hydroelectric Project.

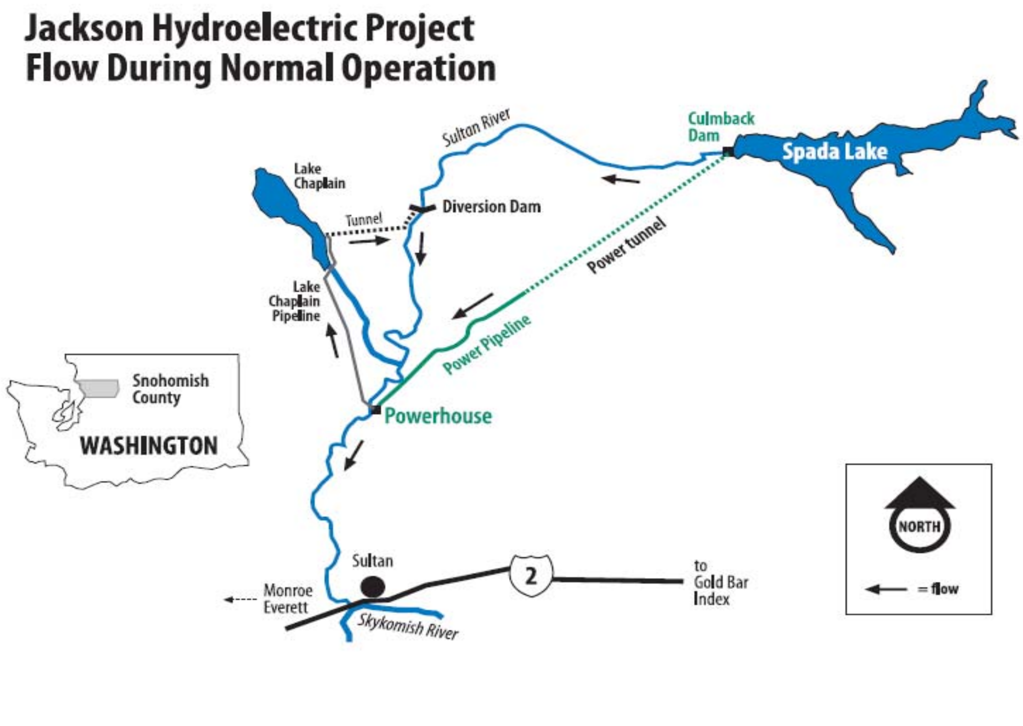

Figure A.1-2 Project flow during normal operating conditions.

A.2 CURRENT HENRY M. JACKSON HYDROELECTRIC PROJECT FACILITIES[1]

A.2.1 Spada Lake Reservoir

The Project reservoir, Spada Lake, has a gross area of 1,908 acres at elevation 1,450 feet msl with a gross storage capacity of 153,260 acre-feet (Figure A.2-1). While the maximum operating pool is at elevation 1,450 feet msl, the normal maximum surface elevation is 1,445 feet msl (normal maximum surface area = 1,802 acres with a storage capacity of 143,982 acre-feet), typically occurring from June through mid-July. Annually, starting in late July, the pool is lowered to elevation 1,415 feet msl by mid-September to avoid spill later in the fall. This measure provides approximately 58,500 acre-feet of incidental flood storage prior to the onset of the October to December wet season. There is no minimum normal operating pool elevation for the Project because operations vary depending on the winter hydrologic conditions. To avoid vortex stresses in the power tunnel, diversion of water into the power tunnel ceases if the pool elevation drops to 1,380 feet or lower.

Figure A.2-1 Sultan River basin with Spada Lake and Culmback Dam in the foreground.

[1] Much of the information presented in this section was first published in the Pre-Application Document, Snohomish County PUD and City of Everett 2005.

Table A.2-1 Morphometric and operational data for Spada Lake.

Drainage area (square miles)		69.21
Drainage area: surface area		23.7 : 1
Average annual discharge (acre-feet)		526,338
Surface elevation (feet msl)		
	Full pool	1,450
	Normal maximum surface elevation	1,445
	Average annual drawdown	1,420
	Maximum drawdown on record (January 20, 1993)	1,395.5
Surface area		
	Full pool (acres)	1,908
	Normal maximum surface area	1,802
	Average days/year at full pool	6.1
	Average days/year > 1445.0 feet	32.8
	Average annual drawdown (acres)	1,500
	Minimum operational pool (acres)	1,380
Volume (acre-feet)		
	Full pool	153,260
	Normal maximum volume	143,982
	Average annual drawdown	102,204
	Minimum operational pool	52,046
Maximum length (miles)		
	Reservoir centerline	5.00
	Old riverbed thalweg	5.25
Shoreline length (miles)		
	Full pool	21.98
	Average annual drawdown	16.90
Depth (feet)		
	Maximum (full pool)	210
	Mean (full pool)	180
Storage ratio (volume/average inflow)		0.29 : 1
Lake filling time (volume/inflow; years)		0.474
Lake flushing time (volume/outflow; years)		0.287

Source: Pfeifer et al. 1998 and District.

The Project uses all inflow to Spada Lake to generate power except for required minimum instream flow releases (to protect and enhance fisheries) and any spill at Culmback Dam. Water required to meet the City's municipal supply demands and to supplement instream flows for fisheries below the Diversion Dam generates power through two Francis turbine units installed at the Powerhouse, using the 700 feet of elevation difference (head) between Spada Lake and Lake Chaplain. Water in excess of the above requirements generates power through two Pelton units discharging directly into the Sultan River, utilizing the 1,000 feet of head between Spada Lake and the Powerhouse.

A.2.2 Culmback Dam

Culmback Dam is an earth and rock-filled dam, located at RM 16.5 on the Sultan River, with a crest elevation of 1,470 feet msl (Figure A.2-2). The crest of the dam is 25 feet wide, 640 feet long, and is 262 feet above the original streambed.

Figure A.2-2 Culmback Dam and the morning glory spillway.

A concrete morning glory spillway is located within the reservoir approximately 250 feet from the right bank. This spillway has a 94-foot-diameter ogee crest, a 38-foot diameter vertical shaft and a 700-foot horizontal tunnel section. The morning glory spillway crest elevation is at 1,450 feet msl and is designed to pass the probable maximum flood of 57,790 cfs at elevation 1,464.6 feet, or 5.4 feet below the crest of the dam.

Reservoir outlet works consist of two 48-inch-diameter conduits embedded in the concrete plug of the diversion tunnel that join the horizontal tunnel section of the spillway. The downstream ends of the conduits are equipped with three slide gate valves (two 42-inch and one 48-inch) and one 48-inch Howell Bunger valve. A 16-inch diameter pipeline runs through the right side of the dam at elevation 1,408 feet, then along its downstream face. This pipeline provides 20 cubic feet per second (cfs) minimum flow releases when the spillway tunnel is dewatered for maintenance or safety inspections. Normal flow releases are accomplished through a 10-inch cone valve piped upstream of the 48-inch Howell Bunger valve that directs flow into the spillway tunnel. A view of the Project hydraulic profile is presented in Figure A.2-3. A 60 kilowatt (kW) turbine generator in the dam outlet works provides onsite electrical power and contributes about 5 cfs to the reach below Culmback Dam. The total flow released by the 10-inch cone valve and the 60 kW turbine generator is 20 cfs.

The Powerhouse intake structure is located near the left abutment, approximately 250 feet upstream of the dam. The 110-foot-tall concrete structure has three 20-foot moveable panels. Positioning of these panels allows the selective withdrawal of stored water from various depths to facilitate the control of water temperature in the Sultan River below the Powerhouse and the Diversion Dam. A single 9-foot wide by 14.3-foot high fixed-wheel gate allows for closure and maintenance of the power tunnel. The gate is operated by a hydraulic cylinder on the access bridge. Hydraulic pressure for the gate operation is provided by a motorized hydraulic power unit located in an enclosure adjacent to the gate hoist.

A.2.3 Power Conduit

An unlined power tunnel, 14 feet in diameter, extends 3.8 miles from the intake structure through Blue Mountain. The tunnel has 3,140 feet of shotcrete-covered steel reinforcing to protect various soft rock areas. At the end of the power tunnel is a 150-foot-long rock trap to capture materials that fall into the tunnel. This collector prevents debris from entering the 10-foot-diameter welded steel power pipeline that transports water for 3.7 miles to the Powerhouse located on the lower Sultan River.

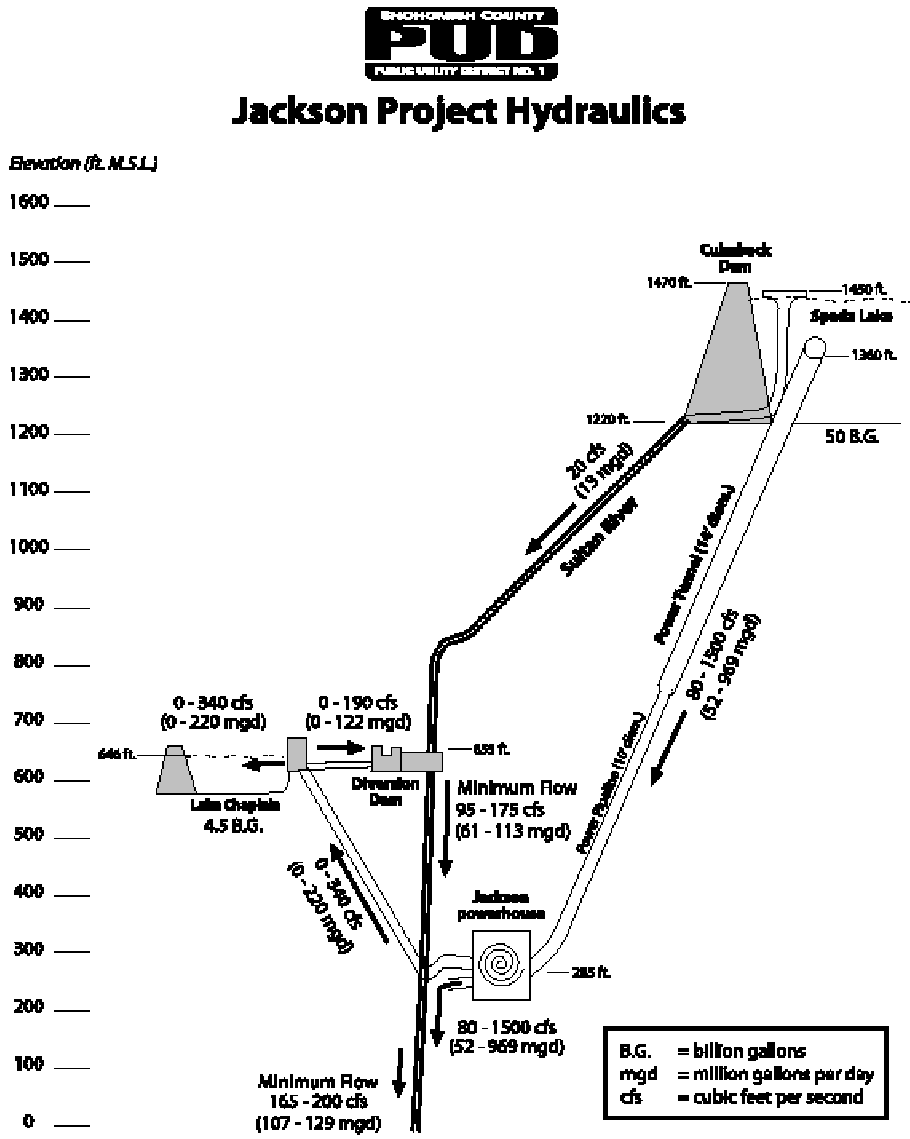

Figure A.2-3 Jackson Project hydraulic view.

A.2.4 Power Plant

A semi-outdoor-type Powerhouse is located adjacent to the left river bank at RM 4.3. The structure is reinforced concrete with the top deck at elevation 316 feet, approximately 30 feet above peak river level for a 100-year flood (Figure A.2-4). Two Pelton turbines and two Francis turbines are housed inside on the lower generator floor of the two-story 200-foot by 71-foot structure. The two Pelton turbines discharge directly into 40-foot-long discharge canals that transport water to the main river channel. The Pelton turbine runners are located 16.25 feet above the floor of the canal. The actual distance between the water surface and the Pelton turbine runners is dependent on discharge and tailrace elevation. During an average water year at average flow the turbine runner would be approximately 11.5 feet above the water surface. See Exhibit F for the physical characteristics of the Powerhouse and the tailrace. Because these are Pelton units the tailwater does not exert a back pressure. The Francis turbines re-route a portion of flow under the river via a pipeline (the Lake Chaplain pipeline) to the City's municipal water supply storage, Lake Chaplain, and to the Diversion Dam to maintain the required minimum instream flows between the City's Diversion Dam and the Project's Powerhouse. The Sultan River stream flows are measured for compliance at USGS Gaging Station No. 12137800 located about 900 feet down stream of the Diversion Dam.

Figure A.2-4 Jackson Project Powerhouse and switchyard.

To alleviate any concerns that at certain flows power generation might cause confusion of adult fish migrating upstream past the Powerhouse, the District constructed and maintains a low-head fish passage berm at the upstream end of the Powerhouse. This berm has a passageway or slot near the Powerhouse to concentrate the river flows into an area that is more attractive to and can be more easily detected by migrating fish. The berm has successfully facilitated fish passage upstream of the Powerhouse since its construction in 1983.

A.2.5 Lake Chaplain Pipeline

The City's water supply requirements are mainly met by diverting water from Spada Lake through the Powerhouse's two Francis units. Sufficient pressure is retained, because of the 700-foot elevation difference between Spada Lake and Lake Chaplain and the Diversion Dam, to route the water from the Powerhouse through a 72-inch-diameter buried pipeline to the Portal 2 structure located on the shore of Lake Chaplain. The first 500 feet of the pipeline is welded steel construction and the remaining 17,886 feet is reinforced concrete cylinder pipe. The two Francis units are sized to meet current water delivery requirements to Lake Chaplain and the minimum instream flow requirements below the Diversion Dam at RM 9.7.

A.2.6 Portal 2 Structure

Under the current license, the amount of water sufficient to maintain minimum instream flows below the Diversion Dam is returned to the Sultan River via a control structure located at the terminus of the Lake Chaplain pipeline. From the control structure the water is forced backward through the pre-existing diversion tunnel to the Diversion Dam. The control structure is called "Portal 2" because it was built on the lower end of the City's diversion tunnel that originally transported water to Lake Chaplain from the Sultan River Diversion Dam (Figure A.2-5). Within the base of the Portal 2 control structure water flowing into Lake Chaplain is constricted by a 5-foot-square slide gate. The restricted gate opening causes water to build up inside the tower, which then creates enough head to cause the water to back-flow to the Diversion Dam. By adjusting the Portal 2 gate opening, the required amount of water to be diverted to both Lake Chaplain and to the Diversion Dam can be accurately controlled.

Figure A.2-5 Portal 2 structure at Lake Chaplain.

A.2.7 Diversion Dam Tunnel and Pipeline

The diversion tunnel connecting Lake Chaplain to the Sultan River is a 1.5-mile-long horseshoe-shaped and concrete lined conveyance. A 72-inch, 2,000-foot-long concrete cylinder pipeline connects the upstream tunnel portal to the Diversion Dam where, under current Project operating conditions, flows are discharged back into the Sultan River to meet the Project instream flow requirements in the reach between the Diversion Dam and the Powerhouse. The flow capacity for returning water to the Sultan River under current hydraulic constraints is estimated at 189 cfs.

A.2.8 Sultan River Diversion Dam

The Sultan River Diversion Dam has been in place since 1930. It was originally used to divert water from the Sultan River into Lake Chaplain for the City of Everett’s water supply. It is a concrete ogee crest gravity structure 25 feet high and 120 feet wide (Figure A.2-6). The Diversion Dam creates only a small headpond measuring a few acres in size. Water from Portal 2 flows into the forebay and is accurately measured through a weir in the main sluice gate. All flow below 280 cfs is routed through this weir. Higher flows are passed over the 120-foot-wide concrete spillway. However, for accuracy and compliance purposes the instream flows in the Sultan River below the Diversion Dam are measured at USGS Gaging Station No. 12137800 located 900 feet downstream of the Diversion Dam.

Figure A.2-6 The Sultan River Diversion Dam at RM 9.7.

When the power conduit or the Lake Chaplain pipeline is not operational, the City’s water requirements can also be met by supplementing Lake Chaplain storage with water diverted from the Sultan River via the Diversion Dam and diversion tunnel to Lake Chaplain (see Section A.2.7 above).

The District will be applying to amend the current license to put in a separate instream flow discharge structure in line with the return pipeline to the Diversion Dam. The proposed structure will be located adjacent to the City's Diversion Dam (approximately 800 feet upstream of the USGS gaging station) and will allow the District to have a new discharge structure for the purposes of meeting the license requirements for minimum instream flows below the Diversion Dam. This new structure will be constructed using the latest technology and controls, providing the District with enhanced regulation over minimum flows below the Diversion Dam. See Section A.3 Proposed New Structures and Exhibit C for description and schedule for completing this Project feature. The new structure will be designed to allow the City of Everett to withdraw water from the Sultan River to flow over to Lake Chaplain when normal operations of the Jackson Project are suspended.

The District is in the process of selecting a consultant to design the structure and prepare plans, specifications and the construction schedule for the new instream flow discharge structure. These drawings will be included in the application to amend the current Project license that will be submitted to FERC by the end of 2009.

A.2.9 Mechanical, Electrical, and Computer Control Equipment

A.2.9.1 Turbines and Generators

The Jackson Project Powerhouse contains two 47.5 MW Pelton turbines (units 1 and 2) and two 8.4 MW Francis turbines (units 3 and 4). Minimum unit discharge for each Pelton unit is 80 cfs and for each Francis unit, 44 cfs. There are four generating units, each equipped with a solid state static excitation and voltage regulation system. The neutral of each generator is grounded through a single phase distribution transformer. The generators are protected against possible winding insulation damage due to lighting or switching surge voltages.

Pelton Units

Each Pelton unit is a vertical shaft six-nozzle impulse turbine rated at 65,000 horsepower (hp), 257 revolutions per minute (rpm), and 1,000 feet of head. Together, the Pelton units can discharge up to 1,438 cfs directly to the river when operating at full power. Each unit has its own digital governor that can regulate the six nozzles each independently of the deflector control. The digital governors operate the generator/turbine in two modes: (1) power generation mode when on-line and synchronized to the transmission lines and (2) water bypass mode to control river level down ramps following unit or system problems that require the unit to quickly cease power generation mode. Each unit also has its own turbine shutoff valve for shutdown or maintenance purposes. The tail water discharges into the Sultan River. A work platform is provided for inspection of the buckets, needles and deflectors inside the turbine pit. Bottom removal of the runner is by means of a handling car and gantry crane outside of the Powerhouse through a hatch in the tailrace.

Generator units 1 and 2 are directly coupled to the Pelton turbines and are of the vertical shaft umbrella type with a combination upper thrust and guide bearing and a lower guide bearing below the rotor. Each is rated at 52.8 megavolt amperes (MVA), or 47,500 kW, at a power factor of 0.9. Main leads are connected by 15 kilovolt (kV), 2,500 ampere, self-cooled isolated phase buses to the generator step-up transformers.

Francis Units

The two Francis units are identical horizontal shaft units rated at 11,500 hp each, 900 rpm, and 675 feet net head. Each unit has its own governor to regulate the wicket gates for load variation with guard valves at the inlet and discharge of the unit. During maintenance periods, water can be diverted through pressure reducing valves before delivery to Portal 2 on the shores of Lake Chaplain. The turbine is coupled to the horizontal generator through a 10 ton flywheel. These units discharge to the Lake Chaplain water supply pipeline which returns up to 390 cfs (the maximum capacity of the Francis units) to Portal 2 for diversion into Lake Chaplain and return to the Diversion Dam.

Generator units 3 and 4 (Francis units) are of the horizontal shaft type and each is rated at 9.34 MVA, or 8,400 kW, at a power factor of 0.9. Main leads area connected to their respective unit breakers by 15 kV armored cable. Connection between the unit breakers and the step-up transformer is by a common non-segregated phase bus. Unit 3 and 4 breakers are the metal-clad switchgear type; each rated 13.8 kV, 1,200 ampere, 500 MVA.

A.2.9.2 Transmission System

Power generated within the Jackson Hydroelectric Project is delivered to the District’s existing transmission system at a switchyard located adjacent to the Powerhouse. The Project’s primary transmission system terminates at the three separate oil-filled circuit breakers located within the switchyard; one circuit breaker associated with each Pelton unit and one serving both Francis units.

From the three switchyard circuit breakers, power is transmitted to the “Jackson Loop,” comprised of two single-circuit 115-kilovolt (kV) transmission lines with ASCR 795 conductors on wood poles. The “south transmission line” extends approximately 3.79 miles east and south from the Powerhouse switchyard and follows existing roads for most of the distance into the community of Sultan, where it connects to the District’s Sultan Substation. After leaving the Powerhouse switchyard, the “north transmission line,” which has never met the standard of a primary transmission line, immediately crosses the Sultan River and connects to the District’s Lake Chaplain Substation approximately 1 mile to the west of the Powerhouse. Together these segments of the Jackson Loop provide dual redundancy for protection of the generation facilities from line outages. Figure A.2-7 describes the entire Jackson Loop. The Jackson Loop also carries power from the BPA depending upon area demand, and it may also carry power from neighboring systems via the Gold Bar substation in the event of a Project shutdown or a failure in certain other parts of the District’s transmission or supply system.

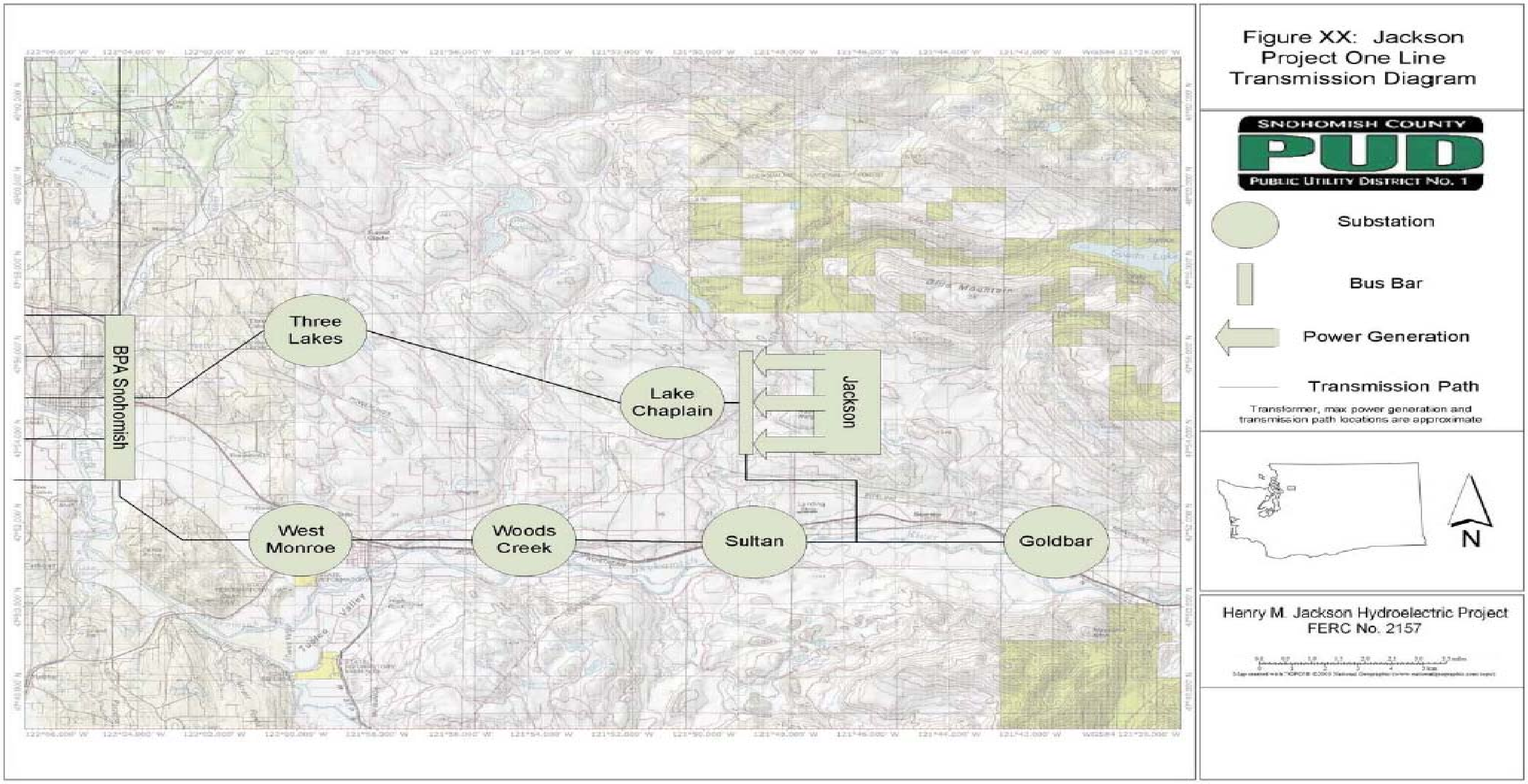

Figure A.2-7 Jackson loop transmission system.

The 3.9 mile segment of the Jackson Loop described as the "south transmission line" was originally a part of the Project and was included in the existing FERC Project boundary. However, as a result of improvements to the south transmission line, it now connects to several District substations prior to its interconnection with the BPA Snohomish Substation. Since this line no longer meets the criteria of a primary line for the Project[2], the District submitted an application to FERC on October 25, 2005, for a license amendment to remove the south transmission line from the Project. FERC amended the license on May 3, 2006, to remove the line from the Project facilities and from the Project boundary.

A.2.9.3 Computer Control System

The Project is monitored and controlled with a Supervisory Control and Data Acquisition (SCADA) system that allows monitoring and alarming of critical Project functions. The system is composed of several computers networked together. The main computer system is a set of dual redundant Digital Equipment Corporation processors with remote terminals to monitor and control functions at the Powerhouse, Culmback Dam, the Diversion Dam, Portal 2, and the electrical transmission and distribution system. The communication link between the master and remote stations is either by leased telephone line or microwave system.

A Main Plant Controller (MPC) consisting of redundant programmable logic controllers (PLCs) interfaces with the SCADA system and the plant control network. The main function of the MPC is to monitor the river level, to schedule Powerhouse generation, and in conjunction with the Pelton unit digital governors, to control the river level and down ramp rates.

An independent computer system at the Powerhouse uses Wonderware HMI (human-machine interface) software to monitor Programmable Logic Controllers (PLC) located at Portal 2, the Diversion Dam, Culmback Dam and the Powerhouse. At the Diversion Dam and Portal 2, these PLC's are programmed to respond to changes in Sultan River flows; thus, allowing the District to automatically meet the instream flow requirements below the Diversion Dam. At Culmback Dam the PLC's monitor and control the opening and closing of the 48-inch Howell Bunger valve and the 10-inch cone valve for accurate control of instream flows and downramping rates of Culmback Dam water releases into the Sultan River.

The computer control system is designed to allow the units to be operated manually or semi-automatically from the main control switchboard located in the Powerhouse control room. The main control switchboard consists of a lineup of panels containing unit controls, indication, metering, recording, alarm, unit and line protection relays.

[2] Section 3(11) of the Federal Power Act, as refined by FERC, defines primary transmission lines to be only those lines used solely to transmit power from the licensed project to the load center, and without which there would be no way to transmit the project power to market.

A.2.10 Other Appurtenant Equipment and Systems

A.2.10.1 Mechanical

Oil Storage and Handling System

An oil storage-oil transfer room for governor and bearing lubricating oil is located in the Powerhouse. Separate used oil and clean oil tanks are provided. Contaminated or dirty oil is transferred into a mobile tank outside of the Powerhouse for disposal. The switchyard has its own oil water separator for transformer/oil circuit breaker leakage.

Cooling Water System

Cooling water for the generator heat exchangers and bearings is taken from the turbine pits by means of vertical pumps and from the Lake Chaplain pipeline by means of a control valve. The heat exchangers have control valves.

Compressed Air System

There is a dual set of air compressors for the purpose of generator air brakes, instrument air and service air. A low pressure isolation valve is provided where only the air brakes are served when the system pressure drops below a preset level.

Fire Prevention System

High pressure bottled CO_2 is provided for the generators and the oil storage room. A manual water fire suppression system is installed in each generator housing. In addition, portable extinguishers, fire hose reels and hydrants are provided and strategically located inside and outside the Powerhouse. Fire water supply is taken from the turbine pit and Lake Chaplain pipeline.

Sanitary Disposal System

A large tank collects all sewage from the bathrooms and water washing stations. Periodically a sewage disposal service removes the contents for proper disposal at a local sewage treatment facility.

Gantry Crane

A gantry crane with a main and auxiliary hoist for maintenance purposes was constructed on the top deck of the Powerhouse. The main and auxiliary hoists are rated for 150 and 25 tons respectively. The bridge is extended beyond the face of the Powerhouse for the purpose of runner removal and installation of bulkheads in the tailrace.

Heating, Ventilating, and Air Conditioning Systems

The Powerhouse is ventilated by means of air handling units, except the control room is air conditioned by a packaged unit. Duct heaters and unit heaters with thermostatic controls, and fire dampers are provided.

System Drain

There is a pressure reducing valve provided for draining the power conduit and the Lake Chaplain pipeline. For power conduit draining, the top portion is through the unit 3 or 4 pressure reducing valve. The residual water in the spiral case is then drained by means of a spiral case drain valve. For the Lake Chaplain pipeline, the Francis units are shut down and the pipeline drained to the Sultan River through the pressure reducing valve.

Power Generation at Culmback Dam

Site power for facilities at Culmback Dam is supplied by a reversed Cornell pump attached to a 60 kW generator located in the outlet chamber below the right abutment. Backup power is supplied by a 60 hp John Deere diesel engine driving a 60 kW Kato light generator located in the control building upstream of the left abutment of the dam.

A.2.10.2 Electrical

Station Service Unit Substation

Station auxiliary power is provided by unit substations fed from unit 2 generator terminal segregated phase buses and the unit 3/4 non-segregated phase bus. Each unit substation consists of a 13.8 kV fused disconnect load interrupter, three single phase step-down transformers, and secondary main breaker. 480/277 volt, 3 ø, 60 Hz power is distributed to strategically located load centers in the Powerhouse. An emergency source is supplied by a 480/277 volt 3 ø padmount transformer located at the South East corner of the top deck. The padmount transformer is connected to a dedicated 12.47 kV 3 ø circuit from the Lake Chaplain Substation.

DC System

A 125 volt direct current (DC) system, consisting of a station battery, dual battery chargers, and DC distribution centers, provides an uninterrupted source for control, protection, and indication.

Grounding

An electrical equipment grounding system serves to protect equipment and provide safety to personnel by reducing touch potential and controlling the potential gradients along the surface of the facilities where high voltage lines and equipment are installed.

Lighting

The lighting system is supplied by 480/277 volt lighting panels suitably located in the Powerhouse. Generally, fluorescent and mercury vapor fixtures are used for normal lighting. Lighting fixture types are selected to suit the particular applications. Illumination levels are adequate for the required visual tasks.

Switchyard

The 115 kV switchyard is located on the east side of the Powerhouse at elevation 313 feet msl. The switchyard contains three-step-up transformers, five oil circuit breakers, disconnect switches, and bus potential transformers. Transformers and the two outgoing transmission lines each have an oil circuit breaker and isolating disconnect switches. All generation and the outgoing line terminate on a single bus. Switchyard structures accommodate the high voltage disconnect switches, insulators, and the bus. All buses in the switchyard are copper conductors.

Transformers

The main transformers are of the three-phase, two-winding, oil-immersed class OA/FA/FA type suitable for outdoor operation. Units 1 and 2 each have a step-up transformer, whereas units 3 and 4 are paralleled to a common step-up transformer.

Oil Circuit Breakers

Oil circuit breakers are rated 121 kV, 1,600 ampere, and 10,000 MVA interrupting.

Disconnect Switches

Disconnect switches are rated 121 kV, 1,600 ampere, 550 kV BIL, and 70,000 ampere momentary.

A.3 PROPOSED NEW STRUCTURES AND FACILITIES

Pelton Unit Bypass

To protect the aquatic resources of the Sultan River below the Powerhouse from rapid dewatering when either of the Pelton units trips off line, the District proposes to remodel the governor and needle valve controls for each unit. These modifications will allow flow continuation through the Powerhouse into the Sultan River while either unit can be shut down as necessary. The current configuration is set up to deflect the Pelton nozzle flow away from the turbines and to close off the needles in a relatively short time. Governor control modifications and upgrades will allow independent controlled operation of the deflector blades and the needle closure. Because this is an important aquatic protective measure, the District has offered to make the expenditures to accomplish this goal by the end of 2009.

Sultan River Discharge Structure

To enhance the District’s regulation of flow below the City’s Diversion Dam, the District is preparing an application to amend the current license in order to construct a concrete discharge structure in line with the 72-inch return line from Portal 2 of the City of Everett Lake Chaplain Tunnel to the Diversion Dam on the Sultan River. This structure would be located on District land adjacent to the City’s Diversion Dam and approximately 800 feet upstream of the USGS gaging station. The tailrace of the new structure would be constructed to ensure minimum flow releases are discharged at about the same location as at present so there would be no adverse affects associated with the new structure. It would be constructed to allow either discharge of water into the Sultan River to meet instream flow requirements or diversion of water from the Sultan River by the City of Everett's Diversion Dam to flow back to Lake Chaplain when normal flow pattern to Lake Chaplain from the Powerhouse is disrupted for long periods of time. Exhibit C presents a more detailed description of the shape and location of this proposed structure and a schedule for design and construction, and Exhibit E evaluates the environmental effects.

A.4 FEDERAL LANDS WITHIN THE PROJECT BOUNDARY

The Jackson Project is located in Snohomish County, Washington State. The current license Project boundary occupies a total of 2,286.0 acres, with approximately 1,908 acres of that inundated by the Spada Lake reservoir. The U.S. Forest Service owns approximately 10.9 acres above the power tunnel, which lies approximately 300 feet below the surface.

When Stage II of the Project was developed (the addition of generating facilities) between 1982 and 1984, approximately 1,325 acres of U.S. Department of Agriculture, U.S. Forest Service (Forest Service) forest lands were affected by the increased inundation of Spada Lake. On February 28, 1991, the Forest Service and the District executed a land exchange for the purpose of consolidating Forest Service lands in other regions and to give the District ownership of the lands within its Project boundary. In a letter to the Assistant Everett Public Works Director on December 17, 1993, the Forest Service stated "[A]s you know, our land exchange with the Snohomish County PUD in 1991 resulted in the Forest Service not having jurisdiction over lands within the Jackson Project Area". A copy of the deed conveying the Forest Service lands to the District was filed with the FERC on December 22, 1992.

For the next Project license, the District proposes to add a total of 2,283.5 acres to the Project boundary. Of these, 2,267.3 acres are currently managed under the FERC-approved Wildlife Habitat Management Plan but are not included in the current Project boundary. Under the proposed license they will be managed under a Terrestrial Resources Management Plan. An additional 16.2 acres of recreation lands and facilities outside of the existing Project boundary are also proposed for inclusion in the boundary. This will make a total of 4,569.5 acres of lands within the proposed Project boundary. Of these, 3,466.7 acres are former Forest Service lands which the FERC claims are subject to the Section 24 reservation under the Federal Power Act[3] and 10.9 acres are owned

[3] In addition to annual administrative fees charged to FERC licensees under section 10(e) of the Federal Power Act, the FERC maintains that it may assess annual land use charges for the use of former Forest Service land, even where that land has been acquired in fee simple by the licensee. The FERC has previously stated that it assesses the same annual land use charge for lands in which the United States retains an interest under section 24 of the Federal Power Act as for lands to which the United States holds the full fee title. While the District disagrees with this

outright by the Forest Service. The location by section, of these "federal lands" within the proposed Jackson Project boundary is shown in Table A.4-1. Federal Power Act Section 24 lands, previously owned by the Forest Service but exchanged with the District for lands outside of the basin in 1991, are discussed in Exhibit H, Section H.10.

Table A.4-1 Federal lands (current or former) within the Proposed Jackson Project boundary.

Location	Ownership	Acreage
T29N, R9E, S30	Forest Service	10.9 (subsurface)
T29N, R8E, S32 T29N, R9E, S13, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S33, S34	District (FPA Section 24)	3,466.7

A.5 REFERENCES

Haring, D. 2002. Salmonid habitat limiting factors analysis; Snohomish River watershed; Water Resource Inventory Area 7 Final Report. December 2002. Washington State Conservation Commission. Lacey, WA.

Pfeifer, B., P. Tappel, A. Vogel, M. Schuh, and W. Brunson. 1998. Spada Lake Bioloigical Assessment and Sport Fishery Evaluation. Washington Department of Fish and Wildlife, Fish Program, Fish Management Division. December, 1998.

Snohomish County PUD and City of Everett. 2005. Pre-Application Document, Henry M. Jackson Hydroelectric Project, FERC No. 2157. December 2005.

interpretation of the Federal Power Act, the District has historically qualified for the municipal exemption from paying annual administrative fees and annual land use charges. The District will continue to seek this exemption in future years. Should the District fail to qualify for the municipal exemption at a future date, the District will either need to pay the annual fees and charges assessed or challenge the FERC's authority to impose annual land use charges against the District under the Federal Power Act.

