

## **APPENDICES**

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## APPENDIX A

### GLOSSARY

The following glossary contains an alphabetical listing of most of the key technical terms used in operational hydrology. For a graphic illustration of reservoir terms see Figures A1 and A2.

**ACRE-FOOT** - a unit of volume equal to one acre of area by one-foot depth (equal to 43,560 ft<sup>3</sup> or 325,872 gallons). This unit is generally used to measure the volumes of water used or stored in reservoirs. Also used are thousands of acre-feet (kaf) and millions of acre-feet (maf).

**ACTIVE STORAGE** - water occupying active storage capacity of a reservoir.

**ACTIVE STORAGE CAPACITY** - the portion of the live storage capacity in which water normally will be stored or withdrawn for beneficial uses, in compliance with operating agreements or restrictions.

**ADJUSTED STREAMFLOW** - observed streamflow adjusted to eliminate effects of specified controls.

**ADVERSE HISTORICAL STREAMFLOW SEQUENCE** - see critical streamflow period.

**ASSURED REFILL CURVE (ARC)** - indicates the end-of-month storage content which would assure refill of a seasonal reservoir based on a specified historical volume of inflow for the whole or remaining portion of the refill period. The specified historical value for most projects in the Columbia basin is the second lowest of historical record. The year 1931 represents the second lowest of historical January-July volume inflows for the system as measured at The Dalles, Oregon.

**ASSURED SYSTEM CAPACITY** - the dependable capacity of system facilities available for serving system load after allowance for required reserve capacity, including the effect of emergency interchange agreements and firm power agreements with other systems.

**AVERAGE** - the sum of the items divided by the number of items; for other than the 1961-90 normal period. See also NORMAL.

**AVERAGE STREAMFLOW** - the average rate of flow at a given point during a specified period.

**BANKFULL STAGE** - The stage at which a stream first overflows its natural banks. (See also FLOOD STAGE. Bankfull stage is a hydraulic term whereas flood stage implies damage.)

**BASE ENERGY CONTENT CURVE** - The higher of the assured refill curve and the first year critical rule curve.

**BASE LOAD** - the minimum load in a stated period of time.

**BASE LOAD PLANT** - a power plant that is normally operated to carry base load and which, consequently, operates essentially at a constant load.

**BASE POWER FLOW** - observed streamflow adjusted to eliminate the effects of reservoirs, controlled lake regulation, and actual Grand Coulee pumping and then further adjusted to a given level of irrigation development.

**BIOLOGICAL OPINION** - A set of recommendations from NMFS defining what operations the Columbia River system operation should be in order to ensure that the endangered species are not placed into jeopardy.

**BRIGHT** - a fall chinook salmon that spawns in the upper river, say, above the Umatilla River, that enters the lower Columbia River in a bright silver condition but that has not yet begun its spawning metamorphosis. See also Tule.

**CAPABILITY** - the maximum load which a generator, turbine, transmission circuit, apparatus, station, or system can supply under specified conditions for a given time interval, without exceeding approved limits of temperature and stress.

**CAPACITY** - the load for which a generator, turbine, transformer, transmission circuit, apparatus, station, or system is rated. Capacity is also used synonymously with capability. NOTE: For definitions pertinent to the capacity of a reservoir to store water, see Reservoir Storage Capacity.

**CONNECTED LOAD** - the sum of the ratings of the electric power consuming apparatus connected to the system, or part of the system, under consideration.

**COLUMBIA BASIN TELECOMMUNICATIONS (CBT)** - the CBT is a medium speed leased line teletype

communication system between major power producing projects, and the operating/forecasting agencies. This system is used to transmit hydrologic data and reservoir operating instructions necessary for efficient project operation. This system replaced the older Columbia Basin Teletype network (CBTT) in 1983.

**COORDINATED SYSTEM RESERVOIRS** - the agencies of the Pacific Northwest who have ratified the Pacific Northwest Coordination Agreement, a formal contract for coordinating the seasonal operation of the generating resources of the member systems for the best utilization of their collective reservoir storage. Finalized in mid-August 1964, the Agreement became effective on January 4, 1965, and terminates on June 30, 2003. The member agencies are:

Bonneville Power Administration	The Montana Power Company
Corps of Engineers	Pacific Power and Light Company
Bureau of Reclamation	Pend Oreille County PUD #1
Chelan County PUD #1	Portland General Electric Company
Colockum Transmission Company	Puget Sound Power and Light Company
Cowlitz County PUD #1	Seattle City Light
Douglas County PUD #1	Tacoma City Light
Eugene Water and Electric Board	The Washington Water Power Company
Grant County PUD #2	

**CONTINUOUS POWER** - hydroelectric power available from a plant on a continuous basis under the most adverse hydraulic conditions contemplated.

**CRITICAL PERIOD** - period when the limitations of hydroelectric power supply due to water conditions are most critical with respect to system load requirements. This is the 42-1/2 month historical sequence of streamflows that occurred from August 16, 1928, through February 29, 1932. Also called Critical Hydro Period and Critical Streamflow Period.

**CRITICAL RULE CURVE (CRC)** - a schedule or budget of seasonal reservoir drafts, with respect to time, as determined from analysis of estimated loads and calculated resources based on critical flow water supply for the period. In the analysis, consideration is given first, to providing power so as to meet system firm loads; second, to economy of operation; and third, to providing power to meet interruptible loads. The schedule or budget of reservoir draft may be shown as a plot of reservoir elevation with respect to time, energy producible from reservoir draft with respect to time or by other similar means.

In multiple-year critical periods there will be a Critical Rule Curve for each corresponding year of the critical period, the first year's curve being the highest in indicated storage energy, the second year's being the next highest, etc.

**CUBIC FEET PER SECOND (cfs)** - unit of measure expressing rates of discharge. Also expressed as thousand cubic feet per second (kcfs).

**DEAD STORAGE** - the volume in a reservoir below the invert of the lowest controllable outlet.

**DEAD STORAGE CAPACITY** - the volume of a reservoir that is below the invert of the lowest outlet and cannot be evacuated by gravity.

**DEMAND** - the rate at which electric energy is delivered to or by a system, part of a system, or piece of equipment, expressed in kilowatts or other suitable unit, at a given instant or averaged over any period of time.

**DEPLETIONS** - Over the past 50 or more years, the natural streamflow patterns in the Columbia Basin have been altered by the gradual development of nearly 43 million acre-feet (53,000 hm<sup>3</sup>) of reservoir storage and by nearly 8 million acres (3,240,000 hm<sup>2</sup>) of land for irrigation. Storage reduces high flows when reservoirs are filling and increases low flows when storage is released. Irrigation not only alters the stream flow pattern by withdrawing water from the rivers but also depletes the water supply through evaporation and infiltration. Consequently, to more accurately compare historical streamflow records, these changes must be taken into consideration. This is done by the "depletions" process in which streamflow data are modified, on a monthly basis, by adjusting flows for both the storage changes in all major lakes and reservoirs and for the irrigation adjustments to a common time of development. The historical records for the Columbia basin have been "depleted" by the Depletions Task Force (DTF) of the CRWMG.

**DISCHARGE** - the rate of flow of a river or stream measured in volume of water per unit of time. The standard

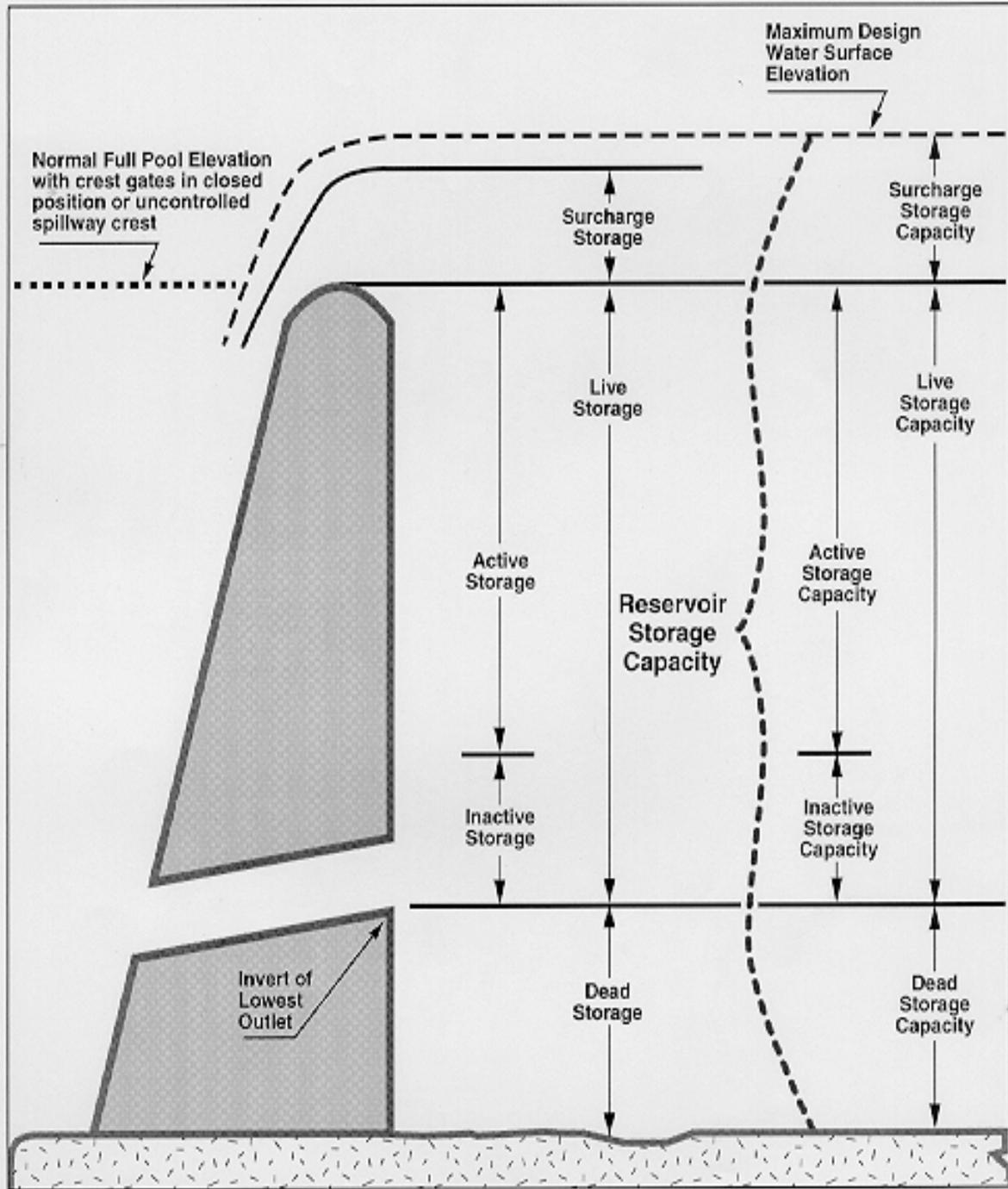
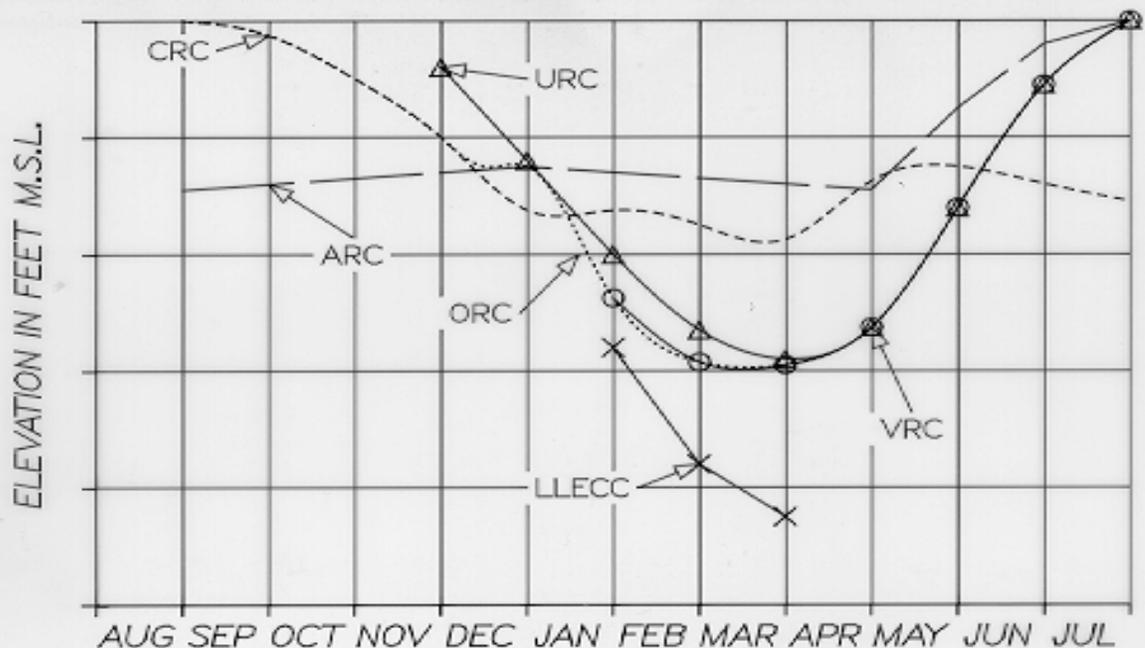


Figure A-1. ILLUSTRATION OF RESERVOIR TERMS



1. CRITICAL RULE CURVE (CRC). This curve is actually a family of one to four curves depending on the length of the critical period. These curves are developed in July of each operating year from historical flows and based on operating under adverse flow conditions.

