REDACTED

USACE WATER CONTROL MANUAL

FOR

BROWNLEE, OXBOW, AND HELLS CANYON DAMS

These projects are regulated by the Federal Energy Regulatory Commission (FERC) with flood control management by the U.S. Army Corps of Engineers. Brownlee, Oxbow, and Hells Canyon Dams are operated and owned by Idaho Power.

U.S. Army Corps of Engineers

Chief of Hydrology: John Heitstuman, P.E., D.WRE

Contact Number: 509.527.7293

Water Management Program Manager: Jonathan Roberts, P.E., PMP

Contact Number: 509.527.7518

Idaho Power Company Operation Office

Contact Number:800.635.7348

Alternate Contact Number: 800.348.4328

U.S. ARMY CORPS OF ENGINEERS, WALLA WALLA DISTRICT JANUARY 1961

REVISED APRIL 1967

US Army Corps
of Engineers
Walla Walla District

Water Control Manual

For

Idaho Power Company Projects

Brownlee, Oxbow and

Hells Canyon

Snake River, Oregon and Idaho

WATER CONTROL MANUAL REVISIONS
FOR BROWNLEE, OXBOW, AND HELLS CANYON DAMS

The following revisions are provided for the updating of the Water Control Manual. This manual will be reviewed annually and updated if necessary. Major revisions pertaining to format and content on accordance with references EC 1110-2-278 and ER 1110-2-240 will be accomplished as time and manpower become available.

FEBRUARY 2011 REVISIONS include:

1. [redacted]
2. WATER CONTROL PLAN – SECTION IV, [redacted] (page 8-14).

1994 REVISIONS include:

1. [redacted]
2. TABLE OF CONTENTS
3. INTRODUCTION
4. DESCRIPTION OF PROJECT
5. HISTORY OF PROJECT
6. WATERSHED CHARACTORISTICS
7. DATA COLLECTION AND COMMUNICATION NETWORKS

1993 REVISIONS include:

1. [redacted]
2. TABLE OF CONTENTS
3. DESCRIPTION OF PROJECT
4. DATA COLLECTION AND COMMUNICATION NETWORKS
5. WATER CONTROL PLAN
6. WATER CONTROL MANAGEMENT
   a. [redacted]
   b. [redacted]
   c. [redacted]

DECEMBER 1988 REVISIONS include:

1. [redacted]
2. TABLE OF CONTENTS
3. Pertinent Data, Oxbow Reservoir
4. Pertinent Data, Hells Canyon Reservoir
5. DATA COLLECTION AND COMMUNICATION NETWORKS
6. WATER CONTROL PLAN
7. HYDROLOGIC FORECASTS
8. EFFECT OF WATER CONTROL PLAN
9. WATER CONTROL MANAGEMENT
10. Plate 8-4, Standard Project Flood - Columbia River al The Dalles.

DECEMBER 1987 REVISIONS include:

1. [redacted]
2. DESCRIPTION OF PROJECT
3. WATER CONTROL MANAGEMENT
   a. [redacted]
   b. [redacted]
   c. [redacted]

MARCH 1987 revisions include:

1. [redacted]
2. WATER CONTROL MANAGEMENT
   a. Text of Manual
   b. [redacted]
   c. [redacted]
   d. [redacted]

RESERVOIR REGULATION MANUAL

BROWNLEE, OXBOW, AND HELLS CANYON RESERVOIRS

FEDERAL POWER COMMISSION PROJECT NO. 1971

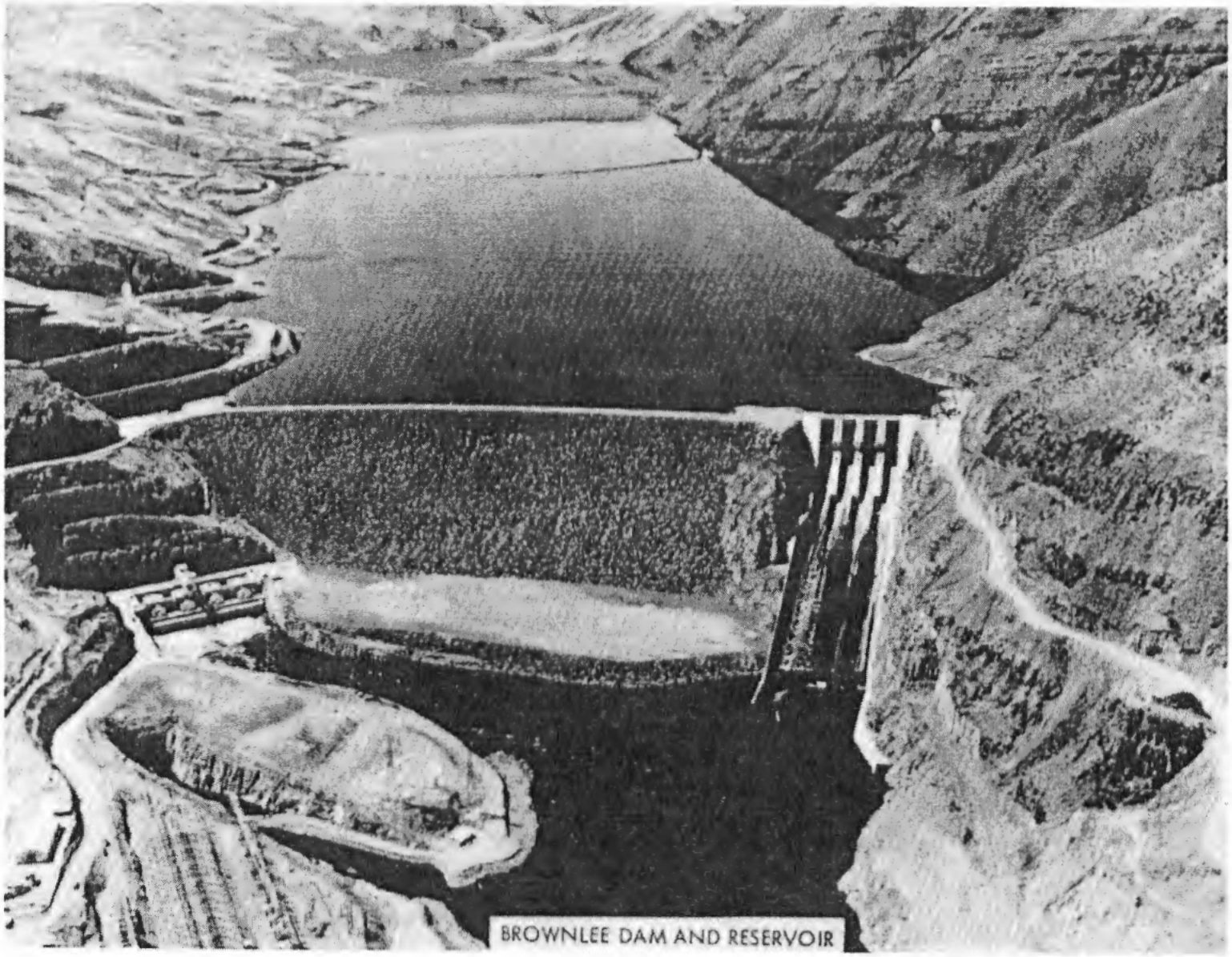
IDAHO POWER COMPANY

U.S. ARMY ENGINEER DISTRICT, WALLA WALLA

CORPS OF ENGINEERS

JANUARY 1961

REVISED APRIL 1967



BROWNLEE DAM AND RESERVOIR

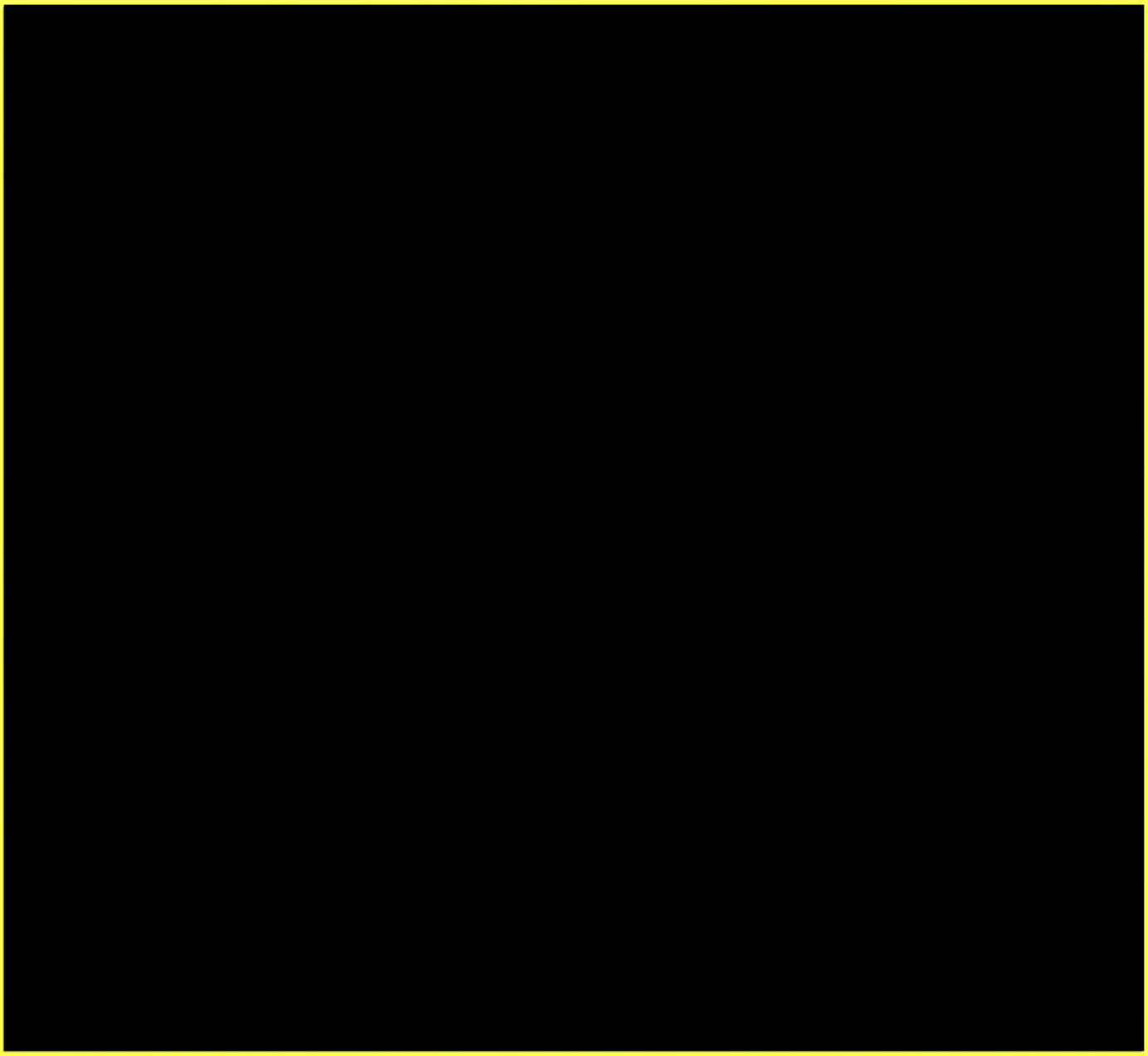

OXBOW DAM

HELLS CANYON DAM - UNDER CONSTRUCTION

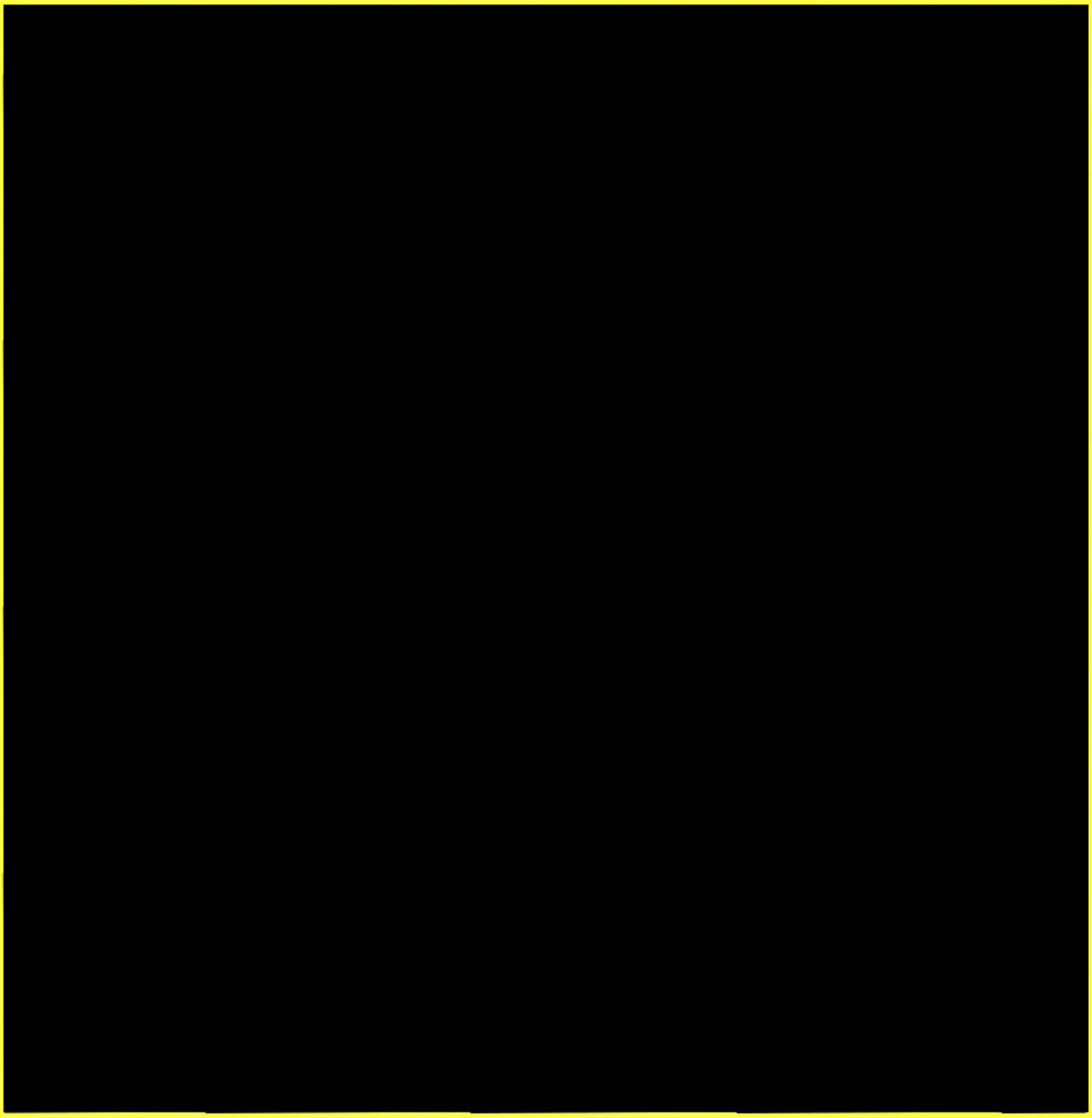
NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in loose leaf from, and only those sections or parts thereof, requiring changes will be revised and printed. Therefore, this cope should be preserved in good condition so that inserts can be made to keep the manual current.

As a continuing program, it will be necessary to revise portions of this manual to keep it up to date. Pertinent discharge rating tables must be revised when changes become evident in the stage-discharge relation; likewise, changes in the plan of operation will be made for the purpose of improving regulation technique, and project developments may occur which require revisions of the information presented in the manual. Whenever revisions are necessitated, new pages containing the revised material will be printed and issued to each person having a copy of the manual so that substitution may be made.



Non-Regulation Emergency. In the event of non-regulation emergency situations such as plant failure (mechanical or structural), fire, flooding, etc., emergency coordination and action are necessary to prevent loss of life and property in the area. The operating personnel at the power plants will be responsible for initiating corrective action at the facility and must be prepared to take emergency action if necessary. If the situation is such as to not require immediate action, the Operator will call the System Dispatcher immediately upon determination that an emergency is developing. The power plant Operator and System Dispatcher must be knowledgeable in recognizing an emergency situation or unusual condition and must act immediately to minimize danger -- to the structure and to all persons within the immediate area, especially in the downstream channel.



BROWNLEE RESERVOIR PERTINENT DATA

RESERVOIR

Total capacity at normal water surface (El. 2,077)	1,420,062 ac.ft.
Dead storage below minimum power pool (El. 1,976)	444,744 ac.ft.
Maximum Space for flood control	975,318 ac.ft.
Surface area at normal water surface	approx. 14,621 acres
Length of reservoir	57.5 miles

DAM

Located at Snake River mile 285, 67 miles below Weiser, Idaho	
Type	Rock filled with sloped clay core
Maximum height	400 ft.
Crest elevation	2,090 m.s.l.
Crest length	1,380 ft.
Spillway crest elevation	2,027 m.s.l.
Combined spillway and outlet capacity at normal water surface, elevation 2,077	300,000 c.f.s.
Spillway capacity – four radial gates at normal water surface, elevation 2,077	175,000 c.f.s
Spillway outlet capacity – three radial gates at normal water surface, elevation 2,077	125,000 c.f.s
Spillway outlet capacity – three radial gates at normal water surface, elevation 2,027	100,000 c.f.s
Spillway outlet capacity – three radial gates at normal water surface, elevation 1,976	51,500 c.f.s

POWER PLANT

Installed generating capacity (four units at 90,100 k.w. nameplate)	360,400 k.w.
Ultimate generating capacity (six units, 1 at 225,000 k.w. nameplate)	675,500 k.w.
Operating power head	176-227 feet
Power plant discharge capacity at minimum power head (four units at full gate turbine operation	22,200 c.f.s.

HYDROLOGIC DATA

Snake River near Weiser, Idaho:	
Drainage area above gage	69,200 sq.mi.
Average annual runoff	13,077,000 ac.ft.
Peak discharge Snake near Weiser, Id. – 29 April 1952	84,500 c.f.s.

OXBOW RESERVOIR PERTINENT DATA

RESERVOIR

Maximum pool elevation	1,812 m.s.l.
Minimum pool elevation	1,795 m.s.l.
Normal full pool elevation	1,805 m.s.l.
Total capacity at normal full pool (El. 1,688)	58,200 ac.ft.
Surface area at normal full pool El. 1,688)	1,150 acres

DAM

Located at Snake River mile 273

Type	Rock filled, sloped clay core
Maximum height	205 feet
Crest elevation	1,825 m.s.l.
Crest length	1,150 feet
Spillway crest elevation	1,755 m.s.l.
Spillway discharge at normal water surface elevation	
One section with three radial gates 32' by 50' each	130,000 c.f.s.
One section with fuseplug 440' by 20' with pool elev. At 1,805 m.s.l.	90,000 c.f.s.
Combined spillway discharge with pool elevation at 1,812 m.s.l.	300,000 c.f.s.

POWER PLANT

Nameplate capacity (four units at 47,500 k.w.)	190,000 k.w.
Power plant maximum discharge	25,000 c.f.s.
Operating power head	110-122 feet
Power plant served by two power tunnels each equipped with a surge tank	

HELLS CANYON RESERVOIR PERTINENT DATA

RESERVOIR

Maximum pool elevation	1,693 m.s.l.
Minimum pool elevation	1,678 m.s.l.
Normal full pool elevation	1,688 m.s.l.
Total capacity at normal full pool (El. 1,688)	167,720 ac.ft.
Surface area at normal full pool (El. 1,688)	2,412 acres

DAM

Located at Snake River mile 247

Type	Concrete gravity
Maximum height	320 feet
Crest elevation	1,695 m.s.l.
Crest length	994 feet

SPILLWAY

Spillway capacity at normal full pool (three radial gates 43' wide by 50' high)	186,000 c.f.s.
Spillway capacity at maximum pool (El. 1,693)	90,000 c.f.s.

OUTLET

Outlet capacity at normal pool El. 1,688 (two radial gates 23' wide by 23' high each at sill elevation 1,549 m.s.l.)	88,000 c.f.s.
Outlet capacity at maximum pool elevation	90,000 c.f.s.

POWER PLANT

Nameplate generating capacity (three units at 130,500 kilowatts each)	391,500 k.w.
Ultimate generating capacity (four units)	522,000 k.w.
Operating power head	200-22[illegible] feet

TABLE OF CONTENTS

TABLES

PLATES

FIGURES

APPENDICES

1 INTRODUCTION

1-01 Authorization.

This manual has been prepared in order to implement the flood control and navigation provisions of the license issued by the Federal Power Commission to Idaho Power Company fro project No. 1971, Brownlee, Oxbow, and Hells Canyon dams, and to coordinate these functions with power operations to the end that maximum overall benefits will be achieved. The specific provisions of the license are contained in Article 18 of FPC Standard Form L-6 and special Articles 42 and 43. The Commission's Order No. 283 and license for Project No. 1971 are contained in Appendix A.

This manual is also presented pursuant to U.S. Army Engineers Engineering Regulation, EM-1110-2-360, the Reservoir Regulation Manual, and authorizing letter from Chief of Engineers to Division Engineer dated 3 April 1958 under subject designation, "Idaho Power Company, project No. 1971".

The management and staff of Idaho Power Company have cooperated in every phase of the development of this manual, in contributing basic data, textual material, engineering studies, conferences, and review of the preliminary draft of this manual.

1-02 Purpose and Scope.

The purpose of this manual is to present information pertinent to the operation of Brownlee, Oxbow, and Hells Canyon dams for flood control and navigation as integrated units in the Columbia-Snake River systems. Coordination with power operations is also considered. It contains a general description of the drainage basin and development; describes the dams in general; outlines system power, flood control, and navigation operations and plans; describes the plan of operation, including the regulation criteria for flood control and for navigation; provides special regulation schedules for unusual conditions, including dry seasons and exceptionally large floods. Comprehensive data pertinent to these aspects are presented, including basin and reservoir maps, outlet and spillway discharge curves, storage tables, discharge rating tables for key gauging stations, power plant capability curves, climatological data and stream flow hydrographs at key points, and other similar information. The organization and responsibilities of those concerned with the operation of these projects are also included. The Idaho Power Company and Corps of Engineers, in cooperation with other public and private agencies, have made extensive studies of water supply depletions and storage operations on the Snake River to be used as the basis for the investigations leading to the adopted operating plan and criteria contained in this manual. It is pointed out that while the procedures and criteria outlined in this manual are important guides to effective and efficient operation, it is recognized that day-to-day operations must of necessity take account of special conditions as they arise and require some modification by mutual agreement.

1-03 Related Manuals and Reports.

1-04 Project Owner.

1-05 Operating Agency.

Idaho Power Company.

1-06 Regulating Agencies.

a. Wild and Scenic River Designation.

On 31 December 1975, Public Law 94-199 (89 Statute 1117) established the Hells Canyon National Recreation Area. The Law classified the Snake River from Hells Canyon Dam (R.M. 247) to Pittsburgh Land (R.M. 214.5) as a wild river and the portion from Pittsburgh Landing to the Wallowa-Whitman National Forest boundary (R.M. 180.2) as a Scenic River. Approximately 67 miles are affected by the law, which is administered through the Forest Service.

2 DESCRIPTION OF PROJECT

2-01 Location.

2-02 Purpose.

2-03 Physical Components.

a. Brownlee Dam and Reservoir. Brownlee Dam is located at Snake River Mile 285, 67 miles downstream from Weiser, Idaho. The dam, which is rock fill type with sloping clay core, rises 400 feet above the foundation. Full pool elevation of the reservoir is 2,077 feet, and the top of the dam is 2,090 feet. The reservoir has a capacity of 1, 420, 062 acre-feet and at full pool, the reservoir extends about 58 miles to approximately 9 miles below Weiser, Idaho. Dead storage below minimum power pool elevation 1976 is 444,744 acre-feet. The concrete spillway is located on the Oregon side of the river and has a discharge capacity of 300,000 cfs at 2077 elevation. The powerhouse, located on the Idaho side of the river, has an initial installed namplate capacity of 360,000 kW. An additional unit rated at 225,000 kW was installed in 1980. Provisions have been made for an additional 180,220 kW unit. The power intake works consist of four 500 foot long concrete and steel lined penstocks of 24 foot diameter, plus one 28 foot diameter intake with is 580 feet long, fed from an intake channel excavation on the Idaho side of the river. Provision is made for future installation of two additional penstocks.

The spillway has four radial gates (sill elevation 2027) and three submerged radial gates (sill elevation 1938). Capacity of these gates at minimum reservoir elevation is 51,500 cfs which, together with the flow from three of the four units at the powerhouse, meets the license requirements of 65,000 cfs at minimum pool. Plates 2-1.1, 2-1.2 and 2-1.3 show a general plan and sections of the dam and area – capacity – discharge curves of the reservoir. Plates 2-2 and 2-3 show spillway and outlet discharge rating curves. Plate 2-4 shows the discharge – power relationships of the Brownlee power plant. Reservoir storage capacities are shown on Table 2-1.

b. Oxbow Dam and Reservoir. Oxbow Dam is located at River Mile 273, some 12 miles downstream from the Brownlee Dam. It consists of a rock fill dam with sloping clay core having a maximum height of about 205 feet and a crest length of 1,150 feet. The reservoir, which serves mainly to reregulate the releases from Brownlee for power production, has a usable storage capacity of approximately 10,000 acre-feet with a drawdown of 10 feet below normal pool elevation 1805.

There are two spillways at Oxbow Dam, one on each abutment, with a combined capacity of 300,000 cfs at maximum pool elevation 1812. The Oregon spillway is

controlled by 3 radial gates, each 32 feet wide by 50 feet high and has a discharge capacity of 153,000 cfs at reservoir water surface elevation 1812. On the Idaho side of the river, the spillways is a fuseplug type, consisting of an approach channel with a fuseplug at its entrance, a chute and an escape channel. The fuseplug is a rock fill dam placed on a concrete sill at elevation 1785. The fuseplug is 440 feet long, has a crest width of 10 feet and a crest elevation varying from 1,812 to 1,814 feet. Along the Idaho abutment there is a pilot channel through the fuseplug with bottom elevation of 1,809 feet where fuseplug erosion starts. The fuseplug is designed to be stable and have a factor of safety against failure equal to ordinary rock fill dams. In the event of an extraordinary flood which will exceed the Oregon spillway capacity, the fuseplug is designed to wash out over a period of three to four hours.

The power plant consists initially of 4 turbines each with a rated horsepower of 73,000 connected to generators with nameplate ratings of 47,500 kW. The power plant is served by two penstocks, each equipped with surge tanks and necessary intake facilities. The project will develop a gross static head of 122 feet. The plans provide for a future installation of one similar power unit by means of an extension of the powerhouse. Power is delivered by 230 kV double circuit steel transmission line from Oxbow to the Brownlee switchyard and on 230 KV line running north to Lewiston, Idaho. Plates 2-5.1, 2-5.2 and 2-5.3 show the general plans for this project. Plate 2-6 shows spillway discharge rating curves for the Oregon spillway and Plate 2-7 shows discharge rating curves for combined spillway operation including fuseplug. Plate 2-8 shows preliminary turbine performance curves for the Oxbow power plant and Plate 2-9 shows area and capacity curves for Oxbow reservoir.

c. Hells Canyon Dam and Reservoir. Hells Canyon Dam, located at Snake River Mile 247, is the most downstream of the three Idaho Power dams. It is 26 and 38 miles from Oxbow and Brownlee, respectively. The dam is a concrete gravity structure with a maximum height of 320 feet and a crest length of 994 feet at elevation 1,695 feet. The spillway is an ogee section with a crest elevation of 1,638 feet located on the Oregon shore and is controlled by three radial gates, 43 feet wide and 50 feet high. Spillway capacity at normal full pool elevation 1688 is 186,000 cfs and at maximum pool elevation of 1693, it is 210,000 cfs. In addition to the spillway, there are two 23 by 23-foot outlets located in the spillway section with a sill elevation of 1,549 feet. These outlets are controlled by two submerged radial gates and have a capacity of 88,000 cfs for a pool elevation of 1,688 feet and 90,000 cfs at the maximum pool elevation of 1,693 feet. Total spillway and outlet capacity at maximum pool is 300,000 cfs. Plates 2-10.1, 2-10.2 and 2-10.3 show general plan and sections of the dam.

The power plant consists of initially three turbines, each with a rated horsepower of 195,000 connected to generators with nameplate ratings of 130,000 kW. The power plant is served by three penstocks and necessary intake facilities. The plans provide for a future installation of one similar power unit by extending the

powerhouse. Plates 2-11 and 2-12 show spillway and outlet discharge rating curves. Plate 2-13 shows preliminary turbine performance curves for the Hells Canyon power plant.

The reservoir which serves mainly to reregulate power releases from the upstream Brownlee and Oxbow dams, has a usable storage capacity of 20,000 acre-feet with a drawdown of 10 feet below normal pool elevation 1688 m.s.l. The reservoir surface is about 2,500 at normal pool elevation. Plate 2-14 shows area and capacity curves for Hells Canyon Reservoir.

2-04 Related Control Facilities.

2-05 Real Estate Acquisition.

2-06 Public Facilities.

3 HISTORY OF PROJECT

3-01 Authorization.

3-02 Planning and Design.

Idaho Power Company filed application for licenses under Section 4(e) of the Federal Power Act for authority to construct, operate and maintain three water power developments in the Hells Canyon reach of the Snake River. The application for Oxbow was filed on 15 December 1050, and the two applications for Brownlee and Hells Canyon were filed on 15 May 1953. The Federal Power Commission consolidated the three applications into one proceeding, with the designation of the Project Nos. 1971, 2132, 2133; but now designated as Project No. 1971. Following a year long hearing, during which a record of 20,000 pages and over 400 technical exhibits were compiled, the Federal Power Commission, on 4 August 1955, issued a license to Idaho Power Company to build the three dams on the Snake river. Subsequently, the Court of Appeals unanimously affirmed the Commission's judgment, and petitions for certiorari review and rehearing were denied in the United States Supreme Court. Approval of the final design plans for the Brownlee dam was received from the Federal Power Commission on 3 November 1955.

3-03 Construction.

a. Brownlee Dam. The contract for the design and construction of the Brownlee project was signed with the International Engineering Company and Morrison-Knudsen Company on 9 November 1955. Construction equipment began moving to the site on 10 November 1955.

Normal flow of the Snake River was diverted through a tunnel in the Idaho abutment to permit unwatering of the dam site during construction. At the end of the construction periods, the intake of the diversion tunnel was partly closed and later sealed with a concrete block. The first generating unit was placed on the line in August 1958, a second unit in October, the third unit in December and the fourth in January 1959.

b. Oxbow Dam. Construction of the Oxbow Dam was initiated during the summer of 1958. A temporary dam diverted the river flow through an existing tunnel (constructed in 1910 for the original Oxbow powerplant) while construction of the dam and powerplant was underway. The first generating unit was placed in service 30 June 1961.

c. Hells Canyon Dam. The coffer dam and diversion tunnel for construction of the Hells Canyon Dam were constructed during the summer and fall of 1964. The first generating units was placed in service 22 October 1967.

3-04 Related Projects.

3-05 Modifications to Regulations.

3-06 Principal Regulation Problems.

4 WATERSHED CHARACTERISTICS

4-01 General Characteristics.

4-02 Topography.

The 1,078 mile Snake River, with a drainage area of 109,000 square miles, is the largest tributary of the Columbia River. The Snake river originates in the high Yellowstone National Park area of western Wyoming and thence traverses the southern part of Idaho in a broad arc running east to west. It then flows almost due north, forming a part of the boundary between Idaho, Oregon and Washington. Near Lewiston, Idaho, it turns west and joins the Columbia River near Pasco, Washington.

The upper portion of the Snake River Basin above King Hill Idaho is characterized by steep mountain ranges and wide valley. The contributing area of this portion of the watershed occupies the eastern part of Idaho and adjacent areas in western Wyoming, northwestern Utah and northeastern Nevada. Principal tributaries contributing to the upper basin water supply in the form of surface runoff are Henrys Fork, Blackfoot River, Portneuf River, and Big Wood River. A considerable portion of the upper basin is occupied by the Snake River plain and yields no appreciable surface runoff. The plain is underlain by a vast ground water storage reservoir which intercepts most of the Sawtooth Mountains' streams north of the Snake River between Heise and King Hill, and large quantities of return flow from irrigated areas. Lost River, Little Lost River, Camas Creek, Birch Creek and Medicine Lodge Creek all flow to the northern edge of the plain and disappear underground. Big and Little Wood Rivers flow directly across the edge of the plain to the Snake River, contributing a considerable portion of their flow to the ground water en route. Three relatively small tributaries enter the river from the south; however their drainage areas receive little precipitation and their contributions to the Snake River are of minor importance. The flow entering the Snake River in the Milner-King Hill reach is principally from the ground water reservoir via springs, located generally in the Hagerman Valley, which discharge at an almost uniform rate of approximately 6,000 cfs through the year.

The King Hill – Hells Canyon portion of the basin includes a 300 mile reach of the Snake River. Major tributaries in the reach area Boise and Payette Rivers, which head in the Sawtooth Mountains, and the Weiser River to the north and east. On the west side of the Snake River, the Powder and Burnt Rivers rise in the Wallowa and Blue Mountains in northeastern Oregon. The Malheur, Owyhee and Bruneau Rivers wind in deep canyons through the high Owyhee Plateau which extends over southeastern Oregon, southwestern Idaho and northern Nevada. The Snake River itself flows in a moderately deep canyon from King Hill to near Marsing, then emerges and is flanked by terraces of varying width, which comprise a large area from Marsing to Weiser.

At Weiser, the river enters the world famous Snake River Canyon through which it travels to Clarkston, Washington, a distance of some 180 miles. Major tributaries in this

part of the Snake River below Hells Canyon Dam are the Salmon and Clearwater Rivers from the east and the Imnaha and Grande Ronde Rivers from the Wallowa and Blue Mountains to the west. Each of these streams drains high mountainous areas having peaks which exceed 9,000 feet. There are no major tributaries between the Brownlee project and Salmon River, through several large creeks, notably Wildhorse, Pine and Sheep Creeks, and the Imnaha River, contribute substantial flows during the spring runoff period.

The Snake River from Clarkston, Washington to its confluence with the Columbia River flows across the Blue Mountains and Walla Walla sections of the Columbia Plateau. The river is deeply entrenched below the general level of the plateau. The Palouse River is the principal tributary to this portion of the Snake River. Plate 4-1 is a map showing the location of Brownlee, Oxbow and Hells Canyon dams and other existing and potential major dam and reservoir developments of the Columbia River Basin.

4-03 Geology and Soils.

4-04 Sediment.

4-05 Climate.

Generally, so far as temperature and precipitation of the Snake River Basin are concerned, altitude is the most important factor of control. The entire basin lies within the region of prevailing westerly winds and is, therefore, dominated largely by Pacific maritime air, with generally mild winters.

The climate may be classified as arid or semi-arid, with wide extremes of temperature. Precipitation ordinarily occurs as snow, which accumulates during the fall and winter seasons and runs off during the spring. Severe summer storms are infrequent. Normal annual precipitation varies from less the 6 inches over the plains of southeastern Idaho to about 60 inches over the Teton Mountains of Wyoming. The normal annual precipitation, when averaged over the entire basin, is approximately 16 inches. Plate 4-2 shows the normal annual precipitation throughout the Snake River Basin.

Ordinarily, in the valleys, the mean temperature ranges from 43 degrees to 52 degrees with hot, dry summers. Over most of the agricultural sections of the basin, the frost free period is usually about four to six months. Climatological data for the basin is shown in Table 4-1.

4-06 Storms and Floods.

a. Lower Columbia River. Flood peaks which occur annually have averaged 589,000 cfs but have ranged in magnitude from as little as 269,000 cfs in 1926 and 273,000 cfs in 1941 to more than a million cfs in 1866, 1894 and 1948. Maximum annual flood peak discharges in excess of 800,000 cfs occurred in the Columbia River near The Dalles in 1859, 1866, 1876, 1880, 1887, 1894, 1948 and 1956. The largest flood observed at The Dalles gauging station occurred in June 1894 with a maximum

discharge of 1,240,000 cfs. The 1876 flood was second highest with 1,010,000 cfs at the gauging station. Little is known of the causes of the 1876 flood. Floods of 1894 and 1948 resulted in greater than normal accumulated snow packs, subnormal temperatures that retarded the runoff during the early part of the runoff season, heavy spring precipitation creating runoff from saturated lands, and prolonged high temperatures in the latter part of May and early June that caused rapid melting of the snow pack.

The most recent flood to exceed 800,000 cfs at The Dalles occurred in 1956 and had an observed peak discharge of 823,000 cfs. However, available storage reduced the peak flow approximately 100,000 cfs. This flood was characterized by a high flood potential recognized early in the year, resulting from heavy rains over much of the Columbia Basin during the fall of 1955 and above normal snow accumulation. During the latter half of December 1955, heavy rains produced large floods in several middle Snake River tributaries and in the Willamette Basin.

Heavy winter rains also occurred over a large portion of the Columbia Basin in December 1964 and January 1965. These rainstorms produced record floods on many streams, and in December, the Columbia River at The Dalles, had a near record winter flow of 364,000 cfs. Approximately two-thirds of this flow was from the Snake River. Plate 4-3 is a summary hydrograph for the Columbia River at The Dalles. Plate 4-4 shows annual peak discharge frequency curves for the Columbia River at The Dalles, Oregon.

b. Lower Snake River (below Lewiston, Idaho). Floods in the Lower Snake River below Lewiston, Idaho are two types: 1. annual spring floods primarily from snowmelt, sometimes augmented by rainstorms and 2. occasional winter or early spring flood resulting from rainstorms, low elevation snowmelt or a combination of the two factors. The spring floods usually begin in March, culminate with the peak for the year between 15 March and 20 June amid a succession of high fluctuation flows and end with recession to low flows in late June and July as snow disappears from principal contributing areas. Flood volumes and the general regimen of high flows for several weeks' duration are somewhat related to the seasonal precipitation received and are fairly well related to snow accumulation at the beginning of the flood season, plus precipitation during the runoff season. Peaks are also somewhat related to seasonal precipitation but they are much more closely related to the high temperatures and precipitation which occur from brief periods of a day or two weeks just preceding the peaks. The statistical average date of such flood peaks is 20 May.

The winter or early spring floods are of shorter duration, seldom exceeding a week or ten days and usually of one peak, preceded and followed by rapidly rising and receding flows. They normally occur with much lower base flows than exist between individual peaks of the spring snowmelt runoff season.

The winter or early spring floods are of shorter duration, seldom exceeding a week or ten days and usually consist of one peak, preceded and followed by rapidly rising and

receding flows. They normally occur with much lower base flows than exist between individual peaks of the spring snowmelt runoff season.

From available records of 1894 and of 1910 to date, on the lower Snake River, large floods with peak discharges exceeding 250,000 cfs occurred in 1984, 1919, 1912, 1917, 1921, 1928, 1948, 1952, 1956, 1957 and 1964. The largest actual flood, in both peak and volume, was that of May and June 1894. The peak discharge of that flood was 409,000 cfs. The 1894 flood originated from abnormal winter precipitation over the basin generally creating a large snow pack, low temperatures during the early part of the usual runoff season which retarded the runoff, and by above normal temperatures and excessive precipitation in late May – June which concentrated flood flows and reduced opportunity for losses. The flood came generally from all usual contributing areas in the basin.

The second largest flood, that of May – June 1948, had a peak discharge of 368,000 cfs. This flood resulted from seasonal precipitation which increased greatly above normal after 1 April and from cool temperatures in April and early May that did not materially reduce the snow pack and from high temperatures plus several rainstorms in late May and June. The extreme upper part of the basin in Wyoming and the area tributary to the lower river, including the Salmon, Grande Ronde and Clearwater Rivers, were principal contributors, whereas floods were not particularly large in southern Idaho tributaries.

The flood of 1957 was an example of a high peaked flood resulting from rainstorms in the mid snowmelt runoff season. The snowmelt peak of 1957 was considerably increased by an unusually hard rainstorm in the Clearwater River Basin on the 19th and 20th of May.

The flood of 1956, with a peak discharge of 292,000 cfs which occurred on 24 May, was principally the result of a large seasonal buildup of snow on the basin, with some abnormalities of precipitation and temperatures during the period of high flows. Plate 4-5 shows maximum annual peak discharge frequency curves for the Snake River near Clarkston. The largest winter flood of record occurred in December 1964 and had a peak discharge of 246,000 cfs at Clarkston. A summary hydrograph for the Snake River near Clarkston is shown on Plate 4-6.

c. Middle Snake River (Clarkston to Weiser). Peak flows on the middle Snake River normally occur from late April through June primarily from snowmelt sometimes augmented by rain. However occasionally winter or early spring rainstorms and above normal temperatures combine to produce flood peaks earlier in the year. The Snake River at Weiser, Idaho, records 56 floods with flows of 50,000 cfs occurred in 1911, 1912, 1913, 1914, 1916, 1917, 1918, 1919, 1921, 1922, 1925, 1927, 1928, 1932, 1936, 1938, 1943, 1946, 1952, 1953, 1956, 1957, 1964, 1965. The largest flood of record occurred on 29 April 1952 and had a peak discharge of 84,000 cfs; the second largest occurred on 23 May 1921, with a peak flow of 83,100 cfs; the third largest occurred on 15 June 1912 with a peak of 73,800 cfs. There was not enough storage space

available in Brownlee Reservoir to afford adequate regulation of this flood and the peak discharge was spilled.

Discharge rating tables for the Snake River at Weiser and near Anatone are shown on Tables 4-2 and 4-3. In addition, a discharge rating for the Salmon River at Whitebird is given on Table 4-4. The Salmon River is the major Snake River tributary in the middle Snake reach. Plate 4-7 shows maximum annual peak discharge frequency curves for the Snake River above the Clearwater River.

4-07 Runoff Characteristics.

a. Runoff. The natural stream flow of the upper Snake River and its tributaries follows a regular runoff pattern. High flows generally occur during the snowmelt season from April through June and low flows normally prevail during the fall and winter. During the snowmelt season, the runoff rate is mainly a function of temperature, and the extent of the snow cover with large changes occurring more gradually than on stream where the flood flow is derived entirely from rain. The natural river flow pattern above Brownlee Dam in materially modified by the operation of about 10 million acre-feet of storage space in controlled lakes and reservoirs. Additionally irrigation diversions of natural flow are estimated to average about 6 million acre-feet but vary widely from year to year. The modification by irrigation diversions and storage tends to decrease the high spring flows, reduce summer flows and increase winter flows by irrigation return flows. The natural runoff pattern is further modified by increased diversions in high runoff years and decreased diversions in low runoff years. With more than one million acres presently receiving surface water from above Milner Dam, increased diversions in a high runoff year may account for a reduction in natural flows of nearly 1,000,000 acre-feet in the months of April through July. In the late fall and winter, precipitation occurs in the form of snow and immediate runoff is small. In the summer, the rain generally falls on unsaturated soil and surface runoff is lost through either evaporation or ground water storage.

The runoff of Snake River at King Hill, Idaho, is relatively uniform throughout the year, since about 70% of the average annual runoff at this point comes from a group of uniformly flowing springs producing about 6,000 cfs inflow between Milner Dam and King Hill, Idaho. Below King Hill, the inflow from tributaries influences the flow of the Snake River. The river at Brownlee shows some of the flow characteristics of the lower tributaries, with higher flows from early spring through the first part of the summer and low flows from late summer through the winter. Two projects with about 202,000 acres of arable land, which are receiving consideration for development, would divert water directly from the Snake River and Boise River. These two projects (Guffey-Mountain Home and Crystal Springs), when developed, would further decrease the April – July runoff at Brownlee by approximately 775,000 acre-feet.

Further water resource development of the Snake River Basin above Brownlee Dam will affect the present and future power and flood control projects downstream on the Snake and Columbia Rivers. The water supply at the downstream projects will be

reduced due to consumptive use from the greater application of water for irrigation and evaporation losses from water surface areas on new storage reservoirs. Potential reservoir development sites with total capacity of 8.9 million acre-feet have been mentioned in reconnaissance surveys of the Snake River Basin above Brownlee. The downstream spring season flows would be reduced due to upstream storage, and low winter flow would be increased as a result of return flows from upstream irrigation and power releases. Present and potential reservoirs for the area above Brownlee are tabulated in Tables 4-5 and 4-6. Plates 4-3 and 4-6 show summary hydrograph data for the Snake River at Clarkston, Washington and Columbia River at The Dalles, Oregon.

b. Vegetation. The Snake River Basin above Brownlee has an area of approximately 46 million acres. Agricultural lands, pasture, and irrigated farms constitute about 25% of the area, while open range lands account for about 55%. Most of the remaining area consists of national forests and parks, primitive recreation area and wasteland.

The principal plant cover on the open range portion is sagebrush, annual weeds and grasses. The forest areas also have considerable grass cover which makes them ideal for summer grazing of cattle and sheep. The approximate land distribution is shown below:

Land Use	Acres
Agriculture	10,800,000
Open Range	26,900,000
Forest	5,700,000
Waste & Miscellaneous	3,000,000

4-08 Water Quality.

4-09 Channel and Floodway Characteristics.

4-10 Upstream Structures.

4-11 Downstream Structures.

4-12 Economic Data.

a. Population. The Snake River Basin above Brownlee is largely rural in character with nearly two thirds of the people living on farms or in small towns. The 1960 census indicates a basin population of approximately 539,000. Principal cities of the basin are shown in the following tabulation:

City	State	1960 Population	City	State	1960 Population
Alameda	Idaho	10,660	Nampa	Idaho	18,013
Blackfoot	Idaho	7,378	Payette	Idaho	4,451
Boise	Idaho	34,481	Pocatello	Idaho	28,534
Buhl	Idaho	3,059	Rexburg	Idaho	4,767
Burley	Idaho	7,508	Rupert	Idaho	4,153
Caldwell	Idaho	12,230	St. Anthony	Idaho	2,700
Emmett	Idaho	3,769	Twin Falls	Idaho	20,126
Gooding	Idaho	2,750	Weiser	Idaho	4,208
Idaho Falls	Idaho	33,161	Nyssa	Oregon	2,611
Jerome	Idaho	4,761	Baker	Oregon	9,986
Total: 219,306					

Both rural and urban populations are heavily concentrated along the Snake River and major tributaries, where the agricultural areas and the principal towns are located. The population is supported primarily by an extensive irrigated agricultural and associated processing and service industries. The main rural population surrounds the larger cities.

b. Agriculture. The economic structure of the Snake River Basin above Brownlee is based upon irrigation of arid and semi-arid lands. Farms located principally along the Snake River utilize arid lands which, without irrigation, would be unproductive.

In 1928, approximately 2.3 million acres were irrigated in the river basin above Brownlee. By 1960, this irrigation development had risen to approximately 3.0 million acres and by the year 2010, it is estimated that the development will have increased to approximately 4.0 million acres.

The present irrigated areas in the reach above Brownlee Dam are shown in the following tabulation for 1928 and 1960 levels of development.

Comparative Irrigated Areas – Snake River Above Brownlee (units in thousands of acres)			
	Level of Development		
River Basin	**1928**	**1956**	**1960**
Snake River in Wyoming	86		90
Henrys Fork	162		172
Main Stem and Minor Tributaries in Idaho Above Milner	929		1,193
Main Stem and Minor Tributaries – Milner to King Hill	268		560
Bruneau	21		69
Owyhee	83		178
Boise	331		335
Malheur	63		90
Payette	130		167
Weiser	38		41
Burnt	28		30
Powder	100		106
Main Stem and Minor Tributaries King Hill to Brownlee	39		41
Snake Above Brownlee	**2,278**	**2,532**	**3,072**

During the early irrigation developments, the ground water resources of the basin were of secondary importance to surface water. Since 1945, extensive development of wells and ground water pumping have added approximately 600,000 acres of irrigated lands within the basin. This has added substantially to the power pumping load.

The major portion of the crops in the basin are grown on irrigated lands. Potatoes, sugar beets, beans and wheat are the most important cash crops. With the expansion of the agricultural economy of the area, the processing of food products and production of frozen and dehydrated methods of handling, storing and processing of potatoes has resulted in a major construction and expansion of processing plants. Hay is the predominant crop in supporting the livestock and dairy industries. Irrigated pastures in the basin and natural rangelands in the foothills, forests and high meadows, support many thousands of beef and dairy cattle.

c. Industry. With from 60 to 75% of the total available phosphate ore of the United States located in and adjacent to the basin, the continued expansion of electro-chemical industry in the production of elemental phosphorus is assured. The mining industry, except for phosphate, is generally in the early stages of development, because of the lack of exploratory work in the extremely rugged terrain.

4-13 Flood Damages.

a. Lower Snake. Flood damages along lower Snake River downstream of Brownlee Dam are minor, as compared to those of lower Columbia River, except for the vulnerability to high water of several dam and reservoir projects during construction. In most reaches the river banks are high and shoreline developments are not extensive. Bankfull discharge in the area of greatest development, the Lewiston-Clarkston area, is in excess of 300,000 cfs.

b. Lower Columbia. The major flood damages downstream of Brownlee Dam occur along the lower Columbia River between the mouth and Bonneville Dam. Flood damage commences along this reach when the discharge of Columbia River as measured at The Dalles exceeds 450,000 cfs, and it is therefore a desired goal to limit all low and moderate floods to that controlled discharge. It is the goal to control larger floods to a maximum of 600,000 cfs at The Dalles, insofar as possible. However, the volume of the largest floods, such as that of 1894, is so great that these floods cannot be controlled to 600,000 cfs by existing major storage reservoir projects.

Table 4-7 summarizes flood damages for the Lower Columbia River at the Dalles for the period 1974-1987. Damages prevented represent the price and development level of the year of occurrence. Damages prevented by control of winter floods on tributary streams are not shown.

TABLE 4-7
LOWER COLUMBIA RIVER
REGULATION OF 1974-1987 FLOODS

Water Year	Peak Flow at Unregulated (kcfs)	The Dalles Regulated (kcfs)	Peak Stage at Unregulated (Feet)	Vancouver[1] Regulated (Feet)	Damages Prevented Lower Columbia (Millions of Dollars)
1974	1,010	590	30.6	21.1	239.73
1975	669	423	22.9	14.3	9.41
1976	637	419	22.2	14.5	15.65
1977	276	183	9.2	7.0	0.00
1978	565	313	20.1	9.9	6.00
1979	482	306	16.9	10.4	1.50
1980	544	341	19.2	10.3	5.16
1981	579	436	21.7	16.7	10.91
1982	759	422	25.4	14.6	15.22
1983	723	400	24.9	15.8	18.48
1984	628	376	22.5	13.0	10.71
1985	550	274	21.7	8.8	10.45
1986	714	388	24.4	12.5	15.66
1987	439	284	15.5	8.8	0.0

1. Stage at Vancouver, Washington gage. Datum is 1.82 feet NGVD.
NOTE: Zero damage stage is 16 feet.
SOURCE: Columbia River Water Management Report for Water Year 1987.

5 DATA COLLECTION AND COMMUNICATION NETWORKS

5-01 Hydrometeorological Stations.

a. Facilities.

(1). Stream Gauging.

Stream gauging facilities are quite numerous throughout the Snake River Basin both upstream and downstream of Brownlee Reservoir. Daily stream flow and reservoir data is essential for optimum regulation of the Brownlee, Oxbow, and Hells Canyon projects. In addition, extensive irrigation development requires gauging facilities for the administration of water rights. All major rivers and reservoirs are gagged and daily reports are usually available when required through the US Bureau of Reclamation's VAX system and the Corps of Engineers – CROHMS system.

(2). Automated Hydromet Systems.

(a). Bureau Hydromet System. The Pacific Northwest Regional Office of the Bureau of Reclamation has an extensive automated hydrometeorological data collection system throughout the upper, middle, and lower Snake River basins. This systems is composed of 1. a Direct Readout Ground Station (DRGS) located in Boise for the Geostationary Operational Environmental Satellite (GOES), 2. a computerized network controller, referred to as the Center Computer Facility (CCF) and 3. remote stations.

The system is unique in that the Data Collection Platform (DCP) at each remote site is microprocessor controlled and has the capability to transmit through two channels on the GOES system. One channel handles only self timed transmissions whereas the second channel is dedicated to only adaptive random transmissions. Operation in the self timed mode is as follows. The DCP interrogates all sensor outputs at 15 minute intervals and stores the values in its memory. At a pre-assigned time interval, every 4 hours, the DCP transmits all stored values from each sensor to the Central Computer Facility through the Direct Readout Ground Station in Boise. This produces a very complete, detailed database.

Transmissions in the adaptive random reporting (R/R) mode are completely unscheduled with the decision to transmit being made by the DCP. This is accomplished by programming threshold values in the microprocessor which the DCP uses to compare with sensor outputs. If the threshold values are exceeded, the DCP computes a random transmission rate and begins to transmit randomly. The microprocessor also computes rates of change between sensor readings if the rate of change exceeds the preprogrammed threshold values, this also causes the DCP to compute a random transmission rate and begin transmitting. Each time a DCP transmits randomly, it only sends three values - the most current value and the two

preceding values. Also, once the DCP goes into random mode it will send at least three transmissions randomly before shutting down. However, if the threshold values are continually exceeded and / or the rates of change increase, the DCP will continue in random mode until the situation returns to normal. It is important to note that as the rate of change of the sensor values increases, the random transmission interval is shortened, thereby transmitting more frequently as the event becomes more serious.

(b). CROHMS (Corps of Engineers). The Columbia River Operational Hydromet and Management System (CROHMS) is a real time water resources data management system. A computer system is used for data reduction, system modeling, forecasting and database support functions. The data acquisition for these functions is supported through the CROHMS Automated Front End (CAFÉ). Figure 5-1 on page 5-7 shows the CROHMS network diagram. Details on the CROHMS data collection system are contained in the Columbia River Basin, Master Water Control Manual, December, 1984.

In addition, the Columbia Basin Telecommunications (CBT) network, operated by the Corps of Engineers, is now merged with CROHMS. The CROHMS CAFÉ computer performs the polling functions of the CBT circuit.

The real time data for the operational management and forecasting of the Columbia River system. The output system is designed to be flexible and easy to use in carrying out the water management responsibilities on a day to day basis or for special operating conditions, for maintaining surveillance of the river and reservoir system and for developing forecasts or operating plans for future regulation.

b. Reporting.

(1). Stream Gauging. The Geological Survey collects stream flow data and annually publishes recorded data in their publication, Water Resources Data for Idaho. The Soil Conservation Service collects manual snow course measurement data and publishes the data in their monthly publication, Water Supply Outlook for Idaho. In addition, SNOTEL stations provide real-time snow water content data on a daily basis via the SCS's Data General System. The National Weather Service collects climatic data and publishes it annually in their Climatological Data for Idaho publication.

For real-time reservoir regulation, data are readily available, once collected, from the Bureau of Reclamation VAX Computer and the Corps of Engineers CROHMS system which provide real-time data as listed on page 5-3.

(2). Automated Hydromet Systems.

(a). Bureau Hydromet System. All data received by the Central Computer Facility (CCF) are immediately processed and stored in the Dayfiles. At 5:00 a.m. each morning, the CCF compiles data from the previous day's Dayfiles database file readings to be put into the Archives database. The Archives database is composed of such

things as midnight reservoir elevation and contents, maximum and minimum temperatures, and mean daily flows, etc. Both Dayfiles and Archives databases are available to users through terminals.

(b). CROHMS (Corps of Engineers). The real time data for the operational management and forecasting of the Columbia River system. The output system is designed to be flexible and easy to use in carrying out the water management responsibilities on a day to day basis or for special operating conditions, for maintaining surveillance of the river and reservoir system and for developing forecasts or operating plans for future regulation.

(3). Stream flow. Stream flow records are collected by the U.S. Geological Survey (USGS) Boise, Idaho office on the Snake River at Hells Canyon Dam (No. 13290450) and the Snake River at Johnson Bar (No. 13290460) for evaluating the effects on navigation in the river downstream of Hells Canyon Dam (River Mile 247). As a check to ensure that minimum stream flow and maximum river stage variation provisions of the license are not violated, the USGS makes quarterly reviews of stream flow records collected on the Snake River at Hells Canyon Dam and Snake River at Johnson Bar gauging stations. The USGS then documents their findings in a letter to the Walla Walla District, Corps of Engineers, and furnishes copies to FERC and Idaho Power Company. River Gages on Salmon River at Whitebird (No. 13317000), Grande Ronde River at Troy (No. 13333000), and Snake River near Anatone (No. 13334300) are also used for evaluating navigation conditions in the Snake River downstream of Johnson Bar, as well as flood forecasting stream flows on Lower Snake River. Plate 5-1 shows the gauging facilities which are most pertinent to operation of the projects.

Figure 5-2 on page 5-8 shows a schematic for the Brownlee, Oxbow, Hells Canyon area hydromet system. The following tabulation summarizes real-time data which are available from the Bureau's hydromet system:

Station	Parameters	
	Stream Gages Archives	**Dayfiles**
1. Snake River near Weiser (WEII)	GD,HJ,QD	GH,HJ,Q
Dam and Reservoir		
1. Hells Canyon Dam (HCDI)	HG,QD	GH,HJ,Q
Stream Gages		
1. Salmon River at Whitebird (WHBI)	GD,HJ,QD	GD,HJ,Q
2. Grand Ronde River at Troy (TRYO)	GD,HJ,QD	GD,HJ,Q
3. Snake River near Anatone (ANAW)	GD,HJ,QD	GD,HJ,Q

GD – Mean daily gage height
GH – Observed gage height
HJ – Gage height rating shift
Q – Total discharge (15 minute)
QD – Daily average discharge

The following data is available from the Corps of Engineer's CROHMS database:

Station	Parameters
1. Weiser River at Weiser (WSRI)	HGIRXZZA, QRIRXZZA, QRDPAZZ
2. Snake River at Weiser (WEII)	HGIRGZZA, QRIRGZZA, QRDPAZZ
3. Brownlee Reservoir (BRN)	HFIRXZZA, LSIRXZZA, QIDRXZZA, QRDPAZZ
4. Hells Canyon Dam (HCDI)	HFIRXZZA, QIDRXZZA, QRDRXZZA
5. Hells Canyon Dam (HCD)	HGIRGZZA, QRIRGZZA
6. Salmon River at Whitebird (WHBI)	HGIRGZZA, QRIRGZZA, QRDPAZZ
7. Imnaha River at Imnaha (IMNO)	HGIRGZA, QRIRGZZA, QRDPAZZ
8. Grande Ronde River at Troy (TRYO)	HGIRPZZA, QRIRPZZA, QRDPAZZ
9. Snake River near Anatone (ANAW)	HGIRGZZA, QRIRGZZA, QRDPAZZ

HFIRXZZA – Forebay Elevation
HGIRGZZA – Gage Height via GOES Satellite
HGIRPZZA – Gage Height via Phone or Radio
HGIRXZZA – Gage Height via Phone or Radio
LSIRXZZA – Reservoir Content (acre-feet)
QIDRXZZA – Computed Inflow Sent from project
QRDPAZZ – Computed Mean Daily Release
QRDRXZZA – Computed Mean Daily Flow
QRIRGZZA – Hourly Flow from Satellite Stage
QRIRPZZA – Hourly Flow from Phone or Radio Stage
QRIRXZZA – Hourly Flow from Phone or Radio Stage

(4). SCS SNOTEL System.

The Soil Conservation Service owns and operates a hydromet system for the Snake River Basin as part of its western states Snow Telemetry (SNOTEL) program. This system uses: (1) two master polling stations located at Boise, Idaho and Ogden, Utah, (2) meteor burst radio communications, and (3) remote stations. The system collects remote data once per day during a nominal polling period (5:00 a.m. to 8:00 a.m. Pacific time) and has capability of additional interrogations (ad hoc polls) as needed. A total of up to six parameters may be retrieved from each remote data site, with ultimate plans for retrieving a total of 16 parameters. The six parameters include:

1. Snow water content as measured by snow pillow (SP).
2. Cumulative precipitation (PC).
3. Air temperature (OB).
4. Maximum air temperature (TMAX).
5. Minimum air temperature (TMIN).
6. Average air temperature (TAVG).

Real-time SNOTEL data is retrieved automatically from the SCS – Data General computer system's data base in Portland, Oregon into the Corps CROHMS system on a

daily basis. Users also have direct access to SNOTEL data through the SCS Data General system.

(5). Use of Real-Time Data.

Real-time data are used for volume forecasting and in the Stream flow Synthesis and Reservoir Regulation (SSARR) Model. Volume forecast and SSARR Model results form the basis for reservoir regulation decisions and resultant reservoir regulation. Also, the output form CROHMS and SNOTEL systems is designed to be flexible and easy to use in carrying out the water management responsibilities on a day-to-day basis or for special operating conditions, for maintaining surveillance of the river and reservoir system, and for developing forecasts or operating plans for future regulation.

5-02 Water Quality Stations.

a. Facilities.

b. Reporting.

c. Maintenance.

5-03 Sediment Stations.

a. Facilities.

b. Reporting.

c. Maintenance.

5-04 Recording Hydrologic Data.

5-05 Communication Network.

Idaho Power Company's telephone system is the normal communication system used for communications between the power plants, the system dispatch center, and other company offices. The local commercial telephone utility system is used for all local and long distance calls from the power plant. These two systems are the primary and alternative communication modes for use during normal and emergency conditions.

5-06 Communication with Project.

a. Regulating Office with Project Office.

The frequency of exchange of basic data pertinent to efficient operation of the dam and regulation of floods will be on a daily basis during the work week except during unusual or rare conditions of weather or reservoir inflow when the frequency will be as

requested or needed. Data is automatically sent to the Corps of Engineers CROHMS system on an hourly basis 7 days per week from the Bureau of Reclamation Hydromet System located in Boise.

b. Between Project Office and Others.

5-07 Project Reporting Instructions.

5-08 Warnings.

6 HYDROLOGIC FORECASTS

6-01 General.

a. Role of the Corps.

The development of reservoir regulation plans for the Brownlee project during flood control and refill operations is based primarily on seasonal runoff volume forecasts and daily stream flow forecasts. The North Pacific Division Corps of Engineers Reservoir Control Center (RCC) is directly responsible for coordination of operational planning and regulation of Corps of Engineers and Section 7 projects for flood control on a system basis. For real-time short range daily regulation, the RCC uses the Stream flow Synthesis And Reservoir Regulation (SSARR) computer program. This program is a mathematical hydrologic model incorporating routing procedures, snowmelt computation, and precipitation data to simulate stream flows. The storage effects of natural lakes and regulated reservoirs can also be evaluated with known stream flow conditions and specific reservoir regulation. The SSARR model is very valuable during the April-July spring refill season for developing and evaluating reservoir regulation plans for Brownlee. RFC and RCC develop SSARR forecasts cooperatively and use results to carry out their public service and operational responsibilities. Refer to the Master Water Control Manual dated December 1984 for more information on use of the SSARR model on day-to-day flood control analysis and power scheduling analysis.

b. Role of Other Agencies.

6-02 Flood Condition Forecasts.

a. Requirements.

On the basis of record on the Columbia river at The Dalles and on the Snake River at Clarkston, it has been concluded that flood control regulation at the Brownlee project should be available during the period from 1 May through June for control of lower Columbia River floods and from mid April through 20 June for control of lower Snake river floods. The amount of flood control space made available in the Brownlee project depends upon the estimated runoff into the project. There are no provisions for providing flood control space for control of winter floods.

Idaho Power Company's three-dam project constitutes the major storage project on the middle Snake River. The project has sufficient storage to provide regulation in the interest of downstream flood control, system power generation for use in the Northwest Power pool, and regulation in consideration of navigation and other requirements. It is an important part of the Columbia River Basin water resources development. Operation of Idaho Power Company's project in conjunction with the total system of Columbia River reservoirs is essential to provide regulation of floods on the lower Columbia.

Due to the nature of the drainage area and the irrigation above Brownlee, there are many problems in forecasting runoff; therefore, regulation will involve a considerable element of prudent judgment. However, any departures from procedures outlined in this manual will be made only after consultation between representative of the Idaho Power Company and the Corps of Engineers.

On the basis of record on the Columbia River at The Dalles and on the Snake River at Clarkston, it has been concluded that flood control regulation at the Brownlee project should be available during the period from 1 May through June for control of lower Columbia River floods and from mid-April through 20 June for control of lower Snake River floods. The amount of flood control space made available in the Brownlee project depends upon the estimated runoff into the project. There are no provisions for providing flood control space for control of winter floods.

b. Methods.

(1). Seasonal Runoff Volume Forecasts.

Runoff volume and stream flow forecast data used by RCC are provided by the National Weather Service Northwest River Forecast Center (RFC) Portland, Oregon. RFC is also responsible for issuing coordinated water supply forecasts for the Columbia River Basin system based on forecasts from B. C. Hydro, Bonneville Power Administration, Bureau of Reclamation, Corps of Engineers, Soil Conservation Service (SCS), and the River Forecast Center (RFC). RFC also makes peak discharge estimates for key gauging stations in the Columbia River Basin based on 1 April runoff volume forecasts. These peak flow forecasts are based on statistical relationships between peak flow and runoff volume.

(2). SSARR Forecasts.

Operational forecasts for short-term daily regulation are made cooperatively by the Reservoir Control Center (RCC) and the Northwest River Forecast Center (RFC). The SSARR model is comprised of three basic components:

1. A generalized watershed model for synthesizing runoff from snowmelt, rainfall, or a combination of the two as drainage basin outflows.

2. A river system model for routing stream flows from upstream points to downstream points through channel and lake storage. Stream flows may be routed as a function of multi-variable relationships involving backwater effects from tides or reservoirs.

3. A reservoir regulation model whereby reservoir outflow and contents may be analyzed in accordance with predetermined or synthesized inflow and free flow or any of several modes of regulating outflow.

SSARR forecasts normally begin about 1 April and continue until the flood potential becomes minimal, which is usually sometime in July. During the early part of the spring flood season, the frequency of these forecasts is 3 days per week on Monday, Wednesday, and Friday. The Monday and Friday forecasts are short-range forecast for 10 days in advance. The Wednesday forecast is a long-range forecast which covers the period from the initial forecast date through July. During the peak flow and recession flow period, long-term extended forecasts are made every day. These extended forecasts continue until the danger of flooding is past and the reservoirs are filled. Since weather forecasts are usually reliable only for 3 to 5 days in advance, the hydrometeorological factors affecting runoff must be extended during the forecast period on the basis of average and extreme snowmelt conditions in order to compare probable flows with the most severe flows likely to occur.

6-03 Conservation Purpose Forecasts.

a. Requirements.

b. Methods.

6-04 Long Range Forecasts.

a. Requirements.

b. Methods.

6-05 Drought Forecasts

a. Requirements.

b. Methods.

7 WATER CONTROL PLAN

7-01 General Objectives.

The objective of this Water control Plan is to define procedures for implementation of the flood control and navigation provisions of the license as outlined in Articles 18, 42, and 43, respectively, and the general provisions of the Federal Power Act with respect to navigation. In addition, power loads and resources and the Lower Snake River flow augmentation (Water Budget) are also covered in this Water Control Plan.

7-02 Constraints.

a. Operations.

(1). Brownlee.

(a). Flood Control.

Flood control is an important consideration in the annual operation of Brownlee reservoir. Under Article 42 a total active storage space of about 1,000,000 acre-feet or 101 feet of drawdown between elevation 1976 (minimum power pool) and elevation 2077 (normal full pool) is available for flood control use if and as required. The only license constraint on Brownlee reservoir is that Brownlee's pool must be no higher than elevation 2034 by 1 March of each year to provide 500,000 acre-feet of flood control space. Depending on spring runoff volume forecasts, the Corps can require up to 500,000 acre-feet more of additional flood control space, which would be provided by evacuation as necessary during March to insure availability of flood control space required on or before 1 April. The North Pacific Division – Corps of Engineers – Reservoir Control Center (RCC) is responsible for defining flood control requirements for 1 April and during refill, and also for coordination of these requirements with Idaho Power Company. Runoff volume and stream flow forecast data used by RCC are provided by the National Weather Service Northwest River Forecast Center (RFC) in Portland, Oregon.

(b). Power.

Unit 5 must not be operated below elevation 1990 due to vortexing.

(c). Discharge.

No limits for minimum release and maximum rate of change.

(2). Oxbow.

(a). Discharge.

No limits for minimum release and maximum rate of change.

(3). Hells Canyon.

Outflows from Hells Canyon Dam (R.M. 247 are constrained by Article 43 of the license. Specific provisions affecting key downstream control points: (1) At Johnson's Bar (17 miles downstream, River Mile 230) and (2) At Lime Point (75 Miles downstream and below the confluence of the Salmon River, River Mile 172) are summarized as follows:

(a). At Johnson's Bar. (River Mile 230)

Minimum Release:

1. Maintenance of a minimum Snake River flow of 5,000 cfs during periods of low flow or normal minimum plant operations.

Maximum Rate of River Stage Change:

1. Ramping restriction is a maximum of 1 foot per hour variation in river stage.

(b). At Lime Point. (River Mile 172)

Minimum Release:

1. Maintenance of 13,000 cfs minimum flow in the Snake River at Lime Point at least 95% of the time with regulated flows of less than 13,000 cfs limited to the months of July, August, and September.

Lime Point flow is calculated by subtracting the flow of the Grande Ronde at Troy form the flow of the Snake River at Anatone.

2. Additionally, when it becomes apparent that minimum flows must be reduced below requirements for safe navigation, Idaho Power Company will notify the Walla Walla District of the Corps of Engineers and downstream interests as far in advance as possible and releases for power will be coordinated with navigation schedules to maintain navigable flows below Johnson's Bar for navigation interests during low flow periods.

b. License Provisions.

Provisions of the license, relating to flood control and navigation, are as follows:

of an emergency nature, the normal communication channels may be out of service and emergency action may have to be used. Emergency actions to be taken are summarized on **page ii** of this Manual.

7-05 Flood Control.

The overall flood regulation of Columbia River by reservoir projects is described in detail in "Columbia River Treaty Flood Control Plan" by the NPD Corps of Engineers. About 40 million acre-feet of joint use storage space can be made available for flood control of spring floods on the Lower Columbia River at The Dalles with 12 million acre-feet of the 40 million acre-feet is on call storage in Canada.

Prior to each spring flood season, reservoirs are drawn down to assure the effective use of flood control space in the reservoirs and to preserve the natural storage effect in large lakes. The amount of reservoir space which must be provided depends upon the magnitude of the flood potential as determined from forecasts of seasonal runoff volume. However, the amount of space actually required to control flows to pre-determined limits is a function of the weather sequence as well as the volume of runoff, and in order to meet the requirements for flood control the storage space must be sufficient to control the flood that may occur under a critical weather sequence. In many years a non-critical weather sequence will occur and less storage than was provided will be required to control the flood. In addition to the major storage reservoirs, a number of other reservoirs in the Columbia River Basin provide lesser amounts of flood benefits. Many of the other reservoirs, particularly those in the Snake River Basin, are operated primarily for irrigation. The aggregate flood reduction effect of such reservoirs varies considerably from year to year, depending upon the relative flood contribution of the various tributaries, the timing of the storing of water as related to the downstream flood peak, the amount of carry-over stored water, and related factors, but it may be substantial in some years. Irrigation depletions also provide some reduction of downstream flood flows. However, the effect of many of the smaller reservoirs and of irrigation depletions in reducing the peak discharge of the lower Columbia River is not dependable during large floods. For this reason, the flood control regulation of only the major reservoirs is directly evaluated in basin-wide control studies.

a. Basic Policies.

The objective of the flood control regulation of Brownlee Reservoir, in coordination with other reservoirs in the Columbia river Basin, is to reduce the downstream river flows to non-damaging levels at all points, insofar as possible consistent with refill requirements of the reservoir. Under authority of Article 42 of the Federal Energy Regulatory Commission (FERC) license. No. 1971, up to 1 million acre-feet of space is made available in Brownlee Reservoir each spring for flood control use, if required.

(1). Flood Control Objective.

Reduction of flood flows on the lower Columbia River is the primary objective of flood control regulation at Brownlee Reservoir, but the Brownlee project also can be used for regulation of flow in the Lower Snake River if needed. The flood potential on lower Columbia River varies from year to year, but some probability of having damaging flood flows exists every year. For this reason, Article 42 of the FERC license for the Brownlee project provides for the evacuation of flood control space each year.

(2). Annual Food Control Plan.

In developing the flood regulation plan each year, both the refill capability of Brownlee Reservoir and the downstream flood potential are evaluated. The adopted plan each year considers both functions, since Idaho Power Company's three-dam project on Snake River contributes substantially to the hydroelectric power resource of the Pacific Northwest Region. Any failure to refill Brownlee resulting from flood control drawdown would result in reduced power production with regional effects.

(3). Coordinated System and Brownlee Regulation.

The overall flood regulation of lower Columbia River requires coordinated regulation of a large number of reservoirs throughout the Columbia River Basin. The North Pacific Division – Corps of Engineers – Reservoir Control Center (RCC) is responsible for this basin-wide flood control regulation including that of Brownlee. Generally, Brownlee storage space will be filled earlier than most Columbia River reservoirs; also, Brownlee regulation will be less flexible for fitting into the overall program. This is due to the high priority assigned to refilling Brownlee and the fact that high river flows at Brownlee usually precede high flows on Columbia River each spring. The objective of flood regulation at Brownlee will be accomplished according to the following successive steps:

1. Evacuation of all reservoir space each year that can be safely refilled, with a moderate degree of assurance, with a continuous outflow rate of 30,000 acre-feet per day.

2. Retention of evacuated reservoir space as long as it is possible to refill with a continuous outflow of 30,000 acre-feet per day, or until flow reduction is accomplished in the interests of flood reduction on lower Columbia River.

(4). Special Regulations.

Requests from public and private organizations and individuals for special regulations affecting degree of flood control and navigation can be expected. Such requests may include Water Budget regulation at Lower Granite for downstream fish migration, navigation water levels, search and rescue activities, etc. Such special regulations will be negotiated by the Corps of Engineers and Idaho Power Company and approved or

denied by the Corps in consideration of flood control and navigation regulation criteria required by the license and current conditions.

b. Flood Control Space Requirements.

(1). Pre-flood drawdown.

As required by Article 42 of the license, Brownlee Reservoir will be no higher than elevation 2034 by 1 March of each year to provide about 500,000 acre-feet of storage space for flood control use except as is discussed in paragraph c. Refill of Flood Control Space. The license also provides that additional storage space required up to 500,000 acre-feet will be obtained by evacuation as necessary during the month of March in a manner to insure availability on or before 1 April of the total storage capacity needed for flood control, as estimated by the North Pacific Division – Corps of Engineers – Reservoir Control Center (RCC). RCC is responsible for defining flood control requirements for 1 April and during the refill, and also for coordinating these requirements with Idaho Power Company. Actually, the necessary space for flood control is not required before approximately 1 May. Because runoff occurring after 1 March is heavily influenced by weather conditions during the snow melt period, forecasts made on 1 March cannot reflect these factors. Therefore, in most years it would be necessary to evacuate the full one million acre-feet of storage space to assure the maximum provided by 1 April as required by license. It shall, therefore, be the objective of the evacuation procedure to obtain the flood control space required by 1 May each year as indicated by Table 7-2 on page 7-10. This may include a determination by the Corps of Engineers in years of very low snow cover of requiring less than 500,000 acre-feet of flood control space by 1 March.

The amount of flood control space provided is determined from Table 7-2 on page 7-10 using the latest forecast of seasonal inflow volume, adjusted to the period April through July. Runoff volume and stream flow forecast used by the Reservoir Control Center (RCC) are provided by the National Weather Service Northwest River Forecasts Center (RFC) in Portland, Oregon. The reservoir evacuation rate is computed from the currently available space and that amount required by 1 May. The required average release during this period is the sum of the evacuation rate and the estimated average inflow. Some variations in the day-to-day releases in the interest of power operations are permissible as long as the necessary evacuation is assured. Adjustments are made when indicated by revised seasonal inflow forecasts.

(2). Use of Seasonal Forecasts.

Normally, the seasonal forecasts by several agencies are compared before adoption of a quantitative value which is used to determine flood control storage space requirements. Effort is made to reach agreement on the quantitative value, but in the event agreement is not reached the Corps of Engineers will determine flood control requirements as stipulated in Article 42(c) of the license.

(3). Rule Curve.

A formal flood control storage reservation diagram is not used for Brownlee, primarily because of the fact that forecasts for the Snake River are relatively inaccurate compared with other basins. The variable space requirement has historically been determined primarily on a cooperative and ad-hoc basis from year-to-year. Table 7-1 on page 7-9 summarizes the flood control request made since 1970. Since seasonal run-off volume forecast errors are so large (due to the inherent problem of spring rains and variations in irrigation requirements), the traditional drawdown curve having variable parameters was not utilized. Instead, a tabular envelope approach, developed in 1983 and revised in 1987, is followed in which regions of forecast magnitude – both at The Dalles and at Brownlee – determine the extent of drawdown. This provides a more stable method than would be achieved by interpolating between parameter lines; and, it incorporates two forecast indices, both of which are important in the Brownlee regulation. Table 7-2 on page 7-10 is a listing of the flood control space requirements. These flood control requirements for Brownlee were tested with the SSARR water shed and river models, using both the simulations of historic floods and historic rainstorms. The flood control criteria in Table 7-2 is satisfactory from the flood control point of view; and, it will result in less stringent requirements for drawdown than are required by the FERC license on 1 March. Table 7-3 on page 7-11 summarizes Flood Control Space requirements for the 1970-1987 period, comparing Table 7-2 requirements with historic requirements requested in past operations. As can be seen, the maximum drawdown is nearly the same as that requested in many past years, but for the lower run-off years the requirement has been lowered. Therefore, Table 7-2 represents modification only to that part of the Flood Control criteria that affects low runoff events while attempting to retain the existing degree of control at higher floods.

TABLE 7-1

	1 FEBRUARY		BRN SPACE - KAF		1 APRIL		BRN SPACE -KAF	
	FORECAST (KAF)		REQUEST	ACTUAL	FORECAST (KAF)		REQUEST	ACTUAL
YEAR	TDA	BRN	1 MAR	1 MAR	TDA	BRN	MAX	MAX
1970	92.8	7.6	500	514	82.8	6.7	500	576
1971	119.3	8.7	500	502	120.6	10.9	980	984
1972	116.5	8.0	500	375	126.5	7.0	980	984
1973	81.6	5.0	500	507	69.6	3.6	500	515
1974	134.6	10.0	500	457*	138.0	11.0	980	776
1975	95.6	3.9	500	480*	105.4	7.1	800	734
1976	108.2	5.2	500	500	115.2	7.2	500	549
1977	57.2	2.2	200	196	55.6	2.0	200	303
1978	111.8	7.6	500	509	96.2	6.4	750	582
1979	73.2	4.0	500	503	81.5	4.4	250	250
1980	81.1	4.6	250	332	84.5	5.1	250	371
1981	85.5	4.2	250	249	77.5	3.4	150	328
1982	109.6	8.9	500	98	115.9	9.7	650	656
1983	95.1	6.0	500	246*	100.0	7.9	650	655
1984	88.9	6.3	500	468	84.0	8.4	500	468
1985	98.6	7.2	500	523	91.3	7.3	650	670
1986	83.3	5.2	400	92	83.9	6.3	400	412
1987	73.4	2.6	200	363	69.5	3.0	100	363

*· Draft to 500 KAF was delayed beyond 1 March. Note: based ad hoc analysis on a year-by-year basis.

TABLE 7-2

BROWNLEE FLOOD CONTROL REQUIREMENTS

THE DALLES FORECAST APR - AUG, MAF		BROWNLEE FORECAST APR - JUL, MAF		SPACE REQUIRED, 1000 AF 28 FEB	31 MAR	15 APR	30 APR
<60		<2.5		0	0	0	0
		>2.5	<3	100	50	0	0
		>3		200	100	50	0
>60	<70	<2.5		0	0	0	0
		>2.5	<3	100	50	0	0
		>3	<4	200	100	50	0
		>4		300	200	100	0
>70	<80	<2.5		200	100	0	0
		>2.5	<3	200	150	50	0
		>3	<5	300	200	100	50
		>5		400	350	250	150
>80	<90	<2.5		200	100	0	0
		>2.5	<3	200	150	50	0
		>3	<4	300	250	150	100
		>4	<5	300	350	400	400
		>5		400	450	500	500
>90	<100	<2.5		200	100	50	0
		>2.5	<3	200	150	100	50
		>3	<4	300	300	250	200
		>4	<5	300	350	400	400
		>5	<6	400	450	500	500
		>6		400	500	550	600
>100	<110	<2.5		200	100	50	0
		>2.5	<3	300	200	150	100
		>3	<4	400	400	350	300
		>4	<5	400	450	500	500
		>5	<6	400	500	550	600
		>6		500	500	600	700
>110	<120	<2.5		200	100	50	0
		>2.5	<3	300	250	200	150
		>3	<4	400	400	400	400
		>4	<5	400	500	550	650
		>5	<6	400	650	750	850
		>6		500	750	850	980
>120	<130	<3		300	300	250	200
		>3	<4	400	500	550	600
		>4	<5	500	750	800	850
		>5		500	750	850	980
>130	<140	<3		500	400	300	200
		>3		500	750	850	980
>140	<150	<3		500	550	600	600
		>3		500	750	850	980
>160		ALL		500	750	850	980

Revised from 2 Feb 83 Table 7/16/87 DDS

CENPD-EN-WM-HES
TABLE 7-3

COMPARISON OF PROPOSED TABLE 7-2 AND HISTORIC BROWNLEE FLOOD CONTROL REQUIREMENTS

	1 FEBRUARY FORECAST KAF		BRN SPACE - KAF PROPOSED REQUEST ACTUAL			1 APRIL FORECAST KAF		BRN SPACE -KAF PROPOSED REQUEST ACTUAL		
YEAR	TDA	BRN	1 MAR	1 MAR	1 MAR	TDA	BRN	MAX	MAX	MAX
1970	92.8	7.6	400	500	514	82.7	6.7	600	500	576
1971	119.3	8.7	500	500	502	120.6	10.9	980	980	984
1972	116.5	8.0	500	500	375	126.5	7.0	980	980	984
1973	81.6	5.0	400	500	507	69.6	3.6	0	500	515
1974	134.6	10.0	500	500	457*	138.0	11.0	980	980	776
1975	95.6	3.9	300	500	480*	105.4	7.1	700	800	734
1976	108.2	5.2	400	500	500	115.2	7.2	980	500	549
1977	57.2	2.2	0	200	196	55.6	2.0	0	200	303
1978	111.8	7.6	500	500	509	96.2	6.4	600	750	582
1979	73.2	4.0	300	500	503	81.5	4.4	400	250	250
1980	81.1	4.6	300	250	332	84.5	5.1	500	250	371
1981	85.5	4.2	300	250	249	77.5	3.4	50	150	328
1982	109.6	8.9	400	500	98	115.9	9.7	980	650	656
1983	95.1	6.0	400	500	246*	100.0	7.9	700	650	655
1984	88.9	6.3	400	500	468	84.0	8.4	500	500	468
1985	98.6	7.2	400	500	523	91.3	7.3	600	650	670
1986	83.3	5.2	400	400	92	83.9	6.3	500	400	412
1987	73.4	2.6	200	200	363	69.5	3.0	0	100	363

* Draft to 500 KAF was delayed beyond 1 March.

In addition to the forecasts of seasonal inflow to Brownlee Reservoir, forecasts of seasonal runoff of lower Columbia River are of importance. The upper and middle Columbia River basins are wetter, on the average, than the Snake River above Brownlee Dam, and the effects of irrigation diversions and return flows are relatively less pronounced. For these and other reasons, both the forecasts for the Columbia River at The Dalles and the Snake River at Brownlee are used to determine Brownlee Flood control requirements.

c. Refill of Flood control Space.

Flood control space required on any given date after 1 May will be maintained according to Plate C4 and progressively updated forecasts of seasonal runoff. The curves on Plate C4 as well as Plates C1, C2 and C3 have been developed from past floods to show for any date the amount of space that can be assured of refilling by a reduction of outflow to a predetermined release. Plate C4 shows refill curves for a release of 15,000 cubic feet per second. Plates C1, C2 and C3 show refill curves for releases of 5,000 cubic feet per second, 7,500 cubic feet per second, and 10,000 cubic feet per second, respectively. They are included in this manual for guidance during special regulations.

Refill should be accomplished in accordance with the parameter curves on Plate C4 for a maximum assurance of refilling. Normally, the Corps will stipulate a regulated release for flood control which will assure refilling by 15 July. If in the opinion of the Corps of Engineers, flood control will not be jeopardized, modification in operation may be made to refill by 30 June or earlier when considered desirable for power production.

d. Spillway Operation For Large Floods.

In the event of an extraordinarily large flood which refills Brownlee Reservoir and still has inflow exceeding the hydraulic capacity of the turbines, the spillway or outlet gates will be operated to maintain the water surface near elevation 2077. Generally the objective would be to maintain outflow equal to inflow.

The regulation of Oxbow and Hells Canyon projects in event of a flood which cannot be controlled by Brownlee Reservoir will be simply to pass the Brownlee releases without exceeding maximum pool elevations, 1812 at Oxbow and 1693 at Hells Canyon. Normally the flows will be passed through the turbines up to approximate turbine capacity, after which the spillways and outlets will be used. Oxbow and Hells Canyon Dams will each have one spillway gate equipped with automatic float controls which will be set to open the gate on a rise of the reservoir above normal pool elevation. Maximum gate openings under automatic operation will be limited to five feet at Hells Canyon, so the gates will be operated manually to pass very large floods.

Several provisions are incorporated in both the Brownlee and Oxbow powerhouse controls to ascertain proper control of Oxbow Reservoir. The reservoir elevation and gate opening positions are telemetered to the Oxbow powerhouse. Visible and audible

annunciator alarms, actuated by DC power, signal any rise in reservoir elevation above 1805 and continue to signal as long as the water surface remains above that elevation. All three gates in the Oregon spillway can be operated at the spillway or by remote control from the oxbow powerhouse. In addition to two independent sources of electric power for operating the hoists, a gasoline-driven power unit is provided at the spillway for emergency use. The Brownlee, Oxbow, and Hells Canyon powerhouses are staffed 24 hours daily by operators. However, the Oxbow powerhouse has primary control responsibility of the Hells Canyon plant using a Supervisory Control and Data Acquisition (SCADA) system. Spillway discharge ratings for Brownlee are shown on Plate 2-2 and Plate 2-3, for Oxbow on Plate 2-6 and Plate 2-7, and for Hells Canyon on Plate 2-11. Outlet discharge rating for Hells Canyon is shown on Plate 2-12.

e. Scheduled Operation of Oxbow Fuseplug Spillway.

The Oxbow fuseplug is designed as an inclined-core rock-fill dam with a factor of safety sufficient to insure its remaining in place until the necessity of passing a flood greater than 140,000 cfs. Should that discharge be exceeded, the reservoir will rise above elevation 1809 and water will flow through a pilot channel and over the downstream face of the fuseplug. The cohesionless fill material would be carried away by the water, progressively eroding back into the fuseplug embankment. When sufficient material has been eroded away such that a section of the sloping core is undermined, a portion of the core will collapse and be carried away, thus allowing water to flow over the gap under increased head. This process will accelerate as the channel becomes deeper until it reaches the concrete sill and the water flows through the gap under full head. Progressive erosion of the end of the fuseplug by the stream of water discharging through the gap then will advance at approximately a uniform rate for each type of material in the different lengths of the embankment. The estimated time for complete removal of the fuseplug is four hours.

Should a discharge in excess of 140,000 cfs occur and the fuseplug breach as designed, the Oregon spillway gate opening will be gradually reduced to maintain the Oxbow Reservoir level nearly constant at approximately elevation 1810, compensating for the progressive increase of the fuseplug discharge. The total outflow from Oxbow would therefore be more or less constant. This method of operation is feasible because the design washout time of four hours substantially exceeds the time to close the Oregon spillway gates, which have a rate of operation of one foot per minute. Should the flood continue to increase after the fuseplug has breached, it may be necessary to reopen the spillway gates on the Oregon side gradually to pass the increasing river flow. At the spillway design discharge of 300,000 cfs the Oxbow pool will be at elevation 1812, and the Oregon and Idaho spillway discharges will be 153,000 cfs and 147,000 cfs respectively, After the flood recedes and the Oxbow pool level drops to elevation 1810, that approximate elevation may be maintained until the spillway gates on the Oregon side are closed.

If the river discharge should be increasing at an exceptionally rapid rate at the time of the fuseplug breach, the Oxbow inflow may be held nearly constant during the

breaching period by surcharging Brownlee Reservoir slightly. Such temporary surcharge could not exceed a few tenths of a foot at the most, even with the most critical snow melt hydrograph considered possible. An additional provision to insure against the possibility of overtopping Oxbow Dam is the automatic operation of the center gate of the three Oregon spillway bays by a float control to provide close regulation of the reservoir water surface. In the event of a rise of the water surface above elevation 1805, such as might be caused by an emergency shutdown of the Oxbow power plant, the center gate of the Oregon spillway will automatically open to discharge the excess flow.

f. Unscheduled Operation of Oxbow Fuseplug Spillway.