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Exhibit B – Project Operations and Resource Utilization

B.1 PROJECT OPERATIONS

B.1.1 Plant Supervision

The four generators at the Henry M. Jackson Project (Project) Powerhouse can be operated on-site either manually or automatically. They may also be operated remotely from the Public Utility District No. 1 of Snohomish County's (District) operations center near Paine Field in south Everett or the main headquarters building in downtown Everett. The Powerhouse, operations center, and headquarters buildings are linked by a system of microwave communications. Information indicating the status of bearing temperature, cooling water flow, relay operation, and other critical functions are relayed to the Supervisory Control and Data Acquisition (SCADA) computers in Everett over the microwave links. In addition to controlling the generators, operators can raise or lower gates at Portal 2 on the east side of Lake Chaplain, close the intake gate at Spada Lake, and the SCADA system will be designed to control minimum flows to OR-2 via a new minimum flow diversion structure that the District is planning to construct adjacent to the Diversion Dam under a proposed amendment to the current license. Although the primary operating control resides at the main headquarters building in Everett and the operations building in South Everett, District staff is on-site to provide oversight 8 hours per day, 5 days per week and remain on-call during the off-hours.

B.1.2 Estimated Annual Plant Factor

Operations of the Jackson Project are governed by an Operating Plan which has been modified several times since the power generation facilities were constructed in the early 1980s. The Jackson Project is not operated to provide flood storage or specific flood regulation; however, flood control is incidental to the operation of the Project to minimize flooding from the Sultan River into the Skykomish River at Sultan, Washington. The rule curves were modified in November of 1989 to allow a larger State 3 area (see Section B.2.4.2); therefore, generation averages calculated from 1990 onward reflect current operations. Based on gross energy generation records (see section B.2.2) and net plant capability under most favorable operating conditions as reported on the Federal Energy Regulatory Commission (FERC) Form 1, the average annual plant factor for water years 1990 through 2007 for the Jackson Project was 42 percent. Based on computer modeling of Project operations where the City of Everett water demands will increase over time, the average annual plant factor over the 30 years from 2011 to 2041 for both current and proposed operations is also expected to be 42 percent. See the Supplemental Paper to the Proposed Operating Plan located in Appendix A for more description of Project operations.

B.1.3 Operation during Low, Mean, and High Water Years

The operation of Spada Lake is in accordance with the reservoir rule curves (see Section B.2.4.2) to minimize spill and contribution to flood conditions on the lower Sultan River. The reservoir elevations are influenced by the inflows and volumes of water withdrawn for generation throughout the year.

For the 1990 to 2008 water years[4] the minimum and maximum water elevation for each day of the water year for this period is shown in Figure B.1-1. Examples of reservoir elevations during low, mean, and high water years are shown in Figures B.1-2 through B.1-4 respectively.

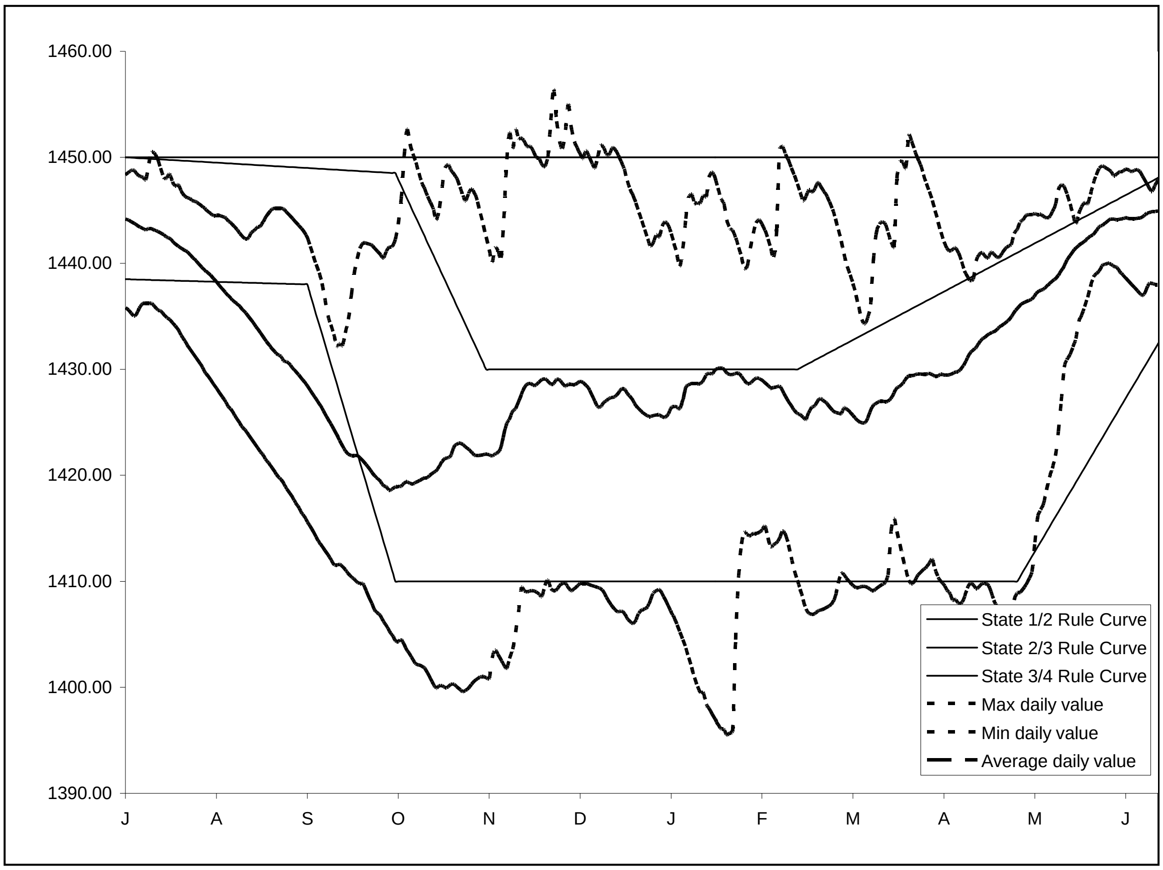


Figure B.1-1 Maximum and minimum daily elevations - July 1990 to June 2008.

[4] Jackson Project water years run from July 1 through June 30.

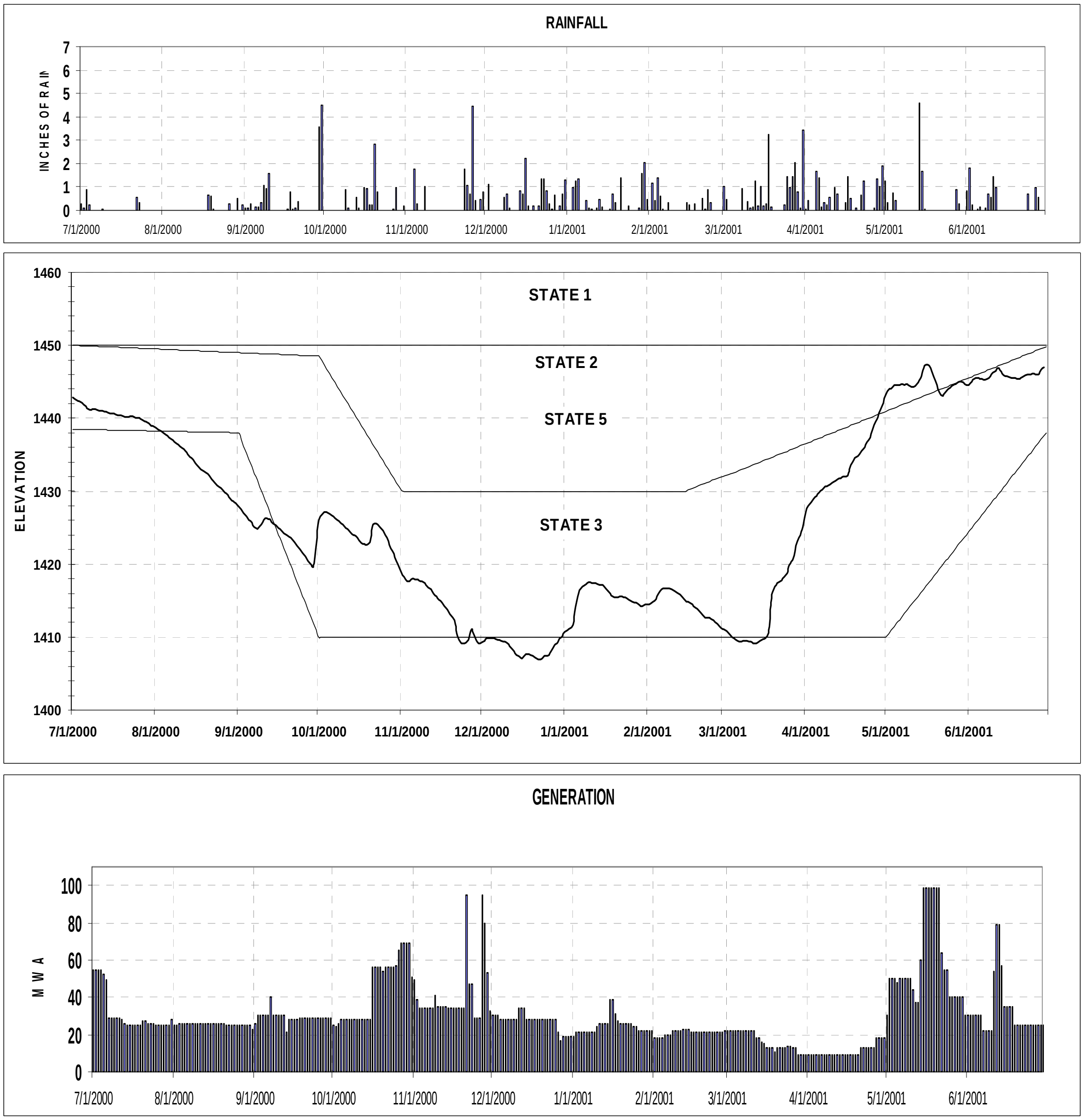


Figure B.1-2 Dry water year reservoir operation (2001). Rainfall = 126 inches, Generation = 264,984 MWh.

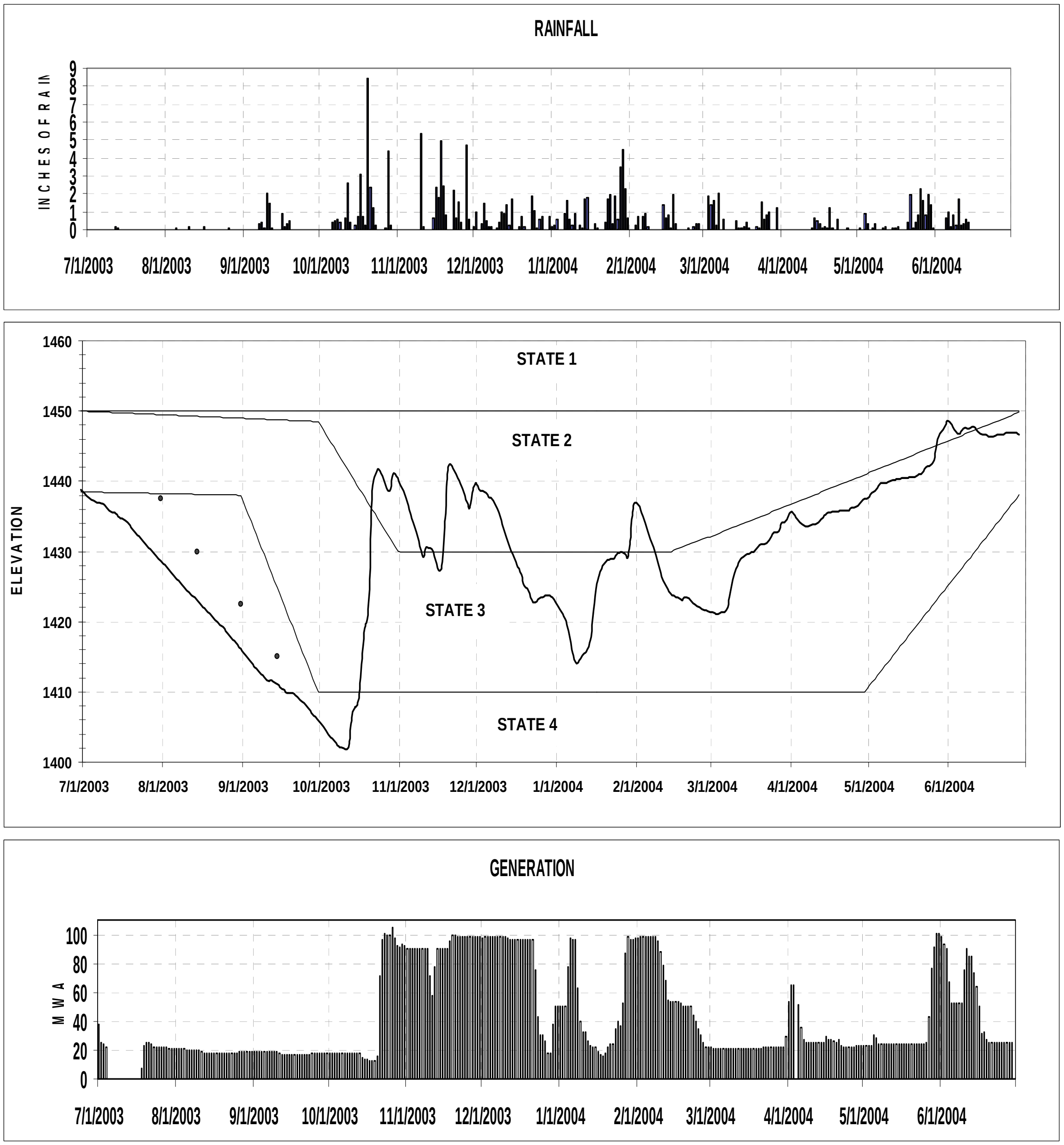


Figure B.1-3 **Mean water year reservoir operation (2004). Rainfall = 153.11 inches, Generation = 373,341 MWh.**

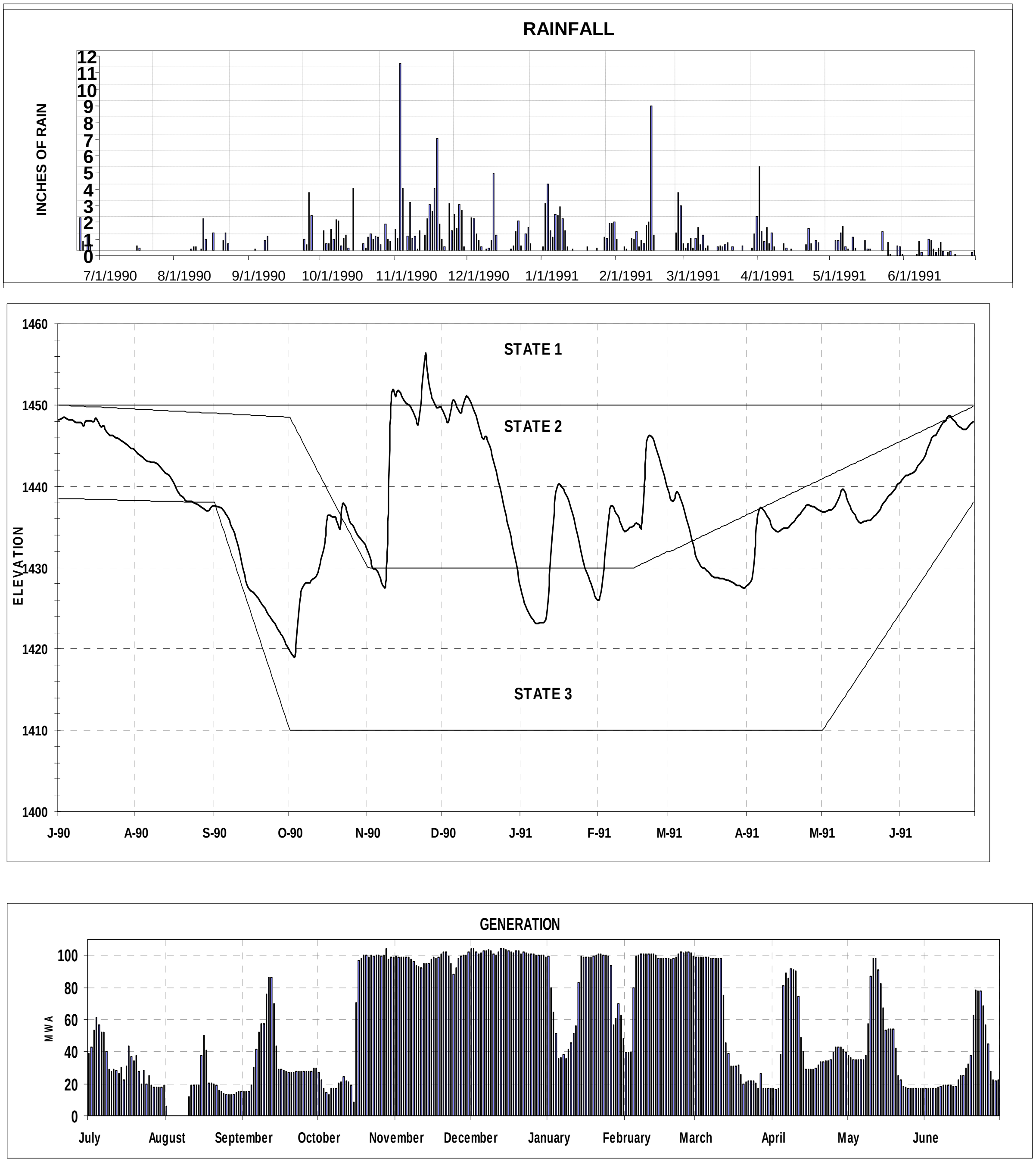


Figure B.1-4 Wet water year reservoir operation (1991). Rainfall = 204 inches, Generation = 496,304 MWh.

B.2 PROJECT CAPACITY AND GENERATION

B.2.1 Dependable Capacity

The dependable capacity is the average output that the Jackson Project can sustain to meet peak-hour load requirements during a critical streamflow period. The daily peak-hours are 6:00 a.m. to 10:00 a.m. and 5:00 p.m. to 9:00 p.m., except for Sunday, which is an off-peak day. The District coordinates operation of the Jackson Project with other generating plants operated by the parties to the Pacific Northwest Coordination Agreement (PNCA). The District has adopted the critical period used under the PNCA (October 1940 to September 1941) as the basis for the Jackson Project critical period used to determine dependable capacity.

Dependable capacity of the Jackson Project under current operating conditions (with City of Everett water demand at 84 mgd in 2008) is estimated to be 28.41 megawatts (MW).

By 2011, when the new license term will start, the current dependable capacity of the Jackson Project under current operating condition is estimated to be 27.76 MW because of the projected increase in the City of Everett water demand. See the Supplemental Paper to the Project Operating Plan in Appendix A of this Final License Application for a more detailed explanation of the impacts of City water demands on Jackson Project power production.

The proposed Project operation includes a modified reservoir management regime and a new downstream release regime consisting of modified minimum flows. Dependable capacity with the proposed operating plan is estimated to be 27.60 MW in the year 2011, a decrease of 0.16 MW. The dependable capacity declines as the City Water demand increases. In approximately 2035, when the City of Everett water demand is expected to be 144 mgd, the dependable capacity under the current and proposed operations are 24.97 MW and 23.16 MW respectively. This decrease in dependable capacity will be a result of longer times in the power-off zone below 1380 feet in Spada Lake (see the Proposed Operating Plan in Appendix A.

B.2.2 Average Annual Generation

As discussed in section B.1.2, the period of record best reflecting current conditions is from water year 1990 through 2008. A full range of flow conditions was encountered during this period, and long term generation during this period is reasonably representative of current conditions.[5]

Annual historical gross generation during the 18-year period from water years 1990 through 2008 averaged 421,800 megawatt-hours (MWh), and station service averaged 829.92 MWh.

[5] The generation data are recorded on a July 1 to June 30 water year basis.

As described in Exhibit C, the District has maintained and upgraded the Jackson Project since the amending of the FERC license to add the hydroelectric facilities in 1981. A computer model of Project operations was developed by Bechtel Corporation to simulate and estimate average annual energy production from the Jackson Project. District staff has continuously updated this model and have simulated operations under the current and proposed operating plans. Table B.2-1 summarizes the modeled estimates of energy generation under the current and proposed operations under a new license. These estimates are based on the simulated hydrology for the Sultan Basin for the period 1900 through 2007. (See the Supplemental Paper to the Proposed Jackson Project Operations Plan in Appendix A of this Final License Application for further description of the Jackson Project simulation modeling)

Table B.2-1a Jackson Project dependable capacity and average annual energy estimates (City of Everett average annual water demand = 84 mgd)

Item	Current Operation	Proposed Operation
Dependable Capacity (MW)	27.76	27.60
Average annual energy (MWh)	421,834	427,155

Table B.2-1b Jackson Project dependable capacity and average annual energy estimates (City of Everett average annual water demand = 144 mgd)

Item	Current Operation	Proposed Operation
Dependable Capacity (MW)	24.97	23.16
Average annual energy (MWh)	398,940	398,261

Table B.2-1c Jackson Project dependable capacity and average annual energy estimates (City of Everett average annual water demand = 192 mgd)

Item	Current Operation	Proposed Operation
Dependable Capacity (MW)	19.54	15.48
Average annual energy (MWh)	370,910	370,231

B.2.3 Flow Data and Flow Duration Curves

Inflow to the Jackson Project reservoir is not measured directly, but rather calculated using a mass balance approach. Flow data are available from U.S. Geological Survey (USGS) Gaging Station No. 12137800 located 900 feet downstream of the Diversion Dam (RM 9.7) and from USGS Gaging Station No. 12138160 located just below the Powerhouse (RM 4.5). Additionally, the District maintains records of reservoir elevations, generation at the Powerhouse, and outflows from Culmback Dam. Combining this information with knowledge of drainage areas and local hydrology allows staff to produce reasonable estimates of Project inflows.

Flow statistics for water years 1990 through 2008, reflecting the period of current Project operation, are summarized in Table B.2.2. The average inflow to Spada Lake is consistent with longer term inflow records. For example, the average flow for water years 1929 through 2008 is 768.5 cfs.

Table B.2.2 Flow statistics for water years 1990 through 2008.

Statistic	Flow (cfs)
Daily average flow	731.4
Minimum daily flow	21
Maximum daily flow	19,670

The annual flow duration curve for the Jackson Project inflows for the period of record of water years 1935 through 2008 is shown in Figure B.2-1. For clarity, the curve is truncated at 2500 cfs. As shown above, the actual maximum is 22,511 cfs, but 2500 cfs represents the 96.3 percent exceedence flow. Monthly flow duration curves for the same period (1935 – 2008 water years) are provided in Attachment B-1 of this exhibit.

The period of critical stream flow used to determine dependable capacity is October 1, 1940 to September 30, 1941. During this period the average daily inflow to Spada Lake was 515.3 cfs.

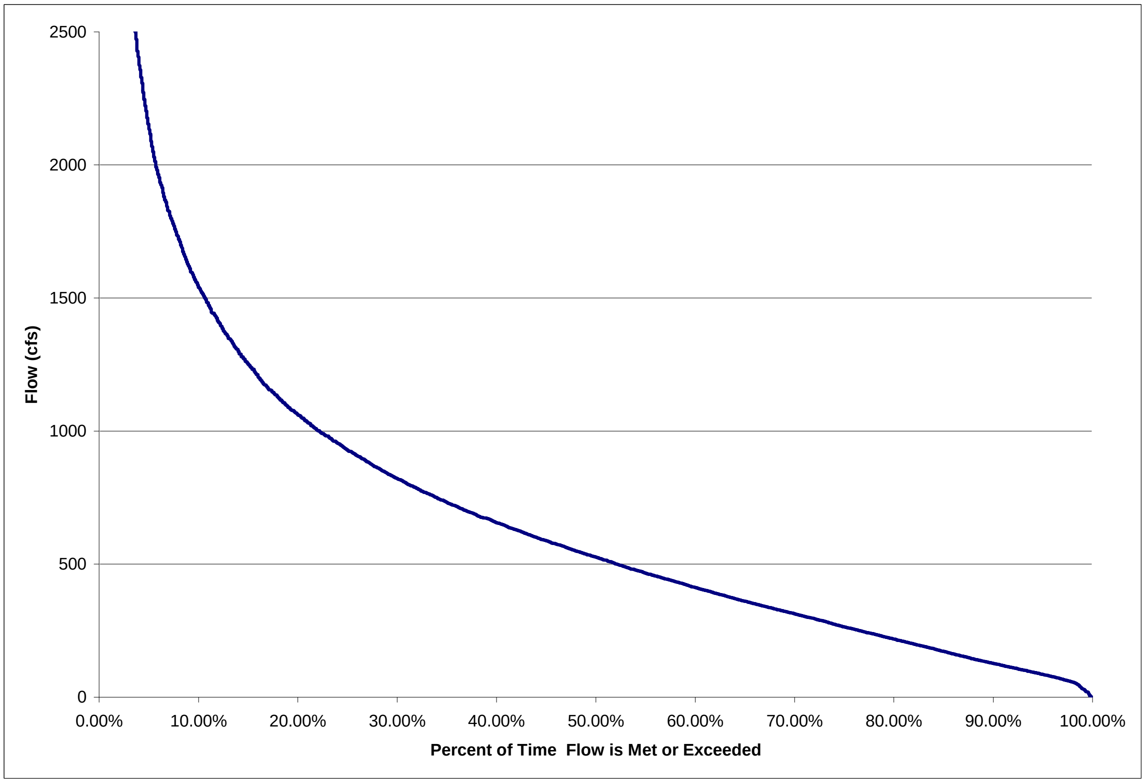
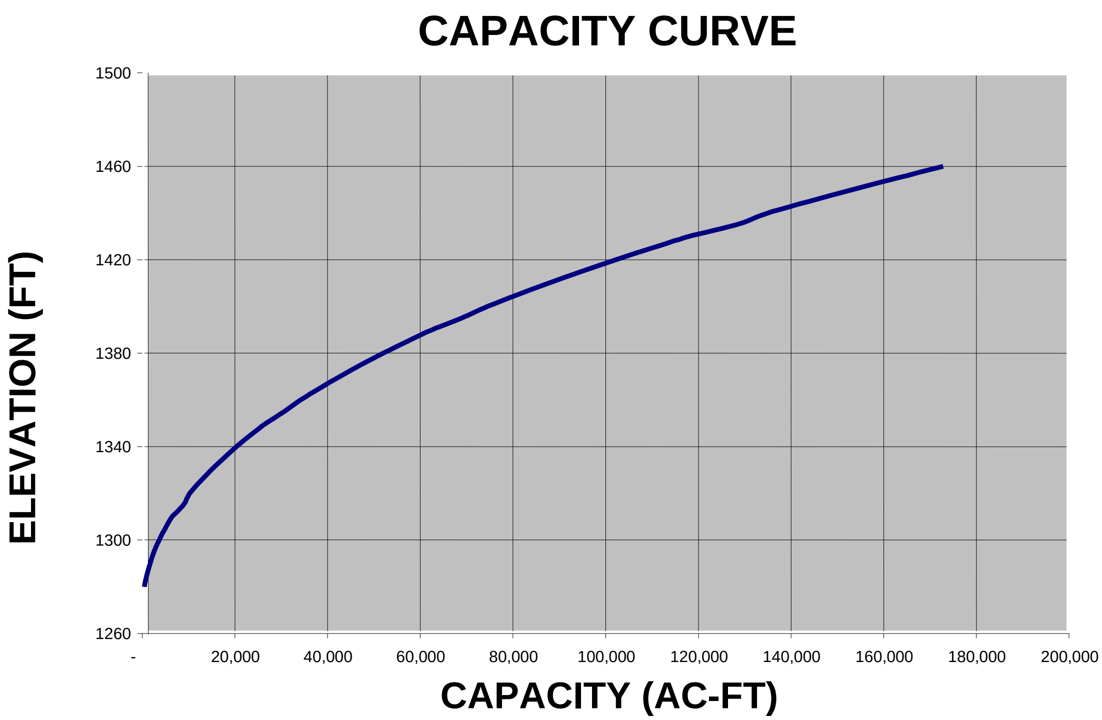


Figure B.2-1 Flow duration curve for unregulated daily average inflows to Spada Lake (water years 1935 to 2008) (Source: Snohomish PUD)

B.2.4 Reservoir Operation Curves

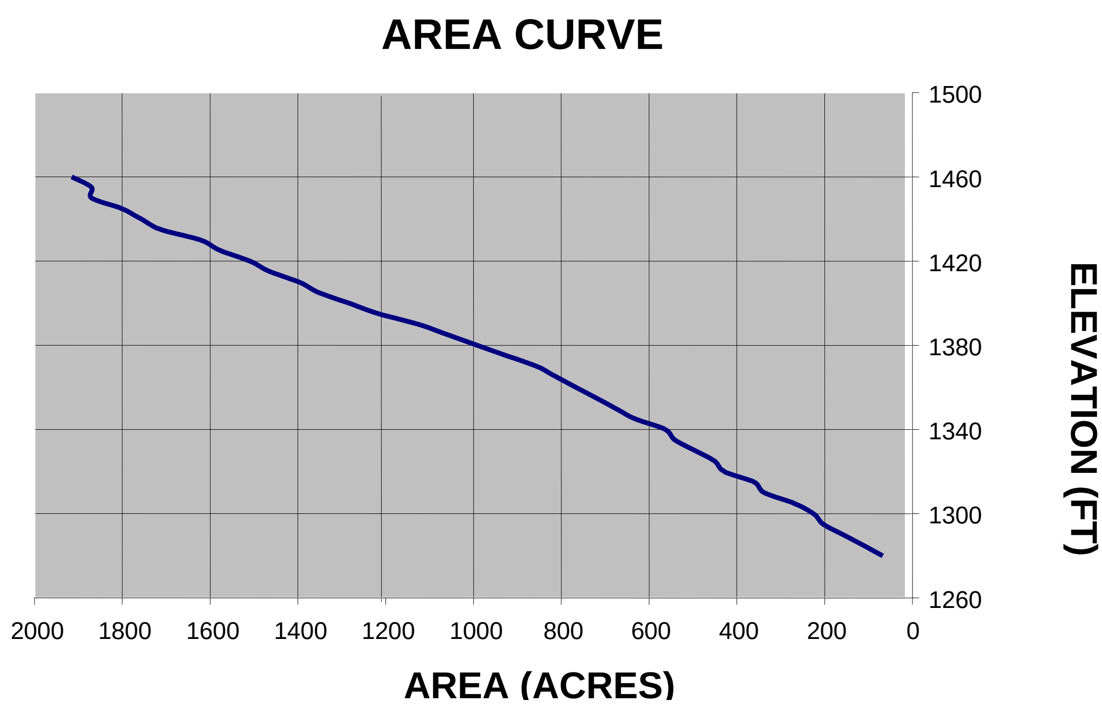
B.2.4.1 Area-Capacity Curves

Surface area and capacity of Spada Lake as a function of elevation are shown in Figures B.2-2 and B.2-3. Gross storage for Spada Lake Reservoir is 153,260 acre-feet. Useable storage for power generation is 101,218 acre-feet from the maximum height of the spillway at 1,450 feet mean sea level (msl) to 1,380 feet msl, the level power operations would cease to avoid inducing coriolis forces in the power tunnel.



(Source: Snohomish, 1980)

Figure B.2-2 Elevation vs. storage curve for Spada Lake.



(Source: Snohomish, 1980)

Figure B.2-3 Elevation vs. area curve for Spada Lake.

B.2.4.2 Reservoir Rule Curves

B.2.4.2.1 Current Rule Curves

The Spada Lake rule curves governing Project operation are shown in Figure B.2-4. These rule curves allow the District to provide a balance of reliable municipal water supply to the City of Everett, instream flows for fisheries resources, incidental winter flood storage, and higher lake levels for early summer recreation. Developed based on the physical storage capacity of Spada Lake and the hydrology of the Sultan Basin, the rule curves divide Spada Lake into States that shift throughout the July through June water year, which is used to minimize the change in storage from year to year.

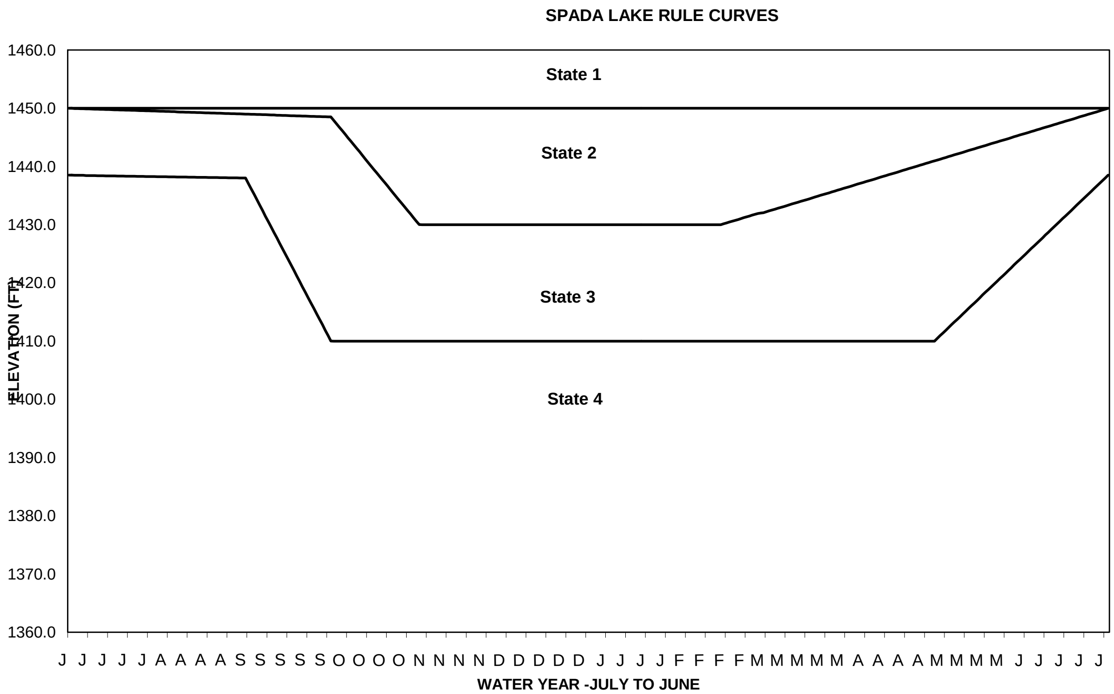


Figure B.2-4 Spada Lake Current Operational Rule Curves

<u>State 1 – Zone of Spill</u>. Above elevation 1,450 msl, Spada Lake is in a state of spill. Therefore, the District operates the Powerhouse to withdraw at least 1,300 cfs through the power tunnel.

<u>State 2 – Zone of Potential Spill</u>. The District operates the Powerhouse to withdraw at least 1,300 cfs through the power tunnel.

<u>State 3 – Zone of Discretionary Operation</u>. The District may operate the Powerhouse between the extremes of State 2 and State 4 depending on maintenance, power supply, and prudent operation to minimize the impacts to the fishery resources.

State 4 – Zone of Water Conservation. The District operates the Powerhouse to satisfy the requirements of its water supply obligations to the City of Everett and the instream flow requirements in the Sultan River.

B.2.4.2.2 Proposed Rule Curves

The only alterations of the Project rule curves proposed for the next license term is a minor modification to the State 3-4 line between July 1 and October 1, the clarification of operations in state 2 and 4 to allow inflow forecasting to enhance prudent decision making, and the designation of State 5 as described below. (Figure B.2-5)

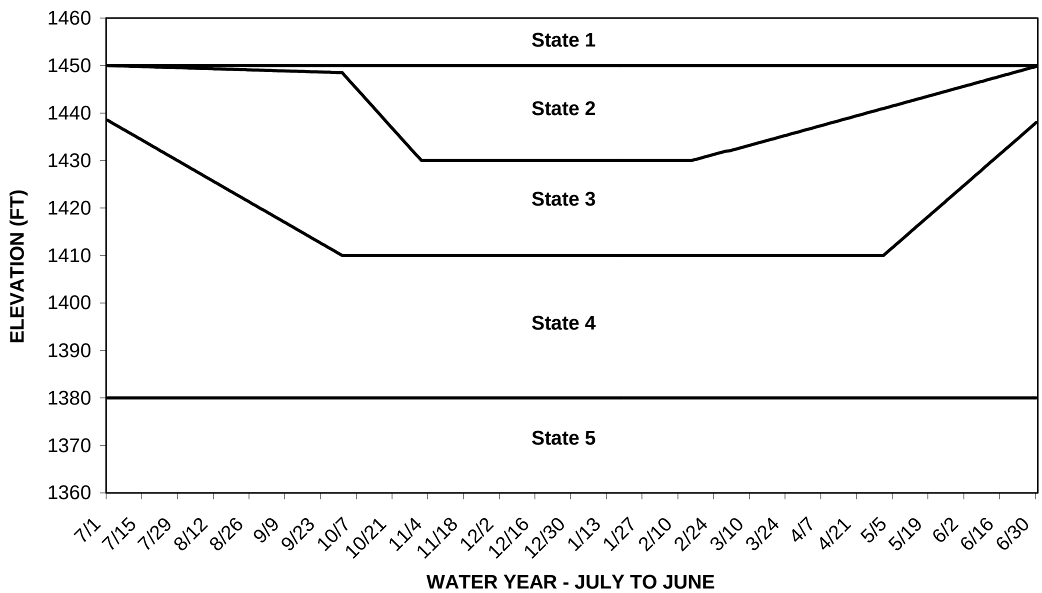


Figure B.2-5 Proposed Spada Lake Operational Rule Curves

State 1 – Zone of Spill. Above elevation 1,450 msl, Spada Lake will be in a state of spill. Therefore, the District will operate the Powerhouse to withdraw at least 1,300 cfs through the power tunnel.

State 2 – Zone of Potential Spill. The District will operate the Powerhouse to withdraw at least 1,300 cfs through the power tunnel unless inflow forecasts show that there is minimal risk of spill.

State 3 – Zone of Discretionary Operation. The District may operate the Powerhouse between the extremes of State 2 and State 4 depending on maintenance, power supply, and prudent operation to minimize the impacts to the fishery resources.

