REDACTED

USACE WATER CONTROL MANUAL

FOR

BOISE RIVER SYSTEM

These projects are considered authority of Section 7 for the U.S. Army Corps of Engineers. Lucky Peak Dam is operated and owned by the U.S. Army Corps of Engineers. Anderson Dam and Arrowrock Dam are operated and owned by the U.S. Bureau of Reclamation.

U.S. Army Corps of Engineers

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U.S. ARMY CORPS OF ENGINEERS, WALLA WALLA DISTRICT APRIL 1985

US Army Corps of Engineers
Walla Walla District

Water Control Manual for Boise River Reservoirs

Boise River, Idaho

WATER CONTROL MANUAL

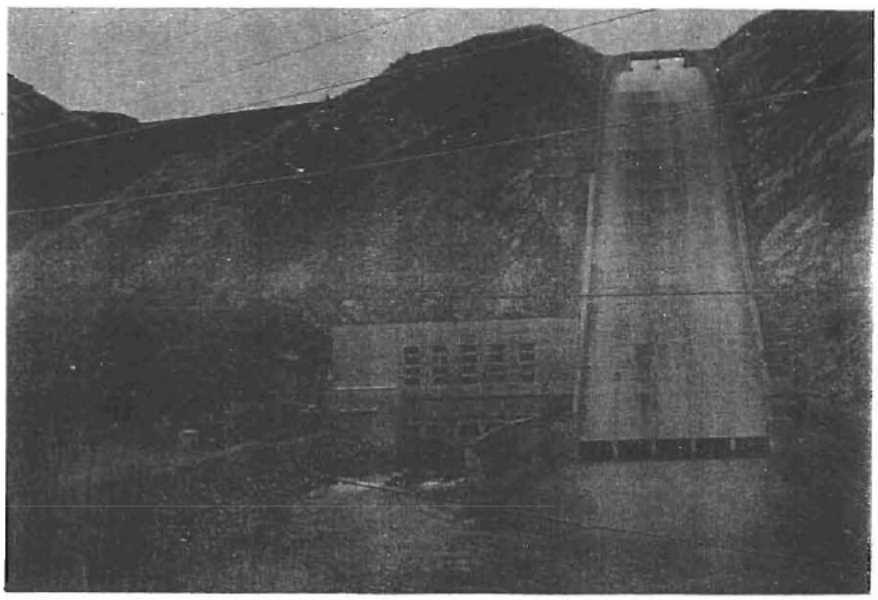
FOR

BOISE RIVER RESERVOIRS

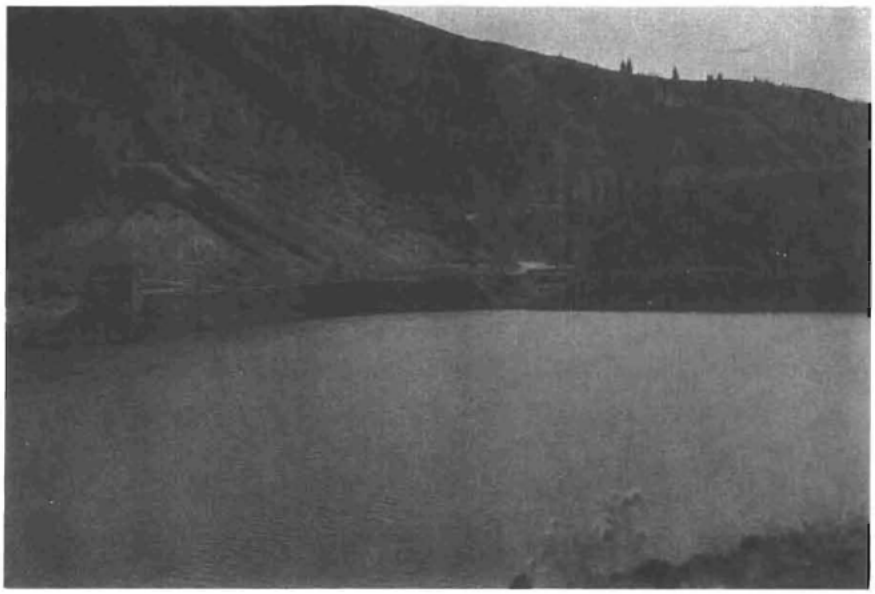
APRIL 1985

U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA DISTRICT

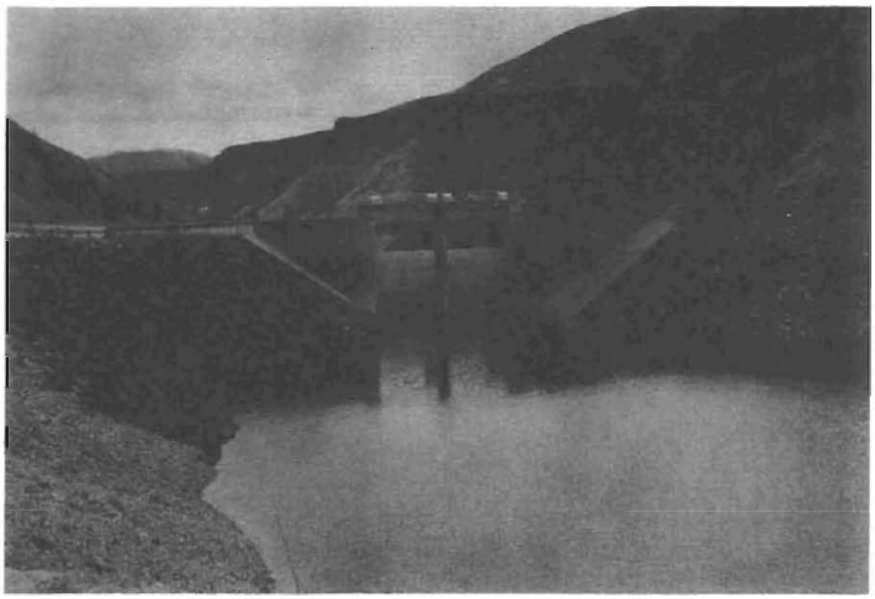
Anderson Ranch Project: Downstream face view of dam.



Anderson Ranch Project: Powerhouse and spillway.

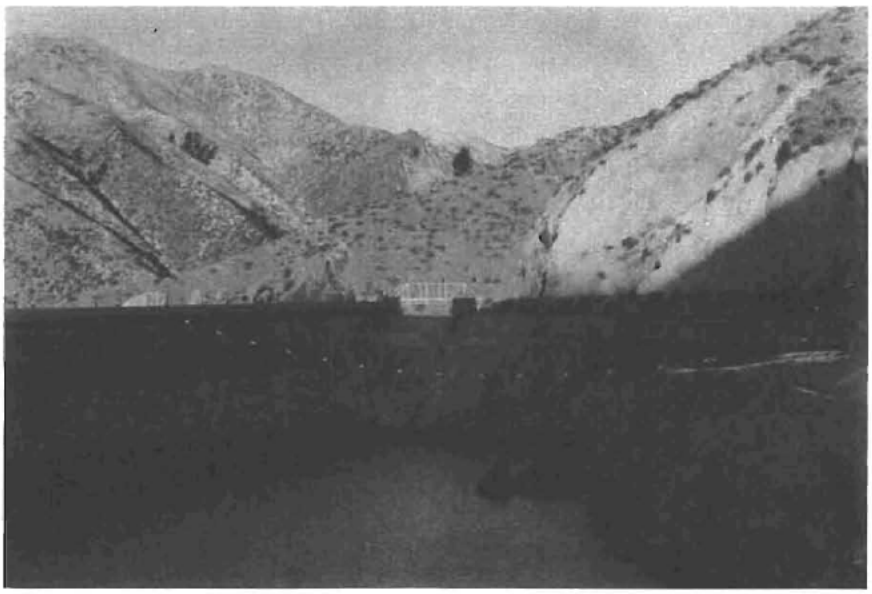


Anderson Ranch Project: Upstream view of dam showing relative locations of intake and spillway gates.

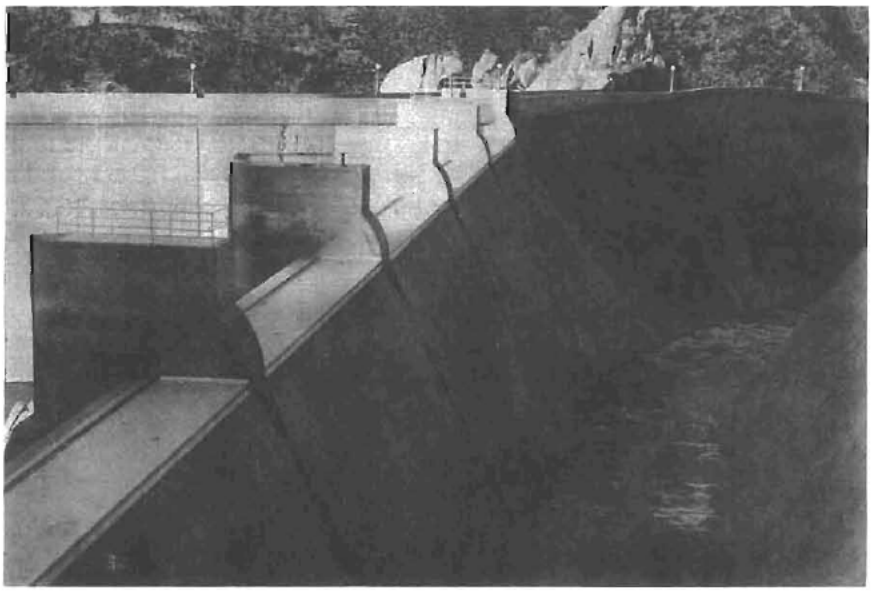


Anderson Ranch Project: Spillway radial gates.

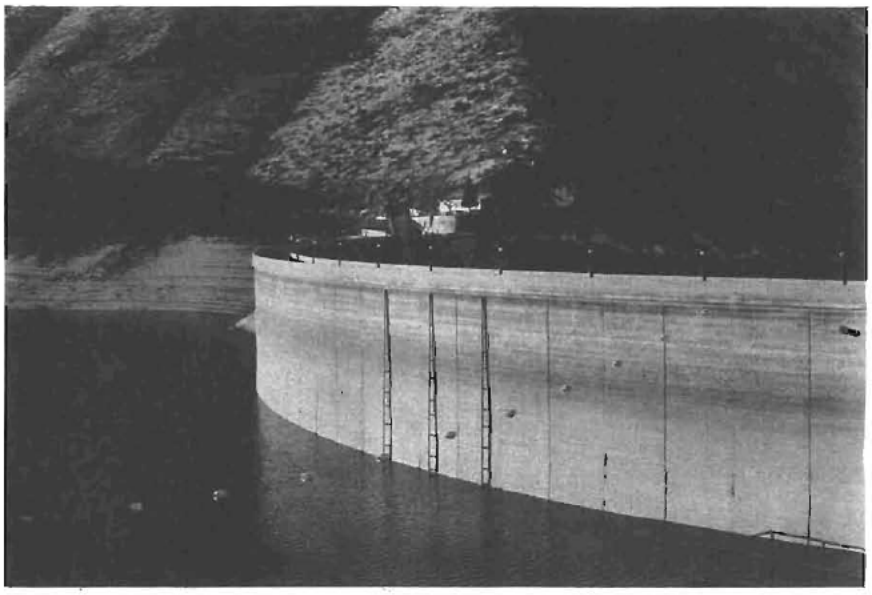
Arrowrock Project: Downstream face of dam.



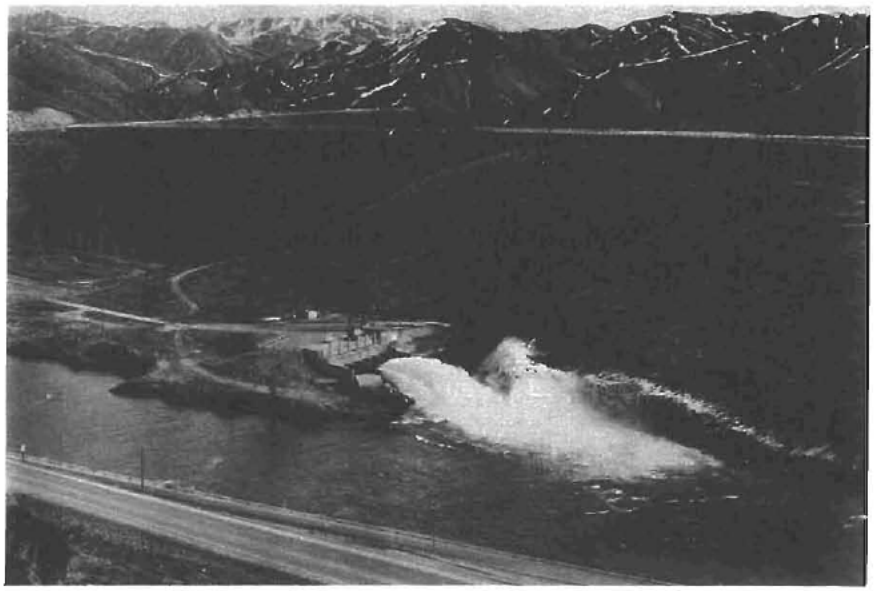
Arrowrock Project: Upstream view of spillway.



Arrowrock Project: Spillway and concrete lined side channel.

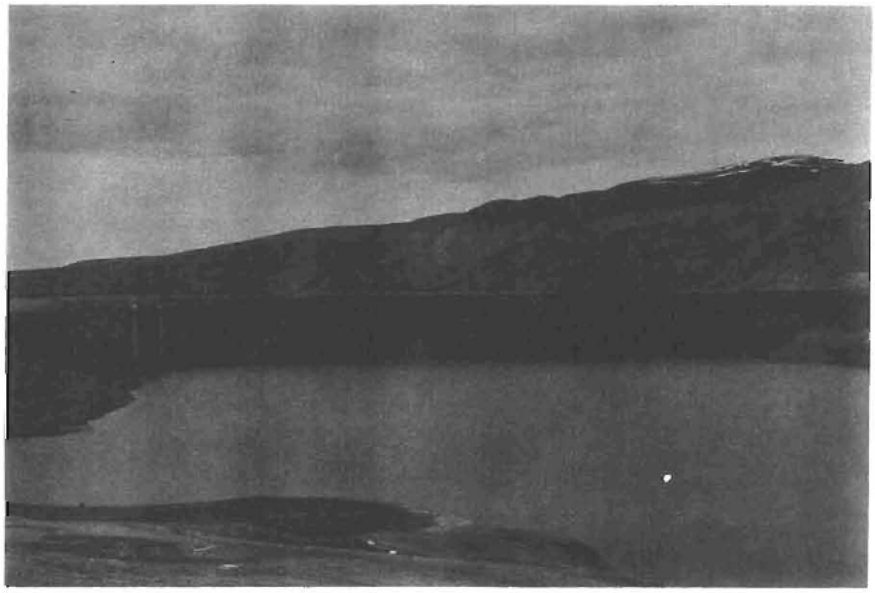


Arrowrock Project: Upstream face view illustrating the arch of the dam.

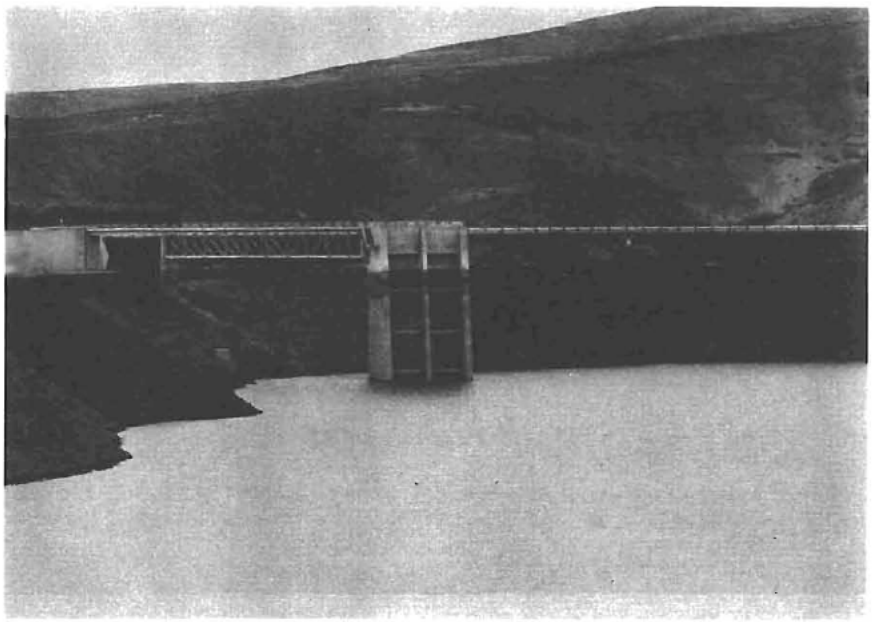


Lucky Peak Project: Downstream face view showing outlet facilities.

Lucky Peak Project: Downstream face of dam with Sandy Point recreation area in foreground.



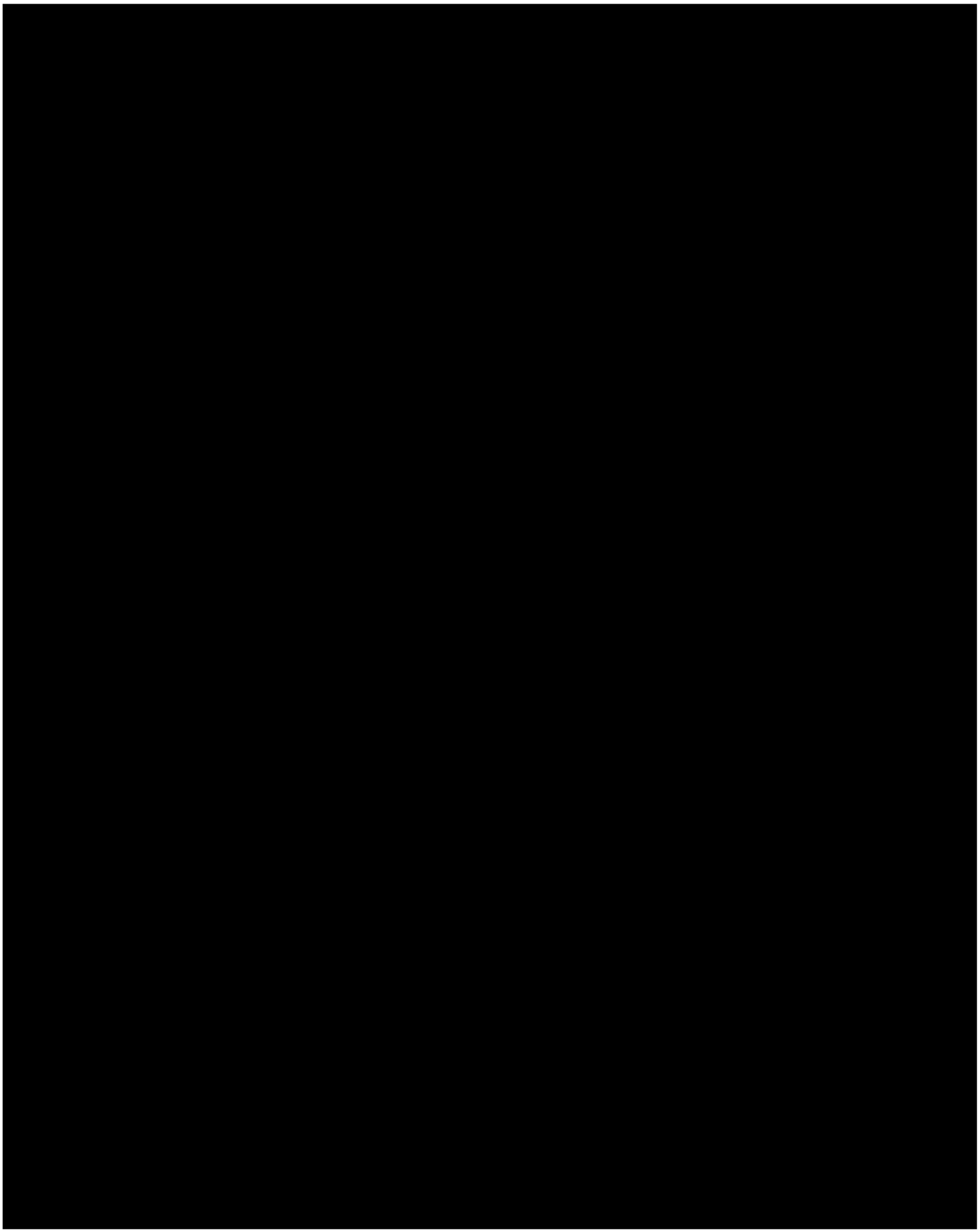
Lucky Peak Project: Upstream face view of dam.



Lucky Peak Project: Close-up view of intake structure.

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in looseleaf form and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the Manual current. New or changed material within the text is identified by use of asterisks.



PERTINENT DATA

ANDERSON RANCH PROJECT - A

ARROWROCK PROJECT - C

LUCKY PEAK PROJECT - E

ANDERSON RANCH PROJECT
Pertinent Data

GENERAL

LOCATION

STATE	Idaho
COUNTY	Elmore
RIVER	South Fork of the Boise River
RIVER MILE	43.5
TOWNSHIP	1 South
RANGE	8 East
SECTION	SE1/2 of Section 1
LATITUDE	43°21'30"
LONGITUDE	115°26'40"
LOCATION FROM NEARBY COMMUNITIES	28 miles northeast of Mountain Home, 75 miles southeast of Boise

BASIN

DRAINAGE AREA	980 square miles
BASIN INCHES	1 basin inch = 52,267 acre-feet

RESPONSIBLE AGENCY	U.S. Bureau of Reclamation
STATUS	Complete, storage began 15 December 1945
COST	$30,000,000 (Estimate)

RESERVOIR

AREA (NORMAL FULL POOL)	4,741 acres
LENGTH	17 miles
AVERAGE WIDTH	2,300 feet

ELEVATIONS (FEET MEAN SEA LEVEL)

CREST OF DAM	4,206
MAXIMUM DESIGN WATER SURFACE	4,198.2
NORMAL FULL POOL	4,196
TOP OF INACTIVE POOL	4,039.6
TOP OF DEAD STORAGE POOL	3,992
STREAMBED AT DAM AXIS	3,866

STORAGE

FREEBOARD	4,198.2 to 4,206 feet MSL	.7.8 feet	
SURCHARGE CAPACITY	4,196 to 4,198.2 feet MSL	10,504	acre-feet
JOINT USE CAPACITY	4,044 to 4,196 feet MSL	.418,178	acre-feet
EXCLUSIVE POWER CAPACITY	4,039.6 to 4,044 feet MSL	.5,000	acre-feet
INACTIVE CAPACITY	3,992 to 4,039.6 feet MSL	41,000	acre-feet
DEAD STORAGE CAPACITY	3,866 to 3,992 feet MSL	29,000	acre-feet
TOTAL ACTIVE CAPACITY	4,039.6 to 4,196 feet MSL	.423,178	acre-feet
TOTAL LIVE CAPACITY	3,992 to 4,196 feet MSL	.464,178	acre-feet
TOTAL GROSS CAPACITY	3,866 to 4,198.2 feet MSL	.503,682	acre-feet

ANDERSON RANCH PROJECT (Continued)
Pertinent Data

DAM

TYPE . . . . . Rolled earth and rockfill

DIMENSIONS (FEET)
STRUCTURAL HEIGHT 456
HYDRAULIC HEIGHT. 330
BASE WIDTH. 2,650
CREST WIDTH 40
CREST LENGTH. 1,350

ELEVATION AT CREST . . . . . 4,206 feet MSL
VOLUME . . . . . 9,653,300 cubic yards

SPILLWAY

TYPE. . . . . Gated, concrete-lined chute
GATE DESCRIPTION. . . . . Two 22-by-25-foot radial gates
ELEVATIONS (FEET MSL)
SPILLWAY CREST. 4,174
TOP OF GATES (IN PLACE) . 4,196
DESIGN CAPACITY 4,198

DESIGN CAPACITY. . . . . .20,000 cfs

OUTLET WORKS

NO., TYPE, AND CONTROL. . One 20-foot-diameter concrete-lined outlet tunnel with penstock to powerhouse and five 72-inch hollow jet valves. Center of intake at 4,000 feet MSL.

DISCHARGE CAPACITY
NORMAL FULL POOL (4,196 feet MSL). . . . . .10,000 cfs
MINIMUM POOL (4,039.6 feet MSL). . . . . 7,200 cfs

POWERPLANT FACILITIES

NUMBER, TYPE. . . . . .Two Francis reaction hydraulic turbines
INSTALLED CAPACITY. . .27,000 kW (13,500 each)

HYDROLOGIC DATA

REPRESENTATIVE STREAMFLOW RECORDS (ANDERSON RANCH UNREGULATED INFLOW)
RECORDS (YEARS). . . . . 1943 through 1980

NATURAL DISCHARGE SUMMARY
MAXIMUM. . . . . 10,072 cfs on 25 May 1956
MINIMUM. . . . . .less than 100 cfs on numerous occasions
AVERAGE (1943 - 1980). . .1,024 cfs

ARROWROCK PROJECT
Pertinent Data

GENERAL

LOCATION

STATE	Idaho
COUNTY	Elmore
RIVER	Boise River
RIVER MILE	75.4
TOWNSHIP	3 North
RANGE	4 East
SECTION	East 1/2 of Section 13
LATITUDE	43°35'40"
LONGITUDE	115°55'19"
LOCATION FROM NEARBY COMMUNITY	25 miles east of Boise

BASIN

DRAINAGE AREA	2,230 square miles
BASIN INCHES	1 basin inch = 117,867 acre-feet

RESPONSIBLE AGENCY	U.S. Bureau of Reclamation
STATUS	Completed in 1915. Raised 5 feet in 1937
COST	$5,200,000

RESERVOIR

AREA (NORMAL FULL POOL)	3,150 acres
LENGTH	17 miles
AVERAGE WIDTH	1,500 feet

ELEVATIONS (FEET MEAN SEA LEVEL)

TOP OF PARAPET WALL	3,219.75
CREST OF DAM	3,216
NORMAL FULL POOL	3,216
TOP OF INACTIVE POOL	2,974
STREAMBED AT DAM AXIS	2,959

STORAGE

FREEBOARD		.0 feet
SURCHARGE CAPACITY	3,216 to 3,219.75 feet MSL	11,630 acre-feet
JOINT USE CAPACITY	2,974 to 3,216 feet MSL	286,600 acre-feet
TOTAL ACTIVE CAPACITY	2,974 to 3,216 feet MSL	286,600 acre-feet
TOTAL GROSS CAPACITY	2,974 to 3,219.75 feet MSL	298,230 acre-feet

DAM

TYPE	Gravity section, concrete arch

DIMENSIONS (FEET)

STRUCTURAL HEIGHT	350
HYDRAULIC HEIGHT	257
BASE WIDTH	223
CREST WIDTH	16
CREST LENGTH	1,150

DAM (Continued)
ELEVATION AT CREST . . . . . 3,219.75 feet MSL
VOLUME . . . . . 636,000 cubic yards

SPILLWAY

TYPE. . . . . .Gated and lined side channel
GATE DESCRIPTION. . . . .Six drum gates, 6 by 62 feet
ELEVATIONS (FEET MSL)
SPILLWAY CREST. 3,210
TOP OF GATES (IN PLACE) . 3,216
DESIGN CAPACITY 3,219.75

DESIGN CAPACITY. . . . . .40,000 cfs

OUTLET WORKS

NO., TYPE, AND CONTROL. 25 outlets in three tiers
UPPER TIER. . . . . Ten 52-inch-diameter outlet tunnels at elevation 3,105 feet controlled by 58-inch-diameter balanced needle valves.
LOWER TIER. . . . . Ten 58-inch balanced-needle valves control three 72-inch-diameter outlets and seven 52-inch-diameter outlet tunnels at elevation 3,018 feet. Valve numb one (72-inch tunnel) is inoperable.
SLUICE OUTLETS. . . . Five 60-inch-diameter sluice outlets with 5-by-5-foo gates at elevation 2,967 feet. Sluice gate number 5 is inoperable.

NOTE: Lower tier outlets may only be used when the water surface elevation is between 3,105 and 3,018 feet. Sluice outlets may only be used when water surface elevation is below 3,018 feet MSL.

DISCHARGE CAPACITY

ELEVATION (FEET MSL)	DISCHARGE (cfs)	OUTLETS USED
3,216 (normal full pool). . . .	.10,230.	10 upper tier
3,110	2,170.	10 upper tier
3,105 (centerline upper tier) . .	7,803.	9 lower tier
3,020	1,395.	9 lower tier
3,018 (centerline lower tier) . .	3,200.	4 sluice outlets

POWERPLANT FACILITIES. . . .None installed

HYDROLOGIC DATA

REPRESENTATIVE STREAMFLOW RECORDS (ARROWROCK UNREGULATED TOTAL INFLOW)
RECORDS (YEARS). . . . . 1918 through 1980

NATURAL DISCHARGE SUMMARY
MAXIMUM. . . . . 22,536 cfs on 23 December 1964
MINIMUM. . . . . .less than 500 cfs on numerous occasions
AVERAGE (1918 - 1980). . .2,394 cfs

LUCKY PEAK PROJECT
Pertinent Data

GENERAL

LOCATION

STATE	Idaho
COUNTY	Ada
RIVER	Boise River
RIVER MILE	63.8
TOWNSHIP	2 North
RANGE	3 East
SECTION	SW¼ of NW¼ of Section 12
LATITUDE	43°31'31"
LONGITUDE	116°03'15"
LOCATION FROM NEARBY COMMUNITY	9 miles southeast of Boise

BASIN

DRAINAGE AREA	2,680 square miles
BASIN INCHES	1 basin inch = 142,933 acre-feet

RESPONSIBLE AGENCY	U.S. Corps of Engineers
STATUS	Complete, storage began 16 October 1954
COST	$19,900,000

RESERVOIR

AREA (NORMAL FULL POOL)	2,820 acres
LENGTH	11.8 miles
AVERAGE WIDTH	2,000 feet

ELEVATIONS (FEET MEAN SEA LEVEL)

CREST OF DAM	3,078
MAXIMUM DESIGN WATER SURFACE	3,072
TOP OF UNCONTROLLED SPILLWAY	3,060
NORMAL FULL POOL	3,055
TOP OF INACTIVE POOL	2,905
STREAMBED AT DAM AXIS	2,824

STORAGE

SPILLWAY FREEBOARD	3,055 to 3,060 feet MSL	5 feet
SURCHARGE CAPACITY	3,055 to 3,060 feet MSL	(13,905) acre-feet
JOINT USE CAPACITY	2,905 to 3,055 feet MSL	264,371 acre-feet
INACTIVE CAPACITY	2,824 to 2,905 feet MSL	28,767 acre-feet
TOTAL ACTIVE CAPACITY	2,905 to 3,055 feet MSL	264,371 acre-feet
TOTAL CAPACITY	2,824 to 3,055 feet MSL	293,138 acre-feet
TOTAL GROSS CAPACITY	2,824 to 3,060 feet MSL	307,043 acre-feet

LUCKY PEAK PROJECT (Continued)
Pertinent Data

DAM

TYPE . . . . . Rolled earth and gravel fill

DIMENSIONS (FEET)
STRUCTURAL HEIGHT 340
HYDRAULIC HEIGHT. 238
BASE WIDTH. 1,350
CREST WIDTH 30
CREST LENGTH. 1,700

ELEVATION AT CREST . . . . . 3,078 feet MSL
VOLUME . . . . . 5,900,000 cubic yards (estimate)

SPILLWAY

TYPE. . . . . 600-foot length, free crest, unlined channel

ELEVATIONS (FEET MSL)
SPILLWAY CREST. 3,060
CAPACITY. 3,072

DESIGN CAPACITY. . . . . .93,300 cfs

OUTLET WORKS

NO., TYPE, AND CONTROL. . One 23-foot-diameter steel-lined tunnel with manifold. Intake invert at elevation 2,824 feet MSL.

DISCHARGE CAPACITY
NORMAL FULL POOL (3,055 feet MSL). . . . . .~~30,500~~ 28500 1/ cfs
MINIMUM POOL (2,905 feet MSL). . . . . .17,000 cfs

POWERPLANT FACILITIES. . . .None installed

HYDROLOGIC DATA

REPRESENTATIVE STREAMFLOW RECORDS (LUCKY PEAK TOTAL UNREGULATED INFLOW)
RECORDS (YEARS). . . . . 1895 through 1980

NATURAL DISCHARGE SUMMARY
MAXIMUM. . . . . 35,500 cfs on 14 June 1896
MINIMUM. . . . . .less than 500 cfs on numerous occasions
AVERAGE (1895 - 1980). . .2,828 cfs

1/ relined intake tunnel reduced hydraulic Capacity

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PLATES

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PLATES (Continued)

EXHIBITS

I - INTRODUCTION

1-01. Authorization. This Water Control Manual has been prepared pursuant to authority contained in Section 7 of ER 1110-2-240, "Engineering and Design - Reservoir Regulation," dated 22 April 1970. The format and content of this Manual are in accordance with criteria set forth in EM 1110-2-3600, dated 25 May 1959, and ETL 1110-2-251, "Engineering and Design - Preparation of Water Control Manuals," dated 14 March 1980.

In addition to OCE directives to maintain up-to-date manuals, the revision of the Boise River Regulation Manual was requested by the State of Idaho in 1974. In May 1974, the Governor of Idaho requested the Department of Water Resources to make a review of Boise River flood control management, identify problems, examine the potential of various alternatives, and present recommendations which would lead to improved operation. A report to the Governor entitled "Review of Boise River Flood Control Management" was completed in November 1974 by the Department of Water Resources. This report contained several major recommendations, with the primary one being that a new Reservoir Regulation Manual should be prepared with an appropriate supporting agreement.

1-02. Purpose and Scope. The purpose of this Manual is to present information pertinent to the regulation of the Boise River reservoir system. Criteria and information within this Manual replace the contents of the "Reservoir Regulation Manual for Boise River Reservoirs," U.S. Army Engineer District, Walla Walla, August 1956. Items discussed within this Manual are as listed below:

a. Description of Projects.

b. History of Projects.

c. Basin Characteristics.

d. Data Collection and Communication Networks.

e. Hydrologic Forecasts.

f. Water Control Plan.

g. Effect of Water Control Plan.

h. Water Control Management.

1-03. Related Manuals and Reports. The following list outlines some of the key manuals and reports which contain information and data which are or have been pertinent to the regulation and operation of the Boise River reservoirs.

a. Standing Operating Procedures - Anderson Ranch Dam and Reservoir - Boise Project, Idaho; U.S. Bureau of Reclamation, 18 April 1978.

b. Standing Operating Procedures - Arrowrock Dam and Reservoir - Boise Project, Idaho; U.S. Bureau of Reclamation, 20 April 1978.

c. Operation and Maintenance Manual - Lucky Peak Project; U.S. Army Engineer District, Walla Walla, 1959.

d. Standing Operating Procedures - Boise River Diversion Dam - Boise Project, Idaho; U.S. Bureau of Reclamation, 20 April 1978.

e. Standing Operating Procedures - Deer Flat Embankments and Lake Lowell Reservoir - Boise Project, Arrowrock Division, Idaho; U.S. Bureau of Reclamation, 12 July 1979.

f. Reservoir Regulation Manual for Boise River Reservoirs; U.S. Army Engineer District, Walla Walla, August 1956.

g. Review of Boise River Flood Control Management; Idaho Department of Water Resources, November 1974.

h. Final Environmental Impact Statement - Lucky Peak Dam and Lake - Boise River, Idaho; U.S. Army Engineer District, Walla Walla, August 1976.

i. Master Plan for Lucky Peak Lake; U.S. Army Engineer District, Walla Walla. Expected date of approval: 1985.

j. Flood Emergency Subplans - Identification, Operation, Repair, Notification, and Inundation Maps - Lucky Peak Lake - Boise River, Idaho; U.S. Army Engineer District, Walla Walla, August 1982.

k. Final Environmental Statement and Feasibility Report - Anderson Ranch Powerplant Third Unit - Boise Project, Idaho; U.S. Bureau of Reclamation, 2 June 1982.

l. Memorandum of Agreement and Reservoir Management Plan between the Forest Service - U.S. Department of Agriculture and the Bureau of Reclamation - U.S. Department of the Interior, 1976.

1-04. Project Owners and Operators. The Bureau of Reclamation (Pacific Northwest Regional Office and Central Snake Projects Office) owns and operates the Anderson, Arrowrock, and Diversion Dam projects and facilities. The Bureau also owns the New York Canal and Lake Lowell projects and facilities, but the Boise Project Board of Control operates them under an operation and maintenance contract with the Bureau. The Walla Walla District Corps of Engineers owns and operates the Lucky Peak project and its facilities.

1-05. Regulating Agencies. Regulation of the Anderson, Arrowrock, and Lucky Peak projects is a joint effort between the Bureau of Reclamation, Corps of Engineers, and the Boise River Watermaster. The Boise Project Board of Control regulates the New York Canal and Lake Lowell.

1-06. Revisions to This Manual. The Boise River reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) are regulated jointly by the Bureau of Reclamation and the Corps of Engineers through a "Memorandum of Agreement Between the Department of the Army and the Department of the Interior for Flood Control Operation of Boise River Reservoirs," dated 20 November 1953. Within Article 7 of the 20 November 1953 Agreement, there are provisions to change or modify the operating plan and procedures if operating experience indicates revisions are needed. Salient features of the Agreement are summarized in paragraph 3-07. of this Manual on pages 3-4 and 3-5.

Since the operating criteria and procedures in the Agreement did not reflect current conditions, needs, and technology, the Bureau, Corps, and State of Idaho jointly agreed to revision of operating criteria and procedures in the Agreement through the Memorandum of Understanding shown in Exhibit C of this Manual. The Memorandum of Understanding is a supplement to the Agreement, which does not change its terms, but rather incorporates a new operating agreement under Article 7 of the 20 November 1953 agreement. The primary features of the Memorandum of Understanding

are: (1) the Boise River reservoirs will be regulated according to criteria and procedures in the Water Control Manual dated April 1985, and (2) revisions to the regulation criteria or procedures shall become effective after a Letter of Agreement for Revisions (which shall specify the nature of the revisions) is signed by authorized Bureau and Corps representatives. No formal document will be necessary for revisions to other portions of this Manual. Revisions to this Manual will be made in accordance with Article 7 of the 20 November 1953 Agreement and paragraph e. of the Memorandum of Understanding (Exhibit C).

As a continuing program, it will be necessary to review this Manual annually in order to keep it up to date.

II - DESCRIPTION OF PROJECTS

2-01. Boise River Reservoir System. Within the Boise River Basin, four separate Federal reservoir projects are being operated as one system, referred to as the "Boise River Reservoir System." This system is composed of three Boise River reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) and an offstream reservoir (Lake Lowell and its related facilities - Diversion Dam and the New York Canal). The three upper reservoirs have a combined gross storage capacity of approximately 1.109 million acre-feet and a usable (active) storage capacity of approximately 0.974 million acre-feet. The upper three reservoir systems are used to control Boise River water for irrigation, flood control, power generation, recreation, and fish and wildlife. The geographical locations of these projects are shown on Plate 2-1. The project descriptions given within this section cover the three Boise River reservoirs, and the Diversion Dam and Lake Lowell.

2-02. Anderson Ranch.

a. Location. Anderson Ranch Dam is located approximately 124 river miles above the mouth of the Boise River and is the most upstream reservoir within the system. The following tabulation outlines the location of the dam.

Anderson Ranch

Stream: South Fork of the Boise River.
River Mile: 43.5 (South Fork).
Drainage Basin: Boise River.
State: Idaho.
County: Elmore.
Location from nearby communities:51/4
28 miles northeast of Mt. Home.
75 miles southeast of Boise.

1/ Approximate road mileage.

b. Project Purposes. Anderson Ranch is a multipurpose project which controls water from the 980-square-mile drainage area above the dam. The project provides irrigation water, flood control, power generation, and recreation. It also provides a permanent dead storage pool for the preservation and propagation of fish and wildlife and silt control. Refer to Section VII - WATER CONTROL PLAN for the system use priorities and regulation plans.

c. Physical Components. The following paragraphs discuss in general terms the physical components of the Anderson Ranch project (both structural and the reservoir). More detailed information on these items is available in the Standing Operating Procedures - Anderson Ranch Dam, Boise Project, Idaho, Pacific Northwest Region, Bureau of Reclamation. Plate 2-2 shows the general plan and sections for Anderson Ranch Dam.

(1) Dam. Anderson Ranch Dam is a rolled earth and rockfill embankment. The dam has a structural height of 456 feet, a hydraulic height of 330 feet, and a crest length of 1,350 feet. Crest width is 40 feet and provides an area for a gravel roadway across the dam. Base width of the dam is 2,650 feet. The upstream face of the dam is on a 1V on 3H slope from the crest elevation of 4206 down to elevation 4092, a 1V on 3.5H slope down to a 50-foot berm at elevation 3960, and a slope of 1V on 3.5H to the base from 3960 to 3870. The downstream face is a 1V on 2H slope from the crest to elevation 4092, 1V on 2.25H slope to elevation 3960, then 1V on 8H slope to the base. Both faces are covered with protective riprap. Material volume of the dam is approximately 9.653 million cubic yards.

(2) Spillway. The spillway is located on the south or left abutment of the dam. It is a gated, concrete-lined open channel or chute approximately 1,100 feet long and 53 feet wide at the top and 100 feet wide at the bottom. The lower end of the chute is supported on a reinforced concrete structure in which the outlet pipes and valves are installed. The crest elevation of the spillway is at 4174 and the lower end of the chute is at elevation 3885.

Discharge over the spillway is regulated with two 25-foot-wide by 22-foot-high radial gates. These gates are made of a structural steel framework, two radial supporting arms, and face plates to cover the upstream sides. The downstream sides of the gates are covered by steel plates to improve the appearance and to prevent trash from collecting on the beams. The arms rotate on pin bearings supported by brackets on the structure sidewalls. Gate hoists installed on the spillway structure operating deck and hoisting cables are used to raise and lower the gates. The tops of the radial gates (in place) are at elevation 4196. The design capacity of the two gates is 20,000 cfs at the full-open position (bottom of gates at 4198). Plate 2-3 shows Anderson Ranch Dam spillway discharge curves.

An ice-prevention air system maintains an ice-free area about 10 feet wide in front of the spillway radial gates during freezing weather and thus prevents ice pressure against the gates. Two electric-motor-driven air compressors and a distribution piping system are used to supply air bubbles which lift warmer water from the lower reservoir depths during the winter. The warmer water reaching the surface then provides the ice-free area.

A spillway stilling basin is located directly below the spillway. It is made of reinforced concrete and is 100 feet wide and 219 feet long. The stilling basin floor elevation is 3830 and has a dentated sill near the upstream end and downstream end (elevation 3860). Capacity of the stilling basin is 30,000 cfs to accommodate full releases from the spill-way (20,000 cfs) and the 10,000-cfs outlet works. Tailwater elevation at 30,000-cfs discharge is 3873.70.

(3) Outlet Works. The outlet works are designed for maximum discharge of 10,000 cfs at a normal reservoir pool elevation of 4196 and a maximum discharge of 7,200 cfs at a minimum pool elevation of 4039.6. The outlet works consist of the following:

(a) Trashrack-protected sloping intake structure.

(b) Outlet tunnel (concrete-lined tunnel and a plate steel penstock).

(c) Penstock manifold with turbine branch penstock openings and outlet pipes.

A trashrack-protected sloping intake structure is located northeast of the spillway structure. The intake structure consists of a concrete slab, fixed-wheel gate, gate rails, hydraulic gate hoist, and a protective trashrack. The structure extends from elevation 3970 to 4211.42 and has a 1V on 1.5H slope. A 15.25-foot-wide by 30-foot-high fixed-wheel gate (bulkhead) is installed on the intake structure to close the outlet tunnel during periods of maintenance repairs. This bulkhead is normally only raised or lowered under balanced-head conditions. During periods of low reservoir heads (100 feet or less - elevation 4100) the bulkhead may be used to regulate flow into the outlet tunnel. The bulkhead is a flat, structural steel leaf with 10 fixed wheels on each side of the leaf to carry the bulkhead load on rails. The bulkhead operates in an inclined slot leading from the top of the intake structure to the outlet tunnel. Lateral movement of the bulkhead is limited by means of two guide rollers on each side of the leaf which bear against guide plates on each side of the bulkhead slot. The bulkhead is raised and lowered with an oil-pressure-operated hydraulic hoist mounted at the top of the bulkhead slot and is connected to the bulkhead by removable bulkhead stem sections 15 feet long and 6.75 inches in diameter. Each bulkhead stem section is supported at the upper end by a carriage having wheels that operate on rails near the center of the bulkhead slot. The bulkhead weighs approximately 257,000 pounds and can be moved between elevations 4000 and 4185.5. A protective trashrack encloses the intake structure and bulkhead equipment.

The outlet tunnel consists of a 20-foot-diameter concrete-lined tunnel and a 15-foot-diameter plate-steel penstock. Refer to Plate 2-2, General Plan and Sections. The outlet tunnel is approximately 1,500 feet in length and extends from the intake structure to the tunnel portal. The 15-foot-diameter penstock is about 830 feet in length and extends downstream from the tunnel plug to the tunnel portal where it is connected to the penstock manifold. From the tunnel plug to the tunnel portal, the penstock is supported by support rings bearing on concrete pads on both sides of the penstock. Beginning at elevation 4000 (centerline of the intake tunnel on the intake structure), the tunnel has an initial slope of 0.450, then a slope of 0.2251, and a final slope of 0.0068 to the tunnel plug. The outlet tunnel invert at the intake structure is at elevation 3992. From the tunnel plug the 15-foot-diameter penstock has a slope of 0.0068 to the tunnel portal.

The penstock manifold, turbine branch penstocks, and outlet pipes beyond the penstock portal are embedded in concrete. (Refer to Plate 2-4). Three 90-inch-inside-diameter, plate-steel turbine branch penstocks (power penstocks) branch off on 33-foot centers from the manifold (centerline at elevation 3870) and lead into the powerplant. The manifold is reduced in size (transitions) beyond the turbine branch penstocks intakes to supply five 72-inch, plate-steel outlet pipes. The centerline elevation of each of the outlet pipes is 3872 and the pipes are set on 20-foot centers.

Flow from the outlet pipes is controlled by a 72-inch, hollow-jet valve installed on the end of each pipe. The hollow-jet valve is attached to the flange of the outlet pipe which extends beyond the concrete-embedded portion into the valve chamber. The valve chamber is provided with stoplog grooves on the stilling basin end so that, with the installation of stoplogs, a valve may be taken out of service while the remaining outlets may be discharging. Each valve control is located directly above the valve on the operating floor and consists of a motor-driven reduction unit driving the valve operating shaft. Each valve is designed to regulate the discharge of water through the outlet pipe from zero to a maximum of 2,500 cfs. Maximum discharge of all five outlet pipes together is limited to 10,000 cfs. Plate 2-5 shows Anderson Ranch Dam outlet works discharge rating chart.

One 72-inch, ring-follower gate is installed in each of the outlet pipes ahead of and used as an emergency and guard gate for the hollow-jet regulating valve. The ring-follower gates are normally in the full-open or full-closed position and are not designed to regulate the flow of water through the outlet pipes. These gates are hydraulically actuated and are designed to be normally opened and closed under balanced-head conditions; however, the design allows for emergency closure of the gates with unrestricted flow through the outlet pipe.

(4) Powerplant Facilities. Anderson Ranch Dam was designed for a total of three generating units. Presently, two units are installed and operating and the third unit installation is planned for the future. (Refer to Plate 2-6). The powerplant facilities consist of the following:

(a) Power penstocks.
(b) Butterfly valves.
(c) Draft-tube bulkheads.
(d) Hydraulic turbines.
(e) Generators.
(f) Transformers.
(g) Transmission lines.

Three power penstocks are connected to the penstock manifold previously described in the outlet works. Each of the three power penstocks is plate steel and has an inside diameter of 90 inches. Two of the three penstocks are waterways for the two existing generating units; the third penstock is presently capped. The centerline of the power penstocks is at elevation 3873 and the penstocks are set on 33-foot centers.

A 100-inch butterfly valve is installed in each of the two operating penstocks and is used as a shutoff valve at the inlet of the hydraulic turbine scroll case. The butterfly valve may be closed in emergencies and is normally closed when its unit is to remain shut down for a prolonged period or to permit unwatering the scroll case prior to inspecting or servicing of the unit. Opening or closing the valve is effected by rotating the horizontally pivoted valve leaf through 90 degrees by means of a piston in a hydraulic cylinder. Each valve is equipped with two bypass lines to equalize the water pressure on the two sides of the leaf before it is opened.

Draft-tube bulkheads, approximately 10 feet wide by 7 feet high, are provided for sealing of the turbine draft-tube openings when a turbine is shut down and unwatering of the draft tube is required. The bulkheads are lowered and raised by a 2-ton, hand-operated, twin-lift chain hoist suspended on a movable hoist frame.

Two vertical-shaft (Francis reaction type, 277 rpm) hydraulic turbines (centerline elevation 3873) are presently installed and operating at the powerplant. Each turbine has 20 movable wicket gates to control the supply of water to the turbine runner. The number of gates and the number of vanes or water passages in the runner are coordinated in a manner to ensure that the turbine will operate without objectionable vibration. Each turbine has a rated capacity of 18,500 horsepower at full-gate opening when operating under a net effective head of 245 feet. At heads above 245 feet, the turbine output is limited to the generator capacity by operating at restricted turbine gate openings. The point of best efficiency is obtained at 260 feet net effective head with a turbine output of approximately 17,000 horsepower. The discharge and plant factor upon which the turbines are based is 3,075 acre-feet per day, or 1,550 cfs, and a plant factor of approximately 45 percent.

A vertical-shaft generator is connected to each of the two existing turbines. Each generator is rated 20,000 kilowatts, 100-percent power factor, 3 phase, 60 cycles, 6,900 volts, and 277 rpm. The maximum possible output of the initial two-unit installation was 30,000 kilowatts at rated head (245 feet) and a power factor of 1.0 and 15,000 kilowatts at minimum head (170 feet). Installed capacity of the plant is 40,000 kilowatts (20,000 kilowatts for each unit). A powerhouse structure encloses the generators and the related operating equipment.

Each generator is connected through 6,900-volt cables to an outdoor-type, self-cooled, step-up transformer bank installed in the switchyard. The switchyard, located adjacent to the powerplant, uses a single bus connected to the outgoing 115,000-volt transmission line through a gang-operated disconnecting switch. Each transformer bank is connected to the bus through a single 115,000-volt oil circuit breaker. Anderson Ranch powerplant was designed to be operated manually from the main control board and no remote control or automatic reclosing of oil circuit breakers is provided. Therefore, it is necessary for the plant to be attended at all times.

(5) Reservoir. The reservoir pool level behind the Anderson Ranch Dam normally fluctuates between pool elevations of 4039.6 and 4196 (156.4 feet). The following tabulation outlines key reservoir elevations and capacity allocations:

Anderson Ranch Reservoir

Reservoir Element	Elevation
Crest of dam	4206
Maximum design water surface	4198.2
Normal full pool	4196
Top of inactive pool	4039.6
Top of dead storage pool	3992
Streambed at dam axis	3866
Lowest point of foundation excavation	3750

Storage Element	Elevation Range	Allocation
Freeboard	4198.2 to 4206	7.8 Feet
Surcharge	4196 to 4198.2	10,504 AF
Joint Use	4044 to 4196	418,178 AF
Exclusive power	4039.6 to 4044	5,000 AF
Inactive	3992 to 4039.6	41,000 AF
Dead	3866 to 3992	29,000 AF
Total active capacity	4039.6 to 4196	423,178 AF
Total live capacity	3992 to 4196	464,178 AF
Total gross capacity	3866 to 4198.2	503,682 AF

Table 2-1, Page T 2-1, lists the elevation-capacity data for Anderson Reservoir.

The reservoir at normal full pool elevation 4196 is an impoundment over a mile wide at its broadest point and 13 miles long with a surface area of 4,740 acres. Anderson Ranch Reservoir has approximately 58 miles of shoreline at normal full pool.

(6) Public Facilities. Recreation areas on Anderson Ranch project lands are administered by the U.S. Forest Service as part of the Boise National Forest under a Memorandum of Agreement with the U.S. Bureau of Reclamation dated 19 January 1970. Table 2-2 (below) lists recreation sites and Plate 2-7 shows the location of recreation sites on project lands adjacent to the reservoir.

TABLE 2-2
Anderson Ranch Reservoir Recreation Areas

Area	Facilities	Activities
	Campgrounds:	
Castle Creek	2 units, toilets	Camping, fishing, boating
Evans Creek	1 unit, toilets	Camping, fishing
Little Wilson Creek	2 units, toilets	Camping, fishing, boating
	Boating Sites:	
Curlew Creek	Ramp, parking, water, toilet, picnic areas	Boat launching, picnicing, undeveloped camping
Deer Creek	Ramp, parking, water, toilet, picnic areas	Boat launching, picnicing, undeveloped camping
Elk Creek	Ramp, parking, toilets	Boat launching
Fall Creek	3 ramps, parking, toilets	Boat launching
Pine Airport	Ramp, parking, toilets	Boat launching, picnicing, undeveloped camping
	Points of Interest:	
Anderson Ranch Dam	Overlook area	Sightseeing
	Other Sites:	
Fall Creek Lodge (commercial)	Food, water, toilets, gas	

Existing facilities at Anderson Ranch recreation sites are generally primitive. None of the sites has developed water supplies. All recreation sites are accessible by road. The recreation areas from Castle Creek upstream to Curlew Creek receive the highest use. Curlew Creek is a popular site with excellent facilities.

Boat launching facilities are located at Curlew Creek, Deer Creek, Elk Creek, Fall Creek, and Pine Airport but only Elk Creek, Fall Creek, and Curlew Creek ramps are usable below normal full pool (elevation 4196). The Elk ramp has a low-water elevation of 4166. Fall Creek has three launching ramps but only two of the ramps are usable below normal full pool and have an estimated low-water elevation of 4181. The Curlew Creek ramp has a low-water elevation of 4116.

2-03. Arrowrock.

a. Location. Arrowrock Dam is located approximately 75 river miles upstream of the mouth of the Boise River and is approximately 49 river miles below Anderson Ranch Dam. Lucky Peak Reservoir is directly downstream of Arrowrock Dam, and during high pool periods water within Lucky Peak Reservoir is backed onto the downstream face of Arrowrock Dam. The following tabulation outlines the location of the dam.

Arrowrock Dam

Stream: Boise River.
River Mile: 75.4.
Drainage Basin: Boise River.
State: Idaho.
Counties: Boise and Elmore.
Location from nearby
community: 25 miles east of Boise.51/4

1/ Approximate road mileage.

b. Project Purposes. Arrowrock is a multipurpose project which controls water from the 1,230-square-mile drainage area above Arrowrock Dam and below Anderson Ranch Dam. The project further regulates releases from Anderson Ranch Dam and provides irrigation water, flood control, and recreation. Refer to Section VII - WATER CONTROL PLAN for the system use priorities and regulation plans.

c. Physical Components. The following paragraphs discuss in general terms the physical components of the Arrowrock project (both structural and the reservoir). More detailed information on these items is available in the Standing Operating Procedures - Arrowrock Dam, Boise Project, Idaho, Pacific Northwest Region, Bureau of Reclamation. Plate 2-8 shows the general plan and sections for Arrowrock Dam.

(1) Dam. Arrowrock Dam is a thick-arch concrete structure with an arch radius of 661.74 feet. The dam has a structural height of 350 feet, a hydraulic height of 257 feet, and a crest length of 1,150 feet. Crest width is 16 feet and provides a road across the dam. The crest elevation is at 3216 for the top of dam roadway and 3219.75 for the top of the parapet wall. Maximum base width of the dam is 223 feet. The upstream face of the dam is set on a near-vertical slope. The downstream face of the dam has a slope of 1V on 0.65H between elevations 3140 and 3170, a slope of 1V on 0.67H between elevations 3010 and 3140, a slope of 1V on 0.70H between elevations 2930 and 3010, and a slope of 1V on 0.80H between elevations 2901 and 2930. The dam contains approximately 636,000 cubic yards of concrete.

There are three operating galleries within the dam. One gallery is at elevation 3090.5 and is approximately 455 feet long. The second gallery is at elevation 3003.5 and is approximately 310 feet long. The third gallery is located at elevation 2980 and is approximately 330 feet long. Access to the three operating galleries is by three entrances to the interior of the dam and stairways within the dam.

The dam contains an internal drainage system in which there are two types of drains. These are foundation drains and collector drains. Water that is picked up from the drains in the upper elevations of the dam is passed to the downstream surface of the dam and spilled at approximately elevation 3090. Other water from drains is collected in the sump pump at operating gallery elevation 2980.

(2) Spillway. The spillway is located in a granite cut at the right side of the dam. It is a gated and lined side channel. The channel is trapezoidal in shape and approximately 800 feet in length. Channel sideslopes are 1V on 2H and the bottom slope begins at 0.12V on 1H and tapers to 0.03V on 1H. Water leaving the channel falls uncontrolled down the right abutment about 400 feet from the end of the dam. The crest of the spillway weir is at elevation 3210.

The effective crest of the spillway is controlled by six drum gates. Each drum gate is 62 feet long, 6 feet high, and separated by 6-foot piers. The drum gates are made of structural steel and are hydraulically operated. The gates act between elevations 3210 and 3216 and are operated only in either the low or high position since there is no stop in between. For pool elevations of 3210 or above, the spillway is used as much as possible to regulate discharges from Arrowrock. Discharges are regulated to some extent by using a combination of the drum gates in the two positions. For example, four gates may be at the 3216 position and two gates at 3210, or five gates may be at 3216 and one at 3210. The spillway capacity maximum flow at a maximum reservoir surface elevation of 3219.75 (the top of the dam parapet wall) is 40,000 cfs. Maximum operating reservoir surface, with the gates in the open position, is set at elevation 3216.

(3) Outlet Works. The outlet works consist of two horizontal rows of 10 discharge outlets each and five low-elevation sluice gates. The outlet works are designed for a maximum discharge of 21,800 cfs at the normal reservoir pool elevation of 3216 under emergency conditions. Maximum discharge capacity otherwise is 10,200 cfs. Outlet capacity at the minimum pool elevation of 2967 is 2,100 cfs. Plate 2-9 is an isometric drawing of the outlet layout.

The upper row of discharge outlets is located at elevation 3105 and consists of 10 outlet pipes (numbers 11 through 20), each approximately 70 feet long and set on 12.5-foot centers. Each outlet pipe is 52 inches in diameter and is lined with steel for the first 9 feet with the remainder being concrete. Ten 58-inch balanced needle valves (numbers 11 through 20) control the flow through the outlet pipes. The needle valves are hydraulically opened and closed using electric-motor-driven horizontal centrifugal pumps. Valves numbers 11, 12, 13, 14, 18, 19, and 20 must be operated in either fully opened or fully closed positions, while valves numbers 15, 16, and 17 are equipped with positive controls to limit valve openings to any desired partially open position. Flows from the upstream side of the dam travel through the valves and outlet pipes and are discharged to the open air on the downstream side of the dam. Rectangular, radially spaced bar trashracks on the upstream face of the dam protect the valves from trash.

The lower row of discharge outlets is located at elevation 3018 and consists of 10 outlet pipes (numbers 1 through 10), each approximately 130 feet long. Outlets numbers 1, 2, and 3 are 72 inches in diameter and discharge into a diversion tunnel. Outlets 4 through 10 are 52 inches in diameter and have the same arrangement as the upper outlets. All 10 outlets have 58-inch, balanced needle valves like those installed on the upper outlets. Valve and outlet number 1 are no longer operable and the outlet pipe has been plugged. Valves in the lower outlets are operated in the same manner as the upper outlets, and valves numbers 4, 5, and 6 are equipped with the positive controls. All valves are protected by trashracks.

The Bureau of Reclamation has placed restrictions on the use of the lower valves. The lower valves (elevation 3018) are not to be used when the reservoir pool is above elevation 3105 because of vibration damages which occur as a result of high heads. Not using the lower valves does limit vibration damages, but it also seriously limits discharge capabilities. Table 2-3, page T2-2, outlines valve and spillway discharge capacities for varying reservoir pool elevation conditions.

The sluice gates consist of five 60-inch-diameter tunnels, each with a 5-foot by 5-foot hydraulic-operated slide gate, trashrack, and an upstream bulkhead for closing the tunnel for inspection and maintenance. Centerline elevation of the sluice gates is 2967. Currently, only gates 1 through 4 are operational. Gate 5 is no longer used and the trashrack for it has been removed.

The Bureau of Reclamation has placed restrictions on use of the sluice gates. The sluice gates are used for releases only when the reservoir elevation is below 3018 and the Lucky Peak Lake elevation is below the outlets. These gates can be used to drain Arrowrock Reservoir, but they should never be opened with less than 15 to 20 feet difference in head between Arrowrock and Lucky Peak Reservoirs. (The head difference is necessary to prevent mud from washing into the gates from Lucky Peak Lake and preventing closure of the sluice gates.)

(4) Power Facilities. Arrowrock Dam presently has no generating units installed but the dam was designed so that power facilities could be added in the future. Outlets 1, 2, and 3 were designated as power tunnel outlets and they currently are connected to a diversion tunnel. Power generation potential at Arrowrock Dam was substantially reduced when Lucky Peak Dam was constructed since water backs up on the downstream face of Arrowrock Dam and thus reduces the effective power head. The Bureau of Reclamation is presently evaluating the feasibility of power at Arrowrock Dam and perhaps power generation will be installed in the future.

(5) Reservoir. The reservoir pool level behind Arrowrock Dam normally fluctuates between pool elevations of 2974 and 3216 (242 feet). The following tabulation outlines key reservoir elevations and capacity allocations:

Arrowrock Dam

Reservoir Element	Elevation
Top of parapet wall	3219.75
Crest of dam	3216
Normal full pool	3216
Top of inactive pool	2974
Streambed at dam axis	2959
Lowest point of foundation excavation	2866

Storage Element	Elevation Range	Allocation
Freeboard		0 Feet
Surcharge	3216 to 3219.75	11,630 AF
Joint use	2974 to 3216	286,600 AF
Total active capacity	2974 to 3216	286,600 AF
Total gross capacity	2974 to 3219.75	298,230 AF

Table 2-4, Page T2-3, lists the elevation-capacity data for Arrowrock Reservoir.

The reservoir at normal full pool elevation 3216 is an impoundment with a surface area of 3,150 acres and 60 miles of shoreline. Two prominent reservoir arms extend up the Middle Fork and South Fork of the Boise River. The Middle Fork reservoir arm is about 9 miles long from the dam to the upper end of the reservoir. The South Fork reservoir arm is about 7 miles long from its confluence with the Middle Fork to the upper end of the reservoir. Arrowrock Reservoir is approximately 1/2-mile wide at its broadest point above Grouse Creek because of the generally steep terrain along the reservoir shoreline.

Access to either arm of the reservoir is over good standard gravel or sandy surfaced roads. About 4 miles of the South Fork arm and the south and east sides of the Middle Fork arm are inaccessible except by foot, horseback, or boat.

(6) Public Facilities. Recreation areas on Arrowrock project lands are administered by the U.S. Forest Service as part of the Boise National Forest under a Memorandum of Agreement with the Bureau of Reclamation dated 30 July 1952. Table 2-5 (below) lists recreation sites, and Plate 2-10 shows the location of these recreation sites on project lands.

TABLE 2-5
Arrowrock Reservoir Recreation Areas

Area	Facilities	Activities
Campgrounds:		
Cottonwood Creek	3 units, toilets	Camping, fishing, picnicking
Irish Point	Undeveloped, water, toilets	Undeveloped camping, fishing, picnicking
Willow Creek	10 units, water, toilets	Camping (trailers allowed), fishing, picnicking
Boating Sites:		
Arrowrock	Ramp, parking, toilets	Boat launching
Points of Interest:		
Arrowrock Dam		Sightseeing

Boating facilities within the reservoir area are limited to Arrowrock boat ramp which is located 1-1/2 miles above Arrowrock Dam. Arrowrock boat ramp has a low-water elevation of 3125 (91 feet below normal full pool elevation 3216).

2-04. Lucky Peak.

a. Location. Lucky Peak Dam is located approximately 64 river miles above the mouth of the Boise River and is approximately 12 river miles below Arrowrock Dam. The following tabulation outlines the location of the dam.

Lucky Peak Dam

Stream: Boise River.
River Mile: 63.8.
Drainage Basin: Boise River.
State: Idaho.
County: Ada.
Location from nearby community:51/4
9 miles southeast of Boise.

1/ Approximate road mileage.

b. Project Purposes. Lucky Peak is a multipurpose project which controls water from the 470-square-mile drainage basin above Lucky Peak Dam and below Arrowrock Dam. The project also reregulates releases from Arrowrock Dam and provides flood control, irrigation water, recreation, and fish and wildlife water. Refer to Section VII - WATER CONTROL PLAN for the system use priorities and regulation plans.

c. Physical Components. The following paragraphs discuss in general terms the physical components of the Lucky Peak project (both structural and the reservoir). More detailed information on these items is available in the Operation and Maintenance Manual - Lucky Peak Project, U. S. Army Engineer District, Walla Walla, 1959. Plate 2-11 shows the general plan and sections for Lucky Peak Dam.

(1) Dam. Lucky Peak Dam is a rolled earth and gravel embankment with a central impervious core extending from the base to the top of the dam. The dam has a structural height of 340 feet, a hydraulic height of 238 feet, and a crest length of 1,700 feet. The crest of the dam is at elevation 3078 and has a width of 30 feet which provides an area for a roadway across the dam. Base width of the dam is 1,350 feet. The upstream face of the dam is on a 1V on 2.25H slope from the crest elevation 3078 down to elevation 3008, a 1V on 2.75H slope down to elevation 2928, and a slope of 1V on 3.25H down to elevation 2850. The downstream face is on a 1V on 1.50H slope from the crest down to elevation 3066, a 1V on 2H slope down to elevation 3008, a 1V on 2.25H slope down to elevation 2928, and a 1V on 2.50H slope down to elevation 2845. Material volume of the dam is approximately 5.9 million cubic yards.

(2) Spillway. The spillway is located south of the dam. It is 600 feet long, has training wall abutments at each end, is made of reinforced concrete, and has an ogee shape with an apron on the downstream side. The crest of the spillway is at elevation 3060.

Discharge over the spillway is uncontrolled and travels over the unlined open hillside to the river below the project structures. At a maximum design pool elevation of 3072, approximately 93,300 cfs would be passed over the spillway. The spillway is for emergency use only and should never be used for normal operations, since use of the spillway is expected to severely erode the unlined hillside below the spillway. To prevent overtopping the spillway, either accidentally or by wave action, the reservoir pool must be maintained at elevations below 3060.

28,500

(3) Outlet Works. The outlet works are designed for a maximum discharge of 30,500 cfs at a normal reservoir pool elevation of 3055 and a maximum discharge of 17,000 cfs at a minimum pool elevation of 2905. The outlet works consist of the following:

(a) Intake tower structure.

(b) Tunnel and penstock.

(c) Outlet manifold structure.

(d) Auxiliary tunnel and cone valves.

(e) Powerhouse.

A vertical intake tower is located south of the left abutment of the dam and is connected to the dam by a 231-foot-long, 12-foot-wide access bridge. (Refer to Plate 2-12.) The intake tower is made of concrete and is approximately 259 feet high, extending from elevation 2824 (top of foundation) to elevation 3083. The tower is approximately 55 feet wide and has a depth of approximately 41 feet (including trashrack slots and facilities) at its top. The intake structure sidewalls and downstream face are vertical and the upstream structure face is on a 6V on 1H slope. The sloping upstream tower face is equipped with trashrack slots and facilities. The trashracks consist of nine equal panels, each of which is 22 feet 7 inches wide and 11 feet 3 inches high. The trashracks extend between elevations 2824 and 2924. Within the intake tower there are two emergency gates and one bulkhead gate. Valves (sluice gates), with handles on the top deck, provide means of balancing hydraulic heads as needed to return gates to operating condition after inspection and/or maintenance.

Each of the two emergency gates is 11 feet wide and 24 feet high and is mounted on caterpillar roller treads which run in the emergency gate slots. The emergency gates are moved up and down with steel cables mounted on operating hoists. These two gates are used to shut off flow into the tunnel for emergency and maintenance uses and were designed to close under any reservoir head that can be imposed upon them. They are designed to open at a differential head equal to a pool elevation of only 2960. For reservoir elevations greater than 2960, the hydrostatic head on either side of the gates must be balanced before opening the gates. Filling the tunnel and tower to pool elevation by opening either or both sets of equalizing valves (sluice gates) will balance the head on the emergency gates. Balanced heads on closing, though not necessary, allow the gate to seat more securely and reduce leakage. Minimum leakage is especially desirable prior to an extended tunnel unwatering period. The emergency gates should not be used for flow regulation into the tunnel since high-velocity water causes gate vibrations that would damage rollers and seals.

A single intake bulkhead gate is provided for an extra closure of either one of the two tunnel openings. The normal use of this bulkhead is as a tunnel entrance closure to permit repairs on one or the other emergency gate during a time when it should be closed or to permit unusual repairs to one gate frame. The bulkhead gate is 11 feet 6 inches wide and approximately 26 feet high and is designed to withstand only a hydrostatic head equal to a 2940 pool elevation. However, an overload on the bulkhead may be allowed up to a maximum pool elevation of 2960. The bulkhead can only be moved under balanced-head and no-flow conditions. Bulkhead movement is guided by bulkhead slots within the intake tower and the bulkhead is moved by using a mobile crane from the top of the intake structure.

An outlet tunnel and penstock carry water from the intake structure 1,165 feet through the left abutment ridge to the manifold structure in the downstream channel. Centerline of the tunnel at the intake tower is at elevation 2835.5 and the tunnel has a slope of 0.003. The tunnel is 23 feet in diameter (top 815 feet lined to 22 feet diameter), lined with steel, and grouted with concrete to the rock. A 200-foot buried steel penstock, also 23 feet in diameter, carries water from the tunnel exit to the manifold structure. The centerline of the penstock is at elevation 2832 and the penstock has no slope.

The outlet manifold structure controls discharges from Lucky Peak (Plate 2-13). It contains the manifold water passages, bulkhead slots and gates, six slide gates and flipbuckets, and manifold control house. The manifold control house contains the hydraulic machinery, an engine generator and controls, and the remote recording gages for slide gate openings, hollow jet valve opening, and pool elevation. The outlet manifold water passage is approximately 148 feet in length and has a centerline elevation of 2832. The manifold is 23 feet in diameter where connected to the tunnel penstock and tapers to a 20.4-foot-square chamber over a 35-foot transition length. The manifold then tapers to approximately 9 feet wide by 15 feet high at the end of its 148-foot length. Six outlet chambers (5 feet 3 inches wide and 10 feet in height) branch off from the main manifold passage at 60-degree angles. Each outlet chamber contains slots for a bulkhead and a 5-foot 3-inch-wide by 10-foot-high slide gate which is operated by a hydraulic gate-operating cylinder. Centerlines of the outlet chambers are set approximately 21 feet apart. Table 2-6 lists discharge rating for Lucky Peak Dam slide gates. In addition to the six outlet chambers just described, a smaller (2-foot-wide by 3-foot-high) chamber also branches from the manifold passage at a 60-degree angle. A 2-foot-wide by 3-foot-high slide gate is located within the chamber. Maximum release capacity from all the outlets at normal full pool (elevation 3055) is approximately 30,500 cfs and release capacity at a minimum pool elevation of 2905 is approximately 17,000 cfs. When releasing water from Lucky Peak Reservoir, certain precautions must be taken to avoid problems. Some of these problems are discussed in the following paragraph.

Erosion has occurred with severity at gate openings of 1.7 and 1.8 feet when pool head is over 100 feet. For that reason, gate openings should always be more than 2 feet (preferably 4 feet) when there is 100 feet of head. At gate openings from zero to 2 feet the water is directed downward, causing erosion on the bottom of the channel and the sides near the bottom. When the head drops below 100 feet there is no serious erosion problem at any gate setting. Cavitation occurs near the maximum gate opening; therefore, the top foot of opening (between the ninth and tenth foot) should normally not be used. When reservoir releases would normally require gate settings between 9 and 10 feet of opening, an additional gate is operated and both are set at smaller openings. A flipbucket at the end of each outlet produces a long jet of water which, to a small extent, dissipates energy in flight. The primary purpose of the flipbucket is to throw the water downstream where the resultant turbulence will not endanger the integrity of the dam and outlet manifold structure. It is therefore most desirable to use gates 1 or 2 as much as possible to reduce the amount of spray on the roadway.

The auxiliary by-pass system consists of an intake structure, a steel-lined conduit, 12 feet in diameter and 2435 feet long, 1325 feet encased in a drilled tunnel and 1085 in open cut and fill, and an outlet works. Intake works include an intake gate, maintenance bulkhead gate and trashracks. Outlet works include a concrete valve house with two 84-inch fixed cone energy dissipating valves. Design discharge at elevation 3055 is 5861 cfs.

(4) Powerplant Facilities. In 1988 a 3-unit powerhouse with about 90 mw of total installed capacity was added to Lucky Peak. The powerplant facilities consist of the following:

(a) Power penstocks.
(b) Butterfly valves.
(c) Draft-tube bulkheads.
(d) Hydraulic turbines.

Three power penstocks are connected to the existing outlet tunnel. Each of the three power penstocks is plate steel and encased in concrete. Two of them have an inside diameter of 168 inches and the small one has an inside diameter of 84 inches just upstream of the turbine shutoff valve. The centerline of the power penstocks is at elevation 2788 for the large units and elevation 2783 for the small one.

A 168 inch butterfly valve is installed in each of the two large penstocks and an 84 butterfly valve is installed on the small one. These valves are used as a shutoff valves at the inlet of the hydraulic turbine scroll cases. The butterfly valve may be closed in emergencies and is normally closed when its unit is to remain shut down for a prolonged period or to permit unwatering the scroll case prior to inspecting or servicing of the unit. Opening or closing the valve is effected by rotating the horizontally pivoted valve leaf through 90 degrees by means of a piston in a hydraulic cylinder. Each valve is equipped with two bypass lines to equalize the water pressure on the two sides of the leaf before it is opened.

Four draft-tube bulkheads (two for each unit), approximately 19 feet wide by 12 feet high, are provided for sealing of the large turbine draft-tube openings when a turbine is shut down and unwatering of the draft tube is required. One draft-tube bulkhead, approximately 19 feet wide by 6 feet high, is provided for sealing of the small turbine draft-tube opening when the turbine is shut down and unwatering of the draft tube is required. The bulkheads are lowered and raised by the 15-ton powerhouse gantry crane and are dogged in place at the top of the gate slots for storage when not in use.

Two vertical-shaft Kaplan hydraulic turbine generator units rated 46 mw each and one vertical-shaft Kaplan hydraulic turbine generator unit rated at 11.5 mw are presently installed and operating at the powerplant. Each turbine has 20 movable wicket gates to control the supply of water to the turbine runner. The number of gates and the number of vanes or water passages in the runner are coordinated in a manner to ensure that the turbine will operate without objectionable vibration. Operating range is 242 ft. to 80 ft. A powerhouse structure encloses the generators and the related operating equipment.

(4) Reservoir. The reservoir pool level behind Lucky Peak Dam normally fluctuates between pool elevations of 2905 and 3055 (150 feet). The following tabulation outlines key reservoir elevations and capacity allocations.

Lucky Peak Reservoir

Reservoir Element	Elevation
Crest of dam	3078
Maximum design water surface	3072
Top of uncontrolled spillway	3060
Normal full pool	3055
Top of active conservation pool	2905
Streambed at dam axis	2824
Lowest point of foundation excavation	--

Storage Element	Elevation Range	Allocation
Spillway freeboard	3055 to 3060	5 Feet
Surcharge	3055 to 3060	13,905 AF
Joint use	2905 to 3055	264,371 AF
Inactive	2824 to 2905	28,767 AF
Total active capacity	2905 to 3055	264,371 AF
Total gross capacity	2824 to 3060	307,043 AF

Table 2-7, Page T 2-4, lists the elevation-capacity data for Lucky Peak Reservoir.

(5) Project Lands. Project-related land resources are managed for a variety of public purposes in addition to the actual operation of the dam facilities and reservoir. Among these land uses are recreation developments, roads and highways, and wildlife management.

(6) Public Facilities. Recreation developments on project lands are the responsibility of the Corps of Engineers, with cooperation by the Idaho Department of Parks and Recreation. Under the Federal Water Project Recreation Act of 1965 (Public Law 89-72), the Corps is authorized to include all new recreation developments as part of a project on a 50-percent cost-sharing basis. While the entire Lucky Peak Lake area contributes to public recreational needs, most recreational activities and expenditures are concentrated in nine locations, with the Forest Service assuming responsibility for one additional area. The locations of the recreational areas are shown on Plate 2-15 along with a list of these areas and activities. All of the recreational areas except Lucky Peak viewpoint and Sandy Point have boat tie-up docks. Boat launching facilities are located at Barclay Bay, Macks Creek, Robie Creek, and Spring Shores, but only Barclay Bay and Spring Shores have launching ramps which are usable below normal full pool (elevation 3055). There are two ramps and a boat handling dock at Barclay Bay area. The Turner ramp has a low-water elevation of 2910 and the other Barclay ramp is at 3055. The Spring Shores area has one ramp at a low-water elevation of 2950 and another ramp at 3050. Spring Shores is a public marina which provides boat moorage.

2-05. Diversion Dam, New York Canal, Lake Lowell.

a. Locations. The Boise River Diversion Dam is located 1.8 miles downstream from Lucky Peak Dam and about 7 miles southeast of Boise. The New York Canal headworks is located on the left abutment of the Diversion Dam. From the Diversion Dam, the New York Canal follows a winding southwesterly path for 40 miles to Lake Lowell. Lake Lowell is located 27 miles southwest of Boise. Plate 2-1 shows the locations for the Diversion Dam, New York Canal, and Lake Lowell.

b. Project Purposes. The Diversion Dam diverts water from the Boise River into the New York Canal and Penitentiary Canal for irrigation and flood control. The New York Canal carries water from its headworks at the Diversion Dam to serve distribution laterals and Lake Lowell. Lake Lowell provides storage for Boise River water diverted for irrigation water.

c. Project Descriptions.

(1) Diversion Dam and New York Canal.The Diversion Dam is a rubble-concrete, weir-type structure with an earthfill section on each abutment protected on the upstream face by a concrete retaining wall. he overall length of the dam from abutment to abutment is about 500 feet. The ogee-type spillway has a structural height of 46 feet, a hydraulic height of 35 feet, and a crest length of 216 feet, excluding the 30-foot logway. The spillway crest elevation is 2812.24. The spillway capacity is 40,000 cfs. The following tabulation lists pertinent elevations for the Diversion Dam:

Top of New York Canal headworks	2829.84
Crest of dam	2812.84
Roller gate seal	2808.84
New York Canal	2803.84
Crest of roller gate	2818.90
Top of flashboards	2818.90
Normal maximum pool	2818.90

On 15 March 1976 the Boise River Diversion Dam and Powerplant were designated historic structures in the National Register. The powerhouse main floor elevation is 2827.84 and has three inactive generators.

The headworks of the New York Canal consist of eight 5-foot-wide by 9-foot-high motor-operated slide gates that control the flow of water into the canal. Maximum hydraulic capacity of the canal is 2,815 cfs.

Details of operation and maintenance and structural features for the Boise River Diversion Dam and New York Canal are presented in the Standing Operating Procedures (SOP) - Boise River Diversion Dam - Boise Project, Idaho; U.S. Bureau of Reclamation, 20 April 1978.

(2) Lake Lowell. The Deer Flat Dams, three earthen embankments (upper, middle, and lower) form the offstream Lake Lowell Reservoir. Lake Lowell's total active storage capacity is 169,000 acre-feet and inactive capacity is 8,000 acre-feet, which amounts to a total storage capacity of 177,000 acre-feet. Lake Lowell has a surface area of about 9,800 acres at normal full pool elevation 2530.5. Details on operation and maintenance and structural features for the Deer Flat Embankments and Lake Lowell are presented in the Standing Operating Procedures - Deer Flat Embankments and Lake Lowell Reservoir - Boise Project, Arrowrock Division, Idaho; U.S. Bureau of Reclamation, 12 July 1979.

d. Public Facilities.

(1) Diversion Dam. The Diversion Dam reservoir cannot support much recreation use because of the need to regulate diversion flows and flows passing the dam. However, group tours of the Diversion Dam and inactive powerplant can be arranged through the Bureau of Reclamation - Central Snake Projects Office during the summer season.

(2) Lake Lowell. Lake Lowell is a high-recreation-use area with fishing, boating, and picnicking being the most popular recreation activities. A park with boat ramp, concession stand, and picnic areas is located between the lower and middle (Forest) embankments. Numerous access roads lead to various areas around the lake.

III - HISTORY OF PROJECTS

3-01. General. The Boise River reservoir system was initially developed to support irrigation and has been expanded through the years because of the increasing demand for irrigation and flood control. The earliest use for the water was primarily agricultural and the first right to divert the water from the Boise River for irrigation purposes was developed in 1864. This water irrigated the town of Boise and supplied Fort Boise. Agriculture then actively started in the early 1880's when settlers began filing on desert lands under private irrigation enterprises. Late in 1900, the Idaho legislature provided for the formation of irrigation districts. Passage of the Federal Reclamation Act in 1902 enabled landowners to organize and to petition for Government development, which resulted in the initiation of the Boise Project by the Bureau of Reclamation. Authorization for construction of the original Boise Project (now the Arrowrock Division which serves that portion of the Boise Project lands situated between the Boise and Snake Rivers) was made on 27 March 1905. Since its first authorization, the Project has expanded in accordance with an orderly program of development. Diversion Dam, New York Canal, and Lake Lowell (Deer Flat Reservoir) were the first Project facilities completed. Next came the construction of Arrowrock Dam. All of these facilities were authorized and built for irrigation purposes. Later, Anderson Ranch Dam was built as a multipurpose project. The Corps of Engineers then built Lucky Peak Dam as a multipurpose project authorized primarily for flood control.

3-02. Lake Lowell, Diversion Dam, and New York Canal. These facilities were authorized on 27 March 1905 under the original Boise Project. Construction began in 1906 and Lake Lowell began storing water in 1908. A powerplant at Diversion Dam, built originally to supply power for construction of Arrowrock Dam, was completed by 10 October 1908 and placed in operation in 1912. Since the original construction of these facilities, some modifications have occurred. The Upper Lake Lowell Dam was modified in 1909 and 1913, and both Lake Lowell dams were modified in 1911 and 1938. The New York Canal was enlarged in the period from 1909 through 1912.

Along with the facilities came water rights granted to the Bureau of Reclamation. The earliest right grew out of a filing by C.W. Moore, et al., as Water Right No. 63-0301 with a priority date of 14 December 1903. This was transferred to the Secretary of the Interior on 24 February 1904. The original application was for 5,200 cfs but was modified to 1,355 cfs

for irrigation of 240,000 acres in the Boise Valley. This application was preparatory to the development of Boise Project storage in Lake Lowell. The second filing was applied for by W. E. Weymouth, Supervising Engineer for the U.S. Reclamation Service. The original request was for 3,553 cfs for a power installation at Diversion Dam and 634 cfs for storage water in Lake Lowell. The final right was developed for 1,500 cfs for power (right No. 63-0367) and 926.5 cfs for irrigation (rights Nos. 63-0302 and 63-0373). After the New York Canal was enlarged, B. E. Stoutmeyer, District Counsel for the Bureau of Reclamation, made an application for 300 cfs listed to serve 164,572 acres of Boise Project land. This application, water right No. 63-2388, has a priority date of 18 August 1924.

3-03. Arrowrock Dam. Construction of Arrowrock Dam was authorized on 6 January 1911. The construction period was from 1911 to 1915 and the first storage began on 22 October 1914. During the period 1935 through 1937, Arrowrock Dam was repaired and raised 5 feet, thus increasing storage by 9,000 acre-feet. The original construction involved the use of a rather high proportion of sand-cement, and by 1935 the concrete on the downstream face of the structure showed deterioration due to climatic conditions. Repairs included refacing the downstream face and spillway channel.

Arrowrock Reservoir carries two water rights. The first was filed for by W. E. Weymouth in the name of the U.S. Reclamation Service as water right No. 63-0303. This water right is for 8,000 cfs and has a priority date of 13 January 1911. As a result of the enlargement of Arrowrock Reservoir in 1937, R. J. Newell filed water right No. 63-3613 for 15,000 acre-feet of water with a priority date of 25 June 1938 for the Bureau of Reclamation. This water was to serve Federal project lands in Ada and Canyon Counties and was the first right identified in terms of annual storage amounts in a reservoir.

3-04. Anderson Ranch. Construction of Anderson Ranch Dam was authorized on 12 August 1940 by the Secretary of the Interior under the provision of Section 9 under the Reclamation Project Act of 1939 (53 Stat. 1187). The construction period started in 1941 and the project was completed in 1950. Storage began on 15 December 1945.

To cover the operations and development of Anderson Ranch Dam and Reservoir, a water rights filing was made for the Bureau of Reclamation as water right No. 63-3614 for 493,161 acre-feet for power and irrigation use. The priority date is 9 December 1940 and lists 275,766 acres of land to be served and a powerplant of 324 feet of head and 20,000-kW capacity.

3-05. Lucky Peak. Construction of Lucky Peak Dam was authorized by Public Law 526, Seventy-Ninth Congress, Second Session, approved 24 July 1946, which reads as follows:

> "The project for the Lucky Peak Reservoir on Boise River, Idaho, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in his report dated 13 May 1946....Provided that, said dam and reservoir shall be so constructed as not substantially to damage the structure of the Arrowrock Dam, and shall be operated in such manner as not materially to interfere with the operation of said Arrowrock Reservoir."

Construction began in October 1949 and the project was completed in December 1957. Storage began on 16 October 1954. Listed below are a few of the important events and dates within the project history.

Project authorized.	24 July 1946
Dam and tunnel construction started	October 1949
Tunnel completed	March 1951
Permanent river flowing through tunnel	July 1952
Reservoir water raised to elevation 2854	April 1954
Outlet works and machinery completed.	February 1955
Intake tower bridge and machinery completed	May 1955
Dedication of project	23 June 1955
Reservoir raised to elevation 3060.	25 June 1955
Project completed other than road relocation.	December 1957

The Bureau of Reclamation has filed for all storage rights within Lucky Peak Reservoir. This filing was for 307,000 acre-feet of storage (278,200 usable capacity) and was under water right No. 63-3618. A storage permit with a priority date of 12 April 1963 was issued to the Bureau and the license is pending upon proof of beneficial use. The existing permit was issued on the following condition: "...that the yield of water from 50,000 acre-feet of space be available for maintaining minimum wintertime flow in the Boise River below Boise Diversion Dam under a release pattern established from time to time by the Director of the Idaho Department of Fish and Game."

3-06. Project Water Rights. The water and storage rights discussed within each project history have evolved with the projects and are as important as the physical project facilities. Authorization for and building of the irrigation projects depended upon having the water available to fully utilize the projects and realize the benefits. The following tabulation summarizes water and storage rights within the Boise River reservoir system granted to the Bureau of Reclamation.

Date of Priority	Point of Diversion	Amount
14 December 1903	Diversion Dam	1,354.58 cfs
01 April 1909	Diversion Dam	292.5 cfs
16 June 1909	Diversion Dam	634 cfs
13 January 1911	Arrowrock Reservoir	8,000 cfs
18 August 1924	Diversion Dam	300 cfs
25 June 1938	Arrowrock Reservoir	15,000 AF
09 December 1940	Anderson Ranch Reservoir	493,161 AF
12 April 1963	Lucky Peak Reservoir[1/]	307,000 AF

1/ License pending upon proof of beneficial use.