The possibility of an unscheduled fuseplug breach and the resulting effects at Hells Canyon Dam and downstream points has been studied in detail. Federal Power Commission "Order Approving Revised Exhibit L Drawings", project No. 1971, Brownlee, Oxbow, and Hells Canyon, issued 11 December 1959, approved the Oxbow fuseplug spillway: "*****subject to the condition that within one year from the date of issuance of this order, the licensee shall submit for Commission approval a spillway gate operating procedure for the Hells Canyon development of Project No. 1971 during an unscheduled operation of the Oxbow fuseplug, and such spillway gate operating procedure shall be developed in collaboration with the District Engineer, Corps of Engineers, at Walla Walla, Washington."

Coordinated studies by the Idaho Power Company and the Walla Walla District, Corps of Engineers, have demonstrated that no change should be made in the Hells Canyon spillway gate settings in event of an unscheduled fuseplug breach at Oxbow. The additional volume of water that would be released by a fuseplug failure would be relatively small and could be entirely stored in Hells Canyon Reservoir, thus preventing a downstream flood surge. If the spillway gates are initially closed at the time of the fuseplug failure, they should remain closed, except for the automatic gate. If one or more of the Hells Canyon spillway gates are initially open, as might be the case during a flood, the gate settings will be maintained, except for possible small changes in the automatic gate. The automatic gate will open 2.0 and 8.0 feet when the reservoir exceeds normal pool by 0.5 and 0.7 feet, respectively. The maximum automatic gate opening will be eight feet, at which opening the discharge will be 12,200 cfs at a pool elevation of 1692.5 or 4.5 feet above normal pool. Under these conditions, approximately 2,800 cfs would be spilling over the top of the remaining two gates (assuming them fully closed). The total increase in Hells Canyon outflow resulting from an unscheduled breach of the Oxbow fuseplug would be about 15,000 cfs.

The same procedure of maintaining current Oxbow gate settings will apply should an unscheduled fuseplug breach occur concurrently with loading of either the Oxbow or Hells Canyon power plants. Likewise, the same procedure will be applicable should a premature operation of the fuseplug occur during the early stages of a large flood. Since snow melt floods rise relatively slowly as compared to rain floods, and the additional volume of water which would be released by the fuseplug breach would be

small, no immediate adjustment of the Hells Canyon spillway gates would be required to compensate for the additional inflow. As the river discharge continued to increase, the orderly operation of the Hells Canyon gates would be carried on in the same systematic manner as if the fuseplug breach had not occurred.

Unscheduled failure of the fuseplug could conceivably occur whether the Oxbow spillway gates are open or closed and at any degree of opening, except that if the discharge should exceed 150,000 cfs the scheduled breaching would already have occurred. If the oxbow spillway gates are open, the operation would be the same whether the fuseplug breach is scheduled or unscheduled; in either case the gates would be gradually closed to compensate for the increasing fuseplug discharge. Under conditions of a very rapid unscheduled breach there might not be time for such operation during the washout period. In that event, the Oxbow gates should be closed as soon as possible.

An exception to the general rule of maintaining current spillway gate settings at Hells Canyon should there be an unscheduled fuseplug breach would be an event of a power load rejection at Hells Canyon concurrently with the breach. With that combination of events, one or more of the Hells Canyon spillway gates should be operated manually to release water at the rate that was passing through the powerhouse prior to the outage. This would be in addition to the water passed by the automatic gate.

7-06 Recreation.

7-07 Water Quality.

7-08 Fish and Wildlife.

a. Lower Granite Water Budget.

The Water Budget is a recommended amount of water specifically reserved for the enhancement of flows at Lower Granite Dam to aid in the spring migration of smolts through the Lower Snake River reservoir system. This Water Budget may be used during the 15 April-15 June period when the major smolt migration is occurring at Lower Granite Dam, hence the water budget approach rather than a minimum flow requirement to enhance spring migration conditions. A total Water Budget of 20 KCFS-months (1.19 MAF) has been recommended for shaping spring flows under the Columbia River Basin Fish and Wildlife Program developed by the Pacific Northwest Power Planning Council in 1982 and amended in 1984 and 1987.

In most years, the Water Budget flows will be the result of runoff from uncontrolled drainage basins above Lower Granite because of the limited amount of water available from storage in Dworshak and Brownlee reservoirs with which to control the Lower Snake River flows. If the Snake River flows at Lower Granite Dam are not adequate (less than 85 KCFS) to move fish quickly through the reservoir, additional water may be released from upstream reservoirs (Dworshak and Brownlee), if available.

Under the Lower Granite Water Budget Implementation Procedure developed by the Engineering Division of the North Pacific Division, Corps of Engineers, a sliding scale, based on the Lowe Granite April-July runoff volume forecast, is used to determine the volume of water to be allocated from Dworshak for the Lower Granite Water Budget. Idaho Power Company's participation, use of Brownlee storage, in the Lower Granite Water Budget is determined by Idaho Power on a year-by-year basis.

Water Budget flows at Lower Granite will be an operational consideration whenever requested during the 15 April-15 June period. Requests for Water Budget flows will originate from fish and wildlife agencies and tribes through two Fish Passage Managers. These managers will be the primary points of contact between the power system operators and the fish and wildlife agencies and tribes on matters concerning the Water Budget and fish passage. The flow requests must be greater than average weekly firm power flows and less than 140 KCFS. For Water Budget accounting purposes, the Power Planning Council has used firm power flows for Lower Granite Dam as follows:

Period	Average Weekly Firm Power Flows (KCFS)
15 April-30 April	50
1 May-31 May	65
1 June-15 June	60

b. Fishery Regulation.

Since Lower Granite, Little Goose, Lower Monumental, and Ice Harbor are operated as run-of-river projects, The Water Budget flows provided at Lower Granite from the use of Dworshak and Brownlee storage will be passed through the Lower Snake River reservoir system and into the Lower Columbia River.

(1). Water Budget Regulation.

During a year when the Lower Granite runoff volume inflow forecast for April-July is 23.0 MAF or less, the use of upstream reservoir storage for providing Water Budget flows will be coordinated by the North Pacific Division Corps of Engineers, Reservoir Control Center (RCC). The RCC and Fish Passage Mangers will jointly monitor the runoff and juvenile migration and may by mutual agreement modify the minimum level of flow at Lower Granite if necessary. The RCC will be responsible for coordinating releases from upstream storage to the extent that water is available for shaping fish flows at Lower Granite. The regulation objectives will be to provide well-timed flows from upstream reservoirs in addition to the uncontrolled spring runoff to aid and enhance migration. Total water available for Water Budget requests above uncontrolled runoff is provided from Dworshak and Brownlee storage under the following conditions:

1. Brownlee storage may be available to meet Lower Granite Water Budget requests if such releases are agreeable to Idaho Power Company.

2. Water from Dworshak for shaping Water Budget flows at Lower Granite may be used to maintain average weekly flows of at least 85 KCFS at Lower Granite. Additional water may be available from Dworshak to provide extended flows up to 140 KCFS if Dworshak refill is not jeopardized and the Corps is not collecting and transporting juvenile fish at Lower Granite or Little Goose.

3. Water Budget requests may not be implemented if it conflicts with other non-power constraints at Dworshak. The severity of the conflict will be analyzed by the RCC and appropriate action taken, with documentation of the basis of the decision forwarded to the Fish Passage Managers.

(2). No Water Budget Regulation.

During a year when the Lower Granite runoff volume inflow forecast for April-July is greater than 23.0 MAF, reservation of water for the Water Budget is not required. However, RCC would still coordinate requests for the regulation of releases from Dworshak and Brownlee to the extent that water is available for flow augmentation at Lower Granite.

7-09 Water Supply.

7-10 Hydroelectric Power.

a. Power loads.

Idaho Power Company serves an area extending from Baker City, Oregon, on the west to Blackfoot, Idaho, on the east, roughly paralleling the Snake River. A major portion of the load is served at retail. The load is predominantly domestic irrigation and small commercial. The one large industrial customer is FMC at its Pocatello elemental phosphorus plant.

Irrigation pumping load during the 15 April -15 October period results in the company having slightly higher loads in the summer season than the occurring in the winter season.

Idaho Power Company is and has been a member of the Northwest Power Pool and the Intercompany Pool, and is subject to the benefits and obligations of these organizations.

b. Hydroelectric Power Resources.

The following tabulation of Idaho Power company hydroelectric plants, other than Brownlee, Oxbow, and Hells Canyon, shows name of plant, maximum capacity, stream, and operating characteristics:

Plant	Max. Capacity(MW)	Stream	Characteristic
American Falls	92.34	Snake	*Run of River
Twin Falls	10.0	Snake	Run of River
Shoshone Falls	12.5	Snake	Run of River
Clear Lake	2.4	Springs	Run of River
Thousand Springs	8.0	Springs	Run of River
Upper Salmon #3 & #4	19.0	Snake	Run of River
Upper Salmon #1 & #2	20.0	Snake	Run of River
Lower Salmon	70.0	Snake	Pondage
Upper Malad	9.0	Springs	Run of River
Lower Malad	15.0	Springs	Run of River
Bliss	80.0	Snake	Pondage
C. J. Strike	89.0	Snake	Pondage
Swan Falls	12.0	Snake	Run of River
Cascade	12.42	Payette	** Run of River
TOTAL	451.66		

* Below American Falls irrigation reservoir in which company owns 44,274 acre-feet of primary storage rights, water from which can be used at this and other downstream plants.

** Below Cascade irrigation reservoir, flow from which is always sufficient to operate plant.

The dependable capacity of these plants is 360 MW peak, with an average energy capability varying from 227 MW under 1936-37 flows to 241 MW under median water conditions during the 15 September – 15 April period. During the fill-hold period of 15 April – 15 September, the average capability is 228 MW under 1936-37 flows and 242 MW under median flow conditions.

The above capacities are calculated on the basis of water flows for the period beginning July 1929 and ending 30 June 1957, adjusted for 1960 depleted flows as calculated by the Water Management Subcommittee of the CBIAC. The data herein included for Brownlee reservoir rule curve for power operation is shown on Plate 7-1.

7-11 Navigation.

a. River Flows Required For Navigation.

The Corps of Engineers has interviewed most river boat operators using the Snake River above Lewiston, Idaho, to gain the benefit of their navigation experience in establishing the reasonably safe, minimum navigable flow for the reaches above and below the mount of Salmon River. Engineering personnel familiar with open-river navigation have accompanied the mail boat operator from Lewiston to Johnson's Bar Landing to observe the operating conditions experienced with various river discharges. **The July 1988 field investigation indicated that more optimum jet boat operating conditions are experienced when the minimum navigable flow is limited to 6,500 cfs for the Snake River above its confluence with the Salmon River.** However, more experienced jet boat operators can navigate the river, if necessary, when the flow at Johnson's Bar is 5,000 cfs. Article 43 of the Federal power Commission license allows Idaho power Company to reduce the river flow at Johnson's Bar to 5,000 cfs during periods of low flow or for normal minimum plant operations. When it becomes apparent that minimum flows must be reduced below requirements for safe navigation, the Idaho power Company will advise the Corps of Engineers and downstream interests as far in advance as possible. Plate 7-2 shows travel times of water between Oxbow an Clarkston. Typical regulated hydrographs are shown on Plate 7-3 and Plate 7-4.

In order to maintain navigable flows below Johnson's Bar Landing for as much of the time as possible, releases for power will be coordinated with navigation schedules during low flows. This will be accomplished so that navigable flows can be maintained for certain days of the week, most desirable for navigation interests, as determined from time to time, with less than navigable flows for the other days of the week. The Corps of Engineers Reservoir Control Center (RCC) will confer with the Idaho Power Company and navigation interests in formulating and coordinating such schedules. Stream Flow Forecast data used by RCC are provided by the National Weather Service Northwest River forecast Center (RFC). "Appendix B contains copies of correspondence between the Seattle Regional Office of the Post Office Department, the Federal Power Commission (now Federal Energy Regulatory Commission), and the Corps of Engineers outlining the Corps' interpretation of Article 43 of the FERC license for Idaho Power Company projects in Hells Canyon reach of Snake River. An index of river miles locations for Snake River Below Weiser is given in Table 7-4.

Public awareness of scheduled outflows from Hells Canyon Dam will be a major factor affecting safe navigation below the project. As a result, Idaho Power company provides outflow information on a daily basis via the following sources:

1. Lewiston cable television channel 30.
2. Toll-free telephone number for Idaho Residents: (800) 422-3143.
3. Toll-free telephone number for out of state Residents: (800) 422-3143

b. Navigation Channel.

There are 86 rapids in the Snake River from Lewiston, Idaho, to Johnson's Bar. Prior to 1950 a fair amount of rock, which impaired navigation traffic, was removed from the river. Again, in 1968, additional rock was removed at six different rapids. Since then, maintenance work on the navigation channel has consisted of an annual project condition survey in conjunction with repair of the survey markers. The markers are vertical 2-by 12-inch wood planks which are painted white and vertically striped with 10-inch-wide, red fluorescent tape. Markers are set in groups of two or three mounted in a base consisting of native rock and concrete, and are located on the centerline of the navigation channel. Work on the markers is normally accomplished in July or August, low-water period. The critical rapids which prevent passage during low flows are due to shallow depth over wide gravel bars and tortuous rock channels. The most critical rapids are referred to as follows:

1. Cochran Island Rapids	River Mile 179
2. Imnaha Rapids	River Mile 191
3. White Horse Rapids	River Mile 195
4. Dry Creek Rapids	River Mile 201
5. Roland Creek bar	River Mile 204
6. Cottonwood Creek Rapids	River Mile 209
7. Upper Pleasant Valley Rapids	River Mile 214
8. Temperance Creek Rapids	River Mile 224

7-12 Drought Contingency Plans

7-13 Flood Emergency Actions Plans

See the Idaho Power Emergency Action Plans Manual.

7-14 Other.

7-15 Deviation from Normal Regulation.

a. Emergencies.

b. Unplanned Minor Deviations.

c. Planned Deviations.

7-16 Rate of Release of Change.

8 EFFECT OF WATER CONTROL PLAN

8-01 General.

The various water control plans are intended as a means of outlining project regulation and/or management practices that maximize benefits derived from project functions. These water control plans provide for flood control, navigation, and coordination for power operations.

Overall benefits and effects from the project include:

1. Coordinated system regulation to primarily minimize flood damages on Lower Columbia River with capability to also regulate flows on the Lower Snake River for flood control.
2. Regulation for navigation interests below Hells Canyon Dam.
3. Production of hydroelectric power.
4. Water oriented recreational opportunities for the public.
5. Lower Snake flow augmentation for Lower Granite Water Budget.

8-02 Flood Control.

The project is operated as part of the Columbia River reservoir system and provides important river control for effective downstream flood control on the Lower Columbia River at The Dalles and the Snake River at Clarkston (Lower Granite).

For the control of Lower Snake River spring floods at Brownlee and at Lower Granite (at Clarkston), approximately 4.2 million acre-feet and 6.2 million acre-feet, respectively, of joint use storage space can be made available from existing projects on a forecast basis.

For the control of Lower Columbia River spring floods at The Dalles about 40 million acre-feet of joint use storage space can be made available from existing projects on a forecast basis. 12 million acre-feet of the 40 million acre-feet is on call storage in Canada.

a. Spillway Design Flood.

b. Standard Project Flood.

(1). Lower Snake River. Plate 8-1.1 shows the standard project floods for the Snake River at Brownlee and Plate 8-1.2 shows the standard project flood for the Snake River at Lower Granite and contributions from major upstream subbasins. Data from Plate 8-1.1 and Plate 8-1.2 are summarized in the following tabulation:

STANDARD PROJECT FLOOD		
	At Brownlee	**At Lower Granite**
Unregulated SPF Peak, cfs	215,000	575,000
Regulated Peak, cfs	77,500	420,000

(2). Lower Columbia River. Plate 8-2 shows the standard project flood for the Columbia River at The Dalles. Data from Plate 8-2 is summarized in the following tabulation:

Unregulated SPF Peak, cfs	1,550,000
Regulated Peak, cfs	900,000

c. Other Floods.

(1). Lower Snake River. Plate 8-3 shows unregulated and regulated flood hydrographs of the 1894, 1948, and 1956 floods for the Snake River at Brownlee and the Snake River at Lower Granite (at Clarkston). Data from Plate 8-3 , Regulation of Large Snake River Floods, are summarized in the following tabulation and shows how storage from existing project would be used to control large historic Snake River floods:

LARGE SNAKE RIVER FLOODS				
	At Brownlee		**At Lower Granite**	
	Unregulated Peak (cfs)	**Regulated Peak (cfs)**	**Unregulated Peak (cfs)**	**Regulated Peak (cfs)**
1894 Flood	130,000	50,000	409,000	295,000
1948 Flood	83,000	27,000	380,000	280,000
1956 Flood	93,000	18,000	310,000	230,000
1972 Flood [1/]	136,000	55,000	346,000	233,000
1974 [1/]	121,000	61,800	385,000	345,000

[1/] Source: Columbia River Water Management Report for 1972 and 1974.

The 1894 flood is the largest known historical flood on the Lower Snake River. For the Snake River at Lower Granite, the 1894 flood unregulated peak discharge of 409,000 cfs is 71 % of the standard project flood peak discharge of 575,000 cfs, 48 per of the probable maximum flood peak discharge of 850,000 cfs.

Frequency curves of unregulated and regulated annual flood peaks for the Snake River at Lower Granite are shown on Plate 8-4.

(2). Lower Columbia River. Plate 8-5.1 and Plate 8-5.2 show unregulated and regulated flood hydrographs of the 1894, 1933, 1936, 1948, 1954, and 1956 floods for the Columbia River at The Dalles. Data from Plate 8-5.1 (Regulated Hydrographs For Columbia River At The Dalles), Plate 8-5.2 (1948 Flood, Comparison of 1967 and 1984 Regulation Studies), and the Columbia River Water Management For 1972, and 1974 for the 1894, 1948, 1956, 1972, and 1974 floods summarized in the following tabulation

and shows how storage from existing project would be used to control large historic Lower Columbia River floods:

LARGE LOWER COLUMBIA RIVER FLOODS		
FLOOD	**Unregulated Peak (cfs)**	**Regulated Peak (cfs)**
1894 Flood	1,240,000 *	668,000 *
1948 Flood	999,000 **	700,000 **
1956 Flood	868,000 *	509,000 *
1972 Flood	1,053,000 ***	618,000 ***
1974 Flood	1,007,000 ***	588,000 ***

* Data from Plate 8-5.1
** Data from Plate 8-5.2
*** Source: Columbia River Water Management Report for 1972 and 1974.

The 1894 flood is the maximum flood of record for the Columbia River at The Dalles. The four largest floods that have occurred on the Lower Columbia through 1988 include the 1894, 1948, 1972, and 1974 floods. For the Columbia River at The Dalles, the 1894 flood unregulated peak discharge of 1,240,000 cfs is 80 % of the standard project flood peak discharge of 1,550,000 cfs, 48 % of the probable maximum flood peak discharge of 2,660,000 cfs.

Frequency curves of unregulated and regulated annual flood peaks for the Columbia River at The Dalles are shown on Plate 8-6.

8-03 Recreation.

The Brownlee, Oxbow, Hells Canyon project has greatly improved the recreation opportunities in the middle reach of the Snake River from Brownlee reservoir downstream to Hells Canyon Dam. The relatively stable pool levels generally provided by operation near elevation 2077 (normal full pool) provide excellent conditions for reservoir recreation activities during the summer-fall recreation season (June – September). Project recreation activities include boating, fishing, water skiing, swimming, picnicking, and camping. These recreation opportunities enhance the quality of life for people in the region and have a significant impact on the local economy.

8-04 Water Quality.

8-05 Fish and Wildlife.

Well timed releases from both Brownlee and Dworshak for flow augmentation in Lower Snake River at Lower Granite during the juvenile outmigration in Lower Snake River at Lower Granite during the juvenile outmigration results in enhanced stream flow conditions and greater survival rates for outmigrating juvenile fish. Flow augmentation

during low flow periods provides higher flow conditions, which reduce travel times through the reservoirs.

8-06 Water Supply.

8-07 Hydroelectric Power.

Power produced by the Brownlee, Oxbow, Hells Canyon projects is used to meet the utility's power load requirements. This hydroelectric power generation helps to meet the power needs of the Pacific Northwest region at a cost considerably lower than would be possible using fossil fuels.

8-08 Navigation.

For navigation downstream of Hells Canyon Dam, the outflows from Hells Canyon are constrained by special provisions of the license (refer to Section 7 – Water Control Plan for details). The project has operated satisfactorily in the interest of navigation to ensure that minimum stream flow and maximum river stage variation provisions are not violated.

8-09 Drought Contingency Plans.

8-10 Flood Emergency Actions Plans.

8-11 Frequencies.

a. Peak Inflow Probability.

b. Pool Elevation Duration and Frequency.

(1). Snake River at Lower Granite.

Plate 8-4 shows frequency curves for natural peak discharges and regulated peak discharges for the Snake River at Lower Granite Dam. These frequencies were computed by CENPD-EN-WM-HES in May 1978. The frequency curve for natural discharges is based on the station record from 1894-1975 (81 years) which is adjusted for irrigation depletion and storage and extended by correlation with 1858-1975 (117 years) Columbia River at The Dalles station record. The frequency curve for regulated discharge is based on the 1975 level of storage development and 1985 level of irrigation depletions. Regulated discharges are from regulation studies for 1894, 1929 through 1958, and in addition the high runoff years of 1972 and 1974. Data from Plate 8-3, Snake River at Lower Granite Frequency curves, are summarized in the following tabulation:

Maximum annual Peak Discharge Frequencies			
Exceedence Probability (%)	**Average Recurrence Interval (years)**	**Unregulated Discharge (cfs)**	**Regulated Discharge (cfs)**
Standard Project	Flood	575,000	420,000
1	100	426,000	319,000
2	50	403,000	300,000
5	20	367,000	270,000
10	10	334,000	244,000
20	5	298,000	214,000
50	2	231,000	163,000

(2). Columbia River at The Dalles.

Plate 8-6 shows frequency curves for natural and regulated peak discharges for the Columbia River at The Dalles. These curves were computed by CENPD-EN-WM-HES in June 1987. The frequency curve for natural discharges is based on the 1858-1985 (128 years) period. Observed flows have been adjusted for irrigation depletion and storage. The frequency curve for regulated discharges is based on 1985 level of storage development and irrigation depletions. Regulated discharges are based on a relationship with unregulated discharge as derived from recent historic regulations and computer simulations. Data from Plate 8-6, Columbia River at The Dalles, frequency curves are summarized in the following:

Maximum Annual Peak Discharge Frequencies			
Exceedence Probability (%)	**Average Recurrence Interval (years)**	**Unregulated Discharge (cfs)**	**Regulated Discharge (cfs)**
Standard Project	Flood	1,550,000	900,000*
1	100	1,060,000	680,000
2	50	993,000	635,000
5	20	890,000	567,000
10	10	813,000	515,000
20	5	732,000	461,000
50	2	580,000	360,000

* CENPD-EN-WM 1984 Regulation Study; Refer to Columbia River and Tributaries Study, CRT-61, March 1985 for more information.

9 WATER CONTROL MANAGEMENT

9-01 Responsibilities and Organization.

The various functions of the water regulation operations at Brownlee, Oxbow, and Hells Canyon Dams demand close cooperation and coordination between the Idaho Power Company, Corps of Engineers, navigation interests, and others in order to secure the maximum benefits. The following paragraphs outline organization and responsibilities of the Corps of Engineers and the Idaho Power Company as related to project operations and the administration of the Columbia River system regulation programs. Details of organization and responsibilities, liaison with other agencies, coordinated regulation on a system basis, and related matters are described in the Master Water Control Manual for the Columbia River Basin dated December 1984.

a. Corps of Engineers.

(1). Walla Walla District.

The Walla Walla District of the Corps of Engineers is responsible for prescribing and coordinating navigation regulations in accordance with the Federal Power Act and the provisions of the license for project No. 1971. In addition, the Walla Walla District is responsible for developing seasonal runoff forecast procedures, making periodic runoff forecasts, and determining amounts of reservoir space that can be refilled according to the forecasts. Regulation specifically for navigation, exclusive of flood control considerations, applies largely to Snake River below Hells Canyon Dam (R.M. 247) and is coordinated between the company and Walla Walla District of the Corps of Engineers. Likewise, local flood control operations confined entirely to Snake River below the company project are the responsibility of Walla Walla District.

(2). North Pacific Division.

The North Pacific Division, Corps of Engineers, is responsible for prescribing flood control operations at Brownlee reservoir, and coordinating the Brownlee regulation with regulation at other reservoirs in the Columbia River system. The flood control regulation involves determination of both the amount of flood control space to be provided and reservoir releases. Direct coordination is maintained between Idaho Power Company and the Water Management Branch's Reservoir Control Center of the North Pacific Division on Flood control matters. Although regulations contained in this Manual will generally prevail, instructions received from the Division Engineer will supersede these provisions in the event that special conditions required abnormal operations. Refer to Page ii (yellow sheets) in the front of this Manual for telephone numbers of key personnel in the Corps of Engineers who will be contacted in the event that unusual or emergency regulation conditions arise. Operations at all times will be consistent with requirements for protecting dams and reservoirs from major damage.

Organizational charts and telephone numbers on pages **i** and **9-9** of this Manual show the portions of the North Pacific Division and Walla Walla District of the Corps of Engineers which will be responsible for regulations pertaining to Idaho Power Company's Hells Canyon Complex.

(3). Portland River Forecast Center (RFC).

The Portland RFC is authorized to issue coordinated runoff volume forecasts, peak flow forecasts, and flood stage forecasts for key gauging stations within the Columbia River Basin. See Section VII of this manual for details on hydrologic forecasts. A formal agreement in 1963 between the Corps of Engineers and the National Weather Service formed the Cooperative Columbia River Forecasting Service. In 1971, this agreement was amended to include Bonneville Power Administration. A three-member technical committee provides technical advice and guidance to the Columbia River Forecasting Service. The three committee members are as follows:

Chief, Hydrologic Engineering Section, NPD
Hydrologist in Charge, National Weather Service, Portland RFC
Chief, Hydrometeorology Branch Bonneville Power Administration

b. Other Federal Agencies.

Other entities with which the RCC coordinates and exchanges information in the process of carrying out reservoir regulation activities include the Bureau of Reclamation, U.S. Geological Survey, Soil Conservation Service, Federal Energy Regulatory Commission, Northwest Power Planning Council, the Fish Passage Center representing Federal and state fish and wildlife agencies and the Indian tribes, Federal and state water quality agencies, non-Federal public utilities, private power utilities, and navigation interests. Details on coordination of reservoir regulation activities with other agencies on a system basis are provided in the RCC Guidance Memorandum dated January 1972 and the Master Water Control Manual for the Columbia River Basin dated December 1984.

c. State and county Agencies.

d. Private Organizations.

(1). Idaho Power Company.

The operation of Idaho Power Company is under the direction of the (1) a Chief Executive Officer and Chairman of the Board; (2) a President and Chief Operating Officer; and (3) a Senior Vice President of Power Supply. The power operations are the direct responsibility of the Manager of Power Operations. Flood control operations will normally be coordinated with the Power Resource Coordinator or the Manager of Power Operations. Coordination of day-by-day power and navigation requirements will normally be accomplished by contact with the Chief dispatcher, during normal business

hours and at other times with the dispatcher on shift. Personnel of the Idaho Power Company will be on duty 24 hours daily to perform operations required. In the event that unusual or emergency regulation conditions arise, the key personnel of the Idaho Power company listed on **page ii (yellow sheet)** in the front of this Manual will be contacted.

Responsibilities of the Idaho Power Company include maintenance of communications for providing operational data and conformance with requirements for flood control and navigation. The company's specific responsibilities are generally defined by the license for project No. 1971 and various orders of the federal Power Commission.

The organization chart for Idaho Power company with personnel names is shown on page **9-9.**

9-02 Interagency Coordination.

a. Local Press and Corps Bulletins.

b. .National Weather Service.

c. U.S. Geological Service.

d. Power Marketing Agency.

e. Other Federal, State or Local Agencies.

9-03 Interagency Agreements.

9-04 Commissions, River Authorities, Compacts, and Committees.

The principal organizations which have been formed to coordinate the planning and operation of the Columbia River system projects are the Northwest Power Pool, the Pacific Northwest Coordination Contract Committee, the Columbia River Treaty Operating Committee, and the Columbia River Water Management Group.

a. Northwest Power Pool.

The Northwest Power Pool is a voluntary organization whose primary function is to coordinate the operation and maintenance of the power systems of the Pacific Northwest. It also serves as a coordinating group for the solution of a variety of system operating problems.

The membership of the Northwest Power Pool includes 20 utilities and agencies as follows:

1. Bonneville power Administration
2. Bureau of Reclamation
3. British Columbia Hydro and Power Authority
4. Chelan County PUD
5. Corps of Engineers
6. Douglas County PUD
7. Eugene Water and Electric Board
8. Grant County PUD
9. Idaho Power Company
10. Montana Power company
11. Pacific Power and Light Company
12. Portland General Electric Company
13. Puget Sound Power and Light Company
14. Seattle City Light
15. Sierra Pacific Company
16. Tacoma City Light
17. Transalta Utilities Corporation
18. Utah Power and Light Company
19. Washington Water Power
20. West Kootenay Power and Light Company

The functions of the pool are carried out by means of an Operating Committee and a Coordinating Group:

(1). Operating Committee.

The Operating Committee consists of one member from each participating system through whom all pool matters are handled. Implementation of any pool action requires unanimous approval by the Operating Committee. The Operating Committee has three continuous subcommittees: Relaying, Communications, and Maintenance.

(2). Coordinating Group.

The Coordinating Group is headquartered in Portland, Oregon. It acts as a staff for the Operating Committee and the Coordination Contract Committee of the Pacific Northwest Coordination Agreement and provides a clearinghouse for all pool utilities. The group initiates telephone conference calls, chairs Operating Committee meetings, prepares numerous load-resource analyses, takes a lead in coordinating operation with the pool and with adjacent areas, and makes other operating studies and reports. A considerable amount of time is spent on making load-resource analyses for both the Coordinated System of the Pacific Northwest Coordination Agreement and the Northwest Power Pool. Utilizing digital computers, these analyses are made from load and resource data supplied by the utilities. The Northwest Power Pool does not

maintain a centralized group to schedule and dispatch the combined resources of the members of the pool. Rather, each member system remains autonomous, scheduling and dispatching its own resources to serve its own load. The Northwest Power Pool is a member of the North American power Systems Interconnection Committee (NAPSIC) which coordinates energy interchange between 10 regional systems.

b. Pacific Northwest Coordination Agreement.

The utilities of the Pacific Northwest have long recognized the need for coordinated operation. Through the years the Northwest Power Pool and other inter-utilities arrangements have accomplished much toward this end. These efforts culminated in 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 (Contract No. 14-02-4822) became effective on 4 January 1965 and terminates on 30 June 2003. The following 18 agencies and utilities have ratified the agreement:

1. Bonneville power Administration
2. Bureau of Reclamation
3. Corps of Engineers
4. Chelan County PUD
5. Colockum Transmission Company
6. Cowlitz County PUD
7. Douglas County PUD
8. Eugene Water and Electric Board
9. Grant County PUD
10. Montana Power company
11. Pacific Power and Light Company
12. Pend Oreille PUD
13. Portland General Electric Company
14. Puget Sound Power and Light Company
15. Seattle City Light
16. Snohomish County PUD
17. Tacoma City Light
18. Washington Water Power Company

A fundamental concept of the Coordination Agreement is "Firm Load Carrying Capability," commonly abbreviated as FLCC. For the coordinated system of all 18 parties, the FLCC is the aggregate firm load that the system could carry under coordinated operation with critical period stream flow conditions and with the use of all reservoir storage.

In order to accomplish such coordinated operation, the combined power facilities of the parties are operated to produce optimum firm load-carrying ability.

Each party is entitled to a Firm Energy Load Carrying Capability (FELCC) equal to its capability in the critical stream flow period with full upstream storage release, except for reimbursement of Canadian Treaty benefits and restoration of capability to parties which suffer loss in critical period energy capability as a result of the Canadian Treaty storage. FELCC's are sustained by exchange of energy between parties.

Prior to the start of a contract year, a reservoir operating and storage schedule is developed to provide the optimum FELCC of the coordinated system. This schedule is melded with a schedule that provides adequate assurance of reservoir refill. The resulting schedule, called an Energy Content Curve (ECC), is used in the operation of the system to determine system energy generation capability. Generation in excess of FELCC resulting from draft to ECC can be used to serve secondary load. If draft below ECC is required to carry FELCC, then secondary load may not be served. The above discussion refers primarily to the procedures followed to insure meeting FELCC during periods of critical stream flow. However, the same basic procedures are used to insure optimum utilization of reservoir storage during years of plentiful stream flow as well.

If, as may frequently happen, the best operation for the coordinated system requires a utility to cut back on releases and to hold storage for later use thereby reducing its present generation below its FELCC and perhaps below its load requirements, it has the right to call for and receive interchange energy from a party with excess capability. Later, when the first party's storage is scheduled for release, it will be able to return the energy. Provision is made to pay for any imbalances in such interchange energy exchange accounts that may remain at the end of a contract year.

The agreement provides that, upon request, a utility is entitled to the energy that it could generate at its plants if upstream reservoirs released all water above their ECC's. The upstream party can either release the water or, if it has surplus energy and wishes to conserve its storage for later use, it may deliver energy "in lieu" of the water. The upstream party is not required to spill water to satisfy demands of a downstream utility. Representatives of the participants in the agreement are members of the Coordination Contract Committee. This committee makes studies and analyses and rules on any actions concerning the agreement. Most of its work is delegated to the Northwest Power Pool Coordinating Group. However, some of the work is delegated to one or more of the participants.

Other provisions of the agreement include the following: Each party shall accept for storage in available reservoir space energy surplus to other parties' needs. Equitable compensation shall be made for the benefits from reservoir storage. The obligation to reimburse treaty power to Canada shall be shared by the projects which benefit from treaty storage in proportion to their benefits. Interconnecting transmission facilities shall be made available for coordination use subject to the owner's prior requirements. Equitable charges shall be made for capacity, energy, transmission, storage and other services. Nothing in the agreement is intended to conflict with project constraints for other functions such as flood control, recreation, fish, irrigation, etc.

c. Columbia River Treaty.

In 1964 the Columbia River Treaty for the international development of the Columbia River was ratified by the governments of Canada and the United States. The treaty provided for Canada to build and operate three reservoirs presently known as Duncan Lake, Arrow Lake, and Kinbasket Lake. These three reservoirs have a combined usable storage of 20.5 million acre-feet. Under the treaty, Canada operates these reservoirs in a manner which increases downstream power generation and reduces flood damage in the United States. In return for the benefits received, the United States gives Canada half of the dependable capacity and half the energy gain in the United States as a result of Canadian storage and pay Canada an amount equal to half the value of flood damages prevented.

In carrying out the functions required under the Columbia River Treaty, each country has set up a working organization. The treaty working organization is comprised of a permanent engineering board, U. S. and Canadian entities, U. S. coordinators, Manager – Canadian Entity Service, and two international committees. The RCC guidance Memorandum dated January 1972 provides details on functions and responsibilities of these working organizations.

d. Columbia River Water Management Group.

The Columbia River Water Management Group acts as a committee to consider problems relating to operation and management of water control facilities in the Columbia River Basin. Upon review and discussion of the problems, the group makes tentative recommendations for consideration of the individual agencies having primary responsibilities in these areas. The basic function of the group is coordination of river systems operations including the efficient operation of the hydrometeorological system required for each operation. The Water Management Group prepares an annual report which summarizes hydrometeorological, reservoir regulation activities, and activities and accomplishments of member agencies as related to the Columbia River and tributaries.

The membership of the Columbia River Management Group is composed of representatives from the following state and Federal agencies:

1. Bureau of Reclamation
2. Bonneville power Administration
3. Corps of Engineers
4. National Weather Service
5. United States Geological Survey
6. Environmental Protection Agency – Water Quality Office
7. U.S. Forest Service
8. Soil Conservation Service
9. Bureau of Land Management
10. Federal Energy Regulatory Commission

11. Fish and Wildlife Service
12. National Marine Fisheries Service
13. Oregon Water Resources Department
14. Washington department of Ecology
15. Idaho Department of Ecology
16. Nevada State Engineer
17. Department of Natural Resources and Conservation (Montana)
18. Wyoming State Engineer

9-05 Non Federal Hydropower.

9-06 Reports.

9-07 Navigation.

a. Background.

The River and Harbor Acts of 1902 and 1935 give the Corps authority to maintain and construct a navigation channel in the Snake River from Lewiston, Idaho (R.M. 141) to Johnson's Bar (R.M. 230). This reach of the river is a navigable waterway of the United States; administratively it is put in that category by the Corps because of the historic, present, and future use in commercial navigation.

b. Current Use.

Most of the current use in the river is by jetboat and floatboat users. Floatboaters generally begin their trips at Hells Canyon Dam (R.M. 247) launch site and end either at Pittsburgh Landing (33 miles downstream, R.M. 214.5) or near the mouth of the Grande Ronde River (78 miles downstream, R.M. 168.7). Most jetboat users begin at or below Grande Ronde River and travel upstream to Johnson's Bar. One of the tourist jetboats has a weekly service taking materials, supplies, and mail to ranches along the river.

Normally, downstream navigation requirements are met by the regulations of Hells Canyon outflows in accordance with provisions of the License. However, occasionally a variance of a specific requirement is requested by Idaho Power. Requests for variances, if approved by the Corps, are considered on a one-time basis only and for a limited time period.

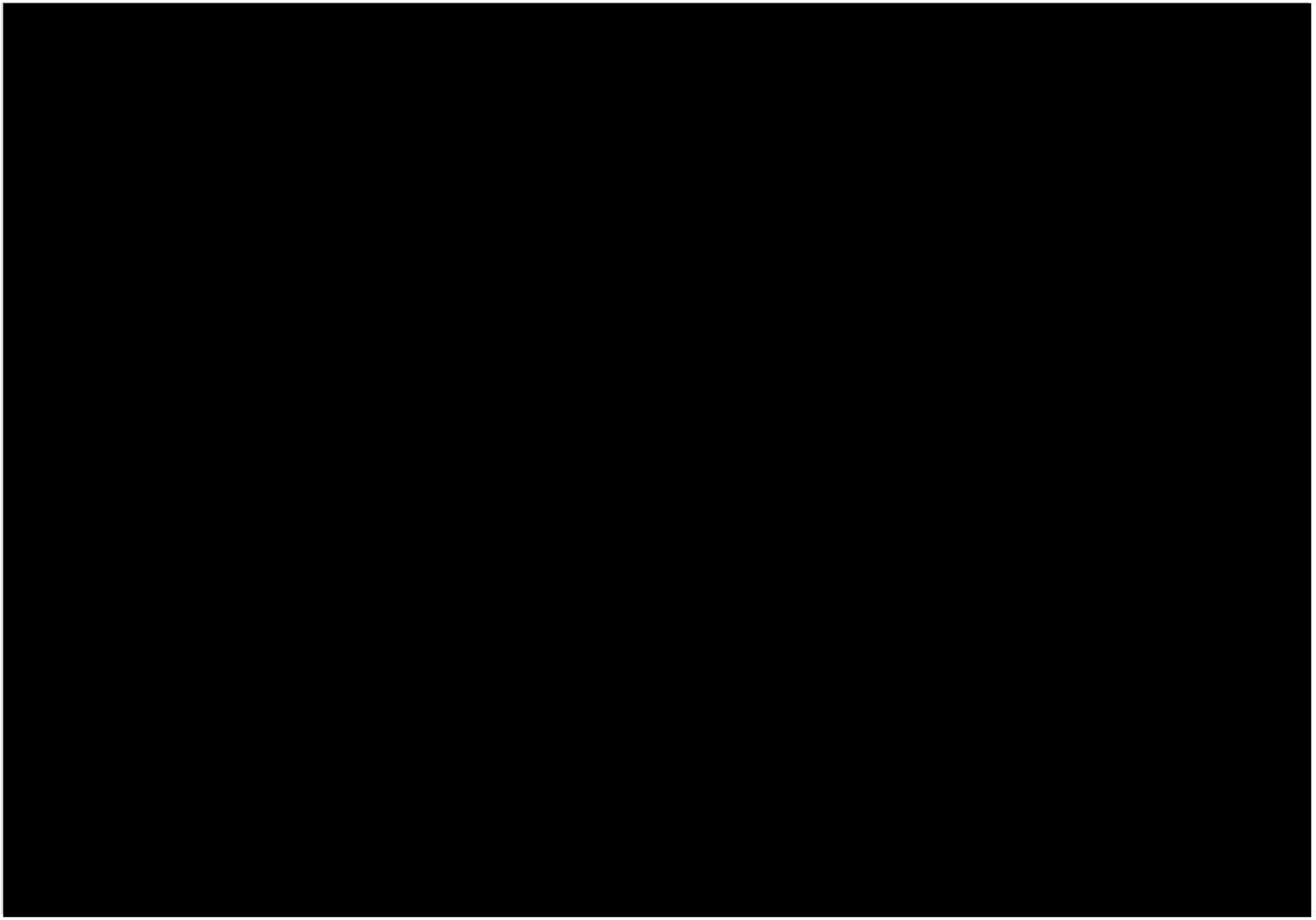


TABLE 2-1
REVISED APR. 1985 Page 1 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2079.90	1463155	1463306	1463457	1463608	1463759	1463910	1464061	1464212	1464364	1464515
2079.80	1461646	1461797	1461948	1462098	1462249	1462400	1462551	1462702	1462853	1463004
2079.70	1460138	1460289	1460440	1460590	1460741	1460892	1461043	1461193	1461344	1461495
2079.60	1458633	1458783	1458934	1459084	1459235	1459385	1459536	1459686	1459837	1459988
2079.50	1457128	1457279	1457429	1457579	1457730	1457880	1458031	1458181	1458332	1458482
2079.40	1455626	1455776	1455926	1456076	1456227	1456377	1456527	1456677	1456828	1456978
2079.30	1454125	1454275	1454425	1454575	1454725	1454875	1455025	1455175	1455326	1455476
2079.20	1452626	1452776	1452926	1453075	1453225	1453375	1453525	1453675	1453825	1453975
2079.10	1451128	1451278	1451428	1451577	1451727	1451877	1452027	1452176	1452326	1452476
2079.00	1449632	1449782	1449931	1450081	1450231	1450380	1450530	1450679	1450829	1450979
2078.90	1448138	1448288	1448437	1448586	1448736	1448885	1449035	1449184	1449333	1449483
2078.80	1446646	1446795	1446944	1447093	1447242	1447392	1447541	1447690	1447840	1447989
2078.70	1445155	1445304	1445453	1445602	1445751	1445900	1446049	1446198	1446347	1446496
2078.60	1443665	1443814	1443963	1444112	1444261	1444410	1444559	1444708	1444857	1445006
2078.50	1442178	1442327	1442475	1442624	1442773	1442921	1443070	1443219	1443368	1443517
2078.40	1440692	1440840	1440989	1441138	1441286	1441435	1441583	1441732	1441881	1442029
2078.30	1439208	1439356	1439504	1439653	1439801	1439950	1440098	1440246	1440395	1440543
2078.20	1437725	1437873	1438021	1438170	1438318	1438466	1438614	1438763	1438911	1439059
2078.10	1436244	1436392	1436540	1436688	1436836	1436984	1437132	1437281	1437429	1437577
2078.00	1434765	1434913	1435060	1435208	1435356	1435504	1435652	1435800	1435948	1436096
2077.90	1433287	1433435	1433582	1433730	1433878	1434026	1434173	1434321	1434469	1434617
2077.80	1431811	1431958	1432106	1432254	1432401	1432549	1432696	1432844	1432992	1433139
2077.70	1430337	1430484	1430631	1430779	1430926	1431074	1431221	1431368	1431516	1431663
2077.60	1428864	1429011	1429158	1429305	1429453	1429600	1429747	1429895	1430042	1430189
2077.50	1427393	1427540	1427687	1427834	1427981	1428128	1428275	1428422	1428569	1428717
2077.40	1425923	1426070	1426217	1426364	1426511	1426658	1426805	1426952	1427099	1427246
2077.30	1424455	1424602	1424749	1424896	1425042	1425189	1425336	1425483	1425630	1425776
2077.20	1422989	1423136	1423282	1423429	1423576	1423722	1423869	1424015	1424162	1424309
2077.10	1421525	1421671	1421817	1421964	1422110	1422257	1422403	1422550	1422696	1422843
2077.00	1420062	1420208	1420354	1420501	1420647	1420793	1420939	1421086	1421232	1421378
2076.90	1418601	1418747	1418893	1419039	1419185	1419331	1419477	1419623	1419769	1419916
2076.80	1417141	1417287	1417433	1417579	1417725	1417871	1418017	1418163	1418309	1418455
2076.70	1415683	1415829	1415974	1416120	1416266	1416412	1416558	1416703	1416849	1416995
2076.60	1414227	1414372	1414518	1414663	1414809	1414955	1415100	1415246	1415392	1415537
2076.50	1412772	1412917	1413063	1413208	1413354	1413499	1413645	1413790	1413936	1414081
2076.40	1411319	1411464	1411609	1411755	1411900	1412045	1412191	1412336	1412481	1412627
2076.30	1409867	1410013	1410158	1410303	1410448	1410593	1410738	1410883	1411028	1411174
2076.20	1408418	1408563	1408707	1408852	1408997	1409142	1409287	1409432	1409577	1409722
2076.10	1406969	1407114	1407259	1407404	1407549	1407693	1407838	1407983	1408128	1408273
2076.00	1405523	1405668	1405812	1405957	1406101	1406246	1406391	1406535	1406680	1406825
2075.90	1404078	1404222	1404367	1404511	1404656	1404800	1404945	1405089	1405234	1405378
2075.80	1402635	1402779	1402923	1403068	1403212	1403356	1403501	1403645	1403789	1403934
2075.70	1401193	1401337	1401481	1401625	1401770	1401914	1402058	1402202	1402346	1402490
2075.60	1399753	1399897	1400041	1400185	1400329	1400473	1400617	1400761	1400905	1401049
2075.50	1398315	1398458	1398602	1398746	1398890	1399034	1399178	1399321	1399465	1399609
2075.40	1396878	1397022	1397165	1397309	1397452	1397596	1397740	1397883	1398027	1398171
2075.30	1395443	1395586	1395730	1395873	1396017	1396160	1396304	1396447	1396591	1396734
2075.20	1394009	1394153	1394296	1394439	1394582	1394726	1394869	1395013	1395156	1395299
2075.10	1392577	1392720	1392864	1393007	1393150	1393293	1393436	1393579	1393723	1393866
2075.00	1391147	1391290	1391433	1391576	1391719	1391862	1392005	1392148	1392291	1392434

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2074.90	1389718	1389861	1390004	1390147	1390290	1390433	1390575	1390718	1390861	1391004
2074.80	1388291	1388434	1388577	1388719	1388862	1389005	1389147	1389290	1389433	1389576
2074.70	1386866	1387008	1387151	1387293	1387436	1387578	1387721	1387864	1388006	1388149
2074.60	1385442	1385584	1385727	1385869	1386011	1386154	1386296	1386439	1386581	1386724
2074.50	1384020	1384162	1384304	1384446	1384589	1384731	1384873	1385015	1385158	1385300
2074.40	1382599	1382741	1382883	1383025	1383167	1383309	1383452	1383594	1383736	1383878
2074.30	1381180	1381322	1381464	1381606	1381748	1381890	1382032	1382174	1382315	1382457
2074.20	1379763	1379905	1380046	1380188	1380330	1380472	1380613	1380755	1380897	1381039
2074.10	1378347	1378489	1378630	1378772	1378914	1379055	1379197	1379338	1379480	1379621
2074.00	1376933	1377075	1377216	1377357	1377499	1377640	1377782	1377923	1378064	1378206
2073.90	1375521	1375662	1375803	1375944	1376086	1376227	1376368	1376509	1376651	1376792
2073.80	1374110	1374251	1374392	1374533	1374674	1374815	1374956	1375097	1375239	1375380
2073.70	1372701	1372842	1372982	1373123	1373264	1373405	1373546	1373687	1373828	1373969
2073.60	1371293	1371434	1371574	1371715	1371856	1371997	1372137	1372278	1372419	1372560
2073.50	1369887	1370027	1370168	1370309	1370449	1370590	1370730	1370871	1371012	1371152
2073.40	1368482	1368623	1368763	1368904	1369044	1369185	1369325	1369465	1369606	1369746
2073.30	1367080	1367220	1367360	1367500	1367641	1367781	1367921	1368061	1368202	1368342
2073.20	1365678	1365818	1365959	1366099	1366239	1366379	1366519	1366659	1366799	1366939
2073.10	1364279	1364419	1364559	1364699	1364838	1364978	1365118	1365258	1365398	1365538
2073.00	1362881	1363020	1363160	1363300	1363440	1363580	1363719	1363859	1363999	1364139
2072.90	1361484	1361624	1361763	1361903	1362043	1362182	1362322	1362462	1362601	1362741
2072.80	1360090	1360229	1360368	1360508	1360647	1360787	1360926	1361066	1361205	1361345
2072.70	1358696	1358836	1358975	1359114	1359253	1359393	1359532	1359671	1359811	1359950
2072.60	1357305	1357444	1357583	1357722	1357861	1358000	1358139	1358279	1358418	1358557
2072.50	1355915	1356054	1356193	1356331	1356470	1356609	1356748	1356887	1357027	1357166
2072.40	1354526	1354665	1354804	1354943	1355081	1355220	1355359	1355498	1355637	1355776
2072.30	1353139	1353278	1353417	1353555	1353694	1353833	1353971	1354110	1354249	1354387
2072.20	1351754	1351893	1352031	1352170	1352308	1352447	1352585	1352724	1352862	1353001
2072.10	1350371	1350509	1350647	1350785	1350924	1351062	1351201	1351339	1351477	1351616
2072.00	1348988	1349127	1349265	1349403	1349541	1349679	1349818	1349956	1350094	1350232
2071.90	1347608	1347746	1347884	1348022	1348160	1348298	1348436	1348574	1348712	1348850
2071.80	1346229	1346367	1346505	1346643	1346781	1346918	1347056	1347194	1347332	1347470
2071.70	1344852	1344990	1345127	1345265	1345403	1345540	1345678	1345816	1345954	1346091
2071.60	1343476	1343614	1343751	1343889	1344026	1344164	1344301	1344439	1344577	1344714
2071.50	1342102	1342239	1342377	1342514	1342652	1342789	1342926	1343064	1343201	1343339
2071.40	1340730	1340867	1341004	1341141	1341278	1341416	1341553	1341690	1341828	1341965
2071.30	1339359	1339496	1339633	1339770	1339907	1340044	1340181	1340318	1340455	1340592
2071.20	1337989	1338126	1338263	1338400	1338537	1338674	1338811	1338948	1339085	1339222
2071.10	1336622	1336758	1336895	1337032	1337169	1337305	1337442	1337579	1337716	1337853
2071.00	1335256	1335392	1335529	1335665	1335802	1335938	1336075	1336212	1336348	1336485
2070.90	1333891	1334027	1334164	1334300	1334437	1334573	1334710	1334846	1334983	1335119
2070.80	1332528	1332664	1332800	1332937	1333073	1333209	1333346	1333482	1333618	1333755
2070.70	1331167	1331303	1331439	1331575	1331711	1331847	1331983	1332119	1332256	1332392
2070.60	1329807	1329943	1330079	1330215	1330351	1330487	1330622	1330759	1330895	1331031
2070.50	1328449	1328584	1328720	1328856	1328992	1329127	1329263	1329399	1329535	1329671
2070.40	1327092	1327228	1327363	1327499	1327634	1327770	1327906	1328041	1328177	1328313
2070.30	1325737	1325872	1326008	1326143	1326279	1326414	1326550	1326685	1326821	1326956
2070.20	1324383	1324519	1324654	1324789	1324925	1325060	1325195	1325331	1325466	1325601
2070.10	1323031	1323167	1323302	1323437	1323572	1323707	1323842	1323978	1324113	1324248
2070.00	1321681	1321816	1321951	1322086	1322221	1322356	1322491	1322626	1322761	1322896

TABLE 2-1
REVISED APR. 1985 Page 2 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2069.90	1320332	1320467	1320602	1320737	1320872	1321006	1321141	1321276	1321411	1321546
2069.80	1318985	1319120	1319254	1319389	1319524	1319659	1319793	1319928	1320063	1320198
2069.70	1317639	1317774	1317908	1318043	1318178	1318312	1318447	1318581	1318716	1318850
2069.60	1316295	1316430	1316564	1316698	1316833	1316967	1317102	1317236	1317371	1317505
2069.50	1314953	1315087	1315221	1315356	1315490	1315624	1315758	1315893	1316027	1316161
2069.40	1313612	1313746	1313880	1314014	1314148	1314282	1314416	1314551	1314685	1314819
2069.30	1312273	1312407	1312540	1312674	1312808	1312942	1313076	1313210	1313344	1313478
2069.20	1310935	1311069	1311202	1311336	1311470	1311604	1311737	1311871	1312005	1312139
2069.10	1309599	1309732	1309866	1309999	1310133	1310267	1310400	1310534	1310668	1310801
2069.00	1308264	1308397	1308531	1308664	1308798	1308931	1309065	1309198	1309332	1309465
2068.90	1306931	1307064	1307198	1307331	1307464	1307597	1307731	1307864	1307997	1308131
2068.80	1305600	1305733	1305866	1305999	1306132	1306265	1306398	1306531	1306665	1306798
2068.70	1304270	1304403	1304535	1304668	1304801	1304934	1305067	1305200	1305333	1305466
2068.60	1302941	1303074	1303207	1303340	1303472	1303605	1303738	1303871	1304004	1304137
2068.50	1301614	1301747	1301880	1302012	1302145	1302278	1302410	1302543	1302676	1302808
2068.40	1300289	1300422	1300554	1300687	1300819	1300952	1301084	1301217	1301349	1301482
2068.30	1298965	1299098	1299230	1299362	1299495	1299627	1299759	1299892	1300024	1300157
2068.20	1297643	1297775	1297908	1298040	1298172	1298304	1298436	1298569	1298701	1298833
2068.10	1296323	1296455	1296587	1296719	1296851	1296983	1297115	1297247	1297379	1297511
2068.00	1295004	1295136	1295267	1295399	1295531	1295663	1295795	1295927	1296059	1296191
2067.90	1293686	1293818	1293950	1294081	1294213	1294345	1294477	1294608	1294740	1294872
2067.80	1292370	1292502	1292633	1292765	1292897	1293028	1293160	1293291	1293423	1293555
2067.70	1291056	1291187	1291319	1291450	1291582	1291713	1291844	1291976	1292107	1292239
2067.60	1289743	1289874	1290006	1290137	1290268	1290399	1290531	1290662	1290793	1290925
2067.50	1288432	1288563	1288694	1288825	1288956	1289087	1289219	1289350	1289481	1289612
2067.40	1287122	1287253	1287384	1287515	1287646	1287777	1287908	1288039	1288170	1288301
2067.30	1285814	1285945	1286076	1286206	1286337	1286468	1286599	1286730	1286861	1286991
2067.20	1284508	1284638	1284769	1284899	1285030	1285161	1285291	1285422	1285553	1285683
2067.10	1283203	1283333	1283463	1283594	1283724	1283855	1283985	1284116	1284246	1284377
2067.00	1281899	1282029	1282160	1282290	1282420	1282551	1282681	1282811	1282942	1283072
2066.90	1280597	1280727	1280857	1280988	1281118	1281248	1281378	1281508	1281639	1281769
2066.80	1279297	1279427	1279557	1279687	1279817	1279947	1280077	1280207	1280337	1280467
2066.70	1277998	1278128	1278257	1278387	1278517	1278647	1278777	1278907	1279037	1279167
2066.60	1276701	1276830	1276960	1277090	1277219	1277349	1277479	1277609	1277738	1277868
2066.50	1275405	1275534	1275664	1275793	1275923	1276052	1276182	1276312	1276441	1276571
2066.40	1274111	1274240	1274369	1274499	1274628	1274757	1274887	1275016	1275146	1275275
2066.30	1272818	1272947	1273076	1273206	1273335	1273464	1273593	1273723	1273852	1273981
2066.20	1271527	1271656	1271785	1271914	1272043	1272172	1272301	1272430	1272560	1272689
2066.10	1270237	1270366	1270495	1270624	1270753	1270882	1271011	1271140	1271269	1271398
2066.00	1268949	1269078	1269207	1269335	1269464	1269593	1269722	1269851	1269979	1270108
2065.90	1267663	1267791	1267920	1268048	1268177	1268306	1268434	1268563	1268692	1268820
2065.80	1266378	1266506	1266634	1266763	1266891	1267020	1267148	1267277	1267405	1267534
2065.70	1265094	1265222	1265351	1265479	1265607	1265736	1265864	1265992	1266121	1266249
2065.60	1263812	1263940	1264069	1264197	1264325	1264453	1264581	1264709	1264838	1264966
2065.50	1262532	1262660	1262788	1262916	1263044	1263172	1263300	1263428	1263556	1263684
2065.40	1261253	1261381	1261509	1261637	1261764	1261892	1262020	1262148	1262276	1262404
2065.30	1259976	1260103	1260231	1260359	1260486	1260614	1260742	1260870	1260997	1261125
2065.20	1258700	1258827	1258955	1259083	1259210	1259338	1259465	1259593	1259720	1259848
2065.10	1257426	1257553	1257680	1257808	1257935	1258063	1258190	1258318	1258445	1258572
2065.00	1256153	1256280	1256407	1256535	1256662	1256789	1256916	1257044	1257171	1257298

TABLE 2-1
REVISED APR. 1985 Page 3 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2064.90	1254882	1255009	1255136	1255263	1255390	1255517	1255644	1255772	1255899	1256026
2064.80	1253612	1253739	1253866	1253993	1254120	1254247	1254374	1254501	1254628	1254755
2064.70	1252344	1252471	1252598	1252724	1252851	1252978	1253105	1253232	1253358	1253485
2064.60	1251077	1251204	1251331	1251457	1251584	1251711	1251837	1251964	1252091	1252217
2064.50	1249812	1249939	1250065	1250192	1250318	1250445	1250571	1250698	1250824	1250951
2064.40	1248549	1248675	1248801	1248928	1249054	1249180	1249307	1249433	1249560	1249686
2064.30	1247287	1247413	1247539	1247665	1247791	1247918	1248044	1248170	1248296	1248423
2064.20	1246026	1246152	1246278	1246404	1246530	1246656	1246782	1246908	1247035	1247161
2064.10	1244767	1244893	1245019	1245145	1245271	1245397	1245523	1245648	1245774	1245900
2064.00	1243510	1243636	1243761	1243887	1244013	1244138	1244264	1244390	1244516	1244642
2063.90	1242254	1242379	1242505	1242631	1242756	1242882	1243007	1243133	1243259	1243384
2063.80	1240999	1241125	1241250	1241376	1241501	1241627	1241752	1241877	1242003	1242128
2063.70	1239747	1239872	1239997	1240122	1240248	1240373	1240498	1240623	1240749	1240874
2063.60	1238495	1238620	1238745	1238870	1238996	1239121	1239246	1239371	1239496	1239621
2063.50	1237245	1237370	1237495	1237620	1237745	1237870	1237995	1238120	1238245	1238370
2063.40	1235997	1236122	1236247	1236371	1236496	1236621	1236746	1236871	1236996	1237120
2063.30	1234750	1234875	1234999	1235124	1235249	1235373	1235498	1235623	1235747	1235872
2063.20	1233505	1233629	1233754	1233878	1234003	1234127	1234252	1234376	1234501	1234626
2063.10	1232261	1232385	1232510	1232634	1232758	1232883	1233007	1233132	1233256	1233380
2063.00	1231019	1231143	1231267	1231391	1231515	1231640	1231764	1231888	1232012	1232137
2062.90	1229778	1229902	1230026	1230150	1230274	1230398	1230522	1230646	1230770	1230895
2062.80	1228539	1228662	1228786	1228910	1229034	1229158	1229282	1229406	1229530	1229654
2062.70	1227301	1227425	1227548	1227672	1227796	1227920	1228043	1228167	1228291	1228415
2062.60	1226065	1226188	1226312	1226435	1226559	1226683	1226806	1226930	1227053	1227177
2062.50	1224830	1224953	1225077	1225200	1225324	1225447	1225570	1225694	1225818	1225941
2062.40	1223597	1223720	1223843	1223966	1224090	1224213	1224336	1224460	1224583	1224706
2062.30	1222365	1222488	1222611	1222734	1222857	1222981	1223104	1223227	1223350	1223473
2062.20	1221135	1221258	1221381	1221504	1221627	1221750	1221873	1221996	1222119	1222242
2062.10	1219906	1220029	1220151	1220274	1220397	1220520	1220643	1220766	1220889	1221012
2062.00	1218679	1218801	1218924	1219047	1219169	1219292	1219415	1219538	1219660	1219783
2061.90	1217453	1217575	1217698	1217820	1217943	1218066	1218188	1218311	1218433	1218556
2061.80	1216229	1216351	1216473	1216596	1216718	1216841	1216963	1217085	1217208	1217330
2061.70	1215006	1215128	1215250	1215373	1215495	1215617	1215739	1215862	1215984	1216106
2061.60	1213785	1213907	1214029	1214151	1214273	1214395	1214517	1214639	1214762	1214884
2061.50	1212565	1212687	1212809	1212931	1213053	1213175	1213297	1213419	1213541	1213663
2061.40	1211347	1211468	1211590	1211712	1211834	1211956	1212077	1212199	1212321	1212443
2061.30	1210130	1210252	1210373	1210495	1210616	1210738	1210860	1210982	1211103	1211225
2061.20	1208915	1209036	1209158	1209279	1209401	1209522	1209644	1209765	1209887	1210008
2061.10	1207701	1207822	1207944	1208065	1208186	1208308	1208429	1208550	1208672	1208793
2061.00	1206489	1206610	1206731	1206852	1206973	1207095	1207216	1207337	1207458	1207580
2060.90	1205278	1205399	1205520	1205641	1205762	1205883	1206004	1206125	1206246	1206368
2060.80	1204069	1204190	1204310	1204431	1204552	1204673	1204794	1204915	1205036	1205157
2060.70	1202861	1202982	1203102	1203223	1203344	1203465	1203585	1203706	1203827	1203948
2060.60	1201655	1201775	1201896	1202016	1202137	1202258	1202378	1202499	1202619	1202740
2060.50	1200450	1200570	1200691	1200811	1200932	1201052	1201172	1201293	1201413	1201534
2060.40	1199246	1199367	1199487	1199607	1199728	1199848	1199968	1200089	1200209	1200329
2060.30	1198045	1198165	1198285	1198405	1198525	1198645	1198766	1198886	1199006	1199126
2060.20	1196844	1196964	1197084	1197204	1197324	1197444	1197564	1197684	1197804	1197925
2060.10	1195645	1195765	1195885	1196005	1196125	1196245	1196365	1196484	1196604	1196724
2060.00	1194448	1194568	1194687	1194807	1194927	1195047	1195166	1195286	1195406	1195526

TABLE 2-1
REVISED APR. 1985 Page 4 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2059.90	1193252	1193372	1193491	1193611	1193730	1193850	1193970	1194089	1194209	1194328
2059.80	1192057	1192176	1192296	1192415	1192535	1192654	1192774	1192893	1193013	1193132
2059.70	1190863	1190982	1191101	1191221	1191340	1191460	1191579	1191698	1191818	1191937
2059.60	1189669	1189789	1189908	1190027	1190146	1190266	1190385	1190504	1190624	1190743
2059.50	1188477	1188596	1188715	1188834	1188954	1189073	1189192	1189311	1189431	1189550
2059.40	1187286	1187405	1187524	1187643	1187762	1187881	1188000	1188119	1188239	1188358
2059.30	1186095	1186214	1186333	1186452	1186571	1186690	1186809	1186928	1187047	1187166
2059.20	1184906	1185025	1185143	1185262	1185381	1185500	1185619	1185738	1185857	1185976
2059.10	1183717	1183836	1183955	1184074	1184192	1184311	1184430	1184549	1184668	1184787
2059.00	1182530	1182648	1182767	1182886	1183004	1183123	1183242	1183361	1183480	1183598
2058.90	1181343	1181462	1181580	1181699	1181818	1181936	1182055	1182174	1182292	1182411
2058.80	1180157	1180276	1180394	1180513	1180631	1180750	1180869	1180987	1181106	1181224
2058.70	1178973	1179091	1179210	1179328	1179446	1179565	1179683	1179802	1179920	1180039
2058.60	1177789	1177907	1178026	1178144	1178262	1178381	1178499	1178617	1178736	1178854
2058.50	1176606	1176724	1176843	1176961	1177079	1177197	1177316	1177434	1177552	1177671
2058.40	1175424	1175542	1175661	1175779	1175897	1176015	1176133	1176251	1176370	1176488
2058.30	1174243	1174361	1174480	1174598	1174716	1174834	1174952	1175070	1175188	1175306
2058.20	1173063	1173181	1173299	1173417	1173535	1173653	1173771	1173889	1174007	1174125
2058.10	1171884	1172002	1172120	1172238	1172356	1172474	1172592	1172710	1172828	1172946
2058.00	1170706	1170824	1170942	1171060	1171178	1171295	1171413	1171531	1171649	1171767
2057.90	1169529	1169647	1169765	1169882	1170000	1170118	1170236	1170353	1170471	1170589
2057.80	1168353	1168471	1168588	1168706	1168824	1168941	1169059	1169176	1169294	1169412
2057.70	1167178	1167296	1167413	1167531	1167648	1167766	1167883	1168001	1168118	1168236
2057.60	1166004	1166121	1166239	1166356	1166473	1166591	1166708	1166826	1166943	1167061
2057.50	1164831	1164948	1165065	1165182	1165300	1165417	1165534	1165652	1165769	1165886
2057.40	1163658	1163775	1163893	1164010	1164127	1164244	1164362	1164479	1164596	1164713
2057.30	1162487	1162604	1162721	1162838	1162955	1163072	1163190	1163307	1163424	1163541
2057.20	1161316	1161433	1161550	1161667	1161784	1161901	1162019	1162136	1162253	1162370
2057.10	1160147	1160264	1160381	1160498	1160615	1160732	1160848	1160965	1161082	1161199
2057.00	1158978	1159095	1159212	1159329	1159446	1159563	1159679	1159796	1159913	1160030
2056.90	1157811	1157927	1158044	1158161	1158278	1158394	1158511	1158628	1158745	1158862
2056.80	1156644	1156761	1156877	1156994	1157111	1157227	1157344	1157461	1157577	1157694
2056.70	1155478	1155595	1155711	1155828	1155945	1156061	1156178	1156294	1156411	1156527
2056.60	1154314	1154430	1154547	1154663	1154779	1154896	1155012	1155129	1155245	1155362
2056.50	1153150	1153266	1153383	1153499	1153615	1153732	1153848	1153964	1154081	1154197
2056.40	1151987	1152103	1152219	1152336	1152452	1152568	1152685	1152801	1152917	1153033
2056.30	1150825	1150941	1151057	1151174	1151290	1151406	1151522	1151638	1151754	1151871
2056.20	1149664	1149780	1149896	1150012	1150128	1150244	1150361	1150477	1150593	1150709
2056.10	1148504	1148620	1148736	1148852	1148968	1149084	1149200	1149316	1149432	1149548
2056.00	1147345	1147461	1147577	1147693	1147808	1147924	1148040	1148156	1148272	1148388
2055.90	1146187	1146303	1146418	1146534	1146650	1146766	1146882	1146997	1147113	1147229
2055.80	1145030	1145145	1145261	1145377	1145492	1145608	1145724	1145839	1145955	1146071
2055.70	1143873	1143989	1144104	1144220	1144336	1144451	1144567	1144683	1144798	1144914
2055.60	1142718	1142833	1142949	1143064	1143180	1143295	1143411	1143527	1143642	1143758
2055.50	1141564	1141679	1141794	1141910	1142025	1142141	1142256	1142372	1142487	1142602
2055.40	1140410	1140525	1140641	1140756	1140871	1140987	1141102	1141217	1141333	1141448
2055.30	1139258	1139373	1139488	1139603	1139718	1139834	1139949	1140064	1140180	1140295
2055.20	1138106	1138221	1138336	1138451	1138567	1138682	1138797	1138912	1139027	1139142
2055.10	1136955	1137070	1137185	1137300	1137416	1137531	1137646	1137761	1137876	1137991
2055.00	1135806	1135921	1136036	1136151	1136265	1136380	1136495	1136610	1136725	1136840

TABLE 2-1
REVISED APR. 1985 Page 5 of 21

TABLE 2-1
REVISED APR. 1985 Page 6 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2054.90	1134657	1134772	1134887	1135001	1135116	1135231	1135346	1135461	1135576	1135691
2054.80	1133509	1133624	1133739	1133853	1133968	1134083	1134198	1134312	1134427	1134542
2054.70	1132362	1132477	1132592	1132706	1132821	1132936	1133050	1133165	1133280	1133394
2054.60	1131216	1131331	1131445	1131560	1131675	1131789	1131904	1132018	1132133	1132248
2054.50	1130071	1130186	1130300	1130415	1130529	1130644	1130758	1130873	1130987	1131102
2054.40	1128927	1129042	1129156	1129270	1129385	1129499	1129614	1129728	1129842	1129957
2054.30	1127784	1127898	1128013	1128127	1128241	1128356	1128470	1128584	1128699	1128813
2054.20	1126642	1126756	1126870	1126984	1127099	1127213	1127327	1127441	1127556	1127670
2054.10	1125501	1125615	1125729	1125843	1125957	1126071	1126185	1126299	1126414	1126528
2054.00	1124360	1124474	1124588	1124702	1124816	1124930	1125044	1125158	1125273	1125387
2053.90	1123221	1123335	1123449	1123563	1123677	1123791	1123904	1124018	1124132	1124246
2053.80	1122083	1122196	1122310	1122424	1122538	1122652	1122765	1122879	1122993	1123107
2053.70	1120945	1121059	1121172	1121286	1121400	1121514	1121627	1121741	1121855	1121969
2053.60	1119808	1119922	1120036	1120149	1120263	1120377	1120490	1120604	1120718	1120831
2053.50	1118673	1118786	1118900	1119013	1119127	1119240	1119354	1119468	1119581	1119695
2053.40	1117538	1117651	1117765	1117878	1117992	1118105	1118219	1118332	1118446	1118559
2053.30	1116404	1116518	1116631	1116744	1116858	1116971	1117084	1117198	1117311	1117425
2053.20	1115271	1115385	1115498	1115611	1115724	1115838	1115951	1116064	1116178	1116291
2053.10	1114140	1114253	1114366	1114479	1114592	1114705	1114819	1114932	1115045	1115158
2053.00	1113009	1113122	1113235	1113348	1113461	1113574	1113687	1113800	1113913	1114026
2052.90	1111878	1111991	1112104	1112217	1112330	1112443	1112556	1112669	1112782	1112895
2052.80	1110749	1110862	1110975	1111088	1111201	1111314	1111427	1111540	1111653	1111766
2052.70	1109621	1109734	1109847	1109959	1110072	1110185	1110298	1110411	1110524	1110636
2052.60	1108494	1108607	1108719	1108832	1108945	1109057	1109170	1109283	1109396	1109508
2052.50	1107368	1107480	1107593	1107705	1107818	1107931	1108043	1108156	1108269	1108381
2052.40	1106242	1106355	1106467	1106580	1106692	1106805	1106917	1107030	1107142	1107255
2052.30	1105118	1105230	1105342	1105455	1105567	1105680	1105792	1105905	1106017	1106130
2052.20	1103994	1104106	1104219	1104331	1104443	1104556	1104668	1104780	1104893	1105005
2052.10	1102871	1102984	1103096	1103208	1103320	1103433	1103545	1103657	1103769	1103882
2052.00	1101750	1101862	1101974	1102086	1102198	1102311	1102423	1102535	1102647	1102759
2051.90	1100629	1100741	1100853	1100965	1101077	1101189	1101301	1101413	1101526	1101638
2051.80	1099509	1099621	1099733	1099845	1099957	1100069	1100181	1100293	1100405	1100517
2051.70	1098390	1098502	1098614	1098726	1098838	1098950	1099061	1099173	1099285	1099397
2051.60	1097272	1097384	1097496	1097608	1097719	1097831	1097943	1098055	1098167	1098278
2051.50	1096155	1096267	1096379	1096490	1096602	1096714	1096825	1096937	1097049	1097161
2051.40	1095039	1095151	1095262	1095374	1095485	1095597	1095709	1095820	1095932	1096044
2051.30	1093924	1094035	1094147	1094258	1094370	1094481	1094593	1094704	1094816	1094928
2051.20	1092810	1092921	1093032	1093144	1093255	1093367	1093478	1093589	1093701	1093812
2051.10	1091696	1091807	1091919	1092030	1092141	1092253	1092364	1092475	1092587	1092698
2051.00	1090584	1090695	1090806	1090917	1091029	1091140	1091251	1091362	1091474	1091585
2050.90	1089472	1089583	1089694	1089806	1089917	1090028	1090139	1090250	1090361	1090473
2050.80	1088362	1088473	1088584	1088695	1088806	1088917	1089028	1089139	1089250	1089361
2050.70	1087252	1087363	1087474	1087585	1087696	1087807	1087918	1088029	1088140	1088251
2050.60	1086143	1086254	1086365	1086476	1086587	1086697	1086808	1086919	1087030	1087141
2050.50	1085035	1085146	1085257	1085368	1085478	1085589	1085700	1085811	1085922	1086032
2050.40	1083929	1084039	1084150	1084260	1084371	1084482	1084593	1084703	1084814	1084925
2050.30	1082823	1082933	1083044	1083154	1083265	1083375	1083486	1083597	1083707	1083818
2050.20	1081717	1081828	1081938	1082049	1082159	1082270	1082380	1082491	1082601	1082712
2050.10	1080613	1080724	1080834	1080944	1081055	1081165	1081276	1081386	1081497	1081607
2050.00	1079510	1079620	1079731	1079841	1079951	1080062	1080172	1080282	1080393	1080503

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET.

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2049.90	1078408	1078518	1078628	1078738	1078849	1078959	1079069	1079179	1079290	1079400
2049.80	1077306	1077416	1077527	1077637	1077747	1077857	1077967	1078077	1078187	1078298
2049.70	1076206	1076316	1076426	1076536	1076646	1076756	1076866	1076976	1077086	1077196
2049.60	1075106	1075216	1075326	1075436	1075546	1075656	1075766	1075876	1075986	1076096
2049.50	1074008	1074118	1074227	1074337	1074447	1074557	1074667	1074777	1074887	1074996
2049.40	1072910	1073020	1073130	1073239	1073349	1073459	1073569	1073678	1073788	1073898
2049.30	1071813	1071923	1072033	1072142	1072252	1072362	1072471	1072581	1072691	1072800
2049.20	1070717	1070827	1070936	1071046	1071156	1071265	1071375	1071484	1071594	1071704
2049.10	1069622	1069732	1069841	1069951	1070060	1070170	1070279	1070389	1070498	1070608
2049.00	1068528	1068638	1068747	1068856	1068966	1069075	1069185	1069294	1069404	1069513
2048.90	1067435	1067545	1067654	1067763	1067872	1067982	1068091	1068200	1068310	1068419
2048.80	1066343	1066452	1066561	1066671	1066780	1066889	1066998	1067107	1067217	1067326
2048.70	1065252	1065361	1065470	1065579	1065688	1065797	1065906	1066016	1066125	1066234
2048.60	1064161	1064270	1064379	1064488	1064597	1064706	1064815	1064925	1065034	1065143
2048.50	1063072	1063181	1063290	1063399	1063508	1063616	1063725	1063834	1063943	1064052
2048.40	1061983	1062092	1062201	1062310	1062419	1062527	1062636	1062745	1062854	1062963
2048.30	1060896	1061004	1061113	1061222	1061331	1061439	1061548	1061657	1061766	1061875
2048.20	1059809	1059918	1060026	1060135	1060244	1060352	1060461	1060570	1060678	1060787
2048.10	1058723	1058832	1058940	1059049	1059157	1059266	1059375	1059483	1059592	1059700
2048.00	1057638	1057747	1057855	1057964	1058072	1058181	1058289	1058398	1058506	1058615
2047.90	1056554	1056663	1056771	1056879	1056988	1057096	1057205	1057313	1057421	1057530
2047.80	1055471	1055579	1055688	1055796	1055904	1056013	1056121	1056229	1056338	1056446
2047.70	1054389	1054497	1054605	1054714	1054822	1054930	1055038	1055146	1055255	1055363
2047.60	1053308	1053416	1053524	1053632	1053740	1053848	1053956	1054065	1054173	1054281
2047.50	1052227	1052335	1052443	1052551	1052659	1052767	1052875	1052984	1053092	1053200
2047.40	1051148	1051256	1051364	1051472	1051580	1051688	1051795	1051903	1052011	1052119
2047.30	1050069	1050177	1050285	1050393	1050501	1050609	1050716	1050824	1050932	1051040
2047.20	1048992	1049099	1049207	1049315	1049423	1049530	1049638	1049746	1049854	1049962
2047.10	1047915	1048023	1048130	1048238	1048346	1048453	1048561	1048669	1048776	1048884
2047.00	1046839	1046947	1047054	1047162	1047269	1047377	1047485	1047592	1047700	1047807
2046.90	1045764	1045872	1045979	1046087	1046194	1046302	1046409	1046517	1046624	1046732
2046.80	1044690	1044798	1044905	1045012	1045120	1045227	1045335	1045442	1045549	1045657
2046.70	1043617	1043725	1043832	1043939	1044046	1044154	1044261	1044368	1044476	1044583
2046.60	1042545	1042652	1042759	1042867	1042974	1043081	1043188	1043296	1043403	1043510
2046.50	1041474	1041581	1041688	1041795	1041902	1042009	1042117	1042224	1042331	1042438
2046.40	1040403	1040510	1040617	1040725	1040832	1040939	1041046	1041153	1041260	1041367
2046.30	1039334	1039441	1039548	1039655	1039762	1039869	1039976	1040083	1040190	1040297
2046.20	1038265	1038372	1038479	1038586	1038693	1038800	1038907	1039013	1039120	1039227
2046.10	1037198	1037305	1037411	1037518	1037625	1037732	1037838	1037945	1038052	1038159
2046.00	1036131	1036238	1036344	1036451	1036558	1036664	1036771	1036878	1036984	1037091
2045.90	1035065	1035172	1035278	1035385	1035491	1035598	1035705	1035811	1035918	1036024
2045.80	1034000	1034107	1034213	1034320	1034426	1034533	1034639	1034746	1034852	1034959
2045.70	1032936	1033043	1033149	1033255	1033362	1033468	1033575	1033681	1033787	1033894
2045.60	1031873	1031979	1032086	1032192	1032298	1032405	1032511	1032617	1032724	1032830
2045.50	1030811	1030917	1031023	1031130	1031236	1031342	1031448	1031554	1031661	1031767
2045.40	1029750	1029856	1029962	1030068	1030174	1030280	1030386	1030492	1030599	1030705
2045.30	1028689	1028795	1028901	1029007	1029113	1029219	1029325	1029431	1029537	1029644
2045.20	1027630	1027736	1027842	1027947	1028053	1028159	1028265	1028371	1028477	1028583
2045.10	1026571	1026677	1026783	1026889	1026994	1027100	1027206	1027312	1027418	1027524
2045.00	1025513	1025619	1025725	1025831	1025936	1026042	1026148	1026254	1026359	1026465

TABLE 2-1
REVISED APR. 1985 Page 7 of 21

TABLE 2-1
REVISED APR. 1985 Page 8 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2044.90	1024457	1024562	1024668	1024774	1024879	1024985	1025091	1025196	1025302	1025408
2044.80	1023401	1023506	1023612	1023717	1023823	1023928	1024034	1024140	1024245	1024351
2044.70	1022346	1022451	1022557	1022662	1022768	1022873	1022979	1023084	1023190	1023295
2044.60	1021292	1021397	1021502	1021608	1021713	1021818	1021924	1022029	1022135	1022240
2044.50	1020238	1020344	1020449	1020554	1020659	1020765	1020870	1020975	1021081	1021186
2044.40	1019186	1019291	1019396	1019502	1019607	1019712	1019817	1019923	1020028	1020133
2044.30	1018135	1018240	1018345	1018450	1018555	1018660	1018765	1018870	1018976	1019081
2044.20	1017084	1017189	1017294	1017399	1017504	1017609	1017714	1017819	1017924	1018029
2044.10	1016034	1016139	1016244	1016349	1016454	1016559	1016664	1016769	1016874	1016979
2044.00	1014986	1015091	1015195	1015300	1015405	1015510	1015615	1015720	1015825	1015929
2043.90	1013938	1014043	1014147	1014252	1014357	1014462	1014566	1014671	1014776	1014881
2043.80	1012891	1012996	1013100	1013205	1013310	1013414	1013519	1013624	1013728	1013833
2043.70	1011845	1011949	1012054	1012159	1012263	1012368	1012472	1012577	1012682	1012786
2043.60	1010800	1010904	1011009	1011113	1011218	1011322	1011427	1011531	1011636	1011740
2043.50	1009755	1009860	1009964	1010069	1010173	1010277	1010382	1010486	1010591	1010695
2043.40	1008712	1008816	1008921	1009025	1009129	1009234	1009338	1009442	1009547	1009651
2043.30	1007670	1007774	1007878	1007982	1008087	1008191	1008295	1008399	1008504	1008608
2043.20	1006628	1006732	1006836	1006940	1007045	1007149	1007253	1007357	1007461	1007565
2043.10	1005587	1005691	1005795	1005900	1006004	1006108	1006212	1006316	1006420	1006524
2043.00	1004548	1004652	1004756	1004859	1004963	1005067	1005171	1005275	1005379	1005483
2042.90	1003509	1003613	1003716	1003820	1003924	1004028	1004132	1004236	1004340	1004444
2042.80	1002471	1002575	1002678	1002782	1002886	1002990	1003093	1003197	1003301	1003405
2042.70	1001434	1001537	1001641	1001745	1001848	1001952	1002056	1002160	1002263	1002367
2042.60	1000397	1000501	1000605	1000708	1000812	1000915	1001019	1001123	1001226	1001330
2042.50	999362	999466	999569	999673	999776	999880	999983	1000087	1000190	1000294
2042.40	998328	998431	998535	998638	998741	998845	998948	999052	999155	999259
2042.30	997294	997397	997501	997604	997707	997811	997914	998018	998121	998224
2042.20	996262	996365	996468	996571	996674	996778	996881	996984	997088	997191
2042.10	995230	995333	995436	995539	995642	995746	995849	995952	996055	996158
2042.00	994199	994302	994405	994508	994611	994714	994817	994920	995023	995127
2041.90	993169	993272	993375	993478	993581	993684	993787	993890	993993	994096
2041.80	992140	992243	992346	992448	992551	992654	992757	992860	992963	993066
2041.70	991112	991214	991317	991420	991523	991626	991728	991831	991934	992037
2041.60	990084	990187	990290	990392	990495	990598	990701	990803	990906	991009
2041.50	989058	989160	989263	989366	989468	989571	989674	989776	989879	989982
2041.40	988032	988135	988237	988340	988442	988545	988648	988750	988853	988955
2041.30	987008	987110	987213	987315	987417	987520	987622	987725	987827	987930
2041.20	985984	986086	986189	986291	986393	986496	986598	986700	986803	986905
2041.10	984961	985063	985165	985268	985370	985472	985575	985677	985779	985882
2041.00	983939	984041	984143	984246	984348	984450	984552	984654	984757	984859
2040.90	982918	983020	983122	983224	983326	983428	983530	983633	983735	983837
2040.80	981898	982000	982102	982204	982306	982408	982510	982612	982714	982816
2040.70	980878	980980	981082	981184	981286	981388	981490	981592	981694	981796
2040.60	979860	979962	980063	980165	980267	980369	980471	980573	980675	980776
2040.50	978842	978944	979046	979147	979249	979351	979453	979554	979656	979758
2040.40	977826	977927	978029	978130	978232	978334	978435	978537	978639	978741
2040.30	976810	976911	977013	977114	977216	977318	977419	977521	977622	977724
2040.20	975795	975896	975998	976099	976201	976302	976404	976505	976607	976708
2040.10	974781	974882	974984	975085	975186	975288	975389	975491	975592	975693
2040.00	973768	973869	973970	974071	974173	974274	974375	974477	974578	974679

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2039.90	972756	972857	972959	973060	973161	973262	973364	973465	973566	973667
2039.80	971744	971846	971947	972048	972149	972250	972351	972453	972554	972655
2039.70	970733	970834	970935	971036	971138	971239	971340	971441	971542	971643
2039.60	969723	969824	969925	970026	970127	970228	970329	970430	970531	970632
2039.50	968713	968814	968915	969016	969117	969217	969319	969420	969521	969622
2039.40	967703	967804	967905	968006	968107	968208	968309	968410	968511	968612
2039.30	966694	966795	966896	966997	967098	967199	967300	967401	967501	967602
2039.20	965686	965787	965888	965989	966090	966190	966291	966392	966493	966594
2039.10	964679	964780	964880	964981	965082	965182	965283	965384	965485	965586
2039.00	963672	963773	963873	963974	964075	964175	964276	964377	964477	964578
2038.90	962666	962766	962867	962967	963068	963169	963269	963370	963471	963571
2038.80	961660	961760	961861	961961	962062	962163	962263	962364	962464	962565
2038.70	960655	960755	960856	960956	961057	961157	961258	961358	961459	961559
2038.60	959650	959751	959851	959952	960052	960152	960253	960353	960454	960554
2038.50	958646	958747	958847	958947	959048	959148	959249	959349	959449	959550
2038.40	957643	957743	957844	957944	958044	958145	958245	958345	958446	958546
2038.30	956640	956741	956841	956941	957041	957142	957242	957342	957442	957543
2038.20	955638	955739	955839	955939	956039	956139	956240	956340	956440	956540
2038.10	954637	954737	954837	954937	955037	955138	955238	955338	955438	955538
2038.00	953636	953736	953836	953936	954036	954136	954236	954337	954437	954537
2037.90	952636	952736	952836	952936	953036	953136	953236	953336	953436	953536
2037.80	951636	951736	951836	951936	952036	952136	952236	952336	952436	952536
2037.70	950637	950737	950837	950937	951037	951137	951237	951336	951436	951536
2037.60	949639	949739	949838	949938	950038	950138	950238	950338	950437	950537
2037.50	948641	948741	948840	948940	949040	949140	949240	949339	949439	949539
2037.40	947644	947743	947843	947943	948043	948142	948242	948342	948441	948541
2037.30	946647	946747	946846	946946	947046	947145	947245	947345	947444	947544
2037.20	945651	945751	945850	945950	946050	946149	946249	946348	946448	946548
2037.10	944656	944755	944855	944954	945054	945153	945253	945352	945452	945552
2037.00	943661	943760	943860	943959	944059	944158	944258	944357	944457	944556
2036.90	942667	942766	942866	942965	943064	943164	943263	943363	943462	943562
2036.80	941673	941773	941872	941971	942071	942170	942269	942369	942468	942567
2036.70	940680	940780	940879	940978	941077	941177	941276	941375	941475	941574
2036.60	939688	939787	939886	939986	940085	940184	940283	940383	940482	940581
2036.50	938696	938795	938895	938994	939093	939192	939291	939390	939490	939589
2036.40	937705	937804	937903	938002	938101	938201	938300	938399	938498	938597
2036.30	936715	936814	936913	937012	937111	937210	937309	937408	937507	937606
2036.20	935725	935824	935923	936022	936121	936220	936319	936418	936517	936616
2036.10	934735	934834	934933	935032	935131	935230	935329	935428	935527	935626
2036.00	933747	933845	933944	934043	934142	934241	934340	934439	934537	934636
2035.90	932758	932857	932956	933055	933154	933252	933351	933450	933549	933648
2035.80	931771	931870	931968	932067	932166	932265	932363	932462	932561	932660
2035.70	930784	930883	930981	931080	931179	931277	931376	931475	931573	931672
2035.60	929798	929896	929995	930094	930192	930291	930389	930488	930587	930685
2035.50	928812	928911	929009	929108	929206	929305	929403	929502	929601	929699
2035.40	927827	927925	928024	928122	928221	928319	928418	928516	928615	928713
2035.30	926842	926941	927039	927138	927236	927335	927433	927531	927630	927728
2035.20	925858	925957	926055	926154	926252	926350	926449	926547	926646	926744
2035.10	924875	924973	925072	925170	925268	925367	925465	925563	925662	925760
2035.00	923892	923991	924089	924187	924285	924384	924482	924580	924679	924777