State 4 – Zone of Water Conservation. The District will operate the Powerhouse to satisfy the requirements of its water supply obligations to the City of Everett and the instream flow requirements in the Sultan River. Generally, the Project is operated to conserve water unless inflow forecasts and snowpack measurements indicate higher rates of water withdrawal through power production are warranted.

State 5 – Zone of Tunnel Protection. Below elevation 1,380 feet msl the District ceases to operate by water withdrawal through the Powerhouse at flows which would result in vortex creation in the power tunnel. Vortexes could cause power tunnel collapse from the negative hydraulic pressures of spiral flow. The District would release supplemental water from the outlet valves at the base of Culmback Dam to satisfy instream flow and water supply requirements. The Culmback Dam outlet valves are at elevation 1,220 feet msl.

B.2.5 Hydraulic Capacity

The minimum plant hydraulic capacity at the Jackson Powerhouse is 70 cfs. The maximum plant hydraulic capacity at the Jackson Powerhouse is 1,300 cfs.

B.2.6 Tailwater Rating Curve

Because the turbines that discharge into the Sultan River below the Powerhouse are Pelton units, a tailwater rating curve is not applicable.

B.2.7 Power Plant Capacity versus Head Curve

Figure B.2-6 illustrates the relationship between the output capacity of both the Jackson Project Pelton units and the net head. Each Pelton unit is rated at a capacity of 47.5 MW and limited by protective relays at 55 MW each. The maximum normal head occurs when the headwater is at the normal full pool level of 1,450 feet msl. This results in a gross head of 1,165 feet, which when adjusted for head loss results in a net head of 928 feet at 100 MW of generation (both Peltons combined). Under the median pool level of 1,430 feet msl, the corresponding gross head would be 1,145 feet and the net head would be 908 feet if producing 100 MW of generation. Similar computations at the minimum generating pool of 1,380 feet yield a gross head of 1,095 feet. The curve illustrates that as the generation of the Powerhouse increases the net head decreases because of friction losses in the power tunnel.

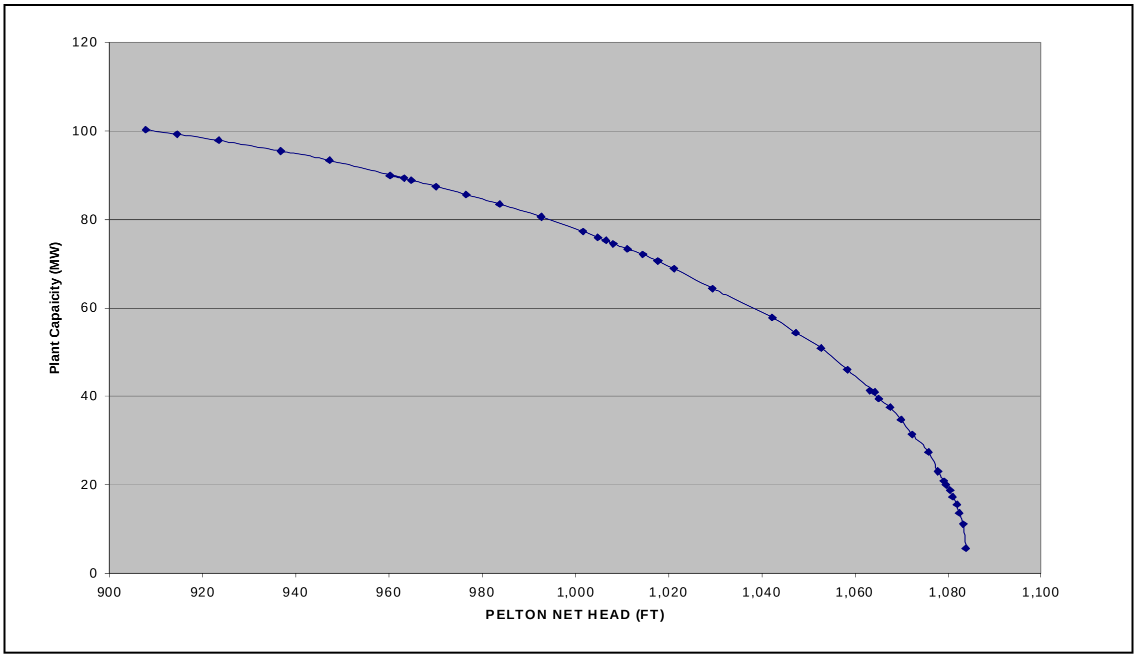


Figure B.2-6 Jackson Powerhouse Capacity vs. Head Curve (Spada Lake 1430 ft)

Figure B.2-7 illustrates the relationship between the output capacity of the Jackson Project Francis units and the net head. The capacity of the Francis units is rated at 8.4 MW with relay protection limits of 10.5 MW. The maximum normal head occurs when the headwater is at the normal full pool level of 1,450 feet msl. This results in a gross head of 780 feet, which when adjusted for head loss results in a net head of 685 feet at 8.4 MW of generation. Under the median pool level of 1430 feet msl, the corresponding gross head would be 760 feet and the net head would be 685 feet if producing 8.4 MW of generation. Similar computations at the minimum generating pool of 1,380 feet yield a gross head of 710 feet. Actual net head is determined by the actual lake level and the operating status of the other 3 units which in turn affect the power conduit flow and resulting head loss.

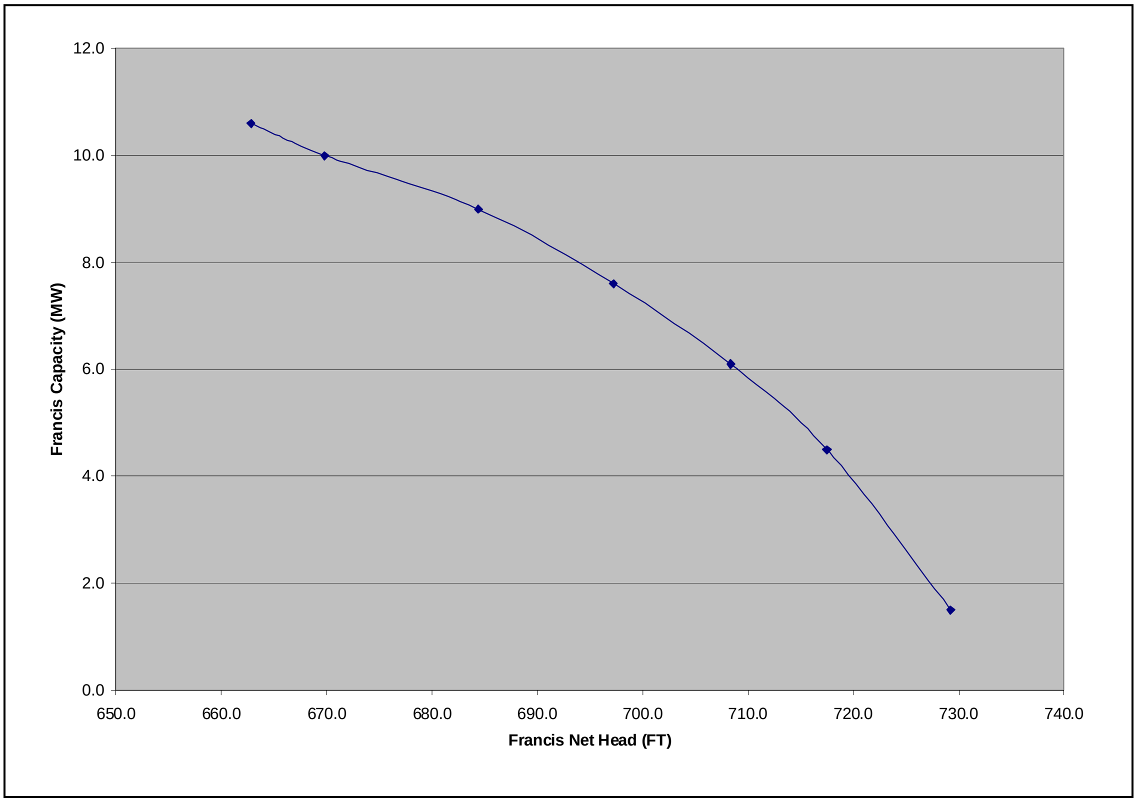


Figure B.2-7 Jackson Project Francis Unit Capacity vs. Head Curves

B.3 PROJECT OUTPUT UTILIZATION

The District uses the output of the Jackson Project to meet system load. A portion of the Project output is used to meet station service requirements as described in Section B.2.2. The system load for the District varies from 468 MWa to 1560 MWa depending on time of day and season of use. Figure B.3-1 illustrates the District's monthly load curve. On average the Jackson Project annually produces approximately 5 percent of the District's power supply needs.

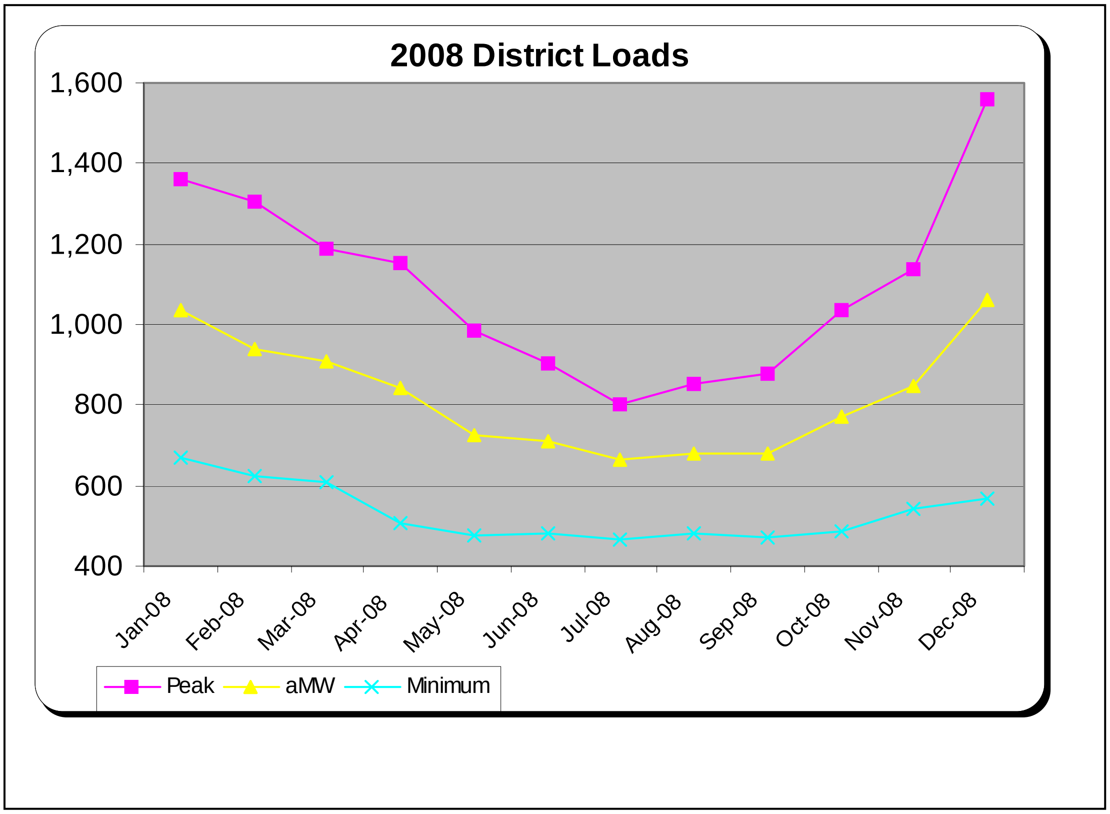


Figure B.3-1 Maximum, Minimum, and Average monthly system load (MW) for Snohomish County PUD.

B.4 FUTURE PROJECT DEVELOPMENT

At this time, the District is not proposing to develop any additional generation or capacity during the term of a new license. However, in the future, if the District decides to add additional generation or capacity, to the extent necessary, a request for a license amendment will be filed with FERC. The District will continue to look for increased electrical or mechanical efficiencies and hydraulic improvements.

Proposed alterations to the Powerhouse include installation of Pelton unit governor controls and use of flow deflectors to allow bypass and controlled downramping when these units trip off-line. These alterations will allow adherence to the proposed Project Operating Plan downramping rates at the Powerhouse.

No other future development is proposed at this time.

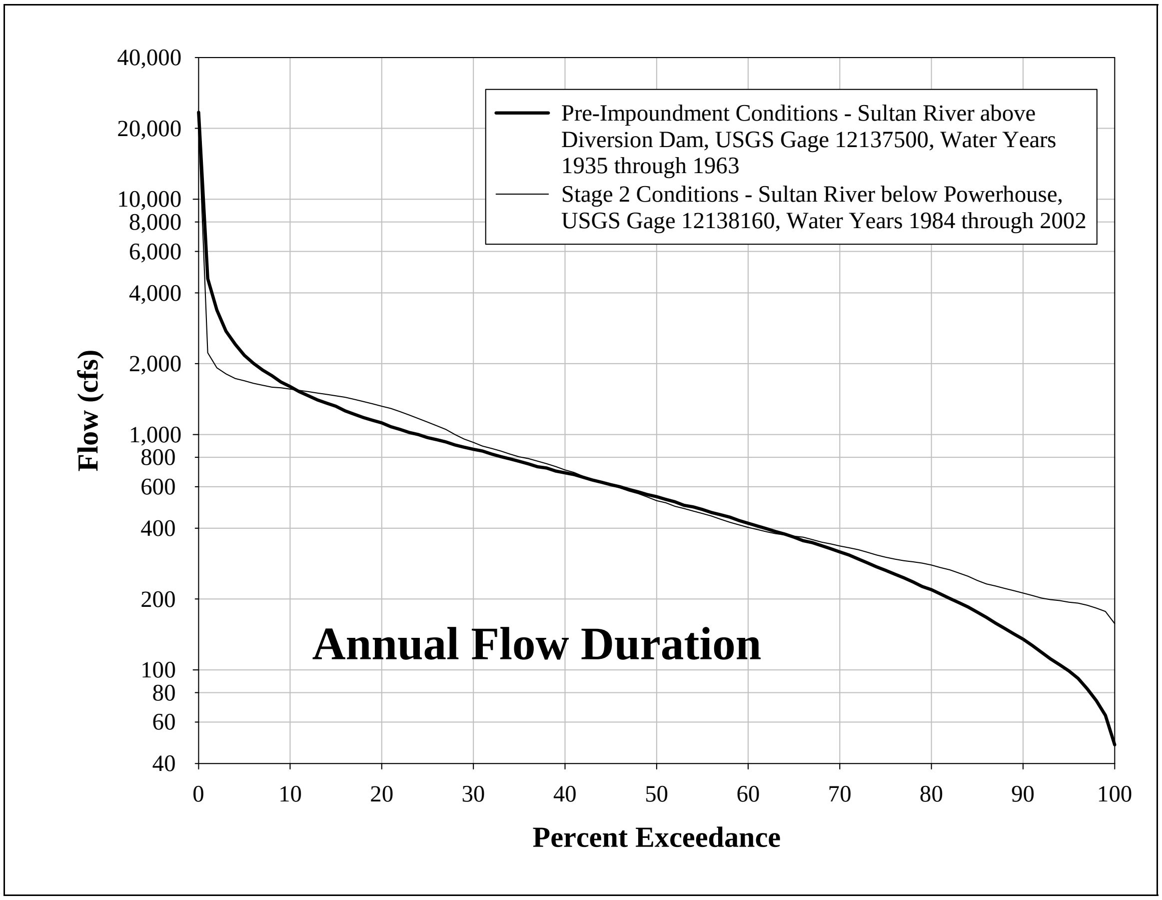
B.5 LITERATURE CITED

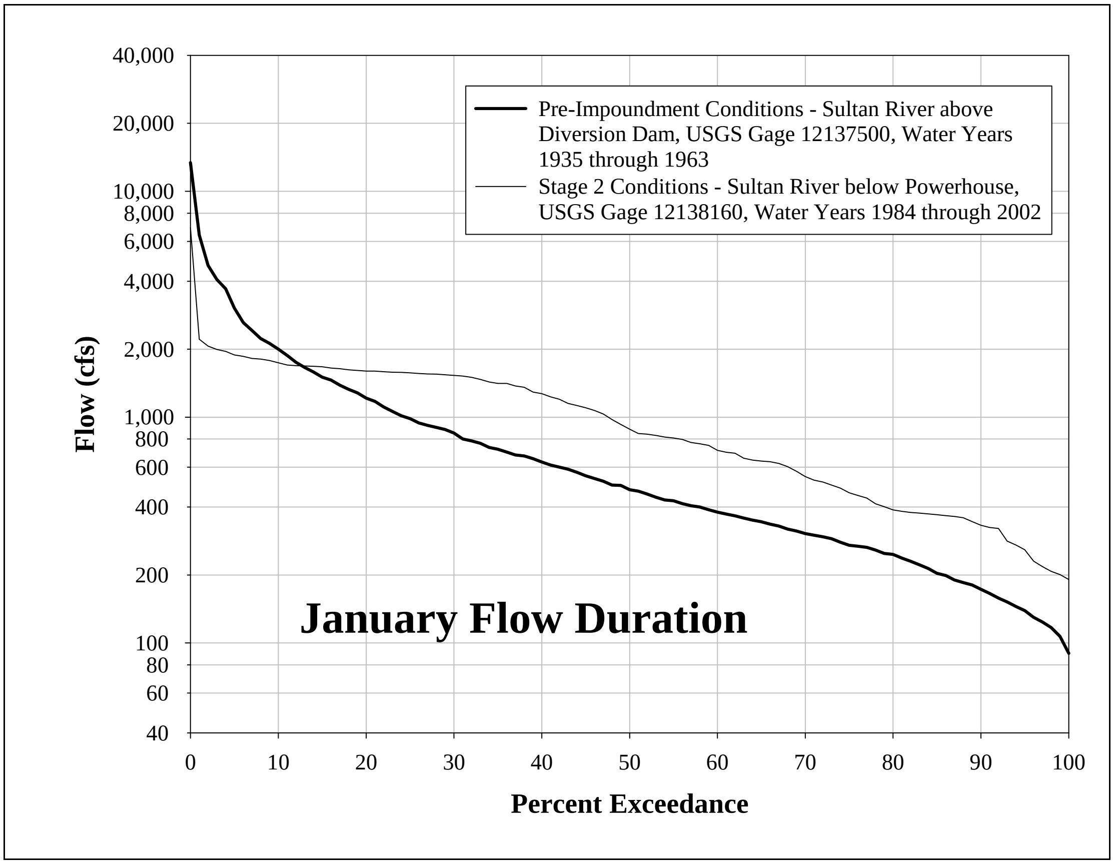
Snohomish County PUD (Public Utility District No. 1 of Snohomish County). 1980a. Sultan River Project Stage II – Engineering Feasibility Report. Prepared by Bechtel Incorporated. March 1980.

Snohomish County PUD (Public Utility District No. 1 of Snohomish County) and City of Everett. 2005. Pre-Application Document for Henry M. Jackson Hydroelectric Project Relicensing. Volume 1. Public Information. December 2005.

Snohomish County PUD (Public Utility District No. 1 of Snohomish County) and City of Everett. 2005. Pre-Application Document for Henry M. Jackson Hydroelectric Project Relicensing. Volume 2. Appendices. December 2005.

Attachment B-1
Sultan River Flow Duration Curves




January Flow Duration
Flow (cfs)
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
40,000
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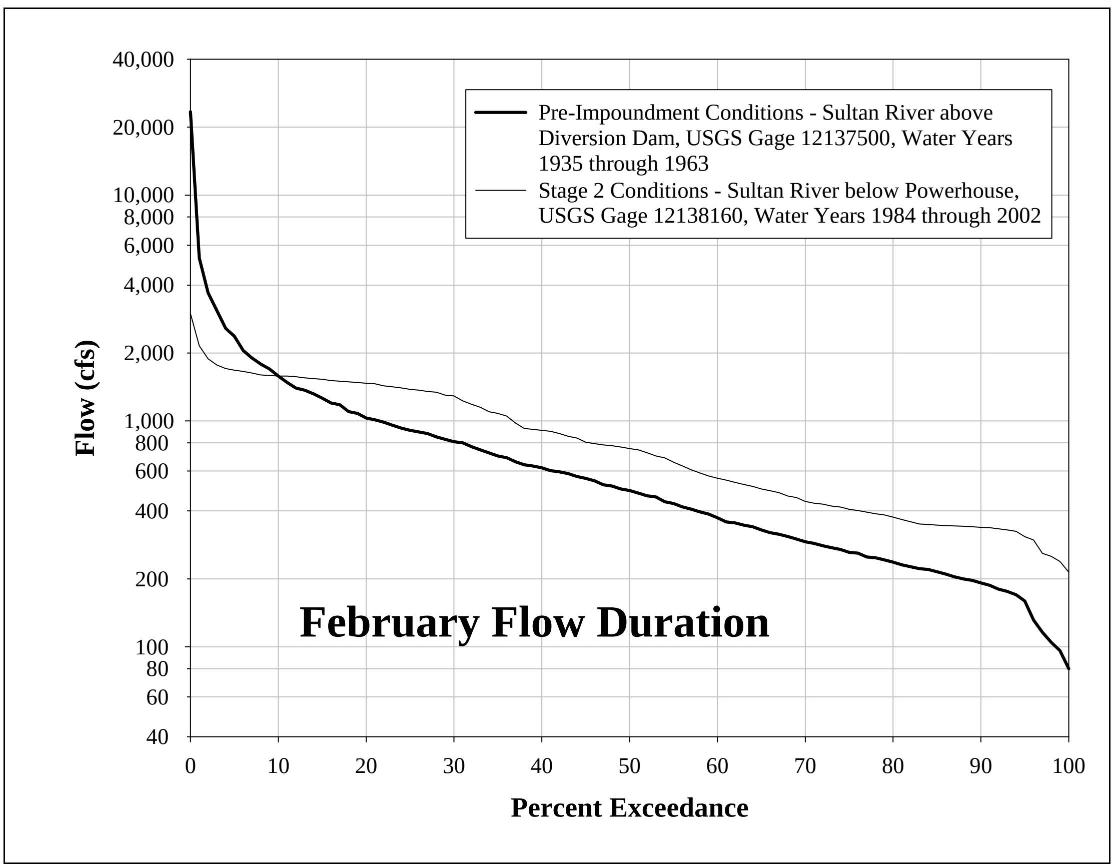
February Flow Duration
Flow (cfs)
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
40,000
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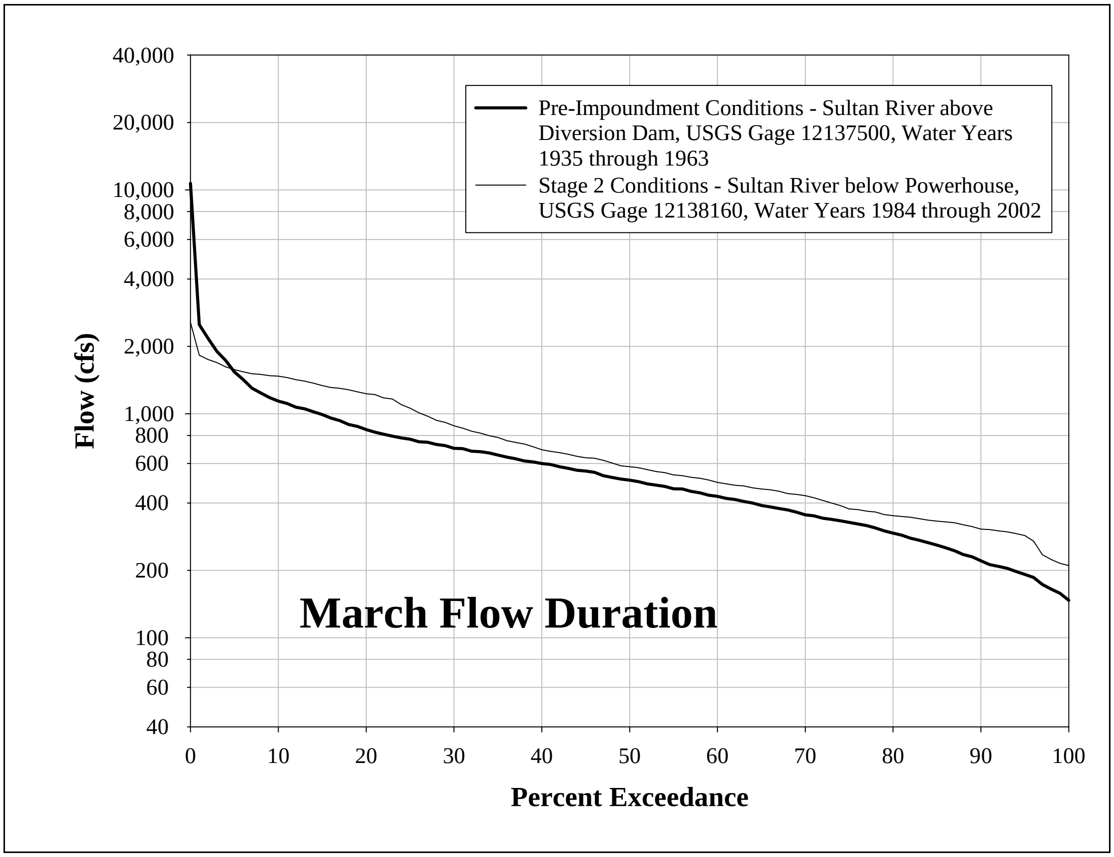

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Flow (cfs)
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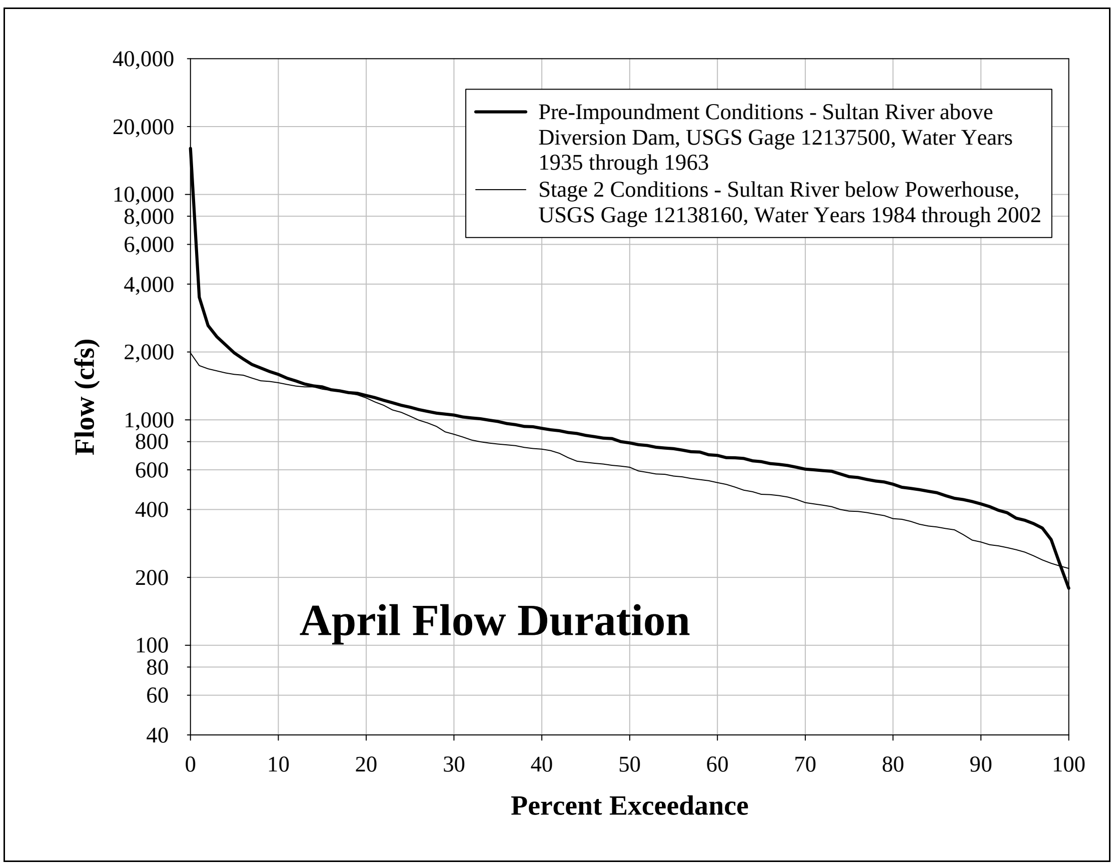
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
March Flow Duration



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40
Flow (cfs)
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30
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70
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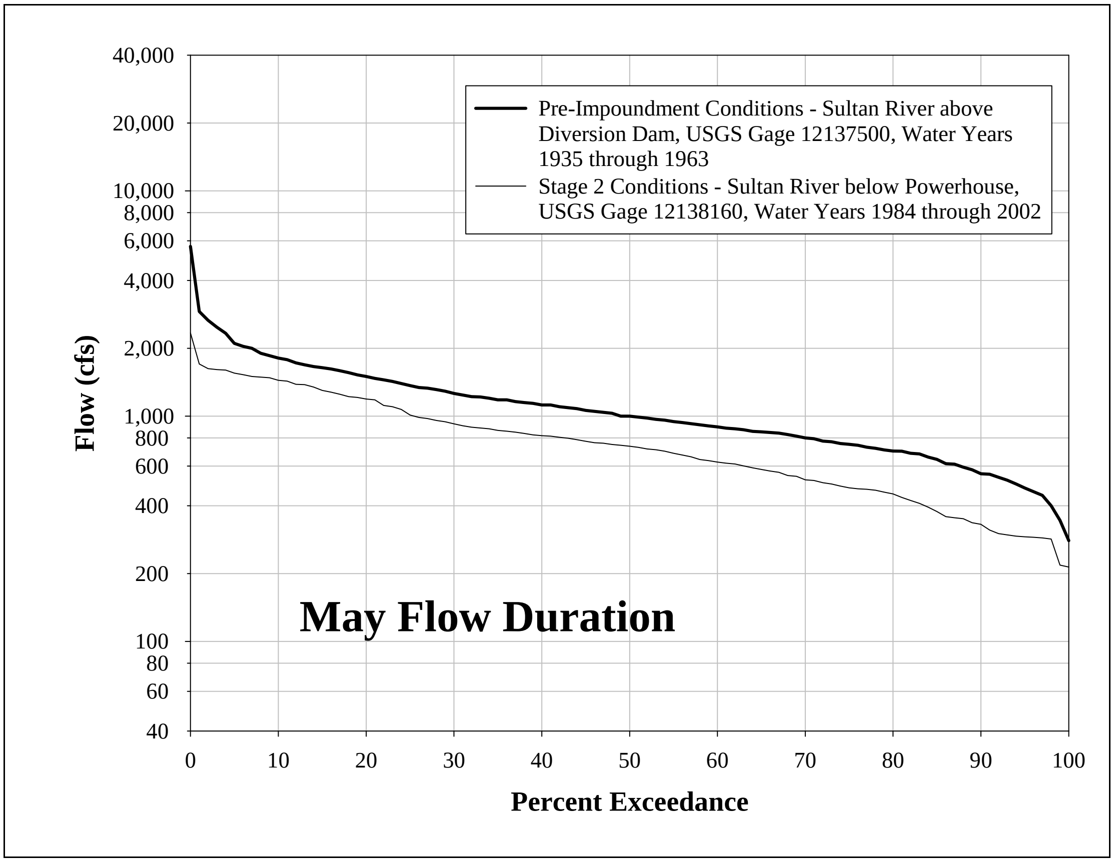
90
100
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
April Flow Duration



Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
May Flow Duration
Flow (cfs)
40,000
20,000
10,000
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2,000
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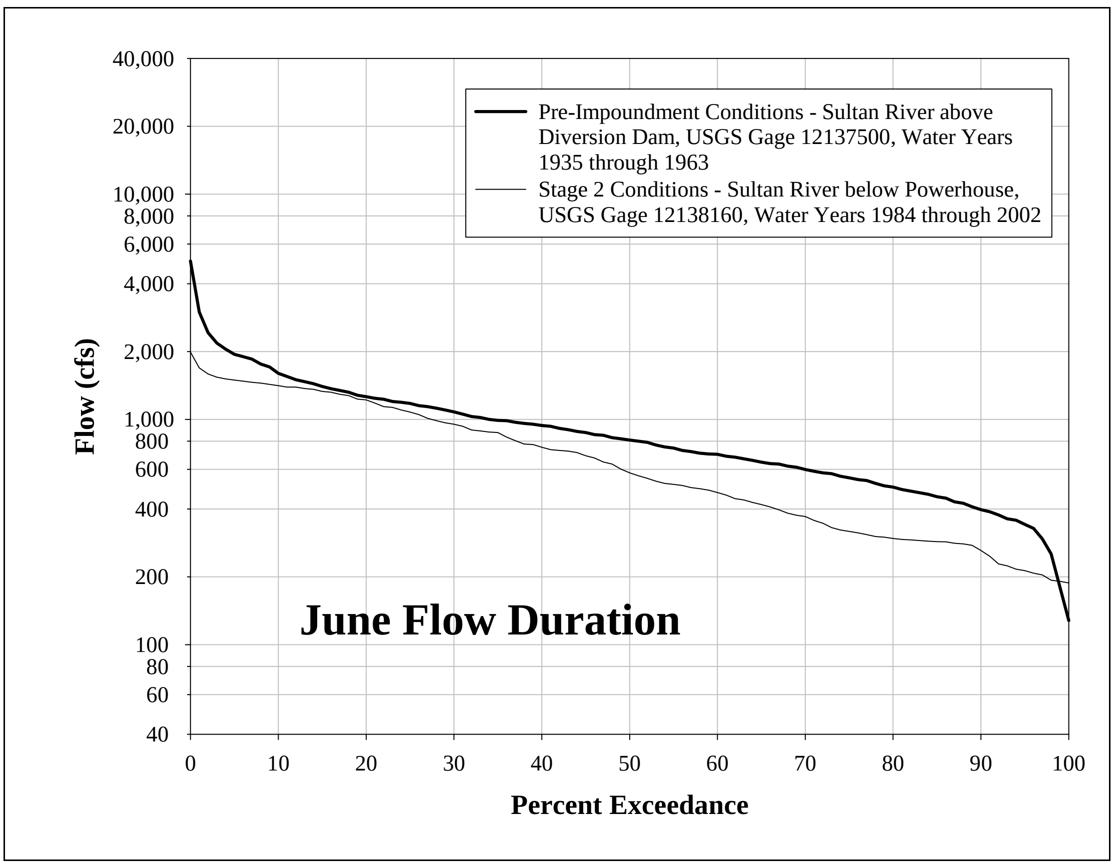
Percent Exceedance



Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
June Flow Duration
Flow (cfs)
40,000
20,000
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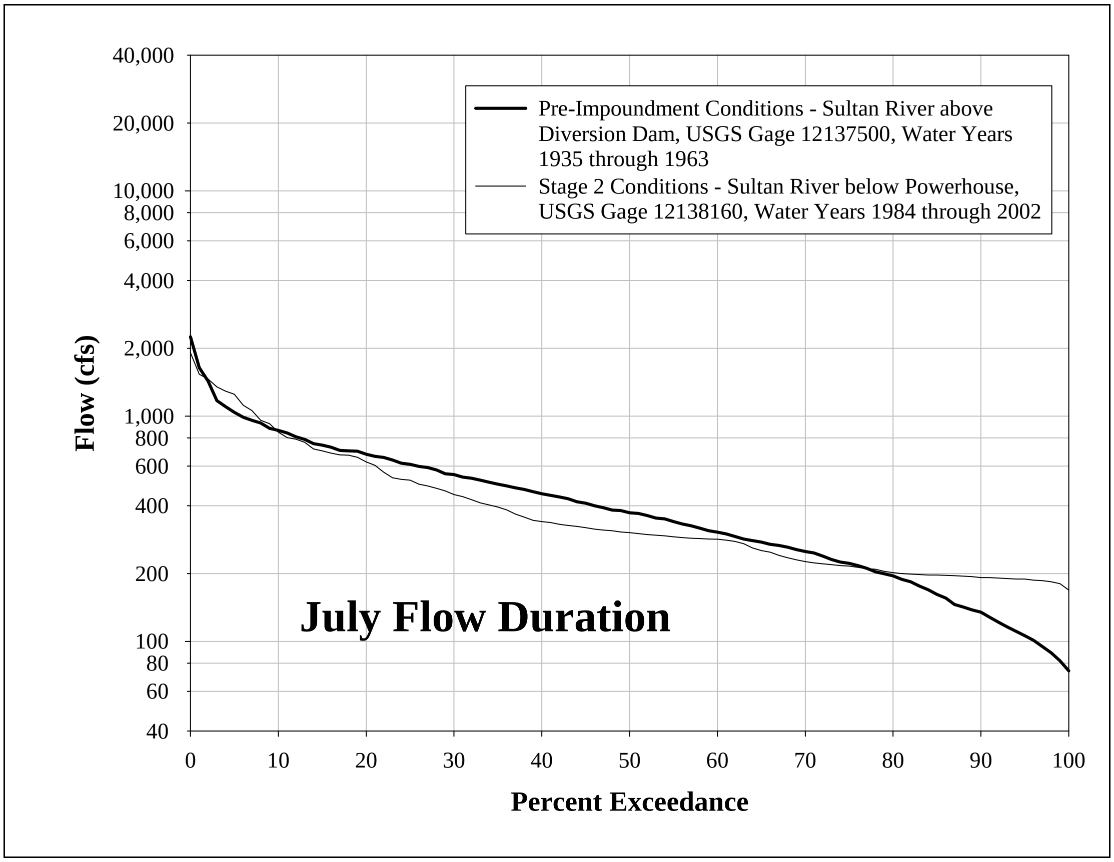
Percent Exceedance



Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
July Flow Duration
Flow (cfs)
40,000
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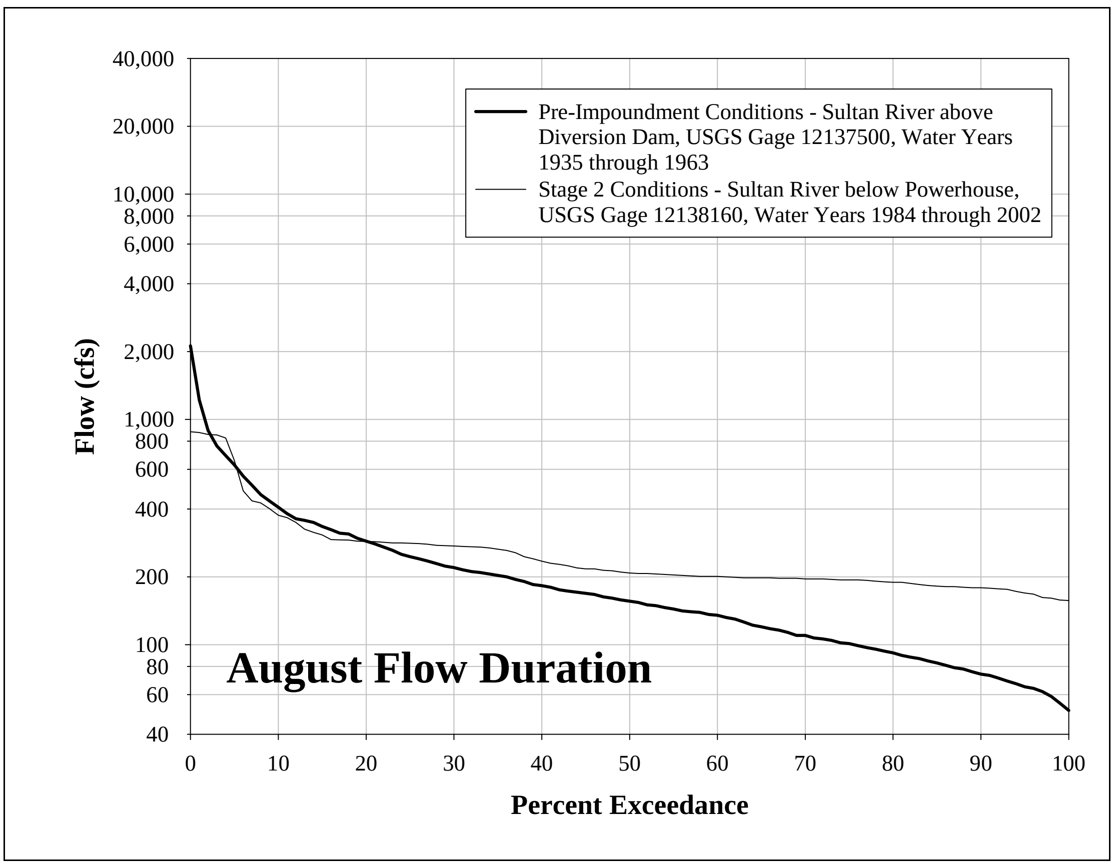
Percent Exceedance



Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
August Flow Duration
Flow (cfs)
40,000
20,000
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4,000
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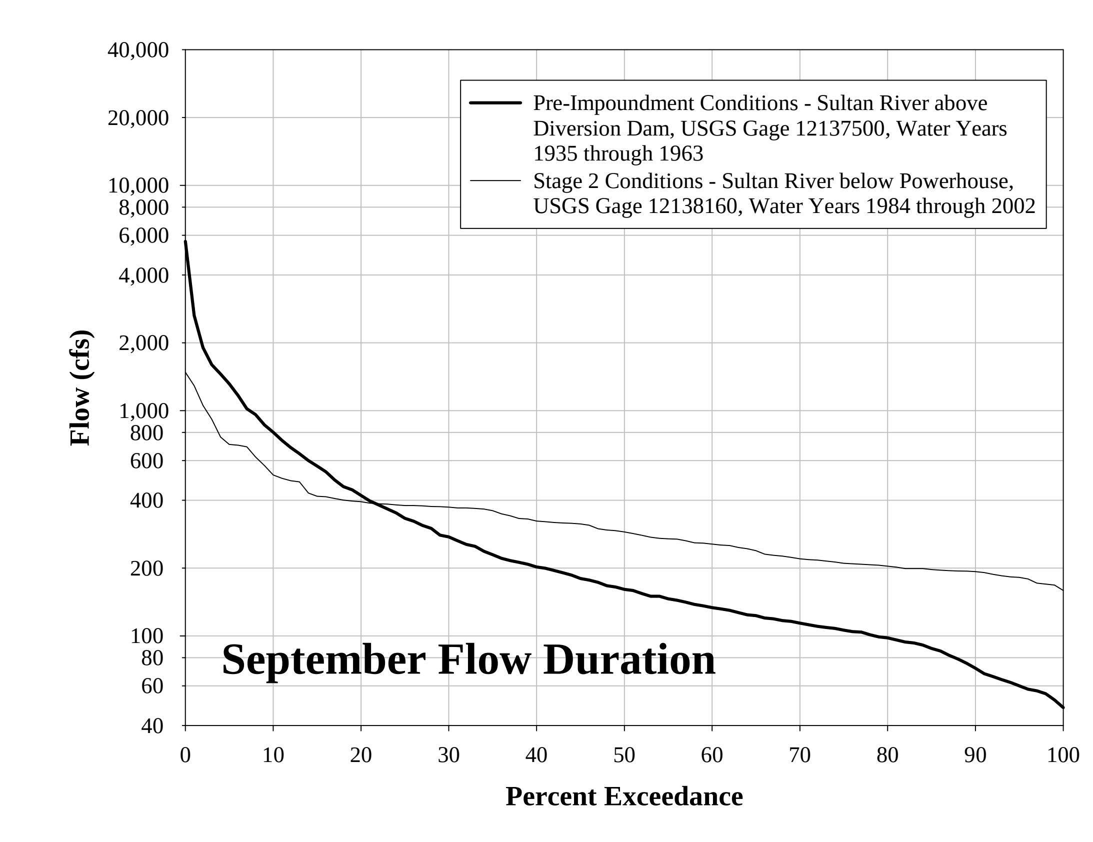
Percent Exceedance



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Flow (cfs)
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
September Flow Duration
0
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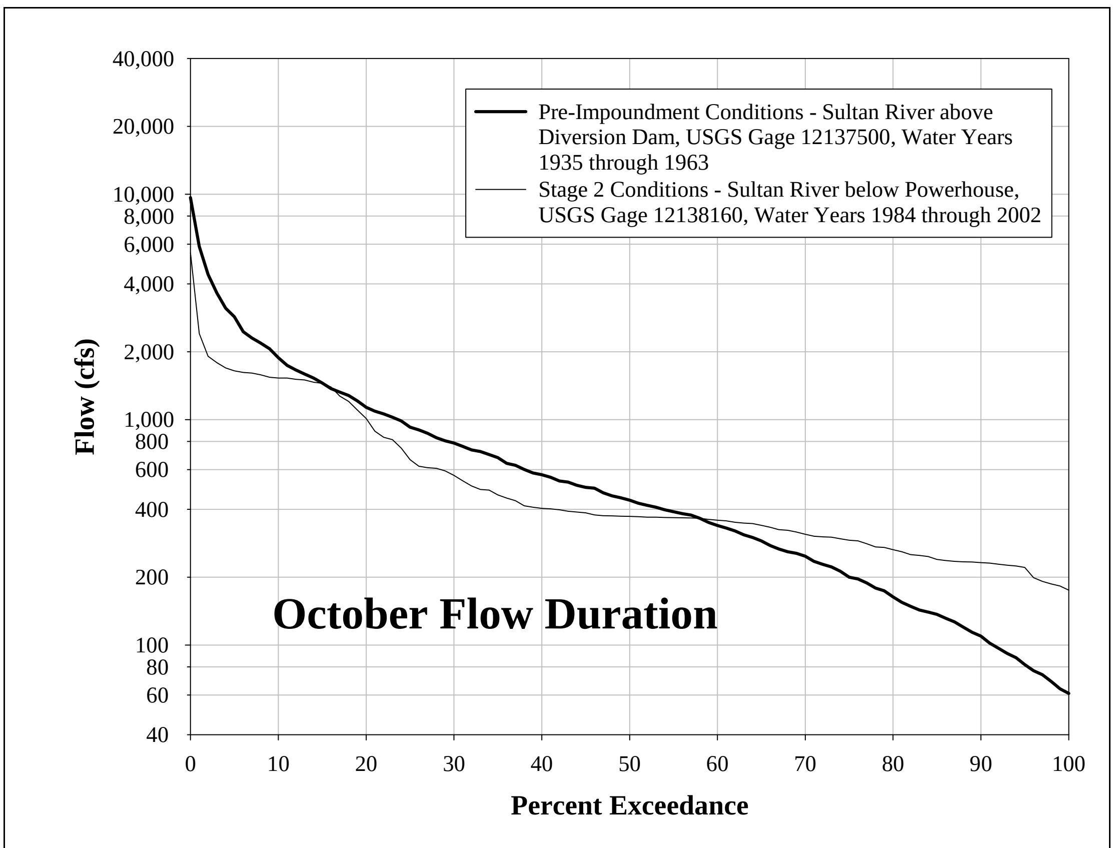
Percent Exceedance



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100
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Flow (cfs)
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
October Flow Duration
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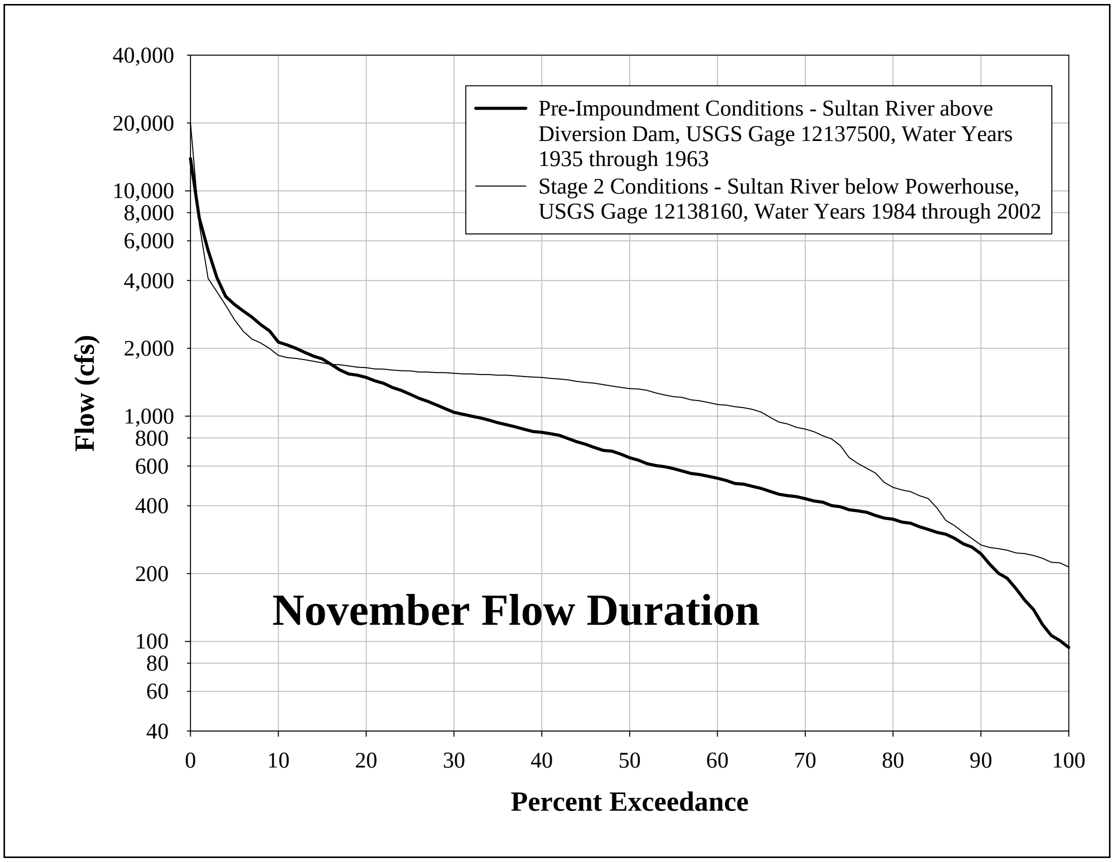
Percent Exceedance



November Flow Duration
Flow (cfs)
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
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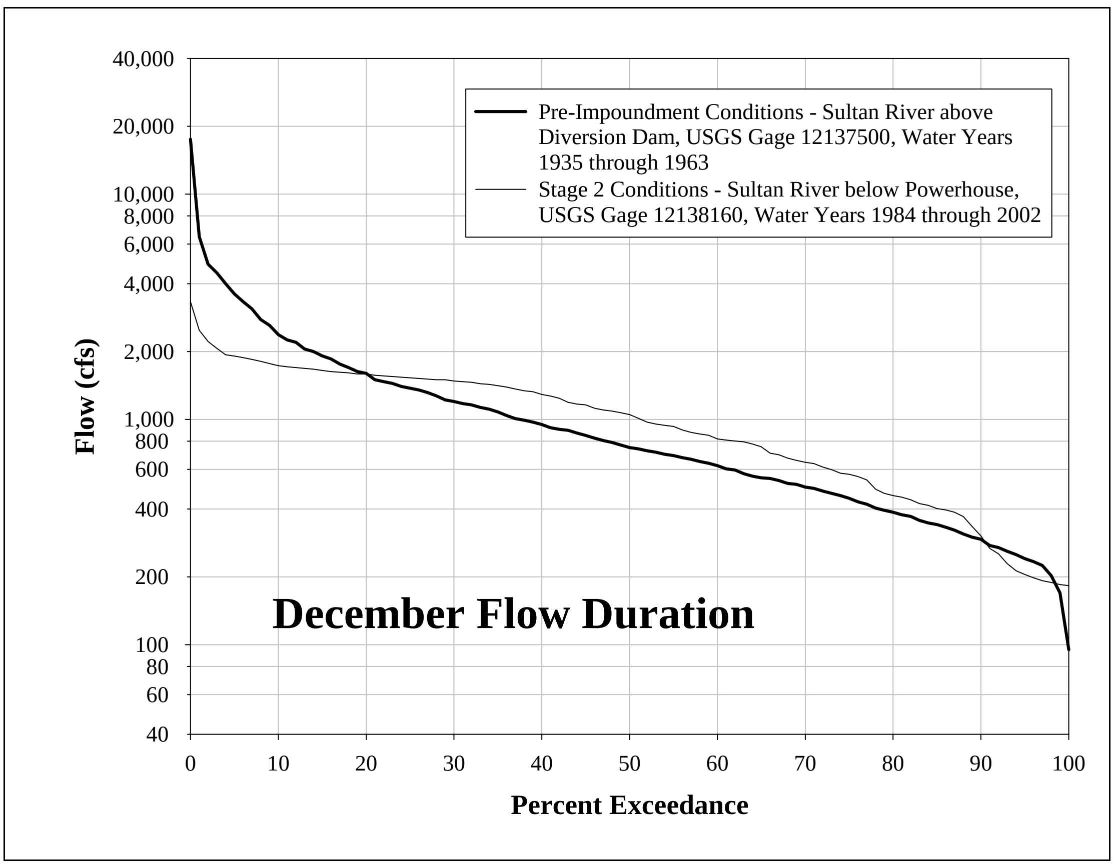

December Flow Duration
Flow (cfs)
Percent Exceedance
Pre-Impoundment Conditions - Sultan River above Diversion Dam, USGS Gage 12137500, Water Years 1935 through 1963
Stage 2 Conditions - Sultan River below Powerhouse, USGS Gage 12138160, Water Years 1984 through 2002
40,000
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Exhibit C – Construction History and Proposed Construction Schedule

C.1 PROJECT HISTORY

C.1.1 City of Everett Municipal Water Supply

The City of Everett (City) first began diverting water from the Sultan River for its municipal water supply in 1917 via a diversion dam located at approximate river mile (RM) 9.2. In 1930, the City removed its original diversion dam and constructed the current Diversion Dam at RM 9.7. The City then diverted its water supply from the Diversion Dam through a pipeline and tunnel west to Lake Chaplain for storage and distribution. Although the method of diverting water to Lake Chaplain for the City's municipal water supply changed with the Stage II construction of Culmback Dam, Lake Chaplain remains the City's water supply reservoir. The City of Everett continues to maintain the Diversion Dam as a back-up diversion structure for diverting water from the Sultan River for its water supply needs.

C.1.2 Hydropower on the Sultan River

Public Utility District No. 1 of Snohomish County (District) and the City filed a joint application with the Federal Power Commission (now the Federal Energy Regulatory Commission or FERC) in 1960 to develop a hydroelectric project that was then known as the Sultan River Project (now known as the Henry M. Jackson Project). From the beginning, the Sultan River Project was seen as serving two purposes; generating power for the District from the waters of the Sultan River and increasing the City's water supply system to meet growing demands. The Federal Power Commission issued a license authorizing construction of the Sultan River Project in two stages on June 6, 1961.

C.1.2.1 Stage I Development

The Stage I development of the Sultan River Project was completed in 1965 and involved the construction of Culmback Dam, located at RM 16.5, and the formation of Spada Lake which greatly increased the City's reliable water supply from the Sultan River basin. The Stage I Culmback Dam was a rock-filled, impervious core structure with a crest length and width of approximately 520 and 130 feet, respectively. The crest elevation of the Stage I dam was 1,408 feet mean sea level (msl), 200 feet above the original streambed. The concrete morning glory spillway, with an inside diameter of 38 feet, was constructed within the reservoir approximately 250 feet from the right bank. Spada Lake had a normal water level at elevation 1,360 feet msl, a surface area of 766 acres, and a useable storage capacity of 35,600 acre-feet with 8.5 miles of shoreline (FERC 1981). The function of the downstream Diversion Dam and tunnel to Lake Chaplain remained essentially unchanged as water stored behind Culmback Dam was released to the river to meet the City's municipal needs. No power generation equipment or facilities were included in the Stage I development.

C.1.2.2 Stage II Development

Originally Stage II, the addition of the hydropower generation facilities, was to commence in 1967. Economic studies undertaken at that time indicated that the cost of power from the Bonneville Power Administration (BPA) was still low enough to call into question the financial feasibility of moving ahead with Stage II. FERC granted a series of time extensions so the District and the City could investigate alternative plans.

In 1976, BPA, the source of almost all of the District's power at that time, announced it would not be able to meet the District's additional power needs after mid-1983. BPA offered to purchase the early years of power generated from new non-thermal resources which motivated the District to develop the generating potential of the Sultan River.

On July 6, 1979, the District and the City filed an application with FERC to amend the original license with a revised hydroelectric scenario better suited to the regional economic and load demand projections, and to reduce the environmental impacts of the original Stage II design. FERC granted this amendment on October 16, 1981, and construction of generating facilities and raising of Culmback Dam commenced in 1982.

Culmback Dam was raised to elevation 1,470 feet msl by placement of a compacted rock-filled dam with an impervious clay core on top of the existing dam, along with a 90 foot raise in elevation of the existing morning glory spillway shaft to elevation 1,450 feet msl. The new dam crest is 25 feet wide, 640 feet long, and 262 feet above the original streambed (Snohomish County PUD and City of Everett 1979). Spada Lake now has a gross area of 1,908 acres at elevation 1,450 feet msl (full pool) and a gross storage capacity of 153,260 acre-feet. The shoreline around Spada Lake has increased from 8.5 miles in Stage I to 21.98 miles at full pool in Stage II.

Construction of new facilities at Culmback Dam included the addition of a short 16-inch pipeline to the Stage I 48-inch diameter conduit outlet works. This pipe transitions to a 10-inch cone valve to allow effective release of minimum flows. A 16-inch bypass pipeline was constructed across the top of the Stage I dam to allow maintenance of instream flows below Culmback Dam when spillway tunnel inspections are conducted. Finally, a power tunnel intake structure was constructed near the left dam abutment with three 20-foot moveable panels for selective withdrawal to control downstream water temperature.

The Stage II intake structure moves flow through a 3.8 mile 14 foot diameter power tunnel, and then a 3.7 mile 10 foot diameter steel power pipeline to the Powerhouse located on the left river bank at RM 4.3. Two 47.5 megawatt (MW) Pelton turbines and two 8.4 MW Francis turbines are housed on the generator floor in the Powerhouse. Peak power output is approximately 104 MW, with average annual generation approximately 421,800 megawatt hours (MWh). The Pelton units discharge water directly back into the main Sultan River channel, while the Francis units re-route up to 390 cubic feet per second (cfs) through a pipeline under the river (the Lake Chaplain pipeline) to Lake Chaplain for municipal water supply and to the Diversion Dam to meet the minimum instream flow requirements between the Diversion Dam and the Powerhouse. Prior to the completion of Stage II, water flowed <u>west</u> from the Diversion Dam through the Diversion

Dam pipeline/tunnel to Lake Chaplain; post-Stage II, water normally flows east through the tunnel/pipeline between the Portal 2 structure at Lake Chaplain and the Diversion Dam (Snohomish County PUD and City of Everett 2005).

The Sultan River Project was renamed the Henry M. Jackson Project (Project) when operation began in 1984 in honor of the late Senator Henry M. Jackson, one of the most influential senators in this country's history and a native of Everett, Washington.

C.1.2.3 Transmission System

The power generated at the Project is delivered to the District's existing transmission system at a switchyard located adjacent to the Powerhouse. The Project's primary transmission system terminates at the three circuit breakers located within the switchyard; one circuit breaker associated with each Pelton unit and one serving both Francis units.

From the circuit breakers power is transmitted to the "Jackson Loop," comprised of two single-circuit 115-kilovolt (kV) transmission lines; the "north transmission line" and the "south transmission line." Together these segments of the Jackson Loop provide dual redundancy for protection of the generation facilities from line outages. The Jackson Loop also carries power from BPA depending upon area demand, and it may carry power from neighboring systems via the Gold Bar substation in the event of a Project shutdown or a failure in certain other parts of the District's transmission or supply system.

The north transmission line has never been considered a primary transmission line and is not included under the existing Project license because it connects to several District substations before connecting to BPA's Snohomish Substation. The south transmission line was originally a part of the Project and was included in the existing FERC Project boundary. However, because it is part of the District's transmission loop which serves customers off the BPA Snohomish Substation using several District substations, the south transmission line no longer meets the criteria of a primary line for the Project. Therefore, the current license was amended on May 3, 2006, to remove the south transmission line from the Project.

C.1.3 Project Chronology

Table C.1-1 Jackson Project chronology.

Activity	Date
License issued to construct Sultan River Project in two stages	1961
Stage I Construction – Culmback Dam and formation of Spada Lake	1964–1965
FERC grants series of delays for construction of Stage II	1967–1979
Licensee files with FERC application to amend Stage II facilities and siting	1979
FERC grants license amendment for redesigned Stage II	1981
Stage II - Raise Culmback Dam and add power generation facilities	1982–1984
Lake Chaplain flow control structure automated	1999–2000
Upgrade of SCADA microwave system to digital	2004
Upper runner seal ring on unit 4 replaced	2004
License amended to remove south line from transmission system	2006

C.2 PROPOSED PROJECT DEVELOPMENTS

C.2.1 Proposed New Development

C.2.1.1 Powerhouse Pelton Unit Flow Continuation System

The District will install a governor control system to allow bypass of the flow through the turbine needle valves into the Sultan River to mitigate for the rare emergency situation when the turbine or generator function must be terminated. This bypass system will consist of independent controls of each of the six needle valves and their flow deflectors. The benefits would be refined control of needle valve configuration changes to allow for optimized unit efficiency while eliminating most of the excessive flow variation experienced under the current control system. The District believes that implementing a new digital governor control system for the Pelton units would provide a feasible solution to the occasional need for bypass when the Pelton units are required to shut down operation.

While not all situations which might create the need for an emergency shutdown of the Pelton turbines can be mitigated (such as a power conduit failure), the probability and frequency of occurrence for bypass is now very limited. When the need arises to terminate generation rapidly for equipment protection, the proposal for Pelton flow continuation using the existing deflectors and enhanced governor control system will allow the District to avoid rapid dewatering of the Sultan River below the Powerhouse for most situations involving Pelton unit shutdown.

In addition, flow variation which can occur during needle valve changes is expected to be reduced or eliminated. Over the past 10 years there have been 3 incidents where the downramping rates were exceeded within a 15 minute period during needle valve changes.

Pelton unit shutdown is a protective operation that currently stops the flow of water into the Sultan River below the Powerhouse over a short period of time. Shutdown has the potential to substantially decrease downstream water quantity. Sultan River flows may decrease by as much as 650 cfs per unit. Events where both units would be shut down from full operation are extreme and rare in occurrence. The more likely event, based on history, is a partial power shutdown of one unit. Currently, any emergency shutdown has the potential for stranding fry that may be present in the lower Sultan River during some times of the year (usually March through August).

Independent governor controls for each needle and deflector would be installed and tested under possible shutdown conditions to fully identify the reduction of impacts to the Sultan River. Then a more accurate determination of the system's ability to successfully mitigate for shutdown impacts can be made.

The new governor control system will also allow the other Pelton unit, if operating or in "standby" mode, to be operated to mitigate for a single unit outage (8 of the 10 Pelton unit outages in the last decade were single unit outages).

From the Project's operating history, the District believes that the corrections made to address the causes of past shutdowns combined with the enhanced controls from this proposal will ensure that future shutdown events will remain rare and have minimal impacts to the aquatic resources of the Sultan River.

C.2.1.2 Sultan River Discharge Structure

The District does not intend to utilize the City of Everett's Diversion Dam for instream flow measurements or discharge into the Sultan River during the term of a new license. An amendment to the current license is under preparation to remove the Diversion Dam as a Project feature, and thereby remove the structure from the Project boundary. This new structure will be constructed using the latest technology and controls, providing the District with enhanced regulation over minimum flows below the Diversion Dam. The District would construct a concrete discharge structure in line with the 72-inch return line from Portal 2 of the City of Everett Lake Chaplain Tunnel to the Diversion Dam on the Sultan River. This structure would be located on District land adjacent to the City's Diversion Dam, discharging into the Diversion Dam tailrace, and approximately 800 feet upstream of USGS Gaging Station No. 12137800. It would be constructed to allow either discharge of water into the Sultan River to meet instream flow requirements or diversion of water from the Sultan River by the City of Everett's Diversion Dam to flow back to Lake Chaplain when normal flow pattern to Lake Chaplain from the Powerhouse is disrupted for long periods of time. See Figures C.2.-1 and C.2-2 for a conceptual drawing of the location and configuration of this proposed structure.

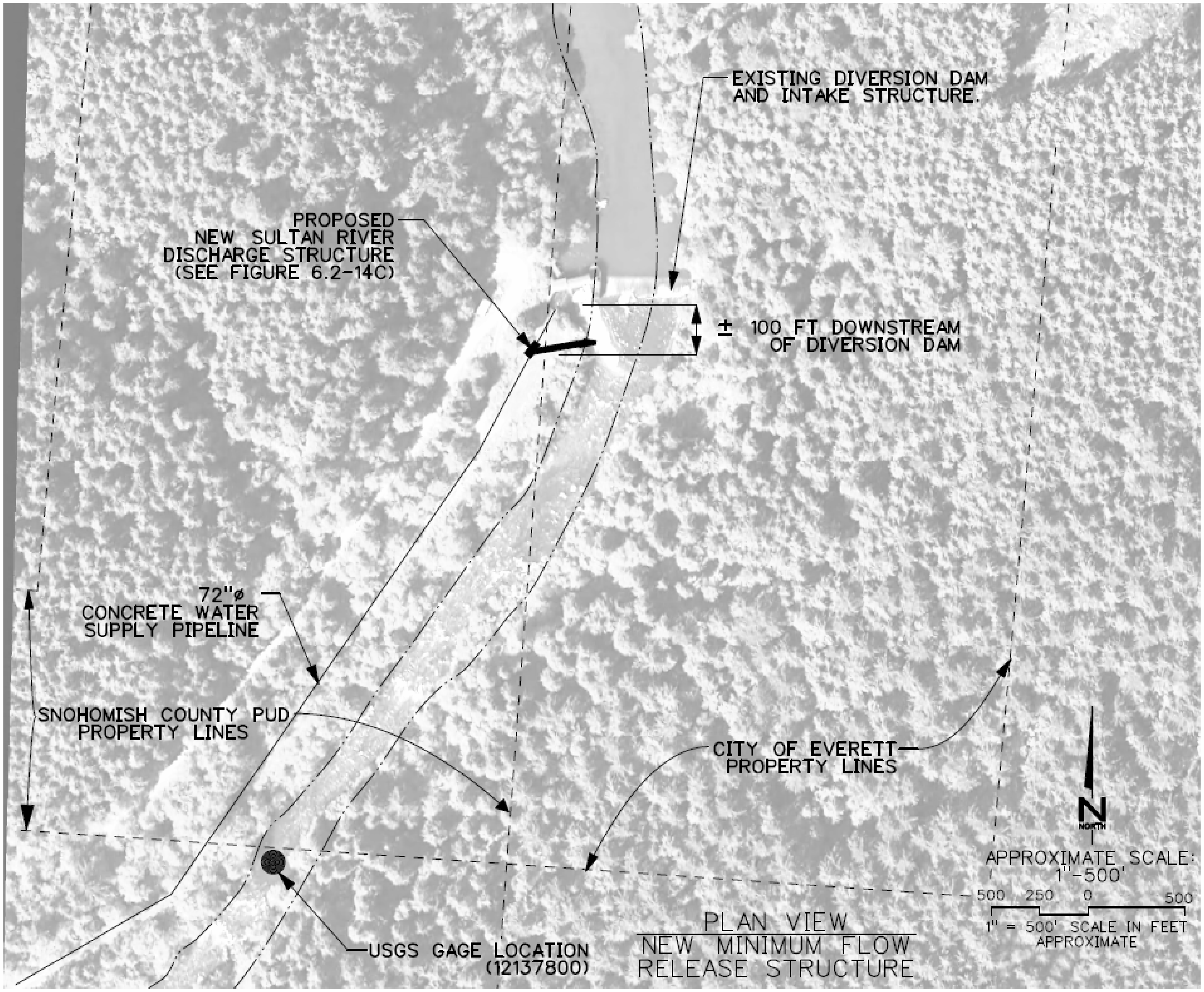

Figure C.2-1 Location of Proposed Sultan River Discharge Structure

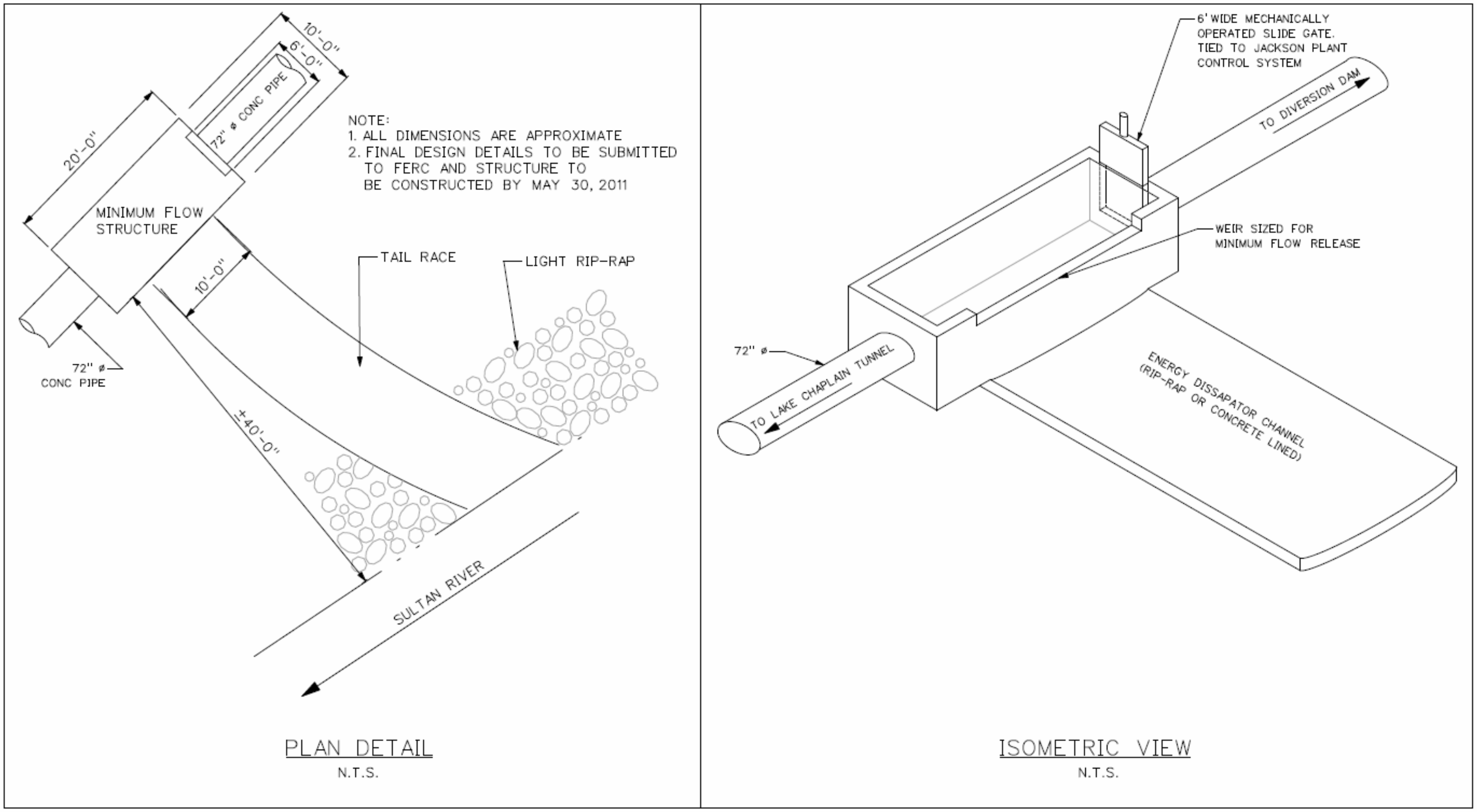

Figure C.2-2 Sultan River Discharge Structure Concept Drawing

C.2.2 Proposed Construction Schedule

C.2.2.1 Powerhouse Pelton Unit Flow Continuation System Schedule

The District proposes to implement the above described Pelton Unit Flow Continuation System by October 2009 in an effort to address Pelton unit bypass as early as possible. Early implementation before the issuance of a new FERC license in 2011 would allow for testing of the existing equipment with the new governor controls to obtain information necessary for the Endangered Species Act Biological Opinion.

C.2.2.2 Sultan River Discharge Structure Schedule

The District proposes the following schedule to complete the permitting and development of the Sultan River Discharge Structure in time to be placed in service at the expiration of the current license.

September 2009	Select consultant for design
October 2009	File amendment to current FERC License
December 2009	File Plan and Schedule for construction with FERC
July 2010	Award construction contract
August 2010	Start construction
May 2011	Complete construction

In the event that the license amendment is not granted prior to license issuance, the District intends to provide an alternative plan that allows for the discharge of flows into the Sultan River without the use of the City's Diversion Dam to meet minimum flows as measured at the USGS Gaging Station No. 12137800.

C.3 LITERATURE CITED

FERC. 1981. Sultan River Project No. 2157-Washington, Final Environmental Impact Statement. Federal Energy Regulatory Commission, Office of Electric Power Regulation. March 1981.

Snohomish County PUD and City of Everett. 1979. Sultan River Project Stage II Application for Amended License, FERC Project No. 2157. Volume II, Exhibit W Environmental Report. Public Utility District of Snohomish County and City of Everett. September 1979.

Snohomish County PUD and City of Everett. 2005. Pre-Application Document, Henry M. Jackson Hydroelectric Project, FERC No. 2157. December 2005

Exhibit D - Statement of Costs and Financing

D.1 ORIGINAL COST OF THE JACKSON HYDROELECTRIC PROJECT

This application is for renewal of the license for the Henry M. Jackson Hydroelectric Project, FERC 2157, originally issued June 6, 1961. Therefore, tabulated statements of the actual or approximate original cost of the facility are not required. However, Section D.6.0, Sources of Financing and Revenues, describes the cost of the Stage II Project construction which cover the costs of developing the generation facilities.

D.2 JACKSON HYDROELECTRIC PROJECT TAKEOVER COSTS

The District is a municipal organization established under the laws of the State of Washington. Therefore, it is not subject to Section 14 of the Federal Power Act, 16 USC 807 concerning takeover of the Project upon expiration of the license.

D.3 ESTIMATED COSTS OF PROPOSED JACKSON HYDROELECTRIC PROJECT NEW DEVELOPMENTS

The District proposes to develop a new Sultan River Discharge Structure just downstream of the Diversion Dam. See Appendix C for further details. The District will be submitting an amended license application to construct this structure by May 2011. The District's cost estimate for this facility is $237,000 in 2009$. The annual maintenance for the discharge structure is estimated to be $1,000.

D.4 ESTIMATED AVERAGE ANNUAL COSTS OF THE JACKSON HYDROELECTRIC PROJECT

The District developed average annual cost data from several sources. Financial information for the period 1984 through 2008 is based on separately tracked financial results for the Jackson Project from each of those years. Forecasted financial results for 2009 are based on the budgeted expenditures for the current year. Expenditures for the period 2010 through 2041 are forecast based on the following assumptions: (1) normal operating expenses inflated annually, (2) capital replacements and maintenance based on an interim replacement and renewal schedule for the next 30 years (through 2041) from a life assessment study[6] of all Project structures and equipment, and (3) debt service costs

[6] EES Consulting, Inc. Life Assessment Study, June, 2004

based on the debt schedules of currently outstanding bonds. Table D.4-1 below shows estimated annual costs of the Project.