2. ASSURED REFILL CURVE (ARC). This curve is the elevation that each project can refill if the second lowest historical water year (1931), January thru July run-off should occur.

3. VARIABLE REFILL CURVE (VRC). This curve depicts the reservoir elevation needed to refill with 95 % assurance based on the current run-off forecast.

4. UPPER RULE CURVE (URC). This curve for the period August thru December is based on historical flows and for the period January thru July is based on forecast flows. The URC reflects the amount of storage space needed to protect against a flood.

5. LOWER LIMIT ENERGY CONTENT CURVE (LLECC). This curve serves as a limit on the project draft in January, February, and March to protect the system's capability to meet firm loads until the start of the spring runoff. Limits are determined by using 1936-1937 water year to meet the system's firm energy loads.

6. OPERATING RULE CURVE (ORC). (August thru December) The ORC is the higher of the ARC or the CRC unless the URC is lower, then it controls. (January thru March) The ORC method is the same as August thru December period unless the VRC is lower, then it controls. When the VRC controls the ORC can be higher than the URC. But in no case can the ORC be lower than the LLECC. (April thru July) The ORC method is the same as January thru March period, except without the LLECC consideration.

Figure A-2. RULE CURVE DEFINITIONS

units of measure are cubic feet per second (cfs) or thousand cubic feet per second (kcfs).

**DIVERSION DEMAND** - the amount of water withdrawn from surface or groundwater sources.

**DRAWDOWN** - the distance that the water surface of a reservoir is lowered from a given elevation as the result of the withdrawal of water.

**EFFICIENCY, STATION OR SYSTEM** - the ratio of the energy delivered from the station or system to the energy received by it under specified conditions.

**ELECTRIC POWER** - a term used in the electric power industry to mean inclusively power and energy.

**ENDANGERED SPECIES** - any species which, as determined by the Fish and Wildlife Service, is in danger of extinction throughout all or a significant portion of its range other than a species of the class Insecta determined to constitute a pest whose protection would present an overwhelming and overriding risk to man.

**ENERGY** - that which does or is capable of doing work. It is measured in units of the work; electric energy is usually measured in kilowatt-hours.

**ENERGY CONTENT CURVE (ECC)** - provides sufficient storage at all times so that the Coordinated System will be able to generate its Firm Energy Load Carrying Capability under a recurrence of any historical streamflow sequence. The ECC is obtained the same way as the Operating Rule Curve (defined in Figure A-2) except the proportional draft point needed to generate the Firm Energy Load Carrying Capability is also part of the ECC.

The curve is a guide to the use of storage water from each reservoir and is used to define certain operating rights, obligations and limitations. The ECC for each reservoir consists of a graphic, tabular or other representation of reservoir elevations at the end of specified periods.

**EXTRA HIGH VOLTAGE (EHV)** - a term applied to voltage levels of transmission lines which are higher than the voltage levels commonly used. At present, the electric industry generally considers EHV to be any voltage greater than 230,000 volts.

**FEDERAL COLUMBIA RIVER POWER SYSTEM RESERVOIRS** - the Federally owned projects that generate hydroelectric power include the following existing and planned projects:

Albeni Falls	Hungry Horse
Anderson Ranch	John Day
Big Cliff	Ice Harbor
Black Canyon	Libby
Boise Diversion	Little Goose
Bonneville	Lookout Point
Chandler	Lost Creek
Chief Joseph	Lower Granite
Cougar	Lower Monumental
Detroit	McNary
Dexter	Minidoka
Dworshak	Palisades
Foster	Roza
Grand Coulee, incl Pumped Storage and Third Powerplant	Strube (Cougar Reregulator) <sup>1</sup> Teton <sup>2</sup> The Dalles
Green Peter	
Green Springs	<sup>1</sup> Planned.
Hills Creek	<sup>2</sup> Status undetermined.

**FINGERLING** - Trout, salmon, or steelhead whose size ranges from approximately 1 to 3 inches.

**FIRM ENERGY** - electric energy which is intended to have assured availability to the customer to meet all or any agreed upon portion of his load requirements.

**FIRM ENERGY LOAD CARRYING CAPABILITY (FELCC)** - the firm energy load that a system is able to supply in any period after deducting the required energy reserve and Forced Outage Reserve.

**FIRM POWER** - power intended to have assured availability to the customer to meet all or any agreed upon portion of his load requirements.

**FISHPASS** - a computer model developed by the Corps of Engineers to simulate anadromous smolt migration and survival as they travel through a river system. It allows analysis of the impacts of proposed migration such as the Water Budget fish screens, fish spill, and fish transportation on juvenile fish survival through river systems

and past dams.

**FLASH FLOOD** - a flood with a very rapid rate of rise that is generally caused by intense rainfall, failure of ice jams or dams, etc. They occur in small drainages and the time between the peak rate of rainfall and the peak discharge is very small.

**FLOOD CONTROL RULE CURVE** - a curve or family of curves of reservoir contents, with respect to time, indicating space required to control flood flow. These curves are determined from analysis of magnitude, duration, and potential damage of flood flows throughout the year or for certain periods during the year. Also called Mandatory Rule Curve (MRC).

**FLOOD PLAIN** - the low lands adjoining the channel of a river, stream, watercourse, lake, or ocean that have been or may be inundated by floodwaters and other areas subject to flooding.

**FOREBAY** - that area of a reservoir immediately upstream of a dam and in the vicinity of the outlet structures.

**FLOOD STAGE** - The stage at which the overflow of the natural banks of a stream begins to cause damage in the reach in which the elevation is measured. (See BANKFULL STAGE.)

**FORCED OUTAGE** - the shutting down of a generating unit, transmission line, or other facility, for emergency reasons.

**FRY** - The stage in the life of a fish between the hatching of the egg and the absorption of the yolk sac. From this stage until they attain a length of one inch the young fish are considered advanced fry.

**FUEL REPLACEMENT ENERGY** - electric energy generated at a hydroelectric plant as a substitute for energy that would otherwise have been generated by a thermal-electric plant.

**GENERATING UNIT** - an electric generator together with its prime mover.

**GENERATION** - act or process of producing electric energy from other forms of energy; also the amount of electric energy so produced.

**HABITAT** - the natural abode of a plant or animal, including all biotic, climatic, or soil conditions or other environmental influences affecting life.

**HATCHERY FISH** - fish that are reared from fertilization in a hatchery environment.

**HISTORICAL STREAMFLOW** - synonymous with observed streamflow over the period of record.

**HYDROELECTRIC PLANT** - an electric power generating plant in which turbine-generator units are driven by falling or running water.

**INACTIVE STORAGE** - water occupying inactive storage capacity of a reservoir.

**INACTIVE STORAGE CAPACITY** - the portion of live storage capacity from which water normally will not be withdrawn, in compliance with operating agreements.

**INSTALLED CAPACITY** - the total of the capacities as shown by the nameplates of similar kinds of apparatus such as generating units, turbines, synchronous condensers, transformers, or other equipment in a station or system.

**INTERCHANGE ENERGY** - electric energy received by one electric utility system usually in exchange for energy delivered to the other system at another time or place. Interchange energy is to be distinguished from a direct purchase or sale, although accumulated energy balances are sometimes settled for in cash.

**INTERRUPTIBLE LOAD** - electric power loads that may be curtailed at the supplier's discretion, or in accordance with a contractual agreement.

**INTERRUPTIBLE POWER** - power made available under agreements that permit curtailment or cessation of delivery by the supplier.

**LINE LOSS** - energy loss and power loss on a transmission or distribution line.

**LIVE STORAGE** - water occupying live storage capacity of a reservoir.

**LIVE STORAGE CAPACITY** - the volume of a reservoir exclusive of dead and surcharge storage capacity.

**LOAD** - the amount of electric power delivered at a given point.

**LOAD FACTOR** - the ratio of the average load over a designated period to the peak-load occurring in that period.

**MANDATORY RULE CURVE** - same as Flood Control Rule Curve.

**MAXIMUM STREAMFLOW** - the maximum rate of flow at a given point during a specified period.

**MEDIAN STREAMFLOW** - the rate of flow at a given point for which there are equal numbers of greater and lesser flow occurrences during a specified period.

**MINIMUM STREAMFLOW** - the minimum rate of flow at a given point during a specified period.

**MODIFIED FLOW** - the observed or historical flow which has been adjusted to a common level of development

by correcting for the effects of diversion demand including evaporation, return flow, and changes in storage of upstream reservoirs and lakes. As used in this report, a modified flow is corrected to a 1990 level of irrigation development, and is the flow available for power generation.

**NATURAL STREAMFLOW** - is the rate of flow at a given point of an uncontrolled stream, or streamflow adjusted to eliminate the effects of all man-made development.

**NET ENERGY FOR SYSTEM** - the electric energy requirements of a system, including losses, defined as: (1) net generation of the system, plus (2) energy received from others, less (3) energy delivered to other systems for resale.

**NONFIRM ENERGY** - electric energy having limited or no assured availability.

**NONFIRM POWER** - power which does not have assured availability to the customer to meet his load requirements.

**NORMAL** - the average value on an element over the fixed period 1961-90.

**OBSERVED STREAMFLOW** - is the amount of water that has been historically measured or otherwise determined to have occurred at a specified point in the stream system.

**ONE PERCENT ANNUAL CHANCE FLOOD** - a flood of a magnitude that has a one-percent chance of being equaled or exceeded in any given year; often referred to as the 100-year flood.

**OPERATING RULE CURVE** - a curve, or family of curves, indicates how a reservoir is to be operated under specific conditions to obtain best or predetermined results.

**OPERATING YEAR** - The period from August 1 through July 31 of the following calendar year. The operating year is the time base used in energy production. Prior to the operating year ending on July 31, 1991, the operating year had been defined as the period from July 1 through June 30 of the following calendar year. This revised definition is based upon an agreement between the signatories to the Pacific Northwest Coordinating Agreement (PNCA).

**OUTAGE** - the period during which a generating unit, transmission line, or other facility, is out of service.

**OVERLOAD CAPABILITY** - the maximum load that a machine, apparatus, or device can carry for a specified period of time under specified conditions when operating beyond its normal rating but within the limits of the manufacturer's guarantee, or in the case of expiration of the guarantee, within safe limits as determined by the owner.

**PEAK LOAD** - the maximum load in a stated period.

**PEAKING CAPABILITY** - maximum peak load that can be supplied by a generating unit, station, or system in a stated time period. It may be the maximum instantaneous load or the maximum average load over a designated interval of time.

**PEAKING CAPACITY** - generating equipment normally operated only during the hours of highest daily, weekly, or seasonal loads. Some generating equipment may be operated at certain times as peaking capacity and at other times to serve loads on a round-the-clock basis.

**PEAK LOAD PLANT** - a power plant which is normally operated to provide power during maximum load periods.

**PLANT FACTOR** - the ratio of the average load on the plant for the period of time considered to the aggregate rating of all the generating equipment installed in the plant.

**POTENTIAL HYDRO ENERGY** - the aggregate energy capable of being developed over a specified period by practicable use of the available streamflow and river gradient.

**POWER** - the time rate of transferring energy. NOTE: The term is frequently used in a broad sense, as a commodity of capacity and energy, having only general association with classic or scientific meaning (see also "Electric Power").

**POWER STORAGE** - that portion of the active storage, designated to be used for generating electric energy. Sometimes referred to as the power pool.

**PRIMARY ENERGY** - hydroelectric energy available from continuous power.

**PRIME POWER** - same as continuous power.

**PUMPED STORAGE PLANT** - a power plant using an arrangement whereby electric energy is generated for peak load by using water pumped into a storage reservoir usually during off-peak periods. A pumped storage plant may also be used to provide reserve-generating capacity.

**RECURRENCE INTERVAL** - the average interval in which a flood of a given size is equaled or exceeded as an annual maximum.

**REDD** - a type of fish-nesting area of a gravel stream scoured out by salmonids for spawning.

**REFILL YEAR** - the period from August 1 through July 31 of the following year. The refill year is used in energy production studies.

**REGULATED STREAMFLOW** - the controlled rate of flow at a given point during a specified period resulting from an actual reservoir operation (observed streamflow below the project), or a theoretical operation.

**RESERVE GENERATING CAPACITY** - extra generating capacity available to meet unanticipated demands for power or to generate power in the event of loss of generation resulting from scheduled or unscheduled outages of regularly used generating capacity.

**RESERVOIR STORAGE** - the volume of water in a reservoir at a given time. Also Reservoir Contents.

**RESERVOIR CONTENT CAPACITY** - same as Reservoir Storage Capacity.

**RESERVOIR STORAGE CAPACITY** - the volume of a reservoir available to store water.

**RETURN FLOW** - that portion of the diversion demand that is returned to the stream system and is available for further downstream use.