TABLE 2-1
REVISED APR. 1985 Page 9 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2034.90	922910	923009	923107	923205	923303	923401	923500	923598	923696	923794
2034.80	921929	922027	922125	922223	922321	922420	922518	922616	922714	922812
2034.70	920948	921046	921144	921242	921340	921438	921536	921635	921733	921831
2034.60	919968	920066	920164	920262	920360	920458	920556	920654	920752	920850
2034.50	918988	919086	919184	919282	919380	919478	919576	919674	919772	919870
2034.40	918009	918107	918205	918303	918401	918498	918596	918694	918792	918890
2034.30	917030	917128	917226	917324	917422	917520	917617	917715	917813	917911
2034.20	916053	916150	916248	916346	916444	916541	916639	916737	916835	916933
2034.10	915075	915173	915271	915368	915466	915564	915662	915759	915857	915955
2034.00	914099	914196	914294	914392	914489	914587	914685	914782	914880	914978
2033.90	913123	913220	913318	913415	913513	913610	913708	913806	913903	914001
2033.80	912147	912245	912342	912440	912537	912635	912732	912830	912927	913025
2033.70	911172	911270	911367	911465	911562	911660	911757	911855	911952	912050
2033.60	910198	910295	910393	910490	910588	910685	910782	910880	910977	911075
2033.50	909224	909322	909419	909516	909614	909711	909808	909906	910003	910100
2033.40	908251	908348	908446	908543	908640	908738	908835	908932	909030	909127
2033.30	907279	907376	907473	907570	907668	907765	907862	907959	908057	908154
2033.20	906307	906404	906501	906598	906695	906793	906890	906987	907084	907181
2033.10	905335	905433	905530	905627	905724	905821	905918	906015	906112	906210
2033.00	904365	904462	904559	904656	904753	904850	904947	905044	905141	905238
2032.90	903395	903492	903589	903686	903783	903880	903977	904074	904171	904268
2032.80	902425	902522	902619	902716	902813	902910	903007	903104	903201	903298
2032.70	901456	901553	901650	901747	901844	901941	902038	902134	902231	902328
2032.60	900488	900585	900682	900778	900875	900972	901069	901166	901263	901359
2032.50	899520	899617	899714	899811	899907	900004	900101	900198	900294	900391
2032.40	898553	898650	898747	898843	898940	899037	899133	899230	899327	899424
2032.30	897587	897683	897780	897877	897973	898070	898166	898263	898360	898456
2032.20	896621	896717	896814	896910	897007	897104	897200	897297	897393	897490
2032.10	895655	895752	895848	895945	896041	896138	896235	896331	896428	896524
2032.00	894691	894787	894884	894980	895077	895173	895269	895366	895462	895559
2031.90	893727	893823	893919	894016	894112	894209	894305	894401	894498	894594
2031.80	892763	892859	892956	893052	893148	893245	893341	893437	893534	893630
2031.70	891800	891896	891993	892089	892185	892282	892378	892474	892570	892667
2031.60	890838	890934	891030	891126	891223	891319	891415	891511	891608	891704
2031.50	889876	889972	890068	890165	890261	890357	890453	890549	890645	890742
2031.40	888915	889011	889107	889203	889299	889395	889492	889588	889684	889780
2031.30	887954	888050	888146	888242	888339	888435	888531	888627	888723	888819
2031.20	886994	887090	887186	887282	887378	887474	887570	887666	887762	887858
2031.10	886035	886131	886227	886323	886419	886515	886611	886707	886803	886898
2031.00	885076	885172	885268	885364	885460	885556	885651	885747	885843	885939
2030.90	884118	884214	884310	884406	884501	884597	884693	884789	884885	884980
2030.80	883161	883256	883352	883448	883544	883639	883735	883831	883927	884022
2030.70	882204	882299	882395	882491	882586	882682	882778	882873	882969	883065
2030.60	881247	881343	881438	881534	881630	881725	881821	881917	882012	882108
2030.50	880291	880387	880483	880578	880674	880769	880865	880960	881056	881152
2030.40	879336	879432	879527	879623	879718	879814	879909	880005	880100	880196
2030.30	878382	878477	878573	878668	878763	878859	878954	879050	879145	879241
2030.20	877428	877523	877618	877714	877809	877905	878000	878095	878191	878286
2030.10	876474	876570	876665	876760	876856	876951	877046	877142	877237	877332
2030.00	875521	875617	875712	875807	875902	875998	876093	876188	876284	876379

TABLE 2-1
REVISED APR. 1985 Page 10 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2029.90	874569	874664	874760	874855	874950	875045	875140	875236	875331	875426
2029.80	873618	873713	873808	873903	873998	874093	874188	874284	874379	874474
2029.70	872666	872762	872857	872952	873047	873142	873237	873332	873427	873522
2029.60	871716	871811	871906	872001	872096	872191	872286	872381	872476	872571
2029.50	870766	870861	870956	871051	871146	871241	871336	871431	871526	871621
2029.40	869817	869912	870007	870102	870197	870291	870386	870481	870576	870671
2029.30	868868	868963	869058	869153	869248	869342	869437	869532	869627	869722
2029.20	867920	868015	868110	868204	868299	868394	868489	868584	868679	868773
2029.10	866973	867067	867162	867257	867352	867446	867541	867636	867731	867825
2029.00	866026	866120	866215	866310	866404	866499	866594	866689	866783	866878
2028.90	865079	865174	865269	865363	865458	865553	865647	865742	865836	865931
2028.80	864134	864228	864323	864417	864512	864606	864701	864796	864890	864985
2028.70	863189	863283	863378	863472	863567	863661	863756	863850	863945	864039
2028.60	862244	862338	862433	862527	862622	862716	862811	862905	863000	863094
2028.50	861300	861394	861489	861583	861678	861772	861866	861961	862055	862150
2028.40	860357	860451	860545	860640	860734	860828	860923	861017	861111	861206
2028.30	859414	859508	859602	859697	859791	859885	859980	860074	860168	860262
2028.20	858472	858566	858660	858754	858849	858943	859037	859131	859225	859320
2028.10	857530	857624	857718	857813	857907	858001	858095	858189	858283	858378
2028.00	856589	856683	856777	856871	856966	857060	857154	857248	857342	857436
2027.90	855649	855743	855837	855931	856025	856119	856213	856307	856401	856495
2027.80	854709	854803	854897	854991	855085	855179	855273	855367	855461	855555
2027.70	853770	853864	853958	854051	854145	854239	854333	854427	854521	854615
2027.60	852831	852925	853019	853113	853206	853300	853394	853488	853582	853676
2027.50	851893	851987	852081	852174	852268	852362	852456	852550	852643	852737
2027.40	850956	851049	851143	851237	851330	851424	851518	851612	851705	851799
2027.30	850019	850112	850206	850300	850393	850487	850581	850674	850768	850862
2027.20	849082	849176	849270	849363	849457	849550	849644	849738	849831	849925
2027.10	848147	848240	848334	848427	848521	848614	848708	848802	848895	848989
2027.00	847212	847305	847399	847492	847586	847679	847773	847866	847960	848053
2026.90	846277	846370	846464	846557	846651	846744	846838	846931	847025	847118
2026.80	845343	845436	845530	845623	845717	845810	845903	845997	846090	846184
2026.70	844410	844503	844596	844690	844783	844876	844970	845063	845156	845250
2026.60	843477	843570	843663	843757	843850	843943	844037	844130	844223	844316
2026.50	842545	842638	842731	842824	842918	843011	843104	843197	843290	843384
2026.40	841613	841706	841799	841893	841986	842079	842172	842265	842358	842452
2026.30	840682	840775	840868	840961	841054	841148	841241	841334	841427	841520
2026.20	839752	839845	839938	840031	840124	840217	840310	840403	840496	840589
2026.10	838822	838915	839008	839101	839194	839287	839380	839473	839566	839659
2026.00	837893	837986	838078	838171	838264	838357	838450	838543	838636	838729
2025.90	836964	837057	837150	837242	837335	837428	837521	837614	837707	837800
2025.80	836036	836129	836221	836314	836407	836500	836593	836685	836778	836871
2025.70	835108	835201	835294	835387	835479	835572	835665	835758	835850	835943
2025.60	834181	834274	834367	834459	834552	834645	834738	834830	834923	835016
2025.50	833255	833348	833440	833533	833626	833718	833811	833903	833996	834089
2025.40	832329	832422	832514	832607	832700	832792	832885	832977	833070	833163
2025.30	831404	831497	831589	831682	831774	831867	831959	832052	832144	832237
2025.20	830480	830572	830664	830757	830849	830942	831034	831127	831219	831312
2025.10	829556	829648	829740	829833	829925	830018	830110	830202	830295	830387
2025.00	828632	828725	828817	828909	829002	829094	829186	829279	829371	829463

TABLE 2-1
REVISED APR. 1985 Page 11 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2024.90	827709	827802	827894	827986	828078	828171	828263	828355	828448	828540
2024.80	826787	826879	826972	827064	827156	827248	827340	827433	827525	827617
2024.70	825865	825958	826050	826142	826234	826326	826418	826511	826603	826695
2024.60	824944	825037	825129	825221	825313	825405	825497	825589	825681	825773
2024.50	824024	824116	824208	824300	824392	824484	824576	824668	824760	824852
2024.40	823104	823196	823288	823380	823472	823564	823656	823748	823840	823932
2024.30	822185	822277	822369	822460	822552	822644	822736	822828	822920	823012
2024.20	821266	821358	821450	821542	821633	821725	821817	821909	822001	822093
2024.10	820348	820440	820531	820623	820715	820807	820899	820990	821082	821174
2024.00	819430	819522	819614	819705	819797	819889	819981	820072	820164	820256
2023.90	818513	818605	818697	818788	818880	818972	819063	819155	819247	819338
2023.80	817597	817688	817780	817872	817963	818055	818147	818238	818330	818422
2023.70	816681	816772	816864	816956	817047	817139	817230	817322	817414	817505
2023.60	815766	815857	815949	816040	816132	816223	816315	816406	816498	816589
2023.50	814851	814942	815034	815125	815217	815308	815400	815491	815583	815674
2023.40	813937	814028	814120	814211	814302	814394	814485	814577	814668	814760
2023.30	813023	813115	813206	813297	813389	813480	813571	813663	813754	813846
2023.20	812110	812202	812293	812384	812476	812567	812658	812749	812841	812932
2023.10	811198	811289	811381	811472	811563	811654	811745	811837	811928	812019
2023.00	810286	810377	810469	810560	810651	810742	810833	810925	811016	811107
2022.90	809375	809466	809557	809648	809740	809831	809922	810013	810104	810195
2022.80	808465	808556	808647	808738	808829	808920	809011	809102	809193	809284
2022.70	807554	807645	807736	807827	807918	808009	808100	808191	808282	808374
2022.60	806645	806736	806827	806918	807009	807100	807191	807282	807373	807464
2022.50	805736	805827	805918	806009	806100	806191	806281	806372	806463	806554
2022.40	804828	804919	805009	805100	805191	805282	805373	805464	805554	805645
2022.30	803920	804011	804102	804192	804283	804374	804465	804555	804646	804737
2022.20	803013	803104	803194	803285	803376	803467	803557	803648	803739	803829
2022.10	802106	802197	802288	802378	802469	802560	802650	802741	802832	802922
2022.00	801200	801291	801382	801472	801563	801653	801744	801835	801925	802016
2021.90	800295	800386	800476	800567	800657	800748	800838	800929	801019	801110
2021.80	799390	799481	799571	799662	799752	799843	799933	800024	800114	800205
2021.70	798486	798576	798667	798757	798848	798938	799028	799119	799209	799300
2021.60	797582	797673	797763	797853	797944	798034	798124	798215	798305	798396
2021.50	796679	796770	796860	796950	797040	797131	797221	797311	797402	797492
2021.40	795777	795867	795957	796047	796138	796228	796318	796408	796499	796589
2021.30	794875	794965	795055	795145	795235	795326	795416	795506	795596	795686
2021.20	793973	794064	794154	794244	794334	794424	794514	794604	794694	794785
2021.10	793073	793163	793253	793343	793433	793523	793613	793703	793793	793883
2021.00	792172	792262	792352	792442	792532	792622	792712	792802	792893	792983
2020.90	791273	791363	791453	791543	791633	791723	791812	791902	791992	792082
2020.80	790374	790464	790553	790643	790733	790823	790913	791003	791093	791183
2020.70	789475	789565	789655	789745	789835	789924	790014	790104	790194	790284
2020.60	788577	788667	788757	788847	788936	789026	789116	789206	789296	789385
2020.50	787680	787770	787859	787949	788039	788129	788218	788308	788398	788488
2020.40	786783	786873	786963	787052	787142	787232	787321	787411	787501	787590
2020.30	785887	785977	786066	786156	786245	786335	786425	786514	786604	786694
2020.20	784991	785081	785171	785260	785350	785439	785529	785618	785708	785797
2020.10	784096	784186	784275	784365	784454	784544	784633	784723	784812	784902
2020.00	783202	783291	783381	783470	783560	783649	783739	783828	783917	784007

TABLE 2-1
REVISED APR. 1985 Page 12 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2019.90	782307	782396	782486	782575	782664	782754	782843	782932	783022	783111
2019.80	781414	781503	781592	781681	781771	781860	781949	782039	782128	782217
2019.70	780521	780610	780699	780789	780878	780967	781056	781146	781235	781324
2019.60	779629	779718	779807	779896	779985	780075	780164	780253	780342	780432
2019.50	778737	778826	778915	779005	779094	779183	779272	779361	779450	779539
2019.40	777846	777935	778024	778113	778202	778292	778381	778470	778559	778648
2019.30	776956	777045	777134	777223	777312	777401	777490	777579	777668	777757
2019.20	776066	776155	776244	776333	776422	776511	776600	776689	776778	776867
2019.10	775177	775266	775354	775443	775532	775621	775710	775799	775888	775977
2019.00	774288	774377	774466	774554	774643	774732	774821	774910	774999	775088
2018.90	773400	773489	773577	773666	773755	773844	773933	774021	774110	774199
2018.80	772512	772601	772690	772778	772867	772956	773045	773134	773222	773311
2018.70	771625	771714	771803	771891	771980	772069	772157	772246	772335	772424
2018.60	770739	770828	770916	771005	771093	771182	771271	771359	771448	771537
2018.50	769853	769942	770030	770119	770207	770296	770385	770473	770562	770650
2018.40	768968	769056	769145	769233	769322	769410	769499	769588	769676	769765
2018.30	768083	768172	768260	768349	768437	768526	768614	768703	768791	768879
2018.20	767199	767288	767376	767464	767553	767641	767730	767818	767906	767995
2018.10	766316	766404	766492	766581	766669	766757	766846	766934	767022	767111
2018.00	765433	765521	765609	765698	765786	765874	765963	766051	766139	766227
2017.90	764550	764639	764727	764815	764903	764992	765080	765168	765256	765345
2017.80	763669	763757	763845	763933	764021	764110	764198	764286	764374	764462
2017.70	762788	762876	762964	763052	763140	763228	763316	763404	763492	763581
2017.60	761907	761995	762083	762171	762259	762347	762435	762523	762611	762699
2017.50	761027	761115	761203	761291	761379	761467	761555	761643	761731	761819
2017.40	760147	760235	760323	760411	760499	760587	760675	760763	760851	760939
2017.30	759268	759356	759444	759532	759620	759708	759796	759884	759972	760059
2017.20	758390	758478	758566	758654	758741	758829	758917	759005	759093	759181
2017.10	757512	757600	757688	757776	757863	757951	758039	758127	758215	758302
2017.00	756635	756723	756811	756898	756986	757074	757161	757249	757337	757425
2016.90	755759	755846	755934	756022	756109	756197	756285	756372	756460	756548
2016.80	754883	754970	755058	755145	755233	755321	755408	755496	755583	755671
2016.70	754007	754095	754182	754270	754357	754445	754532	754620	754707	754795
2016.60	753132	753220	753307	753395	753482	753570	753657	753745	753832	753920
2016.50	752258	752345	752433	752520	752608	752695	752782	752870	752957	753045
2016.40	751384	751472	751559	751646	751734	751821	751908	751996	752083	752171
2016.30	750511	750598	750686	750773	750860	750948	751035	751122	751210	751297
2016.20	749638	749726	749813	749900	749987	750075	750162	750249	750336	750424
2016.10	748766	748854	748941	749028	749115	749202	749290	749377	749464	749551
2016.00	747895	747982	748069	748156	748243	748331	748418	748505	748592	748679
2015.90	747024	747111	747198	747285	747372	747459	747547	747634	747721	747808
2015.80	746154	746241	746328	746415	746502	746589	746676	746763	746850	746937
2015.70	745284	745371	745458	745545	745632	745719	745806	745893	745980	746067
2015.60	744415	744502	744589	744676	744762	744849	744936	745023	745110	745197
2015.50	743546	743633	743720	743807	743894	743980	744067	744154	744241	744328
2015.40	742678	742765	742852	742939	743025	743112	743199	743286	743373	743459
2015.30	741811	741897	741984	742071	742158	742244	742331	742418	742505	742591
2015.20	740944	741031	741117	741204	741291	741377	741464	741551	741637	741724
2015.10	740078	740164	740251	740337	740424	740511	740597	740684	740771	740857
2015.00	739212	739298	739385	739471	739558	739645	739731	739818	739904	739991

TABLE 2-1
REVISED APR. 1985 Page 13 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2014.90	738347	738433	738520	738606	738693	738779	738866	738952	739039	739125
2014.80	737482	737568	737655	737741	737828	737914	738001	738087	738174	738260
2014.70	736618	736704	736791	736877	736964	737050	737136	737223	737309	737396
2014.60	735754	735841	735927	736013	736100	736186	736272	736359	736445	736532
2014.50	734892	734978	735064	735150	735237	735323	735409	735496	735582	735668
2014.40	734029	734115	734202	734288	734374	734460	734547	734633	734719	734805
2014.30	733167	733254	733340	733426	733512	733598	733684	733771	733857	733943
2014.20	732306	732392	732478	732565	732651	732737	732823	732909	732995	733081
2014.10	731446	731532	731618	731704	731790	731876	731962	732048	732134	732220
2014.00	730586	730672	730758	730844	730930	731016	731102	731188	731274	731360
2013.90	729726	729812	729898	729984	730070	730156	730242	730328	730414	730500
2013.80	728867	728953	729039	729125	729211	729297	729382	729468	729554	729640
2013.70	728009	728095	728180	728266	728352	728438	728524	728610	728695	728781
2013.60	727151	727237	727322	727408	727494	727580	727666	727751	727837	727923
2013.50	726294	726379	726465	726551	726637	726722	726808	726894	726979	727065
2013.40	725437	725523	725608	725694	725780	725865	725951	726037	726122	726208
2013.30	724581	724667	724752	724838	724923	725009	725095	725180	725266	725351
2013.20	723725	723811	723897	723982	724068	724153	724239	724324	724410	724495
2013.10	722871	722956	723041	723127	723212	723298	723383	723469	723554	723640
2013.00	722016	722102	722187	722272	722358	722443	722529	722614	722700	722785
2012.90	721162	721248	721333	721418	721504	721589	721675	721760	721845	721931
2012.80	720309	720394	720480	720565	720650	720736	720821	720906	720992	721077
2012.70	719456	719542	719627	719712	719797	719883	719968	720053	720138	720224
2012.60	718604	718689	718775	718860	718945	719030	719115	719201	719286	719371
2012.50	717753	717838	717923	718008	718093	718178	718263	718349	718434	718519
2012.40	716902	716987	717072	717157	717242	717327	717412	717497	717582	717667
2012.30	716051	716136	716221	716306	716391	716476	716561	716646	716731	716817
2012.20	715201	715286	715371	715456	715541	715626	715711	715796	715881	715966
2012.10	714352	714437	714522	714607	714692	714777	714861	714946	715031	715116
2012.00	713503	713588	713673	713758	713843	713928	714012	714097	714182	714267
2011.90	712655	712740	712825	712909	712994	713079	713164	713249	713334	713418
2011.80	711807	711892	711977	712062	712146	712231	712316	712401	712485	712570
2011.70	710960	711045	711130	711214	711299	711384	711469	711553	711638	711723
2011.60	710114	710198	710283	710368	710452	710537	710622	710706	710791	710876
2011.50	709268	709352	709437	709522	709606	709691	709775	709860	709945	710029
2011.40	708423	708507	708592	708676	708761	708845	708930	709014	709099	709183
2011.30	707578	707662	707747	707831	707916	708000	708085	708169	708254	708338
2011.20	706733	706818	706902	706987	707071	707156	707240	707324	707409	707493
2011.10	705890	705974	706059	706143	706227	706312	706396	706480	706565	706649
2011.00	705047	705131	705215	705300	705384	705468	705552	705637	705721	705805
2010.90	704204	704288	704373	704457	704541	704625	704710	704794	704878	704962
2010.80	703362	703446	703530	703615	703699	703783	703867	703951	704036	704120
2010.70	702521	702605	702689	702773	702857	702941	703025	703110	703194	703278
2010.60	701680	701764	701848	701932	702016	702100	702184	702268	702352	702437
2010.50	700840	700924	701008	701092	701176	701260	701344	701428	701512	701596
2010.40	700000	700084	700168	700252	700336	700420	700504	700588	700672	700756
2010.30	699161	699244	699328	699412	699496	699580	699664	699748	699832	699916
2010.20	698322	698406	698490	698573	698657	698741	698825	698909	698993	699077
2010.10	697484	697568	697651	697735	697819	697903	697987	698070	698154	698238
2010.00	696646	696730	696814	696898	696981	697065	697149	697233	697316	697400

TABLE 2-1
REVISED APR. 1985 Page 14 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2009.90	695809	695893	695977	696060	696144	696228	696312	696395	696479	696563
2009.80	694973	695057	695140	695224	695308	695391	695475	695558	695642	695726
2009.70	694137	694221	694304	694388	694471	694555	694639	694722	694806	694889
2009.60	693302	693385	693469	693552	693636	693719	693803	693887	693970	694054
2009.50	692467	692551	692634	692718	692801	692884	692968	693051	693135	693218
2009.40	691633	691716	691800	691883	691967	692050	692133	692217	692300	692384
2009.30	690799	690883	690966	691049	691133	691216	691300	691383	691466	691550
2009.20	689966	690050	690133	690216	690300	690383	690466	690549	690633	690716
2009.10	689134	689217	689300	689384	689467	689550	689633	689717	689800	689883
2009.00	688302	688385	688468	688552	688635	688718	688801	688884	688968	689051
2008.90	687471	687554	687637	687720	687803	687886	687969	688053	688136	688219
2008.80	686640	686723	686806	686889	686972	687055	687138	687221	687304	687388
2008.70	685810	685893	685976	686059	686142	686225	686308	686391	686474	686557
2008.60	684980	685063	685146	685229	685312	685395	685478	685561	685644	685727
2008.50	684151	684234	684317	684399	684482	684565	684648	684731	684814	684897
2008.40	683322	683405	683488	683571	683654	683736	683819	683902	683985	684068
2008.30	682494	682577	682660	682743	682825	682908	682991	683074	683157	683239
2008.20	681667	681749	681832	681915	681998	682080	682163	682246	682329	682411
2008.10	680840	680923	681005	681088	681171	681253	681336	681419	681501	681584
2008.00	680014	680096	680179	680261	680344	680427	680509	680592	680675	680757
2007.90	679188	679270	679353	679435	679518	679601	679683	679766	679848	679931
2007.80	678363	678445	678528	678610	678693	678775	678858	678940	679023	679105
2007.70	677538	677620	677703	677785	677868	677950	678033	678115	678198	678280
2007.60	676714	676796	676878	676961	677043	677126	677208	677291	677373	677455
2007.50	675890	675972	676055	676137	676220	676302	676384	676467	676549	676631
2007.40	675067	675149	675232	675314	675396	675479	675561	675643	675725	675808
2007.30	674245	674327	674409	674491	674574	674656	674738	674820	674903	674985
2007.20	673423	673505	673587	673669	673751	673834	673916	673998	674080	674162
2007.10	672601	672684	672766	672848	672930	673012	673094	673176	673258	673341
2007.00	671781	671863	671945	672027	672109	672191	672273	672355	672437	672519
2006.90	670960	671042	671124	671206	671288	671370	671452	671535	671617	671699
2006.80	670141	670223	670305	670387	670469	670550	670632	670714	670796	670878
2006.70	669322	669403	669485	669567	669649	669731	669813	669895	669977	670059
2006.60	668503	668585	668667	668749	668830	668912	668994	669076	669158	669240
2006.50	667685	667767	667849	667930	668012	668094	668176	668258	668339	668421
2006.40	666868	666949	667031	667113	667194	667276	667358	667440	667521	667603
2006.30	666051	666132	666214	666296	666377	666459	666541	666622	666704	666786
2006.20	665234	665316	665397	665479	665561	665642	665724	665806	665887	665969
2006.10	664418	664500	664582	664663	664745	664826	664908	664989	665071	665153
2006.00	663603	663685	663766	663848	663929	664011	664092	664174	664255	664337
2005.90	662789	662870	662951	663033	663114	663196	663277	663359	663440	663522
2005.80	661974	662056	662137	662219	662300	662381	662463	662544	662626	662707
2005.70	661161	661242	661323	661405	661486	661567	661649	661730	661812	661893
2005.60	660348	660429	660510	660592	660673	660754	660835	660917	660998	661079
2005.50	659535	659616	659698	659779	659860	659941	660023	660104	660185	660266
2005.40	658723	658804	658886	658967	659048	659129	659210	659292	659373	659454
2005.30	657912	657993	658074	658155	658236	658318	658399	658480	658561	658642
2005.20	657101	657182	657263	657344	657425	657506	657587	657669	657750	657831
2005.10	656291	656372	656453	656534	656615	656696	656777	656858	656939	657020
2005.00	655481	655562	655643	655724	655805	655886	655967	656048	656129	656210

TABLE 2-1
REVISED APR. 1985 Page 15 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2004.90	654672	654753	654834	654915	654995	655076	655157	655238	655319	655400
2004.80	653863	653944	654025	654106	654187	654267	654348	654429	654510	654591
2004.70	653055	653136	653217	653297	653378	653459	653540	653621	653702	653782
2004.60	652248	652328	652409	652490	652571	652651	652732	652813	652894	652974
2004.50	651441	651521	651602	651683	651763	651844	651925	652005	652086	652167
2004.40	650634	650715	650795	650876	650957	651037	651118	651199	651279	651360
2004.30	649828	649909	649989	650070	650151	650231	650312	650392	650473	650554
2004.20	649023	649103	649184	649264	649345	649426	649506	649587	649667	649748
2004.10	648218	648299	648379	648460	648540	648620	648701	648781	648862	648942
2004.00	647414	647494	647575	647655	647736	647816	647896	647977	648057	648138
2003.90	646610	646691	646771	646851	646932	647012	647092	647173	647253	647334
2003.80	645807	645887	645968	646048	646128	646209	646289	646369	646450	646530
2003.70	645004	645085	645165	645245	645325	645406	645486	645566	645647	645727
2003.60	644202	644283	644363	644443	644523	644603	644684	644764	644844	644924
2003.50	643401	643481	643561	643641	643721	643802	643882	643962	644042	644122
2003.40	642600	642680	642760	642840	642920	643000	643080	643161	643241	643321
2003.30	641800	641880	641960	642040	642120	642200	642280	642360	642440	642520
2003.20	641000	641080	641160	641240	641320	641400	641480	641560	641640	641720
2003.10	640200	640280	640360	640440	640520	640600	640680	640760	640840	640920
2003.00	639402	639482	639561	639641	639721	639801	639881	639961	640041	640121
2002.90	638603	638683	638763	638843	638923	639002	639082	639162	639242	639322
2002.80	637806	637886	637965	638045	638125	638205	638284	638364	638444	638524
2002.70	637009	637088	637168	637248	637327	637407	637487	637567	637646	637726
2002.60	636212	636292	636371	636451	636531	636610	636690	636770	636849	636929
2002.50	635416	635496	635575	635655	635734	635814	635894	635973	636053	636132
2002.40	634621	634700	634780	634859	634939	635018	635098	635177	635257	635336
2002.30	633826	633905	633985	634064	634144	634223	634303	634382	634462	634541
2002.20	633031	633111	633190	633270	633349	633428	633508	633587	633667	633746
2002.10	632237	632317	632396	632476	632555	632634	632714	632793	632872	632952
2002.00	631444	631523	631603	631682	631761	631841	631920	631999	632079	632158
2001.90	630651	630731	630810	630889	630968	631048	631127	631206	631286	631365
2001.80	629859	629938	630018	630097	630176	630255	630334	630414	630493	630572
2001.70	629067	629147	629226	629305	629384	629463	629542	629622	629701	629780
2001.60	628276	628355	628435	628514	628593	628672	628751	628830	628909	628988
2001.50	627486	627565	627644	627723	627802	627881	627960	628039	628118	628197
2001.40	626696	626775	626854	626933	627012	627091	627170	627249	627328	627407
2001.30	625906	625985	626064	626143	626222	626301	626380	626459	626538	626617
2001.20	625117	625196	625275	625354	625433	625512	625591	625670	625748	625827
2001.10	624329	624408	624487	624565	624644	624723	624802	624881	624960	625038
2001.00	623541	623620	623699	623777	623856	623935	624014	624093	624171	624250
2000.90	622754	622832	622911	622990	623069	623147	623226	623305	623384	623462
2000.80	621967	622046	622124	622203	622282	622360	622439	622518	622596	622675
2000.70	621181	621259	621338	621417	621495	621574	621652	621731	621810	621888
2000.60	620395	620474	620552	620631	620709	620788	620866	620945	621024	621102
2000.50	619610	619688	619767	619845	619924	620002	620081	620159	620238	620317
2000.40	618825	618904	618982	619061	619139	619218	619296	619375	619453	619531
2000.30	618041	618120	618198	618276	618355	618433	618512	618590	618668	618747
2000.20	617258	617336	617414	617493	617571	617649	617728	617806	617885	617963
2000.10	616475	616553	616631	616710	616788	616866	616945	617023	617101	617179
2000.00	615692	615771	615849	615927	616005	616084	616162	616240	616318	616397

TABLE 2-1
REVISED APR. 1985 Page 16 of 21

TABLE 2-1
REVISED APR. 1985 Page 17 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1999.90	614911	614989	615067	615145	615224	615302	615380	615458	615536	615615
1999.80	614130	614208	614286	614364	614442	614520	614598	614676	614755	614833
1999.70	613349	613427	613505	613583	613661	613739	613817	613895	613973	614052
1999.60	612569	612647	612725	612803	612881	612959	613037	613115	613193	613271
1999.50	611789	611867	611945	612023	612101	612179	612257	612335	612413	612491
1999.40	611011	611088	611166	611244	611322	611400	611478	611556	611634	611712
1999.30	610232	610310	610388	610466	610544	610621	610699	610777	610855	610933
1999.20	609455	609532	609610	609688	609766	609843	609921	609999	610077	610155
1999.10	608678	608755	608833	608911	608988	609066	609144	609222	609299	609377
1999.00	607901	607979	608056	608134	608212	608289	608367	608445	608522	608600
1998.90	607125	607203	607280	607358	607436	607513	607591	607668	607746	607824
1998.80	606350	606428	606505	606583	606660	606738	606815	606893	606970	607048
1998.70	605575	605653	605730	605808	605885	605963	606040	606118	606195	606273
1998.60	604801	604879	604956	605033	605111	605188	605266	605343	605420	605498
1998.50	604028	604105	604182	604260	604337	604414	604492	604569	604647	604724
1998.40	603255	603332	603409	603487	603564	603641	603719	603796	603873	603950
1998.30	602483	602560	602637	602714	602791	602869	602946	603023	603100	603178
1998.20	601711	601788	601865	601942	602020	602097	602174	602251	602328	602405
1998.10	600940	601017	601094	601171	601248	601325	601402	601480	601557	601634
1998.00	600169	600246	600323	600400	600478	600555	600632	600709	600786	600863
1997.90	599400	599476	599553	599630	599707	599784	599861	599938	600015	600092
1997.80	598630	598707	598784	598861	598938	599015	599092	599169	599246	599323
1997.70	597862	597938	598015	598092	598169	598246	598323	598400	598476	598553
1997.60	597093	597170	597247	597324	597401	597477	597554	597631	597708	597785
1997.50	596326	596403	596479	596556	596633	596710	596786	596863	596940	597017
1997.40	595559	595636	595712	595789	595866	595942	596019	596096	596172	596249
1997.30	594793	594869	594946	595022	595099	595176	595252	595329	595406	595482
1997.20	594027	594103	594180	594257	594333	594410	594486	594563	594639	594716
1997.10	593262	593338	593415	593491	593568	593644	593721	593797	593874	593950
1997.00	592497	592574	592650	592727	592803	592879	592956	593032	593109	593185
1996.90	591733	591810	591886	591962	592039	592115	592192	592268	592344	592421
1996.80	590970	591046	591123	591199	591275	591352	591428	591504	591581	591657
1996.70	590207	590283	590360	590436	590512	590589	590665	590741	590817	590894
1996.60	589445	589521	589597	589674	589750	589826	589902	589979	590055	590131
1996.50	588683	588760	588836	588912	588988	589064	589140	589217	589293	589369
1996.40	587923	587999	588075	588151	588227	588303	588379	588455	588531	588607
1996.30	587162	587238	587314	587390	587466	587542	587618	587694	587770	587846
1996.20	586402	586478	586554	586630	586706	586782	586858	586934	587010	587086
1996.10	585643	585719	585795	585871	585947	586023	586099	586175	586250	586326
1996.00	584885	584960	585036	585112	585188	585264	585340	585416	585491	585567
1995.90	584127	584202	584278	584354	584430	584505	584581	584657	584733	584809
1995.80	583369	583445	583521	583596	583672	583748	583823	583899	583975	584051
1995.70	582612	582688	582764	582839	582915	582991	583066	583142	583218	583293
1995.60	581856	581932	582007	582083	582158	582234	582310	582385	582461	582537
1995.50	581100	581176	581251	581327	581403	581478	581554	581629	581705	581780
1995.40	580345	580421	580496	580572	580647	580723	580798	580874	580949	581025
1995.30	579591	579666	579742	579817	579893	579968	580043	580119	580194	580270
1995.20	578837	578912	578988	579063	579138	579214	579289	579365	579440	579515
1995.10	578084	578159	578234	578310	578385	578460	578536	578611	578686	578762
1995.00	577331	577406	577481	577557	577632	577707	577783	577858	577933	578008

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1994.90	576579	576654	576729	576804	576880	576955	577030	577105	577181	577256
1994.80	575827	575902	575978	576053	576128	576203	576278	576353	576429	576504
1994.70	575076	575151	575227	575302	575377	575452	575527	575602	575677	575752
1994.60	574326	574401	574476	574551	574626	574701	574776	574851	574926	575001
1994.50	573576	573651	573726	573801	573876	573951	574026	574101	574176	574251
1994.40	572827	572902	572977	573052	573127	573202	573277	573352	573426	573501
1994.30	572079	572153	572228	572303	572378	572453	572528	572603	572677	572752
1994.20	571331	571405	571480	571555	571630	571705	571779	571854	571929	572004
1994.10	570583	570658	570733	570807	570882	570957	571032	571106	571181	571256
1994.00	569836	569911	569986	570060	570135	570210	570284	570359	570434	570508
1993.90	569090	569165	569239	569314	569389	569463	569538	569612	569687	569762
1993.80	568344	568419	568494	568568	568643	568717	568792	568866	568941	569016
1993.70	567599	567674	567748	567823	567897	567972	568046	568121	568195	568270
1993.60	566855	566929	567004	567078	567153	567227	567302	567376	567450	567525
1993.50	566111	566185	566260	566334	566409	566483	566557	566632	566706	566781
1993.40	565368	565442	565516	565591	565665	565739	565814	565888	565962	566037
1993.30	564625	564699	564774	564848	564922	564996	565071	565145	565219	565293
1993.20	563883	563957	564031	564106	564180	564254	564328	564402	564477	564551
1993.10	563141	563216	563290	563364	563438	563512	563586	563660	563735	563809
1993.00	562400	562475	562549	562623	562697	562771	562845	562919	562993	563067
1992.90	561660	561734	561808	561882	561956	562030	562104	562178	562252	562326
1992.80	560920	560994	561068	561142	561216	561290	561364	561438	561512	561586
1992.70	560181	560255	560329	560403	560477	560551	560625	560698	560772	560846
1992.60	559442	559516	559590	559664	559738	559812	559886	559959	560033	560107
1992.50	558704	558778	558852	558926	559000	559073	559147	559221	559295	559369
1992.40	557967	558041	558114	558188	558262	558336	558409	558483	558557	558631
1992.30	557230	557304	557377	557451	557525	557598	557672	557746	557820	557893
1992.20	556494	556567	556641	556715	556788	556862	556936	557009	557083	557156
1992.10	555758	555832	555905	555979	556052	556126	556199	556273	556347	556420
1992.00	555023	555096	555170	555243	555317	555390	555464	555538	555611	555685
1991.90	554288	554362	554435	554509	554582	554656	554729	554803	554876	554950
1991.80	553555	553628	553701	553775	553848	553921	553995	554068	554142	554215
1991.70	552821	552894	552968	553041	553114	553188	553261	553334	553408	553481
1991.60	552088	552162	552235	552308	552381	552455	552528	552601	552675	552748
1991.50	551356	551429	551503	551576	551649	551722	551795	551869	551942	552015
1991.40	550625	550698	550771	550844	550917	550990	551063	551137	551210	551283
1991.30	549893	549967	550040	550113	550186	550259	550332	550405	550478	550551
1991.20	549163	549236	549309	549382	549455	549528	549601	549674	549747	549820
1991.10	548433	548506	548579	548652	548725	548798	548871	548944	549017	549090
1991.00	547704	547777	547850	547923	547995	548068	548141	548214	548287	548360
1990.90	546975	547048	547121	547194	547267	547339	547412	547485	547558	547631
1990.80	546247	546320	546393	546465	546538	546611	546684	546757	546829	546902
1990.70	545519	545592	545665	545738	545810	545883	545956	546029	546101	546174
1990.60	544792	544865	544938	545010	545083	545156	545229	545301	545374	545447
1990.50	544066	544139	544211	544284	544356	544429	544502	544574	544647	544720
1990.40	543340	543413	543485	543558	543630	543703	543776	543848	543921	543993
1990.30	542615	542687	542760	542832	542905	542977	543050	543123	543195	543268
1990.20	541890	541963	542035	542108	542180	542253	542325	542397	542470	542542
1990.10	541166	541239	541311	541383	541456	541528	541601	541673	541745	541818
1990.00	540443	540515	540587	540660	540732	540804	540877	540949	541021	541094

TABLE 2-1
REVISED APR. 1985 Page 18 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1989.90	539720	539792	539864	539937	540009	540081	540153	540226	540298	540370
1989.80	538997	539070	539142	539214	539286	539358	539431	539503	539575	539647
1989.70	538276	538348	538420	538492	538564	538636	538709	538781	538853	538925
1989.60	537554	537626	537699	537771	537843	537915	537987	538059	538131	538203
1989.50	536834	536906	536978	537050	537122	537194	537266	537338	537410	537482
1989.40	536114	536186	536258	536330	536402	536474	536546	536618	536690	536762
1989.30	535394	535466	535538	535610	535682	535754	535826	535898	535970	536042
1989.20	534675	534747	534819	534891	534963	535035	535107	535178	535250	535322
1989.10	533957	534029	534101	534172	534244	534316	534388	534460	534532	534603
1989.00	533239	533311	533383	533455	533526	533598	533670	533742	533813	533885
1988.90	532522	532594	532665	532737	532809	532881	532952	533024	533096	533168
1988.80	531805	531877	531949	532020	532092	532164	532235	532307	532379	532450
1988.70	531089	531161	531233	531304	531376	531447	531519	531591	531662	531734
1988.60	530374	530446	530517	530589	530660	530732	530803	530875	530946	531018
1988.50	529659	529731	529802	529874	529945	530017	530088	530159	530231	530303
1988.40	528945	529016	529088	529159	529230	529302	529373	529445	529516	529588
1988.30	528231	528302	528374	528445	528517	528588	528659	528731	528802	528873
1988.20	527518	527589	527661	527732	527803	527874	527946	528017	528088	528160
1988.10	526805	526877	526948	527019	527090	527162	527233	527304	527375	527447
1988.00	526093	526165	526236	526307	526378	526449	526521	526592	526663	526734
1987.90	525382	525453	525524	525595	525666	525738	525809	525880	525951	526022
1987.80	524671	524742	524813	524884	524955	525026	525098	525169	525240	525311
1987.70	523961	524032	524103	524174	524245	524316	524387	524458	524529	524600
1987.60	523251	523322	523393	523464	523535	523606	523677	523748	523819	523890
1987.50	522542	522613	522684	522755	522826	522896	522967	523038	523109	523180
1987.40	521833	521904	521975	522046	522117	522188	522258	522329	522400	522471
1987.30	521125	521196	521267	521338	521409	521479	521550	521621	521692	521763
1987.20	520418	520489	520559	520630	520701	520772	520842	520913	520984	521055
1987.10	519711	519782	519852	519923	519994	520065	520135	520206	520277	520347
1987.00	519005	519075	519146	519217	519287	519358	519429	519499	519570	519641
1986.90	518299	518370	518440	518511	518581	518652	518723	518793	518864	518934
1986.80	517594	517665	517735	517806	517876	517947	518017	518088	518158	518229
1986.70	516889	516960	517030	517101	517171	517242	517312	517383	517453	517524
1986.60	516185	516256	516326	516397	516467	516537	516608	516678	516749	516819
1986.50	515482	515552	515623	515693	515763	515834	515904	515974	516045	516115
1986.40	514779	514849	514920	514990	515060	515131	515201	515271	515341	515412
1986.30	514077	514147	514217	514288	514358	514428	514498	514568	514639	514709
1986.20	513375	513445	513515	513586	513656	513726	513796	513866	513937	514007
1986.10	512674	512744	512814	512884	512954	513025	513095	513165	513235	513305
1986.00	511973	512043	512114	512184	512254	512324	512394	512464	512534	512604
1985.90	511273	511343	511413	511483	511553	511623	511693	511763	511833	511903
1985.80	510574	510644	510714	510784	510854	510924	510994	511064	511134	511203
1985.70	509875	509945	510015	510085	510155	510224	510294	510364	510434	510504
1985.60	509177	509247	509316	509386	509456	509526	509596	509666	509735	509805
1985.50	508479	508549	508619	508688	508758	508828	508898	508967	509037	509107
1985.40	507782	507852	507921	507991	508061	508130	508200	508270	508340	508409
1985.30	507085	507155	507225	507294	507364	507434	507503	507573	507643	507712
1985.20	506389	506459	506528	506598	506668	506737	506807	506876	506946	507016
1985.10	505694	505763	505833	505902	505972	506041	506111	506181	506250	506320
1985.00	504999	505068	505138	505207	505277	505346	505416	505485	505555	505624

TABLE 2-1
REVISED APR. 1985 Page 19 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1989.90	539720	539792	539864	539937	540009	540081	540153	540226	540298	540370
1989.80	538997	539070	539142	539214	539286	539358	539431	539503	539575	539647
1989.70	538276	538348	538420	538492	538564	538636	538709	538781	538853	538925
1989.60	537554	537626	537699	537771	537843	537915	537987	538059	538131	538203
1989.50	536834	536906	536978	537050	537122	537194	537266	537338	537410	537482
1989.40	536114	536186	536258	536330	536402	536474	536546	536618	536690	536762
1989.30	535394	535466	535538	535610	535682	535754	535826	535898	535970	536042
1989.20	534675	534747	534819	534891	534963	535035	535107	535178	535250	535322
1989.10	533957	534029	534101	534172	534244	534316	534388	534460	534532	534603
1989.00	533239	533311	533383	533455	533526	533598	533670	533742	533813	533885
1988.90	532522	532594	532665	532737	532809	532881	532952	533024	533096	533168
1988.80	531805	531877	531949	532020	532092	532164	532235	532307	532379	532450
1988.70	531089	531161	531233	531304	531376	531447	531519	531591	531662	531734
1988.60	530374	530446	530517	530589	530660	530732	530803	530875	530946	531018
1988.50	529659	529731	529802	529874	529945	530017	530088	530159	530231	530303
1988.40	528945	529016	529088	529159	529230	529302	529373	529445	529516	529588
1988.30	528231	528302	528374	528445	528517	528588	528659	528731	528802	528873
1988.20	527518	527589	527661	527732	527803	527874	527946	528017	528088	528160
1988.10	526805	526877	526948	527019	527090	527162	527233	527304	527375	527447
1988.00	526093	526165	526236	526307	526378	526449	526521	526592	526663	526734
1987.90	525382	525453	525524	525595	525666	525738	525809	525880	525951	526022
1987.80	524671	524742	524813	524884	524955	525026	525098	525169	525240	525311
1987.70	523961	524032	524103	524174	524245	524316	524387	524458	524529	524600
1987.60	523251	523322	523393	523464	523535	523606	523677	523748	523819	523890
1987.50	522542	522613	522684	522755	522826	522896	522967	523038	523109	523180
1987.40	521833	521904	521975	522046	522117	522188	522258	522329	522400	522471
1987.30	521125	521196	521267	521338	521409	521479	521550	521621	521692	521763
1987.20	520418	520489	520559	520630	520701	520772	520842	520913	520984	521055
1987.10	519711	519782	519852	519923	519994	520065	520135	520206	520277	520347
1987.00	519005	519075	519146	519217	519287	519358	519429	519499	519570	519641
1986.90	518299	518370	518440	518511	518581	518652	518723	518793	518864	518934
1986.80	517594	517665	517735	517806	517876	517947	518017	518088	518158	518229
1986.70	516889	516960	517030	517101	517171	517242	517312	517383	517453	517524
1986.60	516185	516256	516326	516397	516467	516537	516608	516678	516749	516819
1986.50	515482	515552	515623	515693	515763	515834	515904	515974	516045	516115
1986.40	514779	514849	514920	514990	515060	515131	515201	515271	515341	515412
1986.30	514077	514147	514217	514288	514358	514428	514498	514568	514639	514709
1986.20	513375	513445	513515	513586	513656	513726	513796	513866	513937	514007
1986.10	512674	512744	512814	512884	512954	513025	513095	513165	513235	513305
1986.00	511973	512043	512114	512184	512254	512324	512394	512464	512534	512604
1985.90	511273	511343	511413	511483	511553	511623	511693	511763	511833	511903
1985.80	510574	510644	510714	510784	510854	510924	510994	511064	511134	511203
1985.70	509875	509945	510015	510085	510155	510224	510294	510364	510434	510504
1985.60	509177	509247	509316	509386	509456	509526	509596	509666	509735	509805
1985.50	508479	508549	508619	508688	508758	508828	508898	508967	509037	509107
1985.40	507782	507852	507921	507991	508061	508130	508200	508270	508340	508409
1985.30	507085	507155	507225	507294	507364	507434	507503	507573	507643	507712
1985.20	506389	506459	506528	506598	506668	506737	506807	506876	506946	507016
1985.10	505694	505763	505833	505902	505972	506041	506111	506181	506250	506320
1985.00	504999	505068	505138	505207	505277	505346	505416	505485	505555	505624

TABLE 2-1
REVISED APR. 1985 Page 20 of 21

HELLS CANYON COMPLEX - BROWNLEE ELEVATION VS. STORAGE IN ACRE FEET

ELEV	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1979.90	470305	470372	470438	470505	470571	470638	470705	470771	470838	470905
1979.80	469639	469706	469772	469839	469905	469972	470039	470105	470172	470238
1979.70	468974	469040	469107	469174	469240	469307	469373	469440	469506	469573
1979.60	468309	468376	468442	468509	468575	468642	468708	468775	468841	468908
1979.50	467645	467712	467778	467844	467911	467977	468044	468110	468176	468243
1979.40	466982	467048	467114	467181	467247	467313	467380	467446	467512	467579
1979.30	466319	466385	466451	466517	466584	466650	466716	466783	466849	466915
1979.20	465656	465722	465789	465855	465921	465987	466054	466120	466186	466252
1979.10	464994	465060	465126	465193	465259	465325	465391	465457	465524	465590
1979.00	464333	464399	464465	464531	464597	464663	464730	464796	464862	464928
1978.90	463672	463738	463804	463870	463936	464002	464068	464134	464201	464267
1978.80	463012	463078	463144	463210	463276	463342	463408	463474	463540	463606
1978.70	462352	462418	462484	462550	462616	462682	462748	462814	462880	462946
1978.60	461693	461759	461824	461890	461956	462022	462088	462154	462220	462286
1978.50	461034	461100	461166	461232	461297	461363	461429	461495	461561	461627
1978.40	460376	460442	460507	460573	460639	460705	460771	460836	460902	460968
1978.30	459718	459784	459850	459916	459981	460047	460113	460179	460244	460310
1978.20	459061	459127	459193	459258	459324	459390	459455	459521	459587	459653
1978.10	458405	458470	458536	458602	458667	458733	458799	458864	458930	458996
1978.00	457749	457814	457880	457946	458011	458077	458142	458208	458274	458339
1977.90	457093	457159	457224	457290	457356	457421	457487	457552	457618	457683
1977.80	456439	456504	456570	456635	456700	456766	456831	456897	456962	457028
1977.70	455784	455850	455915	455981	456046	456111	456177	456242	456308	456373
1977.60	455131	455196	455261	455327	455392	455457	455523	455588	455654	455719
1977.50	454477	454543	454608	454673	454739	454804	454869	454935	455000	455065
1977.40	453825	453890	453955	454020	454086	454151	454216	454281	454347	454412
1977.30	453173	453238	453303	453368	453433	453499	453564	453629	453694	453759
1977.20	452521	452586	452651	452716	452782	452847	452912	452977	453042	453107
1977.10	451870	451935	452000	452065	452130	452195	452260	452326	452391	452456
1977.00	451219	451284	451349	451414	451480	451545	451610	451675	451740	451805
1976.90	450569	450634	450699	450764	450829	450894	450959	451024	451089	451154
1976.80	449920	449985	450050	450115	450180	450245	450310	450375	450439	450504
1976.70	449271	449336	449401	449466	449531	449595	449660	449725	449790	449855
1976.60	448623	448688	448752	448817	448882	448947	449012	449077	449141	449206
1976.50	447975	448040	448104	448169	448234	448299	448364	448428	448493	448558
1976.40	447328	447392	447457	447522	447587	447651	447716	447781	447845	447910
1976.30	446681	446746	446810	446875	446940	447004	447069	447134	447198	447263
1976.20	446035	446099	446164	446229	446293	446358	446422	446487	446552	446616
1976.10	445389	445454	445518	445583	445647	445712	445777	445841	445906	445970
1976.00	444744	444809	444873	444938	445002	445067	445131	445196	445260	445325

TABLE 2-1
REVISED APR. 1985 Page 21 of 21

TABLE 4-1

CLIMATOLOGICAL DATA

Station	Elevation (in feet)	Temperature °F				Annual Precipiation (Inches)			
		Years of Record	Mean Annual	Highest Recorded	Lowest Recorded	Years of Record	Average	Maximum	Minimum
Alpha, Idaho	4,780	34	40.0	100	-47	34	25.91	34.3	17.2
Arco, Idaho	5,320	24	41.8	102	-37	35	9.4	16.6	5.1
Ashton, Idaho	5,100	50	41.4	100	-37	50	16.2	24.2	9.0
Bedford, Wyoming	6,221	55	38.6	97	-46	55	18.9	29.7	10.8
Blackfoot, Idaho	4,503	53	45.0	108	-40	55	10.8	18.1	5.2
Boise, Idaho	2,858	93	50.8	121	-28	93	11.5	25.8	6.7
Burley, Idaho	4.180	40	48.7	106	-35	40	9.4	15.0	3.5
Danner, Oregon	4,000	28	46.5	109	-46	28	10.5	16.5	5.6
Driggs, Idaho	6,097	50	38.9	97	-50	50	16.9	28.8	10.5
Gold Creek, Nevada	6,600	-	-	-	-	27	13.2	20.1	6.3
Hailey, Idaho	5,322	49	43.5	109	-36	50	15.3	22.0	8.2
Idaho City, Idaho	3,940	38	45.4	109	-38	40	21.5	35.5	12.5
Idaho Falls, Idaho	4,730	27	44.3	104	-37	27	11.6	21.3	6.0
Irwin, Idaho	5,200	47	41.4	102	-45	53	14.6	24.2	4.8
Island Park, Idaho	6,300	20	37.5	90	-60	19	28.8	37.4	21.2
Jackson, Wyoming	6,244	40	37.6	96	-52	40	16.6	28.4	11.1
Mackay, Idaho	5,897	43	42.3	104	-29	49	9.3	15.0	3.6
McCall, Idaho	5,025	38	39.8	104	-35	42	25.4	35.3	13.8
Moran, Wyoming	6,740	46	34.3	92	-63	46	21.7	29.3	14.6
Oakley, Idaho	4,191	55	48.3	108	-27	54	10.2	16.5	5.8
Owyhee, Nevada	5,401	35	46.2	108	-35	35	13.2	19.4	5.7
Payette, Idaho	2,159	56	50.5	113	-33	58	10.87	18.6	5.9
Pocatello, Idaho	4,466	57	47.2	105	-28	57	13.4	22.4	6.5
Richfield, Idaho	4,306	32	45.0	105	-40	33	9.7	14.0	5.7
Snake River, Wyoming	6,800	46	34.6	93	-56	46	27.8	50.1	21.3
Standrod, Utah	6,000	32	45.2	95	-18	32	12.6	19.7	8.8
Tuscarora, Nevada	6,400	-	-	-	-	47	14.1	19.9	8.3
Twin Falls, Idaho	3,770	50	48.5	106	-30	52	9.8	18.4	4.0
Warm Springs, Oregon	3,310	30	48.1	111	-53	30	9.3	18.3	4.4

DISCHARGE RATING TABLE

WEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.00	3700	3730	3760	3790	3820	3850	3880	3910	3940	3970
1.10	4000	4033	4066	4099	4132	4165	4198	4231	4264	4297
1.20	4330	4364	4398	4432	4465	4499	4533	4567	4601	4635
1.30	4669	4704	4738	4773	4808	4842	4877	4912	4946	4981
1.40	5016	5051	5086	5122	5157	5192	5228	5263	5298	5334
1.50	5369	5405	5441	5477	5513	5549	5585	5621	5657	5693
1.60	5729	5765	5802	5839	5875	5912	5948	5985	6022	6058
1.70	6095	6132	6170	6207	6244	6282	6319	6357	6394	6431
1.80	6469	6507	6545	6583	6621	6659	6697	6735	6773	6811
1.90	6849	6888	6926	6965	7004	7042	7081	7120	7158	7197
2.00	7236	7275	7314	7354	7393	7432	7472	7511	7550	7590
2.10	7629	7669	7709	7749	7789	7829	7869	7910	7950	7990
2.20	8030	8071	8111	8152	8193	8233	8274	8315	8355	8396
2.30	8437	8478	8520	8561	8602	8644	8685	8727	8768	8809
2.40	8851	8893	8935	8977	9019	9061	9103	9146	9188	9230
2.50	9272	9315	9357	9400	9443	9486	9529	9571	9614	9657
2.60	9700	9743	9787	9830	9873	9917	9960	10004	10047	10090
2.70	10134	10178	10222	10266	10311	10355	10399	10443	10487	10532
2.80	10576	10621	10665	10710	10755	10800	10845	10889	10934	10979
2.90	11024	11069	11115	11160	11206	11251	11297	11342	11388	11433
3.00	11479	11525	11571	11617	11663	11709	11755	11802	11848	11894
3.10	11940	11987	12034	12081	12127	12174	12221	12268	12315	12362
3.20	12409	12456	12504	12551	12599	12646	12694	12741	12789	12836
3.30	12884	12932	12980	13028	13077	13125	13173	13221	13269	13318
3.40	13366	13415	13463	13512	13561	13610	13659	13707	13756	13805

DISCHARGE RATING TABLE

WEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
3.50	13854	13903	13953	14003	14052	14102	14151	14201	14251	14300
3.60	14350	14400	14450	14500	14551	14601	14651	14701	14751	14802
3.70	14852	14903	14954	15005	15055	15106	15157	15208	15259	15310
3.80	15361	15412	15464	15516	15567	15619	15670	15722	15774	15825
3.90	15877	15929	15981	16034	16086	16138	16191	16243	16295	16348
4.00	16400	16451	16502	16553	16604	16655	16706	16757	16808	16859
4.10	16910	16961	17012	17063	17114	17165	17216	17267	17318	17369
4.20	17420	17471	17522	17573	17624	17675	17726	17777	17828	17879
4.30	17930	17981	18032	18083	18134	18185	18236	18287	18338	18389
4.40	18440	18491	18542	18593	18644	18695	18746	18797	18848	18899
4.50	18950	19001	19052	19103	19154	19205	19256	19307	19358	19409
4.60	19460	19511	19562	19613	19664	19715	19766	19817	19868	19919
4.70	19970	20021	20072	20123	20174	20225	20276	20327	20378	20429
4.80	20480	20531	20582	20633	20684	20735	20786	20837	20888	20939
4.90	20990	21041	21092	21143	21194	21245	21296	21347	21398	21449
5.00	21500	21554	21608	21662	21717	21771	21825	21879	21933	21988
5.10	22042	22096	22150	22204	22258	22312	22366	22421	22475	22529
5.20	22583	22637	22691	22745	22800	22854	22908	22962	23016	23071
5.30	23125	23179	23233	23287	23342	23396	23450	23504	23558	23613
5.40	23667	23721	23775	23829	23883	23937	23991	24046	24100	24154
5.50	24208	24262	24316	24370	24425	24479	24533	24587	24641	24696
5.60	24750	24804	24858	24912	24967	25021	25075	25129	25183	25238
5.70	25292	25346	25400	25454	25508	25562	25616	25671	25725	25779
5.80	25833	25887	25941	25995	26050	26104	26158	26212	26266	26321
5.90	26375	26429	26483	26537	26592	26646	26700	26754	26808	26863

DISCHARGE RATING TABLE

WEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
6.00	26917	26971	27025	27079	27133	27187	27241	27296	27350	27404
6.10	27458	27512	27566	27620	27675	27729	27783	27837	27891	27946
6.20	28000	28060	28120	28180	28240	28300	28360	28420	28480	28540
6.30	28600	28660	28720	28780	28840	28900	28960	29020	29080	29140
6.40	29200	29260	29320	29380	29440	29500	29560	29620	29680	29740
6.50	29800	29860	29920	29980	30040	30100	30160	30220	30280	30340
6.60	30400	30460	30520	30580	30640	30700	30760	30820	30880	30940
6.70	31000	31060	31120	31180	31240	31300	31360	31420	31480	31540
6.80	31600	31660	31720	31780	31840	31900	31960	32020	32080	32140
6.90	32200	32260	32320	32380	32440	32500	32560	32620	32680	32740
7.00	32800	32860	32920	32980	33040	33100	33160	33220	33280	33340
7.10	33400	33460	33520	33580	33640	33700	33760	33820	33880	33940
7.20	34000	34060	34120	34180	34240	34300	34360	34420	34480	34540
7.30	34600	34660	34720	34780	34840	34900	34960	35020	35080	35140
7.40	35200	35260	35320	35380	35440	35500	35560	35620	35680	35740
7.50	35800	35860	35920	35980	36040	36100	36160	36220	36280	36340
7.60	36400	36460	36520	36580	36640	36700	36760	36820	36880	36940
7.70	37000	37065	37130	37195	37260	37325	37390	37455	37520	37585
7.80	37650	37715	37780	37845	37910	37975	38040	38105	38170	38235
7.90	38300	38365	38430	38495	38560	38625	38690	38755	38820	38885
8.00	38950	39015	39080	39145	39210	39275	39340	39405	39470	39535
8.10	39600	39665	39730	39795	39860	39925	39990	40055	40120	40185
8.20	40250	40315	40380	40445	40510	40575	40640	40705	40770	40835
8.30	40900	40965	41030	41095	41160	41225	41290	41355	41420	41485
8.40	41550	41615	41680	41745	41810	41875	41940	42005	42070	42135

TABLE 4-2

DISCHARGE RATING TABLE

WEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
8.50	42200	42265	42330	42395	42460	42525	42590	42655	42720	42785
8.60	42850	42915	42980	43045	43110	43175	43240	43305	43370	43435
8.70	43500	43565	43630	43695	43760	43825	43890	43955	44020	44085
8.80	44150	44215	44280	44345	44410	44475	44540	44605	44670	44735
8.90	44800	44865	44930	44995	45060	45125	45190	45255	45320	45385
9.00	45450	45515	45580	45645	45710	45775	45840	45905	45970	46035
9.10	46100	46170	46240	46310	46380	46450	46520	46590	46660	46730
9.20	46800	46870	46940	47010	47080	47150	47220	47290	47360	47430
9.30	47500	47570	47640	47710	47780	47850	47920	47990	48060	48130
9.40	48200	48270	48340	48410	48480	48550	48620	48690	48760	48830
9.50	48900	48970	49040	49110	49180	49250	49320	49390	49460	49530
9.60	49600	49670	49740	49810	49880	49950	50020	50090	50160	50230
9.70	50300	50370	50440	50510	50580	50650	50720	50790	50860	50930
9.80	51000	51070	51140	51210	51280	51350	51420	51490	51560	51630
9.90	51700	51770	51840	51910	51980	52050	52120	52190	52260	52330
10.00	52400	52470	52540	52610	52680	52750	52820	52890	52960	53030
10.10	53100	53170	53240	53310	53380	53450	53520	53590	53660	53730
10.20	53800	53870	53940	54010	54080	54150	54220	54290	54360	54430
10.30	54500	54570	54640	54710	54780	54850	54920	54990	55060	55130
10.40	55200	55270	55340	55410	55480	55550	55620	55690	55760	55830
10.50	55900	55970	56040	56110	56180	56250	56320	56390	56460	56530
10.60	56600	56670	56740	56810	56880	56950	57020	57090	57160	57230
10.70	57300	57375	57450	57525	57600	57675	57750	57825	57900	57975
10.80	58050	58125	58200	58275	58350	58425	58500	58575	58650	58725
10.90	58800	58875	58950	59025	59100	59175	59250	59325	59400	59475

DISCHARGE RATING TABLE

WEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
11.00	59550	59625	59700	59775	59850	59925	60000	60075	60150	60225
11.10	60300	60375	60450	60525	60600	60675	60750	60825	60900	60975
11.20	61050	61125	61200	61275	61350	61425	61500	61575	61650	61725
11.30	61800	61875	61950	62025	62100	62175	62250	62325	62400	62475
11.40	62550	62625	62700	62775	62850	62925	63000	63075	63150	63225
11.50	63300	63377	63454	63531	63608	63685	63762	63839	63916	63993
11.60	64070	64147	64224	64301	64378	64455	64532	64609	64686	64763
11.70	64840	64917	64994	65071	65148	65225	65302	65379	65456	65533
11.80	65610	65687	65764	65841	65918	65995	66072	66149	66226	66303
11.90	66380	66457	66534	66611	66688	66765	66842	66919	66996	67073
12.00	67150	67227	67304	67381	67458	67535	67612	67689	67766	67843
12.10	67920	67997	68074	68151	68228	68305	68382	68459	68536	68613
12.20	68690	68767	68844	68921	68998	69075	69152	69229	69306	69383
12.30	69460	69537	69614	69691	69768	69845	69922	69999	70076	70153
12.40	70230	70307	70384	70461	70538	70615	70692	70769	70846	70923
12.50	71000	71078	71156	71234	71312	71390	71468	71546	71624	71702
12.60	71780	71858	71936	72014	72092	72170	72248	72326	72404	72482
12.70	72560	72638	72716	72794	72872	72950	73028	73106	73184	73262
12.80	73340	73418	73496	73574	73652	73730	73808	73886	73964	74042
12.90	74120	74198	74276	74354	74432	74510	74588	74666	74744	74822
13.00	74900	74980	75060	75140	75220	75300	75380	75460	75540	75620
13.10	75700	75780	75860	75940	76020	76100	76180	76260	76340	76420
13.20	76500	76580	76660	76740	76820	76900	76980	77060	77140	77220
13.30	77300	77380	77460	77540	77620	77700	77780	77860	77940	78020
13.40	78100	78180	78260	78340	78420	78500	78580	78660	78740	78820

DISCHARGE RATING TABLE

QEII SNAKE RIVER NEAR WEISER, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
13.50	78900	78980	79060	79140	79220	79300	79380	79460	79540	79620
13.60	79700	79780	79860	79940	80020	80100	80180	80260	80340	80420
13.70	80500	80580	80660	80740	80820	80900	80980	81060	81140	81220
13.80	81300	81380	81460	81540	81620	81700	81780	81860	81940	82020
13.90	82100	82180	82260	82340	82420	82500	82580	82660	82740	82820
14.00	82900	82970	83040	83110	83180	83250	83320	83390	83460	83530
14.10	83600	83670	83740	83810	83880	83950	84020	84090	84160	84230
14.20	84300	84370	84440	84510	84580	84650	84720	84790	84860	84930
14.30	85000	85070	85140	85210	85280	85350	85420	85490	85560	85630
14.40	85700	85770	85840	85910	85980	86050	86120	86190	86260	86330
14.50	86400	86470	86540	86610	86680	86750	86820	86890	86960	87030
14.60	87100	87170	87240	87310	87380	87450	87520	87590	87660	87730
14.70	87800	87870	87940	88010	88080	88150	88220	88290	88360	88430
14.80	88500	88570	88640	88710	88780	88850	88920	88990	89060	89130
14.90	89200	89270	89340	89410	89480	89550	89620	89690	89760	89830
15.00	89900.									

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.50										
1.60	6450	6480	6510	6540	6570	6600	6630	6660	6690	6720
1.70	6750	6780	6810	6840	6870	6900	6930	6960	6990	7020
1.80	7050	7080	7110	7140	7170	7200	7230	7260	7290	7320
1.90	7350	7380	7410	7440	7470	7500	7530	7560	7590	7620
2.00	7650	7680	7710	7740	7770	7800	7830	7860	7890	7920
2.10	7950	7980	8010	8040	8070	8100	8130	8160	8190	8220
2.20	8250	8285	8320	8355	8390	8425	8460	8495	8530	8565
2.30	8600	8635	8670	8705	8740	8775	8810	8845	8880	8915
2.40	8950	8985	9020	9055	9090	9125	9160	9195	9230	9265
2.50	9300	9335	9370	9405	9440	9475	9510	9545	9580	9615
2.60	9650	9685	9720	9755	9790	9825	9860	9895	9930	9965
2.70	10000	10035	10070	10105	10140	10175	10210	10245	10280	10315
2.80	10350	10385	10420	10455	10490	10525	10560	10595	10630	10665
2.90	10700	10735	10770	10805	10840	10875	10910	10945	10980	11015
3.00	11050	11090	11130	11170	11210	11250	11290	11330	11370	11410
3.10	11450	11490	11530	11570	11610	11650	11690	11730	11770	11810
3.20	11850	11890	11930	11970	12010	12050	12090	12130	12170	12210
3.30	12250	12290	12330	12370	12410	12450	12490	12530	12570	12610
3.40	12650	12690	12730	12770	12810	12850	12890	12930	12970	13010
3.50	13050	13095	13140	13185	13230	13275	13320	13365	13410	13455
3.60	13500	13545	13590	13635	13680	13725	13770	13815	13860	13905
3.70	13950	13995	14040	14085	14130	14175	14220	14265	14310	14355
3.80	14400	14445	14490	14535	14580	14625	14670	14715	14760	14805
3.90	14850	14895	14940	14985	15030	15075	15120	15165	15210	15255

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
4.00	15300	15345	15390	15435	15480	15525	15570	15615	15660	15705
4.10	15750	15795	15840	15885	15930	15975	16020	16065	16110	16155
4.20	16200	16245	16290	16335	16380	16425	16470	16515	16560	16605
4.30	16650	16695	16740	16785	16830	16875	16920	16965	17010	17055
4.40	17100	17150	17200	17250	17300	17350	17400	17450	17500	17550
4.50	17600	17645	17690	17735	17780	17825	17870	17915	17960	18005
4.60	18050	18095	18140	18185	18230	18275	18320	18365	18410	18455
4.70	18500	18550	18600	18650	18700	18750	18800	18850	18900	18950
4.80	19000	19050	19100	19150	19200	19250	19300	19350	19400	19450
4.90	19500	19550	19600	19650	19700	19750	19800	19850	19900	19950
5.00	20000	20050	20100	20150	20200	20250	20300	20350	20400	20450
5.10	20500	20550	20600	20650	20700	20750	20800	20850	20900	20950
5.20	21000	21050	21100	21150	21200	21250	21300	21350	21400	21450
5.30	21500	21550	21600	21650	21700	21750	21800	21850	21900	21950
5.40	22000	22050	22100	22150	22200	22250	22300	22350	22400	22450
5.50	22500	22550	22600	22650	22700	22750	22800	22850	22900	22950
5.60	23000	23060	23120	23180	23240	23300	23360	23420	23480	23540
5.70	23600	23660	23720	23780	23840	23900	23960	24020	24080	24140
5.80	24200	24260	24320	24380	24440	24500	24560	24620	24680	24740
5.90	24800	24860	24920	24980	25040	25100	25160	25220	25280	25340
6.00	25400	25460	25520	25580	25640	25700	25760	25820	25880	25940
6.10	26000	26060	26120	26180	26240	26300	26360	26420	26480	26540
6.20	26600	26660	26720	26780	26840	26900	26960	27020	27080	27140
6.30	27200	27260	27320	27380	27440	27500	27560	27620	27680	27740
6.40	27800	27860	27920	27980	28040	28100	28160	28220	28280	28340

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
6.50	28400	28460	28520	28580	28640	28700	28760	28820	28880	28940
6.60	29000	29060	29120	29180	29240	29300	29360	29420	29480	29540
6.70	29600	29660	29720	29780	29840	29900	29960	30020	30080	30140
6.80	30200	30260	30320	30380	30440	30500	30560	30620	30680	30740
6.90	30800	30870	30940	31010	31080	31150	31220	31290	31360	31430
7.00	31500	31570	31640	31710	31780	31850	31920	31990	32060	32130
7.10	32200	32270	32340	32410	32480	32550	32620	32690	32760	32830
7.20	32900	32970	33040	33110	33180	33250	33320	33390	33460	33530
7.30	33600	33670	33740	33810	33880	33950	34020	34090	34160	34230
7.40	34300	34370	34440	34510	34580	34650	34720	34790	34860	34930
7.50	35000	35070	35140	35210	35280	35350	35420	35490	35560	35630
7.60	35700	35770	35840	35910	35980	36050	36120	36190	36260	36330
7.70	36400	36470	36540	36610	36680	36750	36820	36890	36960	37030
7.80	37100	37170	37240	37310	37380	37450	37520	37590	37660	37730
7.90	37800	37870	37940	38010	38080	38150	38220	38290	38360	38430
8.00	38500	38570	38640	38710	38780	38850	38920	38990	39060	39130
8.10	39200	39270	39340	39410	39480	39550	39620	39690	39760	39830
8.20	39900	39970	40040	40110	40180	40250	40320	40390	40460	40530
8.30	40600	40670	40740	40810	40880	40950	41020	41090	41160	41230
8.40	41300	41370	41440	41510	41580	41650	41720	41790	41860	41930
8.50	42000	42080	42160	42240	42320	42400	42480	42560	42640	42720
8.60	42800	42880	42960	43040	43120	43200	43280	43360	43440	43520
8.70	43600	43680	43760	43840	43920	44000	44080	44160	44240	44320
8.80	44400	44480	44560	44640	44720	44800	44880	44960	45040	45120
8.90	45200	45280	45360	45440	45520	45600	45680	45760	45840	45920

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
9.00	46000	46080	46160	46240	46320	46400	46480	46560	46640	46720
9.10	46800	46880	46960	47040	47120	47200	47280	47360	47440	47520
9.20	47600	47680	47760	47840	47920	48000	48080	48160	48240	48320
9.30	48400	48480	48560	48640	48720	48800	48880	48960	49040	49120
9.40	49200	49280	49360	49440	49520	49600	49680	49760	49840	49920
9.50	50000	50080	50160	50240	50320	50400	50480	50560	50640	50720
9.60	50800	50880	50960	51040	51120	51200	51280	51360	51440	51520
9.70	51600	51680	51760	51840	51920	52000	52080	52160	52240	52320
9.80	52400	52480	52560	52640	52720	52800	52880	52960	53040	53120
9.90	53200	53280	53360	53440	53520	53600	53680	53760	53840	53920
10.00	54000	54080	54160	54240	54320	54400	54480	54560	54640	54720
10.10	54800	54880	54960	55040	55120	55200	55280	55360	55440	55520
10.20	55600	55680	55760	55840	55920	56000	56080	56160	56240	56320
10.30	56400	56480	56560	56640	56720	56800	56880	56960	57040	57120
10.40	57200	57280	57360	57440	57520	57600	57680	57760	57840	57920
10.50	58000	58080	58160	58240	58320	58400	58480	58560	58640	58720
10.60	58800	58880	58960	59040	59120	59200	59280	59360	59440	59520
10.70	59600	59680	59760	59840	59920	60000	60080	60160	60240	60320
10.80	60400	60480	60560	60640	60720	60800	60880	60960	61040	61120
10.90	61200	61280	61360	61440	61520	61600	61680	61760	61840	61920
11.00	62000	62080	62160	62240	62320	62400	62480	62560	62640	62720
11.10	62800	62880	62960	63040	63120	63200	63280	63360	63440	63520
11.20	63600	63680	63760	63840	63920	64000	64080	64160	64240	64320
11.30	64400	64480	64560	64640	64720	64800	64880	64960	65040	65120
11.40	65200	65280	65360	65440	65520	65600	65680	65760	65840	65920

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
11.50	66500	66590	66680	66770	66860	66950	67040	67130	67220	67310
11.60	67400	67490	67580	67670	67760	67850	67940	68030	68120	68210
11.70	68300	68390	68480	68570	68660	68750	68840	68930	69020	69110
11.80	69200	69290	69380	69470	69560	69650	69740	69830	69920	70010
11.90	70100	70190	70280	70370	70460	70550	70640	70730	70820	70910
12.00	71000	71090	71180	71270	71360	71450	71540	71630	71720	71810
12.10	71900	71990	72080	72170	72260	72350	72440	72530	72620	72710
12.20	72800	72890	72980	73070	73160	73250	73340	73430	73520	73610
12.30	73700	73790	73880	73970	74060	74150	74240	74330	74420	74510
12.40	74600	74690	74780	74870	74960	75050	75140	75230	75320	75410
12.50	75500	75590	75680	75770	75860	75950	76040	76130	76220	76310
12.60	76400	76490	76580	76670	76760	76850	76940	77030	77120	77210
12.70	77300	77390	77480	77570	77660	77750	77840	77930	78020	78110
12.80	78200	78290	78380	78470	78560	78650	78740	78830	78920	79010
12.90	79100	79190	79280	79370	79460	79550	79640	79730	79820	79910
13.00	80000	80090	80180	80270	80360	80450	80540	80630	80720	80810
13.10	80900	80990	81080	81170	81260	81350	81440	81530	81620	81710
13.20	81800	81890	81980	82070	82160	82250	82340	82430	82520	82610
13.30	82700	82790	82880	82970	83060	83150	83240	83330	83420	83510
13.40	83600	83690	83780	83870	83960	84050	84140	84230	84320	84410
13.50	84500	84590	84680	84770	84860	84950	85040	85130	85220	85310
13.60	85400	85490	85580	85670	85760	85850	85940	86030	86120	86210
13.70	86300	86390	86480	86570	86660	86750	86840	86930	87020	87110
13.80	87200	87290	87380	87470	87560	87650	87740	87830	87920	88010
13.90	88100	88190	88280	88370	88460	88550	88640	88730	88820	88910

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
14.00	89000	89090	89180	89270	89360	89450	89540	89630	89720	89810
14.10	89900	89990	90080	90170	90260	90350	90440	90530	90620	90710
14.20	90800	90890	90980	91070	91160	91250	91340	91430	91520	91610
14.30	91700	91790	91880	91970	92060	92150	92240	92330	92420	92510
14.40	92600	92690	92780	92870	92960	93050	93140	93230	93320	93410
14.50	93500	93590	93680	93770	93860	93950	94040	94130	94220	94310
14.60	94400	94490	94580	94670	94760	94850	94940	95030	95120	95210
14.70	95300	95390	95480	95570	95660	95750	95840	95930	96020	96110
14.80	96200	96290	96380	96470	96560	96650	96740	96830	96920	97010
14.90	97100	97190	97280	97370	97460	97550	97640	97730	97820	97910
15.00	98000	98090	98180	98270	98360	98450	98540	98630	98720	98810
15.10	98900	98990	99080	99170	99260	99350	99440	99530	99620	99710
15.20	99800	99890	99980	100070	100160	100250	100340	100430	100520	100610
15.30	100700	100790	100880	100970	101060	101150	101240	101330	101420	101510
15.40	101600	101690	101780	101870	101960	102050	102140	102230	102320	102410
15.50	102500	102590	102680	102770	102860	102950	103040	103130	103220	103310
15.60	103400	103490	103580	103670	103760	103850	103940	104030	104120	104210
15.70	104300	104390	104480	104570	104660	104750	104840	104930	105020	105110
15.80	105200	105290	105380	105470	105560	105650	105740	105830	105920	106010
15.90	106100	106190	106280	106370	106460	106550	106640	106730	106820	106910
16.00	107000	107100	107200	107300	107400	107500	107600	107700	107800	107900
16.10	108000	108100	108200	108300	108400	108500	108600	108700	108800	108900
16.20	109000	109100	109200	109300	109400	109500	109600	109700	109800	109900
16.30	110000	110100	110200	110300	110400	110500	110600	110700	110800	110900
16.40	111000	111100	111200	111300	111400	111500	111600	111700	111800	111900

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
16.50	112000	112100	112200	112300	112400	112500	112600	112700	112800	112900
16.60	113000	113100	113200	113300	113400	113500	113600	113700	113800	113900
16.70	114000	114100	114200	114300	114400	114500	114600	114700	114800	114900
16.80	115000	115100	115200	115300	115400	115500	115600	115700	115800	115900
16.90	116000	116100	116200	116300	116400	116500	116600	116700	116800	116900
17.00	117000	117100	117200	117300	117400	117500	117600	117700	117800	117900
17.10	118000	118100	118200	118300	118400	118500	118600	118700	118800	118900
17.20	119000	119100	119200	119300	119400	119500	119600	119700	119800	119900
17.30	120000	120100	120200	120300	120400	120500	120600	120700	120800	120900
17.40	121000	121100	121200	121300	121400	121500	121600	121700	121800	121900
17.50	122000	122100	122200	122300	122400	122500	122600	122700	122800	122900
17.60	123000	123100	123200	123300	123400	123500	123600	123700	123800	123900
17.70	124000	124100	124200	124300	124400	124500	124600	124700	124800	124900
17.80	125000	125100	125200	125300	125400	125500	125600	125700	125800	125900
17.90	126000	126100	126200	126300	126400	126500	126600	126700	126800	126900
18.00	127000	127100	127200	127300	127400	127500	127600	127700	127800	127900
18.10	128000	128100	128200	128300	128400	128500	128600	128700	128800	128900
18.20	129000	129100	129200	129300	129400	129500	129600	129700	129800	129900
18.30	130000	130100	130200	130300	130400	130500	130600	130700	130800	130900
18.40	131000	131100	131200	131300	131400	131500	131600	131700	131800	131900
18.50	132000	132100	132200	132300	132400	132500	132600	132700	132800	132900
18.60	133000	133100	133200	133300	133400	133500	133600	133700	133800	133900
18.70	134000	134100	134200	134300	134400	134500	134600	134700	134800	134900
18.80	135000	135100	135200	135300	135400	135500	135600	135700	135800	135900
18.90	136000	136100	136200	136300	136400	136500	136600	136700	136800	136900

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
19.00	137000	137100	137200	137300	137400	137500	137600	137700	137800	137900
19.10	138000	138100	138200	138300	138400	138500	138600	138700	138800	138900
19.20	139000	139100	139200	139300	139400	139500	139600	139700	139800	139900
19.30	140000	140100	140200	140300	140400	140500	140600	140700	140800	140900
19.40	141000	141100	141200	141300	141400	141500	141600	141700	141800	141900
19.50	142000	142100	142200	142300	142400	142500	142600	142700	142800	142900
19.60	143000	143100	143200	143300	143400	143500	143600	143700	143800	143900
19.70	144000	144100	144200	144300	144400	144500	144600	144700	144800	144900
19.80	145000	145100	145200	145300	145400	145500	145600	145700	145800	145900
19.90	146000	146100	146200	146300	146400	146500	146600	146700	146800	146900
20.00	147000	147100	147200	147300	147400	147500	147600	147700	147800	147900
20.10	148000	148100	148200	148300	148400	148500	148600	148700	148800	148900
20.20	149000	149100	149200	149300	149400	149500	149600	149700	149800	149900
20.30	150000	150100	150200	150300	150400	150500	150600	150700	150800	150900
20.40	151000	151100	151200	151300	151400	151500	151600	151700	151800	151900
20.50	152000	152100	152200	152300	152400	152500	152600	152700	152800	152900
20.60	153000	153100	153200	153300	153400	153500	153600	153700	153800	153900
20.70	154000	154100	154200	154300	154400	154500	154600	154700	154800	154900
20.80	155000	155100	155200	155300	155400	155500	155600	155700	155800	155900
20.90	156000	156100	156200	156300	156400	156500	156600	156700	156800	156900
21.00	157000	157110	157220	157330	157440	157550	157660	157770	157880	157990
21.10	158100	158210	158320	158430	158540	158650	158760	158870	158980	159090
21.20	159200	159310	159420	159530	159640	159750	159860	159970	160080	160190
21.30	160300	160410	160520	160630	160740	160850	160960	161070	161180	161290
21.40	161400	161510	161620	161730	161840	161950	162060	162170	162280	162390

DISCHARGE RATING TABLE

ANAU SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
21.50	162500	162610	162720	162830	162940	163050	163160	163270	163380	163490
21.60	163600	163710	163820	163930	164040	164150	164260	164370	164480	164590
21.70	164700	164810	164920	165030	165140	165250	165360	165470	165580	165690
21.80	165800	165910	166020	166130	166240	166350	166460	166570	166680	166790
21.90	166900	167010	167120	167230	167340	167450	167560	167670	167780	167890
22.00	168000	168110	168220	168330	168440	168550	168660	168770	168880	168990
22.10	169100	169210	169320	169430	169540	169650	169760	169870	169980	170090
22.20	170200	170310	170420	170530	170640	170750	170860	170970	171080	171190
22.30	171300	171410	171520	171630	171740	171850	171960	172070	172180	172290
22.40	172400	172510	172620	172730	172840	172950	173060	173170	173280	173390
22.50	173500	173610	173720	173830	173940	174050	174160	174270	174380	174490
22.60	174600	174710	174820	174930	175040	175150	175260	175370	175480	175590
22.70	175700	175810	175920	176030	176140	176250	176360	176470	176580	176690
22.80	176800	176910	177020	177130	177240	177350	177460	177570	177680	177790
22.90	177900	178010	178120	178230	178340	178450	178560	178670	178780	178890
23.00	179000	179110	179220	179330	179440	179550	179660	179770	179880	179990
23.10	180100	180210	180320	180430	180540	180650	180760	180870	180980	181090
23.20	181200	181310	181420	181530	181640	181750	181860	181970	182080	182190
23.30	182300	182410	182520	182630	182740	182850	182960	183070	183180	183290
23.40	183400	183510	183620	183730	183840	183950	184060	184170	184280	184390
23.50	184500	184610	184720	184830	184940	185050	185160	185270	185380	185490
23.60	185600	185710	185820	185930	186040	186150	186260	186370	186480	186590
23.70	186700	186810	186920	187030	187140	187250	187360	187470	187580	187690
23.80	187800	187910	188020	188130	188240	188350	188460	188570	188680	188790
23.90	188900	189010	189120	189230	189340	189450	189560	189670	189780	189890

DISCHARGE RATING TABLE

ANAW SNAKE RIVER NEAR ANATONE, WA 4 FEBRUARY 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
24.00	190000.									