Table D.4-1 Estimated Annual Cost of the Jackson Hydroelectric Project (in 2008 Dollars)

	Average Costs[2]	
Item	1984 – May 2011	June 2011 – May 2041
Bond Interest and Principal[1]	$36,196,408	$6,338,334
Local, State, and Federal Taxes	$227,219	$56,911
Depreciation or Amortization	$5,775,693	$2,931,786
Operation and Maintenance, including interim replacements, insurance, administrative and general expenses, contingencies, relicensing costs and FERC charges	$5,784,159	$4,325,387
TOTAL ANNUAL PROJECT COSTS	$47,983,479	$13,652,418

1 Represents interest and principal payments on bonds associated with the Jackson Project. From 1984 to May 2011, average interest costs are $26,865,193 and average principal payments are $9,331,215; from June 2011 – May 2041, average interest costs are projected to be $1,712,013 and average principal payments are projected to be $4,626,321.

2 Average Costs were calculated for each period based on 2008 dollars.

In addition to the annual costs provided in Table D.4-1, there is expected to be additional costs for license compliance and implementation of protection, mitigation and enhancement (PM&E) measures that will be required in the new license terms and conditions. PM&E costs have not been included in Table D.4-1. Those PME costs are described in Section 6 of Exhibit E.

D.5 ESTIMATED AVERAGE ANNUAL VALUE OF THE JACKSON HYDROELECTRIC PROJECT POWER

The entire generation output of the Jackson Project is consumed by the District's retail customers that reside within the District's service territory. To determine the value of the Project's power benefits, this analysis assumed the dollar value of the Project's generation would be the cost of purchasing an equivalent amount of energy from the wholesale power market under average water conditions. Jackson's average annual energy value based on market prices would be approximately $46.07 per MWh.

The 30-year annual average cost for replacement power, in 2011 dollars, without inflation or escalation effects, of continuing to operate the Project under current license conditions would be approximately $18,752,816 under average water conditions.

D.6 SOURCES OF FINANCING AND REVENUES

The Jackson Project is accounted for as part of the District's Generation System. Power from the Jackson Project is sold exclusively to the District's Electric System; however, the retail load requirements of the District's distribution system exceed the power output of the Jackson Hydroelectric Project. The majority of the retail load for the District is supplied by the Bonneville Power Administration (BPA) through a power purchase agreement. The remainder of the District's retail demand is supplied primarily through smaller power purchase agreements. The distribution system provides electric service to approximately, 320,000 retail customers in Snohomish County, Washington.

Construction of the Jackson Hydroelectric Project was financed through the sale of revenue bonds issued by the District through its Generation System. Funding for capital improvements since the Project's construction has been provided by the District's Electric System on a monthly basis as a component of the cost of power sold to the Electric System.

The Project was initially financed in 1982 with short-term notes to avoid the high interest rates available at the time. These notes were refinanced with long-term revenue bonds in 1983, and again in 1986, 1993 and 2002 in order to take advantage of lower interest rates. Each time the bonds were refinanced, the principal outstanding increased to fund the outstanding principal of the refinanced bonds, along with any call premium and interest necessary to finance the bonds to the call date. In some cases, the term of the bonds was extended when the bonds were refinanced, As of December 31, 2008, principal outstanding on the Series 2002 Generation System bonds allocated to the Jackson Hydroelectric Project was $169,555,000.

As of December 31, 2008, the ratings for outstanding District bonds were as follows:

Moody's Investor Services	Standard & Poor's	Fitch Ratings
Aa3	AA-	AA-

Moody's, Standard & Poor's and Fitch IBCA affirmed these ratings in publications dated October 20, 2008, October 17, 2008, and October 9, 2008 respectively. As of December 31, 2008, the Jackson Hydroelectric Project's net book value for the utility plant totaled $120,936,115 and current asset book value was $6,878,899.

Revenues are generated by the District primarily through retail sales of electricity to customers within its service territory which is Snohomish County, Washington and portions of Island County, Washington. This includes electricity generated from Jackson Hydroelectric Project, as well as energy the District obtains from a variety of other sources to meet the energy needs of it retail customers. Public Utility District No. 1 of Snohomish County is a municipal corporation organized pursuant to the Washington State Constitution and statutes.[7] It is owned by the ratepayers within Snohomish County. Rates for energy sales are set by the Board of Commissioners, an elected body consisting of three members. Rates are set in accordance with a rate structure and public utility policies so that, in general, cost of service is covered by revenue, with some allowances for contingency and reserves, and no profit. Therefore, revenues should always be

[7] The District generally sets its rates and charges in a manner to cover its operating expenses, debt service and other costs, and to provide desired operating, capital and other reserves.

available to meet the costs identified in the paragraphs above via the rate-setting authority of the District.

D.7 ESTIMATED COST TO DEVELOP THE LICENSE APPLICATION

The estimated costs to develop the Final License Application are approximately $8,000,000. This includes consultant and District costs. Consultant costs pertain to the Pre-Application Document, Relicensing Studies, Preliminary Licensing Proposal and Final License Application. District costs relate to staff time and equipment and services purchased.

D.8 ON-PEAK AND OFF-PEAK VALUES OF PROJECT POWER

Because BPA serves as the District's load controller and, with the restrictive Sultan River downramping constraints, the Jackson Project serves the base of the District's load. Therefore, On-Peak or Off-Peak values for the Project Power are not applicable.

D.9 ESTIMATED AVERAGE ANNUAL INCREASE OR DECREASE IN PROJECT GENERATION

Jackson average annual power generation is affected by city of Everett water demands and the minimum instream flows required in each of the three reaches of the Sultan River below Culmback Dam. The City of Everett's water demands are projected to increase over the next 30 years which will lead to a corresponding decrease in Project generation as water is shifted from the Pelton units to the Francis units.

The table below shows Project generation based on current license condition continuing over the next 30 years and based on the proposed license conditions over the same period.

Table D.9-1 Average Annual Generation for Jackson Project (MWhs).

Year	Current	Proposed
2008	421,834	
2011	419,290	423,945
2041	394,135	393,456
30 yr. Average	406,600	408,054

Over a 30-year period the average proposed plan of operation would generate 1,454 more MWhs than continuing the current operation.

Exhibit F - General Design Drawings

F.1 Design Drawings

Exhibit F consists of general design drawings of the principal Project works described in Exhibit A of this application for new license for the Henry M. Jackson Project. Also included is the one-line diagram required in Exhibit H, section H.6.3.

The Federal Energy Regulatory Commission Rule RM02-40-000, Order No. 630, as amended by RM02-4-001 and PL02-1-001; Order No. 630-A; and Order No. 702, RM06-23-000, requires applicants to separate certain information into the following categories:

- Public
- Critical Energy Infrastructure Information (CEII)
- Privileged (other non-public)

Drawings of the general design and principal Project works for the Henry M. Jackson Project are classified as CEII under Order 630. To comply with this order, each of the Exhibit F drawings is marked as CEII. The drawings are submitted in Volume II as non-public CEII and will not be available in FERC's Public Reference Room or as a public access image on FERC's eLibrary web location, except as an indexed item.

The drawings contained in this Exhibit F are listed in Table F-1 below. The procedures for requesting access to CEII may be found at 18 CFR § 388.113. Requests for access to CEII should be made in writing to FERC's CEII Coordinator and include the requester's name, title, address, telephone number, and social security number; the name, address, and telephone number of the person or entity on whose behalf the information is requested; a detailed statement explaining the particular need for and intended use of the information; and a statement as to the requester's willingness to adhere to limitations on the use and disclosure of the information requested.

Table F-1 Jackson Project general design drawings.

Drawing Number	Drawing Title
F-1	Reservoir Map
F-2	Dam and Appurtenances Plan
F-3	Dam and Appurtenances Sections
F-4	Spillway Plan, Profile and Sections
F-5	Outlet Works Plans and Profiles
F-6	Intake Structure Sections
F-7	Power Tunnel Sections and Details
F-8	Power Pipeline Sections and Details
F-9	Powerhouse – Site Plan

Drawing Number	Drawing Title
F-10	Powerhouse – Plans Top Deck
F-11	Powerhouse – Plans Generator Floor
F-12	Powerhouse – Plans Turbine Floor
F-13	Powerhouse – Plans Turbine Pit and Tailrace
F-14	Powerhouse – Cross Section
F-15	Powerhouse – Longitudinal Section
F-16	One-line Diagram
F-17	Lake Chaplain Pipeline Sections and Details
F-18	Sultan River New Instream Flow Diversion Structure Plan
F-19	Pre-existing Water Supply Line Profile Map and Sections
F-20	Pre-existing Water Supply Pipeline (Replacement of Woodstave Pipeline) Section and Details
F-21	Power Tunnel Plan and Profile
F-22	Pipeline to Powerhouse Plan and Profile (sheet 1 of 2)
F-23	Pipeline to Powerhouse Plan and Profile (sheet 2 of 2)
F-24	Lake Chaplain Pipeline Plan and Profile (sheet 1 of 2)
F-25	Lake Chaplain Pipeline Plan and Profile (sheet 2 of 2)
F-26	Access Road

F.2 Supporting Design Report

Public Utility District No. 1 of Snohomish County directs FERC to the 2006 Part 12 Dam Safety Report for Culmback Dam, dated and filed with the FERC on December 11, 2006. All information required for the Supporting Design Report is included in this most recent Part 12 Report and the Supporting Technical Information Document appended to the Part 12 Report. The next Part 12 inspection will occur in 2011. The Part 12 Dam Safety Report and Supporting Technical Information Document are both considered non-public under CEII.

Exhibit G - Maps of the Project

The Henry M. Jackson Hydroelectric Project is located in Snohomish County in the state of Washington. Exhibit G contains Table G-1.a through G-1.d which describes the Project boundary in metes and bounds or contour elevations, and a series of five maps depicting the location and principal features of the Project. These maps also delineate the current Project boundary and land ownership within that boundary, as well as the proposed adjustments to the boundary.

The Jackson Project currently occupies a total of 2,286.0 acres within its boundary. The U.S. Forest Service owns approximately 10.9 acres above the power tunnel, which lies approximately 300 feet below surface. Washington Department of Natural Resources owns 98.9 acres around Spada Lake and along the power tunnel and pipeline alignment. The City of Everett (City) owns 27.3 acres that include the Diversion Dam under the current license, the fish water return pipeline and tunnel, and the Lake Chaplain pipeline between the Powerhouse and Portal 2. Private parties own 3.4 acres of the power pipeline area and the City of Sultan owns 2.3 acres.

The District proposes to add a total of 2,283.5 acres to the Project Boundary. Of these, 2,267.3 acres are currently managed under the FERC-approved Wildlife Management Plan. Under the proposed license they will be managed under the Terrestrial Resources Management Plan. An additional 16.2 acres of lands for existing and proposed recreation facilities are also included in the proposed Project boundary. Therefore, under the proposed Project boundary the District will own 4,420.8 acres, the City of Everett will own 26.1 acres after removal of the Diversion Dam from the boundary, the City of Sultan will own 2.3 acres, the DNR will own 106.1 acres, private citizens will own 3.4 acres, and the U.S. Forest Service will own 10.9 acres.

A description of federal lands located within the current and proposed Project boundary and identified on these maps can be found in Exhibit A, section A.4 of this application for new license.

Table G-1a Snohomish County PUD – Henry M. Jackson Hydroelectric Project, Sultan River Basin 09-037 Pipeline ROW – Lake to Powerhouse (Spada Lake 1983 Boundary)

Areas: 24,186,912.02 SF
96.12 Acres

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
832	PC	355949.938	1431852.705						R/W
				S50°40'28"W	110.642	13°31'09"	470.000	110.899	
831	PT	355879.821	1431767.117						R/W
				S57°26'02"W	20137.737				
605		345040.254	1414795.605						R/W
				S7°47'27"E	121.151				
607		344920.222	1414812.028						R/W
				S57°26'02"W	160.000				
614		344834.098	1414677.185						R/W
				N79°57'07"W	203.823				
615		344869.660	1414476.487						R/W
				S57°26'02"W	1228.554				
616		344208.365	1413441.097						R/W
				S58°50'42"W	2692.027				
617		342815.636	1411137.336						R/W
				S31°09'18"E	26.000				
618		342793.386	1411150.787						R/W
				S58°50'42"W	1343.578				
619		342098.281	1410000.991						R/W
				S51°25'24"W	392.213				
620		341853.712	1409694.369						R/W
				S66°58'32"W	169.088				
621		341787.577	1409538.750						R/W
				S82°31'40"W	630.887				
622		341705.533	1408913.220						R/W
				S20°44'33"W	2282.103				
623		339571.351	1408104.973						R/W
				N69°15'27"W	26.000				

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
624		339580.559	1408080.659						R/W
				S20°44'33"W	71.431				
625		339513.758	1408055.360						R/W
				S45°27'38"W	148.446				
626		339409.638	1407949.553						R/W
				S70°10'43"W	2829.155				
627		338450.305	1405288.012						R/W
				S56°45'56"W	223.726				
628		338327.688	1405100.880						R/W
				S43°21'08"W	2200.065				
629		336727.920	1403590.572						R/W
				S31°39'49"W	1250.768				
630		335663.335	1402934.006						R/W
				S50°31'30"W	1028.621				
631		335009.397	1402140.013						R/W
				S46°36'07"W	2119.685				
632		333553.044	1400599.850						R/W
				N0°14'21"W	123.379				
633		333676.422	1400599.335						R/W
				N46°36'07"E	2038.374				
634		335076.909	1402080.417						R/W
				N50°31'30"E	1016.754				
635		335723.302	1402865.250						R/W
				N31°39'49"E	1245.031				
636		336783.005	1403518.805						R/W
				N43°21'08"E	2219.861				
637		338397.167	1405042.702						R/W
				N56°45'56"E	244.892				
638		338531.384	1405247.538						R/W
				N70°10'43"E	2820.017				
639		339487.619	1407900.483						R/W
				N45°27'38"E	109.005				
640		339564.075	1407978.178						R/W

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
				N20°44'33"E	51.711				
641		339612.434	1407996.492						R/W
				S69°15'27"E	26.000				
642		339603.226	1408020.807						R/W
				N20°44'33"E	2335.951				
643		341787.766	1408848.125						R/W
				N82°31'40"E	672.445				
644		341875.215	1409514.860						R/W
				N66°58'32"E	144.508				
645		341931.735	1409647.856						R/W
				N51°25'24"E	385.760				
646		342172.281	1409949.434						R/W
				N58°50'42"E	1349.415				
647		342870.405	1411104.226						R/W
				N31°09'18"W	26.000				
648		342892.655	1411090.774						R/W
				N58°50'42"E	1499.880				
649		343668.623	1412374.330						R/W
				N31°09'18"W	82.000				
650		343738.797	1412331.907						R/W
				N58°50'42"E	139.990				
651		343811.221	1412451.706						R/W
				S31°09'18"E	82.000				
652		343741.047	1412494.129						R/W
				N58°50'42"E	1051.048				
653		344284.811	1413393.587						R/W
				N57°26'02"E	1367.446				
654		345020.868	1414546.031						R/W
				N28°11'06"E	229.225				
655		345222.912	1414654.299						R/W
				S66°15'22"E	54.083				
656		345201.136	1414703.804						R/W
				S32°33'58"E	65.000				

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
657		345146.356	1414738.792						R/W
				N57°26'02"E	20085.259				
658		355957.675	1431666.078						R/W
				S66°38'36"E	27.067				
482		355946.944	1431690.926						1460
				N88°56'24"E	161.806				
832		355949.938	1431852.705						R/W

Table G-1b Snohomish County PUD – Henry M. Jackson Hydroelectric Project, Sultan River Basin 09-037 Pipeline ROW from Powerhouse to Diversion Boundary

Areas: 2,203,469.41 SF
50.58 Acres

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
862		332760.748	1399506.206						R/W
				N54°22'30"W	301.901				
863		332936.598	1399260.807						R/W
				N11°52'02"W	134.252				
864		333067.981	1399233.199						R/W
				N78°07'58"E	30.000				
865		333074.151	1399262.558						R/W
				N11°52'02"W	73.330				
866		333145.913	1399247.478						R/W
				N78°07'58"E	50.000				
867		333156.195	1399296.409						R/W
				N11°52'02"W	503.606				
868		333649.038	1399192.846						R/W
				N87°00'28"E	91.091				
869		333653.792	1399283.812						R/W
				N11°52'02"W	348.118				
870	PC	333994.470	1399212.224						R/W
				N21°58'56"E	757.535	67°41'55"	680.000	803.464	
871	PT	334696.933	1399495.783						R/W
				N55°49'53"E	171.703				
872		334793.366	1399637.848						R/W
				N28°40'38"E	543.182				
873		335269.920	1399898.508						R/W
				N40°19'03"E	366.867				
874		335549.646	1400135.879						R/W
				N1°32'00"W	405.776				
875		335955.276	1400125.021						R/W

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
				N11°26'33"E	421.893				
876		336368.784	1400208.719						R/W
				N10°04'05"W	489.775				
877		336851.018	1400123.098						R/W
				N33°11'22"W	670.841				
878		337412.420	1399755.873						R/W
				N11°10'57"E	708.183				
879		338107.158	1399893.215						R/W
				N24°14'47"W	689.899				
880		338736.199	1399609.899						R/W
				N25°05'56"W	507.762				
881		339196.017	1399394.517						R/W
				N19°05'07"W	781.346				
882		339934.414	1399139.035						R/W
				N16°38'31"W	385.640				
883		340303.900	1399028.591						R/W
				N10°12'29"W	582.326				
884		340877.008	1398925.391						R/W
				N10°12'28"W	547.980				
885		341416.315	1398828.279						R/W
				N31°15'04"W	305.139				
886		341677.179	1398669.976						R/W
				N31°15'03"W	415.048				
887		342032.005	1398454.656						R/W
				N6°01'48"W	284.481				
888		342314.912	1398424.771						R/W
				N37°10'51"W	402.966				
889		342635.968	1398181.246						R/W
				N19°21'57"W	429.776				
890		343041.427	1398038.733						R/W
				N28°26'57"W	336.821				
891		343337.574	1397878.280						R/W
				N37°55'15"W	215.843				

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
892		343507.844	1397745.628						R/W
				N40°59'32"W	221.724				
893		343675.201	1397600.187						R/W
				N42°47'59"W	680.699				
894		344174.653	1397137.695						R/W
				N45°15'50"W	413.298				
895		344465.549	1396844.106						R/W
				N23°23'47"W	745.585				
896		345149.832	1396548.042						R/W
				N68°24'03"W	89.999				
897		345182.962	1396464.363						R/W
				N23°23'54"W	260.917				
898		345422.422	1396360.747						R/W
				N8°23'48"W	714.862				
899		346129.621	1396256.359						R/W
				N44°13'02"E	145.000				
900		346233.542	1396357.479						R/W
				N8°23'41"W	75.004				
901		346307.743	1396346.529						R/W
				N44°13'14"E	299.430				
903		346522.333	1396555.357						R/W
				N1°23'59"W	53.178				
904		346575.496	1396554.058						R/W
				N47°01'26"W	148.160				
944		346676.495	1396445.659						R/W
				N34°51'57"W	225.901				
905		346861.846	1396316.521						R/W
				N27°09'30"W	445.638				
906		347258.352	1396113.110						R/W
				N11°24'28"W	383.605				
907		347634.379	1396037.236						R/W
				N0°44'29"E	1395.408				
908		349029.670	1396055.293						R/W

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
				N13°12'49"W	104.182				
909		349131.094	1396031.479						R/W
				S83°09'59"W	34.230				
910		349127.021	1395997.492						R/W
				N6°50'01"W	200.000				
911		349325.600	1395973.695						R/W
				N83°09'59"E	7244.886				
912		350187.655	1403167.111						R/W
				N44°32'54"E	500.000				
913		350543.984	1403517.867						R/W
				N55°29'26"E	130.000				
914		350617.635	1403624.991						R/W
				N42°23'50"E	360.000				
915		350883.490	1403867.727						R/W
				N36°17'55"E	215.000				
916		351056.768	1403995.006						R/W
				N24°10'54"E	150.000				
917		351193.606	1404056.450						R/W
				N35°18'15"E	425.000				
919		351540.446	1404302.066						R/W
				N25°16'57"E	105.000				
920		351635.388	1404346.910						R/W
				N11°43'02"E	70.000				
921		351703.929	1404361.125						R/W
				N90°00'00"E	215.000				
922		351703.929	1404576.125						R/W
				S18°04'18"E	80.000				
923		351627.876	1404600.942						R/W
				S0°11'18"W	123.947				
924		351503.929	1404600.534						R/W
				S90°00'00"W	175.000				
925		351503.929	1404425.534						R/W
				S36°12'01"W	205.000				

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
926		351338.503	1404304.460						R/W
				S22°48'27"W	80.000				
927		351264.758	1404273.449						R/W
				S55°01'24"W	70.000				
928		351224.631	1404216.092						R/W
				S26°15'40"W	220.000				
929		351027.338	1404118.751						R/W
				S50°55'53"W	110.000				
930		350958.010	1404033.348						R/W
				S38°49'17"W	145.000				
931		350845.040	1403942.448						R/W
				S31°48'05"W	160.000				
932		350709.059	1403858.132						R/W
				S49°39'56"W	145.000				
933		350615.208	1403747.601						R/W
				S65°12'03"W	130.000				
934		350560.681	1403629.590						R/W
				S39°51'01"W	75.000				
935		350503.102	1403581.531						R/W
				S44°19'17"W	250.000				
936		350324.243	1403406.860						R/W
				S37°30'04"W	250.000				
937		350125.908	1403254.666						R/W
				S32°08'30"W	165.000				
938		349986.197	1403166.883						R/W
				S83°09'59"W	7166.335				
939		349133.488	1396051.460						R/W
				S13°12'49"E	104.393				
940		349031.859	1396075.323						R/W
				S0°44'29"W	1395.727				
941		347636.248	1396057.262						R/W
				S11°24'28"E	378.710				
942		347265.020	1396132.167						R/W

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
				S27°09'30"E	441.524				
943		346872.174	1396333.701						R/W
				S34°51'57"E	222.424				
945		346689.676	1396460.851						R/W
				S47°01'26"E	154.442				
946		346584.394	1396573.847						R/W
				S1°23'59"E	70.002				
947		346514.413	1396575.557						R/W
				S44°13'14"W	297.954				
948		346300.881	1396367.758						R/W
				S8°23'41"E	75.004				
949		346226.681	1396378.708						R/W
				S44°13'02"W	144.999				
950		346122.760	1396277.588						R/W
				S8°23'48"E	702.341				
951		345427.948	1396380.148						R/W
				S23°23'54"E	249.998				
952		345198.508	1396479.428						R/W
				S68°24'03"E	90.000				
953		345165.378	1396563.108						R/W
				S23°23'47"E	750.006				
954		344477.037	1396860.927						R/W
				S45°15'50"E	409.865				
955		344188.557	1397152.077						R/W
				S42°47'59"E	681.445				
956		343688.558	1397615.076						R/W
				S40°59'32"E	222.576				
957		343520.558	1397761.076						R/W
				S37°55'15"E	218.036				
958		343348.558	1397895.075						R/W
				S28°26'57"E	340.066				
959		343049.558	1398057.075						R/W
				S19°21'57"E	428.230				

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
960		342645.557	1398199.075						R/W
				S37°10'51"E	405.406				
961		342322.557	1398444.075						R/W
				S6°01'48"E	285.581				
962		342038.556	1398474.075						R/W
				S31°15'03"E	410.573				
963		341687.555	1398687.074						R/W
				S31°15'04"E	308.854				
964		341423.515	1398847.304						R/W
				S10°12'28"E	551.694				
965		340880.553	1398945.074						R/W
				S10°12'29"E	581.202				
966		340308.551	1399048.075						R/W
				S16°38'31"E	384.089				
967		339940.550	1399158.075						R/W
				S19°05'07"E	779.869				
968		339203.549	1399413.074						R/W
				S25°05'56"E	506.860				
969		338744.548	1399628.074						R/W
				S24°14'47"E	696.436				
970		338109.546	1399914.074						R/W
				S11°10'57"W	706.415				
971		337416.543	1399777.075						R/W
				S33°11'22"E	666.776				
972		336858.542	1400142.075						R/W
				S10°04'05"E	497.666				
973		336368.540	1400229.075						R/W
				S11°26'33"W	423.418				
974		335953.538	1400145.075						R/W
				S1°32'00"E	411.149				
975		335542.536	1400156.076						R/W
				S40°19'03"W	372.476				
976		335258.534	1399915.076						R/W

Point	Type	Northing	Easting	Bearing	Horiz Dist	Delta	Radius	Arc Length	Description
				S28°40'38"W	545.974				
977		334779.531	1399653.077						R/W
				S55°49'53"W	176.533				
978	PC	334680.385	1399507.015						R/W
				S21°58'56"W	735.254	67°41'55"	-660.001		779.833
979	PT	333998.583	1399231.797						R/W
				N78°07'58"E	660.000				
988	SS	334134.307	1399877.691						RP
				S11°52'02"E	351.241				
980		333654.849	1399304.027						R/W
				N87°00'28"E	50.606				
981		333657.491	1399354.564						R/W
				S11°52'02"E	378.622				
982		333286.961	1399432.425						R/W
				N78°07'58"E	10.000				
983		333289.018	1399442.212						R/W
				S11°52'02"E	192.520				
984		333100.612	1399481.802						R/W
				S78°07'58"W	10.000				
985		333098.556	1399472.016						R/W
				S11°52'02"E	21.713				
986		333077.307	1399476.481						R/W
				S54°22'30"E	205.928				
987		332957.359	1399643.869						R/W
				S34°59'56"W	240.014				
862		332760.748	1399506.206						R/W

Table G-1c Snohomish County PUD – Henry M. Jackson Hydroelectric Project, Sultan River Basin 09-037 Powerhouse Boundary

Areas: 1,186,806.94 SF
27.25 Acres

Point	Northing	Easting	Bearing	Horiz Dist	Description
571	334059.899	1399863.164			P-hse
			N85°57'07"E	736.190	
570	334111.870	1400597.517			P-hse
			S0°14'21"E	939.936	
569	333171.943	1400601.441			P-hse
			S85°57'07"W	149.990	
568	333161.354	1400451.826			P-hse
			S0°14'21"E	449.969	
567	332711.389	1400453.704			P-hse
			S85°57'07"W	249.983	
566	332693.742	1400204.345			P-hse
			S0°14'21"E	249.983	
564	332443.761	1400205.388			P-hse
			S0°14'21"E	99.993	
562	332343.769	1400205.806			P-hse
			S85°57'07"W	599.959	
561	332301.415	1399607.344			P-hse
			N0°14'21"W	99.993	
560	332401.407	1399606.926			P-hse
			N0°14'21"W	263.600	
559	332665.005	1399605.826			P-hse
			N35°00'00"E	500.000	
558	333074.581	1399892.614			approx riv
			N4°00'00"E	500.000	
557	333573.363	1399927.492			approx riv
			N16°00'00"W	300.000	
556	333861.741	1399844.801			approx riv
			N5°17'40"E	199.007	
571	334059.899	1399863.164			P-hse

Table G-1d Snohomish County PUD – Henry M. Jackson Hydroelectric Project, Sultan River Basin 09-037 Spada Lake 1983 Boundary