**REVERSIBLE TURBINE** - a hydraulic turbine, normally installed in a pumped storage plant, which can be used alternately as a pump and prime mover.

**RUN-OF-RIVER PLANT** - a hydroelectric power plant using pondage or the flow of the stream as it occurs.

**SCHEDULED OUTAGE** - the shutdown of a generating unit, transmission line, or other facility, for inspection or maintenance, in accordance with an advance schedule.

**SEASONAL STORAGE** - water held over from the annual high-water season to the following low-water season.

**SECOND-FOOT DAY** - volume of water equal to one cubic foot per second flowing continuously for one day of 24 hours.

**SECONDARY ENERGY** - all hydroelectric energy other than primary energy.

**SECTION 7 PROJECTS** - those projects that qualify under Section 7 of the Flood Control Act approved 22 December 1944 (58 stat. 890; 33.U.S.C. 709). The Federal Power Act was approved 10 June 1920 (41 Stat. 1063; 16 U.S.C. 79(a)), and other references apply. See list in Appendix C.

**SMOLT** - an anadromous fish that is physiologically ready to undergo the transition from fresh water to salt water; age varies depending upon species and environmental conditions.

**SPAWNING** - the laying of eggs, especially by fish.

**SPILL** - the discharge of water through gates, spillways, or conduits that bypass the turbines of a hydroplant.

**STAGE** - the height of the water surface in a river or body of water measured above an arbitrary datum, usually at or near the river bottom. Measurements of reservoirs are generally measured above sea level.

**STANDARD PROJECT FLOOD** - a very large (low frequency) design flood standard applied to the design of major flood control structures and representing the most severe combination of meteorological and hydrological conditions considered reasonably characteristic of a particular region.

**STORAGE CAPACITY** - same as Reservoir Storage Capacity.

**STREAMFLOW** - the rate at which water passes a given point in a stream usually expressed in cubic feet per second.

**STREAMFLOW DEPLETION** - that portion of diversion demand that is permanently removed from the stream system.

**SURCHARGE STORAGE CAPACITY** - the volume of a reservoir between the crest of an uncontrolled spillway, or the volume between the normal full pool elevation with the crest gates in the normal closed position, and the maximum water surface elevation for which the dam is designated.

**SURPLUS CAPACITY** - the difference between assured system capacity and the system peak load for a specified period.

**SURPLUS ENERGY** - generally energy generated that is beyond the immediate needs of the producing system. Specifically for BPA, electric energy generated at Pacific Northwest hydroelectric projects of the Government that would otherwise be wasted because of the lack of a market therefore at any established rate. This energy is frequently sold on an interruptible basis.

**TAILWATER** - that portion of a river or water body immediately downstream of a dam or powerhouse.

**TULE** - a fall chinook salmon that spawn in the lower Columbia River that enters the river system in the spawning metamorphosis state and has already lost its shiny silver color.

**UNREGULATED STREAMFLOW** - regulated stream-flow adjusted to eliminate the effects of reservoir regulation, but reflecting the effects of natural storage in lakes and river channels.

**UPPER RULE CURVE (URC)** - same as Flood Control Rule Curve.

**VALLEY STORAGE** - the natural storage capacity in a given reach of a stream both within and without the banks. It varies with the position of the water surface.

**VARIABLE ENERGY CONTENT CURVE (VECC)** - determined for certain large reservoirs that do not have all storage drafted to normal bottom elevation by Base Energy Content Curves. The Variable Energy Content Curves provide for drafts below the Base Energy Content Curve by the amount the forecasted volume inflow is in excess of total requirements for refill of the reservoir, minimum discharge requirements, non-owner requirements for water at-site and upstream, and water required to refill upstream reservoirs. The inflow volume at each reservoir may be reduced by deducting the 95% confidence forecast error, power discharge requirement, non-power requirements upstream (if any), and water required for refill at upstream reservoirs.

The rights, obligations and limitations are the same as those defined by the Energy Content Curve.

**VARIABLE REFILL CURVE (VRC)** - is the elevation needed to refill a reservoir with 95 percent assurance based on the current runoff forecast.

**WATER BUDGET** - a specific volume of water set aside in reservoirs to be released in a manner and at a time to provide benefit to the migration of salmonids.

**WATER YEAR** - The period from October 1 through September 30 of the following calendar year. It is the time base used in hydrology.

**WILD FISH** - fish that are spawned and reared in natural redds, as opposed to hatchery produced stock.

## APPENDIX B

### ABBREVIATIONS

ab or abv	- above	IDWR	- Idaho Department of Water Resources
AER	- actual energy regulation	IJC	- International Joint Commission
af	- acre-feet	IPC	- Idaho Power Company
AOP	- assured operating plan	kaf	- thousand acre-feet
ARC	- assured refill curve	kcfs	- thousand cubic feet per second
BC Hydro	-British Columbia Hydro	ksfd	- thousand second-foot days
& Power Authority		LARC	- limited automatic remote collector
BDT	- binary decimal transmitter	LLECC	- lower limits energy content curve
BIA	- Bureau of Indian Affairs	m	- meter
BiOp	- Biological Opinion	Maf	- million acre-feet
bl or blw	- below	mcy	- million cubic yards
BLM	- Bureau of Land Management	MF	- Middle Fork
Bonneville	-Bonneville Power Administration	mg/l	- milligrams per liter
BPA	- Bonneville Power Administration	mm	- millimeters
BWMP	- base water monitoring program	MRC	- mandatory rule curve
CAFE	- CROHMS automatic front end	MSL	- mean sea level
CBIAC	- Columbia Basin Inter-Agency Committee	MWh	- MegaWatt-hours
CBTT	- Columbia Basin Teletype Circuit	NASA	- National Aeronautics and Space Admin
CBT	- Columbia Basin Telecommunications	NF	- North Fork
CF	- Coast Fork	NPD	- North Pacific Div, Corps of Engineers
cfs	- cubic feet per second	NPP	- Portland District, Corps of Engineers
COE	- Corps of Engineers	NPPC	- Northwest Power Planning Council
COFO	- Committee on Fishery Operation	NPS	- Seattle District, Corps of Engineers
Corps	- Corps of Engineers	NPW	- Walla Walla Dist, Corps of Engineers
CPO	- coordinated plan of operation	nr	- near
CRC	- critical rule curve	NRCS	- Natural Resources Conservation Service
CRFS	- Columbia River Forecast Service	NRFC	- Northwest River Forecast Center
CRITFC	- Columbia River Inter-Tribal Fish Commission	NWS	- National Weather Service
CROHMS	-Columbia River Operational Hydromet Management System	ODFW	- Oregon Department of Fish and Wildlife
CRT	- cathode ray tube	ORC	- operating rule curve
CRWMG	- Columbia River Water Management Group	PNCA	- Pacific Northwest Coordination Agrem't
DO	- dissolved oxygen	PNRBC	- Pacific Northwest River Basins Com
DTF	- Depletions Task Force	PUD	- Public Utility District
ECC	- energy content curve	Puget Power	- Puget Sound Power and Light Company
EHV	- extra high voltage	R	- river
EPA	- Environmental Protection Agency	RCC	- Reservoir Control Center, NPD, COE
FCRC	- flood control rule curve	Reclamation	- US Bureau of Reclamation
FDR Lake	- Franklin D Roosevelt Lake	RM	- river mile
FELCC	- firm energy load carrying capability	SF	- South Fork
FERC	- Federal Energy Regulatory Commission	sfd	- second-foot day
FLCC	- firm load carrying capability	SI	- System International d'Unites
FPC	- Fish Passage Center	Seattle	- City of Seattle, Department of Light
GOES	- Geosynchronous Orbiting Environmental Satellite	Tacoma	- City of Tacoma, Department of Light
HDC	- Hydromet Data Committee	URC	- upper rule curve

USBR	- US Bureau of Reclamation
USDA	- US Department of Agriculture
USFS	- US Forest Service
USGS	- US Geological Survey
VECC	- variable energy content curve
VRC	- variable refill curve
WDOE	- Washington Department of Ecology
WF	- West Fork
WQI	- water quality index
WY	- Water Year (Oct 1 - Sep 30)
YRBWEP	- Yakima River Basin Water Enhancement Project

**NOTE:** Additional abbreviations and their definitions will be found on page 140 of Appendix C.

## APPENDIX C

### PERTINENT DATA ON SELECTED DAMS AND RESERVOIRS

This appendix provides a comprehensive list of dams and reservoirs in the Columbia and coastal basins. The criteria for selecting the listed projects were to include all impoundments having 5,000 af or more of active storage or a minimum of five MegaWatts of hydroelectric generating capacity.

Reference sources used were:

1. RECLAMATION PROJECT DATA. United States Department of Interior.
2. RESERVOIRS AND HYDRO-ELECTRIC STATIONS. Northwest Power Pool.
3. ELECTRIC POWER PLANTS IN THE PACIFIC NORTHWEST AND ADJACENT AREAS.
4. COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY. Pacific Northwest River Basins Commission, Sept 1972.
5. PROJECT DATA AND OPERATING LIMITS, Columbia River and Tributaries Review Study (CRT) 49 (Revised), Book 1; and (CRT) 69, Book 2; both dated July 1989.
6. Other miscellaneous reports.

The pertinent data given in this appendix are the most complete information available at the time of publication. Any additions or corrections to the tabulation will be noted in further publications. Pertinent data included in the tabulations are:

1. CBT Identifiers. The three or four letter abbreviation used to identify projects when data are reported on the Columbia Basin Telecommunications and CROHMS data collection systems. For additional information consult the CBT USER'S MANUAL published by the North Pacific Division, Corps of Engineers, at the address inside the back cover of this report.
  2. Year of Completion. Usually, the year the project began controlling the impoundment of water. This is usually prior to the completion of the installation of all the powerhouse generators. In some cases the date of completion is the date of the latest modification or installation of the last generator unit.
  3. River. River on which the project is located, or, for off-stream impoundments, the stream from which the major water supply is derived.
  4. River Mile. The distance, in statute miles, from the mouth of the river, on which the project is located, to the axis of the dam, as measured along the main river channel.
  5. Owner or Operator. These include both publicly owned projects (Federal or other governmental bodies) and privately owned projects. Abbreviations are explained in last page of tabulations.
- For additional information on the following projects

privately owned projects. Abbreviations are explained in last page of tabulations.

6. Remarks. Self-explanatory.
7. Project Functions. Water resource uses for which the project is authorized and operated. The major functions include one or more of the following: flood control, energy generation, irrigation, navigation, recreation, conservation, etc. Abbreviations are explained on last page of tabulation.
8. Normal Maximum Forebay. The top of the normal operating pool range, expressed in feet of elevation above mean sea level. Some projects may have surcharge above the listed maximum forebay elevation, either by adding flashboards or because the added head is required to pass inflow through the outlet structure. Some large natural lakes such as Kootenay, Pend Oreille, Coeur d'Alene and Flathead, will experience involuntary storage above the listed normal maximum pool during periods of unusually high inflows due to the constriction at the natural outlet of the lake.
9. Normal Minimum Forebay. The bottom of the normal operating range, expressed in feet of elevation above mean sea level. Under special conditions some reservoirs may be drawn below this level for a limited period of time.
10. Storage In 1,000 Acre-Feet. Active storage between normal maximum and normal minimum forebay elevations.
11. Top Foot Storage. The volume of storage, in 1,000 acre-feet, in the top foot of the reservoir.
12. Installed Generation. Number of units. The number of existing units or the number being installed under existing contracts.
13. Generation Capacity of all installed hydroelectric turbines, in cfs, rated according to the rate of water usage.
14. Generation Capacity of all installed hydroelectric generators, in MegaWatts, rated according to the amount of Power they can generate. (Nameplate capacity and Station service capacity if applicable, but not including Overload capacity.)
15. Normal Maximum Head. The difference, in feet, between the normal maximum forebay and the average tailwater elevation with all units operating. The heads shown in this preliminary tabulation are those given in the Northwest Power Pool list of projects or the Reclamation Project Data publication.
16. Average Annual Discharges. Update to 25-year averages, where available.

consult the **Project Data and Operating Limits**, CRT 49

Book 1 (Revised), and **Project Data and Operating Limits**, CRT 69 Book 2, both dated July 1989, published by the NPD, Corps of Engineers, address on the inside of the back cover.

**PERTINENT DATA INDEX**

The following table alphabetizes the projects listed in the Pertinent Data table at the end of this appendix. This latter table lists projects in downstream order whereas the former table cross references these projects numerically for quicker reference.