TABLE 4-3
Page 10 of 10

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
11.00										
11.10	1840	1852	1864	1876	1888	1900	1912	1924	1936	1948
11.20	1960	1972	1984	1996	2008	2020	2032	2044	2056	2068
11.30	2080	2093	2106	2119	2132	2145	2158	2171	2184	2197
11.40	2210	2223	2236	2249	2262	2275	2288	2301	2314	2327
11.50	2340	2353	2366	2379	2392	2405	2418	2431	2444	2457
11.60	2470	2484	2498	2512	2526	2540	2554	2568	2582	2596
11.70	2610	2624	2638	2652	2666	2680	2694	2708	2722	2736
11.80	2750	2764	2778	2792	2806	2820	2834	2848	2862	2876
11.90	2890	2905	2920	2935	2950	2965	2980	2995	3010	3025
12.00	3040	3055	3070	3085	3100	3115	3130	3145	3160	3175
12.10	3190	3205	3220	3235	3250	3265	3280	3295	3310	3325
12.20	3340	3355	3370	3385	3400	3415	3430	3445	3460	3475
12.30	3490	3505	3520	3535	3550	3565	3580	3595	3610	3625
12.40	3640	3656	3672	3688	3704	3720	3736	3752	3768	3784
12.50	3800	3816	3832	3848	3864	3880	3896	3912	3928	3944
12.60	3960	3977	3994	4011	4028	4045	4062	4079	4096	4113
12.70	4130	4147	4164	4181	4198	4215	4232	4249	4266	4283
12.80	4300	4317	4334	4351	4368	4385	4402	4419	4436	4453
12.90	4470	4488	4506	4524	4542	4560	4578	4596	4614	4632
13.00	4650	4668	4686	4704	4722	4740	4758	4776	4794	4812
13.10	4830	4848	4866	4884	4902	4920	4938	4956	4974	4992
13.20	5010	5029	5048	5067	5086	5105	5124	5143	5162	5181
13.30	5200	5219	5238	5257	5276	5295	5314	5333	5352	5371
13.40	5390	5410	5430	5450	5470	5490	5510	5530	5550	5570

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
13.50	5590	5610	5630	5650	5670	5690	5710	5730	5750	5770
13.60	5790	5810	5830	5850	5870	5890	5910	5930	5950	5970
13.70	5990	6011	6032	6053	6074	6095	6116	6137	6158	6179
13.80	6200	6221	6242	6263	6284	6305	6326	6347	6368	6389
13.90	6410	6431	6452	6473	6494	6515	6536	6557	6578	6599
14.00	6620	6642	6664	6686	6708	6730	6752	6774	6796	6818
14.10	6840	6862	6884	6906	6928	6950	6972	6994	7016	7038
14.20	7060	7083	7106	7129	7152	7175	7198	7221	7244	7267
14.30	7290	7313	7336	7359	7382	7405	7428	7451	7474	7497
14.40	7520	7544	7568	7592	7616	7640	7664	7688	7712	7736
14.50	7760	7784	7808	7832	7856	7880	7904	7928	7952	7976
14.60	8000	8025	8050	8075	8100	8125	8150	8175	8200	8225
14.70	8250	8275	8300	8325	8350	8375	8400	8425	8450	8475
14.80	8500	8525	8550	8575	8600	8625	8650	8675	8700	8725
14.90	8750	8776	8802	8828	8854	8880	8906	8932	8958	8984
15.00	9010	9036	9062	9088	9114	9140	9166	9192	9218	9244
15.10	9270	9297	9324	9351	9378	9405	9432	9459	9486	9513
15.20	9540	9567	9594	9621	9648	9675	9702	9729	9756	9783
15.30	9810	9837	9864	9891	9918	9945	9972	9999	10026	10053
15.40	10080	10107	10134	10161	10188	10215	10242	10269	10296	10323
15.50	10350	10377	10404	10431	10458	10485	10512	10539	10566	10593
15.60	10620	10647	10674	10701	10728	10755	10782	10809	10836	10863
15.70	10890	10917	10944	10971	10998	11025	11052	11079	11106	11133
15.80	11160	11187	11214	11241	11268	11295	11322	11349	11376	11403
15.90	11430	11457	11484	11511	11538	11565	11592	11619	11646	11673

DISCHARGE RATING TABLE

UHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
16.00	11700	11730	11760	11790	11820	11850	11880	11910	11940	11970
16.10	12000	12030	12060	12090	12120	12150	12180	12210	12240	12270
16.20	12300	12330	12360	12390	12420	12450	12480	12510	12540	12570
16.30	12600	12630	12660	12690	12720	12750	12780	12810	12840	12870
16.40	12900	12930	12960	12990	13020	13050	13080	13110	13140	13170
16.50	13200	13230	13260	13290	13320	13350	13380	13410	13440	13470
16.60	13500	13530	13560	13590	13620	13650	13680	13710	13740	13770
16.70	13800	13830	13860	13890	13920	13950	13980	14010	14040	14070
16.80	14100	14130	14160	14190	14220	14250	14280	14310	14340	14370
16.90	14400	14430	14460	14490	14520	14550	14580	14610	14640	14670
17.00	14700	14735	14770	14805	14840	14875	14910	14945	14980	15015
17.10	15050	15085	15120	15155	15190	15225	15260	15295	15330	15365
17.20	15400	15435	15470	15505	15540	15575	15610	15645	15680	15715
17.30	15750	15785	15820	15855	15890	15925	15960	15995	16030	16065
17.40	16100	16135	16170	16205	16240	16275	16310	16345	16380	16415
17.50	16450	16485	16520	16555	16590	16625	16660	16695	16730	16765
17.60	16800	16835	16870	16905	16940	16975	17010	17045	17080	17115
17.70	17150	17185	17220	17255	17290	17325	17360	17395	17430	17465
17.80	17500	17535	17570	17605	17640	17675	17710	17745	17780	17815
17.90	17850	17885	17920	17955	17990	18025	18060	18095	18130	18165
18.00	18200	18235	18270	18305	18340	18375	18410	18445	18480	18515
18.10	18550	18585	18620	18655	18690	18725	18760	18795	18830	18865
18.20	18900	18935	18970	19005	19040	19075	19110	19145	19180	19215
18.30	19250	19285	19320	19355	19390	19425	19460	19495	19530	19565
18.40	19600	19640	19680	19720	19760	19800	19840	19880	19920	19960

DISCHARGE RATING TABLE

UHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
18.50	20000	20040	20080	20120	20160	20200	20240	20280	20320	20360
18.60	20400	20440	20480	20520	20560	20600	20640	20680	20720	20760
18.70	20800	20840	20880	20920	20960	21000	21040	21080	21120	21160
18.80	21200	21240	21280	21320	21360	21400	21440	21480	21520	21560
18.90	21600	21640	21680	21720	21760	21800	21840	21880	21920	21960
19.00	22000	22040	22080	22120	22160	22200	22240	22280	22320	22360
19.10	22400	22440	22480	22520	22560	22600	22640	22680	22720	22760
19.20	22800	22840	22880	22920	22960	23000	23040	23080	23120	23160
19.30	23200	23240	23280	23320	23360	23400	23440	23480	23520	23560
19.40	23600	23640	23680	23720	23760	23800	23840	23880	23920	23960
19.50	24000	24040	24080	24120	24160	24200	24240	24280	24320	24360
19.60	24400	24440	24480	24520	24560	24600	24640	24680	24720	24760
19.70	24800	24840	24880	24920	24960	25000	25040	25080	25120	25160
19.80	25200	25240	25280	25320	25360	25400	25440	25480	25520	25560
19.90	25600	25640	25680	25720	25760	25800	25840	25880	25920	25960
20.00	26000	26040	26080	26120	26160	26200	26240	26280	26320	26360
20.10	26400	26440	26480	26520	26560	26600	26640	26680	26720	26760
20.20	26800	26840	26880	26920	26960	27000	27040	27080	27120	27160
20.30	27200	27240	27280	27320	27360	27400	27440	27480	27520	27560
20.40	27600	27640	27680	27720	27760	27800	27840	27880	27920	27960
20.50	28000	28045	28090	28135	28180	28225	28270	28315	28360	28405
20.60	28450	28495	28540	28585	28630	28675	28720	28765	28810	28855
20.70	28900	28945	28990	29035	29080	29125	29170	29215	29260	29305
20.80	29350	29395	29440	29485	29530	29575	29620	29665	29710	29755
20.90	29800	29845	29890	29935	29980	30025	30070	30115	30160	30205

TABLE 4-4

DISCHARGE RATING TABLE

UHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
21.00	30250	30295	30340	30385	30430	30475	30520	30565	30610	30655
21.10	30700	30745	30790	30835	30880	30925	30970	31015	31060	31105
21.20	31150	31195	31240	31285	31330	31375	31420	31465	31510	31555
21.30	31600	31645	31690	31735	31780	31825	31870	31915	31960	32005
21.40	32050	32095	32140	32185	32230	32275	32320	32365	32410	32455
21.50	32500	32545	32590	32635	32680	32725	32770	32815	32860	32905
21.60	32950	32995	33040	33085	33130	33175	33220	33265	33310	33355
21.70	33400	33445	33490	33535	33580	33625	33670	33715	33760	33805
21.80	33850	33895	33940	33985	34030	34075	34120	34165	34210	34255
21.90	34300	34350	34400	34450	34500	34550	34600	34650	34700	34750
22.00	34800	34850	34900	34950	35000	35050	35100	35150	35200	35250
22.10	35300	35350	35400	35450	35500	35550	35600	35650	35700	35750
22.20	35800	35850	35900	35950	36000	36050	36100	36150	36200	36250
22.30	36300	36350	36400	36450	36500	36550	36600	36650	36700	36750
22.40	36800	36850	36900	36950	37000	37050	37100	37150	37200	37250
22.50	37300	37350	37400	37450	37500	37550	37600	37650	37700	37750
22.60	37800	37850	37900	37950	38000	38050	38100	38150	38200	38250
22.70	38300	38350	38400	38450	38500	38550	38600	38650	38700	38750
22.80	38800	38850	38900	38950	39000	39050	39100	39150	39200	39250
22.90	39300	39350	39400	39450	39500	39550	39600	39650	39700	39750
23.00	39800	39850	39900	39950	40000	40050	40100	40150	40200	40250
23.10	40300	40350	40400	40450	40500	40550	40600	40650	40700	40750
23.20	40800	40850	40900	40950	41000	41050	41100	41150	41200	41250
23.30	41300	41350	41400	41450	41500	41550	41600	41650	41700	41750
23.40	41800	41850	41900	41950	42000	42050	42100	42150	42200	42250

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
23.50	42300	42350	42400	42450	42500	42550	42600	42650	42700	42750
23.60	42800	42855	42910	42965	43020	43075	43130	43185	43240	43295
23.70	43350	43405	43460	43515	43570	43625	43680	43735	43790	43845
23.80	43900	43955	44010	44065	44120	44175	44230	44285	44340	44395
23.90	44450	44505	44560	44615	44670	44725	44780	44835	44890	44945
24.00	45000	45055	45110	45165	45220	45275	45330	45385	45440	45495
24.10	45550	45605	45660	45715	45770	45825	45880	45935	45990	46045
24.20	46100	46155	46210	46265	46320	46375	46430	46485	46540	46595
24.30	46650	46705	46760	46815	46870	46925	46980	47035	47090	47145
24.40	47200	47255	47310	47365	47420	47475	47530	47585	47640	47695
24.50	47750	47805	47860	47915	47970	48025	48080	48135	48190	48245
24.60	48300	48355	48410	48465	48520	48575	48630	48685	48740	48795
24.70	48850	48905	48960	49015	49070	49125	49180	49235	49290	49345
24.80	49400	49455	49510	49565	49620	49675	49730	49785	49840	49895
24.90	49950	50005	50060	50115	50170	50225	50280	50335	50390	50445
25.00	50500	50560	50620	50680	50740	50800	50860	50920	50980	51040
25.10	51100	51160	51220	51280	51340	51400	51460	51520	51580	51640
25.20	51700	51760	51820	51880	51940	52000	52060	52120	52180	52240
25.30	52300	52360	52420	52480	52540	52600	52660	52720	52780	52840
25.40	52900	52960	53020	53080	53140	53200	53260	53320	53380	53440
25.50	53500	53560	53620	53680	53740	53800	53860	53920	53980	54040
25.60	54100	54160	54220	54280	54340	54400	54460	54520	54580	54640
25.70	54700	54760	54820	54880	54940	55000	55060	55120	55180	55240
25.80	55300	55360	55420	55480	55540	55600	55660	55720	55780	55840
25.90	55900	55960	56020	56080	56140	56200	56260	56320	56380	56440

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
26.00	56500	56565	56630	56695	56760	56825	56890	56955	57020	57085
26.10	57150	57215	57280	57345	57410	57475	57540	57605	57670	57735
26.20	57800	57865	57930	57995	58060	58125	58190	58255	58320	58385
26.30	58450	58515	58580	58645	58710	58775	58840	58905	58970	59035
26.40	59100	59165	59230	59295	59360	59425	59490	59555	59620	59685
26.50	59750	59815	59880	59945	60010	60075	60140	60205	60270	60335
26.60	60400	60465	60530	60595	60660	60725	60790	60855	60920	60985
26.70	61050	61115	61180	61245	61310	61375	61440	61505	61570	61635
26.80	61700	61765	61830	61895	61960	62025	62090	62155	62220	62285
26.90	62350	62415	62480	62545	62610	62675	62740	62805	62870	62935
27.00	63000	63070	63140	63210	63280	63350	63420	63490	63560	63630
27.10	63700	63770	63840	63910	63980	64050	64120	64190	64260	64330
27.20	64400	64470	64540	64610	64680	64750	64820	64890	64960	65030
27.30	65100	65170	65240	65310	65380	65450	65520	65590	65660	65730
27.40	65800	65870	65940	66010	66080	66150	66220	66290	66360	66430
27.50	66500	66570	66640	66710	66780	66850	66920	66990	67060	67130
27.60	67200	67270	67340	67410	67480	67550	67620	67690	67760	67830
27.70	67900	67970	68040	68110	68180	68250	68320	68390	68460	68530
27.80	68600	68670	68740	68810	68880	68950	69020	69090	69160	69230
27.90	69300	69370	69440	69510	69580	69650	69720	69790	69860	69930
28.00	70000	70070	70140	70210	70280	70350	70420	70490	70560	70630
28.10	70700	70770	70840	70910	70980	71050	71120	71190	71260	71330
28.20	71400	71470	71540	71610	71680	71750	71820	71890	71960	72030
28.30	72100	72170	72240	72310	72380	72450	72520	72590	72660	72730
28.40	72800	72870	72940	73010	73080	73150	73220	73290	73360	73430

DISCHARGE RATING TABLE

UHBI : SALMON RIVER AT UHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
28.50	73500	73570	73640	73710	73780	73850	73920	73990	74060	74130
28.60	74200	74270	74340	74410	74480	74550	74620	74690	74760	74830
28.70	74900	74970	75040	75110	75180	75250	75320	75390	75460	75530
28.80	75600	75670	75740	75810	75880	75950	76020	76090	76160	76230
28.90	76300	76370	76440	76510	76580	76650	76720	76790	76860	76930
29.00	77000	77070	77140	77210	77280	77350	77420	77490	77560	77630
29.10	77700	77770	77840	77910	77980	78050	78120	78190	78260	78330
29.20	78400	78470	78540	78610	78680	78750	78820	78890	78960	79030
29.30	79100	79170	79240	79310	79380	79450	79520	79590	79660	79730
29.40	79800	79870	79940	80010	80080	80150	80220	80290	80360	80430
29.50	80500	80570	80640	80710	80780	80850	80920	80990	81060	81130
29.60	81200	81270	81340	81410	81480	81550	81620	81690	81760	81830
29.70	81900	81970	82040	82110	82180	82250	82320	82390	82460	82530
29.80	82600	82670	82740	82810	82880	82950	83020	83090	83160	83230
29.90	83300	83370	83440	83510	83580	83650	83720	83790	83860	83930
30.00	84000	84080	84160	84240	84320	84400	84480	84560	84640	84720
30.10	84800	84880	84960	85040	85120	85200	85280	85360	85440	85520
30.20	85600	85680	85760	85840	85920	86000	86080	86160	86240	86320
30.30	86400	86480	86560	86640	86720	86800	86880	86960	87040	87120
30.40	87200	87280	87360	87440	87520	87600	87680	87760	87840	87920
30.50	88000	88080	88160	88240	88320	88400	88480	88560	88640	88720
30.60	88800	88880	88960	89040	89120	89200	89280	89360	89440	89520
30.70	89600	89680	89760	89840	89920	90000	90080	90160	90240	90320
30.80	90400	90480	90560	90640	90720	90800	90880	90960	91040	91120
30.90	91200	91280	91360	91440	91520	91600	91680	91760	91840	91920

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
31.00	92000	92080	92160	92240	92320	92400	92480	92560	92640	92720
31.10	92800	92880	92960	93040	93120	93200	93280	93360	93440	93520
31.20	93600	93680	93760	93840	93920	94000	94080	94160	94240	94320
31.30	94400	94480	94560	94640	94720	94800	94880	94960	95040	95120
31.40	95200	95280	95360	95440	95520	95600	95680	95760	95840	95920
31.50	96000	96080	96160	96240	96320	96400	96480	96560	96640	96720
31.60	96800	96880	96960	97040	97120	97200	97280	97360	97440	97520
31.70	97600	97680	97760	97840	97920	98000	98080	98160	98240	98320
31.80	98400	98480	98560	98640	98720	98800	98880	98960	99040	99120
31.90	99200	99280	99360	99440	99520	99600	99680	99760	99840	99920
32.00	100000	100080	100160	100240	100320	100400	100480	100560	100640	100720
32.10	100800	100880	100960	101040	101120	101200	101280	101360	101440	101520
32.20	101600	101680	101760	101840	101920	102000	102080	102160	102240	102320
32.30	102400	102480	102560	102640	102720	102800	102880	102960	103040	103120
32.40	103200	103280	103360	103440	103520	103600	103680	103760	103840	103920
32.50	104000	104080	104160	104240	104320	104400	104480	104560	104640	104720
32.60	104800	104880	104960	105040	105120	105200	105280	105360	105440	105520
32.70	105600	105680	105760	105840	105920	106000	106080	106160	106240	106320
32.80	106400	106480	106560	106640	106720	106800	106880	106960	107040	107120
32.90	107200	107280	107360	107440	107520	107600	107680	107760	107840	107920
33.00	108000	108090	108180	108270	108360	108450	108540	108630	108720	108810
33.10	108900	108990	109080	109170	109260	109350	109440	109530	109620	109710
33.20	109800	109890	109980	110070	110160	110250	110340	110430	110520	110610
33.30	110700	110790	110880	110970	111060	111150	111240	111330	111420	111510
33.40	111600	111690	111780	111870	111960	112050	112140	112230	112320	112410

DISCHARGE RATING TABLE

WHBI SALMON RIVER AT WHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
33.50	112500	112590	112680	112770	112860	112950	113040	113130	113220	113310
33.60	113400	113490	113580	113670	113760	113850	113940	114030	114120	114210
33.70	114300	114390	114480	114570	114660	114750	114840	114930	115020	115110
33.80	115200	115290	115380	115470	115560	115650	115740	115830	115920	116010
33.90	116100	116190	116280	116370	116460	116550	116640	116730	116820	116910
34.00	117000	117090	117180	117270	117360	117450	117540	117630	117720	117810
34.10	117900	117990	118080	118170	118260	118350	118440	118530	118620	118710
34.20	118800	118890	118980	119070	119160	119250	119340	119430	119520	119610
34.30	119700	119790	119880	119970	120060	120150	120240	120330	120420	120510
34.40	120600	120690	120780	120870	120960	121050	121140	121230	121320	121410
34.50	121500	121590	121680	121770	121860	121950	122040	122130	122220	122310
34.60	122400	122490	122580	122670	122760	122850	122940	123030	123120	123210
34.70	123300	123390	123480	123570	123660	123750	123840	123930	124020	124110
34.80	124200	124290	124380	124470	124560	124650	124740	124830	124920	125010
34.90	125100	125190	125280	125370	125460	125550	125640	125730	125820	125910
35.00	126000	126090	126180	126270	126360	126450	126540	126630	126720	126810
35.10	126900	126990	127080	127170	127260	127350	127440	127530	127620	127710
35.20	127800	127890	127980	128070	128160	128250	128340	128430	128520	128610
35.30	128700	128790	128880	128970	129060	129150	129240	129330	129420	129510
35.40	129600	129690	129780	129870	129960	130050	130140	130230	130320	130410
35.50	130500	130590	130680	130770	130860	130950	131040	131130	131220	131310
35.60	131400	131490	131580	131670	131760	131850	131940	132030	132120	132210
35.70	132300	132390	132480	132570	132660	132750	132840	132930	133020	133110
35.80	133200	133290	133380	133470	133560	133650	133740	133830	133920	134010
35.90	134100	134190	134280	134370	134460	134550	134640	134730	134820	134910

DISCHARGE RATING TABLE

UHBI SALMON RIVER AT UHITEBIRD, ID 1 FEB 1980

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
36.00	135000.									

TABLE 4-4
Page 11 of 11

TABLE 4-5

EXISTING RESERVOIRS
SNAKE RIVER BASIN ABOVE BROWNLEE DAM

State of Wyoming

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
1	Jackson Lake	Snake River	T45N R115W	847,000	
2	Emma Matilda	Emma Matilda Lake	T45N R114W		
3	Two Ocean	Two Ocean Lake	T46N R114W	5,000	
4	Grassy Lake	Falls River	T48N R117W	15,400	

State of Idaho

Bannock County

1	Hawkins	Hawkins Creek	Near Virginia	2,500	
	6 Small Dams			1,130	

Blaine County

1	Carey Valley	Fish Creek	T1N R22E	14,410	
2	Little Fish	Little Fish Creek	T1N R21E	450	
3	Cameron	Little Fish Creek	T1N R21E	1,200	
4	Little Wood	Little Wood River	T1N R20E	30,000	
5	Magic	Big Wood River	T2S R18E	191,500	
6	Campbell	Lava Draw	T2N R21E	2,700	
7	Sonner	Canyon Creek	T2S R19E	2,400	
	5 Small Dams			510	

Bonneville County

1	Sessions	Deep Creek	T2N R41E	500	
2	Palisades	Snake River	T1S R45E	1,402,000	
	3 Small Dams			430	

Bingham County

1	Equalizing Res	Blackfoot River	- -	3,000	

Camas County

1	Lake	Lake Creek	T2S R14E	31,000	
2	Johnson	W Springs Creek	T2S R15E	400	
3	Twin Lakes	Camas Creek	- -	31,240	Off-stream
	10 Small			1,670	

Caribou County

1	Grays Lake	Grays Lake	T5S R42E	100,000	
2	Chesterfield	24 Mile Creek	T6S R39E	700	
3	Portneuf-Marsit	Portneuf River	T6S R38E	23,690	
4	Blackfoot	Blackfoot River	T5S R40E	409,000	
	9 Small Dams			1,570	

.TABLE 4-5 CON'T.

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		Cassia County			
1	Neddo	Meadow Creek	T13S R26E	1,200	
2	Sublett	Sublett Creek	T13S R29E	2,390	
3	Oakley	Goose Creek	T14S R22E	74,350	
4	Marsh	Marsh Creek	T11S R25E	750	
	2 Small Dams			450	
		Clark County			
1	Aldous	Aldous Lake	T14N R39E	500	
2	Sheridan	Dry Creek	T13N R40E	4,500	
3	Harmon	W. Camas Creek	T12N R38E	6,000	
4	Modoc	Modoc Creek	Near Humphrey	220	
		Custer County			
1	Blaine	Dry Creek	T9N R24E	3,270	
2	Mackay	Big Lost River	T7N R23E	38,400	
	4 Small Dams			1,300	
		Fremont County			
1	Henry's Lake	Dry Creek	T15N R43E	79,000	
2	Island Park	N Fork Snake River	T13N R43E	127,300	
	5 Small Dams			450	
		Gooding County			
1	Frey Lake	Dry Creek	T4S R13E	760	
2	Lower Salmon Falls	Snake River	- -	5,200	
	2 Small Dams			150	
		Jefferson County			
1	Hays	Snake River	T5N R37E	3,500	
2	Wilson	Spring Lake	T7N R34E	4,640	
3	Neyman	Unnamed Lake	T6N R36E	600	
4	Hamer	Hamer Lake	T7N R36E	1,200	
5	Mudlake	Mud Lake	T6N R34E	41,500	
6	Sand Hole Lake	Spring Creek	T7N R35E	1,500	
7	Jefferson	Jefferson Lake	T7N R34E	1,200	
		Minidoka County			
1	Lake Walcott	Snake River	T9S R25E	107,000	
		Power County			
1	American Falls	Snake River	T7S R31E	1,700,000	

TABLE 4-5 CON'T.

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		Twin Falls County			
1	Shoshone	Shoshone Creek	T14S R17E	2,750	
2	Deep Creek	Deep Creek	T13S R15E	1,500	
3	Salmon Falls	Salmon Falls Creek	T14S R15E	182,600	
4	Cedar Creek	Cedar Creek	T13S R14E	26,000	
5	Milner	Snake River	T10S R21E		Diversion
6	Cottonwood Cr	Cottonwood Creek	T13S R17E	1,500	
	4 Small Dams			910	
		Teton County			
1	Pack Saddle	Pack Saddle Creek	T5N R44E	500	
		Ada County			
1	Pleasant Valley	10 Mile Creek	T2N R3E	7,900	
2	Hubbard Lake	Waste N Y Canal	T2N R1E	7,500	
3	Diversion Dam	Boise River	T2N R3E		Diversion
4	Orchard	Indian Creek	T1N R4E	2,450	
5	Lucky Peak	Boise River	T3N R4E	307,000	
	4 Small Dams			270	
		Adams County			
1	Hornet Creek	Hornet Creek	T17N R3W	480	
2	Lost Valley	Lost Valley Creek	T19N R1W	14,000	
3	C Ben Ross	Little Weiser	T14N R1W	9,580	
4	Swisher	Anderson Creek	T14N R1W	480	
		Boise County			
1	Arrowrock	Boise River	T3N R4E	286,500	
		Canyon County			
1	Deer Flat	Boise River	T3N R3W	177,000	Off-stream
		Elmore County			
1	Anderson Ranch	South Fork Boise	T1S R8E	493,200	
2	Little Canyon	Little Canyon Creek	T5S R10E	500	
3	Little Camas	Little Camas Creek	T1S R9E	23,000	
4	Long Tom	Long Tom Creek	T1S R7E	4,300	
5	Cow Creek	Cow Creek	T1S R11E	1,280	
6	Frazier	Canyon Creek	T3S R5E	3,530	
7	Rattlesnake	Rattlesnake Creek	T3S R7E	5,600	
	9 Small Dams			1,570	
		Gem County			
1	Black Canyon	Payette	T7N R1W	1,100	
2	Sage Hen	Sage Hen Creek	T12N R2E	4,000	
	4 Small Dams			290	

TABLE 4-5 CON'T.

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		Owyhee County			
1	Mary's Creek	Mary's Creek	T14S R4E	1,240	
2	Little Blue	Little Blue Creek	T13S R3E	2,000	
3	Blue Creek	Blue Creek	T13S R2E	1,130	
4	Cherry Creek	Cherry Creek	T9S R6W	1,000	
5	Slack	Unnamed Stream	T16S R1W	1,400	
6	Shoo Fly	Shoo Fly Creek	T14S R1E	940	
7	Battle Creek	Battle Creek	T11S R1E	500	
8	Juniper	Juniper Creek	T9S R5W	500	
9	Castle	N Fork Castle Cr	T11S R4W	550	
10	Foreman	Castle Creek	T5S R1E	1,200	
11	Cowan	Jarbidge River	T15S R8E	1,330	
12	Louisa	Louisa Creek	T8S R2W	1,200	
13	C. J. Strike	Snake River	- -	84,000	
14	Rattlesnake	Rattlesnake Creek	T12S R5E	750	
15	Nettleton	Castle Creek	T7S R2W	720	
16	Snow	Snow Creek	T15S R4E	1,280	
	24 Small Dams			3,730	
		Valley County			
1	Lake Fork	Lake Fork	- -	16,940	
2	Boulder Lake	Boulder Lake	T18N R4E	1,960	
3	Poison Lake	Poison Lake	T15N R2E	1,590	
4	Little Payette	Little Payette Lake	T18N R3E	15,000	
5	Big Payette	Big Payette Lake	T18N R3E	50,000	
6	Warm Spring	Warm Spring Creek	T12N R4E	560	
7	Deadwood	Deadwood River	T11N R7E	161,900	
8	Upper Payette	Upper Payette Lake	T21N R4E	8,000	
9	Granite Lake	Granite Lake	T20N R3E	2,600	
10	Fall Creek	Fall Creek	T19N R4E	800	
11	Box Lake	Box Lake	T20N R4E	1,390	
12	Hidden Lake	Hidden Lake	T13N R3E	800	
13	Pine	Pine Creek	T11N R2E	800	
14	Cascade	N Fork Payette Riv	T14N R3E	704,100	
15	Pearsol	Pearsol Creek	T14N R4E	600	
16	Cruickshank	Lake Fork	T18N R3E	1,100	
17	Jug	Jug Creek	T17N R4E	1,130	
18	Skunk	Skunk Creek	T12N R4E	560	
	14 Small Dams			2,430	
		Washington County			
1	Hodges	Unnamed Stream	T12N R3W	600	
2	Barton	Monroe Creek	T11N R5W	2,000	
3	Paddock Valley	Little Willow Creek	T10N R2W	32,000	
4	Crane	Crane Creek	T12N R2W	70,000	

TABLE 4-5 CON'T.

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		Washington County, Cont'd			
5	Keithley	Keithley Creek	T14N R4W	500	
6	Brownlee	Snake River	T17N R5W	1,000,000	
	6 Small Dams			1,160	
		Jerome County			
1	Wilson Lake	Snake River	- -	18,500	Off-stream
		State of Nevada			
1	Wild Horse Res	S. Fork Owyhee	T44S R54E	32,600	
		State of Oregon			
1	Antelope Res	Jordan Creek	T30S R45E	36,500	
2	Warm Springs Res	Warm Springs Creek	T22S R36E	190,000	
3	Agency Res	N Fork Malheur	T19S R37E	60,000	
4	Willow Cr #3	Willow Creek	T14S R41E	26,000	Needs Rebui
5	Unity Res	Burnt River	T12S R37E	25,000	
6	Owyhee Res	Owyhee River	T22S R45E	715,000	
7	Thief Valley Res	Powder River	T6S R40E	17,000	
8	Summerville	Soldier Creek	T32S R44E	2,000	
9	Mud Hat	Off Stream	T33S R45E	2,020	
10	Bully Creek	Bully Creek	T18S R43E	30,000	
11	Upper Cowlake	Succor Creek	T28S R44E	3,100	
12	Lower Cowlake	Jordan Creek	T29S R44E	3,600	
13	Mud Creek Res	Off Willow Creek	T17S R43E	2,500	
	Powder River Bas	15 Reservoirs		8,700	

TABLE 4-5

RESERVOIR PROJECT DATA FOR COLUMBIA RIVER BASIN FLOOD CONTROL SYSTEM

Project	River	Pool Elev., MSL Min	Pool Elev., MSL Max	ACTIVE STORAGE, AC. FT. Total[1]	ACTIVE STORAGE, AC. FT. Committed for Flood Control	Project Owner
Mica	Columbia	2320	2475	12,000,000	12,000,000[2]	B.C. Hydro and Power Authority
Duncan	Duncan	1792	1892	1,417,000	1,412,000[2]	B.C. Hydro and Power Authority
Libby	Kootenai	2287	2459	4,934,000	4,934,000	U.S. Corps of Engineers
Hungry Horse	S. Fk. Flathead	3336	3560	3,161,000[3]	2,980,000[4]	U.S. Bureau of Reclamation
Noxon	Clark Fork	2295	2331	231,000	[5]	Washington Water Power
Brownlee	Snake	1976	2077	980,000	980,000	Idaho Power Company
Dworshak	N. Fk. Clearwater	1445	1600	2,016,000	2,016,000	U.S. Corps of Engineers
	CATEGORY II					
Jackson Lake	Snake	6730	6769	847,000	1,400,000	U.S. Bureau of Reclamation
Palisades	Snake	5497	5620	1,200,000		U.S. Bureau of Reclamation
Anderson Ranch	S. Fk. Boise	4039.6	4196	423,000		U.S. Bureau of Reclamation
Arrowrock	Boise	2967	3216	286,600	988,000	U.S. Bureau of Reclamation
Lucky Peak	Boise	2905	3060	278,200		U.S. Corps of Engineers
Cascade	N. Fk. Payette	4787	4828	653,200	[5]	U.S. Bureau of Reclamation
Deadwood	Deadwood	5203	5334	160,400	[5]	U.S. Bureau of Reclamation
5 Yakima River Reservoirs		--	--	1,065,500	[5]	U.S. Bureau of Reclamation
	CATEGORY III					
Corra Linn Dam - Kootenay L.	Kootenay	1738	1745.32[6]	787,000	[7]	W. Kootenay
Kerr Dam - Flathead L.	Flathead	2883	2893 [6]	1,219,000	[7]	Montana Power Co.
Albeni Falls Dam - Pend Oreille L.	Pend Oreille	2049.7	2062.5 [6]	1,155,000	[7]	U.S. Corps of Engineers
Post Falls Dam - Coeur d'Alene L.	Spokane	2120.5	2178 [6]	225,000	[7]	Washington Water Power
	CATEGORY IV					
Arrow	Columbia	1377	1444[8]	7,145,000	7,145,000[2,9]	B.C. Hydro and Power Authority
Grand Coulee	Columbia	1208	1290	5,228,000	5,228,000	U.S. Bureau of Reclamation
John Day	Columbia	257	268	535,000	535,000	U.S. Corps of Engineers
	CATEGORY V					
Chief Joseph	Columbia	930	956	116,000[12]	[10]	U.S. Corps of Engineers
Wells	Columbia	767	779	125,000[12]	125,000[11]	Douglas County PUD
Rocky Reach	Columbia	703	707	36,000[12]	170,000[11]	Chelan County PUD
Wanapum	Columbia	539	575	144,000[12])		Grant County PUD
Priest Rapids	Columbia	465.9	491.5	44,000[12])	500,000	Grant County PUD
McNary	Columbia	335	340.5	205,000[12]	[10]	U.S. Corps of Engineers
The Dalles	Columbia	155	160	53,000[12]	[10]	U.S. Corps of Engineers
Bonneville	Columbia	70	74	87,000[12]	[10]	U.S. Corps of Engineers
Lower Granite	Snake	733	738	53,000[12]	[10]	U.S. Corps of Engineers
Little Goose	Snake	633	638	49,000[12]	[10]	U.S. Corps of Engineers
Lower Monumental	Snake	537	540	20,000[12]	[10]	U.S. Corps of Engineers
Ice Harbor	Snake	437	440	25,000[12]	[10]	U.S. Corps of Engineers

1/ From best information available as of September 1982.

2/ Total of primary flood control and "on-call" storage.

3/ Reflects 6% of measured capacity to account for bank storage.

4/ Total measured capacity between pool limits, not including bank storage.

5/ Not committed but operated voluntarily by project owner for flood regulation.

6/ Controlled elevation for normal power operation. May be exceeded involuntarily during flood period.

7/ Normally operated to preserve natural lake storage during flood period.

8/ May be operated to El. 1446 under large flood.

9/ Includes involuntary storage.

10/ Pondage for re-regulation of floodflows.

11/ Maximum allowable for replacement of lost valley storage.

12/ Normal power pondage.

TABLE 4-6

PROPOSED RESERVOIRS
SNAKE RIVER BASIN ABOVE BROWNLEE DAM

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		State of Wyoming			
A	Blind Canyon	Snake River	T37N R117W	765,000	
B	Hoback Site	Snake River	T39N R116W	1,223,000	
C	Buffalo Fork	Buffalo Fork	T45N R113W	200,000	
D	Cottonwood	Gros Ventre	T41N R112W	200,000	
E	Pfisterer Ranch	Hoback	T38N R113W	400,000	
F	Elbow Site	Greys River	T34N R116W	200,000	
G	Stump Creek	Stump Creek	T32N R119W	(15,000)	May be
H	Elk Valley	Spring Creek	T31N R120W	(3,000)	increased
I	Crow Creek	Crow Creek	T31N R119W	(1,500)	to 80,700
J	Bechler Meadows	Bechler River	Yellowstone Park	186,000	
K	Mountain Ash	Falls River	Yellowstone Park	48,600	
L	Teton Canyon	Teton Creek	T44N R118W	3,000	
		State of Idaho			
A	Tetonia	Teton River	T6N R44E	131,000	
B	Lower Willow	Willow Creek	T1N R40E	200,000	
C	Beacon	Bannock Creek	T8S R33E	25,000	
D	Holly's Nipple	Rock Creek	T10S R31E	3,000	
E	Thornton	Rock Creek	T9S R30E	45,000	
F	Raft River	Raft River	T15S R26E	25,000	
G	Otley	Cassia Creek	T13S R25E	20,000	
H	Albion	Marsh Creek	T11S R25E	25,000	
I	Crockett	Rock Creek	T12S R18E	25,000	
J	Williams #2	McMullin Creek	T12S R18E	8,000	
K	Williams #1	Cottonwood Cr	T11S R17E		
L	Camas	Camas Creek	T12N R39E	27,000	
M	Modoc	Modoc Creek	T14N R36E	10,000	
N	Medicine Lodge	Medicine L. Cr	T12N R33E	6,000	
O	Birch	Birch Creek	T10N R29E	35,000	
P	Garden Creek	Big Lost Riv	T7N R20E	180,000	
Q	Castle	E. Fork Big Lost	T7N R21E	100,000	
R	Antelope	Antelope Cr	T5N R25E	70,000	
S	Little Wood	Little Wood R.	T2N R20E	45,000	
T	Ketchum Site	Big Wood Riv	T4N R18E	300,000	
U	Forks Site	Big Wood Riv	T5N R17E	130,000	
V	Warm Springs	Warm Springs Cr	T4N R17E	20,000	
W	Upper Clover Cr	Clover Creek	T5S R12E	10,000	
X	Bliss	Snake River	T6S R12E		Deferred
Y	Tuana	Snake River	T7S R12E	(52,000)	Crystal Spr
Z	Grindstone Butte	Snake River	T8S R11E	(113,000)	Project
AA	Crane Falls	Snake River	T5S R4E		Deferred

TABLE 4-6 CON'T.

No.	Name	Stream	Location	Acre-Feet Active Capacity	Remarks
		State of Idaho, Cont'd			
AB	Guffey	Snake River	T2S R1W		
AC	Marsing	Snake River	T2N R4W		Deferred
AD	Bruneau Forks	Bruneau River	T10S R7E	350,000	
AE	Castle Creek	Castle Creek	T6S R1W	5,000	
AF	Reynolds	Reynolds Creek	T2S R3W	20,000	
AG	Squaw Creek	Squaw Creek	T1N R4W	19,000	
AH	Jordan Creek	Jordan Creek	T6S R5W	40,000	
AI	Twin Springs	Main Fork Boise R.	T4N R7E	300,000	
AJ	Dog Creek	Main Fork Boise R.	T3N R10E	200,000	
AK	Garden Valley	S. Fork Payette R.	T9N R4E	1,250,000	
AL	Johnson Park	Johnson Creek	T16N R2W	2,300	
AM	Horse Flat	Camp Creek	T15N R3W	3,300	
AN	Voder	Mann Creek	T12N R5W	7,000	
AO	Lost Valley	Lost Creek	T19N R1W	5,500	Increase
AP	Tamarack	Weiser River	T19N R1W	20,000	
AQ	Upper Crane Creek Project		T13N R1W		
		Upper Hog Creek		3,000	
		Bed Rock Flats		7,400	
		Granger		2,000	
		Lower Hog Creek		2,800	
		Shirts Creek		2,300	
AR	S. Crane	S. Crane Creek	T11N R2W	1,500	
AS	Squaw Flat	M. Fork Weiser	T16N R2E	1,220	
AT	Bacon Creek	Weiser River	T15N R2W	300,000	
AU	Duck Valley	Miller Creek	T16S R3E	20,000	
AV	Thomas Creek	Little Weiser	T16N R2E	3,500	
AW	Swan Falls	Snake River	T2S R1W		Deferred
	Small Reservoirs - State of Idaho			61,670	
		State of Nevada			
A	Duck Valley Res.	S. Fork Owyhee	T46N R53E	100,000	Indian Lan
B	Bull Run Res.	Bull Run Creek	T42N R51E	15,000	Indian Lan
		State of Oregon			
A	Isaac Reservoir	Succor Creek	T23S R46E	38,000	
B	Duncan Ferry	Owyhee River	T30S R41E	1,000,000	
C	S. Fork Res.	S. Fork Malheur	T24S R37E	90,000	
D	Otis Creek Res.	Cottonwood Creek	T20S R36E	10,000	
E	Mason Dam	Powder River	T10S R39E	60,000	
F	North Burnt	N. Fork Burnt	T11S R37E	15,000	
G	Thief Valley	Powder River	T6S R40E	83,000	Increase

TABLE 7-4

RIVER MILE INDEX - SNAKE RIVER BELOW WEISER

River mile Location miles	Description
0.0	Mouth of Snake River
9.7	Ice Harbor Dam
41.6	Lower Monumental Dam
59.5	Palouse River (right bank)
62.2	Tucannon River (left bank)
70.3	Little Goose Dam
107.5	Lower Granite Dam
132.9	Stream gage nr. Clarkston
139.1	Idaho - Washington state line
139.3	Clearwater River (right bank)
139.6	Interstate bridge (Wash.-Ida.)
145.6	Asotin
146.5	Asotin damsite
167.2	Stream gage nr. Anatone
168.7	Grande Ronde River (left bank)
172.5	China Gardens damsite
188.2	Salmon River (right bank)
188.9	High Mountain Sheep damsite
191.7	Imnaha River (left bank)
192.3	Stream gage nr. Joseph
214.5	Pittsburg Landing
230.5	Johnson Bar
247.0	Hells Canyon Dam
273.0	Oxbow Dam
285.0	Brownlee Dam
295.7	Powder River (left bank)
327.7	Burnt River (left bank)
351.9	Weiser River (right bank)

Source NWD

PROJECT NAME: BROWNLEE 07/24/96

PROJECT NUMBER: 2 PAGE 1

STORAGE LOWER BOUND (SLB) = 444.70KAF STORAGE UPPER BOUND (SUB) = 1420.10 KAF

ELEVATION FEET		GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
1976.0	SLB	444.7	224.2	0.0	0.0	975.4	491.7
.1		445.4	224.6	0.7	0.4	974.7	491.4
.2		446.1	224.9	1.4	0.7	974.0	491.1
.3		446.8	225.3	2.1	1.1	973.3	490.7
.4		447.5	225.6	2.8	1.4	972.6	490.4
.5		448.2	226.0	3.5	1.8	971.9	490.0
.6		448.9	226.3	4.2	2.1	971.2	489.7
.7		449.5	226.6	4.8	2.4	970.6	489.3
.8		450.2	227.0	5.5	2.8	969.9	489.0
.9		450.9	227.3	6.2	3.1	969.2	488.6
1977.0		451.6	227.7	6.9	3.5	968.5	488.3
.1		452.3	228.0	7.6	3.8	967.8	487.9
.2		453.0	228.4	8.3	4.2	967.1	487.6
.3		453.7	228.7	9.0	4.5	966.4	487.2
.4		454.4	229.1	9.7	4.9	965.7	486.9
.5		455.0	229.4	10.3	5.2	965.1	486.6
.6		455.7	229.8	11.0	5.6	964.4	486.2
.7		456.4	230.1	11.7	5.9	963.7	485.9
.8		457.1	230.5	12.4	6.3	963.0	485.5
.9		457.8	230.8	13.1	6.6	962.3	485.2
1978.0		458.5	231.1	13.8	6.9	961.6	484.8
.1		459.2	231.5	14.5	7.3	960.9	484.5
.2		459.8	231.8	15.1	7.6	960.3	484.1
.3		460.5	232.2	15.8	8.0	959.6	483.8
.4		461.2	232.5	16.5	8.3	958.9	483.4
.5		461.9	232.9	17.2	8.7	958.2	483.1
.6		462.6	233.2	17.9	9.0	957.5	482.7
.7		463.3	233.6	18.6	9.4	956.8	482.4
.8		464.0	233.9	19.3	9.7	956.1	482.1
.9		464.6	234.3	19.9	10.1	955.5	481.7
1979.0		465.3	234.6	20.6	10.4	954.8	481.4
.1		466.0	235.0	21.3	10.7	954.1	481.0
.2		466.7	235.3	22.0	11.1	953.4	480.7
.3		467.4	235.6	22.7	11.4	952.7	480.3
.4		468.1	236.0	23.4	11.8	952.0	480.0
.5		468.8	236.3	24.1	12.1	951.3	479.6
.6		469.5	236.7	24.8	12.5	950.6	479.3
.7		470.1	237.0	25.4	12.8	950.0	478.9
.8		470.8	237.4	26.1	13.2	949.3	478.6
.9		471.5	237.7	26.8	13.5	948.6	478.2
1980.0		472.2	238.1	27.5	13.9	947.9	477.9
.1		472.9	238.4	28.2	14.2	947.2	477.6
.2		473.6	238.8	28.9	14.6	946.5	477.2
.3		474.3	239.1	29.6	14.9	945.8	476.9
.4		474.9	239.5	30.2	15.2	945.2	476.5
.5		475.6	239.8	30.9	15.6	944.5	476.2
.6		476.3	240.1	31.6	15.9	943.8	475.8
.7		477.0	240.5	32.3	16.3	943.1	475.5
.8		477.7	240.8	33.0	16.6	942.4	475.1
.9		478.4	241.2	33.7	17.0	941.7	474.8

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
1981.0	479.1	241.5	34.4	17.3	941.0	474.4
.1	479.8	241.9	35.1	17.7	940.3	474.1
.2	480.4	242.2	35.7	18.0	939.7	473.7
.3	481.1	242.6	36.4	18.4	939.0	473.4
.4	481.8	242.9	37.1	18.7	938.3	473.1
.5	482.5	243.3	37.8	19.1	937.6	472.7
.6	483.2	243.6	38.5	19.4	936.9	472.4
.7	483.9	244.0	39.2	19.7	936.2	472.0
.8	484.6	244.3	39.9	20.1	935.5	471.7
.9	485.2	244.6	40.5	20.4	934.9	471.3
1982.0	485.9	245.0	41.2	20.8	934.2	471.0
.1	486.6	245.3	41.9	21.1	933.5	470.6
.2	487.3	245.7	42.6	21.5	932.8	470.3
.3	488.0	246.0	43.3	21.8	932.1	469.9
.4	488.7	246.4	44.0	22.2	931.4	469.6
.5	489.4	246.7	44.7	22.5	930.7	469.2
.6	490.0	247.1	45.3	22.9	930.1	468.9
.7	490.7	247.4	46.0	23.2	929.4	468.6
.8	491.4	247.8	46.7	23.6	928.7	468.2
.9	492.1	248.1	47.4	23.9	928.0	467.9
1983.0	492.8	248.4	48.1	24.2	927.3	467.5
.1	493.5	248.8	48.8	24.6	926.6	467.2
.2	494.2	249.1	49.5	24.9	925.9	466.8
.3	494.9	249.5	50.2	25.3	925.2	466.5
.4	495.5	249.8	50.8	25.6	924.6	466.1
.5	496.2	250.2	51.5	26.0	923.9	465.8
.6	496.9	250.5	52.2	26.3	923.2	465.4
.7	497.6	250.9	52.9	26.7	922.5	465.1
.8	498.3	251.2	53.6	27.0	921.8	464.7
.9	499.0	251.6	54.3	27.4	921.1	464.4
1984.0	499.7	251.9	55.0	27.7	920.4	464.1
.1	500.3	252.3	55.6	28.1	919.8	463.7
.2	501.0	252.6	56.3	28.4	919.1	463.4
.3	501.7	252.9	57.0	28.7	918.4	463.0
.4	502.4	253.3	57.7	29.1	917.7	462.7
.5	503.1	253.6	58.4	29.4	917.0	462.3
.6	503.8	254.0	59.1	29.8	916.3	462.0
.7	504.5	254.3	59.8	30.1	915.6	461.6
.8	505.1	254.7	60.4	30.5	915.0	461.3
.9	505.8	255.0	61.1	30.8	914.3	460.9
1985.0	506.5	255.4	61.8	31.2	913.6	460.6
.1	507.2	255.7	62.5	31.5	912.9	460.3
.2	507.9	256.1	63.2	31.9	912.2	459.9
.3	508.6	256.4	63.9	32.2	911.5	459.6
.4	509.3	256.8	64.6	32.6	910.8	459.2
.5	510.0	257.1	65.3	32.9	910.1	458.9
.6	510.6	257.4	65.9	33.2	909.5	458.5
.7	511.3	257.8	66.6	33.6	908.8	458.2
.8	512.0	258.1	67.3	33.9	908.1	457.8
.9	512.7	258.5	68.0	34.3	907.4	457.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
1986.0	513.4	258.8	68.7	34.6	906.7	457.1
.1	514.1	259.2	69.4	35.0	906.0	456.8
.2	514.8	259.5	70.1	35.3	905.3	456.4
.3	515.4	259.9	70.7	35.7	904.7	456.1
.4	516.1	260.2	71.4	36.0	904.0	455.8
.5	516.8	260.6	72.1	36.4	903.3	455.4
.6	517.5	260.9	72.8	36.7	902.6	455.1
.7	518.2	261.3	73.5	37.1	901.9	454.7
.8	518.9	261.6	74.2	37.4	901.2	454.4
.9	519.6	261.9	74.9	37.7	900.5	454.0
1987.0	520.2	262.3	75.5	38.1	899.9	453.7
.1	520.9	262.6	76.2	38.4	899.2	453.3
.2	521.6	263.0	76.9	38.8	898.5	453.0
.3	522.3	263.3	77.6	39.1	897.8	452.6
.4	523.0	263.7	78.3	39.5	897.1	452.3
.5	523.7	264.0	79.0	39.8	896.4	451.9
.6	524.4	264.4	79.7	40.2	895.7	451.6
.7	525.1	264.7	80.4	40.5	895.0	451.3
.8	525.7	265.1	81.0	40.9	894.4	450.9
.9	526.4	265.4	81.7	41.2	893.7	450.6
1988.0	527.1	265.8	82.4	41.5	893.0	450.2
.1	527.8	266.1	83.1	41.9	892.3	449.9
.2	528.5	266.4	83.8	42.2	891.6	449.5
.3	529.2	266.8	84.5	42.6	890.9	449.2
.4	529.9	267.1	85.2	42.9	890.2	448.8
.5	530.5	267.5	85.8	43.3	889.6	448.5
.6	531.2	267.8	86.5	43.6	888.9	448.1
.7	531.9	268.2	87.2	44.0	888.2	447.8
.8	532.6	268.5	87.9	44.3	887.5	447.4
.9	533.3	268.9	88.6	44.7	886.8	447.1
1989.0	534.0	269.2	89.3	45.0	886.1	446.8
.1	534.7	269.6	90.0	45.4	885.4	446.4
.2	535.3	269.9	90.6	45.7	884.8	446.1
.3	536.0	270.3	91.3	46.0	884.1	445.7
.4	536.7	270.6	92.0	46.4	883.4	445.4
.5	537.4	270.9	92.7	46.7	882.7	445.0
.6	538.1	271.3	93.4	47.1	882.0	444.7
.7	538.8	271.6	94.1	47.4	881.3	444.3
.8	539.5	272.0	94.8	47.8	880.6	444.0
.9	540.2	272.3	95.5	48.1	879.9	443.6
1990.0	540.8	272.7	96.1	48.5	879.3	443.3
.1	541.5	273.0	96.8	48.8	878.6	442.9
.2	542.2	273.4	97.5	49.2	877.9	442.6
.3	542.9	273.7	98.2	49.5	877.2	442.3
.4	543.6	274.1	98.9	49.9	876.5	441.9
.5	544.3	274.4	99.6	50.2	875.8	441.6
.6	545.0	274.7	100.3	50.5	875.1	441.2
.7	545.6	275.1	100.9	50.9	874.5	440.9
.8	546.3	275.4	101.6	51.2	873.8	440.5
.9	547.0	275.8	102.3	51.6	873.1	440.2

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
1991.0	547.7	276.1	103.0	51.9	872.4	439.8
.1	548.5	276.5	103.8	52.3	871.6	439.4
.2	549.3	276.9	104.6	52.7	870.8	439.0
.3	550.0	277.3	105.3	53.1	870.1	438.7
.4	550.8	277.7	106.1	53.5	869.3	438.3
.5	551.6	278.1	106.9	53.9	868.5	437.9
.6	552.4	278.5	107.7	54.3	867.7	437.5
.7	553.2	278.9	108.5	54.7	866.9	437.1
.8	553.9	279.3	109.2	55.1	866.2	436.7
.9	554.7	279.7	110.0	55.5	865.4	436.3
1992.0	555.5	280.1	110.8	55.9	864.6	435.9
.1	556.3	280.5	111.6	56.3	863.8	435.5
.2	557.1	280.9	112.4	56.7	863.0	435.1
.3	557.9	281.3	113.2	57.0	862.2	434.7
.4	558.6	281.6	113.9	57.4	861.5	434.3
.5	559.4	282.0	114.7	57.8	860.7	433.9
.6	560.2	282.4	115.5	58.2	859.9	433.5
.7	561.0	282.8	116.3	58.6	859.1	433.1
.8	561.8	283.2	117.1	59.0	858.3	432.7
.9	562.5	283.6	117.8	59.4	857.6	432.4
1993.0	563.3	284.0	118.6	59.8	856.8	432.0
.1	564.1	284.4	119.4	60.2	856.0	431.6
.2	564.9	284.8	120.2	60.6	855.2	431.2
.3	565.7	285.2	121.0	61.0	854.4	430.8
.4	566.4	285.6	121.7	61.4	853.7	430.4
.5	567.2	286.0	122.5	61.8	852.9	430.0
.6	568.0	286.4	123.3	62.2	852.1	429.6
.7	568.8	286.8	124.1	62.6	851.3	429.2
.8	569.6	287.2	124.9	63.0	850.5	428.8
.9	570.3	287.5	125.6	63.3	849.8	428.4
1994.0	571.1	287.9	126.4	63.7	849.0	428.0
.1	571.9	288.3	127.2	64.1	848.2	427.6
.2	572.7	288.7	128.0	64.5	847.4	427.2
.3	573.5	289.1	128.8	64.9	846.6	426.8
.4	574.2	289.5	129.5	65.3	845.9	426.5
.5	575.0	289.9	130.3	65.7	845.1	426.1
.6	575.8	290.3	131.1	66.1	844.3	425.7
.7	576.6	290.7	131.9	66.5	843.5	425.3
.8	577.4	291.1	132.7	66.9	842.7	424.9
.9	578.1	291.5	133.4	67.3	842.0	424.5
1995.0	578.9	291.9	134.2	67.7	841.2	424.1
.1	579.7	292.3	135.0	68.1	840.4	423.7
.2	580.5	292.7	135.8	68.5	839.6	423.3
.3	581.3	293.1	136.6	68.9	838.8	422.9
.4	582.0	293.4	137.3	69.2	838.1	422.5
.5	582.8	293.8	138.1	69.6	837.3	422.1
.6	583.6	294.2	138.9	70.0	836.5	421.7
.7	584.4	294.6	139.7	70.4	835.7	421.3
.8	585.2	295.0	140.5	70.8	834.9	420.9
.9	586.0	295.4	141.3	71.2	834.1	420.6

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
1996.0	586.7	295.8	142.0	71.6	833.4	420.2
.1	587.5	296.2	142.8	72.0	832.6	419.8
.2	588.3	296.6	143.6	72.4	831.8	419.4
.3	589.1	297.0	144.4	72.8	831.0	419.0
.4	589.9	297.4	145.2	73.2	830.2	418.6
.5	590.6	297.8	145.9	73.6	829.5	418.2
.6	591.4	298.2	146.7	74.0	828.7	417.8
.7	592.2	298.6	147.5	74.4	827.9	417.4
.8	593.0	299.0	148.3	74.8	827.1	417.0
.9	593.8	299.4	149.1	75.1	826.3	416.6
1997.0	594.5	299.7	149.8	75.5	825.6	416.2
.1	595.3	300.1	150.6	75.9	824.8	415.8
.2	596.1	300.5	151.4	76.3	824.0	415.4
.3	596.9	300.9	152.2	76.7	823.2	415.0
.4	597.7	301.3	153.0	77.1	822.4	414.6
.5	598.4	301.7	153.7	77.5	821.7	414.3
.6	599.2	302.1	154.5	77.9	820.9	413.9
.7	600.0	302.5	155.3	78.3	820.1	413.5
.8	600.8	302.9	156.1	78.7	819.3	413.1
.9	601.6	303.3	156.9	79.1	818.5	412.7
1998.0	602.3	303.7	157.6	79.5	817.8	412.3
.1	603.1	304.1	158.4	79.9	817.0	411.9
.2	603.9	304.5	159.2	80.3	816.2	411.5
.3	604.7	304.9	160.0	80.7	815.4	411.1
.4	605.5	305.3	160.8	81.1	814.6	410.7
.5	606.2	305.6	161.5	81.4	813.9	410.3
.6	607.0	306.0	162.3	81.8	813.1	409.9
.7	607.8	306.4	163.1	82.2	812.3	409.5
.8	608.6	306.8	163.9	82.6	811.5	409.1
.9	609.4	307.2	164.7	83.0	810.7	408.7
1999.0	610.1	307.6	165.4	83.4	810.0	408.4
.1	610.9	308.0	166.2	83.8	809.2	408.0
.2	611.7	308.4	167.0	84.2	808.4	407.6
.3	612.5	308.8	167.8	84.6	807.6	407.2
.4	613.3	309.2	168.6	85.0	806.8	406.8
.5	614.1	309.6	169.4	85.4	806.0	406.4
.6	614.8	310.0	170.1	85.8	805.3	406.0
.7	615.6	310.4	170.9	86.2	804.5	405.6
.8	616.4	310.8	171.7	86.6	803.7	405.2
.9	617.2	311.2	172.5	87.0	802.9	404.8
2000.0	618.0	311.6	173.3	87.3	802.1	404.4
.1	618.7	311.9	174.0	87.7	801.4	404.0
.2	619.5	312.3	174.8	88.1	800.6	403.6
.3	620.3	312.7	175.6	88.5	799.8	403.2
.4	621.1	313.1	176.4	88.9	799.0	402.8
.5	621.9	313.5	177.2	89.3	798.2	402.4
.6	622.6	313.9	177.9	89.7	797.5	402.1
.7	623.4	314.3	178.7	90.1	796.7	401.7
.8	624.2	314.7	179.5	90.5	795.9	401.3
.9	625.0	315.1	180.3	90.9	795.1	400.9

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2001.0	625.8	315.5	181.1	91.3	794.3	400.5
.1	626.5	315.9	181.8	91.7	793.6	400.1
.2	627.3	316.3	182.6	92.1	792.8	399.7
.3	628.1	316.7	183.4	92.5	792.0	399.3
.4	628.9	317.1	184.2	92.9	791.2	398.9
.5	629.7	317.5	185.0	93.3	790.4	398.5
.6	630.4	317.8	185.7	93.6	789.7	398.1
.7	631.2	318.2	186.5	94.0	788.9	397.7
.8	632.0	318.6	187.3	94.4	788.1	397.3
.9	632.8	319.0	188.1	94.8	787.3	396.9
2002.0	633.6	319.4	188.9	95.2	786.5	396.5
.1	634.3	319.8	189.6	95.6	785.8	396.2
.2	635.1	320.2	190.4	96.0	785.0	395.8
.3	635.9	320.6	191.2	96.4	784.2	395.4
.4	636.7	321.0	192.0	96.8	783.4	395.0
.5	637.5	321.4	192.8	97.2	782.6	394.6
.6	638.2	321.8	193.5	97.6	781.9	394.2
.7	639.0	322.2	194.3	98.0	781.1	393.8
.8	639.8	322.6	195.1	98.4	780.3	393.4
.9	640.6	323.0	195.9	98.8	779.5	393.0
2003.0	641.4	323.4	196.7	99.2	778.7	392.6
.1	642.1	323.8	197.4	99.5	778.0	392.2
.2	642.9	324.1	198.2	99.9	777.2	391.8
.3	643.7	324.5	199.0	100.3	776.4	391.4
.4	644.5	324.9	199.8	100.7	775.6	391.0
.5	645.3	325.3	200.6	101.1	774.8	390.6
.6	646.1	325.7	201.4	101.5	774.0	390.2
.7	646.8	326.1	202.1	101.9	773.3	389.9
.8	647.6	326.5	202.9	102.3	772.5	389.5
.9	648.4	326.9	203.7	102.7	771.7	389.1
2004.0	649.2	327.3	204.5	103.1	770.9	388.7
.1	650.0	327.7	205.3	103.5	770.1	388.3
.2	650.7	328.1	206.0	103.9	769.4	387.9
.3	651.5	328.5	206.8	104.3	768.6	387.5
.4	652.3	328.9	207.6	104.7	767.8	387.1
.5	653.1	329.3	208.4	105.1	767.0	386.7
.6	653.9	329.7	209.2	105.5	766.2	386.3
.7	654.6	330.0	209.9	105.8	765.5	385.9
.8	655.4	330.4	210.7	106.2	764.7	385.5
.9	656.2	330.8	211.5	106.6	763.9	385.1
2005.0	657.0	331.2	212.3	107.0	763.1	384.7
.1	657.8	331.6	213.1	107.4	762.3	384.3
.2	658.5	332.0	213.8	107.8	761.6	384.0
.3	659.3	332.4	214.6	108.2	760.8	383.6
.4	660.1	332.8	215.4	108.6	760.0	383.2
.5	660.9	333.2	216.2	109.0	759.2	382.8
.6	661.7	333.6	217.0	109.4	758.4	382.4
.7	662.4	334.0	217.7	109.8	757.7	382.0
.8	663.2	334.4	218.5	110.2	756.9	381.6
.9	664.0	334.8	219.3	110.6	756.1	381.2

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2006.0	664.8	335.2	220.1	111.0	755.3	380.8
.1	665.6	335.6	220.9	111.4	754.5	380.4
.2	666.3	335.9	221.6	111.7	753.8	380.0
.3	667.1	336.3	222.4	112.1	753.0	379.6
.4	667.9	336.7	223.2	112.5	752.2	379.2
.5	668.7	337.1	224.0	112.9	751.4	378.8
.6	669.5	337.5	224.8	113.3	750.6	378.4
.7	670.2	337.9	225.5	113.7	749.9	378.0
.8	671.0	338.3	226.3	114.1	749.1	377.7
.9	671.8	338.7	227.1	114.5	748.3	377.3
2007.0	672.6	339.1	227.9	114.9	747.5	376.9
.1	673.4	339.5	228.7	115.3	746.7	376.5
.2	674.2	339.9	229.5	115.7	745.9	376.1
.3	674.9	340.3	230.2	116.1	745.2	375.7
.4	675.7	340.7	231.0	116.5	744.4	375.3
.5	676.5	341.1	231.8	116.9	743.6	374.9
.6	677.3	341.5	232.6	117.3	742.8	374.5
.7	678.1	341.9	233.4	117.6	742.0	374.1
.8	678.8	342.2	234.1	118.0	741.3	373.7
.9	679.6	342.6	234.9	118.4	740.5	373.3
2008.0	680.4	343.0	235.7	118.8	739.7	372.9
.1	681.2	343.4	236.5	119.2	738.9	372.5
.2	682.0	343.8	237.3	119.6	738.1	372.1
.3	682.7	344.2	238.0	120.0	737.4	371.8
.4	683.5	344.6	238.8	120.4	736.6	371.4
.5	684.3	345.0	239.6	120.8	735.8	371.0
.6	685.1	345.4	240.4	121.2	735.0	370.6
.7	685.9	345.8	241.2	121.6	734.2	370.2
.8	686.6	346.2	241.9	122.0	733.5	369.8
.9	687.5	346.6	242.8	122.4	732.6	369.3
2009.0	688.4	347.1	243.7	122.9	731.7	368.9
.1	689.3	347.5	244.6	123.3	730.8	368.5
.2	690.1	347.9	245.4	123.7	730.0	368.0
.3	691.0	348.4	246.3	124.2	729.1	367.6
.4	691.9	348.8	247.2	124.6	728.2	367.1
.5	692.8	349.3	248.1	125.1	727.3	366.7
.6	693.6	349.7	248.9	125.5	726.5	366.3
.7	694.5	350.1	249.8	125.9	725.6	365.8
.8	695.4	350.6	250.7	126.4	724.7	365.4
.9	696.3	351.0	251.6	126.8	723.8	364.9
2010.0	697.1	351.5	252.4	127.3	723.0	364.5
.1	698.0	351.9	253.3	127.7	722.1	364.1
.2	698.9	352.3	254.2	128.1	721.2	363.6
.3	699.7	352.8	255.0	128.6	720.4	363.2
.4	700.6	353.2	255.9	129.0	719.5	362.7
.5	701.5	353.7	256.8	129.5	718.6	362.3
.6	702.4	354.1	257.7	129.9	717.7	361.9
.7	703.2	354.5	258.5	130.3	716.9	361.4
.8	704.1	355.0	259.4	130.8	716.0	361.0
.9	705.0	355.4	260.3	131.2	715.1	360.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2011.0	705.9	355.9	261.2	131.7	714.2	360.1
.1	706.7	356.3	262.0	132.1	713.4	359.7
.2	707.6	356.8	262.9	132.5	712.5	359.2
.3	708.5	357.2	263.8	133.0	711.6	358.8
.4	709.4	357.6	264.7	133.4	710.7	358.3
.5	710.2	358.1	265.5	133.9	709.9	357.9
.6	711.1	358.5	266.4	134.3	709.0	357.5
.7	712.0	359.0	267.3	134.8	708.1	357.0
.8	712.8	359.4	268.1	135.2	707.3	356.6
.9	713.7	359.8	269.0	135.6	706.4	356.1
2012.0	714.6	360.3	269.9	136.1	705.5	355.7
.1	715.5	360.7	270.8	136.5	704.6	355.3
.2	716.3	361.2	271.6	137.0	703.8	354.8
.3	717.2	361.6	272.5	137.4	702.9	354.4
.4	718.1	362.0	273.4	137.8	702.0	353.9
.5	719.0	362.5	274.3	138.3	701.1	353.5
.6	719.8	362.9	275.1	138.7	700.3	353.0
.7	720.7	363.4	276.0	139.2	699.4	352.6
.8	721.6	363.8	276.9	139.6	698.5	352.2
.9	722.5	364.2	277.8	140.0	697.6	351.7
2013.0	723.3	364.7	278.6	140.5	696.8	351.3
.1	724.2	365.1	279.5	140.9	695.9	350.8
.2	725.1	365.6	280.4	141.4	695.0	350.4
.3	726.0	366.0	281.3	141.8	694.1	350.0
.4	726.8	366.4	282.1	142.2	693.3	349.5
.5	727.7	366.9	283.0	142.7	692.4	349.1
.6	728.6	367.3	283.9	143.1	691.5	348.6
.7	729.4	367.8	284.7	143.6	690.7	348.2
.8	730.3	368.2	285.6	144.0	689.8	347.8
.9	731.2	368.6	286.5	144.4	688.9	347.3
2014.0	732.1	369.1	287.4	144.9	688.0	346.9
.1	732.9	369.5	288.2	145.3	687.2	346.4
.2	733.8	370.0	289.1	145.8	686.3	346.0
.3	734.7	370.4	290.0	146.2	685.4	345.6
.4	735.6	370.8	290.9	146.6	684.5	345.1
.5	736.4	371.3	291.7	147.1	683.7	344.7
.6	737.3	371.7	292.6	147.5	682.8	344.2
.7	738.2	372.2	293.5	148.0	681.9	343.8
.8	739.1	372.6	294.4	148.4	681.0	343.4
.9	739.9	373.0	295.2	148.8	680.2	342.9
2015.0	740.8	373.5	296.1	149.3	679.3	342.5
.1	741.7	373.9	297.0	149.7	678.4	342.0
.2	742.6	374.4	297.9	150.2	677.5	341.6
.3	743.4	374.8	298.7	150.6	676.7	341.2
.4	744.3	375.3	299.6	151.0	675.8	340.7
.5	745.2	375.7	300.5	151.5	674.9	340.3
.6	746.0	376.1	301.3	151.9	674.1	339.8
.7	746.9	376.6	302.2	152.4	673.2	339.4
.8	747.8	377.0	303.1	152.8	672.3	339.0
.9	748.7	377.5	304.0	153.3	671.4	338.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2016.0	749.5	377.9	304.8	153.7	670.6	338.1
.1	750.4	378.3	305.7	154.1	669.7	337.6
.2	751.3	378.8	306.6	154.6	668.8	337.2
.3	752.2	379.2	307.5	155.0	667.9	336.8
.4	753.0	379.7	308.3	155.5	667.1	336.3
.5	753.9	380.1	309.2	155.9	666.2	335.9
.6	754.8	380.5	310.1	156.3	665.3	335.4
.7	755.7	381.0	311.0	156.8	664.4	335.0
.8	756.5	381.4	311.8	157.2	663.6	334.5
.9	757.4	381.9	312.7	157.7	662.7	334.1
2017.0	758.3	382.3	313.6	158.1	661.8	333.7
.1	759.2	382.7	314.5	158.5	660.9	333.2
.2	760.0	383.2	315.3	159.0	660.1	332.8
.3	760.9	383.6	316.2	159.4	659.2	332.3
.4	761.8	384.1	317.1	159.9	658.3	331.9
.5	762.6	384.5	317.9	160.3	657.5	331.5
.6	763.5	384.9	318.8	160.7	656.6	331.0
.7	764.4	385.4	319.7	161.2	655.7	330.6
.8	765.3	385.8	320.6	161.6	654.8	330.1
.9	766.1	386.3	321.4	162.1	654.0	329.7
2018.0	767.0	386.7	322.3	162.5	653.1	329.3
.1	767.9	387.1	323.2	162.9	652.2	328.8
.2	768.8	387.6	324.1	163.4	651.3	328.4
.3	769.6	388.0	324.9	163.8	650.5	327.9
.4	770.5	388.5	325.8	164.3	649.6	327.5
.5	771.4	388.9	326.7	164.7	648.7	327.1
.6	772.3	389.3	327.6	165.1	647.8	326.6
.7	773.1	389.8	328.4	165.6	647.0	326.2
.8	774.0	390.2	329.3	166.0	646.1	325.7
.9	774.9	390.7	330.2	166.5	645.2	325.3
2019.0	775.7	391.1	331.0	166.9	644.4	324.9
.1	776.6	391.5	331.9	167.3	643.5	324.4
.2	777.5	392.0	332.8	167.8	642.6	324.0
.3	778.4	392.4	333.7	168.2	641.7	323.5
.4	779.2	392.9	334.5	168.7	640.9	323.1
.5	780.1	393.3	335.4	169.1	640.0	322.7
.6	781.0	393.7	336.3	169.5	639.1	322.2
.7	781.9	394.2	337.2	170.0	638.2	321.8
.8	782.7	394.6	338.0	170.4	637.4	321.3
.9	783.6	395.1	338.9	170.9	636.5	320.9
2020.0	784.5	395.5	339.8	171.3	635.6	320.5
.1	785.4	396.0	340.7	171.7	634.7	320.0
.2	786.2	396.4	341.5	172.2	633.9	319.6
.3	787.1	396.8	342.4	172.6	633.0	319.1
.4	788.0	397.3	343.3	173.1	632.1	318.7
.5	788.9	397.7	344.2	173.5	631.2	318.3
.6	789.7	398.2	345.0	174.0	630.4	317.8
.7	790.6	398.6	345.9	174.4	629.5	317.4
.8	791.5	399.0	346.8	174.8	628.6	316.9
.9	792.3	399.5	347.6	175.3	627.8	316.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2021.0	793.2	399.9	348.5	175.7	626.9	316.1
.1	794.1	400.4	349.4	176.2	626.0	315.6
.2	795.0	400.8	350.3	176.6	625.1	315.2
.3	795.8	401.2	351.1	177.0	624.3	314.7
.4	796.7	401.7	352.0	177.5	623.4	314.3
.5	797.6	402.1	352.9	177.9	622.5	313.8
.6	798.5	402.6	353.8	178.4	621.6	313.4
.7	799.3	403.0	354.6	178.8	620.8	313.0
.8	800.2	403.4	355.5	179.2	619.9	312.5
.9	801.1	403.9	356.4	179.7	619.0	312.1
2022.0	802.0	404.3	357.3	180.1	618.1	311.6
.1	802.8	404.8	358.1	180.6	617.3	311.2
.2	803.7	405.2	359.0	181.0	616.4	310.8
.3	804.6	405.6	359.9	181.4	615.5	310.3
.4	805.5	406.1	360.8	181.9	614.6	309.9
.5	806.3	406.5	361.6	182.3	613.8	309.4
.6	807.2	407.0	362.5	182.8	612.9	309.0
.7	808.1	407.4	363.4	183.2	612.0	308.6
.8	808.9	407.8	364.2	183.6	611.2	308.1
.9	809.8	408.3	365.1	184.1	610.3	307.7
2023.0	810.7	408.7	366.0	184.5	609.4	307.2
.1	811.6	409.2	366.9	185.0	608.5	306.8
.2	812.4	409.6	367.7	185.4	607.7	306.4
.3	813.3	410.0	368.6	185.8	606.8	305.9
.4	814.2	410.5	369.5	186.3	605.9	305.5
.5	815.1	410.9	370.4	186.7	605.0	305.0
.6	815.9	411.4	371.2	187.2	604.2	304.6
.7	816.8	411.8	372.1	187.6	603.3	304.2
.8	817.7	412.2	373.0	188.0	602.4	303.7
.9	818.6	412.7	373.9	188.5	601.5	303.3
2024.0	819.4	413.1	374.7	188.9	600.7	302.8
.1	820.4	413.6	375.7	189.4	599.7	302.4
.2	821.3	414.1	376.6	189.9	598.8	301.9
.3	822.3	414.6	377.6	190.4	597.8	301.4
.4	823.3	415.1	378.6	190.9	596.8	300.9
.5	824.2	415.5	379.5	191.3	595.9	300.4
.6	825.2	416.0	380.5	191.8	594.9	299.9
.7	826.1	416.5	381.4	192.3	594.0	299.5
.8	827.1	417.0	382.4	192.8	593.0	299.0
.9	828.0	417.5	383.3	193.3	592.1	298.5
2025.0	829.0	418.0	384.3	193.8	591.1	298.0
.1	830.0	418.4	385.3	194.2	590.1	297.5
.2	830.9	418.9	386.2	194.7	589.2	297.0
.3	831.9	419.4	387.2	195.2	588.2	296.6
.4	832.8	419.9	388.1	195.7	587.3	296.1
.5	833.8	420.4	389.1	196.2	586.3	295.6
.6	834.8	420.9	390.1	196.7	585.3	295.1
.7	835.7	421.3	391.0	197.1	584.4	294.6
.8	836.7	421.8	392.0	197.6	583.4	294.1
.9	837.6	422.3	392.9	198.1	582.5	293.7

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2026.0	838.6	422.8	393.9	198.6	581.5	293.2
.1	839.5	423.3	394.8	199.1	580.6	292.7
.2	840.5	423.8	395.8	199.5	579.6	292.2
.3	841.5	424.2	396.8	200.0	578.6	291.7
.4	842.4	424.7	397.7	200.5	577.7	291.2
.5	843.4	425.2	398.7	201.0	576.7	290.8
.6	844.3	425.7	399.6	201.5	575.8	290.3
.7	845.3	426.2	400.6	202.0	574.8	289.8
.8	846.2	426.6	401.5	202.4	573.9	289.3
.9	847.2	427.1	402.5	202.9	572.9	288.8
2027.0	848.2	427.6	403.5	203.4	571.9	288.4
.1	849.1	428.1	404.4	203.9	571.0	287.9
.2	850.1	428.6	405.4	204.4	570.0	287.4
.3	851.0	429.1	406.3	204.9	569.1	286.9
.4	852.0	429.5	407.3	205.3	568.1	286.4
.5	853.0	430.0	408.3	205.8	567.1	285.9
.6	853.9	430.5	409.2	206.3	566.2	285.5
.7	854.9	431.0	410.2	206.8	565.2	285.0
.8	855.8	431.5	411.1	207.3	564.3	284.5
.9	856.8	432.0	412.1	207.8	563.3	284.0
2028.0	857.7	432.4	413.0	208.2	562.4	283.5
.1	858.7	432.9	414.0	208.7	561.4	283.0
.2	859.7	433.4	415.0	209.2	560.4	282.6
.3	860.6	433.9	415.9	209.7	559.5	282.1
.4	861.6	434.4	416.9	210.2	558.5	281.6
.5	862.5	434.9	417.8	210.7	557.6	281.1
.6	863.5	435.3	418.8	211.1	556.6	280.6
.7	864.4	435.8	419.7	211.6	555.7	280.1
.8	865.4	436.3	420.7	212.1	554.7	279.7
.9	866.4	436.8	421.7	212.6	553.7	279.2
2029.0	867.3	437.3	422.6	213.1	552.8	278.7
.1	868.3	437.8	423.6	213.6	551.8	278.2
.2	869.2	438.2	424.5	214.0	550.9	277.7
.3	870.2	438.7	425.5	214.5	549.9	277.2
.4	871.1	439.2	426.4	215.0	549.0	276.8
.5	872.1	439.7	427.4	215.5	548.0	276.3
.6	873.1	440.2	428.4	216.0	547.0	275.8
.7	874.0	440.7	429.3	216.4	546.1	275.3
.8	875.0	441.1	430.3	216.9	545.1	274.8
.9	875.9	441.6	431.2	217.4	544.2	274.3
2030.0	876.9	442.1	432.2	217.9	543.2	273.9
.1	877.9	442.6	433.2	218.4	542.2	273.4
.2	878.8	443.1	434.1	218.9	541.3	272.9
.3	879.8	443.5	435.1	219.3	540.3	272.4
.4	880.7	444.0	436.0	219.8	539.4	271.9
.5	881.7	444.5	437.0	220.3	538.4	271.5
.6	882.6	445.0	437.9	220.8	537.5	271.0
.7	883.6	445.5	438.9	221.3	536.5	270.5
.8	884.6	446.0	439.9	221.8	535.5	270.0
.9	885.5	446.4	440.8	222.2	534.6	269.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2031.0	886.5	446.9	441.8	222.7	533.6	269.0
.1	887.4	447.4	442.7	223.2	532.7	268.6
.2	888.4	447.9	443.7	223.7	531.7	268.1
.3	889.3	448.4	444.6	224.2	530.8	267.6
.4	890.3	448.9	445.6	224.7	529.8	267.1
.5	891.3	449.3	446.6	225.1	528.8	266.6
.6	892.2	449.8	447.5	225.6	527.9	266.1
.7	893.2	450.3	448.5	226.1	526.9	265.7
.8	894.1	450.8	449.4	226.6	526.0	265.2
.9	895.1	451.3	450.4	227.1	525.0	264.7
2032.0	896.0	451.8	451.3	227.6	524.1	264.2
.1	897.0	452.2	452.3	228.0	523.1	263.7
.2	898.0	452.7	453.3	228.5	522.1	263.2
.3	898.9	453.2	454.2	229.0	521.2	262.8
.4	899.9	453.7	455.2	229.5	520.2	262.3
.5	900.8	454.2	456.1	230.0	519.3	261.8
.6	901.8	454.7	457.1	230.5	518.3	261.3
.7	902.8	455.1	458.1	230.9	517.3	260.8
.8	903.7	455.6	459.0	231.4	516.4	260.3
.9	904.7	456.1	460.0	231.9	515.4	259.9
2033.0	905.6	456.6	460.9	232.4	514.5	259.4
.1	906.6	457.1	461.9	232.9	513.5	258.9
.2	907.5	457.6	462.8	233.3	512.6	258.4
.3	908.5	458.0	463.8	233.8	511.6	257.9
.4	909.5	458.5	464.8	234.3	510.6	257.4
.5	910.4	459.0	465.7	234.8	509.7	257.0
.6	911.4	459.5	466.7	235.3	508.7	256.5
.7	912.3	460.0	467.6	235.8	507.8	256.0
.8	913.3	460.4	468.6	236.2	506.8	255.5
.9	914.2	460.9	469.5	236.7	505.9	255.0
2034.0	915.2	461.4	470.5	237.2	504.9	254.6
.1	916.2	461.9	471.5	237.7	503.9	254.1
.2	917.1	462.4	472.4	238.2	503.0	253.6
.3	918.1	462.9	473.4	238.7	502.0	253.1
.4	919.0	463.3	474.3	239.1	501.1	252.6
.5	920.0	463.8	475.3	239.6	500.1	252.1
.6	920.9	464.3	476.2	240.1	499.2	251.7
.7	921.9	464.8	477.2	240.6	498.2	251.2
.8	922.9	465.3	478.2	241.1	497.2	250.7
.9	923.8	465.8	479.1	241.6	496.3	250.2
2035.0	924.8	466.2	480.1	242.0	495.3	249.7
.1	925.7	466.7	481.0	242.5	494.4	249.2
.2	926.7	467.2	482.0	243.0	493.4	248.8
.3	927.7	467.7	483.0	243.5	492.4	248.3
.4	928.6	468.2	483.9	244.0	491.5	247.8
.5	929.6	468.7	484.9	244.5	490.5	247.3
.6	930.5	469.1	485.8	244.9	489.6	246.8
.7	931.5	469.6	486.8	245.4	488.6	246.3
.8	932.4	470.1	487.7	245.9	487.7	245.9
.9	933.4	470.6	488.7	246.4	486.7	245.4

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2036.0	934.4	471.1	489.7	246.9	485.7	244.9
.1	935.3	471.6	490.6	247.4	484.8	244.4
.2	936.3	472.0	491.6	247.8	483.8	243.9
.3	937.2	472.5	492.5	248.3	482.9	243.4
.4	938.2	473.0	493.5	248.8	481.9	243.0
.5	939.1	473.5	494.4	249.3	481.0	242.5
.6	940.1	474.0	495.4	249.8	480.0	242.0
.7	941.1	474.5	496.4	250.2	479.0	241.5
.8	942.0	474.9	497.3	250.7	478.1	241.0
.9	943.0	475.4	498.3	251.2	477.1	240.6
2037.0	943.9	475.9	499.2	251.7	476.2	240.1
.1	944.9	476.4	500.2	252.2	475.2	239.6
.2	945.8	476.9	501.1	252.7	474.3	239.1
.3	946.8	477.3	502.1	253.1	473.3	238.6
.4	947.8	477.8	503.1	253.6	472.3	238.1
.5	948.7	478.3	504.0	254.1	471.4	237.7
.6	949.7	478.8	505.0	254.6	470.4	237.2
.7	950.6	479.3	505.9	255.1	469.5	236.7
.8	951.7	479.8	507.0	255.6	468.4	236.2
.9	952.7	480.3	508.0	256.1	467.4	235.6
2038.0	953.8	480.9	509.1	256.7	466.3	235.1
.1	954.9	481.4	510.2	257.2	465.2	234.6
.2	955.9	481.9	511.2	257.7	464.2	234.0
.3	957.0	482.5	512.3	258.3	463.1	233.5
.4	958.0	483.0	513.3	258.8	462.1	233.0
.5	959.1	483.5	514.4	259.3	461.0	232.4
.6	960.1	484.1	515.4	259.9	460.0	231.9
.7	961.2	484.6	516.5	260.4	458.9	231.4
.8	962.2	485.1	517.5	260.9	457.9	230.8
.9	963.3	485.7	518.6	261.5	456.8	230.3
2039.0	964.3	486.2	519.6	262.0	455.8	229.8
.1	965.4	486.7	520.7	262.5	454.7	229.2
.2	966.4	487.3	521.7	263.0	453.7	228.7
.3	967.5	487.8	522.8	263.6	452.6	228.2
.4	968.6	488.3	523.9	264.1	451.5	227.7
.5	969.6	488.8	524.9	264.6	450.5	227.1
.6	970.7	489.4	526.0	265.2	449.4	226.6
.7	971.7	489.9	527.0	265.7	448.4	226.1
.8	972.8	490.4	528.1	266.2	447.3	225.5
.9	973.8	491.0	529.1	266.8	446.3	225.0
2040.0	974.9	491.5	530.2	267.3	445.2	224.5
.1	975.9	492.0	531.2	267.8	444.2	223.9
.2	977.0	492.6	532.3	268.4	443.1	223.4
.3	978.0	493.1	533.3	268.9	442.1	222.9
.4	979.1	493.6	534.4	269.4	441.0	222.3
.5	980.2	494.2	535.5	270.0	439.9	221.8
.6	981.2	494.7	536.5	270.5	438.9	221.3
.7	982.3	495.2	537.6	271.0	437.8	220.7
.8	983.3	495.8	538.6	271.6	436.8	220.2
.9	984.4	496.3	539.7	272.1	435.7	219.7

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2041.0	985.4	496.8	540.7	272.6	434.7	219.2
.1	986.5	497.3	541.8	273.1	433.6	218.6
.2	987.5	497.9	542.8	273.7	432.6	218.1
.3	988.6	498.4	543.9	274.2	431.5	217.6
.4	989.6	498.9	544.9	274.7	430.5	217.0
.5	990.7	499.5	546.0	275.3	429.4	216.5
.6	991.7	500.0	547.0	275.8	428.4	216.0
.7	992.8	500.5	548.1	276.3	427.3	215.4
.8	993.9	501.1	549.2	276.9	426.2	214.9
.9	994.9	501.6	550.2	277.4	425.2	214.4
2042.0	996.0	502.1	551.3	277.9	424.1	213.8
.1	997.0	502.7	552.3	278.5	423.1	213.3
.2	998.1	503.2	553.4	279.0	422.0	212.8
.3	999.1	503.7	554.4	279.5	421.0	212.2
.4	1000.2	504.3	555.5	280.1	419.9	211.7
.5	1001.2	504.8	556.5	280.6	418.9	211.2
.6	1002.3	505.3	557.6	281.1	417.8	210.6
.7	1003.3	505.9	558.6	281.6	416.8	210.1
.8	1004.4	506.4	559.7	282.2	415.7	209.6
.9	1005.4	506.9	560.7	282.7	414.7	209.1
2043.0	1006.5	507.4	561.8	283.2	413.6	208.5
.1	1007.6	508.0	562.9	283.8	412.5	208.0
.2	1008.6	508.5	563.9	284.3	411.5	207.5
.3	1009.7	509.0	565.0	284.8	410.4	206.9
.4	1010.7	509.6	566.0	285.4	409.4	206.4
.5	1011.8	510.1	567.1	285.9	408.3	205.9
.6	1012.8	510.6	568.1	286.4	407.3	205.3
.7	1013.9	511.2	569.2	287.0	406.2	204.8
.8	1014.9	511.7	570.2	287.5	405.2	204.3
.9	1016.0	512.2	571.3	288.0	404.1	203.7
2044.0	1017.0	512.8	572.3	288.6	403.1	203.2
.1	1018.1	513.3	573.4	289.1	402.0	202.7
.2	1019.1	513.8	574.4	289.6	401.0	202.1
.3	1020.2	514.4	575.5	290.2	399.9	201.6
.4	1021.3	514.9	576.6	290.7	398.8	201.1
.5	1022.3	515.4	577.6	291.2	397.8	200.6
.6	1023.4	515.9	578.7	291.7	396.7	200.0
.7	1024.4	516.5	579.7	292.3	395.7	199.5
.8	1025.5	517.0	580.8	292.8	394.6	199.0
.9	1026.5	517.5	581.8	293.3	393.6	198.4
2045.0	1027.6	518.1	582.9	293.9	392.5	197.9
.1	1028.6	518.6	583.9	294.4	391.5	197.4
.2	1029.7	519.1	585.0	294.9	390.4	196.8
.3	1030.7	519.7	586.0	295.5	389.4	196.3
.4	1031.8	520.2	587.1	296.0	388.3	195.8
.5	1032.9	520.7	588.2	296.5	387.2	195.2
.6	1033.9	521.3	589.2	297.1	386.2	194.7
.7	1035.0	521.8	590.3	297.6	385.1	194.2
.8	1036.0	522.3	591.3	298.1	384.1	193.6
.9	1037.1	522.9	592.4	298.7	383.0	193.1

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2046.0	1038.1	523.4	593.4	299.2	382.0	192.6
.1	1039.2	523.9	594.5	299.7	380.9	192.0
.2	1040.2	524.4	595.5	300.2	379.9	191.5
.3	1041.3	525.0	596.6	300.8	378.8	191.0
.4	1042.3	525.5	597.6	301.3	377.8	190.5
.5	1043.4	526.0	598.7	301.8	376.7	189.9
.6	1044.4	526.6	599.7	302.4	375.7	189.4
.7	1045.5	527.1	600.8	302.9	374.6	188.9
.8	1046.6	527.6	601.9	303.4	373.5	188.3
.9	1047.6	528.2	602.9	304.0	372.5	187.8
2047.0	1048.7	528.7	604.0	304.5	371.4	187.3
.1	1049.7	529.2	605.0	305.0	370.4	186.7
.2	1050.8	529.8	606.1	305.6	369.3	186.2
.3	1051.8	530.3	607.1	306.1	368.3	185.7
.4	1052.9	530.8	608.2	306.6	367.2	185.1
.5	1053.9	531.4	609.2	307.2	366.2	184.6
.6	1055.0	531.9	610.3	307.7	365.1	184.1
.7	1056.0	532.4	611.3	308.2	364.1	183.5
.8	1057.1	533.0	612.4	308.7	363.0	183.0
.9	1058.1	533.5	613.4	309.3	362.0	182.5
2048.0	1059.2	534.0	614.5	309.8	360.9	182.0
.1	1060.3	534.5	615.6	310.3	359.8	181.4
.2	1061.3	535.1	616.6	310.9	358.8	180.9
.3	1062.4	535.6	617.7	311.4	357.7	180.4
.4	1063.4	536.1	618.7	311.9	356.7	179.8
.5	1064.5	536.7	619.8	312.5	355.6	179.3
.6	1065.5	537.2	620.8	313.0	354.6	178.8
.7	1066.6	537.7	621.9	313.5	353.5	178.2
.8	1067.6	538.3	622.9	314.1	352.5	177.7
.9	1068.7	538.8	624.0	314.6	351.4	177.2
2049.0	1069.7	539.3	625.0	315.1	350.4	176.6
.1	1070.8	539.9	626.1	315.7	349.3	176.1
.2	1071.9	540.4	627.2	316.2	348.2	175.6
.3	1072.9	540.9	628.2	316.7	347.2	175.0
.4	1074.0	541.5	629.3	317.3	346.1	174.5
.5	1075.0	542.0	630.3	317.8	345.1	174.0
.6	1076.1	542.5	631.4	318.3	344.0	173.4
.7	1077.1	543.0	632.4	318.8	343.0	172.9
.8	1078.2	543.6	633.5	319.4	341.9	172.4
.9	1079.2	544.1	634.5	319.9	340.9	171.9
2050.0	1080.3	544.6	635.6	320.4	339.8	171.3
.1	1	[illegible]	[illegible]	.0	338.8	170.8
.2	1	[illegible]	[illegible]	.5	337.7	170.3
.3	1	[illegible]	[illegible]	.0	336.7	169.7
.4	1	[illegible]	[illegible]	.6	335.6	169.2
.5	1	[illegible]	[illegible]	.1	334.5	168.7
.6	1	[illegible]	[illegible]	.6	333.5	168.1
.7	1	[illegible]	[illegible]	.2	332.4	167.6
.8	1	[illegible]	[illegible]	.7	331.4	167.1
.9	1	[illegible]	[illegible]	.2	330.3	166.5