3-07. Memorandum of Agreement. From 1953 until the date of final approval of this Water Control Manual, the Boise River reservoirs were regulated under terms of a Memorandum of Agreement between the Department of the Army and the Department of the Interior. This agreement committed the existing irrigation reservoirs (Arrowrock and Anderson Ranch) to a flood control operation with Lucky Peak Reservoir. The agreement was made upon completion of Lucky Peak Reservoir to protect existing irrigation use of Anderson Ranch and Arrowrock reservoirs during flood control regulation and to commit the space in Lucky Peak Reservoir to irrigation as well as flood control use. Important features of the Memorandum of Agreement included:

a. Commitment of 983,000 acre-feet of space in the three reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) to use for flood control and irrigation. This was essentially all of the active space in the reservoirs.

b. Specification of flood space parameter curves to be used from 1 January to 31 July, with agreed-upon forecasts of runoff to determine evacuation requirements.

c. Protection of space allocations in Arrowrock, Anderson Ranch, and Lake Lowell against water loss as a result of flood control operations.

d. Provision for coordination and agreement on runoff forecasts.

e. Specification of a maximum regulated flow objective of 6,500 cfs below Diversion Dam at the Glenwood gage during the reservoir refill period. This flow could be made if diversion rates assumed in the derivation of the flood control space parameter curves were not made.

f. Provision of evacuation and refill sequence among the three reservoirs.

g. Provision for releases during the refill period greater than 6,500 cfs below Diversion Dam when forecasts of runoff required more than 983,000 acre-feet to be provided for flood control. Those increased releases would be specified by the Chief of Engineers (U.S. Army Corps of Engineers) after consultation with the Commissioner of Reclamation.

h. Provision for maintaining Lucky Peak Lake full as long as possible after the flood control season or until 15 September for recreation purposes. This would be done by releasing Arrowrock water first for downstream irrigation uses.

i. Provisions for modification of the regulating plan with respect to allowable releases and space requirements for flood control upon agreement of the Chief of Engineers and Commissioner of Reclamation or their authorized representatives. Such modification would take place only after consultation with the Idaho Reclamation Engineer, Boise River Watermaster, and Boise Board of Control Manager.

IV - BASIN CHARACTERISTICS

4-01. General. The Boise River Basin has a total drainage area of approximately 4,130 square miles. It is located in southwestern Idaho and is one of the major tributaries of the Snake River, a principal branch of the Columbia River system. The Payette and Salmon River Basins are to the north and the Sawtooth Mountains and Big Wood River Basin are located to the east. The main stem of the Snake River is to the south and west. The long basin axis trends east-west and includes large portions of Ada, Canyon, and Elmore Counties and small portions of Boise and Camas Counties. Principal streams within the Boise Basin flow in a westerly direction from the headwaters in the Sawtooth Mountains to the mouth of the Boise River, a distance of about 200 river miles. Topography and runoff characteristics naturally divide the Boise River Basin into two separate and distinctive watersheds--an upper and lower watershed.

4-02. Watershed Topography and Characteristics. The upper watershed consists of approximately 2,680 square miles of drainage area upstream of Lucky Peak Dam and is a fan-shaped, mountainous area which contains the headwaters of all the significant tributaries. This area is composed largely of precipitous mountains and is characterized by a highly dissected topography with deep V-shaped valleys, steep slopes, and narrow sharp top ridges. The upper watershed ranges in elevation from 3,000 to 10,600 feet and the mean elevation is approximately 5,800 feet. Principal tributaries of the Boise River are (1) South Fork-1,310 square miles, (2) Middle Fork and North Fork-830 square miles, (3) Mores Creek-430 square miles. These four tributaries contain approximately 62 percent of the total area of the Boise River above its mouth. The upper watershed is characterized by sparse population and very limited development.

The lower watershed consists of approximately 1,450 square miles of drainage area below Lucky Peak Dam. This area is composed of river bottoms, terraces, and low rolling to steep hills with few distinct mountains. Adjoining the Boise River is bottom land, varying from 1 to 3 miles in width, which constitutes the normal flood plain. Adjacent to this bottom land is a series of two terraces; the first occurs at an elevation of approximately 2,500 feet and the second between 3,000 and 4,000 feet. The terraces grade upward toward the east to a ridge that cuts the basin north and south at approximately the location of Lucky Peak Dam. This ridge (known as the Boise Front) forms the boundary between the

upper and lower watersheds. In contrast to the upper watershed, the lower watershed is quite heavily populated and is extensively developed. Streamflow within the lower watershed is quite limited and the main tributaries are Indian Creek, Willow Creek, and Dry Creek. These streams, except Indian Creek, are intermittent and normally flow only during the spring and early summer months.

4-03. Soils and Geology. The soils in the Boise Basin are of two types, residuals and sedimentary deposits. The residuals are disintegrated granite, rhyolite, and basalt. From the standpoint of runoff, the granite soil is of major importance since it covers 90 percent of the upper watershed and this is the part of the basin that contributes practically the entire runoff of the Boise River.

The geology of the Boise Valley area is very complex. Southwestern Idaho has been described as being a region of broad flood plains, dissected lava plateaus, mesas, buttes, cinder cones, minor faults and faultline scarps, badland piedmont hills, and mountains of uplifted crystalline rock. The Boise Valley within this area has been described as a broad alluvial plain having low relief lying adjacent to the Boise River. The following description of the geology of the area has been abstracted from the report by Nace:

> "The Boise Valley is underlain by a trough-like, impermeable floor of ancient consolidated rocks. Within the trough there is a great thickness of stream-and-lake-deposited sediments (Payette formation) and volcanic rocks (Owyhee rhyolite and Columbia River basalt), all having generally low permeability. Resting on these materials is a younger group of sediments--the Idaho formation--which is a lake-laid deposit. This formation is quite varied in permeability but generally is somewhat more permeable than the older sediments. The Idaho formation, consisting chiefly of clay, silt, and sand, is a source of moderately deep artesian water in the Boise and Snake River Valleys. Streams spread a thick sheet of rather permeable terrace gravel on the ancient land surface of the Idaho formation. Lava flows formed the Snake River basalt which lies on the lower part of the gravel in some places and at others is covered by the upper part of the gravel. The present course of the Snake River resulted as the river cut a deep canyon through the basalt and sediments.
>
> The Boise Valley developed by alternate stream erosion and deposition, resulting in terraces underlain by permeable younger terrace gravel and the bottom land occupied by highly permeable recent alluvium. Recent local basalt flows are interbedded with terrace gravels at a few places. The younger, variable, but more permeable deposits in the Boise Valley

thus occupy a partly closed basin that was eroded in the older terrace gravel and Idaho formation. Outflow occurs only to the westward on the surface and at shallow depth. Under natural water conditions the water table was at shallow depth in the bottom lands and not more than 100 to 200 feet deep under the terraces and lowland slopes. Under irrigation development, with much of the irrigated area on the terraces and surface applications of large amounts of water, a great deal of water which formerly discharged in the river now enters the ground and must be discharged westward through the ground. Earth materials to the west, however, are generally less permeable than those to the east. As a result, the water table has risen to the east to develop enough hydraulic gradient to move the water westward. Consequently, drainage problems have been encountered through most of the length of the valley and, due to the lenticular character of much of the alluvium, trouble spots still develop."1/

4-04. Water Quality and Sediment. Boise River water is of good quality in the upper watershed, and as it leaves Lucky Peak Dam the water has a high oxygen content, low BOD, TDS, and bacteria, and nutrient levels below those that will produce nuisance growth of algae. A water quality analysis of the Lucky Peak discharge is shown on Table 4-1, page 4-4. This water is adequate for swimming and other water contact recreation and supports a trout fishery; however, the quality of the water in the river degenerates as it moves through the Boise Valley. Water quality is dependent upon numerous factors and varies from year to year and seasonally. Groundwater flows coming into the river have a dissolved oxygen (DO) deficit that exerts considerable influence on the river DO. City wastewater treatment plants, storm drain discharges, sewage lagoon discharges, feedlot runoff, and irrigation drain discharges all add to the degeneration of water quality throughout the valley. Steps have been and are being taken to reduce pollution loading on the river, but water quality within the lower Boise River is still a major problem.

4-05. Climate. The climate of the Boise River Basin is characterized by hot dry summers and moderately cold winters. The area is dominated by Pacific maritime air, considerably modified by intervening topographic barriers as it travels eastward from the ocean. Although generally deflected to the east by the Rocky Mountain barrier, polar continental air occasionally enters the area during the winter months, resulting in

1/ Nace, R.L., S.W. West and R.W. Hower, 1957, U.S. Geological Survey, Water Supply Paper 1576, p. 121.

TABLE 4-1

WATER QUALITY ANALYSIS OF LUCKY PEAK RESERVOIR DISCHARGE[1]

Constituents	18 Sep 74 Concentration	12 Dec 74 Concentration	Average or the Higher[2] of the Two Values
Aluminum	95.5 ug Al/L	92.3 ug Al/L	93.9 ug Al/L
Antimony	17 ug Sb/L	6.0 ug Sb/L	11.5 ug Sb/L
Arsenic	< 10 ug As/L	< 1.0 ug As/L	< 10 ug As/L
Barium	12.5 ug Ba/L	14.8 ug Ba/L	13.7 ug Ba/L
Beryllium	< 5.0 ug Be/L	< 0.5 ug Be/L	< 5.0 ug Be/L
Boron	190 ug B/L	60 ug B/L	125 ug B/L
Cadmium	< 1.0 ug Cd/L	< 1.0 ug Cd/L	< 1.0 ug Cd/L
Calcium	7.6 mg Ca/L	9.3 mg Ca/L	8.5 Mg Ca/L
Chromium	< 1.0 ug Cr/L	< 1.0 ug Cr/L	< 1.0 ug Cr/L
Cobalt	< 1.0 ug Co/L	< 1.0 ug Co/L	< 1.0 ug Co/L
Copper	< 1.0 ug Cu/L	< 1.0 ug Cu/L	< 1.0 ug Cu/L
Cyanides	< 2 ug CN/L	< 8.0 ug CN/L	< 8.0 ug CN/L
Fluorides at 22°C.	0.27 mg F/L	0.34 mg F/L	0.30 mg F/L
Lead	32 ug Pb/L	11.3 ug Pb/L	21.7 ug Pb/L
Magnesium	0.88 mg Mg/L	1.20 mg Mg/L	1.0 mg Mg/L
Manganese	9.7 ug Mn/L	8.75 ug Mn/L	9.2 ug Mn/L
Mercury	< 0.07 ug Hg/L	< 0.01 ug Hg/L	< 0.07 ug Hg/L
Molybdenum	1.2 ug Mo/L	1.3 ug Mo/L	1.3 ug Mo/L
Nickel	< 1.0 ug Ni/L	< 1.0 ug Ni/L	< 1.0 ug Ni/L
Potassium	0.45 mg K/L	0.55 mg K/L	0.50 mg K/L
Selenium	< 5.0 ug Se/L	< 5.0 ug Se/L	< 5.0 ug Se/L
Silver	< 1.0 ug Ag/L	< 1.0 ug Ag/L	< 1.0 ug Ag/L
Sodium	2.43 mg Na/L	3.5 mg Na/L	3.0 mg Na/L
Thallium	< 1.0 ug Tl/L	< 1.0 ug Tl/L	< 1.0 ug Tl/L
Tin	< 10 ug Sn/L	< 1 ug Sn/L	< 10 ug Sn/L
Titanium	< 50 ug Ti/L	< 50 ug Ti/L	< 50 ug Ti/L
Zinc	240 ug Zn/L	187 ug Zn/L	214 ug Zn/L
Conductivity 3/	45 UMHOS/cm	48 UMHOS/cm	46.5 UMHOS/cm
Bicarbonates	31.5 mg/L as $CaCO_3$	35.39 mg/L as $CaCO_3$	33.5 mg/L as $CaCO_3$
Biochemical Oxygen Demand (5 day)	1.2 mg O_2/L	1.5 mg O_2/L	1.4 mg O_2/L
Carbon Dioxide 3/	1.0 mg/L	3.5 mg/L	2.3 mg/L
Chemical Oxygen Demand	5.2 mg O_2/L	3.5 mg O_2/L	4.4 mg O_2/L
Chlorides	1.0 mg Cl/L	1.0 mg Cl/L	1.0 mg Cl/L
Ammonia as Nitrogen	0.07 mg N/L	0.238 mg N/L	.154 mg N/L
Nitrate and Nitrite as Nitrogen	0.065 mg N/L	0.15 mg N/L	.108 mg N/L
Total Organic Nitrogen as Nitrogen	0.645 mg N/L	0.099 mg N/L	.372 mg N/L
Phenols	3.4 ug Phenols/L	2.2 ug Phenols/L	2.8 ug Phenols/L
Sulfates	4.0 mg SO_4/L	2.5 mg SO_4/L	3.3 mg SO_4/L
Suspended Solids	1.7 mg Solids/L	2.2 mg Solids/L	2.0 Solids/L
Total Alkalinity 3/	32.0 mg/L as $CaCO_3$	37.2 mg/L as $CaCO_3$	34.6 mg/L as $CaCO_3$
Temperature 3/	59°F.	42.8°F.	50.9°F.
Total Dissolved Solids	48 mg Solids/L	64 mg Solids/L	56 mg Solids/L
Total Organic Carbon	1.1 mg C/L	< 0.75 mg C/L	1.1 mg C/L
Total Phosphorus as Ortho Phosphate	0.1 mg PO_4/L	0.24 mg PO_4/L	0.17 mg PO_4/L
Dissolved Oxygen 3/	8.4 mg/L	11.0 mg/L	9.7 mg/L
Color	1.0 Color Units	0.5 Color Units	0.75 Color Units
Fecal Coliform	1.0/100 mls	< 1.0/100 mls	1.0/100 mls
Fecal Streptococci	1.0/100 mls	< 1.0/100 mls	1.0/100 mls
Total Coliform	10.0/100 mls	< 1.0/100 mls	< 10.0/100 mls
Floatables	< 0.1 ml/L	< 1.0 ml/L	< 1.0 ml/L
Oil and Greases	< 1.0 mg Oil/L	< 1.0 mg Oil/L	< 1.0 mg Oil/L
pH 3/	7.5	8.0	7.8
Settleable Solids	< 0.1 ml/L	< 1.0 ml/L	< 1.0 ml/L
Surfactant (Detergents)	< 10 ug/L as Apparent LAS	< 100 ug/L as Apparent LAS	< 100 ug/L as Apparent LAS
Taste and Odor:			
at 40°C	1.0 Threshold Odor Units	1.8 Threshold Odor Units	1.4 Threshold Odor Units
at 60°C	1.5 Threshold Odor Units	1.3 Threshold Odor Units	1.4 Threshold Odor Units
Turbidity	3.0 F.T.U.	3.0 F.T.U.	3.0 F.T.U.
Volatile Solids	23 mg Solids/L	10 mg Solids/L	16.5 mg Solids/L
Gamma Radiation:			
90-Sr	< 1 picocuries/L	< 1 picocuries/L	< 1 picocuries/L
226-Ra	< 5 picocuries/L	< 5 picocuries/L	< 5 picocuries/L
Gross Alpha Radiation	< 40 picocuries/L	< 40 picocuries/L	< 40 picocuries/L
Gross Beta Radiation	< 200 picocuries/L	< 200 picocuries/L	< 200 picocuries/L
Pesticides:			
Lindane	< 0.01 ug/L	< 0.01 ug/L	< 0.01 ug/L
Heptachlor	< 0.05 ug/L	< 0.05 ug/L	< 0.05 ug/L
Aldrin	< 0.07 ug/L	< 0.07 ug/L	< 0.07 ug/L
Heptachlor Epoxide	< 0.25 ug/L	< 0.25 ug/L	< 0.25 ug/L
DDE-P,P	< 0.01 ug/L	< 0.01 ug/L	< 0.01 ug/L
Dieldrin	< 0.01 ug/L	< 0.01 ug/L	< 0.01 ug/L
DDD (TDE)	< 0.02 ug/L	< 0.02 ug/L	< 0.02 ug/L
DDT-P,P	< 0.02 ug/L	< 0.02 ug/L	< 0.02 ug/L

1/ Water samples were taken from stilling basin. All laboratory analysis done at Washington State University.
2/ Where constituents are expressed as less than a certain value, and there is a difference, higher measurement is used.
3/ This value measured in field by U.S. Corps of Engineers.

short periods of extremely low temperatures. Plate 4-1 shows the locations of streamflow, precipitation-temperature, and snow stations within the basin.

The following paragraphs discuss and outline temperature, precipitation, snow, evaporation, and wind data within the Boise River Basin. Of particular importance are the hydrologic stations which are used to supply real-time data necessary to regulate the Boise River reservoirs.

a. Temperature. Temperature records for the Boise Airport, Lucky Peak Dam, Arrowrock Dam, Anderson Ranch Dam, and Idaho City stations have been summarized. Table 4-2, page T4-1, lists an average of the maximum daily temperatures by month for each station, and Table 4-3, page T4-2, lists an average of the minimum daily temperatures by month. Temperatures within the Boise Basin can fluctuate dramatically from month to month and year to year. The following tabulation outlines temperature extremes which have occurred at some of the key stations.

Maximum and Minimum Temperature Extremes (Degrees F)

Month	Boise Airport 1/		Idaho City 2/		Arrowrock Dam 2/		Anderson Ranch Dam 2/	
	Max	Min	Max	Min	Max	Min	Max	Min
Jan	63	-17	56	-32	56	-32	55	-21
Feb	69	-12	61	-30	60	-12	59	-16
Mar	81	6	76	-20	76	- 6	74	- 4
Apr	92	19	81	8	82	21	84	21
May	98	26	93	18	96	21	96	22
Jun	109	33	97	24	105	33	104	32
Jul	111	41	105	26	109	39	107	41
Aug	110	37	106	27	109	37	105	27
Sep	102	23	99	11	102	26	102	27
Oct	91	11	87	2	89	16	88	15
Nov	73	- 3	68	-17	70	- 6	72	- 2
Dec	65	-23	54	-26	59	-10	59	-13

1/ Period of record, 1940-1980.
2/ Period of record, 1951-1973.

b. Precipitation. Plate 4-2 defines normal annual precipitation for areas within the Boise River Basin. Monthly precipitation records for the Boise Airport, Lucky Peak Dam, Arrowrock Dam, Anderson Ranch Dam, Idaho City, and Centerville stations are listed on Table 4-4, page T4-3.

Large amounts of precipitation can and do significantly affect the regulation of the Boise River reservoirs. The following tabulation lists maximum 24-hour precipitation accumulations which have occurred at some of the key stations.

Maximum 24-Hour Precipitation Accumulation (Inches)

Month	Boise Airport 1/	Idaho City 2/	Arrowrock Dam 2/	Anderson Ranch Dam 2/
Jan	1.48	1.97	2.20	2.07
Feb	1.00	2.09	1.51	2.03
Mar	1.12	1.64	1.00	1.57
Apr	1.27	1.44	1.37	1.38
May	1.51	1.36	0.96	0.84
Jun	2.24	2.61	0.81	1.20
Jul	0.94	0.41	0.59	0.97
Aug	1.61	1.33	0.78	1.69
Sep	1.74	1.27	1.69	1.27
Oct	0.76	1.14	1.26	1.44
Nov	0.88	1.72	2.05	1.65
Dec	1.16	2.15	1.68	2.18

1/ Period of record, 1940-1980.
2/ Period of record, 1951-1973.

c. Snow. Snowfall and accumulation within the lower watershed are very light as compared to the upper watershed. Table 4-5, page T4-4, summarizes snow course data for the upper watershed. The accumulation of snow over the upper watershed directly affects the snowmelt runoff and dictates the degree of regulation necessary and the manner in which the Boise River reservoirs are regulated. The following tabulation compares some snow courses for a small runoff volume and a large runoff volume year.

1 April Snow Course Water Content (Inches)

Snow Course	1977	1965
Atlanta Summit	7.4	55.8
Bogus Basin	11.2	31.0
Dollarhide Summit	4.4	37.2
Galena	3.4	31.8
Galena Summit	5.8	39.4
Jackson Peak	9.2	48.0
Mores Creek Summit	10.0	47.8
Trinity Mountain	9.8	65.2
Vienna Mine	10.4	46.0
April through July Runoff Volume (Upper Watershed)	316,540 AF	2,578,260 AF

d. Evaporation. Evaporation losses within the basin vary with temperatures. Table 4-6, page T4-5, lists and summarizes evaporation rates which have occurred at Arrowrock Station. Annual water losses from the combined surfaces of Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs under full pool conditions are estimated to range between 35,000 and 40,000 acre-feet.

e. Wind. Wind data for the Boise Airport Station are listed and summarized in Table 4-7, page T4-6.

4-06. Runoff Characteristics.

a. Streamflow Records. Records of streamflow have been maintained for many years at several locations on the Boise River, on major tributaries, and on important diversions. In addition, natural streamflow of the Boise River at Diversion Dam has been computed by the Boise River Watermasters since the construction of the Boise River reservoirs. Table 4-8 on page 4-8 outlines key gaging stations and records within the Boise River Basin, plus pertinent reservoir storage records.

b. Lower Watershed Runoff. Natural streamflow from the lower watershed constitutes only a small percentage of the total runoff from the entire Boise River Basin. Streams within the lower watershed normally contain very limited amounts of runoff (normally only in the spring and early summer) and flow intermittently. Occasionally thunderstorms or rapid snowmelt on frozen ground can produce high peaks and short-duration local runoffs causing local flooding and drainage problems; but these storms normally have very little impact on the Boise River flows and have little or no impact on regulation of the Boise River reservoirs.

c. Upper Watershed Runoff. Most of the natural runoff from the upper watershed results primarily from snowmelt, and high flows occur each year in the spring when temperatures are increasing and the snow melts. The annual high-water period begins with a gradual increase in discharge in March, culminates with a peak discharge usually between 15 April and 15 June, and terminates with a gradual recession to base flows during July. Low flows then normally prevail from August through February. From 1895 through 1980, natural annual runoff volumes from the upper watershed have averaged approximately 2.040 million acre-feet per year (14.27 basin inches). Approximately 78 percent of this total average annual runoff volume comes off during the March through July snowmelt period. The amount of seasonal runoff and, to a considerable extent, the peak discharge vary with the amount of water accumulated in snow on the basin.

TABLE 4-8

KEY GAGING STATIONS - BOISE RIVER BASIN

Station	Gage	Period of Record 4/	Drainage Area above Station (square miles)	Average Runoff Volume Ac.Ft/Year	Period of Record Discharge - cfs		
					Average	Maximum	Minimum
S.F. Boise R near Featherville	River	Apr 1945 to Sep 1980	635	571,600	789	7,580 (24 May 1956)	30 (10 Feb 1949)
Anderson Ranch Reservoir	Res Storage	Dec 1945 to Sep 1980	980	---	---	---	---
S.F. Boise R at Anderson Ranch Dam	River	Apr 1943 to Sep 1980	982	725,200	1,001	9,850 (25 May 1956)	0.1 (13 Nov 1959)
Boise R near Twin Springs	River	Mar 1911 to Sep 1980	830	869,400	1,200	18,800 (23 Dec 1964)	105 (28 Nov 1976)
Arrowrock Reservoir	Res Storage	Oct 1917 to Sep 1980	2,210	---	---	---	---
Mores Creek above Robie Creek	River	Oct 1950 to Sep 1980	399	213,700	295	5,440 (23 Dec 1955)	7.4 (18 Aug 1977)
Lucky Peak Lake	Res Storage	Oct 1954 to Sep 1980	2,680	---	---	---	---
Boise R near Boise	River	Oct 1954 to Sep 1980 2/	2,680	2,139,000	2,976	11,600 (15 May 1965)	near zero
Boise R at Boise 1/	River	Oct 1954 to Sep 1980 2/	2,760	938,200	1,295		1.3 (3 Feb 1955)
Boise R near Middleton 3/	River	Dec 1974 to Sep 1980	3,050	---	---	--- ---	38 (4 Sep 1977)
Boise R near Parma	River	Sep 1971 to Sep 1980	3,970	1,216,000	1,650	7,840 (3 Mar 1972)	93 (29 Apr 1977)
Natural Flow - Boise River above Lucky Peak Dam	Computed	Jan 1895 to present	2,680	2,040,000	2,814	35,500 (14 Jun 1896)	--- (near zero)

1/ Station is being relocated from Capitol Street Bridge to the Glenwood Bridge.

2/ Period since completion of Lucky Peak Dam.

3/ Low flow station.

4/ Statistics based on record through Sep 1980.

Peak snowmelt discharges are occasionally augmented by runoff from general rainstorms or thunderstorms. Occasionally rapid snowmelt on frozen ground, especially when augmented by heavy warm rains, will produce high peak flows during the winter. Most of these winter runoff events are of short duration and limited volume.

The upper watershed contains four primary subbasin tributaries to the Boise River: (1) South Fork, (2) Middle Fork, (3) North Fork, and (4) Mores Creek. A streamgaging station called "South Fork Boise River near Featherville" records streamflows for approximately 48 percent of the South Fork subbasin drainage area. This station is located approximately 15 miles upstream of Anderson Ranch Dam and is used to monitor natural inflows into Anderson Ranch Reservoir. Plate 4-3 summarizes streamflows recorded at this station since April 1945 and Table 4-9, page T4-7, lists monthly runoff volumes. Most of the streamflow from the Middle and North Fork subbasin drainage areas is recorded at a gaging station called "Boise River near Twin Springs." This station is located about 2 miles upstream from the maximum flow line of Arrowrock Reservoir. Plate 4-4 summarizes streamflows recorded at this station since March 1911 and Table 4-10, page T4-8, lists monthly runoff volumes. Most of the streamflow from the Mores Creek subbasin drainage area is recorded at a gaging station called "Mores Creek above Robie Creek, near Arrowrock Dam." This station is located about 5 miles northwest of Arrowrock Dam. Plate 4-5 summarizes streamflows recorded at this station since October 1950 and Table 4-11, page T4-9, lists monthly runoff volumes.

As mentioned previously, natural streamflows for the total upper watershed above Lucky Peak Dam have been computed by the Boise River Watermasters since construction of the Boise River reservoirs. Plate 4-6 summarizes the total natural streamflow since January 1895 and Table 4-12, page T4-10, lists monthly runoff volumes. Plate 4-7 shows daily natural streamflows of the Boise River above Lucky Peak Dam for the period of record. Of this total natural runoff from the upper watershed, an average of approximately 81 percent of the annual runoff volume is recorded at the Featherville, Twin Springs, and Mores Creek gaging stations. The following tabulation outlines the average annual contribution from each of these three gages to runoff at Lucky Peak.

Gage	Average Annual Runoff Contribution	Percent of Total Area
S. F. near Featherville	24%	24%
N. & M. F. near Twin Springs	44%	31%
Mores Creek	10%	15%
Totals	81%	70%

Table 4-13 on page 4-11 lists station contributions for the normal high water period (March through July) for individual years from 1951. Contributions shown indicate some variations from year to year, but generally the basin is quite consistent on which areas produce the runoff.

(1) Floods. Natural or unregulated annual maximum daily spring snowmelt-event discharges in excess of 20,000 cfs have occurred on 10 occasions since 1895 in the Boise River at the Lucky Peak damsite. In the period of years between 1865 and 1894, which is prior to actual gaged records, five floods (based on precipitation records at Boise) are estimated to have equaled or exceeded 35,000-cfs peak discharge. The tabulation below summarizes the largest runoff events.

Date	Maximum Annual Mean Daily Peak Discharge (cfs)	April through July Runoff Volume (Million Acre-Feet)
	Measured Events	
14 June 1896	35,500	2.700
14 April 1897	29,500	1.542
18 April 1943	25,040	2.717
28 April 1952	23,430	2.269
25 May 1956	22,950	2.249
22 May 1958	21,750	1.914
23 April 1965	20,850	2.578
10 May 1928	20,710	1.590
14 May 1971	20,250	2.477
18 May 1927	20,060	1.998
	Estimated Events	
1871	43,000	--
1872	50,000	--
1874	36,000	--
1875	36,000	--
1894	35,000	--

Using (1) the observed maximum annual mean daily peak discharges for 1895 through 1976 and estimated peaks for 1865 through 1894, and (2) observed April through July runoff volumes from 1895 through 1974, the following frequency data had been computed for past Boise River studies.

TABLE 4-13

STATION RUNOFF CONTRIBUTIONS (Percentage)

March through July

Year	Featherville	Twin Springs	Mores Creek	Total
1951	30.4	42.7	9.7	82.8
52	27.1	38.7	11.5	77.3
53	27.7	46.7	10.9	85.3
54	27.9	49.1	9.9	86.9
1955	27.6	51.0	9.4	88.0
56	28.2	42.5	10.3	81.0
57	26.4	43.4	12.3	82.1
58	28.5	42.3	11.3	82.1
59	28.8	49.2	9.2	87.2
1960	25.0	44.9	10.9	80.8
61	27.1	52.0	8.7	87.8
62	30.9	45.9	8.7	85.5
63	30.4	48.1	8.0	86.5
64	28.3	46.2	10.0	84.5
1965	29.3	39.5	10.3	79.1
66	30.6	46.5	8.1	85.2
67	33.5	46.0	7.0	86.5
68	30.2	52.7	7.0	89.9
69	30.8	40.3	10.4	81.5
1970	27.0	45.0	10.0	82.0
71	27.7	40.6	10.9	79.2
72	23.6	41.1	10.9	75.6
73	28.4	49.6	9.1	87.1
74	26.9	44.4	10.8	82.1
1975	28.3	40.5	10.8	79.6
76	27.1	44.6	10.3	82.0
77	28.1	51.8	7.8	87.7
78	29.4	46.5	10.3	86.2
79	30.1	52.3	9.8	92.2
1980	29.3	44.7	10.5	84.5

Exceedence Probability[1] (Percent)	Average Recurrence Interval (Years)	Unregulated Annual Spring Snowmelt Peak Discharge (cfs)	Unregulated April through July Runoff Volume (Million Acre-Feet)
1	100	41,200	3.100
2	50	36,200	2.900
5	20	30,000	2.550
10	10	25,200	2.270
20	5	20,400	1.950
50	2	13,800	1.400

1/ Frequency data for unregulated streamflow and runoff volume of the Boise River at Lucky Peak Dam.

Significant winter rainstorm-snowmelt flood events occurred in the upper watershed in November 1909, December 1955, and December 1964. The December 1964 flood event had a computed instantaneous peak discharge of approximately 44,000 cfs and is estimated to have been in excess of a 100-year winter flood event. The following tabulation summarizes the four largest winter flood events.

Date	Unregulated Maximum Mean Daily Discharge[1] (cfs)	Duration Above 5,000 cfs (days)	Runoff Volume Above 5,000 cfs (Acre-Feet)
December 1964	27,295	7	125,000
December 1955	20,551	5	72,000
November 1909	15,200	6	52,000
December 1937	10,641	2	16,000

1/ Unregulated flow at Lucky Peak damsite.

(2) Droughts. Years of low runoff volumes from the upper watershed can critically affect irrigation within the lower watershed. Since 1895, 9 years have had annual runoff volumes of less than 1.250 million acre-feet, as compared to a normal of 2.040 million acre-feet. The 1977 drought year was the lowest runoff year of record and the annual maximum mean daily peak discharge only reached 3,190 cfs. The following tabulation summarizes annual runoff volumes and peak discharges for the 9 lowest runoff volume years of record.

Year	October-September Annual Runoff Volume (Million Acre-Feet)	Annual Maximum Mean Daily Peak Discharge[1/] (cfs)
1977	0.659	3,190
1924	0.892	3,923
1931	0.947	4,057
1934	1.080	4,161
1926	1.114	3,999
1937	1.166	6,148
1961	1.176	4,820
1905	1.183	4,128
1915	1.214	4,421

1/ Unregulated flow at Lucky Peak damsite.

4-07. Boise River Channel. The capacity and condition of the existing Boise River channel within the lower watershed restrict and establish the manner in which the Boise River reservoirs can be regulated for flood control. The following paragraphs discuss capacity, condition, diversion from, and key gaging locations for the Boise River channel.

a. Capacity and Conditions. Capacity of the Boise River channel through the lower watershed (Boise Valley) varies between approximately 3,500 cfs and 10,000 cfs. At 3,500 cfs, a few small areas are subjected to out-of-channel flow and are inundated. For flows up to 6,500 cfs at the Glenwood Bridge, flooding is normally limited to pastureland, low-lying farmland, gravel pits near the river, and a few buildings located directly at the edge of the river. Flows in the 5,000-cfs to 6,500-cfs range do, however, result in significant channel and bank erosion. Flood damages caused by flows within the 5,000-cfs to 8,000-cfs range, represent an accumulation of bank and channel erosion problems over a 50-mile river reach. Flooding and damages dramatically increase as the flow levels increase above 10,000 cfs. The following tabulation summarizes approximate flood damages within the Boise Valley at various flow levels based on an October 1980 price and development level.

Flow (cfs) 1/	Flood Damages (dollars)
4,000	0
5,000	24,000
6,500	76,800
7,000	182,400
7,200	227,000
8,000	397,000
10,000	1,717,000
12,000	6,640,000
15,000	15,747,000
20,000	34,946,000
25,000	63,366,000
30,000	112,125,000
35,000	178,147,000
40,000	242,272,000
45,000	304,488,000

1/ Flow of Boise River below New York Canal Diversion.

Information on areas subject to flooding by the Boise River can be found in existing flood plain information reports. The following list outlines some reports which are available.

(1) Flood Plain Information, Boise, Idaho, and Vicinity - Boise River and Northside Tributaries, U.S. Army Corps of Engineers, Walla Walla, Washington, October 1967.

(2) Special Flood Hazard Information - Boise River - Caldwell, Idaho, and Vicinity, U.S. Army Corps of Engineers, Walla Walla, Washington, April 1975.

(3) Flood Insurance Study, City of Garden City, Idaho, U.S. Army Corps of Engineers, Walla Walla, Washington, April 1978.

(4) Flood Insurance Study, City of Boise, Idaho, U.S. Army Corps of Engineers, Walla Walla, Washington, May 1978.

(5) Flood Insurance Study - Ada County, Idaho, U.S. Army Corps of Engineers, Walla Walla, Washington, October 1978.

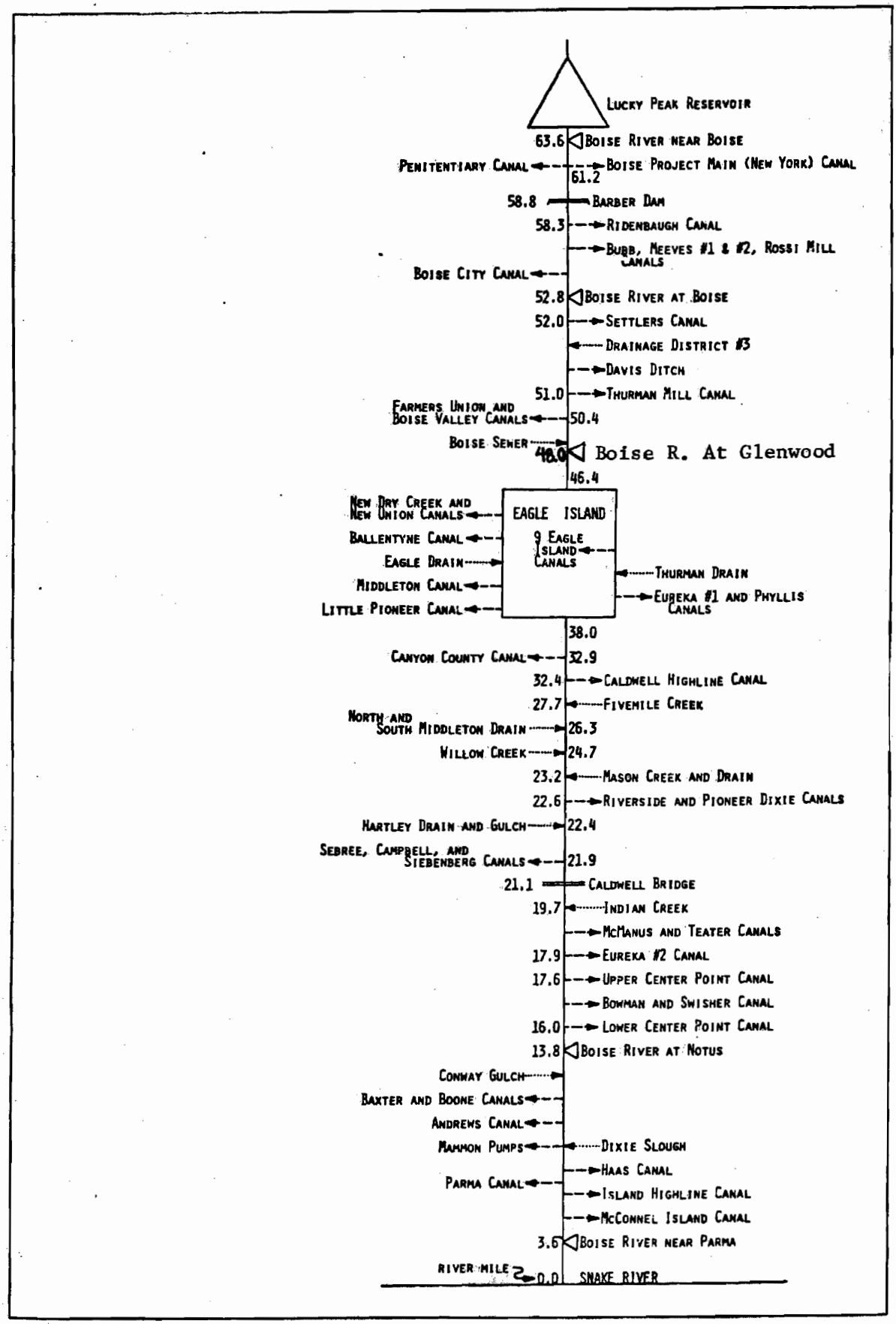
(6) Floodway Boundary Map - City of Caldwell, Idaho, Federal Insurance Administration, 3 September 1980.

Observation of the Boise River channel in the lower watershed shows that most of the channel is generally in very poor condition. Large gravel bars have formed within the channel and trees and brush are growing in the channel and at the banks. In some reaches of the river, local landowners, flood control districts, and land developers have done some channel clearing and have constructed levees to increase channel capacity at specific locations. Without a comprehensive and continuing maintenance program, it is expected that gravel bar, tree, and brush accumulation within the channel will continue. Annual flushing of the channel with high releases (6,000 cfs to 6,500 cfs at the Glenwood Bridge) may slow and somewhat reduce this type of accumulation in the channel.

b. Key Gaging Locations and Irrigation Diversions. The Eagle Island area is the first reach of the Boise River with a very restricted channel capacity. For this reason, this area has been used as the point of flood control regulation for the Boise River reservoirs. In the past, a river gaging station (Boise River at Boise) was located at the Capitol Boulevard Bridge in Boise. This station has been relocated downstream to the Glenwood Bridge where it will more accurately define flows at the upstream end of Eagle Island.

Between Lucky Peak Dam and Eagle Island, many irrigation canals divert water during the irrigation season (April through 15 October). The flood control season and the irrigation season generally overlap and the amount of water being diverted for irrigation directly affects release amounts from Lucky Peak when trying to limit floodflows at Eagle Island to 6,500 cfs or less. The diagram on page 4-16 outlines Boise River diversions and drains. The following tabulation summarizes approximate average diversions for the canals between Lucky Peak Dam and Eagle Island during the peak irrigation season.

Canal	Average Diversion (cfs)
New York	2,600
Ridenbaugh	550
Penitentiary and Bubb, Meeves, Rossi Mill	68
Boise City	30
Settlers	180
Davis Ditch	10
Thurman Mill	35
Farmers Union, Boise Valley	250
Total	3,723


Lucky Peak Reservoir
63.6
Boise River near Boise
Penitentiary Canal
Boise Project Main (New York) Canal
61.2
58.8
Barber Dam
58.3
Ridenbaugh Canal
Bubb, Meeves #1 & #2, Rossi Mill Canals
Boise City Canal
52.8
Boise River at Boise
52.0
Settlers Canal
Drainage District #3
Davis Ditch
51.0
Thurman Mill Canal
Farmers Union and Boise Valley Canals
50.4
Boise Sewer
48.0
Boise R. At Glenwood
46.4
New Dry Creek and New Union Canals
EAGLE ISLAND
Ballentyne Canal
9 Eagle Island Canals
Eagle Drain
Thurman Drain
Middleton Canal
Eureka #1 and Phyllis Canals
Little Pioneer Canal
38.0
Canyon County Canal
32.9
32.4
Caldwell Highline Canal
27.7
Fivemile Creek
North and South Middleton Drain
26.3
Willow Creek
24.7
23.2
Mason Creek and Drain
22.6
Riverside and Pioneer Dixie Canals
Hartley Drain and Gulch
22.4
Sebree, Campbell, and Siebenberg Canals
21.9
21.1
Caldwell Bridge
19.7
Indian Creek
McManus and Teater Canals
17.9
Eureka #2 Canal
17.6
Upper Center Point Canal
Bowman and Swisher Canal
16.0
Lower Center Point Canal
13.8
Boise River at Notus
Conway Gulch
Baxter and Boone Canals
Andrews Canal
Mammon Pumps
Dixie Slough
Haas Canal
Parma Canal
Island Highline Canal
McConnel Island Canal
3.6
Boise River near Parma
River Mile
0.0
Snake River

Input to the Boise River from Drainage District No. 3 and the Boise sewer normally averages only about 30 cfs during this period. Thus, Lucky Peak releases of approximately 10,200 cfs will normally result in Boise River flows of approximately 6,500 cfs (10,200 - 3,700 cfs) when irrigation demand is near normal.

c. Travel Times. The following tabulation outlines approximate travel times for water released from Lucky Peak, assuming that Diversion Dam pondage is full and irrigation diversions remain constant.

Location	Travel Time From Lucky Peak (Hours)
Diversion Dam	1/4
Ridenbaugh	1
Capitol Boulevard Bridge	2
Glenwood Bridge	3½
Eagle Island	4

4-08. Economy and Population. The economy of the Boise Valley is based on four major sources: (1) agricultural, (2) commercial, (3) industrial, and (4) governmental employment. The agricultural source includes crops, cattle feeding, forestry products, and food processing. The City of Boise is the state capital, the administrative center of Idaho, and also the largest city within Idaho. It is also the location of many regional Federal offices and is designated as a Standard Metropolitan Statistical Area (the only such district within 300 miles).

Population data presented in the following tabulation depict the rapid recent growth within the Boise Valley.

Area	Population		
	1960	1970	1980
Ada County	93,460	112,230	173,306
Canyon County	57,662	61,288	93,756
Boise	34,481	74,990	102,451
Nampa	18,897	20,768	25,112
Caldwell	12,230	14,219	17,699

This population growth has resulted in increased and changing demands on the water resources of the Boise River. Water-based recreation uses have increased substantially. A larger segment of the people is

concerned about Boise River water quality and instream flows. Housing developments have taken place on land that was used for irrigated agriculture. There is now a much broader segment of the public that is concerned about the operation of the Boise River system.

4-09. Irrigation Systems. Boise River water is used to irrigate approximately 327,000 acres of land in the Boise Valley. The Boise Valley can be divided into three general irrigated areas. The largest is the Boise Project. The Boise Project in turn can be divided into an upper and lower system. The upper system, 116,300 acres, includes the area served directly from the Boise River, mostly by the New York and Ridenbaugh canals. The lower system, 50,600 acres, includes the area that received water after it has first been stored in Lake Lowell.

The second general irrigated area lies immediately north and south of the Boise River between Diversion Dam and the Snake River. This area includes older privately developed irrigation districts which divert directly from the river. These canals supply approximately 160,000 acres of land.

The northwest portion of the Boise Valley is irrigated with water diverted from the Payette River. Irrigation of this area does not significantly affect flows of the Boise River.

SECTION V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Data Collection. Data for the key streamflow, snow course, and climatic stations within the upper Boise River watershed were previously outlined in paragraphs 4-05 and 4-06, and Plate 4-1 shows the station locations. The Bureau of Reclamation and the Corps of Engineers have cooperative agreements with other agencies to collect and publish specific hydrologic data necessary for reservoir regulation. Under the terms of these agreements, the Bureau and Corps pay the Geological Survey, Soil Conservation Service, and the National Weather Service for their data collection services. The Geological Survey collects streamflow 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 Soil Conservation Service and the National Weather Service. The Bureau of Reclamation and the Soil Conservation Service have established automated hydromet systems for the Boise River Basin which provide real-time data as listed in paragraph 5-03.

5-02. REPORTING AND EXCHANGING BASIC DATA.

a. Purpose. To fully regulate winter and spring floods and assure sufficient storage of water for irrigation, a timely exchange of basic data between the Bureau of Reclamation and the Corps of Engineers is required. A list of key officials and telephone numbers is included on pages ix and x (pink sheets) of this Manual for both normal regulation and abnormal events. During abnormal events, the exchange of data will be expedited by telephone to these officials during non-duty hours. On occasions 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 pages xi and xii (pink sheets) of this Manual.

b. Frequency of Exchange. 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.

3. Automated Hydromet Systems.

a. Bureau Hydromet System. The Pacific Northwest Regional Office of the Bureau of Reclamation has a hydromet system for the Boise Basin as part of an extensive automated hydrometeorological data collection system throughout the upper and middle Snake River Basin. This system 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 Central 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 preassigned 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 data base.

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 the random mode until the situation returns to normal. It is important to note that as the rate of change of the sensor value increases, the random transmission interval is shortened, thereby transmitting more frequently as the event becomes more serious.

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.

Figure 5-1 on page 5-6 shows a schematic for the Boise River basin hydromet system. The following tabulation summarizes real-time data which are available from the Bureau's hydromet system.

Station Dam and Reservoir	Parameters Archives	Dayfiles
1. Anderson Ranch Reservoir (AND)..	AF,FB,MM,MN,MX,PC,SD	AF,FB,PC,OB
2. Arrowrock Reservoir (ARK).....	AF,FB,ID,MM,MN,MX,PC	AF,FB,PC,OB
3. Lucky Peak Lake (LUC).....	AF,FB,ID,QD,QRD,QU, QV,XQD	AF,FB,Q,QE,QS QR,QT,XQ
4. Lake Lowell near Caldwell (LOW).	AF,FB	AF,FB
Stream Gages		
1. S.F. Boise River near Featherville (BRFI).....	GD,HJ,MM,MN,MX,QD	GH,HJ,OB,Q
2. S.F. Boise River at Anderson Ranch Dam (ANDI).....	GD,HJ,QD,QU	GH,HJ,Q
3. Boise River near Twin Springs (BTSI).....	GD,HJ,QD	GH,HJ,Q
4. Boise River at Arrowrock (ARKI).	(QD,QU) 1/	
5. Mores Creek above Robie Creek (MORI).....	GD,HJ,QD	GH,HJ,Q
6. New York Canal Diversion at headworks (BSEI).....	GJ,HH,QJ	CH,HH,QC
7. Boise River Diversion Dam (BDDI)	FB,GD,HJ,HM,QD	AF,FB,GH HJ,HK,Q
8. Boise River at Glenwood (BIGI)..	GD,HJ,QD	GH,HJ,Q
9. Boise River near Middleton (BOMI).....	GD,HJ,QD	GH,HJ,Q
10. Boise River near Parma (PARI)...	GD,HJ,QD	GH,HJ,Q

1/ not "real time" manually entered

Regional Climate Stations	Elevation	Parameters Archives	Dayfiles
1. Atlanta 3 (ATLI)	5,450	SP,MM,MN,MX,PC,PP,PU	OB,PC
2. Deadwood Dam (DED)	5,343	SP,MM,MN,MX,PC,PP,PU	OB,PC
3. Cascade Dam (CSC)	4,828	SD,MM,MN,MX,PC,PP,PU	OB,PC
4. Idaho City (IDHI)	3,965	SP,MM,MN,MX,PC,PP,PU	OB,PC
5. Centerville (CVAI)	4,300	PC,PP,PU	PC

AF - Reservoir content
CH - Outlet channel gage height
FB - Reservoir forebay elevation
GD - Mean daily gage height
GH - Observed gage height
GJ - Mean daily canal stage
HH - Gage height shift for canal
HJ - Gage height rating shift
HK - Diversion Pool Height
ID - Daily average reservoir inflow
MM - Average daily temperature
MN - Minimum daily temperature
MX - Maximum daily temperature
OB - Observed air temperature
PC - Cumulative Precipitation
PP - Daily precipitation
PU - Cumulative precipitation, inches (water year)
Q - Total discharge (15 minute)
QC - Outlet channel discharge
QD - Daily average discharge
QE - Turbine discharge
QJ - Mean daily canal discharge
QR - Discharge (cone valves)
QS - Discharge (slide valves)
QT - Discharge (powerhouse + slidegates (Aquasonic)
QU - Daily computed unregulated flow
QV - Daily average power discharge
SD - Snow depth
SP - Snow water content
XQ - Secondary total
XQD - Daily secondary total

b. SCS SNOTEL System. The Soil Conservation Service owns and operates a hydromet system for the Boise River and adjacent river basins 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 the capability of additional interrogations (ad hoc polls) as needed. A total of three parameters can be retrieved from each remote data site, with ultimate plans for retrieving a total of 16 parameters. The following tabulation summarizes real-time data which are available from the SNOTEL system.

	Station Name (No.)	Elevation (ft. msl)	Basin	Location Latitude Deg.	Min.	Longitude Deg.	Min.
1.	Atlanta Summit (15F04S)	7,600	Boise	43	45	115	14
2.	Graham Guard Sta. (15F14S)	5,690	Boise	43	57	115	16
3.	Jackson Peak (15E09S)	7,070	Boise	44	03	115	27
4.	Mores Cr. Summit (13E06S)	6,100	Boise	43	55	115	40
5.	Prairie (15F06S)	4,800	Boise	43	30	115	35
6.	Trinity Mountain (15F05S)	7,770	Boise	43	38	115	26
7.	Dollarhide Summit (14F08S)	8,420	Big Wood	43	36	114	40
8.	Galena (14F01S)	7,440	Big Wood	43	53	114	40
9.	Galena Summit (14F12S)	8,780	Big Wood	43	51	114	43
10.	Vienna Mine (14F04S)	8,960	Salmon	43	48	114	51
11.	Bennett Mountain (15F07S)	6,560	Canyon Cr.	42	16	115	26
12.	Cozy Cove (15E08S)	5,380	Payette	44	17	115	39
13.	Deadwood Summit (15E04S)	6,860	Payette	44	33	115	34

Parameters reported by these SNOTEL stations include:

1. PILL - Snow water content from snow pillow
2. PREC - Cumulative precipitation
3. TMAX - Maximum daily air temperature
4. TMIN - Minimum daily air temperature
5. TAVE - Average daily air temperature

Note: SNOTEL stations provide real-time snow water content data on a daily basis via the SCS's Data General System.

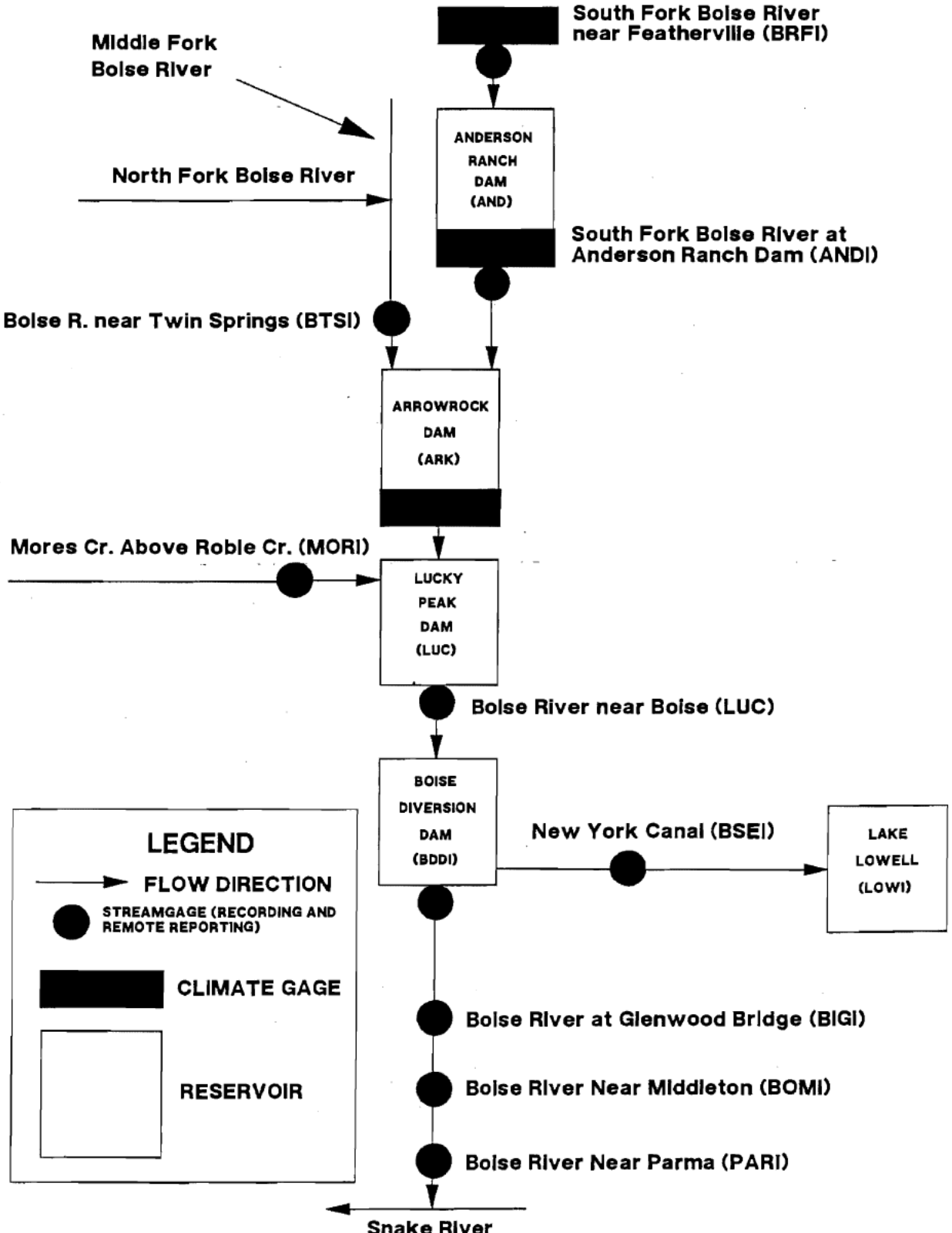
5-04. CORPS OF ENGINEERS - CROHMS SYSTEM

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 data base support functions. The data acquisition for these three functions is supported through the CROHMS Automated Front End (CAFE). Figure 5-2 on page 5-7 shows the CROHMS network diagram.

The CAFE is a centralized computer facility consisting of a primary computer and a backup, communications interface, storage for data, and software capabilities. It functions as a central point of raw data collection for CROHMS, a source of raw data files, and a distribution center for reports processed by the CROHMS computer.

5-05. Use of Real-Time Data. The real-time data are used for volume forecasting and in the Streamflow Synthesis and Reservoir Regulation (SSARR) model and thus form the basis for decisions and resultant reservoir regulation. All of the regulating agencies plan continued support for the existing data collection programs.

FIGURE 5-1
BOISE RIVER GAGING FACILITIES



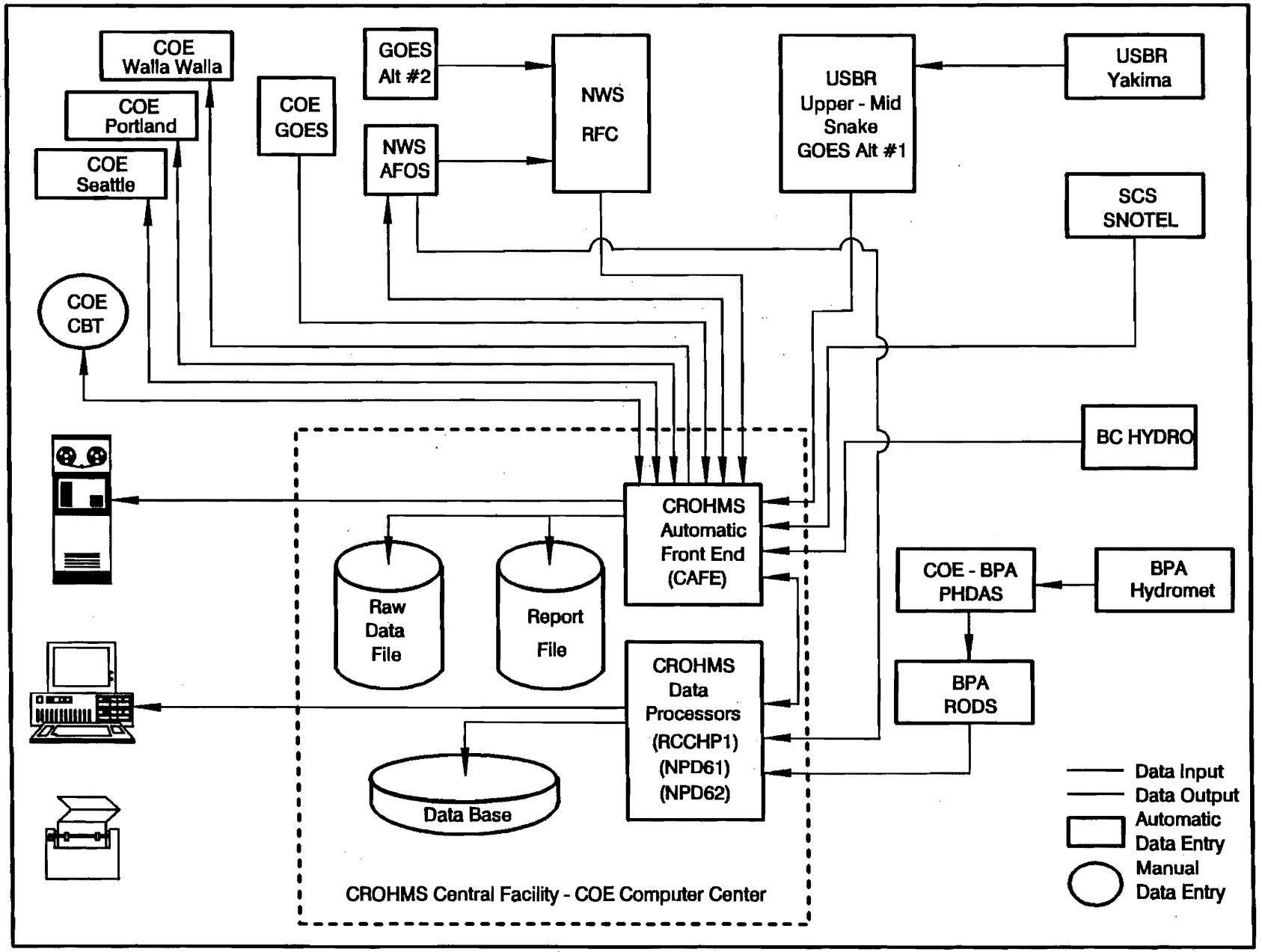


FIGURE 5-2 CROHMS Data Collection System

VI - HYDROLOGIC FORECASTS

6-01. General. Reservoir regulation (Anderson Ranch, Arrowrock, and Lucky Peak) for flood control and refill is primarily based on forecasts of expected runoff volumes from the watershed; thus, accurate forecasts are very important for successful regulation of the system. Runoff volume forecasts for the upper Boise River watershed are normally prepared by the Bureau of Reclamation, Corps of Engineers, Northwest River Forecast Center-National Weather Service, U.S. Soil Conservation Service, and the Boise Project Board of Control. Each entity has its own volume forecast procedure and purpose for the volume forecast. The Bureau and Corps forecasts are normally the only ones used for reservoir regulation. Procedures used by the entities are generally based on regression and correlation techniques and use snow water content and precipitation data as the primary independent variables. Some of the forecast procedures also have indices for base flow and soil moisture. All of the entities continually try to update and improve their procedures as much as is practical. The major sources for errors in these procedures are future weather conditions and an inability to account for all of the factors which affect runoff.

In addition to regression techniques, the Bureau, Corps, and River Forecast Center use SSARR models (daily mathematical simulation model - "Streamflow Synthesis and Reservoir Regulation") for short-term forecasting. The SSARR models account for most of the factors controlling runoff and are especially useful late in the season during final refill of the reservoirs.

6-02. Operational Forecasts. It is the responsibility of the Bureau of Reclamation and the Corps of Engineers to jointly agree upon the runoff volume forecasts which will be used for the regulation of the three Boise River reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak). Reservoir and River Operations Branch personnel prepare the Bureau of Reclamation runoff volume forecasts. Hydrology Branch personnel prepare the Corps of Engineers runoff volume forecasts. Personnel from these two staff level offices then agree upon an "operational" runoff volume forecast which will be used for reservoir regulation. Normally, the agreed-to operational forecast should be an average of the Bureau and Corps forecasts. These official operational runoff volume forecasts are determined approximately every 2 weeks (near the first of the month and mid-month) beginning on 1 January each year and continuing until flood control season is over.

In the latter part of the flood control season, the Bureau and the Corps normally use SSARR models for short-term volume forecasting. Volume forecasts derived from the SSARR models can be used for operational forecasts so long as staff level Bureau and Corps personnel can agree upon the numbers. The joint agreement method used between the Bureau and Corps for determining operational forecasts (from either regression procedures or SSARR models) has been adequate in the past and will be continued in the future. Regression analysis forecast procedures used by the Bureau and Corps are presented in Exhibit A of this manual.

6-03. Conservation Forecasts. Neither the Bureau nor the Corps has volume forecasting procedures designed specifically for low runoff or drought years, but both agencies do have SSARR models which can adequately forecast streams necessary for regulation during drought years. Future efforts will examine utilization of different forecast procedures during drought or low-flow years.

VII - WATER CONTROL PLAN

7-01. General Objectives. It is the objective of this Water Control Plan to define reservoir regulation procedures and practices for joint use of the storage spaces in Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs. Storage in Lake Lowell is affected by this Water Control Plan through regulation of the upstream reservoir projects, but Lake Lowell is an off-stream irrigation project regulated by the Boise Project Board of Control through an operation and maintenance contract between the Board and the Bureau of Reclamation. Thus, this Water Control Plan contains no direct regulation criteria for Lake Lowell.

7-02. Authorized Reservoir Uses. Authorized reservoir uses were discussed in Section III - HISTORY OF PROJECTS, and the Memorandum of Agreement (paragraph 3-07) outlined reservoir uses since 1953. This Water Control Plan basically retains the same uses and priorities as defined in the 1953 Memorandum of Agreement. This Plan also recognizes 50,000 acre-feet of Lucky Peak storage space to provide flows for downstream fish and wildlife as required by the current Lucky Peak storage permit. The Bureau of Reclamation is in the process of amending and finalizing the Lucky Peak Lake storage permit by designating 102,300 acre-feet of noncontracted space for streamflow maintenance and municipal and industrial uses.

As a system, Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs normally add water to storage from the end of the irrigation season (in October) each year until the annual flood control season is over (normally ranging between 15 April to 1 July).

From the end of the irrigation season until April, Idaho Department of Fish and Game and noncontracted space water is released from Lucky Peak Lake to maintain minimum flows in the downstream river.

The normal end of irrigation season storage of Lake Lowell is 120,000 to 140,000 acre-feet. If storage is below this amount, diversion from the Boise River is usually begun in February or March. Lake Lowell is then normally filled as soon after 1 April as possible and in most years is full by 1 May. Boise River natural flows have always been sufficient to credit Lake Lowell with having filled under its water right (see paragraph 7-06.e.). However, part of this water is usually temporarily stored in upstream reservoirs to avoid canal operation problems in winter, then transferred to Lake Lowell in the spring.

The amount of water stored in the system and precisely when it is stored is dependent on water rights, the amount of water available as runoff, the timing of the runoff, and the required flood control regulation. Flood control regulation during this period (1 November through the spring high water period) endeavors to maintain adequate flood control spaces within the reservoirs and yet refill the reservoirs without exceeding 6,500 cfs as measured at the Glenwood Bridge gaging station. In the low runoff years, flood control regulation during the spring snowmelt period is normally limited or not necessary, and water conservation and reservoir refill are the primary objectives. Runoff years near normal require delicate balances between flood control and refill regulation, with runoff timing and volume forecasts as the key factors for the balances. In large runoff years, maintaining adequate flood control space within the reservoirs and passing excess water through the system without unduly jeopardizing system refill, are the primary objectives.

After the annual spring flood season is over and until the end of the irrigation season, the reservoirs are drafted to maintain irrigation flows. Arrowrock Reservoir is drafted first to maintain the power head at Anderson Ranch Reservoir and also a desirable recreation level at Lucky Peak Reservoir. If the storage in Arrowrock has been used before the end of August, both Anderson Ranch and Lucky Peak Reservoirs are drafted without exceeding powerplant capacity at Anderson Ranch. After the end of August, irrigation demands are met primarily from storage in Lucky Peak Reservoir. Normal project inspections and maintenance then generally occur just after the irrigation season each year.

7-03. Use Priorities. Flood control and irrigation are the primary uses for Anderson Ranch, Arrowrock, and Lucky Peak storage spaces. Idaho Fish and Game's 50,000 acre-feet for streamflow maintenance and the noncontracted space on 102,300 acre-feet for streamflow maintenance and municipal and industrial uses at Lucky Peak are also primary uses. Secondary uses for the storage spaces include power generation at Anderson Ranch and recreation at Lucky Peak. Incidental uses include recreation (at Anderson, Arrowrock, and Boise River below Lucky Peak Dam), downstream water quality, and sedimentation pools within the reservoirs.

7-04. Use Conflicts. Because the Boise River reservoirs are managed as a multiple-purpose system, it is not possible to optimize regulation for each of the separate uses. Thus, this Water Control Plan represents compromises between the various uses as established within the priorities listed. Flood control use directly conflicts with all of the other system

uses to some degree. Optimum flood control protection possible with the system would require that the reservoirs be maintained empty and available to control floodwaters. Even with this type of regulation, past studies have shown that the existing system (with the limited downstream channel capacity) would not be adequate to control large spring snowmelt flood volumes (events of approximately 50-year magnitude or larger) to desirable levels of downstream flooding.

Optimum irrigation use would require that the system be maintained as full as possible to provide carryover storage water for the drought years, and even this operation would not necessarily assure adequate water supplies for a series of drought years. Full refill of the system for irrigation does not conflict with recreation until the reservoirs have to be drawn down to meet irrigation requirements in the summer and fall. During the winter, refill for irrigation directly conflicts with the maintenance of minimum fish and wildlife and water quality flows.

Some of the use conflicts have just been outlined and more could be discussed, but the key conflict is that of flood control versus refill regardless of the intended use of the stored water.

7-05. Flood Control Plan. This element of the Water Control Plan defines specific reservoir regulation criteria which shall be strictly followed during the flood control season. The flood control plan consists of the following:

a. Winter Requirements. Flood control regulation during the period 1 November through 1 March requires that specific minimum flood control spaces be maintained in the reservoir projects to protect against unpredictable winter floodflows resulting from rapid snowmelt and/or

heavy precipitation on frozen ground. Maintaining these space requirements ensures that the 100-year winter flood can be contained within the projects.

From 1 November through 31 December, the following tabulation defines required minimum winter flood control spaces for the projects:

Projects	Minimum Space Requirements (Acre-Feet)
Anderson + Arrowrock + Lucky Peak	300,000 1/
Arrowrock + Lucky Peak	165,000 1/
Lucky Peak	50,000 2/

1/ Maintain from 1 November through 31 December.
2/ Maintain from 1 November through 31 March.

These minimum requirements must be maintained each year without consideration to either existing climatic conditions or refill potential. If a violation of these criteria occurs, excess storage must be evacuated as rapidly as is practical without exceeding 6,500 cfs at the Glenwood gage. The following tabulation provides general information on refill assurances during the early winter period.

Space to be Refilled 1/	Percent Chance of Refill	Beginning of Month Storage 1/ (Acre-Feet) November	December	January
Total Active Capacity (974,149 AF)	98	745,000	775,000	805,000
	95	685,000	715,000	750,000
	90	615,000	630,000	690,000
Allocated Space (1982) (871,728 AF)	98	655,000	675,000	705,000
	95	585,000	615,000	650,000
	90	515,000	550,000	590,000
All Space Excluding Lucky Peak (709,778 AF)	98	485,000	515,000	545,000
	95	425,000	455,000	490,000
	90	355,000	390,000	430,000

1/ Does not include dead or inactive storage, but may include storage credited to Lake Lowell.

Since a minimum of 300,000 acre-feet of winter flood control space will be maintained in the Anderson Ranch, Arrowrock, and Lucky Peak system from 1 November through 31 December each year, refill assurances for the total active system capacity will be approximately 89 percent on 1 January for normal runoff volumes.

From 1 January through 1 March, the required winter space for the system is a function of the flood potential related to runoff volume forecasts determined from the procedure described in Section VI - HYDROLOGIC FORECASTS. The winter space line shown on Plate 7-1 defines the system winter requirements when runoff volume forecasts are near or above normal. If runoff volume forecasts are significantly above normal, system winter space requirements (in excess of the winter space line) are also shown on Plate 7-1. If runoff volume forecasts are below normal, system winter space requirements can be reduced below the winter space line on Plate 7-1 in accordance with the criteria shown on Plate 7-2. Using Plate 7-2 maintains a 100-year winter flood control assurance and also provides a 95-percent refill assurance for 871,728 acre-feet of system space within the limits of the runoff volume forecasts shown. Under no condition will the system space be less than 150,000 acre-feet from 1 January through the end of February. The following tabulation illustrates use of Plates 7-1 and 7-2 to define 1 January through 1 March winter space requirements.

1 February Forecasted Runoff Volume (Million Acre-Feet)	1 February Winter Space Requirement (Acre-Feet)
2.3	360,000 (Plate 7-1)
1.8	300,000 (Plate 7-1)
1.5	237,000 (Plate 7-2)
1.1	150,000 (Plate 7-2)

A minimum of 55 percent of the total winter flood control requirement (from Plates 7-1 or 7-2 as appropriate) during the 1 January through 1 March period must be held within the Arrowrock and Lucky Peak projects; and no less than 50,000 acre-feet of space will be in Lucky Peak. If a violation of the winter flood control criteria occurs, excess storage must be evacuated as rapidly as is practical without exceeding 6,500 cfs at the Glenwood gage.

b. Spring Evacuation Requirements. Flood control regulation during the spring snowmelt evacuation period (1 January through 31 March) normally requires some evacuation of stored water from the Boise River reservoirs by 1 April. This evacuation is necessary to provide adequate flood spaces within the reservoir projects to control forecasted floodflows resulting from melting snowpacks within the upper Boise Basin. The normal active snowmelt season generally begins during the first 2 weeks in April; thus, evacuation should be completed by approximately 1 April to ensure adequate spaces are available. The amount of evacuation necessary and the required 1 April target flood control spaces are based on:

1. Operational runoff volume forecasts.
   (Determined from procedure in Section VI - HYDROLOGIC FORECASTS.)

2. Flood control rules curves.
   (Plates 7-1 or 7-2 as appropriate)

3. Space distribution curves.
   (Plate 7-3)

4. Inflow volume projections.

Years with small runoff volume forecasts may require no evacuation while years with large runoff volume forecasts may require large releases for evacuation.

During the evacuation period, it is necessary to maintain current day flood control spaces and distribution requirements and also schedule releases such that all 1 April requirements will be properly met. The following procedure outlines steps necessary to check the current date flood control requirements:

1. Compute current date through 31 July residual runoff volume forecast using the operational forecast and unregulated runoff volumes to date.

2. Determine current date required system flood control space from the flood control rule curves (Plates 7-1 or 7-2 as appropriate).

3. Determine current date space distribution requirements from the distribution curves (Plate 7-3).

4. Compare the current date flood control requirements to the observed current date data.

The following procedure outlines steps necessary to compute 1 April target flood control requirements (refer to Table 7-1 on page 7-8 as a worksheet).

1. Compute the expected residual 1 April through 31 July total Lucky Peak unregulated inflow volume using the current operational runoff forecast and the following projection equations for inflows prior to 1 April.

Inflow Projection Period	Projection Equation 1/ $Y = A_0 + A_1 X$ (KAF)	Standard Error 2/ (KAF)
1 Jan - 31 Mar	$Y = 68.792 + 0.129677 X$	72.473
16 Jan - 31 Mar	$Y = 59.698 + 0.119461 X$	69.986
1 Feb - 31 Mar	$Y = 43.598 + 0.107706 X$	73.436
15 Feb - 31 Mar	$Y = 46.446 + 0.085270 X$	59.385
1 Mar - 31 Mar	$Y = 19.088 + 0.080381 X$	69.108
16 Mar - 31 Mar	$Y = 14.256 + 0.055828 X$	49.807

1/ Y = Projected inflow volume (1,000 acre-feet) expected during inflow projection period.
X = Forecasted runoff volume (1,000 acre-feet) corresponding to volume forecast period (date through 31 July).

2/ Standard error for regression equation (1,000 acre-feet). Projection equations and standard errors developed from 1895 through 1980 period of record.

2. Determine 1 April expected system flood control requirements from the flood control rule curves (Plate 7-1).

3. Compute minimum required flood control release using the expected 1 April flood control space requirement, present available space, and the date through 31 March inflow projection volume.

TABLE 7-1
LUCKY PEAK RELEASE SCHEDULING WORKSHEET
(BEFORE 1 APRIL)

Forecast Period (Date - 31 July): 1 February - 31 July DATE: Example
Volume Forecast (Date - 31 July): 2,000 KAF NAME:
Target Date: 1 April

1. Expected Residual 1 April through 31 July Unregulated Inflow Volume.

   a. Volume Forecast (Date - 31 July): 2,000 KAF

   b. Expected Inflow Volume (Date - 31 March) (Y = 43.598 + 0.107706 X)
   (Projection Equations Page 7-12) 259 KAF

   c. Residual Forecast (1 April - 31 July) (a-b) 1,741 KAF

2. Expected 1 April System Flood Control Space Requirements
   [Enter Flood Control Rule Curve (Plate 7-1) with
   Residual Volume Forecast on 1 April]

   a. Required 1 April System Flood Control Space 435 KAF

3. Minimum Required Flood Control Release

   a. Required 1 April System Flood Control
   Space (From 2.a.) 435 KAF

   b. Present Available Space 320 KAF

   c. Minimum Required Evacuation (a-b) 115 KAF

   d. Expected Inflow Volume (Date - 31 March)
   (From 1.b.) 259 KAF

   e. Minimum Required Release Volume
   (Date - 31 March) (c+d) 374 KAF

   f. Minimum Required Daily Release =
   (e) (500/Inflow Projection Period in Days) $= \frac{(374)(500)}{59} =$ 3,169 CFS

4. Minimum Space Distributions,
   (Enter Plate 7-3 with Residual Forecast on 1 April)

   a. Minimum Percentage of 1 April Flood Control Space
   Required in Arrowrock and Lucky Peak Projects 30 %

   b. Required 1 April System Flood Control
   Space (From 2.a.) 435 KAF

   c. Minimum 1 April Space Required in Arrowrock
   and Lucky Peak Projects, (a)(b)/100 = (30)(435)/100 = 131 KAF

4. Determine the minimum space distribution percentage which is expected to be required in Lucky Peak and Arrowrock on 1 April using the expected 1 April through 31 July residual runoff volume forecast and Plate 7-2. Compute the minimum expected 1 April flood control requirement for Lucky Peak and Arrowrock using the Lucky Peak and Arrowrock minimum space distribution percentage and the expected 1 April flood control requirement for the system.

After current date and expected 1 April flood control requirements have been determined, reservoir releases must be scheduled such that violations of these flood control requirements do not occur. Minimum flood control releases from Lucky Peak should not average less than the value computed under step 3 of the 1 April target requirement procedure. If the current date system space requirement is being violated, the required Lucky Peak release must be larger than the computed step 3 value; but it will not normally exceed 6,500 cfs at the Glenwood gage.

If the required minimum Lucky Peak release (as computed from step 3 of the 1 April target requirement procedure, Table 7-1 on page 7-8) exceeds 6,500 cfs at the Glenwood gage, it may be necessary to increase the regulation objective above 6,500 cfs at the Glenwood gage. Computed releases above 6,500 cfs usually occur as a result of exceptionally heavy snowpacks within the upper Boise Basin or very large increases in the runoff volume forecasts. Regulated flows at the Glenwood gage should not exceed 6,500 cfs before 1 April when there is more than a 50-percent chance that the expected flood can be controlled to 6,500 cfs. If the probability of controlling the expected flood to 6,500 cfs is 50 percent or less, the regulation objective must be increased as necessary (not to exceed 10,000 cfs at the Glenwood gage) to maintain at least a 50-percent control probability.

Computed releases above 6,500 cfs at the Glenwood gage usually occur as a result of exceptionally heavy snowpacks within the upper Boise Basin or very large increases in the runoff volume forecasts. If the required minimum Lucky Peak release (as computed from step 3 of the 1 April target requirement procedure, Table 7-1 on page 7-8) exceeds 6,500 cfs at the Glenwood gage, it may be necessary to increase the regulation objective above 6,500 cfs at the Glenwood gage. Criteria affecting increases above the regulation objective of 6,500 cfs at the Glenwood gage are listed as follows:

1. When the probability of controlling the expected flood to 6,500 cfs is more than 50 percent, regulated flows at the Glenwood gage should not exceed 6,500 cfs before 1 April.

2. If the probability of controlling the expected flood to 6,500 cfs is 50 percent or less, the regulation objective must be increased as necessary (not to exceed 10,000 cfs at the Glenwood gage).

The 50-percent control probability during the 1 January to 31 March evacuation period is defined as the system space required on the current date to control the following spring flood conditions to the regulation objective of 6,500 cfs at the Glenwood gage.

1. 50-percent exceedence (normal) runoff volume forecast.

2. 50-percent confidence level (normal) runoff timing sequence.

Methods which could be used to evaluate flood control space requirements for a 50-percent control probability are summarized as follows:

1. Summary Hydrograph Method. Using a normal or mean hydrograph from a summary hydrograph and adjusting the hydrograph to maintain the timing and match the operational runoff volume forecast. Then routing this hydrograph through the Boise River reservoir system.

2. Inflow Projection Method. Using inflow projection equations listed in Exhibit B to distribute the operational runoff volume forecast with time and then develop volume-time distribution data, a 50-percent flood hydrograph can be computed and routed through the Boise River reservoir system.

The procedures outlined in the preceding paragraphs should be repeated each time that a new operational runoff volume forecast is made (normally near the first of each month and mid-month during the 1 January through 31 March period). Plate 7-4 provides 95-percent refill assurance information which can be used to evaluate how the proposed flood control regulation will impact refill during this period.

c. Refill Requirements. Flood control regulation during the refill period (1 April through 31 July) requires the use of snowmelt runoff to refill flood control spaces within the Boise River reservoirs. Refill rates for these flood control spaces must be controlled such that the regulation objective of 6,500 cfs at the Glenwood gage is not exceeded and the required reservoir project spaces are refilled at the end of the snowmelt runoff period. Premature filling of these spaces (before natural floodflows had decreased to regulation objective levels) would result in extensive flood damages below Lucky Peak Dam. Reservoir regulation during the refill period is normally the most difficult and most critical of the three flood control periods. Therefore, it is absolutely essential that required minimum flood control spaces and space distributions be maintained while the reservoir projects are being refilled. Reservoir releases must be scheduled such that flood control requirements are not violated; and yet, release fluctuations at Lucky Peak must be limited as much as practical to avoid unnecessary interference with irrigation diversions during this period. Flood control requirements and rates of refill during the refill period are based on:

1. Operational runoff volume forecasts.
   (Determined from the procedure in
   Section VI - HYDROLOGIC FORECASTS.)

2. Flood control rule curves.
   (Plates 7-1, 7-2, or 7-3A as appropriate)

3. Space distribution curves.
   (Plate 7-3)

4. Projections of 15-day and 30-day
   inflow volumes.

During the refill period, it is necessary to maintain current day flood control spaces and distribution requirements and also schedule releases such that 15-day and 30-day target requirements will be properly met. A procedure for checking the current date flood control requirements was outlined in paragraph 7-05.b. The following procedure outlines steps necessary to compute expected 15-day and 30-day target flood control spaces and release requirements (refer to Table 7-2 on page 7-13 as a worksheet).

1. Compute expected 15-day and 30-day residual runoff volume forecasts from the current date using the current operational runoff volume and the following projection equations.

Volume Forecast Date	Inflow Projection Period (Days)	Projection Equation 1/ $Y = A_0 + A_1 X$ (KAF)	Standard 2/ Error (KAF)
1 Apr	15	Y = 19.726 + 0.084950 X	56.041
1 Apr	30	Y = 17.487 + 0.229886 X	106.060
16 Apr	15	Y = 11.296 + 0.150415 X	75.344
16 Apr	30	Y = 52.610 + 0.301187 X	111.155
1 May	15	Y = 60.102 + 0.163226 X	63.217
1 May	30	Y = 114.571 + 0.350973 X	100.209
16 May	15	Y = 81.481 + 0.208614 X	65.625
16 May	30	Y = 63.450 + 0.516790 X	67.799
1 Jun	15	Y = 15.702 + 0.394130 X	42.760
1 Jun	30	Y = -2.683 + 0.738186 X	33.958
16 Jun	15	Y = -6.034 + 0.557465 X	22.875
16 Jun	30	Y = -10.831 + 0.870625 X	9.935
1 Jul	15	Y = -8.343 + 0.702454 X	5.670
1 Jul	30	- - - - - - - - - - - - - - - - - - - -	

1/ Y = Projected inflow volume (1,000 acre-feet) expected during the inflow projection period.

X = Operational runoff volume forecast (1,000 acre-feet) from the volume forecast date through 31 July.

2/ Standard error (1,000 acre-feet) for the projection equation. Equations and standard errors developed using the 1895 through 1980 period of record.

2. Determine the 15-day and 30-day target date expected system flood control requirements from the flood control rule curves (Plate 7-1).

3. Compute minimum required flood control releases from Lucky Peak using the 15-day and 30-day flood control space requirements and the 15-day and 30-day inflow volume projections.

4. Determine 15-day and 30-day space distribution requirements from the space distribution curves (Plate 7-3).

TABLE 7-2
LUCKY PEAK RELEASE SCHEDULING WORKSHEET
(AFTER 1 APRIL)

Forecast Period (Date - 31 July): 1 May - 31 July Date: Example
Volume Forecast (Date - 31 July): 1,200 KAF Name:
Target Dates (15-Day): 15 May (30-Day): 30 May

	15-Day Target Date	30-Day Target Date
1. Expected Residual Target Date through 31 July Unregulated Inflow Volume		
a. Volume Forecast (Date - 31 July)	1,200 KAF	1,200 KAF
b. Expected Inflow Volume (Date-Target Date) (Y = 60.102+0.163226 X) (Projection Equations Page 7-12)	256 KAF	(Y = 114.571+0.350973 X) 536 KAF
c. Residual Forecast (Target Date - 31 July) (a-b)	944 KAF	664 KAF
2. Expected Target Date System Flood Control Space Requirements [Enter Flood Control Rule Curve (Plate 7-1) with Residual Volume Forecasts and Target Dates]		
a. Required System Flood Control Space	252 KAF	167 KAF
3. Minimum Required Flood Control Release		
a. Required System Flood Control Space (From 2.a.)	252 KAF	167 KAF
b. Present Available Space	305 KAF	305 KAF
c. Minimum Required Evacuation (a-b)	-53 KAF	-138 KAF
d. Expected Inflow Volume (Date - Target Date) (From 1.b.)	256 KAF	536 KAF
e. Minimum Required Release Volume (Date - Target Date) (c+d)	203 KAF	398 KAF
f. Minimum Required Daily Release	=(e) (500/15) 6,767 CFS	= (e) (500/30) 6,633 CFS
4. Minimum Space Distributions (Enter Plate 7-3 with Residual Forecast and Target Date)		
a. Minimum Percentage of Flood Control Space Required in Arrowrock and Lucky Peak Projects	30 %	30 %
b. Required System Flood Control Space (From 2.a.)	252 KAF	167 KAF
c. Minimum Space Required in Arrowrock and Lucky Peak Projects (a)(b)/100	76 KAF	50 KAF

Step 1 of the procedure just outlined can use methods other than the projection equations to determine total Lucky Peak unregulated inflows expected between the current date and 15 days and 30 days later. Using other methods, such as the SSARR model but not limited to SSARR, can be very advantageous for short-term inflow forecasting since these models use many more parameters and are generally more accurate than the projection equations. If methods other than the projection equations are used for projecting short-term inflow volumes, the regulating agencies must agree on inflow volume values before these values are used for release scheduling. If, however, the regulating agencies cannot agree on inflow volume values, the projection equation procedure will be the required step and must be used.

After current date and expected 15-day and 30-day flood control requirements have been determined, reservoir releases must be scheduled such that violations of these flood control requirements do not occur. Minimum flood control releases from Lucky Peak should not average less than the smaller of the two values computed under step 3 of the 15-day and 30-day target flood control procedure. If the current date system space requirement is being violated, the required Lucky Peak release must be equal to or greater than the larger of either value computed under step 3; but it will not normally exceed 6,500 cfs at the Glenwood gage.

If the required minimum Lucky Peak release (as computed from step 3 of the 15-day and 30-day target flood control procedure) exceeds 6,500 cfs at the Glenwood gage, it is necessary to check a second set of criteria to determine if the 6,500-cfs regulation objective must be increased. The purpose of the additional criteria is to insure that exceeding 6,500 cfs is actually necessary to control the flood as opposed to meeting the 15-day and 30-day space targets. The desired flood control objective (April through July) is to maintain an 80-percent control probability. While flows between 6,500 cfs and 10,000 cfs at the Glenwood gage do result in significant flood damages, flows in excess of 10,000 cfs produce major flood damages and should be avoided, if possible. Criteria used to determine flows in excess of 6,500 cfs at the Glenwood gage are summarized as follows:

1. When the probability of controlling the expected flood to 6,500 cfs is more than 80 percent, regulated flows at the Glenwood gage should not exceed 6,500 cfs.

2. When the probability of controlling the expected flood to 6,500 cfs is less than 80 percent, regulated flows at the Glenwood gage must be increased to the 80-percent control probability level (20-percent risk).

The regulation objective necessary to maintain an 80-percent control probability from April through July is evaluated by routing two synthetic 20-percent exceedence flood hydrographs through the Boise River reservoir system to determine the minimum constant flow required at the Glenwood gage to control the expected floods. These two synthetic hydrographs (one with a 50-percent timing distribution and a 20-percent exceedence volume and a second hydrograph with a 50-percent volume and a 20-percent early timing exceedence) can be developed by any of the following methods:

1. Using the joint (Bureau-Corps) operational runoff volume forecast and its standard error of estimate, the two synthetic hydrographs are calculated with the inflow projection equations and standard errors listed in Exhibit B.

2. Using the joint (Bureau-Corps) operational runoff volume forecast and the unregulated summary hydrograph, the forecasted volume is distributed to represent each of the two synthetic flood hydrographs.

3. Using the SSARR computer model with the 50-percent and 20-percent exceedence runoff volume forecasts, 20-percent and 50-percent exceedence temperature sequences are input into the model to generate the early and normal timing distributions for the synthetic hydrographs.