**UPPER COLUMBIA**

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
5	Aberfeldie	22	Hungry Horse	33	Ninepipe
39	Albeni Falls	24	Kerr	37	Noxon Rapids
23	Ashley Lake	32	Kicking Horse	27	Pablo
35	Black Lake	12	Kootenay Canal	20	Painted Rock Lake
43	Boundary	6	Libby	47	Post Falls
41	Box Canyon	25	Little Bitterroot Lake	40	Priest Lake
16	Brilliant	53	Little Falls	2	Revelstoke
38	Cabinet Gorge	52	Long Lake	44	Seven Mile
21	Como Lake	14	Lower Bonnington	15	South Slocan
11	Corra Linn	28	Lower Crow	8	Smith Creek
10	Duncan	34	Lower Jocko Lake	42	Sullivan Lake
9	Erickson	31	McDonald	30	Tabor
18	East Fork Rock Creek	1	Mica	36	Thompson Falls
17	Flint Creek	29	Mission	46	Twin Lakes
54	Grand Coulee	50	Monroe Street	13	Upper Bonnington
48	Hayden Lake	7	Moyie Upper	49	Upper Falls
26	Hubbart	19	Nevada Creek	45	Waneta
4	Hugh Keenleyside	51	Nine Mile	3	Whatshan

**MID-COLUMBIA**

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
23	Bumping Lake	26	Naches	10	Salmon Lake
28	Chandler	2	Nile Valley	16	Snow Lakes
14	Chelan Lake	1	North Dam - Dry Falls	4	Soda Lake
7	Chief Joseph	5	O=Sullivan	9	Spectacle Lake
22	Cle Elum	6	Owhi	25	Tieton
24	Clear Lake	3	Pinto	18	Wanapum
11	Conconully	19	Priest Rapids	13	Wells
20	Keechelus	17	Rock Island	8	Zosel
21	Lake Kachees	15	Rocky Reach		
12	Leader Lake	27	Roza		

### UPPER SNAKE

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
54	Agency Valley	3	Henrys Lake	43	Owyhee
13	American Falls	60	Horseshoe Bend	64	Paddock Valley
46	Anderson Ranch	49	Hubbard	2	Palisades
43	Antelope	4	Island Park	57	Payette Lake
47	Arrowrock	1	Jackson Lake	50	Pleasant Valley
5	Ashton	58	Lake Fork	12	Portneuf
63	Black Canyon	45	Little Camas	11	Ririe
10	Blackfoot	29	Little Wood	61	Sage Hen
35	Bliss	65	Lost Valley	21	Salmon Falls Creek
55	Bully Creek	34	Lower Malad	20	Shoshone Falls
66	C Ben Ross	28	Lower Salmon Falls	52	Silver Creek
37	C J Strike	48	Lucky Peak	38	Swan Falls
59	Cascade	25	Mackay	16	Twin Falls Creek
22	Cedar Creek	32	Magic	31	Twin Lakes
42	Chimney Creek	68	Mann Creek	33	Upper Malad
67	Crane Creek	18	Milner	27	Upper Salmon A
60	Deadwood	14	Minidoka	26	Upper Salmon B
51	Deer Flat	36	Mountain Home	53	Warm Springs
6	Falls River	39	Mountain View	40	Wild Horse
30	Fish Creek	24	Mud Lake	56	Willow Creek #3
8	Gem State	19	Murtaugh	17	Wilson Lake
7	Grassy Lake	15	Oakley	41	Wilson River
9	Grays Lake	23	One Thousand Springs		

### LOWER-MIDDLE SNAKE

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
4	Brownlee	14	Ice Harbor	5	Oxbow
8	Brundage	11	Lower Granite	3	Thief Valley
10	Dworshak	13	Lower Monumental	1	Unity
7	Goose Lake	12	Little Goose	9	Wallowa Lake
6	Hells Canyon	2	Mason		

## LOWER COLUMBIA

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
12	Arthur B Bowman	10	Haystack	15	Pelton
19	Bonneville	6	John Day	17	Powerdale
22	Bull Run	30	Mayfield	14	Round Butte
20	Bull Run #1	3	McKay	23	Swift #1
21	Bull Run #2	2	McNary	24	Swift #2
4	Cold Springs	26	Merwin	16	The Dalles
18	Condit	1	Mill Creek	11	Wasco
7	Crane Prairie	29	Mossyrock	8	Wickiup
9	Crescent Lake	13	Ochoco	5	Willow Creek
28	Cowlitz Falls	27	Packwood	25	Yale

## WILLAMETTE

<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>	<u>No.</u>	<u>Project</u>
18	Big Cliff	25	Faraday	26	River Mill
11	Blue River	14	Fern Ridge	19	Scoggins
7	Carmen	16	Foster	8	Smith
5	Cottage Grove	15	Green Peter	22	Stone Creek
10	Cougar	1	Hills Creek	21	Timothy Lake
17	Detroit	12	Leaburg	9	Train Bridge
3	Dexter	2	Lookout Point	20	T W Sullivan
6	Dorena	24	North Fork	13	Walterville
4	Fall Creek	23	Oakgrove Powerhouse		

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	CBTT IDENT	YEAR COMP- LETION	L O C A T I O N		OWNER OR OPERATOR	REMARKS	
			RIVER	MILE			
U P P E R C O L U M B I A R I V E R							
1	MICA	MCDB	1973	COLUMBIA	1018.0	B C HYDRO	KINBASKET LK FORMLY MCNAUGHTON LK
2	REVELSTOKE	REVB	1983	COLUMBIA	934.0	B C HYDRO	
3	WHATSHAN	WSHB	1971	WHATSHAN	5.0	B C HYDRO	
4	HUGH KEENLEYSIDE	ARDB	1968	COLUMBIA	780.0	B C HYDRO	ARROW LAKE
5	ABERFELDIE	ABEB	1922	BULL	8.4	B C HYDRO	
6	LIBBY	LIB	1973	KOOTENAI	221.9	COE	LAKE KOOCANUSA
7	MOYIE UPPER		1941	MOYIE	1.8	B FERRY	
8	SMITH CREEK		1990	SMITH CREEK		SMITH	
9	ERICKSON		1933	GOAT	7.7	W KOOTENAY	
10	DUNCAN	DCDB	1967	DUNCAN	8.3	B C HYDRO	DUNCAN RESERVOIR
11	CORRA LINN	CORB	1932	KOOTENAY	16.1	W KOOTENAY	KOOTENAY LAKE
12	KOOTENAY CANAL		1975	OFF KOOTENAY	-	B C HYDRO	DIVERTS WATER FROM KOOTENAY LAKE
13	UPPER BONNINGTON		1907	KOOTENAY	14.8	W KOOTENAY	
14	LOWER BONNINGTON			KOOTENAY	14.3	W KOOTENAY	RUN-OF-RIVER PROJECTS D/S CORB
15	SOUTH SLOCAN		1928	KOOTENAY	13.4	W KOOTENAY	
16	BRILLIANT	BRDB	1944	KOOTENAY	1.9	COMINCO	
17	FLINT CR		1901	FLINT CR	38.8	MONTANA	GEORGETOWN LAKE
18	EAST FORK ROCK CR		1937	E F ROCK CR	9.7		
19	NEVADA CR		1938	NEVADA CR		S MONTANA	
20	PAINTED ROCK LAKE		1940	W F BITTERROOT	19.8		
21	COMO	CMO	1910	ROCK CR	5.0	USBR/BID	
22	HUNGRY HORSE *	HGH	1953	S F FLATHEAD	5.2	USBR	GENERATOR UPGRADE 1993
23	ASHLEY LAKE			ASHLEY CR	26.2	ASH	
24	KERR *	KER	1938	FLATHEAD	72.0	MONTANA	FLATHEAD LAKE
25	L BITTERROOT LAKE		1918	LITTLE BITTERROOT	70.3		
26	HUBBART		1924	LITTLE BITTERROOT	55.8		
27	PABLO		1914	FLATHEAD		BIA	
28	LOWER CROW		1933	CROW CR	3.4	BIA	
29	MISSION		1935	MISSION CR	16.7	BIA	
30	TABOR		1919	DRY CR			ST MARYS LAKE
31	McDONALD		1919	POST CR	12.4	BIA	
32	KICKING HORSE		1930	CROW CR		BIA	
33	NINEPIPE		1911	FLATHEAD		BIA	
34	LOWER JOCKO LAKE		1937	N F JOCKO	15.0	BIA	
35	BLACK LAKE		1967	JOCKO CR		BIA	
36	THOMPSON FALLS	TOM	1917	CLARK FORK	208.0	MONTANA	
37	NOXON RAPIDS	NOX	1959	CLARK FORK	169.7	WWP	
38	CABINET GORGE	CAB	1953	CLARK FORK	149.9	WWP	
39	ALBENI FALLS	ALF	1955	PEND OREILLE	86.9	COE	LAKE PEND OREILLE
40	PRIEST LAKE	PSL	1951	PRIEST	42.0	WWP	STORAGE FOR D/S POWER
41	BOX CANYON	BOX	1955	PEND OREILLE	34.5	PEND	
42	SULLIVAN LAKE		1931	OUTLET CR	5.0	PEND	TRIBUTARY TO SULLIVAN CR
43	BOUNDARY	BDY	1967	PEND OREILLE	17.0	SEATTLE	
44	SEVEN MILE		1979	PEND d'OREILLE	6.0	B C HYDRO	
45	WANETA	WANB	1954	PEND d'OREILLE	0.5	COMINCO	
46	TWIN LAKES			STRANGER CR			
47	POST FALLS	POS	1906	SPOKANE	102.1	WWP	COEUR D'ALENE LAKE
48	HAYDEN LAKE	HAD	1948	HAYDEN CR		HAYDEN	
49	UPPER FALLS		1922	SPOKANE	74.2	WWP	DAM ADDED
50	MONROE STREET		1890	SPOKANE	74.2	WWP	
51	NINE MILE	NIN	1908	SPOKANE	58.1	WWP	POWERHOUSE REPLACED 1992
52	LONG LAKE	LLK	1915	SPOKANE	33.9	WWP	LAKE SPOKANE
53	LITTLE FALLS	LIT	1910	SPOKANE	29.3	WWP	
54	GRAND COULEE *	GCL	1942	COLUMBIA	596.6	USBR	FRANKLIN D ROOSEVELT LAKE

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	FUNC-TION	NORMAL MAXIMUM FOREBAY	NORMAL MINIMUM FOREBAY	STORAGE (1000 AC FT)		INSTALLED GENERATION			NORMAL MAXIMUM HEAD	AVE ANN DISCHARGE (CFS)
				ACTIVE	TOP FT	NO OF UNITS	CAP IN CFS	CAP IN MW		
U P P E R C O L U M B I A R I V E R										
MICA	FP	2475.0	2320.0	12046.0	106.00	4	41,600	1,740	615	20,510
REVELSTOKE	FP	1880.0	1830.0	1276.0		4	56,000	1,800	425	
WHATSHAN	P	2104.0	2084.0	83.8	4.36	1	1,330	50.0	677	
HUGH KEENLEYSIDE	FRPNI	1444.0	1377.9	7257.0	128.90	0		0.0	69	40,100
ABERFELDIE	P	2880.0						5.0	275	
LIBBY	FPrc	2459.0	2287.0	4979.5	46.40	5	24,100	525.0	337	11,350
MOYIE UPPER	P	2035.3						2.0	200	
SMITH CREEK	P					3		38		
ERICKSON	P							1.3	65	
DUNCAN	FPI	1892.0	1794.2	1398.6	18.25	0		0.0	120	3,534
CORRA LINN	PFI	1745.3	1733.3	673.0	111.67	3	12,600	40.5	58	27,570
KOOTENAY CANAL	P	1745.3	1729.0			4	26,000	528	245	
UPPER BONNINGTON	P	1682.7				6	13,500	60.0	71	
LOWER BONNINGTON	P					3	9,500	41.0	66	
SOUTH SLOCAN	P	1543.5				3	10,500	54.0	72	
BRILLIANT	PFI	1477.0	1472.0			4	18,000	108.8	98	30,650
FLINT CREEK	PR	6429.5	6398.0	31.0	3.00	2	30	1.1	717	30
EASTFORK ROCK CR	I	6055.5	5990.0	16.0	0.44					148
NEVADA CREEK	IR	4616.0	4551.5	12.6	0.38					37
PAINTED ROCK LAKE	IR	4725.5	4625.5	31.7	0.66					294
COMO	I	4242.7	4188.5	35.1	0.94					148
HUNGRY HORSE *	FPIrc	3561.0	3336.0	3161.0	23.91	4	8,900	428.0	484	3,517
ASHLEY LAKE	I			30.0	3.00					29
KERR *	PFR	2893.0	2883.0	1218.7	125.56	3	14,346	168.0	187	11,550
L BITTERROOT LAKE	I	3906.5	3898.0	26.0	2.90					
HUBBART	IR	3219.0	3140.0	12.1	0.46					
PABLO	I	3210.2	3179.0	27.1	2.04					
LOWER CROW	I	2877.0	2800.0	10.4	0.34					
MISSION	I	3406.0	3340.7	7.3	0.29					
TABOR	I	4024.0	3911.5	23.3	0.29					
McDONALD	I	3598.0	3545.0	8.2	0.20					
KICKING HORSE	I	3061.9	3042.0	8.4	0.79					
NINEPIPE	C	3010.0	2895.4	14.9	1.60					
LOWER JOCKO LAKE	IR	4340.0	4267.0	6.4	0.12					
BLACK LAKE	I			5.1						
THOMPSON FALLS	P	2396.0	2380.0	15.0	1.45	6	11,100	52.6	63	19,820
NOXON RAPIDS	P	2331.0	2295.0	231.0	7.93	5	50,000	396.9	156	19,370
CABINET GORGE	P	2175.0	2160.0	42.8	3.19	4	35,700	200	111	21,850
ALBENI FALLS	FPNrc	2062.5	2051.0	1155.2	94.60	3	33,000	42.6	30	25,340
PRIEST LAKE	PF	2437.6	2434.6	71.3	23.8	0				1,180
BOX CANYON	P	2030.7	2014.0	6.9	2.78	4	28,500	60	42	15,970
SULLIVAN LAKE	P	2588.7	2564.0	31.0	1.29	0			548	
BOUNDARY	P	1990.0	1950.0	27.1	1.65	4	33,000	633.7	275	26,720
SEVEN MILE	P	1715.0	1690.0	21.2	0.48	3	36,000	605	197	26,800
WANETA	PI	1517.8	1502.0	4.2	0.36	4	25,000	283.0	205	27,820
TWIN LAKES	I			15.1	1.89					
POST FALLS	P	2128.0	2120.8	225.0	42.45	6	5,410	15.0	61	6,300
HAYDEN LAKE	ORC			73.0						72
UPPER FALLS	P	1870.5	1864.5	0.8	0.14	1	2,500	10.2	64	6,675
MONROE STREET	P	1806.0	1806.0			1	1,800	14.8	72	6,864
NINE MILE	P	1606.6	1590.0	4.6	0.42	4	5,000	26.0	70	7,220
LONG LAKE	P	1536.0	1512.0	104.2	5.00	4	6,300	70.0	174	7,793
LITTLE FALLS	P	1362.0	1351.0	2.2	0.26	4	7,200	32	84	7,793
GRAND COULEE *	FPIRC	1290.0	1208.0	5185.5	80.53	24	280,000	6,180.0	343	107,700