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2051.0	1090.8	550.0	646.1	325.8	329.3	166.0
.1	1091.9	550.5	647.2	326.3	328.2	165.5
.2	1092.9	551.0	648.2	326.8	327.2	164.9
.3	1094.0	551.6	649.3	327.3	326.1	164.4
.4	1095.0	552.1	650.3	327.9	325.1	163.9
.5	1096.2	552.7	651.5	328.5	323.9	163.3
.6	1097.4	553.3	652.7	329.1	322.7	162.7
.7	1098.6	553.9	653.9	329.7	321.5	162.1
.8	1099.8	554.5	655.1	330.3	320.3	161.5
.9	1101.0	555.1	656.3	330.9	319.1	160.9
2052.0	1102.2	555.7	657.5	331.5	317.9	160.3
.1	1103.4	556.3	658.7	332.1	316.7	159.7
.2	1104.6	556.9	659.9	332.7	315.5	159.1
.3	1105.8	557.5	661.1	333.3	314.3	158.5
.4	1107.0	558.1	662.3	333.9	313.1	157.9
.5	1108.1	558.7	663.4	334.5	312.0	157.3
.6	1109.3	559.3	664.6	335.1	310.8	156.7
.7	1110.5	559.9	665.8	335.7	309.6	156.1
.8	1111.7	560.5	667.0	336.3	308.4	155.5
.9	1112.9	561.1	668.2	336.9	307.2	154.9
2053.0	1114.1	561.7	669.4	337.5	306.0	154.3
.1	1115.3	562.3	670.6	338.1	304.8	153.7
.2	1116.5	562.9	671.8	338.7	303.6	153.1
.3	1117.7	563.5	673.0	339.3	302.4	152.5
.4	1118.9	564.1	674.2	339.9	301.2	151.9
.5	1120.1	564.7	675.4	340.5	300.0	151.3
.6	1121.2	565.3	676.5	341.1	298.9	150.7
.7	1122.4	565.9	677.7	341.7	297.7	150.1
.8	1123.6	566.5	678.9	342.3	296.5	149.5
.9	1124.8	567.1	680.1	342.9	295.3	148.9
2054.0	1126.0	567.7	681.3	343.5	294.1	148.3
.1	1127.2	568.3	682.5	344.1	292.9	147.7
.2	1128.4	568.9	683.7	344.7	291.7	147.1
.3	1129.6	569.5	684.9	345.3	290.5	146.5
.4	1130.8	570.1	686.1	345.9	289.3	145.9
.5	1132.0	570.7	687.3	346.5	288.1	145.3
.6	1133.2	571.3	688.5	347.1	286.9	144.7
.7	1134.3	571.9	689.6	347.7	285.8	144.1
.8	1135.5	572.5	690.8	348.3	284.6	143.5
.9	1136.7	573.1	692.0	348.9	283.4	142.9
2055.0	1137.9	573.7	693.2	349.5	282.2	142.3
.1	1139.1	574.3	694.4	350.1	281.0	141.7
.2	1140.3	574.9	695.6	350.7	279.8	141.1
.3	1141.5	575.5	696.8	351.3	278.6	140.5
.4	1142.7	576.1	698.0	351.9	277.4	139.9
.5	1143.9	576.7	699.2	352.5	276.2	139.3
.6	1145.1	577.3	700.4	353.1	275.0	138.7
.7	1146.3	577.9	701.6	353.7	273.8	138.1
.8	1147.5	578.5	702.8	354.3	272.6	137.5
.9	1148.6	579.1	703.9	354.9	271.5	136.9

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2056.0	1149.8	579.7	705.1	355.5	270.3	136.3
.1	1151.0	580.3	706.3	356.1	269.1	135.7
.2	1152.2	580.9	707.5	356.7	267.9	135.1
.3	1153.4	581.5	708.7	357.3	266.7	134.5
.4	1154.6	582.1	709.9	357.9	265.5	133.9
.5	1155.8	582.7	711.1	358.5	264.3	133.3
.6	1157.0	583.3	712.3	359.1	263.1	132.7
.7	1158.2	583.9	713.5	359.7	261.9	132.1
.8	1159.4	584.5	714.7	360.3	260.7	131.5
.9	1160.6	585.1	715.9	360.9	259.5	130.9
2057.0	1161.7	585.7	717.0	361.5	258.4	130.3
.1	1162.9	586.3	718.2	362.1	257.2	129.7
.2	1164.1	586.9	719.4	362.7	256.0	129.1
.3	1165.3	587.5	720.6	363.3	254.8	128.5
.4	1166.5	588.1	721.8	363.9	253.6	127.9
.5	1167.7	588.7	723.0	364.5	252.4	127.3
.6	1168.9	589.3	724.2	365.1	251.2	126.6
.7	1170.1	589.9	725.4	365.7	250.0	126.0
.8	1171.3	590.5	726.6	366.3	248.8	125.4
.9	1172.5	591.1	727.8	366.9	247.6	124.8
2058.0	1173.7	591.7	729.0	367.5	246.4	124.2
.1	1174.8	592.3	730.1	368.1	245.3	123.6
.2	1176.0	592.9	731.3	368.7	244.1	123.0
.3	1177.2	593.5	732.5	369.3	242.9	122.4
.4	1178.4	594.1	733.7	369.9	241.7	121.8
.5	1179.6	594.7	734.9	370.5	240.5	121.2
.6	1180.8	595.3	736.1	371.1	239.3	120.6
.7	1182.0	595.9	737.3	371.7	238.1	120.0
.8	1183.2	596.5	738.5	372.3	236.9	119.4
.9	1184.4	597.1	739.7	372.9	235.7	118.8
2059.0	1185.6	597.7	740.9	373.5	234.5	118.2
.1	1186.8	598.3	742.1	374.1	233.3	117.6
.2	1188.0	598.9	743.3	374.7	232.1	117.0
.3	1189.1	599.5	744.4	375.3	231.0	116.4
.4	1190.3	600.1	745.6	375.9	229.8	115.8
.5	1191.5	600.7	746.8	376.5	228.6	115.2
.6	1192.7	601.3	748.0	377.1	227.4	114.6
.7	1193.9	601.9	749.2	377.7	226.2	114.0
.8	1195.1	602.5	750.4	378.3	225.0	113.4
.9	1196.3	603.1	751.6	378.9	223.8	112.8
2060.0	1197.5	603.7	752.8	379.5	222.6	112.2
.1	1198.7	604.3	754.0	380.1	221.4	111.6
.2	1199.9	604.9	755.2	380.7	220.2	111.0
.3	1201.1	605.5	756.4	381.3	219.0	110.4
.4	1202.2	606.1	757.5	381.9	217.9	109.8
.5	1203.4	606.7	758.7	382.5	216.7	109.2
.6	1204.6	607.3	759.9	383.1	215.5	108.6
.7	1205.8	607.9	761.1	383.7	214.3	108.0
.8	1207.0	608.5	762.3	384.3	213.1	107.4
.9	1208.2	609.1	763.5	384.9	211.9	106.8

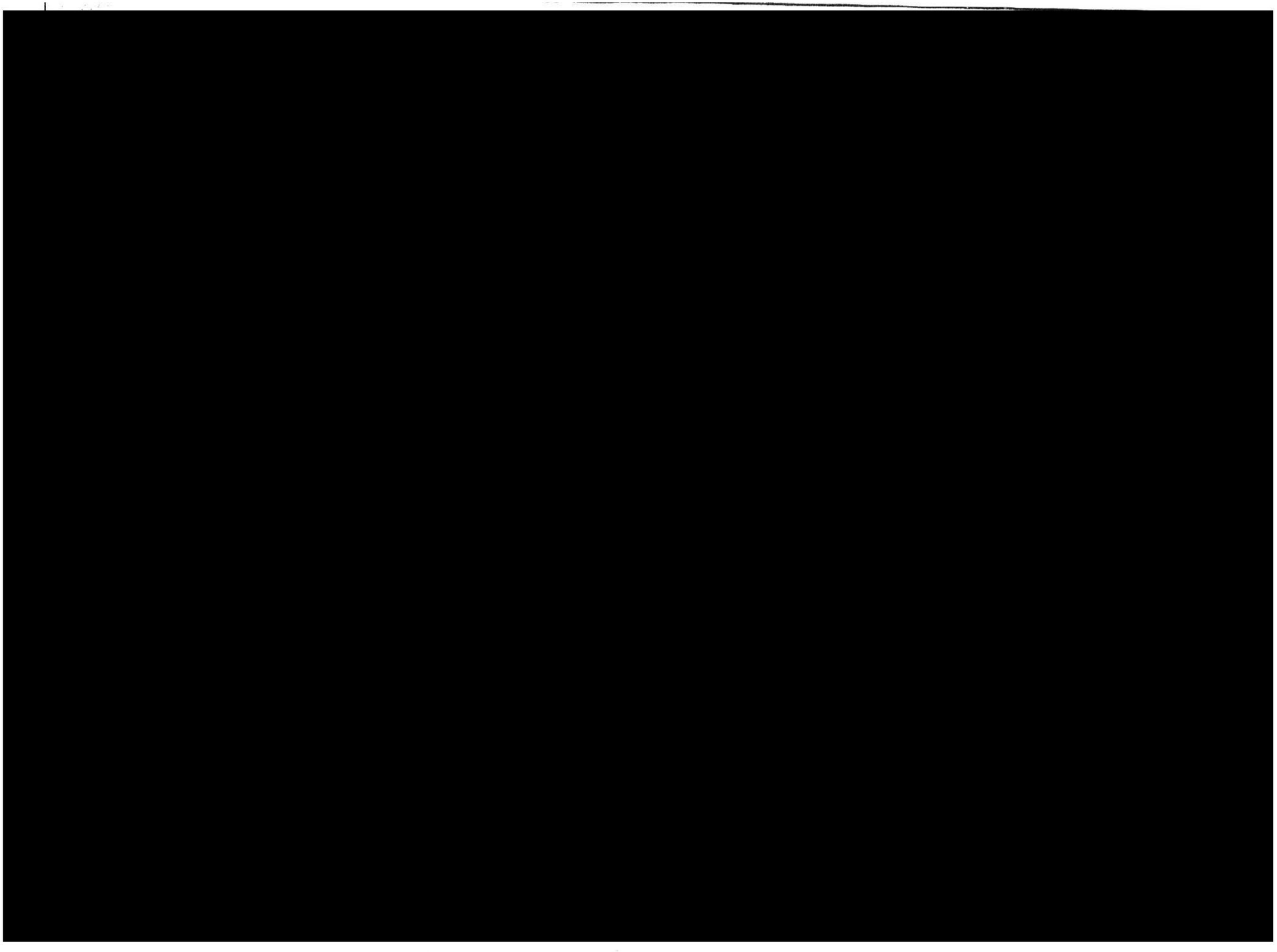
ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2061.0	1209.4	609.7	764.7	385.5	210.7	106.2
.1	1210.6	610.3	765.9	386.1	209.5	105.6
.2	1211.8	610.9	767.1	386.7	208.3	105.0
.3	1213.0	611.5	768.3	387.3	207.1	104.4
.4	1214.2	612.1	769.5	387.9	205.9	103.8
.5	1215.3	612.7	770.6	388.5	204.8	103.2
.6	1216.5	613.3	771.8	389.1	203.6	102.6
.7	1217.7	613.9	773.0	389.7	202.4	102.0
.8	1218.9	614.5	774.2	390.3	201.2	101.4
.9	1220.1	615.1	775.4	390.9	200.0	100.8
2062.0	1221.3	615.7	776.6	391.5	198.8	100.2
.1	1222.5	616.3	777.8	392.1	197.6	99.6
.2	1223.7	616.9	779.0	392.7	196.4	99.0
.3	1224.9	617.5	780.2	393.3	195.2	98.4
.4	1226.1	618.1	781.4	393.9	194.0	97.8
.5	1227.3	618.7	782.6	394.5	192.8	97.2
.6	1228.5	619.3	783.8	395.1	191.6	96.6
.7	1229.6	619.9	784.9	395.7	190.5	96.0
.8	1230.8	620.5	786.1	396.3	189.3	95.4
.9	1232.0	621.1	787.3	396.9	188.1	94.8
2063.0	1233.2	621.7	788.5	397.5	186.9	94.2
.1	1234.4	622.3	789.7	398.1	185.7	93.6
.2	1235.6	622.9	790.9	398.7	184.5	93.0
.3	1236.8	623.5	792.1	399.3	183.3	92.4
.4	1238.0	624.1	793.3	399.9	182.1	91.8
.5	1239.2	624.7	794.5	400.5	180.9	91.2
.6	1240.4	625.3	795.7	401.1	179.7	90.6
.7	1241.6	625.9	796.9	401.7	178.5	90.0
.8	1242.7	626.6	798.0	402.3	177.4	89.4
.9	1243.9	627.2	799.2	402.9	176.2	88.8
2064.0	1245.1	627.8	800.4	403.5	175.0	88.2
.1	1246.3	628.4	801.6	404.1	173.8	87.6
.2	1247.5	629.0	802.8	404.7	172.6	87.0
.3	1248.7	629.6	804.0	405.4	171.4	86.4
.4	1249.9	630.2	805.2	406.0	170.2	85.8
.5	1251.1	630.8	806.4	406.6	169.0	85.2
.6	1252.3	631.4	807.6	407.2	167.8	84.6
.7	1253.5	632.0	808.8	407.8	166.6	84.0
.8	1254.7	632.6	810.0	408.4	165.4	83.4
.9	1255.8	633.2	811.1	409.0	164.3	82.8
2065.0	1257.0	633.8	812.3	409.6	163.1	82.2
.1	1258.2	634.4	813.5	410.2	161.9	81.6
.2	1259.4	635.0	814.7	410.8	160.7	81.0
.3	1260.6	635.6	815.9	411.4	159.5	80.4
.4	1261.8	636.2	817.1	412.0	158.3	79.8
.5	1263.0	636.8	818.3	412.6	157.1	79.2
.6	1264.2	637.4	819.5	413.2	155.9	78.6
.7	1265.4	638.0	820.7	413.8	154.7	78.0
.8	1266.6	638.6	821.9	414.4	153.5	77.4
.9	1267.8	639.2	823.1	415.0	152.3	76.8

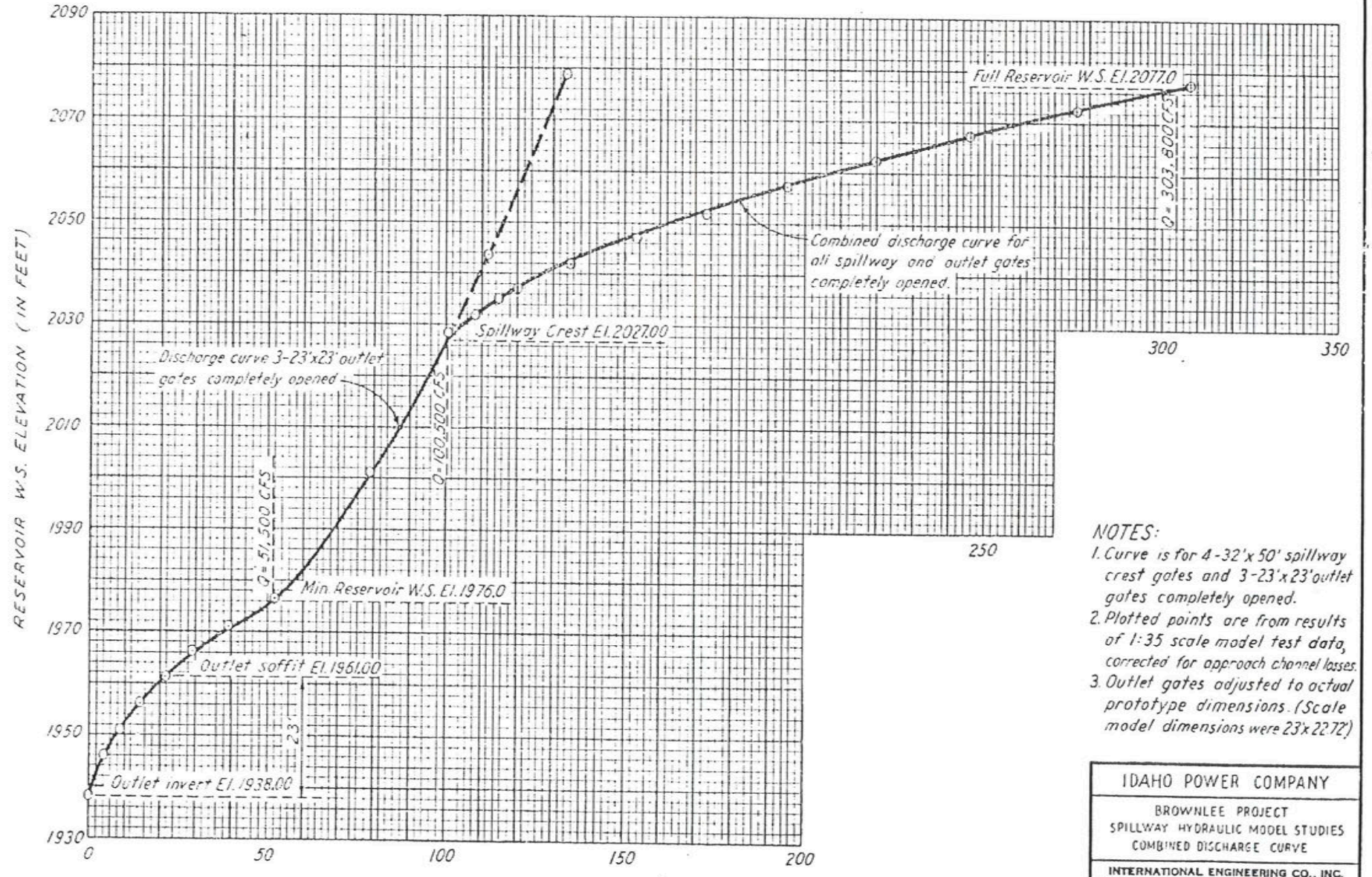
ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2066.0	1268.9	639.8	824.2	415.6	151.2	76.2
.1	1270.3	640.5	825.6	416.3	149.8	75.5
.2	1271.7	641.1	827.0	416.9	148.4	74.8
.3	1273.1	641.8	828.4	417.6	147.0	74.1
.4	1274.4	642.5	829.7	418.3	145.7	73.4
.5	1275.8	643.2	831.1	419.0	144.3	72.7
.6	1277.2	643.9	832.5	419.7	142.9	72.0
.7	1278.6	644.6	833.9	420.4	141.5	71.4
.8	1279.9	645.3	835.2	421.1	140.2	70.7
.9	1281.3	646.0	836.6	421.8	138.8	70.0
2067.0	1282.7	646.7	838.0	422.5	137.4	69.3
.1	1284.1	647.4	839.4	423.2	136.0	68.6
.2	1285.4	648.1	840.7	423.9	134.7	67.9
.3	1286.8	648.8	842.1	424.6	133.3	67.2
.4	1288.2	649.5	843.5	425.3	131.9	66.5
.5	1289.6	650.2	844.9	425.9	130.5	65.8
.6	1290.9	650.8	846.2	426.6	129.2	65.1
.7	1292.3	651.5	847.6	427.3	127.8	64.4
.8	1293.7	652.2	849.0	428.0	126.4	63.7
.9	1295.0	652.9	850.3	428.7	125.1	63.0
2068.0	1296.4	653.6	851.7	429.4	123.7	62.4
.1	1297.8	654.3	853.1	430.1	122.3	61.7
.2	1299.2	655.0	854.5	430.8	120.9	61.0
.3	1300.5	655.7	855.8	431.5	119.6	60.3
.4	1301.9	656.4	857.2	432.2	118.2	59.6
.5	1303.3	657.1	858.6	432.9	116.8	58.9
.6	1304.7	657.8	860.0	433.6	115.4	58.2
.7	1306.0	658.5	861.3	434.3	114.1	57.5
.8	1307.4	659.2	862.7	435.0	112.7	56.8
.9	1308.8	659.8	864.1	435.6	111.3	56.1
2069.0	1310.2	660.5	865.5	436.3	109.9	55.4
.1	1311.5	661.2	866.8	437.0	108.6	54.7
.2	1312.9	661.9	868.2	437.7	107.2	54.0
.3	1314.3	662.6	869.6	438.4	105.8	53.3
.4	1315.7	663.3	871.0	439.1	104.4	52.7
.5	1317.0	664.0	872.3	439.8	103.1	52.0
.6	1318.4	664.7	873.7	440.5	101.7	51.3
.7	1319.8	665.4	875.1	441.2	100.3	50.6
.8	1321.2	666.1	876.5	441.9	98.9	49.9
.9	1322.5	666.8	877.8	442.6	97.6	49.2
2070.0	1323.9	667.5	879.2	443.3	96.2	48.5
.1	1325.3	668.2	880.6	444.0	94.8	47.8
.2	1326.6	668.9	881.9	444.6	93.5	47.1
.3	1328.0	669.5	883.3	445.3	92.1	46.4
.4	1329.4	670.2	884.7	446.0	90.7	45.7
.5	1330.8	670.9	886.1	446.7	89.3	45.0
.6	1332.1	671.6	887.4	447.4	88.0	44.3
.7	1333.5	672.3	888.8	448.1	86.6	43.7
.8	1334.9	673.0	890.2	448.8	85.2	43.0
.9	1336.3	673.7	891.6	449.5	83.8	42.3

ELEVATION FEET	GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2071.0	1337.6	674.4	892.9	450.2	82.5	41.6
.1	1339.0	675.1	894.3	450.9	81.1	40.9
.2	1340.4	675.8	895.7	451.6	79.7	40.2
.3	1341.8	676.5	897.1	452.3	78.3	39.5
.4	1343.1	677.2	898.4	453.0	77.0	38.8
.5	1344.5	677.9	899.8	453.7	75.6	38.1
.6	1345.9	678.5	901.2	454.3	74.2	37.4
.7	1347.3	679.2	902.6	455.0	72.8	36.7
.8	1348.6	679.9	903.9	455.7	71.5	36.0
.9	1350.0	680.6	905.3	456.4	70.1	35.3
2072.0	1351.4	681.3	906.7	457.1	68.7	34.6
.1	1352.7	682.0	908.0	457.8	67.4	34.0
.2	1354.1	682.7	909.4	458.5	66.0	33.3
.3	1355.5	683.4	910.8	459.2	64.6	32.6
.4	1356.9	684.1	912.2	459.9	63.2	31.9
.5	1358.2	684.8	913.5	460.6	61.9	31.2
.6	1359.6	685.5	914.9	461.3	60.5	30.5
.7	1361.0	686.2	916.3	462.0	59.1	29.8
.8	1362.4	686.9	917.7	462.7	57.7	29.1
.9	1363.7	687.6	919.0	463.3	56.4	28.4
2073.0	1365.1	688.2	920.4	464.0	55.0	27.7
.1	1366.5	688.9	921.8	464.7	53.6	27.0
.2	1367.9	689.6	923.2	465.4	52.2	26.3
.3	1369.2	690.3	924.5	466.1	50.9	25.6
.4	1370.6	691.0	925.9	466.8	49.5	25.0
.5	1372.0	691.7	927.3	467.5	48.1	24.3
.6	1373.4	692.4	928.7	468.2	46.7	23.6
.7	1374.7	693.1	930.0	468.9	45.4	22.9
.8	1376.1	693.8	931.4	469.6	44.0	22.2
.9	1377.5	694.5	932.8	470.3	42.6	21.5
2074.0	1378.8	695.2	934.1	471.0	41.3	20.8
.1	1380.2	695.9	935.5	471.7	39.9	20.1
.2	1381.6	696.6	936.9	472.4	38.5	19.4
.3	1383.0	697.2	938.3	473.0	37.1	18.7
.4	1384.3	697.9	939.6	473.7	35.8	18.0
.5	1385.7	698.6	941.0	474.4	34.4	17.3
.6	1387.1	699.3	942.4	475.1	33.0	16.6
.7	1388.5	700.0	943.8	475.8	31.6	15.9
.8	1389.8	700.7	945.1	476.5	30.3	15.3
.9	1391.2	701.4	946.5	477.2	28.9	14.6
2075.0	1392.6	702.1	947.9	477.9	27.5	13.9
.1	1394.0	702.8	949.3	478.6	26.1	13.2
.2	1395.3	703.5	950.6	479.3	24.8	12.5
.3	1396.7	704.2	952.0	480.0	23.4	11.8
.4	1398.1	704.9	953.4	480.7	22.0	11.1
.5	1399.5	705.6	954.8	481.4	20.6	10.4
.6	1400.8	706.3	956.1	482.0	19.3	9.7
.7	1402.2	706.9	957.5	482.7	17.9	9.0
.8	1403.6	707.6	958.9	483.4	16.5	8.3
.9	1404.9	708.3	960.2	484.1	15.2	7.6

ELEVATION FEET		GROSS STORAGE KAF	GROSS STORAGE KSFD	USABLE STORAGE KAF	USABLE STORAGE KSFD	CUMULATIVE DRAFT KAF	CUMULATIVE DRAFT KSFD
2076.0		1406.3	709.0	961.6	484.8	13.8	6.9
.1		1407.7	709.7	963.0	485.5	12.4	6.3
.2		1409.1	710.4	964.4	486.2	11.0	5.6
.3		1410.4	711.1	965.7	486.9	9.7	4.9
.4		1411.8	711.8	967.1	487.6	8.3	4.2
.5		1413.2	712.5	968.5	488.3	6.9	3.5
.6		1414.6	713.2	969.9	489.0	5.5	2.8
.7		1415.9	713.9	971.2	489.7	4.2	2.1
.8		1417.3	714.6	972.6	490.4	2.8	1.4
.9		1418.7	715.3	974.0	491.1	1.4	0.7
2077.0	SUB	1420.1	715.9	975.4	491.7	0.0	0.0
.1		1421.5	716.7				
.2		1423.0	717.4				
.3		1424.5	718.2				
.4		1426.0	718.9				
.5		1427.4	719.7				
.6		1428.9	720.4				
.7		1430.4	721.2				
.8		1431.9	721.9				
.9		1433.3	722.6				
2078.0		1434.8	723.4				

PLATE 2-1.2





NOTES:

1. Curve is for 4-32'x 50' spillway crest gates and 3-23'x 23' outlet gates completely opened.
2. Plotted points are from results of 1:35 scale model test data, corrected for approach channel losses.
3. Outlet gates adjusted to actual prototype dimensions. (Scale model dimensions were 23'x 22.72')

PLATE 2-2

IDAHO POWER COMPANY		
BROWNLEE PROJECT SPILLWAY HYDRAULIC MODEL STUDIES COMBINED DISCHARGE CURVE		
INTERNATIONAL ENGINEERING CO., INC. SAN FRANCISCO, CALIF.		
DR. K.A.S. CK. J.Y. HGH	RECOMMENDED H.Y. Han	APPROVED H.J. Lindsay
DATE: Nov. 1956	CV-04-237	

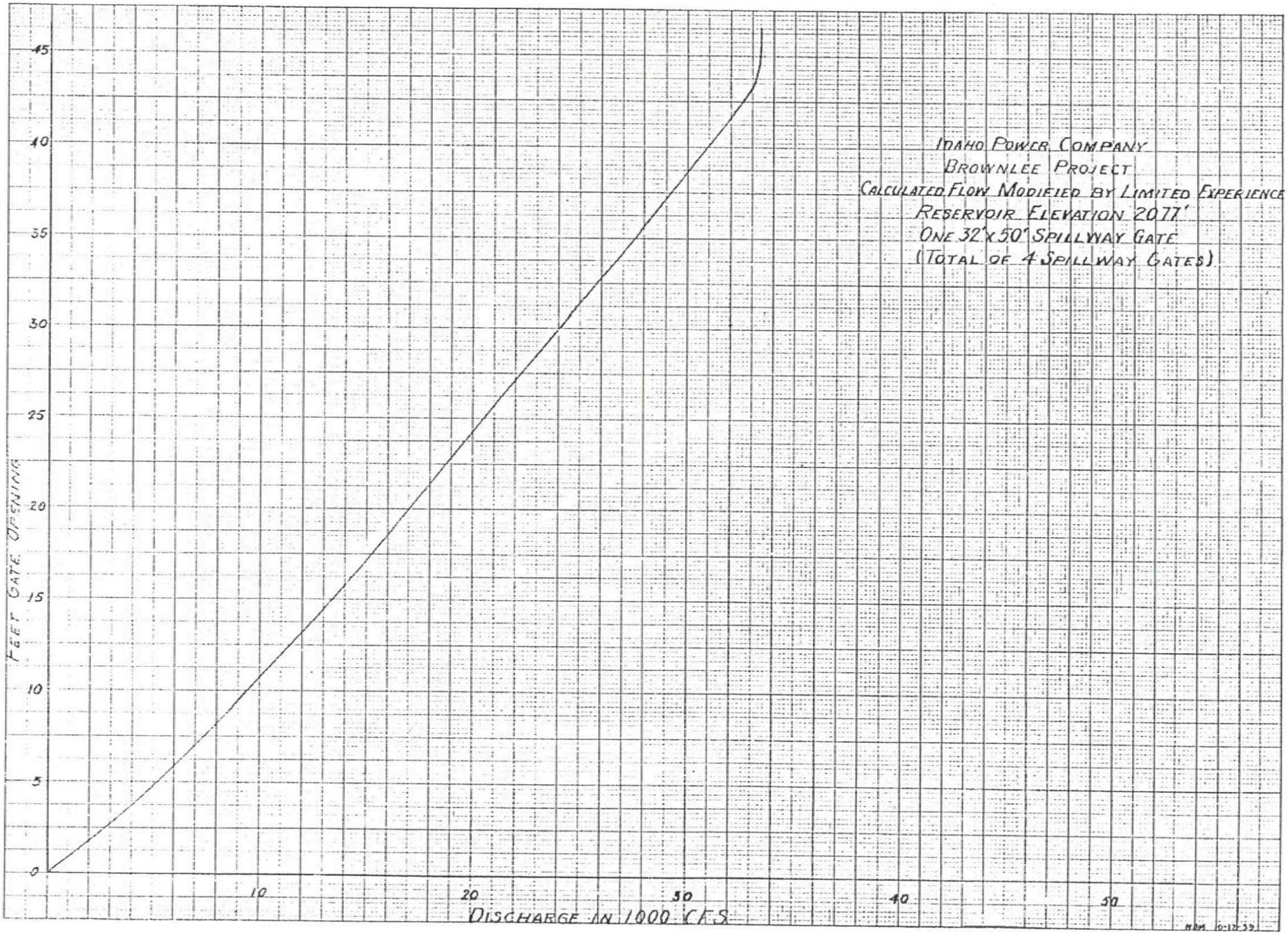
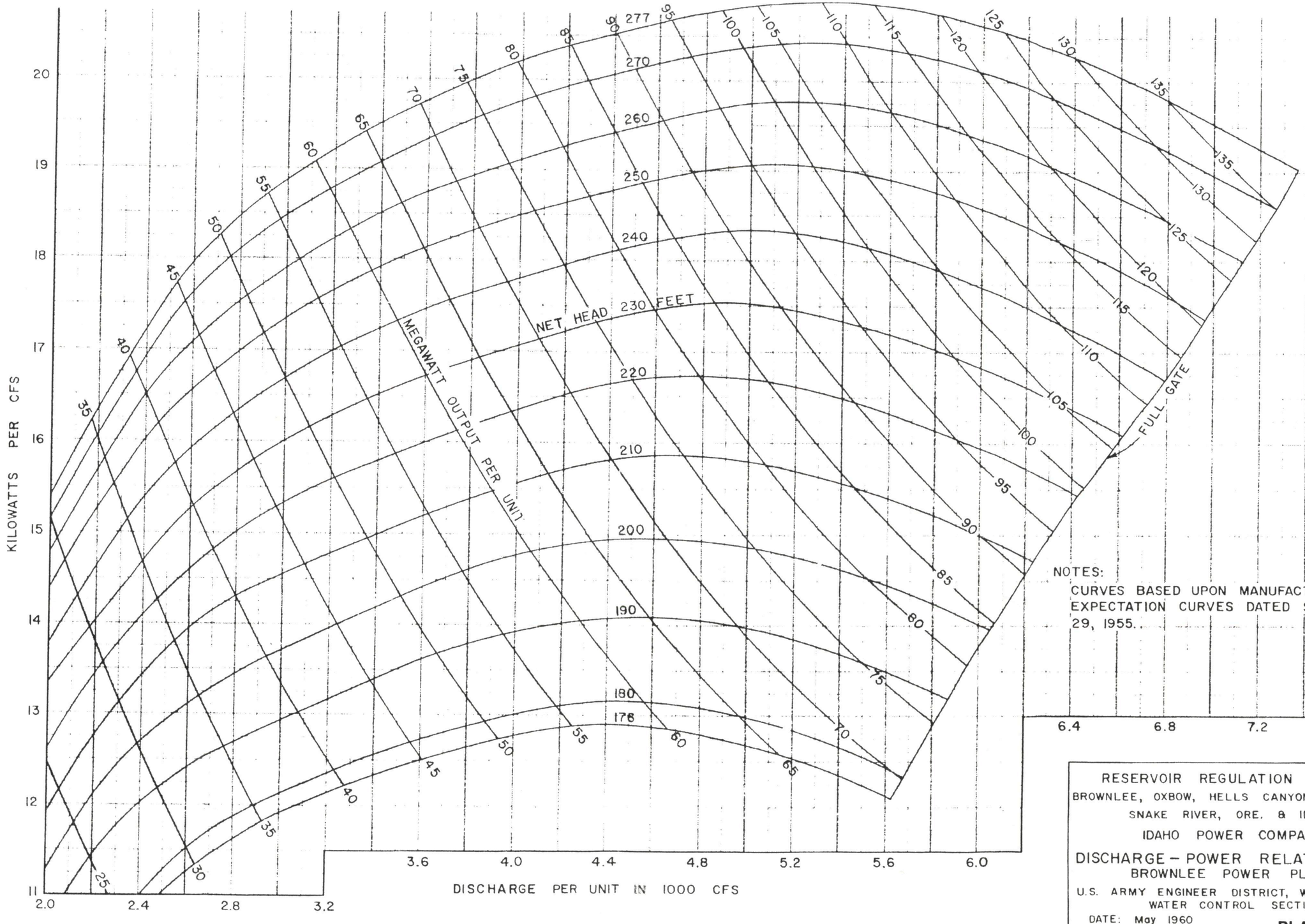

IDAHO POWER COMPANY
BROWNLEE PROJECT
CALCULATED FLOW MODIFIED BY LIMITED EXPERIENCE
RESERVOIR ELEVATION 2077'
ONE 32'x50' SPILLWAY GATE
(TOTAL OF 4 SPILLWAY GATES)
FEET GATE OPENING
0
5
10
15
20
25
30
35
40
45
10
20
30
40
50
DISCHARGE IN 1000 C.F.S.

PLATE 2-3



NOTES:

CURVES BASED UPON MANUFACTURER'S EXPECTATION CURVES DATED SEPTEMBER 29, 1955.

RESERVOIR REGULATION MANUAL

BROWNLEE, OXBOW, HELLS CANYON PROJECTS

SNAKE RIVER, ORE. & IDAHO

IDAHO POWER COMPANY

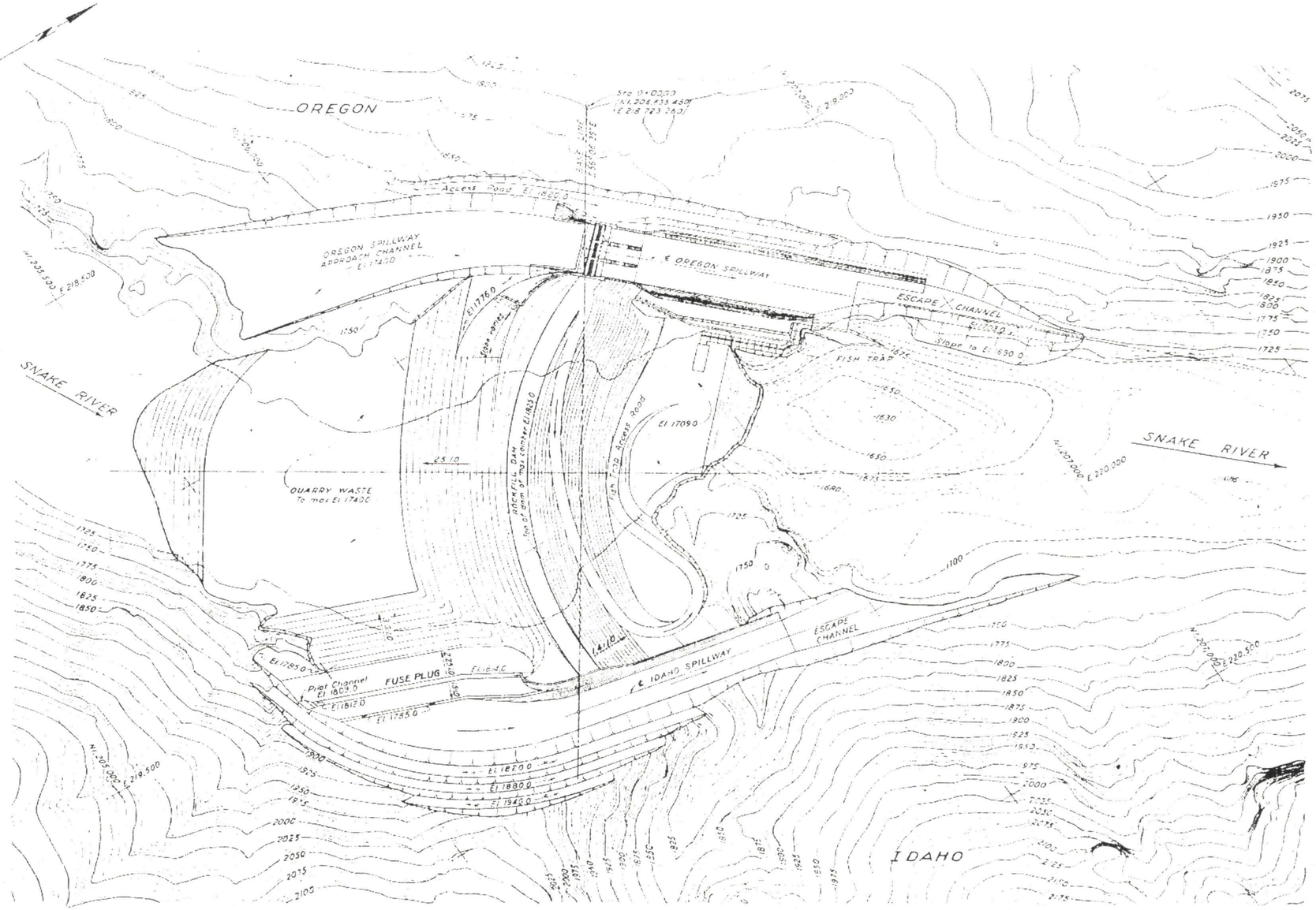
DISCHARGE – POWER RELATIONSHIPS

BROWNLEE POWER PLANT

U.S. ARMY ENGINEER DISTRICT, WALLA WALLA WATER CONTROL SECTION

DATE: May 1960

PLATE 2-4



DEPARTMENT OF THE ARMY
Approved in accordance with the provisions of Section 4(e) of the Federal Power Act insofar as the plans affect the navigable capacity of any navigable waters of the U.S.

November 1959 Ed Stechner
Lieutenant Col of Engineers

November 1959 Secretary of the Army

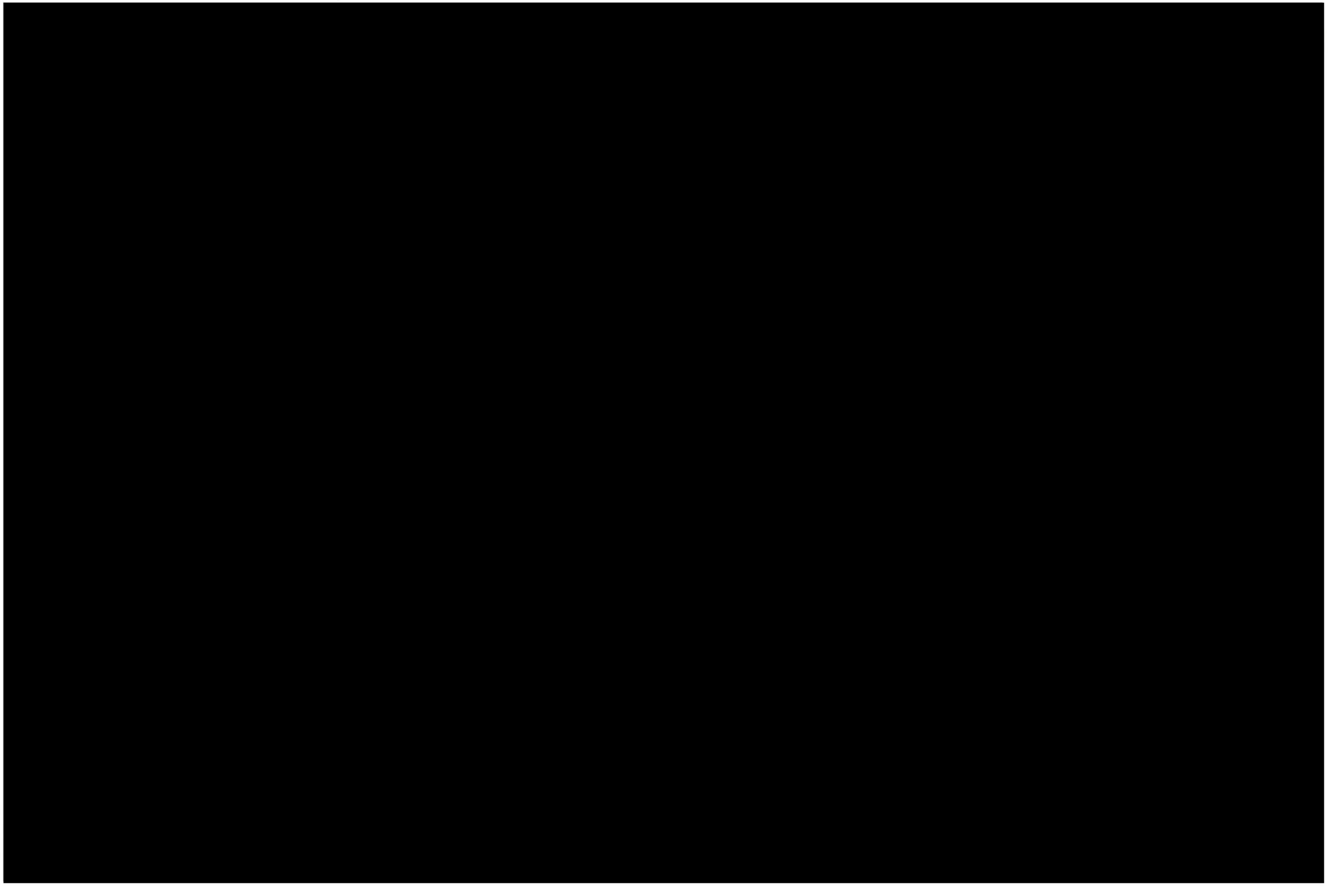
THIS DRAWING IS FILED PURSUANT TO ARTICLES 29 AND 30 OF LICENSE FOR PROJECT 1971 ISSUED AUGUST 4, 1955. (SUPERSEDES DWG. F.P.C. No 1971-56)

IDAHO POWER COMPANY
BY [signature]
PRESIDENT
DATED AUGUST 31 1959

PROJECT 1971 EXHIBIT L
OXBOW H.E. DEVELOPMENT
DAM AND SPILLWAY
PLAN
IDAHO POWER COMPANY
BOISE, IDAHO
SHEET 2 OF 5 E-14572

REVISED AUGUST 1959

PLATE 2-5.1



EJ 1600

[redacted]

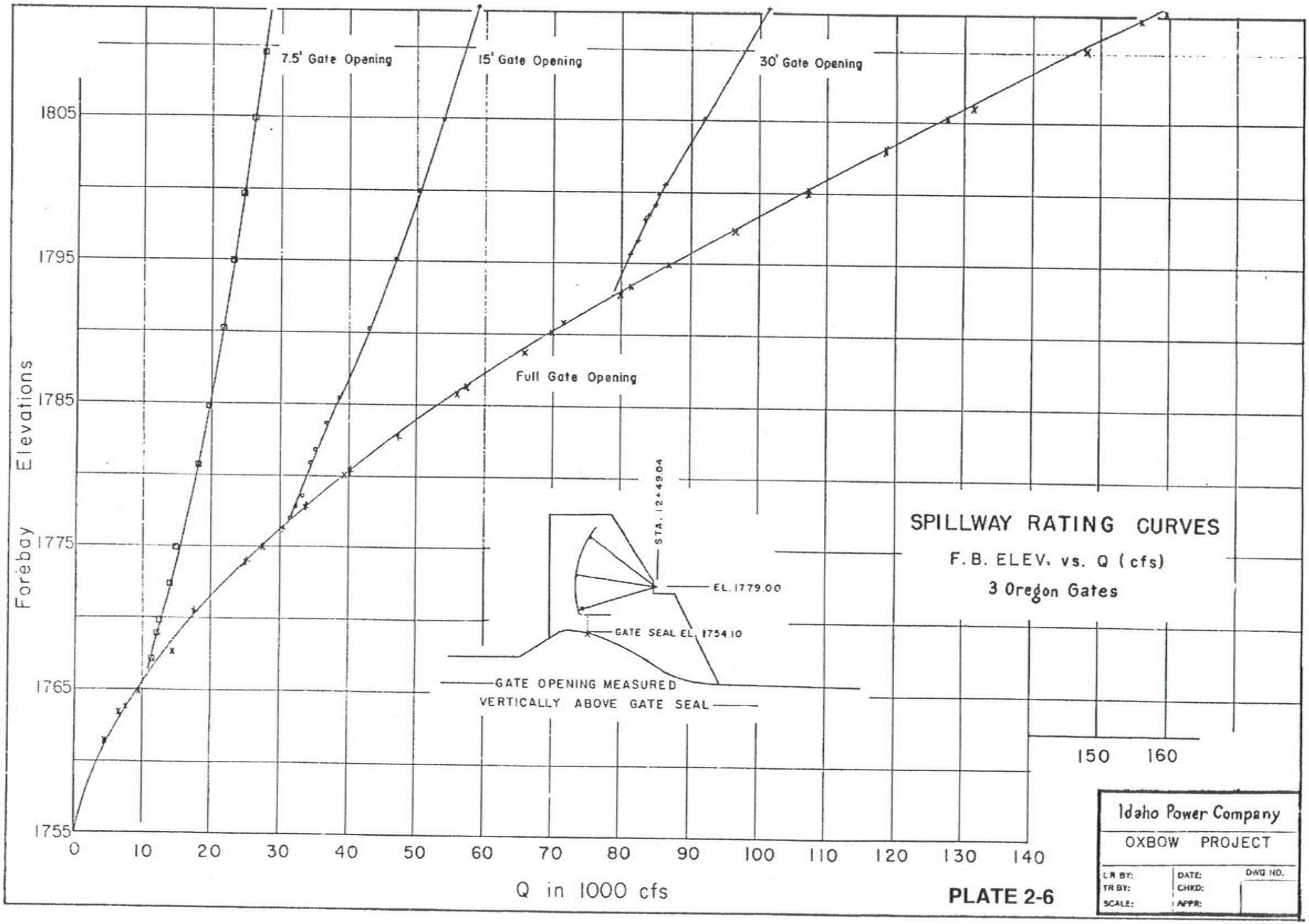

7.5' Gate Opening
15' Gate Opening
30' Gate Opening
Full Gate Opening
Forebay Elevations
1805
1795
1785
1775
1765
1755
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
Q in 1000 cfs
STA. 12+49.04
EL. 1779.00
GATE SEAL EL. 1754.10
GATE OPENING MEASURED
VERTICALLY ABOVE GATE SEAL
SPILLWAY RATING CURVES
F.B. ELEV. vs. Q (cfs)
3 Oregon Gates
Idaho Power Company
OXBOW PROJECT
DR BY:
TR BY:
SCALE:
DATE:
CHKD:
APPR:
DWG NO.

PLATE 2-6

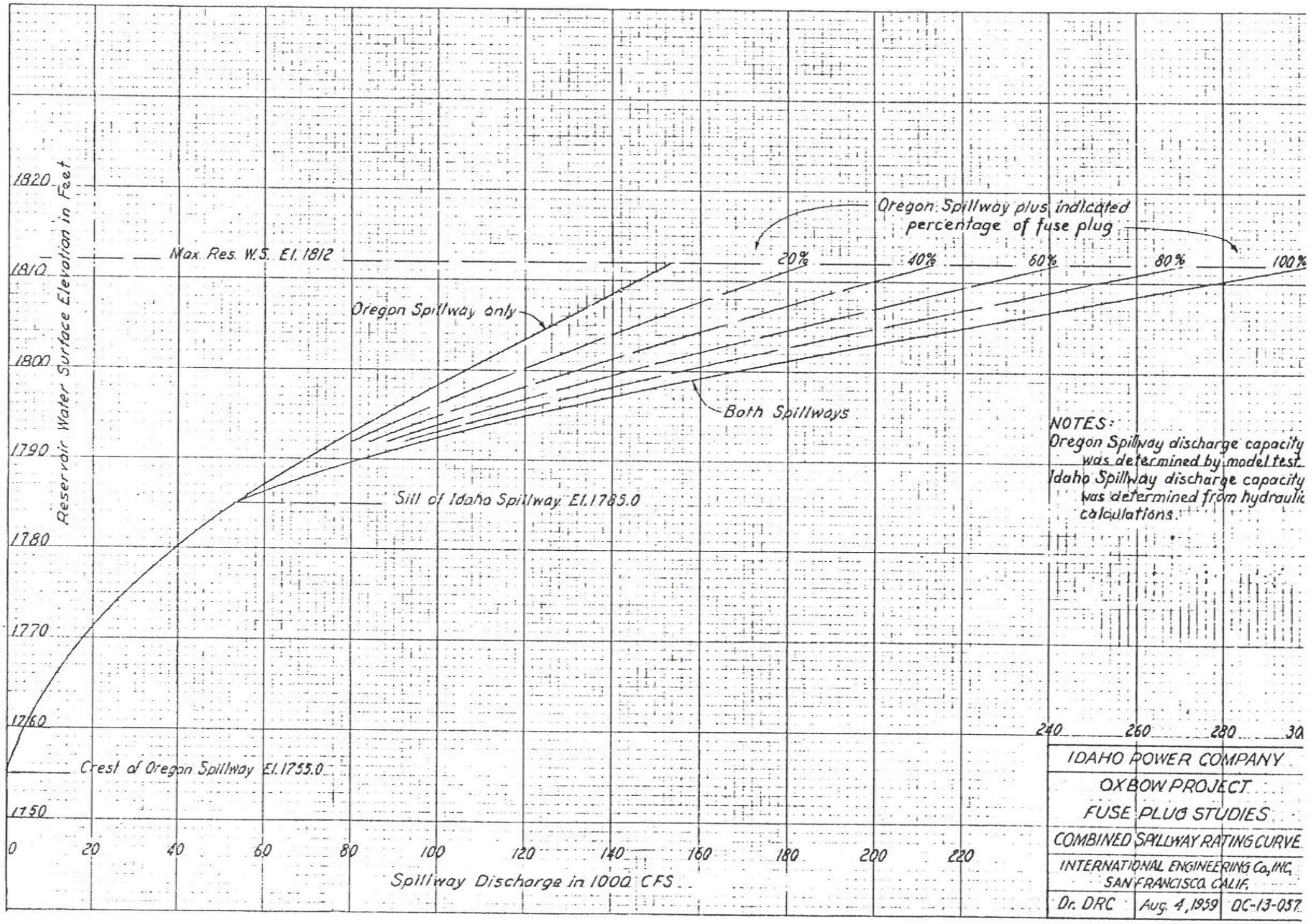
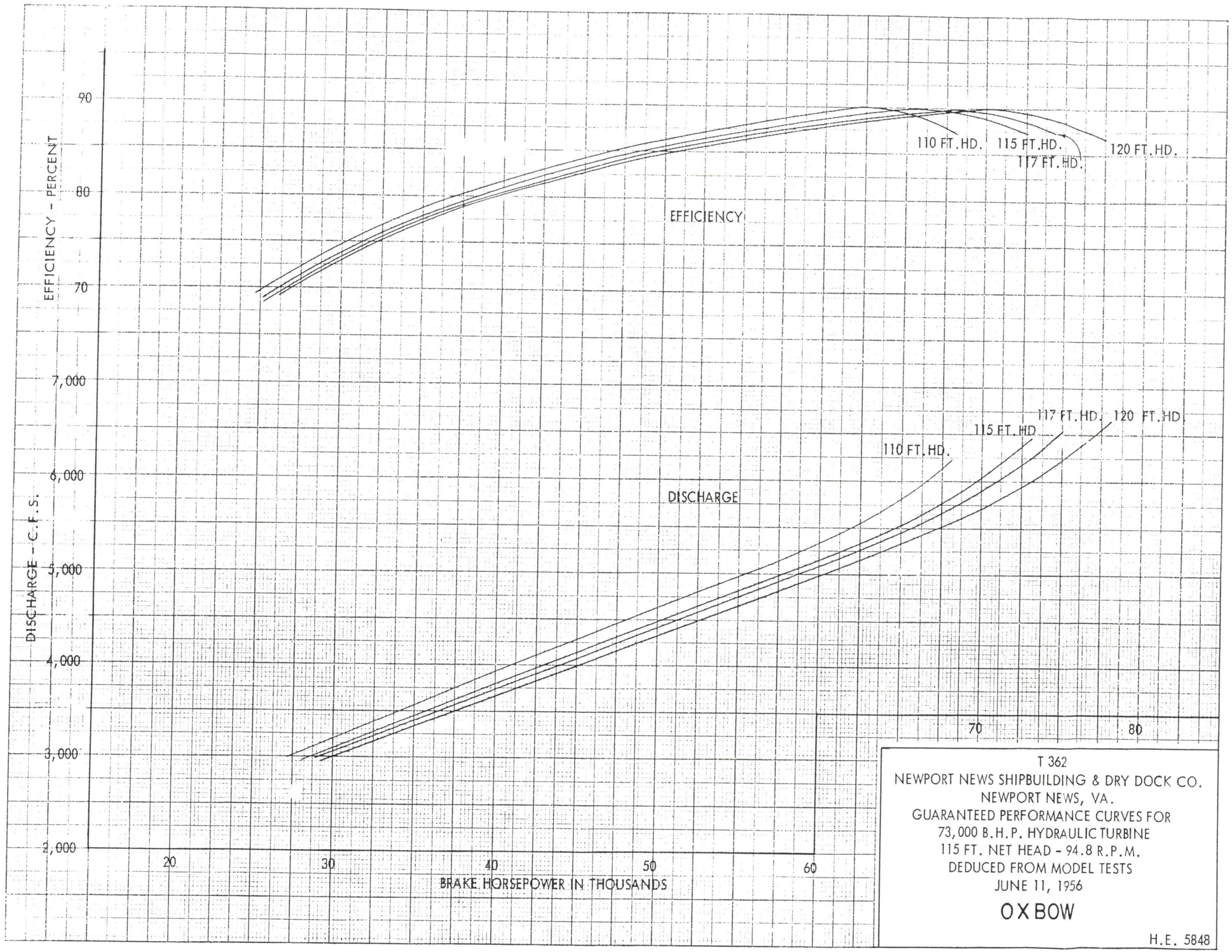

Reservoir Water Surface Elevation in Feet
1820
1810
1800
1790
1780
1770
1760
1750
Max. Res. W.S. El. 1812
Oregon Spillway plus indicated percentage of fuse plug
20%
40%
60%
80%
100%
Oregon Spillway only
Both Spillways
Sill of Idaho Spillway El. 1785.0
Crest of Oregon Spillway El. 1755.0
NOTES:
Oregon Spillway discharge capacity was determined by model test.
Idaho Spillway discharge capacity was determined from hydraulic calculations.
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
30
Spillway Discharge in 1000 CFS
IDAHO POWER COMPANY
OXBOW PROJECT
FUSE PLUG STUDIES
COMBINED SPILLWAY RATING CURVE
INTERNATIONAL ENGINEERING Co., INC.
SAN FRANCISCO, CALIF.
Dr. DRC
Aug. 4, 1959
OC-13-057

PLATE 2-7



T 362
NEWPORT NEWS SHIPBUILDING & DRY DOCK CO.
NEWPORT NEWS, VA.
GUARANTEED PERFORMANCE CURVES FOR
73,000 B.H.P. HYDRAULIC TURBINE
115 FT. NET HEAD - 94.8 R.P.M.
DEDUCED FROM MODEL TESTS
JUNE 11, 1956

OXBOW

H.E. 5848

PLATE 2-8

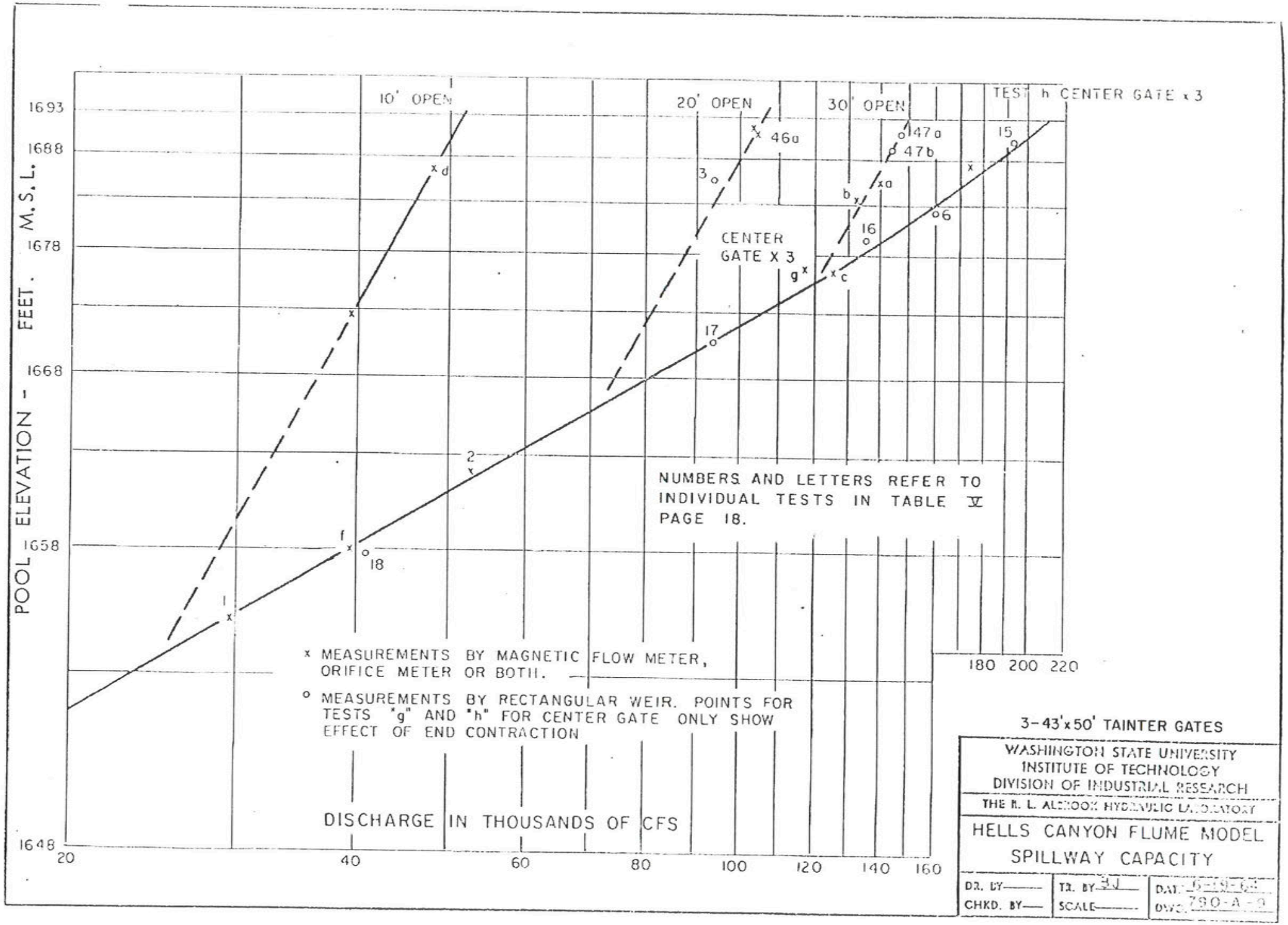
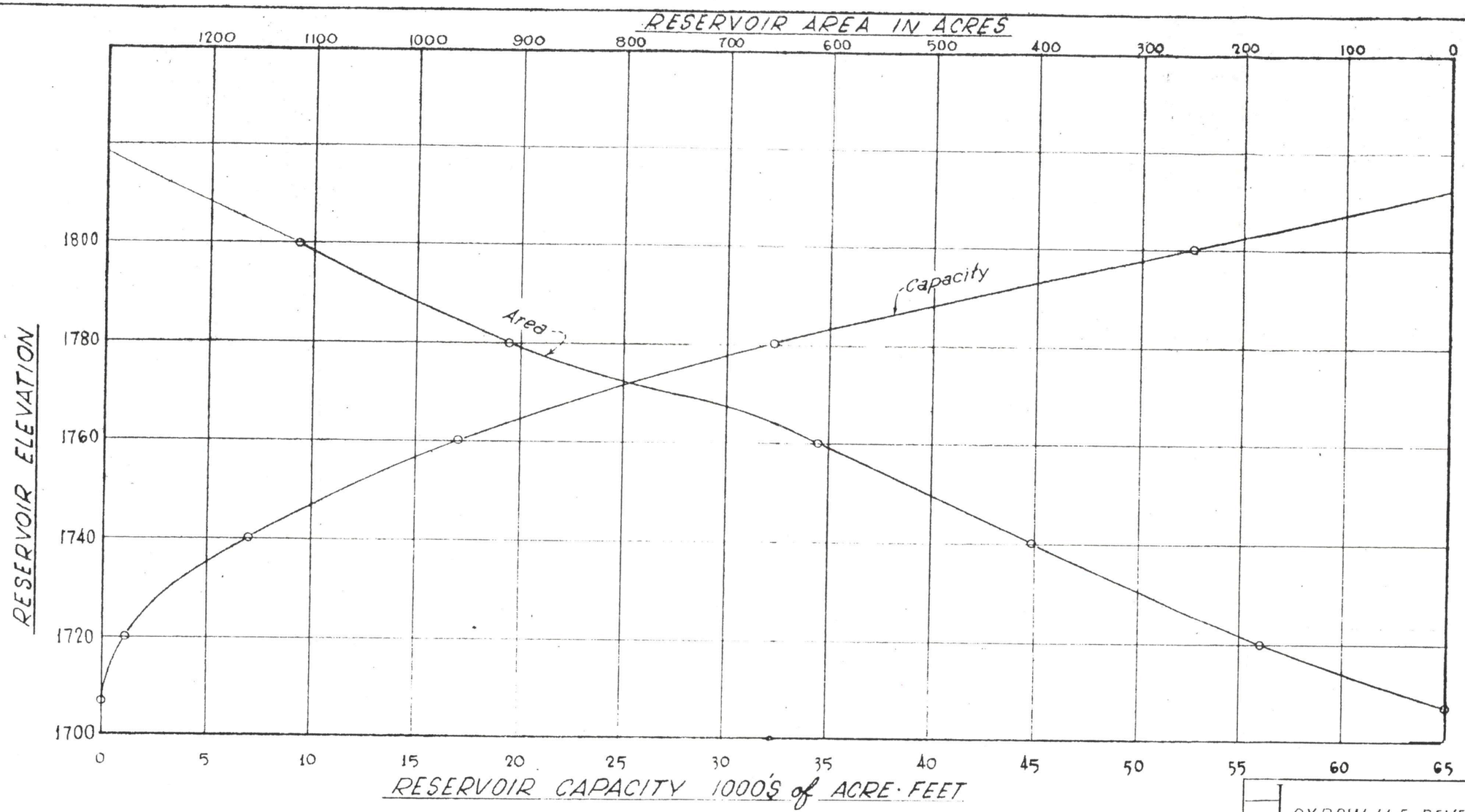

10' OPEN
20' OPEN
30' OPEN
TEST h CENTER GATE x 3
CENTER GATE X 3
POOL ELEVATION - FEET. M.S.L.
1693
1688
1678
1668
1658
1648
NUMBERS AND LETTERS REFER TO INDIVIDUAL TESTS IN TABLE V PAGE 18.
x MEASUREMENTS BY MAGNETIC FLOW METER, ORIFICE METER OR BOTH.
o MEASUREMENTS BY RECTANGULAR WEIR. POINTS FOR TESTS "g" AND "h" FOR CENTER GATE ONLY SHOW EFFECT OF END CONTRACTION
DISCHARGE IN THOUSANDS OF CFS
20
40
60
80
100
120
140
160
180
200
220
3-43'x50' TAINTER GATES
WASHINGTON STATE UNIVERSITY
INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL RESEARCH
THE R. L. ALBROOK HYDRAULIC LABORATORY
HELLS CANYON FLUME MODEL
SPILLWAY CAPACITY
DR. BY
TR. BY
CHKD. BY
SCALE
DWG. 780-A-3

PLATE 2-11



10/4/55

DATA FROM 0-9K-15

OXBOW H.E. DEVELOPMENT
RESERVOIR AREA
AND CAPACITY CURVES

IDAHO POWER CO. BOISE, IDAHO

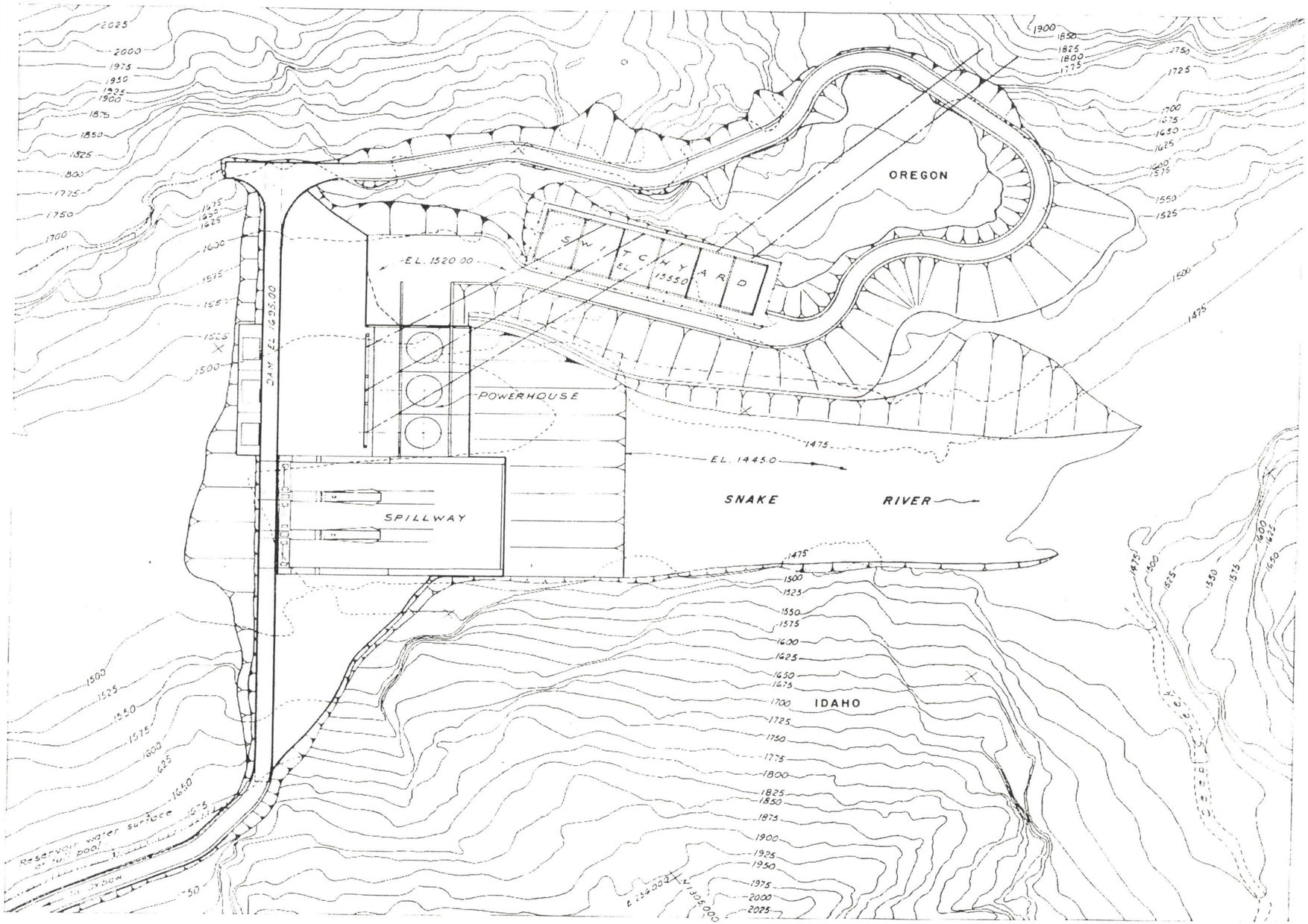
SCALE AS SHOWN DATE

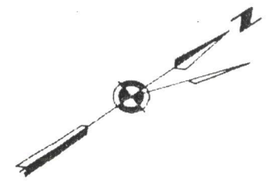
DR. A.P.H. APPROV. 20 B-

TR. B.O.

REV. CH. SHT. 1

PLATE 2-9





60 0 60 120 180 240 300

Scale : 1"=60'

NOTE:

Permanent right of way to be determined

THIS DRAWING IS FILED PURSUANT TO LICENSE ARTICLE 29 AND IS A PART OF THE APPLICATION FOR AN AMENDMENT TO THE LICENSE FOR PROJECT NO 1971, MADE BY THE UNDERSIGNED THIS 22ND DAY OF APRIL, 1963.

IDAHO POWER COMPANY

BY _____

PRESIDENT

PROJECT 1971 EXHIBIT L

HELLS CANYON H.E. DEVELOPMENT

GENERAL PLAN

IDAHO POWER COMPANY
BOISE, IDAHO
SHEET 1 OF 6

PLATE 2-10.1

PLATE 2-10.2

PLATE 2-10.3

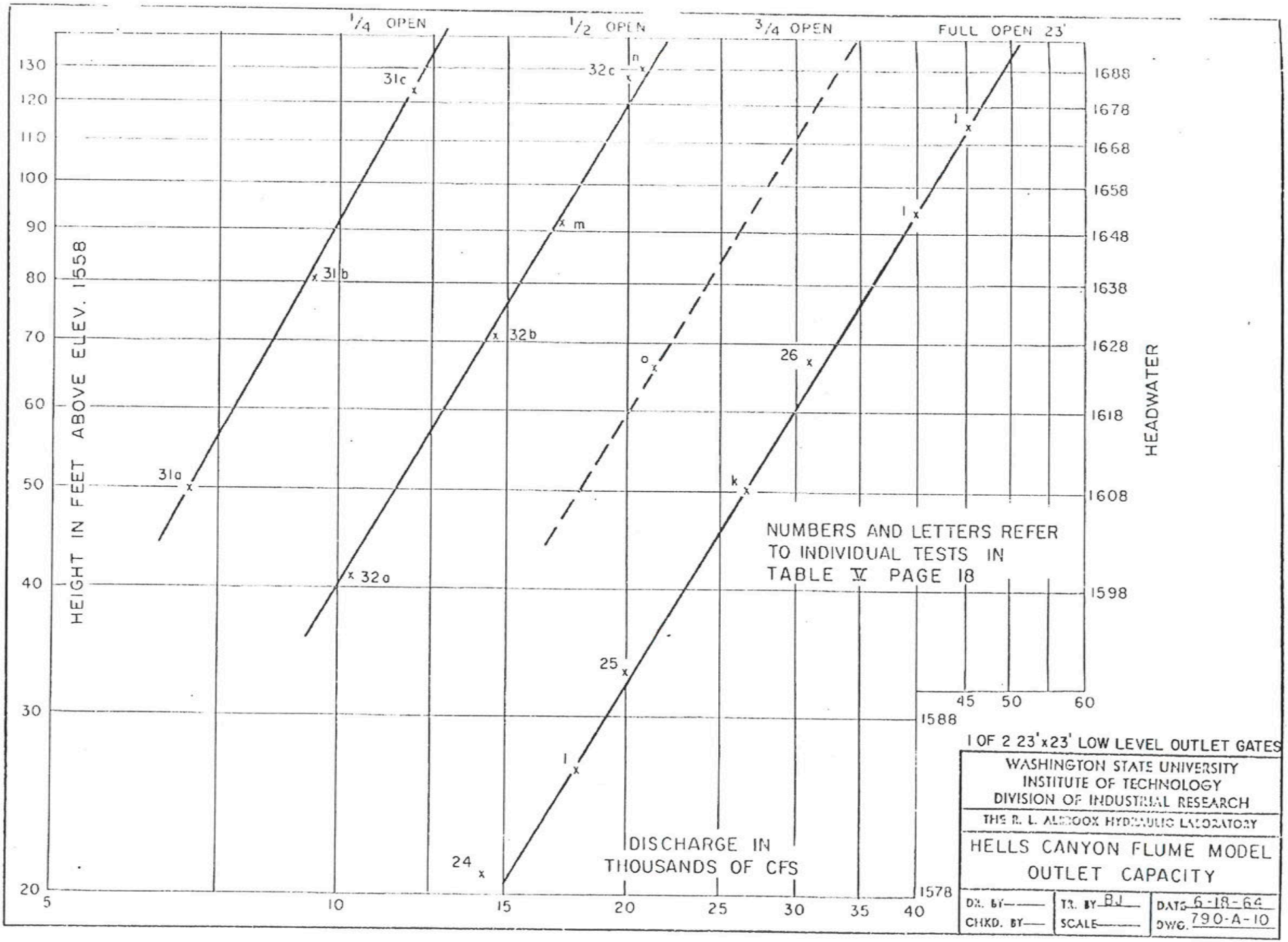
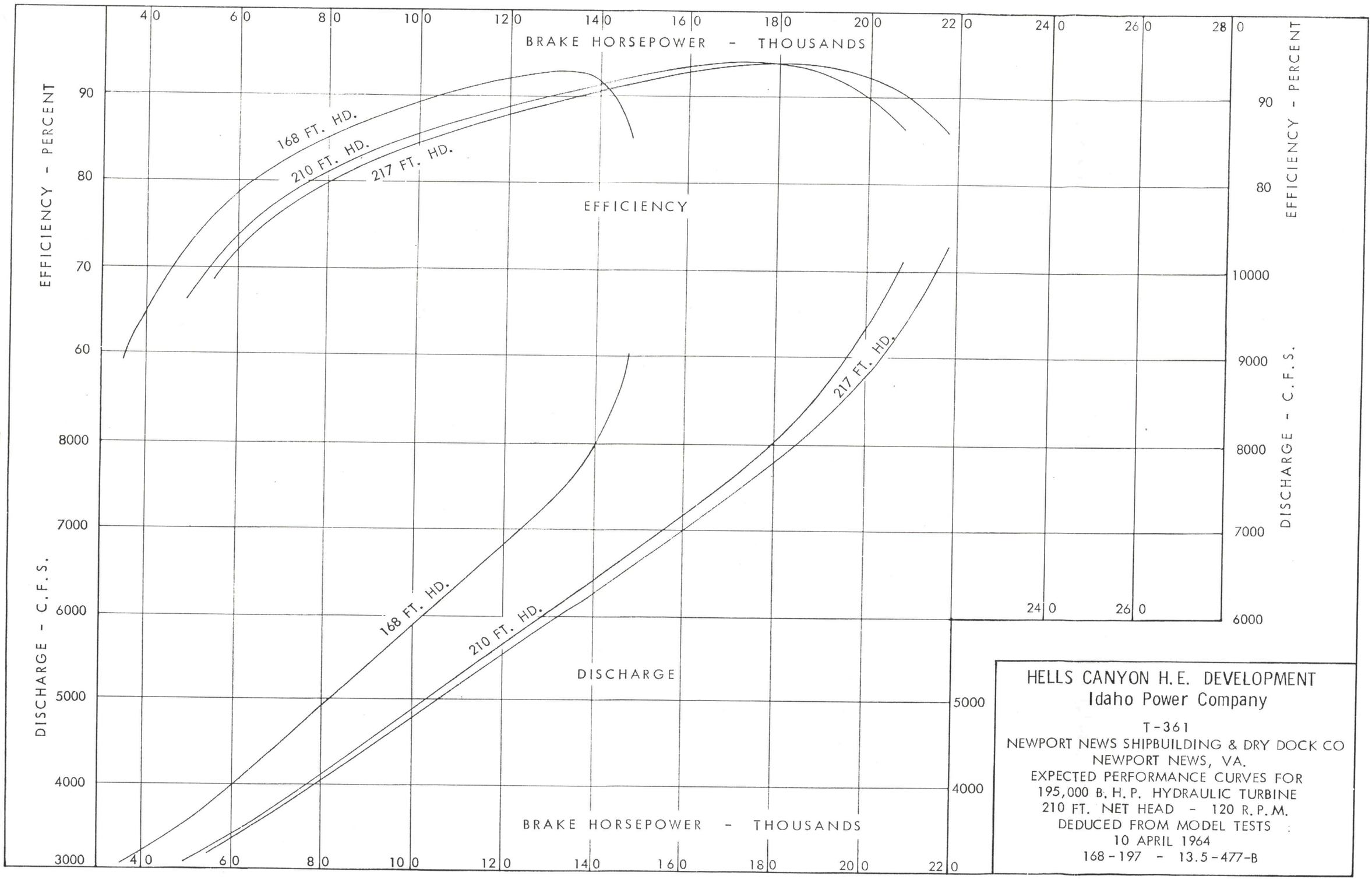

1/4 OPEN
1/2 OPEN
3/4 OPEN
FULL OPEN 23'
HEIGHT IN FEET ABOVE ELEV. 1558
HEADWATER
DISCHARGE IN THOUSANDS OF CFS
NUMBERS AND LETTERS REFER TO INDIVIDUAL TESTS IN TABLE V PAGE 18
31a
31b
31c
32a
32b
32c
24
25
26
1 OF 2 23'x23' LOW LEVEL OUTLET GATES
WASHINGTON STATE UNIVERSITY
INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL RESEARCH
THE R. L. ALBROOK HYDRAULIC LABORATORY
HELLS CANYON FLUME MODEL
OUTLET CAPACITY
DR. BY
CHKD. BY
TR. BY BJ
SCALE
DATE 6-18-64
DWG. 790-A-10

PLATE 2-12



HELLS CANYON H.E. DEVELOPMENT
Idaho Power Company

T-361
NEWPORT NEWS SHIPBUILDING & DRY DOCK CO
NEWPORT NEWS, VA.
EXPECTED PERFORMANCE CURVES FOR
195,000 B.H.P. HYDRAULIC TURBINE
210 FT. NET HEAD - 120 R.P.M.
DEDUCED FROM MODEL TESTS
10 APRIL 1964
168-197 - 13.5-477-B

PLATE 2-13

RESERVOIR AREA in ACRES

3200 2800 2400 2000 1600 1200 800 400 0

1760 1720 1680 1640 1600 1560 1520 1480 1440

RESERVOIR ELEVATION

AREA

CAPACITY

EL. 1707 ± (OXBOW DAM) above 1707 ± capacities to face of dam.

0 40 80 120 160 200 240 280 320 360

RESERVOIR CAPACITY in 1000's of ACRE FEET

DATA FROM H.C.-9K-7

DATE 6-17-59

HELLS CANYON H.E. DEVELOPMT
RESERVOIR AREA
AND CAPACITY CURVES

IDAHO POWER CO. BOISE, IDAHO

SCALE AS SHOWN DATE

DR. A.P.H. APPROV.

TR. B.O.

REV. CH.

20 B-

SHT. 1

PLATE 2-14

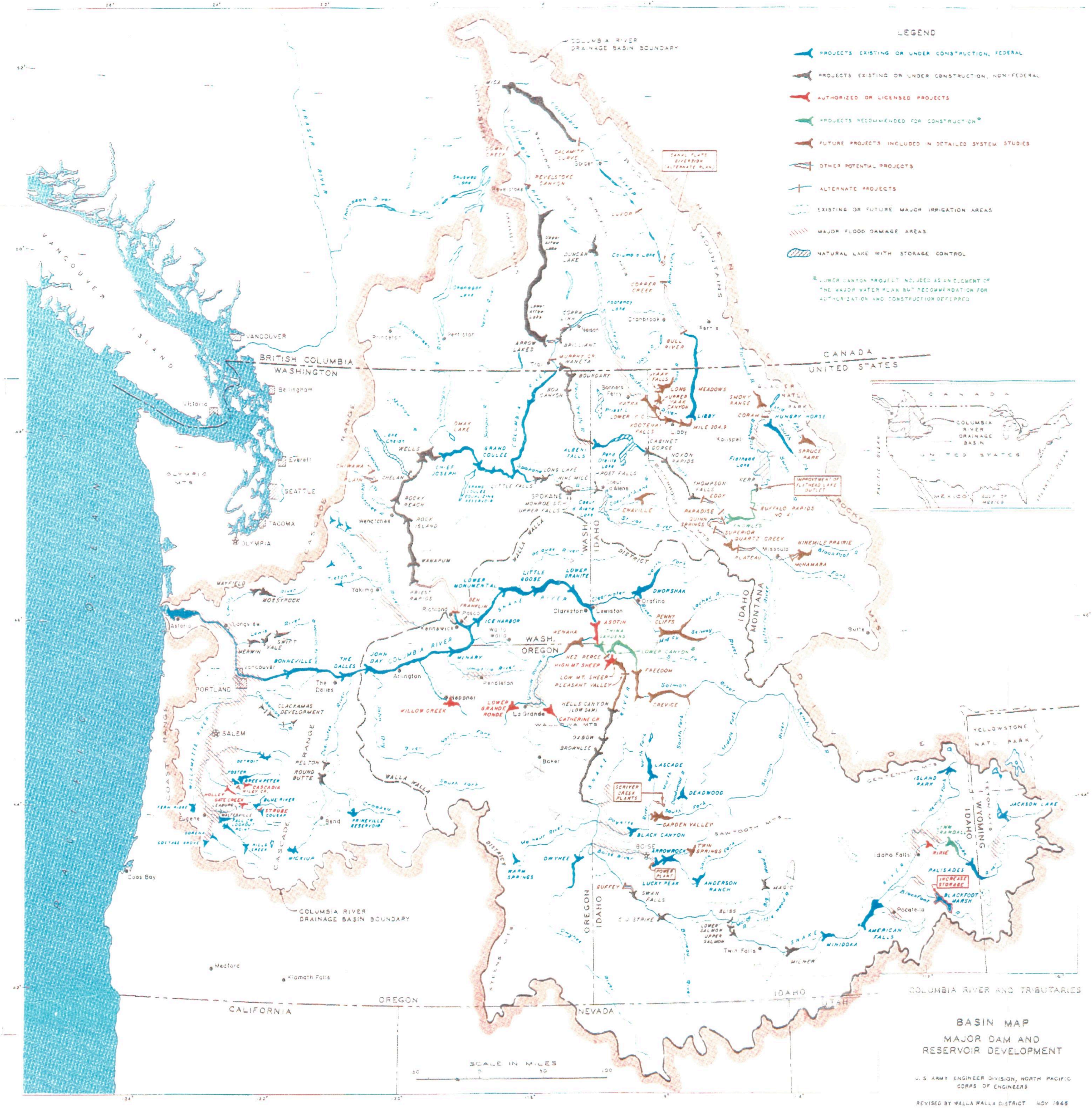
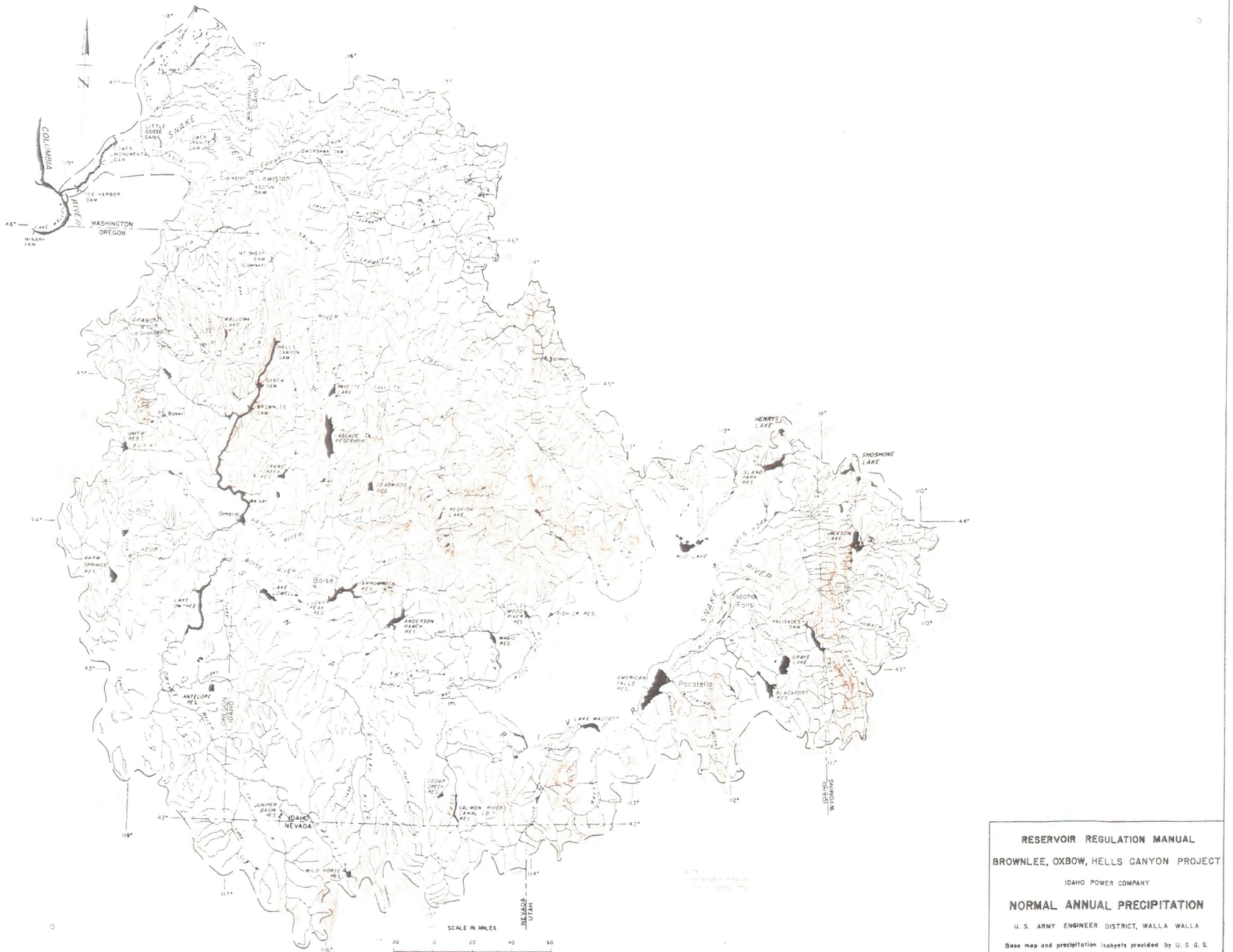

LEGEND
PROJECTS EXISTING OR UNDER CONSTRUCTION, FEDERAL
PROJECTS EXISTING OR UNDER CONSTRUCTION, NON-FEDERAL
AUTHORIZED OR LICENSED PROJECTS
PROJECTS RECOMMENDED FOR CONSTRUCTION*
FUTURE PROJECTS INCLUDED IN DETAILED SYSTEM STUDIES
OTHER POTENTIAL PROJECTS
ALTERNATE PROJECTS
EXISTING OR FUTURE MAJOR IRRIGATION AREAS
MAJOR FLOOD DAMAGE AREAS
NATURAL LAKE WITH STORAGE CONTROL
* LOWER CANYON PROJECT INCLUDED AS AN ELEMENT OF THE MAJOR WATER PLAN BUT RECOMMENDATION FOR AUTHORIZATION AND CONSTRUCTION DEFERRED
COLUMBIA RIVER DRAINAGE BASIN BOUNDARY
CANADA
UNITED STATES
BRITISH COLUMBIA
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLUMBIA RIVER
GRAND COULEE
CHIEF JOSEPH
BONNEVILLE
THE DALLES
JOHN DAY
McNARY
ICE HARBOR
LOWER MONUMENTAL
LITTLE GOOSE
LOWER GRANITE
DWORSHAK
HUNGRY HORSE
LIBBY
BROWNLEE
OXBOW
AMERICAN FALLS
PALISADES
JACKSON LAKE
PORTLAND
SEATTLE
SPOKANE
BOISE
YELLOWSTONE NATL PARK
SCALE IN MILES
COLUMBIA RIVER AND TRIBUTARIES
BASIN MAP
MAJOR DAM AND
RESERVOIR DEVELOPMENT
U.S. ARMY ENGINEER DIVISION, NORTH PACIFIC
CORPS OF ENGINEERS
REVISED BY WALLA WALLA DISTRICT NOV 1965

PLATE 4-1



RESERVOIR REGULATION MANUAL

BROWNLEE, OXBOW, HELLS CANYON PROJECT

IDAHO POWER COMPANY

NORMAL ANNUAL PRECIPITATION

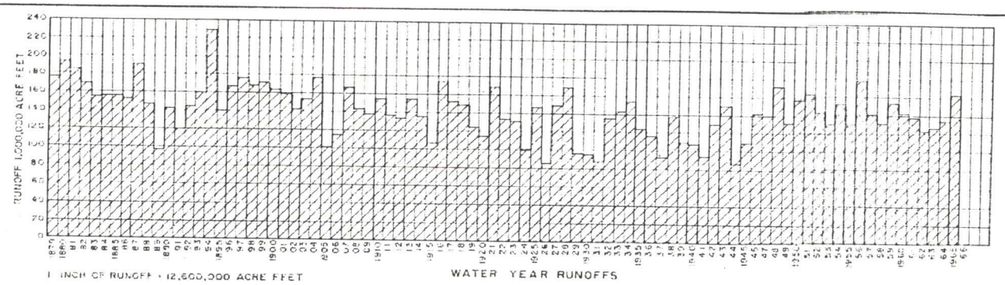
U. S. ARMY ENGINEER DISTRICT, WALLA WALLA

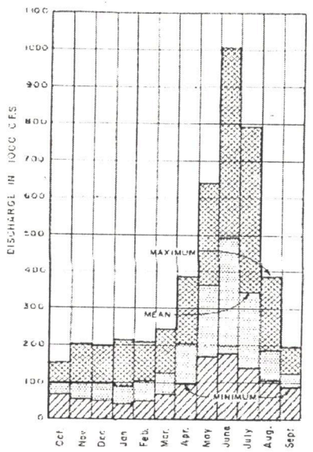
Base map and precipitation isohyets provided by U. S. G. S.