The procedures outlined in the preceding paragraphs should be repeated each time that a new operational runoff volume forecast is made (normally near the first of each month and mid-month during the 1 April through 1 June period). Plate 7-4 provides 95-percent refill assurance information which can be used to evaluate how proposed flood control regulation will impact refill during this period. Plate 7-5 provides 1-percent flood control space information which can be used to evaluate risks being taken with proposed flood control regulation.

The final 60,000 acre-feet of reservoir system space to be refilled each year (within the Anderson Ranch, Arrowrock, Lucky Peak projects, excluding surcharge) will be used jointly for flood control protection for late

season, large rainstorms; underestimation of remaining runoff; river regulation during emergency conditions (such as canal breaks, construction within the Boise River channel, etc.); and storage of water for stream maintenance flows and municipal and industrial uses. The Bureau of Reclamation has the temporary State permit for Lucky Peak Lake storage and will be finalizing the permit by requesting that the Lucky Peak Lake noncontracted space be assigned as follows:

1. 13,950 acre-feet of water volume between pool elevations 3055 to 3060 for exclusive flood control.

2. 102,300 acre-feet for stream maintenance flows and municipal and industrial uses.

Even though the 60,000 acre-feet of space has last priority in the Boise reservoir system for the purpose of improving the flood control operation, the regulating agencies should try to refill the space because the water stored in the space is critical to maintaining minimum Boise River stream maintenance flows.

When Anderson Ranch, Arrowrock, and Lucky Peak projects have a total of 60,000 acre-feet of space or less (excluding surcharge) during the annual snowmelt flood control season, reservoir regulation will be guided by current basin conditions such as snowpack water contents, expected precipitation and temperatures, current irrigation diversions, and any other data which are available and indicate current flood potential. The regulating agencies will jointly determine current flood control requirements for existing basin conditions. If it is deemed safe to refill a portion of the final 60,000 acre-feet of space, the regulating agencies must agree on the proposed regulation schedule before additional planned filling begins. This filling will be limited by the "Final Fill Flood Control Requirements" shown on Plate 7-3A when unregulated inflows are greater than 10,000 cfs.

d. Constraints and Considerations. As part of the plans presented for each of the three flood control periods, there are some general constraints and considerations which affect final flood control regulation. The following information outlines these items.

(1) Regulation Objectives. The purpose of regulating the Boise River for flood control is to prevent loss of life and limit property damage due to flooding of the Boise River. To accomplish these goals,

it is desirable to contain Boise River natural floodflows within the reservoir projects while limiting downstream flows at the Glenwood Bridge gaging station to 6,500 cfs or less. The 6,500-cfs regulation objective at the Glenwood gage is a primary regulation target and should not be violated unless an emergency exists or is anticipated (refer to the individual flood control plans for each of the three periods). Flows of 6,500 cfs at the Glenwood gage do result in some minor flooding (primarily overbank flooding of agricultural and pastureland and seepage into low elevation areas); however, 6,500 cfs is considered to be the normal acceptable damage flow level by the regulating agencies. Using regulation objectives, less than 6,500 cfs would result in reducing the flood control capability of the system and past studies have shown that average annual flood damages would increase if the regulation objective was decreased. Streamflow magnitudes of 6,500 cfs at Glenwood gage are less serious later in the irrigation season as more water is diverted from the river below Glenwood gage.

During the irrigation season, irrigation water is diverted from the Boise River between Lucky Peak Dam and the Glenwood Bridge gaging station. These diversions are normally quite dependable from year to year and significantly aid in reducing flows and thus allow Lucky Peak releases to be increased by an equal amount if necessary for flood control. The following tabulation lists assumed irrigation diversions and total Lucky Peak releases used for the development of flood control criteria for normal flood control regulation.

Period	Flood Control Objective Boise River at Glenwood Gage (cfs)	Assumed Irrigation Diversions Lucky Peak to Glenwood Gage (cfs)	Flood Control Objective Lucky Peak Release (cfs)
1 Jan-31 Mar	6,500	0	6,500
1 Apr-30 Apr	6,500	1,600	8,100
1 May-31 May	6,500	3,700	10,200
1 Jun-31 Jul	6,500	3,800	10,300

A secondary flood control regulation objective is to maintain the downstream flows at the Parma gaging station to 7,000 cfs or less whenever possible. Flows at the Parma gage are dependent upon flows at the Glenwood gage, current irrigation diversions and return flows, and upon local runoff from rain or snowmelt.

The normal flood control regulation objectives just presented outline desirable maximum flood control limits which are usually obtainable within the physical limits of the existing reservoir system and the restricted downstream channel capacity. Occasionally a large or unusual flood event will occur which cannot be controlled within the reservoir system while maintaining 6,500 cfs at the Glenwood gage. When the flood control space requirements cannot be maintained with 6,500 cfs at the Glenwood gage, flood control strategies necessary to prevent loss of flood control regulation and still significantly reduce flood damages are presented within paragraphs 7-05.a., b., and c.

(2) Allocations. The following flood control space allocations define maximum spaces which can be used for flood control in each of the Boise River reservoir projects.

Project	Flood Control Allocation (Acre-Feet)		Reservoir Pool Range (Feet)
Anderson Ranch	418,178	423,178	4,044 to 4,196
Arrowrock	286,600		2,974 to 3,216
Lucky Peak	264,371		2,905 to 3,055
Lake Lowell	0		--
Diversion Dam	0		--
Total	969,149	974,149	

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Flood control allocations for the Anderson Ranch and Arrowrock projects remain the same as shown in earlier manuals and references. The flood control allocation for the Lucky Peak project has been reduced from 278,276 acre-feet to 264,371 acre-feet in this manual to provide 5 feet of freeboard (surcharge) at the project to avoid inadvertent use of the emergency spillway. No flood control allocations are used for Lake Lowell or Diversion Dam pond even though floodwaters have been diverted to Lake Lowell to reduce Boise River flows in the past. It is expected that Lake Lowell will probably continue to be used to reduce floodwaters in the future; but these floodflow diversions are made by agreement with the Boise Project Board of Control and possible canal problems could arise which would make any allocation unusable. Therefore, the flood control plan excludes flood control diversions above conservative irrigation demand.

(3) Reservoir Surcharges. Surcharge storage spaces within the reservoir projects should not be used as normal planned flood control space. These spaces should only be used during emergencies when potentially hazardous downstream situations can be alleviated by temporarily utilizing some of the surcharge spaces. Any water in surcharge will be released as soon as the downstream situation permits. The following tabulation summarizes surcharge storage spaces which can be used for emergencies.

Project	Surcharge Space (Acre-Feet)	Reservoir Pool Range (Feet)
Anderson Ranch	10,504	4,196 to 4,198.20
Arrowrock	11,630	3,216 to 3,219.75
Lucky Peak	13,905	3,055 to 3,060.00
Total	36,039	

(4) Rule Curves. Operational flood control rule curves (Plate 7-1) define required system flood control spaces as functions of date and operational runoff volume forecasts. These rule curves represent a balance between flood control risks and refill assurances and were specifically designed to minimize the impact of volume forecast errors and abnormal runoff timing sequences. Use of the operational flood control rule curves does not provide complete assurance that flows in excess of 6,500 cfs at the Glenwood gage can be prevented during the entire flood control season, nor that the reservoir system will completely refill. When runoff volume forecasts increase significantly because of heavy accumulations of precipitation or when runoff volume forecast errors and/or runoff timing sequences are outside of the limits of the rule curves, it may not be possible to maintain required rule curve spaces without exceeding 6,500 cfs at the Glenwood gage. During years with large runoff volume forecasts that require large downstream releases, release limitations at the Arrowrock project can sometimes make it impossible to maintain rule curve spaces. Forecast errors and/or abnormal timing sequences may also prevent filling the reservoir system occasionally. Early in the season, assurances for flood control and refill are high, and then decrease later in the season. Table 7-3 on page T7-1 approximates how the flood control and refill assurances are incorporated in the Plate 7-1 rule curves as the season progresses.

e. Regulation Procedures. The Corps of Engineers (Walla Walla District) and the Bureau of Reclamation (Pacific Northwest Region) are the regulating agencies for the Anderson Ranch, Arrowrock, and Lucky Peak projects during the annual flood control season. It is the responsibility of these agencies to jointly develop and implement real-time regulation plans and schedules for the three Boise River reservoirs which satisfy both the flood control and nonflood control requirements of these projects during the flood control season. The Corps of Engineers is responsible for ensuring that criteria within the flood control plans are not violated and they also have the final authority to specify releases from the three reservoirs if mutual agreement cannot be achieved. The Boise River Watermaster is not responsible for flood control regulation; but through his duties as watermaster, he is an integral part of the regulation planning during the flood control season by providing information about river conditions, planned activities, and irrigation requirements. Section IX - WATER CONTROL MANAGEMENT defines overall agency responsibilities and organizational structures and the following four paragraphs outline staff level offices involved in the daily regulation of the three reservoirs during the flood control season.

(1) Hydrology Branch Personnel (Corps of Engineers - Walla Walla District) are responsible for developing seasonal runoff forecasts, defining and proposing regulation plans and schedules which will meet required flood criteria, and agreeing to operational forecasts and release schedules. During the flood control season, these personnel order releases at Lucky Peak, inform the Watermaster of Lucky Peak release schedules, and keep State of Idaho Department of Water Resources personnel (Hydrology Section) informed of current regulation.

(2) Central Snake Projects Personnel (Bureau of Reclamation - Pacific Northwest Region) are responsible for defining and proposing regulation plans and schedules which will meet nonflood control requirements for the projects (such as power generation at Anderson Ranch, storage contract obligations, fish and game releases, storage transfers to Lake Lowell, etc.) during the flood control season. These personnel work very closely with the Watermaster and irrigation users to integrate their water rights and irrigation requirements into their nonflood control regulation plans and schedules. Central Snake projects personnel are responsible for agreeing to final release schedules, ordering releases at the Anderson Ranch and Arrowrock projects, and informing the Watermaster of project storages and releases.

e. Flood Control Regulation Procedures. The Corps of Engineers (Walla Walla District) and the Bureau of Reclamation (Pacific Northwest Region) are responsible for the regulating the three Boise River reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak projects) during the annual flood control season. The Corps of Engineers and the Bureau of Reclamation jointly develop and implement real-time regulation plans and schedules for the three Boise River reservoirs which satisfy both the flood control and nonflood control requirements of these projects during the flood control season.

The Boise River Watermaster is not responsible for flood control regulation; but through his duties as watermaster, he is an integral part of the regulation planning during the flood control season by providing information about river conditions, planned activities, and irrigation requirements.

Figure 7-1 on page 7-22A and the following paragraphs outline duties and procedures of staff level offices involved in the daily regulation of the three reservoirs during the flood control season:

(1) Corps of Engineers - Walla Walla District,

(2) Bureau of Reclamation - Pacific Northwest Region,

(3) Boise River Watermaster,

(4) Coordination Procedures.

(1) Corps of Engineers - Walla Walla District.

(a) Hydrology Branch Personnel are responsible for developing seasonal runoff forecasts, defining and proposing regulation plans and schedules which will meet required flood criteria, and agreeing to operational forecasts and release schedules. During the flood control season, these personnel order releases at Lucky Peak through the Project Manager, inform the Watermaster of Lucky Peak release schedules, and keep State of Idaho Department of Water Resources personnel (Hydrology Section) informed of current regulation.

The Corps of Engineers is responsible for ensuring that criteria within the flood control plans are not violated and also have the final authority to specify releases from the three reservoirs if mutual agreement cannot be achieved.

(b) Lucky Peak Project Manager or his representative has the primary responsibility for (1) ordering flood control releases from the Lucky Peak Powerhouse and auxiliary outlet, which is owned and operated by the Boise River Board of Control, (2) making additional releases from the main Corps of Engineers outlet works, when the total releases required for flood control exceed the combined hydraulic capacity of both the powerhouse and auxiliary outlet works, and (3) monitoring Lucky Peak reservoir conditions. The combined hydraulic capacity for Lucky Peak's powerhouse and auxiliary outlet works are summarized in the following tabulation:

HYDRAULIC CAPACITY OF LUCKY PEAK POWERHOUSE
AND AUXILIARY OUTLET WORKS

POOL ELEVATION (FMSL)	POWERHOUSE DISCHARGE (CFS)	AUXILIARY DISCHARGE (CFS)	TOTAL DISCHARGE (CFS)
3,055	~~5,584~~ 5600	~~5,890~~ 5900	~~11,474~~ 11,500
2,905	~~6,330~~ 6300	~~411~~ 400	~~6,741~~ 6,700

(2) Bureau of Reclamation) - Pacific Northwest Region.

(a) Central Snake Projects Personnel are responsible for defining and proposing regulation plans and schedules which will meet nonflood control requirements for the projects (such as power generation at Anderson Ranch, storage contract obligations, fish and game releases, storage transfers to Lake Lowell, etc.) during the flood control season. These personnel work very closely with the Watermaster and irrigation users to integrate their water rights and irrigation requirements into their nonflood control regulation plans and schedules. Central Snake projects personnel are responsible for agreeing to final release schedules, ordering releases at the Anderson Ranch and Arrowrock projects, and informing the Watermaster of project storages and releases.

(b) Reservoir and River Operations Branch Personnel provide technical data and assistance to the Central Snake Projects Office personnel. They serve as the coordination office between the Hydrology Branch (Corps) and Central Snake Projects Office (Bureau). During the flood control season, Reservoir and River Operations Branch personnel develop seasonal runoff forecasts and agree to operating forecasts, review, evaluate, and coordinate proposed flood control and nonflood control plans and schedules between the Corps and Bureau offices until one plan and schedule is agreed upon to satisfy all of the requirements.

(3) Boise River Watermaster is responsible for the measurement, accounting, and distribution of Boise River water according to all decreed and licensed rights. During the flood control season, the Watermaster defines required Lucky Peak releases necessary to meet water right requirements and also provides information on current river and channel conditions, changing irrigation diversions, activities along the river, etc.

(4) Coordination Procedures. Daily regulation of the three reservoirs during the flood control season requires that agency personnel (Hydrology Branch-Corps), Central Snake Projects-Bureau, Reservoir and River Operations- Bureau, Boise River Watermaster) closely coordinate their planning and scheduling to accomplish the desired regulation goals. Coordination procedures used to derive and agree upon reservoir releases and schedules during the flood control season are summarized in the following steps:

Step 1. Walla Walla District - Hydrology Branch personnel shall call the Boise River Watermaster in the morning to get current information on (1) water right release requirements, (2) downstream diversion changes, and (3) Boise River channel conditions.

Step 2. After completing Step 1, the Walla Walla District - Hydrology Branch personnel shall call the Bureau of Reclamation - Reservoir and River Operations Branch to coordinate release schedules for flood control requirements.

Step 3. After release schedules have been coordinated and agreed upon between the Walla Walla District - Hydrology Branch and the Bureau of Reclamation - Central Snake Projects Office and Reservoir and River Operations Branch,

a. The Walla Walla District - Hydrology Branch personnel shall:

(1) notify the Boise River Watermaster of any release schedule changes at Lucky Peak in order to provide 24 hour notice to the watermaster for safety reasons;

(2) call Lucky Peak project personnel to order required release changes; and

(3) brief the Idaho Department of Water Resources personnel (Hydrology Section) from time to time to keep them informed of the general flood situations and plans.

b. The Bureau of Reclamation - Central Snake Projects Office shall:

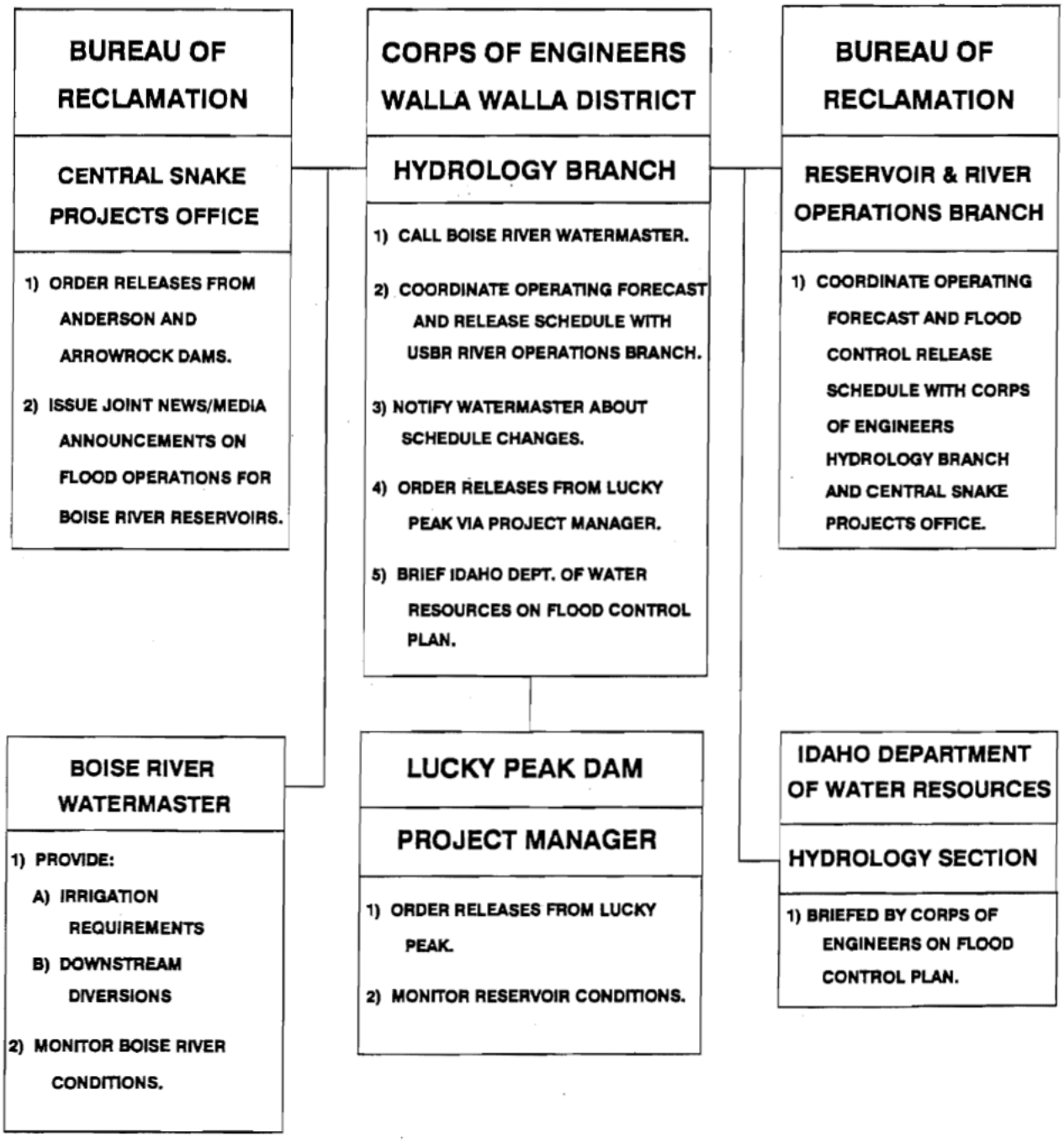
(1) order any release changes needed at the Arrowrock and/or Anderson Ranch projects.

(2) issue joint (Bureau - Corps) news releases about the Boise reservoir system, When appropriate.

Step 4. Whenever a new operational runoff volume forecast is made or the flood control situation is critical, the current flood control plan must be reevaluated and a new plan and schedules must be coordinated and agreed upon. Normally, final agreement should be reached within 2 days from the date that the first flood control plan is submitted. If agreement cannot be reached within 2 days or if the flood control situation is too critical to allow a 2-day coordination period and agreement cannot be reached immediately, each office will take the proposed plans and schedules to higher authorities to resolve. Higher authority for the Corps of Engineers will be the Walla Walla District Commander. Higher authority for the Bureau of Reclamation will be the Regional Director, Pacific Northwest Region. The District Commander will have final flood control authority if agreement cannot be reached with the Regional Director.

NOTE: criteria within this manual should not be violated under normal operation. However, situations may arise in the future where it may not always be possible or practical to exactly follow the criteria. Therefore, the flood control criteria can be temporarily violated, but only with approval of both the Walla Walla District Engineer and the Pacific Northwest Regional Director.

BOISE RIVER RESERVOIRS
(ANDERSON, ARROWROCK, AND LUCKY PEAK)
FLOOD CONTROL COORDINATION PLAN



7-06. Irrigation Water Supply Plan.

a. Purpose of Plan. The purpose of the irrigation water supply plan is to document irrigation water supply and management practices which are generally being used for Boise River water.

b. Water Rights. Existing water rights form the base from which Boise River water is managed and used for irrigation. Early water right decrees on the Boise River were preceded by many court cases involving claims of different individuals and companies contending harm from the over-allocation of Boise River waters. All decreed rights below Lucky Peak are now governed by the Stewart Decree of 1906 and the Bryan Decree of 1929 which state the priorities, amounts, and procedures by which each canal receives water. Table 7-4 on page T7-2 summarizes Stewart and * Bryan Decree filings by canals. In addition to these rights, the State of Idaho has issued rights which permit storage of Boise River water into Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs. Lucky Peak storage is currently under a permit. All storage rights and permits are held by the Bureau of Reclamation primarily for irrigation water supply. Contracts have been made between the Bureau and various irrigation districts and canal companies for the stored water. These contracts are not water rights but they do define the space allocations of water stored under the Bureau rights. Space allocations in Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs are shown in Tables 7-5, 7-6, and 7-7 on pages T7-3 and T7-4, respectively. The entire space of Arrowrock and Anderson Ranch Reservoirs has been allocated to irrigation districts or canal companies with two exceptions. In Anderson Ranch, 5,200 acre-feet have been allocated to power production, and in Arrowrock 23,000 acre-feet have been reserved for future irrigation in the Hillcrest area of the Boise Valley. Of the total 264,250 acre-feet in Lucky Peak Reservoir, 111,950 acre-feet are allocated to irrigation districts or canal companies for irrigation and 152,300 acre-feet are allocated for streamflow maintenance. *

c. Administration of Water Rights. Surface water rights on the Boise River are administered by the Boise River Watermaster. The Watermaster is responsible for the measurement, accounting, and distribution of water according to all decreed, licensed, and permitted rights.

* d. Irrigation Water Supply Periods. For the purposes of water right administration, the irrigation season on Boise River is considered to be 1 April to 1 November. However, actual diversions for irrigation usually begin on approximately 15 April and end near 15 October. During this period, the Boise River Watermaster distributes water to the irrigation districts, canal companies, and others who hold natural flow rights and/or reservoir space contracts. Water deliveries are reported each year in the report "Water Distribution of Boise River - District #63," prepared by the Watermaster. Reservoir storage, which generally begins near the end of the irrigation season, occurs whenever runoff exceeds irrigation demand or when releases are not required for flood control. *

e. Boise River Reservoir Storage Accrual. Boise River reservoir storage accrues on a daily basis to each reservoir according to the priority of the water right(s) for the reservoir(s) and the natural flow supply available at the point of diversion. Natural flow is determined at the
* location of the dams for the main river reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) and at the New York Canal Diversion Dam for the offstream reservoir, Lake Lowell. *

In order of priority, the water rights for storage in Arrowrock, Anderson Ranch, Lucky Peak, and Lake Lowell Reservoirs are as follows:

Priority	Rate (cfs)	Volume (acre-feet)	Remarks[1/]
14 December 1903	1,354.58	--	New York Canal (BD)
13 January 1911	8,000.00	--	Arrowrock (BD)
25 June 1938	--	15,000	Arrowrock (L)
* 9 December 1940	--	493,161	Anderson Ranch (L)
12 April 1963	--	293,050	Lucky Peak (P) *

1/ BD - Bryan Decree; L - License; P - Permit. All of these rights are held by the Bureau of Reclamation for the Department of the Interior.

The New York Canal right of 1,354.58 cfs is an irrigation right * which can also be used to store water offstream in Lake Lowell Reservoir during the nonirrigation season. The volume of water storable per annum is limited by the physical capacity of Lake Lowell, 177,150 acre-feet. Transmission losses in the New York Canal from 1 November to 1 April may * be diverted in addition to the physical capacity of Lake Lowell to compensate for such losses.

Arrowrock Reservoir is filled according to two rights, one for 8,000 cfs for a physical capacity of 275,000 acre-feet and another for 15,000 acre-feet with no limit on the diversion rate. However, because of siltation, the current total physical capacity is 286,600 acre-feet.

Anderson Ranch Reservoir is filled by a right for 493,161 acre-feet with no limit on diversion rate. This right is limited by dead storage of 28,980 acre-feet plus normally inactive storage of 40,981 acre-feet to 423,200 acre-feet active space.

* Lucky Peak Reservoir is filled by a right for 293,050 acre- * feet, also having no limit on diversion rate. The right is limited by normally inactive storage of 28,800 acre-feet to 264,250 acre-feet of space. At the time of this agreement the Lucky Peak right is at permit stage with licensing pending.

The above-described reservoir rights are the primary diversion rights in effect during the nonirrigation season (1 November to 1 April). * Prior to and subsequent to these dates when natural flow is sufficient to meet some or all of these storage rights, they are equal in stature to all other rights subject to priority date and other conditions imposed by state water law. To provide for efficiency and flexibility in reservoir operations, storage under the Arrowrock, Anderson Ranch, and Lucky Peak rights can physically occur in any of the three reservoirs without * regard to the reservoir specified in the right as long as the capability of any other right to be exercised remains unaffected.

The volume stored per annum, beginning on 1 November of each year, cannot exceed the volume specified by the water right or the physical capacity of the reservoir unless all subsequent rights have been met. The volume stored (including unused storage from a previous year) cannot, on any given day, exceed the specified or physical volume of the reservoir. Previously unused storage (carryover) which is released during the

nonirrigation season for a specified beneficial use can be replaced in the same year within the constraints of the right(s) governing that space. *

At the end of the irrigation season, it is the responsibility of the Bureau, in conjunction with the Watermaster, to determine the amount of unused storage in each of the three main river reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) within 30 days of the time the Watermaster has determined the amount of stored water used. It is the duty of the Watermaster to determine on a daily basis the accumulation of stored water under the rights of each of the three reservoirs and to notify the Bureau each season when the maximum fill of each reservoir is known. * The Bureau shall in turn inform the Watermaster of each user's stored water allocation in sufficient detail for proper delivery of that water.

f. Distribution of Irrigation Water. Water rights for direct diversion of flow for irrigation are potentially valid only during the 1 April through 31 October irrigation season. The Boise River Watermaster makes a daily calculation of natural (unregulated) flow at one or more locations near these points of diversion to sufficiently estimate the available natural flow supply. The Watermaster then credits the natural flow to appropriate users based on a list of water rights in force provided by the State of Idaho, Department of Water Resources. When the rate of diversion of a user is greater than the credited natural flow, the remainder is charged by the Watermaster to the user's stored water supply, or lacking storage, the rate of diversion must be reduced.

In many years flood control regulation extends several weeks into the irrigation season. When Lucky Peak flood control releases are equal to or greater than the demand for irrigation water (all users are receiving an adequate supply), the entire release is considered surplus to the Boise River and the above computation of natural flow diversion by user is not necessary. During this period, no charges are made against stored water supplies.

During the irrigation season, the Watermaster defines irrigation releases which are needed at Lucky Peak Dam. The Bureau in turn transfers water from Anderson Ranch and Arrowrock Reservoirs as necessary to provide water for irrigation release. Irrigation releases made from Lucky Peak are normally near 4,500 cfs.

g. Irrigation Responsibilities. It is the responsibility of the Central Snake Projects personnel (Bureau of Reclamation) and the Boise River Watermaster to supply water to the downstream users. The Central Snake Projects personnel regulate the Anderson Ranch, Arrowrock, and Lucky Peak projects for the purpose of water supply, and the Boise River Watermaster defines required Lucky Peak releases necessary to meet demands and then ensures that these demands are met.

From 1 April to approximately 1 July each year, the flood control season and the irrigation season normally overlap. Coordination for the purpose of meeting irrigation requirements during the flood control-irrigation overlap period will be done in accordance with the procedures defined within paragraph 7-05.e. of the Flood Control Plan. After the flood control season is over, the Corps of Engineers has only a limited responsibility in the regulation of the projects; therefore, the procedure in the following paragraphs will be used to eliminate unnecessary interagency coordination.

After the flood control season each year, the Chief of Hydrology Branch (Corps of Engineers) will by letter designate the Central Snake Projects Superintendent (Bureau of Reclamation) as the person responsible for releases from the Lucky Peak project. The Central Snake Projects Superintendent is then responsible for Lucky Peak releases during the remainder of the irrigation season because water will be withdrawn from storages for which the Bureau of Reclamation holds the storage licenses and permit. After the irrigation season each year, Lucky Peak releases will again become the responsibility of the Chief of the Hydrology Branch. Chief of the Hydrology Branch will then notify necessary personnel of this transfer in responsibility by letter.

The Central Snake Projects Superintendent, after being designated as responsible for Lucky Peak releases, will by letter designate personnel authorized to call Lucky Peak project personnel and order release changes. He may designate either himself and members of his staff or the Boise River Watermaster as authorized personnel, but only one office at one time will be authorized to call Lucky Peak.

7-07. Maintenance Plan. After the irrigation season ends (approximately 15 October), Lucky Peak releases are reduced to minimum and water is normally stored within the three reservoirs until flood control releases are required, or until storage transfer to Lake Lowell, or until irrigation season begins again. Project inspections and maintenance as well as downstream maintenance and construction should normally be scheduled within

this period and as soon after irrigation season as possible. The length of this low-flow maintenance period is dependent upon storage within the system, project inflows, and runoff volume forecasts beginning on 1 January. Winter flood control requirements outlined in paragraph 7-05.a. will not be violated in order to limit flows below Lucky Peak Dam for downstream maintenance or construction during this period.

Lucky Peak Lake should normally be at elevation 2960 by the end of irrigation season so that annual inspections and maintenance can be completed. If it is necessary during this time to reduce Lucky Peak releases to zero, the storage pool behind Diversion Dam will be used to temporarily supply Boise River minimum flows.

Inspections and maintenance at the Anderson Ranch and Arrowrock projects should also be scheduled as much as possible for this period after irrigation season. Normal irrigation season requirements and regulation practices generally reduce the Arrowrock storage to levels which coincide with annual inspection and maintenance requirements.

System regulation for the purpose of project inspection and maintenance is a cooperative regulation effort between the Bureau of Reclamation and the Corps of Engineers. Shortly after the end of flood control season, it is desirable for personnel (from the Central Snake Projects Office - Bureau, Reservoir and River Operations Branch Office - Bureau, Hydrology Branch Office - Corps, and Lucky Peak Project Office - Corps) to meet for the purpose of defining inspection and maintenance requirements and scheduling target pool elevations for the maintenance period. This meeting (if held) should also be attended by the Boise River Watermaster and representatives from the State of Idaho, Department of Water Resources.

Lucky Peak releases made during the irrigation season for the purpose of meeting maintenance-period target pool elevations should be scheduled in accordance with the procedure outlined in paragraph 7-06.g. of the Irrigation Plan. During the maintenance period (after irrigation season), Lucky Peak releases will be scheduled through Hydrology Branch personnel - Corps of Engineers. If it is necessary to reduce Lucky Peak releases to zero during the maintenance period, the Lucky Peak Project Supervisor and/or his staff will coordinate Diversion Dam pool requirements directly with the Central Snake Projects Superintendent and/or his staff in order to maintain minimum Boise River flows below Diversion Dam. Lucky Peak project personnel will keep Hydrology Branch personnel (Corps) notified of the schedules for this purpose.

7-08. Hydroelectric Power Plan. Hydroelectric power generation at Anderson Ranch Dam is a secondary use to flood control and irrigation water supply. It is desirable to generate power whenever possible; but the amount of power produced is dependent upon releases needed for flood control, irrigation, and balancing storage distributions within the system rather than optimizing power production. Anderson Ranch Dam normally generates some power year-round and the power is marketed under the authority of the Bonneville Power Administration (BPA) and then added to the Federal system. The Central Snake Projects Superintendent and his staff are responsible for power generation at Anderson Ranch Dam. Normally, no special water control coordination is needed between the regulating agencies.

If and when power generation facilities are installed at Lucky Peak and/or Arrowrock, power generation will be a secondary use and operation of the plant(s) will not adversely impact flood control or irrigation.

7-09. Recreational Plan. As the population of Boise and adjacent areas has rapidly grown, the demand for nearby outdoor recreation opportunities has also increased. This has been particularly true with regard to water-oriented recreational activities such as boating, fishing, water skiing, and swimming; but exceptional demands for water-adjacent picnicking and general relaxation are also being experienced. Plate 7-6 shows the locations of some of the recreation sites surrounding the Boise area.

Recreational opportunities at the Boise River reservoirs cannot be fully optimized because of the manner in which the reservoirs must be regulated for flood control and irrigation water supply. Flood control regulation normally restricts early filling of the reservoirs for recreation, and irrigation releases producing reservoir drawdown restrict late season reservoir recreation. Special emphasis will be placed on optimizing recreational opportunities at Lucky Peak Lake as much as practical. It is desirable to refill Lucky Peak Lake to elevation 3035 by Memorial Day each year (if allowed by the flood control criteria) and after flood control season to hold the recreation pool (elevation 3055) until Labor Day if possible. Maintaining the Lucky Peak recreation pool during the irrigation season will be done by drafting water from Arrowrock. As a result of this regulation, Lucky Peak recreation season is extended, but primarily at the expense of recreational opportunities at Arrowrock. If the reservoirs do not refill by the end of the flood control season, water

will be drafted from Arrowrock to enhance the Lucky Peak recreational opportunities. Plates 7-7, 7-8, and 7-9 show past reservoir storages for Anderson Ranch, Arrowrock, and Lucky Peak.

Management of the Lucky Peak recreational pool is the responsibility of the Corps of Engineers, but filling the pool and then maintaining it is a cooperative regulation effort between the Corps of Engineers and the Bureau of Reclamation. After flood control season, the Central Snake Projects Superintendent and his staff will schedule Arrowrock releases such that the Lucky Peak recreational pool will remain near constant until Arrowrock storage is nearly depleted and downstream irrigation demand must be met with Lucky Peak storage. Lucky Peak releases after flood control season are scheduled according to the procedure in paragraph 7-06.g. of the Irrigation Plan.

Management of the Anderson Ranch and Arrowrock recreational pools is the responsibility of the Bureau of Reclamation. As previously discussed, recreational opportunities at Arrowrock are quite limited, but it is desirable to enhance the Anderson Ranch recreational opportunities as much as practical. No water control coordination between the regulating agencies is required for recreation at Anderson Ranch or Arrowrock.

7-10. Fish and Wildlife Plan. It is desirable to enhance fish and wildlife resources within the three reservoirs, in the Boise River, and adjacent areas as much as is practical. In order to accomplish this goal, specific policies and practices have been established. Lucky Peak Lake contains a minimum conservation pool of 28,767 acre-feet of storage (elevation 2824 to 2905). Anderson Ranch Reservoir contains a minimum conservation pool of 41,000 acre-feet of storage (elevation 3992 to 4039.6). At Arrowrock Reservoir it is desirable to maintain 28,700 acre-feet of storage (elevation 2974 to 3078.32) as a conservation pool. Occasionally it may be necessary (because of inspections, maintenance, or flood control) to evacuate some or all of this Arrowrock storage, but this should be avoided whenever possible.

In addition to conservation pools at each reservoir, there are provisions for minimum fish flows below Lucky Peak and Anderson Ranch dams. Lucky Peak Lake has a 50,000-acre-foot space allocation for the Idaho Fish and Game Department as required by the current Lucky Peak storage permit. This allocation is a primary use within Lucky Peak and is equal to flood control and irrigation. The purpose of this space allocation is to provide minimum fish and wildlife streamflows below Lucky

Peak Dam during the nonirrigation season. The 50,000 acre-feet of stored water is sufficient to provide a continuous flow of 137 cfs over a 182-day period from 16 October to 14 April, or a continuous flow of 160 cfs for a 156-day period. The actual release pattern is to be established by the * Director of the Idaho Fish and Game Department; however, since an additional 102,300 acre-feet of space in Lucky Peak is used for stream maintenance flows along with the Idaho Department of Fish and Game space, the release from the Fish and Game space could vary from a minimum of about 70 cfs to larger releases. *

At Anderson Ranch, the Bureau of Reclamation has a verbal agreement with the Idaho Fish and Game Department to maintain minimum releases from Anderson Ranch Dam of 300 cfs during the nonirrigation season and 600 cfs during the irrigation season. The maximum flow release during the irrigation season is about 1,600 cfs. This verbal agreement is contingent upon having ample storage water and favorable forecasts to indicate that it is practical to make these minimum releases. It is also desirable at Anderson Ranch to avoid, if possible, making large spring releases which would disturb downstream spawning beds.

7-11. Minimum Streamflow Maintenance. A continuous flow of 80 cfs as a * minimum below Diversion Dam will be provided from the 102,300 acre-foot streamflow maintenance space in Lucky Peak for the purpose of flow maintenance. This 80-cfs minimum requirement will not be violated unless required maintenance within the Lucky Peak outlet tunnel makes it temporarily impractical to do so. As specified within paragraph 7-10., a continuous minimum of 70 cfs will also be released from the 50,000-acre-foot Idaho Fish and Game Department allocation during the nonirrigation season (if stored water is available). Thus, the normal total nonirrigation season minimum streamflow below Diversion Dam will generally be 150 cfs. This normal minimum can be larger than 150 cfs if the Director of Idaho Fish and Game Department specifies a release larger than 70 cfs from the 50,000-acre-foot allocation. If water is not available in Lucky Peak Lake's 102,300-acre-foot streamflow maintenance space to maintain an 80-cfs flow release to the Boise River, the 80-cfs flow * release would be made from the Idaho Department of Fish and Game space, if water is available.

There is no minimum release requirement for Arrowrock. A minimum release is not necessary since there is no channel reach between Arrowrock Dam and Lucky Peak Reservoir.

There is no specific minimum release requirement for Anderson Ranch. As described within paragraph 7-10., there is a verbal agreement and desirable goal to maintain 300 cfs and 600 cfs during the nonirrigation and irrigation seasons, respectively, but these are desired goals and not specific requirements.

7-12. Rate of Release Change. There are criteria for rates of release changes at Anderson Ranch Dam for power peaking operation during the winter and at the end of the irrigation season, but there are no requirements or criteria for rates of release changes at Arrowrock and Lucky Peak.

The Anderson Ranch powerplant is operated to meet peak electrical needs on winter weekdays from January through March. Daily fluctuations are necessary on winter weekdays to generate hydropower when it is needed most. Although infrequent, the power peaking operation may begin in October. The winter power peaking operation is restricted to a maximum increase in electrical generation of 12 megawatts per hour until the desired peak electrical output is reached. Power peaking is avoided on winter weekends because of whitefish fishing on the South Fork of the Boise River. To protect the South Fork fishery, the maximum winter power peaking release would be restricted to 1,800 cfs per hour. The maximum rate of decline would have no specific limitation down to 600 cfs. Further flow reductions would be at a rate of no more than 35 cfs per 10 minutes (210 cfs per hour) down to the minimum riverflow. During the irrigation season the release to the South Fork of the Boise River is usually about 1,600 cfs. At the end of the irrigation season, flows are reduced gradually to prevent aquatic insects from becoming dewatered and dessicated and juvenile fish from becoming stranded. Initial discharge reductions are unrestricted down to 1,000 cfs. However, below 1,000 cfs, irrigation releases are reduced about 35 cfs per 10 minutes (210 cfs per hour) each day until the minimum instream flow is reached.

Lucky Peak does not have any restriction on maximum rate of release change which affects downstream river stage fluctuations. However, changes in releases from Lucky Peak shall be made in such a manner that any downstream effects are minimized. The actual rate of release change will depend on current conditions. Since 1954, adjustments to Lucky Peak's discharge have been made on a gradual basis and have not resulted in significant downstream problems. In addition, as consideration for downstream safety, local authorities are notified and a public notice is issued when significant release changes are scheduled from Lucky Peak.

7-13. Drought Contingency Plan. Of the total 264,250 acre-feet in Corps of Engineer's Lucky Peak Reservoir, 111,950 acre-feet are allocated for irrigation and 152,300 are allocated for streamflow maintenance. The regulation of the Lucky Peak project as a part of the Boise River reservoir system is controlled by existing state water right laws during the irrigation season (1 April - 1 November) and the minimum streamflow maintenance during the non-irrigation season. During the irrigation season releases of water from the Boise River Reservoir system through Lucky Peak Dam is controlled by water right seniority as established by the Idaho Department of Water Resources and as outlined in Paragraph 7-06 Irrigation Water Supply Plan on page 7-23 of this manual. During the non-irrigation season Lucky Peak releases will comply with Paragraph 7-11 Minimum Streamflow Maintenance on page 7-31 of this manual and any deviations from the minimum flow requirements because of drought conditions and municipal water supply shortages will be coordinated by the Bureau of Reclamation with the Idaho Department of Water Resources, Idaho Department of Fish and Game, Corps of Engineers, and other affected parties.

VIII - EFFECT OF WATER CONTROL PLAN

8-01. General. The expected effects or results of the various water control plans will be generally outlined in the following paragraphs. The flood control plan set forth specific procedures and requirements to be followed without violation during the flood control seasons. The other water control plans generally documented regulation and/or management practices currently being used to accomplish desired goals.

8-02. Flood Control. The flood control plan set forth specific regulation criteria to be followed without violation. The plan itself is designed to minimize the effects of runoff volume forecast errors and account for varying runoff timing sequences, thus establishing desirable operating ranges for both flood control and refill during most of the flood period. This concept becomes somewhat unworkable late in the flood control season during the refill period, basically because the remaining runoff volume decreases much faster than standard forecast errors. Thus, the final 60,000 acre-feet of system space is to be refilled on a day-to-day basis when the real-time evaluation of the flood potential indicates that it is reasonably safe to do so. Specific criteria are stated in the flood control plan and on Plate 7-3A for the refill of the final 60,000 acre-feet of system space. Basin conditions are so dynamic during the final refill period that normal regression equation forecast procedures are inadequate for regulation. In addition to Plate 7-3A, mathematical simulation models can realistically provide the real-time regulation criteria necessary for the final refill. Both the Bureau and the Corps are presently using the SSARR model for detailed regulation.

Taking this approach for the final refill will require more work, cooperation, and coordination by the regulating agencies, but it should provide better regulation than has been experienced in the past. Consistently in the past, both flood control and refill have been limited. Runoff volume forecast errors and resultant parameter curve-space requirements, during refill of the last 60,000 acre-feet of system space, fixed regulation such that only drastic increases or decreases in Lucky Peak releases could be used in an attempt to overcome errors as they became apparent.

Plate 8-1 shows expected regulated peak discharge frequencies at Boise for various natural peak discharges and Plate 8-2 shows regulation of the Standard Project Flood. Both plates demonstrate the inability to

regulate large floods to desirable levels of downstream flooding with the present reservoir system space and downstream capacity. Table 8-1 on Page T8-1 lists natural and regulated peak discharges for the Boise River. Since the completion of Lucky Peak Dam in 1954, it is estimated that the flood control regulation of Anderson Ranch, Arrowrock, and Lucky Peak has jointly reduced Boise River flood damages by $106,956,000 through 1980. The summary hydrograph shown on Plate 8-3 summarizes regulated Boise River streamflows which have occurred at the Capitol Boulevard Bridge since the completion of Lucky Peak Dam.

8-03. Other Plans. Information presented within the (1) irrigation plan, (2) maintenance plan, (3) hydroelectric plan, (4) recreation plan, (5) fish and wildlife plan, (6) minimum flow plan, and (7) rate of release plan generally documents practices currently being used. Following these practices should result in meeting desirable goals. The agencies responsible for managing and updating the water control plans should continually try to improve these practices and more effectively utilize the reservoir storages wherever possible.

IX - WATER CONTROL MANAGEMENT

9-01. General. Anderson Ranch, Arrowrock, and Lucky Peak are federally-owned projects each managed by the Federal agency which constructed it. The Bureau of Reclamation manages and is responsible for Anderson Ranch and Arrowrock projects, and the Corps of Engineers manages and is responsible for Lucky Peak project. Jointly the Bureau and the Corps try to utilize and regulate these three reservoir projects as one multipurpose system. Regulation criteria used to regulate this multipurpose system are jointly developed by the Bureau, Corps, and the Department of Water Resources (acting as representative for the State of Idaho). Day-to-day regulation of the system requires coordination between the Bureau, Corps, Department of Water Resources, and Boise River Watermaster (elected representative of the State of Idaho - Water District #63). Paragraphs 9-02, 9-03, 9-04, and 9-05 outline the overall responsibilities that each entity has in the management of the multipurpose system. Specific coordination procedures used between the entities to perform day-to-day regulation are outlined within Section VII - WATER CONTROL PLAN. Organizational structures for these entities are shown on page 9-2 and corresponding personnel names and office telephone numbers are listed on page 9-3.

9-02. United States Department of the Interior, Bureau of Reclamation, Pacific Northwest Region. As a Federal agency, the Bureau of Reclamation is responsible for the overall management of the Anderson Ranch and Arrowrock projects. This management responsibility (regulation, operation, and maintenance of the project functions, facilities, and lands) is the responsibility of the Pacific Northwest Regional Director and specific personnel within his staff.

The Bureau of Reclamation is also responsible for jointly (with the Corps and Department of Water Resources) developing and revising regulation plans used for regulation of Anderson Ranch, Arrowrock, and Lucky Peak projects as one multipurpose system. The Bureau holds State of Idaho storage licenses for Anderson Ranch and Arrowrock projects and a State of Idaho storage permit for the Lucky Peak project, and based on these licenses and permit, the Bureau has contracted with water user organizations to provide stored water for downstream use. Thus, through joint development and revision of the system regulation plans, the Bureau is able to ensure that all three reservoir projects will be regulated as a system which will allow them to meet their storage contract obligations (if water is available) and ensure that downstream demand water is supplied in a usable manner with limited Boise River fluctuations at diversion structures.

[redacted]

9-03. United States Department of Defense, Department of the Army, Corps of Engineers, Walla Walla District. As a Federal agency the Corps of Engineers is responsible for the overall management of the Lucky Peak project. This management responsibility (regulation, operation, and maintenance of the project functions, facilities, and lands) is the responsibility of the Walla Walla District Engineer and specific personnel within his staff.

The Corps of Engineers is also responsible for jointly (with the Bureau and Department of Water Resources) developing and revising regulation plans used for regulation of Anderson Ranch, Arrowrock, and Lucky Peak projects as one multipurpose system. The Corps is responsible for utilizing storage spaces within the system for flood control to protect downstream life and property. Thus, through joint development and revision of the system regulation plans, the Corps is able to ensure that all three reservoir projects will be regulated as a system which will provide reasonable downstream flood control protection within the physical limitations of the existing project storage space capacities and the restricted downstream channel.

[redacted]

9-04. State of Idaho, Department of Water Resources. As a State agency, the Department of Water Resources is responsible for ensuring that Idaho water is regulated, stored, conserved, distributed, and used in an effective manner consistent with State of Idaho laws and policies. Maintaining these interests for the State of Idaho is the responsibility of the Director and specific personnel within his staff.

The Department of Water Resources is also responsible for jointly (with the Bureau and/or Corps) developing and revising regulation plans used for regulation of Anderson Ranch, Arrowrock, and/or Lucky Peak projects. Through joint development and revision of the regulation plans, the Department of Water Resources is able to protect the water control management interests of the State of Idaho.

[redacted]

9-05. State of Idaho-Water District #63. [redacted]

The Boise River Watermaster is responsible for the measurement, accounting, and distribution of Boise River water according to all decreed, licensed, and permitted rights. The Watermaster receives day-to-day irrigation demand information from individual person(s) and water user organizations, defines total water demand requirements for the Lucky Peak releases, and then ensures that each irrigation district, organization, or individual, as appropriate, is receiving their rightful water. The Boise River Watermaster must work very closely with staff level personnel from Bureau, Corps, and Department of Water Resources to accomplish his duties as Watermaster. As part of his duties, he computes natural flows, does continuous accountings for the Boise River water, and monitors activities within the Boise River channel. The manner in which he measures, accounts, and distributes Boise River water is in accordance with the Idaho laws and as overseen by the Western Regional Supervisor, Department of Water Resources.

9-06. Other Agencies. While not involved with project regulation, the National Weather Service, Soil Conservation Service, and the Geological Survey collect support data (precipitation and temperature, snow survey measurements, and streamflows) under contract with the regulating agencies. This data is essential for the regulation and these data collection programs must be supported and continued.

9-07. Public Information. The regulating agencies have an obligation to provide pertinent regulation information to the Idaho Department of Water

Resources so that they can routinely monitor the regulation and evaluate the effectiveness of regulation. When significant regulation and release changes are necessary, the regulating agencies have an obligation to provide public information news releases.

TA[illegible]1

ANDERSON RESERVOIR - ELEVATION CAPACITY TABLE

DAM LOCATION: BOISE RIVER BASIN, IDAHO - SOUTH FORK BOISE RIVER MILE 43.5

RESERVOIR ELEMENT:
CREST OF DAM. . . . . 4,206 feet MSL
MAXIMUM DESIGN WATER SURFACE . . . . 4,198.2 feet MSL
NORMAL FULL POOL . . . . . 4,196 feet MSL
TOP OF INACTIVE POOL . . . . . 4,039.6 feet MSL
TOP OF DEAD STORAGE POOL . . . . . 3,992 feet MSL
STREAMBED AT DAM AXIS. . . . . 3,866 feet MSL

STORAGE ELEMENT:
FREEBOARD. . . . . 4,198.2 to 4,206 feet MSL. . . . . .7.8 feet
SURCHARGE CAPACITY . . 4,196 to 4,198.2 feet MSL. . . . . 10,504 acre-feet
JOINT USE CAPACITY . . 4,044 to 4,196 feet MSL. . . . . .418,178 acre-feet
EXCLUSIVE POWER
CAPACITY . . . . . 4,039.6 to 4,044 feet MSL. . . . . .5,000 acre-feet
INACTIVE CAPACITY. . . 3,992 to 4,039.6 feet MSL. . . . . 41,000 acre-feet
DEAD STORAGE CAPACITY .3,866 to 3,992 feet MSL. . . . . 29,000 acre-feet

TOTAL ACTIVE CAPACITY. 4,039.6 to 4,196 feet MSL. . . . .423,178 acre-feet
TOTAL LIVE CAPACITY. . 3,992 to 4,196 feet MSL. . . . . .464,178 acre-feet
TOTAL GROSS CAPACITY . 3,866 to 4,198.2 feet MSL. . . . .503,682 acre-feet

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
4039.6	0		4055	18371		4071	41420	
		462			1310			1589
4040	462		4056	19681		4072	43009	
		1116			1327			1606
4041	1578		4057	21008		4073	44615	
		1126			1345			1624
4042	2704		4058	22353		4074	46239	
		1136			1362			1641
4043	3840		4059	23715		4075	47880	
		1147			1380			1661
4044	4987		4060	25095		4076	49541	
		1157			1397			1683
4045	6144		4061	26492		4077	51224	
		1167			1414			1705
4046	7311		4062	27906		4078	52929	
		1178			1432			1728
4047	8489		4063	29338		4079	54657	
		1188			1449			1750
4048	9677		4064	30787		4080	56407	
		1198			1467			1772
4049	10875		4065	32254		4081	58179	
		1209			1484			1794
4050	12084		4066	33738		4082	59973	
		1223			1502			1817
4051	13307		4067	35240		4083	61790	
		1240			1519			1839
4052	14547		4068	36759		4084	63629	
		1257			1536			1861
4053	15804		4069	38295		4085	65490	
		1275			1554			1883
4054	17079		4070	39849		4086	67373	
		1292			1571			1906

T 2-1

Sheet 1

TABLE 2 (Continued)

ANDERSON RESERVOIR - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
4087	69279	
		1928
4088	71207	
		1950
4089	73157	
		1972
4090	75129	
		1998
4091	77127	
		2029
4092	79156	
		2059
4093	81215	
		2089
4094	83304	
		2119
4095	85423	
		2150
4096	87573	
		2180
4097	89753	
		2210
4098	91963	
		2240
4099	94203	
		2270
4100	96473	
		2298
4101	98771	
		2321
4102	101092	
		2345
4103	103437	
		2369
4104	105806	
		2392
4105	108198	
		2416
4106	110614	
		2440
4107	113054	
		2463
4108	115517	
		2487
4109	118004	
		2511
4110	120515	
		2532
4111	123047	
		2550
4112	125597	
		2569
4113	128166	
		2587
4114	130753	
		2606
4115	133359	
		2624
4116	135983	
		2643
4117	138626	
		2661
4118	141287	
		2680
4119	143967	
		2698
4120	146665	
		2717
4121	149382	
		2736
4122	152118	
		2755
4123	154873	
		2774
4124	157647	
		2793
4125	160440	
		2812
4126	163252	
		2831
4127	166083	
		2850
4128	168933	
		2869
4129	171802	
		2888
4130	174690	
		2911
4131	177601	
		2939
4132	180540	
		2968
4133	183508	
		2996
4134	186504	
		3024
4135	189528	
		3052
4136	192580	
		3080
4137	195660	
		3109
4138	198769	
		3137
4139	201906	
		3165
4140	205071	
		3191
4141	208262	
		3216
4142	211478	
		3240
4143	214718	
		3264
4144	217982	
		3289
4145	221271	
		3313
4146	224584	
		3337
4147	227921	
		3362
4148	231283	
		3386
4149	234669	
		3410
4150	238079	
		3433
4151	241512	
		3454
4152	244966	
		3475
4153	248441	
		3496
4154	251937	
		3517
4155	255454	
		3538
4156	258992	
		3558
4157	262550	
		3579
4158	266129	
		3600
4159	269729	
		3621
4160	273350	
		3645
4161	276995	
		3671
4162	280666	
		3697
4163	284363	
		3723
4164	288086	
		3749
4165	291835	
		3776
4166	295611	
		3802
4167	299413	
		3828

TABLE 2-1 (Continued)

ANDERSON RESERVOIR - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
4168	303241	
		3854
4169	307095	
		3880
4170	310975	
		3909
4171	314884	
		3939
4172	318823	
		3970
4173	322793	
		4000
4174	326793	
		4031
4175	330824	
		4061
4176	334885	
		4092
4177	338977	
		4123
4178	343100	
		4153
4179	347253	
		4184
4180	351437	
		4217
4181	355654	
		4254
4182	359908	
		4291
4183	364199	
		4327
4184	368526	
		4364
4185	372890	
		4400
4186	377290	
		4437
4187	381727	
		4474
4188	386201	
		4510
4189	390711	
		4547
4190	395258	
		4580
4191	399838	
		4609
4192	404447	
		4639
4193	409086	
		4668
4194	413754	
		4697
4195	418451	
		4727
4196	423178	

SURCHARGE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
4196	0	
		4756
4197	4756	
		4785
4198	9541	
		963
4198.2	10504	

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Sheet 3

TABLE 2-3

ARROWROCK DAM
UPPER GATE ELEVATION-DISCHARGE TABLE
(Discharge per Gate)

ELEVATION (feet)	DISCHARGE (cfs)	ELEVATION (feet)	DISCHARGE (cfs)	ELEVATION (feet)	DISCHARGE (cfs)
3110	217	3150	645	3190	889
11	235	51	653	91	894
12	253	52	660	92	899
13	270	53	668	93	905
14	287	54	675	94	910
15	303	55	682	95	915
16	317	56	688	96	920
17	332	57	695	97	925
18	346	58	702	98	930
19	360	59	708	99	935
3120	373	3160	715	3200	940
21	385	61	722	01	945
22	398	62	728	02	950
23	410	63	735	03	955
24	421	64	742	04	960
25	432	65	748	05	965
26	443	66	754	06	970
27	453	67	760	07	975
28	464	68	766	08	980
29	474	69	772	09	985
3130	484	3170	778	3210	989
31	494	71	784	11	994
32	503	72	790	12	999
33	512	73	796	13	1,005
34	521	74	802	14	1,011
35	530	75	808	15	1,017
36	539	76	813	16	1,023
37	547	77	819	17	1,029
38	555	78	825	18	1,035
39	563	79	831		
3140	571	3180	836		
41	578	81	842		
42	588	82	847		
43	594	83	852		
44	602	84	858		
45	610	85	863		
46	617	86	868		
47	624	87	874		
48	632	88	879		
49	639	89			

TABLE 2-3 (Continued)

ARROWROCK DAM
LOWER GATE ELEVATION-DISCHARGE TABLE
(Discharge per Gate)

ELEVATION (feet)	DISCHARGE (cfs)	ELEVATION (feet)	DISCHARGE (cfs)	ELEVATION (feet)	DISCHARGE (cfs)
3020	155	3060	601	3100	842
21	173	61	608	01	847
22	191	62	615	02	852
23	209	63	622	03	857
24	227	64	629	04	862
25	245	65	636	05	867
26	261	66	643	06	872
27	276	67	650	07	877
28	291	68	656	08	882
29	305	69	663	09	887
3030	319	3070	669	3110	891
31	332	71	675	11	895
32	345	72	682	12	901
33	358	73	689	13	906
34	371	74	695	14	910
35	383	75	701	15	915
36	394	76	708	16	920
37	405	77	714	17	925
38	416	78	720	18	930
39	427	79	726	19	935
3040	437	3080	732	3120	939
41	447	81	738	21	944
42	457	82	744	22	948
43	466	83	750	23	953
44	475	84	755	24	958
45	484	85	761	25	963
46	493	86	766	26	967
47	502	87	772	27	972
48	510	88	778	28	976
49	518	89	784	29	981
3050	526	3090	789	3130	985
51	534	91	795	31	990
52	542	92	800	32	994
53	550	93	805	33	999
54	557	94	810	34	1,003
55	565	95	816	35	1,008
56	572	96	821	36	1,012
57	580	97	826	37	1,017
58	587	98	831	38	1,021
59	594	99	837		

TABLE 2-3 (Continued)

ARROWROCK DAM
SPILLWAY ELEVATION-DISCHARGE TABLE
(Discharge per Gate)

Elevation (feet)	Discharge Each Gate (cfs)	Elevation (feet)	Discharge Each Gate (cfs)
3210.00	0	3214.30	1,627
3210.10	12	3214.40	1,683
3210.20	24	3214.50	1,739
3210.30	36	3214.60	1,795
3210.40	48	3214.70	1,851
3210.50	60	3214.80	1,907
3210.60	84	3214.90	1,963
3210.70	108	3215.00	2,019
3210.80	132	3215.10	2,070
3210.90	156	3215.20	2,120
3211.00	180	3215.30	2,170
3211.10	210	3215.40	2,220
3211.20	240	3215.50	2,270
3211.30	270	3215.60	2,352
3211.40	300	3215.70	2,434
3211.50	330	3215.80	2,516
3211.60	364	3215.90	2,598
3211.70	408	3216.00	2,680
3211.80	442	3216.10	2,752
3211.90	476	3216.20	2,824
3212.00	500	3216.30	2,896
3212.10	542	3216.40	2,968
3212.20	584	3216.50	3,040
3212.30	626	3216.60	3,152
3212.40	668	3216.70	3,264
3212.50	710	3216.80	3,376
3212.60	756	3216.90	3,488
3212.70	802	3217.00	3,600
3212.80	848	3217.10	3,780
3212.90	894	3217.20	3,960
3213.00	940	3217.30	4,140
3213.10	992	3217.40	4,320
3213.20	1,044	3217.50	4,500
3213.30	1,096	3217.60	4,680
3213.40	1,148	3217.70	4,860
3213.50	1,200	3217.80	5,040
3213.60	1,252	3217.90	5,220
3213.70	1,304	3218.00	5,400
3213.80	1,356	3218.10	5,440
3213.90	1,408	3218.20	5,480
3214.00	1,460	3218.30	5,520
3214.10	1,516	3218.40	5,560
3214.20	1,571	3218.50	5,600

TABLE 2-4

ARROWROCK RESERVOIR - ELEVATION CAPACITY TABLE

DAM LOCATION: BOISE RIVER BASIN, IDAHO - BOISE RIVER MILE 75.4

RESERVOIR ELEMENT:
- TOP OF PARAPET WALL. . . . . 3,219.75 feet MSL
- CREST OF DAM . . . . . 3,216 feet MSL
- NORMAL FULL POOL . . . . . 3,216 feet MSL
- TOP OF INACTIVE POOL . . . . . 2,974 feet MSL
- STREAMBED AT DAM AXIS. . . . . 2,959 feet MSL

STORAGE ELEMENT:
- FREEBOARD. . . . . .0 feet
- SURCHARGE CAPACITY . . . 3,216 to 3,219.75 feet MSL. . . . . 11,630 acre-feet
- JOINT USE CAPACITY . . . 2,974 to 3,216 feet MSL. . . . . 286,600 acre-feet

- TOTAL ACTIVE CAPACITY. . 2,974 to 3,216 feet MSL. . . . . 286,600 acre-feet
- TOTAL GROSS CAPACITY . . 2,974 to 3,219.75 feet MSL. . . . .298,230 acre-feet

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
2974	0		2990	500		3006	1740	
		20			60			110
2975	20		2991	560		3007	1850	
		20			60			110
2976	40		2992	620		3008	1960	
		20			60			120
2977	60		2993	680		3009	2080	
		20			60			130
2978	80		2994	740		3010	2210	
		20			60			130
2979	100		2995	800		3011	2340	
		20			70			130
2980	120		2996	870		3012	2470	
		20			70			140
2981	140		2997	940		3013	2610	
		30			70			150
2982	170		2998	1010		3014	2760	
		30			70			150
2983	200		2999	1080		3015	2910	
		30			80			160
2984	230		3000	1160		3016	3070	
		40			90			170
2985	270		3001	1250		3017	3240	
		40			90			180
2986	310		3002	1340		3018	3420	
		40			100			180
2987	350		3003	1440		3019	3600	
		50			100			200
2988	400		3004	1540		3020	3800	
		50			100			200
2989	450		3005	1640		3021	4000	
		50			100			200

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Sheet 1

TABLE 2-4 (Continued)

ARROWROCK RESERVOIR - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3022	4200	
		200
3023	4400	
		200
3024	4600	
		200
3025	4800	
		210
3026	5010	
		210
3027	5220	
		210
3028	5430	
		220
3029	5650	
		220
3030	5870	
		220
3031	6090	
		220
3032	6310	
		220
3033	6530	
		240
3034	6770	
		240
3035	7010	
		240
3036	7250	
		240
3037	7490	
		260
3038	7750	
		260
3039	8010	
		260
3040	8270	
		280
3041	8550	
		300
3042	8850	
		320
3043	9170	
		340
3044	9510	
		360
3045	9870	
		390
3046	10260	
		400
3047	10660	
		410
3048	11070	
		420

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3049	11490	
		430
3050	11920	
		440
3051	12360	
		450
3052	12810	
		460
3053	13270	
		470
3054	13740	
		480
3055	14220	
		490
3056	14710	
		500
3057	15210	
		510
3058	15720	
		520
3059	16240	
		530
3060	16770	
		540
3061	17310	
		550
3062	17860	
		560
3063	18420	
		570
3064	18990	
		580
3065	19570	
		600
3066	20170	
		620
3067	20790	
		630
3068	21420	
		650
3069	22070	
		660
3070	22730	
		670
3071	23400	
		690
3072	24090	
		700
3073	24790	
		710
3074	25500	
		720
3075	26220	
		730

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3076	26950	
		740
3077	27690	
		760
3078	28450	
		770
3079	29220	
		780
3080	30000	
		800
3081	30800	
		800
3082	31600	
		800
3083	32400	
		800
3084	33200	
		800
3085	34000	
		900
3086	34900	
		900
3087	35800	
		900
3088	36700	
		900
3089	37600	
		900
3090	38500	
		1000
3091	39500	
		1000
3092	40500	
		1000
3093	41500	
		1000
3094	42500	
		1000
3095	43500	
		1100
3096	44600	
		1100
3097	45700	
		1100
3098	46800	
		1100
3099	47900	
		1100
3100	49000	
		1200
3101	50200	
		1200
3102	51400	
		1200

TABL (Continued)

ARROWROCK RESERVOIR - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3103	52600	
		1200
3104	53800	
		1200
3105	55000	
		1300
3106	56300	
		1300
3107	57600	
		1300
3108	58900	
		1300
3109	60200	
		1300
3110	61500	
		1300
3111	62800	
		1300
3112	64100	
		1300
3113	65400	
		1300
3114	66700	
		1300
3115	68000	
		1400
3116	69400	
		1400
3117	70800	
		1400
3118	72200	
		1400
3119	73600	
		1400
3120	75000	
		1500
3121	76500	
		1500
3122	78000	
		1500
3123	79500	
		1500
3124	81000	
		1500
3125	82500	
		1600
3126	84100	
		1600
3127	85700	
		1600
3128	87300	
		1600
3129	88900	
		1600
3130	90500	
		1700
3131	92200	
		1700
3132	93900	
		1700
3133	95600	
		1700
3134	97300	
		1700
3135	99000	
		1700
3136	100700	
		1700
3137	102400	
		1700
3138	104100	
		1700
3139	105800	
		1700
3140	107500	
		1800
3141	109300	
		1800
3142	111100	
		1800
3143	112900	
		1800
3144	114700	
		1800
3145	116500	
		1900
3146	118400	
		1900
3147	120300	
		1900
3148	122200	
		1900
3149	124100	
		1900
3150	126000	
		2000
3151	128000	
		2000
3152	130000	
		2000
3153	132000	
		2000
3154	134000	
		2000
3155	136000	
		2000
3156	138000	
		2000
3157	140000	
		2000
3158	142000	
		2000
3159	144000	
		2000
3160	146000	
		2100
3161	148100	
		2100
3162	150200	
		2100
3163	152300	
		2100
3164	154400	
		2100
3165	156500	
		2100
3166	158600	
		2100
3167	160700	
		2100
3168	162800	
		2100
3169	164900	
		2100
3170	167000	
		2200
3171	169200	
		2200
3172	171400	
		2200
3173	173600	
		2200
3174	175800	
		2200
3175	178000	
		2300
3176	180300	
		2300
3177	182600	
		2300
3178	184900	
		2300
3179	187200	
		2300
3180	189500	
		2400
3181	191900	
		2400
3182	194300	
		2400
3183	196700	
		2400

TABLE 2-4 (Continued)

ARROWROCK RESERVOIR - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3184	199100	
		2400
3185	201500	
		2500
3186	204000	
		2500
3187	206500	
		2500
3188	209000	
		2500
3189	211500	
		2500
3190	214000	
		2600
3191	216600	
		2600
3192	219200	
		2600
3193	221800	
		2600
3194	224400	
		2600
3195	227000	
		2600
3196	229600	
		2600
3197	232200	
		2600
3198	234800	
		2600
3199	237400	
		2600
3200	240000	
		2800
3201	242800	
		2800
3202	245600	
		2800
3203	248400	
		2800
3204	251200	
		2800
3205	254000	
		2900
3206	256900	
		2900
3207	259800	
		2900
3208	262700	
		2900
3209	265600	
		2900
3210	268500	
		3000
3211	271500	
		3000
3212	274500	
		3000
3213	277500	
		3000
3214	280500	
		3000
3215	283500	
		3100
3216	286600	

SURCHARGE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3216	0	
		3100
3217	3100	
		3100
3218	6200	
		3100
3219	9300	
		2330
3819.75	11630	

3219.75

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Sheet 4

TABLE 2-6

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
WALLA WALLA, WASHINGTON

July, 1962

DISCHARGE RATING TABLE
CFS
Lucky Peak Dam Slide Gates

	Gate Opening - feet																			
	1		2		3		4		5		6		7		8		9		10	
Pool Elev	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff
2850	166	163	329	159	488	158	646	157	803	174	977	187	1164	206	1370	225	1595	246	1841	
2851	170	166	336	163	499	162	661	162	823	178	1001	192	1193	212	1405	233	1638	254	1892	
2852	173	170	343	167	510	166	676	165	841	184	1025	198	1223	216	1439	240	1679	262	1941	
2853	177	174	351	170	521	169	690	170	860	187	1047	204	1251	222	1473	247	1720	269	1989	
2854	180	177	357	175	532	174	706	172	878	192	1070	208	1278	228	1506	253	1759	277	2036	
2855	183	181	364	178	542	176	718	177	895	199	1094	211	1305	234	1539	259	1798	283	2081	
2856	187	184	371	181	552	180	732	181	913	201	1114	217	1331	242	1573	262	1835	291	2126	
2857	190	187	377	185	562	184	746	184	930	205	1135	222	1357	244	1601	271	1872	301	2173	
2858	193	191	384	188	572	187	759	188	947	209	1156	226	1382	250	1632	277	1909	303	2212	
2859	196	194	390	191	581	191	772	191	963	213	1176	231	1407	255	1662	283	1945	310	2255	
2860	199	197	396	195	591	194	785	194	979	218	1197	235	1432	260	1692	288	1980	316	2296	
2861	202	200	402	198	600	197	797	198	995	221	1216	240	1456	265	1721	293	2014	323	2337	
2862	206	203	409	200	609	201	810	201	1011	225	1236	244	1480	269	1749	299	2048	329	2377	
2863	208	207	415	203	618	204	822	204	1026	229	1255	248	1503	276	1779	302	2081	335	2416	
2864	211	209	420	207	627	207	834	208	1042	232	1274	252	1526	278	1804	310	2114	341	2455	
2865	214	212	426	210	636	210	846	211	1057	235	1292	257	1549	283	1832	314	2146	347	2493	
2866	217	215	432	213	645	212	857	215	1072	239	1311	260	1571	287	1858	320	2178	353	2531	
2867	220	218	438	215	653	216	869	217	1086	243	1329	264	1593	292	1885	324	2209	359	2568	
2868	223	220	443	219	662	218	880	220	1100	247	1347	267	1614	297	1911	330	2241	363	2604	
2869	225	224	449	221	670	221	891	224	1115	249	1364	272	1636	300	1936	335	2271	369	2640	
2870	228	226	454	224	678	224	902	227	1129	252	1381	276	1657	305	1962	339	2301	374	2675	
2871	231	228	459	227	686	227	913	229	1142	257	1399	279	1678	308	1986	345	2331	379	2710	
2872	233	232	465	229	694	230	924	232	1156	260	1416	282	1698	313	2011	349	2360	385	2745	
2873	236	234	470	232	702	233	935	235	1170	262	1432	287	1719	317	2036	353	2389	390	2779	
2874	239	236	475	235	710	235	945	238	1183	266	1449	289	1738	322	2060	358	2418	395	2813	
2875	241	239	480	238	718	238	956	240	1196	269	1465	293	1758	325	2083	362	2445	401	2846	
2876	244	241	485	241	726	240	966	244	1210	271	1481	297	1778	329	2107	367	2474	405	2879	
2877	246	244	490	243	733	243	976	246	1222	276	1498	300	1798	332	2130	371	2501	410	2911	
2878	249	246	495	246	741	246	987	248	1235	278	1513	304	1817	336	2153	376	2529	414	2943	
2879	251	249	500	248	748	249	997	251	1248	281	1529	307	1836	340	2176	380	2556	419	2975	
2880	254	251	505	251	756	250	1006	254	1260	285	1545	310	1855	344	2199	383	2582	425	3007	
2881	256	254	510	253	763	253	1016	257	1273	286	1559	314	1873	348	2221	388	2609	430	3039	
2882	258	257	515	255	770	256	1026	259	1285	290	1575	317	1892	350	2242	393	2635	434	3069	
2883	261	259	520	257	777	259	1036	261	1297	293	1590	320	1910	355	2265	396	2661	436	3097	
2884	263	261	524	260	784	261	1045	264	1309	296	1605	323	1928	359	2287	400	2687	443	3130	
2885	265	264	529	262	791	263	1054	267	1321	299	1620	323	1943	365	2308	404	2712	447	3159	
2886	268	265	533	265	798	266	1064	269	1333	302	1635	329	1964	365	2329	409	2738	451	3189	
2887	270	268	538	267	805	268	1073	272	1345	304	1649	333	1982	368	2350	412	2762	456	3218	
2888	272	271	543	269	812	270	1082	274	1356	307	1663	336	1999	372	2371	416	2787	461	3248	
2889	274	273	547	272	819	273	1092	276	1368	310	1678	338	2016	376	2392	420	2812	465	3277	
2890	277	275	552	274	826	274	1100	279	1379	313	1692	341	2033	380	2413	423	2836	469	3305	
2891	279	277	556	276	832	278	1110	281	1391	315	1706	344	2050	383	2433	427	2860	473	3333	
2892	281	279	560	279	839	279	1118	284	1402	318	1720	348	2068	385	2453	431	2884	478	3362	
2893	283	282	565	281	846	281	1127	286	1413	321	1734	350	2084	389	2473	435	2908	481	3389	
2894	285	284	569	283	852	284	1136	288	1424	324	1748	353	2101	392	2493	439	2932	485	3417	
2895	287	286	573	286	859	286	1145	290	1435	326	1761	356	2117	396	2513	442	2955	489	3444	
2896	290	288	578	287	865	289	1154	292	1446	328	1774	360	2134	398	2532	446	2978	494	3472	
2897	292	290	582	289	871	291	1162	295	1457	331	1788	362	2150	402	2552	449	3001	498	3499	
2898	294	292	586	292	878	293	1171	297	1468	333	1801	365	2166	405	2571	453	3024	501	3525	
2899	296	294	590	294	884	295	1179	299	1478	336	1814	368	2182	408	2590	457	3047	506	3553	
2900	298	297	595	295	890	297	1187	302	1489	339	1828	370	2198	411	2609	460	3069	509	3578	
2901	300	299	599	297	896	300	1196	304	1500	341	1841	372	2213	415	2628	464	3092	513	3605	
2902	302	301	603	300	903	301	1204	306	1510	344	1854	375	2229	418	2647	467	3114	517	3631	
2903	304	303	607	302	909	303	1212	308	1520	346	1866	379	2245	420	2665	471	3136	521	3657	
2904	306	305	611	304	915	305	1220	311	1531	348	1879	381	2260	423	2683	475	3158	525	3683	
2905	308	307	615	306	921	307	1228	313	1541	351	1892	384	2276	426	2702	477	3179	529	3708	
2906	310	309	619	308	927	310	1237	314	1551	353	1904	387	2291	429	2720	481	3201	533	3734	
2907	312	311	623	310	933	311	1244	317	1561	356	1917	389	2306	432	2738	484	3222	537	3759	
2908	314	313	627	312	939	314	1253	318	1571	358	1929	392	2321	435	2756	487	3243	540	3783	
2909	316	314	630	315	945	315	1260	321	1581	361	1942	394	2336	438	2774	491	3265	543	3808	
2910	318	316	634	317	951	317	1268	323	1591	363	1954	396	2350	442	2792	494	3286	547	3833	
2911	320	318	638	318	956	320	1276	325	1601	365	1966	399	2365	444	2809	497	3306	552	3858	
2912	322	320	642	320	962	322	1284	327	1611	367	1978	402	2380	447	2827	500	3327	555	3882	
2913	324	322	646	322	968	324	1292	329	1621	369	1990	404	2394	450	2844	504	3348	558	3906	
2914	325	325	650	324	974	325	1299	331	1630	372	2002	407	2409	453	2862	506	3368	562	3930	
2915	327	326	653	326	979	328	1307	333	1640	374	2014	409	2423	456	2879	510	3389	565	3954	
2916	329	328	657	328	985	329	1314	336	1650	376	2026	411	2437	459	2896	513	3409	569	3978	
2917	331	330	661	329	990	332	1322	337	1659	378	2037	415	2452	461	2913	516	3429	572	4001	
2918	333	332	665	331	996	333	1329	339	1668	381	2049	417	2466	464	2930	519	3449	576	4025	
2919	335	333	668	334	1002	335	1337	341	1678	383	2061	419	2480	466	2946	523	3469	579	4048	
2920	337	335	672	335	1007	337	1344	343	1687	385	2072	422	2494	469	2963	525	3488	583	4071	

DISCHARGE RATING TABLE
CFS
Lucky Peak Dam Slide Gates

Pool Elev	Gate Opening - feet																			
	1		2		3		4		5		6		7		8		9		10	
	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff
2921	338	338	676	337	1013	339	1352	345	1697	387	2084	424	2508	472	2980	528	3508	586	4094	
2922	340	339	679	339	1018	341	1359	347	1706	389	2095	427	2522	474	2996	532	3528	589	4117	
2923	342	341	683	340	1023	343	1366	349	1715	392	2107	428	2535	478	3013	535	3548	592	4140	
2924	344	342	686	343	1029	345	1374	350	1724	394	2118	431	2549	480	3029	537	3566	597	4163	
2925	345	345	690	344	1034	347	1381	352	1733	396	2129	434	2563	482	3045	541	3586	599	4185	
2926	347	347	694	346	1040	348	1388	354	1742	398	2140	436	2576	486	3062	543	3605	603	4208	
2927	349	348	697	348	1045	350	1395	356	1751	400	2151	439	2590	488	3078	546	3624	606	4230	
2928	351	350	701	349	1050	352	1402	358	1760	402	2162	441	2603	491	3094	549	3643	609	4252	
2929	353	351	704	352	1056	353	1409	360	1769	405	2174	442	2616	493	3109	553	3662	612	4274	
2930	354	354	708	353	1061	355	1416	362	1778	406	2184	446	2630	495	3125	555	3680	616	4296	
2931	356	355	711	355	1066	357	1423	364	1787	408	2195	448	2643	498	3141	558	3699	619	4318	
2932	358	356	714	357	1071	359	1430	366	1796	410	2206	450	2656	501	3157	561	3718	622	4340	
2933	359	359	718	358	1076	361	1437	367	1804	413	2217	452	2669	503	3172	564	3736	626	4362	
2934	361	360	721	360	1081	363	1444	369	1813	415	2228	454	2682	506	3188	567	3755	628	4383	
2935	363	362	725	362	1087	364	1451	371	1822	416	2238	457	2695	508	3203	570	3773	631	4404	
2936	364	364	728	364	1092	366	1458	372	1830	419	2249	459	2708	510	3218	573	3791	635	4426	
2937	366	365	731	366	1097	368	1465	374	1839	421	2260	461	2721	513	3234	575	3809	638	4447	
2938	368	367	735	367	1102	369	1471	376	1847	423	2270	463	2733	516	3249	578	3827	641	4468	
2939	369	369	738	369	1107	371	1478	378	1856	425	2281	465	2746	518	3264	581	3845	644	4489	
2940	371	370	741	371	1112	373	1485	379	1864	427	2291	468	2759	521	3280	583	3863	647	4510	
2941	373	372	745	372	1117	374	1491	382	1873	428	2301	470	2771	523	3294	587	3881	650	4531	
2942	374	374	748	374	1122	376	1498	383	1881	431	2312	472	2784	525	3309	589	3898	654	4552	
2943	376	375	751	515	1266	239	1505	384	1889	433	2322	474	2796	528	3324	592	3916	656	4572	
2944	378	377	755	376	1131	380	1511	387	1898	434	2332	476	2808	531	3339	594	3933	660	4593	
2945	379	379	758	378	1136	382	1518	388	1906	437	2343	478	2821	533	3354	596	3950	664	4614	
2946	381	380	761	380	1141	383	1524	390	1914	439	2353	480	2833	535	3368	600	3968	666	4634	
2947	383	381	764	382	1146	385	1531	391	1922	441	2363	482	2845	538	3383	602	3985	669	4654	
2948	384	383	767	384	1151	386	1537	394	1931	442	2373	485	2858	539	3397	606	4003	671	4674	
2949	386	385	771	385	1156	388	1544	395	1939	444	2383	487	2870	542	3412	608	4020	674	4694	
2950	387	387	774	387	1161	389	1550	397	1947	446	2393	489	2882	544	3426	611	4037	677	4714	
2951	389	388	777	388	1165	392	1557	398	1955	448	2403	491	2894	547	3441	613	4054	680	4734	
2952	390	390	780	390	1170	393	1563	400	1963	450	2413	493	2906	549	3455	616	4071	683	4754	
2953	392	391	783	392	1175	394	1569	402	1971	452	2423	495	2918	551	3469	619	4088	686	4774	
2954	393	393	786	393	1179	396	1575	404	1979	453	2432	498	2930	553	3483	621	4104	690	4794	
2955	395	395	790	394	1184	398	1582	405	1987	455	2442	499	2941	557	3498	623	4121	692	4813	
2956	397	396	793	396	1189	399	1588	407	1995	457	2452	501	2953	559	3512	626	4138	695	4833	
2957	398	398	796	398	1194	400	1594	408	2002	460	2462	503	2965	561	3526	628	4154	698	4852	
2958	400	399	799	399	1198	403	1601	409	2010	461	2471	506	2977	563	3540	631	4171	701	4872	
2959	401	401	802	401	1203	404	1607	411	2018	463	2481	507	2988	566	3554	633	4187	704	4891	
2960	403	402	805	402	1207	406	1613	413	2026	465	2491	509	3000	568	3568	636	4204	706	4910	
2961	404	404	808	404	1212	407	1619	415	2034	466	2500	511	3011	570	3581	639	4220	709	4929	
2962	406	405	811	405	1216	409	1625	416	2041	469	2510	513	3023	572	3595	641	4236	712	4948	
2963	407	407	814	407	1221	410	1631	418	2049	470	2519	515	3034	575	3609	644	4253	714	4967	
2964	409	408	817	409	1226	411	1637	420	2057	472	2529	517	3046	576	3622	646	4268	718	4986	
2965	410	410	820	410	1230	413	1643	421	2064	474	2538	519	3057	579	3636	649	4285	720	5005	
2966	412	411	823	412	1235	414	1649	423	2072	475	2547	522	3069	580	3649	652	4301	723	5024	
2967	413	413	826	413	1239	416	1655	425	2080	477	2557	523	3080	583	3663	653	4316	726	5042	
2968	415	414	829	415	1244	418	1662	425	2087	479	2566	525	3091	585	3676	657	4333	728	5061	
2969	416	416	832	416	1248	419	1667	428	2095	481	2576	526	3102	588	3690	658	4348	732	5080	
2970	418	417	835	417	1252	421	1673	429	2102	483	2585	529	3114	589	3703	661	4364	734	5098	
2971	419	419	838	419	1257	422	1679	431	2110	484	2594	531	3125	591	3716	664	4380	737	5117	
2972	421	420	841	420	1261	424	1685	432	2117	486	2603	533	3136	594	3730	665	4395	740	5135	
2973	422	422	844	422	1266	425	1691	433	2124	488	2612	535	3147	596	3743	668	4411	742	5153	
2974	423	423	846	424	1270	427	1697	435	2132	489	2621	537	3158	598	3756	671	4427	745	5172	
2975	425	424	849	425	1274	429	1703	436	2139	491	2630	539	3169	600	3769	673	4442	748	5190	
2976	426	426	852	427	1279	430	1709	438	2147	492	2639	541	3180	602	3782	676	4458	750	5208	
2977	428	427	855	428	1283	431	1714	440	2154	495	2649	542	3191	604	3795	678	4473	753	5226	
2978	429	429	858	429	1287	433	1720	441	2161	496	2657	545	3202	606	3808	680	4488	756	5244	
2979	431	430	861	431	1292	434	1726	442	2168	498	2666	546	3212	609	3821	683	4504	758	5262	
2980	432	432	864	432	1296	436	1732	444	2176	499	2675	548	3223	611	3834	685	4519	761	5280	
2981	433	434	867	433	1300	437	1737	446	2183	501	2684	550	3234	613	3847	687	4534	763	5297	
2982	435	434	869	435	1304	439	1743	447	2190	503	2693	552	3245	615	3860	689	4549	767	5316	
2983	436	436	872	437	1309	440	1749	448	2197	505	2702	553	3255	618	3873	692	4565	768	5333	
2984	438	437	875	438	1313	441	1754	450	2204	507	2711	555	3266	619	3885	694	4579	772	5351	
2985	439	439	878	439	1317	443	1760	452	2212	508	2720	557	3277	621	3898	696	4594	774	5368	
2986	440	441	881	440	1321	445	1766	453	2219	509	2728	559	3287	623	3910	699	4609	777	5386	
2987	442	441	883	443	1326	445	1771	455	2226	511	2737	561	3298	625	3923	701	4624	779	5403	
2988	443	443	886	444	1330	447	1777	456	2233	513	2746	562	3308	628	3936	703	4639	781	5420	
2989	445	444	889	445	1334	449	1783	457	2240	514	2754	565	3319	629	3948	706	4654	784	5438	
2990	446	446	892	446	1338	450	1788	459	2247	516	2763	566	3329	632	3961	708	4669	786	5455	
2991	447	447	894	448	1342	452	1794	460	2254	518	2772	568	3340	633	3973	710	4683	789	5472	
2992	449	448	897	449	1346	453	1799	462	2261	519	2780	570	3350	635	3985	713	4698	792	5490	
2993	450	450	900	450	1350	455	1805	463	2268	521	2789	572	3361	637	3998	715	4713	793	5506	

TABLE 2-6 (Continued)