Areas: 91,999,455 SF
2,112.02 Acres

Point	Northing	Easting	Bearing	Horiz Dist	Description
1	357250.436	1431460.316			1460
			N19°11'02"W	113.670	
2	357357.794	1431422.964			1460
			N14°25'14"E	283.248	
3	357632.117	1431493.503			1460
			N43°40'01"E	67.112	
4	357680.664	1431539.842			1460
			N24°08'14"E	76.075	
5	357750.087	1431570.951			1460
			N39°08'22"E	111.130	
6	357836.281	1431641.097			1460
			N63°23'09"E	72.709	
7	357868.853	1431706.102			1460
			N83°51'04"E	119.476	
8	357881.650	1431824.891			1460
			N40°33'47"E	159.330	
9	358002.692	1431928.501			1460
			N18°27'26"E	80.905	
10	358079.436	1431954.115			1460
			N63°03'34"E	165.535	
11	358154.434	1432101.686			1460
			S26°51'56"E	159.330	
12	358012.301	1432173.687			1460
			S79°10'00"E	55.848	
13	358001.804	1432228.540			1460
			N73°37'24"E	182.584	
14	358053.283	1432403.717			1460
			N79°54'11"E	274.505	
15	358101.408	1432673.970			1460
			N66°41'41"E	82.678	
16	358134.118	1432749.902			1460
			N62°56'30"E	86.701	
17	358173.558	1432827.113			1460
			N64°46'44"E	210.339	
18	358263.186	1433017.400			1460
			S80°03'12"E	236.532	
19	358222.329	1433250.376			1460
			N81°14'52"E	113.231	
20	358239.559	1433362.289			1460
			N7°43'04"W	189.884	
21	358427.723	1433336.789			1460
			N80°45'10"E	95.664	
22	358443.095	1433431.210			1460
			S36°54'57"E	227.920	
23	358260.869	1433568.108			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S84°45'04"E	162.242	
24	358246.027	1433729.670			1460
			S67°46'11"E	317.184	
25	358126.027	1434023.278			1460
			S48°28'02"E	111.604	
26	358052.028	1434106.822			1460
			S68°37'20"E	75.363	
27	358024.557	1434177.000			1460
			N79°16'58"E	88.426	
28	358041.001	1434263.884			1460
			N57°36'09"E	70.591	
29	358078.823	1434323.488			1460
			N34°17'15"E	74.574	
30	358140.438	1434365.499			1460
			N76°15'18"E	73.926	
31	358158.003	1434437.308			1460
			S75°58'49"E	76.204	
32	358139.542	1434511.242			1460
			N70°22'26"E	50.259	
33	358156.423	1434558.581			1460
			S70°59'13"E	145.957	
34	358108.873	1434696.575			1460
			N85°40'20"E	123.556	
35	358118.197	1434819.779			1460
			N79°27'07"E	195.825	
36	358154.045	1435012.295			1460
			N17°15'19"E	143.198	
37	358290.798	1435054.772			1460
			N25°05'11"E	187.835	
38	358460.915	1435134.411			1460
			S71°12'47"E	105.462	
39	358426.951	1435234.254			1460
			S10°00'36"E	156.149	
40	358273.179	1435261.396			1460
			S44°34'43"E	150.251	
41	358166.157	1435366.855			1460
			S48°09'03"E	114.059	
42	358090.060	1435451.818			1460
			S43°36'17"E	213.540	
43	357935.432	1435599.092			1460
			S81°55'11"E	86.319	
44	357923.299	1435684.554			1460
			N57°27'49"E	52.566	
45	357951.571	1435728.870			1460
			N51°05'17"E	89.254	
46	358007.634	1435798.320			1460
			N85°12'33"E	205.552	
47	358024.801	1436003.154			1460
			S57°09'25"E	44.668	
48	358000.576	1436040.682			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S57°09'24"E	240.112	
49	357870.353	1436242.414			1460
			S52°49'58"E	243.998	
50	357722.943	1436436.850			1460
			S39°41'42"E	263.440	
51	357520.238	1436605.109			1460
			S49°56'40"E	172.447	
52	357409.263	1436737.104			1460
			N14°09'44"W	567.471	
53	357959.487	1436598.262			1460
			N24°42'11"E	120.201	
54	358068.688	1436648.496			1460
			N49°24'14"E	314.468	
55	358273.320	1436887.276			1460
			N52°04'49"E	197.153	
56	358394.482	1437042.805			1460
			S20°50'57"E	173.706	
57	358232.150	1437104.629			1460
			S77°55'38"E	206.549	
58	358188.949	1437306.610			1460
			S63°22'49"E	170.951	
59	358112.352	1437459.440			1460
			N87°43'00"E	402.756	
60	358128.398	1437861.876			1460
			S58°57'23"E	368.013	
61	357938.617	1438177.180			1460
			S66°54'03"E	272.698	
62	357831.631	1438428.015			1460
			S28°38'25"E	247.940	
63	357614.027	1438546.855			1460
			S40°16'38"E	273.795	
64	357405.142	1438723.860			1460
			S61°14'08"E	120.033	
65	357347.381	1438829.082			1460
			N44°51'41"E	179.617	
66	357474.696	1438955.783			1460
			N31°18'07"E	253.354	
67	357691.172	1439087.412			1460
			S47°55'34"E	202.174	
68	357555.697	1439237.482			1460
			N66°31'38"E	113.491	
69	357600.902	1439341.581			1460
			N46°27'21"E	287.297	
70	357798.825	1439549.826			1460
			N13°00'28"E	276.851	
71	358068.572	1439612.141			1460
			N47°56'34"E	272.527	
72	358251.130	1439814.486			1460
			N19°27'07"E	122.906	
73	358367.021	1439855.416			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N17°17'24"E	1.867	
74	358368.804	1439855.971			1460
			N17°16'43"E	230.816	
75	358589.204	1439924.528			1460
			N87°35'12"E	247.164	
76	358599.612	1440171.473			1460
			S57°23'14"E	269.770	
77	358454.217	1440398.709			1460
			S55°28'39"E	172.587	
78	358356.407	1440540.904			1460
			S35°05'13"E	317.743	
79	358096.404	1440723.549			1460
			S41°01'23"E	125.245	
80	358001.914	1440805.755			1460
			S81°50'34"E	275.554	
81	357962.815	1441078.521			1460
			S51°36'06"E	357.489	
82	357740.770	1441358.689			1460
			N16°26'06"E	233.681	
83	357964.903	1441424.804			1460
			N16°26'06"E	177.101	
84	358134.768	1441474.911			1460
			N54°19'09"E	162.702	
85	358229.667	1441607.070			1460
			N28°01'30"E	111.883	
86	358328.431	1441659.639			1460
			N28°01'30"E	44.318	
87	358367.552	1441680.462			1460
			N1°14'45"E	147.182	
88	358514.699	1441683.662			1460
			N43°40'14"E	210.554	
89	358666.997	1441829.052			1460
			N76°03'33"E	229.469	
90	358722.281	1442051.762			1460
			N39°16'47"E	310.813	
91	358962.870	1442248.540			1460
			N3°29'20"E	391.119	
92	359353.264	1442272.341			1460
			S86°44'28"E	144.337	
93	359345.059	1442416.445			1460
			N84°57'09"E	253.126	
94	359367.330	1442668.589			1460
			S77°04'13"E	268.263	
95	359307.305	1442930.050			1460
			S57°24'04"E	290.723	
96	359150.677	1443174.973			1460
			S89°37'52"E	502.584	
97	359147.442	1443677.547			1460
			S38°13'01"E	249.110	
98	358951.723	1443831.657			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S59°33'38"E	213.500	
99	358843.558	1444015.729			1460
			S83°15'21"E	158.817	
100	358824.907	1444173.447			1460
			N68°25'54"E	176.483	
101	358889.784	1444337.573			1460
			N65°10'21"E	449.069	
102	359078.343	1444745.137			1460
			N77°34'08"E	218.693	
103	359125.420	1444958.703			1460
			N82°56'10"E	332.444	
104	359166.303	1445288.624			1460
			S83°43'50"E	358.807	
105	359127.119	1445645.285			1460
			S89°56'58"E	147.672	
106	359126.989	1445792.957			1460
			S67°31'00"E	327.781	
107	359001.641	1446095.824			1460
			S86°24'29"E	115.548	
108	358994.402	1446211.145			1460
			S69°05'05"E	305.182	
109	358885.456	1446496.218			1460
			S75°08'00"E	152.047	
110	358846.445	1446643.175			1460
			S84°56'17"E	401.797	
111	358810.993	1447043.405			1460
			S84°56'15"E	92.710	
112	358802.812	1447135.753			1460
			S62°09'30"E	302.125	
113	358661.711	1447402.905			1460
			S82°35'03"E	503.954	
114	358596.665	1447902.644			1460
			S89°23'26"E	327.221	
115	358593.185	1448229.846			1460
			N85°01'16"E	255.572	
116	358615.366	1448484.454			1460
			S76°19'30"E	206.061	
117	358566.650	1448684.674			1460
			N81°00'52"E	145.275	
118	358589.340	1448828.166			1460
			N66°25'05"E	218.784	
119	358676.867	1449028.679			1460
			N82°29'44"E	248.901	
120	358709.374	1449275.448			1460
			N84°18'00"E	326.711	
121	358741.823	1449600.544			1460
			N58°47'05"E	202.346	
122	358846.690	1449773.596			1460
			N1°22'04"W	228.248	
123	359074.873	1449768.148			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N68°23'14"E	339.782	
124	359200.025	1450084.042			1460
			S86°44'02"E	337.697	
125	359180.785	1450421.190			1460
			S79°27'11"E	288.926	
126	359127.900	1450705.235			1460
			N89°27'33"E	121.848	
127	359129.050	1450827.078			1460
			N84°54'10"E	171.969	
128	359144.329	1450998.367			1460
			N55°41'33"E	293.496	
129	359309.754	1451240.802			1460
			N45°22'51"E	409.186	
130	359597.163	1451532.057			1460
			N36°35'47"E	169.291	
131	359733.079	1451632.984			1460
			N13°36'04"E	299.968	
132	360024.635	1451703.525			1460
			N83°07'07"E	221.199	
133	360051.138	1451923.131			1460
			N63°39'07"E	89.326	
134	360090.783	1452003.177			1460
			N12°18'22"E	196.333	
135	360282.605	1452045.022			1460
			N38°17'24"E	85.020	
136	360349.336	1452097.704			1460
			N38°17'24"E	190.033	
137	360498.490	1452215.456			1460
			N34°32'59"E	327.140	
138	360767.934	1452400.984			1460
			N0°24'46"W	387.713	
139	361155.637	1452398.190			1460
			N5°39'05"E	181.744	
140	361336.498	1452416.087			1460
			N30°50'47"E	211.393	
141	361517.988	1452524.476			1460
			N22°07'13"E	274.803	
142	361772.564	1452627.954			1460
			N18°24'49"E	166.426	
143	361930.469	1452680.524			1460
			N7°37'16"E	111.483	
144	362040.967	1452695.309			1460
			N49°38'47"E	335.388	
145	362258.132	1452950.895			1460
			N31°43'37"E	162.133	
146	362396.036	1453036.156			1460
			N23°27'46"E	87.436	
147	362476.243	1453070.969			1460
			N34°00'22"E	250.777	
148	362684.132	1453211.224			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N42°01'31"E	336.457	
149	362934.069	1453436.468			1460
			N37°00'52"E	200.408	
150	363094.092	1453557.117			1460
			N51°08'37"E	112.043	
151	363164.384	1453644.367			1460
			N48°00'47"E	302.365	
152	363366.655	1453869.114			1460
			N64°37'12"E	171.559	
153	363440.189	1454024.115			1460
			N64°37'12"E	191.541	
154	363522.287	1454197.169			1460
			N70°36'29"E	140.602	
155	363568.971	1454329.795			1460
			N28°37'14"E	306.369	
156	363837.905	1454476.548			1460
			S46°09'10"E	181.635	
157	363712.080	1454607.541			1460
			S14°11'36"W	199.819	
158	363518.361	1454558.547			1460
			S25°25'21"W	91.851	
159	363435.404	1454519.116			1460
			S25°25'24"W	106.859	
160	363338.893	1454473.241			1460
			S23°08'19"W	384.948	
161	362984.911	1454321.973			1460
			S13°03'14"W	199.378	
162	362790.685	1454276.940			1460
			S69°47'15"W	127.991	
163	362746.464	1454156.831			1460
			S49°26'57"W	297.431	
164	362553.097	1453930.834			1460
			S28°46'36"W	201.876	
165	362376.152	1453833.652			1460
			S15°06'37"W	172.906	
166	362209.224	1453788.579			1460
			S12°24'18"E	144.508	
167	362068.090	1453819.622			1460
			S12°43'09"W	188.515	
168	361884.201	1453778.116			1460
			S6°56'31"E	133.151	
169	361752.026	1453794.209			1460
			S27°28'57"W	315.077	
170	361472.505	1453648.808			1460
			S22°28'27"W	126.312	
171	361355.786	1453600.523			1460
			S27°21'28"W	366.374	
172	361030.389	1453432.158			1460
			S81°29'42"W	221.091	
173	360997.690	1453213.498			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S35°39'55"W	101.576	
174	360915.166	1453154.274			1460
			N57°12'04"W	209.305	
175	361028.545	1452978.337			1460
			N21°27'53"W	111.063	
176	361131.905	1452937.696			1460
			S54°58'10"W	84.132	
177	361083.612	1452868.805			1460
			S10°53'14"E	87.427	
178	360997.759	1452885.318			1460
			S21°06'18"W	103.525	
179	360901.178	1452848.041			1460
			S8°56'37"W	142.818	
180	360760.096	1452825.838			1460
			S23°44'58"E	117.136	
181	360652.880	1452873.013			1460
			S10°52'34"W	92.270	
182	360562.267	1452855.603			1460
			S20°45'12"E	72.768	
183	360494.221	1452881.388			1460
			S11°07'01"E	296.862	
184	360202.929	1452938.627			1460
			S16°00'44"E	132.053	
185	360075.999	1452975.053			1460
			S7°12'14"E	192.579	
186	359884.940	1452999.203			1460
			S26°17'41"E	207.668	
187	359698.760	1453091.198			1460
			S47°26'17"E	220.630	
188	359549.529	1453253.702			1460
			S18°48'03"E	288.884	
189	359276.058	1453346.803			1460
			S37°58'36"E	76.693	
190	359215.604	1453393.995			1460
			S50°41'51"E	113.950	
191	359143.426	1453482.171			1460
			S51°33'41"E	95.835	
192	359083.848	1453557.236			1460
			S89°57'12"E	71.190	
193	359083.790	1453628.426			1460
			N82°59'10"E	187.137	
194	359106.641	1453814.163			1460
			N78°49'22"E	218.643	
195	359149.024	1454028.659			1460
			N40°42'48"E	75.925	
196	359206.574	1454078.183			1460
			N7°44'14"E	154.861	
197	359360.025	1454099.032			1460
			N38°59'15"E	186.906	
198	359505.304	1454216.624			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N65°40'09"E	154.943	
199	359569.141	1454357.805			1460
			S89°43'48"E	186.079	
200	359568.264	1454543.882			1460
			N72°18'55"E	190.913	
201	359626.259	1454725.773			1460
			S65°05'02"E	291.101	
202	359503.621	1454989.780			1460
			S25°20'16"E	106.351	
203	359407.501	1455035.293			1460
			S47°16'46"E	99.860	
204	359339.754	1455108.657			1460
			S47°16'48"E	81.705	
205	359284.324	1455168.684			1460
			N75°51'58"E	116.386	
206	359312.744	1455281.547			1460
			N77°33'16"E	210.994	
207	359358.216	1455487.583			1460
			S83°31'24"E	412.432	
208	359311.695	1455897.383			1460
			S60°37'58"E	175.325	
209	359225.715	1456050.178			1460
			S22°07'44"E	178.039	
210	359060.791	1456117.244			1460
			S18°01'13"E	399.128	
211	358681.241	1456240.716			1460
			S1°29'55"W	292.379	
212	358388.962	1456233.070			1460
			S17°30'44"E	281.173	
213	358120.821	1456317.678			1460
			S5°37'21"E	6.012	
214	358114.838	1456318.267			1460
			S5°30'28"E	183.245	
215	357932.439	1456335.855			1460
			S49°12'40"E	137.858	
216	357842.380	1456440.230			1460
			S39°17'39"E	188.414	
217	357696.565	1456559.553			1460
			S61°36'19"E	255.536	
218	357575.047	1456784.346			1460
			S78°01'34"E	244.878	
219	357524.243	1457023.896			1460
			N69°44'02"E	411.576	
220	357666.805	1457409.993			1460
			N69°44'01"E	108.846	
221	357704.508	1457512.101			1460
			S11°39'54"E	133.331	
222	357573.931	1457539.059			1460
			S4°20'16"W	183.419	
223	357391.037	1457525.186			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S24°43'04"W	169.344	
224	357237.208	1457454.375			1460
			S43°17'44"W	63.025	
225	357191.337	1457411.155			1460
			S43°17'46"W	86.131	
226	357128.649	1457352.089			1460
			S32°47'25"W	76.291	
227	357064.514	1457310.772			1460
			N88°01'17"W	206.208	
228	357071.634	1457104.687			1460
			S85°23'13"W	245.637	
229	357051.878	1456859.846			1460
			S84°56'19"W	282.119	
230	357026.988	1456578.827			1460
			N43°05'07"W	132.833	
231	357124.001	1456488.091			1460
			N58°43'56"W	603.957	
232	357437.478	1455971.858			1460
			N84°55'27"W	122.423	
233	357448.309	1455849.915			1460
			N72°01'35"W	81.227	
234	357473.374	1455772.652			1460
			N75°29'09"W	144.151	
235	357509.501	1455633.101			1460
			N43°25'30"W	207.166	
236	357659.960	1455490.694			1460
			S46°13'22"W	215.126	
237	357511.124	1455335.365			1460
			S88°44'33"W	139.027	
238	357508.073	1455196.371			1460
			N65°10'07"W	150.244	
239	357571.168	1455060.017			1460
			N43°00'37"W	193.561	
240	357712.706	1454927.983			1460
			N55°40'13"W	214.559	
241	357833.707	1454750.799			1460
			N55°45'20"W	317.611	
242	358012.435	1454488.248			1460
			N29°22'14"W	117.488	
243	358114.822	1454430.625			1460
			N29°22'11"W	116.480	
244	358216.331	1454373.498			1460
			S58°29'55"W	184.531	
245	358119.910	1454216.162			1460
			S58°29'57"W	292.587	
246	357967.030	1453966.693			1460
			N44°39'29"W	154.091	
247	358076.637	1453858.387			1460
			N37°26'59"W	66.261	
248	358129.241	1453818.096			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N37°26'54"W	273.668	
249	358346.506	1453651.693			1460
			N89°33'46"W	461.493	
250	358350.027	1453190.213			1460
			S3°02'00"W	206.027	
251	358144.289	1453179.311			1460
			S3°02'00"W	356.920	
252	357787.869	1453160.424			1460
			S45°47'56"W	232.019	
253	357626.110	1452994.090			1460
			S47°48'25"W	236.985	
254	357466.943	1452818.511			1460
			N53°19'57"W	153.851	
255	357558.818	1452695.105			1460
			S75°26'39"W	230.543	
256	357500.877	1452471.962			1460
			N73°17'43"W	329.870	
257	357595.694	1452156.013			1460
			S88°23'37"W	95.492	
258	357593.017	1452060.559			1460
			S88°23'34"W	221.810	
259	357586.796	1451838.836			1460
			N52°41'37"W	393.165	
260	357825.084	1451526.110			1460
			S85°42'41"W	56.672	
261	357820.846	1451469.597			1460
			S59°03'00"W	134.961	
262	357751.437	1451353.852			1460
			S10°23'23"E	162.001	
263	357592.092	1451383.068			1460
			S14°01'13"W	435.688	
264	357169.383	1451277.516			1460
			S44°40'02"W	372.675	
265	356904.336	1451015.530			1460
			S21°31'47"W	196.216	
266	356721.810	1450943.522			1460
			S75°26'36"W	198.765	
267	356671.853	1450751.137			1460
			S39°24'37"W	151.363	
268	356554.907	1450655.041			1460
			S58°33'13"W	107.589	
269	356498.778	1450563.254			1460
			S15°39'51"W	283.855	
270	356225.465	1450486.613			1460
			N4°22'04"E	88.199	
271	356313.408	1450493.330			1460
			N13°18'01"W	197.435	
272	356505.547	1450447.909			1460
			S77°59'33"W	154.990	
273	356473.303	1450296.310			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N87°28'48"W	211.584	
274	356482.606	1450084.931			1460
			S86°31'53"W	139.175	
275	356474.186	1449946.011			1460
			N86°35'46"W	184.409	
276	356485.135	1449761.927			1460
			N70°46'04"W	123.504	
277	356525.817	1449645.316			1460
			S48°24'52"W	117.608	
278	356447.756	1449557.349			1460
			S17°33'57"E	150.885	
279	356303.907	1449602.886			1460
			S32°27'13"E	67.260	
280	356247.151	1449638.979			1460
			S80°28'00"E	135.180	
281	356224.762	1449772.292			1460
			S80°16'01"W	184.989	
282	356193.488	1449589.966			1460
			N32°28'50"W	89.728	
283	356269.180	1449541.781			1460
			N20°09'16"W	105.120	
284	356367.863	1449505.562			1460
			N89°12'46"W	36.242	
285	356368.361	1449469.323			1460
			S72°00'58"W	87.200	
286	356341.438	1449386.383			1460
			S1°18'40"W	159.833	
287	356181.647	1449382.726			1460
			S1°18'41"W	389.597	
288	355792.152	1449373.810			1460
			S1°18'40"W	226.903	
289	355565.308	1449368.618			1460
			N89°30'02"W	534.448	
290	355569.968	1448834.190			1460
			N89°30'01"W	474.512	
291	355574.106	1448359.696			1460
			N89°30'01"W	574.408	
292	355579.115	1447785.310			1460
			N89°30'01"W	434.553	
293	355582.904	1447350.774			1460
			N89°30'01"W	374.613	
294	355586.171	1446976.175			1460
			N89°30'02"W	274.718	
295	355588.566	1446701.467			1460
			N83°22'14"W	366.222	
296	355630.845	1446337.694			1460
			S15°26'48"E	275.175	
297	355365.610	1446410.985			1460
			S15°47'57"W	157.216	
298	355214.333	1446368.180			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S17°44'03"E	167.827	
299	355054.481	1446419.300			1460
			S21°26'57"E	214.877	
300	354854.486	1446497.875			1460
			S15°11'18"W	170.952	
301	354689.505	1446453.087			1460
			N81°28'52"W	216.837	
302	354721.626	1446238.642			1460
			N3°09'36"E	89.128	
303	354810.618	1446243.555			1460
			N69°41'28"W	162.422	
304	354866.992	1446091.230			1460
			N50°18'46"W	106.031	
305	354934.703	1446009.635			1460
			N77°16'25"W	197.386	
306	354978.186	1445817.098			1460
			N15°09'10"W	280.129	
307	355248.576	1445743.874			1460
			N12°36'29"W	248.832	
308	355491.408	1445689.559			1460
			S48°49'27"W	264.387	
309	355317.343	1445490.557			1460
			N77°39'06"W	170.425	
310	355353.789	1445324.075			1460
			S57°01'49"W	206.816	
311	355241.240	1445150.565			1460
			N63°27'32"W	181.853	
312	355322.499	1444987.877			1460
			N81°34'34"W	83.135	
313	355334.678	1444905.639			1460
			S4°42'34"W	78.099	
314	355256.843	1444899.227			1460
			S20°10'39"E	124.580	
315	355139.909	1444942.198			1460
			S55°13'48"E	331.389	
316	354950.923	1445214.416			1460
			S67°58'34"W	155.979	
317	354892.432	1445069.819			1460
			S16°44'13"W	284.075	
318	354620.391	1444988.011			1460
			S26°44'24"E	270.119	
319	354379.159	1445109.549			1460
			N46°29'20"W	171.812	
320	354497.451	1444984.944			1460
			N69°01'48"W	121.505	
321	354540.935	1444871.486			1460
			S58°01'04"W	231.550	
322	354418.293	1444675.082			1460
			N42°43'54"E	234.489	
323	354590.534	1444834.198			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N2°38'21"E	177.865	
324	354768.210	1444842.388			1460
			N20°18'50"W	336.442	
325	355083.727	1444725.588			1460
			S75°58'44"W	164.910	
326	355043.773	1444565.591			1460
			S22°51'20"E	206.346	
327	354853.628	1444645.738			1460
			N50°26'47"W	195.228	
328	354977.949	1444495.212			1460
			S53°13'01"W	226.916	
329	354842.075	1444313.473			1460
			S42°14'49"W	124.572	
330	354749.860	1444229.720			1460
			S2°44'45"E	191.181	
331	354558.899	1444238.879			1460
			S35°06'51"E	134.501	
332	354448.876	1444316.245			1460
			S31°44'04"W	147.308	
333	354323.591	1444238.763			1460
			S9°26'53"W	133.221	
334	354192.177	1444216.894			1460
			N67°09'24"W	222.102	
335	354278.400	1444012.212			1460
			N65°09'28"W	134.512	
336	354334.911	1443890.147			1460
			N65°55'57"W	272.659	
337	354446.105	1443641.192			1460
			N59°15'09"W	298.842	
338	354598.890	1443384.359			1460
			S51°37'35"W	291.899	
339	354417.683	1443155.516			1460
			N85°30'11"W	193.001	
340	354432.815	1442963.109			1460
			S17°07'48"W	144.871	
341	354294.371	1442920.439			1460
			S25°08'54"W	280.099	
342	354040.823	1442801.407			1460
			S50°32'17"W	207.804	
343	353908.750	1442640.972			1460
			N59°02'23"W	158.106	
344	353990.087	1442505.392			1460
			S33°10'35"W	152.192	
345	353862.704	1442422.110			1460
			S49°11'57"W	239.472	
346	353706.225	1442240.833			1460
			S32°14'41"E	286.315	
347	353464.066	1442393.592			1460
			S82°53'35"W	220.704	
348	353436.760	1442174.584			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S27°13'30"W	289.900	
349	353178.976	1442041.959			1460
			S46°33'40"W	192.721	
350	353046.465	1441902.023			1460
			S27°53'59"W	68.954	
351	352985.526	1441869.758			1460
			S29°06'45"W	223.484	
352	352790.276	1441761.027			1460
			S6°22'02"E	170.070	
353	352621.255	1441779.888			1460
			S11°41'32"E	129.540	
354	352494.403	1441806.140			1460
			S36°57'55"E	141.592	
355	352381.271	1441891.284			1460
			S44°41'11"E	114.571	
356	352299.815	1441971.853			1460
			S18°17'28"E	117.928	
357	352187.845	1442008.864			1460
			S49°21'56"E	162.791	
358	352081.830	1442132.403			1460
			S21°38'00"E	79.514	
359	352007.917	1442161.717			1460
			S27°53'08"E	247.741	
360	351788.943	1442277.587			1460
			S33°49'00"E	257.977	
361	351574.610	1442421.161			1460
			S17°52'59"E	239.077	
362	351347.084	1442494.575			1460
			S24°58'25"W	120.966	
363	351237.428	1442443.503			1460
			S38°08'27"E	234.676	
364	351052.856	1442588.438			1460
			S53°14'27"E	117.025	
365	350982.822	1442682.194			1460
			S56°54'16"E	143.609	
366	350904.406	1442802.504			1460
			N80°11'23"E	169.358	
367	350933.262	1442969.386			1460
			S24°51'28"E	168.936	
368	350779.977	1443040.401			1460
			S33°50'29"E	186.425	
369	350625.136	1443144.220			1460
			S18°44'58"E	136.430	
370	350495.946	1443188.073			1460
			S42°20'23"E	307.680	
371	350268.520	1443395.304			1460
			S27°41'08"E	254.408	
372	350043.239	1443513.507			1460
			S28°10'06"E	228.237	
373	349842.033	1443621.249			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S32°14'47"E	197.675	
374	349674.847	1443726.721			1460
			S33°32'00"E	182.062	
375	349523.086	1443827.296			1460
			S47°03'24"E	168.315	
376	349408.417	1443950.507			1460
			S49°33'08"E	221.329	
377	349264.829	1444118.938			1460
			S25°23'51"E	248.040	
378	349040.761	1444225.321			1460
			S57°56'11"E	109.115	
379	348982.836	1444317.792			1460
			S37°48'19"E	194.346	
380	348829.283	1444436.922			1460
			S46°46'47"E	167.262	
381	348714.741	1444558.810			1460
			S61°02'33"E	72.778	
382	348679.505	1444622.489			1460
			S68°41'48"E	199.440	
383	348607.047	1444808.301			1460
			S43°06'01"E	127.465	
384	348513.977	1444895.395			1460
			S64°28'07"E	160.014	
385	348445.010	1445039.783			1460
			S41°04'48"E	212.074	
386	348285.150	1445179.139			1460
			S29°00'29"E	136.650	
387	348165.643	1445245.405			1460
			S28°11'45"E	187.717	
388	348000.201	1445334.099			1460
			S39°09'33"E	215.192	
389	347833.342	1445469.988			1460
			S25°42'34"E	114.359	
390	347730.304	1445519.598			1460
			S25°42'35"E	103.801	
391	347636.779	1445564.628			1460
			S53°18'51"E	384.811	
392	347406.882	1445873.217			1460
			S4°43'14"E	147.599	
393	347259.784	1445885.364			1460
			S8°41'06"E	170.421	
394	347091.317	1445911.098			1460
			S19°50'35"W	51.991	
395	347042.413	1445893.450			1460
			S22°23'05"E	141.481	
396	346911.593	1445947.329			1460
			S23°09'14"E	293.083	
397	346642.117	1446062.570			1460
			S50°27'26"W	135.355	
398	346555.943	1445958.191			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N42°41'43"W	309.968	
399	346783.761	1445748.002			1460
			N11°51'33"W	223.695	
400	347002.681	1445702.031			1460
			N88°59'54"W	312.657	
401	347008.147	1445389.422			1460
			N26°13'39"W	280.759	
402	347260.001	1445265.345			1460
			N5°22'29"W	248.161	
403	347507.071	1445242.100			1460
			N26°40'09"W	113.867	
404	347608.824	1445190.992			1460
			N39°11'56"W	63.723	
405	347658.207	1445150.718			1460
			N83°57'03"W	119.564	
406	347670.807	1445031.820			1460
			S79°16'37"W	258.540	
407	347622.703	1444777.795			1460
			N68°06'51"W	90.737	
408	347656.526	1444693.598			1460
			N59°18'21"W	164.104	
409	347740.294	1444552.484			1460
			N59°18'23"W	44.780	
410	347763.152	1444513.977			1460
			N59°04'07"W	68.135	
411	347798.174	1444455.532			1460
			N32°15'49"E	191.669	
412	347960.249	1444557.848			1460
			N11°37'24"W	90.736	
413	348049.124	1444539.567			1460
			S71°40'08"W	114.009	
414	348013.267	1444431.343			1460
			N19°32'48"W	79.665	
415	348088.341	1444404.689			1460
			N49°05'01"W	180.649	
416	348206.658	1444268.179			1460
			S76°06'12"W	184.941	
417	348162.240	1444088.651			1460
			N84°30'01"W	176.668	
418	348179.172	1443912.796			1460
			N34°50'14"W	188.280	
419	348333.708	1443805.242			1460
			N57°02'25"W	120.456	
420	348399.242	1443704.173			1460
			N62°12'32"W	199.541	
421	348492.278	1443527.649			1460
			N65°09'53"W	161.387	
422	348560.062	1443381.187			1460
			N50°50'31"W	206.206	
423	348690.273	1443221.293			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N3°37'55"E	306.569	
424	348996.226	1443240.713			1460
			N14°28'47"E	61.287	
425	349055.566	1443256.037			1460
			N26°18'48"W	88.750	
426	349135.120	1443216.696			1460
			N45°14'51"W	83.175	
427	349193.679	1443157.629			1460
			N66°13'22"W	194.517	
428	349272.105	1442979.623			1460
			N72°51'21"W	312.819	
429	349364.317	1442680.704			1460
			N26°35'32"W	293.643	
430	349626.897	1442549.259			1460
			N52°22'45"W	180.960	
431	349737.361	1442405.926			1460
			N42°08'24"W	162.500	
432	349857.856	1442296.898			1460
			N45°21'38"W	195.929	
433	349995.524	1442157.486			1460
			N39°42'54"W	99.329	
434	350071.931	1442094.018			1460
			N42°49'40"W	112.625	
435	350154.530	1442017.456			1460
			N47°50'23"W	152.073	
436	350256.602	1441904.729			1460
			N50°16'35"W	127.525	
437	350338.101	1441806.645			1460
			N53°42'16"W	136.640	
438	350418.985	1441696.517			1460
			N43°28'37"W	92.349	
439	350485.998	1441632.975			1460
			N44°33'56"W	21.909	
440	350501.607	1441617.601			1460
			N44°33'56"W	154.398	
441	350611.608	1441509.256			1460
			N51°28'35"W	213.458	
442	350744.558	1441342.257			15460
			N65°50'25"W	164.666	
443	350811.953	1441192.014			1460
			N44°12'23"W	90.826	
444	350877.060	1441128.686			1460
			N21°20'46"W	347.688	
445	351200.896	1441002.127			1460
			N15°58'55"W	213.919	
446	351406.547	1440943.228			1460
			N34°52'12"W	344.101	
447	351688.865	1440746.499			1460
			N26°22'20"W	320.676	
448	351976.167	1440604.054			160

Point	Northing	Easting	Bearing	Horiz Dist	Description
			N36°48'00"W	228.738	
449	352159.325	1440467.035			1460
			N36°51'59"W	180.749	
450	352303.931	1440358.594			1460
			N49°22'47"W	209.527	
451	352440.342	1440199.555			1460
			N45°46'34"E	226.552	
452	352598.354	1440361.907			1460
			N12°41'23"E	336.661	
453	352926.792	1440435.861			1460
			S77°27'17"W	271.425	
454	352867.836	1440170.916			1460
			S87°19'23"W	196.001	
455	352858.682	1439975.129			1460
			N81°00'35"W	291.891	
456	352904.295	1439686.824			1460
			N45°43'56"W	116.756	
457	352985.792	1439603.217			1460
			N45°44'00"W	152.062	
458	353091.931	1439494.326			1460
			N45°43'59"W	623.216	
459	353526.938	1439048.044			1460
			S80°21'15"W	286.186	
460	353478.985	1438765.904			1460
			N51°21'39"W	222.602	
461	353617.981	1438592.031			1460
			N66°34'58"W	314.340	
462	353742.907	1438303.581			1460
			N59°53'07"W	400.424	
463	353943.813	1437957.205			1460
			N49°40'57"W	375.406	
464	354186.710	1437670.969			1460
			N61°23'01"W	231.246	
465	354297.464	1437467.971			1460
			N73°09'46"W	243.159	
466	354367.896	1437235.236			1460
			N64°22'07"W	275.686	
467	354487.152	1436986.679			1460
			N53°59'35"W	494.379	
468	354777.790	1436586.754			1460
			N78°10'05"W	297.415	
469	354838.772	1436295.658			1460
			N56°44'22"W	341.853	
470	355026.260	1436009.805			1460
			N54°59'23"W	264.993	
471	355178.293	1435792.763			1460
			N53°37'56"W	284.961	
472	355347.265	1435563.305			1460
			N62°39'04"W	215.339	
473	355446.193	1435372.036			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S41°59'22"W	155.745	
474	355330.433	1435267.844			1460
			N27°07'52"W	506.195	
475	355780.929	1435037.004			1460
			S67°47'55"W	318.432	
476	355660.605	1434742.180			1460
			N46°30'19"W	273.269	
477	355848.693	1434543.940			1460
			N85°56'44"W	627.532	
478	355893.061	1433917.978			1460
			S87°33'47"W	257.534	
479	355882.110	1433660.678			1460
			N75°49'08"W	251.240	
480	355943.661	1433417.094			1460
			N84°01'10"W	287.310	
481	355973.597	1433131.347			1460
			S88°56'24"W	1440.667	
482	355946.944	1431690.926			1460
			N66°38'36"W	857.580	
483	356286.935	1430903.621			1460
			N38°41'54"W	110.373	
484	356373.075	1430834.614			1460
			N52°05'44"E	353.298	
485	356590.123	1431113.379			1460
			N23°00'01"W	50.710	
486	356636.801	1431093.565			1460
			N2°30'31"E	48.739	
487	356685.493	1431095.698			1460
			N18°38'25"E	50.302	
488	356733.157	1431111.776			1460
			N34°33'50"E	49.386	
489	356773.825	1431139.793			1460
			N63°29'07"W	61.913	
490	356801.465	1431084.392			1460
			N19°56'10"W	87.299	
491	356883.532	1431054.626			1460
			N17°11'47"W	77.469	
492	356957.538	1431031.723			1460
			N28°02'13"W	22.736	
493	356977.606	1431021.036			1460
			N18°43'21"E	74.323	
494	357047.996	1431044.892			1460
			N15°36'01"E	35.025	
495	357081.730	1431054.311			1460
			N26°57'41"E	67.700	
496	357142.072	1431085.006			1460
			S86°02'50"E	35.912	
497	357139.597	1431120.832			1460
			N80°57'15"E	105.114	
498	357156.123	1431224.639			1460

Point	Northing	Easting	Bearing	Horiz Dist	Description
			S11°19'18"E	28.522	
499	357128.156	1431230.238			1460
			S64°12'36"E	16.482	
500	357120.985	1431245.079			1460
			S36°18'36"E	105.921	
1504	357035.632	1431307.800			1460
			N35°22'32"E	263.443	
1	357250.436	1431460.316			1460

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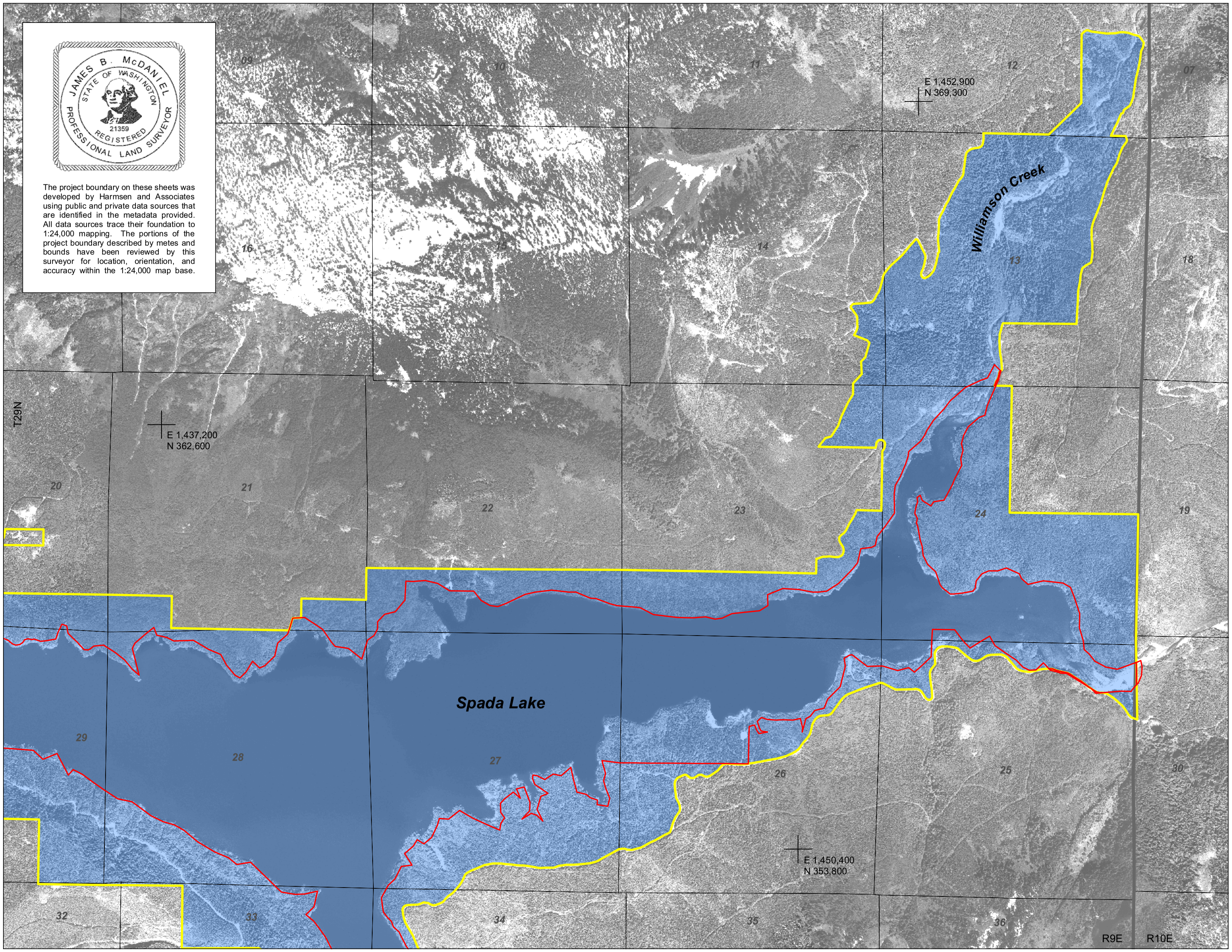


SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1

LEGEND

- Existing Project Boundary
- Proposed Project Boundary
- District Land Ownership
- Federal Land Ownership
- Section Lines
- GIS Reference Points *

* Washington State Plane, North Zone, NAD 83, US Survey Feet.

GIS Map Composition by R2 Resource Consultants, Inc.

MAP KEY

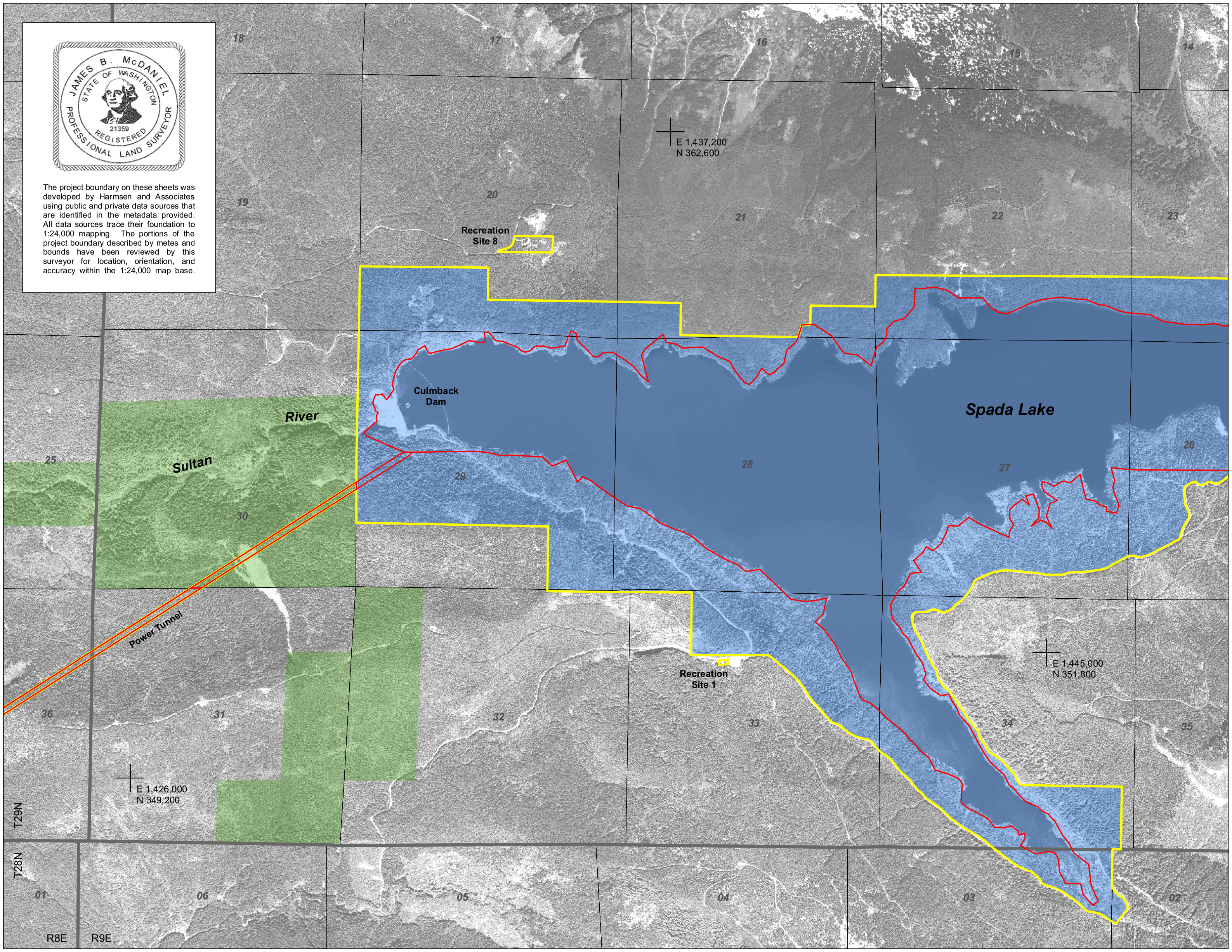
1 2 3 4 5

Scale 1:24,000

0 1,000
Feet

SNOHOMISH COUNTY PUD NO. 1
APPLICATION FOR NEW LICENSE - EXHIBIT G
HENRY M. JACKSON PROJECT, FERC NO. 2157

Figure G-1
Existing and Proposed Project Boundaries



SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT No. 1

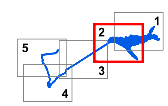
LEGEND

- Existing Project Boundary
- Proposed Project Boundary
- District Land Ownership
- Federal Land Ownership
- Section Lines
- GIS Reference Points *

* Washington State Plane, North Zone, NAD 83, US Survey Feet.

GIS Map Composition by R2 Resource Consultants, Inc.

MAP KEY

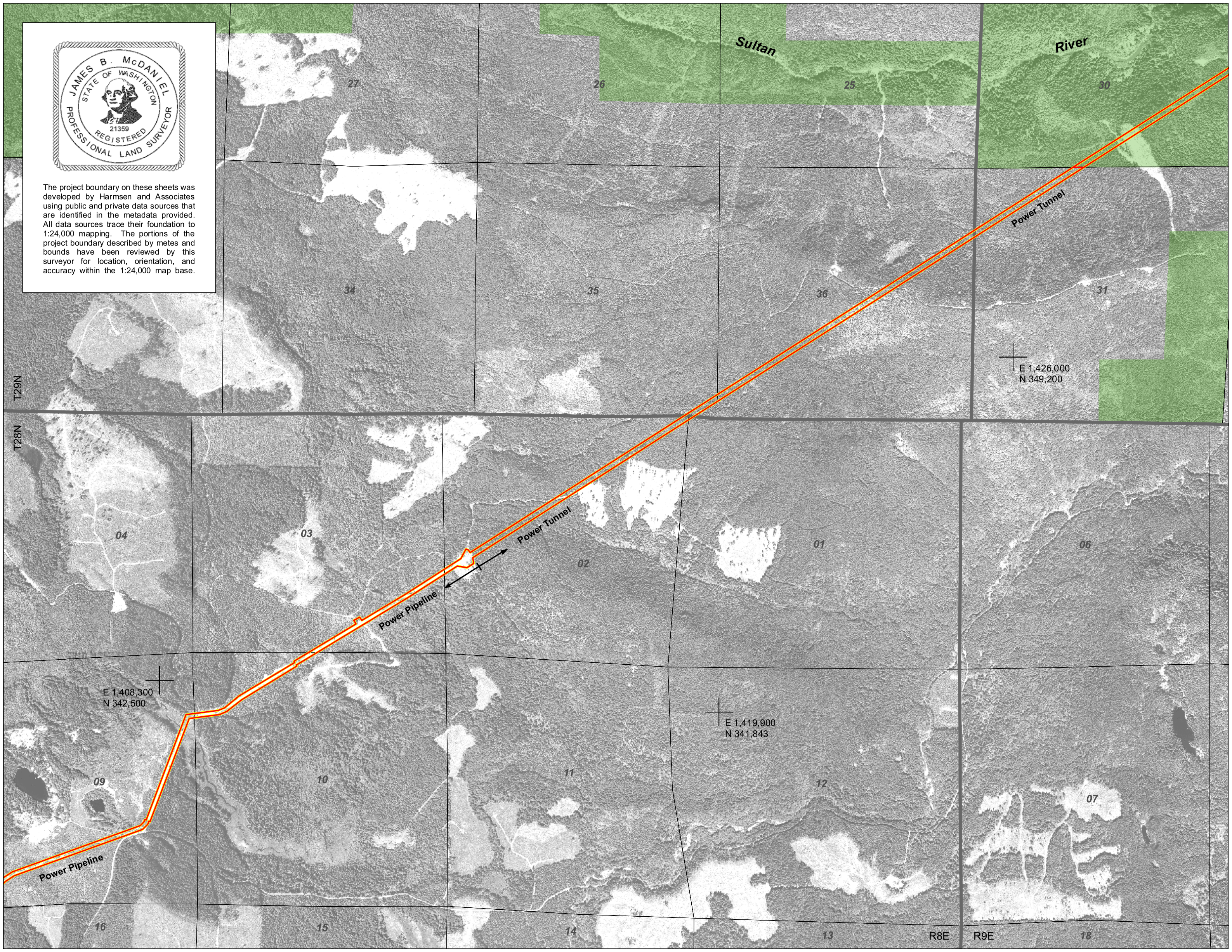


Scale 1:24,000

0 1,000
Feet

SNOHOMISH COUNTY PUD NO. 1
APPLICATION FOR NEW LICENSE - EXHIBIT G
HENRY M. JACKSON PROJECT, FERC NO. 2157

Figure G-2
Existing and Proposed
Project Boundaries



SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT No. 1

LEGEND

- Existing Project Boundary
- Proposed Project Boundary
- District Land Ownership
- Federal Land Ownership
- Section Lines
- GIS Reference Points *

* Washington State Plane, North Zone, NAD 83, US Survey Feet.