PLATE 4-2

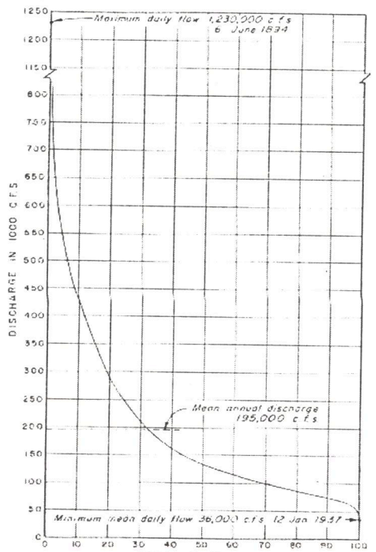
CORPS OF ENGINEERS

U. S. ARMY





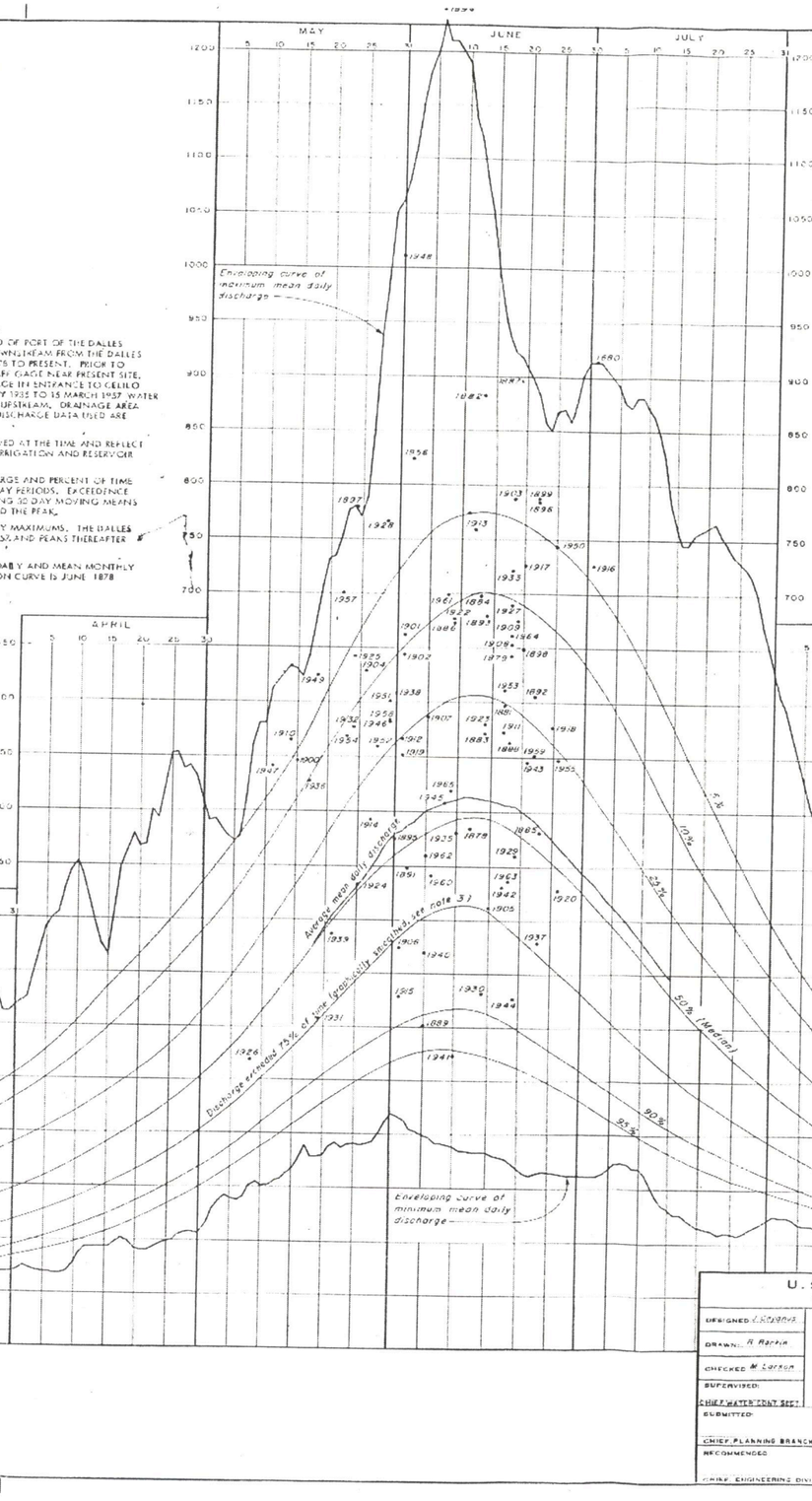
MEAN MONTHLY DISCHARGES



FLOW DURATION CURVE

NOTES:

1. GAGE IS LOCATED AT UPSTREAM END OF PORT OF THE DALLES DOCK AT THE DALLES, 3.2 MILES DOWNSTREAM FROM THE DALLES DAM. RECORDS AVAILABLE JUNE 1878 TO PRESENT. PRIOR TO 1 OCT. 1931 RECORDS BASED ON STAFF GAGE NEAR PRESENT SITE. 1 OCT 1931 TO 1 MAY 1935 STAFF GAGE IN ENTRANCE TO CELILO CANAL 11.8 MILES UPSTREAM. 2 MAY 1935 TO 15 MARCH 1957 WATER STAGE RECORDER AT SITE 11.7 MILES UPSTREAM. DRAINAGE AREA 237,000 SQ. MI. APPROXIMATELY. DISCHARGE DATA USED ARE FROM U.S.G.S. PUBLISHED DATA.
2. DISCHARGES USED ARE THOSE OBSERVED AT THE TIME AND REFLECT VARYING EFFECTS OF PROGRESSIVE IRRIGATION AND RESERVOIR STORAGE DEVELOPMENT.
3. THE RELATIONSHIPS BETWEEN DISCHARGE AND PERCENT OF TIME EXCEEDED WERE COMPUTED FOR 10 DAY PERIODS. EXCEEDENCE LINES WERE SMOOTHED BY COMPUTING 30 DAY MOVING MEANS ADJUSTED SLIGHTLY UPWARD AROUND THE PEAK.
4. PEAKS PRIOR TO 1957 ARE MOMENTARY MAXIMUMS. THE DALLES DAM POOL WAS RAISED IN MARCH 1957 AND PEAKS THEREAFTER ARE MEAN DAILY MAXIMUMS.
5. PERIOD OF RECORD FOR CHARTS OF DAILY AND MEAN MONTHLY DISCHARGES AND THE FLOW DURATION CURVE IS JUNE 1878 THROUGH SEPTEMBER 1962.



MAXIMUM ANNUAL MOMENTARY DISCHARGE

YEAR	DAY	C.F.S.	YEAR	DAY	C.F.S.
1878	12 JUNE	485,000	1914	27 MAY	493,000
1879	18 JUNE	643,000	1915	1 JUNE	328,000
1880	1 JULY	914,000	1916	1 JULY	727,000
1881	17 JUNE	598,000	1917	20 JUNE	727,000
1882	13, 14 JUNE	883,000	1918	25 JUNE	578,000
1883	14 JUNE	573,000	1919	1 JUNE	563,000
1884	13 JUNE	698,000	1920	26 JUNE	428,000
1885	23 JUNE	482,000	1921	11 JUNE	775,000
1886	9 JUNE	673,000	1922	9 JUNE	677,000
1887	19 JUNE	896,000	1923	14, 15 JUNE	581,000
1888	18 JUNE	564,000	1924	25-27 MAY	433,000
1889	5, 8 JUNE	362,000	1925	24, 25 MAY	642,000
1890	14-22 MAY	633,000	1926	8, 9 MAY	269,000
1891	2 JUNE	448,000	1927	18 JUNE	690,000
1892	22, 23 JUNE	607,000	1928	29 MAY	706,000
1893	14 JUNE	679,000	1929	19 JUNE	460,000
1894	6 JUNE	1,240,000	1930	14 JUNE	332,000
1895	31 MAY	475,000	1931	19 MAY	306,000
1896	22 JUNE	765,000	1932	24 MAY	578,000
1897	24 MAY	780,000	1933	18 JUNE	722,000
1898	20, 21 JUNE	649,000	1934	2 MAY	453,000
1899	22 JUNE	787,000	1935	10 JUNE	480,000
1900	19 MAY	547,000	1936	17 MAY	529,000
1901	1 JUNE	662,000	1937	23-25 JUNE	379,000
1902	1 JUNE	644,000	1938	31 MAY	609,000
1903	18, 19 JUNE	787,000	1939	21 MAY	387,000
1904	26 MAY	629,000	1940	5 JUNE	370,000
1905	15 JUNE	412,000	1941	10 JUNE	273,000
1906	1 JUNE	374,000	1942	17 JUNE	431,000
1907	5 JUNE	587,000	1943	21 JUNE	546,000
1908	18 JUNE	653,000	1944	19 JUNE	527,000
1909	19 JUNE	675,000	1945	8 JUNE	508,000
1910	14 MAY	566,000	1946	30 MAY	583,000
1911	17, 18 JUNE	574,000	1947	11 MAY	542,000
1912	1 JUNE	568,000	1948	31 MAY	1,010,000
1913	12 JUNE	739,000	1949	18 MAY	624,000
			1950	25 JUNE	744,000
			1951	30 MAY	692,000
			1952	28 MAY	561,000
			1953	17 JUNE	612,000
			1954	23 MAY	570,000
			1955	26 JUNE	548,000
			1956	2 JUNE	823,000

MEAN DAILY PEAKS

1957	22 MAY	700,000
1958	30 MAY	584,000
1959	22 JUNE	552,000
1960	6 JUNE	442,000
1961	8 JUNE	679,000
1962	5 JUNE	460,000
1963	18 JUNE	437,000
1964	18 JUNE	662,000
1965	9 JUNE	520,000
1966		
1967		
1968		
1969		
1970		

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: C. ROJAS
DRAWN: R. RAPKIN
CHECKED: M. LARSON
SUPERVISED:
CHIEF WATER CONT SECT

SUMMARY HYDROGRAPHS
COLUMBIA RIVER AT THE DALLES

SUBMITTED:
CHIEF, PLANNING BRANCH
RECOMMENDED:
CHIEF, ENGINEERING DIVISION

APPROVED: DATE:
COLONEL, C. E. DISTRICT ENGINEER

SCALE AS SHOWN | INV. NO. ENG
FILE NO.
SHEET

PLATE 4.2

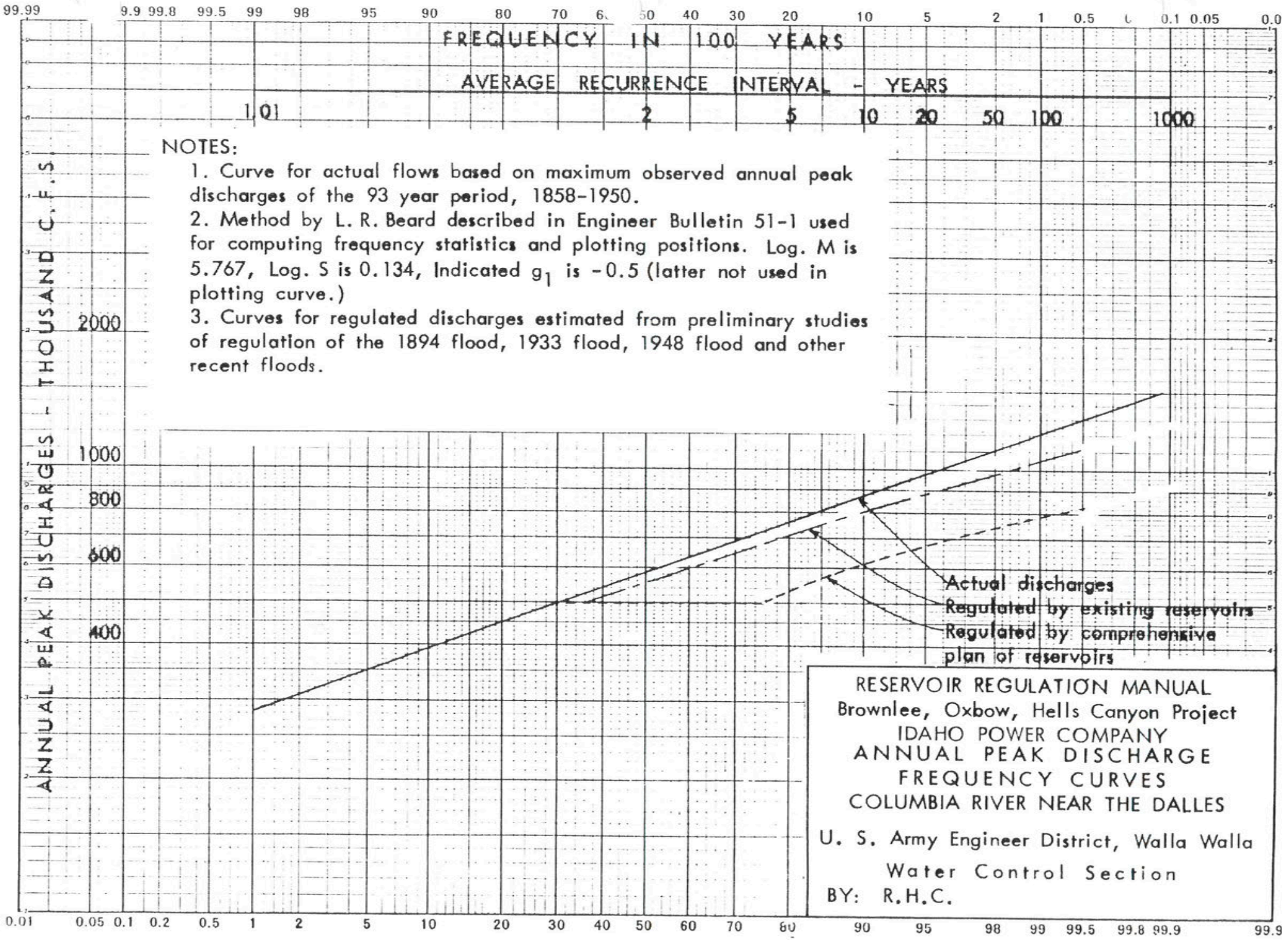

99.99 9.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.1 0.05 0.0
FREQUENCY IN 100 YEARS
AVERAGE RECURRENCE INTERVAL - YEARS
1.01 2 5 10 20 50 100 1000
ANNUAL PEAK DISCHARGES - THOUSAND C.F.S.
2000
1000
800
600
400
NOTES:
1. Curve for actual flows based on maximum observed annual peak discharges of the 93 year period, 1858-1950.
2. Method by L. R. Beard described in Engineer Bulletin 51-1 used for computing frequency statistics and plotting positions. Log. M is 5.767, Log. S is 0.134, Indicated g_1 is -0.5 (latter not used in plotting curve.)
3. Curves for regulated discharges estimated from preliminary studies of regulation of the 1894 flood, 1933 flood, 1948 flood and other recent floods.
Actual discharges
Regulated by existing reservoirs
Regulated by comprehensive plan of reservoirs
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.9
RESERVOIR REGULATION MANUAL
Brownlee, Oxbow, Hells Canyon Project
IDAHO POWER COMPANY
ANNUAL PEAK DISCHARGE
FREQUENCY CURVES
COLUMBIA RIVER NEAR THE DALLES
U. S. Army Engineer District, Walla Walla
Water Control Section
BY: R.H.C.

PLATE 4-4

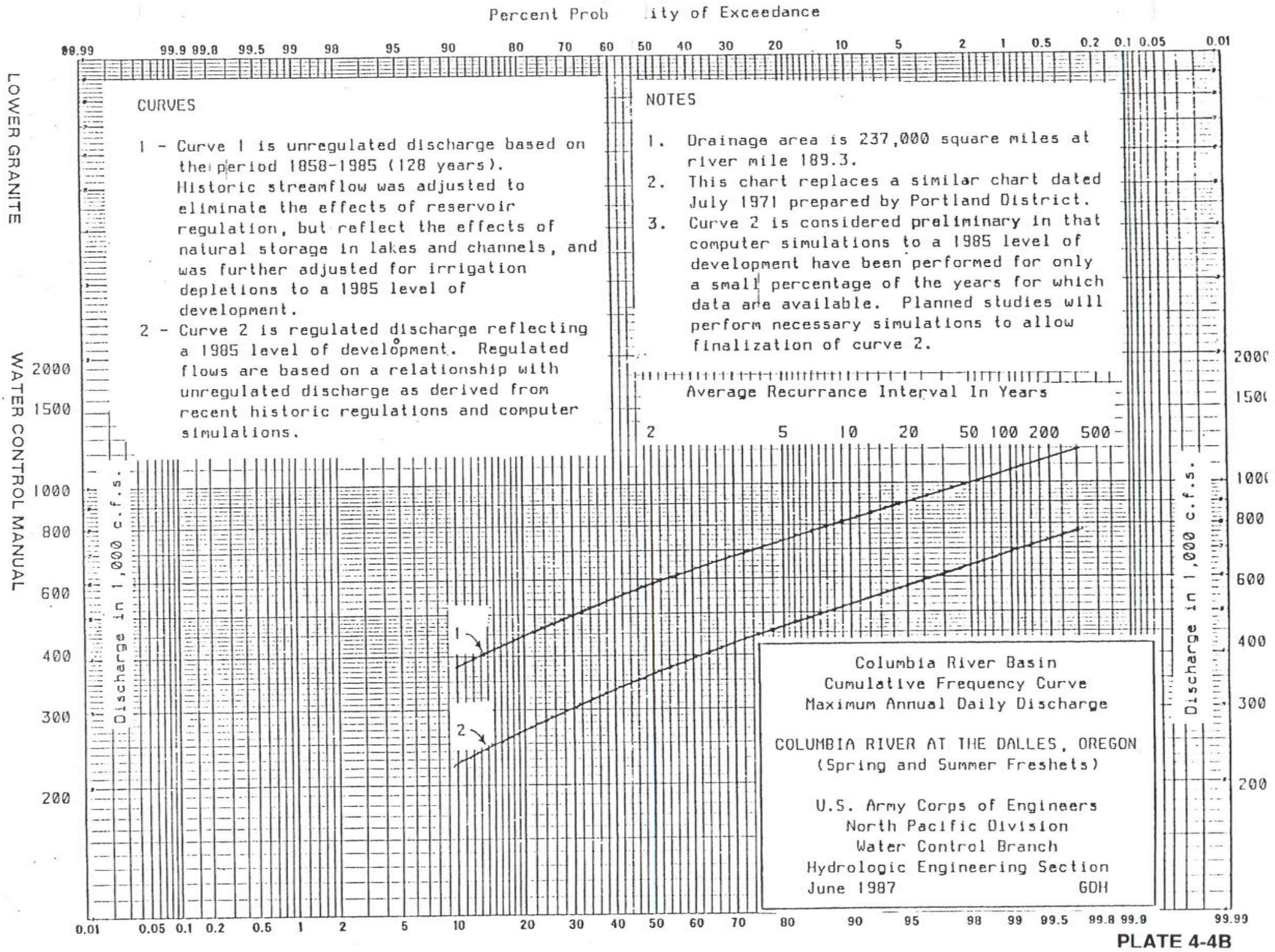
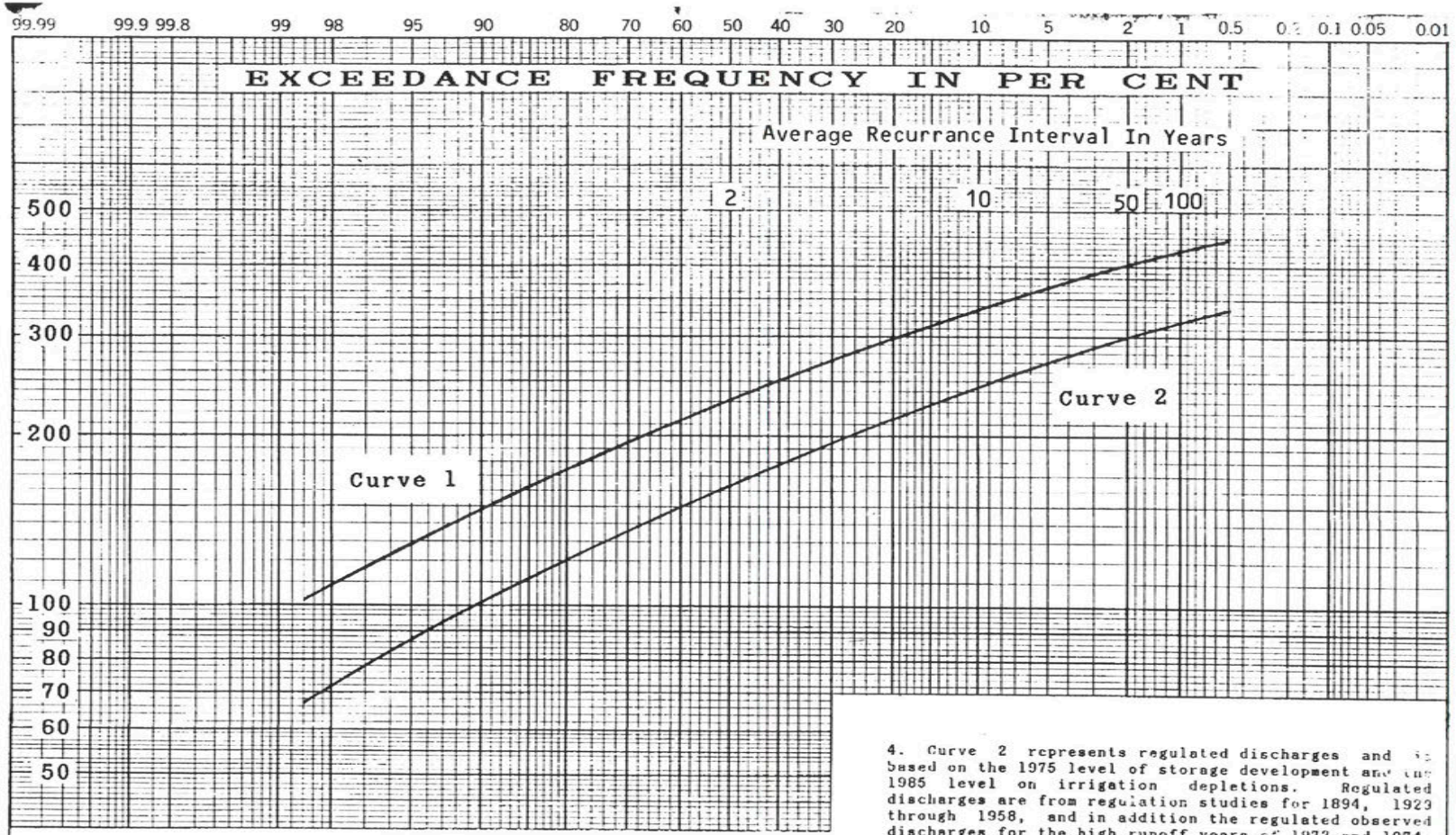

Percent Probability of Exceedance
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
CURVES
1 - Curve 1 is unregulated discharge based on the period 1858-1985 (128 years). Historic streamflow was adjusted to eliminate the effects of reservoir regulation, but reflect the effects of natural storage in lakes and channels, and was further adjusted for irrigation depletions to a 1985 level of development.
2 - Curve 2 is regulated discharge reflecting a 1985 level of development. Regulated flows are based on a relationship with unregulated discharge as derived from recent historic regulations and computer simulations.
NOTES
1. Drainage area is 237,000 square miles at river mile 189.3.
2. This chart replaces a similar chart dated July 1971 prepared by Portland District.
3. Curve 2 is considered preliminary in that computer simulations to a 1985 level of development have been performed for only a small percentage of the years for which data are available. Planned studies will perform necessary simulations to allow finalization of curve 2.
Average Recurrance Interval In Years
2 5 10 20 50 100 200 500
Discharge in 1,000 c.f.s.
2000 1500 1000 800 600 400 300 200
1
2
Columbia River Basin
Cumulative Frequency Curve
Maximum Annual Daily Discharge
COLUMBIA RIVER AT THE DALLES, OREGON
(Spring and Summer Freshets)
U.S. Army Corps of Engineers
North Pacific Division
Water Control Branch
Hydrologic Engineering Section
June 1987 GDH
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

PLATE 4-4B



NOTES

1. Drainage area equals 103,200 sq. mi.

2. This is a preliminary graph subject to revision.

3. Curve 1 represents natural discharges and is based on the 1894-1975 station record adjusted for irrigation depletions and storage and extended by correlation with the 1858-1975 Columbia River at The Dalles station record. It includes an expected probability adjustment. The station and adopted skew is -0.5. Natural discharges for the 1894-1975 period of record are plotted based on their ranking within the extended record. The median plotting position method was utilized.

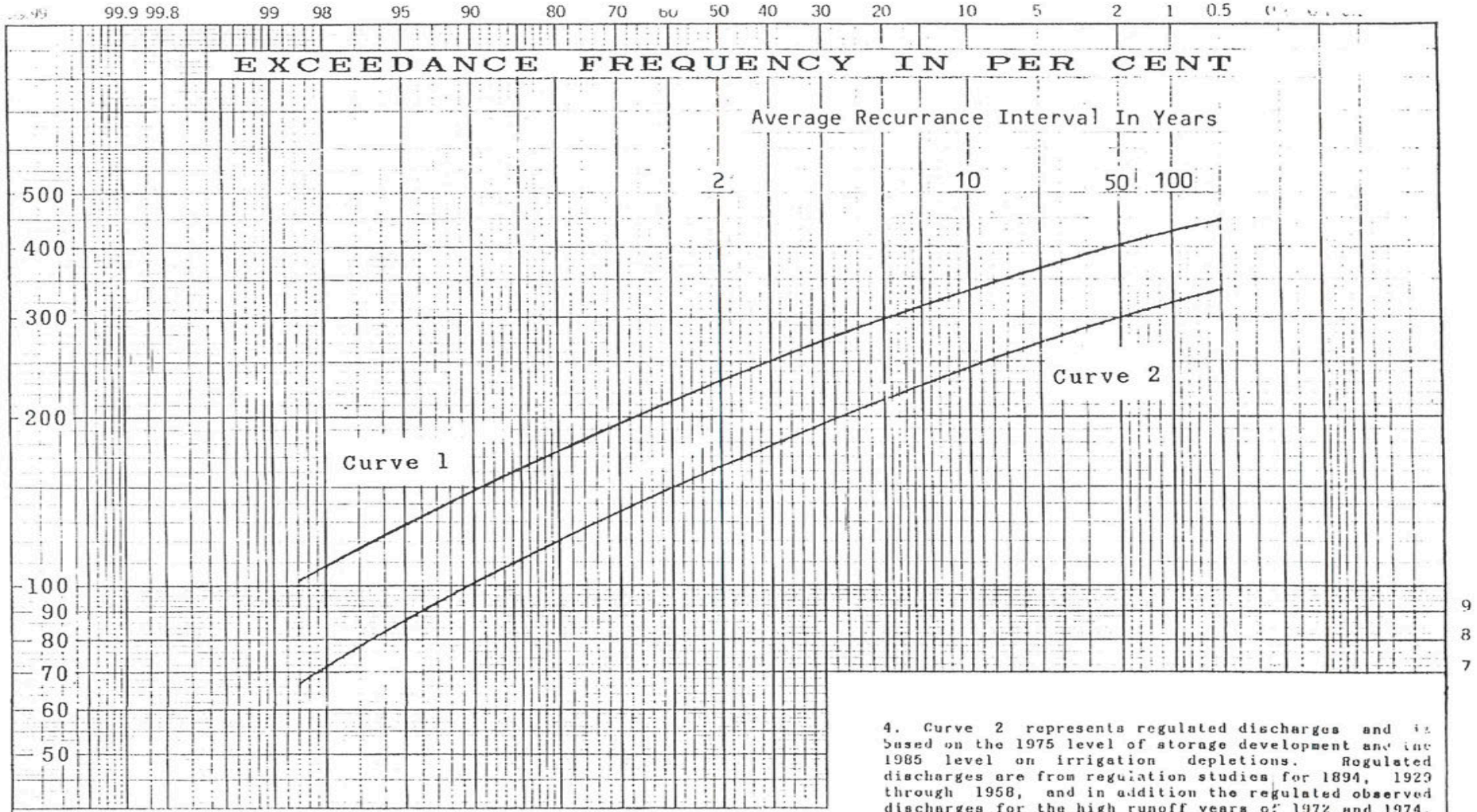
4. Curve 2 represents regulated discharges and is based on the 1975 level of storage development and the 1985 level on irrigation depletions. Regulated discharges are from regulation studies for 1894, 1929 through 1958, and in addition the regulated observed discharges for the high runoff years of 1972 and 1974. The plotting positions for the regulated event years are for the natural frequency curve. Curve 2 is a graphical fit of the regulated data.

DWORSHAK DAM AND RESERVOIR
North Fork Clearwater River, Idaho

ANNUAL PEAK DISCHARGE FREQUENCIES
Snake River At Lower Granite Dam

U.S. Army Engineer Division, N.P.
NPDEN-WM-HES May 1978

PLATE 4-5



NOTES

1. Drainage area equals 103,200 sq. mi.

2. This is a preliminary graph subject to revision.

3. Curve 1 represents natural discharges and is based on the 1894-1975 station record adjusted for irrigation depletions and storage and extended by correlation with the 1858-1975 Columbia River at The Dalles station record. It includes an expected probability adjustment. The station and adopted skew is -0.5. Natural discharges for the 1894-1975 period of record are plotted based on their ranking within the extended record. The median plotting position method was utilized.

4. Curve 2 represents regulated discharges and is based on the 1975 level of storage development and the 1985 level on irrigation depletions. Regulated discharges are from regulation studies for 1894, 1929 through 1958, and in addition the regulated observed discharges for the high runoff years of 1972 and 1974. The plotting positions for the regulated event years are for the natural frequency curve. Curve 2 is a graphical fit of the regulated data.

LOWER GRANITE LOCK AND DAM
Snake River, Ore., Wash., & Ida.

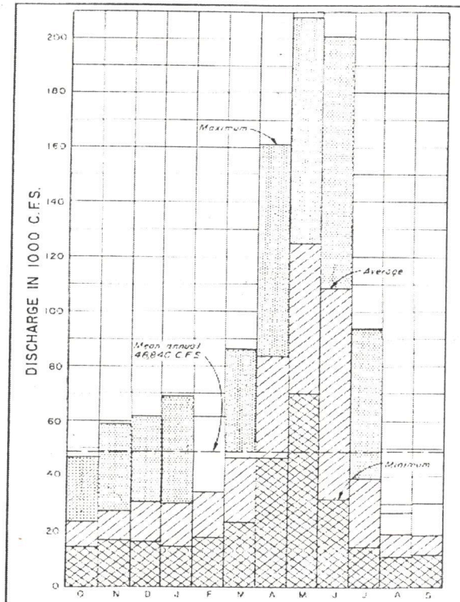
ANNUAL PEAK DISCHARGE FREQUENCIES
Snake River At Lower Granite Dam

U.S. Army Engineer Division, N.P.
NPDEN-WM-HES May 1978

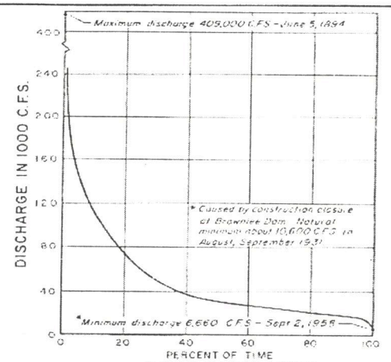
PLATE 4-5B

CORPS OF ENGINEERS

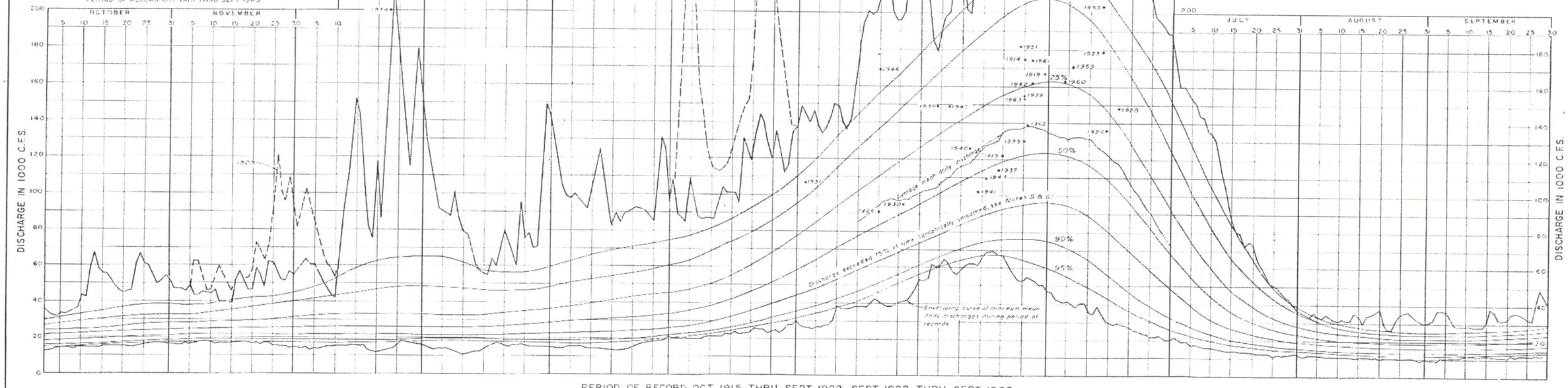
U.S. ARMY



MEAN MONTHLY DISCHARGE
PERIOD OF RECORD OCT 1915 THRU SEPT 1965



FLOW DURATION CURVE
PERIOD OF RECORD OCT 1915 THRU SEPT 1922, SEPT 1928 THRU SEPT 1965



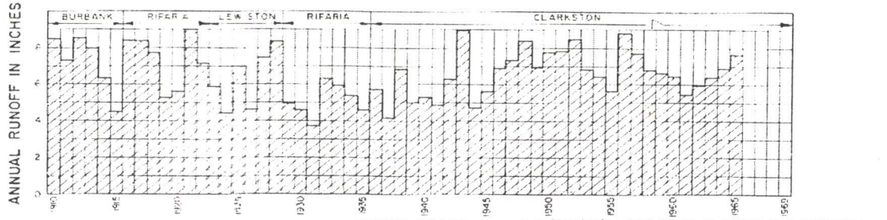
PERIOD OF RECORD OCT. 1915 THRU SEPT 1922, SEPT. 1928 THRU SEPT 1965

NOTES:

1. RECORDS USED:
   1916 TO 1922 INCL. AND 1929 TO 1935 INCL. - RECORDED DISCHARGES AT RIPARIA, WASHINGTON. DRAINAGE AREA = 104,000 SQ. MI.
   1936 TO 1965 INCL. - RECORDED DISCHARGES AT CLARKSTON, WASHINGTON. DRAINAGE AREA = 103,200 SQ. MI.
   DISCHARGE RECORDS USED ARE FROM DATA PUBLISHED BY U.S.G.S.
2. DISCHARGE RECORDS AT CLARKSTON AND RIPARIA HAVE BEEN CONSIDERED COMPARABLE AND HAVE BEEN USED WITHOUT CORRECTIONS FOR INCIDENTAL INFLOW BETWEEN THESE STATIONS.
3. THE MAXIMUM KNOWN STAGE OCCURRED JUNE 5, 1894. GAGE HEIGHT FROM FLOOD MARK, 24.7 FEET AT RIPARIA. ESTIMATED DISCHARGE, 409,000 C.F.S.
4. DISCHARGES USED ARE THOSE OBSERVED AT THE TIME AND REFLECT VARYING EFFECTS OF PROGRESSIVE IRRIGATION AND RESERVOIR STORAGE DEVELOPMENTS.
5. A POINT ON AN EXCEEDENCE CURVE REPRESENTS THE DISCHARGE WHICH HAS BEEN EXCEEDED THE GIVEN PERCENTAGE OF TIME IN A 30-DAY PERIOD CENTERED ON THE POINT (DATE) OF INTEREST.
6. THE RELATIONSHIPS BETWEEN DISCHARGE AND PERCENT OF TIME EXCEEDED WERE COMPUTED FROM 10-DAY PERIODS (1-10, 11-20, 21-END OF MONTH). EXCEEDENCE LINES WERE SMOOTHED BY COMPUTING 30-DAY MOVING MEANS PLOTTED ON MIDPOINT OF 30-DAY PERIOD. PLOTTING DATES WERE THE 5TH, 15TH AND 25TH OF EACH MONTH. FROM 15 MAY TO 15 JUNE THE 30-DAY MOVING MEANS WERE COMPUTED FROM 2-DAY PERIODS INSTEAD OF 10-DAY PERIODS.

Water Year	Date	Cfs	Water Year	Date	Cfs	Water Year	Date	Cfs	Water Year	Date	Cfs
1894	June 5	409,000	1924	May 14	136,000	1939	May 4	149,000	1954	May 21	210,000
1910	May 23	252,000	1925	May 22	219,000	1940	May 12	126,000	1955	June 13	204,000
1911	June 15	242,000	1926	Apr. 20	91,000	1941	Mar. 14	102,000	1956	May 24	292,100
1912	June 10	289,000	1927	May 18	245,000	1942	May 27	162,000	1957	May 20	312,900
1913	May 29	279,000	1928	May 27	271,000	1943	Apr. 20	209,000	1958	May 22	247,600
1914	May 25	173,000	1929	May 21	155,000	1944	May 16	129,600	1959	June 6	171,400
1915	May 20	122,000	1930	Apr. 26	95,600	1945	May 7	149,000	1960	June 4	163,500
1916	June 20	230,000	1931	Apr. 2	102,000	1946	Apr. 20	159,000	1961	May 27	174,100
1917	May 31	256,000	1932	May 23	219,000	1947	May 10	233,000	1962	May 26	135,900
1918	June 14	216,000	1933	June 11	245,000	1948	May 29	369,000	1963	May 22	120,500
1919	May 30	167,000	1934	Dec. 23	200,000	1949	May 16	248,900	1964	June 8	266,200
1920	June 17	143,000	1935	May 25	130,000	1950	June 17	212,000	1965	Dec. 24	247,000
1921	May 20	271,000	1936	May 16	249,000	1951	May 24	182,000	1966		
1922	June 7	233,000	1937	May 19	114,000	1952	Apr. 29	250,000	1967		
1923	June 13	179,000	1938	May 29	219,000	1953	June 13	232,000	1968		

MAXIMUM ANNUAL INSTANTANEOUS DISCHARGES



ANNUAL RUNOFF

1 INCH RUN-OFF = 5,813,333 AC. FT. AT BURBANK, WASHINGTON.
1 INCH RUN-OFF = 5,546,666 AC. FT. AT RIPARIA, WASHINGTON.
1 INCH RUN-OFF = 5,564,000 AC. FT. AT CLARKSTON, WASHINGTON.

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: C. Anthony
DRAWN: E. Lindsey
CHECKED: H. Cochran
SUPERVISED:
CHIEF WATER CONT. SECT.

SNAKE RIVER, OREGON, WASHINGTON & IDAHO
SUMMARY HYDROGRAPHS
SNAKE RIVER NEAR CLARKSTON, WASH.

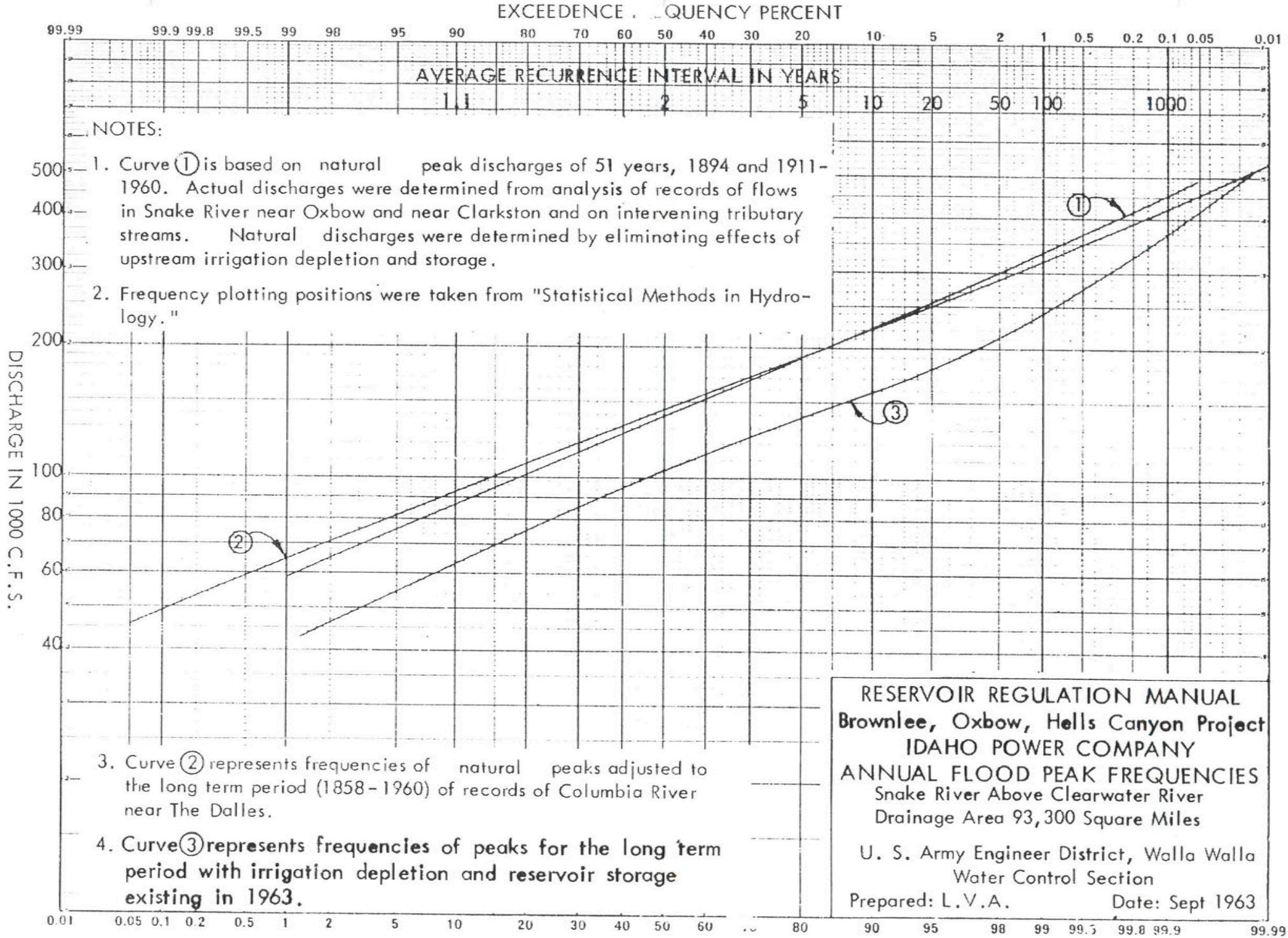
SUBMITTED
CHIEF, PLANNING BRANCH
RECOMMENDED
CHIEF, ENGINEERING DIVISION

APPROVED: DATE:
COLONEL, C. E. DISTRICT ENGINEER
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET

CONT. NO.

VOL. NO.

PLATE 4-6



RESERVOIR REGULATION MANUAL
Brownlee, Oxbow, Hells Canyon Project
IDAHO POWER COMPANY
ANNUAL FLOOD PEAK FREQUENCIES
Snake River Above Clearwater River
Drainage Area 93,300 Square Miles

U. S. Army Engineer District, Walla Walla
Water Control Section
Prepared: L.V.A. Date: Sept 1963

PLATE 4-7

CORPS OF ENGINEERS

U.S. ARMY

	NO.	STATION	ELEVATION
BOISE RIVER	1.	ATLANTA SUMMITT	7500
	2.	GALENA SUMMITT	8765
	3.	BOGUS BASIN	5360
	4.	MORES CREEK SUMMITT	6700
	5.	SOLDIER P.G.	6700
WEISER RIVER	6.	BOULDER CREEK	5500
	7.	PLACER CREEK	6000
	8.	LAKE FORK	6000
	9.	ROCK FLAT SUMMITT	5200
	10.	SQUAW MEADOWS	5800
COYOTE RIVER	11.	BIG BEND	6700
	12.	FEE CANYON	6700
	13.	GOLD CREEK	7600
	14.	LOWER JACK CREEK	6800
	15.	RODEO FLAT	5600
	16.	SILVER CITY	6400
BRUNEAU RIVER	17.	SOUTH MTN. NO. 2	6240
	18.	TAYLOR CANYON	6200
	19.	UPPER BUCKSKIN	7200
	20.	UPPER JACK CREEK	7295
JARBIDGE RIVER	21.	BEAR CREEK	7800
	22.	HOT CREEK	6300
POWDER RIVER	23.	TREMAYNAN RANCH	5100
	24.	BLUE MTN. SPRINGS	5900
	25.	CRANE PRAIRIE	5375
	26.	LAKE CREEK	5100
	27.	ROCK SPRING	5841
	28.	ANTHONY LAKE	7125
HENRYS FORK	29.	BOURSE	5850
	30.	HOCLEY MTN.	5452
	31.	EILERTSON MEADOWS	5865
	32.	GOLD CENTER	5243
	33.	SUMMITT SPRINGS	6000
	34.	TAYLOR GREEN	5742
	35.	KILGORE	5200
	36.	ISLAND PARK NO. 2	6315
	37.	STATE LINE	6490
	38.	VALLEY VIEW	6530
	39.	BIG SPRINGS	6350
	40.	BLUE LEDGE MINE	6700
	41.	WEST YELLOWSTONE	6750
ABOVE JACKSON LAKE	42.	GLADE CREEK	7230
	43.	ASTOR CREEK	7700
	44.	COULTER CREEK	7560
	45.	HUCKLEBERRY DIV.	7350
	46.	LEWIS LAKE DIV.	7900
	47.	TOGWOTEE PASS	9200
	48.	TURPIN MEADOWS	6930
JACKSON LAKE TO AMERICAN FALLS	49.	YELLOWJACKET	7675
	50.	EAST RIM DIV.	7903
	51.	BLACKROCK	8860
	52.	FOUR MILE MEADOWS	7770
	53.	AFTON R.S.	6200
	54.	CCC CAMP	7300
	55.	COTTONWOOD LAKE	7505
	56.	DEADMAN RANCH	6231
	57.	GROVER PARK DIV.	7500

NO.	STATION	ELEVATION
1.	ALTA, WYOMING	6431
2.	JACKSON, WYOMING	6244
3.	MORAN, WYOMING	6772
4.	SNAKE RIVER STATION, WYOMING	6832
5.	ASHTON, IDAHO	5100
6.	DRIGGS, IDAHO	6657
7.	DUBOIS EXP. STATION, IDAHO	5455
8.	IRWIN, IDAHO	5200
9.	ISLAND PARK, IDAHO	6300
10.	TETONIA, IDAHO	5904
11.	OAKLEY, IDAHO	4636
12.	JARBIDGE, NEVADA	6150
13.	THREE CREEK, IDAHO	5420
14.	HAILEY, IDAHO	5322
15.	HILL CITY, IDAHO	5000
16.	IDAHO CITY, IDAHO	5760
17.	ARROWROCK, IDAHO	2257
18.	LOWMAN, IDAHO	3794
19.	DEADWOOD DAM, IDAHO	5615
20.	MICALL, IDAHO	5025
21.	CAMBRIDGE, IDAHO	2652
22.	CASCADE, IDAHO	4865
23.	COUNCIL, IDAHO	2935
24.	NEW MEADOWS, IDAHO	3870
25.	SUGAR, IDAHO	4090
26.	ST. ANTHONY, IDAHO	4968
27.	GROUSE, IDAHO	6100
28.	MACKAY, IDAHO	5900
29.	SUN VALLEY, IDAHO	5821
30.	GWYNN, NEVADA	5398
31.	HEGGEN DAM, MONTANA	6469
32.	BEULAH, OREGON	3277
33.	BURNS, OREGON	4151
34.	UNITY, OREGON	4031
35.	VALE, OREGON	2240
36.	WARM SPRINGS, OREGON	3336
37.	BAKER FAA, OREGON	3368
38.	RICHLAND, OREGON	2215

STATION	COMMUNICATIONS
1. JACKSON L. AT MORAN, WYO.	DAM-BR BURLEY-TT BR-CBTT
2. SNAKE R. AT MORAN, WYO.	DAM-BR BURLEY-TT BR-CBTT
3. PALISADES RESERVOIR, IDAHO	DAM-BR BURLEY-TT BR-CBTT
4. PALISADES RESERVOIR, IDAHO	DAM-BR BURLEY-TT BR-CBTT
5. SNAKE R. BELOW PALISADES DAM	DAM-BR BURLEY-TT BR-CBTT
6. SNAKE R. NEAR HEISE, IDAHO	OBS-PALISADES-BR BURLEY-TT BR-CBTT
7. ISLAND PARK RESERVOIR, IDAHO	DAM-BR BURLEY-TT BR-CBTT
8. HENRYS FORK NEAR ISLAND PARK, IDAHO	DAM-BR BURLEY-TT BR-CBTT
9. HENRYS FORK NEAR REXBURG, IDAHO	OBS-PALDAM-PAL-BR BURLEY-TT BR-CBTT
10. PORTNEUF R. AT POCATELLO, IDAHO	TM-WB POCATELLO-TEL WB BOISE-TEL BR-CBTT
11. AMERICAN FALLS RESERVOIR, IDAHO	DAM-BR BURLEY-TT BR-CBTT
12. SNAKE R. AT NEELEY, IDAHO	DAM-BR BURLEY-TT BR-CBTT
13. SNAKE R. AT MINIDOKA, IDAHO	IPC-TEL BR BURLEY-TT BR-CBTT
14. SNAKE R. AT SWISE PLANT, IDAHO	IPC-TEL BR BURLEY-TT BR-CBTT
15. ANDERSON RANCH RESERVOIR, IDAHO	DAM-BOARD OF CONTROL-TEL BR-CBTT
16. S. FK. BOISE R. AT ANDERSON DAM	DAM-BOARD OF CONTROL-TEL BR-CBTT
17. ARROWROCK RESERVOIR, IDAHO	DAM-BOARD OF CONTROL-TEL BR-CBTT
18. LUCKY PEAK RESERVOIR, IDAHO	DAM-BOARD OF CONTROL-TEL BR-CBTT
19. BOISE R. AT DIVERSION DAM	DAM-BOARD OF CONTROL-TEL BR-CBTT
20. NEW YORK CANAL, IDAHO	DAM-BOARD OF CONTROL-TEL BR-CBTT
21. BOISE R. AT BOISE, IDAHO	OBS-TEL WB BOISE-TT WB/PORTLAND-CBTT
22. CASCADE RESERVOIR, IDAHO	DAM-TEL BR-CBTT
23. N. FK. PAYETTE R. AT CASCADE	OBS-CASCADE-TEL BR-CBTT
24. DEADWOOD RESERVOIR, IDAHO	DAM-TEL BR-CBTT
25. DEADWOOD R. NEAR LOWMAN, IDAHO	OBS-DEADWOOD-TEL BR-CBTT
26. PAYETTE R. AT HORSESHOE BEND, IDAHO	IPC-TEL BR-CBTT
27. PAYETTE R. AT EMMETT, IDAHO	OBS-BLACK CANYON-TEL BR-CBTT
28. WEISER R. NEAR CAMBRIDGE, IDAHO	OBS-TEL WB BOISE-TT WB PORTLAND-CBTT
29. WEISER R. NEAR WEISER, IDAHO	OBS-TEL WB BOISE-TT WB PORTLAND-CBTT
30. SNAKE R. AT WEISER, IDAHO	IPC-TT BPA-CBTT
31. POWDER R. AT BAKER, OREGON	OBS-TEL WB/BOISE-TT WB/PORTLAND-CBTT
32. BROWNLEE RESERVOIR, IDAHO	DAM-C BPA-CBTT
33. OXBOW RESERVOIR, OREGON	DAM-C BPA-CBTT
34. SALMON R. AT WHITEBIRD, IDAHO	TM WB LEWISTON-TT WB PORTLAND-CBTT
35. SNAKE R. NEAR ANATONE, WASHINGTON	TM WB LEWISTON-TT WB PORTLAND-CBTT
36. GRANDE RONDE R. AT TROY, OREGON	OBS-TEL WB/BOISE-TT WB PORTLAND-CBTT
37. CLEARWATER R. AT SPALDING, IDAHO	WWP-TEL WB LEWISTON-TT WB PORTLAND-CBTT
38. SNAKE R. AT LEWISTON, IDAHO	OBS-TEL WB LEWISTON-TT WB PORTLAND-CBTT
39. SNAKE R. NEAR CLARKSTON, WASHINGTON	TM WB LEWISTON-TT WB/PORTLAND-CBTT
40. SNAKE R. NEAR MURPHY, IDAHO	GS-MAIL-ON REQUEST
41. SNAKE R. AT JOHNSONS BAR, OREGON	C-MAIL-CE
42. HELLS CANYON RESERVOIR, IDAHO	DAM-C BPA-CBTT

LEGEND

C - CARRIER
SR - WEATHER BUREAU SERVICE C
WB - U.S. WEATHER BUREAU
IPC - IDAHO POWER CO.
CBTT - COLUMBIA BASIN TELETYPE
CE - CORPS OF ENGINEERS
TT - TELETYPE
BR - U.S. BUREAU OF RECLAMATION
OBS - OBSERVER
GS - U.S. GEOLOGICAL SURVEYS
TM - TELEMASK
BPA - BONNEVILLE POWER AD.
TEL - TELEPHONE
WWP - WASH. WATER POWER CO.

MAP LEGEND

GAGE	RECORDING	NON-RECORDING
PRECIPITATION	●	○
STREAM	▲	△
RESERVOIR	■	□
SNOW	♦	◇

DAM: AUTHORIZED OR LICENSED; UNDER CONST. OR COMPLETE

Note: This map compiled from U.S.G.S. Index Maps.

RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

HYDROLOGIC REPORTING NETWORK

U.S. ARMY ENGINEER DISTRICT, WALLA WALLA
WATER CONTROL SECTION

Prepared: K. Wise — Date: July, 1970

SCALE IN MILES

PLATE 5-1

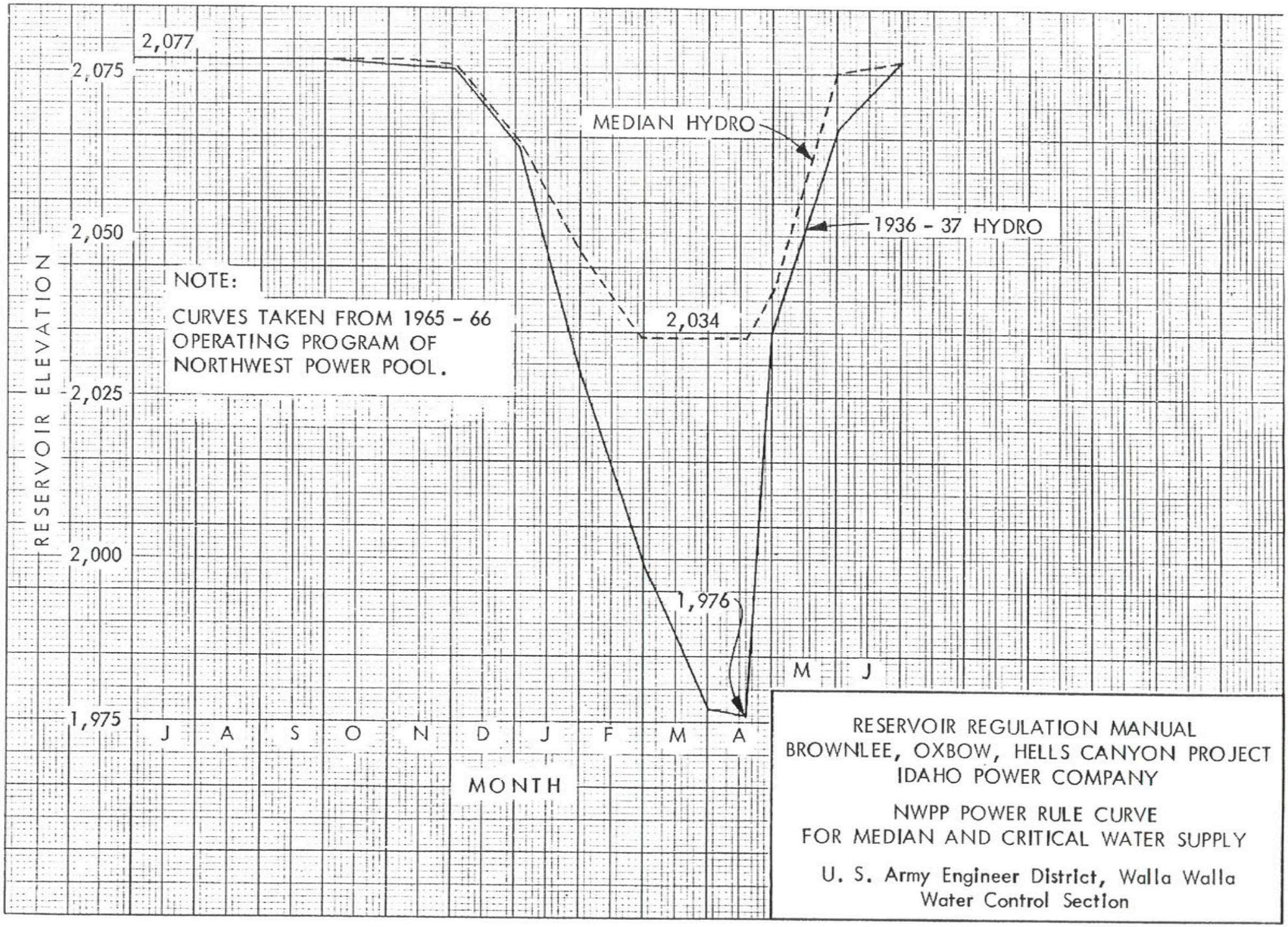
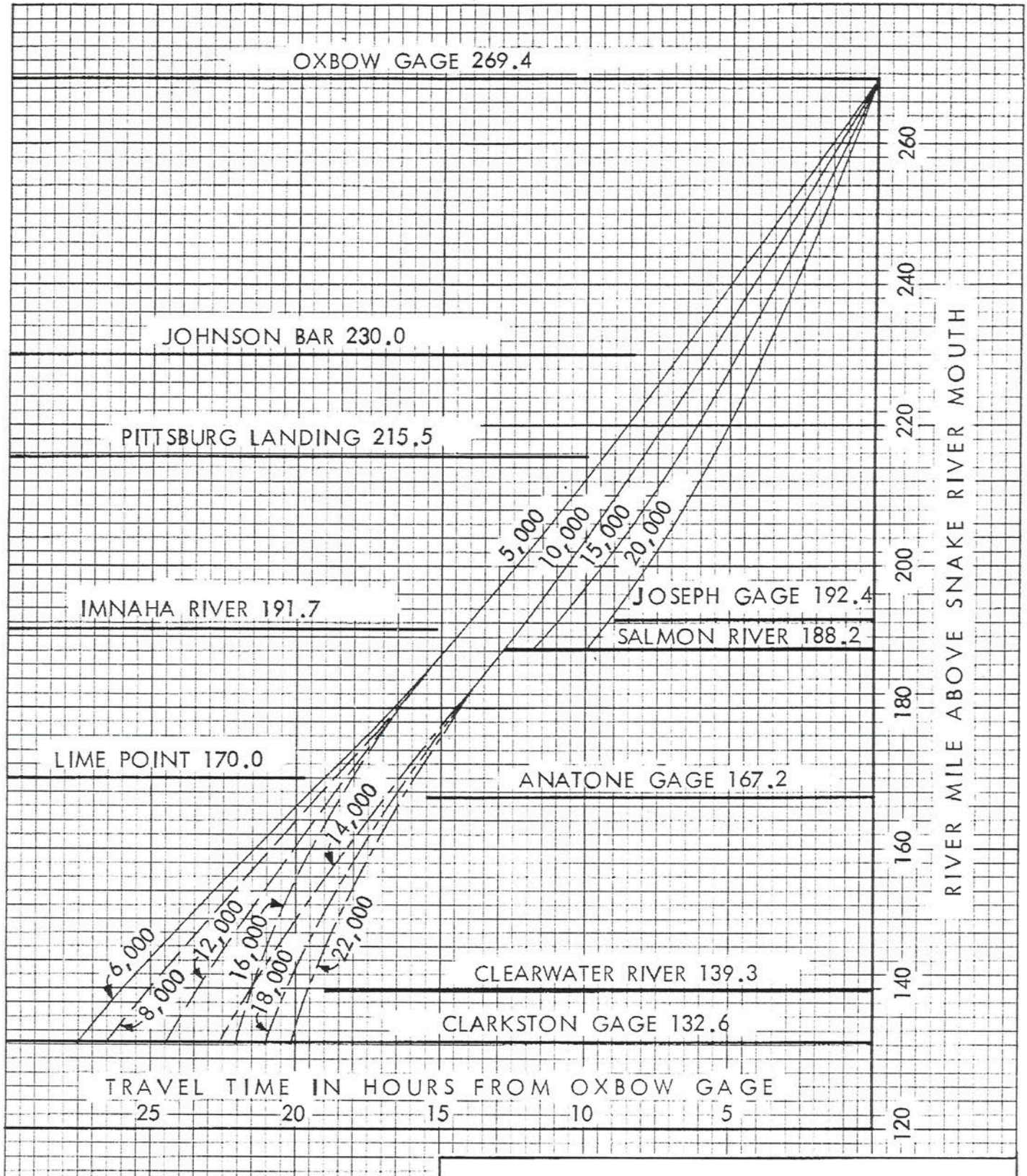

2,077
2,075
2,050
2,025
2,000
1,975
RESERVOIR ELEVATION
MEDIAN HYDRO
1936 - 37 HYDRO
2,034
1,976
NOTE:
CURVES TAKEN FROM 1965 - 66 OPERATING PROGRAM OF NORTHWEST POWER POOL.
J A S O N D J F M A M J
MONTH
RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY
NWPP POWER RULE CURVE
FOR MEDIAN AND CRITICAL WATER SUPPLY
U. S. Army Engineer District, Walla Walla
Water Control Section

PLATE 7-1



NOTE:

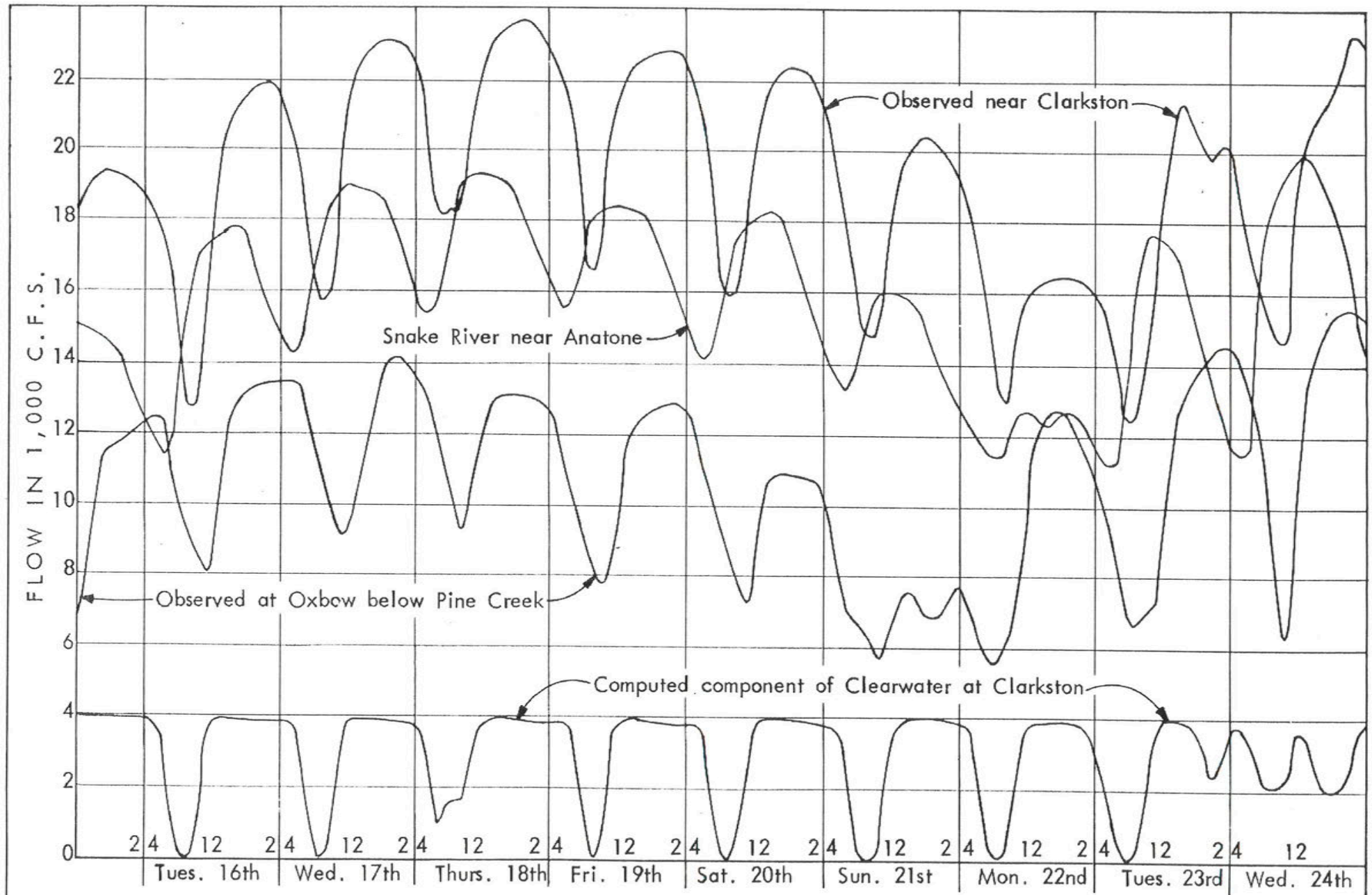
PARAMETERS ARE RIVER DISCHARGE IN C.F.S.

RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

TRAVEL TIMES
SNAKE RIVER BELOW OXBOW

U. S. Army Engineer District, Walla Walla
Water Control Section

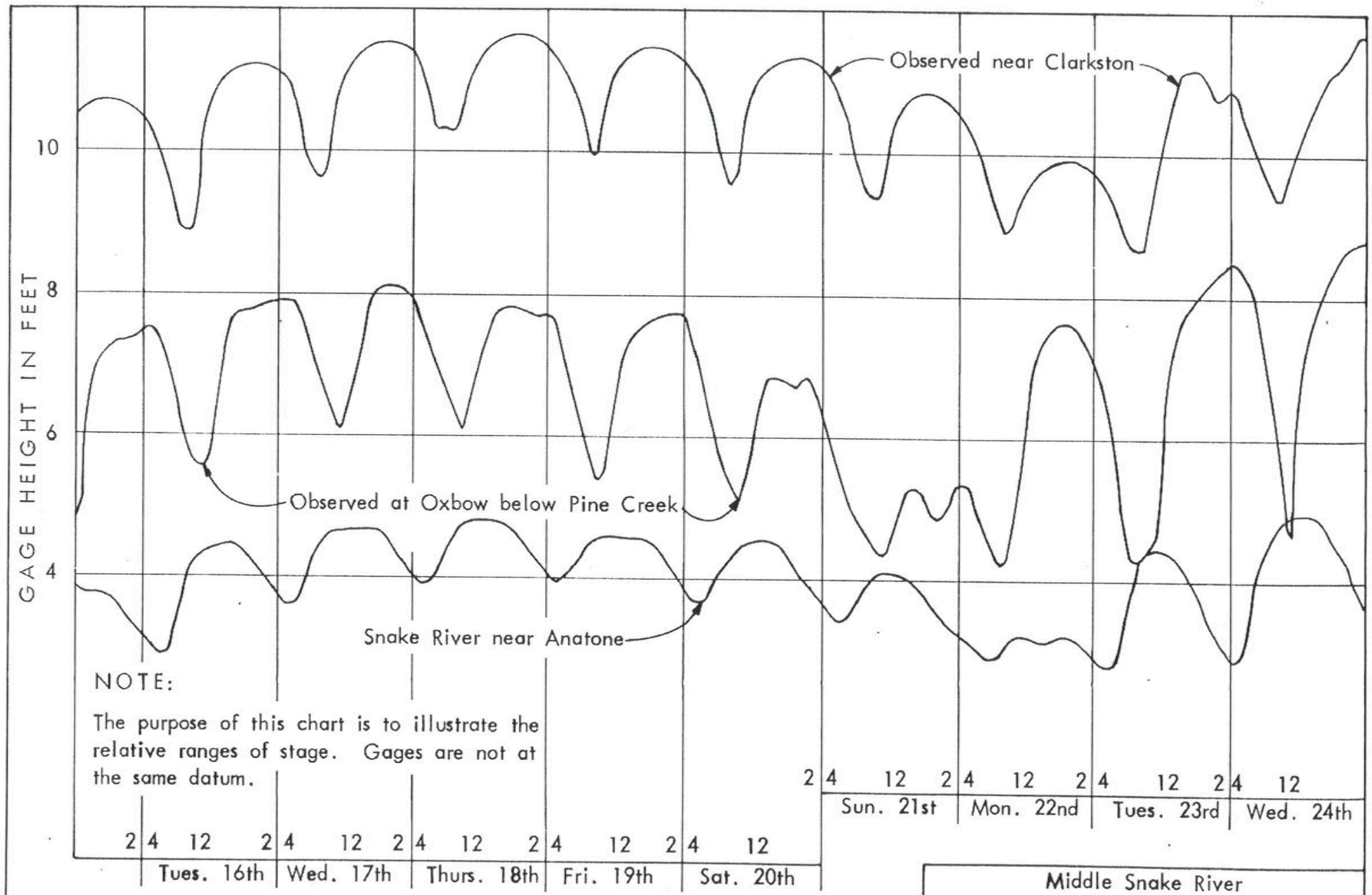
PLATE 7-2



AUGUST 1960

PLATE 7-3

Middle Snake River
TYPICAL REGULATED HYDROGRAPHS
U. S. Army Engineer Dist., Walla Walla
February 1961



AUGUST 1960

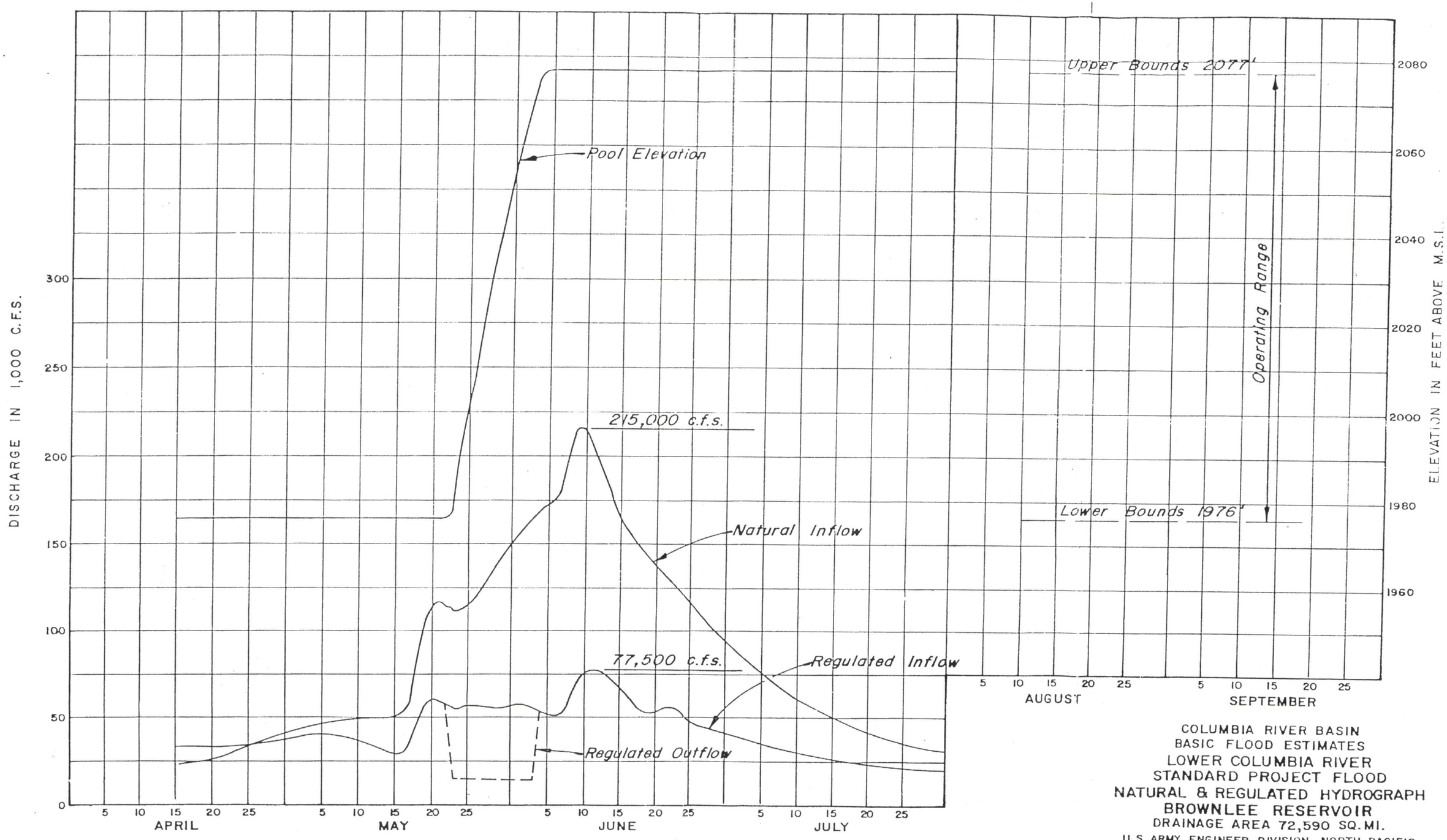
PLATE 7-4

Middle Snake River

TYPICAL REGULATED HYDROGRAPHS

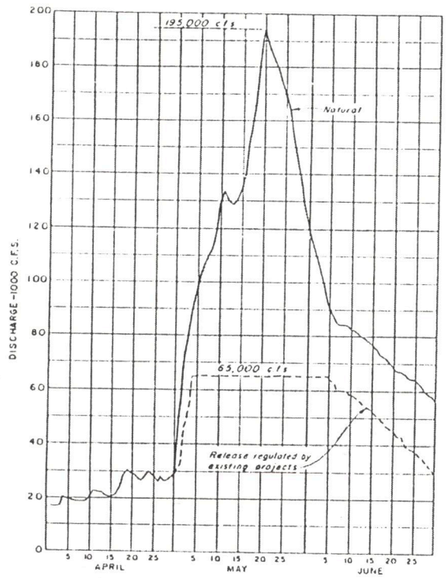
U. S. Army Engineer Dist., Walla Walla

February 1961

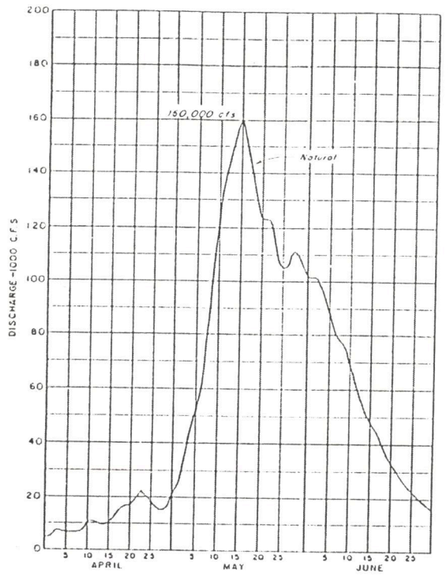


COLUMBIA RIVER BASIN
BASIC FLOOD ESTIMATES
LOWER COLUMBIA RIVER
STANDARD PROJECT FLOOD
NATURAL & REGULATED HYDROGRAPH
BROWNLEE RESERVOIR
DRAINAGE AREA 72,590 SQ.MI.

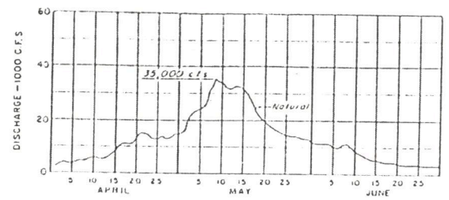
U.S. ARMY ENGINEER DIVISION, NORTH PACIFIC
WATER CONTROL BRANCH SEPTEMBER 1969
PREPARED: D.L.L. CHECKED: D.R.



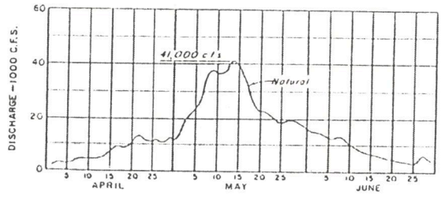
CONTRIBUTION FROM SNAKE RIVER AT BROWNLEE



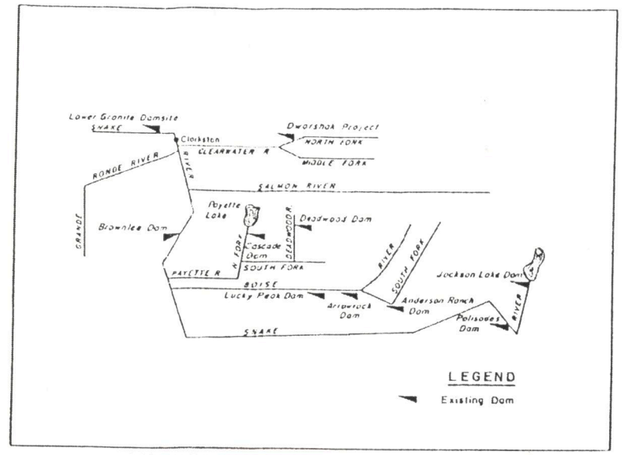
CONTRIBUTION FROM SALMON RIVER AT WHITEBIRD



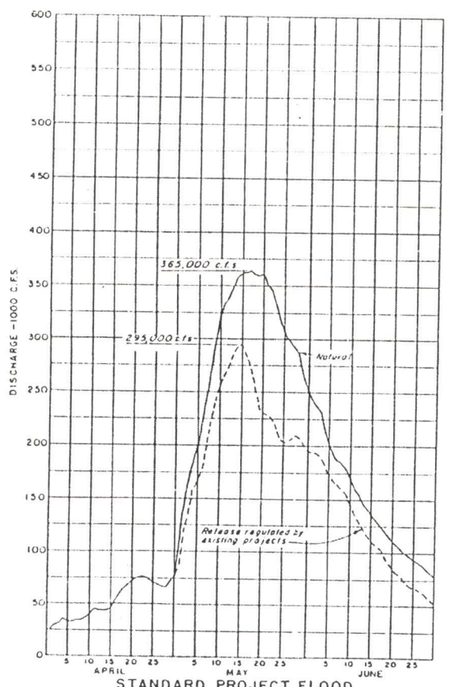
CONTRIBUTION FROM UNGAGED AREAS BETWEEN BROWNLEE AND CLEARWATER CONFLUENCE



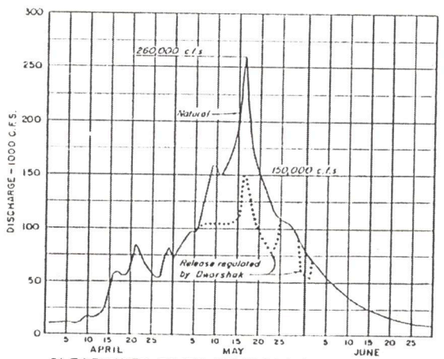
CONTRIBUTION FROM GRANDE RONDE RIVER AT TROY



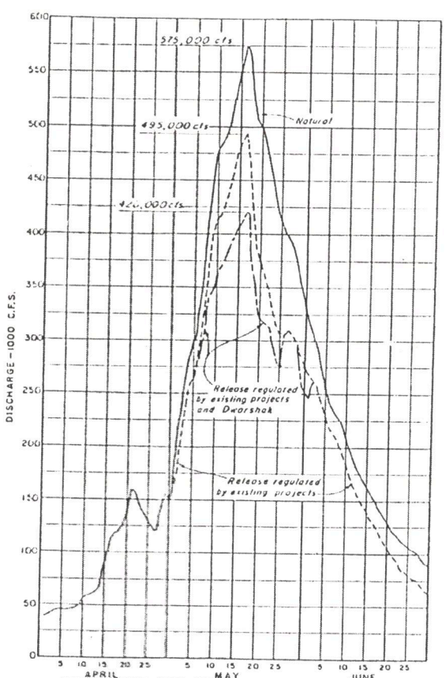
SCHEMATIC DIAGRAM OF MAJOR PROJECTS WITH FLOOD CONTROL STORAGE



STANDARD PROJECT FLOOD SNAKE RIVER ABOVE CLEARWATER RIVER CONFLUENCE



CLEARWATER RIVER STANDARD PROJECT FLOOD AT SPALDING



STANDARD PROJECT FLOOD - SNAKE RIVER AT LOWER GRANITE DAMSITE

BASIN	DRAINAGE AREA SQ. MI.
SNAKE RIVER AT BROWNLEE	72,500
SALMON RIVER AT WHITEBIRD	13,550
GRANDE RONDE AT TROY	3,273
UNGAGED AREA BETWEEN BROWNLEE AND CLEARWATER CONFLUENCE	4,175
SNAKE RIVER ABOVE CLEARWATER CONFLUENCE	93,500
CLEARWATER RIVER AT SPALDING	9,570
AREA BETWEEN SPALDING AND LOWER GRANITE DAMSITE (ASSUMED NON-CONTRIBUTING DURING FLOOD)	430
SNAKE RIVER AT LOWER GRANITE DAMSITE	103,500

NOTE

THE FLOODS SHOWN AS CONTRIBUTIONS FROM SNAKE RIVER AT BROWNLEE, SALMON RIVER AT WHITEBIRD, GRANDE RONDE RIVER AT TROY, AREA ON SNAKE RIVER BETWEEN BROWNLEE AND CLARKSTON, AND CLEARWATER RIVER AT SPALDING ARE NOT STANDARD PROJECT FLOODS FOR THE INDIVIDUAL AREAS BUT CONTRIBUTIONS FROM THESE AREAS TO THE LOWER SNAKE RIVER STANDARD PROJECT FLOODS.

PEN NO.	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

LOWER GRANITE LOCK AND DAM
SNAKE RIVER, ORE., WASH. & IDA.
STANDARD PROJECT FLOODS AND CONTRIBUTIONS

DESIGNED — DRAWN A.L.G. — CHECKED Conway — SUPERVISED: — QUANTITIES CHECKED

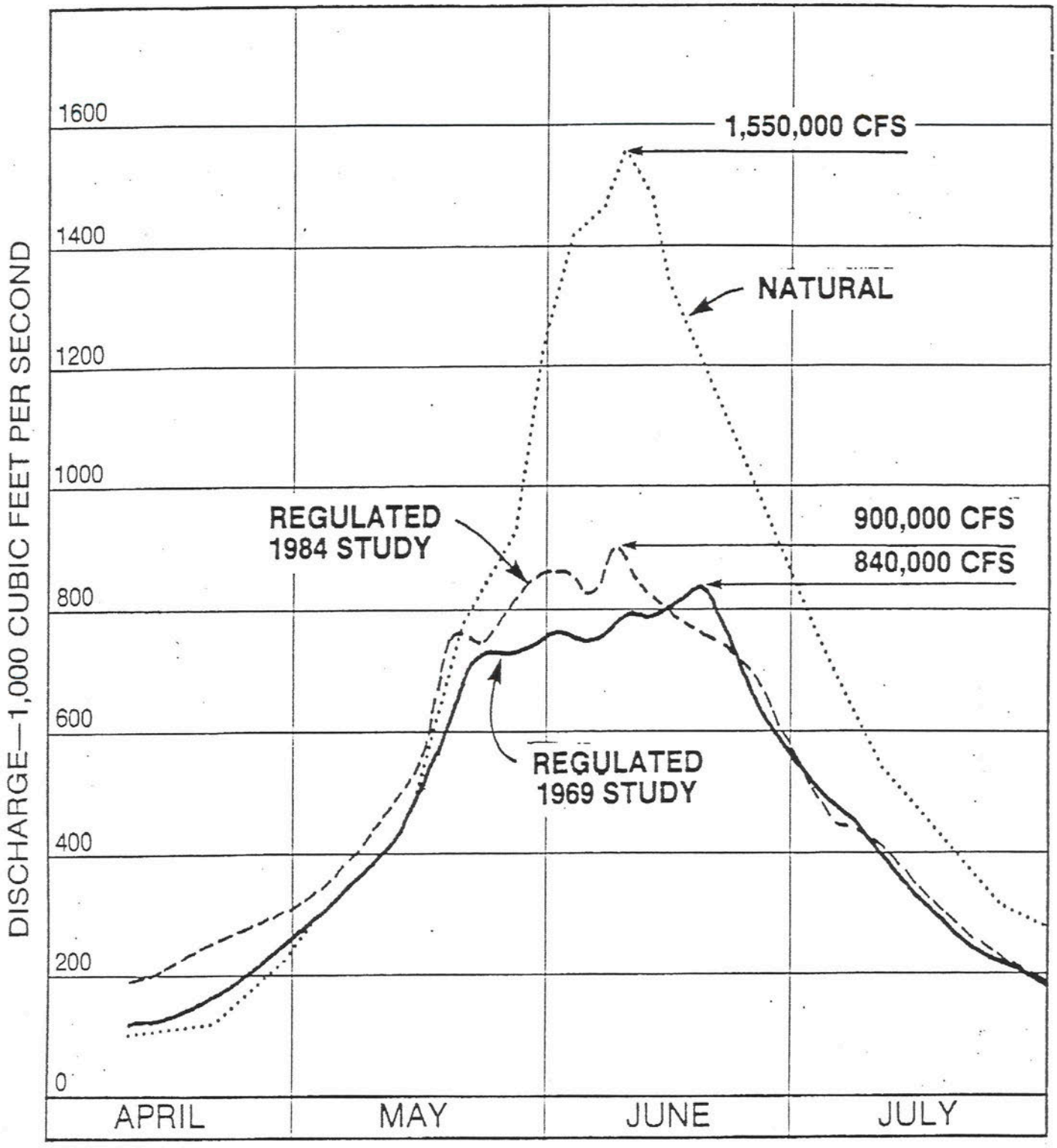
SUBMITTED: Chief, Project Planning Branch

RECOMMENDED: Chief, Engineering Division

APPROVED: Colonel, C.E. District Engineer — DATE 22 Nov 1963

SCALE AS SHOWN — INV. NO. E-46

SHEET — FILE NO. GD-05-3/17



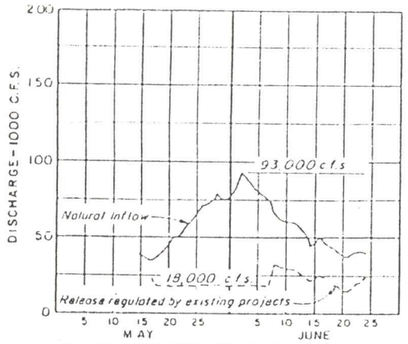
Columbia River at The Dalles, Ore.