DISCHARGE RATING TABLE
CFS
Lucky Peak Dam Slide Gates

	Gate Opening - feet																			
	1		2		3		4		5		6		7		8		9		10	
Pool Elev	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff	Disch	Diff
2994	451	452	903	452	1355	455	1810	465	2275	522	2797	574	3371	639	4010	717	4727	797	5524	
2995	453	452	905	454	1359	457	1816	466	2282	524	2806	575	3381	641	4022	720	4742	798	5540	
2996	454	454	908	455	1363	458	1821	467	2288	526	2814	577	3391	644	4035	721	4756	802	5558	
2997	456	455	911	456	1367	459	1826	469	2295	528	2823	579	3402	645	4047	724	4771	804	5575	
2998	457	456	913	458	1371	461	1832	470	2302	529	2831	581	3412	647	4059	726	4785	806	5591	
2999	458	458	916	459	1375	462	1837	472	2309	531	2840	582	3422	649	4071	728	4799	810	5609	
3000	460	459	919	460	1379	464	1843	473	2316	532	2848	584	3432	651	4083	731	4814	811	5625	
3001	461	460	921	462	1383	465	1848	474	2322	534	2856	586	3442	653	4095	733	4828	814	5642	
3002	462	462	924	463	1387	466	1853	476	2329	536	2865	587	3452	655	4107	735	4842	816	5658	
3003	464	463	927	464	1391	468	1859	477	2336	537	2873	589	3462	657	4119	737	4856	819	5675	
3004	465	464	929	466	1395	469	1864	479	2343	539	2882	590	3472	659	4131	740	4871	821	5692	
3005	466	466	932	467	1399	470	1869	480	2349	541	2890	592	3482	661	4143	741	4884	824	5708	
3006	467	468	935	468	1403	472	1875	481	2356	542	2898	594	3492	663	4155	744	4899	826	5725	
3007	469	468	937	470	1407	473	1880	483	2363	543	2906	596	3502	665	4167	746	4913	828	5741	
3008	470	470	940	471	1411	474	1885	484	2369	545	2914	598	3512	667	4179	748	4927	831	5758	
3009	471	471	942	472	1414	477	1891	485	2376	547	2923	599	3522	669	4191	750	4941	833	5774	
3010	473	472	945	474	1419	477	1896	487	2383	548	2931	601	3532	670	4202	752	4954	836	5790	
3011	474	474	948	474	1422	479	1901	488	2389	550	2939	603	3542	672	4214	754	4968	839	5807	
3012	475	475	950	476	1426	480	1906	490	2396	551	2947	605	3552	674	4226	756	4982	841	5823	
3013	477	476	953	477	1430	482	1912	490	2402	553	2955	606	3561	676	4237	759	4996	842	5838	
3014	478	477	955	479	1434	483	1917	492	2409	554	2963	608	3571	678	4249	761	5010	845	5855	
3015	479	479	958	480	1438	484	1922	494	2416	555	2971	610	3581	680	4261	762	5023	848	5871	
3016	480	481	961	481	1442	485	1927	495	2422	557	2979	612	3591	681	4272	765	5037	850	5887	
3017	481	482	963	483	1446	486	1932	497	2429	558	2987	613	3600	683	4283	768	5051	852	5903	
3018	483	483	966	483	1449	488	1937	498	2435	560	2995	615	3610	685	4295	769	5064	855	5919	
3019	484	484	968	485	1453	489	1942	499	2441	562	3003	616	3619	688	4307	771	5078	857	5935	
3020	485	486	971	486	1457	491	1948	500	2448	563	3011	618	3629	689	4318	773	5091	859	5950	
3021	487	486	973	488	1461	492	1953	501	2454	565	3019	619	3638	692	4330	775	5105	862	5967	
3022	488	488	976	489	1465	493	1958	503	2461	566	3027	621	3648	693	4341	777	5118	864	5982	
3023	489	489	978	490	1468	495	1963	504	2467	568	3035	623	3658	694	4352	780	5132	866	5998	
3024	490	491	981	491	1472	496	1968	505	2473	570	3043	624	3667	697	4364	781	5145	869	6014	
3025	492	491	983	493	1476	497	1973	507	2480	570	3050	627	3677	698	4375	783	5158	871	6029	
3026	493	493	986	494	1480	498	1978	508	2486	572	3058	628	3686	700	4386	786	5172	873	6045	
3027	494	494	988	495	1483	500	1983	509	2492	574	3066	629	3695	702	4397	788	5185	875	6060	
3028	495	496	991	496	1487	501	1988	511	2499	575	3074	631	3705	704	4409	789	5198	878	6076	
3029	497	496	993	498	1491	502	1993	512	2505	577	3082	632	3714	706	4420	792	5212	880	6092	
3030	498	498	996	499	1495	503	1998	513	2511	578	3089	634	3723	708	4431	794	5225	882	6107	
3031	499	499	998	500	1498	505	2003	515	2518	579	3097	636	3733	709	4442	796	5238	884	6122	
3032	500	501	1001	501	1502	506	2008	516	2524	581	3105	637	3742	711	4453	798	5251	887	6138	
3033	502	501	1003	503	1506	507	2013	517	2530	582	3112	639	3751	713	4464	800	5264	889	6153	
3034	503	503	1006	503	1509	509	2018	518	2536	584	3120	641	3761	714	4475	802	5277	891	6168	
3035	504	504	1008	505	1513	510	2023	519	2542	586	3128	642	3770	716	4486	804	5290	894	6184	
3036	505	505	1010	507	1517	510	2027	522	2549	586	3135	644	3779	718	4497	806	5303	896	6199	
3037	506	507	1013	507	1520	512	2032	523	2555	588	3143	645	3788	720	4508	808	5316	898	6214	
3038	508	507	1015	509	1524	513	2037	524	2561	589	3150	647	3797	722	4519	810	5329	900	6229	
3039	509	509	1018	510	1528	514	2042	525	2567	591	3158	649	3807	723	4530	812	5342	902	6244	
3040	510	510	1020	511	1531	516	2047	526	2573	592	3165	651	3816	725	4541	814	5355	904	6259	
3041	511	511	1022	513	1535	517	2052	527	2579	594	3173	652	3825	727	4552	815	5367	907	6274	
3042	512	513	1025	513	1538	519	2057	528	2585	596	3181	653	3834	729	4563	817	5380	909	6289	
3043	514	513	1027	515	1542	520	2062	529	2591	597	3188	655	3843	731	4574	819	5393	911	6304	
3044	515	515	1030	516	1546	520	2066	531	2597	599	3196	656	3852	732	4584	822	5406	913	6319	
3045	516	516	1032	517	1549	522	2071	532	2603	600	3203	658	3861	734	4595	824	5419	915	6334	
3046	517	517	1034	519	1553	523	2076	534	2610	600	3210	660	3870	736	4606	825	5431	919	6350	
3047	518	519	1037	519	1556	525	2081	535	2616	602	3218	661	3879	737	4616	828	5444	920	6364	
3048	520	519	1039	521	1560	525	2085	537	2622	603	3225	663	3888	739	4627	829	5456	922	6378	
3049	521	520	1041	522	1563	527	2090	538	2628	605	3233	664	3897	741	4638	831	5469	924	6393	
3050	522	522	1044	523	1567	528	2095	538	2633	607	3240	666	3906	742	4648	833	5481	927	6408	
3051	523	523	1046	524	1570	530	2100	540	2640	607	3247	667	3914	745	4659	835	5494	929	6423	
3052	524	525	1049	525	1574	530	2104	541	2645	610	3255	669	3924	745	4669	837	5506	931	6437	
3053	525	526	1051	527	1578	531	2109	542	2651	611	3262	670	3932	748	4680	839	5519	933	6452	
3054	527	526	1053	528	1581	533	2114	543	2657	612	3269	672	3941	750	4691	840	5531	935	6466	
3055	528	528	1056	529	1585	533	2118	545	2663	614	3277	673	3950	751	4701	843	5544	937	6481	
3056	529	529	1058	530	1588	535	2123	546	2669	615	3284	675	3959	753	4712	844	5556	940	6496	
3057	530	530	1060	531	1591	537	2128	547	2675	616	3291	677	3968	754	4722	847	5569	941	6510	
3058	531	532	1063	532	1595	537	2132	549	2681	617	3298	678	3976	756	4732	849	5581	943	6524	
3059	532	533	1065	534	1599	538	2137	550	2687	619	3306	679	3985	758	4743	850	5593	999	6592	
3060	533	534	1067	535	1602	540	2142	551	2693	620	3313	681	3994	759	4753	852	5605	948	6553	

TABLE 2-7

LUCKY PEAK LAKE - ELEVATION CAPACITY TABLE

DAM LOCATION: BOISE RIVER BASIN, IDAHO - BOISE RIVER MILE 63.8

RESERVOIR ELEMENT:

CREST OF DAM	3,078 feet MSL
MAXIMUM DESIGN WATER SURFACE	3,072 feet MSL
TOP OF UNCONTROLLED SPILLWAY	3,060 feet MSL
NORMAL FULL POOL	3,055 feet MSL
TOP OF INACTIVE POOL	2,905 feet MSL
STREAMBED AT DAM AXIS	2,824 feet MSL

STORAGE ELEMENT:

SPILLWAY FREEBOARD	3,055 to 3,060 feet MSL	5 feet
SURCHARGE CAPACITY	3,055 to 3,060 feet MSL	13,905 acre-feet
JOINT USE CAPACITY	2,905 to 3,055 feet MSL	264,371 acre-feet
INACTIVE CAPACITY	2,824 to 2,905 feet MSL	28,767 acre-feet
TOTAL ACTIVE CAPACITY	2,905 to 3,055 feet MSL	264,371 acre-feet
TOTAL CAPACITY	2,824 to 3,055 feet MSL	293,138 acre-feet
TOTAL GROSS CAPACITY	2,824 to 3,060 feet MSL	307,043 acre-feet

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
2905	0		2921	14387		2937	32128	
		808			1008			1223
2906	808		2922	15395		2938	33351	
		820			1021			1236
2907	1628		2923	16416		2939	34587	
		831			1035			1250
2908	2459		2924	17451		2940	35837	
		843			1048			1264
2909	3302		2925	18499		2941	37101	
		856			1061			1278
2910	4158		2926	19560		2942	38379	
		867			1075			1291
2911	5025		2927	20635		2943	39670	
		879			1089			1304
2912	5904		2928	21724		2944	40974	
		891			1102			1318
2913	6795		2929	22826		2945	42292	
		903			1115			1332
2914	7698		2930	23941		2946	43624	
		917			1129			1344
2915	8615		2931	25070		2947	44968	
		929			1143			1358
2916	9544		2932	26213		2948	46326	
		943			1156			1370
2917	10487		2933	27369		2949	47696	
		955			1170			1385
2918	11442		2934	28539		2950	49081	
		969			1183			1396
2919	12411		2935	29722		2951	50477	
		981			1196			1408
2920	13392		2936	30918		2952	51885	
		995			1210			1421

TABLE 2-7 (Continued)

LUCKY PEAK LAKE - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
2953	53306	
		1434
2954	54740	
		1446
2955	56186	
		1458
2956	57644	
		1471
2957	59115	
		1484
2958	60599	
		1496
2959	62095	
		1508
2960	63603	
		1520
2961	65123	
		1533
2962	66656	
		1545
2963	68201	
		1557
2964	69758	
		1569
2965	71327	
		1581
2966	72908	
		1593
2967	74501	
		1605
2968	76106	
		1617
2969	77723	
		1629
2970	79352	
		1641
2971	80993	
		1653
2972	82646	
		1665
2973	84311	
		1678
2974	85989	
		1690
2975	87679	
		1702
2976	89381	
		1716
2977	91097	
		1728
2978	92825	
		1740
2979	94565	
		1754
2980	96319	
		1766
2981	98085	
		1778
2982	99863	
		1792
2983	101655	
		1804
2984	103459	
		1816
2985	105275	
		1829
2986	107104	
		1842
2987	108946	
		1854
2988	110800	
		1866
2989	112666	
		1879
2990	114545	
		1892
2991	116437	
		1904
2992	118341	
		1916
2993	120257	
		1929
2994	122186	
		1942
2995	124128	
		1954
2996	126082	
		1966
2997	128048	
		1979
2998	130027	
		1992
2999	132019	
		2004
3000	134023	
		2016
3001	136039	
		2030
3002	138069	
		2042
3003	140111	
		2056
3004	142167	
		2068
3005	144235	
		2082
3006	146317	
		2094
3007	148411	
		2108
3008	150519	
		2120
3009	152639	
		2134
3010	154773	
		2146
3011	156919	
		2160
3012	159079	
		2172
3013	161251	
		2185
3014	163436	
		2198
3015	165634	
		2210
3016	167844	
		2223
3017	170067	
		2236
3018	172303	
		2248
3019	174551	
		2261
3020	176812	
		2274
3021	179086	
		2286
3022	181372	
		2299
3023	183671	
		2312
3024	185983	
		2324
3025	188307	
		2338
3026	190645	
		2352
3027	192997	
		2365
3028	195362	
		2379
3029	197741	
		2393
3030	200134	
		2406
3031	202540	
		2420
3032	204960	
		2434
3033	207394	
		2447

TABLE 2-7 (Continued)

LUCKY PEAK LAKE - ELEVATION CAPACITY TABLE

ACTIVE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3034	209841		3042	229903		3050	250831	
		2460			2568			2679
3035	212301		3043	232471		3051	253510	
		2474			2582			2693
3036	214775		3044	235053		3052	256203	
		2488			2596			2708
3037	217263		3045	237649		3053	258911	
		2501			2609			2723
3038	219764		3046	240258		3054	261634	
		2514			2623			2737
3039	222278		3047	242881		3055	264371	
		2528			2636			
3040	224806		3048	245517				
		2542			2650			
3041	227348		3049	248167				
		2555			2664			

SURCHARGE CAPACITY (ACRE-FEET)

ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.	ELEVATION (Feet)	CAPACITY (Ac-Ft)	DIFF. PER. FT.
3055	0		3061	16730		3067	33981	
		2752			2839			2925
3056	2752		3062	19569		3068	36906	
		2767			2853			2940
3057	5519		3063	22422		3069	39846	
		2781			2868			2954
3058	8300		3064	25290		3070	42800	
		2795			2883			2969
3059	11095		3065	28173		3071	45769	
		2810			2897			2983
3060	13905		3066	31070		3072	48752	
		2825			2911			

TABLE 4-2

BOISE BASIN - AVERAGE MAXIMUM MONTHLY TEMPERATURES

ANDERSON RANCH DAM

Average Maximum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1948	--	--	--	--	--	--	--	--	80.8	87.9	88.6	79.5	--	--	--
1949	70.1	43.5	28.7	16.9	32.9	47.5	66.6	72.9	77.9	91.1	92.4	83.7	60.4	92.4	16.9
1950	61.4	59.0	37.2	28.5	38.4	43.7	55.0	66.9	77.4	89.1	89.8	76.8	60.3	89.8	28.5
1951	67.7	48.7	40.6	33.5	38.8	43.3	63.4	69.9	76.3	92.6	86.5	79.9	61.8	92.6	33.5
1952	58.2	44.6	32.0	29.5	31.1	40.0	59.2	71.2	78.0	89.0	89.4	83.4	58.8	89.4	29.5
1953	73.9	46.2	37.6	41.5	43.3	50.5	57.8	64.6	74.4	93.1	89.2	82.5	62.9	93.1	37.6
1954	68.9	56.1	--	36.3	42.5	45.7	61.4	76.4	75.4	94.2	86.5	79.5	--	--	--
1955	66.4	55.7	37.6	31.5	35.7	41.1	52.2	68.0	80.8	88.1	92.8	78.7	60.7	92.8	31.5
1956	66.7	41.6	37.9	35.9	31.9	45.6	62.3	--	79.6	92.0	87.2	82.1	--	--	--
1957	59.8	47.0	39.1	29.5	39.7	47.5	58.1	--	79.9	91.1	89.0	82.5	--	--	--
1958	61.5	44.6	38.7	35.0	42.4	44.5	54.6	79.3	79.0	88.8	92.3	77.6	61.5	92.3	35.0
1959	70.5	45.0	43.7	37.4	39.4	48.1	63.8	63.8	83.6	93.8	86.3	71.4	62.2	93.8	37.4
1960	62.3	51.0	41.3	32.8	35.4	45.1	60.4	68.4	84.5	96.4	86.8	81.5	62.2	96.4	32.8
1961	64.0	45.6	37.6	38.2	41.9	47.6	59.3	72.2	89.1	93.9	92.9	69.8	62.7	93.9	37.6
1962	60.8	44.4	32.9	30.7	38.1	42.4	65.5	66.1	80.4	88.7	86.6	80.9	59.8	88.7	30.7
1963	65.7	50.3	42.3	35.0	50.0	51.1	55.1	71.3	73.3	88.2	89.9	81.8	62.8	89.9	35.0
1964	69.1	45.9	36.6	32.0	36.2	40.2	55.6	69.2	74.3	92.3	86.8	75.2	59.5	92.3	32.0
1965	69.6	45.3	37.5	38.5	41.6	47.8	59.2	67.0	77.6	89.0	84.1	69.0	60.5	89.0	37.5
1966	73.5	52.1	38.4	36.7	39.4	49.5	62.0	77.0	79.0	93.8	89.6	83.0	64.5	93.8	36.7
1967	64.4	49.9	37.5	39.1	43.6	47.5	51.8	70.4	76.4	93.4	95.3	83.7	62.8	95.3	37.5
1968	64.5	50.1	34.9	35.0	45.5	54.9	58.4	69.2	80.3	94.8	79.6	76.2	62.0	94.8	34.9
1969	63.3	44.6	35.6	36.3	38.3	45.9	61.5	77.0	78.8	91.2	93.6	80.6	62.2	93.6	35.6
1970	57.9	52.0	38.3	36.2	44.5	47.6	52.4	71.2	82.1	91.7	94.3	73.3	61.8	94.3	36.2
1971	60.4	45.8	33.9	35.6	40.8	44.4	58.7	71.9	77.5	91.1	94.9	73.3	60.7	94.9	33.9
1972	60.4	43.7	33.5	34.2	39.5	50.5	57.4	74.4	82.4	90.0	91.2	72.2	60.8	91.2	33.5
1973	63.0	45.9	32.3	34.0	41.6	47.2	58.7	74.6	81.5	92.5	90.0	77.9	61.6	92.5	32.3
1974	65.1	42.2	39.1	32.9	38.5	46.1	60.1	68.2	87.8	90.5	88.7	82.0	61.8	90.5	32.9
1975	67.2	48.2	37.9	35.9	38.4	44.0	49.6	67.1	76.4	92.9	85.3	81.8	60.4	92.9	35.9
1976	61.3	44.2	39.1	35.8	39.9	41.9	57.5	75.0	77.7	92.3	83.0	78.9	60.6	92.3	35.8
1977	65.5	55.1	44.0	36.2	48.4	46.7	68.4	64.3	85.7	88.8	86.8	76.1	63.8	88.8	36.2
1978	67.5	46.3	38.5	39.1	39.8	53.3	57.4	67.4	80.2	88.6	87.0	73.9	61.6	88.6	38.5
1979	69.9	47.1	33.5	27.0	39.0	50.0	58.5	71.3	83.7	90.8	87.4	85.3	62.0	90.8	27.0
1980	--	45.8	40.5	34.5	42.6	47.7	64.3	68.7	--	89.4	85.2	77.0	--	--	--
STATISTICS															
N	31	32	31	32	32	32	32	30	32	33	33	33			
Mean	65.2	47.7	37.4	34.1	40.0	46.5	58.9	70.5	79.7	91.2	88.8	78.5			
Max	73.9	59.0	44.0	41.5	50.0	54.9	68.4	79.3	89.1	96.4	95.3	85.3			
Min	57.9	41.6	28.7	16.9	31.1	40.0	49.6	63.8	73.3	87.9	79.6	69.0			

T 4-1

Sheet 1

TABLE 4 (cont'd)

BOISE BASIN - AVERAGE MAXIMUM MONTHLY TEMPERATURES

ARROWROCK DAM

Average Maximum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1939	63.1	39.7	36.9	36.0	33.8	48.0	65.3	76.0	77.2	91.8	93.0	78.8	61.6	93.0	33.8
1940	61.7	52.0	43.2	37.9	42.7	54.9	60.4	77.6	88.2	93.9	94.5	76.5	65.3	94.5	37.9
1941	66.6	41.4	40.4	37.7	46.6	60.1	64.7	74.2	80.2	93.4	87.3	71.1	63.6	93.4	37.7
1942	61.0	48.7	37.9	26.8	37.5	49.2	61.7	63.0	75.3	93.4	91.0	79.8	60.4	93.4	26.8
1943	65.5	44.6	33.7	31.8	39.1	45.8	65.0	65.3	74.1	90.6	88.1	84.1	60.6	90.6	31.8
1944	63.4	46.6	37.5	32.9	40.2	47.1	57.7	71.6	72.9	88.1	87.1	77.9	60.3	88.1	32.9
1945	70.5	42.8	34.5	35.0	42.1	47.4	56.4	68.1	73.6	92.1	89.8	74.3	60.6	92.1	34.5
1946	67.9	42.1	32.8	28.6	34.7	49.4	63.9	69.2	79.9	91.9	90.1	76.1	60.6	91.9	28.6
1947	53.6	43.3	39.6	29.3	44.3	54.5	60.6	75.5	73.8	92.9	87.8	77.2	61.0	92.9	29.3
1948	64.4	40.5	36.3	36.0	40.0	44.6	56.9	68.9	80.4	86.6	87.3	77.9	60.0	87.3	36.0
1949	66.2	42.6	27.3	13.3	33.2	47.9	67.4	72.8	78.7	90.5	90.3	82.1	59.4	90.5	13.3
1950	57.5	53.3	35.6	30.4	38.5	45.6	58.5	66.9	75.3	89.2	88.4	78.4	59.8	89.2	30.4
1951	67.1	47.6	40.8	32.0	40.0	44.7	64.4	68.8	75.8	92.6	87.7	79.3	61.7	92.6	32.0
1952	57.9	43.9	32.7	30.3	33.3	43.5	65.2	70.5	77.8	88.6	90.0	82.6	59.7	90.0	30.3
1953	72.5	43.4	37.5	41.8	43.8	50.9	57.1	62.3	71.5	91.9	88.1	82.7	62.0	91.9	37.5
1954	67.5	52.5	35.2	37.2	44.1	47.0	61.6	73.8	72.2	91.3	85.1	78.1	62.1	91.3	35.2
1955	63.5	52.4	35.1	28.5	34.7	41.7	52.2	65.5	80.3	86.1	93.7	78.4	59.3	93.7	28.5
1956	64.8	39.1	37.7	36.6	31.2	49.2	61.2	69.8	78.0	91.1	86.5	80.8	60.5	91.1	31.2
1957	60.1	42.2	35.5	26.5	38.2	48.8	57.5	68.5	79.8	90.1	89.5	81.5	59.9	90.1	26.5
1958	60.1	41.7	37.5	31.5	44.5	46.9	55.1	78.1	77.8	89.4	92.8	77.7	61.1	92.8	31.5
1959	70.9	45.3	42.1	39.7	42.3	51.5	66.0	65.9	84.1	94.4	87.9	72.9	63.6	94.4	39.7
1960	61.6	47.9	37.8	32.9	38.2	50.8	63.5	68.7	84.1	97.5	86.8	82.3	62.7	97.5	32.9
1961	64.1	45.8	36.5	38.4	44.7	51.0	60.6	73.5	90.4	96.3	95.4	72.0	64.1	96.3	36.5
1962	60.7	42.9	34.9	29.1	37.5	47.1	66.9	66.3	80.1	88.0	86.4	80.8	60.1	88.0	29.1
1963	63.9	49.0	41.3	32.9	50.8	52.6	56.6	71.0	74.1	87.6	89.5	82.6	62.7	89.5	32.9
1964	67.9	46.7	34.5	32.1	35.3	41.8	55.8	66.3	72.6	90.7	84.4	72.9	58.4	90.7	32.1
1965	66.3	44.4	38.1	36.5	41.3	47.9	59.0	65.6	75.6	87.5	84.8	68.7	59.6	87.5	36.5
1966	70.3	51.9	37.7	37.6	40.7	50.8	60.3	75.0	77.1	90.9	89.2	82.0	63.6	90.9	37.6
1967	61.9	48.9	36.9	38.4	44.6	49.4	51.2	68.7	75.7	92.8	94.8	82.9	62.2	94.8	36.9
1968	60.8	48.3	33.3	34.9	45.2	54.6	55.7	68.2	78.4	92.9	79.5	74.4	60.5	92.9	33.3
1969	61.4	44.4	36.2	36.2	37.9	49.5	60.5	73.7	77.5	88.4	90.9	79.5	61.3	90.9	36.2
1970	56.6	48.0	36.8	35.0	46.8	48.1	52.0	67.9	79.7	88.0	92.1	70.7	60.1	92.1	35.0
1971	57.5	45.8	33.5	33.5	41.1	44.5	57.5	69.3	74.7	88.3	93.7	71.6	59.3	93.7	33.5
1972	58.2	42.5	33.1	32.2	36.4	51.0	55.8	71.1	78.8	87.4	89.5	71.5	59.0	89.5	32.2
1973	61.6	43.6	30.7	34.8	44.6	51.0	57.8	72.2	78.7	90.6	89.1	75.0	60.8	90.6	30.7
1974	63.2	41.6	39.3	29.6	39.4	46.8	56.8	66.0	84.7	87.6	86.1	80.5	60.1	87.6	29.6
1975	64.7	46.0	35.2	31.3	36.6	44.5	48.7	64.1	74.2	92.4	82.2	80.0	58.3	92.4	31.3
1976	59.5	44.0	34.7	32.2	36.8	41.4	55.8	71.8	74.6	88.4	--	76.3	--	--	--
1977	63.0	50.2	37.6	27.5	43.9	46.2	65.8	62.3	84.3	88.0	88.0	75.3	61.0	88.0	27.5
1978	64.1	43.6	38.7	39.4	40.6	56.3	55.6	64.8	76.8	86.2	85.2	71.7	60.3	86.2	38.7
1979	67.3	44.7	33.1	25.8	38.9	50.3	56.3	69.5	80.3	89.8	87.3	84.3	60.6	89.8	25.8
1980	66.9	42.5	39.3	34.8	44.7	47.9	62.3	66.9	75.6	88.5	83.7	75.1	60.7	88.5	34.8

STATISTICS

N	42	42	42	42	42	42	42	42	42	42	41	42
Mean	63.5	45.4	36.4	33.0	40.3	48.6	59.4	69.4	78.0	90.4	88.6	77.6
Max	72.5	53.3	43.2	41.8	50.8	60.1	67.4	78.1	90.4	97.5	95.4	84.3
Min	53.6	39.1	27.3	13.3	31.2	41.4	48.7	62.3	71.5	86.1	79.5	68.7

TABLE 4-2 (Cont'd)

BOISE BASIN - AVERAGE MAXIMUM MONTHLY TEMPERATURES

LUCKY PEAK DAM

Average Maximum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1951	--	--	--	--	47.3	51.3	69.4	73.4	79.5	95.8	91.1	83.8	--	--	--
1952	63.8	--	--	--	41.5	--	--	75.3	83.0	91.9	--	--	--	--	--
1953	--	--	--	--	49.3	58.5	61.8	67.3	75.7	94.9	91.5	86.5	--	--	--
1954	72.5	60.4	--	--	52.0	52.6	--	81.0	79.8	--	86.1	--	--	--	--
1955	--	--	39.5	--	38.7	--	--	69.4	--	--	--	--	--	--	--
1956	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1957	--	--	--	--	--	--	--	--	84.9	93.9	91.7	86.3	--	--	--
1958	64.9	48.9	43.5	39.9	52.2	52.5	60.6	82.5	82.0	91.6	95.3	82.6	66.4	95.3	39.9
1959	75.5	52.3	47.3	46.0	46.9	55.8	68.5	68.5	87.8	97.5	90.4	76.5	67.8	97.5	46.0
1960	67.3	53.6	43.3	35.9	42.6	55.2	66.7	72.0	88.5	100.4	89.1	86.4	66.8	100.4	35.9
1961	68.6	51.6	42.6	45.0	49.6	55.4	64.5	76.5	93.1	96.8	97.5	74.9	68.0	97.5	42.6
1962	65.1	49.6	39.3	31.9	41.3	51.2	71.2	70.4	84.6	91.5	90.9	84.7	64.3	91.5	31.9
1963	67.9	55.0	45.2	36.6	55.0	56.5	60.3	76.0	79.6	91.3	92.7	87.8	67.0	92.7	36.6
1964	73.2	52.1	37.4	36.9	--	47.6	59.0	68.8	75.5	93.2	87.1	76.0	--	--	--
1965	71.8	--	43.4	--	46.8	52.0	62.9	69.0	78.5	90.5	86.7	72.0	--	--	--
1966	73.8	--	--	--	44.0	54.3	63.2	78.1	80.2	91.7	90.9	83.7	--	--	--
1967	67.6	--	--	--	49.0	54.8	55.4	71.3	78.7	95.0	96.5	85.9	--	--	--
1968	66.8	--	--	41.7	49.6	--	59.2	71.2	81.6	94.8	81.2	77.2	--	--	--
1969	65.9	--	--	41.5	--	--	65.1	76.6	79.7	90.8	92.0	81.5	--	--	--
1970	61.0	--	--	--	51.3	52.7	54.9	72.0	83.0	91.9	93.8	72.9	--	--	--
1971	61.6	50.7	39.5	39.0	45.2	48.8	60.2	72.8	77.2	90.7	95.7	74.1	63.0	95.7	39.0
1972	61.9	47.5	37.7	37.0	42.6	55.6	59.9	73.9	82.1	89.4	91.6	72.9	62.7	91.6	37.0
1973	64.8	48.4	34.4	39.1	47.8	54.0	60.8	75.3	81.4	91.2	89.2	76.9	63.6	91.2	34.4
1974	66.0	46.2	43.4	36.5	45.9	51.8	59.2	68.8	87.5	90.0	87.6	82.8	63.8	90.0	36.5
1975	64.0	51.2	38.2	35.7	42.6	49.5	53.0	68.6	76.6	93.5	84.2	82.5	61.6	93.5	35.7
1976	63.4	48.7	39.2	39.1	42.8	47.3	59.9	76.1	77.4	90.8	83.2	78.7	62.2	90.8	39.1
1977	66.2	55.1	42.7	28.3	47.8	50.5	69.4	65.5	86.1	88.3	87.6	77.2	63.7	88.3	28.3
1978	67.0	48.2	43.7	43.6	44.6	60.6	61.0	69.1	80.1	90.4	87.6	75.3	64.3	90.4	43.6
1979	68.9	46.8	35.3	27.0	42.8	56.5	61.6	72.7	84.8	92.3	88.0	84.6	63.4	92.3	27.0
1980	67.6	--	--	--	50.0	51.0	66.6	70.0	78.5	90.5	84.3	76.9	--	--	--

STATISTICS

N	25	17	18	18	26	24	25	28	28	27	27	26
Mean	67.1	51.0	40.9	37.8	46.5	53.2	62.2	72.6	81.7	92.6	89.8	80.0
Max	75.5	60.4	47.3	46.0	55.0	60.6	71.2	82.5	93.1	100.4	97.5	87.8
Min	61.0	46.2	34.4	27.0	38.7	47.3	53.0	65.5	75.5	88.3	81.2	72.0

TABLE 4-2 (Cont'd)

BOISE BASIN - AVERAGE MAXIMUM MONTHLY TEMPERATURES

BOISE AIRPORT WSFO

Average Maximum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1941	--	--	--	40.2	48.1	58.1	62.0	71.0	75.4	90.5	84.6	71.1	--	--	--
1942	62.7	51.7	42.1	28.5	39.3	51.2	63.6	64.2	73.6	91.9	89.0	78.7	61.4	91.9	28.5
1943	66.0	48.5	38.8	35.5	45.0	49.8	67.1	66.8	74.6	88.9	87.2	82.5	62.6	88.9	35.5
1944	65.4	49.3	40.7	34.0	41.6	49.5	60.1	72.3	72.1	87.3	86.9	77.7	61.4	87.3	34.0
1945	71.7	45.0	34.8	37.9	45.2	49.0	58.4	69.1	74.2	91.5	89.3	74.7	61.7	91.5	34.8
1946	69.4	47.2	38.0	36.9	42.0	53.8	65.8	71.1	80.2	91.0	89.4	76.0	63.4	91.0	36.9
1947	55.9	45.6	43.9	32.6	47.1	56.5	62.0	76.4	73.9	91.8	87.8	77.5	62.6	91.8	32.6
1948	66.5	43.5	38.5	41.8	41.2	47.7	59.1	69.0	79.9	86.2	86.2	76.5	61.3	86.2	38.5
1949	66.2	46.5	33.2	20.1	38.9	53.3	68.3	74.8	80.4	90.5	89.1	80.7	61.8	90.5	20.1
1950	58.5	55.1	38.7	33.2	44.6	48.7	59.7	67.9	77.0	88.7	88.3	76.5	61.4	88.7	33.2
1951	69.1	51.5	42.2	35.9	44.8	47.2	64.6	69.7	76.6	91.5	86.8	78.1	63.2	91.5	35.9
1952	59.8	47.5	34.1	33.7	38.3	45.3	66.2	71.0	77.2	88.7	88.5	80.9	60.9	88.7	33.7
1953	71.9	46.4	40.4	47.8	45.9	53.9	58.1	64.1	72.4	91.1	86.8	81.6	63.4	91.1	40.4
1954	66.5	55.7	38.4	44.1	48.3	50.7	63.0	75.2	74.2	91.5	82.9	76.7	63.9	91.5	38.4
1955	65.1	54.4	38.8	30.6	35.3	45.7	54.6	65.6	81.0	86.1	91.7	77.0	60.5	91.7	30.6
1956	66.4	43.5	41.8	40.5	35.8	53.0	64.0	72.0	78.5	90.8	84.8	79.5	62.6	90.8	35.8
1957	61.4	44.2	37.3	30.0	42.1	51.6	59.9	69.2	80.2	88.9	86.7	80.6	61.0	88.9	30.0
1958	60.2	45.8	40.7	37.9	50.8	50.5	57.7	78.2	78.0	88.7	90.5	76.2	62.9	90.5	37.9
1959	70.0	49.9	44.1	42.9	44.8	52.3	63.9	65.3	83.5	92.3	84.9	71.3	63.8	92.3	42.9
1960	62.2	48.2	39.1	32.5	41.3	53.3	62.1	68.4	85.0	97.3	84.1	81.9	63.0	97.3	32.5
1961	66.0	49.8	39.1	42.5	49.1	54.2	61.7	72.5	89.1	93.2	92.7	70.8	65.1	93.2	39.1
1962	60.8	46.7	37.1	28.0	38.0	48.5	67.1	68.1	80.7	87.6	85.9	80.8	60.8	87.6	28.0
1963	65.3	50.8	42.4	32.0	52.6	55.5	59.1	72.9	76.0	88.7	89.1	84.5	64.1	89.1	32.0
1964	69.1	51.7	34.2	33.8	34.3	46.6	58.2	68.7	74.0	91.3	84.5	74.1	60.0	91.3	33.8
1965	66.3	45.3	42.4	39.1	46.2	52.1	61.0	67.9	78.4	89.0	84.9	70.1	61.9	89.0	39.1
1966	70.5	53.0	37.6	39.9	42.6	55.1	62.7	77.2	79.5	90.6	88.3	81.2	64.9	90.6	37.6
1967	63.9	51.6	38.0	42.9	47.9	52.3	54.3	71.4	79.5	94.2	94.5	82.8	64.4	94.5	38.0
1968	63.7	49.5	35.4	37.5	49.9	58.0	60.2	71.6	81.8	94.1	80.8	76.7	63.3	94.1	35.4
1969	64.6	49.3	41.5	41.3	42.6	54.0	63.6	76.2	78.3	89.3	89.5	78.1	64.0	89.5	41.3
1970	57.5	50.3	41.3	41.6	50.8	51.5	54.3	70.5	81.4	92.0	93.1	71.8	63.0	93.1	41.3
1971	58.8	50.2	39.8	39.8	45.6	49.5	60.7	72.6	77.1	90.0	94.0	72.5	62.6	94.0	39.8
1972	60.4	47.8	36.7	37.7	44.3	56.4	58.3	74.9	81.3	89.6	90.1	71.5	62.4	90.1	36.7
1973	62.9	47.4	32.1	38.2	47.8	53.1	61.2	75.3	81.9	91.9	88.4	76.9	63.1	91.9	32.1
1974	64.1	48.0	44.4	36.1	46.6	51.1	61.3	68.8	88.0	89.6	87.6	81.8	64.0	89.6	36.1
1975	64.3	50.4	40.5	36.1	43.5	50.4	53.9	69.0	78.3	94.3	84.3	82.4	62.3	94.3	36.1
1976	63.0	49.2	37.2	38.8	42.0	46.6	59.2	74.6	77.8	89.5	81.6	77.5	61.4	89.5	37.2
1977	64.7	52.5	41.8	26.1	44.6	51.2	69.2	65.1	84.9	88.3	87.6	75.5	62.6	88.3	26.1
1978	65.8	49.0	43.5	43.5	45.1	59.9	58.6	67.2	79.4	88.7	86.4	74.8	63.5	88.7	43.5
1979	69.0	46.9	35.5	25.3	41.7	54.2	60.4	71.9	82.2	90.4	85.7	83.5	62.2	90.4	25.3
1980	66.9	44.4	43.9	37.3	47.2	51.3	65.2	68.5	76.7	89.5	83.7	76.4	62.6	89.5	37.3
STATISTICS															
N	39	39	39	40	40	40	40	40	40	40	40	40			
Mean	64.7	48.8	39.2	36.4	44.1	51.8	61.3	70.7	78.9	90.4	87.5	77.5			
Max	71.9	55.7	44.4	47.8	52.6	59.9	69.2	78.2	89.1	97.3	94.5	84.5			
Min	55.9	43.5	32.1	20.1	34.3	45.3	53.9	64.1	72.1	86.1	80.8	70.1			

TABLE 4- ...t'd)

BOISE BASIN - AVERAGE MAXIMUM MONTHLY TEMPERATURES

IDAHO CITY

Average Maximum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1937	72.3	54.7	39.6	23.8	36.6	51.8	56.1	74.7	78.0	92.2	90.4	84.9	62.9	92.2	23.8
1938	71.1	50.1	40.7	39.9	44.0	47.1	63.0	68.6	80.6	87.2	89.5	86.3	64.0	89.5	39.9
1939	65.8	42.1	40.3	40.0	37.1	53.5	68.1	77.8	77.4	92.1	94.3	81.7	64.2	94.3	37.1
1940	66.0	56.7	45.2	41.1	44.5	55.6	62.4	78.7	88.6	92.0	94.2	76.5	66.8	94.2	41.1
1941	66.3	42.2	40.9	41.2	43.8	57.4	61.2	71.1	75.9	90.5	84.9	71.7	62.3	90.5	40.9
1942	64.5	50.9	40.2	33.0	37.4	49.8	64.7	65.6	76.4	94.2	91.6	82.0	62.5	94.2	33.0
1943	65.8	47.6	35.7	34.8	44.1	46.5	65.8	66.7	73.6	89.4	88.0	84.5	61.9	89.4	34.8
1944	64.6	51.3	43.0	38.8	41.4	46.6	58.5	72.3	72.1	86.5	86.6	79.1	61.7	86.6	38.8
1945	74.4	43.9	39.4	39.2	41.6	48.6	57.5	69.0	72.8	90.6	89.3	74.8	61.8	90.6	39.2
1946	69.5	41.7	35.1	35.4	38.0	47.1	62.5	68.4	76.6	91.1	90.0	77.3	61.1	91.1	35.1
1947	53.9	42.5	41.4	33.2	45.7	53.9	60.5	75.1	72.9	90.2	87.2	77.3	61.2	90.2	33.2
1948	66.3	42.9	38.5	39.9	39.9	44.2	56.2	68.5	79.5	85.4	86.3	78.9	60.5	86.3	38.5
1949	69.5	42.2	30.5	22.4	34.6	48.4	66.9	72.6	80.2	89.6	89.5	83.0	60.8	89.6	22.4
1950	60.9	58.4	37.3	29.6	43.8	45.7	58.2	66.6	75.4	86.6	86.7	76.2	60.5	86.7	29.6
1951	66.7	48.8	41.6	35.0	41.8	44.6	63.5	68.1	73.9	89.4	84.3	80.3	61.5	89.4	35.0
1952	58.4	46.1	32.7	33.1	38.5	43.4	64.1	70.4	75.1	86.4	86.9	83.7	59.9	86.9	32.7
1953	76.8	49.9	37.6	42.8	44.8	51.8	57.6	62.7	72.8	90.6	87.3	83.0	63.1	90.6	37.6
1954	70.8	54.2	37.3	37.3	47.4	48.2	61.6	73.7	71.6	89.0	81.7	79.9	62.7	89.0	37.3
1955	68.3	57.3	38.9	33.7	38.3	42.8	52.7	66.3	78.1	82.5	90.4	77.0	60.5	90.4	33.7
1956	66.9	41.1	38.5	38.5	35.5	47.9	63.2	70.9	75.4	86.6	84.1	81.2	60.8	86.6	35.5
1957	--	43.7	37.9	29.5	40.1	46.0	57.1	67.7	78.1	87.4	85.7	79.8	--	--	--
1958	57.9	43.3	36.7	34.4	42.5	45.2	52.8	76.4	75.4	84.9	88.5	75.6	59.5	88.5	34.4
1959	69.0	44.6	41.2	37.2	39.4	46.8	61.8	62.7	80.2	90.9	82.8	68.4	60.4	90.9	37.2
1960	60.2	48.3	39.8	30.7	35.4	46.2	58.6	65.4	80.1	92.7	83.0	80.3	60.1	92.7	30.7
1961	62.9	43.8	37.5	40.5	40.5	47.1	57.1	69.3	84.5	90.9	90.6	68.9	61.1	90.9	37.5
1962	58.8	42.7	32.9	31.3	37.8	43.4	63.7	63.6	77.4	84.9	83.1	78.8	58.2	84.9	31.3
1963	61.9	47.9	40.4	32.8	49.2	49.8	52.4	68.3	71.5	83.4	86.1	79.0	60.2	86.1	32.8
1964	67.1	43.6	34.7	31.8	37.7	40.5	54.7	66.9	71.9	88.2	81.5	73.5	57.7	88.2	31.8
1965	68.8	43.6	33.3	33.7	40.2	45.8	57.6	65.3	77.4	84.0	81.9	67.2	58.2	84.0	33.3
1966	70.3	49.3	38.2	36.1	41.1	50.8	61.0	75.2	75.9	89.9	88.3	81.3	63.1	89.9	36.1
1967	63.5	47.7	37.5	36.7	44.6	47.5	50.4	68.9	73.9	90.1	93.8	82.5	61.4	93.8	36.7
1968	61.2	48.4	33.8	36.5	46.5	54.8	56.0	66.2	77.3	91.2	77.1	73.2	60.2	91.2	33.8
1969	61.4	43.0	34.1	33.5	38.4	47.4	61.7	73.4	74.5	87.0	90.3	78.0	60.2	90.3	33.5
1970	56.7	50.3	37.3	35.0	46.8	47.0	51.9	68.3	78.4	87.1	91.1	70.7	60.1	91.1	35.0
1971	58.2	43.5	32.2	34.4	40.9	44.5	58.8	69.5	73.3	86.4	91.0	70.2	58.6	91.0	32.2
1972	60.5	43.0	31.7	33.0	39.3	51.3	54.7	70.8	77.3	85.2	87.5	70.4	58.7	87.5	31.7
1973	63.2	44.4	30.7	33.6	44.3	48.5	57.3	71.3	78.6	89.8	86.5	74.6	60.2	89.8	30.7
1974	62.8	40.5	36.8	32.1	41.8	45.5	58.1	66.2	84.4	86.2	84.9	80.9	60.0	86.2	32.1
1975	66.6	46.9	35.9	34.3	38.9	44.5	49.1	64.6	72.7	88.2	80.7	79.1	58.5	88.2	34.3
1976	59.0	43.0	38.4	36.9	40.0	43.9	57.5	73.0	73.5	86.9	77.7	76.7	58.9	86.9	36.9
1977	64.7	53.5	42.0	35.1	48.7	44.2	64.2	58.7	80.5	83.3	83.7	71.2	60.8	83.7	35.1
1978	65.0	43.1	37.6	37.4	41.7	55.9	57.1	64.5	76.7	83.9	83.4	71.9	59.9	83.9	37.4
1979	69.3	45.1	31.3	28.8	39.1	50.4	57.3	68.8	80.6	88.6	84.8	82.3	60.5	88.6	28.8
1980	65.2	44.1	38.5	34.1	45.2	46.8	63.1	67.6	75.1	86.1	--	75.4	--	--	--
STATISTICS															
N	43	44	44	44	44	44	44	44	44	44	43	44			
Mean	65.0	46.6	37.4	34.8	41.3	47.9	59.1	69.1	76.7	88.2	86.7	77.5			
Max	76.8	58.4	45.2	42.8	49.2	57.4	68.1	78.7	88.6	94.2	94.3	86.3			
Min	53.9	40.5	30.5	22.4	34.6	40.5	49.1	58.7	71.5	82.5	77.1	67.2			

TABLE 4-3

BOISE BASIN - AVERAGE MINIMUM MONTHLY TEMPERATURES

ANDERSON RANCH DAM

Average Minimum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1948	--	--	--	--	--	--	--	--	50.1	51.7	51.1	44.8	--	--	--
1949	36.4	25.7	12.6	-4.8	16.1	29.2	35.2	44.4	46.3	53.9	54.4	46.5	33.0	54.4	-4.8
1950	32.4	33.1	19.8	14.0	19.2	24.7	32.6	36.3	45.6	53.5	52.6	47.1	34.2	53.5	14.0
1951	40.3	31.8	27.5	17.0	22.7	22.3	34.9	43.7	46.0	56.6	55.6	47.6	37.2	56.6	17.0
1952	37.8	28.9	18.6	14.7	10.5	21.5	33.3	42.8	49.0	55.6	55.6	49.2	34.8	55.6	10.5
1953	41.8	25.5	24.8	30.9	23.8	29.3	33.8	38.3	45.8	56.1	55.6	49.2	37.9	56.1	23.8
1954	41.2	35.5	23.1	23.1	25.7	26.3	36.1	44.7	46.2	58.0	53.3	47.1	38.4	58.0	23.1
1955	37.3	33.8	22.3	14.7	15.1	20.8	31.6	40.9	48.9	56.1	56.7	46.5	35.4	56.7	14.7
1956	39.2	26.1	23.8	23.0	12.4	23.0	35.2	--	48.5	56.7	53.8	47.5	--	--	--
1957	38.4	27.6	23.7	11.9	20.2	27.8	35.2	--	50.2	56.0	54.8	48.4	--	--	--
1958	39.9	26.9	25.2	19.7	27.1	24.8	34.1	46.5	50.6	56.1	58.7	47.4	38.1	58.7	19.7
1959	40.3	29.3	30.4	24.8	24.1	28.2	35.9	39.5	52.0	56.4	53.7	46.8	38.5	56.4	24.1
1960	39.7	28.9	23.8	19.1	18.7	26.5	35.6	40.5	50.9	61.0	52.4	50.0	37.3	61.0	18.7
1961	38.3	31.6	22.2	21.7	28.6	30.0	34.1	43.4	55.1	58.1	61.5	44.4	39.1	61.5	21.7
1962	37.0	27.6	20.0	12.5	21.7	21.5	35.1	42.5	48.7	54.8	53.1	47.8	35.2	54.8	12.5
1963	40.9	32.7	27.0	19.4	30.7	29.3	33.7	45.3	48.3	52.9	55.9	52.3	39.0	55.9	19.4
1964	44.2	31.1	21.2	16.4	14.3	21.3	32.2	40.8	48.3	55.4	52.2	43.4	35.1	55.4	14.3
1965	39.9	28.8	22.2	24.1	23.0	24.1	36.3	40.3	48.5	54.9	53.9	42.2	36.5	54.9	22.2
1966	40.0	34.7	24.1	22.5	22.2	26.4	32.9	44.1	47.7	56.0	55.2	51.4	38.1	56.0	22.2
1967	36.5	33.5	23.5	26.0	24.8	29.2	32.7	40.7	49.8	58.7	59.4	52.7	39.0	59.4	23.5
1968	39.2	32.7	18.5	19.3	27.0	31.3	32.9	40.9	49.8	57.8	53.1	45.9	37.4	57.8	18.5
1969	35.6	30.4	23.7	21.1	20.3	20.8	34.9	44.5	50.2	53.6	55.6	46.1	36.4	55.6	20.3
1970	34.0	29.4	23.8	23.3	25.1	27.5	30.8	41.0	49.7	56.3	55.6	41.7	36.5	56.3	23.3
1971	35.7	32.7	20.5	20.9	23.0	22.7	34.2	42.3	48.0	54.9	58.2	41.9	36.3	58.2	20.5
1972	36.5	29.0	18.6	18.8	22.6	29.5	33.8	43.0	51.3	54.1	57.1	44.6	36.6	57.1	18.6
1973	39.8	32.3	18.4	20.6	22.6	28.3	34.9	43.0	50.0	57.3	56.0	46.9	37.5	57.3	18.4
1974	38.5	29.8	24.7	16.8	18.6	29.1	34.1	40.3	50.9	56.0	51.8	45.5	36.3	56.0	16.8
1975	37.5	29.7	20.7	15.3	21.4	27.2	32.0	39.6	47.8	60.0	52.4	47.4	35.9	60.0	15.3
1976	39.1	27.0	26.2	20.3	21.0	20.1	33.9	43.3	47.0	57.6	52.4	49.6	36.5	57.6	20.1
1977	37.6	30.9	22.2	17.5	25.1	26.7	37.2	40.0	54.7	56.4	57.2	47.1	37.7	57.2	17.5
1978	38.4	29.2	27.2	25.3	23.4	30.7	36.6	40.7	48.6	56.5	52.0	44.9	37.8	56.5	23.4
1979	38.0	27.4	16.8	10.0	21.6	27.6	34.1	42.6	50.2	56.9	56.1	49.9	35.9	56.9	10.0
1980	--	24.5	24.5	19.9	26.2	26.9	36.8	43.2	--	55.5	52.3	47.9	--	--	--
STATISTICS															
N	31	32	32	32	32	32	32	30	32	33	33	33			
Mean	38.4	29.9	22.6	18.7	21.8	26.1	34.3	42.0	49.2	56.1	54.8	47.0			
Max	44.2	35.5	30.4	30.9	30.7	31.3	37.2	46.5	55.1	61.0	61.5	52.7			
Min	32.4	24.5	12.6	-4.8	10.5	20.1	30.8	36.3	45.6	51.7	51.1	41.7			

TABLE 4-3 (Continued)

BOISE BASIN - AVERAGE MINIMUM MONTHLY TEMPERATURES

ARROWROCK DAM

Average Minimum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1939	38.8	23.2	22.5	17.9	11.4	24.2	35.6	44.2	45.1	56.6	56.6	45.7	35.2	56.6	11.4
1940	36.0	25.5	27.7	24.0	26.1	30.6	36.3	44.1	50.3	56.5	55.7	48.8	38.5	56.5	24.0
1941	38.8	24.7	23.6	21.2	25.4	29.0	34.7	43.4	48.1	57.5	56.5	43.9	37.2	57.5	21.2
1942	36.7	30.2	26.1	12.3	18.7	25.2	35.4	39.6	45.8	56.5	54.5	45.8	35.6	56.5	12.3
1943	35.5	28.6	22.0	16.4	19.2	23.2	38.1	39.9	46.1	54.7	52.5	47.9	35.3	54.7	16.4
1944	39.3	28.5	24.4	14.6	23.1	24.1	33.9	42.2	46.8	53.0	52.3	46.1	35.7	53.0	14.6
1945	38.4	30.9	22.3	23.6	26.1	27.0	32.6	43.3	46.7	55.6	53.7	42.9	36.9	55.6	22.3
1946	37.4	28.9	18.9	13.1	15.9	29.0	37.1	42.8	48.6	57.3	55.3	44.5	35.7	57.3	13.1
1947	34.0	29.8	28.6	12.2	25.1	31.9	37.0	46.7	48.6	55.5	54.4	46.6	37.5	55.5	12.2
1948	40.7	26.7	22.6	19.7	19.7	24.9	34.5	42.0	51.8	52.3	53.2	46.6	36.2	53.2	19.7
1949	36.5	26.9	11.4	-8.8	15.1	28.5	36.2	44.3	47.2	54.6	55.9	48.2	33.0	55.9	-8.8
1950	31.9	30.8	20.2	14.5	19.5	27.2	34.9	38.8	47.5	54.9	54.6	49.0	35.3	54.9	14.5
1951	40.1	31.7	29.3	16.0	23.2	22.7	35.4	43.0	46.4	56.3	54.7	45.3	37.0	56.3	16.0
1952	37.1	27.1	18.6	15.4	14.8	23.5	36.5	42.9	48.7	53.3	55.0	46.9	35.0	55.0	14.8
1953	37.7	22.5	24.3	30.7	25.7	29.7	33.4	39.6	46.2	55.3	53.8	47.9	37.2	55.3	22.5
1954	37.0	33.2	22.8	25.3	27.6	27.2	35.5	44.2	46.5	56.0	52.0	44.3	37.6	56.0	22.8
1955	33.7	31.4	20.3	12.0	12.9	21.5	32.0	40.7	49.8	54.9	55.6	44.6	34.1	55.6	12.0
1956	36.7	24.7	24.2	24.4	14.4	26.3	36.5	44.8	48.4	56.9	52.9	44.6	36.2	56.9	14.4
1957	36.6	25.7	22.2	9.9	20.1	29.5	36.6	46.0	50.4	57.5	58.5	48.8	36.8	58.5	9.9
1958	36.8	24.4	25.6	18.6	29.0	28.3	35.3	47.1	52.5	57.1	58.7	46.4	38.3	58.7	18.6
1959	39.1	30.3	31.0	27.6	28.1	30.3	36.9	40.0	51.6	57.7	53.0	46.2	39.3	57.7	27.6
1960	39.2	27.6	23.3	20.0	21.7	29.1	36.6	41.2	50.9	61.5	51.9	49.0	37.7	61.5	20.0
1961	36.8	31.3	22.6	22.9	30.7	32.3	34.3	43.3	53.9	56.9	60.4	44.0	39.1	60.4	22.6
1962	36.7	27.7	22.7	13.3	24.3	26.8	37.7	43.6	48.9	55.5	52.9	46.4	36.4	55.5	13.3
1963	38.9	32.7	28.7	17.8	31.0	31.2	35.5	46.6	49.6	54.2	55.3	52.1	39.5	55.3	17.8
1964	44.2	32.9	22.9	18.5	15.8	21.8	33.2	41.5	50.5	57.6	53.1	43.3	36.3	57.6	15.8
1965	37.4	29.0	25.0	25.3	25.2	25.3	38.5	41.6	49.8	56.5	54.5	43.0	37.6	56.5	25.0
1966	40.0	34.3	25.2	25.1	23.8	29.3	35.2	45.1	49.3	55.3	53.6	50.1	38.9	55.3	23.8
1967	34.1	33.0	24.7	26.4	26.6	29.7	32.3	41.1	50.2	58.9	56.9	49.7	38.6	58.9	24.7
1968	34.8	31.7	19.5	19.5	27.5	31.3	31.7	40.7	49.6	56.1	51.8	44.1	36.5	56.1	19.5
1969	35.8	30.3	23.5	23.4	23.9	25.6	36.6	44.5	50.9	54.9	53.3	45.0	37.3	54.9	23.4
1970	31.2	27.5	24.3	24.7	26.6	28.9	30.1	41.0	50.8	55.3	54.1	38.7	36.1	55.3	24.3
1971	32.7	31.9	21.0	19.7	22.0	22.9	33.9	42.5	48.3	56.2	59.4	41.0	36.0	59.4	19.7
1972	35.2	29.8	22.1	20.4	22.7	29.8	33.2	42.5	51.7	54.9	57.2	41.6	36.8	57.2	20.4
1973	37.4	30.4	18.9	21.7	28.0	31.1	34.8	43.2	49.6	57.1	54.0	44.6	37.6	57.1	18.9
1974	35.9	30.7	27.5	16.2	21.0	28.0	33.4	39.1	52.3	56.3	54.3	45.4	36.7	56.3	16.2
1975	37.6	30.3	22.7	18.3	22.4	27.4	31.3	38.6	46.8	59.3	51.9	45.3	36.0	59.3	18.3
1976	38.8	27.1	23.4	19.1	18.8	21.1	32.4	42.6	45.9	56.9	--	46.2	--	--	--
1977	34.0	26.9	18.7	14.7	20.1	25.1	35.8	37.7	52.6	53.3	54.5	43.4	34.7	54.5	14.7
1978	34.3	27.1	26.9	25.8	26.8	32.1	36.0	39.8	47.0	56.0	52.1	45.0	37.4	56.0	25.8
1979	36.2	25.9	16.2	7.4	22.2	27.8	33.1	42.5	48.9	56.2	55.2	48.9	35.0	56.2	7.4
1980	42.2	26.3	27.0	22.2	30.0	31.3	39.0	44.3	46.7	56.6	50.8	47.4	38.7	56.6	22.2
STATISTICS															
N	42	42	42	42	42	42	42	42	42	42	41	42			
Mean	37.0	28.8	23.2	18.6	22.7	27.4	35.0	42.4	49.0	56.1	54.6	45.8			
Max	44.2	34.3	31.0	30.7	31.0	32.3	39.0	47.1	53.9	61.5	60.4	52.1			
Min	31.2	22.5	11.4	-8.8	11.4	21.1	30.1	37.7	45.1	52.3	50.8	38.7			

TABLE 4-3 (Continued)

BOISE BASIN - AVERAGE MINIMUM MONTHLY TEMPERATURES

LUCKY PEAK DAM

Average Minimum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1951	--	--	--	--	27.6	28.5	37.8	45.1	47.3	58.7	57.9	48.3	--	--	--
1952	37.2	--	--	--	22.0	--	--	45.2	49.8	56.4	--	--	--	--	--
1953	--	--	--	--	28.7	31.8	34.5	39.3	45.2	56.1	55.1	51.4	--	--	--
1954	41.7	36.0	--	--	30.5	27.8	--	--	47.3	--	51.2	--	--	--	--
1955	--	--	--	--	21.2	27.5	34.9	42.1	--	--	--	--	--	--	--
1956	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1957	--	--	--	--	--	--	--	--	54.5	59.0	57.3	52.4	--	--	--
1958	40.5	28.3	27.9	23.5	33.8	31.7	37.5	51.7	54.9	60.0	61.1	47.9	41.6	61.1	23.5
1959	41.2	31.0	28.8	27.0	27.8	28.6	35.7	38.3	50.2	56.3	51.1	48.7	38.7	56.3	27.0
1960	41.6	28.9	24.6	20.2	25.8	33.6	38.1	43.0	52.2	62.9	52.4	50.6	39.5	62.9	20.2
1961	42.0	34.2	25.1	26.3	33.5	35.2	37.1	45.4	58.3	62.0	64.3	47.2	42.6	64.3	25.1
1962	39.6	29.8	24.1	14.0	25.9	29.9	40.6	44.2	52.0	57.7	55.8	51.8	38.8	57.7	14.0
1963	41.7	33.3	28.4	16.5	33.4	32.3	36.5	48.0	50.0	54.9	57.2	57.8	40.8	57.8	16.5
1964	48.0	36.5	23.9	21.1	--	26.4	34.7	41.5	52.0	60.1	55.4	46.6	--	--	--
1965	42.2	--	26.5	--	26.5	26.2	39.2	42.0	51.8	60.3	59.1	45.5	--	--	--
1966	44.1	--	--	--	23.5	31.1	37.9	48.1	52.8	58.9	59.0	54.9	--	--	--
1967	39.1	--	--	--	28.2	31.1	34.4	42.7	52.4	62.6	63.3	56.7	--	--	--
1968	40.8	--	--	22.7	31.4	--	33.0	43.0	51.0	60.5	56.6	49.1	--	--	--
1969	39.7	--	--	23.1	--	--	36.9	46.5	53.2	57.8	56.9	51.7	--	--	--
1970	35.4	--	--	--	30.4	30.7	30.9	43.8	55.2	59.9	59.7	44.2	--	--	--
1971	37.6	34.6	24.6	25.9	27.6	27.8	36.3	45.4	50.9	59.0	63.2	44.9	39.8	63.2	24.6
1972	36.5	30.4	23.0	22.4	26.5	33.8	34.4	45.4	53.3	55.9	60.2	46.5	39.0	60.2	22.4
1973	41.6	33.7	19.1	23.9	30.5	31.5	35.9	45.2	50.7	59.4	57.8	49.1	39.9	59.4	19.1
1974	39.7	34.4	29.9	20.0	28.7	33.0	35.6	41.3	53.4	56.9	55.4	49.1	39.8	56.9	20.0
1975	39.7	34.6	24.8	18.6	26.9	28.3	31.6	39.7	48.7	62.5	55.7	51.5	38.6	62.5	18.6
1976	40.8	29.0	24.6	23.9	25.4	26.5	35.1	42.7	44.7	56.8	53.7	50.3	37.8	56.8	23.9
1977	37.2	30.1	20.1	11.6	22.5	25.8	35.2	39.5	54.0	53.6	59.1	48.5	36.4	59.1	11.6
1978	41.2	29.7	30.4	29.6	30.0	34.8	40.0	41.6	49.8	56.6	53.5	47.6	40.4	56.6	29.6
1979	39.3	26.4	19.4	9.0	27.3	31.6	36.3	42.6	48.4	56.9	58.2	50.6	37.2	58.2	9.0
1980	42.7	27.2	--	--	33.8	30.3	39.1	46.0	48.7	57.9	53.5	49.8	--	--	--
STATISTICS															
N	25	18	17	18	26	25	26	27	28	27	27	26			
Mean	40.4	31.6	25.0	21.1	28.1	30.2	36.1	43.7	51.2	58.5	57.2	49.7			
Max	48.0	36.5	30.4	29.6	33.8	35.2	40.6	51.7	58.3	62.9	64.3	57.8			
Min	35.4	26.4	19.1	9.0	21.2	25.8	30.9	38.3	44.7	53.6	51.1	44.2			

TABLE 4-3 (Continued)

BOISE BASIN - AVERAGE MINIMUM MONTHLY TEMPERATURES

BOISE AIRPORT WSFO

Average Minimum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1941	--	--	--	26.3	35.8	32.8	38.2	45.9	50.4	60.4	57.3	44.7	--	--	--
1942	39.1	32.4	27.9	12.8	23.8	29.3	40.0	41.8	47.9	59.5	56.8	47.6	38.2	59.5	12.8
1943	39.1	30.8	28.1	20.8	26.8	30.0	40.9	41.2	48.7	57.6	54.6	50.8	39.1	57.6	20.8
1944	42.4	30.8	24.9	16.1	26.5	27.2	37.7	44.8	49.4	57.2	54.5	49.8	38.4	57.2	16.1
1945	44.2	32.4	23.3	26.4	29.9	31.1	33.7	44.2	48.0	58.3	57.5	45.1	39.5	58.3	23.3
1946	41.1	32.1	23.6	21.1	25.6	33.7	37.9	44.2	50.5	58.7	57.1	46.0	39.3	58.7	21.1
1947	34.4	29.8	28.5	13.9	29.0	33.3	36.7	48.1	49.6	58.4	56.6	48.2	38.9	58.4	13.9
1948	43.8	28.7	24.2	24.2	22.9	28.1	37.0	43.6	53.1	54.5	54.5	47.2	38.5	54.5	22.9
1949	38.4	27.5	17.7	0.5	22.5	33.0	38.5	48.2	50.9	58.3	58.2	50.5	37.0	58.3	0.5
1950	34.4	34.1	23.4	17.5	25.9	30.9	35.4	40.2	50.2	57.8	57.0	49.8	38.1	57.8	17.5
1951	44.6	33.7	30.3	22.2	28.9	27.0	36.7	43.8	48.0	59.9	57.6	49.1	40.2	59.9	22.2
1952	38.6	29.8	20.8	19.5	22.5	28.2	38.7	44.1	51.1	58.3	57.2	49.8	38.2	58.3	19.5
1953	41.9	23.6	27.7	34.2	26.9	30.8	34.1	40.2	46.3	57.0	56.2	50.3	39.1	57.0	23.6
1954	39.2	34.9	24.1	28.9	29.3	27.9	36.7	44.6	48.4	59.2	53.5	46.4	39.4	59.2	24.1
1955	36.6	32.6	22.3	16.4	19.0	26.7	33.4	41.6	52.3	56.4	57.5	47.9	36.9	57.5	16.4
1956	40.2	27.6	28.9	26.4	18.9	30.8	37.1	46.9	50.5	59.5	54.6	48.8	39.2	59.5	18.9
1957	38.7	26.4	24.0	12.9	26.8	32.8	37.5	47.1	51.8	57.4	54.7	50.0	38.3	57.4	12.9
1958	38.8	27.0	28.0	25.0	33.6	30.8	37.8	50.4	54.0	59.3	61.2	47.8	41.1	61.2	25.0
1959	40.5	30.5	29.1	28.7	29.5	29.7	37.4	40.1	53.7	59.7	55.1	48.1	40.2	59.7	28.7
1960	37.0	21.2	16.7	15.4	25.8	32.5	35.8	40.5	52.7	64.0	53.8	50.0	37.1	64.0	15.4
1961	39.3	31.3	21.8	23.3	33.3	34.6	34.5	43.2	56.6	59.3	62.9	43.5	40.3	62.9	21.8
1962	37.3	27.3	24.6	14.2	26.4	28.6	37.6	43.8	50.2	56.8	55.5	49.6	37.7	56.8	14.2
1963	40.8	31.9	28.4	14.5	34.0	33.0	37.4	48.7	51.8	55.6	57.8	57.3	40.9	57.8	14.5
1964	46.5	35.6	22.0	18.2	18.3	28.5	32.4	41.4	51.0	58.4	53.9	45.0	37.6	58.4	18.2
1965	39.5	28.5	27.9	29.1	27.5	26.2	39.4	41.9	50.9	57.6	57.3	44.1	39.2	57.6	26.2
1966	42.2	35.6	22.5	24.9	23.9	31.3	35.6	45.7	50.4	55.8	55.8	51.2	39.6	55.8	22.5
1967	34.9	34.4	24.5	29.5	28.6	31.6	33.4	41.5	52.6	62.7	61.5	54.4	40.8	62.7	24.5
1968	37.7	31.9	20.2	21.4	32.2	33.8	32.4	44.0	53.9	60.5	56.6	49.2	39.5	60.5	20.2
1969	40.2	34.6	28.7	27.3	29.8	31.0	37.4	45.9	54.2	56.5	55.3	50.2	40.9	56.5	27.3
1970	34.3	29.1	27.9	30.7	31.6	31.3	33.3	44.5	56.3	60.6	58.4	43.8	40.2	60.6	27.9
1971	36.2	36.1	27.2	28.0	29.3	30.8	37.7	47.3	52.6	59.4	63.1	45.8	41.1	63.1	27.2
1972	37.6	31.6	23.7	24.1	28.7	34.6	35.0	46.3	53.8	57.4	58.9	46.0	39.8	58.9	23.7
1973	40.5	33.5	15.5	23.2	31.0	32.9	37.0	45.6	53.3	59.2	57.5	49.3	39.9	59.2	15.5
1974	40.7	35.4	32.4	22.6	30.8	34.0	38.1	42.0	55.4	58.0	55.8	48.8	41.2	58.0	22.6
1975	40.1	33.0	25.8	20.3	30.3	32.5	35.1	43.3	50.4	62.3	55.7	48.6	39.8	62.3	20.3
1976	41.6	29.7	25.6	25.5	26.3	27.5	35.4	43.9	47.3	56.7	53.8	50.7	38.7	56.7	25.5
1977	36.9	29.2	16.8	11.9	22.9	28.4	38.9	42.2	55.5	57.1	59.5	48.4	37.3	59.5	11.9
1978	40.5	30.2	31.0	30.5	31.3	37.4	38.4	41.4	49.5	56.9	53.4	47.9	40.7	56.9	30.2
1979	36.6	26.5	18.4	7.1	26.8	32.2	36.9	43.6	51.2	57.8	56.6	51.1	37.1	57.8	7.1
1980	41.8	25.0	27.6	23.2	32.3	30.8	39.9	45.9	48.4	56.3	50.7	48.7	39.2	56.3	23.2
STATISTICS															
N	39	39	39	40	40	40	40	40	40	40	40	40			
Mean	39.4	30.7	24.8	21.5	27.6	30.9	36.7	44.1	51.3	58.4	56.6	48.5			
Max	46.5	36.1	32.4	34.2	35.8	37.4	40.9	50.4	56.6	64.0	63.1	57.3			
Min	34.3	21.2	15.5	0.5	18.3	26.2	32.4	40.1	46.3	54.5	50.7	43.5			

TABLE 4-3 (Continued)

BOISE BASIN - AVERAGE MINIMUM MONTHLY TEMPERATURES

IDAHO CITY

Average Minimum Monthly Temperature (Degrees F.)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WATER YEAR AVG	WATER YEAR MAX	WATER YEAR MIN
1937	24.9	12.9	14.1	-5.0	9.7	20.2	25.8	31.7	37.1	45.0	37.8	35.4	24.1	45.0	-5.0
1938	27.1	25.5	16.2	14.2	19.2	21.0	27.3	31.6	38.7	45.5	40.3	39.7	28.9	45.5	14.2
1939	33.3	16.4	17.0	13.4	9.2	19.8	27.3	34.6	35.7	45.5	42.7	35.2	27.5	45.5	9.2
1940	29.6	19.5	24.0	19.1	20.9	25.2	30.0	34.0	39.5	44.9	42.0	42.1	30.9	44.9	19.1
1941	32.4	20.3	18.5	17.6	22.1	23.1	27.4	36.0	40.3	45.1	45.1	32.4	30.0	45.1	17.6
1942	27.6	22.1	18.4	7.1	6.6	16.8	26.6	32.6	35.6	42.0	41.0	33.1	25.8	42.0	6.6
1943	28.6	22.9	17.6	3.8	10.5	15.7	31.6	32.6	38.6	42.8	39.9	35.1	26.6	42.8	3.8
1944	31.4	21.7	17.0	7.2	16.2	16.6	28.5	32.7	38.5	42.8	39.6	36.2	27.4	42.8	7.2
1945	30.8	26.7	15.5	17.1	20.1	21.0	24.7	35.4	39.2	43.5	43.2	32.9	29.2	43.5	15.5
1946	28.7	22.2	13.4	4.7	8.4	20.9	28.8	34.3	39.4	46.5	42.9	34.7	27.1	46.5	4.7
1947	27.0	22.7	21.7	4.9	18.6	25.8	27.9	37.5	39.0	41.6	40.1	34.1	28.4	41.6	4.9
1948	33.5	19.9	16.9	10.8	12.9	15.7	28.3	35.8	43.5	41.2	39.4	33.5	27.6	43.5	10.8
1949	25.6	19.8	3.0	-15.6	10.9	21.8	26.2	36.8	37.3	42.4	42.1	35.2	23.8	42.4	-15.6
1950	23.6	23.2	10.9	6.7	10.8	18.1	25.0	27.4	37.2	41.9	42.1	38.6	25.5	42.1	6.7
1951	33.2	26.4	22.9	8.3	17.0	13.7	26.7	34.4	35.7	43.1	41.9	31.5	27.9	43.1	8.3
1952	30.1	20.6	11.2	8.3	5.8	14.8	25.7	34.6	40.7	42.1	40.6	34.0	25.7	42.1	5.8
1953	25.5	12.7	17.3	22.8	14.8	21.0	25.5	32.0	37.1	41.3	42.0	35.5	27.3	42.0	12.7
1954	28.3	26.9	11.1	16.6	17.7	19.4	28.5	33.3	37.8	44.3	39.2	31.0	27.8	44.3	11.1
1955	23.4	22.4	11.0	4.6	5.3	12.4	25.7	32.1	37.9	43.9	39.1	32.4	24.2	43.9	4.6
1956	28.2	17.8	15.3	13.5	7.0	16.2	26.1	36.5	37.7	42.5	38.5	29.8	25.8	42.5	7.0
1957	--	--	15.4	4.9	16.9	23.7	28.9	39.2	40.5	43.9	40.7	36.2	--	--	--
1958	30.7	18.3	18.3	12.7	23.7	20.6	29.3	38.7	44.8	45.9	47.0	35.7	30.5	47.0	12.7
1959	28.5	23.2	24.9	19.7	21.6	21.7	27.9	32.5	41.7	44.3	41.6	38.5	30.5	44.3	19.7
1960	31.4	19.6	14.3	13.5	13.4	21.7	29.5	32.5	40.1	49.1	41.2	38.1	28.7	49.1	13.4
1961	29.7	24.7	14.7	15.4	24.8	25.0	27.7	35.2	44.9	45.7	50.7	34.5	31.1	50.7	14.7
1962	29.2	19.8	15.4	5.9	17.9	18.9	29.0	35.6	40.0	43.8	41.4	36.0	27.7	43.8	5.9
1963	32.5	25.5	21.0	12.3	25.3	23.1	28.2	38.2	42.7	42.4	43.5	42.7	31.5	43.5	12.3
1964	35.3	26.7	15.7	11.9	8.4	17.8	25.8	32.3	42.5	46.1	41.8	34.3	28.2	46.1	8.4
1965	29.5	21.1	19.3	20.6	17.0	16.6	32.0	33.7	40.7	45.3	45.4	32.1	29.4	45.4	16.6
1966	29.7	27.1	15.6	16.1	14.0	20.6	26.9	34.7	39.4	42.1	43.5	40.6	29.2	43.5	14.0
1967	26.9	26.4	19.2	21.2	19.5	23.9	27.6	33.0	42.1	48.0	46.3	41.9	31.3	48.0	19.2
1968	29.9	25.0	13.2	13.7	23.3	25.6	25.0	31.9	40.1	45.4	44.5	38.1	29.6	45.4	13.2
1969	29.0	26.0	18.8	17.6	16.1	16.7	28.6	36.6	41.5	44.0	42.3	38.2	29.6	44.0	16.1
1970	26.9	22.2	18.5	20.5	20.1	22.8	24.5	34.1	43.3	47.1	43.7	32.6	29.7	47.1	18.5
1971	26.3	27.5	11.5	15.0	16.8	19.8	27.9	35.7	40.5	45.2	47.8	32.4	28.9	47.8	11.5
1972	28.0	22.9	15.4	13.4	10.4	22.6	27.0	34.7	42.8	42.8	46.0	34.4	28.4	46.0	10.4
1973	30.8	25.3	13.4	15.5	20.6	23.1	26.7	34.5	40.9	45.9	44.2	38.0	29.9	45.9	13.4
1974	30.6	28.0	22.2	12.3	15.0	24.3	28.6	32.9	41.4	45.8	42.4	34.4	29.8	45.8	12.3
1975	30.5	25.2	16.3	14.8	19.3	22.0	25.4	32.5	38.8	50.5	43.4	35.5	29.5	50.5	14.8
1976	31.9	21.4	19.4	14.5	15.3	14.8	27.4	34.6	37.6	47.0	43.7	40.3	29.0	47.0	14.5
1977	26.5	21.7	13.4	9.3	17.6	19.2	26.6	32.1	44.1	44.9	45.8	37.2	28.2	45.8	9.3
1978	28.9	23.4	21.9	21.6	23.7	26.5	31.6	34.6	39.3	46.2	42.7	38.9	31.6	46.2	21.6
1979	27.4	21.8	5.8	3.5	16.8	22.7	29.4	35.4	39.5	45.5	47.5	37.7	27.8	47.5	3.5
1980	32.3	19.0	20.5	15.0	23.4	24.0	31.2	37.8	40.4	46.2	--	39.2	--	--	--
STATISTICS															
N	43	43	44	44	44	44	44	44	44	44	43	44			
Mean	29.2	22.4	16.3	11.8	16.0	20.4	27.6	34.3	39.9	44.6	42.7	35.9			
Max	35.3	28.0	24.9	22.8	25.3	26.5	32.0	39.2	44.9	50.5	50.7	42.7			
Min	23.4	12.7	3.0	-15.6	5.3	12.4	24.5	27.4	35.6	41.2	37.8	29.8			

TABLE 4-4

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

ANDERSON RANCH DAM

Elevation = 3,882

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1942	--	--	--	1.74	3.16	0.57	1.23	2.27	0.59	0.04	0.08	0.07
1943	0.52	5.72	10.37	3.39	1.63	2.75	1.49	0.63	1.04	0.10	0.00	0.00
1944	2.35	0.81	0.66	1.08	1.83	0.58	2.84	0.28	2.46	0.00	0.00	0.10
1945	0.49	2.57	1.84	1.02	4.08	2.54	0.51	2.62	1.68	0.06	0.00	0.65
1946	0.85	3.46	5.66	2.96	2.84	2.88	0.25	1.64	0.15	0.28	0.03	1.00
1947	2.74	2.50	2.19	1.20	0.90	3.10	0.59	0.91	1.85	0.04	0.13	0.05
1948	2.76	1.12	0.73	1.93	2.51	1.29	1.58	0.64	1.19	0.21	0.00	0.00
1949	0.58	2.76	3.46	0.81	3.81	0.51	0.07	2.12	0.66	0.07	0.03	0.59
1950	0.93	1.90	1.32	3.84	2.27	4.43	0.36	0.88	0.57	0.37	0.40	3.17
1951	1.06	3.63	3.19	3.60	3.76	1.01	1.65	0.76	0.56	0.34	0.41	0.01
1952	2.71	3.12	6.34	3.83	8.15	1.75	0.69	1.44	1.41	0.28	0.01	0.00
1953	0.00	1.37	3.30	4.08	1.63	0.90	0.96	3.22	1.78	0.00	0.18	0.11
1954	0.22	2.48	1.87	4.07	1.53	1.76	1.05	0.20	2.03	0.55	0.25	0.41
1955	0.42	1.55	2.01	1.59	0.97	1.50	2.10	1.22	1.36	0.12	0.00	0.49
1956	1.19	3.49	6.80	5.65	2.56	0.84	0.55	1.72	0.70	0.00	0.10	0.11
1957	3.66	0.68	2.56	2.53	3.28	2.99	2.02	3.45	0.35	0.02	0.10	0.00
1958	0.69	1.33	4.11	3.09	2.86	2.21	3.11	2.13	1.20	0.97	0.37	0.02
1959	0.25	3.54	2.34	3.69	2.31	2.45	0.37	1.93	0.36	0.18	0.26	4.17
1960	1.97	0.90	2.78	2.02	3.53	3.63	0.32	1.02	0.00	0.00	0.51	0.42
1961	0.80	4.28	0.89	1.29	1.26	2.18	0.66	0.25	0.44	0.28	0.15	1.54
1962	2.73	2.53	2.66	1.50	3.33	2.63	1.09	2.11	0.55	0.49	0.40	0.65
1963	1.14	2.63	1.06	2.06	3.29	1.26	2.95	1.64	3.78	0.07	0.96	1.91
1964	0.55	5.77	1.19	4.49	0.26	1.91	1.34	0.77	2.69	0.12	0.03	0.39
1965	0.19	4.12	9.49	4.87	0.55	0.62	3.48	0.87	1.39	0.21	2.96	0.77
1966	0.09	2.64	1.09	2.47	0.72	2.00	1.22	0.76	0.07	0.04	0.00	0.31
1967	0.59	2.47	2.80	5.55	0.79	1.36	2.05	0.66	3.02	1.29	0.00	0.23
1968	1.65	2.74	2.04	1.47	4.73	0.52	0.29	0.80	1.31	0.12	3.10	0.59
1969	0.78	3.04	4.64	7.52	1.66	0.16	0.31	0.08	2.46	0.21	0.00	1.83
1970	0.89	0.38	4.98	11.14	0.64	1.70	1.53	0.84	3.69	0.74	0.49	0.76
1971	2.49	6.81	4.62	6.33	1.89	3.03	0.40	1.35	1.83	0.66	0.02	0.41
1972	1.16	3.31	3.79	5.82	2.28	3.20	1.23	1.05	0.77	0.00	0.44	1.27
1973	1.62	1.71	4.03	2.38	1.47	0.75	0.86	0.72	0.56	0.52	0.12	0.87
1974	1.01	5.76	5.41	3.61	1.64	3.52	1.30	0.31	0.57	0.09	0.20	0.00
1975	0.92	1.51	3.37	3.03	5.60	5.24	1.34	0.66	0.64	1.30	0.71	0.26
1976	4.00	2.36	3.26	3.26	2.99	1.30	1.48	0.50	0.55	0.22	1.80	1.71
1977	0.58	0.00	0.01	0.54	0.42	1.20	0.08	2.19	0.80	1.39	1.30	0.69
1978	0.32	4.17	6.67	3.78	3.44	0.95	2.39	0.66	0.43	1.36	0.40	2.46
1979	0.02	0.86	2.36	3.26	2.33	0.20	0.74	1.28	0.19	0.37	1.52	0.18
1980	1.61	1.96	1.95	5.33	2.40	1.41	0.99	2.08	0.75	0.28	0.10	2.05
STATISTICS												
N	38	38	38	39	39	39	39	39	39	39	39	39
Mean	1.22	2.68	3.36	3.38	2.44	1.87	1.22	1.25	1.19	0.34	0.45	0.78
Max.	4.00	6.81	10.37	11.14	8.15	5.24	3.48	3.45	3.78	1.39	3.10	4.17
Min.	0.00	0.00	0.01	0.54	0.26	0.16	0.07	0.08	0.00	0.00	0.00	0.00

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

ARROWROCK DAM

Elevation = 3,275

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1912	--	--	2.09	4.99	2.49	2.00	2.40	2.33	1.27	0.87	0.24	0.87
1913	1.56	0.65	2.01	2.75	0.12	3.60	0.45	0.10	2.22	3.31	0.29	0.79
1914	2.80	4.28	3.35	2.99	1.84	0.20	1.71	1.55	0.32	1.03	0.00	0.49
1915	1.70	0.33	0.60	1.96	2.59	0.95	2.65	4.19	1.47	0.56	0.00	0.41
1916	0.18	4.10	5.13	5.06	7.99	1.38	0.50	1.27	1.70	0.83	0.55	0.00
1917	0.88	2.70	2.40	2.73	2.10	3.45	3.70	1.70	0.00	0.00	0.00	1.00
1918	0.13	2.65	6.05	3.40	0.60	2.45	0.35	0.65	0.10	0.00	0.25	2.16
1919	0.85	0.60	0.60	2.60	4.15	2.90	1.30	0.40	0.00	0.00	0.00	0.35
1920	1.90	4.85	1.30	1.50	0.30	2.50	2.05	0.53	1.42	0.00	0.38	0.79
1921	1.86	3.93	3.58	2.35	2.44	1.20	1.60	2.29	0.30	0.00	0.00	0.62
1922	0.32	6.10	2.41	1.14	0.79	2.46	1.48	0.46	0.68	0.20	1.29	0.00
1923	0.56	0.95	2.79	3.85	0.27	0.62	1.38	1.64	2.41	0.27	0.63	0.67
1924	2.37	1.08	1.31	0.70	1.34	0.50	0.40	0.00	0.14	0.03	0.00	0.14
1925	2.37	1.56	3.43	4.15	3.19	0.72	3.09	0.44	1.80	0.47	0.33	0.85
1926	2.08	1.98	2.06	0.88	3.99	0.48	1.18	1.42	0.16	0.29	1.08	0.00
1927	0.10	5.53	2.48	3.20	5.56	1.35	0.46	2.03	1.20	0.00	0.46	1.06
1928	1.24	6.99	1.89	2.41	0.44	3.78	1.03	0.63	0.16	0.10	0.12	0.56
1929	1.21	0.98	2.52	4.43	1.55	1.58	2.13	0.30	0.96	0.00	0.37	0.26
1930	0.43	0.00	2.41	2.46	2.91	2.05	1.54	2.20	0.11	0.00	0.87	0.78
1931	1.34	2.41	0.41	1.62	1.18	3.78	1.53	0.00	0.09	0.00	0.06	0.58
1932	0.77	2.77	1.79	1.91	1.27	5.09	1.63	1.79	1.47	1.19	0.05	0.00
1933	0.84	2.73	2.04	2.53	3.14	1.13	0.67	1.84	0.27	0.00	0.00	0.12
1934	1.23	0.28	2.79	2.24	1.50	1.75	0.56	0.35	1.06	0.05	0.06	0.16
1935	2.19	3.00	2.68	1.45	1.14	1.26	3.55	0.87	0.05	0.00	0.00	0.00
1936	0.15	1.18	1.02	5.54	4.60	1.46	1.12	0.59	1.68	0.30	0.25	0.30
1937	0.00	0.00	1.45	2.83	3.11	1.50	2.24	0.93	0.56	0.28	0.00	0.29
1938	1.36	3.17	3.65	3.08	1.03	4.36	0.73	2.71	2.35	2.09	0.00	0.14
1939	1.57	3.40	1.60	1.85	2.89	0.80	0.60	0.15	0.21	0.26	0.11	1.38
1940	2.00	0.03	1.97	3.17	4.13	2.89	3.04	0.08	0.08	0.31	0.05	2.43
1941	1.78	2.39	2.11	2.68	1.66	0.53	2.23	2.67	2.49	0.50	1.18	0.13
1942	1.13	1.51	4.20	1.45	2.32	0.63	1.50	2.54	0.62	0.00	0.08	0.00
1943	0.48	6.32	7.38	3.84	1.78	2.85	1.75	0.55	1.35	0.13	0.00	0.00
1944	2.46	1.22	0.58	0.61	2.35	0.87	2.81	0.15	2.59	0.00	0.00	0.07
1945	0.61	3.16	1.89	1.54	4.45	2.55	0.80	3.24	1.49	0.07	0.04	0.47
1946	0.75	3.51	5.90	3.85	3.54	2.19	0.66	1.04	0.13	0.01	0.12	0.40
1947	2.11	3.28	1.81	2.01	0.94	3.36	0.87	0.97	1.38	0.00	0.05	0.63
1948	2.79	1.62	1.34	2.43	3.04	1.78	2.52	0.77	1.80	0.18	0.00	0.22
1949	0.55	2.34	5.23	0.78	5.97	0.73	0.04	1.48	0.67	0.00	0.09	0.21
1950	1.80	2.09	1.93	4.58	2.13	4.53	0.62	1.35	0.81	0.17	0.42	1.14
1951	1.01	3.00	3.15	4.26	4.24	1.76	1.66	0.95	0.91	0.22	0.18	0.01

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

ARROWROCK DAM (Continued)

Elevation = 3,275

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1952	3.07	3.53	5.01	2.46	2.82	1.51	0.61	1.15	0.92	0.41	0.00	0.01
1953	0.00	0.77	2.20	6.94	1.79	2.32	1.25	2.96	1.79	0.00	0.26	0.05
1954	0.16	3.31	2.13	2.92	1.03	2.04	0.97	0.65	2.25	0.08	0.08	0.23
1955	0.31	1.54	2.56	1.43	0.81	1.48	3.31	1.59	1.06	0.18	0.00	0.35
1956	1.46	3.28	5.49	4.56	2.48	0.82	1.40	2.56	1.02	0.59	0.11	0.01
1957	3.69	0.45	2.32	1.97	3.72	3.20	1.82	2.63	0.15	0.00	0.00	0.03
1958	0.99	1.73	4.95	3.15	3.11	1.89	3.29	1.06	3.46	0.59	0.15	0.17
1959	0.21	3.11	2.37	3.42	1.86	2.00	0.35	2.96	0.13	0.00	0.37	3.74
1960	2.17	0.88	1.65	1.94	4.09	3.12	0.46	1.96	0.02	0.34	0.68	0.78
1961	0.72	4.09	1.22	1.05	2.17	2.39	0.62	0.83	0.40	0.12	0.34	1.01
1962	3.57	2.86	2.44	1.56	2.20	2.82	1.14	2.21	0.62	0.01	0.06	0.65
1963	1.55	2.50	0.50	1.56	3.11	0.78	2.61	1.71	2.35	0.00	0.39	1.35
1964	0.70	5.07	1.05	4.20	0.19	1.46	1.13	0.88	1.26	0.47	0.11	1.15
1965	0.33	4.55	7.57	5.05	0.65	0.89	3.94	1.14	1.36	0.19	1.27	1.30
1966	0.28	2.85	0.96	2.36	0.82	1.92	1.10	0.16	0.25	0.02	0.00	0.10
1967	0.48	2.67	2.44	3.89	1.04	1.00	1.52	0.62	2.73	0.11	0.00	0.57
1968	1.74	1.37	0.92	0.95	4.19	0.77	0.67	0.98	0.79	0.01	3.85	0.12
1969	1.06	3.17	4.05	5.20	1.55	0.30	1.03	0.34	1.57	0.09	0.00	0.38
1970	0.43	0.68	3.22	9.09	1.07	0.91	1.27	1.63	2.52	0.88	0.02	0.88
1971	2.23	4.95	3.84	5.19	1.66	2.93	0.25	0.62	2.15	0.10	0.05	0.34
1972	0.77	4.54	4.19	5.51	2.15	2.33	1.47	0.90	1.11	0.05	0.41	1.09
1973	0.70	2.49	3.12	1.78	0.98	1.02	2.11	0.70	0.44	0.04	0.08	0.72
1974	1.28	5.36	4.37	1.86	2.01	2.66	0.78	0.09	0.57	0.57	0.33	0.00
1975	1.08	2.02	3.22	1.57	4.24	3.79	1.71	0.64	0.72	0.47	0.23	0.27
1976	3.08	1.44	3.53	4.07	1.73	0.73	1.68	0.48	1.40	0.10	1.99	1.66
1977	0.50	0.06	0.12	0.72	0.54	1.41	0.19	2.26	1.29	0.54	0.71	0.72
1978	0.37	3.74	4.49	2.61	3.08	1.44	3.15	0.44	1.02	1.53	0.28	1.41
1979	0.00	0.87	1.78	2.17	1.97	0.72	1.02	1.28	0.35	0.00	0.86	0.39
1980	2.13	1.64	1.15	4.27	2.77	1.98	0.77	3.18	0.69	0.07	0.01	3.00

STATISTICS

N	68	68	69	69	69	69	69	69	69	69	69	69
Mean	1.24	2.56	2.70	2.92	2.33	1.89	1.48	1.27	1.07	0.31	0.32	0.62
Max.	3.69	6.99	7.57	9.09	7.99	5.09	3.94	4.19	3.46	3.31	3.85	3.74
Min.	0.00	0.00	0.12	0.61	0.12	0.20	0.04	0.00	0.00	0.00	0.00	0.00