GIS Map Composition by R2 Resource Consultants, Inc.

MAP KEY

1 2 3 4 5

Scale 1:24,000

0 1,000

Feet

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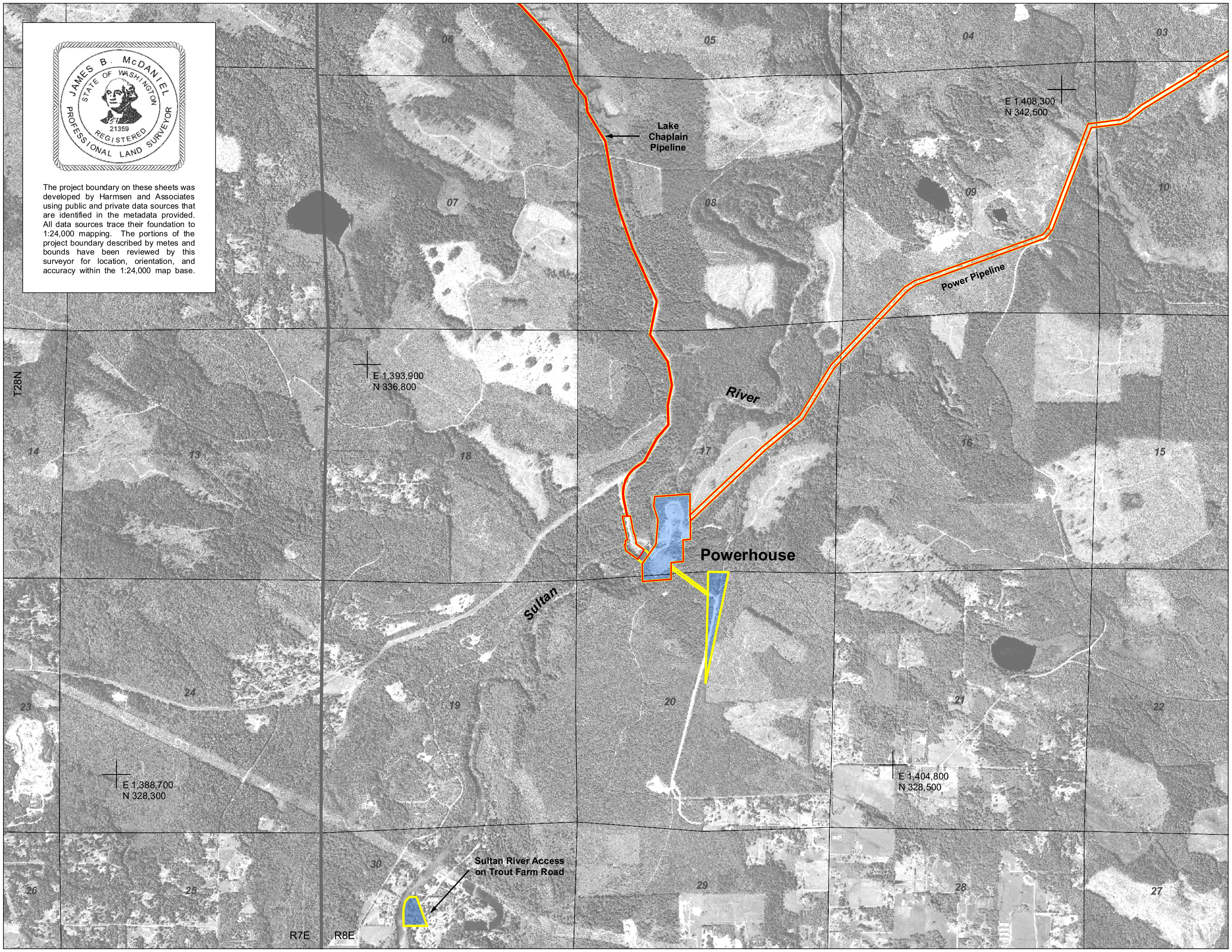
SNOHOMISH COUNTY PUD NO. 1
APPLICATION FOR NEW LICENSE - EXHIBIT G
HENRY M. JACKSON PROJECT, FERC NO. 2157

Figure G-3
Existing and Proposed
Project Boundaries



The project boundary on these sheets was developed by Harmsen and Associates using public and private data sources that are identified in the metadata provided. All data sources trace their foundation to 1:24,000 mapping. The portions of the project boundary described by metes and bounds have been reviewed by this surveyor for location, orientation, and accuracy within the 1:24,000 map base.

SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1

LEGEND

- Existing Project Boundary
- Proposed Project Boundary
- District Land Ownership
- Federal Land Ownership
- Section Lines
- GIS Reference Points *

* Washington State Plane, North Zone, NAD 83, US Survey Feet.

GIS Map Composition by R2 Resource Consultants, Inc.

MAP KEY

1 2 3 4 5

N

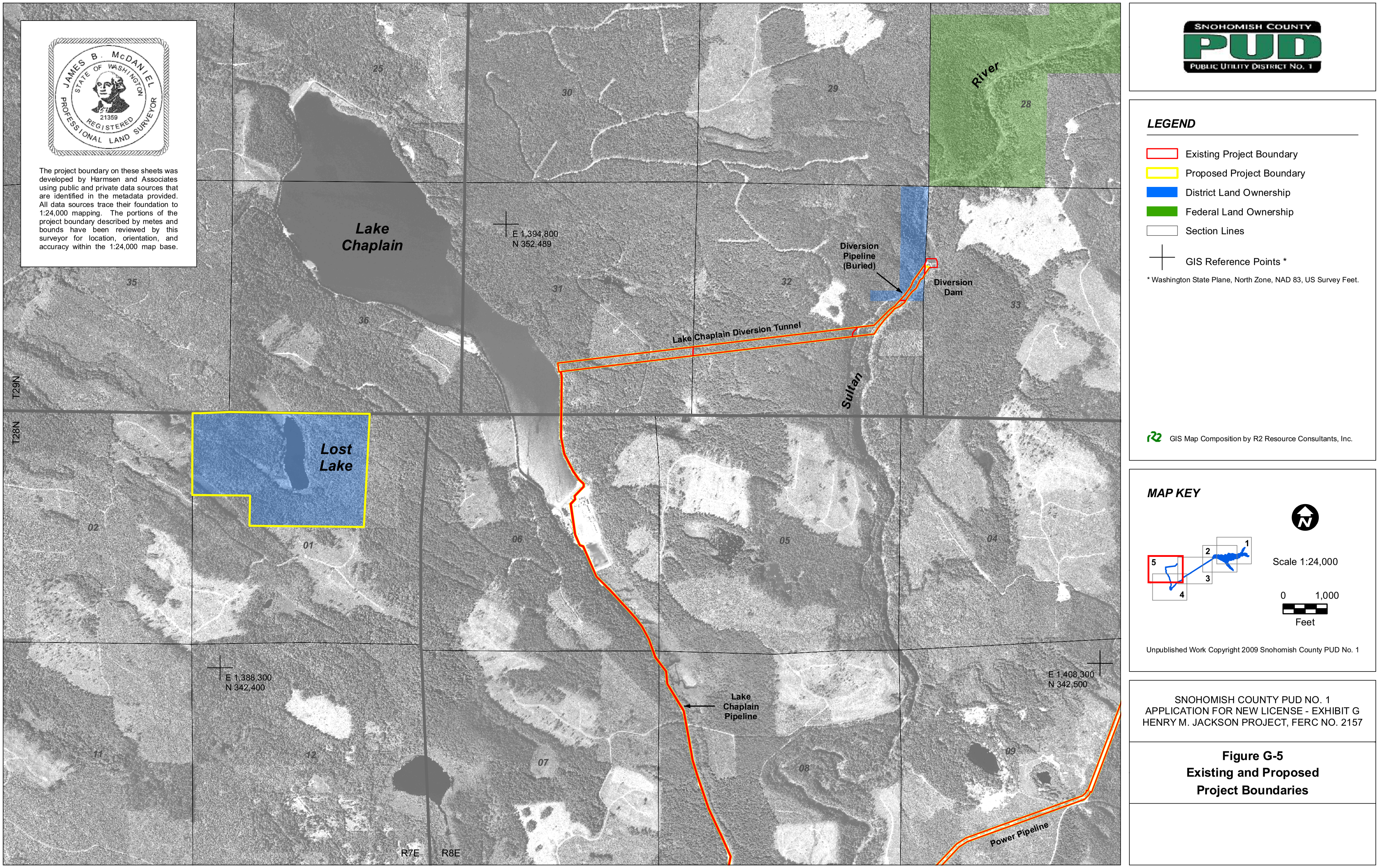
Scale 1:24,000

0 1,000

Feet

SNOHOMISH COUNTY PUD NO. 1
APPLICATION FOR NEW LICENSE - EXHIBIT G
HENRY M. JACKSON PROJECT, FERC NO. 2157

Figure G-4
Existing and Proposed Project Boundaries



SNOHOMISH COUNTY PUD NO. 1
APPLICATION FOR NEW LICENSE - EXHIBIT G
HENRY M. JACKSON PROJECT, FERC NO. 2157

Figure G-5
Existing and Proposed Project Boundaries

Exhibit H – General (Supplemental) Information

H.1 EFFICIENCY AND RELIABILITY

The District has furnished electric and water service within Snohomish County, Washington since its creation over 70 years ago. Since the development of the 111.8 MW generation facilities for the Jackson Hydroelectric Project in the early 1980s, the District continually modifies and upgrades the plant control systems and equipment to provide reliable and efficient electricity and water supply for the citizens of Snohomish County.

The Jackson Hydroelectric Project was designed and is operated to accommodate and assure the continued viability of the City of Everett's municipal water supply. The Jackson Project diverts water from its reservoir, Spada Lake, through the Project facilities to the City of Everett's water supply reservoir, Lake Chaplain. Through an agreement between the City of Everett and the District, and existing and applied for water rights, the District is unable to increase its water withdrawal, thereby limiting its ability to increase Project capacity.

The Supervisory Control and Data Acquisition computer control system for remote generation control has been upgraded twice since its initial installation in 1983. In addition, automation of the Portal 2 sluice gate at Lake Chaplain represents a significant automation upgrade to improve efficiency of operation and reliability of compliance and service.

Although no additional District upstream or downstream water resource projects are located on the Sultan River, the District also owns the Woods Creek Project (FERC No. P-3602) (650 KW) and is preparing for construction of the Youngs Creek Project (FERC No. P-10359) (7.5 MW), both of these hydro projects are located geographically close to the Jackson Project and reside within the Snohomish River basin. The power output from these projects will be interconnected to the District's 115 kV transmission system which serves the Jackson Project.

H.1.1 Plans for Increased Capacity or Generation

The Jackson Project's major equipment has been in operation for 25 years. No rewinds or turbine refurbishments have been required to date. At this time, no major upgrades are planned, although it is likely that new generators or turbines will be installed during the term of the new license. If new equipment is installed or major modifications make to the generating equipment the District will design said improvement to optimize efficiencies which may increase electrical output but will not change the nameplate capacity of the Project.

As a result of the relicensing process studies and development of protection, mitigation, and enhancement measures the following items will impact the generation capacity and annual production of the Jackson Project:

1) Whitewater releases from Culmback Dam will decrease annual generation by 286 MWh per year.

2) Process flow releases from Culmback Dam will decrease annual generation by 393 MWh per year.

3) Instream flows proposed below the Powerhouse and Diversion Dam will increase average generation by 5334 MWhs per year at the beginning of the new license over the current scenario. Because of the projected increases in the City of Everett water demand, Project generation under the proposed scenario will be approximately the same at the end of 30 years as the current scenario. (See Exhibit D, Table D.9-1)

H.1.2 Project Coordination with Other Electric Systems

The District operates, tests and maintains the Jackson Project in accordance with operating guidelines established by both the Western Electricity Coordinating Council (WECC) and the North American Electric Reliability Council (NERC). Because the Project resides within the Bonneville Power Administration (BPA) Balancing Authority, its operations must be coordinated and comply with BPA's requirements for reliability. The District is required under NERC standards to maintain a 5 percent operating reserve requirement for the amount of online generation the Project produces each hour.

Further, the Project is operated within the established constraints of maintaining the:

1) District's obligations to provide the water supply to the City of Everett;
2) Project's license requirements for aquatic habitat minimum instream flow on the Sultan River; and
3) Down ramping rate constraints on the two Pelton generating units.

The District coordinates the Project's generation output with BPA on an hourly basis. The available generation is based on the current Spada Lake reservoir elevation and rule curves.

H.1.3 Flood Control Coordination with Upstream or Downstream Projects

There are no District-owned water resource developments upstream or downstream of the Jackson Project on the Sultan River.

The Corp of Engineers considers flood control benefits from the Jackson Project to be incidental to Project operations. Spada Lake is drafted in the fall of the year to insure that most hydrologic conditions occurring in the late fall and winter will not cause spill at Spada Lake. This is the result of the process prescribed by Article 57 of the current license where the Licensees developed a flood control plan with the Corps of Engineers in consultation with the resource agencies.

H.2 APPLICANT'S NEED FOR THE PROJECT

The District serves over 320,000 retail customer accounts within Snohomish County, including residential, commercial, and industrial customers. Their load requirements amount to more than 6.9 million MWhs annually.

The Snohomish County economy continues to grow, despite the current recession. This continued growth has a direct bearing on the electrical demand which is projected to increase at a rate of approximately two percent annually.

The Jackson Hydroelectric Project has historically produced, on average, 412,091 MWhs of energy each year during the period of the current operating plan (1990-2008). All of the power produced by the Project is taken into the District's electric system for consumption by the utility's customers.

Based on current accounting methods, the average historical annual cost of power produced by the Project has been approximately $31.9 million, or approximately $82.1 per MWh, for the period 2003 to 2008 (average generation for this period was approximately 388,400 MWh). (See Exhibit E Section 7.1)

Based on the District's computer model to simulate operations, the 2008 estimated annual output of the Project under critical water conditions is 28.4 aMW (84 mgd and 1941 critical water conditions). This figure represents minimum annual generation projected under current license operating plan.

Repayment of the revenue bonds sold to finance the Project is guaranteed by an agreement between the Electric Utility and the Generation Utility within the District. Based on an average annual consumption of 12,000 kWh's per household, the average power production from the Jackson Project is enough to satisfy the needs of approximately 35,000 homes in Snohomish County.

H.2.1 Costs and Availability of Alternate Sources of Power if License Not Granted

In 2008, over 88 percent of the District's long-term power supply is purchased from BPA, with 4 percent provided from long-term power supply contracts, 2 percent from the District's co-generation Project, and 6 percent from the Jackson Project, depending on annual hydrologic conditions. The District purchases and sells power in the short-term energy markets to balance the seasonal and daily variations in its customer loads and the District's owned and contracted resources. The one exception is that all of the power produced by the Jackson Project enters the District's electric system, and is consumed by the utility's customers.

The District has also engaged in progressive conservation efforts to encourage its customers to be as efficient as possible with their electric consumption (see Section H.11.2 for information on the District's conservation program features, costs and results).

If load growth can not be met through cost-effective conservation then new resource acquisition(s), wholesale market purchases, or power supply contract(s) must be sought.

The District's current power supply contract with BPA expires September 30, 2011. In December 2008, the District executed a new long-term power supply contract with BPA that spans October 1, 2011 through September 30, 2028. This new contract allocates a set portion of BPA's Federal hydroelectric power to the utility at a "Tier 1" or cost-based rate. Any load growth the utility incurs over and above this initial allocation must be met by the utility providing either new generating resources, wholesale market purchases, third-party power supply contracts, or through acquisition of BPA-offered generating resources at a "Tier 2" or to be determined market rate. In accordance with the provisions of the new 2012-2028 BPA power supply contract, the utility is also required to provide advance notice of any new resource, including megawatt-hour quantity at the hourly level, which it intends to use to serve its load growth.

If a new license is not granted for the Jackson Project, the District would purchase an equivalent amount of replacement power from the wholesale power market. The estimated cost to the District for 30-year replacement power, in 2011 dollars, without inflation, would be approximately $ 562,584,480 under average water conditions (47 aMW).

H.2.2 Replacement Costs and Increased Costs if License Not Granted

The current estimate of the 30-year annual cost of owning and operating the Jackson Hydroelectric Project, starting in 2011, is $14,772,097, in 2011 dollars, without inflation. and approximately $20,646,747, using an inflation factor of 2.66 percent. This is based the current operating regulations.

If the District is not granted a new license for the Jackson Hydroelectric Project, it would purchase replacement power in the wholesale power market. The 30-year annual average cost for replacement power, in 2011 dollars, without inflation, would be approximately $18,752,816 under average water conditions. Relying on the wholesale power market to replace the Project's generation exposes the District to increased financial and supply risk.

H.2.3 Effects of Alternative Sources of Power

H.2.3.1 Effects on Customers

The District service territory covers all of Snohomish County and portions of Island County in western Washington State. As a Public Utility formed under the laws of the State of Washington, the District's ratepayers elect a board of three commissioners who hire the General Manager who has the authority to hire staff to implement the policies approved by the board. The District's commissioners set customer rates for the cost of services.

The annual costs of operations, debt service, and capital improvements are passed from the generation system to the District's electric system, which is the sole recipient and distributor of the Project generation. These costs are then incorporated in the electric system's total cost for power acquisition, operation, maintenance, and capital improvements. The rate schedules for the District's industrial, commercial, and residential customers are designed to recover these costs without profit.

Any viable new generating resource equal in output and comparable in operating characteristics to the Jackson Project would likely be substantially more expensive than continued operation of the existing Project. Therefore, under current laws and regulations, replacing the Project with a different generating resource would likely increase the retail power costs in our service territory.

H.2.3.2 Effects on Operating and Load Characteristics

The Jackson Project is a reliable, baseload generation resource within the District's power portfolio. Although the Project is relatively small in comparison to the load it serves, the Project can, under most circumstances, be quickly brought online to help meet peak loads. If a new license is not granted for the Project, the District would be required to replace the lost production through a combination of wholesale market energy and capacity purchases.

Load frequency stability for the District's electric system is controlled by the BPA Balancing Authority. Because the Project is a small contributor to the District's overall power supply portfolio, there would be minimal impact to the region's overall load characteristics. However, the loss of any base load generation, such as the Jackson Project, sited within the Puget Sound Region would likely increase the number of transmission curtailments the District and other Puget Sound utilities could expect under certain system conditions. This would likely reduce energy deliveries need by the utilities from other resource providers in the region.

H.2.3.3 Effects on Communities Served

The Jackson Project is part of the District power supply system. The actual power is absorbed into the 115 kV transmission system that loops out of the BPA Snohomish Substation. This loop runs through the Lake Chaplain substation and the Sultan Substation, among others, where power is disbursed for local community power requirements. The loss of the Jackson Project generating resource would create up to 100 MW of additional load on the transmission lines out of BPA Snohomish Substation. BPA's network transmission system assumes operation of the Jackson Project for voltage stability during certain periods of the year. Loss of this 100 MW Project could place more pressure on BPA to provide transmission system reinforcements for the purpose of voltage stability during the winter months.

If the license were transferred to a different licensee, the Project's operating costs and power benefits would be transferred to the new license. This would result in a reallocation of the Project's net benefits from the Snohomish customers to the customers of the new license.

H.3 DATA ON COST, NEED, AND AVAILABILITY OF ALTERNATIVES

H.3.1 Cost of Project Power

The power production costs of the Jackson Project consist of bond principal and interest, taxes, depreciation, and operations and maintenance (O&M) expenses.

H.3.1.1 Current License Conditions

Under the current license, over a 30-year analysis period (2011-2041), the current annual O&M expenses, including FERC fees, are $4,680,127 in 2011$ and $7,146,988 with inflation

The annual average cost over the 30-year analysis period, adjusted to include interest, principal, O&M expenses (including FERC fees), depreciation, excise tax, property tax, and insurance, are $14,772,097 in 2011$ and $20,646,747 with inflation. Based on average annual generation of 406,600 MWhs over the 30 year period, the production cost for current license conditions is $36.3 per MWh in 2011$ and $50.8 with inflation.

H.3.1.2 Proposed License Conditions

The estimated cost of power incorporates the protection, mitigation and enhancement (PM&E) measures, as described in the District's environmental assessment made a part of this application for new license. With these measures included, over the same 30-year analysis period (2011-2041), the annual average O&M expenses (including FERC fees) are $5,667,188 in 2011$ and $8,395,970 with inflation.

The annual average cost over the 30-year analysis period, adjusted to include interest, principal, O&M expenses (including FERC fees), depreciation, excise tax, property tax, and insurance, are $15,838,977 in 2011$ and $22,590,990 with inflation. The average annual generation is 408,054 MWhs, and the power production cost is $38.8 per MWh in 2011$ and $55.4 per MWh with inflation. The actual cost of power from the Project would depend on the ultimate terms of the new license.

H.3.2 Resource Requirements

H.3.2.1 Capacity and Energy Requirements over the Short and Long Term

Each year, the District develops a 5 year forecast of customers, energy sales, and peak demands for its electric service territory. The District uses this forecast in short-term planning activities, as well as in various long-term planning activities such as development of its Integrated Resource Plan (IRP). The following summarize key assumptions and results from the power planning forecast:

- Annual real gross domestic product is anticipated to grow at 2 percent over the forecast period (compared to an average of 3 percent between 1970 and 2007);
- Employment growth in the District's service territory is anticipated to grow at an annual rate of 2 percent over the period (compared to 30 year historical employment growth of 3 percent per year);
- Electric rates (in nominal dollars) are anticipated to grow between 0 and 2.5 percent per year over the next 20 years, resulting in declining real electric rates.
- Electric conservation savings are assumed to grow by 7 plus aMW per year (just under 1 percent of total billed sales) for the next 10 years;
- The District anticipates the number of electric customers to grow at an average annual rate of 2 percent per year, to 415,000 thousand customers in 2020.
- The District's electric sales are forecasted to grow at an average annual rate of 1.4 percent per year in the base case projection, from 6.9 million MWhs in 2008 to 8.5 million MWhs in 2020.

To determine the amount of power that needs to be generated to supply the forecasted electric sales, the sales forecast is increased to account for transmission and distribution losses (6.4 percent).

The District forecasts peak load, which is defined as the highest hourly load expected to occur during the winter months (November through February) at normal temperatures. Based on historical data, there is a 50 percent probability of experiencing a minimum hourly temperature during the winter months that is below normal. The expected peak load for the year is expected to occur in December of each year given the District's customer historic load profiles.

H.3.2.2 Existing Energy and Capacity Resources

The District's Integrated Resources Plan (IRP) forecasts customer demand and examines how existing and future resources can serve that load.

In 2008, 88 percent of the District's long-term power supply is purchased from BPA, with 4 percent provided from long-term power supply contracts, 2 percent from the

District's co-generation Project, and 6 percent from the Jackson Project, depending on hydrologic conditions. The District purchases and sells power in the short-term energy markets to balance the seasonal and daily variations in its customer loads and the District's owned and contracted resources. The one exception is that all of the power produced by the Jackson Project enters the District's electric system, and is consumed by the utility's customers.

The District has also engaged in progressive conservation efforts to encourage its customers to be as efficient as possible with their electric consumption (see Section H.11.2 for information on the District's conservation program features, costs and results). Load growth that cannot be met through cost-effective conservation will need to be met through the wholesale power market, new resource acquisition(s) or power supply contract(s).

H.3.2.2.1 Conservation and Efficiency

The District has been actively engaged in energy efficiency for over two decades. Since 1980, the District's programs have cumulatively acquired over 788,400 MWh (accounts for degradation of savings as measures installed reach the end of their life). The District offers educational services, rebates, customer incentives and technical assistance to residential, commercial and industrial customers. More recently, the District has sponsored or installed conservation measures with annual incremental energy savings averaging 45,000 MWh from 2004 to 2006, and over 56,000 MWh in 2007 and 2008.

The District plans to pursue all energy efficiency measures that are both cost-effective and achievable. Energy efficiency programs are anticipated to reduce loads by approximately 788,400 MWh per year by the year 2020. The District expects to meet this target by augmenting its current program portfolio with new technologies, new program designs and enhanced marketing methods.

Programs currently available to District customers include incentives and technical assistance to encourage home weatherization, adoption of high-efficiency heating and lighting technologies, and efficiency improvements in commercial production processes. Residential customers can obtain loans, upfront cash incentives or rebates for weatherization (new floor, wall ceiling and duct insulation, high-efficiency heat pumps, and insulated windows); rebates for efficient appliances (clothes washers, dishwashers, and refrigerators); coupons for compact fluorescent lighting; and cash incentives for eliminating inefficient second refrigerators or freezers. The District also offers a program for residential builders to encourage the inclusion of ENERGY STAR® appliances (clothes washers, refrigerators and dishwashers, and efficient lighting) in newly built homes.

Commercial and industrial customers are offered technical assistance, incentives and rebates for lighting controls and fixtures, heating, ventilating, and air conditioning equipment, compressed air systems, motors, pumps and fans, refrigeration, heat recovery systems, and controls and variable frequency drives. The District's Executive Account Managers work closely with District Energy Engineers to identify custom efficiency solutions for large commercial and industrial customers. In addition, the District introduced standard rebates for a number of energy efficient technologies such as lighting and commercial cooking equipment. The standard rebates make it easier for small to medium sized businesses to pursue efficiency improvements. The District offers incentives for new construction projects, which enables District staff to influence adoption of efficiency measures in the early design and building phase.

Other energy efficiency programs include online power monitoring tools, weatherization and energy efficiency improvements for low-income consumers and in multiple-unit housing. The District has also made significant improvements in distribution efficiency and is pursuing efficiency opportunities within its own facilities. The District is actively involved in regional conservation and efficiency efforts, working with the Northwest Power and Conservation Council, the Northwest Energy Efficiency Alliance, Bonneville, the Consortium for Energy Efficiency, and the Electric Power Research Institute (the "EPRI") and other groups dedicated to the reduction of energy use within the region.

Average annual spending on conservation programs through 2020 is projected at $20.3 million per year to achieve projected average annual savings of 65,000 MWh.

H.3.2.2.2 Bonneville Power Administration Contracts

In 2001, the District entered into a long-term power sales agreement with Bonneville, purchasing a product called “Block-Slice.” The Block-Slice product is a combination of two energy products: the Block component provides a set amount of energy delivered in a flat block over all hours in a given month, with the energy amount varying each month based on the District’s loads; the Slice component represents a “slice” or percentage of the actual output of the Federal System. The contract term ends September 30, 2011, at which time a new long-term power sales agreement becomes effective for the period October 1, 2011 through September 30, 2028.

Under the current Block-Slice power supply contract with BPA, the District receives Block power in flat monthly amounts that average 353 aMW over a contract year. The amount of energy the District receives from the Block product is based on the District’s typical monthly load shape. In January, for example, the Block product provides the District 449 aMW, while in June, the total Block amount is 287 aMW.

The Slice product is delivered in variable amounts that reflect the actual output of the Federal System. It provides the District with the ability to follow its customer loads by storing and dispatching energy within the contractual constraints and physical limits of the Federal System.

Under the Slice product, the District takes responsibility for managing its portion of the Federal System, and assumes the inherent risks. If snowpack and water conditions are above average in the region, the energy output is also above average. If snowpack and water conditions are low, the District’s energy supply is correspondingly reduced. As a purchaser of the Slice product, the District has an obligation to pay its pro-rata share of Bonneville’s actual operating costs. The District’s share of the Slice of the Federal System is 4.9929 percent. Under critical water conditions, this represents 353 aMW.

H.3.2.2.3 District-Owned Power Supply

The District relies on three District-owned generation projects: the Jackson Hydroelectric Project, the Cogeneration Project, and a small hydroelectric project on Woods Creek in Snohomish County.

The Jackson Hydroelectric Project is located on the Sultan River, north of the City of Sultan and is owned and operated by the District. The City of Everett is currently a co-licensee of the Project, which expires in 2011, at which time the District will become the sole licensee. The City receives its water supply from Lake Chaplain, which the Project feeds. The District receives all of the generation output from the plant.

The Everett Co-Generation Project is located at Kimberly-Clark Corporation's Everett pulp and paper facility, is owned by the District and operated under contract with Kimberly-Clark. The project was first commissioned in December of 1996. It has a 52 MW nameplate capacity rating and produces 30-35 aMW per year. For the first 10 years of the project, the output was sold to the Sacramento Municipal Utility District. Since October 1, 2007, the generation has been used to serve District loads. The operating contract with Kimberly Clark expires in 2017.

The Woods Creek Hydroelectric Project (FERC License No. 3602) was acquired by the District in 2008. It is a small hydroelectric project in Snohomish County with a nameplate capacity of 0.65 MW.

Youngs Creek Hydroelectric Project (FERC License No. P-10359) was purchased as partially constructed by the District in late 2008. This 7.5 MW nameplate hydroelectric project will be constructed, owned and operated by the District. It is located east of the City of Sultan in Snohomish County, Washington, and has an estimated construction completion date of December 2011.

H.3.2.2.4 Long-Term Third-Party Power Purchase Contracts

The District currently has a number of long-term contracts for power supply. All but one of these contracts is tied to the output of specific generating plants.

Morgan Stanley Contract: In 2001, the District entered into a long-term power supply contract with Morgan Stanley Capital Group, Inc. for a 25 MW block of power. The Morgan Stanley Contract expires on December 31, 2009.

Klickitat County PUD Landfill Gas Contract: In 1998, the District executed a contract with Klickitat County PUD for 2.5 aMW of energy from the Klickitat County landfill gas project. In 1999, the contracted amount increased to 5 aMW. Though the 5 aMW contract term will end May 31, 2009, the District was able to secure a second power purchase agreement for 2 aMW agreements through October 1, 2015. The output of the resource comes as a flat block of energy.

Hampton Lumber Mill Co-Generation Contract: In 2006, the District executed a contract with Hampton Lumber Mills-Washington, Inc. for the electrical output of a cogeneration project located at Hampton's Lumber Mill in Darrington, Washington. The project utilizes wood waste and has a nameplate capacity of 7 MW. It is producing approximately 1 to 2 aMW of energy on a continuous basis. The project began commercial operation on November 1, 2006. The District has contracted for electrical output for a term of ten years.

White Creek Wind Contract: Beginning in January 2008, the District executed a 20-year power purchase contract with LL&P Wind, a wholly owned subsidiary of Lakeview Light & Power, Tacoma, Washington, for the output of approximately 10 percent, or 20 MW of the White Creek Wind Project. The project is located in south-central Washington along the Columbia River Gorge.

Packwood Hydroelectric Project Contract: The Energy Northwest Packwood Hydroelectric Project, located 20 miles south of Mount Rainier in Packwood, Washington, began operation in 1964. It has a nameplate capacity of 27.5 MW. The District has a 20 percent share, or 2 aMW, of the energy output of the project. From 2002 to 2008, the District assigned its share to Franklin and Benton County PUDs. In October 2008, the District recalled its 20 percent share and negotiated the purchase of the balance of the project output from the other participants for the period October 2008 through September 2011. This short-term agreement added 9 aMW of firm energy to the District's power portfolio.

Hay Canyon Wind Project: As part of its long term resource strategy, the District executed two power purchase agreements in February 2009 with Hay Canyon Wind, LLC, for the entire output of the Hay Canyon Wind Project. This 100.8 MW nameplate project interconnects with the Bonneville transmission system and is located in north central Oregon along the Columbia River Gorge. The project was developed by Hay Canyon Wind, LLC, a subsidiary of Iberdrola Renewables, Inc. The District began receiving energy output under the agreements on March 1, 2009. The District will receive 50 percent of the project's output for a term of 15 years, and the remaining 50 percent for a term of 18 years.

Wheatfield Wind Project: The District signed a 20-year power purchase agreement with Wheat Field Wind Project, LLC for the entire output of the 97 MW nameplate wind project known as the Wheat Field Wind Project. This project interconnects with the Bonneville transmission system and is located near the City of Arlington in Sherman County, Oregon. The District began taking delivery from the project on April 1, 2009.

H.3.2.3 Load-Resource Outlook

The District expects its loads will grow by 22.5 percent from 2009 to 2020 with a compound annual growth rate of 1.9 percent per year during that period. The District expects to meet this increased demand and is pursuing a diverse mix of conservation and new renewable resources shown in Table H.3-1.

Table H.3-1 District Preferred Resource Plan (aMW)

	2008	2010	2012	2016	2020
Expected Loads	818.5	861.9	895.5	951.1	1,011.1
New Conservation (w/ line losses)	(7.2)	(21.2)	(35.6)	(65.4)	(96.0)
Net Loads after Conservation	811.2	840.7	859.8	885.6	915.1
Existing Resources[1]:					
BPA Contracts	699.3	699.3	699.3	699.3	659.1
Jackson Hydro[2]	29.5	29.5	29.5	29.5	29.5
Everett Cogeneration	37.0	37.0	37.0	37.0	0.0
Wind (White Creek)	4.9	4.9	4.9	4.9	4.9
Klickitat Landfill Gas	4.9	0.0	0.0	0.0	0.0
Hampton Biomass	1.0	1.0	1.0	1.0	0.0
Market Purchases	24.5	0.0	0.0	0.0	0.0
PSE Conservation Transfer	(10.2)	(1.7)	0.0	0.0	0.0
New Resources[2]:					
BPA Tier 1 and 2	0.0	0.0	54.0	49.0	49.0
New Wind	0.0	58.0	58.0	58.0	58.0
Biomass/Landfill Gas	0.0	4.9	9.8	9.8	19.8
Small Hydro	0.0	2.0	2.0	5.0	5.0
Tidal	0.0	0.0	0.0	1.0	5.0
Geothermal	0.0	0.0	0.0	30.0	90.0
Short/Term Market Purchases	20.3	5.8	(35.7)	(38.9)	(7.2)
Total Planned Resources	811.2	840.7	859.8	885.6	915.1
% of I-937 Eligible Renewables	1.4%	8.2%	10.8%	14%	21.6%
Renewable Energy Surplus	11	69	68	46	61

1 Includes line losses, under critical water conditions. Jackson values were based on City water demand for 2007.
2 The 2008 Integrated Resource Plan (IRP) shows Jackson at 29.5 aMW under critical water conditions (1941). The 2010 IRP will reflect the critical water generation based on the final license agreement.
Source: 2008 Integrated Resource Plan

The District's most recent Integrated Resource Plan (the "IRP") was adopted in August 2008. It sets forth the policies and actions necessary to meet the District's expected load growth and planning for resources, at reasonable cost, to meet the District's future load growth. Achieving this objective requires consideration of all possible options and a plan that is adaptable to changing circumstances. Energy efficiency, renewable power supplies, purchased power contracts, wholesale market purchases, and District-owned resources are all among potential alternatives. Pursuant to the IRP, the District is planning on and exploring the following resources. Actual development of a resource is dependent on various factors.

> Conservation: The District plans to use conservation programs to reduce loads by roughly 7 aMW a year, for a planned cumulative impact of 89 aMW by the year 2020. This amount is slightly higher than the District's conservation load

reductions to date (which as of December 2008 totaled 90 aMW). Half of the savings are planned to come from residential customers, with commercial customers accounting for most of the remaining amount. Programs are expected to include financial incentives, appliance rebates, education services and efficiency measures.

<u>Additional Bonneville Power</u>: On December 1, 2008, the District executed a new power supply contract, which begins October 2011 and will continue through September 30, 2028. The amount of low-cost Tier 1 Power allocated to the District will depend on several factors: (i) the District's actual loads as measured in 2010; (ii) the forecasted output capability of Bonneville's resources; (iii) and the total demand for Federal System power from all of Bonneville's Preference customers. Preliminary estimates from Bonneville indicate the District could receive as much as 802 aMW of low-cost Tier 1 Power for the October 2011 through September 2028 contract period. For planning purposes, the IRP conservatively estimated the District's Tier 1 Power allocation to be 756 aMW, which is 50 aMW higher than under the District's existing Slice/Block contract. The District also anticipates purchasing a small amount of energy (5 aMW) from Bonneville at its Tier 2 rate in order to preserve its option to elect additional Tier 2 resources from Bonneville in future periods.