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	CBTT IDENT	YEAR COMP-LETION	LOCATION		OWNER OR OPERATOR	REMARKS	
			RIVER	MILE			
M I D D L E C O L U M B I A R I V E R							
1	NORTH DAM(DRY FALLS)	BNK	1951	OFF COLUMBIA R	--	USBR	(PUMP-TURBINE GENERATORS) BANKS LK
2	NILE VALLEY		1918	WILSON CR		NVR	
3	PINTO	PIN	1948	OFF STREAM BANKS L	--	USBR	BILLY CLAPP LAKE FORMERLY (LONG LK)
4	SODA LAKE		1952	OFF STREAM	--	USBR	
5	O'SULLIVAN	POT	1949	CRAB CR	45.8	USBR/GRANT	S COLUMBIA BSN I D POWERHOUSE 1990
6	OWHI			LITTLE NESPELEM			
7	CHIEF JOSEPH	CHJ	1961	COLUMBIA	545.1	COE	RUFUS WOODS LAKE
8	ZOSEL		1927	OKANOGAN	77.4	WHITE	
9	SPECTACLE LAKE		1969	OFF TOATS COULLE CR	--		WHITE NEAR TONASKET, WA
10	SALMON LAKE	SAL	1921	OFF SALMON CR	--	OKANOGAN	CONCONALLY LK (NORTH)
11	CONCONULLY	CCL	1910	SALMON CR	15.5		OKANOGAN CONCONALLY RESERVOIR
12	LEADER LAKE		1910	LOUP LOUP CR		PVP	
13	WELLS *	WEL	1967	COLUMBIA	515.1	DOUGLAS	LAKE PATEROS
14	CHELAN	CHL	1927	CHELAN	4.8	CHELAN	
15	ROCKY REACH *	RRH	1961	COLUMBIA	473.7	CHELAN	LAKE ENTIAT
16	SNOW LAKES			SNOW CR		CI	
17	ROCK ISLAND	RIS	1933	COLUMBIA	453.4	CHELAN	2ND POWERHOUSE ADDED 1981
18	WANAPUM *	WAN	1964	COLUMBIA	415.8	GRANT	
19	PRIEST RAPIDS *	PRD	1961	COLUMBIA	397.1	GRANT	
20	KECHELUS	KEE	1917	YAKIMA	214.5	USBR	
21	LAKE KACHESS	KAC	1912	KACHESS	0.9	USBR	
22	CLE ELUM	CLE	1933	CLE ELUM	8.2	USBR	
23	BUMPING LAKE	BUM	1910	BUMPING	17.0	USBR	
24	CLEAR LAKE	CLR	1914	N F TIETON	40.2	USBR	RAISED 18 FT IN 1918, REHAB 1964
25	TIETON	RIM	1925	TIETON	21.3	USBR	RIMROCK LAKE
26	NACHES		1906	NACHES	9.7	PP&L	
27	ROZA	RZA	1939	YAKIMA	127.9	USBR	
28	CHANDLER	CDR	1956	YAKIMA	47.1	USBR	
U P P E R S N A K E R I V E R							
1	JACKSON LAKE	JCK	1911	SNAKE	1000.2	USBR	
2	PALISADES *	PAL	1957	SNAKE	901.6	USBR	REBUILT 1995
3	HENRYS LAKE	HEN	1923	HENRYS FORK	117.4	N FORK	
4	ISLAND PARK	ISL	1938	HENRYS FORK	1.7	USBR	
5	ASHTON		1917	HENRYS FORK	45.0	UP&L	
6	FALLS RIVER		1993	FALLS		MHP	
7	GRASSY LAKE	GRS	1939	GRASSY CR	48.0	USBR	INTER-BASIN TRANSFER TO BLACKFOOT
8	GEM STATE		1993	SNAKE		MHP	
9	GRAYS LAKE		1924	WILLOW CR		BIA	
10	BLACKFOOT	BLK	1910	BLACKFOOT	69.0	BIA	ENLARGED IN 1924, REHAB 1986
11	RIRIE *	RIR	1977	WILLOW CR	17.0	USBR	
12	PORTNEUF		1951	PORTNEUF	82.7	PM	
13	AMERICAN FALLS *	AMF	1927	SNAKE	714.0	USBR	
14	MINIDOKA	MIN	1911	SNAKE	675.0	USBR	LAKE WALCOTT
15	OAKLEY	OKL	1913	GOOSE CR	29.9	OAKLEY	
16	TWIN FALLS CREEK		1935	SNAKE	617.4	IDAHO	REBUILT 1995
17	WILSON LAKE		1909	OFF STREAM	7.4	N SIDE	
18	MILNER	MIL	1905	SNAKE	640.0	TF/IDAHO	REBUILT 1932, POWERHOUSE 1992
19	MURTAUGH		1905	OFF STREAM		TF	
20	SHOSHONE FALLS		1904	SNAKE	614.7	IDAHO	
21	SALMON FALLS CREEK	SAM	1911	SALMON FALLS CR	46.0	SALMON	
22	CEDAR CREEK		1920	CEDAR CR		CEDAR	
23	1000 SPRINGS		1912	SNAKE (SPRINGS)	584.7	IDAHO	
24	MUD LAKE	MUDI	1921	CAMAS CR		OWSLEY	TERMINAL LAKE WITH DIKES
25	MACKAY	MAC	1918	BIG LOST		B LOST R	
26	UPPER SALMON B		1947	SNAKE	580.8	IDAHO	
27	UPPER SALMON A		1937	SNAKE	579.6	IDAHO	
28	LOWER SALMON FALLS		1949	SNAKE	572.9	IDAHO	
29	LITTLE WOOD *	WOD	1936	LITTLE WOOD	78.8	USBR	PROJECT ENLARGED 1960
30	FISH CREEK			FISH CR (WOOD)		CAREY V	

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	FUNC-TION	NORMAL MAXIMUM FOREBAY	NORMAL MINIMUM FOREBAY	STORAGE (1000 AC FT)		INSTALLED GENERATION			NORMAL MAXIMUM HEAD	AVE ANN DISCHARGE (CFS)
				ACTIVE	TOP FT	NO OF UNITS	CAP IN CFS	CAP IN MW		
M I D D L E C O L U M B I A R I V E R										
NORTH DAM(DRY FALLS)	IP	1570.0	1539.5	715.0	27.00	6	19,200	314.0	280	
NILE VALLEY	I			6.7						
PINTO	I	1335.0	1312.8	21.2		0				
SODA LAKE	I	1008.2	1008.2							
O'SULLIVAN	IFP	1046.5	1022.5	332.2	29.00	1		6.7		
OWHI	I			5.3	0.54					
CHIEF JOSEPH	Pirg	956.0	930.0	116.0	7.80	27	219,000	2,075.0	177	108,000
ZOSEL	M	911.5	909.0	17.0		0				
SPECTACLE LAKE	I	1371.0	1352.0	6.2		0				
SALMON LAKE	I	2324.3	2282.1	10.5	0.31	0				3
CONCONULLY	I	2287.0	2232.4	13.0	0.45					29
LEADER LAKE	IP			5.3						
WELLS *	PFR	781.0	771.0	74.0	10.70	10	220,000	774.3	72	112,500
CHELAN	PR	1100.0	1079.0	677.4	32.90	2	2,016	48.0	393	2,024
ROCKY REACH *	PFR	707.0	703.0	36.0	9.20	11	220,000	1,273.2	93	121,320
SNOW LAKES				12.5	0.18					
ROCK ISLAND	P	613.0	609.0	9.5	2.50	18	220,000	788.0	54	118,200
WANAPUM *	PFR	571.0	560.0	161.0	13.80	10	178,000	831.3	83.5	118,300
PRIEST RAPIDS *	PFR	488.0	481.5	44.0	7.00	10	187,000	288.5	82.5	118,400
KEECHELUS	I	2517.0	2425.0	158.0	2.56					330
LAKE KACHESS	I	2262.0	2192.8	239.0	4.54					285
CLE ELUM	I	2240.0	2110.0	436.9	4.80					909
BUMPING LAKE	I	3426.0	3389.6	33.7	1.30					291
CLEAR LAKE	I	3018.0	2960.0	5.3	0.27					
TIETON	I	2926.0	2766.0	198.0	2.53	0				489
NACHES	P	1496.4				2	495	4.5	151	
ROZA	PIC		1220.5			1	1,080	11.3	160	
CHANDLER	PI	618.5				2	1,500	12.0	122	
U P P E R S N A K E R I V E R										
JACKSON LAKE	IFrc	6760.0	6730.0	847.0	25.20	0				1,410
PALISADES *	IFPrc	5620.0	5497.9	1200.0	16.24	4	14,500	118.8	245	6,220
HENRYS LAKE	IPF	6473.9	6457.2	90.4						53
ISLAND PARK	I	6302.0	6239.0	127.3	7.80					585
ASHTON	P	5157.4				3	1,930	5.8	48	1,450
FALLS RIVER	P					2	750	9.1	252	
GRASSY LAKE	I	7210.0	7135.0	15.2	0.31					40
GEM STATE	P							22.4		
GRAYS LAKE	I	6388.0		40.0	22.00					
BLACKFOOT	I	6120.5	6086.0	350.0	17.30					
RIRIE *	FRC	5112.8	5023.0	80.5	1.56					180
PORTNEUF	I	5681.0		23.7						142
AMERICAN FALLS *	IFPmrc	4354.5	4295.8	1672.6	56.10	3	12,188	92.3	88	6,910
MINIDOKA	IPF	4245.0	4236.0	95.2	11.70	7	5,000	15.6		6,040
OAKLEY	I	4756.0	4619.0	74.4	1.25					62
TWIN FALLS CREEK	P	3519.4	3507.0	0.9	0.10	1	935	43.7	147	2,850
WILSON LAKE	I	4012.0		18.5	1.43					
MILNER	IPr	4133.8	4122.8			2		58.3		2,550
MURTAUGH	I			5.2						
SHOSHONE FALLS	IP	3362.0	3357.0	0.6	0.12	3	860	12.5	212	
SALMON FALLS CREEK	I	5025.8	4445.8	182.7	3.40	0				
CEDAR CREEK	I			23.7						27
1000 SPRINGS	P	3061.9	3061.9	0		3	560	8.0	182	
MUD LAKE	I			44.0						
MACKAY	I	6066.5	6007.0	44.4	1.36					306
UPPER SALMON B	P	2878.2	2876.2	1.2	0.60	2	6,500	19.5	37	
UPPER SALMON A	P	2841.3	2841.1			2	6,000	17.6	43	
LOWER SALMON FALLS	IP	2798.6	2792.6	4.6	0.83	4	16,000	70.0	60	8,410
LITTLE WOOD *	IC	5237.3	5127.4	30.0	0.57					135
FISH CREEK	I			12.7	0.56					