TABLE 4-4 (Continued)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

LUCKY PEAK DAM

Elevation = 2,840

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1950	--	--	--	--	--	--	--	--	--	--	--	--
1951	--	--	--	--	2.02	1.24	1.15	0.93	0.76	0.19	0.00	0.00
1952	1.87	1.84	3.11	1.22	1.21	1.68	0.68	1.27	0.97	0.10	0.00	0.00
1953	0.00	0.66	1.39	4.58	1.40	1.27	1.55	2.43	1.53	0.00	0.19	0.02
1954	0.11	1.75	1.34	1.12	0.42	1.20	0.24	0.58	1.50	0.00	0.06	0.38
1955	0.31	0.95	1.16	2.03	0.35	0.71	2.75	1.52	--	--	--	--
1956	--	--	--	--	--	--	--	--	--	--	--	--
1957	--	--	--	--	--	--	--	--	0.13	0.00	0.01	0.05
1958	0.77	1.56	2.76	2.50	2.23	1.71	2.87	2.28	2.82	0.51	0.26	0.30
1959	0.13	1.53	1.66	1.80	1.06	1.20	0.21	2.37	0.49	0.00	1.26	2.14
1960	0.98	0.58	0.75	1.43	2.29	1.84	0.41	1.62	0.01	1.11	0.77	0.45
1961	0.40	2.34	0.53	0.53	1.20	1.54	0.49	0.59	0.46	0.00	0.35	0.72
1962	2.15	1.06	1.07	0.74	1.23	1.26	1.12	2.66	0.58	0.00	0.02	0.59
1963	0.98	2.00	0.26	1.09	2.59	0.41	2.24	1.01	2.49	0.00	1.18	0.40
1964	0.74	2.87	1.13	2.09	0.15	0.83	1.40	1.77	1.61	0.22	0.25	0.82
1965	0.25	2.32	4.63	3.51	0.44	0.66	3.20	0.70	1.03	0.03	1.39	0.33
1966	0.26	2.14	0.48	0.85	0.78	1.07	0.95	0.27	0.21	0.00	0.00	0.15
1967	0.31	2.03	1.29	1.66	0.53	0.39	1.24	0.72	1.66	0.46	0.00	0.34
1968	0.86	0.97	0.73	0.58	2.34	0.98	0.54	0.44	1.02	0.00	4.14	0.42
1969	0.73	2.31	1.49	3.15	0.90	0.27	1.90	0.25	1.95	0.02	0.00	0.30
1970	0.40	0.54	2.62	4.48	0.58	0.97	1.35	1.02	2.76	0.67	0.03	1.10
1971	1.38	2.90	1.43	2.64	0.69	1.84	0.44	0.59	2.29	0.01	0.01	0.27
1972	0.68	3.03	1.94	2.37	1.00	1.98	1.02	0.81	0.62	0.16	0.12	0.94
1973	0.78	1.40	1.63	0.91	0.44	0.61	1.55	0.79	0.27	0.17	0.03	1.10
1974	1.10	2.92	2.54	1.02	0.65	1.10	0.96	0.21	0.60	0.48	0.21	0.00
1975	1.68	1.49	3.05	0.93	2.70	2.29	2.26	0.96	0.85	0.68	0.27	0.00
1976	2.71	0.94	1.58	2.56	1.39	1.58	2.31	0.48	1.72	0.22	2.02	1.86
1977	0.52	0.06	0.20	0.55	0.54	1.11	0.47	2.31	1.45	0.36	0.68	0.97
1978	0.22	2.19	3.03	2.91	2.21	1.58	3.12	0.48	1.03	0.89	0.17	1.43
1979	0.00	0.89	1.11	2.30	1.54	0.75	1.38	1.59	0.23	0.00	1.51	0.31
1980	1.61	1.82	0.84	2.37	1.75	2.82	1.16	4.07	0.85	0.02	0.00	2.57
STATISTICS												
N	27	27	27	27	28	28	28	28	28	28	28	28
Mean	0.81	1.67	1.62	1.92	1.24	1.25	1.39	1.24	1.14	0.23	0.53	0.64
Max.	2.71	3.03	4.63	4.58	2.70	2.82	3.20	4.07	2.82	1.11	4.14	2.57
Min.	0.00	0.06	0.20	0.53	0.15	0.27	0.21	0.21	0.01	0.00	0.00	0.00

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

BOISE AIRPORT - WSFO

Elevation = 2,838

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1944	1.42	0.50	0.41	0.41	1.20	0.18	2.92	0.36	2.04	0.06	0.00	0.16
1945	0.43	1.60	1.09	1.09	2.17	1.76	0.47	2.21	0.78	0.07	0.08	0.44
1946	0.62	1.51	2.24	1.37	1.31	1.67	0.35	0.55	0.13	0.04	0.26	0.16
1947	1.11	2.05	0.86	0.50	0.44	1.84	0.52	1.02	0.80	0.00	0.05	0.80
1948	2.18	1.27	0.66	0.81	1.58	1.42	1.37	0.91	1.57	0.08	0.05	0.31
1949	0.68	1.02	2.11	0.12	2.05	0.48	0.09	0.73	0.37	0.00	0.12	0.19
1950	1.20	1.40	0.68	2.53	1.09	2.01	0.55	1.27	0.92	0.04	0.52	0.92
1951	0.42	1.53	2.19	1.66	2.16	1.05	0.94	0.94	0.70	0.29	0.07	0.01
1952	1.60	1.80	2.47	1.24	1.12	2.05	1.08	1.08	1.10	0.15	0.00	0.05
1953	0.00	0.35	1.00	3.35	1.49	0.92	1.52	2.59	1.22	0.00	0.12	0.02
1954	0.11	1.31	1.15	1.09	0.55	1.20	0.42	0.95	1.10	0.06	0.24	0.08
1955	0.44	0.94	1.09	1.32	0.43	0.39	3.04	1.48	0.63	0.39	0.00	0.12
1956	0.74	1.43	2.22	2.17	0.91	0.39	1.62	2.18	0.80	0.15	0.08	0.02
1957	2.25	0.41	0.84	1.04	1.72	2.27	1.15	2.79	0.25	0.00	0.00	0.06
1958	0.42	0.81	2.08	1.37	1.91	0.57	1.94	2.05	2.94	0.48	0.53	0.12
1959	0.09	1.04	1.28	1.33	0.63	1.08	0.19	1.68	0.27	0.00	0.64	2.54
1960	0.76	0.36	0.53	1.33	1.74	1.39	0.43	1.21	0.01	0.95	0.83	0.29
1961	0.49	1.82	0.43	0.42	1.20	1.39	0.22	0.54	0.55	0.25	0.21	0.79
1962	1.76	0.95	0.90	1.00	0.77	1.27	0.92	2.90	0.12	0.04	0.12	0.40
1963	1.22	1.67	0.25	1.13	1.70	0.21	1.65	0.85	1.90	0.00	0.64	0.75
1964	0.99	2.41	1.02	2.46	0.19	0.64	1.35	1.76	2.00	0.41	0.53	0.70
1965	0.21	2.33	3.19	2.89	0.31	0.43	2.81	0.80	1.20	0.25	0.88	0.55
1966	0.28	1.51	0.61	0.81	0.73	0.60	0.61	0.32	0.01	0.06	0.01	0.19
1967	0.29	1.60	1.41	1.49	0.35	0.37	1.47	0.49	1.07	0.05	0.00	0.58
1968	0.42	0.89	0.50	0.43	1.86	0.71	0.35	0.40	0.60	0.00	2.37	0.10
1969	0.70	1.50	1.95	3.50	1.00	0.26	1.35	0.50	2.00	0.02	0.00	0.68
1970	0.64	0.59	1.77	3.87	0.30	1.04	0.93	0.73	1.72	0.28	0.10	1.00
1971	0.81	2.03	1.37	2.04	0.65	1.50	0.40	0.25	1.58	0.12	0.18	0.64
1972	0.53	2.32	1.63	2.15	0.91	1.50	0.62	0.32	0.90	0.21	0.05	1.11
1973	0.64	1.11	1.79	1.14	0.42	0.65	1.49	0.74	0.19	0.07	0.03	0.82
1974	1.15	2.44	2.23	1.35	0.66	1.50	0.67	0.10	0.60	0.53	0.22	0.00
1975	1.45	0.67	1.71	0.59	2.62	1.92	1.53	0.88	0.78	0.82	0.48	0.01
1976	1.99	0.78	1.29	1.49	1.31	0.72	1.60	0.46	1.66	1.15	0.95	2.11
1977	0.52	0.14	0.09	0.65	0.57	0.86	0.19	1.80	1.26	0.41	0.73	1.20
1978	0.21	1.86	2.46	2.37	1.50	1.43	2.34	0.36	0.56	0.48	0.24	0.89
1979	0.00	1.06	0.60	1.93	1.20	0.48	1.60	1.28	0.18	0.01	1.81	0.04
1980	1.50	1.30	0.74	1.56	1.29	2.14	1.20	3.77	0.58	0.03	0.00	1.59
STATISTICS												
N	37	37	37	37	37	37	37	37	37	37	37	37
Mean	0.82	1.31	1.32	1.51	1.14	1.09	1.13	1.17	0.95	0.21	0.36	0.55
Max.	2.25	2.44	3.19	3.87	2.62	2.27	3.04	3.77	2.94	1.15	2.37	2.54
Min.	0.00	0.14	0.09	0.12	0.19	0.18	0.09	0.10	0.01	0.00	0.00	0.00

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

CENTERVILLE ARBAUGH RH

Elevation = 4,300

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1936	1.03	1.35	1.75	7.73	6.50	2.47	1.43	2.12	2.06	0.88	0.83	0.44
1937	0.12	0.18	1.91	4.17	4.76	2.95	3.09	1.53	1.70	0.14	0.00	0.82
1938	1.49	4.09	6.29	4.12	2.69	7.55	2.93	1.68	1.65	1.33	0.20	0.36
1939	2.57	4.04	1.92	2.74	3.34	1.87	0.80	0.35	0.84	0.51	0.16	2.58
1940	1.32	0.23	4.66	3.65	8.37	5.52	3.39	0.27	0.39	0.65	0.00	3.64
1941	3.03	3.05	2.91	2.43	2.27	1.34	2.40	4.96	3.61	0.42	2.89	0.82
1942	2.14	2.89	7.14	2.64	3.10	0.75	2.91	4.32	0.80	0.00	0.09	0.03
1943	1.16	6.67	10.44	6.53	1.83	4.35	3.07	0.88	1.56	0.20	0.19	0.00
1944	2.87	2.25	0.85	1.03	2.81	1.96	3.90	1.41	4.05	0.50	0.00	0.80
1945	1.45	3.87	2.53	1.71	6.62	3.14	0.72	5.34	2.24	0.34	0.31	0.77
1946	1.13	5.17	6.04	3.39	3.87	2.62	1.67	1.27	0.32	0.41	0.03	1.31
1947	3.30	6.98	3.00	2.49	2.14	3.32	1.17	1.75	2.78	0.00	0.29	1.04
1948	4.63	1.53	1.35	3.01	3.86	1.84	2.66	2.25	1.59	0.10	0.12	0.49
1949	1.26	4.98	7.65	0.39	6.29	--	--	2.26	0.12	0.00	--	0.58
1950	1.19	2.54	2.91	6.41	3.24	5.60	1.06	1.37	1.38	0.26	1.08	1.92
1951	2.15	3.49	4.22	5.08	3.91	3.57	1.89	1.88	1.56	0.52	1.47	0.14
1952	6.46	4.79	6.87	3.86	3.57	2.84	0.78	1.70	1.71	0.74	0.30	0.11
1953	0.01	1.23	4.92	8.58	4.09	2.34	2.31	3.58	2.68	0.00	0.53	0.05
1954	0.69	4.97	3.55	6.45	2.52	3.56	1.94	1.07	3.00	0.44	0.79	0.29
1955	0.42	2.00	3.07	2.17	2.03	3.16	5.02	1.99	1.40	0.94	0.00	0.86
1956	2.17	5.74	10.51	5.38	3.59	1.44	2.26	4.41	2.10	0.28	0.10	0.44
1957	5.93	1.05	3.25	2.83	5.66	4.75	2.48	3.44	0.65	0.05	0.17	0.17
1958	1.71	1.74	6.87	4.41	4.82	2.78	4.68	2.06	3.04	0.71	0.44	0.60
1959	0.27	4.57	3.01	4.74	3.48	2.41	1.02	3.15	1.22	0.02	1.67	4.45
1960	1.90	1.12	1.55	2.70	4.52	3.82	1.59	1.86	0.27	0.54	1.51	0.60
1961	1.02	5.30	1.22	1.42	3.84	3.95	1.23	1.79	0.35	0.11	0.84	1.26
1962	3.65	4.21	3.45	1.58	3.49	2.94	1.61	3.02	0.57	0.30	0.70	1.01
1963	4.80	3.19	1.15	2.12	3.17	2.30	3.46	3.21	3.45	0.00	0.75	1.81
1964	1.40	5.18	1.17	5.30	0.41	3.83	1.85	0.63	3.32	0.21	0.91	0.81
1965	0.59	6.32	12.25	7.04	1.18	1.12	3.96	1.14	0.63	0.33	1.81	0.50
1966	0.57	2.82	2.08	3.30	0.97	2.35	0.65	0.34	1.07	0.02	0.00	0.44
1967	0.85	3.47	3.10	6.26	0.81	2.04	2.34	1.75	3.61	1.01	0.01	0.71
1968	2.88	1.52	2.03	2.48	5.16	1.34	0.30	1.33	1.53	0.57	5.37	1.31
1969	1.41	4.19	6.44	10.44	2.59	0.44	0.60	0.69	2.76	0.27	0.00	1.12
1970	0.34	0.65	3.44	11.41	1.42	2.62	1.71	0.83	3.59	0.34	0.04	1.67
1971	3.14	5.01	7.00	6.36	2.21	4.96	0.46	1.68	2.92	1.64	0.12	0.28
1972	0.72	3.46	7.19	7.15	3.98	3.19	1.53	0.55	2.54	0.00	0.48	2.24
1973	0.95	2.57	5.27	4.16	1.52	0.86	1.92	0.89	0.95	0.00	0.29	1.82
1974	2.09	6.97	4.74	5.38	2.46	4.93	1.10	0.57	0.92	0.61	0.79	0.00
1975	1.37	2.18	3.73	3.27	5.44	3.80	2.37	1.16	2.82	0.80	0.73	0.04

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

CENTERVILLE ARBAUGH RH (Continued)

Elevation = 4,300

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	4.19	2.39	3.02	4.77	2.65	1.88	1.62	0.85	1.20	1.01	1.32	1.72
1977	0.43	0.03	0.37	0.88	0.95	1.78	0.33	4.12	2.37	1.13	1.26	3.20
1978	0.84	4.65	7.16	5.14	4.28	1.24	3.62	0.80	0.88	0.35	0.66	2.08
1979	0.01	1.61	2.17	3.16	3.50	1.05	0.76	1.40	0.69	0.04	1.70	0.25
1980	3.10	1.30	2.80	6.96	2.50	2.47	1.54	3.91	1.08	0.60	0.14	2.74

STATISTICS

N	45	45	45	45	45	44	44	45	45	45	44	45
Mean	1.88	3.28	4.20	4.38	3.39	2.84	2.00	1.95	1.78	0.43	0.71	1.07
Max.	6.46	6.98	12.25	11.41	8.37	7.55	5.02	5.34	4.05	1.64	5.37	4.45
Min.	0.01	0.03	0.37	0.39	0.41	0.44	0.30	0.27	0.12	0.00	0.00	0.00

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

IDAHO CITY

Elevation = 3,965

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1894	--	--	--	--	2.65	3.94	3.33	0.83	0.90	0.00	0.99	--
1895	--	0.00	4.02	3.23	1.32	1.81	0.31	2.68	0.00	0.52	0.17	0.78
1896	0.00	1.02	2.49	5.00	1.46	4.11	3.56	6.26	1.70	1.86	0.91	0.45
1897	0.60	5.96	3.62	1.98	4.94	6.74	1.41	1.43	0.39	1.26	0.00	1.27
1898	0.71	3.00	4.10	1.05	2.40	1.67	0.15	--	--	0.70	0.00	--
1899	--	--	1.56	--	--	--	1.12	1.23	0.82	0.00	1.51	0.00
1900	5.48	2.10	5.12	1.48	2.50	1.78	1.91	2.25	0.70	0.00	0.00	--
1901	2.94	--	--	--	--	--	0.07	0.28	0.00	0.00	0.01	0.13
1902	0.70	1.03	2.21	0.26	3.77	1.16	--	--	--	2.00	0.00	--
1903	--	--	--	--	--	0.81	0.59	1.16	0.46	--	--	--
1904	--	--	--	--	--	--	0.93	0.26	1.11	0.48	0.48	0.46
1905	1.38	0.72	2.93	0.99	--	2.68	1.17	1.70	0.45	0.00	0.00	0.00
1906	--	--	--	--	--	--	--	--	--	--	--	--
1907	--	--	--	--	--	--	--	--	--	--	--	--
1908	--	--	--	--	--	--	--	--	--	--	--	--
1909	--	--	--	--	4.63	1.24	0.45	--	1.16	0.33	0.49	2.25
1910	0.88	8.49	3.25	2.68	4.12	1.16	1.62	--	--	--	--	--
1911	--	--	--	--	1.29	0.61	1.02	--	--	--	--	--
1912	--	3.56	1.84	4.51	2.63	2.22	3.47	--	--	--	--	--
1913	--	--	--	--	--	--	--	--	--	--	--	--
1914	--	4.55	2.68	4.75	2.70	0.33	2.13	0.73	1.66	0.39	0.00	1.31
1915	1.72	0.86	0.56	3.24	2.77	1.08	0.92	4.71	0.96	0.61	0.00	0.84
1916	0.33	2.62	3.80	5.38	6.09	2.63	0.91	1.05	2.36	0.92	1.04	0.30
1917	1.01	2.64	3.55	2.27	3.43	3.13	2.64	2.46	0.29	0.00	0.48	1.18
1918	0.00	2.40	6.57	2.95	2.42	2.98	1.30	0.37	0.15	0.20	0.95	2.68
1919	1.97	1.10	0.74	2.96	4.77	2.20	0.92	0.90	0.00	0.12	0.16	0.80
1920	2.20	3.11	1.99	2.81	0.35	2.95	1.62	0.84	1.08	0.00	1.42	0.74
1921	2.69	4.80	5.40	5.00	3.00	2.50	1.78	1.50	0.03	0.00	0.20	1.05
1922	0.60	7.61	1.46	1.45	3.06	3.18	1.75	1.48	0.75	0.30	1.83	0.00
1923	0.72	1.24	5.40	4.62	1.71	1.33	2.45	3.51	3.27	0.83	0.67	0.62
1924	2.77	1.38	2.22	1.04	2.04	0.38	0.76	0.09	0.16	0.01	0.05	0.39
1925	3.50	2.55	3.56	5.46	4.85	1.19	1.98	0.90	1.16	0.44	0.65	0.47
1926	2.00	1.01	2.75	1.20	2.90	0.20	1.50	1.32	0.20	0.12	0.93	0.00
1927	0.00	8.25	2.54	4.17	8.00	1.80	0.94	1.93	1.45	0.00	0.87	1.77
1928	1.18	8.67	2.70	3.10	0.90	4.26	1.19	0.72	0.13	0.00	0.00	0.00
1929	1.48	0.80	3.09	4.60	1.17	1.25	1.84	0.52	1.63	0.00	0.50	0.39
1930	0.65	0.00	5.15	3.19	3.53	1.21	1.14	1.94	0.29	0.00	0.75	1.44
1931	1.23	2.58	0.63	2.00	1.38	4.12	0.66	0.00	0.15	0.00	0.00	0.87
1932	1.63	3.49	4.65	1.84	1.21	5.24	1.53	2.19	1.19	2.23	0.29	0.00
1933	0.48	2.26	3.87	4.41	3.12	0.95	0.43	1.66	0.42	0.00	0.00	0.24

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

IDAHO CITY (Continued)

Elevation = 3,965

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1934	1.90	0.60	4.91	3.11	0.80	2.17	0.79	0.16	1.56	0.58	0.00	0.05
1935	2.69	3.90	3.80	2.51	0.92	1.78	3.20	1.05	0.11	0.11	0.00	0.00
1936	0.32	0.95	1.59	7.52	6.15	2.36	1.13	0.80	2.15	0.51	0.22	0.15
1937	0.00	0.00	1.96	3.67	4.53	1.72	3.04	0.87	0.97	0.48	0.00	0.81
1938	1.32	3.16	5.80	3.47	2.11	6.15	0.47	2.98	2.07	1.06	0.05	0.25
1939	2.19	3.21	2.78	2.74	3.55	1.37	0.71	0.36	0.50	0.26	0.02	1.50
1940	0.90	0.00	2.75	3.30	6.80	3.90	1.70	0.00	0.12	0.66	0.00	2.18
1941	2.26	3.13	2.53	2.08	1.68	0.50	2.16	3.53	2.22	1.15	2.30	0.09
1942	1.08	1.53	4.43	2.98	3.18	0.76	1.51	3.41	0.55	0.00	0.00	0.11
1943	1.15	5.54	7.52	7.22	2.17	2.71	2.73	0.78	1.76	0.35	0.08	0.00
1944	2.06	1.22	0.85	0.59	2.20	1.16	3.14	0.65	3.86	0.16	0.00	0.06
1945	1.46	2.98	2.24	1.94	4.46	3.08	0.66	4.89	1.91	0.05	0.00	0.62
1946	1.15	4.41	4.70	2.86	3.36	2.83	1.03	1.50	0.15	0.05	0.15	0.09
1947	1.96	4.82	3.67	2.23	1.94	3.14	1.14	1.23	2.53	0.00	0.16	0.80
1948	4.09	1.97	1.14	3.29	4.43	1.48	3.36	1.83	1.75	0.00	0.13	0.46
1949	0.70	3.63	5.16	0.39	7.18	0.64	0.12	2.41	0.91	0.00	0.08	0.95
1950	1.74	2.34	2.02	5.43	2.32	4.98	0.98	1.08	1.22	0.10	1.12	1.74
1951	2.08	3.64	2.07	3.61	3.95	2.41	1.88	1.90	1.34	0.33	1.10	0.01
1952	4.92	3.58	6.31	3.25	2.47	2.04	0.74	1.38	1.57	0.43	0.00	0.00
1953	0.00	0.92	3.61	7.34	2.91	2.42	1.68	3.75	2.21	0.00	0.55	0.11
1954	0.40	4.77	2.77	6.02	2.12	3.01	2.03	0.65	1.79	0.31	0.41	0.21
1955	0.38	2.25	2.27	1.48	1.58	2.60	4.34	1.24	1.85	0.83	0.00	0.47
1956	1.95	4.54	10.20	4.51	3.49	1.36	1.97	3.22	1.44	0.13	0.03	0.02
1957	5.45	0.53	4.26	2.19	5.05	4.42	2.03	5.66	0.14	0.00	0.13	0.05
1958	1.06	1.31	5.86	4.34	3.72	2.00	3.49	1.28	4.57	0.21	0.05	0.74
1959	0.24	3.26	2.59	3.82	2.81	2.09	0.60	3.03	0.50	0.00	1.04	3.96
1960	1.99	0.95	1.69	2.28	4.48	3.57	1.20	2.22	0.00	0.33	0.89	0.47
1961	0.91	4.19	0.90	1.20	2.71	3.76	1.31	1.09	0.62	0.04	0.72	1.44
1962	3.44	3.58	2.82	1.86	2.94	2.75	1.76	3.13	0.94	0.17	0.22	0.83
1963	3.60	2.33	1.22	1.62	4.56	1.64	3.89	2.50	3.61	0.00	0.39	1.07
1964	1.50	4.64	2.59	5.64	0.51	3.16	1.49	0.86	2.93	0.37	0.82	0.57
1965	0.54	5.29	10.07	7.57	1.27	1.22	4.14	0.73	1.58	0.14	1.78	1.66
1966	0.38	2.49	1.17	3.69	1.07	2.37	1.12	0.18	0.22	0.02	0.00	0.62
1967	0.73	2.84	3.07	6.62	0.95	1.18	2.08	0.87	1.83	0.05	0.00	1.00
1968	1.82	1.85	1.73	1.94	5.15	1.10	0.88	1.13	1.70	0.00	4.89	0.33
1969	1.15	3.77	5.06	9.30	2.05	0.64	0.91	0.43	2.65	0.02	0.00	1.38
1970	0.79	0.95	3.95	10.74	1.36	1.93	1.23	1.50	3.20	0.34	0.06	1.21
1971	2.26	5.30	5.81	5.96	2.21	3.90	0.64	0.95	3.62	0.45	0.02	0.68
1972	1.53	3.66	5.43	7.06	2.87	3.05	1.80	0.56	2.05	0.00	0.26	0.93
1973	1.21	2.70	4.22	2.98	1.28	1.23	1.78	0.71	0.60	0.15	0.04	1.43

TABLE 4-4 (Cont'd)

BOISE BASIN - TOTAL MONTHLY PRECIPITATION (Inches)

IDAHO CITY (Continued)

Elevation = 3,965

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1974	1.93	6.64	5.09	4.53	2.11	4.91	1.41	0.32	0.63	0.71	0.61	0.00
1975	1.71	1.97	3.37	3.84	4.81	4.21	1.85	1.26	1.68	2.26	0.78	0.00
1976	3.63	2.68	3.00	3.60	2.40	1.47	1.68	0.65	1.53	1.19	2.16	2.17
1977	0.28	0.07	0.13	0.70	0.98	1.80	0.30	3.70	2.66	1.19	0.95	2.15
1978	0.53	4.93	7.37	3.37	4.13	1.33	3.22	1.33	0.69	0.12	0.60	2.22
1979	0.00	0.94	2.25	4.19	3.53	1.16	1.37	1.11	0.43	0.05	1.86	0.68
1980	3.24	1.20	2.37	6.10	3.40	2.93	1.51	3.58	0.69	0.39	0.21	2.89
STATISTICS												
N	74	76	77	76	78	80	82	77	78	79	79	75
Mean	1.56	2.88	3.45	3.61	2.97	2.32	1.61	1.63	1.26	0.37	0.51	0.79
Max.	5.48	8.67	10.20	10.74	8.00	6.74	4.34	6.26	4.57	2.26	4.89	3.96
Min.	0.00	0.00	0.13	0.26	0.35	0.20	0.07	0.00	0.00	0.00	0.00	0.00

TABLE 4-5

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

ATLANTA SUMMIT — ELEVATION = 7,600

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1931	--	--	--	--	--	--	--	--	19.8	--	--	--
1932	--	--	--	--	--	--	--	--	--	--	28.0	--
1933	--	--	--	--	--	--	--	--	--	--	23.8	--
1934	--	--	--	--	21.0	--	--	--	13.2	--	--	--
1935	--	--	--	--	--	--	29.2	--	--	--	21.7	--
1936	--	--	--	--	--	--	--	40.6	--	--	--	--
1937	--	--	--	--	--	--	28.1	--	--	--	--	--
1938	--	--	--	--	--	--	40.8	--	--	--	18.6	--
1939	--	--	--	--	--	--	24.7	--	--	--	--	--
1940	--	--	--	--	--	--	31.0	--	--	--	--	--
1941	--	--	--	--	--	23.0	--	--	--	--	--	--
1942	--	--	--	--	--	26.4	--	--	--	--	--	--
1943	--	--	--	--	--	--	55.2	--	--	--	--	--
1944	--	--	--	--	--	--	20.4	--	--	--	--	--
1945	--	--	--	--	23.5	--	28.7	--	--	--	--	--
1946	--	--	--	--	--	--	37.9	--	--	--	--	--
1947	--	--	--	--	32.3	--	--	36.6	--	--	--	--
1948	--	--	--	--	19.9	--	26.8	--	--	--	--	--
1949	--	--	--	--	38.4	--	38.4	--	--	--	--	--
1950	--	--	--	--	28.4	--	42.0	--	41.9	--	--	--
1951	--	--	28.8	--	31.9	--	38.2	--	35.7	--	--	--
1952	--	--	--	--	--	--	46.8	49.8	43.2	33.8	20.6	--
1953	--	--	25.2	--	33.8	--	40.2	--	39.6	--	--	--
1954	--	--	26.8	--	34.6	--	40.0	38.6	37.8	28.0	14.2	--
1955	--	--	11.4	--	19.4	--	27.2	--	33.8	--	--	--
1956	--	--	37.4	--	50.4	--	48.2	48.4	45.8	45.2	39.0	--
1957	--	--	18.6	--	30.0	--	38.4	38.4	39.6	33.0	--	--
1958	16.2	19.4	26.4	30.8	33.0	36.6	44.6	45.8	47.0	42.6	--	--
1959	--	13.0	15.4	--	24.6	25.0	30.0	27.0	25.0	23.6	--	--
1960	--	--	11.6	17.0	18.0	23.8	24.0	24.8	26.6	26.4	--	--
1961	5.6	12.6	18.9	19.4	20.4	25.0	27.8	27.2	27.6	25.2	--	--
1962	18.6	20.6	25.1	28.3	30.0	33.5	37.0	36.0	32.0	25.2	--	--
1963	7.2	9.0	14.9	15.4	22.1	24.8	27.3	28.6	31.5	28.8	8.5	--
1964	11.1	16.2	22.3	23.0	23.4	30.2	31.6	33.0	32.9	32.6	--	--
1965	33.3	33.4	37.6	42.0	43.9	48.9	55.8	53.1	49.0	45.8	--	--
1966	19.2	19.5	22.6	22.7	23.3	25.4	27.0	27.9	27.6	--	4.2	--
1967	12.8	--	27.9	29.2	32.9	--	33.9	--	40.4	37.2	--	--
1968	7.1	--	19.5	--	21.2	--	23.8	--	24.2	--	9.1	--
1969	--	--	34.4	--	43.2	44.6	42.2	--	39.9	--	--	--
1970	9.1	--	26.3	--	28.9	--	35.4	--	37.7	36.0	--	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

ATLANTA SUMMIT — ELEVATION = 7,600

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1971	25.8	--	38.3	--	42.1	45.9	52.5	52.1	49.7	40.7	--	--
1972	--	--	32.5	--	46.7	--	46.9	--	49.9	42.2	35.3	10.8
1973	11.7	--	19.0	--	21.6	--	26.5	--	28.9	--	7.3	--
1974	24.9	--	39.4	--	53.3	--	57.2	54.2	49.6	--	30.9	--
1975	10.7	15.6	20.5	27.2	30.5	32.2	40.4	45.9	47.7	50.3	41.4	27.5
1976	--	20.5	20.3	22.9	--	28.0	35.9	34.8	38.8	27.7	16.6	--
1977	0.7	1.7	2.1	1.8	4.3	5.9	7.4	6.3	1.2	--	--	--
1978	19.3	25.4	28.8	37.5	36.8	39.5	38.2	38.7	40.3	35.1	30.7	--
1979	6.9	11.6	11.8	18.2	22.4	21.6	25.2	25.3	25.0	23.8	8.0	--
1980	10.7	23.1	24.4	25.7	29.9	35.2	37.1	41.1	32.8	27.9	21.4	--
1981	10.1	--	13.0	13.6	17.8	17.6	22.0	21.8	17.8	--	6.8	--
STATISTICS												
N	19	14	30	16	35	20	43	24	34	21	19	2
Mean	13.7	17.3	23.4	23.4	29.5	29.7	35.2	36.5	34.5	33.9	20.3	19.2
Maximum	33.3	33.4	39.4	42.0	53.3	48.9	57.2	54.2	49.9	50.3	41.4	27.5
Minimum	0.7	1.7	2.1	1.8	4.3	5.9	7.4	6.3	1.2	23.6	4.2	10.8

TABL (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

BOGUS BASIN — ELEVATION = 6,340

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1942	--	--	11.8	16.2	17.5	--	18.8	--	16.0	--	0.0	--
1943	--	27.3	--	--	--	42.3	--	--	33.3	--	--	--
1944	4.7	--	4.8	11.2	11.5	13.7	14.3	17.0	18.2	--	--	--
1945	6.7	--	8.7	16.7	18.0	--	24.2	--	22.7	--	--	--
1946	16.0	21.0	25.2	--	32.0	--	35.8	--	31.2	--	--	--
1947	12.7	--	16.0	17.2	18.5	--	25.5	--	18.5	--	--	--
1948	9.7	--	10.0	11.3	14.7	--	21.7	--	22.0	--	--	--
1949	15.0	16.7	17.3	--	29.5	28.0	31.2	28.3	21.3	29.3	--	--
1950	6.3	9.3	13.3	17.3	17.5	22.5	25.5	29.3	29.7	24.7	12.0	--
1951	8.0	12.3	18.3	21.5	25.0	29.0	31.0	27.0	22.3	19.3	4.0	--
1952	17.1	21.7	25.7	28.0	30.0	33.7	38.8	39.5	27.3	24.2	7.3	--
1953	8.7	12.8	21.5	20.3	22.2	26.8	29.0	32.2	28.8	23.5	15.5	0.0
1954	8.2	10.3	16.0	16.8	20.8	20.8	23.0	23.0	17.7	5.5	3.0	--
1955	5.2	6.0	8.3	10.2	11.3	15.0	16.0	18.7	25.0	21.0	17.7	--
1956	12.2	15.3	19.2	21.8	24.5	29.3	26.3	23.5	21.2	18.0	0.0	--
1957	8.8	10.0	15.3	16.0	21.5	24.7	28.8	30.3	29.3	18.0	0.0	--
1958	13.7	15.3	20.0	26.7	23.7	24.7	31.5	29.2	35.5	28.8	1.3	--
1959	4.2	6.7	9.7	12.8	14.8	16.7	18.8	16.7	12.5	7.0	0.0	--
1960	3.8	7.7	9.8	16.2	17.3	21.2	21.8	17.3	18.5	8.0	5.1	--
1961	7.3	7.3	7.8	10.7	13.8	15.2	17.8	17.2	15.5	8.2	0.0	--
1962	13.5	14.7	16.5	18.8	21.5	24.7	25.0	24.2	19.8	7.0	0.0	--
1963	2.5	3.0	8.2	7.5	9.5	8.7	9.0	11.3	14.5	10.0	0.0	--
1964	7.0	10.8	13.7	17.3	17.2	21.2	21.5	22.8	23.0	20.3	4.5	--
1965	14.2	--	28.2	28.3	27.5	29.3	31.0	32.2	27.0	20.2	8.7	--
1966	5.0	10.2	11.2	13.8	14.3	16.5	16.3	16.2	12.5	0.0	0.0	--
1967	7.7	12.5	18.2	19.5	20.2	21.7	24.0	--	28.5	23.8	7.1	--
1968	3.3	6.7	7.8	9.5	10.8	12.8	13.8	16.0	11.3	2.7	0.0	--
1969	13.5	15.2	27.5	28.0	29.5	30.5	29.8	28.2	24.2	0.3	--	--
1970	8.5	13.0	23.0	25.8	26.3	30.7	30.5	--	35.3	25.5	9.8	--
1971	15.7	24.0	26.3	--	29.5	33.0	38.7	37.2	33.7	16.3	2.2	--
1972	19.0	23.0	31.3	33.5	34.2	--	34.2	34.7	36.2	24.7	0.0	--
1973	7.5	--	11.7	--	15.2	18.2	19.0	--	13.3	--	--	--
1974	18.8	17.5	21.7	--	27.5	31.5	32.3	34.2	25.5	--	--	--
1975	11.3	--	17.2	20.8	22.0	25.5	32.5	36.9	38.2	38.5	--	--
1976	7.5	15.5	16.3	17.7	21.7	24.5	23.7	22.7	25.0	9.5	--	--
1977	1.7	--	2.3	2.2	4.8	6.8	11.2	5.2	--	--	--	--
1978	7.5	--	16.3	22.8	25.3	26.2	24.5	--	24.3	14.0	0.0	--
1979	5.2	9.2	10.0	13.7	17.5	18.5	20.2	23.5	17.5	14.0	0.0	--
1980	8.3	--	15.8	--	22.2	--	30.5	--	17.8	--	2.7	--
1981	5.0	4.7	8.0	7.5	9.3	10.0	14.3	15.7	2.3	0.0	--	--
STATISTICS												
N	38	29	39	33	39	33	39	29	39	29	26	1
Mean	9.2	13.1	15.6	17.5	20.3	22.8	24.7	24.5	23.0	15.9	3.9	0.0
Maximum	19.0	27.3	31.3	33.5	34.2	42.3	38.8	39.5	38.2	38.5	17.7	0.0
Minimum	1.7	3.0	8.2	7.5	9.3	8.7	9.0	11.3	2.3	0.0	0.0	0.0

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

DOLLARHIDE SUMMIT — ELEVATION = 8,420

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1950	--	--	20.0	--	25.4	--	33.6	34.6	34.4	--	--	--
1951	16.7	--	24.0	--	28.0	--	34.1	32.9	35.7	33.9	--	--
1952	19.8	--	30.5	--	34.4	--	37.4	37.8	34.0	33.0	--	--
1953	--	15.1	21.2	--	25.2	--	29.4	31.0	30.4	28.3	--	--
1954	8.3	--	19.8	--	26.2	--	30.6	--	29.6	--	--	--
1955	6.2	--	8.0	--	12.8	--	17.2	--	24.2	--	--	--
1956	26.4	--	34.4	--	39.2	--	41.4	--	39.8	--	--	--
1957	10.4	--	13.2	--	22.4	--	27.6	--	30.2	--	--	--
1958	12.8	--	17.4	--	20.4	--	--	--	34.5	--	--	--
1959	--	--	11.2	--	17.6	--	18.9	--	18.9	--	--	--
1960	1.9	--	7.5	--	11.4	--	17.4	--	19.1	--	--	--
1961	8.8	--	9.0	--	13.2	--	17.4	--	18.3	--	--	--
1962	13.3	--	15.7	--	20.2	--	23.9	--	16.9	--	--	--
1963	7.1	--	10.8	--	16.4	--	16.8	--	20.0	--	--	--
1964	10.4	--	15.9	--	16.8	--	21.2	--	18.6	--	--	--
1965	24.8	--	31.2	--	32.7	--	37.2	--	40.3	--	--	--
1966	6.7	--	12.4	--	14.8	--	17.2	--	17.0	--	--	--
1967	10.8	--	16.2	--	18.1	--	23.7	--	31.4	--	--	--
1968	7.7	--	13.2	--	16.1	--	16.3	--	14.0	--	--	--
1969	--	--	--	--	30.1	--	32.6	--	20.4	--	--	--
1970	--	--	--	--	20.3	--	22.5	--	--	--	--	--
1971	--	--	--	--	29.1	--	41.1	--	--	--	--	--
1972	--	--	--	--	33.9	--	38.1	--	31.4	--	--	--
1973	--	--	--	--	18.2	--	18.4	--	--	--	--	--
1974	--	--	--	--	30.1	--	36.2	--	38.4	--	--	--
1975	--	--	--	--	19.9	--	28.6	--	--	--	--	--
1976	--	--	--	--	17.8	--	22.2	--	--	--	--	--
1977	--	--	--	--	2.6	--	4.4	--	--	--	--	--
1978	--	--	--	--	--	--	32.0	--	--	--	--	--
1979	5.0	--	8.8	--	15.0	--	18.0	--	19.7	--	5.1	--
1980	7.6	--	19.1	--	22.6	--	25.9	--	23.2	--	19.9	--
1981	8.2	--	11.2	--	15.0	--	18.5	--	16.0	--	--	--
STATISTICS												
N	19	1	22	0	31	0	31	4	25	3	2	0
Mean	11.2	15.1	16.9	--	21.5	--	25.8	34.1	26.3	31.7	12.5	--
Maximum	26.4	15.1	34.4	--	39.2	--	41.4	37.8	40.3	33.9	19.9	--
Minimum	1.9	15.1	7.5	--	2.6	--	4.4	31.0	14.0	28.3	5.1	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

GALENA — ELEVATION = 7,440

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1938	--	--	--	--	22.2	--	28.0	--	--	--	--	--
1939	--	--	--	--	--	--	9.1	--	--	--	--	--
1940	--	--	--	--	--	--	13.7	--	--	--	--	--
1941	--	--	--	--	--	--	11.0	--	--	--	--	--
1942	--	--	--	--	--	--	17.2	--	--	--	--	--
1943	--	--	--	--	--	--	29.6	--	--	--	--	--
1944	--	--	--	--	--	--	11.1	--	--	--	--	--
1945	--	--	--	--	--	--	12.9	--	--	--	--	--
1946	--	--	--	--	--	--	22.3	--	--	--	--	--
1947	--	--	--	--	--	--	18.8	--	--	--	--	--
1948	--	--	--	--	--	--	13.4	--	--	--	--	--
1949	--	--	13.5	--	19.8	--	21.7	--	10.0	--	--	--
1950	5.1	--	15.3	--	18.0	--	22.1	23.1	19.6	--	--	--
1951	9.6	--	16.2	--	20.0	--	21.7	17.6	14.4	7.5	--	--
1952	13.3	--	20.8	--	24.3	--	24.4	23.6	14.8	5.4	--	--
1953	7.1	--	15.5	--	18.8	--	20.0	19.8	14.4	7.9	--	--
1954	4.8	--	15.3	--	18.6	--	22.4	22.4	14.0	0.0	--	--
1955	4.6	--	6.0	--	8.2	--	13.4	13.2	17.0	10.4	--	--
1956	18.4	--	25.4	--	30.6	--	27.2	26.2	16.6	12.4	--	--
1957	6.4	--	11.4	--	15.6	--	20.6	19.8	15.6	5.4	--	--
1958	8.7	--	11.2	15.1	17.6	--	25.2	--	23.9	12.5	--	--
1959	4.7	--	9.1	--	14.2	--	15.0	9.9	6.6	--	--	--
1960	1.6	--	5.4	8.3	7.9	--	9.1	--	1.5	--	--	--
1961	6.4	--	6.1	--	9.0	--	13.1	--	7.4	--	--	--
1962	10.4	11.3	12.8	16.0	16.0	18.7	19.2	13.2	6.7	0.0	--	--
1963	4.7	--	9.9	9.9	10.9	11.6	13.1	14.0	12.5	8.5	0.0	--
1964	6.5	--	13.0	13.3	13.6	17.7	18.1	15.2	13.3	5.4	0.0	--
1965	19.2	--	29.3	30.2	30.7	30.7	31.6	31.2	30.0	20.1	--	--
1966	4.3	10.8	11.3	12.1	12.5	14.6	13.8	7.3	3.5	0.0	--	--
1967	7.7	9.9	17.1	17.0	18.0	21.3	22.0	23.8	24.8	14.8	--	--
1968	5.2	8.6	10.3	11.5	12.9	13.8	13.8	10.3	5.8	0.0	--	--
1969	9.7	12.6	21.7	23.9	25.7	27.5	25.8	20.9	14.1	0.0	--	--
1970	5.1	8.2	15.9	14.5	16.1	17.9	19.5	19.4	20.8	9.6	--	--
1971	12.4	16.7	20.8	20.6	23.1	26.0	27.3	25.9	23.5	--	--	--
1972	9.6	--	18.7	19.4	22.7	24.3	22.6	22.2	17.7	7.4	0.0	--
1973	5.8	--	10.0	11.5	11.6	13.1	12.9	10.9	7.2	0.0	--	--
1974	13.4	--	21.5	--	24.4	32.1	30.8	33.9	25.1	--	0.8	--
1975	5.9	--	9.8	18.0	18.3	18.5	22.3	24.6	25.6	--	14.8	--
1976	7.3	--	11.0	10.8	13.8	16.5	16.7	14.1	14.2	--	--	--
1977	0.0	1.2	1.3	0.0	0.7	2.4	2.7	0.0	0.0	--	--	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

GALENA — ELEVATION = 7,440

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1978	11.0	--	16.6	21.1	20.5	20.3	21.8	17.8	17.4	3.8	--	--
1979	3.4	--	6.4	--	12.1	10.7	13.1	11.6	8.8	--	0.0	--
1980	6.1	--	11.9	--	16.0	18.3	19.5	20.1	10.7	--	0.0	--
1981	8.6	8.2	10.2	11.1	12.7	11.9	15.0	15.3	6.2	0.0	0.0	--
STATISTICS												
N	32	9	33	19	33	20	44	29	33	21	8	0
Mean	7.7	9.7	13.7	15.0	16.8	18.4	18.7	18.2	14.1	6.2	2.0	--
Maximum	19.2	16.7	29.3	30.2	30.7	32.1	31.6	33.9	30.0	20.1	14.8	--
Minimum	0.0	1.2	1.3	0.0	0.7	2.4	2.7	0.0	0.0	0.0	0.0	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

GALENA SUMMIT — ELEVATION = 8,780

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1949	--	--	16.2	--	23.6	--	24.5	--	21.2	--	--	--
1950	7.4	--	18.0	--	21.2	--	28.5	29.9	28.6	--	--	--
1951	13.2	--	19.8	--	24.0	--	30.3	27.5	30.0	25.8	9.8	--
1952	16.0	--	24.4	--	28.0	--	29.8	31.2	27.0	20.0	8.2	--
1953	7.5	--	16.8	--	20.0	--	24.0	26.2	24.4	26.0	18.9	--
1954	7.4	--	18.8	--	22.8	--	26.8	28.0	25.0	17.4	--	--
1955	5.3	--	6.2	--	9.8	--	14.8	17.4	20.4	17.8	--	--
1956	20.2	--	28.6	--	32.2	--	37.8	33.2	30.0	31.0	--	--
1957	10.0	--	13.2	--	18.2	--	23.2	25.8	25.2	21.4	--	--
1958	9.8	--	13.9	18.6	21.7	--	32.0	--	33.7	28.4	--	--
1959	7.5	--	13.9	--	19.9	--	21.5	20.4	19.3	--	--	--
1960	2.7	--	7.4	11.3	11.2	15.8	15.7	15.3	17.1	10.0	2.9	--
1961	8.9	--	9.5	13.4	14.1	17.4	18.3	17.8	18.8	16.4	1.8	--
1962	12.9	13.6	14.8	19.6	20.4	23.1	24.7	22.7	20.3	17.6	17.7	--
1963	5.9	--	11.6	12.4	14.6	15.4	18.7	21.1	23.3	23.2	11.4	--
1964	8.3	--	16.5	16.6	17.0	22.2	24.3	24.8	24.4	23.9	14.0	--
1965	26.1	--	32.3	34.3	34.4	37.2	38.3	40.6	40.6	40.0	26.6	--
1966	5.5	11.2	12.2	13.5	14.7	16.6	18.1	16.1	15.1	3.8	0.0	--
1967	9.8	12.0	18.2	19.7	20.6	23.8	25.3	28.8	32.4	29.5	14.5	--
1968	7.4	11.0	13.1	14.4	16.8	17.2	18.9	18.4	18.6	16.4	7.9	--
1969	12.0	17.7	24.7	28.2	29.5	30.6	32.4	30.5	29.2	20.9	3.0	--
1970	6.9	9.5	16.4	16.8	18.6	21.7	22.3	24.5	27.7	23.8	12.1	--
1971	15.7	20.7	24.9	26.6	28.8	32.3	34.7	35.3	36.8	--	23.3	--
1972	13.5	--	22.9	23.7	27.3	30.5	30.7	33.8	32.8	28.7	21.4	--
1973	7.5	--	12.6	12.9	13.5	15.3	16.8	18.2	17.8	14.4	0.0	--
1974	16.4	--	26.1	--	30.3	38.9	38.0	43.5	40.5	--	29.7	--
1975	8.9	--	13.9	21.4	21.5	23.6	29.0	33.4	36.8	--	32.6	--
1976	11.3	--	14.7	15.5	19.1	22.3	24.9	25.2	27.4	--	12.5	--
1977	1.1	1.9	2.2	2.3	2.7	4.6	5.6	5.2	0.0	2.9	--	--
1978	13.6	--	19.6	24.8	24.7	25.6	22.8	29.2	29.8	28.4	25.8	--
1979	5.8	--	7.5	--	13.5	12.6	16.1	17.3	18.0	--	0.0	--
1980	6.9	--	15.3	--	19.0	21.4	23.7	27.0	21.2	16.3	13.0	--
1981	9.6	8.8	11.8	12.4	14.4	16.8	19.0	19.7	18.0	13.4	10.3	--
STATISTICS												
N	32	9	33	20	33	22	33	31	33	25	24	0
Mean	10.0	11.8	16.3	17.9	20.2	22.0	24.6	25.4	25.2	20.7	13.2	--
Maximum	26.1	20.7	32.3	34.3	34.4	38.9	38.3	43.5	40.6	40.0	32.6	--
Minimum	1.1	1.9	2.2	2.3	2.7	4.6	5.6	5.2	0.0	2.9	0.0	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

JACKSON PEAK — ELEVATION = 7,070

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1950	--	--	27.4	--	33.8	--	44.9	--	42.6	--	--	--
1951	--	--	20.2	--	34.2	--	36.0	--	30.2	--	--	--
1952	--	--	31.8	--	40.6	--	45.0	42.8	37.9	27.8	9.9	--
1953	--	--	25.4	--	31.6	--	35.6	--	37.9	--	--	--
1954	--	--	27.1	--	34.6	--	39.4	--	35.2	--	--	--
1955	--	--	10.0	--	18.0	--	25.0	--	34.4	--	--	--
1956	--	--	34.6	--	43.0	--	47.0	--	41.0	--	--	--
1957	--	--	--	--	28.4	--	36.0	--	37.8	--	--	--
1958	--	--	22.8	--	29.4	--	36.4	--	42.4	--	--	--
1959	--	--	16.6	--	23.0	--	27.9	--	24.2	--	--	--
1960	--	--	--	--	18.8	--	25.7	--	24.2	--	--	--
1961	--	--	14.9	--	20.8	--	26.1	--	26.4	--	--	--
1962	--	--	21.2	--	--	29.1	31.6	--	26.5	--	--	--
1963	--	--	14.4	--	16.6	--	16.6	--	--	--	--	--
1964	--	--	22.2	--	20.4	--	29.8	--	--	--	--	--
1965	28.1	--	37.8	--	39.7	--	48.0	--	46.4	--	--	--
1966	13.6	--	20.7	--	21.2	--	27.2	--	28.1	--	--	--
1967	11.5	--	24.8	--	26.0	--	32.0	--	--	--	--	--
1968	10.7	--	16.1	--	17.9	--	25.6	--	--	--	--	--
1969	--	--	--	--	38.1	--	35.6	--	--	--	--	--
1970	--	--	28.6	--	35.3	--	34.0	--	--	--	--	--
1971	--	--	--	--	34.1	--	44.4	--	--	--	--	--
1972	--	--	31.7	--	39.2	--	45.6	--	44.3	--	24.5	--
1973	12.3	--	20.6	--	23.4	--	25.5	--	24.6	--	0.0	--
1974	--	--	31.6	--	37.1	--	49.2	--	48.9	43.4	26.8	--
1975	--	--	--	25.0	27.8	28.8	37.7	37.7	40.1	43.2	35.6	--
1976	--	19.7	22.8	23.5	28.2	29.0	35.5	35.8	37.1	25.2	0.0	--
1977	1.0	2.6	2.2	2.0	5.0	7.4	9.2	6.4	0.0	--	--	--
1978	18.8	24.2	30.1	33.7	33.3	35.2	34.8	35.6	35.0	28.9	24.3	--
1979	7.5	10.8	11.5	--	20.7	20.5	22.8	22.6	21.8	--	--	--
1980	9.4	21.0	22.4	24.8	28.4	34.2	35.0	34.8	30.7	23.5	--	--
1981	11.1	-	13.5	14.7	17.6	18.2	21.7	23.1	19.3	--	4.4	--
STATISTICS												
N	10	5	27	6	31	8	32	8	25	6	8	0
Mean	12.4	15.7	22.3	20.6	27.9	25.3	33.3	29.9	32.7	32.0	15.7	--
Maximum	28.1	24.2	37.8	33.7	43.0	35.2	49.2	42.8	48.9	43.4	35.6	--
Minimum	1.0	2.6	2.2	2.0	5.0	7.4	9.2	6.4	0.0	23.5	0.0	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

MOORES CREEK SUMMIT — ELEVATION = 6,100

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1932	--	--	--	--	--	--	--	--	28.7	--	--	--
1933	--	--	--	--	--	--	29.8	--	--	21.1	--	--
1934	--	--	--	--	20.4	--	18.0	--	--	--	--	--
1935	--	--	--	--	22.2	--	--	--	--	--	--	--
1936	--	--	--	--	--	38.4	--	--	--	20.6	--	--
1937	--	--	--	--	--	24.4	--	--	20.6	--	--	--
1938	--	--	--	--	26.6	--	39.2	--	--	25.6	--	--
1939	9.3	--	--	--	--	29.6	--	20.2	10.8	--	--	--
1940	--	--	--	17.8	--	25.0	--	--	10.6	--	--	--
1941	--	11.8	--	--	20.6	--	17.6	--	11.6	--	--	--
1942	--	--	--	19.0	19.4	--	21.6	--	15.7	--	--	--
1943	--	--	46.3	--	49.2	--	56.0	--	42.4	--	--	--
1944	--	7.8	8.0	--	14.7	16.6	--	--	16.1	--	--	--
1945	5.2	--	8.7	--	21.9	--	24.1	--	22.7	--	--	--
1946	18.0	--	28.8	--	38.1	41.6	42.4	--	37.2	--	--	--
1947	21.0	--	23.6	--	28.2	--	33.8	--	26.4	--	--	--
1948	11.0	--	12.2	14.8	20.2	--	25.7	27.6	25.8	--	--	--
1949	20.0	--	22.6	--	37.8	--	36.6	--	30.6	--	--	--
1950	8.6	--	22.8	--	27.8	--	38.0	37.6	33.4	30.8	12.0	--
1951	12.4	--	23.6	--	35.6	--	40.2	37.4	31.2	25.4	6.2	--
1952	21.4	--	33.6	--	42.6	44.3	46.6	44.8	37.8	26.0	4.2	0.7
1953	9.9	--	26.2	--	32.0	--	36.8	39.0	34.0	26.2	19.1	--
1954	15.6	--	30.2	--	35.6	--	39.4	38.1	30.0	16.8	0.4	--
1955	6.9	9.8	9.3	12.8	16.8	23.2	24.3	25.3	33.1	25.4	18.6	--
1956	21.2	--	32.8	--	45.4	48.0	44.2	46.6	36.6	32.8	5.0	--
1957	15.6	--	19.2	--	31.6	38.8	41.2	45.6	40.6	25.2	6.9	--
1958	19.1	--	29.2	32.4	35.6	38.9	40.6	42.9	45.8	36.9	12.8	--
1959	8.9	--	15.5	--	22.6	22.8	26.8	23.5	21.5	13.3	6.8	--
1960	4.3	8.2	10.1	18.7	21.1	26.6	27.7	24.3	23.8	13.7	7.3	--
1961	12.2	11.8	14.0	19.4	20.6	27.1	29.1	27.9	26.5	18.4	0.0	--
1962	18.0	20.4	20.3	24.6	26.6	31.1	32.7	30.3	25.1	17.3	2.0	--
1963	3.4	4.5	10.1	10.4	11.6	12.5	13.0	15.0	17.4	14.7	0.0	--
1964	9.2	15.0	23.7	22.9	22.0	31.6	31.3	31.7	30.0	25.0	10.7	--
1965	26.0	30.9	39.1	41.6	42.7	45.2	47.8	47.0	44.4	39.1	21.9	--
1966	7.3	17.2	18.3	20.9	21.8	24.7	26.2	25.0	24.3	8.9	0.0	--
1967	11.6	16.2	23.6	25.9	28.2	30.8	32.1	34.7	35.8	30.4	11.2	--
1968	7.4	10.2	12.1	14.0	18.1	20.5	21.2	20.9	17.6	9.8	0.0	--
1969	18.7	24.1	31.8	38.0	41.2	43.0	37.9	35.4	33.4	14.4	4.5	--
1970	9.2	16.3	29.3	31.3	33.6	39.4	36.1	36.6	37.0	33.9	15.3	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

MOORES CREEK SUMMIT — ELEVATION = 6,100

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1971	19.4	28.8	36.2	36.8	39.3	45.4	47.6	45.9	45.5	31.6	23.8	--
1972	20.4	27.9	37.7	37.9	42.1	--	49.4	49.6	50.2	41.3	23.3	1.7
1973	12.6	--	19.5	--	23.3	--	24.6	--	23.0	--	0.0	--
1974	20.2	--	27.9	--	36.4	43.1	45.4	50.3	45.0	--	26.7	--
1975	11.1	--	18.4	27.8	29.5	32.8	42.2	42.5	44.0	44.5	33.0	10.6
1976	16.7	24.1	25.6	27.4	35.8	33.9	38.9	39.6	39.2	--	17.2	--
1977	1.9	2.1	2.3	2.2	4.0	7.2	10.0	6.6	1.5	--	--	--
1978	19.5	23.7	26.7	34.2	35.8	36.4	34.2	35.9	35.8	26.7	17.5	--
1979	7.0	12.3	13.0	17.8	21.7	22.7	23.8	24.0	22.5	19.6	4.0	--
1980	9.2	20.7	22.8	24.5	29.5	31.3	35.6	37.6	30.0	22.3	12.6	--
1981	9.2	9.6	12.5	14.3	14.9	15.1	17.6	20.2	12.4	2.6	0.0	--
STATISTICS												
N	38	22	39	25	44	32	43	33	45	31	31	3
Mean	13.1	16.1	22.2	23.5	28.3	31.0	33.2	33.6	29.1	23.9	10.4	4.3
Maximum	26.0	30.9	46.3	41.6	49.2	48.0	56.0	50.3	50.2	44.5	33.0	10.6
Minimum	1.9	2.1	2.3	2.2	4.0	7.2	10.0	6.6	1.5	2.6	0.0	1.7

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

TRINITY MOUNTAIN — ELEVATION = 7,770

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1932	--	--	--	--	--	--	--	--	--	--	30.4	--
1933	--	--	--	--	--	--	--	--	--	--	31.0	--
1934	--	--	--	--	--	29.6	--	--	--	--	--	--
1935	--	--	--	--	--	--	42.0	--	--	--	22.8	--
1936	--	--	--	--	--	--	--	50.2	--	--	--	--
1937	--	--	--	--	--	--	31.0	--	--	--	--	--
1938	--	--	--	--	--	--	54.6	--	--	--	--	20.8
1939	--	--	--	--	--	--	25.3	--	--	14.0	--	--
1940	--	--	--	--	--	--	33.6	--	--	--	15.0	--
1941	--	--	--	--	--	30.0	--	--	--	27.0	5.2	--
1942	--	--	--	--	--	34.0	--	--	--	--	--	--
1943	--	--	--	--	--	--	--	67.4	--	--	--	--
1944	--	--	--	--	--	--	21.0	--	--	--	--	--
1945	--	--	--	--	26.9	--	35.5	--	--	--	--	--
1946	--	--	--	--	43.6	--	47.3	--	--	--	--	--
1947	--	--	--	--	35.9	--	40.9	--	--	28.0	--	--
1948	--	--	--	--	27.4	--	36.2	--	--	--	--	--
1949	--	--	--	--	48.6	--	50.0	--	--	--	--	--
1950	--	--	--	--	47.2	--	56.8	--	--	--	--	--
1951	--	--	39.8	--	46.6	--	48.6	--	37.4	--	--	--
1952	--	--	43.3	--	53.0	--	59.4	59.2	52.0	43.8	--	--
1953	--	--	34.2	--	42.2	--	44.4	--	43.8	--	--	--
1954	--	--	34.8	--	45.6	--	51.6	--	46.6	36.2	18.0	--
1955	--	--	13.4	--	22.8	--	32.8	--	41.6	--	--	--
1956	--	--	47.4	--	62.0	--	64.6	--	59.2	48.0	26.8	--
1957	--	--	22.4	--	35.2	--	46.2	--	48.8	--	--	--
1958	19.8	22.4	30.6	37.2	40.0	43.8	54.8	54.0	56.0	52.6	--	--
1959	11.2	15.8	19.8	30.6	31.2	31.2	37.8	35.2	35.8	33.8	--	--
1960	6.2	12.2	15.0	21.8	23.6	31.0	29.6	31.8	34.6	32.4	--	--
1961	8.8	16.1	20.0	23.4	26.2	32.9	34.6	32.8	34.2	26.1	--	--
1962	24.1	24.8	27.9	37.1	37.4	44.0	45.2	44.4	39.4	30.4	--	--
1963	12.0	12.4	20.4	20.6	26.4	30.1	30.1	36.3	39.5	37.0	18.6	--
1964	14.9	18.5	24.0	26.6	26.4	35.9	34.1	36.9	37.3	33.2	--	--
1965	41.4	44.8	54.8	59.5	61.0	62.2	65.2	67.4	64.2	55.5	49.4	--
1966	21.1	24.0	27.0	28.5	30.1	34.2	36.1	34.0	34.0	25.3	5.4	--
1967	29.6	--	36.0	39.1	41.3	--	42.7	--	--	45.9	--	--
1968	11.7	--	16.3	--	26.5	--	24.0	31.0	26.9	22.4	12.0	2.0
1969	17.3	--	43.9	--	54.2	53.8	49.9	--	47.7	--	--	--
1970	11.4	--	35.0	--	37.3	--	44.4	--	48.1	46.6	32.6	--

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

TRINITY MOUNTAIN — ELEVATION = 7,770

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1971	31.3	--	43.4	--	50.6	59.5	60.4	63.3	61.2	51.2	43.2	--
1972	20.3	--	39.7	--	55.0	--	54.0	--	61.4	48.5	42.9	14.9
1973	15.3	--	24.7	--	26.9	--	33.9	--	33.6	--	8.8	--
1974	32.9	--	48.7	--	60.7	--	70.7	75.7	63.6	--	39.6	--
1975	14.0	--	24.7	34.5	38.7	41.3	52.2	57.0	56.0	57.2	49.6	35.1
1976	--	23.4	25.4	30.9	33.5	36.6	41.1	43.1	45.0	32.1	16.6	--
1977	0.5	2.1	1.8	1.8	4.5	6.2	9.8	6.9	0.0	--	--	--
1978	26.1	33.1	36.1	44.9	45.2	48.0	46.7	48.2	50.4	44.5	36.5	--
1979	8.4	13.4	13.8	21.8	26.6	26.5	30.2	30.2	29.7	28.2	10.6	--
1980	13.5	27.7	30.6	31.6	38.8	43.7	45.2	50.2	43.9	36.9	29.7	--
1981	12.3	--	16.0	16.1	20.7	21.3	26.5	27.7	20.9	18.3	9.5	--
STATISTICS												
N	23	14	31	17	37	21	43	22	30	26	22	4
Mean	17.6	20.8	29.4	29.8	37.8	36.9	42.3	44.7	43.1	36.7	25.2	18.2
Maximum	41.4	44.8	54.8	59.5	62.0	62.2	70.7	75.7	64.2	57.2	49.6	35.1
Minimum	0.5	2.1	1.8	1.8	4.5	6.2	9.8	6.9	0.0	14.0	5.2	2.0

TABLE 4-5 (Cont'd)

BOISE BASIN - SNOW WATER CONTENT DATA (inches)

VIENNA MINE — ELEVATION = 8,960

Water Year	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	1 May	15 May	1 Jun	15 Jun
1950	--	--	--	--	21.7	--	30.4	--	38.1	--	--	--
1951	--	--	--	--	32.4	--	43.6	--	45.2	--	--	--
1952	--	--	--	--	38.8	--	44.4	--	39.2	--	--	--
1953	--	--	--	--	34.4	--	41.4	--	44.6	--	--	--
1954	--	--	30.2	--	36.6	--	41.6	--	43.6	--	--	--
1955	--	--	--	--	18.4	--	31.4	--	38.2	--	--	--
1956	--	--	--	--	53.8	--	55.6	--	--	56.6	--	--
1957	--	--	--	--	29.6	--	38.0	--	40.4	--	--	--
1958	--	--	--	--	33.4	--	45.0	--	46.4	--	--	--
1959	--	--	--	--	30.0	--	34.2	--	31.8	--	--	--
1960	--	--	--	--	18.8	--	24.8	--	27.0	--	--	--
1961	--	--	--	--	19.8	--	27.2	--	27.8	--	--	--
1962	--	--	--	--	30.0	--	36.2	--	33.2	--	--	--
1963	--	--	10.2	--	23.1	--	31.6	--	35.0	--	--	--
1964	--	--	22.5	--	23.4	--	35.8	--	34.8	--	--	--
1965	--	--	47.7	--	51.2	--	56.0	--	54.3	--	--	--
1966	--	--	17.8	--	23.4	--	27.4	--	20.7	--	--	--
1967	--	--	28.8	--	31.4	--	39.2	--	45.4	--	--	--
1968	--	--	22.1	--	29.0	--	31.4	--	31.2	--	--	--
1969	--	--	--	--	46.0	--	48.8	--	39.1	--	--	--
1970	--	--	--	--	28.9	--	36.8	--	--	--	--	--
1971	--	--	--	--	42.1	--	53.6	--	--	--	--	--
1972	--	--	35.0	--	52.4	--	52.8	--	56.2	--	48.3	--
1973	12.3	--	20.1	--	21.1	--	26.0	--	27.6	--	12.1	--
1974	--	--	41.1	--	46.2	--	56.8	--	62.5	--	47.5	--
1975	11.3	--	23.5	28.4	29.9	33.3	--	46.7	49.2	51.7	45.0	33.0
1976	--	21.7	24.1	--	27.8	32.7	36.9	39.0	42.7	33.3	22.4	--
1977	1.1	2.9	3.2	2.9	5.3	6.4	10.4	8.7	5.4	--	--	--
1978	23.4	28.0	30.1	37.7	37.8	39.8	39.5	43.1	45.0	44.3	37.6	--
1979	9.0	13.2	13.8	19.9	24.0	23.5	26.6	--	30.1	29.4	16.0	--
1980	10.4	26.1	29.8	29.7	35.0	39.1	41.1	39.0	40.8	--	30.7	--
1981	12.3	--	16.2	15.5	20.1	21.8	26.8	27.4	26.7	--	17.5	--
STATISTICS												
N	7	5	17	6	32	7	31	6	29	5	9	1
Mean	11.4	18.4	24.5	22.4	31.1	28.1	37.8	34.0	38.0	43.1	30.8	33.0
Maximum	23.4	28.0	47.7	37.7	53.8	39.8	56.8	46.7	62.5	56.6	48.3	33.0
Minimum	1.1	2.9	3.2	2.9	5.3	6.4	10.4	8.7	5.4	29.4	16.0	33.0

TABLE 4-6

BOISE BASIN-TOTAL MONTHLY EVAPORATION (Inches)

ARROWROCK DAM

YEAR	MAY	JUN	JUL	AUG	SEP	OCT
1916	------	------	8.860	8.530	6.141	2.149
1917	4.421	7.522	10.168	9.938	5.592	2.988
1918	5.397	7.657	9.316	7.728	4.776	1.831
1919	7.164	8.780	10.591	10.205	6.077	1.965
1920	6.439	7.623	10.619	9.469	4.688	------
1921	------	------	------	------	------	------
1922	5.639	8.628	10.850	8.641	6.663	3.446
1923	5.530	5.493	10.097	9.213	6.666	1.855
1924	9.349	9.519	11.699	10.549	6.382	------
1925	------	------	------	------	------	------
1926	6.442	9.836	10.810	9.269	5.216	------
1927	4.931	7.381	10.289	8.471	4.375	3.051
1928	7.229	7.510	9.953	9.063	5.667	------
1929	6.536	7.787	10.527	9.278	4.979	------
1930	4.389	7.441	10.265	7.456	4.718	------
1931	7.093	8.481	11.480	9.700	6.225	2.505
1932	5.122	6.816	9.122	8.515	5.621	------
1933	4.520	7.928	10.386	9.112	5.291	------
1934	6.782	6.911	10.593	9.648	5.350	1.907
1935	6.885	10.002	12.093	11.160	7.493	------
1936	8.047	6.983	12.022	10.560	6.949	4.857
1937	8.643	8.100	12.418	11.173	7.101	------
1938	6.147	8.184	9.526	9.012	6.508	1.621
1939	8.355	8.864	11.176	11.310	6.334	2.431
1940	6.174	9.195	9.759	9.945	4.366	1.710
1941	5.050	6.062	9.296	7.361	4.524	2.267
1942	------	7.240	11.574	10.452	6.675	3.041
1943	6.417	6.475	10.687	9.911	7.009	------
1944	7.363	6.340	10.250	10.091	6.487	3.076
1945	5.622	7.097	11.051	9.850	6.130	------
1946	6.243	8.279	11.049	9.677	5.633	2.308
1947	7.434	7.336	11.353	9.943	5.741	------
1948	5.887	7.499	9.921	9.235	5.919	------
1949	5.52	8.97	11.11	9.14	6.79	------

TABLE 4-6 (Continued)

BOISE BASIN-TOTAL MONTHLY EVAPORATION (Inches)

ARROWROCK DAM (Continued)

YEAR	MAY	JUN	JUL	AUG	SEP	OCT
1950	6.74	6.71	10.65	8.52	5.75	------
1951	5.76	8.10	10.82	8.42	6.60	3.26
1952	6.08	6.77	9.03	9.61	6.22	6.70
1953	5.12	5.54	10.28	8.61	6.35	2.95
1954	6.87	5.51	8.99	7.80	6.04	3.06
1955	4.86	7.33	7.66	9.06	5.12	2.42
1956	3.98	6.36	8.96	7.97	5.68	------
1957	4.05	6.91	8.71	7.76	5.85	1.44
1958	5.88	6.17	8.90	7.92	5.25	2.66
1959	4.24	6.59	9.43	7.58	3.92	1.90
1960	5.01	8.21	9.93	7.70	5.93	2.39
1961	5.60	7.89	10.01	8.14	4.23	2.28
1962	5.13	8.07	10.96	8.35	6.37	2.05
1963	5.32	5.30	10.32	8.89	4.89	2.66
1964	7.69	5.79	10.71	9.01	5.23	------
1965	6.37	7.56	10.16	8.35	------	------
1966	7.97	8.60	11.90	10.07	6.66	------
1967	6.91	6.97	11.38	11.56	6.79	------
1968	6.90	9.03	12.28	7.17	------	------
1969	8.17	7.43	11.40	10.66	------	------
1970	6.26	7.81	10.15	10.49	------	------
1971	6.32	7.57	10.88	10.80	------	------
1972	7.84	8.75	11.44	10.66	5.97	------
1973	8.30	9.02	11.54	10.30	5.54	------
1974	7.08	10.71	10.27	10.13	7.49	------
1975	------	8.18	10.81	8.43	6.65	------
1976	8.73	7.83	10.19	------	------	------
1977	4.88	9.44	10.57	8.79	6.51	------
1978	------	8.11	10.06	9.51	4.96	------
1979	7.06	9.54	11.51	8.43	6.94	------
1980	------	------	9.89	8.62	4.94	------
N	58	61	63	62	57	29
Mean	6.31	7.70	10.46	9.24	5.86	2.65
Max.	9.349	10.71	12.418	11.56	7.493	6.70
Min.	3.98	5.30	7.66	7.17	3.92	1.44

TABLE 4-7

AVERAGE MONTHLY WIND SPEED AND DIRECTION

BOISE AIRPORT WSFO

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD	DIR	SPD
1950	ESE	11.2	ESE	7.8	ESE	9.7	WNW	12.2	NNW	11.7	NW	10.7	WNW	11.0	SE	10.3	SE	10.3	SE	12.0	SE	11.1	SE	9.5
1951	ESE	12.5	SE	11.5	SE	13.2	NW	8.8	NW	8.6	WNW	7.2	NW	6.9	NW	6.6	SE	6.9	SE	7.0	SE	8.0	SE	8.3
1952	SE	8.1	SE	7.8	SE	9.6	SE	10.3	NW	7.3	NW	7.0	NW	6.9	NW	5.6	SE	5.9	SE	6.8	SE	7.9	SE	9.7
1953	SE	10.8	NW	11.7	SE	11.9	NW	10.5	NW	10.9	NW	10.2	NW	9.0	NW	9.1	SE	8.4	SE	9.5	SE	10.0	SE	8.6
1954	SE	11.7	SE	10.0	SE	10.9	SE	10.1	NW	11.1	NW	9.8	NW	8.8	NW	9.2	SE	9.0	SE	9.8	SE	8.5	SE	8.5
1955	SE	6.6	SE	9.9	SE	10.8	SE	10.3	WNW	11.5	NW	11.9	NW	9.0	NW	8.3	SE	8.5	SE	10.4	SE	9.8	SE	13.4
1956	SE	12.6	SE	11.6	SE	11.9	WNW	9.8	WNW	8.2	NW	8.9	NW	7.6	WNW	10.5	SE	8.0	SE	9.0	SE	6.3	SE	7.2
1957	SE	6.7	SE	7.2	SE	9.8	NW	10.5	NW	9.5	NW	10.1	NW	9.2	NW	6.9	SE	7.6	SE	8.3	SE	9.3	SE	10.5
1958	SE	9.8	SE	10.3	SE	10.8	SE	10.1	SE	8.0	NW	7.6	NW	6.9	SE	7.5	SE	7.8	SE	7.5	SE	8.5	SE	5.6
1959	SE	9.8	SE	9.0	SE	9.8	SE	9.5	WNW	8.5	NW	7.8	WNW	8.2	NW	7.2	NW	7.5	SE	7.6	SE	7.2	SSE	6.9
1960	SE	6.5	SE	10.1	SE	9.5	NW	9.0	NW	8.7	NW	8.5	WNW	7.2	SE	7.6	SE	7.0	SE	7.0	SE	9.0	SE	4.6
1961	SE	5.2	SE	8.8	SE	9.1	SE	7.6	WNW	9.3	WNW	8.1	NW	7.8	SE	7.7	WNW	8.9	SE	8.2	SE	8.3	SE	7.7
1962	SE	6.8	WNW	7.8	SE	9.9	SE	10.4	WNW	8.9	NW	8.5	WNW	8.2	SE	7.7	SE	7.1	SE	7.6	SE	7.5	SE	5.2
1963	SE	6.3	SE	7.7	SE	10.4	SE	10.1	WNW	7.7	WNW	7.9	NW	7.7	WNW	7.2	SE	7.3	SE	7.7	SE	8.5	SE	4.4
1964	130	7.5	140	7.5	140	8.3	320	8.3	310	8.6	130	8.1	310	7.5	310	7.7	130	7.3	130	6.8	130	7.6	130	9.5
1965	130	7.8	270	8.7	210	8.2	130	9.2	300	10.1	290	7.5	260	7.7	210	7.4	280	7.2	150	7.1	120	7.9	130	6.6
1966	140	8.5	150	7.7	140	9.9	310	8.7	300	9.6	300	8.5	300	7.7	280	8.0	290	7.0	150	7.8	130	8.1	130	7.8
1967	120	8.9	140	9.3	130	10.5	260	9.0	290	8.7	270	8.4	280	7.7	270	7.4	160	7.6	130	8.3	150	7.4	150	8.2
1968	140	8.2	130	8.4	130	9.8	310	10.7	300	9.3	310	9.9	300	8.8	130	8.8	290	8.6	140	8.7	130	7.7	130	10.2
1969	130	9.1	130	8.0	170	7.8	310	10.7	300	7.7	300	8.4	310	8.8	310	9.4	90	9.2	60	9.3	140	8.3	120	10.4
1970	120	11.2	130	8.9	340	10.7	310	11.5	310	10.5	330	10.1	90	9.9	40	9.4	330	9.7	100	8.8	130	10.9	120	10.4
1971	120	8.1	340	9.7	120	10.8	320	10.9	320	11.0	330	9.0	320	8.4	360	8.3	190	9.7	280	8.8	120	8.6	120	9.6
1972	100	8.8	130	7.5	100	8.6	310	11.0	330	9.5	320	8.6	310	8.8	310	8.7	60	7.8	170	7.4	130	7.5	110	8.3
1973	140	8.2	140	8.5	310	11.3	310	11.5	310	9.3	320	10.1	310	8.6	320	8.1	320	8.4	160	8.1	130	11.5	130	9.9
1974	130	8.1	130	10.9	150	10.8	320	11.7	310	9.2	320	9.0	320	8.1	310	7.6	340	7.6	320	6.9	130	7.9	120	8.4
1975	120	7.2	130	10.0	10	9.8	310	9.5	320	10.7	320	9.5	300	8.2	360	7.8	120	7.7	120	9.3	120	8.5	160	6.3
1976	120	7.8	140	9.4	100	10.1	330	11.8	300	10.2	310	9.8	320	8.3	20	8.3	140	7.6	120	7.4	100	6.9	120	6.0
1977	300	4.8	170	6.6	320	9.6	320	10.4	300	9.0	310	8.2	310	8.2	290	7.9	70	8.2	120	7.5	130	7.9	130	7.9
1978	130	7.6	130	8.6	130	8.5	300	9.5	310	10.9	310	8.7	310	8.1	310	7.9	140	8.9	110	7.3	140	7.1	300	7.6
1979	160	5.1	130	8.4	140	7.9	330	8.2	310	9.7	320	9.1	320	7.7	30	7.1	70	7.0	130	7.6	130	6.6	130	7.8
1980	130	7.4	120	6.8	310	9.5	180	8.5	290	8.7	320	7.4	320	7.9	320	7.8	100	7.4	290	7.8	120	6.3	130	6.6
MIN SPEED		4.8		6.6		7.8		7.6		7.3		7.0		6.9		5.6		5.9		6.8		6.3		4.4
MAX SPEED		12.6		11.7		13.2		12.2		11.7		11.9		11.0		10.5		10.3		12.0		11.5		13.4
AVE SPEED		8.4		8.9		10.0		10.0		9.4		8.9		8.2		8.0		8.0		8.2		8.3		8.1
PREVAILING DIRECTION	SE		SE		SE		NW		NW		NW		NW		NW		SE		SE		SE		SE	

DIR = RESULTANT DIRECTION OF WINDS FOR MONTH. NUMERICAL VALUES IN DEGREES WITH NORTH BEING 0 OR 360 DEGREES.
EAST = 90 DEGREES, SOUTH = 180 AND WEST = 270 DEGREES.
SPD = AVERAGE MONTHLY WIND SPEED IN MILES PER HOUR.