STANDARD PROJECT FLOOD

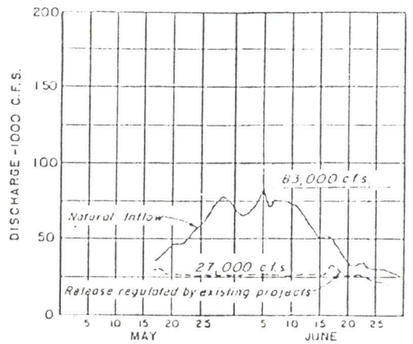
Comparison of 1969 and 1984 Regulation Studies

NPDEN-WM DEC 1984

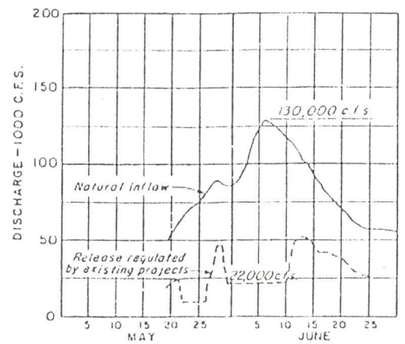
PLATE 8-2



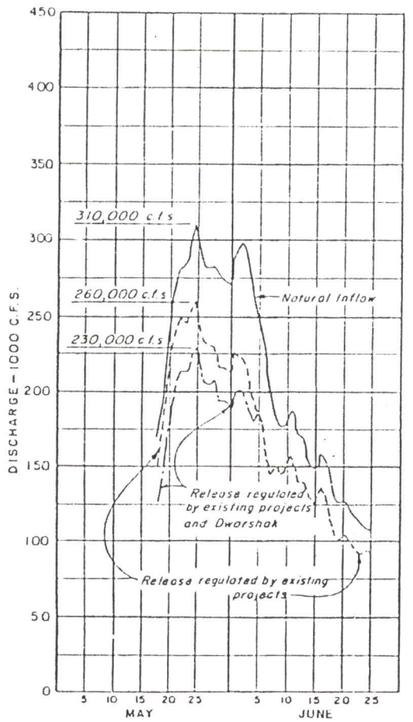
SNAKE RIVER AT BROWNLEE-1956



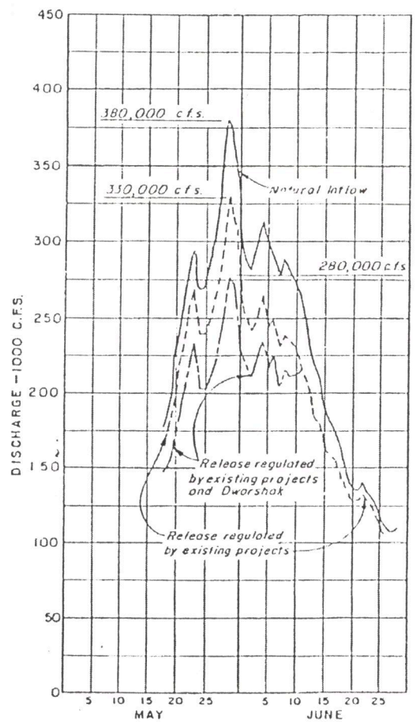
SNAKE RIVER AT BROWNLEE-1948



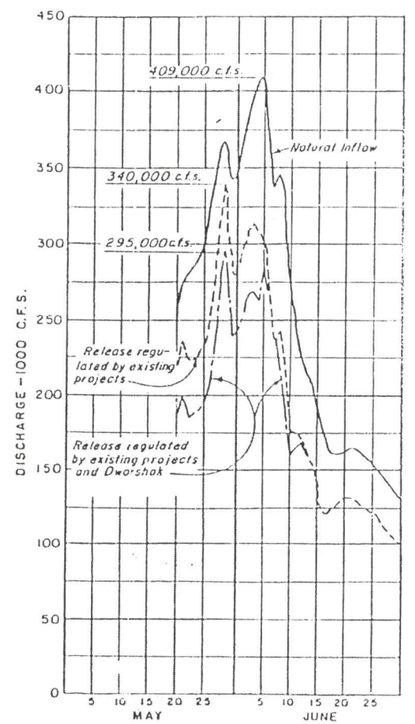
SNAKE RIVER AT BROWNLEE-1894



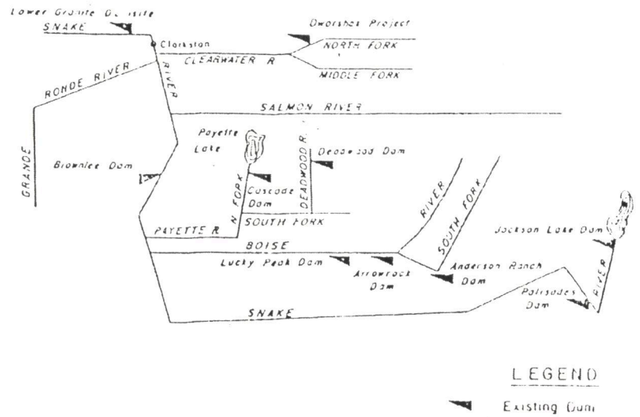
SNAKE RIVER AT CLARKSTON-1956



SNAKE RIVER AT CLARKSTON-1948



SNAKE RIVER AT CLARKSTON-1894



SCHEMATIC DIAGRAM OF MAJOR PROJECTS WITH FLOOD CONTROL STORAGE

MAJOR PROJECTS AND FLOOD CONTROL STORAGE

EXISTING PROJECTS		GROSS USABLE ACRE-FEET
UPPER SNAKE RIVER		
JACKSON LAKE AND PALISADES		1,400,000
BOISE RIVER		
ANDERSON RANCH		418,000
ARROWROCK		286,000
LUCKY PEAK		279,000
PAYETTE RIVER		
CASCADE		653,000
DEADWOOD		160,000
MIDDLE SNAKE RIVER		
BROWNLEE		980,000
	TOTAL	4,176,000
NORTH FORK CLEARWATER		
DWORSHAK		2,000,000
TOTAL EXISTING AND DWORSHAK		6,176,000

NOTES:

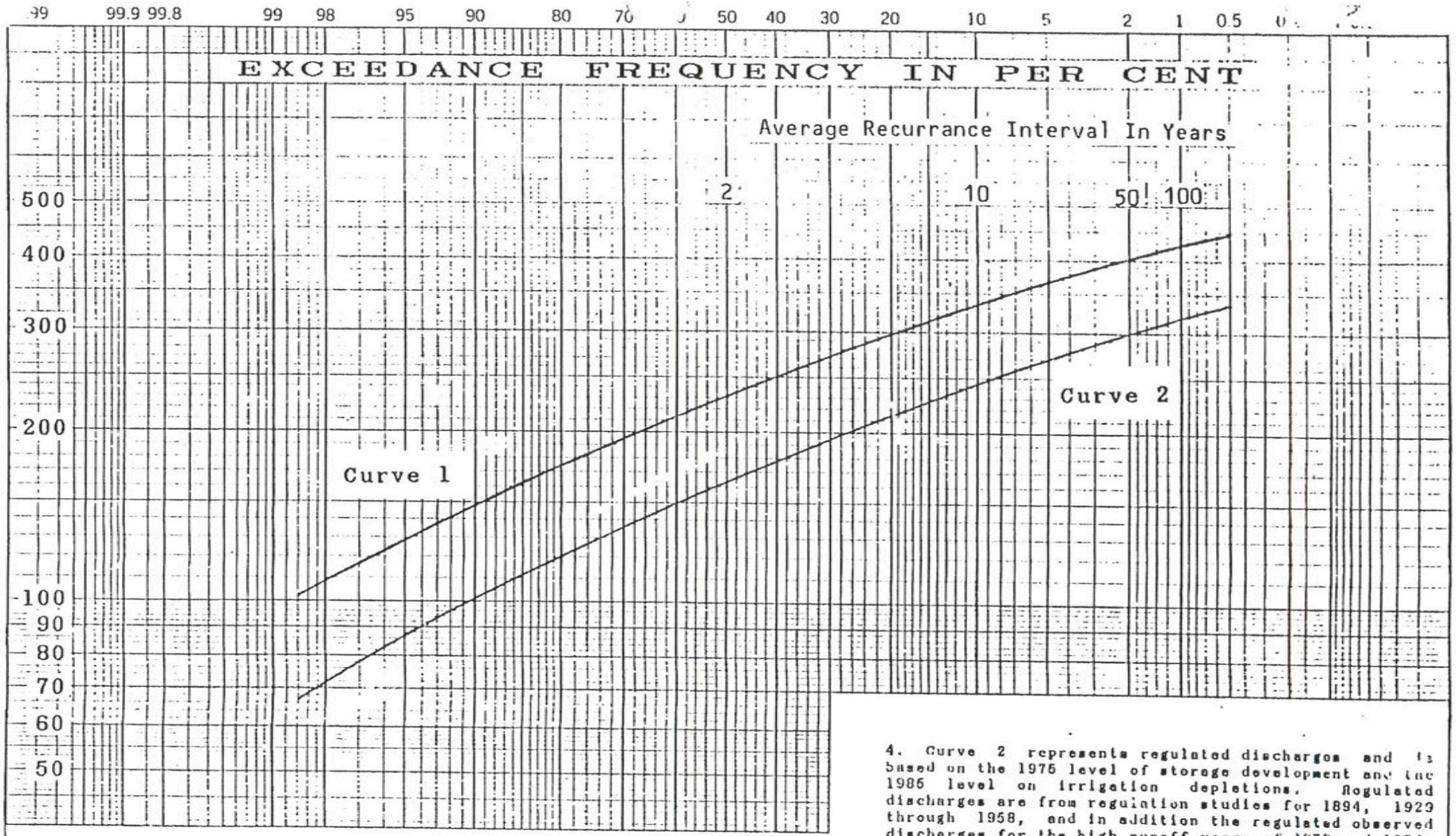
1. REGULATION BY EXISTING PROJECTS IS BASED ON REGULATION PROCEDURES USED IN "JUNE 1958 REVIEW REPORT OF HOUSE DOCUMENT 531."
2. DWORSHAK REGULATION PROCEDURES ARE OUTLINED IN APPENDIX A OF THE 15 SEPTEMBER 1961 "BRUCES EDDY DAM AND RESERVOIR GENERAL DESIGN MEMORANDUM."

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

LOWER GRANITE LOCK AND DAM
SNAKE RIVER, OREGON, WASHINGTON AND IDAHO

REGULATION OF LARGE SNAKE RIVER FLOODS

GD-05-3/18



NOTES

1. Drainage area equals 103,200 sq. mi.

2. This is a preliminary graph subject to revision.

3. Curve 1 represents natural discharges and is based on the 1894-1975 station record adjusted for irrigation depletions and storage and extended by correlation with the 1858-1975 Columbia River at The Dalles station record. It includes an expected probability adjustment. The station and adopted skew is -0.5. Natural discharges for the 1894-1975 period of record are plotted based on their ranking within the extended record. The median plotting position method was utilized.

4. Curve 2 represents regulated discharges and is based on the 1975 level of storage development and the 1985 level on irrigation depletions. Regulated discharges are from regulation studies for 1894, 1929 through 1958, and in addition the regulated observed discharges for the high runoff years of 1972 and 1974. The plotting positions for the regulated event years are for the natural frequency curve. Curve 2 is a graphical fit of the regulated data.

Brownlee, Oxbow, Hells Canyon Project
Idaho Power Company

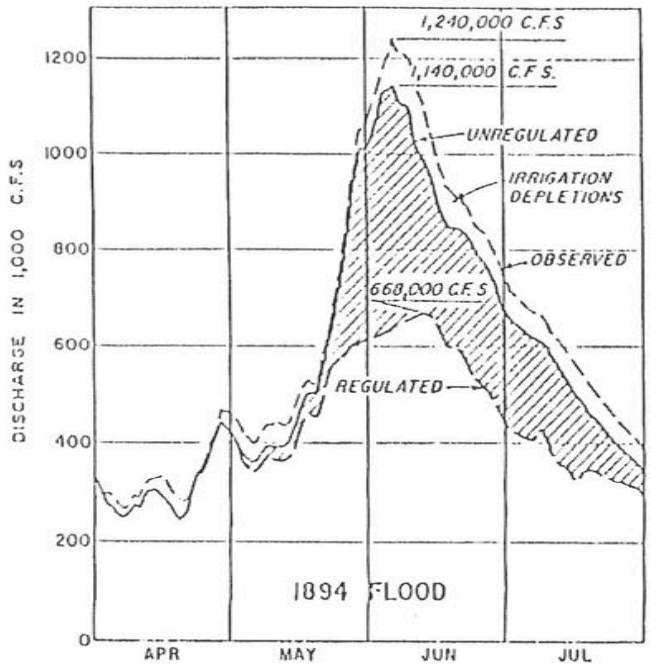
ANNUAL PEAK DISCHARGE FREQUENCIES
Snake River At Lower Granite Dam

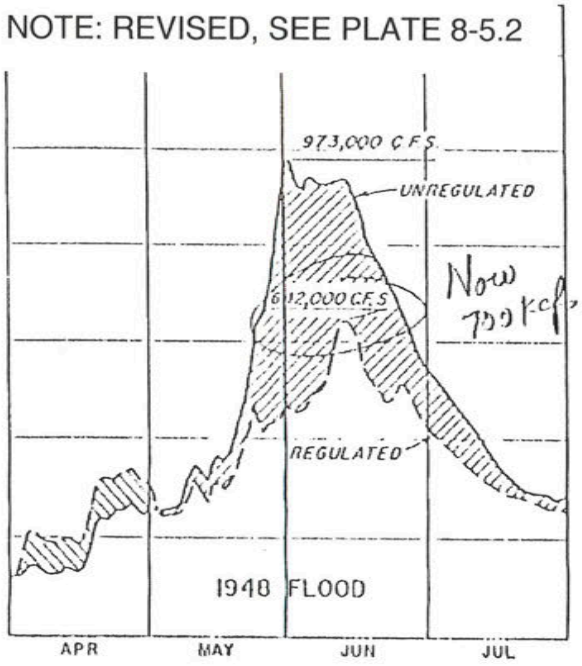
U.S. Army Engineer Division, N.P.
NPDEN-WM-HES

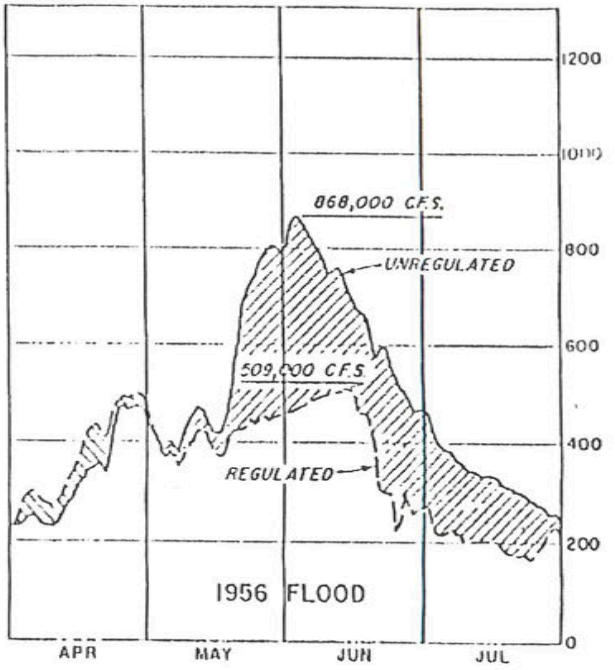
PLATE 8-4

May 1978

NOTE: REVISED, SEE PLATE 8-5.2



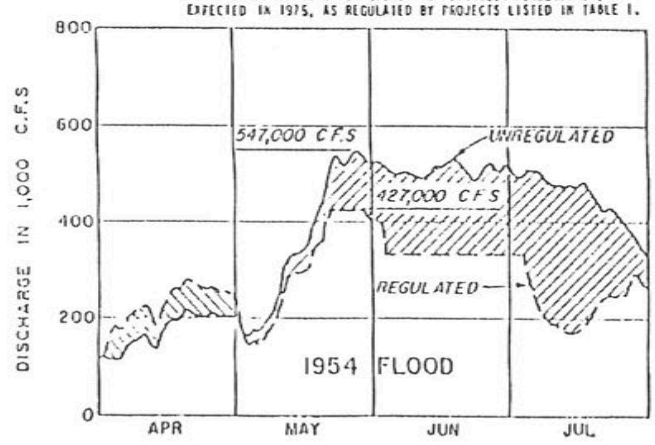


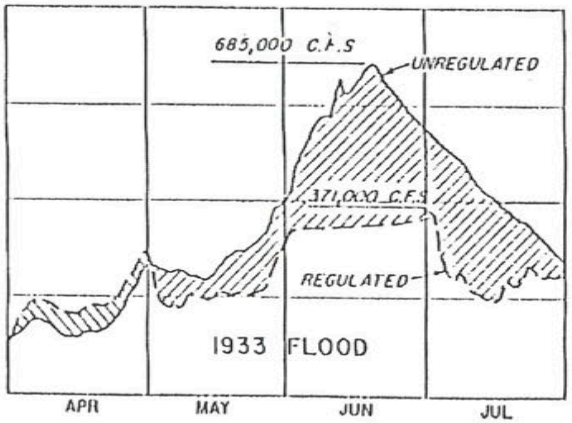


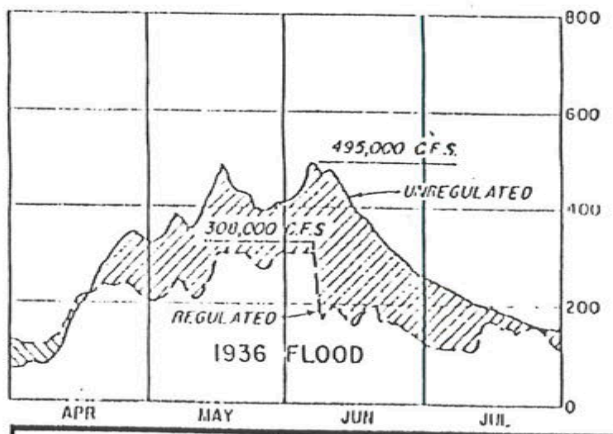
NOTE:

UNREGULATED FLOWS INCLUDE THE EFFECT OF ESTIMATED 1985 LEVEL OF IRRIGATION DEPLETIONS.

REGULATED FLOWS REPRESENT THE RESERVOIR DEVELOPMENT EXPECTED IN 1975, AS REGULATED BY PROJECTS LISTED IN TABLE I.





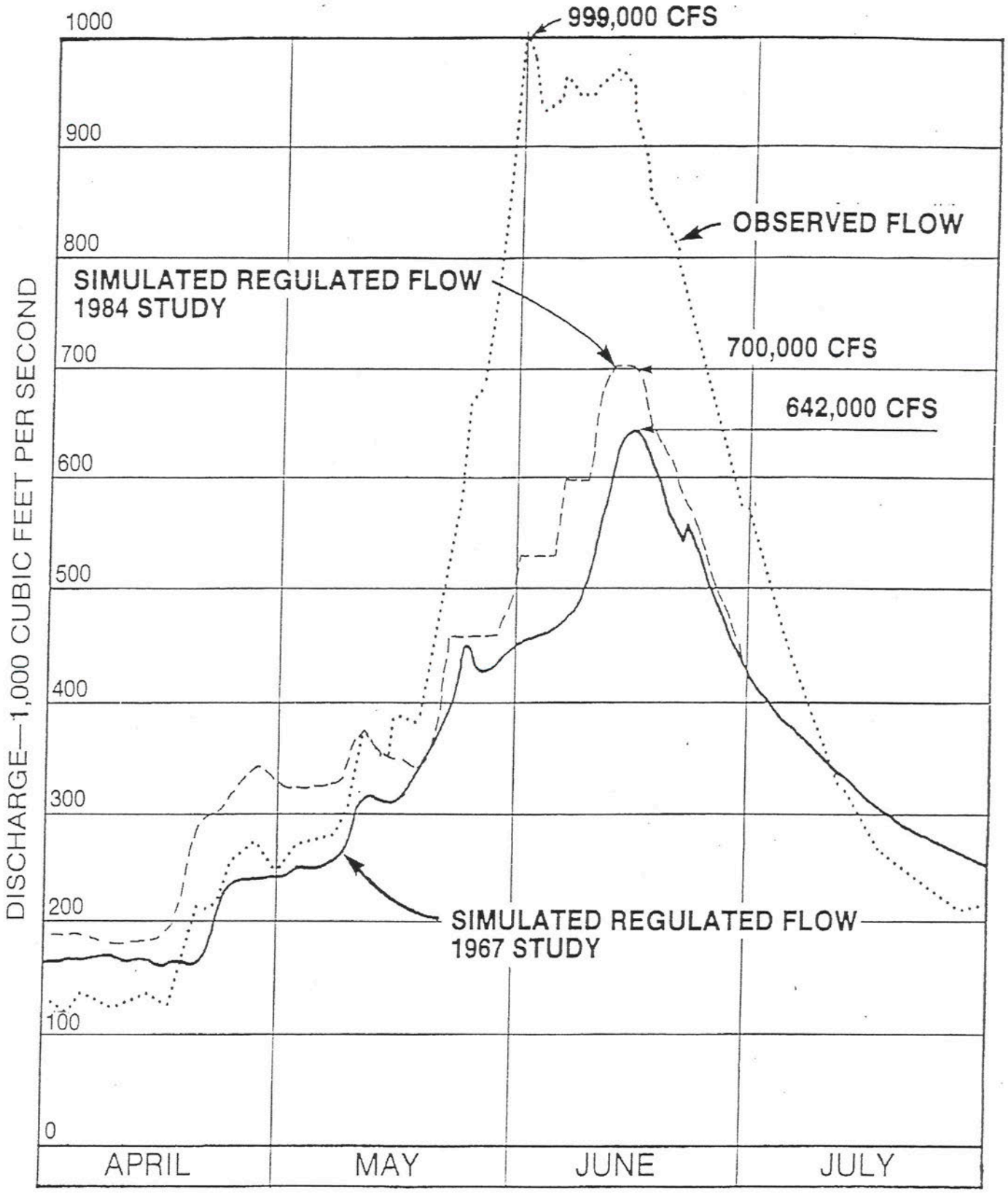


REGULATED HYDROGRAPHS FOR
COLUMBIA RIVER AT THE DALLES, OREGON
1967 REGULATION STUDY

PLATE 8-5.1

BROWNLEE, OXBOW, HELLS CANYON PROJECTS
IDAHO POWER COMPANY

U.S. ARMY ENGINEER DISTRICT
CENPW - PL - H JULY 1988



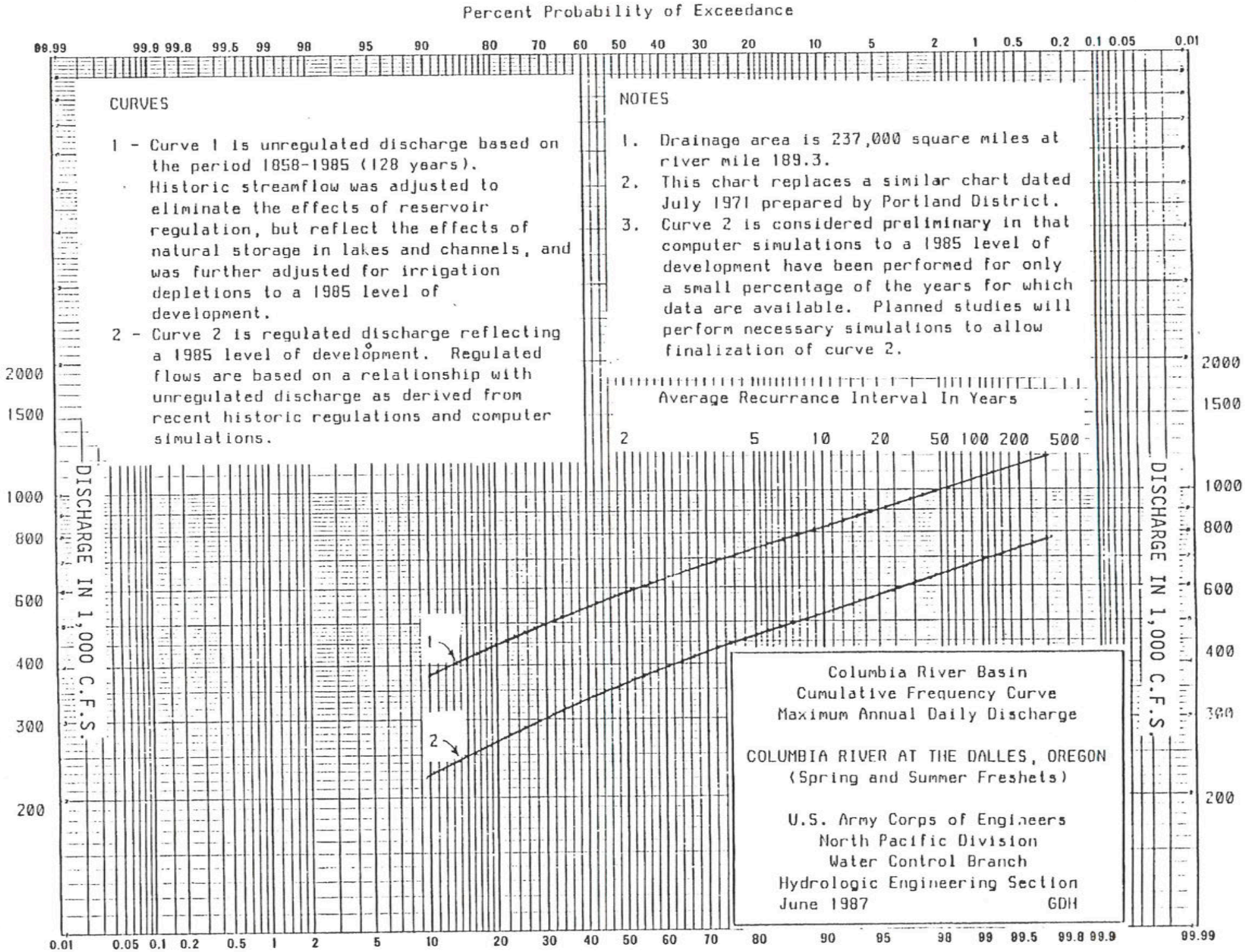
Columbia River at The Dalles, Ore.

1948 FLOOD

Comparison of 1967 and 1984
Regulation Studies

NPDEN-WM DEC 1984

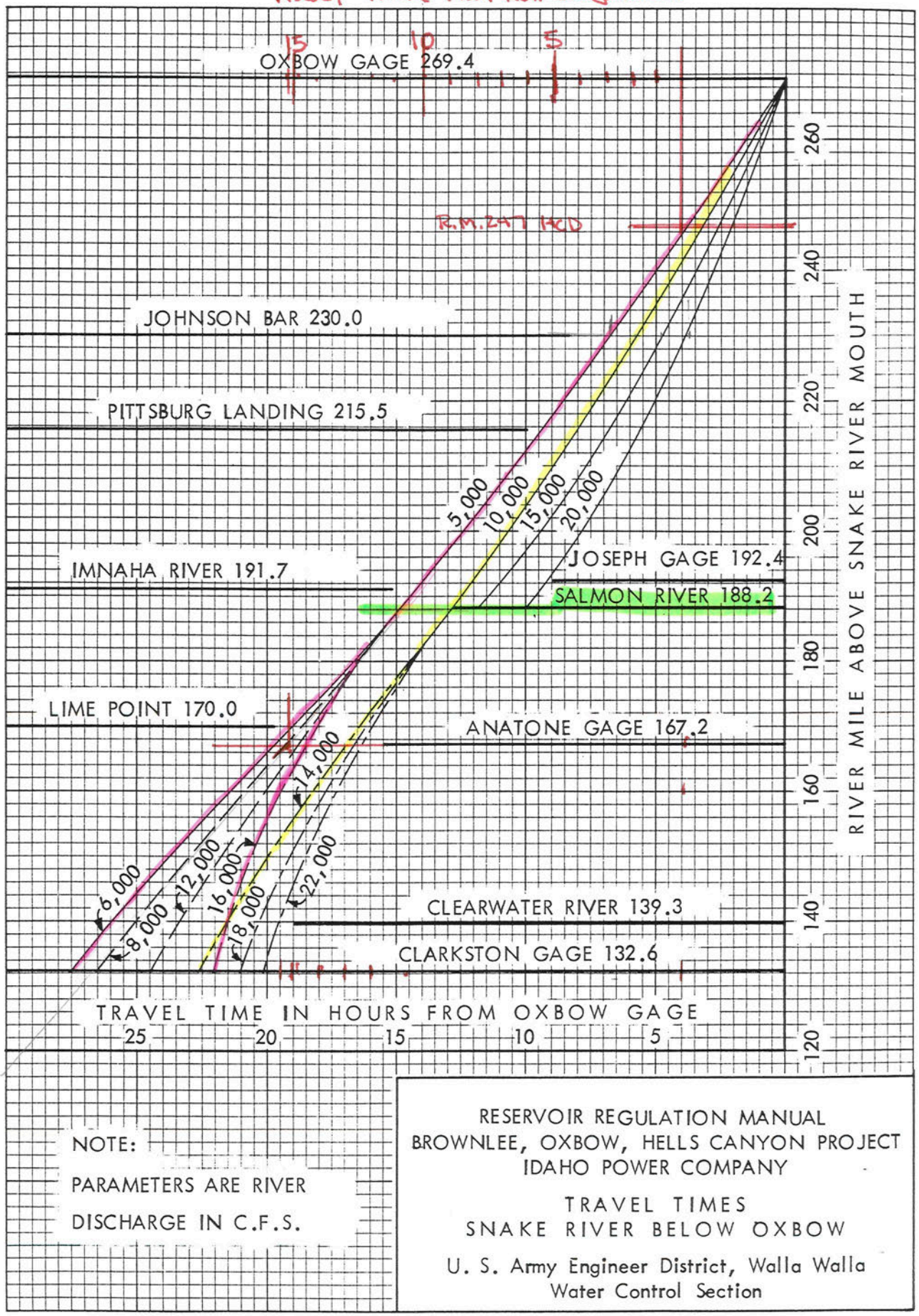
PLATE 8-5.2



BROWNLEE, OXBOW, HELLS CANYON PROJECTS
WATER CONTROL MANUAL

PLATE 8-6

Estimated
Travel Time From Hell Canyon Dam



NOTE:

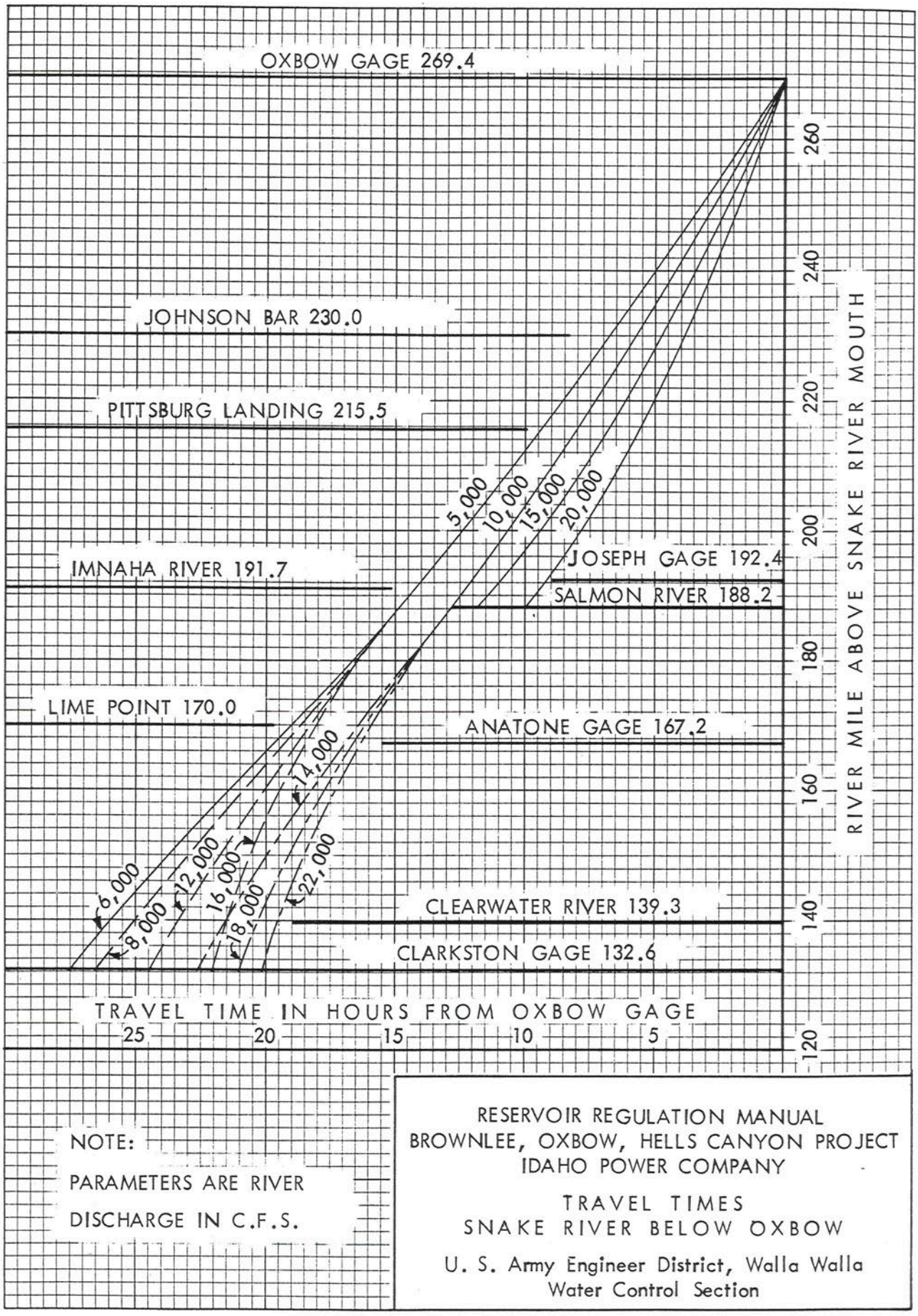
PARAMETERS ARE RIVER DISCHARGE IN C.F.S.

RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

TRAVEL TIMES
SNAKE RIVER BELOW OXBOW

U. S. Army Engineer District, Walla Walla
Water Control Section

PLATE 31



NOTE:

PARAMETERS ARE RIVER DISCHARGE IN C.F.S.

RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

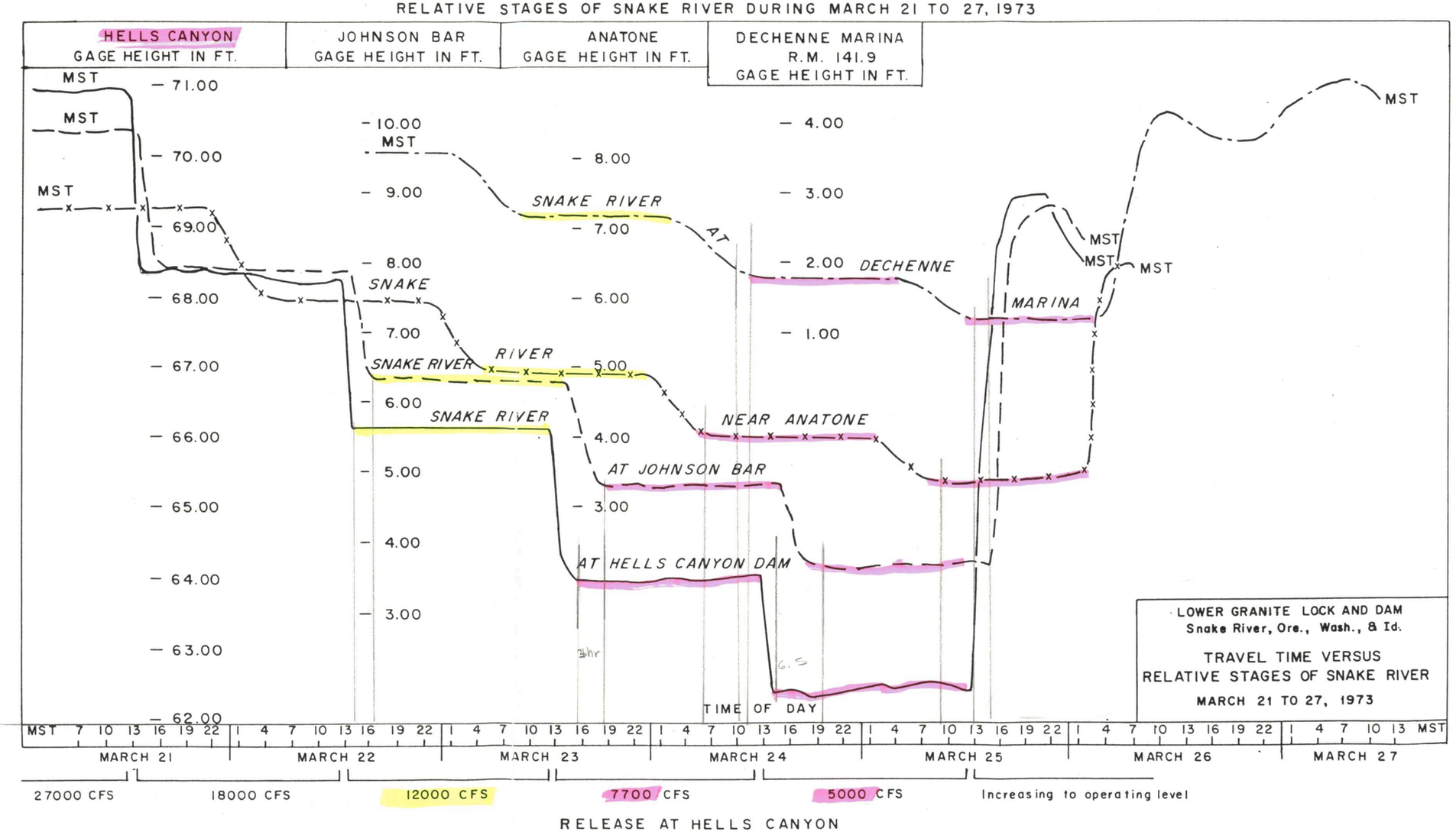
TRAVEL TIMES
SNAKE RIVER BELOW OXBOW

U. S. Army Engineer District, Walla Walla
Water Control Section

PLATE 31

RELATIVE STAGES OF SNAKE RIVER DURING MARCH 21 TO 27, 1973

HELLS CANYON GAGE HEIGHT IN FT.	JOHNSON BAR GAGE HEIGHT IN FT.	ANATONE GAGE HEIGHT IN FT.	DECHENNE MARINA R.M. 141.9 GAGE HEIGHT IN FT.

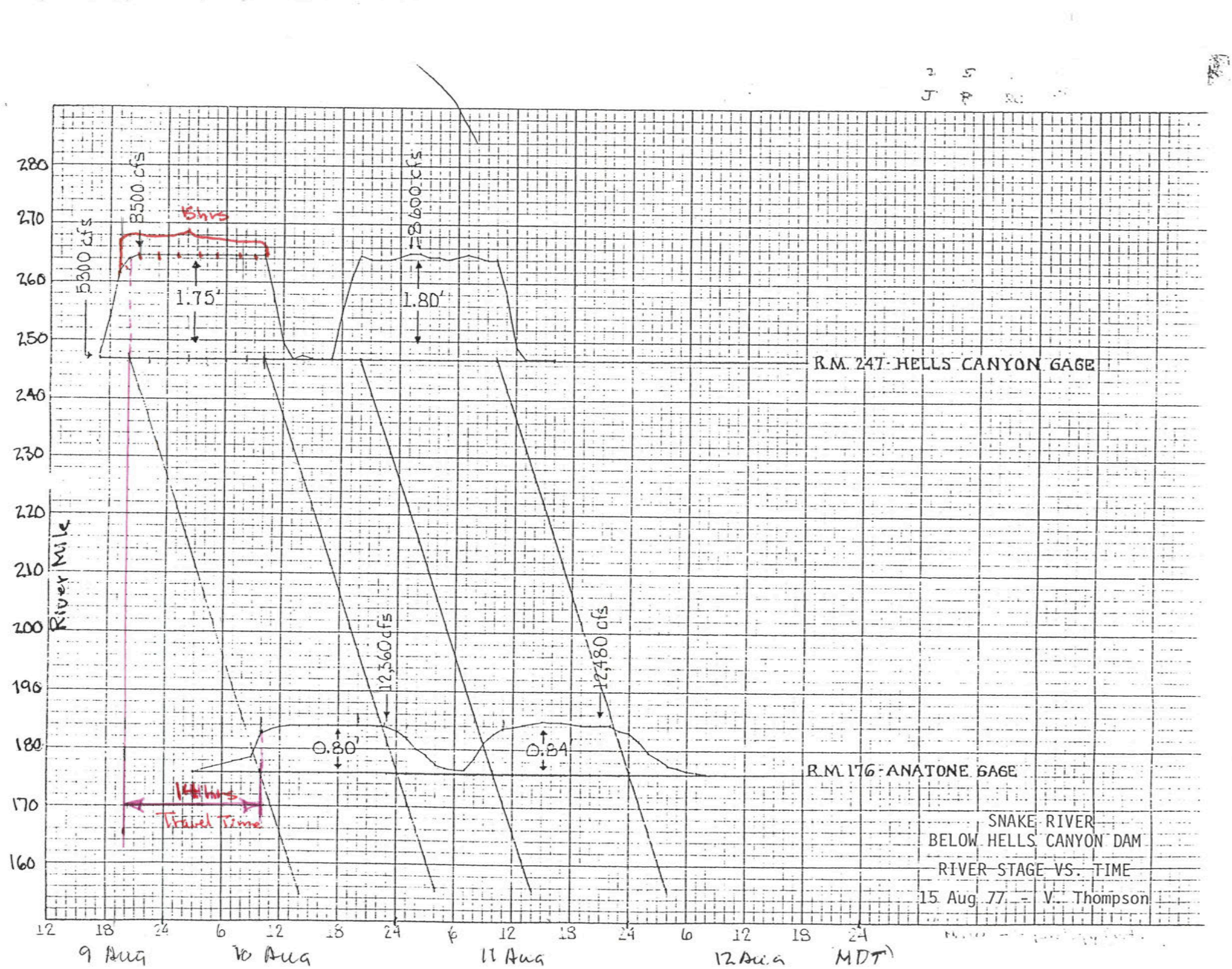


LOWER GRANITE LOCK AND DAM
Snake River, Ore., Wash., & Id.

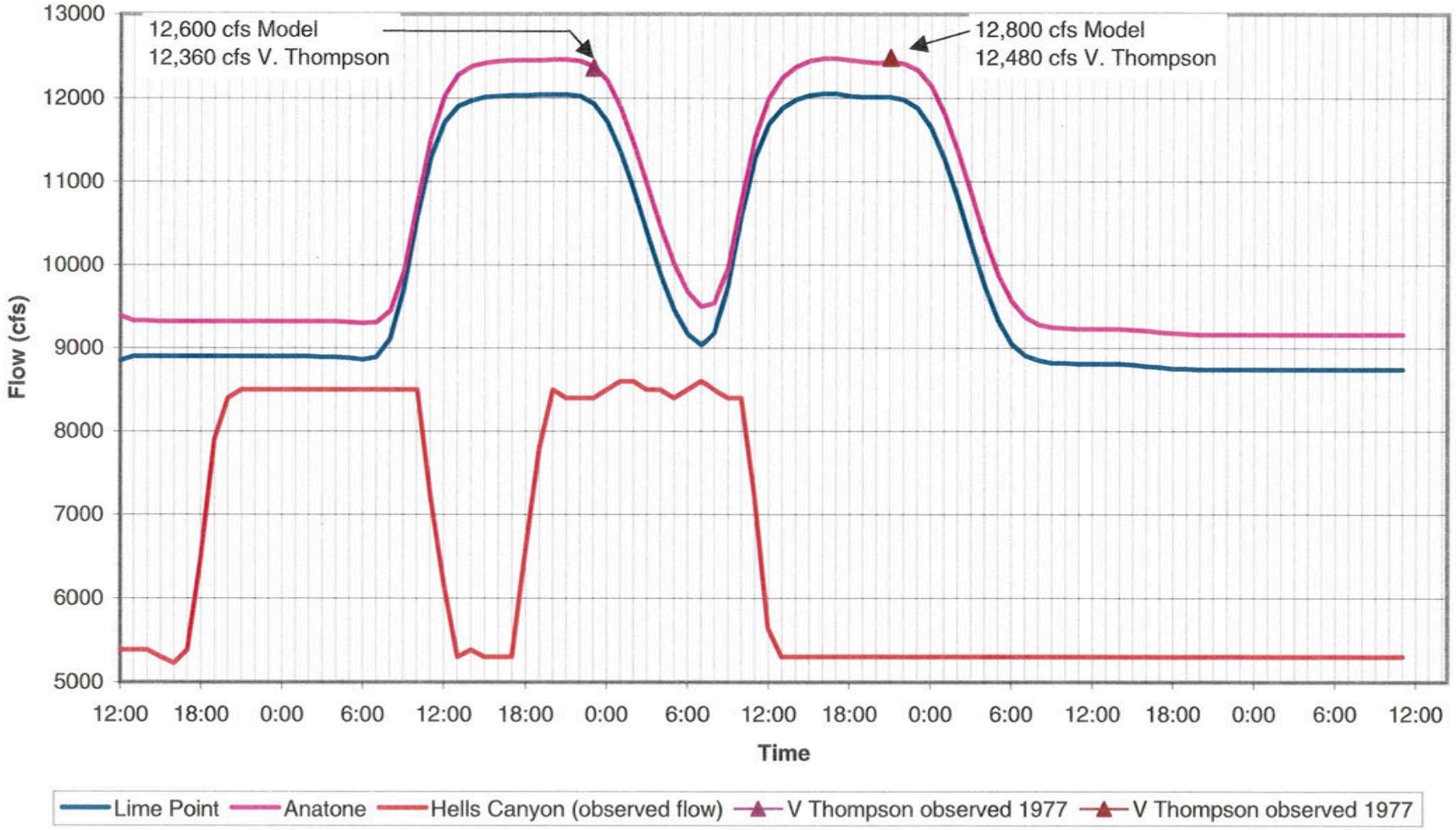
TRAVEL TIME VERSUS
RELATIVE STAGES OF SNAKE RIVER
MARCH 21 TO 27, 1973

WATER CONTROL MANUAL

PLATE 4-10


5300 cfs
8500 cfs
15hrs
1.75'
8600 cfs
1.80'
R.M. 247 - HELLS CANYON GAGE
River Mile
280
270
260
250
240
230
220
210
200
190
180
170
160
12,360 cfs
12,480 cfs
0.80'
0.84'
R.M. 176 - ANATONE GAGE
14 hrs
Travel Time
SNAKE RIVER
BELOW HELLS CANYON DAM
RIVER STAGE VS. TIME
15 Aug 77 - V. Thompson
12 18 24 6 12 18 24 6 12 18 24 6 12 18 24
9 Aug
10 Aug
11 Aug
12 Aug
MDT

Lime Point Flows
Data Starting on 8/9/1977
(Model incorporated observed hourly flows at Hells Canyon Dam, mean daily values on Salmon and Grande Ronde Rivers and estimated flows for all other inflow locations)



GRANDE RONDE RIVER AT TROY, OR - TOTAL DAILY FLOW
DISCHARGE IN 1000 CFS

1 Oct 1976 thru 30 Sep 1977

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.780	0.920	0.676	0.651	0.877	0.807	1.150	2.930	3.000	0.676	0.428	0.835
2	0.793	0.920	0.676	0.640	0.821	0.793	1.180	2.980	3.540	0.626	0.409	0.740
3	0.849	0.920	0.701	0.640	0.793	0.793	1.210	2.980	3.150	0.602	0.409	0.714
4	0.877	0.920	0.767	0.640	0.793	0.780	1.270	2.720	3.030	0.602	0.409	0.676
5	0.877	0.877	0.727	0.620	0.767	0.767	1.590	2.350	3.870	0.663	0.409	0.651
6	0.863	0.849	0.688	0.614	0.767	0.767	2.210	2.150	4.240	0.688	0.418	0.638
7	0.849	0.835	0.767	0.651	0.740	0.821	2.980	1.980	4.450	0.651	0.418	0.602
8	0.877	0.821	0.793	0.651	0.740	0.877	3.960	1.860	4.750	0.626	0.428	0.579
9	0.849	0.821	0.780	0.701	0.727	0.982	4.130	1.940	4.100	0.602	0.428	0.567
10	0.863	0.835	0.753	0.753	0.714	0.997	3.710	2.000	3.260	0.579	0.418	0.567
11	0.849	0.835	0.740	0.800	0.780	0.905	3.260	2.070	2.810	0.545	0.418	0.556
12	0.835	0.821	0.701	0.840	0.849	0.877	2.980	1.980	2.580	0.545	0.418	0.533
13	0.835	0.807	0.638	0.880	0.863	0.863	2.960	2.020	2.440	0.533	0.418	0.511
14	0.821	0.807	0.651	0.930	0.835	0.835	2.830	2.190	2.330	0.511	0.409	0.501
15	0.807	0.821	0.651	0.951	0.780	0.793	2.580	2.170	2.190	0.490	0.409	0.490
16	0.793	0.863	0.676	0.951	0.753	0.780	2.530	2.110	2.070	0.469	0.409	0.479
17	0.780	0.891	0.701	0.920	0.753	0.780	2.460	2.130	1.900	0.448	0.390	0.522
18	0.780	0.935	0.740	0.891	0.740	0.793	2.260	2.210	1.720	0.459	0.371	0.567
19	0.780	0.905	0.701	0.891	0.727	0.835	2.070	2.280	1.540	0.469	0.353	0.579
20	0.780	0.877	0.688	0.863	0.714	0.849	1.920	2.170	1.480	0.459	0.344	0.626
21	0.793	0.863	0.793	0.835	0.753	0.835	1.860	2.170	1.360	0.448	0.362	0.793
22	0.807	0.849	0.753	0.793	0.793	0.849	1.860	2.210	1.210	0.428	0.362	0.780
23	0.807	0.835	0.767	0.780	0.767	0.905	2.110	2.350	1.110	0.428	0.362	0.740
24	0.821	0.821	0.753	0.753	0.727	0.951	2.580	2.790	0.997	0.428	0.371	0.807
25	0.877	0.821	0.714	0.727	0.727	0.966	3.150	2.620	0.935	0.438	0.399	0.821
26	0.905	0.793	0.753	0.780	0.740	0.951	3.440	2.550	0.877	0.459	0.522	0.835
27	0.849	0.727	0.767	0.753	0.714	1.060	3.210	2.830	0.835	0.490	0.590	0.835
28	0.849	0.701	0.740	0.701	0.767	1.130	2.960	2.790	0.793	0.448	0.545	0.877
29	0.849	0.676	0.688	0.676	----	1.080	2.910	2.720	0.740	0.448	0.556	1.280
30	0.835	0.701	0.701	0.676	----	1.050	2.910	2.620	0.714	0.438	0.767	1.470
31	0.835	----	0.688	0.780	----	1.060	----	2.530	----	0.428	0.951	----
Max...	0.905	0.935	0.793	0.951	0.877	1.130	4.130	2.980	4.750	0.688	0.951	1.470
Day	26 Oct	18 Nov	21 Dec	15 Jan	1 Feb	28 Mar	9 Apr	3 May	8 Jun	6 Jul	31 Aug	30 Sep
Min...	0.780	0.676	0.638	0.614	0.714	0.767	1.150	1.860	0.714	0.428	0.344	0.479
Day	1 Oct	29 Nov	13 Dec	6 Jan	10 Feb	5 Mar	1 Apr	8 May	30 Jun	22 Jul	20 Aug	16 Sep
Mean..	0.831	0.836	0.720	0.766	0.769	0.888	2.541	2.368	2.267	0.520	0.448	0.706
Total.	25.764	25.067	22.332	23.732	21.521	27.531	76.230	73.400	68.021	16.124	13.900	21.171

SALMON RIVER AT WHITE BIRD, ID - OBSERVED MEAN DAILY DISCHARGE
DISCHARGE IN 1000 CFS

1 Oct 1976 thru 30 Sep 1977

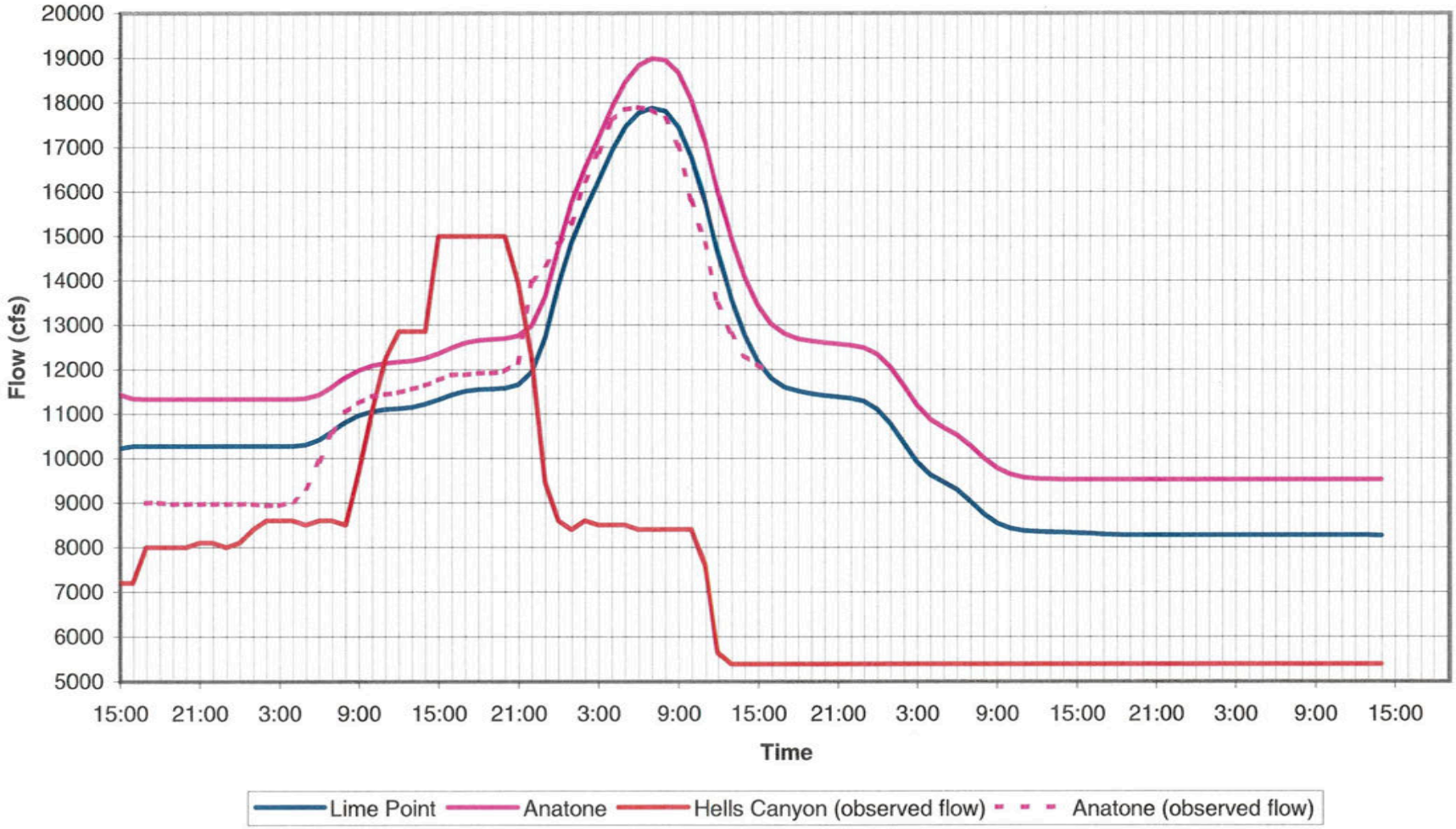
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6.310	5.570	4.390	3.120	3.620	3.850	3.600	12.700	12.500	6.300	4.080	4.010
2	6.290	5.710	4.120	3.160	3.770	3.950	3.620	13.900	14.600	6.110	3.910	3.830
3	6.470	5.900	4.070	3.420	3.970	3.970	3.590	13.900	15.300	6.120	3.780	3.610
4	6.520	6.120	4.140	3.570	4.070	3.880	3.560	12.100	15.900	6.520	3.660	3.450
5	6.410	5.960	4.240	3.770	3.880	3.850	3.650	10.500	17.700	6.880	3.570	3.290
6	6.270	5.750	4.410	3.690	3.680	3.780	3.990	9.350	18.500	6.950	3.550	3.200
7	6.250	5.610	4.440	3.900	3.620	3.770	4.460	8.630	19.500	6.900	3.570	3.110
8	6.160	5.510	4.480	3.850	3.620	3.900	5.210	8.250	20.500	6.490	3.550	2.980
9	6.040	5.490	5.020	3.820	3.660	4.050	6.200	8.180	20.600	6.010	3.510	2.860
10	6.000	5.460	5.120	3.650	3.740	4.170	6.800	8.680	18.200	5.790	3.540	2.780
11	6.000	5.440	4.930	3.470	3.870	3.950	6.690	9.780	18.600	5.620	3.510	2.750
12	5.960	5.380	4.650	3.480	3.930	3.720	6.370	9.410	20.400	5.430	3.440	2.730
13	5.850	5.230	4.380	3.510	3.970	3.650	6.250	9.410	18.800	5.140	3.340	2.710
14	5.770	4.950	4.150	3.870	4.000	3.720	6.270	10.300	17.200	4.940	3.200	2.680
15	5.690	4.620	4.040	4.150	4.020	3.690	6.040	10.100	16.300	4.770	3.070	2.680
16	5.630	4.690	3.880	4.510	4.000	3.560	5.810	9.590	15.100	4.580	3.000	2.850
17	5.610	5.290	3.750	4.670	3.950	3.440	5.790	9.170	14.000	4.390	2.950	3.230
18	5.570	5.440	3.710	4.670	3.950	3.560	5.810	9.090	12.900	4.220	2.880	3.690
19	5.530	5.440	3.560	4.620	3.990	3.660	5.900	9.090	11.900	4.110	2.780	3.830
20	5.490	5.340	3.270	4.510	4.040	3.590	5.710	9.170	11.300	4.170	2.730	3.900
21	5.490	5.150	3.070	4.330	4.050	3.510	5.480	9.190	11.500	4.010	2.680	4.230
22	5.510	4.930	3.030	4.140	4.170	3.470	5.530	9.350	11.200	3.900	2.640	4.600
23	5.510	4.950	3.250	4.000	4.050	3.540	6.100	10.000	10.400	3.980	2.680	4.630
24	5.490	4.910	3.820	3.830	4.020	3.740	7.480	11.200	9.590	4.060	2.810	4.500
25	5.530	4.800	4.270	3.570	3.780	3.820	9.330	11.800	8.880	4.570	2.900	4.520
26	5.710	4.950	4.410	3.180	3.690	3.780	11.200	12.400	8.350	5.790	3.150	4.750
27	5.710	4.710	4.530	3.130	3.770	3.710	11.800	13.000	7.810	6.140	3.550	4.870
28	5.650	3.900	4.440	3.300	3.750	3.720	11.400	12.700	7.320	5.610	3.700	4.910
29	5.570	3.180	4.430	3.470	----	3.680	11.400	12.100	6.950	5.000	3.620	5.570
30	5.550	3.340	3.870	3.500	----	3.560	11.600	11.600	6.600	4.590	3.600	6.810
31	5.570	----	3.340	3.560	----	3.510	----	11.200	----	4.300	3.860	----
Max...	6.520	6.120	5.120	4.670	4.170	4.170	11.800	13.900	20.600	6.950	4.080	6.810
Day	4 Oct	4 Nov	10 Dec	18 Jan	22 Feb	10 Mar	27 Apr	3 May	9 Jun	6 Jul	1 Aug	30 Sep
Min...	5.490	3.180	3.030	3.120	3.620	3.440	3.560	8.180	6.600	3.900	2.640	2.680
Day	20 Oct	29 Nov	22 Dec	1 Jan	1 Feb	17 Mar	4 Apr	9 May	30 Jun	22 Jul	22 Aug	15 Sep
Mean..	5.842	5.124	4.104	3.788	3.880	3.734	6.555	10.511	13.947	5.271	3.316	3.785
Total.	181.110	153.720	127.210	117.420	108.630	115.750	196.640	325.840	418.400	163.390	102.810	113.560

HELLS CANYON - TOTAL DAILY RELEASE
DISCHARGE IN 1000 CFS

1 Oct 1976 thru 30 Sep 1977

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	17.500	15.700	19.600	16.700	14.200	11.100	11.700	5.450	6.960	8.810	6.270	7.130
2	13.400	15.400	20.200	20.300	14.400	11.100	9.030	13.100	6.980	8.940	6.100	5.730
3	11.900	15.600	19.500	21.700	14.300	11.400	10.200	10.900	5.780	8.940	7.850	5.700
4	16.700	17.100	21.200	18.300	15.400	12.300	8.940	8.310	5.760	8.850	7.140	5.650
5	16.100	15.900	20.300	17.900	14.000	14.200	8.900	8.110	6.200	5.900	5.700	5.680
6	18.300	19.300	22.100	19.900	14.500	13.300	8.520	6.300	11.400	7.110	5.730	8.480
7	15.800	15.700	20.900	19.100	15.100	13.500	7.930	4.630	9.580	7.010	5.780	7.800
8	16.000	17.400	19.500	21.200	17.000	12.200	7.780	4.360	9.250	6.770	5.780	6.870
9	15.600	16.500	20.300	18.000	12.800	14.300	7.850	4.430	7.310	6.270	6.590	5.310
10	18.500	16.300	21.800	21.400	13.500	15.200	9.220	4.710	5.760	5.950	7.990	5.380
11	19.300	17.100	19.900	19.700	11.100	12.700	12.300	7.220	5.710	6.050	7.180	5.220
12	20.100	18.300	21.000	20.200	10.600	13.100	11.300	6.850	5.710	7.640	6.150	5.300
13	20.100	17.300	21.400	15.600	9.540	13.700	9.760	5.500	5.660	8.350	5.880	6.150
14	20.000	18.000	22.000	15.600	10.600	16.000	10.100	5.710	5.650	7.290	5.780	7.390
15	19.800	17.300	22.400	15.100	10.300	15.400	7.280	5.850	7.010	5.750	6.750	6.640
16	20.900	15.100	18.300	15.500	11.100	15.100	5.730	5.960	6.960	5.610	11.800	5.310
17	21.500	13.600	18.100	18.700	13.300	13.700	5.730	6.320	5.780	5.730	7.870	5.360
18	21.400	14.500	15.200	19.300	13.400	15.100	6.440	6.880	5.810	6.750	7.160	5.350
19	19.000	15.700	16.100	17.300	9.270	15.700	5.660	6.900	5.830	5.730	5.730	5.330
20	17.200	16.200	19.500	16.900	8.830	12.400	5.630	5.710	9.450	6.940	5.730	6.440
21	17.000	16.600	18.700	16.500	9.650	14.000	7.520	5.730	9.960	7.090	5.780	8.290
22	20.400	16.900	18.600	17.100	10.900	11.600	7.290	5.680	9.510	8.190	5.810	8.310
23	17.700	17.000	17.000	14.300	10.200	10.500	6.450	5.730	10.100	8.790	6.520	7.620
24	17.500	16.800	15.400	17.900	11.000	12.500	5.630	5.750	10.700	6.400	8.030	8.390
25	15.000	14.500	12.000	17.600	13.400	12.500	8.850	6.920	8.940	5.600	7.430	8.440
26	14.100	18.000	9.900	19.300	10.900	12.900	8.900	7.000	5.830	5.680	5.730	8.370
27	15.800	22.500	13.400	16.900	9.850	14.100	9.960	5.700	11.200	7.760	5.750	8.310
28	17.400	21.000	15.700	18.400	11.800	18.200	11.600	5.710	10.500	7.070	5.800	8.520
29	15.200	20.500	16.100	15.900	----	17.000	10.000	5.700	9.330	5.560	5.730	8.960
30	12.900	20.000	17.700	12.500	----	14.600	8.390	5.660	8.740	5.680	6.540	9.180
31	11.900	----	18.700	17.000	----	15.300	----	5.660	----	5.710	8.110	----
Max...	21.500	22.500	22.400	21.700	17.000	18.200	12.300	13.100	11.400	8.940	11.800	9.180
Day	17 Oct	27 Nov	15 Dec	3 Jan	8 Feb	28 Mar	11 Apr	2 May	6 Jun	2 Jul	16 Aug	30 Sep
Min...	11.900	13.600	9.900	12.500	8.830	10.500	5.630	4.360	5.650	5.560	5.700	5.220
Day	3 Oct	17 Nov	26 Dec	30 Jan	20 Feb	23 Mar	20 Apr	8 May	14 Jun	29 Jul	5 Aug	11 Sep
Mean..	17.226	17.060	18.468	17.800	12.176	13.700	8.486	6.401	7.779	6.901	6.651	6.887
Total.	534.000	511.800	572.500	551.800	340.940	424.700	254.590	198.440	233.360	213.920	206.190	206.610

Lime Point Flows
Data starting on 8/15/1977
(Model incorporated observed hourly flows at Hells Canyon Dam, mean daily flows on Salmon and Grande Ronde Rivers and estimated flows for all other inflow locations)



APPENDIX A

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Jerome K. Kuykendall, Chairman; Claude L. Draper, Seaborn L. Digby, Frederick Stueck and William R. Connole

In the Matters of	)	
	)	Projects Nos. 1971, 2132 and 2133
Idaho Power Company	)	

ORDER ISSUING LICENSE (MAJOR)

Application was filed December 15, 1950, by Idaho Power Company, of Boise, Idaho, for a license under the Federal Power Act for a proposed hydroelectric development, known as Oxbow, and designated as Project No. 1971, to be located on Snake River in Idaho and Oregon, and on May 15, 1953 the Company filed applications for licenses for two additional proposed hydroelectric developments on Snake River, known as low Hells Canyon and Brownlee, and designated Projects Nos. 2132 and 2133, respectively. The proposed developments would be located in Adams and Washington Counties, Idaho, and in Wallowa, Baker, and Malheur Counties, Oregon. The applications were supplemented by later filings.

Public hearings were held on the Oxbow application (No. 1971) during July 1952, in Baker, Oregon, and Boise, Idaho, respectively, at which all persons desiring to speak either in favor of or against the issuance of a license were heard. After the filing of the applications for low Hells Canyon (No. 2132) and Brownlee (No. 2133), the proceedings upon the three applications were consolidated for purposes of public hearing. A further public hearing was held in Washington, D. C. commencing on July 7, 1953, in which hearing all parties, including the Applicant, the staff of the Commission, as well as the National Hells Canyon Association, Inc., Lewis County Public Utility District of Washington, et al, National Rural Electric Cooperative Association, the State of Washington and other parities participated, and presented testimony and documentary exhibits. After the close of the hearing, briefs were filed by the various parties and by the staff and an initial decision was rendered by the Presiding Examiner containing findings and conclusions. On July 6, 1955, the Commission heard oral argument on the exceptions to the Examiner's decision.

For the reasons set forth in Opinion No. 283, adopted this date and made a part hereof by reference, and upon consideration of the entire record in these matters, including the reports of the Federal and State agencies, protests from interested citizens, the briefs of the parties

COPY

and the staff filed in connection therewith, the Examiner's decision, and the oral argument thereon, the Commission finds:

(1) The Brownlee, Oxbow and low Hells Canyon developments proposed by Applicant in the Hells Canyon reach of Snake River would occupy lands of the United States.

(2) The Snake River from its junction with the Columbia River up to the mouth of Henrys Fork is a navigable water of the United States.

(3) The proposed Brownlee, Oxbow and Low Hells Canyon developments that would be constructed by Applicant would be located in and along a navigable water of the United States; and they would otherwise affect the interests of interstate or foreign commerce by affecting the downstream navigable capacity of the river.

(4) Under the provisions of Section 23(b) of the Federal Power Act, the Applicant may not construct, operate or maintain any project or part thereof in Hells Canyon reach of Snake River until a license shall have been obtained therefor pursuant to this Act.

(5) The proposed project consists of:

(a) All lands constituting the project area and enclosed by the project boundary or the limits of which are otherwise defined, and/or interest in such lands necessary or appropriate for the purposes of the project, whether such lands or interest therein are owned or held by the applicant or by the United States; the general location of such project area being shown and described by certain exhibits which formed part of the application for license and which are designated and described as follows:

Exhibit "J"

FPC No.	Showing
1971-2	General Map of Oxbow Development
2132-1	General Map of Hells Canyon Development
2133-1	General Map of Brownlee Development

(b) All project works consisting of:

(1) The proposed Brownlee development, to consist of a rockfill dam having a maximum height of 395 feet and a crest length of 1320 feet at elevation 2090 feet in the Snake River at river mile 284.6, and a concrete spillway section surmounted by tainter gates, creating a reservoir with a usable storage capacity of 1,000,000 acre-feet at a drawdown of 101 feet below elevation 2077 feet; a controlled intake, power tunnel and penstocks leading to a powerhouse containing initially four turbines each rated at 139,000 horsepower and connected to a 90,100 kilowatt generator operating under a gross static head of 277 feet, with provision for an additional intake and tunnel and the future installation of two similar units in an extension to the powerhouse; and transmission facilities;

(2) The proposed Oxbow development, to consist of a rockfill dam having a maximum height of 205 feet and a crest length of 725 feet at elevation 1810 feet in the Snake River at river mile 273.2 and a concrete spillway section surmounted by tainter gates, creating a reservoir with a usable storage capacity of 6,200 acre-feet at a drawdown of 5 feet below elevation 1800 feet; a canal, tunnel and penstocks across the Oxbow; a powerhouse containing initially four turbines each rated at 58,000 horsepower and connected to a 37,750 kilowatt generator operating under a gross static head of 117 feet, with provision for an additional tunnel and the future installation of two similar units in an extension to the powerhouse; and transmission facilities; and

(3) The proposed Low Hells Canyon development, to consist of a rockfill dam having a maximum height of 320 feet and a crest length of 860 feet at elevation 1696 feet in the Snake River at river mile 247.5 and a concrete spillway section surmounted by tainter gates, creating a reservoir with a usable storage capacity of 11,200 acre-feet at a drawdown of 5 feet below elevation 1683 feet; an intake and power tunnel and penstocks leading to a powerhouse; a powerhouse containing initially five turbines each

rated at 84,000 horsepower and connected to a 54,400 kilowatt generator operating under a gross static head of 208 feet, with provision for an additional tunnel and intake and the future installation of two turbines each rated at 105,000 horsepower and connected to a 68,000 kilowatt generator in an extension to the powerhouse; and transmission facilities; the location, nature, and character of which are more specifically shown and described by the exhibits heretofore cited and by other exhibits which also formed part of the application for license and which are designated and described as follows:

Exhibit "M"

General Description and Specifications of Equipment

Brownlee Development - Statement in one sheet received in the office of the Commission on May 15, 1953.

Oxbow Development - Statement in two sheets received in the office of the Commission on July 22, 1953

Low Hells Canyon Development - Statement in one sheet received in the office of the Commission on May 15, 1953.

(c) All other structures, fixtures, equipment or facilities used or useful in the maintenance and operation of the project and located on the project area, including such portable property as may be used or useful in connection with the project or any part thereof, whether located on or off the project area, if and to the extent that the inclusion of such property as part of the project is approved or acquiesced in by the Commission; also, all riparian or other rights, the use or possession of which is necessary or appropriate in the maintenance or operation of the project.

(6) Two alternative, mutually exclusive, plans of development have been proposed for development of Hells Canyon reach of Snake River and have been designated for purposes of identification as the one-dam and three-dam plans, the latter plan being proposed by Applicant.

COPY

(7) The one-dam plan would include the high Hells Canyon Project to be located 247.3 miles above the mouth of Snake River and having: a concrete arch dam to develop a 602 foot head, eight 100,000 kilowatt generating units initially with provision for one additional 100,000 kilowatt generating unit, a total storage capacity of 4,400,000 acre-feet of which 3,880,000 acre-feet would be active storage, a spillway with a capacity of 300,000 cubic feet per second, and an operating head at the power plant varying from a maximum head of 602 feet to a design head of 475 feet and thence to a minimum head of 313 feet.

(8) The one-dam plan with an initial power installation of 800,000 kilowatts at the high Hells Canyon Project, or the three-dam plan with an initial installation of 783,400 kilowatts, would develop economically the 602 foot head in Hells Canyon reach of Snake River, could utilize the stream flow of the Snake River economically, and would have engineering feasibility.

(9) Projects with safe and adequate structures can be constructed in the Hells Canyon reach of Snake River regardless of whether they be in the one-dam or three-dam plans of development.

(10) Either plan of development hereinbefore described would provide flood control, navigation and recreational benefits in different degrees but would adversely affect fish and wildlife resources.

(11) The one-dam plan of development would provide the 2,300,000 acre-feet of flood control storage the Army contemplates in the main plan whereas the three-dam plan would provide at least 1,000,000 acre-feet of flood control storage and the difference would have to be provided somewhere else. The Department of the Army has not objected to the Applicant's proposal to provide 1,000,000 acre-feet of flood control storage in lieu of the 2,300,000 acre-feet contemplated under the one-dam plan.

(12) The one-dam plan of development would provide more navigation benefits than the three-dam plan would provide, but for either plan such benefits are not substantial dollar-wise when compared to power benefits.

(13) The Chief of Engineers, Department of the Army, has reported that structures which may affect the interests of navigation are satisfactory.

(14) There is a qualitative indication in the record that the one-dam plan would provide somewhat larger recreational benefits than would the three-dam plan, but sufficient comparative data are not available.

(15) None of the developments in either plan of development of Hells Canyon reach of Snake River would directly supply water for irrigation of lands.

(16) Either plan of development of the Hells Canyon reach would result in loss of, and damage to, wildlife resources but such losses could be mitigated in part if lands adjacent to proposed reservoirs were made available for wildlife development purposes.

(17) Either plan of development of the Hells Canyon reach of Snake River would block the runs of anadromous fish and some type of fish facilities would have to be provided for the protection of this resource.

(18) Assuming financing, construction and operation of both plans by the same entity, the ratio of power benefits to power costs of the three-dam plan is greater than that for the one-dam plan, and although the high Hells Canyon Project would produce a greater amount of power than the three-dam plan, the additional amount of power that could be produced by the high Hells Canyon Project would have a benefit-cost ratio of about one to one. Consequently the power features of the one-dam plan have no clear economic advantage over those of the three-dam plan.

(19) Federal construction of either plan of development proposed for the Hells Canyon reach could provide power revenues to subsidize irrigation works if such use is authorized by Congress.

(20) Federal construction of either plan of development proposed for the Hells Canyon reach could make possible a more extensive development of the phosphate resource located on land of the United States in Idaho and Utah than exists today.

(21) Public purposes such as flood control, navigation, recreation, and power production could be effectuated to about the same extent with private construction, as with Federal construction, of the same developments in the Hells Canyon reach of Snake River.

(22) There is a substantial power market in the area that could be served by projects in either plan considered for development of the Hells Canyon reach of Snake River.

(23) The extent to which electro-metallurgical use would be made of electric power that would be produced by development of the Hells Canyon reach would depend, in part, on the cost of such power.

COPY

(24) The general public has indicated an active interest in the plans proposed for development of the Hells Canyon reach of Snake River, and many individuals and spokesmen for groups have testified and submitted written comments thereon.

(25) The Brownlee, Oxbow and low Hells Canyon developments proposed by Applicant would utilize the head and stream flow in an economical manner.

(26) Safe and adequate structures of the type proposed by Applicant can be constructed in the Hells Canyon reach of the Snake River.

(27) The proposed developments could and would be operated to provide flood control storage and navigation benefits.

(28) Recreational facilities and opportunities would be provided by Applicant at the Brownlee, Oxbow and low Hells Canyon developments.

(29) The estimated cost of construction, exclusive of interest during construction, of the Brownlee, Oxbow and low Hells Canyon developments in the amount of $175,766,000 as estimated by the Commission staff appears reasonable. However, the record indicates that the Applicant may be able to construct these developments at a lower cost.

(30) The peak load requirements of the Idaho Power Company system have been increasing at an average annual rate of about 24,600 kilowatts during the 10-year period 1943 through 1952.

(31) The future peak load of Applicant's system is estimated to increase at an average annual rate of about 30,350 kilowatts.

(32) The total dependable capacity of 767,000 kilowatts that would be provided at the Brownlee, Oxbow and low Hells Canyon developments would be fully utilized in the Applicant's own system by about the year 1975 and in the Northwest area about as soon as it could be developed if indicated arrangements with other systems can be firmed up.

(33) The estimated annual at-market cost to the Applicant of the power output that could be produced by the proposed Brownlee, Oxbow and low Hells Canyon developments is $27,921,000 inclusive of annual cost of fish facilities.

(34) The estimated annual value to the Applicant of the power output at market that could be produced by the proposed Brownlee, Oxbow and low Hells Canyon developments is $36,066,000.

COPY

(35) The Brownlee, Oxbow and low Hells Canyon developments as proposed by Applicant would be economically feasible as power developments.

(36) The Applicant has shown ability to finance the proposed Brownlee, Oxbow and low Hells Canyon developments.

(37) Applicant has investigated power sites on Snake River above the Hells Canyon reach but indications are that such power output would be more expensive than the power output from developments proposed in the Hells Canyon reach.

(38) New steam electric power stations as sources of power supply alternative to new hydroelectric developments would not be as economical.

(39) The Applicant should provide such fish protective facilities as may be required by the Commission upon the recommendations of the Federal and State fishery authorities.

(40) Applicant should provide means to preserve, to the extent practicable, the wildlife resources.

(41) The Applicant should provide means for conducting an archeological investigation in the Hells Canyon reach of the Snake River.

(42) The Applicant should coordinate the operation of its proposed Brownlee, Oxbow and low Hells Canyon developments and its power system with the Northwest Power Pool.

(43) The Idaho Power Company is a corporation organized under the laws of the State of Maine and is duly authorized to do business in the States of Idaho, Oregon, and Nevada and has submitted satisfactory evidence of compliance with the requirements of all applicable State laws insofar as necessary to effect the purposes of a license for each of the developments, namely, Brownlee, Oxbow and low Hells Canyon.

(44) No conflicting application is before the Commission. Public notice has been given as required by the Act.

(45) The proposed developments will not use any Government navigation dam, nor will the issuance of a license therefor as hereinafter provided affect the development of any water resources for public purposes which should be undertaken by the United States.

(46) The issuance of a license for the proposed developments as hereinafter provided will not interfere or be inconsistent with

the purposes for which the Payette, Whitman, and Wallowa National Forests were created or acquired nor with the purposes of any withdrawal of public lands.

(47) The three proposed power developments should be considered as a single project.

(48) The proposed project is best adapted to a comprehensive plan for improving or developing a waterway for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, and for other beneficial public uses, including recreation purposes.

(49) The total installed horsepower capacity of the project hereinafter authorized for the purpose of computing the capacity component of the administrative annual charge is 1,208,000 horsepower.

(50) The amount of annual charges to be paid under the license for the purpose of reimbursing the United States for the costs of administration of Part I of the act, is reasonable as hereinafter fixed and specified.

(51) In accordance with Section 10(d) of the Act, the rate of return upon the net investment in the proposed project, and the proportion of surplus earnings to be paid into and held in amortization reserves, are reasonable as hereinafter specified.

(52) Inasmuch as the record shows a need for revision of some, the Applicant should be required to file revised Exhibits F, K, and L as hereinafter provided.

(53) The amount of reasonable annual charges for the use, occupancy, and enjoyment of lands of the United States to be occupied by the proposed project, including transmission line right-of-way, shall be hereafter fixed and specified by the Commission.

(54) The following described Exhibit J drawings and Exhibit M, filed as parts of the applications for licenses for Projects Nos. 1971, 2132, and 2133, conform to the Commission's rules and regulations and should be approved as part of the license for the project.

Exhibit J: (FPC No. 1971-2), Oxbow H. E. Development General Map;

(FPC No. 2132-2), Hells Canyon H. E. Development, General Map;

(FPC No. 2133-1), Brownlee H. E. Development, General Map.

Exhibit M: General description and specifications of equipment for Projects Nos. 1971, 2132, and 2133 (three exhibits.).

(55) It is desirable to reserve for future Commission determination the question of what transmission lines and appurtenant facilities, if any shall be included in this license:

The Commission orders:

(A) This license is issued to Idaho Power Company under Section 4(e) of the Federal Power Act for a period of fifty years (50) effective as of the first day of the month in which the acknowledgment of acceptance hereof is filed with the Commission, for the construction, operation, and maintenance of the proposed Brownlee, Oxbow and low Hells Canyon developments (which developments for the purposes of this license, shall be considered as units of one complete project designated in the records of the Commission as Project No. 1971), subject to the terms and conditions of the Act which is incorporated by reference as part of this license, and subject to such rules and regulations as the Commission has issued or prescribed under the provisions of the Act.

(B) This license is also subject to the terms and conditions set forth in Form L-6, December 15, 1953, entitled "Terms and Conditions of License for Unconstructed Major Project Affecting Navigable Waters and Lands of the United States," which terms and conditions are attached hereto and made a part hereof and subject to the following special conditions set forth herein as additional articles.

Article 28. The Licensee shall construct the project works as follows:

(a) Commence construction of the Brownlee unit within one year of the effective date of this license, and shall thereafter in good faith and with due diligence prosecute such construction and shall complete that unit in 36 months.

(b) Commence construction of the Oxbow unit within four years of the effective date of this license, and shall thereafter in good faith and with due diligence prosecute such construction; and shall complete that unit in 24 months.

(c) Commence construction of the low Hells Canyon unit within six years of the effective date of this license, and shall thereafter in good faith and with due diligence prosecute such construction; and shall complete that unit in 36 months.

Article 29. The Licensee shall submit, in accordance with the Commission's rules and regulations, revised Exhibit L, and Licensee shall not begin construction of the project works in any unit until the Commission approves the exhibits relating to that unit.

Article 30. The final design of the spillways at the dams of the proposed project shall be based on model tests.

Article 31. The Licensee shall, within one year from the date of commencement of construction of each unit, file with the Commission Exhibits F and K in accordance with the rules and regulations of the Commission.

Article 32. The Licensee shall prior to flooding clear lands in the bottoms and margin of the reservoirs up to high water level, and shall dispose of all temporary structures, unused timber, brush, refuse, or inflammable material resulting from the clearing of the lands or from the construction and maintenance of the projects works. In addition, all trees along the margin of the reservoirs which may die during the operation of the project shall be removed. The clearing of the lands and the disposal of the material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission.

Article 33. The Licensee shall cooperate with the Smithsonian Institution in the salvage of archeological values at four sites recommended by that Institution in a report dated January 1951 (Exhibit 10), and the Licensee shall, upon request of the Institution and further order of the Commission, contribute to that Institution the sum of $12,000 for archeological excavations.

Article 34. The Licensee shall make available to the Secretary of the Interior, upon his request and further order of the Commission, a sum up to $250,000 for use by the Fish and Wildlife Service to carry out detailed studies of the extent and character of the fishery resource of the project areas and to devise means and measures for mitigating losses to that resource.

Article 35. The Licensee shall construct, maintain, and operate or shall arrange for the construction, maintenance and operation of such fish ladders, fish traps or other fish handling facilities for fish protective devices and provide fish hatchery facilities for the purpose of conserving the fishery resources and comply with such reasonable modifications of the project structures and operation in the interest of fish life as may be prescribed hereafter by the Commission upon its own motion or upon the recommendations of the Secretary of the Interior and the conservation agencies of the States of Idaho and Oregon.

Article 36. The Licensee shall negotiate with the Fish and Game Commission of the State of Oregon and Department of Fish and Game of the State of Idaho with respect to the amount the Licensee shall pay each year to defray a reasonable portion of the operation and maintenance cost of fishery facilities to be provided under the license. Should the Licensee and the State agencies fail to agree on the amount to be paid by the Licensee for such purpose, the Commission reserves the right to determine the amount of this annual payment after notice and opportunity for hearing.

Article 37. The Licensee shall negotiate with the Game Commission of the State of Oregon and the Department of Fish and Game of the State of Idaho with respect to the acquisition by the Licensee for the State agencies of island and marsh areas along the Snake River for development as substitutes for waterfowl nesting areas to be lost by reservoir inundation. Should the Licensee and the State agencies fail to agree on the acquisition of such lands, the Commission reserves the right to make a final determination in this matter after notice and opportunity for hearing.

Article 38. The Licensee shall make available to the Secretary of the Interior, upon his request and further

order of the Commission, a sum up to $60,000 for the preparation by the National Park Service in cooperation with Licensee, of a recreational master plan.

Article 39. The Licensee shall operate the project and its system in coordination with the Northwest Power Pool, and shall arrange for such transmission facilities as may be required for such operation.

Article 40. At such time as the Commission may direct and to the extent that it is economically sound and in the public interest to do so, after notice and opportunity for hearing, the Licensee shall install additional generating units at the Brownlee, Oxbow, and/or low Hells Canyon units.

Article 41. The project shall be operated in such manner as will not conflict with the future depletion in flow of the waters of Snake River and its tributaries, or prevent or interfere with the future upstream diversion and use of such water above the backwater created by the project, for the irrigation of lands and other beneficial consumptive uses in the Snake River watershed.

Article 42. In the interest of flood control the Licensee shall operate the project as follows:

(a) The total live storage space of about 1,000,000 acre-feet between elevation 1976 and elevation 2077 mean sea level will be made available for flood control use if and as required.

(b) The reservoir level elevation will be no higher than elevation 2034 by 1 March of each year to provide about 500,000 acre-feet of storage space for flood control use at that time each year.

(c) Additional storage space required up to 500,000 acre-feet will be obtained by evacuation as necessary during the month of March in a manner to insure availability on or before 1 April of the total storage capacity needed for flood control, as estimated by the Corps of Engineers. This space will be retained until capture of flood flows is requested by the Corps of Engineers, subject to possible involuntary storage as may be required due to temporary

inflows in excess of outlet capacity, or until refilling in the interest of power output is authorized by the Corps of Engineers. In the event of involuntary storage, full capacity will be regained as soon as possible.

(d) During the flood storage period controlled outflow will be as requested by the Corps of Engineers. Daily outflows of 30,000 acre-feet, as a minimum, will be permitted when required for power purposes.

(e) In order to achieve the above operation for flood control, discharge capacity of 65,000 cfs at minimum pool, elevation 1976, including gated outlet capacity plus one-half of the ultimate turbine capacity, is to be provided by the Licensee.

(f) The above conditions will be subject to review from time to time as requested by the Licensee or the Corps of Engineers.

Article 43. The project shall be operated in the interest of navigation to maintain 13,000 cfs flow in the Snake River at Lime Point (river mile 172) a minimum of 95% of the time, when determined by the Chief of Engineers to be necessary for navigation. Regulated flows of less than 13,000 cfs will be limited to the months of July, August, and September, during which time operation of the project would be in the best interest of power and navigation, as mutually agreed to by the Licensee and the Corps of Engineers. The minimum flow during periods of low flow or normal minimum plant operations will be 5,000 cfs at Johnson's Bar, at which point the maximum variation in river stage will not exceed one foot per hour. These conditions will be subject to review from time to time as requested by either party.

Article 44. The Licensee shall pay the United States the following annual charges for the purpose of reimbursing it for the costs of administration of Part I of the Act One (1) cent per horsepower on the authorized installed capacity (1,208,000 horsepower) plus two and one half (2-1/2) cents per 1000 kilowatt hours of gross energy generated by the project during the calendar year for which charge is made. The Licensee shall also pay to the United States such charges as may be specified

hereafter for the purpose of recompensing the United States for the use, occupancy and enjoyment of its lands, including transmission line right-of-way.

Article 45. The Commission expressly reserves the right to determine at a later date the question of what transmission lines and appurtenant facilities, if any, shall be covered in this license and included as part of the project works.

(C) The exhibits described in finding (54) above are approved as part of the license for the project.

(D) This order shall become final thirty (30) days from the date of its issuance unless application for rehearing shall be filed as provided by Section 313(a) of the Act, and failure to file such an application shall constitute acceptance of this license. In acknowledgment of the acceptance of this license, it shall be signed for the Licensee and returned to the Commission within sixty (60) days from the date of issuance of this order.

By the Commission.

Leon M. Fuquay,
Secretary

Adopted: July 27, 1955

Issued: August 4, 1955

COPY

AMENDMENT NO. 8
INSTRUMENT NO. 29

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Joseph C. Swidler, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Harold C. Woodward, and David S. Black

Idaho Power Company) Project No. 1971

ORDER APPROVING REVISED PROJECT EXHIBITS AND EXTENDING TIME FOR COMPLETION OF CONSTRUCTION

(Issued May 5, 1964)

On April 24, 1963, Idaho Power Company, licensee for Project No. 1971, filed for Commission approval revised Exhibit L drawings showing certain proposed changes in the project structures and a revised Exhibit M giving a general description of the mechanical, electrical, and transmission equipment for the Hells Canyon development of the project. The licensee also seeks Commission approval of an extension of time for completing construction of the Hells Canyon development.

The proposed changes to the project structures consist essentially of: (1) moving the location of the dam upstream 500 feet to a more favorable site for a concrete gravity dam; (2) changing from a rock-fill type of dam to a concrete gravity dam resulting in a savings of cost; (3) raising the normal water surface elevation of the Hells Canyon reservoir from 1683 feet to 1688 feet; (4) changing the spillway from 8 radial gates each 39 feet wide by 36 feet high to 5 gates, of which 3 would be radial surface gates each 43 feet wide by 50 feet high and 2 would be submerged radial gates, with sill at elevation 1549 feet, each 23 feet wide by 23 feet high; and (5) increasing the initial installed capacity from 270 megawatts (5 units of 54 Mw each) to 370 megawatts (3 units of 123.3 Mw each) and the ultimate installed capacity from 406 megawatts (5 units of 54 Mw each, plus 2 units of 68 Mw each) to 493 megawatts (4 units of 123.3 Mw each).