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	CBTT IDENT	YEAR COMP- LETION	L O C A T I O N		OWNER OR OPERATOR	REMARKS
			RIVER	MILE		
U P P E R S N A K E R I V E R						
31		1908	McKINNEY CR (WOOD)		TL	MORMAN RESERVOIR
32	MAG	1917	BIG WOOD	67.5	BIG WOOD	
33		1949	MALAD	1.0	IDAHO	
34		1911	MALAD	0.2	IDAHO	REBUILT 1948
35	BLS	1949	SNAKE	560.3	IDAHO	
36		1906	RATTLESNAKE CR		MT HOME	
37	CJS	1952	SNAKE	492.0	IDAHO	
38	SWA	1900	SNAKE	457.7	IDAHO	REBUILT 1918, 1994
39		1969	BOYLE CR		DVR	BLUE LAKE
40	WLD		OWYHEE	286.0	BIA	NEAR ELKO, NV
41			S F OWYHEE			
42			S F OWYHEE			
43			JACK CR		JORDAN	
44	OWY	1938	OWYHEE	28.5	USBR/OID	POWERHOUSE ADDED 1991
45		1912	LITTLE CAMAS CR	22.0	MT HOME	INTER-BASIN DIVISION
46	AND	1950	S F BOISE	43.5	USBR	
47	ARK	1915	BOISE	75.4	USBR	DAM CREST RAISE 5' IN 1935
48	LUC	1961	BOISE	63.8	COE	POWERHOUSE CONSTRUCTED BY SCL 1994
49		1902	OFF STREAM	--	BOISE	NEAR BOISE, ID
50		1925	BLACKS CR		PV	
51	LOW	1908	OFF STREAM	--	BOISE	LAKE LOWELL; DIV FROM BOISE R
52		1969	SILVER CR			MOON RESERVOIR
53	WAR	1919	M F MALHEUR	108.0	USBR	
54	BEU	1935	N F MALHEUR	15.0	USBR/VALE	BEULAH RESERVOIR
55	BUL	1963	BULLY CR	12.5	USBR/VALE	
56		1911	MALHEUR		ORCHARDS	
57	PAY	1944	N F PAYETTE	75.4	LAKE	
58		1926	L F PAYETTE	18.0	LAKE	
59	CSC	1948	N F PAYETTE	40.2	USBR	
60	DED	1931	DEADWOOD	24.4	USBR	
61		1993	PAYETTE		HBH	
62		1938	SAGE HEN CR		SQUAW	
63	EMM	1924	PAYETTE	38.7	USBR	
64		1950	LITTLE WILLOW CR		L WILLOW	
65		1929	LOST CR		L VALLEY	
66		1936	OFF STREAM		L WEISER	
67		1920	CRANE CR	12.5	CRANE	
68	MAN	1967	MANN CR	13.0	USBR	
69						
L O W E R A N D M I D D L E S N A K E						
1	UNY	1938	BURNT	63.6	USBR	
2	PHL	1968	POWDER	133.7	USBR	PHILLIPS LAKE
3	THF	1932	POWDER	70.0	USBR	
4	BRN	1959	SNAKE	285.0	IDAHO	
5	OXB	1961	SNAKE	273.0	IDAHO	
6	HCD	1967	SNAKE	247.0	IDAHO	
7		1919	GOOSE CR		GOOSE	
8		1935	BRUNDAGE CR		BRUNDAGE	ENLARGED IN 1987
9	WAL	1929	WALLOWA LAKE		ADC	WALLOWA LAKE
10	DWR	1973	N F CLEARWATER	1.9	COE	
11	LWG	1975	SNAKE	107.5	COE	
12	LGS	1970	SNAKE	70.3	COE	LAKE BRYAN
13	LMN	1970	SNAKE	41.6	COE	LAKE HERBERT G WEST
14	IHR	1961	SNAKE	9.7	COE	LAKE SACAJAWEA

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	FUNC-TION	NORMAL MAXIMUM FOREBAY	NORMAL MINIMUM FOREBAY	STORAGE (1000 AC FT)		INSTALLED GENERATION			NORMAL MAXIMUM HEAD	AVE ANN DISCHARGE (CFS)
				ACTIVE	TOP FT	NO OF UNITS	CAP IN CFS	CAP IN MW		
U P P E R S N A K E R I V E R										
TWIN LAKES	I			31.2	4.04					460
MAGIC	I	4935.0	4821.4	191.5	3.90					
UPPER MALAD	P	3001.3	3007.0			1	800	9.0	124	
LOWER MALAD	P	2876.6	2876.6	0		1	1,200	15.0	153	
BLISS	P	2654.0	2644.0	2.3	0.25	3	15,000	75	70	10,060
MOUNTAIN HOME	I			4.2						
C J STRIKE	P	2455.0	2450.0	36.8	7.40	3	13,800	89.1	88	9,970
SWAN FALLS	P	2314.2	2306.0	6.8	0.89	2	8,000	25	24	10,220
MOUNTAIN VIEW	MR			8.3						
WILD HORSE	I			71.7	2.93					
WILSON RIVER	I			9.0	.83					
CHIMNEY CREEK	I			9.0	0.54					
ANTELOPE	I			55.0						
OWYHEE	IP	2670.0	2590.2	715.0	13.90	1		8		1,604
LITTLE CAMAS	I	4924.0	4904.0	18.4	1.40					
ANDERSON RANCH *	IFP	4196.0	4044.0	418.0	4.74	2	1,800	27.0	330	963
ARROWROCK *	IF	3216.0	2974.0	285.5	3.12					2,411
LUCKY PEAK	FIqcrp	3055.0	2905.0	264.4	2.85	4	5,500	87.5		2,733
HUBBARD	I	2776.0	2757.3	4.1						
PLEASANT VALLEY	I			3.6						
DEER FLAT	I	2530.5	2503.5	169.0	9.84					
SILVER CREEK	I			5.7						
WARM SPRINGS *	IF	3406.0	3327.0	191.0	4.60	0				200
AGENCY VALLEY *	IF	3340.0	3263.2	59.9	1.90					141
BULLY CREEK *	IF	2516.0	2456.6	30.0	0.95					34
WILLOW CREEK #3	I			20.4						
PAYETTE LAKE	IR	4990.0	4984.0	27.7	5.00					369
LAKE FORK	I	5119.0	5101.0	20.4	1.50					147
CASCADE	IP	4828.0	4787.5	653.0	28.30					983
DEADWOOD	IR	5334.0	5202.8	162.0	3.00					235
HORSESHOE BEND	P					2	3,500		9.5	
SAGE HEN	I			5.2						
BLACK CANYON	IP	2497.5	2409.3	44.7	1.09	2	1,540	18.0	94	2,830
PADDOCK VALLEY	I			36.4	1.50					
LOST VALLEY	I	4774.7	4751.6	7.1						41
C. BEN ROSS	I			7.8	0.35					
CRANE CREEK	I	3245.0	3197.0	57.7	2.90					74
MANN CREEK	IR	2889.0	2825.0	11.7	0.28					
L O W E R & M I D D L E S N A K E										
UNITY	I	3820.0	3776.5	25.2	0.93	0				
MASON *	CIFP	4062.4	3985.5	52.5	2.45					100
THIEF VALLEY	I	3133.0	3084.0	17.4	0.74					117
BROWNLEE *	FPN	2077.0	1976.0	975.3	14.50	5	34,500	675	272	17,650
OXBOW *	P	1805.0	1800.0	5.4	0.99	4	25,000	220.0	120	17,800
HELLS CANYON *	PN	1688.0	1635.0	98.8	2.38	3	30,000	450.0	210	18,760
GOOSE LAKE	I			6.6						
BRUNDAGE	I	6238.5		7.33	0.33					
WALLOWA LAKE	IR			37.5	1.29					
DWORSHAK	FPNcr	1600.0	1445.0	2015.8	17.85	3	10,500	400.0	627	5,820
LOWER GRANITE	PNcriq	738.0	733.0	53.0	10.70	6	130,000	810.0	100	49,680
LITTLE GOOSE	PNcriq	638.0	633.0	49.6	9.92	6	130,000	810.0	98	47,230
LOWER MONUMENTAL	PNcriq	540.0	537.0	20.0	6.74	6	130,000	810.0	100	
ICE HARBOR	PNcriq	440.0	437.0	25.0	8.33	6	196,000	603.0	100	

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	CBTT IDENT	YEAR COMP-LETION	LOCATION		OWNER OR OPERATOR	REMARKS	
			RIVER	MILE			
L O W E R C O L U M B I A R I V E R							
1	MILL CREEK	MLL	1942	OFF STREAM	--	COE	VIRGIL B. BENNINGTON LAKE
2	McNARY	MCN	1957	COLUMBIA	292.0	COE	LAKE WALLULA
3	McKAY	MCK	1927	McKAY CR	4.9	USBR	
4	COLD SPRINGS	CLS	1908	OFF STREAM		USBR/HERM	FED FROM UMATILLA RIVER
5	WILLOW CREEK	WIL	1984	WILLOW CR	52.4	COE	HEPPNER, OREGON
6	JOHN DAY	JDA	1968	COLUMBIA	215.6	COE	LAKE UMATILLA
7	CRANE PRAIRIE	CRA	1940	DESCHUTES	238.3	USBR/COID	
8	WICKIUP	WIC	1940	DESCHUTES	226.8	USBR	
9	CRESCENT LAKE	CRE	1922	CRESENT CREEK	29.9	USBR/TID	
10	HAYSTACK	HAY	1957	OFF HAYSTACK CR		USBR/NUID	NEAR MADRAS, OR
11	WASCO	WAS	1959	CLEAR CR	12.1	USBR	
12	ARTHUR B BOWMAN *	PRV	1962	CROOKED	72.5	USBR/OCH	PRINEVILLE RES
13	OCHOCO *	OCH	1920	OCHOCO	10.0	USBR/OCH	REHAB 1950
14	ROUND BUTTE	ROU	1964	DESCHUTES	110.6	PGE	LAKE BILLY CHINOOK
15	PELTON	PEL	1958	DESCHUTES	102.8	PGE	LAKE SIMTUSTUS
16	THE DALLES	TDA	1957	COLUMBIA	191.5	COE	LAKE CELILO, NWCPU D POWERHOUSE 1990
17	POWERDALE		1923	HOOD	3.5	PP&L	
18	CONDIT	UND	1913	WHITE SALMON	3.3	PP&L	
19	BONNEVILLE	BON	1937	COLUMBIA	146.1	COE	UNITS 11-17 IN 1974; 2ND PH 1982
20	BULL RUN #1	BUN	1928	BULL RUN	11.5	PORTLAND	
21	BULL RUN #2	RUN	1961	BULL RUN	6.5	PORTLAND	LAKE BEN MORROW
22	BULL RUN		1912	SANDY	6.5	PGE	LAKE ROSLYN
23	SWIFT #1	SWF	1958	LEWIS	47.9	PP&L	
24	SWIFT #2		1958	LEWIS	44.2	COWLITZ	OPERATED BY PP&L
25	YALE	YAL	1953	LEWIS	34.2	PP&L	
26	MERWIN	MER	1931	LEWIS	19.6	PP&L	LAKE MERWIN (FORMERLY ARIEL DAM)
27	PACKWOOD	PWD	1964	LAKE CR	5.3	WPP	PACKWOOD LAKE
28	COWLITZ FALLS *		1994	COWLITZ	88.6	LEWIS	
29	MOSSYROCK *	MOS	1968	COWLITZ	65.5	TACOMA	RIFFE LAKE (FORMERLY DAVISSON LAKE)
30	MAYFIELD *	MAY	1963	COWLITZ	52.0	TACOMA	
W I L L A M E T T E R I V E R							
1	HILLS CREEK	HCR	1962	M F WILLAMETTE	47.8	COE	
2	LOOKOUT POINT	LOP	1955	M F WILLAMETTE	21.3	COE	
3	DEXTER	DEX	1955	M F WILLAMETTE	18.0	COE	
4	FALL CREEK	FAL	1965	FALL CR	7.2	COE	
5	COTTAGE GROVE	COT	1942	C F WILLAMETTE	29.7	COE	
6	DORENA	DOR	1949	ROW	7.5	COE	
7	CARMEN	CRM	1962	McKENZIE	87.6	EUGENE	POWER PLANT
8	SMITH	SMH	1963	SMITH	2.1	EUGENE	STORAGE FOR CARMEN POWER PLANT
9	TRAIL BRIDGE	TRB	1963	McKENZIE	81.0	EUGENE	
10	COUGAR	CGR	1963	S F McKENZIE	4.5	COE	
11	BLUE RIVER	BLU	1968	BLUE	1.8	COE	
12	LEABURG	LEA	1930	McKENZIE	33.3	EUGENE	
13	WALTERVILLE		1911	McKENZIE	20.8	EUGENE	
14	FERN RIDGE	FRN	1941	LONG TOM	25.6	COE	
15	GREEN PETER	GPR	1967	MIDDLE SANTIAM	5.5	COE	
16	FOSTER	FOS	1967	SOUTH SANTIAM	37.7	COE	
17	DETROIT	DET	1953	NORTH SANTIAM	60.9	COE	
18	BIG CLIFF	BCL	1953	NORTH SANTIAM	58.1	COE	
19	SCOGGINS *	SCO	1975	SCOGGINS CR	4.8	USBR	HENRY HAGG LAKE
20	T W SULLIVAN	ORC	1889	WILLAMETTE	26.6	PGE	WILLAMETTE FALLS, OREGON CITY
21	TIMOTHY LAKE	TMY	1956	CLACKAMAS	15.8	PGE	STORAGE FOR POWER D/S
22	STONE CREEK		1994	CLACKAMAS		EWEB	
23	OAKGROVE POWERHOUSE	OKG	1924	CLACKAMAS	5.1	PGE	SUPPLIED BY HARRIET & TIMOTHY LKS
24	NORTH FORK	NFK	1924	CLACKAMAS	31.1	PGE	
25	FARADAY	FAD	1907	CLACKAMAS	26.2	PGE	
26	RIVER MILL	EST	1911	CLACKAMAS	23.3	PGE	