<u>Geothermal</u>: The District's IRP includes a reliance on 90 aMW of power from geothermal energy in Snohomish County by the year 2020. District staff are moving expeditiously toward exploration of geothermal potential within or close to the District's service territory. The District contracted with geothermal expert, Black Mountain Technology, to conduct a high level feasibility study to determine the potential of geothermal energy production in the region. The results of this study were positive and warranted moving forward to detailed exploration. The District has contracted with GeothermEx, a national leader in geothermal exploration, to design and manage the District's geothermal exploration program.

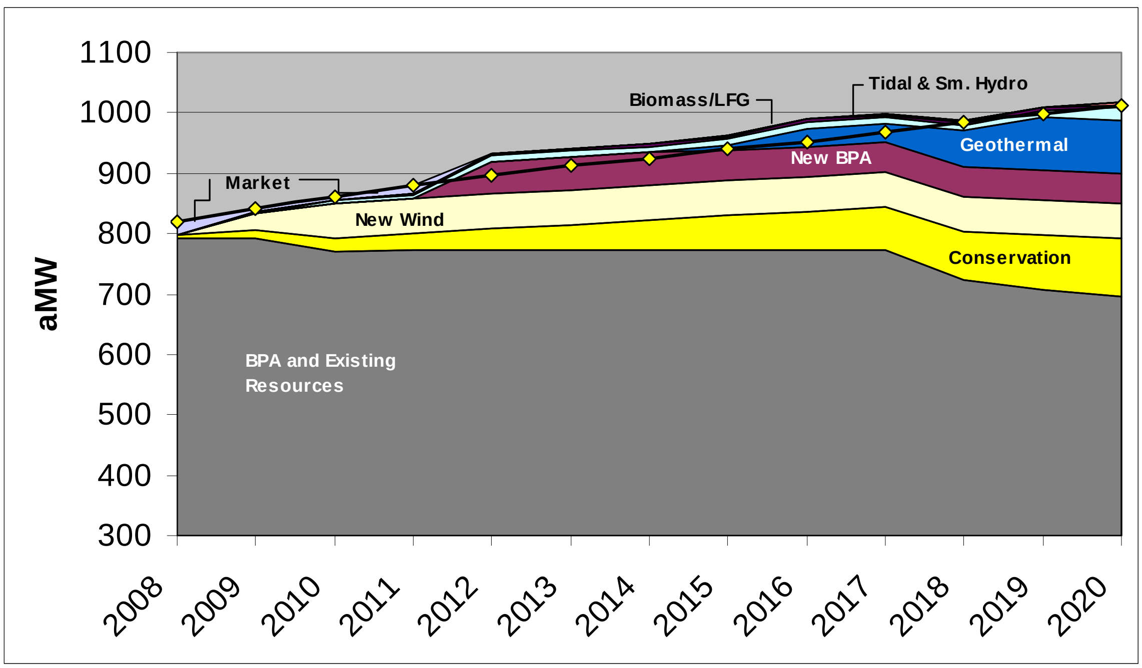
<u>Tidal Energy</u>: The District has taken a leadership role in the research and development of tidal energy in the Northwest. Work to date has included measurement of the velocity and direction of tidal currents in Puget Sound, evaluations of different technologies for hydrokinetic energy, and assessment of environmental issues and regulatory requirements. The results are being shared with and input is being sought from local tribes, environmental groups and interested stakeholders, as well as technical partners such as Bonneville, the EPRI, the U.S. Department of Energy, and the University of Washington. Once the studies are complete, the District will evaluate the technical, economic, and environmental viability of a pilot demonstration plant. For planning purposes, the District has assumed 1 aMW of tidal energy beginning in 2015, growing to 5 aMW by 2020.

<u>Small Scale Low Impact Hydroelectric</u>: The District considers small hydroelectric generation an attractive power supply option because it is

emissions-free, is long-lived, has low operation and maintenance costs, and can produce relatively predictable output. A District initiative is underway to identify potentially viable new hydroelectric sites within or near the District's service territory. Several potential sites have been identified for future study. Results of these studies will be provided to the District's Board of Commissioners in the summer of 2009 for consideration of future studies or development.

Solar Power: Throughout 2008, the District investigated ways to bring solar opportunities to Snohomish County's residential and small business customers. In March 2009, the District introduced its new solar program. The "Solar Express" program has been designed to encourage customer-owned solar photovoltaic and hot water systems by providing low interest loans and incentives. The program will also promote technical advice and education, and includes a 10 kW demonstration project to be installed on the District's Electric Building in downtown Everett, Washington by summer 2009. In 2009, the District hopes the program will result in 62 solar systems that produce the equivalent of 245 kW of clean, renewable energy.

The following graph shows the District's expected future resource mix over the next 20 years:



H.3.2.4 Load Management Measures

Demand response, conservation voltage reduction/regulation (CVR), distributed generation, and smart grid are all tools that can be used by the District to manage its load. Production and distribution efficiencies will play a large part in the District's future load management plans.

CVR is already utilized by the District to decrease demand on the distribution system. CVR uses technology to lower distribution line voltages. National standards require utilities to operate distribution facilities within a margin of 114 volts to 126 volts. Most utilities operate their distribution delivery systems on the higher end of the range to accommodate the natural voltage reductions that occur over long distances. By reducing the voltage delivered to residences to 120 volts or lower, less energy is used by distribution transformers and household appliances without loss of performance.

To enable CVR, regulators and line drop compensation controls have been installed across the District's system. The program has been ongoing since 1988, with average savings per substation of about 800 MWh per year. Savings from work done between 2001 and 2006 was approximately 3.1 aMW. In 2007, additional projects resulted in savings of 0.9 aMW.

The two phases of CVR were completed in 2008, with additional savings of 0.04 aMW expected. A third phase of CVR is under evaluation and would lower the average customer voltage by an additional 1 percent or 2 percent. It is estimated that the additional annual savings potential from CVR is approximately 3.5 aMW. To date, no significant system performance problems have been experienced as a result of the reduction in voltage at the substation, however, intelligent monitoring will be critical to managing the potential risk exposure that the next phase of CVR could present.

H.3.3 Alternative New Sources of Power

Resources available to meet future load growth fall into three broad categories: conservation programs, power supply contracts and District-owned generation. The District's commission set a goal that the utility seek first conservation and then renewable or non-greenhouse gas emitting energy resources.

The District assumes the introduction of 90 aMW of conservation by 2020 and has made commitments to further explore conservation and demand response opportunities. Refer to section H.11.

In addition to conservation resources, the District has researched and where appropriate, contracted for, renewable energy resources such as wind, landfill gas and biomass. In addition, the District is in the process of evaluating geothermal, small hydro and tidal energy that is located within or near its service territory. A new "Solar Express" program has also been launched to help local customers take advantage of photovoltaic generation.

Future costs of various new renewable resources are summarized in Table H.3-2.

Table H.3-2 Future costs for various renewable energy sources (in $000s)[1].

Year	Tidal	Geothermal	Small Hydro	Total
2008				$ -
2009			$ 30,000	$ 30,000
2010				$ -
2011		$ 61,260		$ 61,260
2012	$ 8,279			$ 8,279
2013		$ 128,723		$ 128,723
2014	$ 8,698			$ 8,698
2015		$ 202,859		$ 202,859
2016		$ 207,931		$ 207,931
2017	$ 28,099			$ 28,099
2018				$ -
2019				$ -
2020				$ -
Total	$ 45,076	$ 600,773	$ 30,000	$ 675,849

[1] Source: Snohomish PUD 2008 Integrated Resources Program

While the District anticipates that the combination of new conservation and renewables will be sufficient to address load growth over the next 10 years, the District will routinely assess the optimal mix of resources required to address any load-resource gap attributable to either the loss of an existing resource or long-term power supply contract, as well as meeting renewable portfolio standard mandates. Should the District not receive an economic license for the Jackson Project or accepts a license with reduction to plant capacity it is expected the District could expend $45-50M from 2012-2014 to construct new low impact hydro projects as part of the District's IRP update expected in 2010 or replace any lost power by market purchases.

H.3.3.1 Least Cost Alternative to the Jackson Project

The District's IRP considers an integrated portfolio analysis to value new resources. If an alternative to the Jackson Project's power and capacity is required, no single replacement resource would be assumed. Instead, integrated portfolio planning implies that all of the District's existing resources and loads would be evaluated together to find the best mix of resources base on least cost and lowest risk.

To match the Project's average annual generation and peak-hour capacity, the alternative cost estimate is based on Jackson's projected annual output as if wholesale market purchases were utilized to replace Jackson MWhs. The energy was valued under average water conditions.

H.3.3.2 Replacement Power Costs

See Exhibit H, Section 2.2 for replacement power costs.

H.3.3.3 Emissions from Replacement Resources

The long term resource strategy includes an aggressive goal of renewable resources to meet 15 percent of the District's retail electric customer load by 2020. The strategy also includes the aggressive goal of 7 plus aMW per year of conservation resources. Renewable energy and conservation are projected to meet all of the need for new resources. If the output from the Jackson Project had to be replaced, the District would purchase the energy in the wholesale power market.

Replacing the Jackson Project generation with a like amount of market purchases would result is an increase of approximately 553 lbs of CO_2 equivalent emissions per MWh generated. This translates to the annual addition of approximately 227,681 short tons under average water conditions.

H.3.4 Effect of Alternative Sources on Direct Providers

There are no direct providers who purchase power from the District's Jackson Hydroelectric Project.

H.4 EFFECT ON APPLICANT INDUSTRIAL FACILITIES AND RELATED OPERATIONS

The District does not operate any industrial facilities that depend on the power production of the Jackson Hydroelectric Project.

H.5 INDIAN TRIBE NEED FOR ELECTRICITY

The Applicant is not an Indian Tribe.

H.6 TRANSMISSION SYSTEM IMPACTS

H.6.1 Redistribution of Power Flows

There are two 115kV circuits that move power from the District Jackson Hydro Project. This system is often referred to as the "Jackson Loop". The two circuits that make up the Jackson Loop connect the Bonneville Power Administration ("BPA") Snohomish substation with the Jackson Hydro Project as well as seven District distribution substations. The North circuit serves the Three Lakes and Lake Chaplin District substations and the South loop serves the Snohomish, West Monroe, Woods Creek, Sultan, and Goldbar District substations.

The Gold Bar substation connected to the South circuit also connects the District system to the Puget Sound Energy ("PSE") 115kV Beverly – McKenzie line through a "normally open" switch. The District has closed this tie in the past to minimize planned outage exposure to District customers during periods of construction in the area. Closing this tie requires an agreement with PSE and coordination with BPA.

The Jackson Loop also provides one element out ("N-1") contingency capability to the Jackson Hydro Project and distribution substations served by the two-115kV circuits. If an outage occurs on the Jackson Loop only one circuit should trip allowing part of the transmission load and the Jackson Hydro Project to remain operational. This circuit configuration allows the load connected to the faulted circuit to be isolated and transferred to the adjacent circuit. The loop also reduces outage exposure in the event of a BPA Snohomish bus outage. The BPA Snohomish substation has a bus-sectionalizing breaker that separates the two circuits that serve the Jackson Loop.

Reducing generation levels at the Jackson Powerhouse would reroute the power flow through this transmission loop but would not affect the utility ability to serve its customer base in the vicinity of the Project.

H.6.2 Advantages of the Applicant’s Transmission System in Distribution of Project Power

The Project does not have a transmission system associated with it. The Project interconnects with a District loop transmission system at the Powerhouse Substation.

H.6.3 Single-Line Diagram

See Figures F-16 (Exhibit F) for detailed one-line diagrams of the existing facilities.

H.7 PLANS TO MODIFY PROJECT FACILITIES OR OPERATIONS

The District proposes to modify Project operations to incorporate the protection, mitigation and enhancement (PM&E) measures developed during the relicensing study process and subsequent discussions with the agencies and relicensing stakeholders. These modifications will take the form of refinements of the minimum instream flow schedule, refinements to the downramping rates schedule for the Powerhouse, addition of a downramping rate schedule for the Diversion Dam, and adoption of a downramping rate frequency schedule for the Powerhouse.

H.7.1 Project Operations

The District proposes to operate the Project in accordance with the Proposed Project Operations Plan shown in Appendix A.

H.7.2 Project Facilities

H.7.2.1 Powerhouse Pelton Unit Flow Continuation System

Currently there is no flow bypass system on the two Powerhouse Pelton units. Over the years of the current license the units have tripped off line for a diverse variety of reasons. When this happens the Sultan River below the Powerhouse can drop dramatically exceeding the downramping rates of the Project. As part of the relicensing process, the District conducted a feasibility study of flow continuation for the Pelton units. From that study, the District proposes to install a governor control system to allow bypass of the water flowing through the Pelton turbine needle valves into the Sultan River to mitigate for the rare emergency situation when the turbine or generator function must be terminated. This bypass system will consist of independent controls for each of the six needle valves and their flow deflectors. The benefits would be refined control of the needle valve configuration changes to allow for optimized unit efficiency while eliminating most of the excessive flow variation experienced under the current control system. See Exhibit C.2.1.1 for a more detailed description of this proposed modification to existing facilities.

H.7.2.2.2 Sultan River Discharge Structure

The current Diversion Dam is approximately 78 years old. To operate with a new structure with modern equipment for controlling flow, the District proposes to construct a separate discharge structure to meet flow requirements in the Sultan River below the Diversion Dam. See Exhibit C.2.1.2 for a description of this proposed modification to existing facilities. The District expects to hire consultants to assist in the design of the new structure and submit a request for Project amendment including a plan and schedule for construction of the new facility for FERC review and acceptance by December 31, 2009. Final construction is subject to gaining all regulatory approvals.

H.8 JUSTIFICATION FOR THE LACK OF PLANS TO MODIFY EXISTING PROJECT FACILITIES OR OPERATIONS

As described above in section H.7, the District does propose to modify Project operations and to expand facilities to incorporate altered operations. The District may upgrade components of the Project to improve electrical or mechanical efficiencies as equipment is upgraded and as economics justify.

H.9 APPLICANT’S FINANCIAL AND PERSONNEL RESOURCES

The District has adequate financial resources to meet its obligations under a new license for the Jackson Hydroelectric Project. The District’s 943 employees deliver electricity, water, and energy solutions to more than 320,000 customers in the Snohomish and Island counties of Washington State. Currently the District has 16 FTE’s dedicated to support of the Jackson Project in varying capacities. They are adequate in number and training to operate the Project in accordance with the provisions of the license. The District’s financial information is available on-line in the annual report which can be accessed at: http://www.snopud.com/about/finrate/annual.ashx?p=1865

H.10 PROPERTY BOUNDARY EXPANSION NOTIFICATION

The current Project Boundary includes lands around Spada Lake, the power tunnel and pipeline right of way, the Powerhouse lands, the Lake Chaplain return line right of way, the Diversion Dam tunnel and pipeline and the Diversion Dam. The current Project Boundary around Spada Lake generally follows the 1460 feet msl contour including lands around Culmback Dam. (See Exhibit G Figures 1 and 2) The District is proposing to expand the Project boundary to include all lands owned by the District around Spada Lake. The City of Everett lands within the Project Boundary will decrease because the Diversion Dam will not be needed to provide a point of discharge into the Sultan River with the construction of the proposed Sultan River Discharge Structure. (See Exhibit G Figure 5)

Table H.10-1 shows the ownership of lands within the Project boundary under the current license and as propose for the next license term.

Table H.10-1 Land Ownership within the Project Boundary (Acres)

Ownership	Current	Proposed
District		
• Section 24 lands	2011.0	3466.7
• Other	132.2	954.1
DNR	98.9	106.1
City of Everett	27.3	26.1
City of Sultan	2.3	2.3
Private Landowners	3.4	3.4
US Forest Service	10.9 (subsurface)	10.9 (subsurface)
Total	**2,286.0**	**4,569.6**

H.11 ELECTRICITY CONSUMPTION EFFICIENCY IMPROVEMENT PROGRAM

H.11.1 Energy Conservation and Efficiency Record and Programs

The District has provided conservation services for its electricity customers since 1980. Through 2008, the net cumulative annual savings attributable to these efforts are approximately 790,000 MWh or 90 aMW[8] net cumulative load reduction, which represents over 10 percent of the District's average existing load (table H.3). Of the savings achieved, approximately 40 percent has come from the residential sector; the remaining savings come from the commercial and industrial sector. In 1996, the Commission established a resolution[9] committing at least three percent of revenue for Public Purpose expenditures, including conservation and energy efficiency, renewable resources and low-income weatherization. Since then, the District has invested over $108 million in energy efficiency and conservation resources.

Following is a brief description of the programs currently offered by the District.

H.11.1.1 Residential Weatherization Program

The objective of this program is to reduce the energy consumption of electrically-heated homes. The program offers financing or rebates to encourage customers to install floor, wall, ceiling and duct insulation, high-efficiency heat pumps, and insulated windows. Customers can obtain low-interest, 10-year loans at a current rate of 2.9 percent with no fees or up-front costs. Alternately, customers can choose up-front cash incentives to offset part of their efficiency investment. The program started in the early 1980's and has evolved to meet the needs of customers and the District. Savings depend on the measures selected and the specific characteristics of the home, including: the size of the home; schedule of occupancy; the initial level of efficiency, etc.

H.11.1.2 Residential Resource-Efficient Appliance Rebates

The objective of this program is to encourage residential customers to purchase resource-efficient ENERGY STAR® appliances. The current program started in September 1999. Participants are offered a rebate of $50 to $100 for qualifying clothes washers through the regional Wash wise Program and a $35 rebate for qualifying dishwashers (both of which save energy and water). Customers can apply for the rebate within 90 days of purchasing a qualifying unit. ENERGY STAR® refrigerators are also eligible for a $50 rebate.

H.11.1.3 Residential Compact Fluorescent Lighting (CFL) Program

The objective of the CFL program, which began in September 2000, is to reduce energy consumption related to residential lighting. Customers receive a coupon for $1-off of the regular price of an ENERGY STAR qualified CFL bulb. The customer redeems the coupon when purchasing qualifying CFLs from the District's retailer network. The District also buys down the cost of the bulbs at the wholesale level and establishes a competitive and reliable market for manufacturers and wholesalers. The buy-down reduces the cost to the retailers and provides additional savings to consumers. Retailers are reimbursed at face value for each coupon they submit to the District. There are many

[8] The cumulative savings accounts for degradation of savings as measures installed reach the end of their useful life. While many efficiency measures last for many years, e.g., insulation measures installed in homes create savings for 45 years or more, others, such as lighting upgrades have a shorter life. Sum of annual savings achieved since 1980 would be higher.

[9] Resolution No. 4561.

retail outlets in the county participating in the program. Beginning in 2008, the program increased focus on specialty CFLs, including reflector bulbs for recessed can lights, globe lights, and three-way bulbs.

The District currently offers a CFL fixture program in conjunction with other Puget Sound utilities. District customers, as well as home builders, can receive a $20 instant rebate for each qualifying ENERGY STAR CFL fixture purchased at participating lighting showrooms in the Puget Sound area. Participating showrooms also receive an incentive for each fixture sold.

H.11.1.4 Residential Refrigerator/Freezer Recycling Program

The objective of this program is to save energy by eliminating inefficient second residential refrigerators and freezers in an environmentally safe way. The District funds local appliance recycler, JACO Environmental, to operate the program on its behalf. JACO handles customer calls, tracking, payment, pickup, and recycling. The program offers a $30 payment to customers willing to dispose of old refrigerators and freezers still in operation. The collected appliances are recycled at a JACO Environmental facility in Everett, WA, according to strict guidelines from the U.S. Environmental Protection Agency. Over 95 percent of each refrigerator and freezer is recycled. Customers save 700 kWh or more per year by disposing of an inefficient second refrigerator or freezer. The District first piloted this effort in the region in 2005. It has since been adopted by others, including neighboring Puget Sound utilities, beginning in 2007.

H.11.1.5 Residential New Construction Program – Build with ENERGY STAR

This program is designed to encourage builders to include energy-efficient measures in new homes built in Snohomish County and on Camano Island. The rebates help offset the cost of installing higher energy-efficiency features in new single-family and multi-family homes. Rebates are offered for: high efficiency heat pumps; ENERGY STAR appliances, including clothes washers, refrigerators and dishwashers; and efficient lighting options. The program also includes a bonus rebate for including an advanced lighting package with a minimum of 28 CFL fixtures (i.e., 60 percent or more of the fixtures in a new home). Builders can also take advantage of special pricing on pin-based CFL fixtures at participating lighting showrooms.

H.11.1.6 Residential Low Income Housing Improvement Program (HIP)

The objective of this program is to reduce home energy use for low-income consumers. The program offers funding to community-based organizations for energy-efficient improvements in low-income transitional housing. Projects include weatherization, lighting, heating and efficiency upgrades. Organizations apply for funding. For each application, the District considers the costs involved, the level of energy savings, the number of people served by the organization, whether the organization has received District funding in the past, secondary impacts of the project (health, safety, and comfort), and whether there are other matching funds which can be leveraged.

H.11.1.7 Low-Income Weatherization Program

The objective of this program is to reduce residential energy use by low-income customers with electrically heated homes. By reducing energy use, customers are better able to pay their utility bills and require less assistance from the District. The program offers qualifying low-income customers free energy-efficiency upgrades to their home, including: wall, floor, ceiling, ducts, and water pipe insulation; air and duct sealing; water-saving low-flow showerheads; faucet aerators; ENERGY STAR refrigerators; and compact fluorescent lights. Customers are qualified through the Snohomish County Weatherization Department, which schedules, inspects and pays the contractor for the improvements. Historically, contributions from the District have been matched by Washington State managed Matchmaker funds.

H.11.1.8 Commercial & Industrial Incentives for Existing Buildings

The objective of these commercial and industrial incentive programs is to reduce energy use in non-residential buildings. The core program offers commercial and industrial customers technical assistance, as well as an incentive of up to $0.20 per kWh for every kWh saved in the first year after installation, up to 70 percent of the cost of the energy-efficiency project. Efficiency measures funded include: lighting controls and fixtures, HVAC equipment, compressed air systems, motors, pumps and fans, refrigeration, heat recovery systems & controls, and variable frequency drives. District Energy Engineers work closely with the Executive Account Managers to identify solutions specific to the needs of commercial and industrial customers, particularly those with large energy use.

H.11.1.9 Commercial & Industrial Rebates

To complement the custom incentives and create options designed to make it easier for small business customers to participate in efficiency programs, the District has developed a menu of standard rebate offers. The following are included in the standard rebate offerings:

> **Lighting Rebates.** This is a new program available to District customers to encourage installation of high efficiency lighting systems. Customers can obtain rebates of up to $15,000 for high-performance T8s, T5, CFL or HID (high intensity discharge) fixtures. Lighting contractors and vendors are encouraged to submit proposals to businesses with which they are working. With predetermined rebate amounts available on a wide range of lighting technologies, contractors can include the rebates in describing the overall economics and benefits of a project to the customer.
>
> **Energy Smart Grocer.** Implemented in cooperation with BPA[10], this program is targeted to groceries, convenience stores and other facilities with refrigeration equipment. A system audit is conducted to assess efficiency opportunities in

[10] BPA has contracted with Portland Energy Conservation, Inc. (PECI) to promote this program throughout the Northwest.

individual facilities. Direct installation of low-cost measures and incentives towards the cost of installing more comprehensive refrigeration and lighting upgrades are provided.

Commercial Kitchen Equipment. The District makes cash rebates available through restaurant equipment suppliers for energy-efficient qualified commercial refrigerators and freezers, ENERGY STAR qualified food steamers, fryers and food-holding cabinets. This program element is offered in coordination with other Puget Sound utilities, including PSE to provide incentives for high-efficiency gas technologies where applicable. Additional measures are under consideration.

H.11.1.10 Commercial & Industrial Incentives for New Construction

The objective of this program is to reduce the future energy consumption of commercial and industrial facilities under construction. Working with businesses early in the design phase of a project allows the District to identify a broad range of energy-saving opportunities and then offer technical assistance and financial incentives for projects that incorporate energy-efficiency measures. Financial incentives ranging from $0.15 to $0.25 per kWh are available, based on the type of efficiency measure and its estimated first-year savings. The program covers components such as lighting and controls, heating and ventilation equipment, chillers, variable speed drives, and other measures. To qualify, projects must be designed to perform at least 10 percent more efficiently than required by the Washington State Energy Code (WSEC). Facility operating conditions directly impact incentive levels. Post-facility-occupancy verification of measure performance is reviewed by the District before incentives are paid. The program was launched in 2007.

H.11.2 Compliance with Regulatory Requirements

The District's conservation and efficiency program is consistent with the following laws and regulatory requirements that govern such programs.

- The 1988 voter referendum to amend the state constitution to permanently allow the loaning of public funds for efficiency improvements.

- The 1991 Washington State Energy Code establishing consistent statewide standards for efficiency in new construction.

- Washington State' Renewable Portfolio Standard (I-937) which requires the District to pursue all cost-effective, achievable energy efficiency potential.

H.12 TRIBAL MAILING LIST

The Jackson Project does not occupy any tribal lands. The nearest recognized tribal governments in the vicinity of the Project are:

Tulalip Tribes
6700 Totem Beach Rd
Tulalip, WA 98271
(360) 651-4000
Current Chairman: Melvin R. Sheldon, Jr.

Snoqualmie Tribe
8130 Railroad Ave. NE
P.O. Box 969,
Snoqualmie, Washington 98065
Phone: 425-888-6551/Fax: 425-888-6727
Current Chairman: Joe Mullen

Stillaguamish Tribe of Indians
P.O. Box 277
Arlington, WA 98223
Phone: 360-652-7362/Fax: 360-659-3113
Current Chairman: Shawn Yanity

They are on the stakeholder mailing list for this relicensing process.

H.13 MEASURES TO ENSURE SAFE PROJECT MANAGEMENT, OPERATION, AND MAINTENANCE

H.13.1 Operation During Flood Conditions

Flood control operations are incidental to Project function and benefits which are described in detail in Exhibit B. The Project is operated to create storage space to capture flood events by operating to achieve elevation 1,420 ft msl by September 15. The facilities are designed to operate safely during all flood conditions including the Probable Maximum Flood (PMF). When the inflows to Spada Lake less the withdrawal capacity of the power tunnel exceed the storage capacity of the reservoir, then a spill will occur at Culmback Dam's morning glory spillway. As part of the Culmback Dam Emergency Action Plan (EAP), Project staff will contact officials in the City of Sultan to advise them of the pending spill event so impacts may be minimized.

During flood conditions (generally when Spada Lake is in State 1 or State 2 – see Project Operating Plan in Appendix A), the Powerhouse is operated at full capacity to pass water from Spada Lake directly into the Sultan River. During high spill events the Sultan River may rise which triggers the operation of an air suppression system to prevent the tailrace water level from engaging the Pelton runners. Under certain rare high flow conditions the Pelton unit generation must be reduced to keep the tail water from rising up to engage the runners.

During a PMF, the anticipated maximum water level in Spada Lake would be 1,465.4 feet, which is 4.6 feet msl below the crest of the dam.

H.13.2 Warning Devices for Downstream Public Safety

After the construction of Stage II of the Jackson Project in 1984, the District entered into an agreement with the City of Sultan in 1988 to provide partial funding for the procurement and installation of two sirens to be placed within the community of Sultan. In return, the City of Sultan agreed that the District had no further obligation for purchase of warning devices for their community. The two purchased sirens have been placed on towers within the community (one near the middle school and one on the west side of the Sultan River just north of town). Subsequently, these have been linked to the fire siren located at the fire station in the centre of town. The City of Sultan is currently assessing the feasibility of upgrading their warning system

Notification of an emergency event associated with Culmback Dam based on real time surveillance of critical dam conditions can be provided to the fire and police entities in the cities of Sultan, Monroe, and Snohomish by the county 911 dispatcher, SNOPAC. .

H.13.3 Proposed Changes Affecting the Emergency Action Plan

There are no proposed changes that would affect the Emergency Action Plan.

H.13.4 Structural Safety Monitoring Devices

Instrumentation to monitor the Project structures includes survey monuments, piezometers and an inclinometer.

Monitoring for horizontal and vertical movements of Culmback Dam is made possible by survey measurements of the location and elevation of seven control monuments established on the dam and one monument on each of the spillway, the intake structure, and the outlet structure. Precise measurement of monument location is done semi-annually to assess any changes in the readings from the last set of readings and from the original set of readings. Measurements are evaluated for significant or progressive changes.

Two seismic monitors are installed in Culmback Dam, one in the right abutment valve chamber and the other on the top of the dam. Both are checked quarterly and whenever an earthquake is registered in the area. Each monitor linked to the District's real time computer monitoring and is set to alarm if a seismic event exceeds predefined thresholds of acceleration.

Several piezometers to monitor water levels are installed within the core of Culmback Dam, along the dam right abutment, the geologic right boundary forming Spada Lake and in the backslope of the Powerhouse.

The following table describes the piezometer instrumentation currently in place on the major facilities of the Jackson Project.

Table H.13-1 Piezometer Instrumentation,

Location	Number	Features
Culmback Dam Core	2	Automated sensors recording real time changes in the water level.
Right Dam Abutment	5	Tube in casing. Readings taken monthly.
Pilchuck Plug	4	Two locations with deep and shallow tubes. Readings taken monthly.
Powerhouse Backslope	3	Readings taken monthly.

At the Powerhouse there is an inclinometer for determining if any significant movement of the backslope is occurring. Inclinometer measurements are read twice yearly.

Within the power tunnel is an over-velocity sensor which allows for detection of pipeline rupture. If the sensor is tripped, an automated signal will shut down the Powerhouse generation and close the intake gate at Spada Lake.

Cathodic protection is built around the buried steel pipeline to minimize corrosion. Readings are conducted annually by staff to assess status.

H.13.5 Safety Record

H.13.5.1 Employee/Contractor Safety Program

The District employees are given safety orientations and follow-up refresher trainings on a five-year recurrence interval. All mandated safety training is tracked along with other core competency training by the Employee Resources Division. Reminders are sent to the managers and superintendents when renewal is due. In addition to the generic workplace safety training, the staff at the Powerhouse meets daily to review the day's assignments and raise consciousness about the potential hazards and practices to be followed.

From 1999 through 2008, there has been only one lost time accident or injury associated with the O&M of the Jackson Project. This occurred in 2001 as shown in Table H.13-2.

Table H.13-2 Jackson Project employee lost time accidents/injuries; 1998-2008.

Year	Number
1998	0
1999	0
2000	0
2001	1
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0

H.13.5.2 Public Safety Program

In accordance with FERC requirements, District staff has a Public Safety Plan developed for the Jackson Project. This plan addresses all potentially hazardous site features, as well as signage, fences, and other access accommodations designed to minimize public risk. This document is reviewed annually for update or as operational changes dictate.

Since the beginning of Stage II in the early 1980's there have been no recorded injuries or deaths to the public within the Project boundary

H.14 CURRENT OPERATIONS

The Jackson Project current operations are described in Exhibit B.

H.15 PROJECT HISTORY

A brief description of the Jackson Project is given in Table H.15-1. A more thorough description of the Project history and record of programs to upgrade the operations and maintenance of the Project are presented in Exhibit C.

Table H.15-1 Project History.

Activity	Date
The District and City of Everett issued a license to construct hydro facilities on the Sultan River	1961
Stage I of Culmback Dam completed without generation	1965
Bonneville Power Issues "Notice of Insufficiency"	1976
FERC License 2157 amended to allow construction of Stage II	1981

Activity	Date
FERC accepts the Settlement Agreement with the Joint Agencies	1982
Stage II completed including raising of Culmback Dam and construction of the power generation facilities	1984
Installation for SCADA computer control system	1984
FERC accepts the Wildlife Habitat Management Plan	1988
FERC accepts the Interim Project Operating Plan	1992
FERC accepts the Project Recreation Plan	1992
FERC accepts the Final Project Operating Plan	1996
Installation of Sluice Gate Automated Operational Control	2004

H.16 Generation Lost Due to Outages

From January 1, 2002 to December 31, 2008, there were a total of 10 unscheduled unit outages. Almost all were only partial hours in duration. The longest unit outage was caused when a turbine bearing failure occurred on Francis unit 3 requiring 67 days for repair in 2007. Other reasons for unscheduled outages included: relay operation due to a relay setting miscalculation by BPA staff, Powerhouse isolation from windstorm, CO^2 discharge, relay tripping, Francis turbine broken shear pin, and a penstock man-door seal failure. The 10 unscheduled outages comprise a total of 70 days of outages with a loss of no megawatt-hours of generation because no spill occurred due to the outages. There were no lost MWhs in any of the outages and no unscheduled outages in the years 2002 or 2005. As each incident occurred, appropriate corrective action has been taken to minimize the risk of a repeat of the cause.

H.17 Record of Compliance

The District has demonstrated a good faith effort to operate the Jackson Hydroelectric Project in accordance with the terms and conditions prescribed in the FERC License Order, the Project Operating Plan, and the Settlement Agreement with the Joint Agencies. The District has a long successful history of working both with adjoining communities and involved resource agencies.

Annually the District staff produces reports documenting the previous calendar year's compliance history. These annual reports describe the previous year's activities and results for the Wildlife Habitat Management Plan (WHMP), the Project Operating Plan, and Sultan River continuous water temperature monitoring. The WHMP Report is submitted to the Joint Agencies for review annually and to the FERC every 5 years. The Project Operating Plan Report is submitted to both the FERC and Joint Agencies annually. The Sultan River Temperature Report is submitted to the Joint Agencies annually.

In addition to the annual reporting, Project staff reports any incidents where compliance is questionable to FERC staff and the Joint Agencies. The following is a list of the compliance incidents for the period 1999 through 2008.

Compliance Incident Date	Type	Violation of License
June 22, 1999	MF-DD	(No Response from FERC)
August 3, 1999	MF-PH	No
September 14, 1999	MF-DD	Yes
May 26, 2000	MF/RR-PH	No
July 22, 2000	MF/RR-PH	No
September 13, 2000	RR-PH	No
May 5, 2001	RR-PH	No
June 13, 2002	RR-PH	No
July 1, 2002	MF-DD	No
July 11, 2002	RR-PH	No
July 27, 2002	RR-PH	No
November 1, 2002	MF-PH	Yes
June 19, 2003	MF-PH	No
June 27, 2003	MF-PH	No
July 2, 2003	RR-PH	No
April 6, 2004	RR-PH	No
May 26, 2004	RR-PH	No
December 12-14, 2005	RR-PH	No
February 18, 2006	MF-DD	No
June 21, 2006	RR-PH	No
December 14, 2006	RR-PH	No
March 5, 2007	RR-PH	No
October 10, 2007	RR-PH	(No response from FERC)
April 17, 2008	RR-PH	(No response from FERC)

RR = Downramping Rate MF = Minimum Flow
PH = Powerhouse DD = Diversion Dam

Several times since commencement of the Project (1984) operational conditions deviated from those specified in the Project Operating Plan. Usually these deviations were due to extreme conditions of weather. When such conditions arise, the Operating Plan allows the District to alter the Project operation following consultation and agreement.

H.18 PROJECT ACTIONS AFFECTING THE PUBLIC

The District has a long history of providing the ratepayers of Snohomish County with electric power that is a low cost basis for the local economy. With the construction of the Jackson Project, the District also collaborated with the City of Everett to create a reliable long-term water supply for 80 percent of Snohomish County residents.

In addition the Project provides the following additional benefits:

- 20 percent flood reduction on the Sultan and Skykomish rivers.
- 5 percent of the power supply for the District.
- 6 percent of the peaking capability for the District.
- Ownership and land use control of 4,420 acres (nearly 2,300 acres surrounding Spada Lake and 1,908 acres under Spada Lake) for source water protection of the water supply for 80 percent of Snohomish County residents.
- Purchase and management of 205 acres surrounding Lost Lake.
- Purchase and management of 5 acres at off Trout Farm Road on the lower Sultan River
- Day use recreation facilities at Spada Lake
- Lower Sultan River access at Trout Farm Road, the Powerhouse, and off the Diversion Dam Road.
- Increased recreational fish populations in Sultan River since Stage II operations began in 1984 below the diversion dam.
- Financial support for the annual production and planting of 30,000 steelhead smolts in the Sultan River.
- Enhanced and more consistent availability of downstream habitat with minimum instream flows that exceed the historical flows in spring, summer, and fall.
- Construction of a fishing platform on Lost Lake with Snohomish Sportsman's Club.
- Construction of osprey nesting platforms on Spada Lake, Lake Chaplain, and at the Powerhouse on the lower Sultan River.
- Cooperation with the Adopt-A-Stream Foundation to move and place large woody debris from Culmback Dam to a side channel of the lower Sultan River, within Osprey Park.
- Noxious weed control on Project facility lands.
- School tours of the Powerhouse.
- Whitewater recreational opportunities on the Sultan River.
- Speakers for local service clubs and university engineering classes on the features and benefits of the Jackson Project.
- Payment of $90,000 annually in privilege taxes to state and local governments and public schools.
- Employment of 16 full-time employees who live in Snohomish County.

H.19 EXPENSE IMPACT FROM TRANSFER OF LICENSE

The annual ownership and operating expenses are provided in Exhibit D. District estimates that operations and maintenance cost and taxes for the Jackson Hydroelectric Project will average $4.4 million per year (2008$) under the current operating practices for the next 30 years. These costs would be avoided if the Project license were to be transferred to another entity.

H.20 ANNUAL FEES

The Jackson Project does not occupy any Indian Tribal lands.

The District owns approximately 4,162 acres of land surrounding Spada Lake. These were acquired through land exchanges with the U.S. Forest Service (USFS) and Washington State Department of Natural Resources (DNR) in 1989 and 1990 respectively. The net result was that District ownership in the basin is now 3,466.7 acres from the US Forest Service and 695.3 acres from the DNR. The acreage acquired from the USFS has been determined by FERC to be subject to federal land use charges under Section 24 of the Federal Power Act. Because the Jackson Project cost is higher than the power rate billed to District customers, an exemption from the Use of Federal Lands and the Annual Charges for Administration has been sought for several years.

In addition, the Project power tunnel passes beneath 10.9 acres of National Forest System lands at a depth of 300 feet below ground surface.