TABLE 4-9

RUNOFF VOLUME SUMMARY (BASIN INCHES)

SOUTH FORK BOISE RIVER NEAR FEATHERVILLE
Runoff in Basin Inches
1.0 Basin Inch = 33,867 A.F. for 635 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1946	0.36	0.39	0.44	0.43	0.35	0.72	3.89	5.48	3.57	1.13	0.48	0.37	17.61	2.69	1.50	15.57	15.14	14.79	14.07	10.18	4.70
1947	0.50	0.47	0.50	0.39	0.42	0.95	2.30	4.83	2.60	0.95	0.40	0.33	14.64	3.23	1.76	12.44	12.05	11.63	10.68	8.38	3.55
1948	0.46	0.40	0.36	0.40	0.35	0.39	1.48	4.19	4.28	1.00	0.44	0.35	14.10	2.36	1.14	12.09	11.69	11.34	10.95	9.47	5.28
1949	0.40	0.40	0.38	0.38	0.33	0.57	2.63	5.14	2.82	0.82	0.37	0.31	14.55	2.46	1.28	12.69	12.31	11.98	11.41	8.78	3.64
1950	0.39	0.44	0.37	0.41	0.38	0.54	2.45	5.07	5.60	2.29	0.67	0.53	19.14	2.53	1.33	16.74	16.33	15.95	15.41	12.96	7.89
1951	0.56	0.71	0.56	0.48	0.55	0.65	4.13	6.81	4.46	1.93	0.73	0.45	22.02	3.51	1.68	19.01	18.53	17.98	17.33	13.20	6.39
1952	0.57	0.49	0.54	0.51	0.44	0.52	3.69	8.00	5.18	1.56	0.62	0.40	22.52	3.07	1.47	19.90	19.39	18.95	18.43	14.74	6.74
1953	0.40	0.37	0.42	0.48	0.40	0.70	2.38	3.23	5.31	2.31	0.59	0.38	16.97	2.77	1.58	14.81	14.33	13.93	13.23	10.85	7.62
1954	0.37	0.41	0.38	0.42	0.45	0.68	2.57	5.70	3.14	1.50	0.50	0.37	16.49	2.71	1.55	14.46	14.04	13.59	12.91	10.34	4.64
1955	0.38	0.38	0.33	0.35	0.29	0.35	0.72	3.01	4.06	1.10	0.39	0.30	11.66	2.08	0.99	9.88	9.53	9.24	8.89	8.17	5.16
1956	0.37	0.46	0.81	0.64	0.46	0.84	4.44	7.95	5.78	1.61	0.60	0.40	24.36	3.58	1.94	21.72	21.08	20.62	19.78	15.34	7.39
1957	0.48	0.44	0.45	0.40	0.43	0.66	1.86	6.28	5.25	1.37	0.49	0.37	18.48	2.86	1.49	16.25	15.85	15.42	14.76	12.90	6.62
1958	0.44	0.39	0.42	0.42	0.44	0.52	1.56	8.85	4.96	1.28	0.57	0.41	20.26	2.63	1.38	18.03	17.61	17.17	16.65	15.09	6.24
1959	0.42	0.47	0.55	0.46	0.38	0.52	2.13	2.90	3.51	0.86	0.41	0.50	13.11	2.80	1.36	10.76	10.30	9.92	9.40	7.27	4.37
1960	0.63	0.46	0.37	0.40	0.34	0.72	2.23	3.17	2.99	0.65	0.36	0.33	12.65	2.92	1.46	10.50	10.10	9.76	9.04	6.81	3.64
1961	0.35	0.37	0.32	0.34	0.39	0.52	1.22	2.67	1.94	0.43	0.28	0.31	9.14	2.29	1.25	7.51	7.17	6.78	6.26	5.04	2.37
1962	0.36	0.36	0.35	0.36	0.38	0.42	2.92	3.84	4.75	1.44	0.57	0.39	16.14	2.23	1.16	14.11	13.75	13.37	12.95	10.03	6.19
1963	0.49	0.44	0.43	0.37	0.71	0.61	1.15	4.42	4.03	1.33	0.51	0.43	14.92	3.05	1.69	12.62	12.25	11.54	10.93	9.78	5.36
1964	0.41	0.48	0.40	0.39	0.36	0.43	1.61	3.91	3.98	1.34	0.46	0.36	14.13	2.47	1.18	12.02	11.63	11.27	10.84	9.23	5.32
1965	0.36	0.38	1.24	0.81	0.69	0.83	3.79	7.33	8.44	3.53	1.17	0.70	29.27	4.31	2.33	25.42	24.61	23.92	23.09	19.30	11.97
1966	0.57	0.51	0.43	0.44	0.36	0.60	1.99	3.34	1.70	0.57	0.30	0.26	11.07	2.91	1.40	9.00	8.56	8.20	7.60	5.61	2.27
1967	0.31	0.34	0.32	0.38	0.34	0.52	0.95	4.82	5.84	1.80	0.56	0.40	16.58	2.21	1.24	14.65	14.27	13.93	13.41	12.46	7.64
1968	0.47	0.42	0.40	0.38	0.48	0.76	1.21	2.40	2.78	0.75	0.61	0.44	11.10	2.91	1.62	8.76	8.38	7.90	7.14	5.93	3.53
1969	0.50	0.55	0.47	0.59	0.47	0.73	4.56	7.90	4.24	1.18	0.49	0.40	22.08	3.31	1.79	19.67	19.08	18.61	17.88	13.32	5.42
1970	0.43	0.36	0.37	0.46	0.44	0.72	1.22	4.70	5.35	1.53	0.54	0.43	16.55	2.78	1.62	14.42	13.96	13.52	12.80	11.58	6.88
1971	0.43	0.59	0.51	0.62	0.65	0.74	2.87	8.12	7.36	2.90	0.84	0.57	26.20	3.54	2.01	23.26	22.64	21.99	21.25	18.38	10.26
1972	0.56	0.51	0.49	0.52	0.46	1.37	2.08	5.73	6.71	1.82	0.68	0.49	21.42	3.91	2.35	18.69	18.17	17.71	16.34	14.26	8.53
1973	0.53	0.47	0.45	0.43	0.37	0.54	1.29	3.17	2.02	0.73	0.34	0.33	10.67	2.79	1.34	8.55	8.12	7.75	7.21	5.92	2.75
1974	0.36	0.63	0.50	0.69	0.47	1.20	3.83	6.42	7.32	2.08	0.68	0.43	24.61	3.85	2.36	22.01	21.32	20.85	19.65	15.82	9.40
1975	0.46	0.43	0.40	0.44	0.45	0.79	0.86	4.71	6.91	3.54	0.82	0.49	20.30	2.97	1.68	17.70	17.26	16.81	16.02	15.16	10.45
1976	0.53	0.54	0.57	0.50	0.47	0.54	2.23	5.66	3.23	1.09	0.67	0.57	16.60	3.15	1.51	13.72	13.22	12.75	12.21	9.98	4.32
1977	0.50	0.40	0.36	0.35	0.33	0.37	0.61	0.76	0.87	0.39	0.25	0.25	5.44	2.31	1.05	3.68	3.33	3.00	2.63	2.02	1.26
1978	0.29	0.31	0.46	0.37	0.35	1.04	2.48	4.60	5.07	2.21	0.66	0.56	18.40	2.82	1.76	16.12	15.75	15.40	14.36	11.88	7.28
1979	0.44	0.40	0.39	0.38	0.37	0.58	0.96	3.31	1.93	0.57	0.39	0.31	10.03	2.56	1.33	8.10	7.72	7.35	6.77	5.81	2.50
1980	0.38	0.34	0.35	0.41	0.40	0.55	2.69	5.14	4.08	1.82	0.60	0.51	17.27	2.43	1.36	15.09	14.68	14.28	13.73	11.04	5.90
STATISTICS																					
N	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.
Mean	0.44	0.44	0.46	0.45	0.43	0.66	2.26	4.96	4.34	1.47	0.54	0.41	16.87	2.89	1.54	14.57	14.12	13.69	13.03	10.77	5.81
Max.	0.63	0.71	1.24	0.81	0.71	1.37	4.56	8.85	8.44	3.54	1.17	0.70	29.27	4.31	2.36	25.42	24.61	23.92	23.09	19.30	11.97
Min.	0.29	0.31	0.32	0.34	0.29	0.35	0.61	0.76	0.87	0.39	0.25	0.25	5.44	2.08	0.99	3.68	3.33	3.00	2.63	2.02	1.26
Std. Dev.	0.08	0.09	0.17	0.11	0.10	0.22	1.11	1.90	1.78	0.78	0.18	0.10	5.23	0.52	0.34	4.89	4.81	4.75	4.65	3.94	2.50

TABLE 4-10

RUNOFF VOLUME SUMMARY (BASIN INCHES)

BOISE RIVER NEAR TWIN SPRINGS
Runoff in Basin Inches
1.0 Basin Inch = 44,267 A.F. for 830 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1912	0.55	0.53	0.55	0.70	0.55	0.74	2.52	6.11	7.30	2.10	0.92	0.67	23.24	3.62	1.99	20.02	19.32	18.77	18.03	15.51	9.40
1913	0.62	0.64	0.49	0.49	0.50	0.78	3.23	5.93	4.69	1.85	0.92	0.59	20.73	3.52	1.77	17.47	16.98	16.48	15.70	12.47	6.54
1914	0.67	0.81	0.57	0.62	0.62	1.70	3.96	5.72	3.66	1.39	0.57	0.57	20.86	4.99	2.94	17.67	17.05	16.43	14.73	10.77	5.05
1915	0.76	0.58	0.38	0.43	0.46	0.79	1.96	2.78	2.12	1.02	0.49	0.45	12.22	3.40	1.68	9.56	9.13	8.67	7.88	5.92	3.14
1916	0.45	0.43	0.51	0.43	0.41	1.43	4.14	5.37	6.63	3.69	0.96	0.61	25.06	3.66	2.27	22.10	21.67	21.26	19.83	15.69	10.32
1917	0.62	0.44	0.43	0.39	0.39	0.58	1.85	6.05	7.00	2.98	0.71	0.47	21.91	2.85	1.36	19.24	18.85	18.46	17.88	16.03	9.98
1918	0.45	0.44	1.22	0.92	0.63	1.47	3.48	4.57	6.17	1.27	0.63	0.50	21.75	5.13	3.02	18.51	17.59	16.96	15.49	12.01	7.44
1919	0.57	0.49	0.43	0.37	0.37	0.85	3.30	5.56	2.68	0.78	0.43	0.37	16.20	3.08	1.59	13.91	13.54	13.17	12.32	9.02	3.46
1920	0.46	0.55	0.40	0.60	0.37	0.59	1.46	5.41	4.37	1.40	0.59	0.56	16.76	2.97	1.56	14.20	13.60	13.23	12.64	11.18	5.77
1921	0.69	0.78	0.73	0.81	0.79	1.83	3.16	8.52	7.90	1.94	0.74	0.60	28.49	5.63	3.43	24.95	24.14	23.35	21.52	18.36	9.84
1922	0.56	0.73	0.81	0.52	0.47	0.82	2.08	6.33	6.97	1.61	0.66	0.45	22.01	3.91	1.81	18.80	18.28	17.81	16.99	14.91	8.58
1923	0.45	0.47	0.52	0.52	0.46	0.76	2.11	4.73	4.02	2.13	0.65	0.46	17.28	3.18	1.74	14.73	14.21	13.75	12.99	10.88	6.15
1924	0.54	0.49	0.48	0.46	0.60	0.55	1.36	2.88	0.97	0.45	0.33	0.32	9.43	3.12	1.61	7.27	6.81	6.21	5.66	4.30	1.42
1925	0.42	0.56	0.43	0.45	0.94	1.42	4.13	7.22	4.06	1.75	0.66	0.51	22.55	4.22	2.81	19.97	19.52	18.58	17.16	13.03	5.81
1926	0.56	0.49	0.56	0.53	0.50	1.06	2.23	2.71	1.22	0.51	0.36	0.35	11.08	3.70	2.09	8.76	8.23	7.73	6.67	4.44	1.73
1927	0.38	0.68	0.84	0.57	0.73	1.22	2.87	5.85	7.62	2.63	0.78	0.61	24.78	4.42	2.52	21.49	20.92	20.19	18.97	16.10	10.25
1928	0.67	1.48	1.01	0.87	0.73	1.90	2.52	9.07	3.50	1.30	0.59	0.46	24.10	6.66	3.50	19.89	19.02	18.29	16.39	13.87	4.80
1929	0.50	0.47	0.45	0.42	0.39	0.82	1.39	3.69	3.38	1.09	0.46	0.38	13.44	3.05	1.63	11.18	10.76	10.37	9.55	8.16	4.47
1930	0.41	0.37	0.69	0.41	0.67	0.89	2.79	3.07	2.75	0.81	0.47	0.40	13.73	3.44	1.97	11.39	10.98	10.31	9.42	6.63	3.56
1931	0.57	0.42	0.37	0.42	0.41	0.79	1.82	2.97	1.41	0.46	0.31	0.31	10.26	2.98	1.62	8.28	7.86	7.45	6.66	4.84	1.87
1932	0.37	0.36	0.37	0.41	0.38	0.96	2.56	5.98	4.92	1.53	0.57	0.42	18.83	2.85	1.75	16.74	16.33	15.95	14.99	12.43	6.45
1933	0.44	0.48	0.38	0.44	0.39	0.59	1.95	3.34	6.17	1.18	0.49	0.39	16.24	2.72	1.42	14.06	13.62	13.23	12.64	10.69	7.35
1934	0.43	0.45	0.52	0.66	0.70	1.63	2.91	2.54	1.07	0.46	0.31	0.30	11.98	4.39	2.99	9.97	9.31	8.61	6.98	4.07	1.53
1935	0.42	0.54	0.50	0.51	0.55	0.72	2.63	4.47	4.09	1.09	0.46	0.35	16.33	3.24	1.78	14.06	13.55	13.00	12.28	9.65	5.18
1936	0.38	0.39	0.37	0.41	0.39	0.73	4.72	6.38	3.41	0.89	0.48	0.40	18.95	2.67	1.53	16.93	16.52	16.13	15.40	10.68	4.30
1937	0.39	0.35	0.41	0.38	0.38	0.69	1.56	4.04	2.07	0.66	0.36	0.32	11.61	2.60	1.45	9.78	9.40	9.02	8.33	6.77	2.73
1938	0.38	0.47	1.16	0.65	0.58	1.22	3.59	6.36	5.82	2.08	0.71	0.48	23.50	4.46	2.45	20.30	19.65	19.07	17.85	14.26	7.90
1939	0.57	0.57	0.58	0.50	0.45	1.31	2.83	3.62	1.52	0.68	0.36	0.35	13.34	3.98	2.26	10.91	10.41	9.96	8.65	5.82	2.20
1940	0.43	0.37	0.51	0.52	0.66	1.77	3.28	4.83	2.64	0.74	0.39	0.43	16.57	4.26	2.95	14.44	13.92	13.26	11.49	8.21	3.38
1941	0.54	0.58	0.53	0.50	0.55	0.92	1.66	3.76	2.99	0.95	0.59	0.49	14.06	3.62	1.97	11.33	10.83	10.28	9.36	7.70	3.94
1942	0.49	0.72	1.14	0.62	0.56	0.74	2.99	3.30	3.93	1.57	0.55	0.41	17.02	4.27	1.92	13.71	13.09	12.53	11.79	8.80	5.50
1943	0.41	0.64	0.71	1.11	0.89	1.62	7.61	6.63	6.32	4.13	1.14	0.62	31.83	5.38	3.62	28.31	27.20	26.31	24.69	17.08	10.45
1944	0.66	0.72	0.55	0.51	0.48	0.61	1.50	3.08	2.61	1.14	0.50	0.40	12.76	3.53	1.60	9.93	9.42	8.94	8.33	6.83	3.75
1945	0.41	0.54	0.44	0.52	0.60	0.81	1.79	5.03	4.86	1.83	0.64	0.47	17.94	3.32	1.93	15.44	14.92	14.32	13.51	11.72	6.69
1946	0.48	0.56	0.74	0.73	0.60	1.59	4.94	6.20	4.13	1.47	0.61	0.51	22.56	4.70	2.92	19.66	18.93	18.33	16.74	11.80	5.60
1947	0.70	0.75	1.14	0.65	0.79	1.57	2.96	6.36	3.68	1.47	0.60	0.48	21.15	5.60	3.01	17.48	16.83	16.04	14.47	11.51	5.15
1948	0.64	0.57	0.57	0.76	0.54	0.63	2.44	5.66	5.14	1.34	0.59	0.47	19.35	3.71	1.93	16.51	15.75	15.21	14.58	12.14	6.48
1949	0.50	0.54	0.52	0.47	0.40	1.05	3.63	6.37	3.57	1.09	0.52	0.41	19.07	3.48	1.92	16.58	16.11	15.71	14.66	11.03	4.66
1950	0.50	0.58	0.55	0.65	0.69	1.14	3.24	5.45	5.98	2.92	0.87	0.62	23.19	4.11	2.48	20.07	19.42	18.73	17.59	14.35	8.90
1951	0.71	0.88	0.83	0.64	0.94	0.99	4.52	6.71	4.78	2.30	0.85	0.54	24.69	4.99	2.57	20.88	20.24	19.30	18.31	13.79	7.08
1952	0.85	0.69	0.86	0.63	0.65	0.78	4.96	7.83	5.34	1.85	0.77	0.53	25.74	4.46	2.06	22.04	21.41	20.76	19.98	15.02	7.19
1953	0.47	0.42	0.54	0.79	0.69	0.99	2.87	4.26	6.79	3.12	0.80	0.50	22.24	3.90	2.47	19.51	18.72	18.03	17.04	14.17	9.91
1954	0.47	0.54	0.52	0.57	0.78	1.25	3.79	6.68	4.28	2.29	0.73	0.51	22.41	4.13	2.60	19.64	19.07	18.29	17.04	13.25	6.57

TABLE 4-10 (Cont'd)

RUNOFF VOLUME SUMMARY (BASIN INCHES)

BOISE RIVER NEAR TWIN SPRINGS
Runoff in Basin Inches
1.0 Basin Inch = 44,267 A.F. for 830 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1955	0.50	0.49	0.45	0.45	0.38	0.48	1.06	4.55	5.25	1.71	0.61	0.43	16.36	2.75	1.31	13.88	13.43	13.05	12.57	11.51	6.96
1956	0.52	0.75	2.10	1.38	0.74	1.58	5.19	8.52	6.35	2.17	0.79	0.54	30.63	7.07	3.70	25.93	24.55	23.81	22.23	17.04	8.52
1957	0.62	0.59	0.70	0.52	0.77	1.27	3.03	7.77	5.63	1.67	0.64	0.49	23.70	4.47	2.56	20.66	20.14	19.37	18.10	15.07	7.30
1958	0.56	0.49	0.58	0.54	0.87	0.88	2.24	9.36	5.47	1.54	0.70	0.51	23.74	3.92	2.29	20.90	20.36	19.49	18.61	16.37	7.01
1959	0.49	0.68	0.85	0.72	0.59	0.81	2.69	3.63	4.57	1.29	0.58	0.67	17.57	4.14	2.12	14.30	13.58	12.99	12.18	9.49	5.86
1960	0.97	0.68	0.55	0.55	0.50	1.42	3.04	3.93	4.05	0.96	0.54	0.44	17.63	4.67	2.47	14.45	13.90	13.40	11.98	8.94	5.01
1961	0.45	0.49	0.46	0.42	0.56	0.83	1.79	3.74	2.93	0.66	0.44	0.44	13.21	3.21	1.81	10.93	10.51	9.95	9.12	7.33	3.59
1962	0.52	0.51	0.53	0.56	0.69	0.68	3.89	4.25	4.75	1.62	0.69	0.47	19.16	3.49	1.93	16.44	15.88	15.19	14.51	10.62	6.37
1963	0.76	0.68	0.78	0.58	1.47	0.93	1.90	4.97	4.47	1.70	0.65	0.55	19.44	5.20	2.98	16.02	15.44	13.97	13.04	11.14	6.17
1964	0.54	0.64	0.52	0.53	0.50	0.63	2.18	4.87	4.70	1.72	0.64	0.52	17.99	3.36	1.66	15.13	14.60	14.10	13.47	11.29	6.42
1965	0.47	0.51	2.43	1.25	1.14	1.30	4.86	6.86	7.90	3.72	1.24	0.78	32.46	7.10	3.69	27.03	25.78	24.64	23.34	18.48	11.62
1966	0.66	0.59	0.48	0.53	0.41	0.98	2.30	3.51	2.06	0.68	0.39	0.34	12.93	3.65	1.92	10.47	9.94	9.53	8.55	6.25	2.74
1967	0.38	0.44	0.45	0.54	0.49	0.73	1.16	5.05	5.72	1.98	0.61	0.45	18.00	3.03	1.76	15.67	15.13	14.64	13.91	12.75	7.70
1968	0.58	0.54	0.40	0.42	0.99	1.32	1.80	3.09	3.34	0.98	0.79	0.56	14.81	4.25	2.73	11.94	11.52	10.53	9.21	7.41	4.32
1969	0.67	0.92	0.68	1.18	0.72	1.25	5.05	6.85	4.07	1.41	0.62	0.50	23.92	5.42	3.15	20.53	19.35	18.63	17.38	12.33	5.48
1970	0.54	0.47	0.50	0.93	0.83	1.18	1.53	5.80	6.34	2.37	0.76	0.57	21.82	4.45	2.94	18.98	18.05	17.22	16.04	14.51	8.71
1971	0.56	1.00	0.90	1.26	1.23	1.42	4.04	8.55	7.31	3.35	0.98	0.66	31.28	6.39	3.93	27.18	25.90	24.67	23.25	19.21	10.66
1972	0.66	0.61	0.60	0.69	0.75	3.00	3.04	7.60	7.71	2.30	0.86	0.63	28.45	6.31	4.44	25.09	24.40	23.65	20.65	17.61	10.01
1973	0.62	0.57	0.61	0.63	0.52	0.85	1.70	4.02	2.84	0.96	0.49	0.46	14.27	3.80	2.00	11.52	10.89	10.37	9.52	7.82	3.80
1974	0.46	1.11	0.86	1.37	0.76	1.88	4.82	7.31	9.15	3.14	1.02	0.59	32.47	6.44	4.01	28.43	27.06	26.30	24.42	19.60	12.29
1975	0.57	0.56	0.51	0.57	0.52	0.99	1.33	5.15	6.98	3.94	0.91	0.56	22.59	3.72	2.08	19.48	18.91	18.39	17.40	16.07	10.92
1976	0.64	0.67	0.91	0.66	0.68	0.89	2.99	6.66	3.92	1.55	0.82	0.69	21.08	4.45	2.23	17.35	16.69	16.01	15.12	12.13	5.47
1977	0.59	0.47	0.45	0.41	0.38	0.45	0.96	1.09	1.24	0.49	0.35	0.35	7.23	2.75	1.24	5.02	4.61	4.23	3.78	2.82	1.73
1978	0.38	0.49	1.19	0.64	0.65	2.15	3.40	4.88	5.37	2.86	0.80	0.65	23.46	5.50	3.44	19.95	19.31	18.66	16.51	13.11	8.23
1979	0.52	0.46	0.47	0.43	0.49	0.96	1.44	4.12	2.51	0.74	0.48	0.38	13.00	3.33	1.88	10.69	10.26	9.77	8.81	7.37	3.25
1980	0.47	0.41	0.46	0.69	0.78	0.98	3.61	5.70	4.29	2.07	0.70	0.63	20.79	3.79	2.45	18.12	17.43	16.65	15.67	12.06	6.36
STATISTICS																					
N	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
Mean	0.54	0.59	0.66	0.62	0.62	1.09	2.87	5.29	4.54	1.67	0.64	0.49	19.64	4.12	2.34	16.72	16.10	15.47	14.38	11.51	6.22
Max.	0.97	1.48	2.43	1.38	1.47	3.00	7.61	9.36	9.15	4.13	1.24	0.78	32.47	7.10	4.44	28.43	27.20	26.31	24.69	19.60	12.29
Min.	0.37	0.35	0.37	0.37	0.37	0.45	0.96	1.09	0.97	0.45	0.31	0.30	7.23	2.60	1.24	5.02	4.61	4.23	3.78	2.82	1.42
Std. Dev.	0.12	0.18	0.35	0.24	0.22	0.46	1.25	1.76	1.92	0.90	0.20	0.11	5.78	1.11	0.74	5.26	5.10	4.99	4.76	4.02	2.70

TABLE 4-11

RUNOFF VOLUME SUMMARY (BASIN INCHES)

MORES CREEK ABOVE ROBIE CREEK NEAR ARROWROCK DAM
Runoff in Basin Inches
1.0 Basin Inch = 21,280 A.F. for 399 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1951	0.19	0.32	0.44	0.32	0.97	1.03	4.03	2.54	1.14	0.35	0.15	0.12	11.60	3.27	2.32	10.38	10.06	9.09	8.06	4.03	1.49
1952	0.31	0.29	0.53	0.33	0.50	0.78	6.10	4.00	1.46	0.43	0.15	0.12	15.00	2.74	1.61	13.60	13.27	12.77	11.99	5.89	1.89
1953	0.14	0.15	0.22	0.71	0.76	1.08	2.50	2.26	2.32	0.53	0.15	0.10	10.92	3.06	2.55	10.16	9.45	8.69	7.61	5.11	2.85
1954	0.14	0.27	0.28	0.41	0.74	1.51	2.84	1.93	1.00	0.36	0.13	0.10	9.71	3.35	2.66	8.79	8.38	7.64	6.13	3.29	1.36
1955	0.14	0.19	0.16	0.19	0.17	0.29	1.19	2.17	1.07	0.30	0.08	0.07	6.02	1.14	0.65	5.38	5.19	5.02	4.73	3.54	1.37
1956	0.13	0.29	1.76	1.29	0.66	2.04	4.72	3.31	1.54	0.38	0.16	0.13	16.41	6.17	3.99	13.94	12.65	11.99	9.95	5.23	1.92
1957	0.23	0.28	0.44	0.27	0.66	1.91	3.71	3.83	1.62	0.33	0.11	0.10	13.49	3.79	2.84	12.33	12.06	11.40	9.49	5.78	1.95
1958	0.19	0.19	0.28	0.30	0.88	1.14	3.35	4.20	1.74	0.37	0.15	0.13	12.92	2.98	2.32	11.98	11.68	10.80	9.66	6.31	2.11
1959	0.16	0.27	0.40	0.41	0.41	0.72	1.88	1.47	0.80	0.18	0.10	0.20	7.00	2.37	1.54	5.87	5.46	5.05	4.33	2.45	0.98
1960	0.29	0.23	0.21	0.22	0.37	1.33	2.64	1.77	0.88	0.17	0.10	0.10	8.31	2.65	1.92	7.38	7.16	6.79	5.46	2.82	1.05
1961	0.14	0.24	0.18	0.17	0.36	0.78	1.06	1.04	0.49	0.09	0.04	0.07	4.66	1.87	1.31	3.99	3.82	3.46	2.68	1.62	0.58
1962	0.16	0.20	0.24	0.30	0.41	0.58	2.74	1.59	0.88	0.20	0.05	0.06	7.41	1.89	1.29	6.70	6.40	5.99	5.41	2.67	1.08
1963	0.24	0.25	0.33	0.22	0.86	0.53	1.35	1.71	1.01	0.25	0.08	0.11	6.94	2.43	1.61	5.93	5.71	4.85	4.32	2.97	1.26
1964	0.14	0.28	0.21	0.25	0.24	0.43	2.08	2.21	1.29	0.31	0.10	0.13	7.67	1.55	0.92	6.81	6.56	6.32	5.89	3.81	1.60
1965	0.14	0.25	1.95	1.34	1.51	1.63	5.49	3.69	2.00	0.59	0.24	0.21	19.04	6.82	4.48	16.25	14.91	13.40	11.77	6.28	2.59
1966	0.23	0.28	0.24	0.35	0.24	0.77	1.31	0.89	0.37	0.10	0.04	0.05	4.87	2.11	1.36	4.03	3.68	3.44	2.67	1.36	0.47
1967	0.10	0.18	0.22	0.39	0.39	0.66	0.88	1.65	1.15	0.27	0.07	0.07	6.03	1.94	1.44	5.39	5.00	4.61	3.95	3.07	1.42
1968	0.14	0.17	0.16	0.21	0.79	0.83	0.70	0.77	0.49	0.11	0.17	0.13	4.67	2.30	1.83	3.90	3.69	2.90	2.07	1.37	0.60
1969	0.19	0.32	0.30	0.82	0.48	1.23	5.08	2.53	0.91	0.27	0.09	0.11	12.33	3.34	2.53	11.32	10.50	10.02	8.79	3.71	1.18
1970	0.16	0.17	0.22	1.19	0.86	1.49	1.51	2.71	1.74	0.49	0.14	0.14	10.82	4.09	3.54	9.99	8.80	7.94	6.45	4.94	2.23
1971	0.21	0.47	0.59	1.12	1.30	2.05	5.02	4.02	1.98	0.69	0.19	0.16	17.80	5.74	4.47	16.18	15.06	13.76	11.71	6.69	2.67
1972	0.22	0.25	0.32	0.69	0.62	3.94	3.15	3.35	2.12	0.43	0.16	0.16	15.41	6.04	5.25	14.30	13.61	12.99	9.05	5.90	2.55
1973	0.22	0.28	0.45	0.48	0.34	0.75	1.23	1.32	0.52	0.14	0.05	0.09	5.87	2.52	1.57	4.78	4.30	3.96	3.21	1.98	0.66
1974	0.16	0.41	0.47	0.86	0.52	2.62	4.89	3.18	2.12	0.45	0.15	0.09	15.92	5.04	4.00	14.64	13.78	13.26	10.64	5.75	2.57
1975	0.15	0.20	0.23	0.26	0.32	1.00	1.90	4.27	2.36	0.66	0.19	0.13	11.67	2.16	1.58	10.77	10.51	10.19	9.19	7.29	3.02
1976	0.24	0.29	0.50	0.37	0.39	0.69	3.13	2.69	0.95	0.27	0.20	0.17	9.89	2.48	1.45	8.49	8.12	7.73	7.04	3.91	1.22
1977	0.18	0.17	0.15	0.13	0.17	0.26	0.35	0.36	0.27	0.08	0.04	0.08	2.24	1.06	0.56	1.62	1.49	1.32	1.06	0.71	0.35
1978	0.12	0.22	0.79	0.56	0.75	2.46	2.65	1.94	1.19	0.39	0.13	0.16	11.36	4.90	3.77	9.94	9.38	8.63	6.17	3.52	1.58
1979	0.15	0.17	0.22	0.23	0.28	0.77	1.03	1.39	0.49	0.13	0.09	0.07	5.02	1.82	1.28	4.32	4.09	3.81	3.04	2.01	0.62
1980	0.15	0.19	0.24	0.46	0.82	1.22	2.61	2.48	1.43	0.41	0.14	0.17	10.32	3.08	2.50	9.43	8.97	8.15	6.93	4.32	1.84
STATISTICS																					
N	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.
Mean	0.18	0.25	0.42	0.49	0.59	1.22	2.70	2.38	1.24	0.32	0.12	0.12	10.04	3.16	2.30	8.95	8.46	7.87	6.65	3.94	1.57
Max.	0.31	0.47	1.95	1.34	1.51	3.94	6.10	4.27	2.36	0.69	0.24	0.21	19.04	6.82	5.25	16.25	15.06	13.76	11.99	7.29	3.02
Min.	0.10	0.15	0.15	0.13	0.17	0.26	0.35	0.36	0.27	0.08	0.04	0.05	2.24	1.06	0.56	1.62	1.49	1.32	1.06	0.71	0.35
Std. Dev.	0.05	0.07	0.42	0.35	0.32	0.80	1.58	1.10	0.61	0.17	0.05	0.04	4.39	1.53	1.23	4.03	3.80	3.60	3.10	1.79	0.76

TABLE 4-12

RUNOFF VOLUME SUMMARY (BASIN INCHES)

LUCKY PEAK TOTAL UNREGULATED INFLOW
Runoff in Basin Inches
1.0 Basin Inch =142,933 A.F. for 2,680 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1895	----	----	----	0.55	0.48	0.72	1.70	2.77	1.58	1.07	0.45	0.41	----	----	1.75	8.87	8.32	7.84	7.12	5.42	2.65
1896	0.40	0.38	0.36	0.51	0.47	1.10	2.06	3.89	10.24	2.70	0.57	0.40	23.08	3.22	2.08	20.97	20.46	19.99	18.89	16.83	12.94
1897	0.38	0.43	0.45	0.35	0.39	0.62	3.33	2.55	2.90	1.00	0.47	0.44	14.31	2.62	1.36	12.14	11.79	11.40	10.78	7.45	3.90
1898	0.44	0.45	0.43	0.24	0.47	0.83	1.76	2.24	2.09	0.82	0.32	0.27	10.36	2.86	1.54	8.45	8.21	7.74	6.91	5.15	2.91
1899	0.37	0.39	1.06	1.12	0.55	0.80	2.98	4.25	5.12	2.49	0.77	0.48	20.38	4.29	2.47	17.31	16.19	15.64	14.84	11.86	7.61
1900	0.59	0.63	0.68	0.88	0.70	2.14	2.66	3.57	2.10	0.59	0.37	0.36	15.27	5.62	3.72	12.64	11.76	11.06	8.92	6.26	2.69
1901	0.44	0.43	0.46	0.56	0.69	1.25	2.14	4.38	2.01	0.81	0.37	0.35	13.89	3.83	2.50	11.84	11.28	10.59	9.34	7.20	2.82
1902	0.40	0.39	0.53	0.43	0.63	0.62	1.49	2.47	2.01	0.75	0.35	0.29	10.36	3.00	1.68	8.40	7.97	7.34	6.72	5.23	2.76
1903	0.32	0.38	0.44	0.57	0.44	1.00	3.14	3.64	4.21	1.03	0.37	0.32	15.86	3.15	2.01	14.03	13.46	13.02	12.02	8.88	5.24
1904	0.41	0.47	0.47	0.87	0.76	1.85	4.56	5.80	3.65	1.41	0.50	0.31	21.06	4.83	3.48	18.90	18.03	17.27	15.42	10.86	5.06
1905	0.41	0.38	0.38	0.35	0.40	0.71	1.23	1.61	1.73	0.55	0.28	0.24	8.27	2.63	1.46	6.58	6.23	5.83	5.12	3.89	2.28
1906	0.30	0.29	0.28	0.36	0.40	0.71	2.36	3.00	2.43	1.14	0.37	0.29	11.93	2.34	1.47	10.40	10.04	9.64	8.93	6.57	3.57
1907	0.30	0.51	0.52	0.88	1.08	2.42	4.57	4.78	3.74	2.35	0.71	0.43	22.29	5.71	4.38	19.82	18.94	17.86	15.44	10.87	6.09
1908	0.41	0.39	0.44	0.47	0.44	0.99	2.67	2.59	2.27	1.38	0.45	0.39	12.89	3.14	1.90	10.81	10.34	9.90	8.91	6.24	3.65
1909	0.48	0.41	0.41	0.97	0.77	1.60	3.31	4.23	4.58	1.59	0.45	0.40	19.20	4.64	3.34	17.05	16.08	15.31	13.71	10.40	6.17
1910	0.44	1.40	0.87	0.56	0.47	3.97	4.27	3.58	2.17	0.77	0.39	0.39	19.28	7.71	5.00	15.79	15.23	14.76	10.79	6.52	2.94
1911	0.44	0.52	0.54	0.44	0.53	1.12	2.27	3.84	5.18	1.63	0.52	0.42	17.45	3.59	2.09	15.01	14.57	14.04	12.92	10.65	6.81
1912	0.47	0.47	0.44	0.55	0.53	0.70	2.39	4.79	4.74	1.22	0.58	0.46	17.34	3.16	1.78	14.92	14.37	13.84	13.14	10.75	5.96
1913	0.47	0.47	0.42	0.38	0.36	0.71	2.62	4.01	2.89	1.11	0.58	0.38	14.40	2.81	1.45	12.08	11.70	11.34	10.63	8.01	4.00
1914	0.44	0.56	0.43	0.50	0.52	1.51	3.28	3.87	2.15	0.87	0.41	0.37	14.91	3.96	2.53	12.70	12.20	11.68	10.17	6.89	3.02
1915	0.49	0.41	0.31	0.42	0.42	0.66	1.38	1.92	1.34	0.59	0.29	0.28	8.51	2.71	1.50	6.73	6.31	5.89	5.23	3.85	1.93
1916	0.30	0.32	0.37	0.35	0.44	1.38	3.88	3.94	4.16	2.06	0.56	0.38	18.14	3.16	2.17	16.21	15.86	15.42	14.04	10.16	6.22
1917	0.41	0.38	0.38	0.33	0.33	0.43	1.87	4.58	4.50	1.82	0.46	0.31	15.80	2.26	1.09	13.86	13.53	13.20	12.77	10.90	6.32
1918	0.32	0.35	0.90	0.80	0.54	1.27	2.42	2.87	3.24	0.79	0.39	0.36	14.25	4.18	2.61	11.93	11.13	10.59	9.32	6.90	4.03
1919	0.45	0.40	0.34	0.35	0.37	0.80	2.77	3.56	1.69	0.49	0.25	0.24	11.71	2.71	1.52	10.03	9.68	9.31	8.51	5.74	2.18
1920	0.34	0.40	0.37	0.47	0.47	0.62	1.32	3.15	2.33	0.82	0.28	0.27	10.84	2.67	1.56	9.18	8.71	8.24	7.62	6.30	3.15
1921	0.42	0.53	0.47	0.79	0.66	1.90	2.76	5.77	5.03	1.23	0.44	0.34	20.34	4.77	3.35	18.14	17.35	16.69	14.79	12.03	6.26
1922	0.39	0.55	0.63	0.43	0.37	0.80	2.24	5.26	4.62	1.04	0.46	0.34	17.13	3.17	1.60	14.76	14.33	13.96	13.16	10.92	5.66
1923	0.36	0.34	0.37	0.43	0.36	0.65	1.92	3.18	2.63	1.35	0.47	0.30	12.36	2.51	1.44	10.52	10.09	9.73	9.08	7.16	3.98
1924	0.43	0.37	0.36	0.34	0.51	0.44	0.95	1.70	0.54	0.25	0.17	0.18	6.24	2.45	1.29	4.73	4.39	3.88	3.44	2.49	0.79
1925	0.27	0.38	0.30	0.34	0.91	1.35	3.51	4.90	2.57	1.07	0.42	0.33	16.35	3.55	2.60	14.65	14.31	13.40	12.05	8.54	3.64
1926	0.41	0.36	0.44	0.34	0.45	0.98	1.63	1.73	0.73	0.30	0.22	0.21	7.80	2.98	1.77	6.16	5.82	5.37	4.39	2.76	1.03
1927	0.24	0.47	0.59	0.44	0.75	1.30	2.62	4.62	5.11	1.64	0.52	0.40	18.70	3.79	2.49	16.48	16.04	15.29	13.99	11.37	6.75
1928	0.47	1.00	0.69	0.63	0.55	1.93	2.21	5.96	2.14	0.81	0.36	0.27	17.02	5.27	3.11	14.23	13.60	13.05	11.12	8.91	2.95
1929	0.35	0.35	0.33	0.33	0.34	0.75	1.25	2.52	2.00	0.68	0.25	0.22	9.37	2.45	1.42	7.87	7.54	7.20	6.45	5.20	2.68

TABLE 4-12 (Cont'd)

RUNOFF VOLUME SUMMARY (BASIN INCHES)

LUCKY PEAK TOTAL UNREGULATED INFLOW
Runoff in Basin Inches
1.0 Basin Inch =142,933 A.F. for 2,680 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-JUL	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1930	0.28	0.26	0.49	0.31	0.45	0.72	1.92	2.07	1.80	0.54	0.31	0.25	9.40	2.51	1.48	7.81	7.50	7.05	6.33	4.41	2.34
1931	0.38	0.32	0.31	0.31	0.32	0.64	1.24	1.76	0.78	0.24	0.17	0.17	6.64	2.28	1.27	5.29	4.98	4.66	4.02	2.78	1.02
1932	0.22	0.22	0.25	0.27	0.26	0.95	2.35	3.95	3.21	1.08	0.40	0.30	13.46	2.17	1.48	12.07	11.80	11.54	10.59	8.24	4.29
1933	0.27	0.40	0.28	0.31	0.29	0.45	1.67	2.39	3.77	0.74	0.31	0.23	11.11	2.00	1.05	9.62	9.31	9.02	8.57	6.90	4.51
1934	0.29	0.33	0.39	0.56	0.55	1.06	1.75	1.43	0.60	0.25	0.16	0.18	7.55	3.18	2.17	6.20	5.64	5.09	4.03	2.28	0.85
1935	0.26	0.35	0.36	0.37	0.38	0.58	2.10	3.00	2.54	0.69	0.27	0.21	11.11	2.30	1.33	9.66	9.29	8.91	8.33	6.23	3.23
1936	0.24	0.27	0.26	0.31	0.33	0.70	4.04	4.38	2.23	0.55	0.30	0.27	13.88	2.11	1.34	12.54	12.23	11.90	11.20	7.16	2.78
1937	0.28	0.26	0.29	0.26	0.29	0.63	1.45	2.67	1.25	0.42	0.18	0.18	8.16	2.01	1.18	6.97	6.71	6.42	5.79	4.34	1.67
1938	0.25	0.35	0.81	0.47	0.50	1.34	3.53	4.98	3.90	1.41	0.50	0.33	18.37	3.72	2.31	16.13	15.66	15.16	13.82	10.29	5.31
1939	0.42	0.47	0.43	0.37	0.33	1.15	2.30	2.39	0.95	0.42	0.20	0.21	9.64	3.17	1.85	7.91	7.54	7.21	6.06	3.76	1.37
1940	0.28	0.27	0.34	0.38	0.53	1.41	2.49	3.04	1.59	0.45	0.22	0.28	11.28	3.21	2.32	9.89	9.51	8.98	7.57	5.08	2.04
1941	0.37	0.42	0.40	0.38	0.46	0.79	1.32	2.56	1.87	0.60	0.38	0.29	9.84	2.82	1.63	7.98	7.60	7.14	6.35	5.03	2.47
1942	0.34	0.44	0.75	0.44	0.44	0.61	2.39	2.28	2.54	0.97	0.33	0.25	11.78	3.02	1.49	9.67	9.23	8.79	8.18	5.79	3.51
1943	0.30	0.45	0.57	1.07	0.82	1.65	7.04	5.06	4.39	2.52	0.70	0.37	24.94	4.86	3.54	22.55	21.48	20.66	19.01	11.97	6.91
1944	0.43	0.49	0.39	0.35	0.37	0.48	1.15	2.12	1.73	0.74	0.30	0.25	8.80	2.51	1.20	6.94	6.59	6.22	5.74	4.59	2.47
1945	0.29	0.37	0.30	0.39	0.56	0.69	1.42	3.31	2.84	0.97	0.36	0.27	11.77	2.60	1.64	10.18	9.79	9.23	8.54	7.12	3.81
1946	0.32	0.38	0.52	0.56	0.46	1.53	4.48	4.56	2.65	0.88	0.40	0.32	17.06	3.77	2.55	15.12	14.56	14.10	12.57	8.09	3.53
1947	0.47	0.51	0.77	0.42	0.61	1.27	2.02	3.82	2.08	0.77	0.32	0.27	13.33	4.05	2.30	10.99	10.57	9.96	8.69	6.67	2.85
1948	0.39	0.40	0.39	0.46	0.42	0.51	1.85	3.54	3.22	0.77	0.31	0.26	12.52	2.57	1.39	10.77	10.31	9.89	9.38	7.53	3.99
1949	0.31	0.38	0.36	0.34	0.32	1.03	2.91	4.00	2.13	0.65	0.29	0.22	12.94	2.74	1.69	11.38	11.04	10.72	9.69	6.78	2.78
1950	0.34	0.40	0.36	0.44	0.52	1.08	2.82	3.94	3.84	1.67	0.54	0.34	16.29	3.14	2.04	14.31	13.87	13.35	12.27	9.45	5.51
1951	0.43	0.59	0.62	0.49	0.88	0.88	3.90	4.79	3.08	1.36	0.50	0.30	17.82	3.89	2.25	15.38	14.89	14.01	13.13	9.23	4.44
1952	0.55	0.44	0.61	0.48	0.54	0.72	4.74	6.31	3.63	1.20	0.48	0.35	20.05	3.34	1.74	17.62	17.14	16.60	15.88	11.14	4.83
1953	0.36	0.34	0.38	0.71	0.62	0.89	2.30	2.82	4.12	1.78	0.51	0.34	15.17	3.30	2.22	13.24	12.53	11.91	11.02	8.72	5.90
1954	0.31	0.42	0.40	0.45	0.65	1.05	2.67	4.18	2.38	1.25	0.46	0.29	14.51	3.28	2.15	12.63	12.18	11.53	10.48	7.81	3.63
1955	0.35	0.35	0.32	0.33	0.28	0.39	0.91	2.78	2.93	0.92	0.40	0.29	10.25	2.02	1.00	8.54	8.21	7.93	7.54	6.63	3.85
1956	0.36	0.48	1.44	1.03	0.73	1.60	4.45	5.89	4.08	1.32	0.44	0.39	22.21	5.64	3.36	19.10	18.07	17.34	15.74	11.29	5.40
1957	0.47	0.44	0.49	0.37	0.65	1.36	2.53	5.27	3.62	1.04	0.36	0.37	16.97	3.78	2.38	14.84	14.47	13.82	12.46	9.93	4.66
1958	0.38	0.36	0.41	0.38	0.85	0.87	2.27	6.62	3.51	1.00	0.43	0.38	17.46	3.25	2.10	15.50	15.12	14.27	13.40	11.13	4.51
1959	0.36	0.45	0.59	0.53	0.49	0.65	1.94	2.32	2.53	0.73	0.34	0.47	11.40	3.07	1.67	9.19	8.66	8.17	7.52	5.58	3.26
1960	0.61	0.43	0.34	0.36	0.45	1.21	2.51	2.62	2.33	0.57	0.32	0.32	12.07	3.40	2.02	10.05	9.69	9.24	8.03	5.52	2.90
1961	0.33	0.38	0.34	0.30	0.41	0.64	1.20	2.09	1.60	0.40	0.28	0.27	8.24	2.40	1.35	6.64	6.34	5.93	5.29	4.09	2.00
1962	0.36	0.36	0.36	0.38	0.55	0.58	2.85	2.84	2.98	1.00	0.40	0.35	13.01	2.59	1.51	11.18	10.80	10.25	9.67	6.82	3.98
1963	0.50	0.45	0.46	0.31	1.03	0.64	1.26	3.17	2.88	1.04	0.37	0.40	12.51	3.39	1.98	10.33	10.02	8.99	8.35	7.09	3.92
1964	0.37	0.47	0.36	0.36	0.38	0.50	1.83	3.20	2.85	1.07	0.35	0.37	12.11	2.44	1.24	10.19	9.83	9.45	8.95	7.12	3.92

TABLE 4-12 (Cont'd)

RUNOFF VOLUME SUMMARY (BASIN INCHES)

LUCKY PEAK TOTAL UNREGULATED INFLOW
Runoff in Basin Inches
1.0 Basin Inch =142,933 A.F. for 2,680 Square Mile Basin

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT-SEP	OCT-MAR	JAN-MAR	JAN-	FEB-JUL	MAR-JUL	APR-JUL	MAY-JUL	JUN-JUL
1965	0.33	0.38	1.81	1.12	1.28	1.30	4.37	5.85	5.45	2.37	0.83	0.54	25.63	6.22	3.70	21.[illegible]	20.62	19.34	18.04	13.67	7.82
1966	0.46	0.43	0.37	0.44	0.33	0.69	1.74	2.29	1.25	0.38	0.27	0.26	8.91	2.72	1.46	7.12	6.68	6.35	5.66	3.92	1.63
1967	0.28	0.33	0.34	0.46	0.42	0.58	0.97	3.38	3.68	1.24	0.34	0.32	12.34	2.41	1.46	10.73	10.27	9.85	9.27	8.30	4.92
1968	0.41	0.39	0.35	0.33	0.69	0.83	1.07	1.81	1.95	0.53	0.51	0.39	9.26	3.00	1.85	7.21	6.88	6.19	5.36	4.29	2.48
1969	0.44	0.55	0.44	0.90	0.61	1.01	4.58	5.07	2.77	0.90	0.36	0.34	17.97	3.95	2.52	15.84	14.94	14.33	13.32	8.74	3.67
1970	0.39	0.33	0.37	0.89	0.71	1.04	1.33	4.04	4.00	1.44	0.43	0.38	15.35	3.73	2.64	13.45	12.56	11.85	10.81	9.48	5.4[illegible]
1971	0.42	0.68	0.70	1.09	1.17	1.48	3.84	6.45	4.96	2.08	0.63	0.45	23.95	5.54	3.74	21.07	19.98	18.81	17.33	13.49	7.04
1972	0.48	0.43	0.46	0.71	0.71	3.12	2.76	5.26	5.22	1.46	0.50	0.43	21.54	5.91	4.54	19.24	18.53	17.82	14.70	11.94	6.68
1973	0.47	0.43	0.49	0.52	0.41	0.65	1.26	2.44	1.59	0.53	0.29	0.32	9.40	2.97	1.58	7.40	6.88	6.47	5.82	4.56	2.12
1974	0.33	0.68	0.63	0.92	0.64	1.82	4.20	5.15	5.51	1.67	0.55	0.38	22.48	5.02	3.38	19.91	18.99	18.35	16.53	12.33	7.18
1975	0.42	0.39	0.38	0.42	0.45	1.02	1.43	4.33	4.87	2.42	0.59	0.39	17.11	3.08	1.89	14.94	14.52	14.07	13.05	11.62	7.29
1976	0.49	0.46	0.62	0.50	0.53	0.76	2.68	4.46	2.35	0.88	0.48	0.48	14.69	3.36	1.79	12.16	11.66	11.13	10.37	7.69	3.23
1977	0.42	0.34	0.32	0.31	0.29	0.31	0.53	0.66	0.70	0.33	0.21	0.20	4.62	1.99	0.91	3.13	2.82	2.53	2.22	1.69	1.03
1978	0.28	0.32	0.73	0.57	0.63	1.55	2.67	3.30	3.29	1.61	0.46	0.47	15.88	4.08	2.75	13.62	13.05	12.42	10.87	8.20	4.90
1979	0.38	0.33	0.34	0.34	0.38	0.74	0.98	2.45	1.39	0.41	0.31	0.27	8.32	2.51	1.46	6.69	6.35	5.97	5.23	4.25	1.80
1980	0.31	0.28	0.32	0.51	0.64	0.87	2.54	4.00	2.85	1.27	0.41	0.42	14.42	2.93	2.02	12.68	12.17	11.53	10.66	8.12	4.12
STATISTICS																					
N	85.	85.	85.	86.	86.	86.	86.	86.	86.	86.	86.	86.	85.	85.	86.	86.	86.	86.	86.	86.	86.
Mean	0.38	0.43	0.49	0.51	0.54	1.04	2.47	3.62	2.96	1.07	0.40	0.33	14.27	3.38	2.09	12.20	11.70	11.16	10.12	7.65	4.03
Max.	0.61	1.40	1.81	1.12	1.28	3.97	7.04	6.62	10.24	2.70	0.83	0.54	25.63	7.71	5.00	22.55	21.48	20.66	19.01	16.83	12.94
Min.	0.22	0.22	0.25	0.24	0.26	0.31	0.53	0.66	0.54	0.24	0.16	0.17	4.62	1.99	0.91	3.13	2.82	2.53	2.22	1.69	0.79
Std. Dev.	0.08	0.15	0.24	0.22	0.20	0.58	1.15	1.31	1.50	0.57	0.13	0.08	4.70	1.10	0.85	4.36	4.20	4.09	3.78	3.00	2.00

TABLE 7-3
OPERATIONAL RULE CURVE (PLATE 7-1) ASSURANCES

FLOOD CONTROL ASSURANCES
(Control to 6,500 cfs at Glenwood Bridge)

FORECAST DATE (THRU 31 JULY)	ASSUMED VOLUME FORECAST ERROR (UNDER FORECAST) (ACRE-FEET)	PERCENT CHANCE OF: VOLUME ERROR (SMALLER VOLUME)	LESS CRITICAL TIMING SEQUENCE
1 January	860,000	99	98
16 January	780,000	99	98
1 February	700,000	99	98
15 February	640,000	99	98
1 March	580,000	99	98
16 March	490,000	99	98
1 April	400,000	99	98
16 April	380,000	99	98
1 May	370,000	99	98
16 May	360,000	99	98
1 June	350,000	99	80
16 June	310,000	98	50

REFILL ASSURANCES
(TOTAL SYSTEM - 974,149 ACRE-FEET)

FORECAST DATE (THRU 31 JULY)	ASSUMED VOLUME FORECAST ERROR (UNDER FORECAST) (ACRE-FEET)	PERCENT CHANCE OF: VOLUME ERROR (SMALLER VOLUME)	LESS CRITICAL TIMING SEQUENCE
1 January	610,000	95	98
16 January	550,000	95	98
1 February	490,000	95	98
15 February	450,000	95	98
1 March	410,000	95	98
16 March	350,000	95	98
1 April	280,000	95	98
16 April	270,000	95	98
1 May	140,000	80	50
16 May	110,000	75	50
1 June	40,000	60	50
16 June	10,000	52	50

TABLE 7-4
SUMMARY OF STEWART AND BRYAN DECREE FILINGS BY CANAL

Name of Canal		Total Filing (cfs)
Andrew Ditch		23.50
Ballentyne		15.3526
Baxter		4.00
Boise City		36.3745
Boise Valley		55.78
Boone Ditch		12.70
Bowman & Swisher		9.38
Bubb (South Boise Mutual)		21.14
Caldwell Highline		79.20
Campbell (Canyon Ditch Company)		28.14
Canyon County		80.37
Davis (Little Davis)		13.94
Eagle Islands Canals		54.02
Aiken	5.20	
Conway & Hamming	5.70	
Graham & Gilbert	4.40	
Hart & Davis	9.96	
Lemp Ditch	6.00	
Mace & Catlin	10.92	
Mace & Mace	1.76	
Seven Suckers	1.28	
Warm Springs Slough	8.80	
Eureka No. 1		33.32
Eureka No. 2		50.00
Farmers Union		191.4995
Haas Ditch		17.34
Island High Line		20.00
Little Pioneer		26.82
Lower Center Point		19.60
Mammon		9.36
Meeves		1.80
Middleton Mill		64.562
Middleton Water		112.794
Miscellaneous		11.40
R.B. Betty	0.10	
Crawforth Pump	1.60	
Boise River	1.60	
Drainage District #4	1.04	
Manville-Leonard	3.50	
McCurry Pump	0.56	
Surprise Valley Farms	3.00	
New Dry Creek		62.0842
New Union		13.76
New York Main		2904.58 1/
Parma Ditch		12.76
Penitentiary		2.24
Phyllis		692.215
Pioneer Dixie		58.50
Ridenbaugh		535.14
Riverside		290.374
Roedel Ditch		3.20
Rossi Mill		10.00
Sebree (Farmers Co-op)		318.59
Settlers		186.443
Siebenberg		12.28
Thurman Mill		35.652
Upper Center Point		14.82
	TOTAL	6145.0038

This data is taken from 1973, "Watermaster Report," Water Distribution of Boise River, District No. 63. Details on individual rights are identified in detail in that report.

1/ 300 cfs of New York Main Canal not decreed

TABLE 7-5
ANDERSON RANCH STORAGE WATER ALLOCATIONS

NAME	ACRE FEET OF STORAGE WATER		PERCENT OF SPACE
Boise-Kuna Irrigation District	112,149		26.83
New York Irrigation District	41,006		9.81
Wilder Irrigation District	125,108		29.93
Big Bend Irrigation District	3,887		.93
Nampa & Meridian	77,784		18.61
Total Board of Control		359,934	
Ridenbaugh	15,137		3.62
Pioneer Irrigation District	25,582		6.12
Farmers Union Ditch Co.	5,727		1.37
New Dry Creek Ditch Co.	1,296		.31
Settlers Irrigation District	5,810		1.39
Boise Valley Irrigation Ditch Co.	961		.23
South Boise Mutual Irrigation Co.	543		.13
Ballentyne Ditch Co.	376		.09
Capitol View Irrigation District	460		.11
Pioneer Ditch Company	2,174		.52
TOTAL	418,000		100.00
POWER	5,200		

TABLE 7-6
ARROWROCK STORAGE WATER ALLOCATIONS

NAME	ACRE FEET OF STORAGE WATER	PERCENT OF SPACE
Boise Project Board of Control	177,816	62.01
Nampa & Meridian	55,055	19.25
Pioneer Irrigation District	21,018	7.333
Farmers Union Ditch Co.	2,874	1.000
Settlers Irrigation District	1,778	.62
Farmers Co-op Canal Co.	1,227	.428
Ridenbaugh Canal	3,832	1.337
Hillcrest	23,000	8.02
TOTAL	286,600	99.998

TABLE 7-7

LUCKY PEAK STORAGE WATER ALLOCATIONS

NAME	ACRE FEET OF STORAGE WATER	PERCENT OF SPACE
Ballentyne	1,300	0.492
Boise City	1,000	0.378
Boise Valley	2,500	0.946
Bubb (South Boise Mutual)	500	0.189
Canyon County	6,000	2.271
Capital View Irrig. Dist.	300	0.114
Davis Ditch (Village of Garden City)	1,500	0.568
Eagle Island Water Co.	7,650	2.895
Eureka Water Co. #1	2,800	1.060
Farmers Union	10,000	3.784
Little Pioneer	500	0.189
Middleton Irrig. Assn.	6,380	2.414
Middleton Mill	4,620	1.748
New Dry Creek	3,000	1.135
New Union	1,400	0.530
Phyllis (Pioneer Irrig. Dist.)	16,000	6.055
Ridenbaugh	35,000	13.245
Rossi Mill (South Boise Water)	700	0.265
Settlers	10,000	3.784
Thurman Mill	800	0.303
Idaho Fish & Game	50,000	18.921
Streamflow Maintenance	102,300	38.713
TOTAL	264,250	100.0

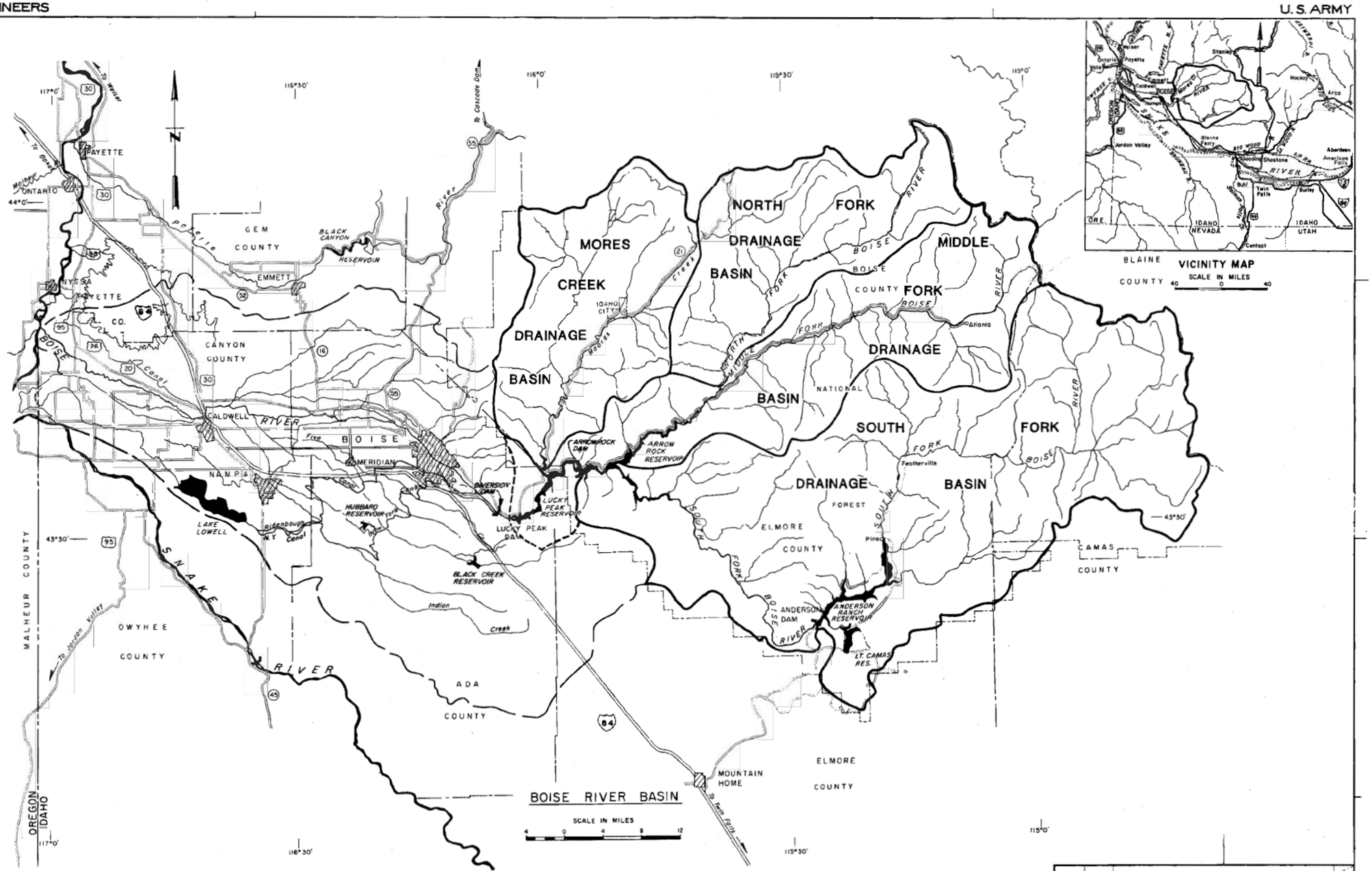
TABLE 8-1

BOISE BASIN - NATURAL AND REGULATED PEAK DISCHARGES

WATER YEAR	NATURAL			REGULATED		
	MONTH	DAY	DISCHARGE (cfs)	MONTH	DAY	DISCHARGE (cfs)
1955	Jun	10	10478	Aug	1	1880
1956	May	25	22949	Mar	10	7010
1957	May	21	16930	Jun	8	6910
1958	May	22	21745	May	13	6620
1959	May	16	9040	Apr	16	1830
1960	May	13	11842	Apr	10	5840
1961	May	27	7830	Apr	28	1580
1962	Apr	21	11343	Jul	1	1600
1963	May	24	11480	May	25	5920
1964	May	21	10938	Jun	21	4690
1965	Dec	24	27294	May	22	7240
1966	May	10	8225	Apr	5	1770
1967	May	25	15598	Jul	5	1640
1968	Jun	4	7048	Apr	23	1870
1969	Apr	24	15935	Apr	22	5330
1970	May	28	14847	Jun	30	5300
1971	May	14	20253	Apr	23	6880
1972	Jun	2	19559	Apr	14	6810
1973	May	20	9555	May	26	1680
1974	May	9	18469	Jun	19	8130
1975	May	17	20618	May	19	6900
1976	May	12	13732	Apr	30	5870
1977	Jun	9	3190	Apr	25	1290
1978	Jun	10	11896	Apr	29	5460
1979	May	25	9622	May	25	1560
1980	May	7	12958	Jun	22	5650

CORPS OF ENGINEERS

U.S. ARMY



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

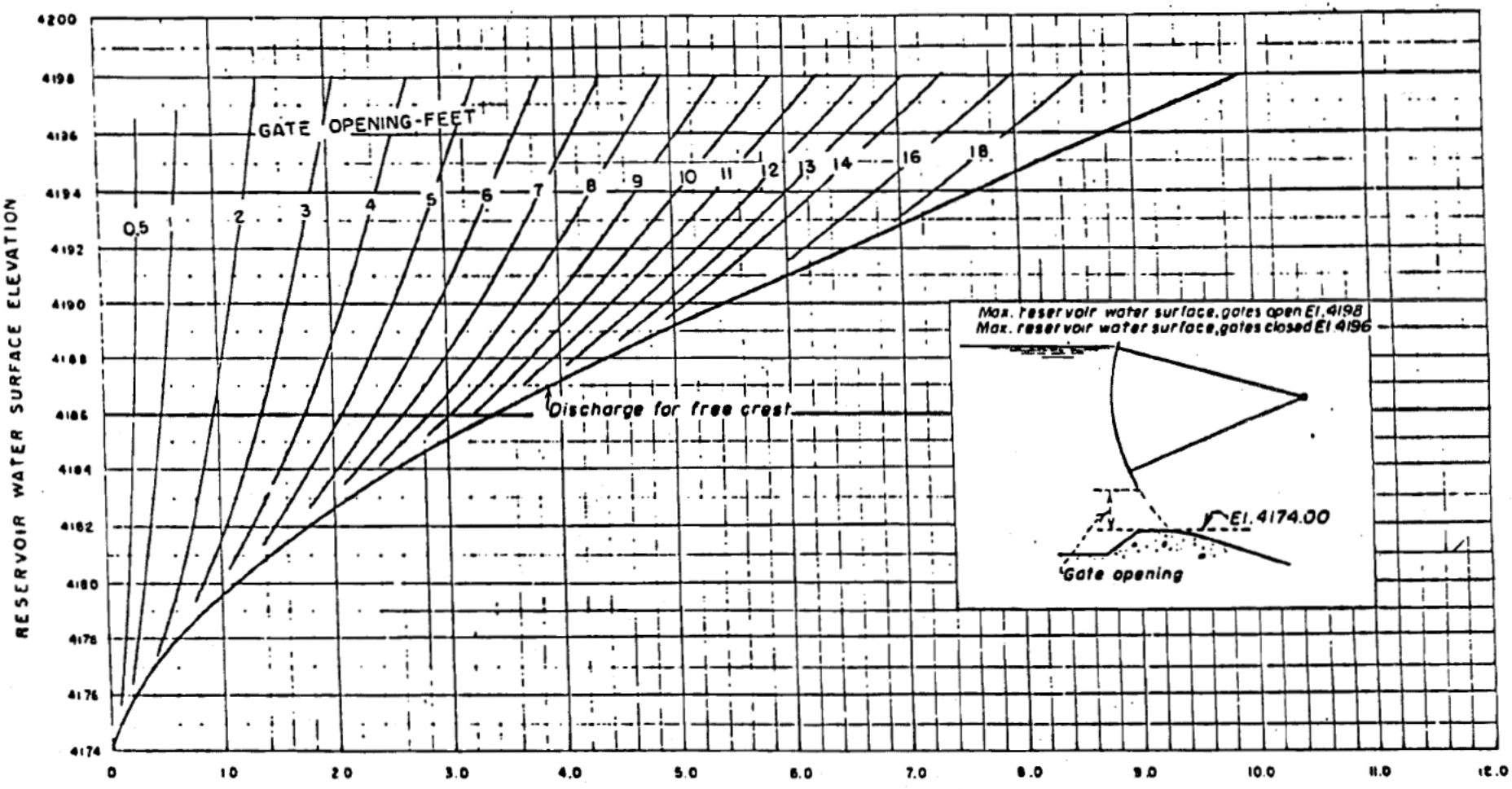
DESIGNED: D. Reese
DRAWN: F. Spaulding
CHECKED: D. Reese
SUPERVISED: CHIEF, DES. BR. SEC.
SUBMITTED: CHIEF, HYDROLOGY BRANCH
CHIEF, PLANNING DIVISION

BOISE RIVER BASIN
LOCATION MAP

DATE: April 1983
SCALE AS SHOWN
INV. NO.
FILE NO. B0-05-6/1
SHEET 1 of 2

PLATE 2-1

VALUE ENGINEERING PAYS



NOTES

Installation consists of 2-25'x 22' radial gates.
For normal operation, flow must be maintained equally under both gates.
Curves show discharge for one gate only. Discharges for free crest obtained from 1:48 scale model. Discharges for partial gate openings are computed.
Any variations in discharge from these curves as determined by measurements of flow downstream from the spillway should be reported to the Chief Engineer.

THIS DRAWING SUPERSEDES DWG 4-D-1409

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
BOISE PROJECT-IDAHO

ANDERSON RANCH DAM
SPILLWAY
DISCHARGE CURVES

DRAWN ... SUBMITTED ...
TRACED ... RECOMMENDED ...
CHECKED ... APPROVED ...
ACT. CHIEF OPERATING ENGINEER

DENVER, COLORADO SEPT 26, 1958 | 4-D-1460

PLATE 2-3

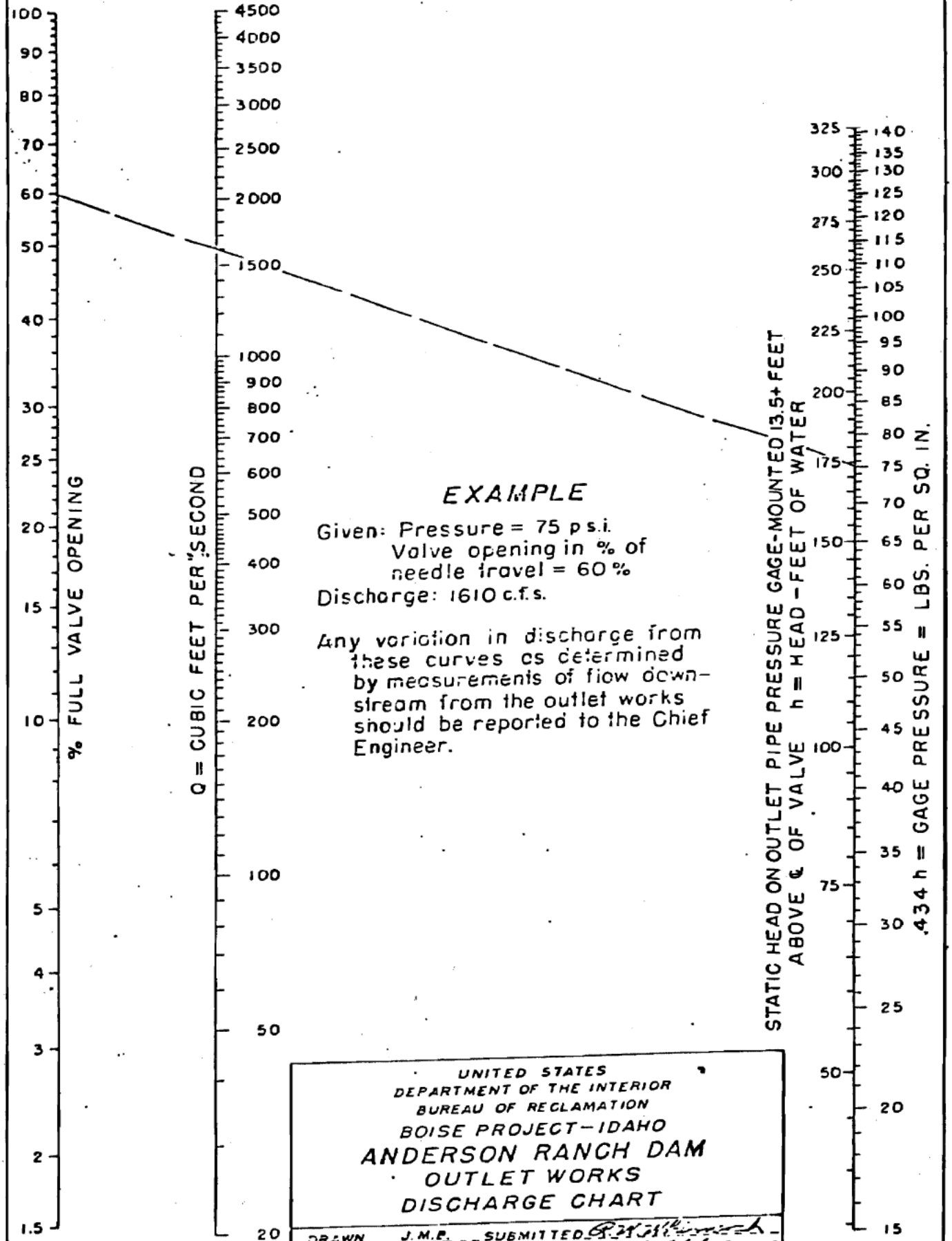
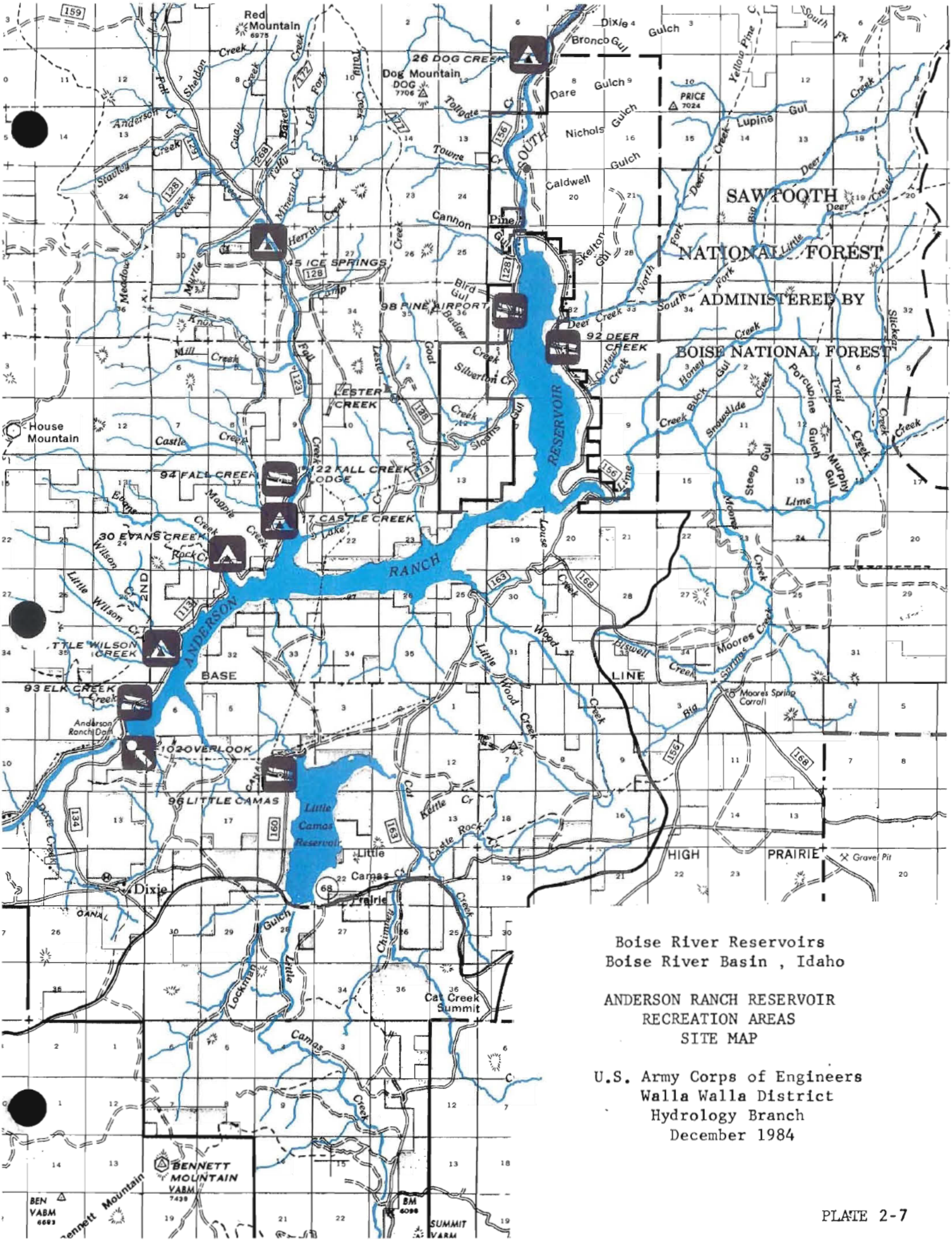

% FULL VALVE OPENING
Q = CUBIC FEET PER SECOND
STATIC HEAD ON OUTLET PIPE PRESSURE GAGE-MOUNTED 13.5+ FEET ABOVE ℄ OF VALVE h = HEAD - FEET OF WATER
.434 h = GAGE PRESSURE = LBS. PER SQ. IN.
EXAMPLE
Given: Pressure = 75 p.s.i.
Valve opening in % of needle travel = 60 %
Discharge: 1610 c.f.s.
Any variation in discharge from these curves as determined by measurements of flow downstream from the outlet works should be reported to the Chief Engineer.
Regulating valve - 72" Hollow jet valve
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
BOISE PROJECT - IDAHO
ANDERSON RANCH DAM
OUTLET WORKS
DISCHARGE CHART
DRAWN J.M.P. SUBMITTED
TRACED H.N.M. RECOMMENDED
CHECKED APPROVED
CHIEF DESIGNING ENGINEER
DENVER, COLORADO, 7-25-50
4-D-1407

PLATE 2-5

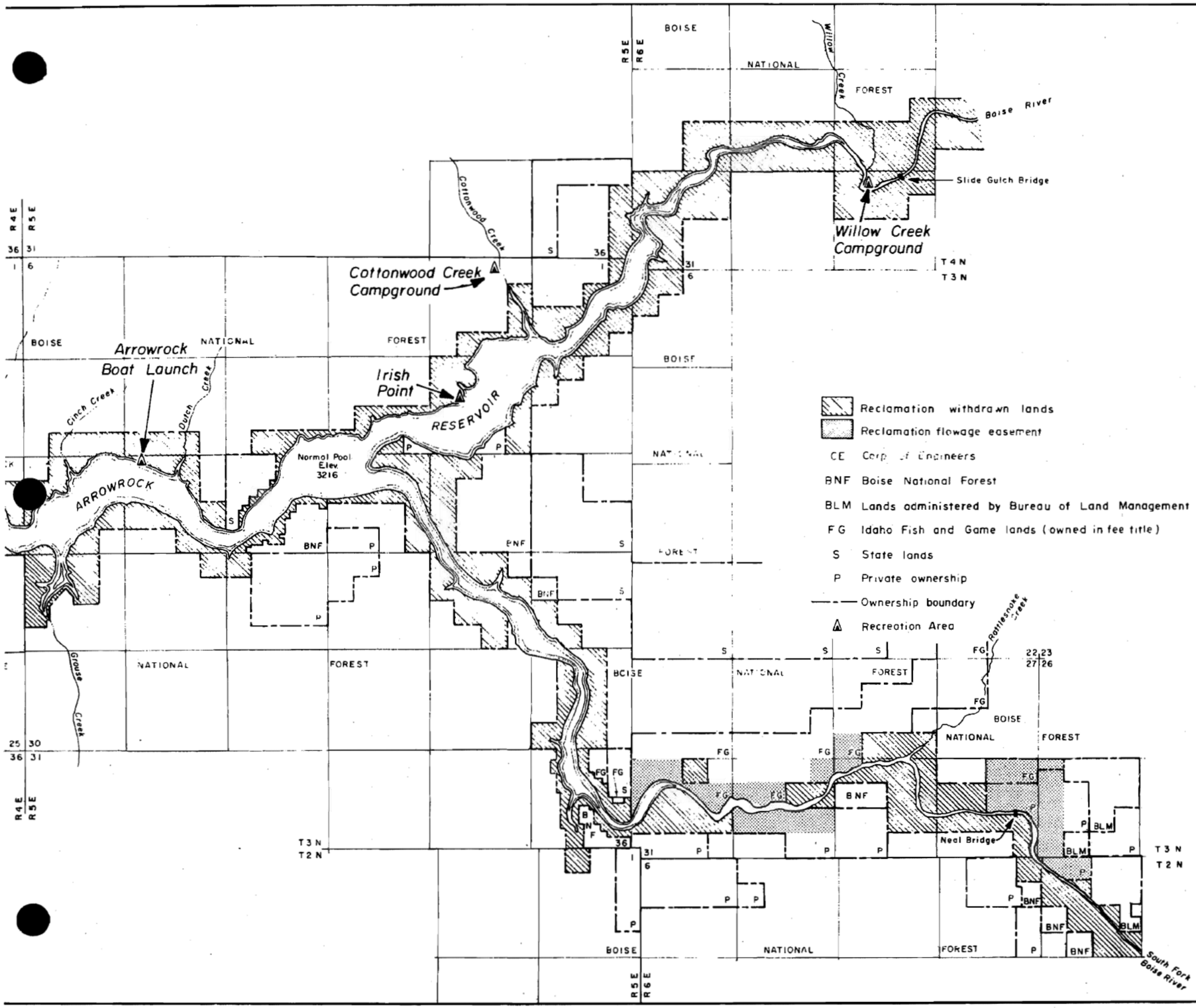


Boise River Reservoirs
Boise River Basin , Idaho

ANDERSON RANCH RESERVOIR
RECREATION AREAS
SITE MAP

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1984

PLATE 2-7

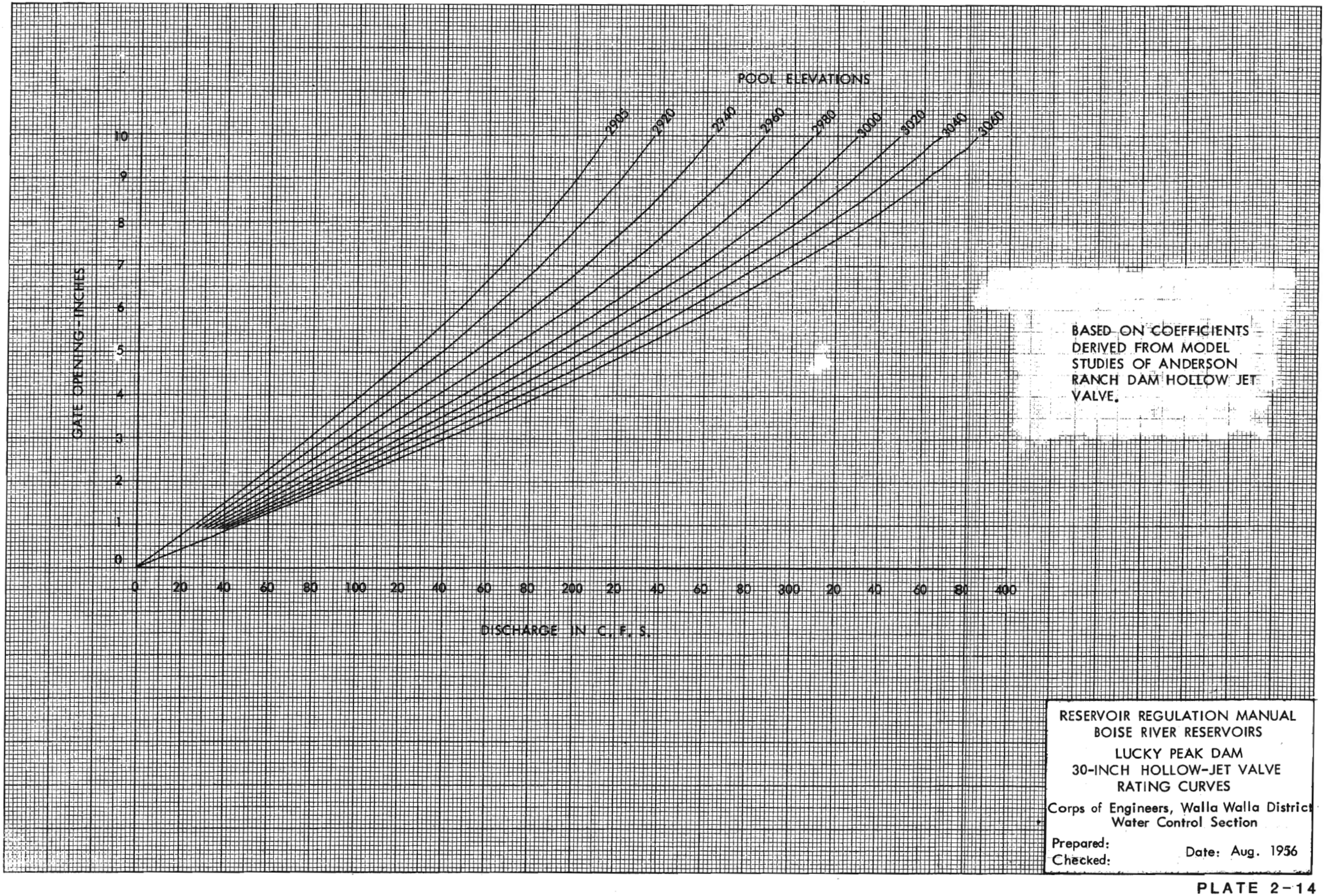


BOISE PROJECT - IDAHO, OREGON
POWER AND MODIFICATION STUDY
ARROWROCK RESERVOIR
OWNERSHIP MAP

February 1981 (Rev. June 1984)

1367-100-4

PLATE 2-10



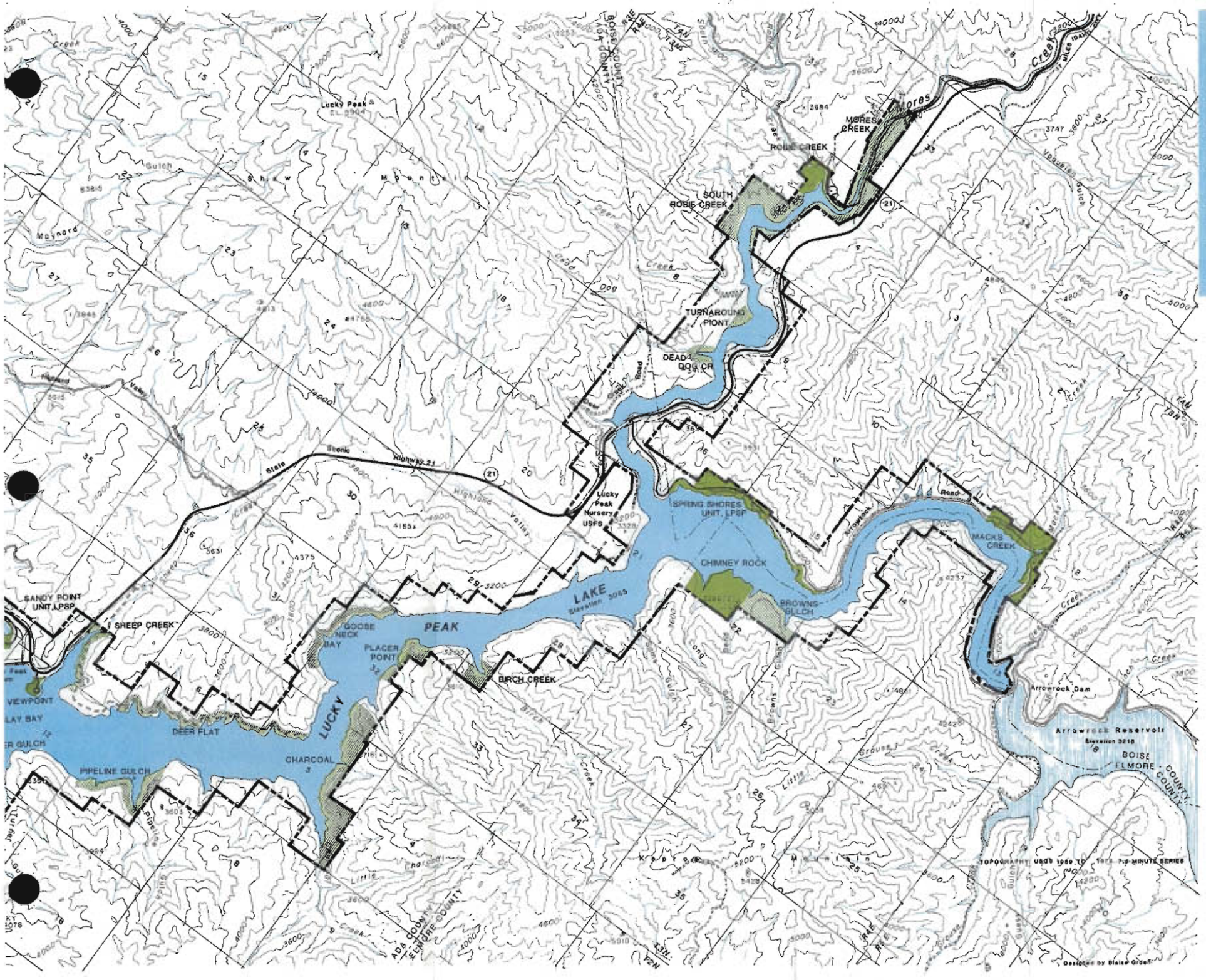
RESERVOIR REGULATION MANUAL
BOISE RIVER RESERVOIRS

LUCKY PEAK DAM
30-INCH HOLLOW-JET VALVE
RATING CURVES

Corps of Engineers, Walla Walla District
Water Control Section

Prepared:
Checked: Date: Aug. 1956

PLATE 2-14



RECREATION SITES

	electric tables	restroom	drinking water	food service	boat access only	parking (vehicles/cars)	marina	launching ramp	swimming	fishing
SANDY POINT UNIT, LPSP ▲	87	flush				324			beach	
BARCLAY BAY TURNER GULCH	9 / 3					207/60		1		
LUCKY PEAK VIEWPOINT	1					15				
DEER FLAT	19	2								
CHARCOAL	17									
PLACER POINT	6	2								
SPRING SHORES UNT, LPSP ▲	45	flush				208a/61	300	4	beach	
CHIMNEY ROCK	5									
MACKS CREEK	5					17a/21a		2		
ROBIE CREEK	10					37a/16		1	beach	
MINOR SITES	32									
DISCOVERY (IDAHO)										

▲ Leased to Idaho Department of Parks and Recreation
* Mores Creek and Lydle Gulch have road access

Boise River Reservoirs
Boise River Basin, Idaho

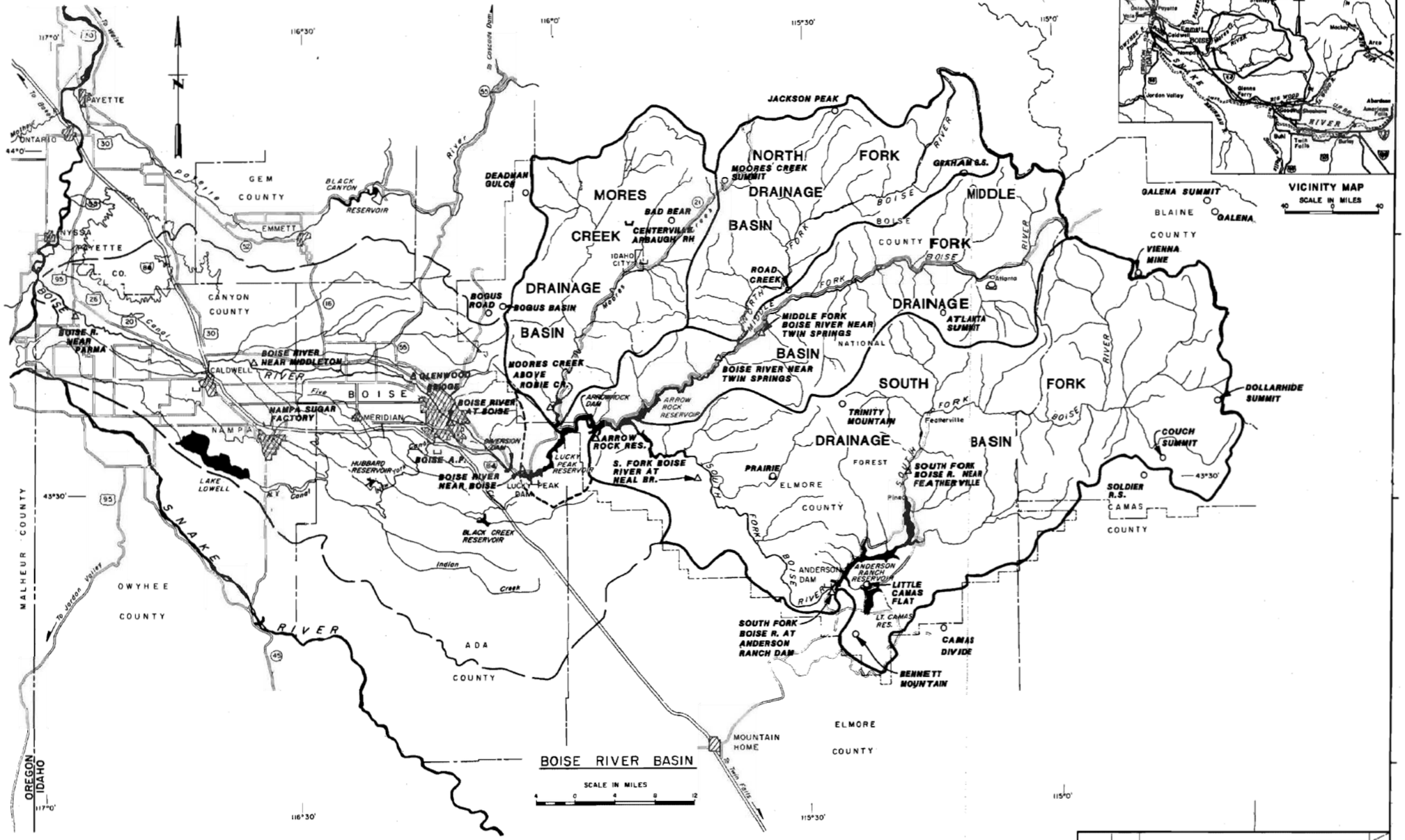
LUCKY PEAK LAKE RECREATION AREAS SITE MAP

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
1988

PLATE 2-15

CORPS OF ENGINEERS

U.S. ARMY



○ SNOW GAGE

⊔ PRECIPITATION GAGE

△ STREAM GAGE

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED D. Reese
DRAWN F. Spalding
CHECKED D. Reese
SUPERVISED
CHIEF, REG. BR. EC

BOISE RIVER BASIN
DATA STATION LOCATION MAP

SUBMITTED
CHIEF, HYDROLOGY BRANCH

DATE April 1982

CHIEF, PLANNING DIVISION

SCALE AS SHOWN | INV. NO.