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	FUNC-TION	NORMAL MAXIMUM FOREBAY	NORMAL MINIMUM FOREBAY	STORAGE (1000 AC FT)		INSTALLED GENERATION			NORMAL MAXIMUM HEAD	AVE ANN DISCHARGE (CFS)
				ACTIVE	TOP FT	NO OF UNITS	CAP IN CFS	CAP IN MW		
L O W E R C O L U M B I A R I V E R										
MILL CREEK	FR	1235.0	1212.0	3.3	0.23	0				
McNARY	PNFcriq	340.0	335.0	185.0	38.10	14	232,000	986.0	75	169,800
McKAY	IFRC	1322.0	1182.0	73.8	1.55					
COLD SPRINGS	I		560.0	44.6	3.93					
WILLOW CREEK	Feri	2063.0	2047.0	9.8	.16	0				19
JOHN DAY	FPNcriq	268.0	257.0	534.0	54.10	16	322,000	2160.0	105	172,400
CRANE PRAIRIE	I	4445.0	4424.0	55.3	4.94					36
WICKIUP	I	4337.7	4250.8		10.60	0				710
CRESCENT LAKE	I	4847.0	4823.4	117.2	3.93					49
HAYSTACK	IF	2842.0	2780.0	5.6	0.26					
WASCO	I	3514.4	3488.0	11.9	0.56	0				15
ARTHUR B BOWMAN *	IFC	3234.8	3114.0	152.8	1.00					365
OCHOCO *	IF		3047.0	47.5	1.00	0				47
ROUND BUTTE	PR	1945.0	1860.0	274.3	3.99	3	11,200	244.1	368	4,115
PELTON	PR	1580.0	1573.0	3.8	0.56	3	11,200	97.2	151	4,315
THE DALLES	PNcriq	160.0	155.0	53.0	10.50	24	375,000	1814.0	85	177,900
POWERDALE	P	292.0	291.0			1	500	6.0	210	
CONDIT	P	301.0	296.0	1.1	0.01	2	1,400	9.6	179	1,128
BONNEVILLE	PNcrq	77.0	70.0	138.0	24.40	18	288,000	1080.2		183,300
BULL RUN #1	M	1044.0		30.7						603
BULL RUN #2	M	860.0		21.0						
BULL RUN	PM	655.0	648.0	0.9	0.16	3	1,120	21.0	326	659
SWIFT #1	P	1007.0	900.0	447.0	4.62	3	9,350	204.0	396	2,919
SWIFT #2	P	604.0	603.3	0.3	0.10	2	8,600	67.5	136	2,919
YALE	P	490.0	430.0	189.6	3.77	2	8,000	108.0	250	3,940
MERWIN	P	239.6	225.0	244.0	3.92	3	11,400	135	187	4,825
PACKWOOD	P	2855.5	2850.5	3.6	0.46	1	300	31.5	1,812	100
COWLITZ FALLS *	PRF	866.0		10.2		2	10,000	70	98	
MOSSYROCK *	PF	778.5	621.5	1397.0	11.63	2	14,500	300	347	5,108
MAYFIELD *	PR	425.0	415.0	21.4	2.20	4	10,150	162.0	182	6,148
W I L L A M E T T E R I V E R										
HILLS CREEK	FPNlcrq	1543.0	1414.0	234.3	2.68	2	1,800	30.0	320	1,087
LOOKOUT POINT	FPNlcrq	929.0	819.0	336.4	4.24	3	9,300	120.0	231	2,900
DEXTER	PFnir	695.0	690.0	4.8	0.99	1	4,200	15	59	2,900
FALL CREEK	FNlcrq	834.0	673.0	125.0	1.85	0				
COTTAGE GROVE	Fcr	791.0	719.0	31.8	1.14	0				264
DORENA	FINcrq	835.0	770.5	72.1	1.87	0				708
CARMEN	P	2605.0				2	3,400	80.0	513	
SMITH	P	2605.0	2525.0	9.9	0.17					96
TRAIL BRIDGE	P	2092.0	2045.0	2.2	0.07	1	1,900	10.0	82	1,009
COUGAR	FPINcrq	1699.0	1516.0	153.5	1.23	2	1,050	25.0	437	78
BLUE RIVER	FNlwrq	1357.0	1132.0	82.8	0.97	0				426
LEABURG	P	742.0	740.0	0.1	0.07	2	2,900	15.3	89	4,323
WALTERVILLE	P	598.0	601.0	0.3		1	2,575	8.0	54	4,461
FERN RIDGE	FINwqr	375.1	340.0	101.0	9.04	0				512
GREEN PETER	FPINwqr	1015.0	922.0	312.5	3.59	2	4,600	80.0	310	2,141
FOSTER	FPINwqr	641.0	609.0	28.3	1.19	2	3,200	20.0	110	2,141
DETROIT	FPINwqr	1569.0	1425.0	321.0	3.45	2	5,340	100.0	360	1,567
BIG CLIFF	Pr	1206.0	1182.0	3.0	0.14	1	3,100	18.0	96	2,524
SCOGGINS *	FIRMC	303.5	252.3	23.6	0.11	0				140
T W SULLIVAN	P	52.0		0		13	5,000	15.4	40	30,640
TIMOTHY LAKE	P	3190.0	3125.0	61.7	1.43	0				132
STONE CREEK	P	3048.0				1		12	680	
OAKGROVE POWERHOUSE	P	1988.0	1958.0	0.4	0.03	2	820	51.0	880	477
NORTH FORK	P	665.0	664.0	6.0	0.35	2	5,455	38.4	135	2,691
FARADAY	P	520.0	515.0	0.6	0.10	6	4,835	34.5	133	2,691
RIVER MILL	PM	388.8	381.6	0.5	0.11	5	4,510	19.1	81	2,691

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	CBTT IDENT	YEAR COMP-LETION	LOCATION		OWNER OR OPERATOR	REMARKS
			RIVER	MILE		
P U G E T S O U N D & C O A S T A L						
1	KOMA KULSHAN		1990	ROCKY-SULPHUR-SANDY		KOMA
2	LAKE WHATCOM		1937	WHATCOM CR		BELLINGHAM
3	ROSS *	ROS	1956	SKAGIT	105.2	SEATTLE
4	DIABLO	DIA	1929	SKAGIT	101.0	SEATTLE
5	GORGE	GOR	1960	SKAGIT	96.6	SEATTLE
6	UPPER BAKER *	UBK	1959	BAKER	9.1	PUGET BAKER LAKE (NATURAL)
7	LOWER BAKER	SHA	1926	BAKER	1.1	PUGET LAKE SHANNON
8	HENRY M JACKSON		1965	SULTON	16.5	PUD #1 SNO SPADA LAKE, FRMLY GEO CALMBACK DAM
9	LAKE CHAPLAIN			CHAPLAIN CR	0.5	
10	TWIN FALLS		1989	SF SNOQUALMIE		TFH
11	SNOQUALMIE #1		1898	SNOQUALMIE	40.5	PUGET
12	SNOQUALMIE #2		1910	SNOQUALMIE	40.0	PUGET
13	TOLT		1963	S F TOLT		SEATTLE
14	CEDAR FALLS		1914	CEDAR	37.2	SEATTLE
15	HOWARD A HANSON	HAH	1962	GREEN	64.5	COE
16	MUD MOUNTAIN	MMD	1949	WHITE	29.6	COE
17	WHITE RIVER	TAP	1911	OFF WHITE R	24.3	PUGET LAKE TAPPS
18	ELECTRON		1904	PUYALLUP	41.7	PUGET
19	ALDER	ALD	1945	NISQUALLY	44.2	TACOMA LAKE ALDER
20	LA GRANDE	LGR	1912	NISQUALLY	42.5	TACOMA
21	YELM		1930	NISQUALLY	26.2	CENTRALIA
22	CUSHMAN #1	CSH	1926	N F SKOKOMISH	19.6	TACOMA LAKE CUSHMAN
23	CUSHMAN #2		1930	N F SKOKOMISH	17.3	TACOMA
24	GLINES CANYON		1927	ELWHA	10.0	JAMES LAKE MILLS
25	WYNOOCHEE	WYN	1972	WYNOOCHEE	51.8	TACOMA POWERHOUSE BUILT 1994
26	LEMOLO #1	LEM	1954	NORTH UMPQUA	88.6	PP&L
27	CLEARWATER #1		1953	CLEARWATER R	9.0	PP&L
28	CLEARWATER #2		1953	CLEARWATER R	5.7	PP&L
29	LEMOLO #2		1956	NORTH UMPQUA	77.3	PP&L
30	TOKETEE		1950	NORTH UMPQUA	75.4	PP&L
31	FISH CREEK		1952	FISH CR	6.6	PP&L
32	SLIDE CREEK		1951	NORTH UMPQUA	73.2	PP&L
33	SODA SPRINGS		1952	NORTH UMPQUA	69.8	PP&L
34	GALESVILLE *	GSV	1985	COW CREEK	60.0	DOUG CO
35	PROSPECT #1		1912	N F ROGUE	169.4	PP&L
36	PROSPECT #2		1928	N F ROGUE	122.0	PP&L
37	PROSPECT #3		1932	S F ROGUE	10.5	PP&L
38	LOST CREEK	LOS	1976	ROGUE	158.4	COE
39	ELK CREEK	ELK	--	ELK CR	1.7	COE CONSTRUCTION SUSPENDED
40	FISH LAKE		1908	N F LTL BUTTE CR	15.7	MID REHAB 1923
41	FOURMILE LAKE \$		1908	FOURMILE CR		MID REBUILT 1922
42	AGATE	AGA	1966	DRY CR	3.0	USBR/ROG
43	HYATT \$	HYA	1923	KEENE CR		USBR/ROG
44	HOWARD PRAIRIE \$	HPD	1958	BEAVER CR		USBR/TAL
45	KENNE CREEK \$		1960	EMIGRANT CR	8.0	USBR/TAL GREEN SPRINGS POWER PLANT
46	EMIGRANT LAKE *	EMI	1924	EMIGRANT CR	29.3	USBR/TAL REBUILT 1960
47	APPLEGATE	APP	1980	APPLEGATE	45.7	COE

**PERTINENT DATA FOR SELECTED DAMS AND RESERVOIRS**

DAM	FUNC-TION	NORMAL MAXIMUM FOREBAY	NORMAL MINIMUM FOREBAY	STORAGE (1000 AC FT)		INSTALLED GENERATION			NORMAL MAXIMUM HEAD	AVE ANN DISCHARGE (CFS)
				ACTIVE	TOP FT	NO OF UNITS	CAP IN CFS	CAP IN MW		
P U G E T S O U N D & C O A S T A L										
KOMA KULSHAN	P							12	1200	
LAKE WHATCOM	M			26.4	5.00					
ROSS *	FPR	1602.5	1475.0	1052.0	11.85	4	15,600	451.0	397	3,377
DIABLO	P	1206.0	1197.0	27.2	0.91	4	6,500	159.0	330	4,093
GORGE	P	875.0	964.0	6.6	0.24	4	7,400	183.0	380	4,458
UPPER BAKER *	FP	724.0	674.0	184.8	4.89	2	5,300	94.4	285	2,026
LOWER BAKER	P	438.6	363.6	142.4	2.22	1	4,300	64.0	263	2,593
HENRY M JACKSON	M,P	1450.0	1429.0	154.9		4	1,300	111.2		97
LAKE CHAPLAIN	M			13.4	0.44					
TWIN FALLS	P							20		
SNOQUALMIE #1	P	401.0		0.4	0.11	5	1,050	11.6	271	2,623
SNOQUALMIE #2	P	401.0	396.5	0.4	0.11	2	1,530	31.0	287	
TOLT	M			57.8						200
CEDAR FALLS	PM	1550.0	1510.0	38.8	1.82	0	700	28.4	620	311
HOWARD A HANSON	FA	1206.0	1040.0	25.0	1.73	0				1,074
MUD MOUNTAIN	F	1215.0	895.0	106.0	0.96	0				1,469
WHITE RIVER	P	543.0	515.0	46.7	2.52	4	2,000	63.0	489	
ELECTRON	P	1538.0	1484.0	54.0	0.01	4	372	23.6	874	534
ALDER	P	1207.0	1140.0	161.5	3.33	2	2,550	50.1	272	1,405
LA GRANDE	P	935.0	910.0	1.0	0.05	5	2,100	64.0	423	1,405
YELM	P	318.0				1		9	208	1,816
CUSHMAN #1	PR	738.0	615.0	372.1	4.20	2	2,500	43.2	257	746
CUSHMAN #2	P	480.0	460.0	2.5	0.11	3	2,700	81.0	480	753
GLINES CANYON	PM	588.3	559.3	21.8	0.44			17.4	192	1,510
WYNOOCHEE	PFCAIRM	800.0	700.0	69.4	1.12	1		12.8	165	556
LEMOLO #1	P	4148.0	4097.0	12.3	0.44	1	565	29.0	752	424
CLEARWATER #1	P	3861.0	3875.0	0.2		1	350	15.0	651	168
CLEARWATER #2	P	3101.3	3168.0			1	460	26.0	760	215
LEMOLO #2	P	3327.7	3325.5			1	620	33.0	729	583
TOKETEE	P	1635.0	2414.0	1.4	0.10	3	1,425	42.5	448	987
FISH CREEK	P	3024.0	3014.0			1	150	11.0	1,034	191
SLIDE CREEK	P	603.0	600.0			1	1,430	18.0	169	1,092
SODA SPRINGS	P	1805.5	1779.0	0.6	0.03	1	1,600	11.0	114	1,237
GALESVILLE *	WIFPR	1881.5	1744.0	42.2		2		1.8	135	
PROSPECT #1	P	2477.2	2477.0	--	--	1	145	3.8		
PROSPECT #2	P	2591.5	2594.5			2	935	32.0	607	804
PROSPECT #3	P	3375.7				1	160	7.2	720	174
LOST CREEK	FPRI	1872.0	1751.0	315.0	3.40	2	2,600	49.0	323	1,821
ELK CREEK	FICMRA	1726.0	1581.0	95.0	1.29	0			204	209
FISH LAKE	I	4641.5	4615.0	7.8	0.42	0				37
FOURMILE LAKE \$	I	5746.5	5724.0	15.6		0				14
AGATE	I	1510.0	1467.0	4.7	0.90	0				
HYATT \$	IP	5016.0	4981.7	16.2		0				12
HOWARD PRAIRIE \$	FI	4526.6	4471.0	60.6	0.88	0				117
KEENE CREEK \$	P	4403.5	4378.0	0.3	1.96	1	133	16.0	1,984	
EMIGRANT *	IF	2241.0	2131.5	39.0	0.81	0				31
APPLEGATE	FIR	1987.0	1854.0	75.2	0.99	0				405