The change in type of dam from rock-fill to concrete gravity was due to a lack of a sufficient amount of suitable core material in the vicinity of the dam and to indicated savings in costs resulting from elimination of retaining walls and the separate concrete gravity spillway section, and from other changes in facilities related to the dam. The geology of the new site is better suited to a concrete gravity dam and the foundation rock was found to be competent.

Raising the normal water surface elevation of the reservoir five feet will result in an economic increase in net power output since the gain in head at Hells Canyon will exceed the loss of head at the upstream Oxbow plant resulting from encroachment. The spillway now proposed will have a capacity equal to that contemplated in the license. The hydraulic performance of the spillway will be verified by means of model tests, prior to construction, in accordance with the provisions of Article 30 of the license for the project.

The increased installed capacity now proposed for the low Hells Canyon development will permit the use of substantially the same amount of water through that generating plant as is now being utilized through the Oxbow plant and will more efficiently utilize the gain in hydraulic head provided by the proposed five foot increase in the elevation of the Hells Canyon reservoir. The increased installed capacity will provide a more economical development.

While the overall changes proposed should result in cost savings in many items of construction, the proposed increase in the installed capacity of the Hells Canyon development is expected to cause a small increase in the total cost of the development. The licensee estimates that the cost of the original initial development would have been about $64.9 million (the earlier estimate of $45.8 million increased by a cost index to January 1963 costs) as compared with an estimated cost of about $65.3 million for the initial development as now proposed, an increase of about $400,000, while the increase in installed capacity is about 100 megawatts.

The concrete gravity structures of the Hells Canyon development have been checked by Commission staff against sliding and overturning for normal and flood water conditions, including the effect of earthquake and found to be stable, and the spillway capacity was found to be adequate.

By its order issued December 11, 1959, the Commission approved, among other things, a fuse plug spillway at the Oxbow development of the project, and ordered the licensee to submit for Commission approval a spillway gate operating procedure for the Hells Canyon development during any unscheduled operation of the Oxbow fuse plug, and to develop that procedure in collaboration with the District Engineer, Corps of Engineers, Walla Walla, Washington. The Chief of Engineers, as a result of such collaboration, has recommended for inclusion in the license a special condition covering the spillway gate operating procedure for the Hells Canyon development which we are herein including as an additional license article.

The Chief of Engineers, and the Secretary of the Army, have approved the plans of the project structures insofar as the interests of navigation are concerned.

The license for Project No. 1971, issued August 1, 1955, called for completion of construction of the Brownlee development by January, 1959, the Oxbow development by August 1, 1961, and the low Hells Canyon development by August 1, 1964. The time for completion of the Brownlee development was extended to February 15, 1959, by Commission order issued January 9, 1959, and the time for completion of Oxbow was extended to September 15, 1961, by Commission order issued January 28, 1960, and was further extended to December 31, 1961, by Commission order issued September 8, 1961. The Oxbow and Brownlee developments were completed and put into operation within the times specified by the Commission's orders. The licensee is now requesting that the time for completion of the Hells Canyon development be extended from August 1, 1964, to March 31, 1968, with the first generating unit to begin operation about November 1, 1967.

At the time revised Exhibit K for the access road to the Hells Canyon site was approved by Commission order issued August 24, 1961, the Commission required the licensee to redesign the structures of the low Hells Canyon development for maximum tailwater elevation of 1515 feet in lieu of elevation 1490 feet contemplated at the time the license was issued. This new elevation is compatible with the reservoir elevation of 1510 feet contemplated for the downstream High Mountain Sheep Project. To meet this requirement, it was necessary for the licensee to undertake extensive studies, including investigation of alternate sites. The revised Exhibit M and the revised Exhibit L drawings for the low Hells Canyon development, filed April 24, 1963, show the result of such studies. Article 29 of the license has prohibited the licensee from commencing construction of the project works for the low Hells Canyon unit until the Commission shall have approved the Exhibit L drawings relating to that unit, which we are doing here.

Furthermore, construction of the low Hells Canyon structures could not proceed until requirements for temporary fish handling facilities were resolved. The Commission order issued December 11, 1963, approved temporary fish facilities for the low Hells Canyon development and provided that determination of what permanent fish facilities should be installed at that development would be made on or before January 1, 1966.

In view of the foregoing, we find that the licensee has proceeded with construction of the project in good faith and with reasonable diligence and that under the circumstances it is not incompatible with the public interests to grant the requested extension of time for completing construction of the low Hells Canyon development.

COPY

The Commission further finds:

(1) Public notice of the application has been given as required by the Federal Power Act. No protests or petitions to intervene have been received.

(2) The following described Exhibit L drawings and Exhibit M conform to the Commission's rules and regulations and should be approved as part of the license for the project and the Exhibit M described in this finding as being superseded and which is now part of the license, should be eliminated from the license.

Exhibit L	FPC No.	Title Hells Canyon H.E. Development
Sheet 1 of 6	1971-201	General Plan
Sheet 2 of 6	1971-196	Elevations and Sections
Sheet 3 of 6	1971-197	Plans and Section

Exhibit M (signed April 22, 1963) entitled "General Description and Specifications of Equipment", superseding the Exhibit M for Low Hells Canyon Development received in the Commission May 15, 1953.

The Commission orders:

(A) The exhibits described in finding (1) above as conforming to the Commission's rules and regulations are hereby approved as part of the license for Project No. 1971, and the exhibit described in the same finding as being superseded is hereby eliminated from the license for the project.

(B) Article 28(c) of the license which specifies the time for completion of construction of the Hells Canyon development is hereby amended to read as follows:

Article 28(c). Commence construction of the low Hells Canyon unit within six years of the effective date of this license, and shall thereafter in good faith and with due diligence prosecute such construction; and shall complete that unit not later than March 31, 1968.

(C) The following additional article is hereby included in the license for Project No. 1971.

Article 48. The Licensee shall install automatic gate operating devices and shall operate the spillway at the Hells Canyon development in accordance with the Reservoir Regulations Manual for Brownlee, Oxbow and Hells Canyon Projects and in accordance with the following conditions:

> The maximum increase in discharge from the Hells Canyon spillway as a result of an unscheduled breach of the Oxbow fuse plug shall be controlled to not exceed 10,000 c.f.s. This increase in discharge shall be in addition to any discharge already being released from the spillway and powerhouse. In case of a load rejection at the Hells Canyon powerhouse, concurrently with an unscheduled breach of the Oxbow fuse plug, the discharge from the Hells Canyon spillway shall be increased so that the rate of discharge from the Hells Canyon Project is unaffected by the load rejection.

(D) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313 (a) of the Act, and failure to file such an application shall constitute acceptance of this order. In acknowledgment of the acceptance of this order, it shall be signed for the licensee and returned to the Commission within 60 days from the date of issuance of this order.

By the Commission.

(S E A L)

Gordon M. Grant,
Acting Secretary.

COPY

ENGCW-EP

21 August 1963

Honorable Joseph C. Swidler
Chairman, Federal Power Commission
Washington 25, D. C.

Dear Mr. Chairman:

Reference is made to the Commission's letter dated 17 May 1963 concerning the application for amendment of license filed by Idaho Power Company for the Hells Canyon Development, hydroelectric Project No. 1971, to be located on Snake River in Idaho and Oregon.

The additional power plant capacity contemplated in the inclosed application will increase materially the power peaking capability of the Hells Canyon Project. The proposed plan of operation of Hells Canyon with the added capability and its effect on the interests of navigation have been discussed with the Licensee. The Licensee has assured the Division Engineer, U. S. Army Engineer Division, North Pacific, Portland, Oregon, that, pending completion of the project next downstream, the Hells Canyon project will be operated in much the same manner as the Brownlee and Oxbow projects have been operated for the past two years in the interest of navigation. The informal arrangements between the Corps of Engineers and the Licensee for operation in the interest of navigation have been generally satisfactory during the past two years. Based on the understanding that this operation will be continued, there is no objection to the increase in the power plant capability.

If the arrangements discussed above should prove inadequate for protection of the interest of navigation, a formal stipulation as to operation in the interest of navigation would become necessary. In this event, it is considered that the terms and conditions in the interest of navigation should be formulated on the basis of experience since the beginning of operation of Project No. 1971.

COPY

ENGCW-EP

21 August 1963

Honorable Joseph C. Swidler

The plans of the structures affecting navigation are satisfactory.

One copy of the application is being returned as requested.

Sincerely yours,

1 Incl
Application

JOSEPH F. GARBACZ
Lt. Col., Corps of Engineers
Assistant Director of Civil Works
for Western Divisions

cc: Division Engineer, North Pacific, w/d
District Engineer, Portland, w/d

COPY

A-22

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Joseph C. Swidler, Chairman;
L. J. O'Connor, Jr., and David S. Black.

Idaho Power Company) Project No. 1971

ORDER AMENDING LICENSE

(Issued September 15, 1964)

This order, amending Article 39 of the license for the Idaho Power Company's Project No. 1971 on the Snake River in Idaho and Oregon, makes clear that the Licensee may share in benefits from any coordination of its project with other power systems.

On October 4, 1963, the Licensee applied for amendment or clarification of Article 39, reading:

> The Licensee shall operate the project and its system in coordination with the Northwest Power Pool, and shall arrange for such transmission facilities as may be required for such operation.

The application stated that the Bonneville Power Administration interprets this language as requiring the Licensee to coordinate with other power systems without entitling the Licensee to share in the resulting benefits. According to the Licensee, this interpretation in effect excludes it from benefits to which it would be entitled as a participant in the Northwest Power Pool. It consequently sought to modify its license to insert a new Article 39 reading as follows:

> The Licensee shall operate the project and its system in coordination with the Northwest Power Pool, so as to achieve maximum coordination benefits which shall be shared equitably by the participants in such coordination. In the event the participants cannot agree thereon, the Commission shall equitably apportion the benefits after notice and opportunity for hearing upon the Commission's own motion or upon motion of any party.

The Secretary of the Interior on March 13, 1964, filed comments and petition to intervene. 1/ The Secretary's position is summarized at pages 10 and 11 of his comments and petition:

1/ As comments, the document was timely filed; as a petition to intervene, it was not filed within the period prescribed.

> The purpose of the Company's present petition is to obtain payment for headwater benefits that it provides to United States Federal projects downstream. The Company having failed to accomplish this in direct negotiations with Bonneville Power Administration now seeks to obtain payment by becoming a party to the Pacific Northwest Coordination Agreement. Under Section 13 (a) of that Agreement . . . there is a sharing of benefits so that downstream generation projects allow credit to upstream non-Federal projects for the benefits that they confer on the Federal plant. The difficulty is, however, that the Idaho Power Company license contains a unique provision. Article 39 places that Company in a different position than other licensees in the Northwest. Article 39 requires coordination without sharing of benefits by the downstream Federal plant. The United States cannot be required to pay for something which it is already entitled to receive without payment.

Article 39 of the license for Project No. 1971 is an early version of a license condition which was designed to require the licensee to coordinate if it did not achieve adequate voluntary coordination. The subsequent evolution of this article may be observed in Article 39 of the license for Project No. 2149, issued on July 12, 1962, 2/ in Article 14 of the license for Project No. 2315, issued on November 21, 1963, 3/ and in Article 14 of the license for Project No. 2243 issued on February 5, 1964, as modified on April 30, 1964. 4/ The opinion issuing license

---

2/ Public Utility District No. 1 of Douglas County, Washington, 28 F.P.C. 128, 133 (1962).

3/ South Carolina Electric and Gas Company, Opinion No. 411 at 6 (November 21, 1963).

4/ Pacific Northwest Power Co., Opinion No. 418-A, at 5 and 15 (April 30, 1964).

for Project No. 2315 said with respect to the coordination article (at P. 3):

> Article 15 requires electrical and hydraulic coordination of the operation of the project with other power systems. This article contemplates that coordination will result in net benefits to be shared by all parties involved, including the licensee.

And in Opinion No. 418-A, in rejecting a similar argument by Interior, we said:

> . . . we do not believe that the Article proposed by Interior, insofar as it refuses to recognize an equitable sharing of benefits in the context of a mixed system of plants in a common basin, will result in the maximum economic benefit to the region.8/ Only by recognizing the contributions of each system in providing for an equitable sharing of benefits will the optimum development of our resources envisioned by the framers of the Water Power Act become a reality.

8/ This is not to say, as Interior alleges, that Article 14 requires the federal government to pay for headwater benefits -- a payment precluded by Section 10 (f) of the Act. As we have earlier stated, Article 14 does not require 10 (f) payments. P.U.D. No. 1 of Douglas County, Project No. 2149, 28 F.P.C. 128.

We find nothing in the Commission's decision in issuing the license for Project No. 1971 which leads us to believe that the licensee in being required to coordinate was not to share in the benefits from coordinated operation to any extent consistent with the Federal Power Act. 5/ The Commission was well aware of the fact that the various participants in the Northwest Power Pool in coordinating the operations of the several projects on the Columbia River and its tributaries did so on the basis of sharing benefits, and in inserting the Article to insure that Idaho Power would join in the coordination efforts we did not purport to require it to participate on a less favorable basis than the other members.

5/ Idaho Power Company, 14 F.P.C. 55 (1955).

We find no basis for the assumption of the Secretary that "the purpose of the company's petition is to obtain payment for headwater benefits that it provides to United States Federal Projects downstream," but, in any event, adoption of a modified Article 39, consistent with the article included in the license for Project No. 2243, will not have this result. We are, of course, aware that Section 10 (f) of the Act requires the Commission to determine payments for headwater benefits provided to non-Federal projects by upstream reservoirs of the United States and that it has been established that this subsection does not authorize the Commission to assess payments against the United States for headwater benefits received from a non-Federal project. 6/ Moreover, we have held that even where a coordination agreement makes provision for credit against the United States for headwater benefits our subsection 10(f) determination may ignore such credit. 7/ Consistent with what we believe is the purport

---

6/ Grand River Dam Authority v. F.P.C., 246 F. 2d 453 (1957). Bills to amend the Federal Power Act to permit such payments were pending in Congress between 1954 and 1960, i.e., through seven Congressional sessions, but none was enacted. See S. Rep. No. 1865, 84th Cong., 2d Sess. (1956); S. Rep. No. 1414, 86th Cong., 2d Sess. (1960); Hearings on S. 3434 Before a Subcommittee of the Senate Committee on Interstate and Foreign Commerce, 83rd Cong., 2d Sess. (1954); Hearings on S. 1574 Before the Subcommittee on Irrigation and Reclamation of the Senate Committee on Interior and Insular Affairs, 84th Cong., 1st Sess. (1955); Hearings on H.R. 5309, H.R. 7201, and H.R. 7494 Before a Subcommittee of the House Committee on Interstate and Foreign Commerce, 86th Cong., 2d Sess. (1959); Hearings on S. 1782, S. 2262, S. 2263, S. 2264, S. 2265, and S. 2266 Before the Senate Committee on Interstate and Foreign Commerce, 86th Cong., 1st Sess. (1959).

7/ See Columbia River Basin Headwater Benefit Investigation, 29 F.P.C. 238 (1963). Though the first and second Pacific Northwest Coordination Agreements, to which Bonneville was party, took account of headwater benefits, the Commission under subsection 10(f) determined headwater benefits payments to the United States for the period covered by these agreements.

of Section 10 (f) of the Act, we would not condition any coordination determination pursuant to the modified language of Article 39 set forth below to compensate the Licensee for headwater benefits it provides to downstream Federal projects. But this does not mean that the Licensee should not share in benefits resulting from electrical coordination or from hydroelectric coordination other than headwater benefits.

We agree with the Secretary that the Licensee's obligations to arrange for such transmission facilities as may be required for proper coordination should not be eliminated from any amended article. As in the case of our action in Opinion No. 418-A, supra, the amended Article we are adopting expressly refers to the Licensee's obligations to make available "the additional transmission facilities," as directed by the Commission, to eliminate any doubt as to this matter. The amended article also makes clear that the Licensee is not barred from participating in the benefits of coordination other than headwater benefits to the projects of the United States.

The Commission finds:

It is appropriate and in the public interest in administering Part I of the Federal Power Act that the following amendment be made in Article 39 of the license issued on August 4, 1955, to the Idaho Power Company for Project No. 1971 on the Snake River, Idaho and Oregon.

The Commission orders:

(A) Article 39 of the license issued on August 4, 1955, for Project No. 1971 on the Snake River, Idaho and Oregon, is amended to read:

> Article 39. The licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other power systems and in such manner including the construction of additional transmission facilities as the Commission may direct in the interest of maximizing power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the licensee as the Commission may order.

(b) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313(a) of the Act, and failure to file such an application shall constitute acceptance of this license amendment. In acknowledgment of the acceptance of this license amendment, it shall be signed for the Licensee and returned to the Commission within 60 days from the date of issuance of this order.

By the Commission.

Joseph H. Gutride,
Secretary.

COPY
A-27

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Joseph C. Swidler, Chairman; L. J. O'Connor, Jr., Charles R. Ross, and David S. Black.

Idaho Power Company) Project No. 1971

ORDER ON REHEARING MODIFYING AND CLARIFYING LICENSE ORDER

(Issued May 6, 1965)

This order upon rehearing modified our order of September 15, 1964, to make clear that the Idaho Power Company, licensee for Project No. 1971 on the Snake River in Idaho and Oregon, may be required under Article 39 of its license to coordinate its entire electric system with other systems. The order of September 15, 1964, amended the article to clarify our intent that the licensee may share in the benefits of coordination other than headwater benefits to downstream projects of the United States.

The license filed an application to clarify or amend Article 39 on October 4, 1963. By order of September 15, 1965, we amended the article as set forth therein and discussed some of the objections to such action which had been made by the Secretary in his comments filed on March 13, 1964. The Secretary's comments had alleged that the "purpose of the present petition (of the licensee) is to obtain payment for headwater benefits that it provides to United States Federal projects downstream." In our order of September 15, 1964, we attempted to make clear that Article 39 may not be used by the licensee to obtain payment for such headwater benefits.

On October 14, 1964, the Secretary filed application for rehearing of the order of September 15, 1964. This application requested that the Commission modify the order to: (1) require the licensee to coordinate its whole electric system, rather than merely its project, and (2) make clear that "headwater benefits" to projects of the United States include those from licensee's assured water releases as well as its incidental releases. The petition was subsequently granted for purposes of further consideration. The Secretary was permitted to intervene, and oral argument was held on February 16, 1965.

Article 39 of the license as originally issued required the licensee to coordinate "the project and its system." In amending the article to clarify our meaning with respect to the sharing of coordination

benefits, the phrase "and its system" was unintentionally deleted. The licensee had not requested the deletion of this language, and in fact, since the project provides the majority of the licensee's total energy resource requirements, coordination of its project as a practical matter must ential coordination of ite entire system. Therefore, we are modifying the article to restore the deleted phrase.

The issue with respect to the nature of the benefits of coordination in which the Commission indicated it will permit the licensee to share revolves around what the Commission meant when it said such sharing will not include headwater benefits. Specifically in question is whether we construe such benefits to include those hydraulic benefits received by downstream Federal projects from the assured water releases which the licensee may be required to make under Article 39 as well as those releases merely incidentally resulting from the presence of the upstream licensed developments. The Commission has held that it may require non-Federal owners of downstream projects to make payments to licensees or the United States for benefits received from assured as well as incidental water releases from headwater improvements. See: Columbia River Basin Headwater Benefit Investigation, 29 F.P.C. 238 (1963); Subparagraph 11.27(a) of the Commission's Regulations under the Federal Power Act. It is accordingly our intent to exclude from any benefit sharing we might order all hydraulic benefits to the downstream Federal projects resulting either from the existence of the upstream project or the coordination required by Article 39.

This will mean that we will order the licensee to share in: (1) all electrical benefits resulting from coordination required pursuant to Article 39, and (2) any hydraulic benefits resulting from coordination required pursuant to Article 39 to projects or developments which are not downstream from the licensed projects. Of course, our order and the license article will have no bearing on any arrangements that might be made between the licensee and any other parties for any coordination over and beyond that we might find necessary under Article 39.

Beyond this we cannot go at this time since the exact benefits of coordination and the category into which they fit with respect to sharing of the benefits cannot be determined until the actual coordination agreement is fixed.

The Commission finds:

It is appropriate and in the public interest in administering Part I of the Federal Power Act (16 U.S.C. 791-823), especially sections 10(a) and 313 thereof (16 U.S.C. 803(a) and 8251), that the order, issued on September 15, 1964, amending the license for Idaho Power Company's Project No. 1971 be modified as hereinafter provided.

The Commission orders:

(A) The order, issued on September 15, 1964, amending the license for Idaho Power Company's Project No. 1971, is modified to provide that Article 39 of the license read:

> Article 39. The licensee shall, after notice and opportunity for hearing, coordinate the operation of the project and its system, electrically and hydraulically, with such other power systems and in such manner including the construction of additional transmission facilities as the Commission may direct in the interest of maximizing power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the licensee as the Commission may order.

(B) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313(a) of the Act, and failure to file such an application shall constitute acceptance of this license amendment. In acknowledgement of the acceptance of this license amendment, it shall be signed for the licensee and returned to the Commission within 60 days from the date of issuance of this order.

By the Commission.

Joseph H. Gutride,
Secretary.

COPY

January 14, 1966

Application for Amendment of License

Project No. 1971

Date received: December 2, 1965

Filed by: Idaho Power Company

Correspondence to:

T. E. Roach, President
Idaho Power Company
Boise, Idaho

Location:

In: Adams and Washington Counties, Idaho, and Baker and Wallowa Counties, Oregon, affecting lands of the United States in Nezperce, Payette and Wallowa - Whitman National Forests.

On: Snake River.

Purpose of Amendment:

Licensee requests the Commission to amend Article 48 of the license to read in line three "15,000 c.f.s." instead of "10,000 c.f.s." The application states that the proposed change is necessary and desirable as additional studies conducted in collaboration with the Corps of Engineers have indicated that a maximum of 15,000 c.f.s. may occur from the Hells Canyon spillway as a result of an unscheduled breach of the Oxbow fuse plug, as provided in the aforesaid Article 48 of the license.

COPY

BEFORE THE FEDERAL POWER COMMISSION

Idaho Power Company Project No. 1971

APPLICATION FOR AMENDMENT OF LICENSE

1. Idaho Power Company, licensee for a power project, designated as Project No. 1971 in the records of the Federal Power Commission, issued August 4, 1955, hereby makes application to said Commission for an amendment of the license for said project, specifically Article 48 thereof, in the manner and to the extent described herein.

2. In its order issued May 5, 1964, the Commission approved revised Exhibit L drawings for the said Hells Canyon unit, and by license amendment included, among other things, an additional license Article 48 which provided as follows:

> "Article 48. The Licensee shall install automatic gate operating devices and shall operate the spillway at the Hells Canyon development in accordance with the Reservoir Regulations Manual for Brownlee, Oxbow and Hells Canyon Projects and in accordance with the following conditions:
>
> > The maximum increase in discharge from the Hells Canyon spillway as a result of an unscheduled breach of the Oxbow fuse plug shall be controlled to not exceed 10,000 c.f.s. This increase in discharge shall be in addition to any discharge already being released from the spillway and powerhouse. In case of a load rejection at the Hells Canyon powerhouse, concurrently with an unscheduled breach of the Oxbow fuse plug, the discharge from the Hells Canyon spillway shall be increased so that the rate of discharge from the Hells Canyon Project is unaffected by the load rejection."

The license amendment herein applied for is that the figure "10,000 c.f.s.," as it appears in said Article 48 (as above), be changed to "15,000 c.f.s."

COPY

3. The proposed change is necessary and desirable for the following reasons: Additional studies conducted in collaboration with the Corps of Engineers have indicated that a maximum 10,000 c.f.s. increase in discharge from the Hells Canyon spillway as a result of an unscheduled breach of the Oxbow fuse plug, as now provided in said Article 48, is insufficient, and that such maximum should be increased to 15,000 c.f.s. The principal factors resulting in the conclusions arrived at in these studies are as follows:

(a) The original studies were based on the installation at Hells Canyon of 6 32' gates with a crest length of 192', whereas 3 43' radial surface gates with a crest length of 129' are to be installed (Exhibit L, Sheet 2, 1971-196). This shorter crest length results in a lower flow over the crest in the initial period of the rise in the Hells Canyon forebay, previous to and during the automatic opening of the gate.

(b) The calculated discharge curve for the Oxbow fuse plug spillway shows a higher initial discharge than the curve formerly used.

(c) It was assumed that the Oxbow power plant would continue to pass a constant flow, rather than to shut down at the time of the unscheduled breach, as was assumed under the previous studies. This results in increased flow into the Hells Canyon forebay as the Oxbow forebay recedes to the fuse plug spillway crest.

WHEREFORE, applicant respectfully requests that Article 48 of the license be amended as stated in the last sentence of paragraph 2 above.

COPY

IN WITNESS WHEREOF, the applicant has caused its name to be hereunto signed by T E Roach, its President, and its corporate seal to be hereto affixed by A C Inman, its Secretary, thereunto duly authorized, this 1st day of December, 1965.

IDAHO POWER COMPANY

By /s/ T E Roach
President

(CORPORATE SEAL)

ATTEST:

/s/ A C Inman
Secretary

VERIFICATION

STATE OF IDAHO)
) ss
County of Ada)

T E Roach, being first duly sworn deposes and says: That he is the President of the Idaho Power Company, the applicant for an amendment to the license for Project No. 1971; that he has read the foregoing application and knows the contents thereof; that the same are true to the best of his knowledge and belief.

/s/ T E Roach

Subscribed and sworn to before me this 1st day of December, 1965.

/s/ Mary L Morton
Notary Public for the State of Idaho
Residing at Boise, Idaho
My Commission expires April 1, 1968

(NOTARIAL SEAL)

COPY

A-34

GATE OPERATING PROCEDURE FOR HELLS CANYON DEVELOPMENT (FPC PROJECT 1971)
IN THE EVENT OF ANY UNSCHEDULED OPERATION OF THE OXBOW FUSE PLUG

One spillway gate at the Hells Canyon unit of Project No. 1971 will be equipped with automatic float control and will be set to open 2 feet on a rise of 0.5 feet of the reservoir above normal pool elevation (Elev 1688), and will be set to open 8 feet with a continuing and additional rise of 0.2 feet in reservoir elevation.

In the event of an unscheduled breach of the Oxbow fuse plug, the resulting rise in the Hells Canyon reservoir would open the automatic gate and pass an estimated 12,200 cfs (8 feet opening); the maximum reservoir elevation would not exceed 1692.5 (i e 0.5 feet under the 5-foot surcharge); and there would be an additional spill over the remaining two gates (assuming them fully closed) aggregating approximately 2,800 cfs, thus causing a total additional outflow of approximately 15,000 cfs.

Operating personnel at Hells Canyon will be instructed (and notices posted at gate operating locations, including the control rooms of the Oxbow and Brownlee power plants) not to open the Hells Canyon spillway gates in an attempt to reduce or avoid high pond elevations in the event of an unscheduled fuse plug washout, or in the event of rises in the Hells Canyon reservoir due to causes as to which the operator is not advised.

In the event of a load rejection at Hells Canyon concurrently with an unscheduled fuse plug washout at Oxbow, one or more of the Hells Canyon spillway gates will be manually opened to release water at the rate that was passing through the powerhouse prior to the resection. This would be in addition to the water passed by the automatic spillway gate.

GJH/WBM/HRM

Revised 10/1/64 to correspond with the gate design changes shown on Hells Canyon Exhibit L drawings dated 4/22/63, and approved by Federal Power Commission Order Issued 4/5/64

COPY

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Idaho Power Company) Project No. 1971

NOTICE OF APPLICATION FOR AMENDMENT OF
LICENSE FOR CONSTRUCTED PROJECT

(February 7, 1966)

Public notice is hereby given that application has been filed under the Federal Power Act (16 U.S.C. 791a-825r) by Idaho Power Company (correspondence to: T. E. Roach, President, Idaho Power Company, Boise, Idaho) for amendment of license for constructed Project No. 1971, situated on the Snake River in Adams and Washington Counties, Idaho, and Baker and Wallowa Counties, Oregon, and affecting lands of the United States within the Nezperce, Payette, and Wallowa - Whitman National Forests.

The application seeks to amend Article 48 of the license for the project to increase the maximum permissible discharge from the Hells Canyon development spillway from 10,000 c.f.s., as now specified in the license article, to 15,000 c.f.s. The proposed increase is sought following additional studies by the licensee and the U.S. Corps of Engineers which have indicated that a maximum of 10,000 c.f.s. increase in discharge from the Hells Canyon spillway as a result of an unscheduled breach of the Oxbow fuse box is insufficient, and that such maximum should be increased to 15,000 c.f.s.

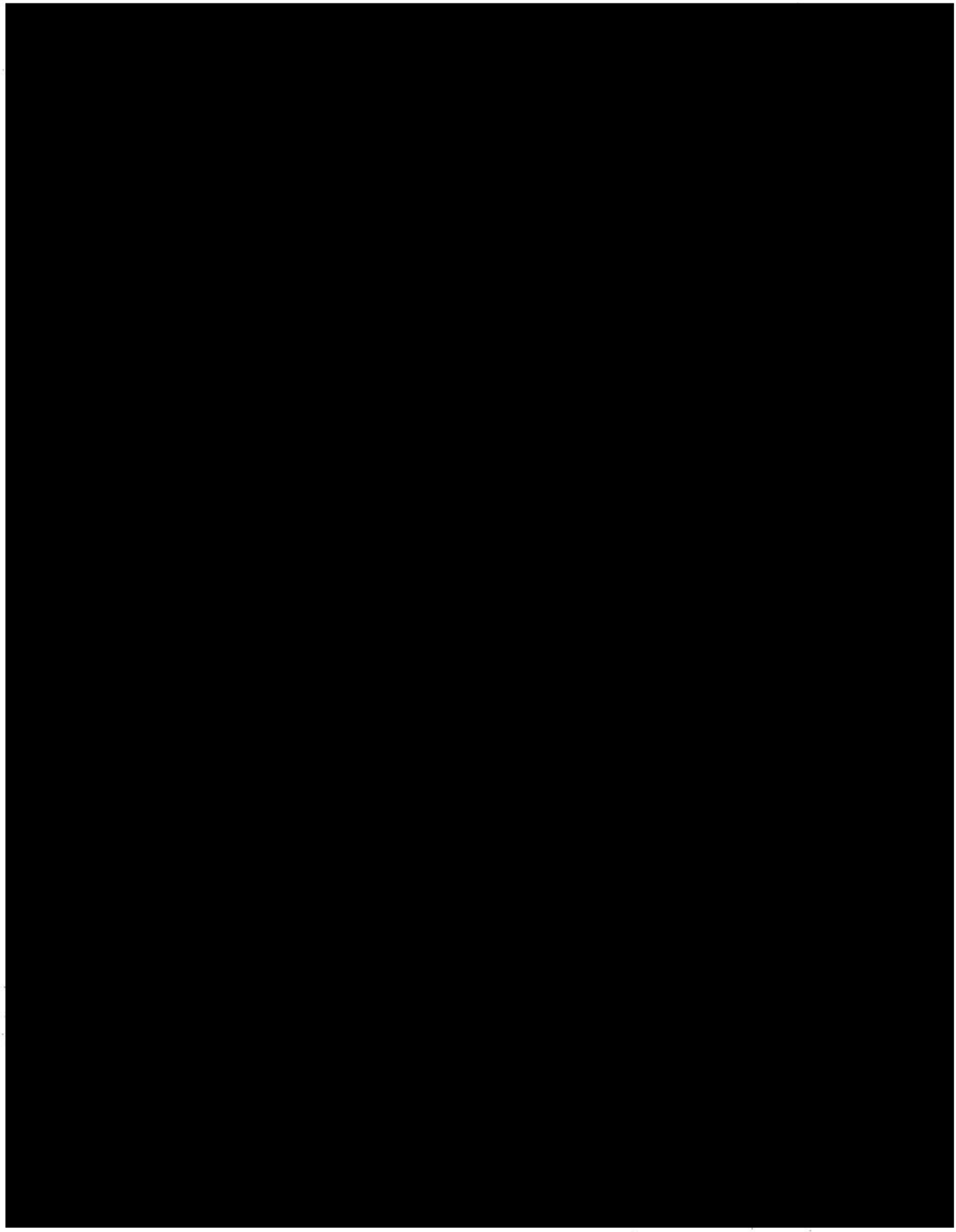
Protests or petitions to intervene may be filed with the Federal Power Commission, Washington, D. C., 20426, in accordance with the Rules of Practice and Procedure of the Commission (18 CFR 1.8 or 1.10). The last day upon which protests or petitions may be filed is March 21, 1966. The application is on file with the Commission for public inspection.

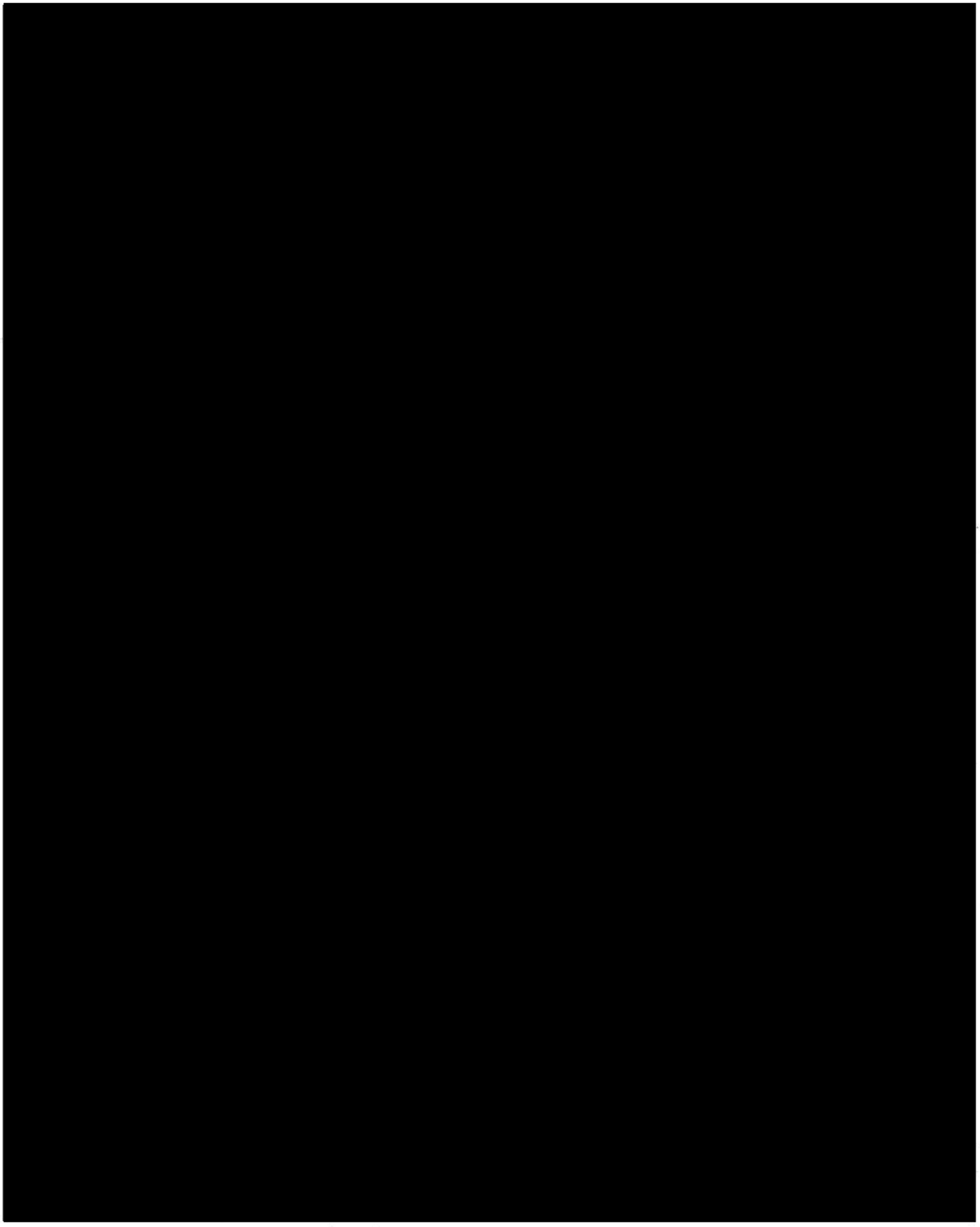
Gordon M. Grant
Acting Secretary

COPY

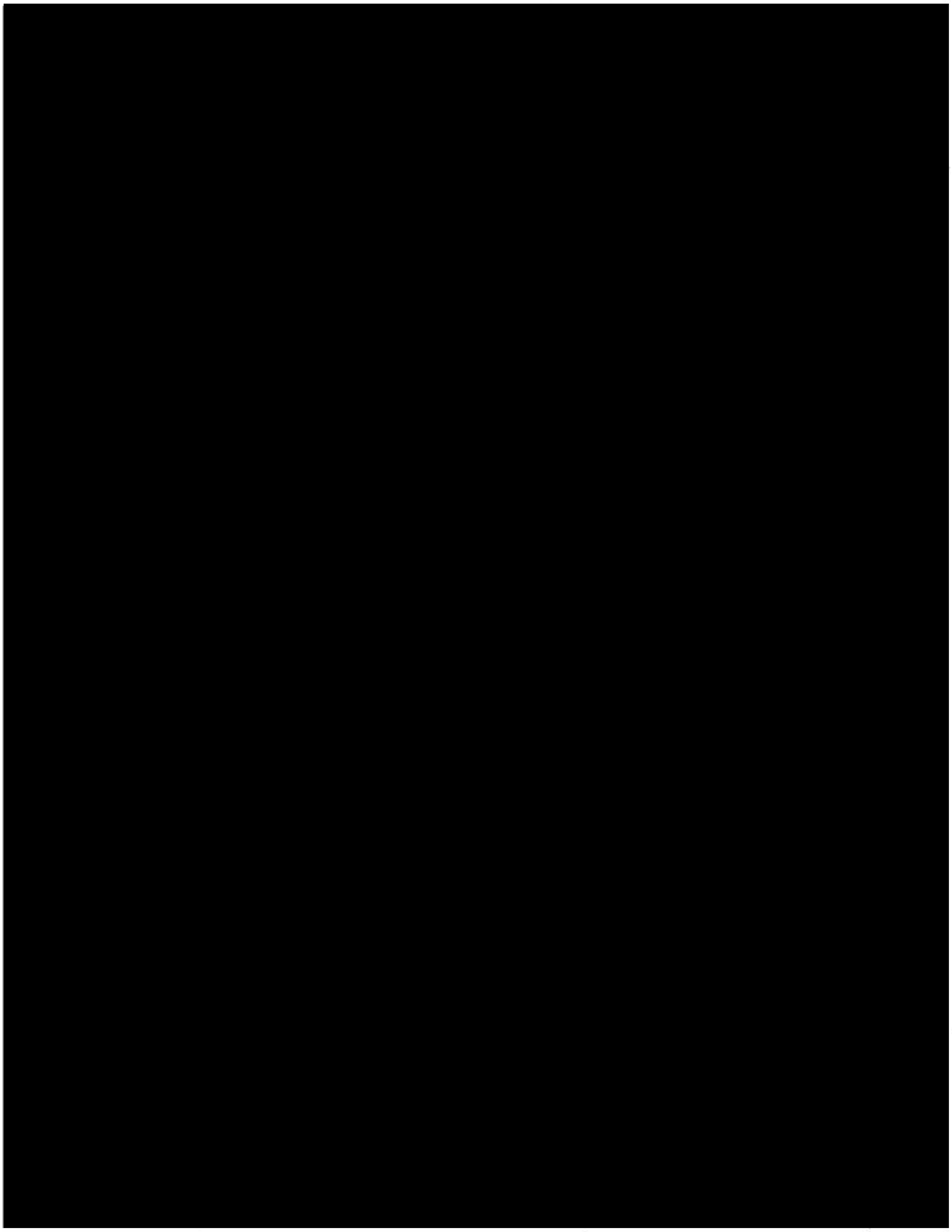
APPENDIX B - [redacted]

[redacted]



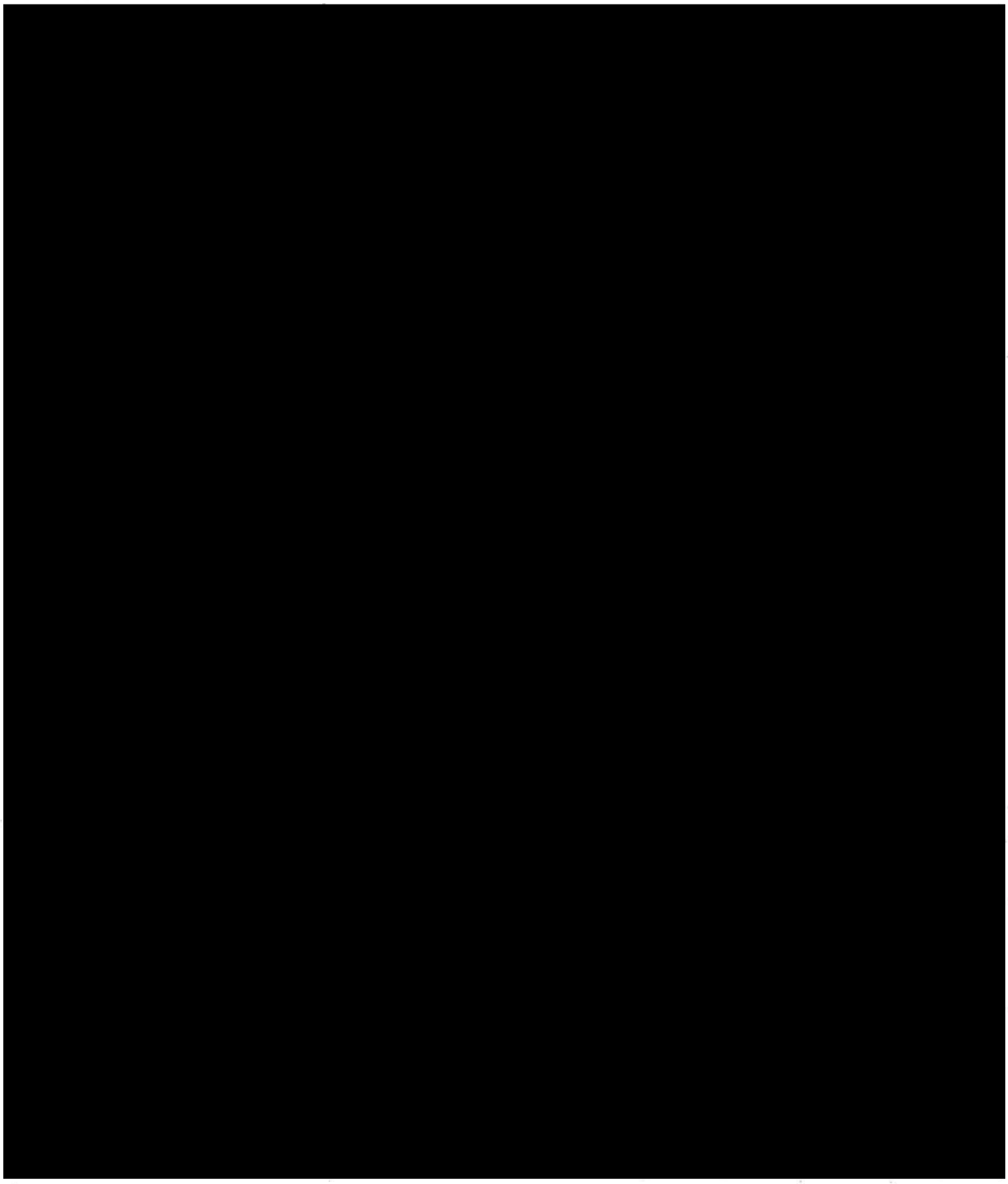


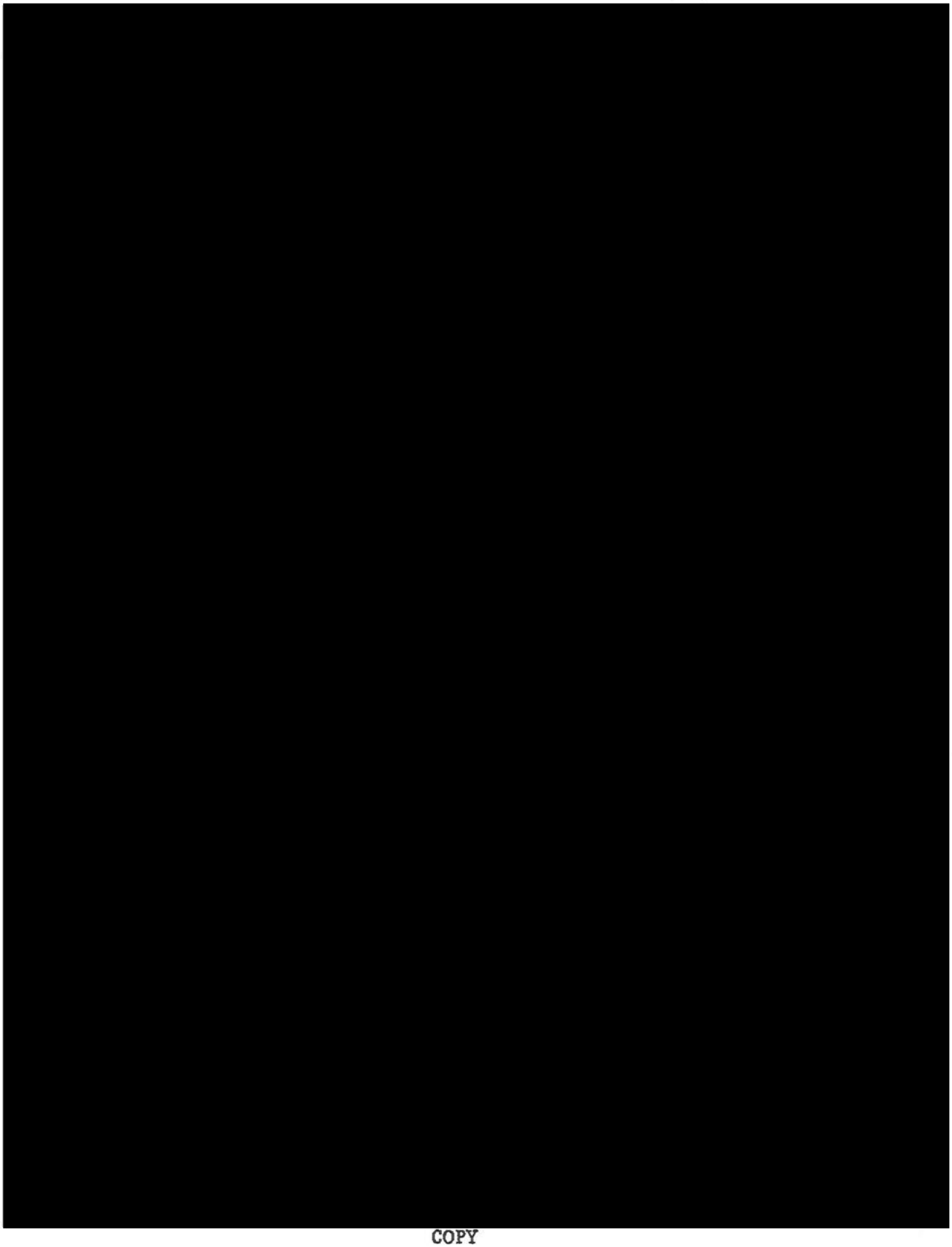
COPY

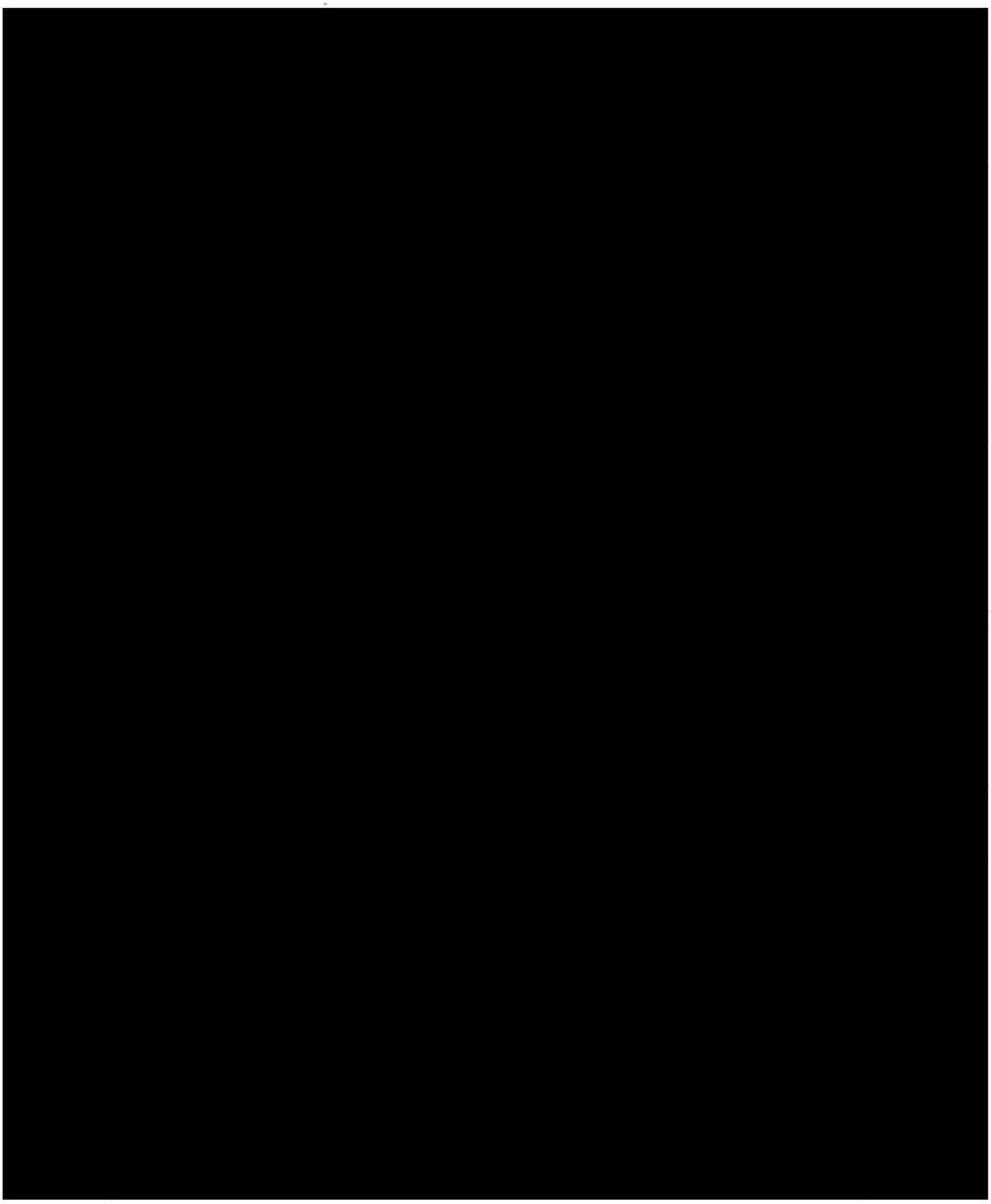


COPY

COPY







COPY

APPENDIX C - DERIVATION OF REGULATION PROCEDURE

1. General. Flood control regulation at Brownlee is provided mainly on the basis of reduction of flows at The Dalles, Oregon, for protection of the lower Columbia-Portland-Vancouver area, and on the Snake River as necessary. Provision for flood control regulation at Brownlee Reservoir for a flood on Columbia River requires that flood control space at Brownlee be maintained until such time as required for control of floods at the downstream point, but only to the extent that flood potential prevails. Water stored in Brownlee Reservoir as a result of storage of flood waters to reduce flows downstream will be utilized throughout the summer, autumn and winter seasons for power production in addition to the water available from natural flows and return flows resulting from upstream irrigation. The power production phase of Brownlee project makes it desirable that the reservoir be refilled to the maximum extent at the end of the flood control season. The minimum rate of release from Brownlee Reservoir during the flood control season is largely dependent upon downstream activities. This will bear on the actual minimum outflows permissible. In lieu of other criteria for establishment of minimum outflows from Brownlee Reservoir, the provision of the license will prevail. For the purposes of this flood control regulation study, a range of minimum discharges from the project has been assumed during the flood control season, ranging up to 15,000 cfs.

2. Providing space at Brownlee for storage of flood control waters during the flood season necessarily demands evacuation of the reservoir so that space will be available when needed. It has been the purpose

of this study to devise such an evacuation procedure which would efficiently provide for the necessary flood control space at Brownlee in a manner that would permit the maximum practicable use of the evacuated water for power production, and likewise to develop a refill procedure to attain maximum storage of flood waters for subsequent use. In accordance with the stipulations of Article 42 of the Federal Power Commission license authorizing construction of the Brownlee, Oxbow, and Hells Canyon Dams, it has been considered that 500,000 acre-feet of flood control space would always be available on 1 March of each year, coincident with the power draft during the previous autumn and winter season. Additional space would be evacuated for flood control after 1 March of each year whenever the forecasted peak at The Dalles indicates a need for flood control space in excess of 500,000 acre-feet. Such space would be maintained and held available for control of floods at The Dalles until the rule curves derived for refilling the reservoir permit storage. The general concept employed in the derivation of a regulation program for flood control at Brownlee is as follows:

a. Derivation of an evacuation procedure which would provide the maximum amount of flood control space and permit maximum use of evacuated waters for power production at site and downstream points.

b. Maintaining the evacuated reservoir space for flood control as long during the spring runoff season as necessary with maximum assurance that the reservoir can be refilled with a given minimum continuous outflow. The minimum outflow rates were assumed at 5,000, 7,500, 10,000 and 15,000 cfs.

c. Refilling the reservoir in the least reasonable time which provided maximum assurance of reservoir refilling at the minimum continuous outflow rate selected.

d. Derivation of parameter curves which establish the date when the discharges from Brownlee Reservoir need to be reduced to the minimum value for refilling.

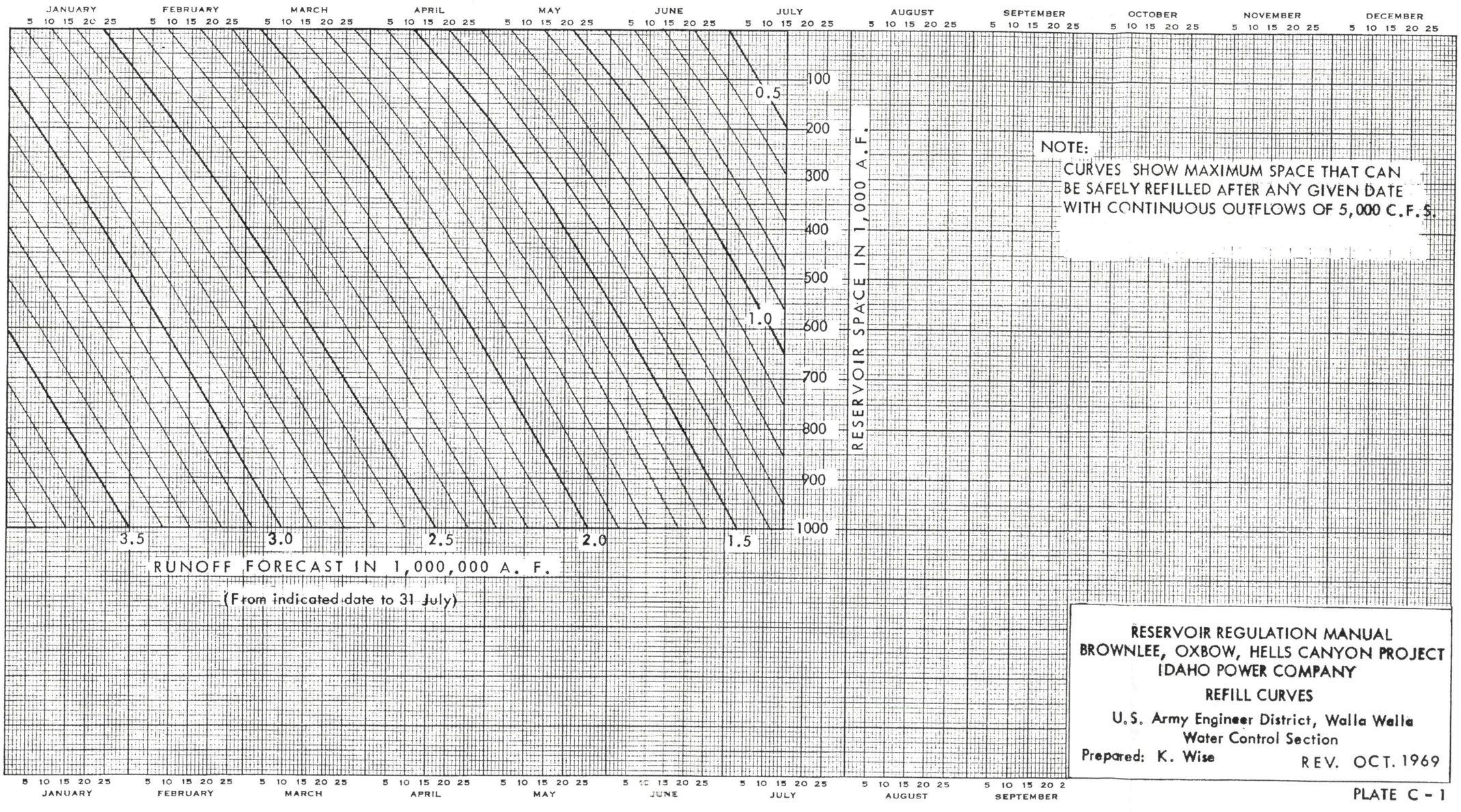
3. The above described parameter curves have been developed in accordance with the following procedures.

4. Basic data. The monthly historical flows at Oxbow, Oregon, modified by depletions for 1960 conditions of irrigation development as published in the CBIAC report on Modified Flows at Selected Power Sites dated June 1957, were compared to the recorded monthly flows at Oxbow as published in the U. S. Geological Survey Water Supply Papers. The monthly ratios of depleted flows to recorded flows thus established were multiplied by the recorded daily flow. This provided depleted daily discharge hydrographs under assumed 1960 development conditions for the years 1929 through 1947. Depletions for the year 1948 were approximated on a ratio basis and forecasted trend of depletions. The term "forecast" as used in this study consists of the amount of runoff occurring from the date of reference to 31 July of any year as reflected by the above derived depleted daily hydrographs. The actual runoff forecast would be determined by the procedure described in Appendix B.

5. Evacuation. Whenever possible the water evacuated from Brownlee Reservoir for flood control should be utilized through the hydroelectric plant. However, some years show depleted hydrographs of such magnitude that the full hydraulic capacity of the power plant would be insufficient to evacuate the reservoir space required. It also is considered that the reservoir space should be evacuated to its maximum amount by 1 May of each year. This date represents the beginning of the flood control period at

The Dalles. Since the maximum capacity of the hydroelectric plant at Brownlee is about 25,000 cfs, it was assumed that evacuation of the reservoir for flows less than 25,000 cfs would be made in an orderly manner programmed in accordance with the normal power production of the plant. For those years where the depleted hydrograph showed discharges in excess of 25,000 cfs during the evacuation period, shortly after 1 March, it was decided that space evacuation would be accomplished at a uniform rate by a constant discharge in excess of reservoir inflows from date of reference to 1 May.

6. Refill Curves. Curves were drawn which enveloped points reflecting the latest date for each year of record that the given amount of reservoir space could be refilled, while maintaining a continuous discharge rate out of Brownlee. The variable amounts of reservoir space considered were in increments of 200,000 acre-feet up to 1,000,000 acre-feet. Such curves were drawn for continuous outflows of 5,000 cfs, 8,500 cfs, 10,000 cfs, and 15,000 cfs. The curves for variable amounts of reservoir space were constructed for each given discharge value which provides four separate refill curves. The curve used in any one season will depend upon the minimum outflow established for that year as related to the effects upon downstream activities. The refill curves thus derived are shown as Plates C-1, C-2, C-3, and C-4 for minimum continuous flows of 5,000, 7,500, 10,000 and 15,000 cfs, respectively.

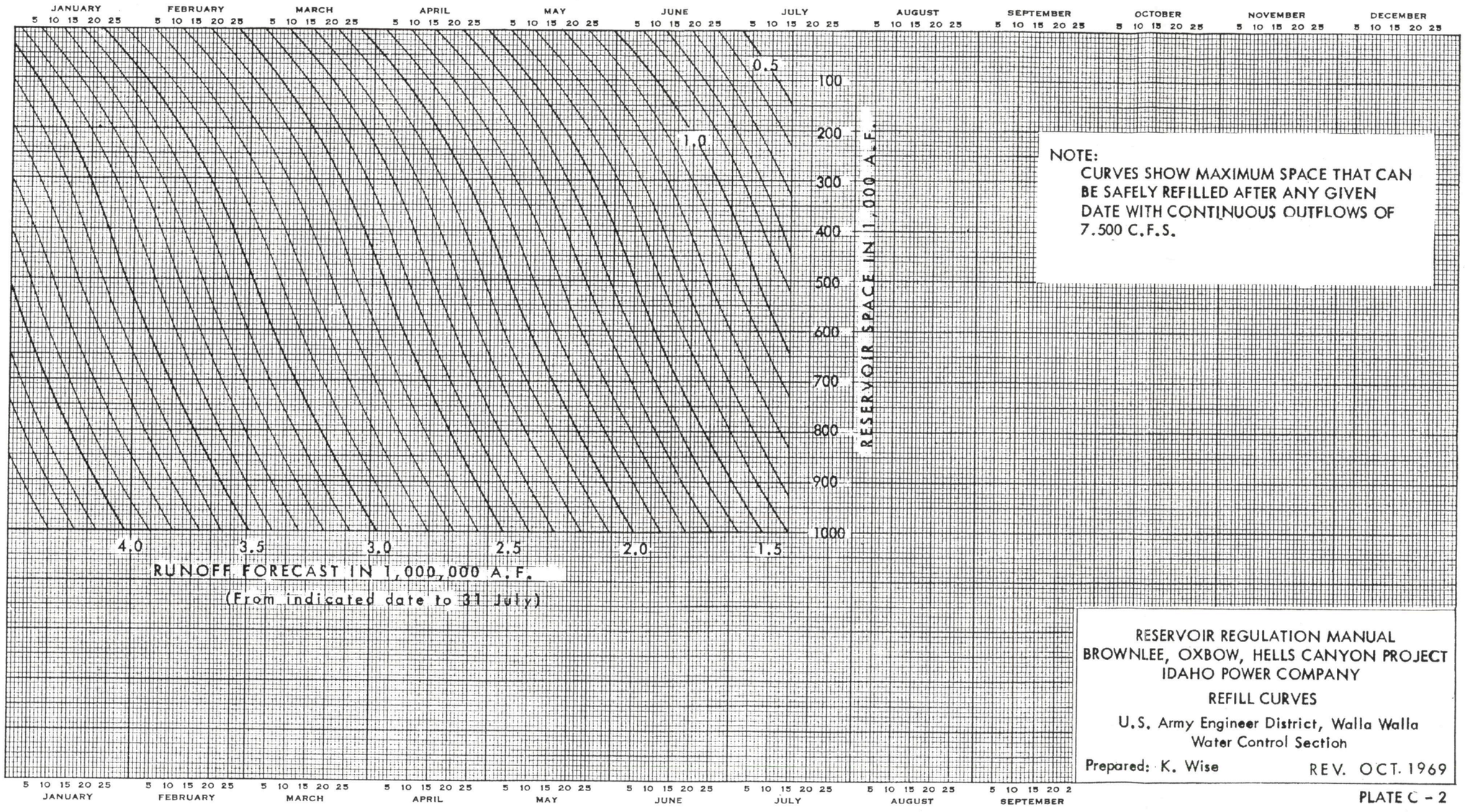


RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

REFILL CURVES

U.S. Army Engineer District, Walla Walla
Water Control Section
Prepared: K. Wise REV. OCT. 1969

PLATE C - 1



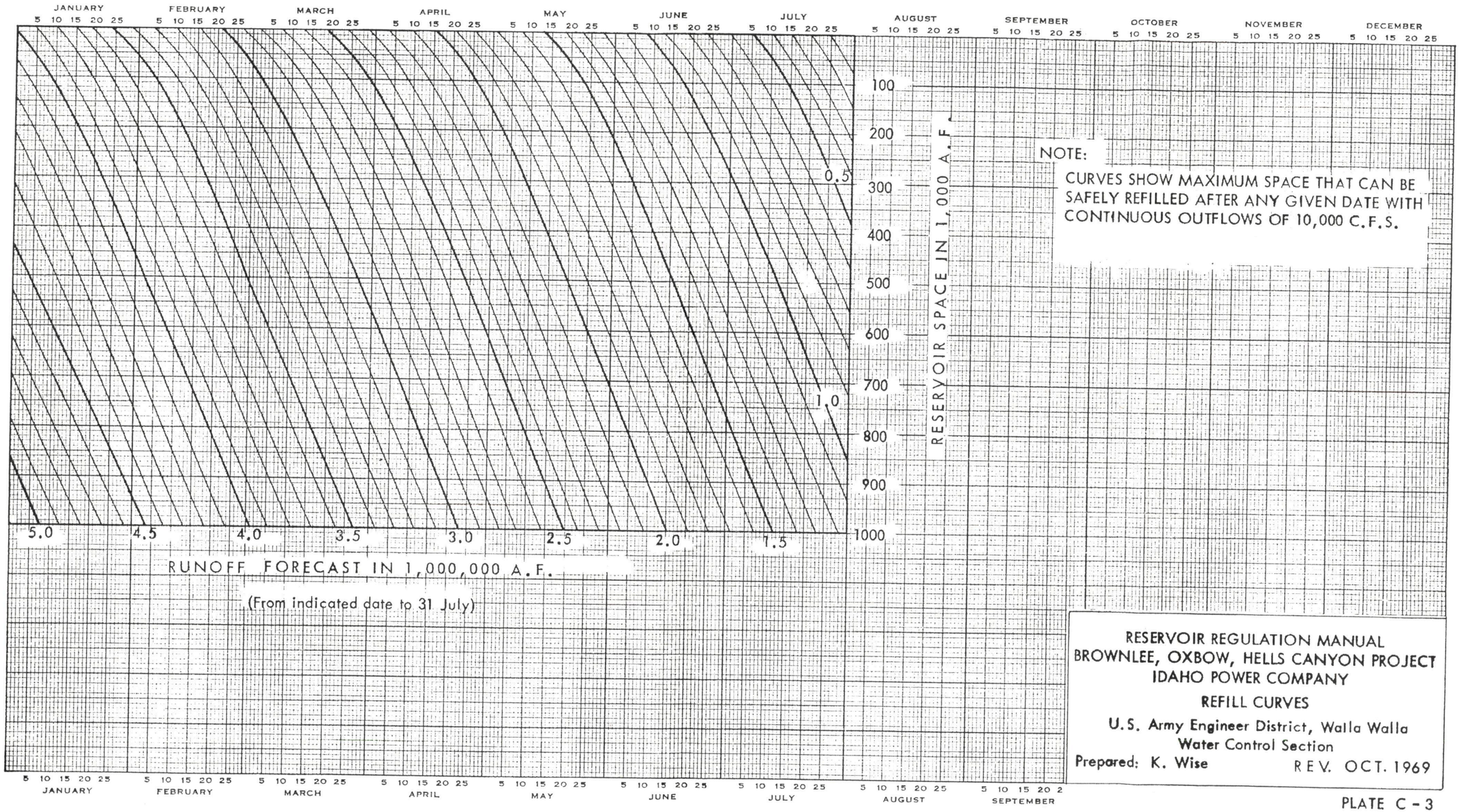
RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

REFILL CURVES

U.S. Army Engineer District, Walla Walla
Water Control Section

Prepared: K. Wise REV. OCT. 1969

PLATE C - 2



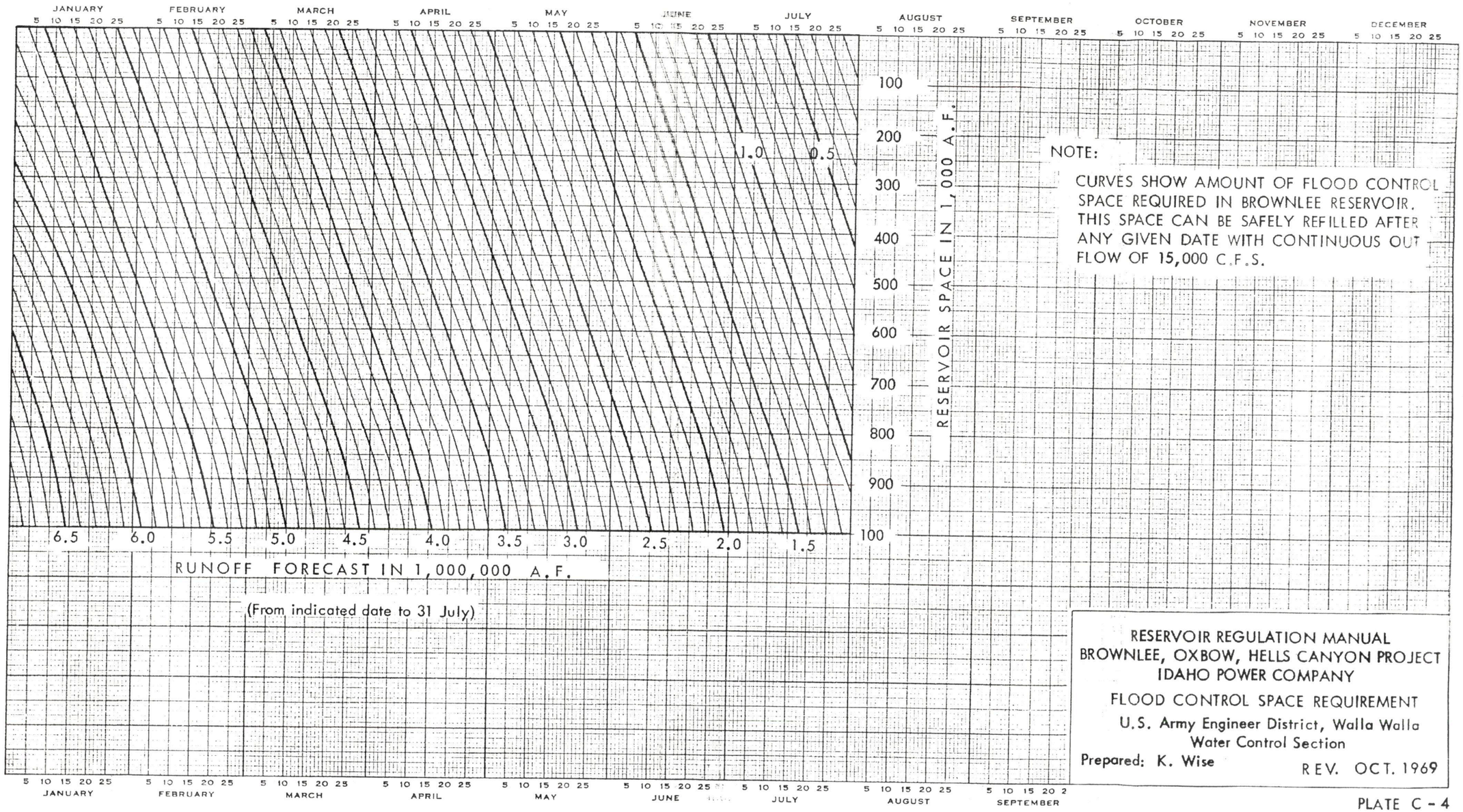
RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

REFILL CURVES

U.S. Army Engineer District, Walla Walla
Water Control Section

Prepared: K. Wise REV. OCT. 1969

PLATE C - 3



RESERVOIR REGULATION MANUAL
BROWNLEE, OXBOW, HELLS CANYON PROJECT
IDAHO POWER COMPANY

FLOOD CONTROL SPACE REQUIREMENT

U.S. Army Engineer District, Walla Walla
Water Control Section

Prepared: K. Wise

REV. OCT. 1969

PLATE C - 4

FACTOR: 0.001

RESERVOIR STORAGE TABLE FOR

BROWNLEE DAM AND RESERVOIR
ON SNAKE RIVER, ID.

DATE: 05/23/03

DB4 STATION NAME: BRN
DB4 TABLE NAME:
DB4 TABLE DATE: 01/24/88

USGS STATION #:
USGS TABLE #
USGS TABLE DATE:

STORAGE (AF KAF MAF)

ELEVATION (FT)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2073	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2074	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2075	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2076	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2077	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2078	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0
2079	1.4 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0	1.5 0.0
2080	1.5									

1 420062
444244
975,318

FACTOR: 0.001

RESERVOIR STORAGE TABLE FOR
BROWNLEE DAM AND RESERVOIR
ON SNAKE RIVER, ID.

DATE: 05/23/03

DB4 STATION NAME: BRN
DB4 TABLE NAME:
DB4 TABLE DATE: 01/24/88

USGS STATION #:
USGS TABLE #
USGS TABLE DATE:

STORAGE (AF KAF MAF)

ELEVATION (FT)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2039	963.7 1.0	964.7 1.0	965.7 1.0	966.7 1.0	967.7 1.0	968.7 1.0	969.7 1.0	970.7 1.0	971.7 1.0	972.8 1.0
2040	973.8 1.0	974.8 1.0	975.8 1.0	976.8 1.0	977.8 1.0	978.8 1.0	979.9 1.0	980.9 1.0	981.9 1.0	982.9 1.0
2041	983.9 1.0	985.0 1.0	986.0 1.0	987.0 1.0	988.0 1.0	989.1 1.0	990.1 1.0	991.1 1.0	992.1 1.0	993.2 1.0
2042	994.2 1.0	995.2 1.0	996.3 1.0	997.3 1.0	998.3 1.0	999.4 1.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0
2043	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0
2044	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0
2045	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0
2046	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0	1.0 0.0
2047	1.0 0.0	1.0 0.0	1.0 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2048	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2049	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2050	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2051	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2052	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2053	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2054	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2055	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0	1.1 0.0
2056	1.1 0.0	1.1 0.0	1.1 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2057	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2058	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2059	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2060	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2061	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2062	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2063	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0
2064	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.2 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2065	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2066	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2067	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2068	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2069	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2070	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2071	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0	1.3 0.0
2072	1.3 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0	1.4 0.0

FACTOR: 0.001

RESERVOIR STORAGE TABLE FOR
BROWNLEE DAM AND RESERVOIR
ON SNAKE RIVER, ID.

DATE: 05/23/03

DB4 STATION NAME: BRN
DB4 TABLE NAME:
DB4 TABLE DATE: 01/24/88

USGS STATION #:
USGS TABLE #
USGS TABLE DATE:

STORAGE (AF KAF MAF)

ELEVATION (FT)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2005	655.5 0.8	656.3 0.8	657.1 0.8	657.9 0.8	658.7 0.8	659.5 0.8	660.3 0.8	661.2 0.8	662.0 0.8	662.8 0.8
2006	663.6 0.8	664.4 0.8	665.2 0.8	666.1 0.8	666.9 0.8	667.7 0.8	668.5 0.8	669.3 0.8	670.1 0.8	671.0 0.8
2007	671.8 0.8	672.6 0.8	673.4 0.8	674.2 0.8	675.1 0.8	675.9 0.8	676.7 0.8	677.5 0.8	678.4 0.8	679.2 0.8
2008	680.0 0.8	680.8 0.8	681.7 0.8	682.5 0.8	683.3 0.8	684.2 0.8	685.0 0.8	685.8 0.8	686.6 0.8	687.5 0.8
2009	688.3 0.8	689.1 0.8	690.0 0.8	690.8 0.8	691.6 0.8	692.5 0.8	693.3 0.8	694.1 0.8	695.0 0.8	695.8 0.8
2010	696.6 0.8	697.5 0.8	698.3 0.8	699.2 0.8	700.0 0.8	700.8 0.8	701.7 0.8	702.5 0.8	703.4 0.8	704.2 0.8
2011	705.0 0.8	705.9 0.8	706.7 0.8	707.6 0.8	708.4 0.8	709.3 0.8	710.1 0.8	711.0 0.8	711.8 0.8	712.7 0.8
2012	713.5 0.8	714.4 0.8	715.2 0.9	716.1 0.9	716.9 0.9	717.8 0.9	718.6 0.9	719.5 0.9	720.3 0.9	721.2 0.9
2013	722.0 0.9	722.9 0.9	723.7 0.9	724.6 0.9	725.4 0.9	726.3 0.9	727.2 0.9	728.0 0.9	728.9 0.9	729.7 0.9
2014	730.6 0.9	731.4 0.9	732.3 0.9	733.2 0.9	734.0 0.9	734.9 0.9	735.8 0.9	736.6 0.9	737.5 0.9	738.3 0.9
2015	739.2 0.9	740.1 0.9	740.9 0.9	741.8 0.9	742.7 0.9	743.5 0.9	744.4 0.9	745.3 0.9	746.2 0.9	747.0 0.9
2016	747.9 0.9	748.8 0.9	749.6 0.9	750.5 0.9	751.4 0.9	752.3 0.9	753.1 0.9	754.0 0.9	754.9 0.9	755.8 0.9
2017	756.6 0.9	757.5 0.9	758.4 0.9	759.3 0.9	760.1 0.9	761.0 0.9	761.9 0.9	762.8 0.9	763.7 0.9	764.6 0.9
2018	765.4 0.9	766.3 0.9	767.2 0.9	768.1 0.9	769.0 0.9	769.9 0.9	770.7 0.9	771.6 0.9	772.5 0.9	773.4 0.9
2019	774.3 0.9	775.2 0.9	776.1 0.9	777.0 0.9	777.8 0.9	778.7 0.9	779.6 0.9	780.5 0.9	781.4 0.9	782.3 0.9
2020	783.2 0.9	784.1 0.9	785.0 0.9	785.9 0.9	786.8 0.9	787.7 0.9	788.6 0.9	789.5 0.9	790.4 0.9	791.3 0.9
2021	792.2 0.9	793.1 0.9	794.0 0.9	794.9 0.9	795.8 0.9	796.7 0.9	797.6 0.9	798.5 0.9	799.4 0.9	800.3 0.9
2022	801.2 0.9	802.1 0.9	803.0 0.9	803.9 0.9	804.8 0.9	805.7 0.9	806.6 0.9	807.6 0.9	808.5 0.9	809.4 0.9
2023	810.3 0.9	811.2 0.9	812.1 0.9	813.0 0.9	813.9 0.9	814.9 0.9	815.8 0.9	816.7 0.9	817.6 0.9	818.5 0.9
2024	819.4 0.9	820.3 0.9	821.3 0.9	822.2 0.9	823.1 0.9	824.0 0.9	824.9 0.9	825.9 0.9	826.8 0.9	827.7 0.9
2025	828.6 0.9	829.6 0.9	830.5 0.9	831.4 0.9	832.3 0.9	833.3 0.9	834.2 0.9	835.1 0.9	836.0 0.9	837.0 0.9
2026	837.9 0.9	838.8 0.9	839.8 0.9	840.7 0.9	841.6 0.9	842.5 0.9	843.5 0.9	844.4 0.9	845.3 0.9	846.3 0.9
2027	847.2 0.9	848.1 0.9	849.1 0.9	850.0 0.9	851.0 0.9	851.9 0.9	852.8 0.9	853.8 0.9	854.7 0.9	855.6 0.9
2028	856.6 0.9	857.5 0.9	858.5 0.9	859.4 0.9	860.4 0.9	861.3 0.9	862.2 0.9	863.2 0.9	864.1 0.9	865.1 0.9
2029	866.0 0.9	867.0 0.9	867.9 0.9	868.9 0.9	869.8 0.9	870.8 1.0	871.7 1.0	872.7 1.0	873.6 1.0	874.6 1.0
2030	875.5 1.0	876.5 1.0	877.4 1.0	878.4 1.0	879.3 1.0	880.3 1.0	881.2 1.0	882.2 1.0	883.2 1.0	884.1 1.0
2031	885.1 1.0	886.0 1.0	887.0 1.0	888.0 1.0	888.9 1.0	889.9 1.0	890.8 1.0	891.8 1.0	892.8 1.0	893.7 1.0
2032	894.7 1.0	895.7 1.0	896.6 1.0	897.6 1.0	898.6 1.0	899.5 1.0	900.5 1.0	901.5 1.0	902.4 1.0	903.4 1.0
2033	904.4 1.0	905.3 1.0	906.3 1.0	907.3 1.0	908.3 1.0	909.2 1.0	910.2 1.0	911.2 1.0	912.1 1.0	913.1 1.0
2034	914.1 1.0	915.1 1.0	916.1 1.0	917.0 1.0	918.0 1.0	919.0 1.0	920.0 1.0	920.9 1.0	921.9 1.0	922.9 1.0
2035	923.9 1.0	924.9 1.0	925.9 1.0	926.8 1.0	927.8 1.0	928.8 1.0	929.8 1.0	930.8 1.0	931.8 1.0	932.8 1.0
2036	933.7 1.0	934.7 1.0	935.7 1.0	936.7 1.0	937.7 1.0	938.7 1.0	939.7 1.0	940.7 1.0	941.7 1.0	942.7 1.0
2037	943.7 1.0	944.7 1.0	945.7 1.0	946.6 1.0	947.6 1.0	948.6 1.0	949.6 1.0	950.6 1.0	951.6 1.0	952.6 1.0
2038	953.6 1.0	954.6 1.0	955.6 1.0	956.6 1.0	957.6 1.0	958.6 1.0	959.7 1.0	960.7 1.0	961.7 1.0	962.7 1.0

FACTOR: 0.001

RESERVOIR STORAGE TABLE FOR

BROWNLEE DAM AND RESERVOIR
ON SNAKE RIVER, ID.

DATE: 05/23/03

DB4 STATION NAME: BRN
DB4 TABLE NAME:
DB4 TABLE DATE: 01/24/88

USGS STATION #:
USGS TABLE #
USGS TABLE DATE:

STORAGE (AF KAF MAF)

ELEVATION (FT)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1971	413.2 0.6	413.8 0.6	414.4 0.6	415.0 0.6	415.6 0.6	416.3 0.6	416.9 0.6	417.5 0.6	418.1 0.6	418.8 0.6
1972	419.4 0.6	420.0 0.6	420.6 0.6	421.3 0.6	421.9 0.6	422.5 0.6	423.1 0.6	423.8 0.6	424.4 0.6	425.0 0.6
1973	425.6 0.6	426.3 0.6	426.9 0.6	427.5 0.6	428.2 0.6	428.8 0.6	429.4 0.6	430.1 0.6	430.7 0.6	431.3 0.6
1974	432.0 0.6	432.6 0.6	433.2 0.6	433.9 0.6	434.5 0.6	435.1 0.6	435.8 0.6	436.4 0.6	437.0 0.6	437.7 0.6
1975	438.3 0.6	439.0 0.6	439.6 0.6	440.2 0.6	440.9 0.6	441.5 0.6	442.2 0.6	442.8 0.6	443.5 0.6	444.1 0.6
1976	444.7 0.6	445.4 0.6	446.0 0.6	446.7 0.6	447.3 0.6	448.0 0.6	448.6 0.6	449.3 0.6	449.9 0.6	450.6 0.7
1977	451.2 0.7	451.9 0.7	452.5 0.7	453.2 0.7	453.8 0.7	454.5 0.7	455.1 0.7	455.8 0.7	456.4 0.7	457.1 0.7
1978	457.7 0.7	458.4 0.7	459.1 0.7	459.7 0.7	460.4 0.7	461.0 0.7	461.7 0.7	462.4 0.7	463.0 0.7	463.7 0.7
1979	464.3 0.7	465.0 0.7	465.7 0.7	466.3 0.7	467.0 0.7	467.6 0.7	468.3 0.7	469.0 0.7	469.6 0.7	470.3 0.7
1980	471.0 0.7	471.6 0.7	472.3 0.7	473.0 0.7	473.6 0.7	474.3 0.7	475.0 0.7	475.7 0.7	476.3 0.7	477.0 0.7
1981	477.7 0.7	478.3 0.7	479.0 0.7	479.7 0.7	480.4 0.7	481.0 0.7	481.7 0.7	482.4 0.7	483.1 0.7	483.7 0.7
1982	484.4 0.7	485.1 0.7	485.8 0.7	486.5 0.7	487.1 0.7	487.8 0.7	488.5 0.7	489.2 0.7	489.9 0.7	490.5 0.7
1983	491.2 0.7	491.9 0.7	492.6 0.7	493.3 0.7	494.0 0.7	494.6 0.7	495.3 0.7	496.0 0.7	496.7 0.7	497.4 0.7
1984	498.1 0.7	498.8 0.7	499.5 0.7	500.2 0.7	500.8 0.7	501.5 0.7	502.2 0.7	502.9 0.7	503.6 0.7	504.3 0.7
1985	505.0 0.7	505.7 0.7	506.4 0.7	507.1 0.7	507.8 0.7	508.5 0.7	509.2 0.7	509.9 0.7	510.6 0.7	511.3 0.7
1986	512.0 0.7	512.7 0.7	513.4 0.7	514.1 0.7	514.8 0.7	515.5 0.7	516.2 0.7	516.9 0.7	517.6 0.7	518.3 0.7
1987	519.0 0.7	519.7 0.7	520.4 0.7	521.1 0.7	521.8 0.7	522.5 0.7	523.3 0.7	524.0 0.7	524.7 0.7	525.4 0.7
1988	526.1 0.7	526.8 0.7	527.5 0.7	528.2 0.7	528.9 0.7	529.7 0.7	530.4 0.7	531.1 0.7	531.8 0.7	532.5 0.7
1989	533.2 0.7	534.0 0.7	534.7 0.7	535.4 0.7	536.1 0.7	536.8 0.7	537.6 0.7	538.3 0.7	539.0 0.7	539.7 0.7
1990	540.4 0.7	541.2 0.7	541.9 0.7	542.6 0.7	543.3 0.7	544.1 0.7	544.8 0.7	545.5 0.7	546.2 0.7	547.0 0.7
1991	547.7 0.7	548.4 0.7	549.2 0.7	549.9 0.7	550.6 0.7	551.4 0.7	552.1 0.7	552.8 0.7	553.6 0.7	554.3 0.7
1992	555.0 0.7	555.8 0.7	556.5 0.7	557.2 0.7	558.0 0.7	558.7 0.7	559.4 0.7	560.2 0.7	560.9 0.7	561.7 0.7
1993	562.4 0.7	563.1 0.7	563.9 0.7	564.6 0.7	565.4 0.7	566.1 0.7	566.9 0.7	567.6 0.7	568.3 0.7	569.1 0.7
1994	569.8 0.7	570.6 0.7	571.3 0.7	572.1 0.7	572.8 0.7	573.6 0.8	574.3 0.8	575.1 0.8	575.8 0.8	576.6 0.8
1995	577.3 0.8	578.1 0.8	578.8 0.8	579.6 0.8	580.3 0.8	581.1 0.8	581.9 0.8	582.6 0.8	583.4 0.8	584.1 0.8
1996	584.9 0.8	585.6 0.8	586.4 0.8	587.2 0.8	587.9 0.8	588.7 0.8	589.4 0.8	590.2 0.8	591.0 0.8	591.7 0.8
1997	592.5 0.8	593.3 0.8	594.0 0.8	594.8 0.8	595.6 0.8	596.3 0.8	597.1 0.8	597.9 0.8	598.6 0.8	599.4 0.8
1998	600.2 0.8	600.9 0.8	601.7 0.8	602.5 0.8	603.3 0.8	604.0 0.8	604.8 0.8	605.6 0.8	606.4 0.8	607.1 0.8
1999	607.9 0.8	608.7 0.8	609.5 0.8	610.2 0.8	611.0 0.8	611.8 0.8	612.6 0.8	613.3 0.8	614.1 0.8	614.9 0.8
2000	615.7 0.8	616.5 0.8	617.3 0.8	618.0 0.8	618.8 0.8	619.6 0.8	620.4 0.8	621.2 0.8	622.0 0.8	622.8 0.8
2001	623.5 0.8	624.3 0.8	625.1 0.8	625.9 0.8	626.7 0.8	627.5 0.8	628.3 0.8	629.1 0.8	629.9 0.8	630.7 0.8
2002	631.4 0.8	632.2 0.8	633.0 0.8	633.8 0.8	634.6 0.8	635.4 0.8	636.2 0.8	637.0 0.8	637.8 0.8	638.6 0.8
2003	639.4 0.8	640.2 0.8	641.0 0.8	641.8 0.8	642.6 0.8	643.4 0.8	644.2 0.8	645.0 0.8	645.8 0.8	646.6 0.8
2004	647.4 0.8	648.2 0.8	649.0 0.8	649.8 0.8	650.6 0.8	651.4 0.8	652.2 0.8	653.1 0.8	653.9 0.8	654.7 0.8