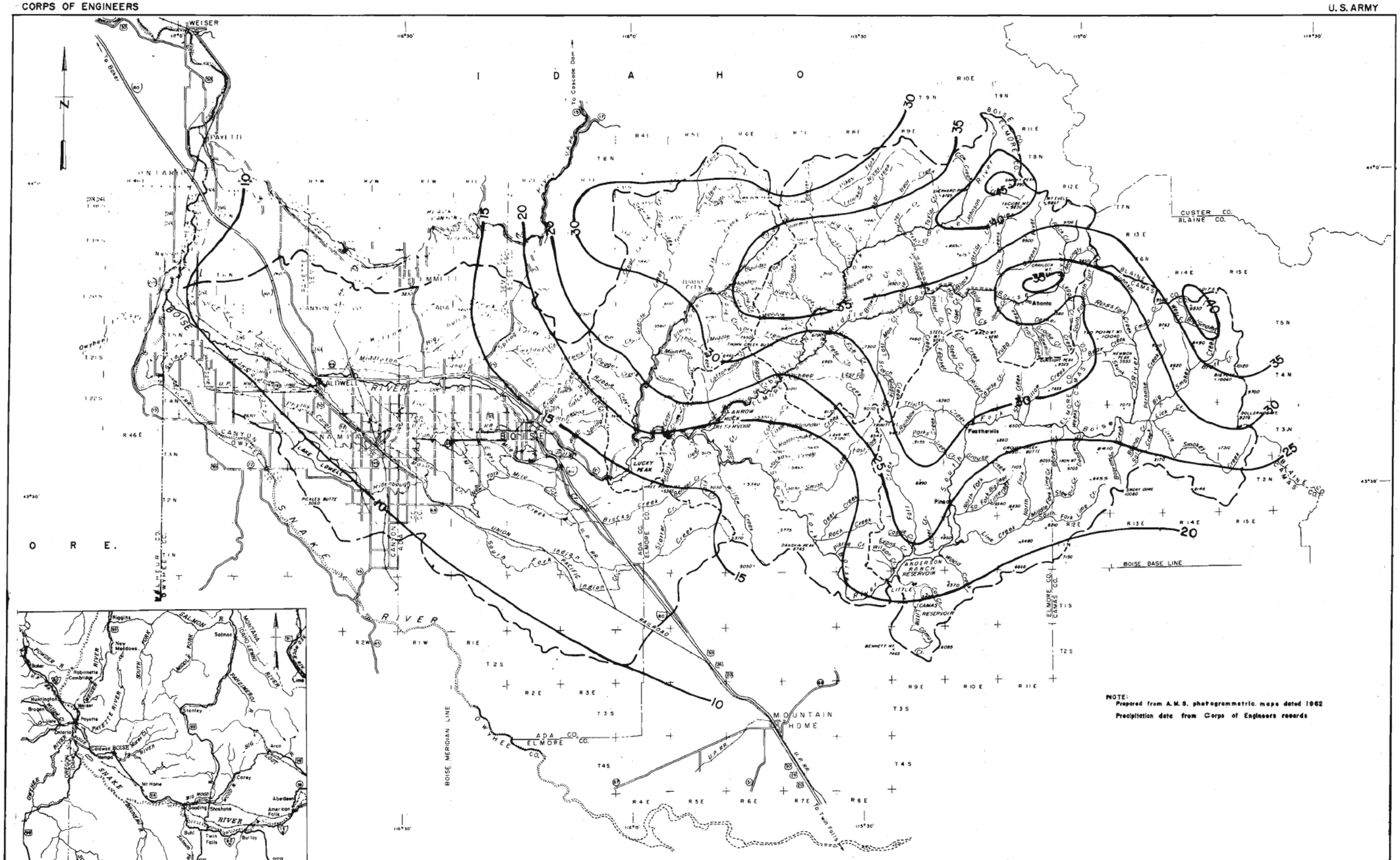
SHEET 2 of 2 | FILE NO. BO-05-6/2

VALUE ENGINEERING PAYS

PLATE 4-1

CORPS OF ENGINEERS

U.S. ARMY



VICINITY MAP

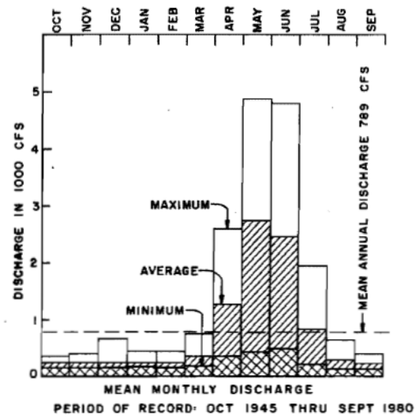
NOTE:
Prepared from A.M.S. photogrammetric maps dated 1962
Precipitation data from Corps of Engineers records

BOISE RIVER BASIN
ISOHYETAL MAP
AVERAGE ANNUAL PRECIPITATION

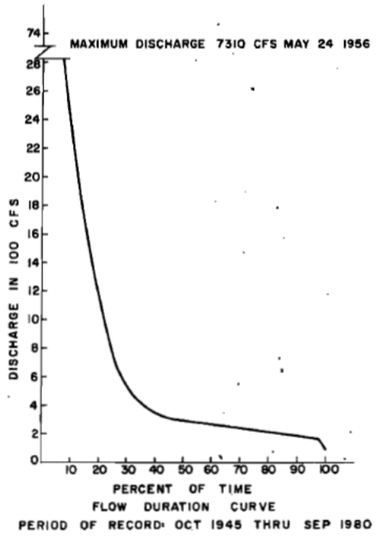
PLATE 4-2

NOTES:

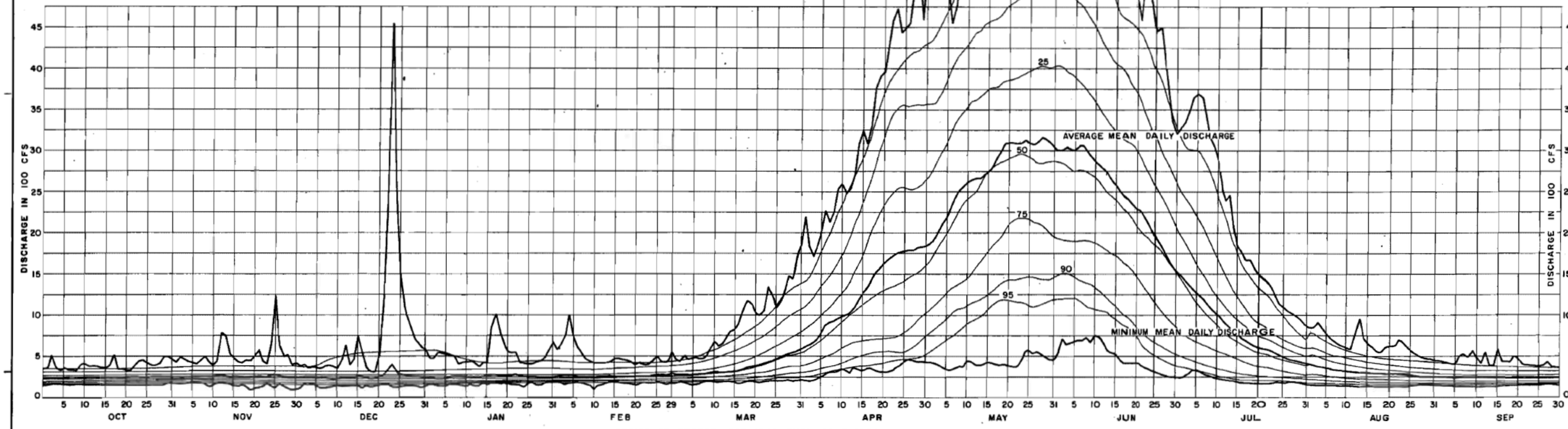
1. DISCHARGE RECORDS TAKEN FROM U.S.G.S. WATER RESOURCES DATA FOR IDAHO. STATION NUMBER 13.1060.00.
2. PERIOD OF RECORD: OCTOBER 1945 THROUGH SEPTEMBER 1980.
3. DRAINAGE AREA ABOVE STREAM GAGE IS 635 SQUARE MILES.



MEAN MONTHLY DISCHARGE
PERIOD OF RECORD: OCT 1945 THRU SEPT 1980



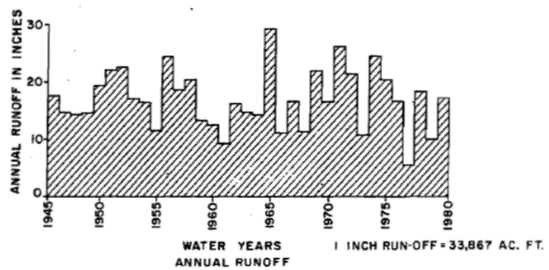
FLOW DURATION CURVE
PERIOD OF RECORD: OCT 1945 THRU SEP 1980



PERIOD OF RECORD: OCT 1945 THRU SEPT 1980

MAXIMUM ANNUAL MEAN DAILY DISCHARGES

WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.
1946	APR 26	4000	1955	JUN 9	3650	1964	MAY 21	3480	1973	MAY 19	3170
1947	MAY 9	4040	1956	MAY 24	7310	1965	JUN 12	6690	1974	MAY 28	5950
1948	MAY 28	4470	1957	JUN 5	5600	1966	MAY 9	2780	1975	JUN 7	5900
1949	MAY 16	3780	1958	MAY 21	7230	1967	MAY 24	5760	1976	MAY 15	4120
1950	MAY 23	4300	1959	MAY 15	2960	1968	JUN 3	2210	1977	JUN 10	748
1951	MAY 28	5190	1960	MAY 12	3970	1969	MAY 14	5760	1978	JUN 10	4300
1952	MAY 4	5360	1961	MAY 26	2650	1970	MAY 27	4750	1979	MAY 25	3190
1953	JUN 13	4470	1962	JUN 12	3390	1971	MAY 13	6390	1980	MAY 6	4100
1954	MAY 21	5080	1963	MAY 23	3980	1972	JUN 2	6090			



1 INCH RUN-OFF = 33,867 AC. FT.

REVISION	DATE	DESCRIPTION	BY

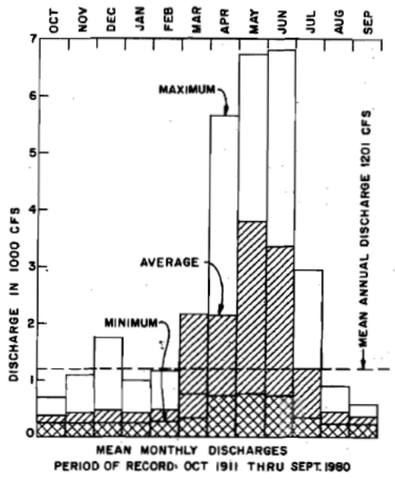
U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: V. Henry
CHECKED:
SUPERVISED:
SUBMITTED:
CHIEF, HYDROLOGY BRANCH
RECOMMENDED:
CHIEF, PLANNING DIVISION

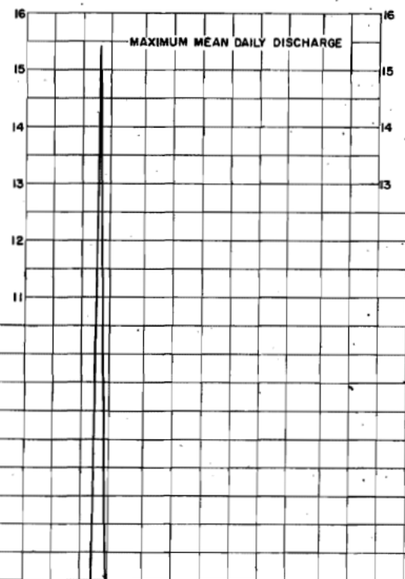
SOUTH FORK BOISE RIVER NEAR FEATHERVILLE

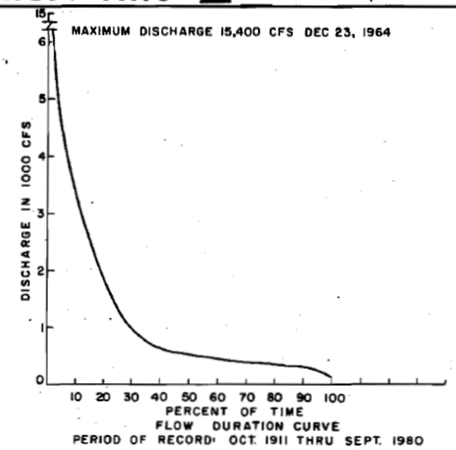
SUMMARY HYDROGRAPHS BOISE RIVER BASIN, IDAHO

DATE:
SCALE AS SHOWN
INV. NO.
FILE NO.
SHEET 3
BO-05-6/3



MEAN MONTHLY DISCHARGES
PERIOD OF RECORD: OCT 1911 THRU SEPT 1980





FLOW DURATION CURVE
PERIOD OF RECORD: OCT 1911 THRU SEPT. 1980

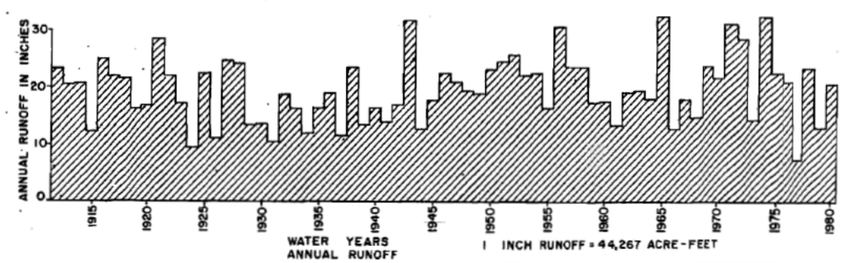
NOTES:

1. DISCHARGE RECORDS TAKEN FROM U.S.G.S. WATER RESOURCES DATA FOR IDAHO.
2. PERIOD OF RECORD OCTOBER 1911 THROUGH SEPTEMBER 1980.
3. DRAINAGE AREA ABOVE BOISE RIVER NEAR TWIN SPRINGS STREAM GAGE IS 830 SQUARE MILES.

PERIOD OF RECORD: OCT. 1911 THRU SEPT. 1980

MAXIMUM ANNUAL MEAN DAILY DISCHARGES

WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.
1912	JUN 13	7900	1930	MAY 29	3680	1948	MAY 28	7790	1966	MAY 7	3920
1913	MAY 28	7220	1931	MAY 7	2870	1949	MAY 16	6760	1967	MAY 24	7140
1914	MAY 23	5520	1932	MAY 14	7060	1950	MAY 23	6150	1968	JUN 3	3690
1915	MAY 19	3030	1933	JUN 14	6660	1951	MAY 28	6970	1969	MAY 15	6530
1916	JUN 19	7990	1934	MAR 29	3440	1952	APR 28	8610	1970	MAY 27	7090
1917	MAY 15	8390	1935	MAY 24	4780	1953	JUN 13	8390	1971	MAY 13	8430
1918	JUN 13	7590	1936	APR 23	8460	1954	MAY 21	7860	1972	JUN 1	9550
1919	MAY 29	7990	1937	MAY 5	3370	1955	JUN 9	5850	1973	MAY 19	5370
1920	MAY 16	5460	1938	MAY 1	8070	1956	MAY 24	10800	1974	JUN 16	9700
1921	MAY 17	8600	1939	APR 30	4120	1957	MAY 19	8410	1975	JUN 7	8070
1922	JUN 6	7660	1940	MAY 12	5020	1958	MAY 21	9980	1976	MAY 11	6890
1923	MAY 26	6080	1941	MAY 27	4290	1959	JUN 14	4830	1977	JUN 11	1400
1924	MAY 17	2850	1942	MAY 26	5800	1960	MAY 13	5700	1978	JUN 10	6020
1925	MAY 20	6860	1943	APR 19	8480	1961	MAY 26	9550	1979	MAY 24	4980
1926	MAY 5	3640	1944	MAY 15	3580	1962	APR 20	5160	1980	MAY 6	5990
1927	MAY 17	9400	1945	MAY 5	5220	1963	MAY 24	5430			
1928	MAY 10	8980	1946	APR 19	6950	1964	MAY 21	5660			
1929	MAY 24	5130	1947	MAY 9	7350	1965	DEC 23	15400			



WATER YEARS
ANNUAL RUNOFF

1 INCH RUNOFF = 44,267 ACRE-FEET

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Pease
DRAWN: V. Henry
CHECKED:
SUBMITTED: D. Pease
CHIEF, ENGR. DES. BR.

BOISE RIVER NEAR TWIN SPRINGS

SUMMARY HYDROGRAPHS

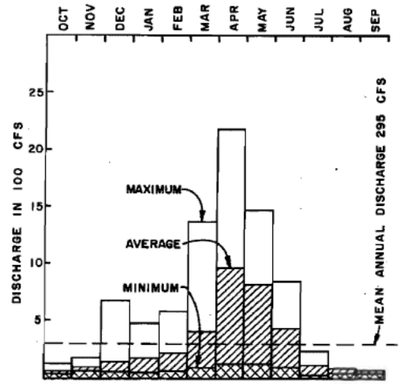
BOISE RIVER BASIN, IDAHO

SUBMITTED: R B Kidd
CHIEF, HYDROLOGY BRANCH
RECOMMENDED: Brian Berchin Jr
CHIEF, PLANNING DIVISION

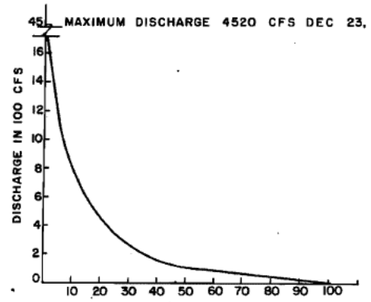
DATE: Sept. 1982
SCALE AS SHOWN
INV. NO.
FILE NO.
SHEET 4
BO-05-6/4

NOTES:

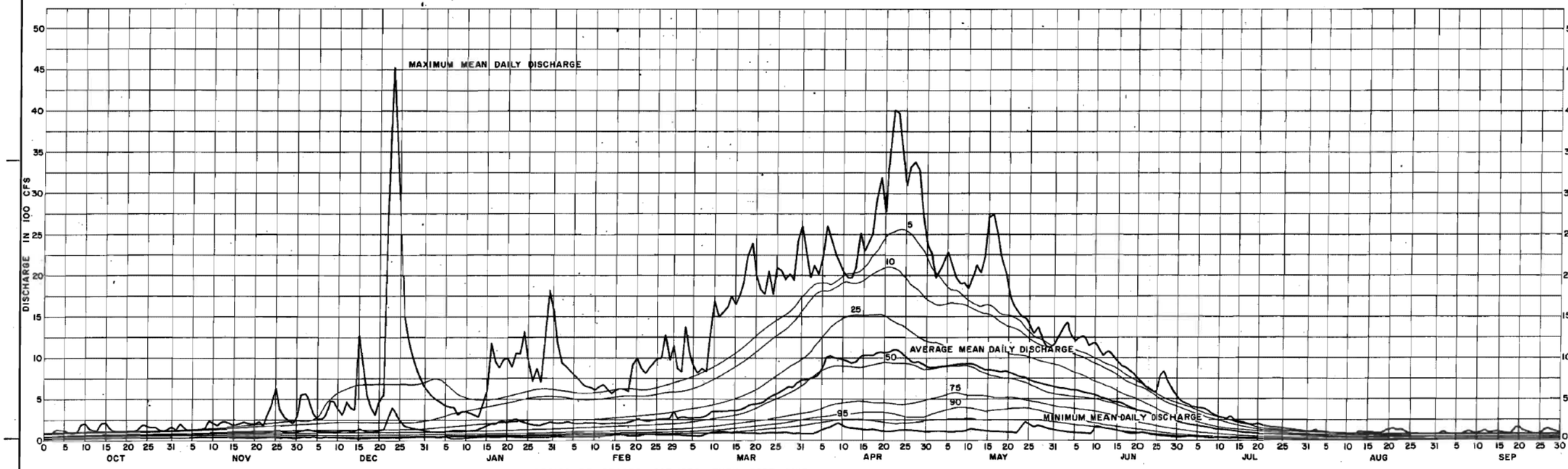
1. DISCHARGE RECORDS TAKEN FROM U.S.G.S. WATER RESOURCES DATA FOR IDAHO. STATION NUMBER 13.2000.00
2. PERIOD OF RECORD: OCTOBER 1950 THROUGH SEPTEMBER 1980.
3. DRAINAGE AREA ABOVE STREAMGAGE IS 399 SQUARE MILES.



MEAN MONTHLY DISCHARGES
PERIOD OF RECORD: OCT 1950 THRU SEP 1980



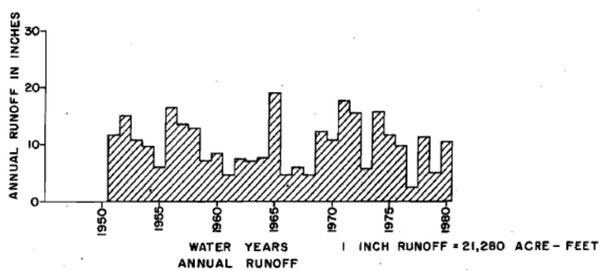
FLOW DURATION CURVE
PERIOD OF RECORD: OCT 1950 THRU SEPT 1980



PERIOD OF RECORD: OCT 1950 THRU SEPT 1980

MAXIMUM ANNUAL MEAN DAILY DISCHARGES

WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.
1951	APR 7	2130	1961	APR 4	696	1971	MAY 5	2280
1952	APR 27	3380	1962	APR 20	1430	1972	MAR 19	2390
1953	APR 28	1820	1963	APR 7	944	1973	APR 14	718
1954	MAR 10	1680	1964	MAY 1	1080	1974	MAR 31	2580
1955	MAY 8	1080	1965	DEC 23	4520	1975	MAY 16	2740
1956	DEC 23	4330	1966	APR 2	795	1976	APR 9	1940
1957	APR 6	1960	1967	MAY 21	869	1977	JUN 11	243
1958	APR 18	2130	1968	FEB 24	934	1978	MAR 31	1890
1959	APR 6	1120	1969	APR 6	2600	1979	MAY 17	591
1960	APR 7	1800	1970	JAN 24	1320	1980	APR 24	1740



WATER YEARS
ANNUAL RUNOFF

1 INCH RUNOFF = 21,280 ACRE-FEET

REVISION	DATE	DESCRIPTION	BY

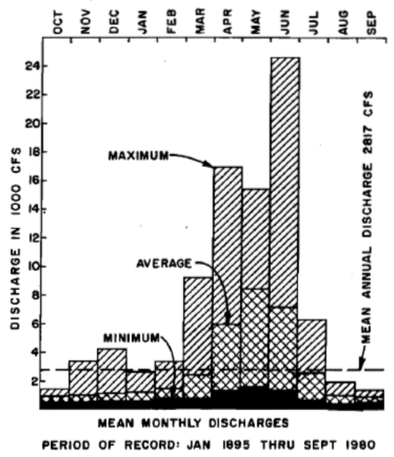
U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: V. Henry
CHECKED:
SUPERVISED: CHIEF, ENG. DES. BR.

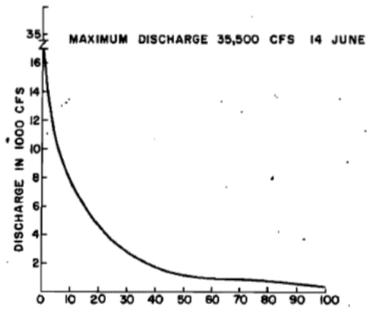
MORES CREEK ABOVE ROBIE CREEK
NEAR ARROWROCK DAM
SUMMARY HYDROGRAPH
BOISE RIVER BASIN, IDAHO

SUBMITTED: CHIEF, HYDROLOGY BRANCH
DATE: April 1981
SCALE AS SHOWN
INV. NO.
FILE NO.
CHIEF, PLANNING DIVISION
SHEET 5
80-05-6/5

CONT. NO.
VOL. NO. PLATE 4-5



MEAN MONTHLY DISCHARGES
PERIOD OF RECORD: JAN 1895 THRU SEPT 1980



FLOW DURATION CURVE
PERIOD OF RECORD: JAN 1895 THRU SEPT 1980

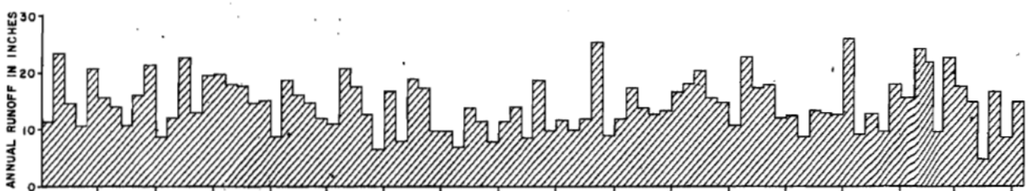
NOTES:

1. DISCHARGE RECORDS TAKEN FROM WATERMASTER ANNUAL REPORTS, BOISE RIVER.
2. CORRECTIONS MADE FOR REGULATION BY ARROWROCK RESERVOIR SINCE 1915, ANDERSON RANCH RESERVOIR SINCE 1945 AND LUCKY PEAK RESERVOIR AFTER STORAGE BEGAN OCTOBER 1954.
3. PERIOD OF RECORD JANUARY 1895 THROUGH SEPTEMBER 1980, EXCEPT FOR THE FOLLOWING MONTHS WHICH HAVE NO RECORD.
   - NOV., DEC. - 1896
   - APR., MAY, JUNE, NOV., DEC. - 1897
   - JAN., FEB. - 1898
   - NOV., DEC. - 1903
   - JAN., FEB., NOV., DEC. - 1904
   - JAN., FEB., MAR. - 1905
   - DEC. - 1906
   - JAN., FEB., DEC. - 1907
   - FEB., DEC. - 1908
   - JAN., FEB. - 1910
   - NOV., DEC. - 1912
   - JAN., FEB. - 1913
   - DEC. - 1914
4. DRAINAGE AREA OF BOISE RIVER ABOVE LUCKY PEAK DAM IS 2,680 SQUARE MILES.

PERIOD OF RECORD JAN 1895 THRU SEPT 1980

MAXIMUM ANNUAL MEAN DAILY DISCHARGES

WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.	WATER YEAR	DATE	C.F.S.
1895	MAY 6	7880	1917	MAY 15	17848	1939	MAY 1	8413	1961	MAY 27	7830
1896	JUN 14	35500	1918	JUN 14	12601	1940	MAY 13	9866	1962	APR 21	11343
1897	APR 19	29500	1919	MAY 30	11580	1941	MAY 27	8861	1963	MAY 24	11480
1898	APR 26	6540	1920	MAY 18	9623	1942	MAY 27	10690	1964	MAY 21	10938
1899	MAY 10	19000	1921	MAY 17	18739	1943	APR 18	25040	1965	DEC 24	27294
1900	MAY 11	11960	1922	MAY 26	18174	1944	MAY 16	7632	1966	MAY 10	8225
1901	MAY 16	12700	1923	MAY 26	11950	1945	MAY 5	11644	1967	MAY 25	15598
1902	MAY 29	8190	1924	MAY 18	5186	1946	APR 19	18812	1968	JUN 4	7048
1903	JUN 2	16800	1925	MAY 20	14350	1947	MAY 9	13838	1969	APR 24	15935
1904	APR 15	19700	1926	MAY 6	7094	1948	MAY 29	15260	1970	MAY 28	14847
1905	JUN 2	6260	1927	MAY 18	20061	1949	MAY 16	12829	1971	MAY 14	20253
1906	MAY 12	8710	1928	MAY 10	20710	1950	MAY 17	13673	1972	JUN 2	19559
1907	APR 15	17000	1929	MAY 25	9374	1951	MAY 29	14065	1973	MAY 20	9555
1908	APR 22	10600	1930	MAY 30	7559	1952	APR 28	23429	1974	MAY 9	18469
1909	JUN 5	16000	1931	MAY 8	5434	1953	JUN 14	14790	1975	MAY 17	20618
1910	MAR 22	16600	1932	MAY 14	13580	1954	MAY 21	14660	1976	MAY 12	13732
1911	JUN 13	15100	1933	JUN 4	12508	1955	JUN 10	10478	1977	JUN 9	3190
1912	JUN 9	15600	1934	MAR 30	6110	1956	MAY 25	22949	1978	JUN 10	11896
1913	MAY 28	13300	1935	MAY 25	9501	1957	MAY 21	16930	1979	MAY 25	9622
1914	APR 16	11300	1936	APR 24	19790	1958	MAY 22	21745	1980	MAY 7	12958
1915	MAY 19	6227	1937	MAY 6	7705	1959	MAY 16	9040			
1916	MAY 7	16550	1938	MAY 5	19286	1960	MAY 13	11842			



1 INCH RUN-OFF=142,933 AC. FT. AT LUCKY PEAK DAM

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED D. Reese
DRAWN V. Henry
CHECKED
CHIEF, ENGINEERING DIVISION

LUCKY PEAK LAKE

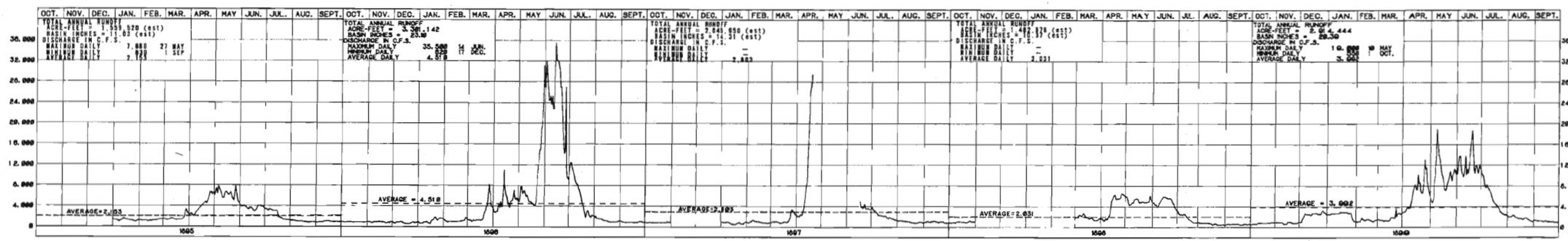
MEAN DAILY TOTAL UNREGULATED INFLOW
SUMMARY HYDROGRAPHS
BOISE RIVER NEAR BOISE, IDAHO

SUBMITTED
CHIEF, HYDROLOGY BRANCH

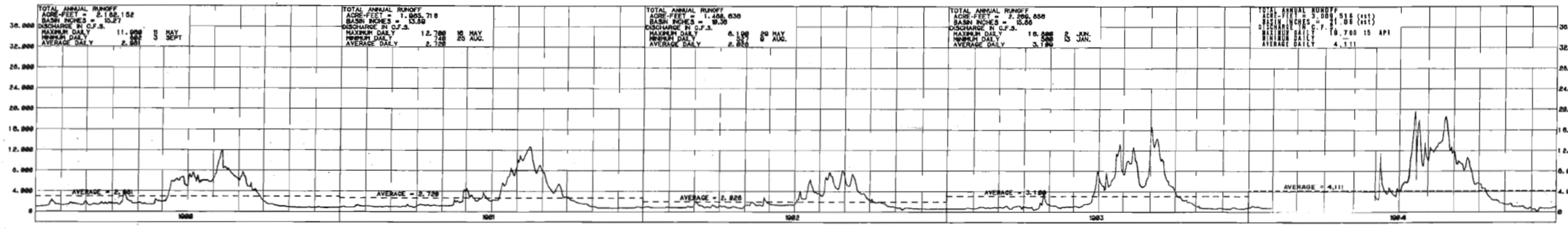
DATE April 1983
SCALE AS SHOWN
INV. NO.
FILE NO.
SHEET 6
B0-05-6/6

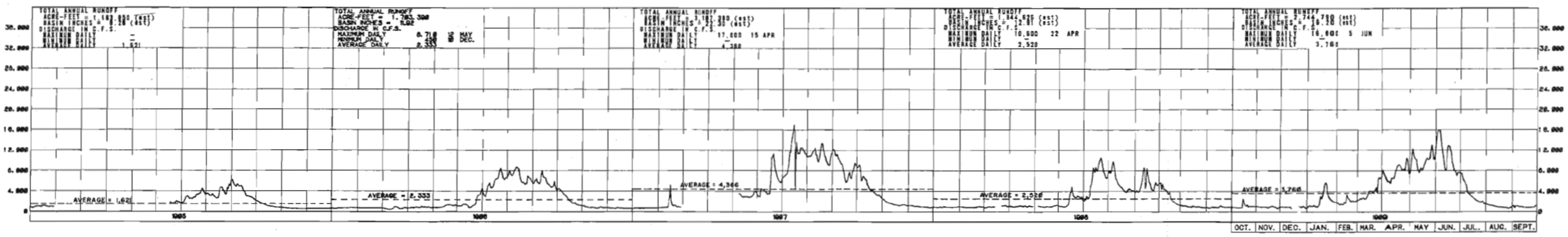
CORPS OF ENGINEERS

U.S. ARMY

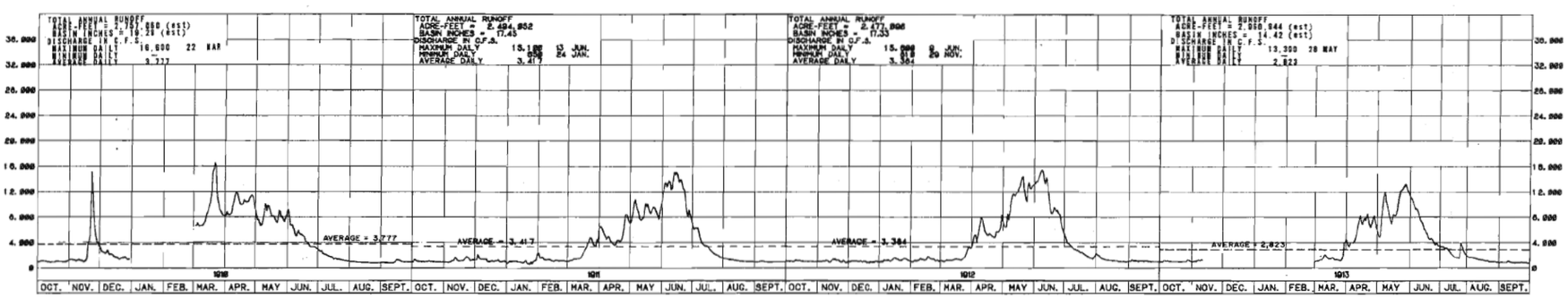


DISCHARGE IN C.F.S.





DISCHARGE IN C.F.S.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Rees
DRAWN: CDP
CHECKED: D. Rees
PREPARED: D. Rees
CHIEF, REG. REG. SEC.

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
MEAN DAILY
TOTAL UNREGULATED INFLOW
PERIOD OF RECORD: 10/1894 - 9/1990

SUBMITTED: K.E. Kuhl
CHIEF, HYDROLOGY BRANCH

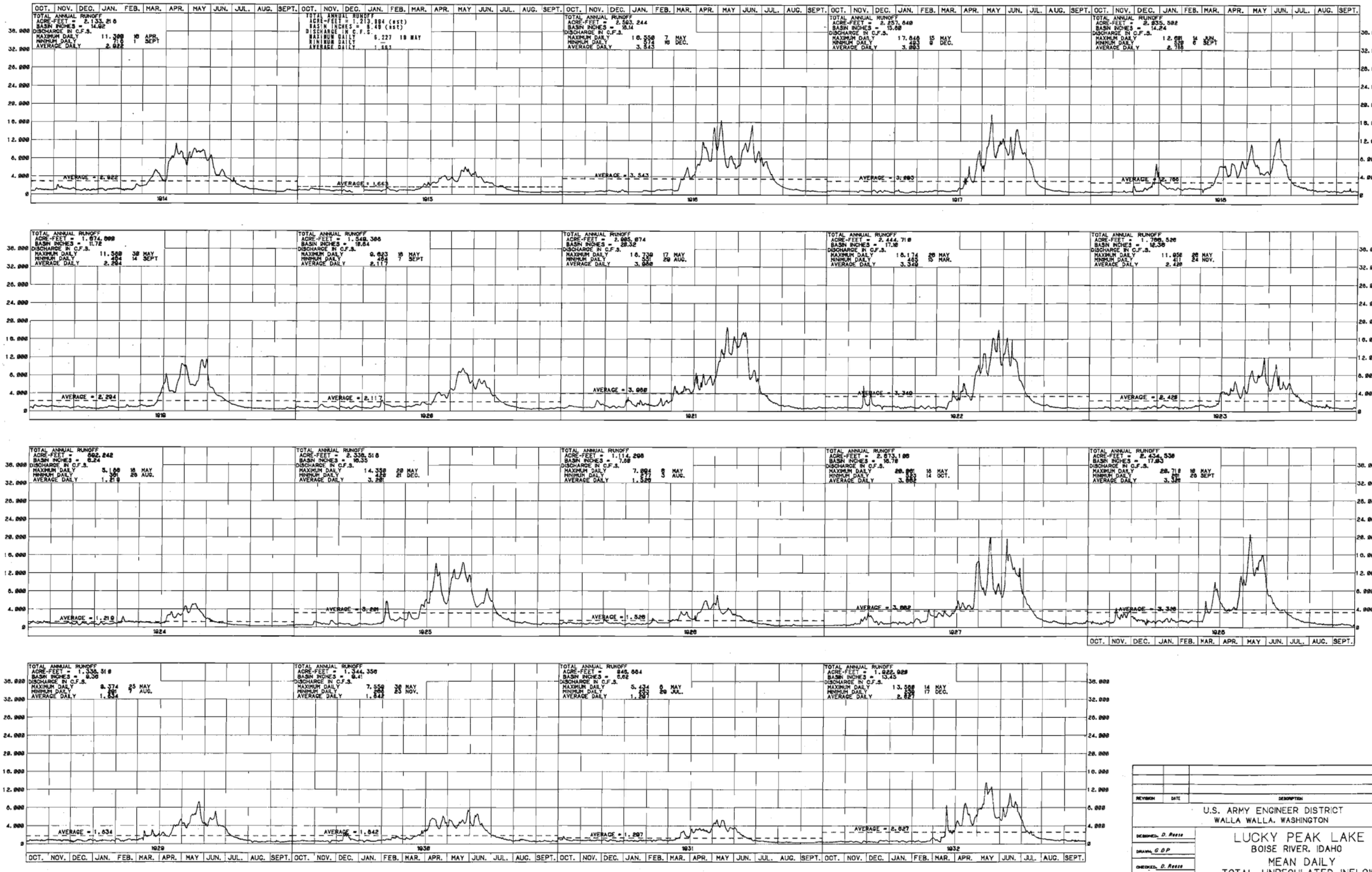
APPROVED: DATE April 1993
COL.(ME), U.S. DISTRICT ENGINEER

RECOMMENDED: Brian Brockbank
CHIEF, PLANNING DIVISION

SCALE AS SHOWN | INV. NO. ENG.
FILE NO.
SHEET 1 of 5 BO-05-6/7

PLATE 4-7

DISCHARGE IN C.F.S.



DISCHARGE IN C.F.S.

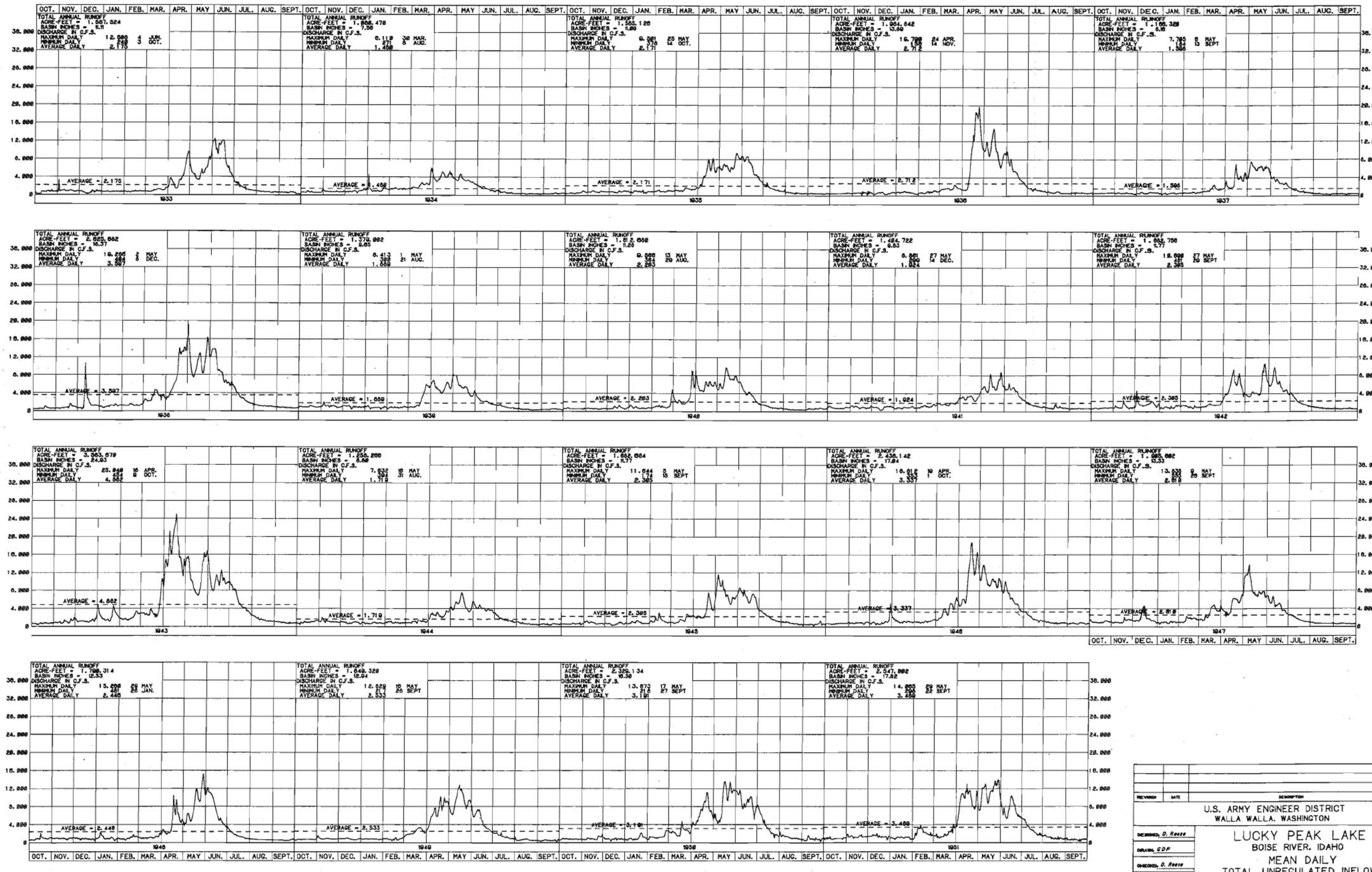
REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: G.D.P.
CHECKED: D. Reese
PREPARED: D. L. Reese, CHIEF, RES. REG. SEC.
SUBMITTED: R. B. Rudd, CHIEF, HYDROLOGY BRANCH
RECOMMENDED: Brian Hinchie for CHIEF, PLANNING DIVISION
APPROVED: COLONEL, U.S. DISTRICT ENGINEER
DATE April 1983
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 2 of 5 BO-05-6/8

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
MEAN DAILY
TOTAL UNREGULATED INFLOW
PERIOD OF RECORD: 10/1894 - 9/1980

PLATE 4-7



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: GDP
CHECKED: D. Reese
PREPARED: D. E. Reese, CHIEF, RES. REG. SEC.

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
MEAN DAILY
TOTAL UNREGULATED INFLOW
PERIOD OF RECORD: 10/1894 - 9/1988

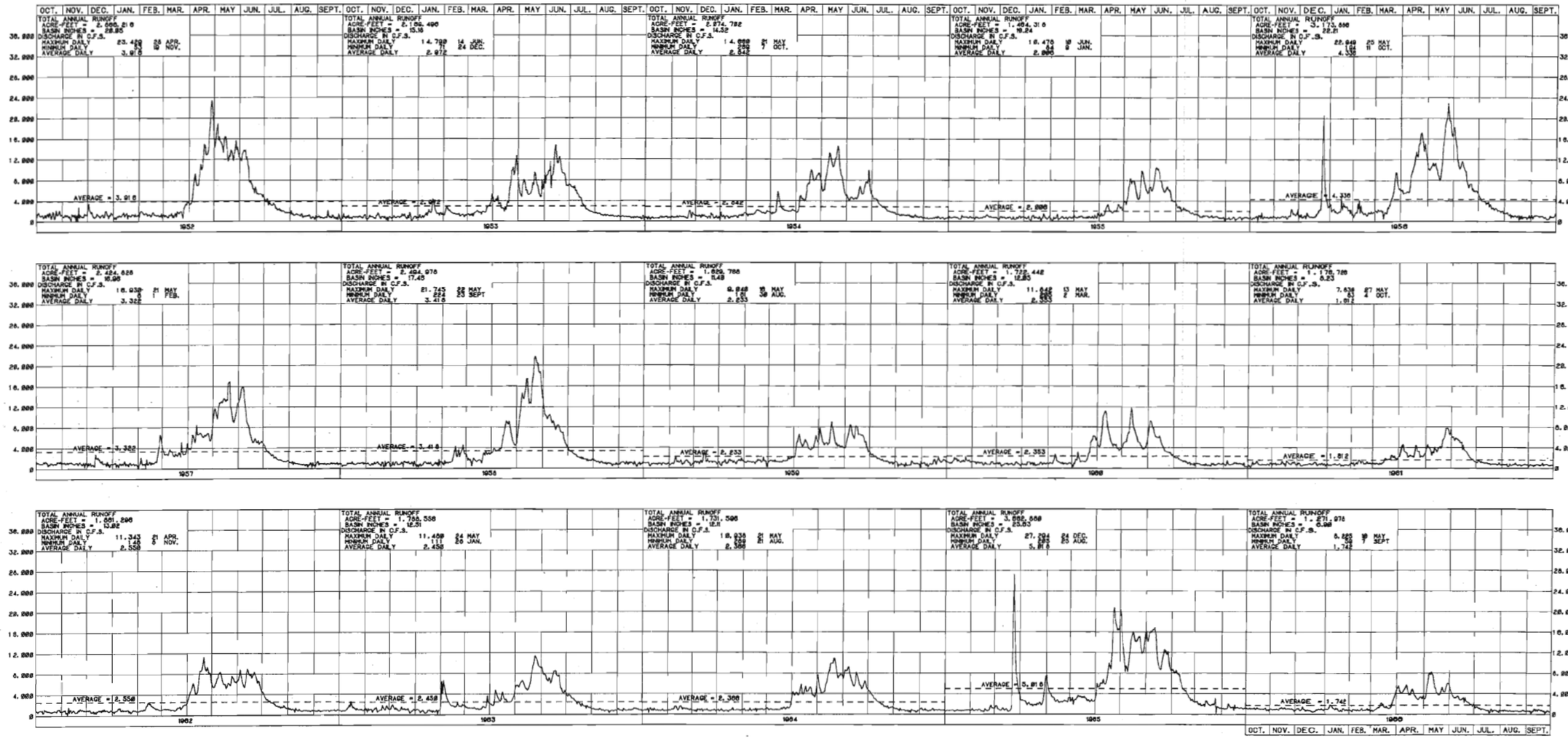
SUBMITTED: R. E. Krull, CHIEF, HYDROLOGY BRANCH
RECOMMENDED: Brian Buckles, CHIEF, PLANNING DIVISION
APPROVED: COLONEL, U.S. DISTRICT ENGINEER
DATE: April 1989
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 3 of 5 BO-05-6/9

PLATE 4-7

CORPS OF ENGINEERS

U.S. ARMY

DISCHARGE IN C.F.S.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: G.D.P.
CHECKED: D. Reese
PREPARED: CHIEF, RES. REG. SEC.

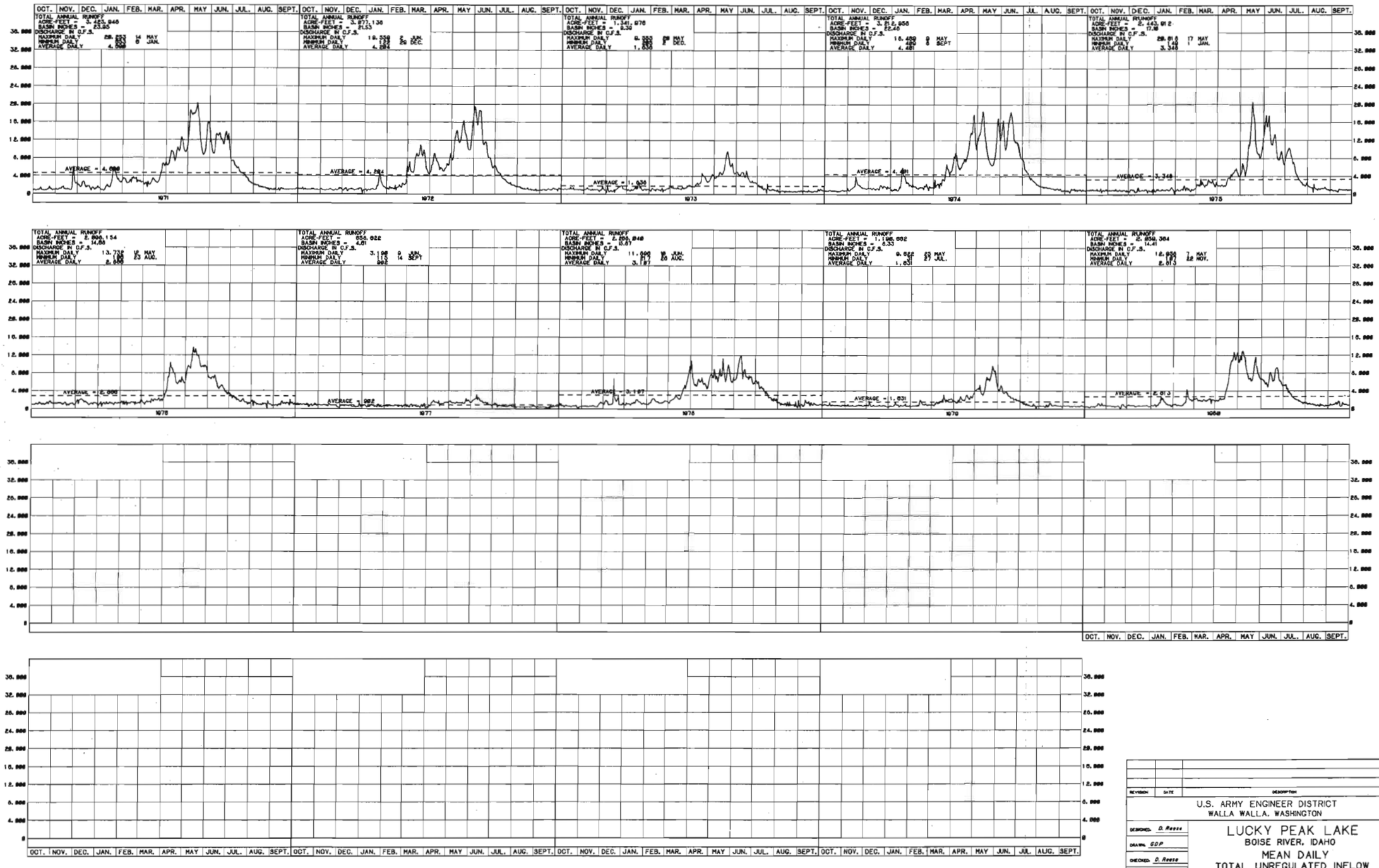
LUCKY PEAK LAKE
BOISE RIVER, IDAHO
MEAN DAILY
TOTAL UNREGULATED INFLOW
PERIOD OF RECORD: 10/1894 - 9/1960

SUBMITTED: CHIEF, HYDROLOGY BRANCH
RECOMMENDED: CHIEF, PLANNING DIVISION
APPROVED: COL, CE, DISTRICT ENGINEER
DATE: Apr. 1963

SCALE AS SHOWN | INV. NO. ENG.
FILE NO.
SHEET 4 of 5 B0-05-6/10

PLATE 4-7

DISCHARGE IN C.F.S.



DISCHARGE IN C.F.S.

REVISION	DATE	DESCRIPTION	BY

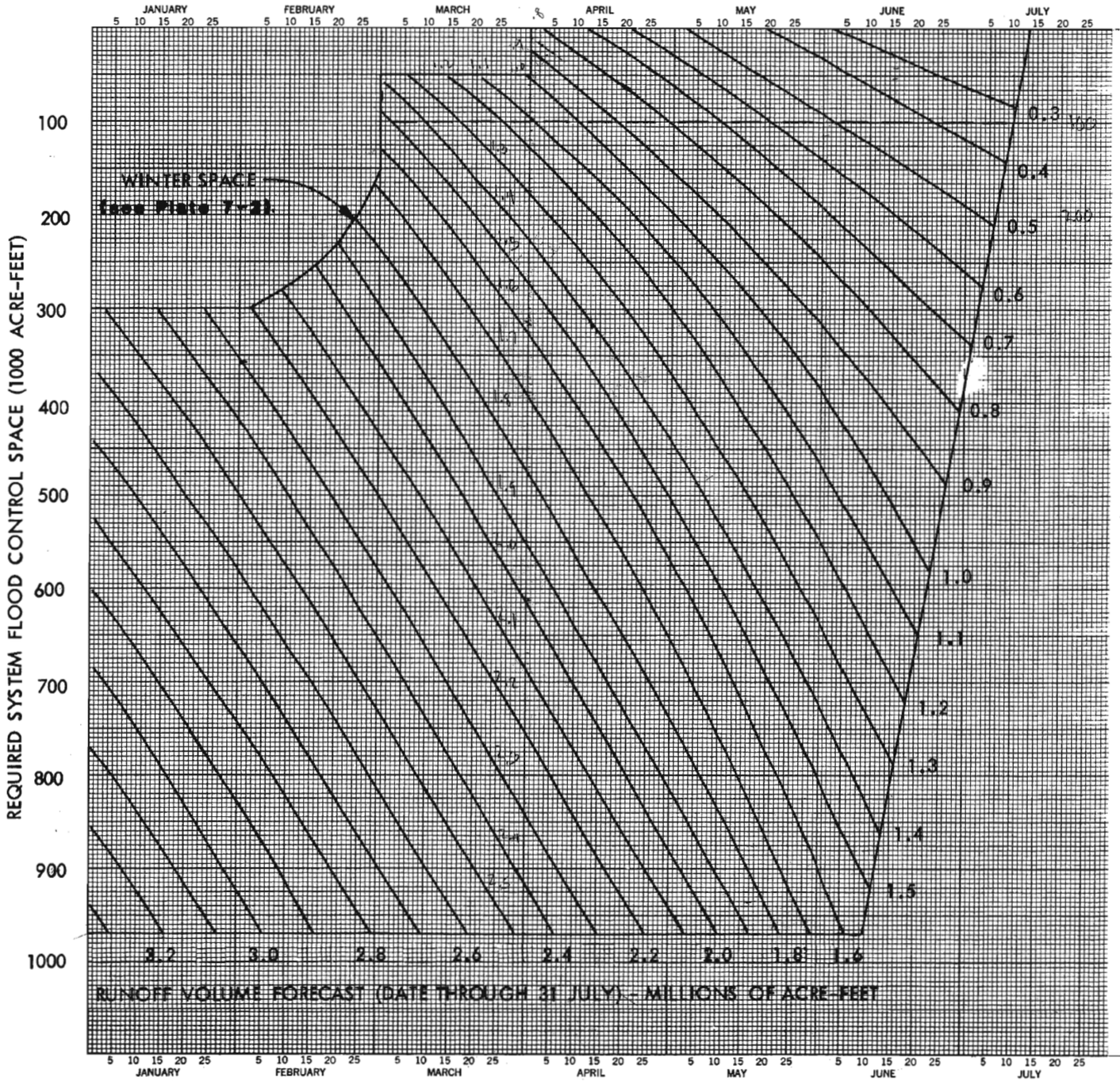
U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED D. Reese
DRAWN GDP
CHECKED D. Reese
PREPARED CHIEF, RES REES SEC.

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
MEAN DAILY
TOTAL UNREGULATED INFLOW
PERIOD OF RECORD 10/1894 - 9/1980

SUBMITTED CHIEF, HYDROLOGY BRANCH
RECOMMENDED CHIEF, PLANNING DIVISION
APPROVED COLONEL, C.E. DISTRICT ENGINEER
DATE April 1983
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 5 of 5 BO-05-6/11

PLATE 4-7



NOTES:

1. Parameters represent forecasted Lucky Peak Lake natural inflow volumes between the forecast date and 31 July. Operational rule curves were derived as follows:

a. Flood Control: For a given volume forecast, the flood control space required for a 1-percent forecast error risk and the space which could be refilled with a 95-percent assurance were determined. If the refillable space plus 100,000 acre-feet exceeded the flood control space, then the flood control space value was used. If the refillable space (95-percent assurance) plus 100,000 acre-feet were less than the flood control space, then the value used was an arithmetic average of the refillable space plus 100,000 acre-feet and the flood control space.

b. Safety Factors - Operational Flood Control Curves:

FLOOD CONTROL ASSURANCES
(Control to 6,500 cfs at Glenwood Bridge)

Forecast Date (Thru 31 July)	Assumed Volume Forecast Error (Under Forecast) (Acre-Feet)	Percent Chance of Volume Error (Smaller Volume)	Percent Chance of Less Critical Timing Sequence
1 January	800,000	99	98
16 January	780,000	99	98
1 February	700,000	99	98
15 February	640,000	99	98
1 March	580,000	99	98
16 March	490,000	99	98
1 April	400,000	99	98
16 April	380,000	99	98
1 May	370,000	99	98
16 May	360,000	99	98
1 June	350,000	99	80
16 June	310,000	98	50

REFILL ASSURANCES
(Total System - 974,149 Acre-Feet)

Forecast Date (Thru 31 July)	Assumed Volume Forecast Error (Over Forecast) (Acre-Feet)	Percent Chance of Volume Error (Larger Volume)	Percent Chance of Less Critical Timing Sequence
1 January	610,000	95	98
16 January	550,000	95	98
1 February	490,000	95	98
15 February	450,000	95	98
1 March	410,000	95	98
16 March	350,000	95	98
1 April	280,000	95	98
16 April	270,000	95	98
1 May	140,000	80	50
16 May	110,000	75	50
1 June	40,000	60	50
16 June	10,000	52	50

2. To determine total vacant space required in all three reservoirs, select parameter corresponding to predicted runoff between that date and 31 July, then read the ordinate of this parameter corresponding to forecast date.

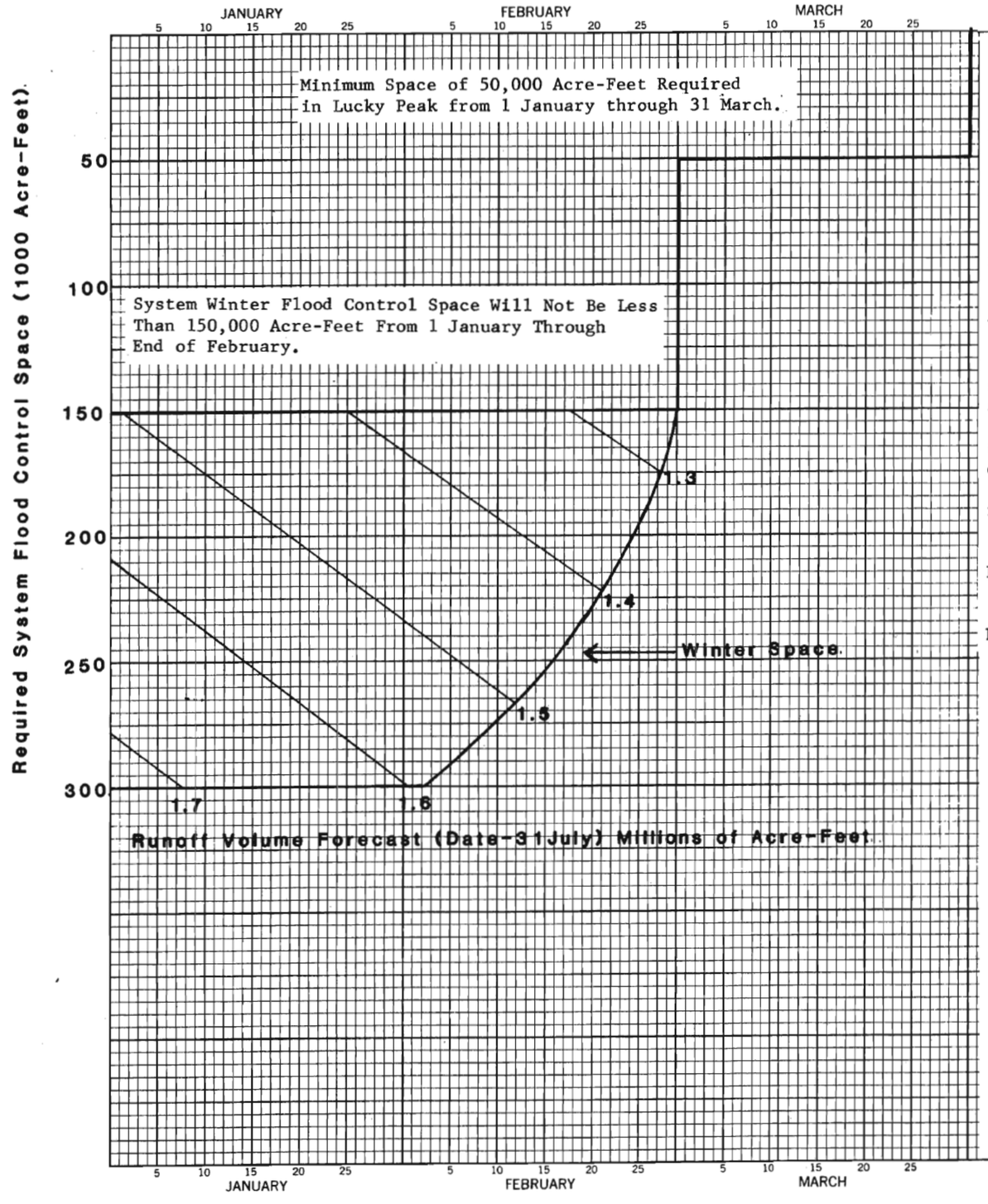
3. Minimum of 50,000 acre-feet of space required in Lucky Peak reservoir from 1 January through 31 March.

Boise River Reservoirs
Boise River Basin, Idaho

OPERATIONAL FLOOD CONTROL
RULE CURVES

U. S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1982

PLATE 7-1



NOTES:

1. Curves define winter flood control space requirements when runoff volume forecasts are below normal during the 1 January through 1 March period.

2. Curves provide 100-year winter flood protection and a 95 percent refill assurance for 871,728 acre-feet of system space.

3. Parameters represent forecasted Lucky Peak Lake unregulated inflow volumes between the forecast date and 31 July.

4. To determine total vacant space required in all three reservoirs, select parameter corresponding to the predicted runoff between that date and 31 July, then read the ordinate of this parameter corresponding to the forecast date. For runoff volume forecasts not defined by these curves, use the space requirements of Plate 7-1. For example, a runoff volume forecast of 1.8 million acre-feet on 1 February is not defined, hence entering Plate 7-1, the space required on 1 February for a 1.8 million acre-feet forecast is defined by the winter space curve and is 300,000 acre-feet.

5. Minimum allowable system space is 150,000 acre-feet, January through February time period.

6. A minimum of 50,000 acre-feet of space must be maintained in Lucky-Peak reservoir from 1 January through 31 March.

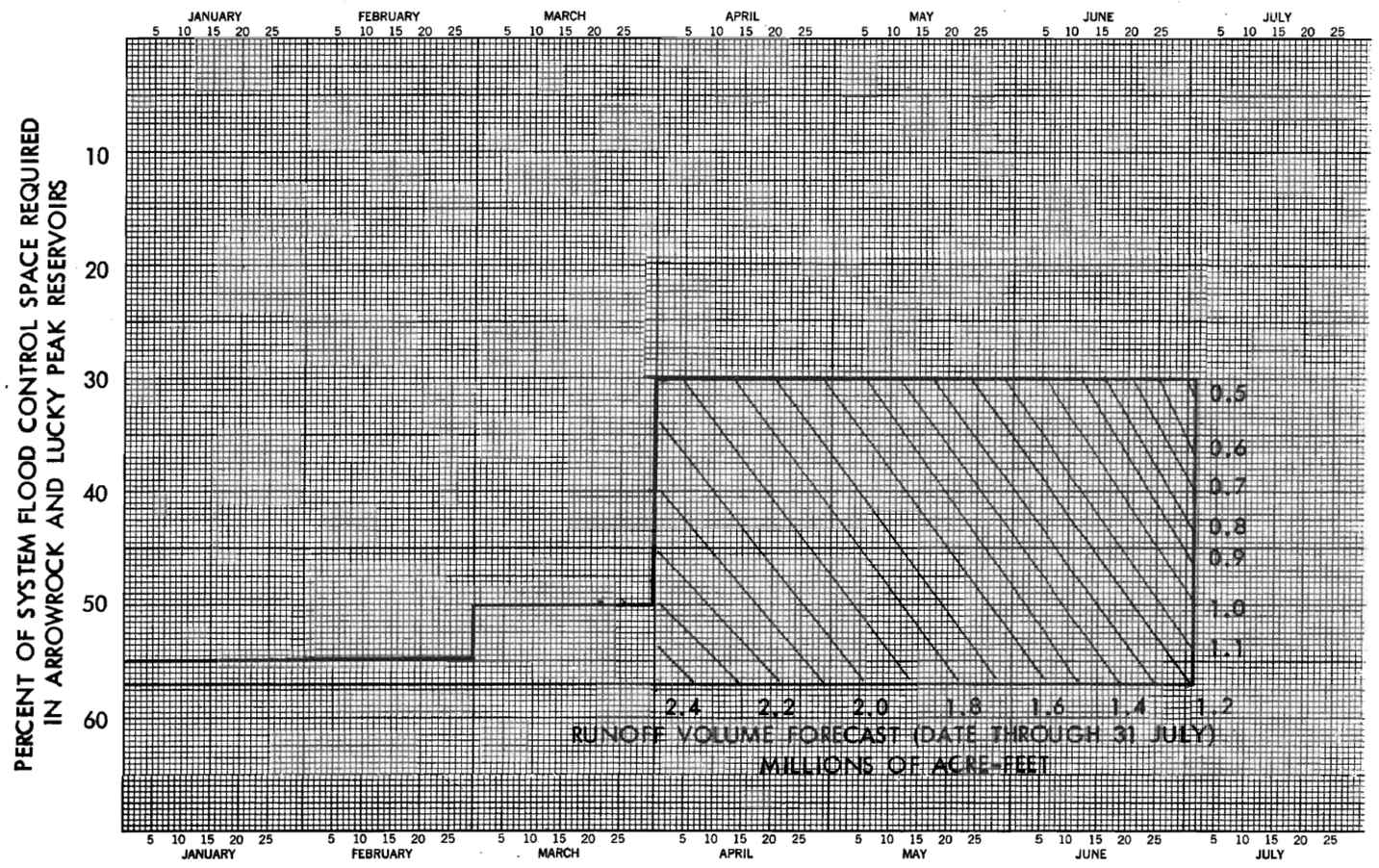
Boise River Reservoirs
Boise River Basin, Idaho

WINTER FLOOD CONTROL
RULE CURVES

For Below Normal Forecasts Occurring
Between 1 January and 1 March

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1982

PLATE 7-2



NOTES:

1. Parameters represent forecasted Lucky Peak Lake natural inflow volumes between the forecast date and 31 July. Distribution curves were derived based on the following assumptions:

a. Arrowrock-Lucky Peak Release Schedule.

Date	Assumed Allowable Flow of Boise River at Glenwood Bridge (cfs)	Assumed Irrigation Diversions, Lucky Peak to Glenwood Bridge (cfs)	Total Assumed Maximum Allowable Lucky Peak Flood Control Releases (cfs)
1 Apr-30 Apr	6,500	1,600	8,100
1 May-31 May	6,500	3,700	10,200
1 Jun-31 Jul	6,500	3,800	10,300

b. Percentage values are based on (1) the 1-percent forecast error risk on the Arrowrock-Lucky Peak local volume forecast, (2) the 95-percent upper confidence limit timing sequence, and (3) a constant 300-cfs inflow (1 April - 31 July minimum Anderson Ranch release). Percentages were determined by dividing the Arrowrock-Lucky Peak local flood control space requirement by the Boise River system flood control space requirement for a given Lucky Peak Lake natural inflow volume forecast.

c. Arrowrock-Lucky Peak Local Volume Forecast and Standard Error. The Arrowrock-Lucky Peak local volume forecast is determined by multiplying the forecasted Lucky Peak Lake natural inflow volume by the appropriate contribution factor shown below:

Forecast Date	Contribution Factor	Standard Error (AF)	Forecast Error (2.3267)x(Standard Error)(AF)
1 April	0.6331	103,400	241,000
15 April	0.6270	86,950	202,000
1 May	0.6209	70,500	164,000
15 May	0.6196	70,500	164,000
1 June	0.6182	70,500	164,000
15 June	0.6300	70,500	164,000
1 July	0.6418	70,500	164,000

2. To determine the minimum percentage of system flood control space required in Arrowrock-Lucky Peak reservoirs, select the parameter corresponding to the predicted runoff between that date and 31 July. Then read the ordinate of this parameter corresponding to the forecast date. This ordinate is the minimum percent of the system flood control space required in Arrowrock-Lucky Peak reservoirs. The minimum space required is the minimum percent multiplied by the system flood control space requirement.

The following allocation has been made of the acre-feet of storage capacity available:

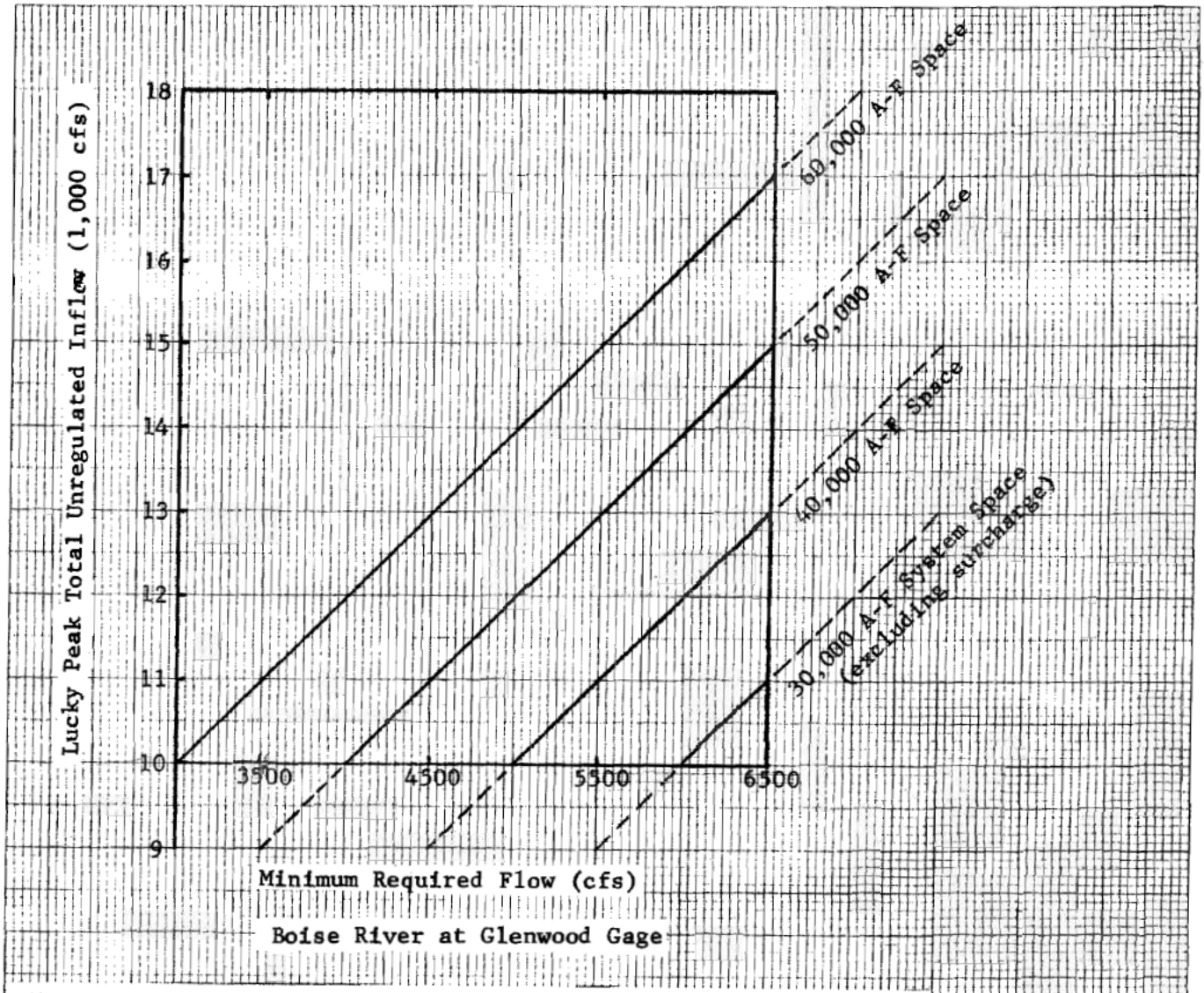
Reservoir	Flood Control	Dead	Total
Arrowrock	286,600	0	286,600
Lucky Peak	264,300	28,800	293,100
Total Space	550,900	28,800	579,700

Boise River Reservoirs
Boise River Basin, Idaho

FLOOD CONTROL SPACE
DISTRIBUTION CURVES

Percent of system flood control space required in Arrowrock and Lucky Peak Reservoirs

U. S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1982



Notes:

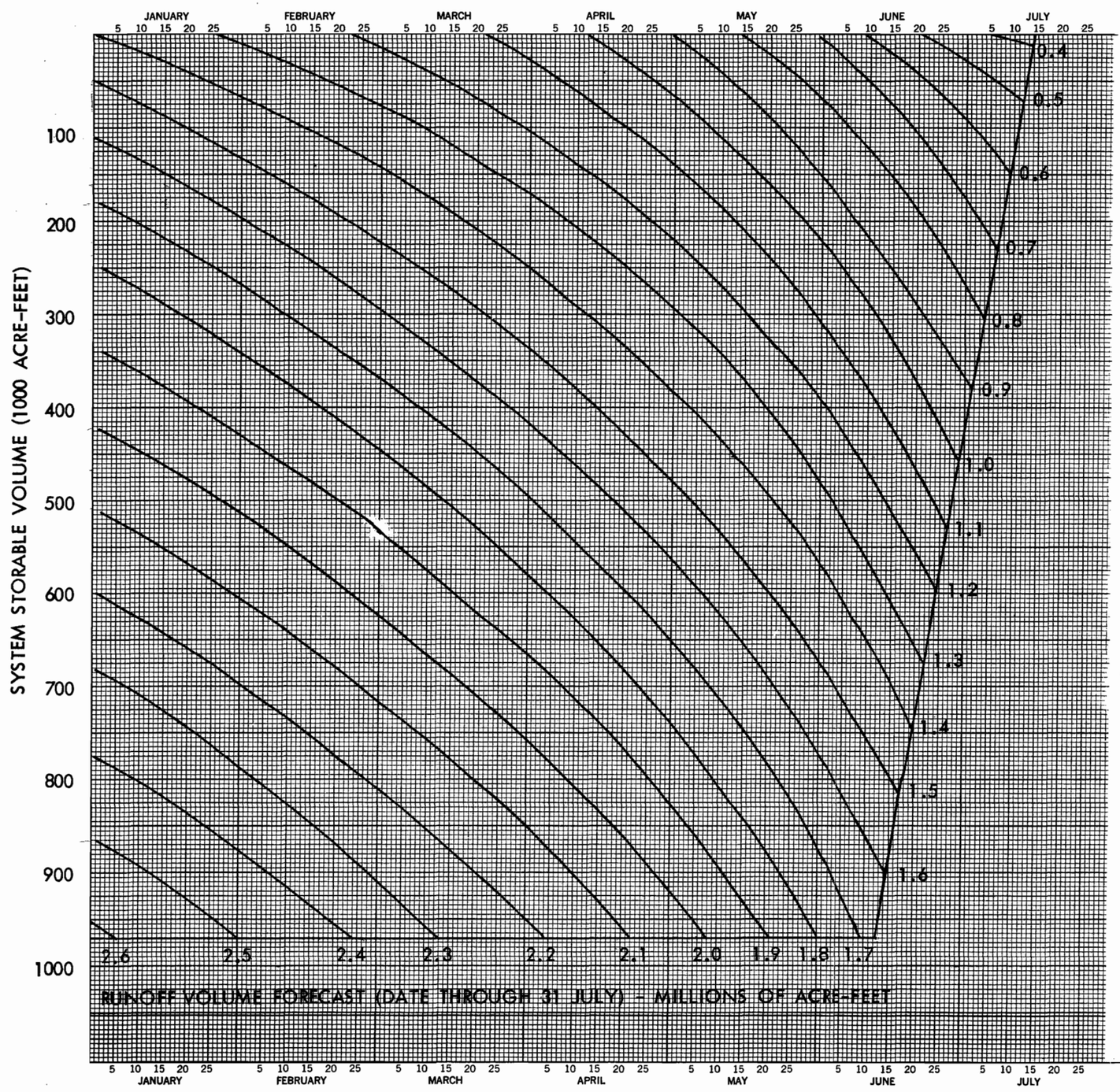
1. These rule curves are only used when the system space is 60,000 acre-feet or less (excluding surcharge) and the total unregulated Lucky Peak inflow is 10,000 cfs or larger.
2. The rule curves define minimum required flows at the Glenwood gage. Larger flows may be required by the "Operational Flood Control Rule Curves" (plate 7-1) by analysis of current basin conditions.
3. These rule curves provide flood protection against late-season rainstorms or underestimation of remaining spring runoff volumes.

Boise River Reservoirs
Boise River Basin , Idaho

FINAL FILL
FLOOD CONTROL REQUIREMENTS

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
July 1983

PLATE 7-3 A



NOTES:

1. Parameters represent forecasted Lucky Peak Lake natural inflow volumes between the forecast date and 31 July. Storable volume curves were derived on the following assumptions:

a. Project Release Schedule:

Date	Maximum Assumed Lucky Peak Releases for Fish & Wildlife (cfs)	Maximum Assumed Irrigation Requirements (cfs)	Total Assumed Lucky Peak Releases Required (cfs)
1 Jan-14 Feb	200	0	200
15 Feb-14 Mar	200	700 1/	900
15 Mar-31 Mar	200	0	200
1 Apr-30 Apr	0	2,600	2,600
1 May-30 Jun	0	4,800	4,800
1 Jul-31 Jul	0	4,600	4,600

1/ Early diversions to Lake Lowell.

b. Refill: Storable volume values are based on (1) the 95-percent volume forecast error, and (2) the 40-percent, 70-percent, 85-percent, and 95-percent lower confidence limits on the expected timing sequence.

c. Standard Error for Runoff Volume Forecasts:

Forecast Date	Standard Error (AF)	Forecast Error (95%) (1.645)x(Standard Error)(AF)
1 January	370,000	610,000
15 January	335,000	550,000
1 February	300,000	490,000
15 February	275,000	450,000
1 March	250,000	410,000
15 March	210,000	350,000
1 April	170,000	280,000
15 April	165,000	270,000
1 May	160,000	260,000
15 May	155,000	250,000
1 June	150,000	250,000
15 June	150,000	250,000
1 July	150,000	250,000
15 July	150,000	250,000

2. To determine total volume available for refill on any forecast date in all three reservoirs, select parameter corresponding to predicted runoff between that date and 31 July; then read the ordinate of this parameter corresponding to forecast date. This ordinate is the total volume available for refill of the system.

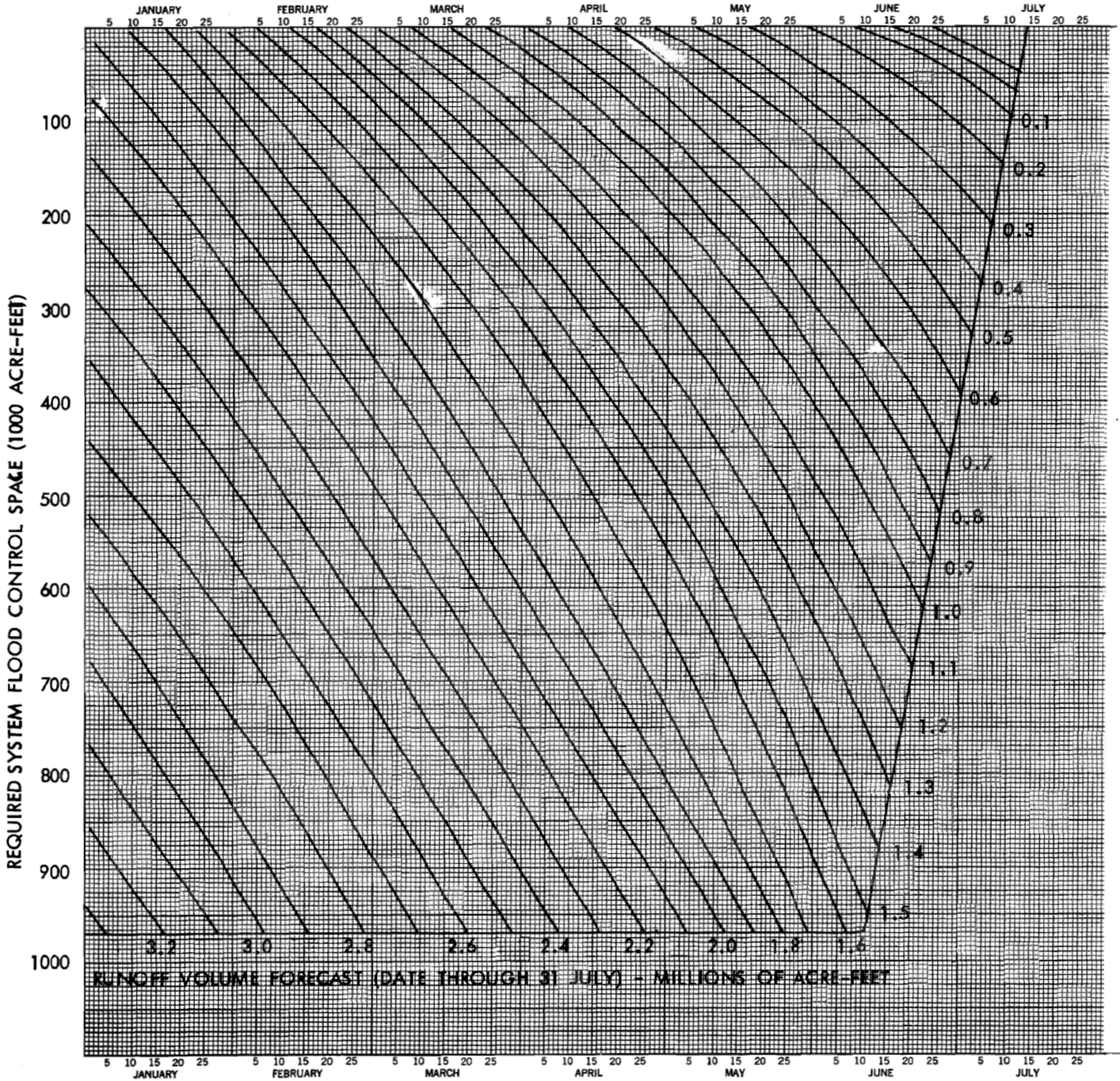
1988
Figured 150 cfs releases 1 Jan-31 Mar
2100 cfs April
3900 cfs May - June
3700 cfs July

e River Reservoirs
River Basin, Idaho

STORABLE VOLUME
(95% ASSURANCE)

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1982

PLATE 7-4



NOTES:

1. Parameters represent forecasted Lucky Peak Lake natural inflow volumes between the forecast date and 31 July. Flood control curves were derived on the following assumptions:

a. Project Release Schedule:

Date	Assumed Allowable Flow of Boise River at Glenwood Bridge (cfs)	Assumed Irrigation Diversions, Lucky Peak to Glenwood Bridge (cfs)	Total Assumed Maximum Allowable Lucky Peak Flood Control Releases (cfs)
1 Jan-31 Mar	6,500	0	6,500
1 Apr-30 Apr	6,500	1,600	8,100
1 May-31 May	6,500	3,700	10,200
1 Jun-31 Jul	6,500	3,800	10,300

b. Flood Control: Flood control space values are based on (1) the 1-percent volume forecast error risk, and (2) the 95-percent upper confidence limit timing sequence.

c. Standard Error for Runoff Volume Forecasts:

Forecast Date	Standard Error (AF)	Forecast Error (1%) (2.3267)x(Standard Error)(AF)
1 January	370,000	860,000
15 January	335,000	780,000
1 February	300,000	700,000
15 February	275,000	640,000
1 March	250,000	580,000
15 March	210,000	490,000
1 April	170,000	400,000
15 April	165,000	380,000
1 May	160,000	370,000
15 May	155,000	360,000
1 June	150,000	350,000
15 June	150,000	350,000
1 July	150,000	350,000
15 July	150,000	350,000

2. To determine total vacant space required on any forecast date in all three reservoirs, select parameter corresponding to predicted runoff between that date and 31 July, then read the ordinate of this parameter corresponding to forecast date. This ordinate is the total space required to control the predicted runoff and limit regulated discharge at Glenwood Bridge to 6,500 cfs.

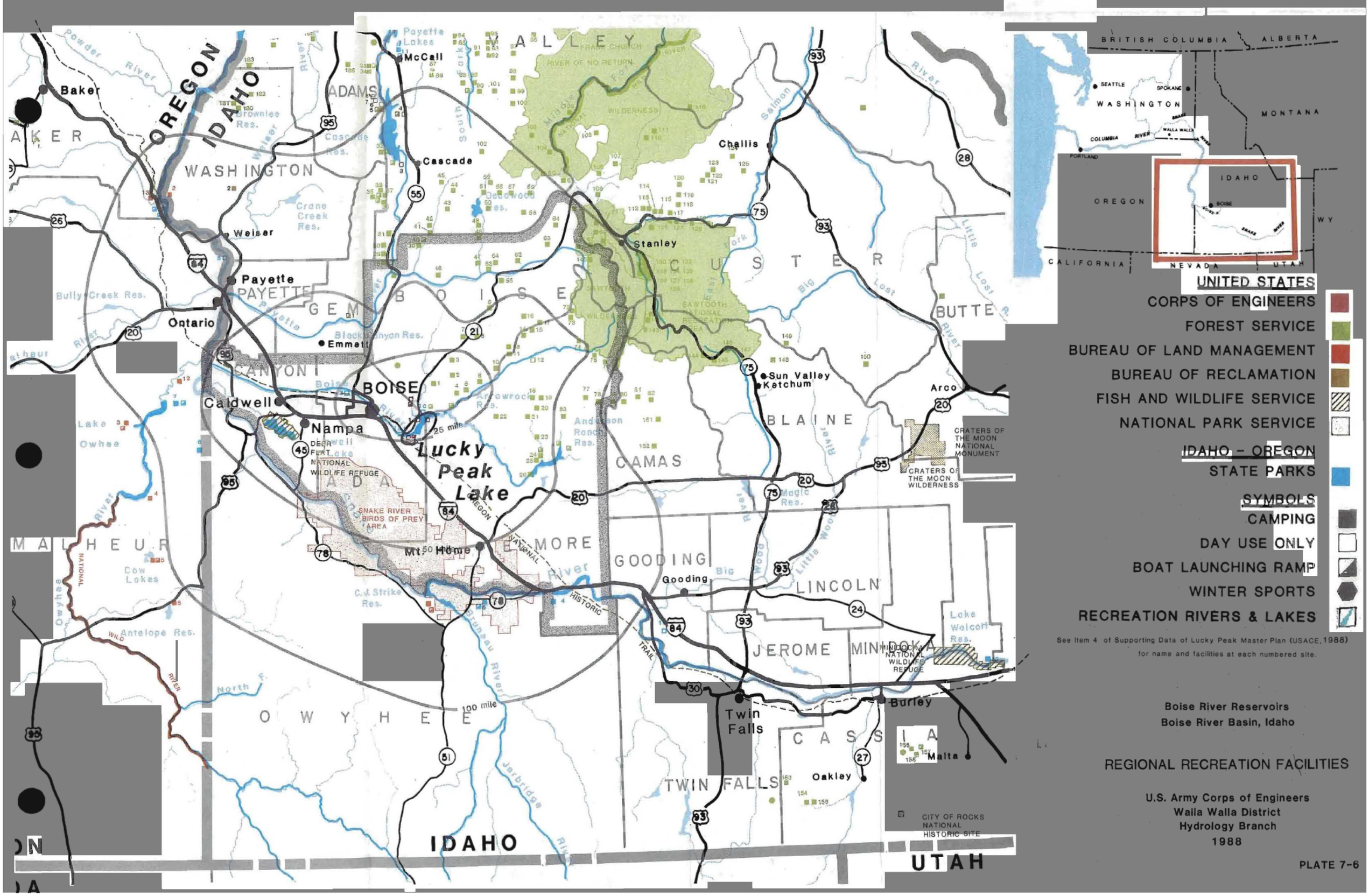
3. Note that these curves are different from the Operating Rule Curves which compromise required flood control space with space required to assure refill.

Boise River Reservoirs
Boise River Basin, Idaho

FLOOD CONTROL SPACE
(1% RISK)

U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
December 1982

PLATE 7-5



UNITED STATES

CORPS OF ENGINEERS

FOREST SERVICE

BUREAU OF LAND MANAGEMENT

BUREAU OF RECLAMATION

FISH AND WILDLIFE SERVICE

NATIONAL PARK SERVICE

IDAHO - OREGON

STATE PARKS

SYMBOLS

CAMPING

DAY USE ONLY

BOAT LAUNCHING RAMP

WINTER SPORTS

RECREATION RIVERS & LAKES

See Item 4 of Supporting Data of Lucky Peak Master Plan (USACE, 1988) for name and facilities at each numbered site.