OWNER OR OPERATOR

ADC  
ASH  
BELLINGHAM

ASSOCIATED DITCH COMPANY  
ASHLEY IRRIGATION DISTRICT  
CITY OF BELLINGHAM

B FERRY	CITY OF BONNERS FERRY
BID	BITTERROOT IRRIGATION DIST
B LOST R	BIG LOST RIVER CANAL COMPANY
BC HYDRO	B C HYDRO & POWER AUTHORITY
BIA	BUREAU OF INDIAN AFFAIRS
BOISE	BOISE PROJECT BOARD OF CONT
BIG WOOD	BIG WOOD CANAL COMPANY
BRUNDAGE	BRUNDAGE WATER USERS
CAREY V	CAREY VALLEY RESERVOIR COMP
CE	CORPS OF ENGINEERS
CEDAR	CEDAR MESA COMPANY
CENTRALIA	CITY OF CENTRALIA
CHELAN	CHELAN COUNTY PUD NO 1
CI	CHELAN IRRIGATION DISTRICT
COID	CENTRAL OREGON IRRIGATION DT
COMINCO	COMINCO, LIMITED
COWLITZ	COWLITZ COUNTY PUD
CRANE	CRANE CREEK RESERVOIR COMP
DVR	SHOI-PAI TRIBE OF DVR
DOUG CO	DOUGLAS COUNTY, OREGON
DOUGLAS	DOUGLAS COUNTY PUD NO 1, WA
EUGENE	CITY OF EUGENE
GOOSE	GOOSE LAKE RESERVOIR COMP
GRANT	GRANT COUNTY PUD NO 2
HAYDEN	HAYDEN L WATERSHED IMPROVE
HBH	HORSESHOE BEND HYDRO
HERM	HERMISTON IRRIGATION DIST
IDAHO	IDAHO POWER COMPANY
JAMES	JAMES RIVER PAPER CO, INC
JORDAN	JORDAN VALLEY IRRIGATION CO
KOMA	KOMA KULSHAN
LAKE	LAKE IRRIGATION DISTRICT
LEWIS	LEWIS COUNTY PUD
L VALLEY	LOST VALLEY RESERVOIR COMP
L WEISER	LITTLE WEISER RIVER IRR DIST
L WILLOW	LITTLE WILLOW CREEK IRR COMP
MHP	MARYSVILLE HYDROPOWER PART
MONTANA	MONTANA MONTANA POWER COMPANY
MT HOME	MT HOME MOUNTAIN HOME IRRIGATION CO
N FORK	NORTH FORK RESERVOIR COMPANY
N SIDE	NORTH SIDE CANAL COMPANY
NUID	NORTH UNIT IRRIGATION DIST
OAKLEY	OAKLEY CANAL COMPANY
OCH	OCHOCO IRRIGATION DISTRICT
OID	OWYHEE IRRIGATION DISTRICT
OKANOGAN	OKANOGAN IRRIGATION DISTRICT
ORCHARDS	ORCHARDS WATER CO
OWSLEY	OWSLEY CANAL COMPANY
PORTLAND	CITY OF PORTLAND
PP&L	PACIFIC POWER & LIGHT COMP
PEND	PEND OREILLE COUNTY PUD
PEND MINES	PEND OREILLE MINES
PV	PLEASANT VALLEY IRRIGATION C
PVP	PLEASANT VALLEY IRR&POWER C
PGE	PORTLAND GENERAL ELECTRIC
PM	PORTNEUF-MARSH VALLEY CO
PUGET	PUGET SOUND POWER & LIGHT CO
PUD #1	SNOHOMISH CO PUD & C OF EVER
ROG	ROGUE RIVER VALLEY IRR DIST
SALMON	SALMON RIVER CANAL
S COL ID	SO COLUMBIA IRRIGATION DISTR
SEATTLE	CITY OF SEATTLE
SQUAW	SQUAW CREEK IRRIGATION COMP
SMITH	SMITH CREEK HYDROPOWER
S MONTANA	STATE OF MONTANA
TACOMA	CITY OF TACOMA
TAL	TALENT IRRIGATION DISTRICT
TID	TUMALO IRRIGATION DISTRICT
TFH	TWIN FALLS HYDRO ASSOCIATES
TW	TWIN LAKE RESERVOIR & IRR CO
TF	TWIN FALLS CANAL COMPANY
UP&L	UTAH POWER & LIGHT COMPANY
USBR	U S BUREAU OF RECLAMATION
VALE	VALE IRRIGATION DISTRICT
WPPSS	WASHINGTON PUB POWER SUPPLY
WWP	WASHINGTON WATER POWER COMP
W KOOTENAY	WEST KOOTENAY POWER & LIGHT
WHITE	WHITESTONE COULEE IRR DISTR

AUTHORIZED PROJECT FUNCTIONC (CAPS)  
OTHER PROJECT FUNCTIONS (lower case)

P HYDROPOWER AT SITE AND/OR DOWNSTREAM  
I IRRIGATION  
F FLOOD CONTROL  
N NAVIGATION  
M MUNICIPAL AND INDUSTRIAL WATER SUPPLY  
C FISH AND WILDLIFE CONSERVATION  
A POLLUTION ABATEMENT OF LOW FLOW AUGMENTATION  
R RECREATION  
Q WATER QUALITY

- \* Section 7 Project.
- % Includes 1-foot flashboards annually installed during the summers.
- @ Includes 2-foot flashboards annually installed during the summers.
- + Storage is a function of flow and pool elevation.
- \$ Klamath River Basin; flows diverted to Rogue Basin.

## APPENDIX D

### LIST OF CHARTS

#### TEMPERATURE & PRECIPITATION INDICES

##### Number

- 1 Western Washington - Fall/Winter
- 2 Western Oregon - Fall/Winter
- 3 Columbia R ab The Dalles - Fall/Winter
- 4 Columbia R ab The Dalles - Spring/Summer

#### STORAGE & STREAMFLOW HYDROGRAPHS

July-August

- 5 Columbia R at Mica Dam, BC
- 6 Columbia R at Revelstoke, BC
- 7 Columbia R at Arrow Dam, BC
- 8 Kootenai R at Libby Dam, MT
- 9 Duncan R at Duncan, BC
- 10 Kootenay R at Kootenay Lake, BC
- 11 SF Flathead R at Hungry Horse Dam, MT
- 12 Flathead R at Flathead Lake, MT
- 13 Pend Oreille R at Pend Oreille Lake, ID
- 14 Columbia R at Grand Coulee Dam, WA
- 15 Snake R at Brownlee Dam, ID-OR
- 16 NF Clearwater R at Dworshak Dam, ID
- 17 Columbia R at John Day Dam, OR-WA
- 18 MF Willamette R at Hills Creek Dam, OR
- 19 MF Willamette R at Lookout Point Dam, OR
- 20 Fall Cr at Fall Creek Dam, OR
- 21 Row R at Dorena Dam, OR
- 22 CF Willamette R at Cottage Grove Dam, OR
- 23 SF McKenzie R at Cougar Dam, OR
- 24 Blue R at Blue River Dam, OR
- 25 Long Tom R at Fern Ridge, OR
- 26 Middle Santiam R at Green Peter Dam, OR
- 27 South Santiam R at Foster Dam, OR
- 28 North Santiam R at Detroit Dam, OR
- 29 Rogue R at Lost Creek Dam, OR
- 30 Applegate R at Applegate Dam, OR

#### STORAGE AND STREAMFLOW HYDROGRAPHS

Water Year

##### Number

- 31 Yakima R at Cle Elum, WA
- 32 Yakima R nr Parker, WA
- 33 Snake R at Jackson Lake, WY
- 34 Snake R nr Heise, ID
- 35 Willow Cr at Ririe Dam, ID
- 36 Snake R nr Shelley, ID
- 37 Snake R at American Falls Dam, ID
- 38 Snake R at Milner Dam, ID
- 39 Little Wood R at Little Wood, ID
- 40 Owyhee R at Owyhee, OR
- 41 Boise R at nr Boise, ID
- 42 Payette R nr Emmett, ID
- 43 NF Malheur R at Agency Valley Dam, OR
- 44 Bully Cr at Bully Creek Dam, OR
- 45 MF Malheur R at Warm Springs Dam, OR
- 46 Snake R at Weiser, ID
- 47 Mill Cr at Mill Creek Dam, WA
- 48 Willow Cr at Willow Creek Dam, OR
- 49 Crooked R at Prineville Dam, OR
- 50 Ochoco R at Ochoco, OR
- 51 Green R at Howard A. Hanson Dam, WA
- 52 White R at Mud Mountain Dam, WA
- 53 Wynoochee R at Wynoochee Dam, WA
- 54 Skagit R at Ross Dam, WA
- 55 Baker R at Upper Baker Dam, WA
- 56 Cowlitz R at Mayfield/Mossyrock Dams, WA

#### FLOOD REGULATION

April-July

- 57 Columbia R at Mica Dam, BC
- 58 Columbia R at Arrow Dam, BC
- 59 Kootenai R at Libby Dam, MT
- 60 Kootenai R at Bonners Ferry, ID



**FLOOD REGULATION (Cont'd)**  
April-July

**Number**

- 61 Duncan R at Duncan Dam, BC
- 62 Kootenay R at Kootenay Lake, BC
- 63 Columbia R at Birchbank, BC
- 64 SF Flathead R at Hungry Horse Dam, MT
- 65 Flathead R at Columbia Falls, MT
- 66 Flathead R at Flathead Lake, MT
- 67 Pend Oreille R at Pend Oreille Lake, ID
- 68 Columbia R at Grand Coulee Dam, WA
- 69 Snake R at Jackson Lake Dam, WY
- 70 Snake R nr Heise, ID
- 71 Snake R nr Shelley, ID
- 72 Boise R at Boise, ID
- 73 Payette R nr Emmett, ID
- 74 Snake R at Weiser, ID
- 75 Snake R at Brownlee Dam, ID-OR
- 76 NF Clearwater R at Dworshak Dam, ID
- 77 Clearwater R at Spalding, ID
- 78 Snake R bl Lower Granite Dam, WA
- 79 Columbia R at Vancouver, WA
- 80 Columbia R at The Dalles Dam, OR

**FLOOD REGULATION**  
November-February

**Number**

- 81 Willamette R at Eugene, OR
- 82 Willamette R at Albany, OR
- 83 Santiam R at Jefferson, OR
- 84 Willamette R at Salem, OR

**SECTION 7 PROJECTS**

Winter and Spring

- 85 Scoggins Dam and Lake
- 86 Galesville Dam and Lake
- 87 Emigrant Dam and Lake
- 88 Mason Dam and Lake

**SUMMARY & ANNUAL HYDROGRAPHS**

Water Year

- 89 Columbia R at Priest Rapids Dam, WA
- 90 Snake R nr Clarkston, WA
- 91 Columbia R at The Dalles Dam, OR
- 92 Willamette R at Salem, OR