Boise River Reservoirs
Boise River Basin, Idaho

REGIONAL RECREATION FACILITIES

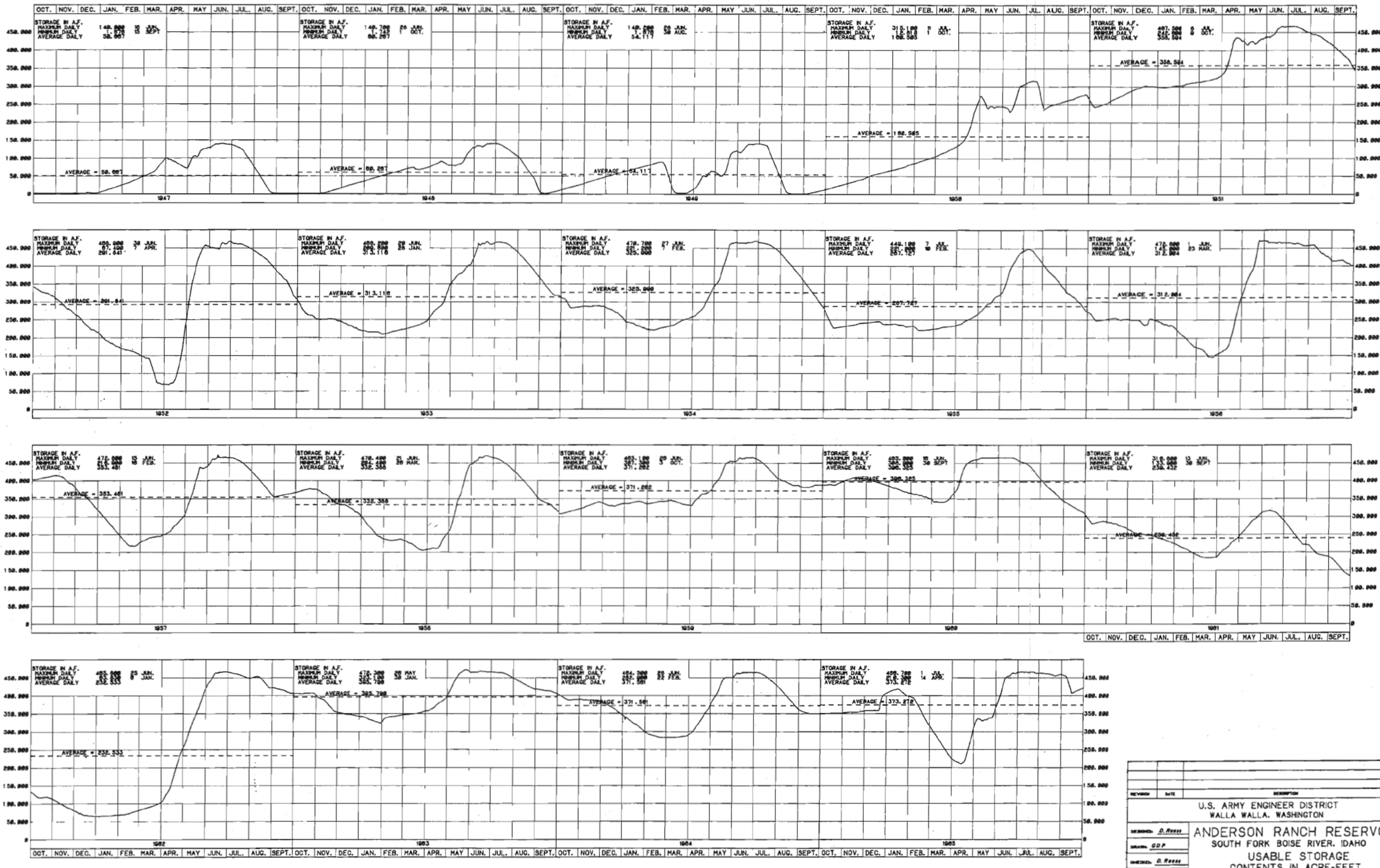
U.S. Army Corps of Engineers
Walla Walla District
Hydrology Branch
1988

PLATE 7-6

CORPS OF ENGINEERS

U.S. ARMY

STORAGE CONTENT IN A.F.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. ROOSE
DRAWN: GDP
CHECKED: D. ROOSE
CHIEF, ENG. DIV.

ANDERSON RANCH RESERVOIR
SOUTH FORK BOISE RIVER, IDAHO
USABLE STORAGE
CONTENTS IN ACRE-FEET
1946 THRU 1965

SUBMITTED: CHIEF, HYDROLOGY BRANCH
RECOMMENDED: CHIEF, PLANNING DIVISION
APPROVED: CHIEF, ENGINEERING DIVISION
DATE: April 1966

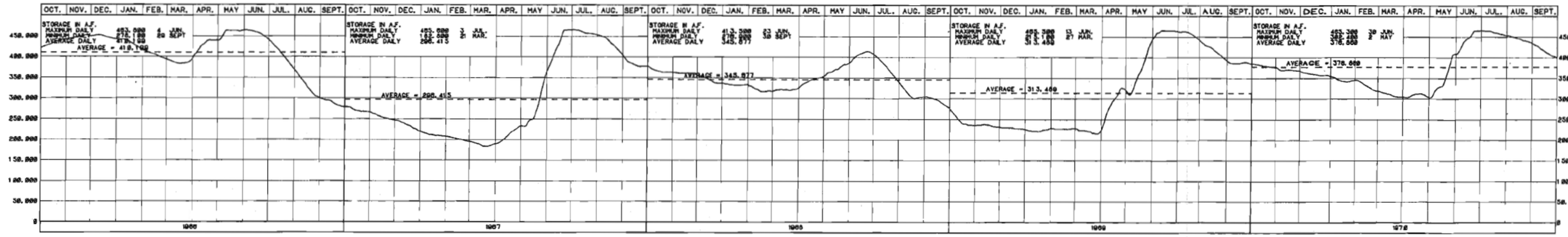
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 1 of 2 BO-05-6/12

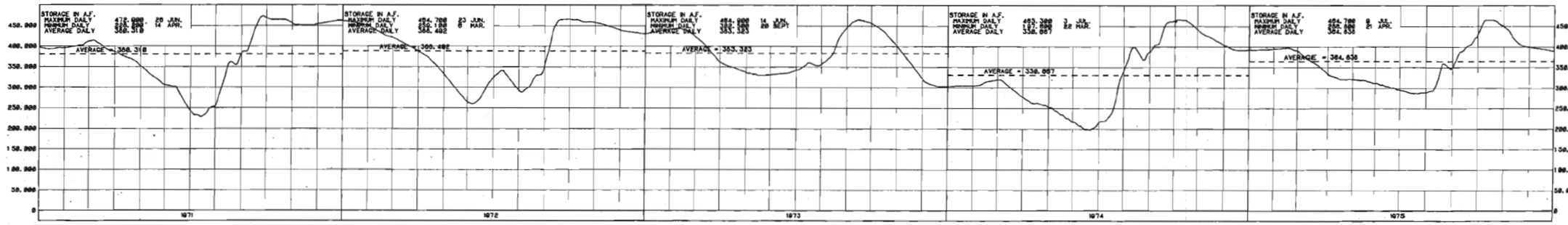
PLATE 7-7

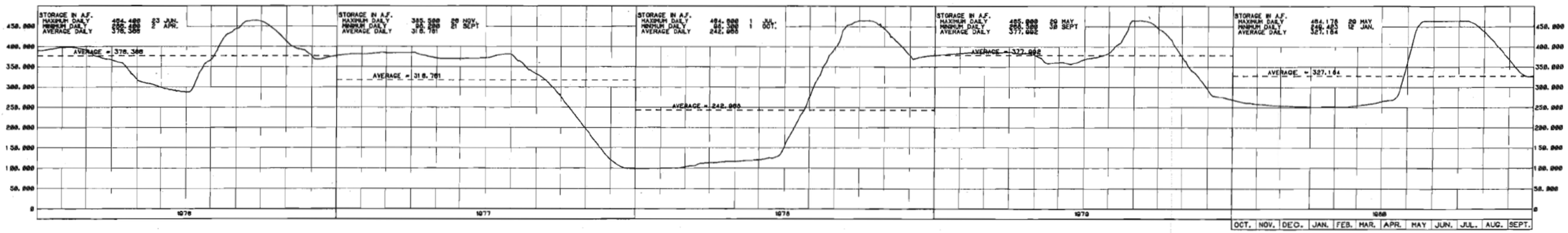
CORPS OF ENGINEERS

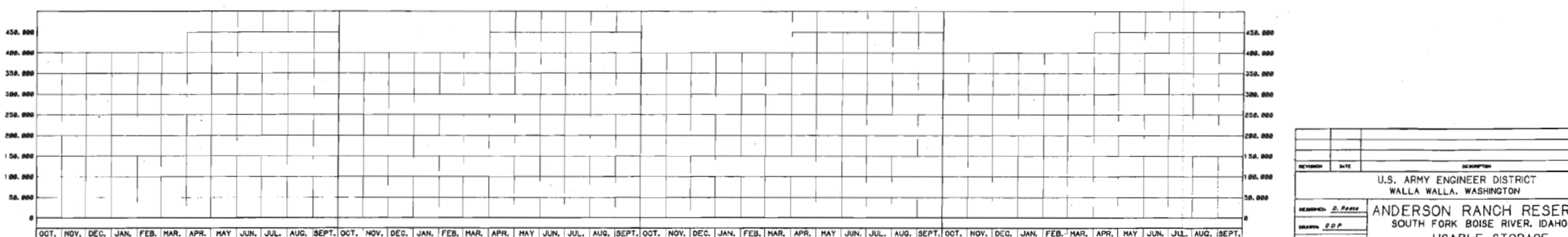
U.S. ARMY

STORAGE CONTENT IN A.F.









REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: GDP
CHECKED: D. Reese
PREPARED: CHIEF, RES. REG. SEC.

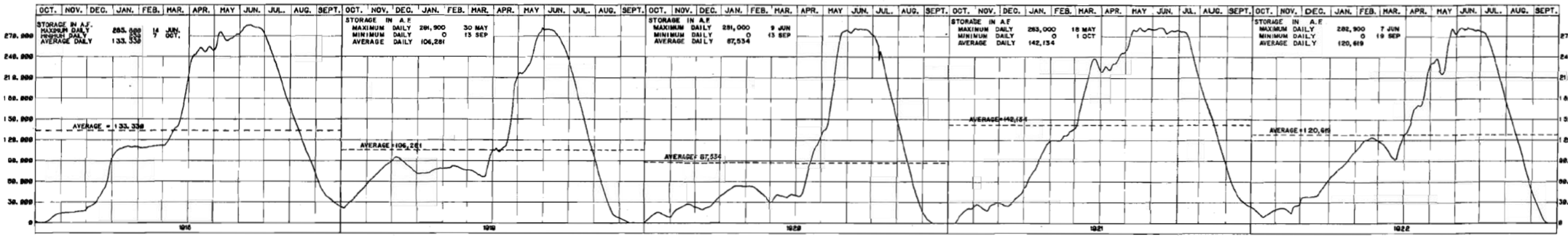
ANDERSON RANCH RESERVOIR
SOUTH FORK BOISE RIVER, IDAHO
USABLE STORAGE
CONTENTS IN ACRE-FEET
1946 THRU 1980

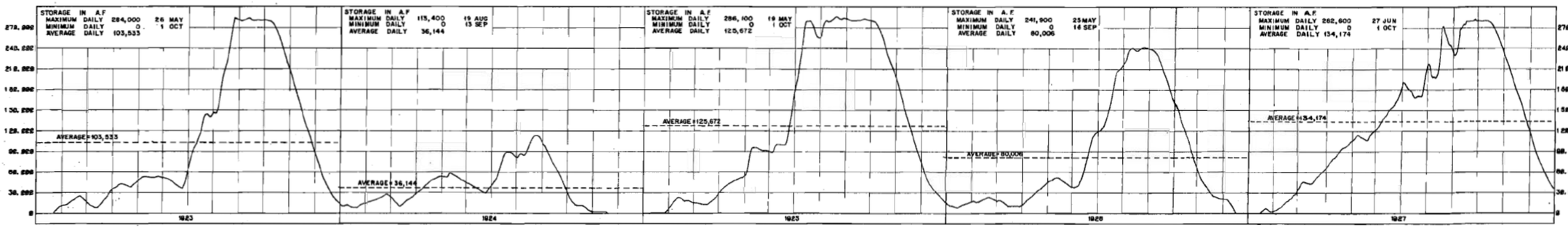
SUBMITTED: CHIEF, HYDROLOGY BRANCH
RECOMMENDED: CHIEF, PLANNING DIVISION
APPROVED: DIV. ENGR. U.S. DISTRICT ENGINEER
DATE April 1981
SCALE AS SHOWN
DIV. NO. ENG.
FILE NO.
SHEET 2 of 2 B0-05-6/13

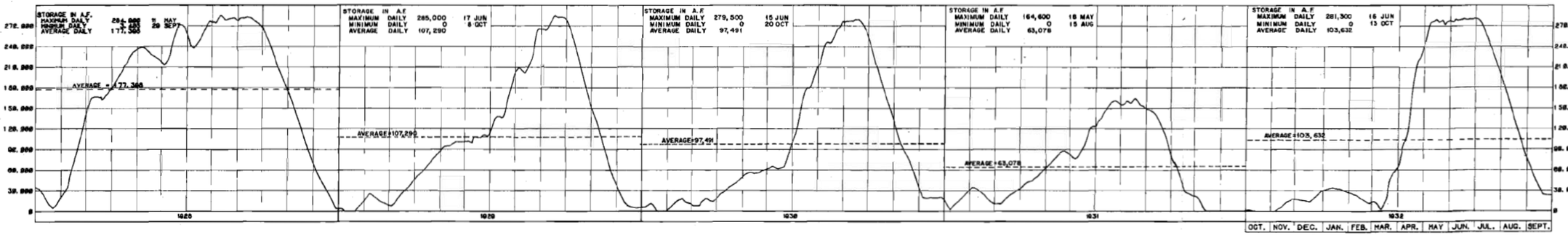
PLATE 7-7

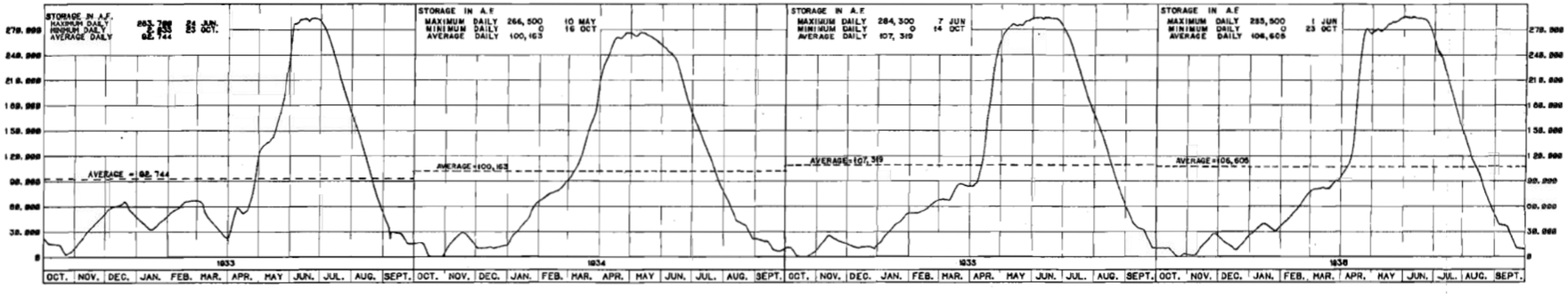
CORPS OF ENGINEERS

STORAGE CONTENT IN A.F.









REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: G.D.P.
CHECKED: D. Reese
PREPARED: D.R. Reese
CHIEF, RES. REG. SEC.

ARROWROCK RESERVOIR
BOISE RIVER, IDAHO
TOTAL STORAGE
CONTENTS IN ACRE-FEET
1916 THRU 1936

SUBMITTED: R.E. Reed
CHIEF, HYDROLOGY BRANCH
RECOMMENDED: Brian Berchis Jr.
CHIEF, PLANNING DIVISION

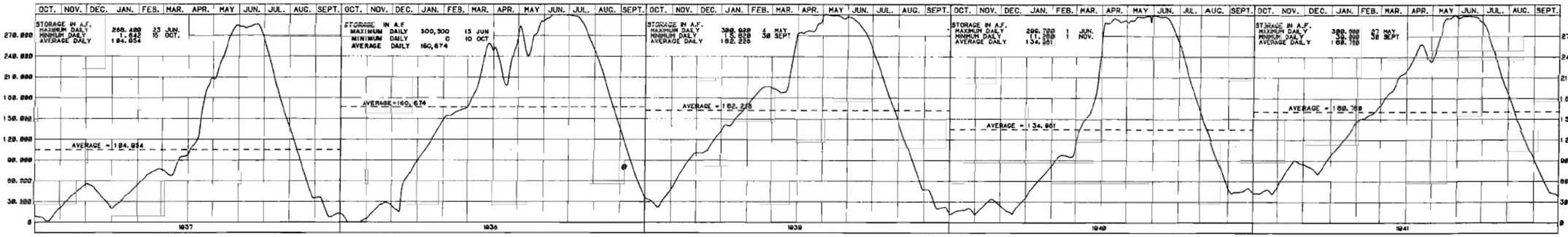
APPROVED: DATE April 1953
COLONEL, C.E. DISTRICT ENGINEER
SCALE: AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 1 of 4 BO-05-6/14

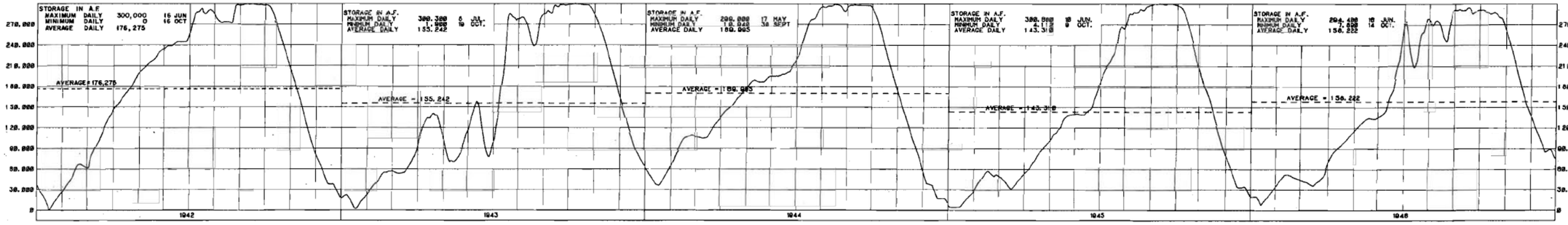
PLATE 7-8

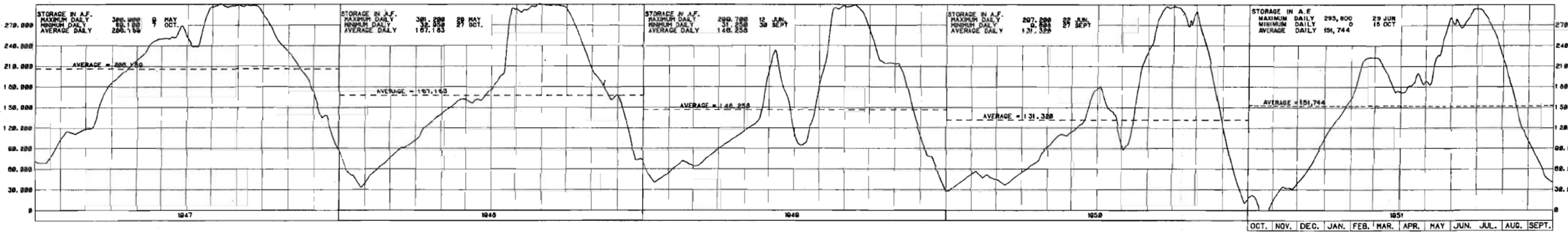
CORPS OF ENGINEERS

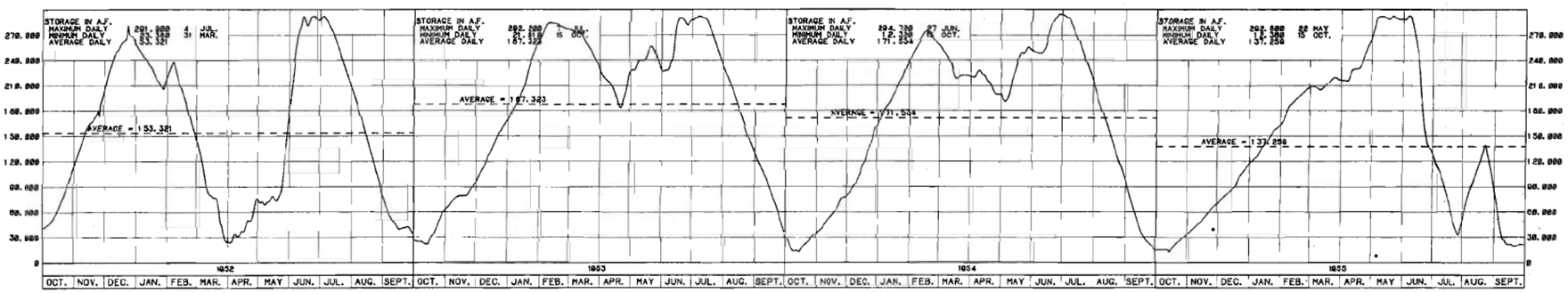
U.S. ARMY

STORAGE CONTENT IN A.F.









REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED D. Reese
DRAWN G.D.P.
CHECKED D. Reese
PREPARED D. E. Reese
CHIEF, RES. MGT. SEC.

ARROWROCK RESERVOIR
BOISE RIVER, IDAHO
TOTAL STORAGE CONTENTS IN ACRE-FEET
1916 THRU 1950

SUBMITTED R. B. Pickel
CHIEF, HYDROLOGY BRANCH
RECOMMENDED Brian Brookie Jol
CHIEF, PLANNING DIVISION

APPROVED DATE April 1953
COLONEL, C.E. DISTRICT ENGINEER

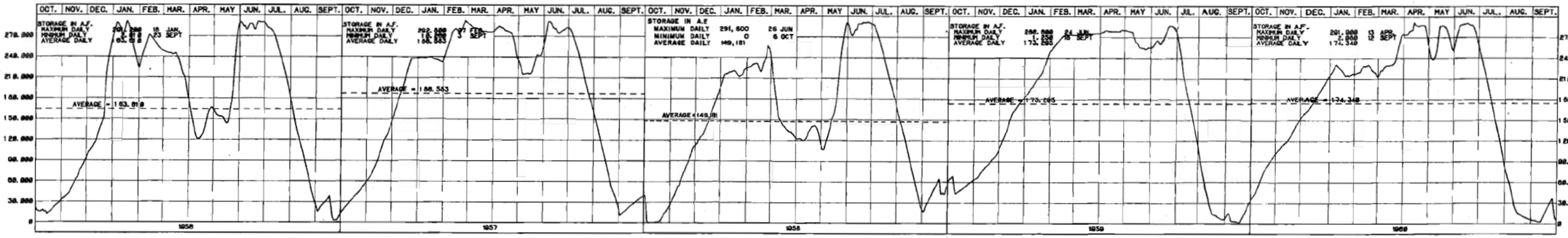
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 2 of 4 BO-05-6/15

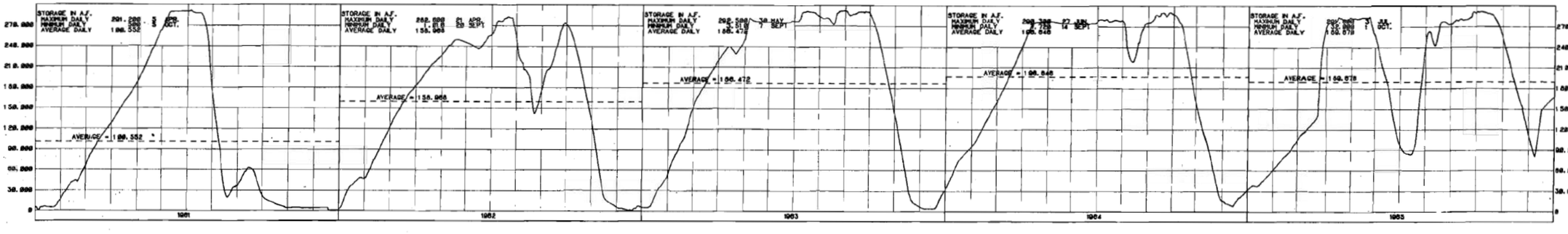
PLATE 7-8

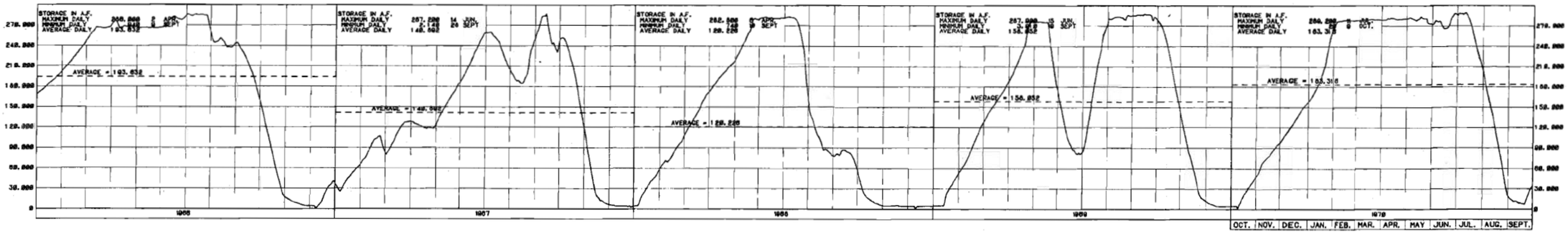
CORPS OF ENGINEERS

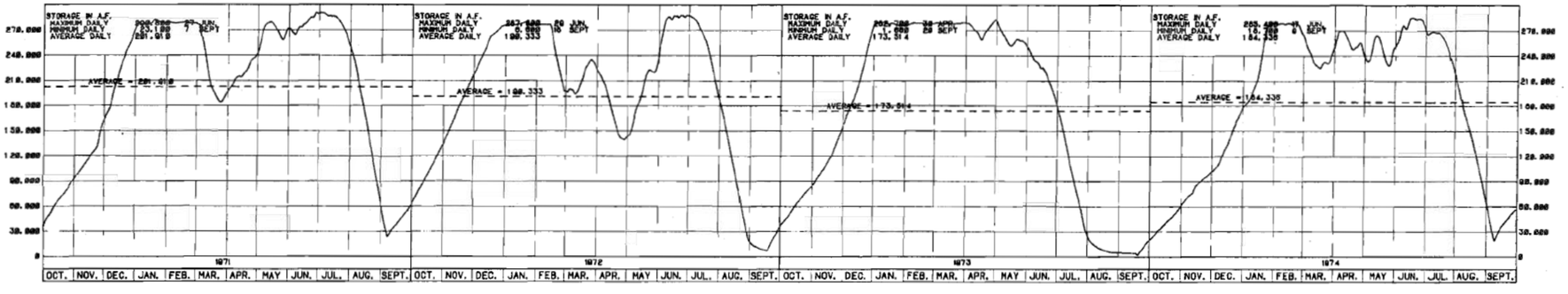
U.S. ARMY

STORAGE CONTENT IN A.F.









STORAGE CONTENT IN A.F.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: GDP
CHECKED: D. Reese
PREPARED: CHIEF, RES. REG. SEC.

ARROWROCK RESERVOIR
BOISE RIVER, IDAHO
TOTAL STORAGE
CONTENTS IN ACRE-FEET
1916 THRU 1980

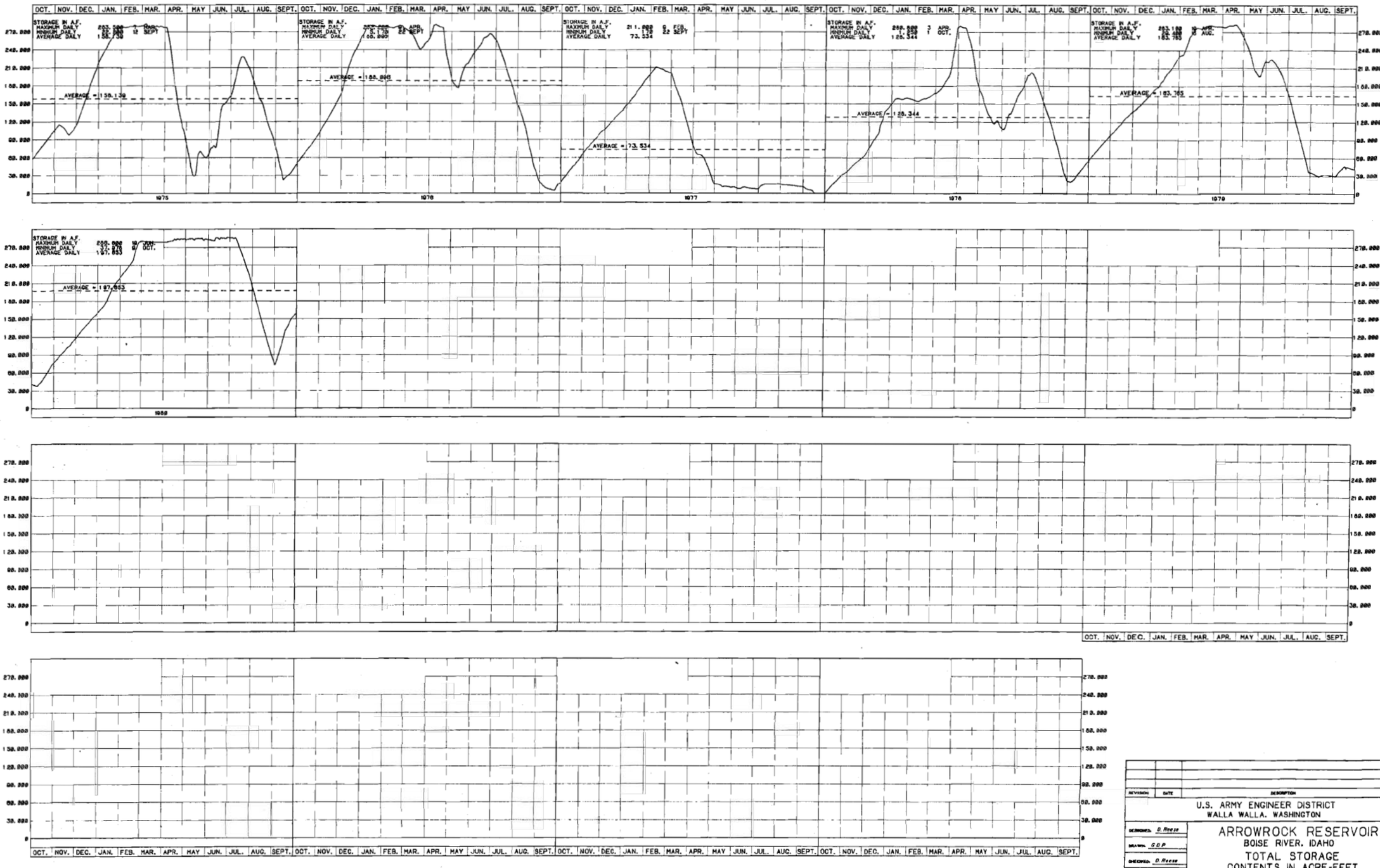
SUBMITTED: CHIEF, HYDROLOGY BRANCH
RECOMMENDED: CHIEF, PLANNING DIVISION
APPROVED: COL, CE, DISTRICT ENGINEER
DATE: April 1983
SCALE AS SHOWN
NV. NO. ENG.
FILE NO.
SHEET 3 of 4
B0-05-6/16

PLATE 7-8

CORPS OF ENGINEERS

U.S. ARMY

STORAGE CONTENT IN A.F.



STORAGE CONTENT IN A.F.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

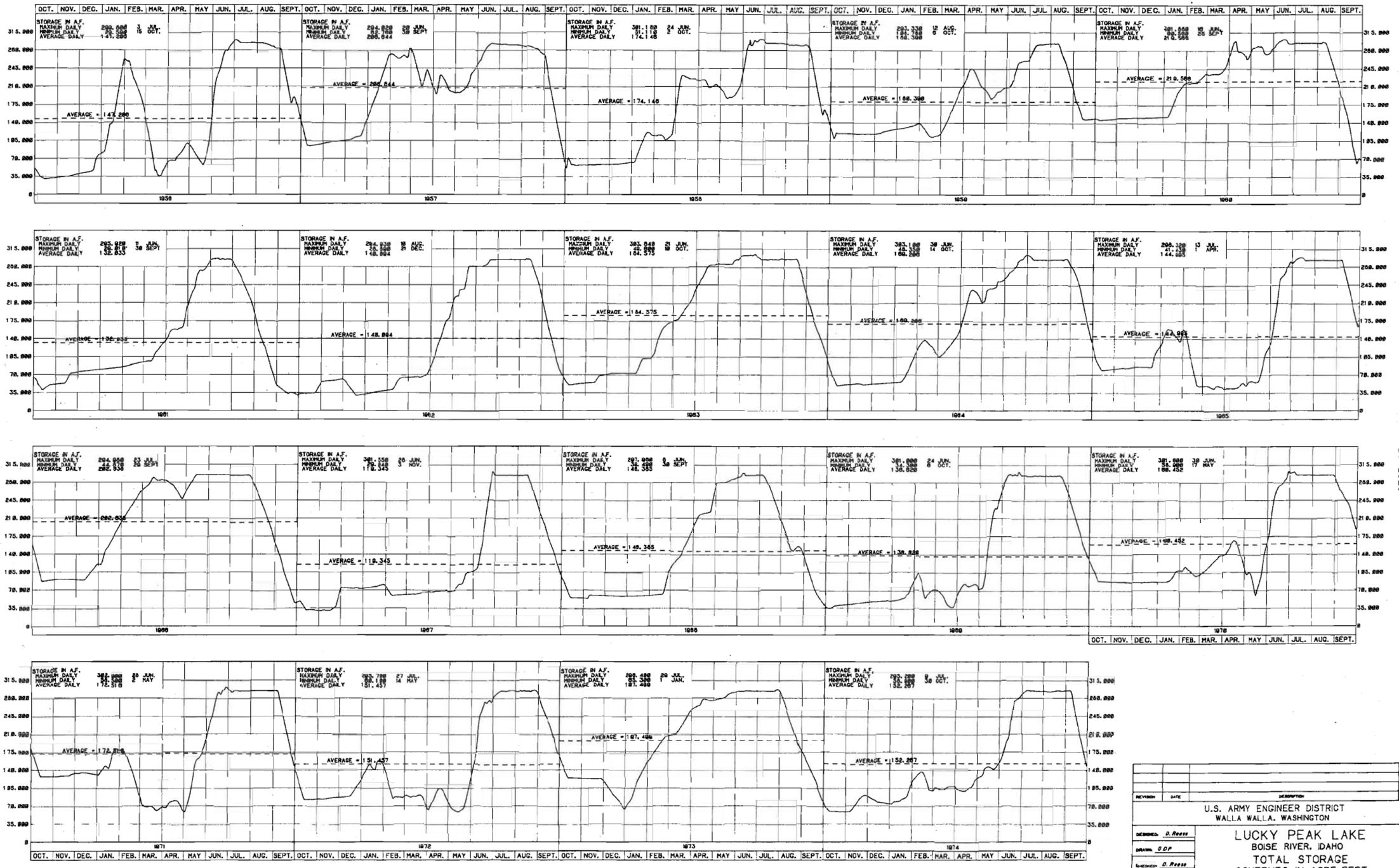
DESIGNED D. Reese
DRAWN G.D.P.
CHECKED D. Reese
PREPARED CHIEF, RES. REG. SEC.

ARROWROCK RESERVOIR
BOISE RIVER, IDAHO
TOTAL STORAGE
CONTENTS IN ACRE-FEET
1918 THRU 1980

SUBMITTED CHIEF, HYDROLOGY BRANCH
RECOMMENDED CHIEF, PLANNING DIVISION
APPROVED COL. CE, DISTRICT ENGINEER
DATE April 1982
SCALE AS SHOWN
INV. NO. ENG.
FILE NO.
SHEET 4 of 4 BO-05-6/17

PLATE 7-8

STORAGE CONTENT IN A.F.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: G.D.P.
CHECKED: D. Reese
PREPARED: D.R. Reese, CHIEF, RES. REG. SEC.
SUBMITTED: CHIEF, HYDROLOGY BRANCH
RECOMMENDED: CHIEF, PLANNING DIVISION

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
TOTAL STORAGE
CONTENTS IN ACRE-FEET
1956 THRU 1960

APPROVED: DATE April 1973
COLONEL, C.E., DISTRICT ENGINEER
SCALE AS SHOWN | INV. NO. ENG.
FILE NO.
SHEET 1 of 2 BO-05-6/18

PLATE 7-9

CORPS OF ENGINEERS

U.S. ARMY

STORAGE CONTENT IN A.F.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. Reese
DRAWN: G.D.P.
CHECKED: D. Reese
PREPARED: D.R. Rama
CHIEF, ENGR. BRANCH

LUCKY PEAK LAKE
BOISE RIVER, IDAHO
TOTAL STORAGE
CONTENTS IN ACRE-FEET
1956 THRU 1960

SUBMITTED: R.E. Reed
CHIEF, HYDROLOGY BRANCH

APPROVED: DATE April 1985
COLONEL, CE, DISTRICT ENGINEER

RECOMMENDED: Brian Beschta for
CHIEF, PLANNING DIVISION

SCALE AS SHOWN | INV. NO. ENG.

SHEET 2 of 2 | FILE NO. BO-05-6/19

PLATE 7-9

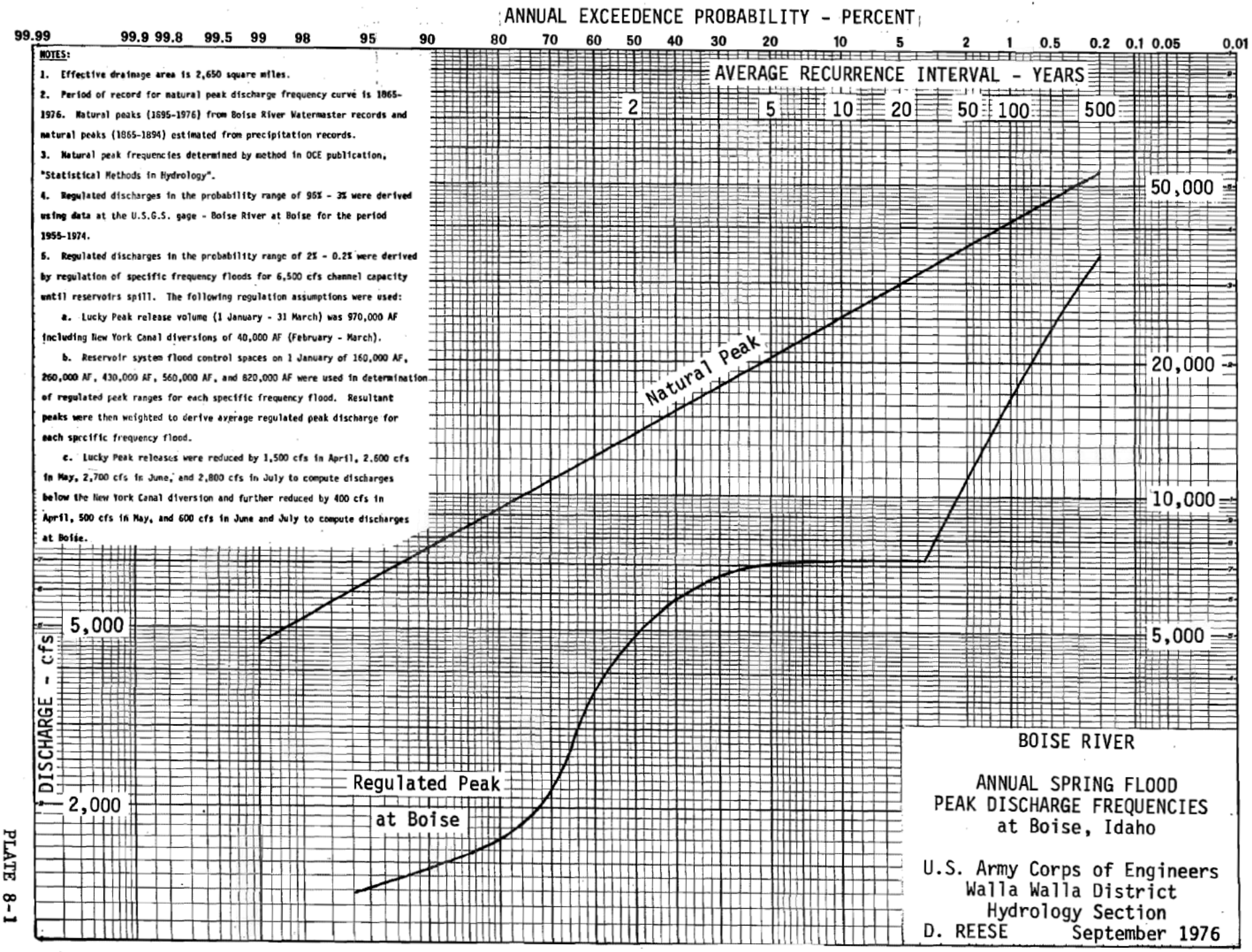

ANNUAL EXCEEDENCE PROBABILITY - PERCENT
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
AVERAGE RECURRENCE INTERVAL - YEARS
2 5 10 20 50 100 500
50,000
20,000
10,000
5,000
2,000
DISCHARGE - cfs
Natural Peak
Regulated Peak at Boise
NOTES:
1. Effective drainage area is 2,650 square miles.
2. Period of record for natural peak discharge frequency curve is 1865-1976. Natural peaks (1895-1976) from Boise River Watermaster records and natural peaks (1865-1894) estimated from precipitation records.
3. Natural peak frequencies determined by method in OCE publication, "Statistical Methods in Hydrology".
4. Regulated discharges in the probability range of 95% - 3% were derived using data at the U.S.G.S. gage - Boise River at Boise for the period 1955-1974.
5. Regulated discharges in the probability range of 2% - 0.2% were derived by regulation of specific frequency floods for 6,500 cfs channel capacity until reservoirs spill. The following regulation assumptions were used:
a. Lucky Peak release volume (1 January - 31 March) was 970,000 AF including New York Canal diversions of 40,000 AF (February - March).
b. Reservoir system flood control spaces on 1 January of 160,000 AF, 260,000 AF, 430,000 AF, 560,000 AF, and 820,000 AF were used in determination of regulated peak ranges for each specific frequency flood. Resultant peaks were then weighted to derive average regulated peak discharge for each specific frequency flood.
c. Lucky Peak releases were reduced by 1,500 cfs in April, 2,600 cfs in May, 2,700 cfs in June, and 2,800 cfs in July to compute discharges below the New York Canal diversion and further reduced by 400 cfs in April, 500 cfs in May, and 600 cfs in June and July to compute discharges at Boise.
BOISE RIVER
ANNUAL SPRING FLOOD
PEAK DISCHARGE FREQUENCIES
at Boise, Idaho
U.S. Army Corps of Engineers
Walla Walla District
Hydrology Section
D. REESE September 1976

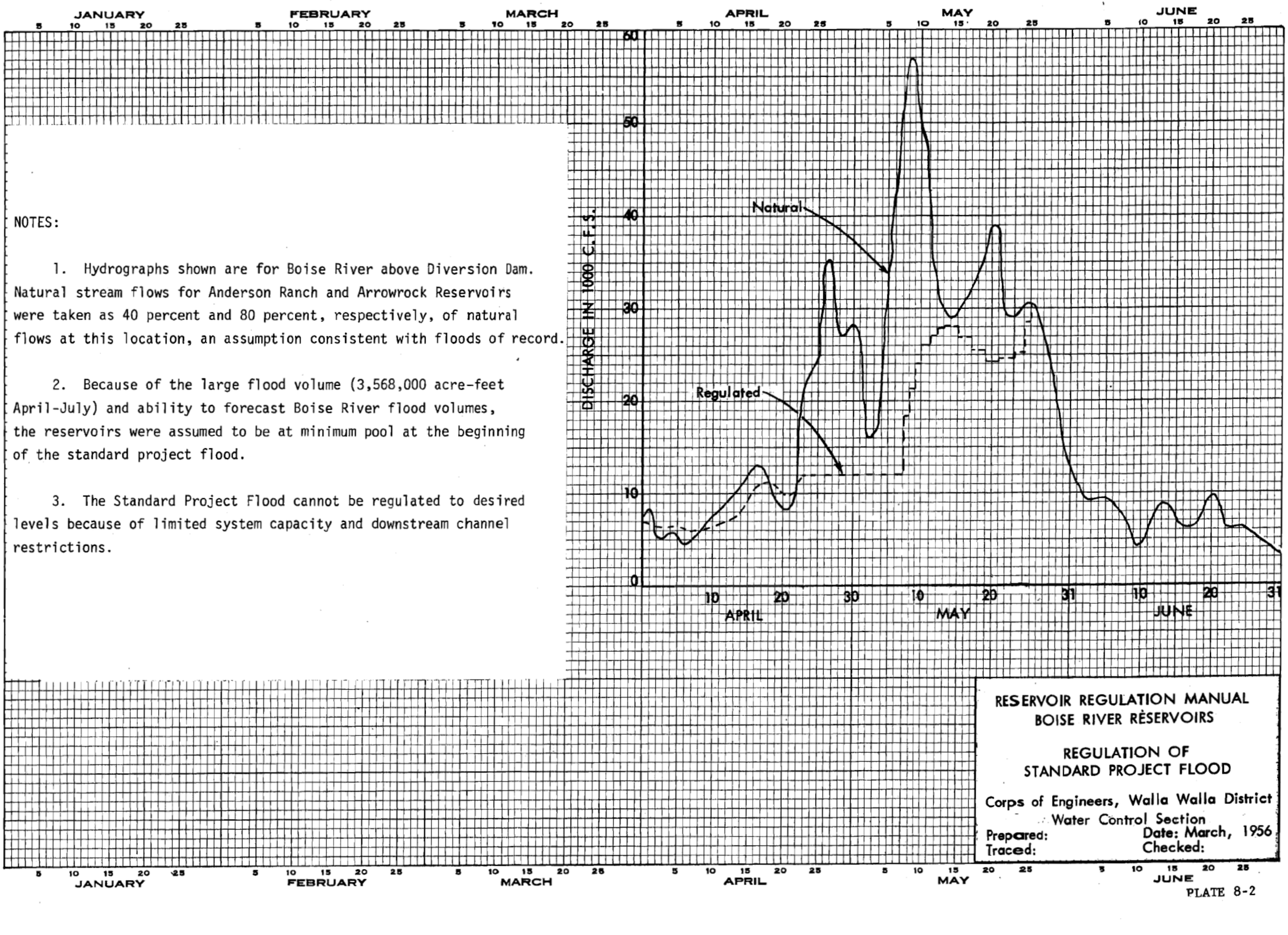
PLATE 8-1

NOTES:

1. Hydrographs shown are for Boise River above Diversion Dam. Natural stream flows for Anderson Ranch and Arrowrock Reservoirs were taken as 40 percent and 80 percent, respectively, of natural flows at this location, an assumption consistent with floods of record.

2. Because of the large flood volume (3,568,000 acre-feet April-July) and ability to forecast Boise River flood volumes, the reservoirs were assumed to be at minimum pool at the beginning of the standard project flood.

3. The Standard Project Flood cannot be regulated to desired levels because of limited system capacity and downstream channel restrictions.



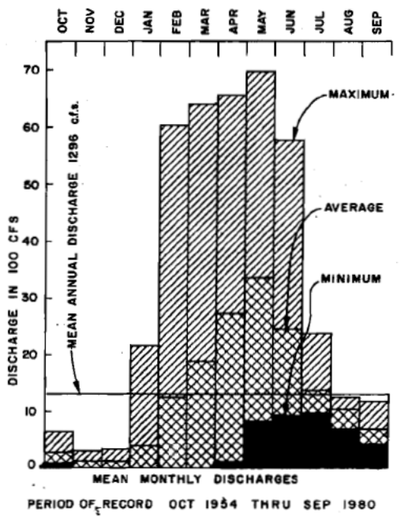
RESERVOIR REGULATION MANUAL
BOISE RIVER RESERVOIRS

REGULATION OF
STANDARD PROJECT FLOOD

Corps of Engineers, Walla Walla District
Water Control Section
Prepared: Date: March, 1956
Traced: Checked:

PLATE 8-2

NOTES:
1. DISCHARGE RECORDS TAKEN FROM U.S.G.S. RECORDS.
2. PERIOD OF RECORD, OCTOBER 1954 THROUGH SEPTEMBER 1980.
3. DRAINAGE AREA = 2760 MI^2 (APPROXIMATELY).
4. DIVERSIONS FOR IRRIGATION ARE MADE ABOVE STATION FROM 1 APRIL THRU 30 SEPTEMBER EACH YEAR.



PERIOD OF RECORD OCT 1954 THRU SEP 1980

PERIOD OF RECORD OCT 1954 THRU SEPT 1980

FLOW DURATION CURVE

PERIOD OF RECORD OCT 1954 THRU SEPT 1980

MAXIMUM ANNUAL MEAN DAILY DISCHARGES

WATER YEAR	DATE	CFS	WATER YEAR	DATE	CFS	WATER YEAR	DATE	CFS
1955	JUN 12	1740	1964	JUN 20	4630	1973	MAY 12	1460
1956	MAR 11	6840	1965	MAY 22	7170	1974	MAY 1	7460
1957	JUN 8	6870	1966	APR 4	1760	1975	MAY 19	6680
1958	MAY 29	6320	1967	JUL 5	1640	1976	APR 30	5730
1959	APR 16	1800	1968	APR 23	1800	1977	APR 24	1230
1960	APR 11	5710	1969	APR 22	5280	1978	APR 29	5460
1961	APR 30	1560	1970	JUN 30	5030	1979	MAY 25	1560
1962	JUL 1	1540	1971	APR 24	6850	1980	JUN 22	5620
1963	MAY 25	5870	1972	MAY 7	6710			

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DESIGNED: D. REESE
DRAWN: W. HENRY
CHECKED:
SUPERVISED:
CHIEF, ENGR. DIV.

BOISE RIVER AT BOISE
(REGULATED DISCHARGE)
SUMMARY HYDROGRAPHS
BOISE RIVER BASIN, IDAHO

SUPERVISED:
CHIEF, HYDROLOGY BRANCH
RECOMMENDED:
CHIEF, PLANNING DIVISION

DATE: April 1983
SCALE AS SHOWN
DIV. NO.
FILE NO.
SHEET 20 B0-05-6/20

E X H I B I T A

RUNOFF VOLUME FORECAST PROCEDURES

Bureau of Reclamation
and
Corps of Engineers

BOISE RIVER VOLUME FORECAST PROCEDURE
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGION

THE BUREAU OF RECLAMATIONS FORECAST PROCEDURE CONSISTS OF A MULTIPLE REGRESSION EQUATION OF THE FOLLOWING FORM:

$$Y = C0 + C1(X1) + C2(X2) + C3(X3) + C4(X4)$$

WHERE,

Y = FORECASTED RUNOFF VOLUME FOR THE PERIOD 1 OCTOBER THROUGH 31 JULY IN 1000'S OF ACRE-FEET (KAF).

X1 = INDEX OF OBSERVED RUNOFF VOLUME FOR THE PERIOD 1 OCTOBER THROUGH 31 DECEMBER IN KAF.

X2 = INDEX OF OBSERVED/EXPECTED TOTAL MONTHLY PRECIPITATION IN INCHES FOR THE 1 OCTOBER THROUGH 31 MARCH TIME PERIOD.

X3 = INDEX OF OBSERVED/EXPECTED 1 APRIL SNOW WATER CONTENT IN INCHES.

X4 = INDEX OF OBSERVED/EXPECTED TOTAL MONTHLY PRECIPITATION FOR THE PERIOD 1 APRIL THROUGH 30 JUNE IN INCHES.

C0,C1,C2,C3,C4 = COEFFICIENTS OF REGRESSION.

THE REGRESSION EQUATION IS FOR THE 1 OCTOBER THROUGH 31 JULY FORECAST PERIOD ONLY. TO FORECAST OTHER TIME PERIODS, SUBTRACT OBSERVED RUNOFF, 1 OCTOBER THROUGH DATE, FROM THE EQUATION RESULT. THE VARIABLES X1 THROUGH X4 ARE COMPUTED USING TABLES A1 THROUGH A4 ON PAGE A-1 SHEETS 2 AND 3.

TABLE A1

X1 INDEX (1 OCTOBER THROUGH 31 DECEMBER RUNOFF VOLUME)

MONTH	OBSERVED RUNOFF (1) (KAF)
OCTOBER	
NOVEMBER	
DECEMBER	

(1) TOTAL OBSERVED LUCKY PEAK LAKE UNREGULATED INFLOW (KAF).

X1 = TOTAL OBSERVED OCT-DEC RUNOFF = _____ KAF
(ENTER X1 ON PAGE A-1, SHEET 5)

TABLE A2

X2 INDEX (1 OCTOBER THROUGH 31 MARCH PRECIPITATION)

STATION	OBSERVED/EXPECTED MONTHLY PRECIPITATION (2) (INCHES)						OBSERVED/EXPECTED OCT-MAR TOTAL PRECIP (INCHES) (A)	STATION WEIGHT (B)	WEIGHTED OCT-MAR PRECIP (INCHES) (A)X(B)
	OCT	NOV	DEC	JAN	FEB	MAR			
ANDERSON								1.0	
ARROWROCK								2.0	
CENTERVILLE								1.0	
IDAHO CITY								1.0	

(2) REFER TO TABLE A6, PAGE A-1, SHEET 4

X2 = TOTAL WEIGHTED OCT-MAR PRECIPITATION = _____ INCHES
(ENTER X2 ON PAGE A-1, SHEET 5)

TABLE A3
X3 INDEX - (1 APRIL WATER CONTENT)

STATION	OBSERVED WATER CONTENT (INCHES) (A)	NORMAL SNOW WATER ACCUMULATION (1) DATE THRU 1 APRIL (INCHES) (B)	EXPECTED 1 APRIL TOTAL WATER CONTENT (INCHES) (C)=(A)+(B)	STATION WEIGHT (D)	WEIGHTED 1 APRIL WATER CONTENT (INCHES) (C)X(D)
ATLANTA SUMMIT				1.0	
JACKSON				1.0	
MOORES CREEK SUMMIT				1.0	
TRINITY MOUNTAIN				1.0	
VIENNA MINE				2.0	

(1) REFER TO TABLE A5, PAGE A-1, SHEET 4

X3 = TOTAL WEIGHTED 1 APRIL WATER CONTENT = _____ INCHES.
(ENTER ON PAGE A-1, SHEET 5)

TABLE A4
X4 INDEX - (1 APRIL THROUGH 30 JUNE PRECIPITATION)

STATION	OBSERVED/EXPECTED MONTHLY PRECIPITATION (2) (INCHES)			TOTAL PRECIPITATION APRIL THROUGH JUNE (INCHES) (A)	STATION WEIGHT (B)	WEIGHTED PRECIPITATION (INCHES) (A)X(B)
	APR	MAY	JUN			
ANDERSON					1.0	
ARROWROCK					2.0	
CENTERVILLE					1.0	
IDAHO CITY					1.0	

(2) REFER TO TABLE A6, PAGE A-1, SHEET 4

X4 INDEX = TOTAL WEIGHTED APRIL-JUNE PRECIPITATION = _____ INCHES.
(ENTER ON PAGE A-1, SHEET 5)

TABLE A5

STATION	NORMAL SNOW WATER ACCUMULATION (DATE - 1 APRIL) INCHES		
	1 JAN	1 FEB	1 MAR
ATLANTA SUMMIT	18.5	11.2	8.4
JACKSON PEAK	11.4	9.2	5.1
MOORES CREEK SUMMIT	20.9	10.9	4.6
TRINITY MOUNTAIN	25.3	14.9	6.5
VIENNA MINE	22.0	15.0	8.9

TABLE A6

STATION	EXPECTED MONTHLY PRECIPITATION (INCHES)					
	JAN	FEB	MAR	APR	MAY	JUN
ANDERSON	4.22	2.01	1.92	1.36	1.08	1.57
ARROWROCK	3.60	1.99	1.70	1.39	1.20	1.38
CENTERVILLE	4.85	2.80	2.67	1.80	1.60	2.06
IDAHO CITY	4.56	2.71	2.48	1.84	1.76	1.80

FORECAST PERIOD _____ FORECAST DATE_____

1 OCTOBER THROUGH 31 JULY VOLUME FORECAST

Y1 = (-857.753) + (2.7132)X1 + (11.9259)X2 + (5.2747)X3 + (9.1542)X4

= (-857.753) + (2.7132)_____ + (11.9259)_____ + (5.2747)_____ + (9.1542)_____
TABLE A1 TABLE A2 TABLE A3 TABLE A4

=_____ KAF.

FORECAST DATE THROUGH 31 JULY VOLUME FORECAST

Y (DATE-31 JULY) = Y1 (1 OCT - 31 JUL) - OBSERVED RUNOFF IN KAF (1 OCT - DATE)

Y (DATE - 31 JUL) = _____ - _____

Y (DATE - 31 JUL) = _____ KAF

BOISE RIVER VOLUME FORECAST PROCEDURE
U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA DISTRICT

1. SNOW-WATER CONTENT (WC) INDEX

SNOW COURSE	ELEVATION (FEET)	MEASURED WC (INCHES) (1)	SNOW COURSE WEIGHT FACTOR (SEE PAGE A-2, SHEET 3) (2)	SNOW COURSE WEIGHTED WC (1) X (2)
ATLANTA SUMMIT	7,500			
BOGUS BASIN	6,120			
DOLLARHIDE SUMMIT	8,620			
GALENA	7,300			
GALENA SUMMIT	8,795			
JACKSON PEAK	7,000			
MOORES CREEK SUMMIT	6,100			
TRINITY MOUNTAIN	7,780			
VIENNA MINE	8,900			

SUM OF SNOW COURSE WEIGHTED WC = _____

X1 = AVERAGE (SUM/NO. OF SNOW COURSES USED) = _____

FORECASTED RUNOFF VOLUME (INCHES) YWC = A0 + (A1)(X1)
(REFER TO PAGE A-2, SHEET 3 FOR COEFFICIENTS A0 AND A1)

YWC (INCHES) = _____

YWC (ACRE-FEET) = (143,000)(YWC INCHES) = _____

*** NOTE ***
AFTER 1 MAY: USE AVERAGE FORECASTED RUNOFF COMPUTED FROM INDIVIDUAL EQUATIONS FOR TRINITY MOUNTAIN, ATLANTA SUMMIT AND GALENA SUMMIT SNOW COURSES. AVERAGE IS THEN YWC.

DATE	SNOW COURSES	EQUATION
15 MAY:		
	ATLANTA SUMMIT	Y= -0.88 + 0.223(X)
	GALENA SUMMIT	Y= 0.72 + 0.259(X)
	TRINITY MOUNTAIN	Y= -1.25 + 0.199(X)
1 JUNE		
	ATLANTA SUMMIT	Y= 1.63 + 0.129(X)
	GALENA SUMMIT	Y= 2.16 + 0.170(X)
	TRINITY MOUNTAIN	Y= 0.97 + 0.135(X)

Y = RUNOFF FROM DATE - 31 JULY (INCHES)
X = MEASURED WC (INCHES)

2. PRECIPITATION INDEX

PRECIPITATION STATION	STATION WEIGHT (1)	MEASURED STATION PRECIPITATION (INCHES)					
		OCT	NOV	DEC	JAN	FEB	MAR
ANDERSON RANCH DAM	1.56						
ARROWROCK DAM	1.55						
CENTERVILLE ARBAUGH RH	1.16						
IDAHO CITY	1.26						
MONTHLY WEIGHT (2)		.70	1.0	1.0	1.0	1.0	1.0

PRECIPITATION STATION	ELEVATION	STATION WEIGHT(1) X MONTHLY WEIGHT(2) X PRECIPITATION					
		OCT	NOV	DEC	JAN	FEB	MAR
ANDERSON RANCH DAM	3,882						
ARROWROCK DAM	3,275						
CENTERVILLE ARBAUGH RH	4,300						
IDAHO CITY	3,965						
WEIGHTED MONTHLY SUM							
AVERAGE MONTHLY SUM							

X2 = ACCUMULATED AVERAGE MONTHLY SUMS = _____

FORECASTED RUNOFF VOLUME (INCHES) YPRECIP = B0 + (B1)(X2)
(REFER TO PAGE A-2, SHEET 3 FOR COEFFICIENTS B0 AND B1)

YPRECIP (INCHES) = _____

YPRECIP (ACRE-FEET) = (143,000) (YPRECIP INCHES) = _____

NOTE ***

1. FOR MIDMONTH FORECAST, USE ACCUMULATED PRECIPITATION FOR FIRST 14 DAYS OF MONTH. USE THE SAME MONTHLY WEIGHT AS FOR THE FIRST OF MONTH.
2. FOR THE 15 APRIL FORECAST:

   YPRECIP (15 APRIL - 31 JULY) = YPRECIP (1 APRIL - 31 JULY) - OBSERVED RUNOFF (1 APRIL - 14 APRIL)
3. FOR THE 1 MAY FORECAST:

   YPRECIP (1 MAY - 31 JULY) = YPRECIP (1 APRIL - 31 JULY) - OBSERVED RUNOFF (1 APRIL - 30 APRIL)

3. COMBINED RUNOFF VOLUME FORECAST (DATE - 31 JULY)

YWC (PAGE A-2, SHEET 1) = _____ ACRE-FEET

YPRECIP (PAGE A-2, SHEET 2) = _____ ACRE-FEET

SUM = _____ ACRE-FEET

YCOMB = AVERAGE = _____ ACRE-FEET

*** NOTE ***

IF FORECAST DATE IS AFTER 1 MAY, DO NOT INCLUDE YPRECIP.
USE YCOMB = YWC.

SNOW COURSE WEIGHT FACTORS

SNOW COURSE	1 JAN	15 JAN	1 FEB	15 FEB	1 MAR	15 MAR	1 APR	15 APR	1 MAY
ATLANTA SUMMIT	1.88	1.54	1.19	1.06	0.93	0.87	0.80	0.80	0.80
BOGUS BASIN	2.98	2.37	1.76	1.57	1.38	1.27	1.15	----	----
DOLLARHIDE SUMMIT	2.35	1.98	1.61	1.47	1.33	1.23	1.12	1.11	1.10
GALENA	3.69	2.88	2.07	1.87	1.67	1.58	1.49	----	----
GALENA SUMMIT	2.86	2.31	1.76	1.59	1.42	1.30	1.17	1.16	1.14
JACKSON PEAK	----	1.65	1.22	1.17	1.11	0.99	0.87	0.87	0.87
MOORES CREEK SUMMIT	2.14	1.71	1.28	1.14	0.99	0.92	0.85	0.90	0.94
TRINITY MOUNTAIN	1.53	1.25	0.96	0.91	0.85	0.75	0.65	0.66	0.66
VIENNA MINE	----	1.40	1.08	1.01	0.93	0.85	0.76	0.75	0.74

REGRESSION COEFFICIENTS

COEFFICIENT	1 JAN	15 JAN	1 FEB	15 FEB	1 MAR	15 MAR	1 APR	15 APR	1 MAY
A0	5.65	4.46	3.26	1.68	0.09	-1.15	-2.38	-2.65	-2.92
A1	0.247	0.281	0.315	0.352	0.389	0.419	0.449	0.413	0.376
B0	3.66	2.64	1.61	0.17	-1.27	-2.15	-3.03	-3.84	-4.65
B1	0.858	0.773	0.687	0.680	0.673	0.644	0.614	0.626	0.638

E X H I B I T B

LUCKY PEAK UNREGULATED INFLOW
PROJECTION DATA

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 January-31 July

(1) Inflow Projection Period (1 Jan thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Jan	1	Y = 0.296 + 0.001096 x	1.313
2 Jan	2	Y = 1.400 + 0.001745 x	2.510
3 Jan	3	Y = 2.183 + 0.002484 x	3.352
5 Jan	5	Y = 3.917 + 0.003869 x	4.940
7 Jan	7	Y = 5.798 + 0.005176 x	6.191
10 Jan	10	Y = 9.007 + 0.006924 x	7.649
15 Jan	15	Y = 13.739 + 0.010502 x	10.703
20 Jan	20	Y = 12.733 + 0.018450 x	14.849
25 Jan	25	Y = 10.831 + 0.027198 x	19.316
30 Jan	30	Y = 12.260 + 0.033295 x	22.553
4 Feb	35	Y = 15.423 + 0.038770 x	25.637
9 Feb	40	Y = 21.375 + 0.042854 x	28.541
14 Feb	45	Y = 27.248 + 0.046915 x	31.082
19 Feb	50	Y = 32.629 + 0.051560 x	33.640
1 Mar	60	Y = 43.766 + 0.062329 x	38.210
11 Mar	70	Y = 52.245 + 0.076834 x	45.267
21 Mar	80	Y = 61.430 + 0.097161 x	57.557
31 Mar	90	Y = 68.792 + 0.129677 x	72.473
10 Apr	100	Y = 76.903 + 0.175792 x	91.894
20 Apr	110	Y = 78.704 + 0.245319 x	113.721
30 Apr	120	Y = 68.905 + 0.331822 x	131.162
10 May	130	Y = 79.775 + 0.416645 x	149.544
20 May	140	Y = 112.556 + 0.497371 x	156.145
30 May	150	Y = 129.945 + 0.587569 x	154.842
9 Jun	160	Y = 102.983 + 0.700021 x	125.116
19 Jun	170	Y = 69.278 + 0.806113 x	80.537
29 Jun	180	Y = 37.939 + 0.889066 x	47.587
9 Jul	190	Y = 14.362 + 0.945427 x	21.556
19 Jul	200	Y = 2.263 + 0.979459 x	6.846

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 January-31 July

(1) Inflow Projection Period (15 Jan thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 Jan	1	Y = 0.532 + 0.001088 x	1.378
16 Jan	2	Y = 1.158 + 0.002160 x	2.505
17 Jan	3	Y = 1.364 + 0.003496 x	3.862
19 Jan	5	Y = 0.707 + 0.006932 x	6.694
21 Jan	7	Y = -1.452 + 0.011366 x	9.425
24 Jan	10	Y = -2.195 + 0.016502 x	12.608
29 Jan	15	Y = -0.651 + 0.022709 x	16.305
3 Feb	20	Y = 2.080 + 0.028373 x	19.640
8 Feb	25	Y = 7.869 + 0.032671 x	22.707
13 Feb	30	Y = 13.809 + 0.036743 x	25.586
18 Feb	35	Y = 19.510 + 0.041199 x	28.422
23 Feb	40	Y = 25.510 + 0.046008 x	31.045
28 Feb	45	Y = 30.639 + 0.051880 x	33.315
5 Mar	50	Y = 34.729 + 0.058944 x	36.303
15 Mar	60	Y = 43.713 + 0.075119 x	46.128
25 Mar	70	Y = 54.948 + 0.098693 x	60.509
4 Apr	80	Y = 62.870 + 0.136635 x	76.996
14 Apr	90	Y = 70.800 + 0.191230 x	96.961
24 Apr	100	Y = 65.941 + 0.272237 x	118.442
4 May	110	Y = 65.412 + 0.356744 x	137.550
14 May	120	Y = 85.192 + 0.443254 x	152.499
24 May	130	Y = 125.147 + 0.521616 x	155.877
3 Jun	140	Y = 113.044 + 0.629910 x	143.588
13 Jun	150	Y = 90.196 + 0.739368 x	110.389
23 Jun	160	Y = 53.995 + 0.841366 x	65.085
3 Jul	170	Y = 27.233 + 0.912933 x	36.904
13 Jul	180	Y = 7.215 + 0.961324 x	14.037
23 Jul	190	Y = 0.613 + 0.987959 x	3.902

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 February-31 July

(1) Inflow Projection Period (1 Feb thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Feb	1	Y = 0.176 + 0.001355 x	1.553
2 Feb	2	Y = 0.910 + 0.002394 x	3.053
3 Feb	3	Y = 1.635 + 0.003440 x	4.248
5 Feb	5	Y = 3.490 + 0.005517 x	7.033
7 Feb	7	Y = 5.723 + 0.007231 x	9.454
10 Feb	10	Y = 9.652 + 0.009646 x	12.042
15 Feb	15	Y = 15.744 + 0.013746 x	15.189
20 Feb	20	Y = 21.378 + 0.018435 x	17.912
25 Feb	25	Y = 27.736 + 0.023266 x	21.084
2 Mar	30	Y = 30.212 + 0.031224 x	24.516
7 Mar	35	Y = 32.835 + 0.039845 x	28.580
12 Mar	40	Y = 35.211 + 0.049735 x	34.953
17 Mar	45	Y = 37.993 + 0.060710 x	43.165
22 Mar	50	Y = 38.421 + 0.076226 x	56.137
1 Apr	60	Y = 44.194 + 0.111896 x	75.425
11 Apr	70	Y = 50.363 + 0.161427 x	96.088
21 Apr	80	Y = 45.360 + 0.239770 x	120.919
1 May	90	Y = 37.506 + 0.329269 x	138.076
11 May	100	Y = 49.407 + 0.416323 x	152.975
21 May	110	Y = 80.417 + 0.500635 x	158.554
31 May	120	Y = 99.765 + 0.593000 x	156.001
10 Jun	130	Y = 81.397 + 0.703782 x	125.520
20 Jun	140	Y = 58.407 + 0.806095 x	80.921
30 Jun	150	Y = 34.384 + 0.886894 x	47.981
10 Jul	160	Y = 12.824 + 0.944047 x	22.135
20 Jul	170	Y = 2.007 + 0.978569 x	7.703

NOTES:

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2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 February-31 July

(1) Inflow Projection Period (15 Feb thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 Feb	1	Y = 1.309 + 0.000824 x	1.088
16 Feb	2	Y = 2.293 + 0.001887 x	2.143
17 Feb	3	Y = 3.514 + 0.002769 x	2.934
19 Feb	5	Y = 5.878 + 0.004650 x	4.549
21 Feb	7	Y = 8.578 + 0.006442 x	6.464
24 Feb	10	Y = 12.448 + 0.009466 x	9.506
1 Mar	15	Y = 17.959 + 0.015629 x	14.669
6 Mar	20	Y = 21.931 + 0.023167 x	19.925
11 Mar	25	Y = 27.503 + 0.030521 x	25.801
16 Mar	30	Y = 32.031 + 0.040076 x	33.721
21 Mar	35	Y = 37.210 + 0.051734 x	42.924
26 Mar	40	Y = 42.879 + 0.066082 x	51.870
31 Mar	45	Y = 46.446 + 0.085270 x	59.385
5 Apr	50	Y = 53.311 + 0.105874 x	69.340
15 Apr	60	Y = 61.799 + 0.165133 x	91.396
25 Apr	70	Y = 54.579 + 0.251918 x	114.706
5 May	80	Y = 57.463 + 0.339317 x	136.202
15 May	90	Y = 80.536 + 0.429194 x	150.840
25 May	100	Y = 122.501 + 0.510590 x	154.870
4 Jun	110	Y = 106.721 + 0.626568 x	139.888
14 Jun	120	Y = 84.795 + 0.740104 x	105.298
24 Jun	130	Y = 50.063 + 0.843700 x	61.952
4 Jul	140	Y = 24.589 + 0.915445 x	33.826
14 Jul	150	Y = 6.093 + 0.963252 x	12.437
24 Jul	160	Y = 0.339 + 0.989439 x	3.227

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 March-31 July

(1) Inflow Projection Period (1 Mar thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Mar	1	Y = 0.861 + 0.001513 x	1.632
2 Mar	2	Y = 1.953 + 0.002919 x	3.398
3 Mar	3	Y = 2.680 + 0.004579 x	4.977
5 Mar	5	Y = 3.997 + 0.007996 x	8.536
7 Mar	7	Y = 5.229 + 0.011561 x	11.899
10 Mar	10	Y = 7.900 + 0.016636 x	16.944
15 Mar	15	Y = 11.922 + 0.026655 x	27.031
20 Mar	20	Y = 13.947 + 0.040197 x	41.220
25 Mar	25	Y = 16.260 + 0.056865 x	57.395
30 Mar	30	Y = 17.921 + 0.076618 x	67.349
4 Apr	35	Y = 23.303 + 0.097398 x	76.557
9 Apr	40	Y = 27.548 + 0.123092 x	86.813
14 Apr	45	Y = 29.841 + 0.155327 x	100.113
19 Apr	50	Y = 30.664 + 0.195403 x	112.412
29 Apr	60	Y = 22.226 + 0.287595 x	131.899
9 May	70	Y = 34.254 + 0.375010 x	148.621
19 May	80	Y = 64.012 + 0.463976 x	156.239
29 May	90	Y = 99.593 + 0.550521 x	156.797
8 Jun	100	Y = 82.395 + 0.667840 x	131.298
18 Jun	110	Y = 64.631 + 0.775782 x	90.791
28 Jun	120	Y = 37.748 + 0.867819 x	53.252
8 Jul	130	Y = 16.779 + 0.931283 x	26.647
18 Jul	140	Y = 3.124 + 0.972164 x	9.621
28 Jul	150	Y = 0.078 + 0.994651 x	1.949

NOTES:

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2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 March-31 July

(1) Inflow Projection Period (15 Mar thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 Mar	1	Y = 1.196 + 0.002020 x	2.671
16 Mar	2	Y = 2.374 + 0.004148 x	5.465
17 Mar	3	Y = 3.364 + 0.006560 x	8.404
19 Mar	5	Y = 4.157 + 0.012819 x	15.812
21 Mar	7	Y = 5.398 + 0.019303 x	23.768
24 Mar	10	Y = 8.597 + 0.028716 x	33.513
29 Mar	15	Y = 11.843 + 0.048029 x	45.165
3 Apr	20	Y = 17.676 + 0.068990 x	56.884
8 Apr	25	Y = 22.833 + 0.094835 x	68.991
13 Apr	30	Y = 25.378 + 0.128418 x	84.216
18 Apr	35	Y = 25.715 + 0.170879 x	99.310
23 Apr	40	Y = 21.378 + 0.217827 x	111.496
28 Apr	45	Y = 17.636 + 0.266604 x	122.506
3 May	50	Y = 23.087 + 0.309543 x	133.033
13 May	60	Y = 46.051 + 0.401807 x	147.682
23 May	70	Y = 87.824 + 0.487215 x	151.973
2 Jun	80	Y = 90.437 + 0.597622 x	143.825
12 Jun	90	Y = 75.291 + 0.713319 x	111.863
22 Jun	100	Y = 47.560 + 0.821412 x	67.753
2 Jul	110	Y = 25.874 + 0.899297 x	39.710
12 Jul	120	Y = 6.915 + 0.953946 x	16.128
22 Jul	130	Y = 0.439 + 0.984478 x	5.489

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 April-31 July

(1) Inflow Projection Period (1 Apr thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Apr	1	Y = 1.699 + 0.003859 x	3.566
2 Apr	2	Y = 3.600 + 0.007746 x	7.403
3 Apr	3	Y = 5.346 + 0.012046 x	11.258
5 Apr	5	Y = 9.244 + 0.020671 x	18.374
7 Apr	7	Y = 12.811 + 0.030417 x	25.133
10 Apr	10	Y = 15.712 + 0.048408 x	36.453
15 Apr	15	Y = 19.726 + 0.084950 x	56.041
20 Apr	20	Y = 20.119 + 0.129621 x	76.612
25 Apr	25	Y = 17.863 + 0.179394 x	92.344
30 Apr	30	Y = 17.487 + 0.229886 x	106.060
5 May	35	Y = 24.413 + 0.274515 x	117.953
10 May	40	Y = 35.160 + 0.323718 x	126.598
15 May	45	Y = 50.817 + 0.371414 x	134.036
20 May	50	Y = 69.961 + 0.418401 x	137.059
30 May	60	Y = 97.482 + 0.519284 x	142.844
9 Jun	70	Y = 80.835 + 0.646835 x	118.011
19 Jun	80	Y = 60.008 + 0.765516 x	79.533
29 Jun	90	Y = 33.470 + 0.863534 x	47.941
9 Jul	100	Y = 13.149 + 0.930968 x	23.172
19 Jul	110	Y = 1.764 + 0.972853 x	8.216
29 Jul	120	Y = 0.047 + 0.995934 x	1.494

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 April-31 July

(1) Inflow Projection Period (15 Apr thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1$ x (KAF)	(4) Standard Error (KAF)
15 Apr	1	Y = 1.471 + 0.008865 x	6.766
16 Apr	2	Y = 3.642 + 0.017201 x	13.737
17 Apr	3	Y = 5.529 + 0.025898 x	20.658
19 Apr	5	Y = 7.013 + 0.044337 x	29.734
21 Apr	7	Y = 8.011 + 0.064596 x	40.476
24 Apr	10	Y = 8.785 + 0.096472 x	54.379
29 Apr	15	Y = 11.296 + 0.150415 x	75.344
4 May	20	Y = 21.022 + 0.197650 x	90.169
9 May	25	Y = 34.662 + 0.250025 x	101.167
14 May	30	Y = 52.610 + 0.301187 x	111.155
19 May	35	Y = 72.253 + 0.352939 x	117.579
24 May	40	Y = 94.614 + 0.401832 x	124.200
29 May	45	Y = 101.448 + 0.463587 x	128.796
3 Jun	50	Y = 92.317 + 0.535639 x	120.690
13 Jun	60	Y = 76.178 + 0.672062 x	95.435
23 Jun	70	Y = 44.755 + 0.800053 x	58.580
3 Jul	80	Y = 22.239 + 0.889830 x	34.249
13 Jul	90	Y = 4.382 + 0.951324 x	13.744
23 Jul	100	Y = -0.302 + 0.984686 x	4.657

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 May-31 July

(1) Inflow Projection Period (1 May thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 May	1	Y = 3.431 + 0.009768 x	5.735
2 May	2	Y = 7.143 + 0.019282 x	11.021
3 May	3	Y = 11.152 + 0.028716 x	15.890
5 May	5	Y = 18.839 + 0.049072 x	24.950
7 May	7	Y = 26.586 + 0.070923 x	33.270
10 May	10	Y = 38.222 + 0.106044 x	44.433
15 May	15	Y = 60.102 + 0.163226 x	63.217
20 May	20	Y = 81.331 + 0.223245 x	78.052
25 May	25	Y = 105.306 + 0.279843 x	90.852
30 May	30	Y = 114.571 + 0.350973 x	100.209
4 Jun	35	Y = 105.257 + 0.436713 x	96.735
9 Jun	40	Y = 93.713 + 0.522889 x	91.000
14 Jun	45	Y = 83.299 + 0.604035 x	82.358
19 Jun	50	Y = 63.254 + 0.688054 x	66.369
29 Jun	60	Y = 30.798 + 0.822607 x	43.893
9 Jul	70	Y = 10.352 + 0.911481 x	21.987
19 Jul	80	Y = -0.402 + 0.966161 x	8.460
29 Jul	90	Y = -0.171 + 0.994835 x	1.463

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 May-31 July

(1) Inflow Projection Period (15 May thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 May	1	Y = 6.575 + 0.012718 x	6.580
16 May	2	Y = 12.731 + 0.025854 x	12.817
17 May	3	Y = 18.941 + 0.039020 x	18.435
19 May	5	Y = 31.752 + 0.064492 x	28.798
21 May	7	Y = 45.454 + 0.088249 x	38.220
24 May	10	Y = 63.776 + 0.127490 x	50.172
29 May	15	Y = 81.481 + 0.208614 x	65.625
3 Jun	20	Y = 77.725 + 0.311778 x	69.145
8 Jun	25	Y = 70.346 + 0.417122 x	70.755
13 Jun	30	Y = 63.450 + 0.516790 x	67.799
18 Jun	35	Y = 45.330 + 0.621983 x	57.625
23 Jun	40	Y = 30.132 + 0.713376 x	48.799
28 Jun	45	Y = 19.198 + 0.786674 x	40.874
3 Jul	50	Y = 12.139 + 0.844199 x	30.970
13 Jul	60	Y = -1.943 + 0.933419 x	13.708
23 Jul	70	Y = -2.685 + 0.979518 x	4.921

NOTES:

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3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 June-31 July

(1) Inflow Projection Period (1 Jun thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Jun	1	Y = 2.728 + 0.024903 x	4.667
2 Jun	2	Y = 5.361 + 0.049426 x	9.085
3 Jun	3	Y = 7.185 + 0.075211 x	13.409
5 Jun	5	Y = 8.259 + 0.131188 x	21.345
7 Jun	7	Y = 10.874 + 0.183792 x	27.786
10 Jun	10	Y = 15.811 + 0.260511 x	35.427
15 Jun	15	Y = 15.702 + 0.394130 x	42.760
20 Jun	20	Y = 4.798 + 0.534306 x	42.668
25 Jun	25	Y = 0.139 + 0.647300 x	39.935
30 Jun	30	Y = -2.683 + 0.738186 x	33.958
5 Jul	35	Y = -4.782 + 0.812016 x	25.434
10 Jul	40	Y = -8.467 + 0.875569 x	17.817
15 Jul	45	Y = -9.673 + 0.923013 x	12.090
20 Jul	50	Y = -8.528 + 0.956439 x	8.092

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 June-31 July

(1) Inflow Projection Period (15 Jun thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 Jun	1	Y = 0.261 + 0.042917 x	4.026
16 Jun	2	Y = 0.036 + 0.086498 x	7.790
17 Jun	3	Y = -0.906 + 0.131443 x	11.137
19 Jun	5	Y = -4.263 + 0.222418 x	16.817
21 Jun	7	Y = -5.570 + 0.302843 x	20.699
24 Jun	10	Y = -5.085 + 0.406215 x	22.852
29 Jun	15	Y = -6.034 + 0.557465 x	22.875
4 Jul	20	Y = -7.316 + 0.682713 x	18.241
9 Jul	25	Y = -10.186 + 0.790255 x	13.572
14 Jul	30	Y = -10.831 + 0.870625 x	9.935
19 Jul	35	Y = -9.269 + 0.927077 x	7.199
24 Jul	40	Y = -5.278 + 0.964549 x	3.908

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 1 July-31 July

(1) Inflow Projection Period (1 Jul thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
1 Jul	1	Y = 0.153 + 0.055625 x	1.390
2 Jul	2	Y = 0.070 + 0.110169 x	2.405
3 Jul	3	Y = -0.511 + 0.166591 x	3.045
5 Jul	5	Y = -2.268 + 0.278195 x	3.812
7 Jul	7	Y = -3.666 + 0.378808 x	4.614
10 Jul	10	Y = -6.498 + 0.520251 x	5.228
15 Jul	15	Y = -8.343 + 0.702454 x	5.670
20 Jul	20	Y = -7.495 + 0.829828 x	4.973
25 Jul	25	Y = -4.450 + 0.917502 x	3.015

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

LUCKY PEAK UNREGULATED
INFLOW PROJECTION DATA SHEET

Forecast Period: 15 July-31 July

(1) Inflow Projection Period (15 Jul thru)	(2) Inflow Projection Period (Days)	(3) Projection Equation $Y=A_0 + A_1 x$ (KAF)	(4) Standard Error (KAF)
15 Jul	1	Y = -0.543 + 0.094179 x	0.688
16 Jul	2	Y = -0.893 + 0.180678 x	1.196
17 Jul	3	Y = -1.330 + 0.263061 x	1.571
19 Jul	5	Y = -1.986 + 0.414538 x	2.025
21 Jul	7	Y = -1.945 + 0.542943 x	2.179
24 Jul	10	Y = -1.642 + 0.713646 x	1.821

NOTES:

1. Column (1) is accurate for a non-leap year only.
2. Column (2) represents the number of days from forecast date.
3. Equations give expected inflow volumes during the inflow projection periods.

   a. Y = projected inflow volume (KAF) expected during the inflow projection period.
   b. x = forecasted runoff volume (KAF) corresponding to the forecast period.

4. Column (4) gives the standard error of regression (KAF) corresponding to the equation of Column (3).
5. Equations and standard errors developed from 1895 through 1980 period of record.

E X H I B I T C

MEMORANDUM OF UNDERSTANDING

APPENDIX A

(COPY)

MEMORANDUM OF AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE DEPARTMENT OF THE INTERIOR
FOR
FLOOD CONTROL OPERATION OF BOISE RIVER RESERVOIRS, IDAHO

THIS MEMORANDUM OF AGREEMENT entered into this (20th) day of (November), 1953, by and between the Department of the Army, represented by (Robert T. Stevens), SECRETARY OF THE ARMY, and the Department of the Interior, represented by (Fred G. Aandahl, Assistant), SECRETARY OF THE INTERIOR,

W I T N E S S E T H

WHEREAS, the Department of the Army, through the Corps of Engineers, is engaged in constructing the Lucky Peak Dam and Reservoir on the Boise River in the State of Idaho, under authority of the Act of July 24, 1946 (60 Stat. 641), which authorized construction of Lucky Peak Reservoir substantially in accordance with the recommendations of the Chief of Engineers in his report of May 13, 1946; and

WHEREAS, said report concurred in the views and recommendations of the Board of Engineers for Rivers and Harbors that the Lucky Peak Reservoir be constructed with the understanding that complete or partial joint use of the storage in the three-reservoir system, viz., Lucky Peak, Arrowrock, and Anderson Ranch Reservoirs, may be undertaken at such time as may be mutually agreed upon by the Secretary

of War (now Secretary of the Army), the Secretary of the Interior, and local interests concerned with flood control and the use of irrigation water; and

WHEREAS, said report concurred in the views and recommendations of the Board of Engineers for Rivers and Harbors that Lucky Peak Reservoir be authorized for construction with the understanding that changes in the method of operation will be made in the future when the Secretary of War (now Secretary of the Army), upon the advice of the Chief of Engineers, finds that such changes are in the best interest of flood control, irrigation, and power development, and that they are agreeable to the Secretary of the Interior and to the local interests concerned with flood control and the use irrigation water; and

WHEREAS, said act provides that Lucky Peak Dam and Reservoir "shall be operated in such manner as not materially to interfere with the operation of said Arrowrock Reservoir"; and

WHEREAS, the Department of the Interior, through the Bureau of Reclamation, acting under the Federal Reclamation Laws (these being the Act of June 17, 1902, 32 Stat, 388, and acts amendatory thereof or supplemental thereto), has constructed and is operating Arrowrock Dam and Reservoir on the Boise River and Anderson Ranch Dam and Reservoir on the south fork of the Boise River, both upstream from the Lucky Peak Dam; and

(COPY)

WHEREAS, there are storage rights in Arrowrock, Anderson Ranch, and Lake Lowell Reservoirs by virtue of appropriations under the laws of Idaho and contracts between the United States, represented by the Department of the Interior, and various water users' organizations serving lands in the Boise Valley, and there are other existing rights in and to the use of waters of the Boise River, both stored and natural flow, which waters are in part diverted and distributed through the transferred works of the Boise Project being operated and maintained by the Boise Project Board of Control and in part by means of other works being operated and maintained by other water users' organizations; and

WHEREAS, certain of the rights above described are adjudicated rights, which are exercised under the supervision of the State of Idaho, represented by the watermaster of District No. 12-A, Boise River; and

WHEREAS, to comply with the above-quoted Congressional declaration of operational policy in regard to Lucky Peak and Arrowrock Dams, and to achieve the greatest multiple-purpose use of the combined total usable flood control and irrigation storage of 983,000 acre-feet of water in all three reservoirs, a coordinated plan of operation is necessary for this reservoir system on the Boise River, a river totally within the State of Idaho, together with Diversion Dam, the New York Canal headworks, and Lake Lowell; and

(COPY)

WHEREAS, it is recognized that the successful operation of this coordinated irrigation and flood control plan will call for the cooperation and assumption of responsibilities by the two Departments and the water users having storage rights in the reservoir system, and that there is need for a policy of mutual coordination, information, and assistance in its performance;

NOW, THEREFORE, for and in consideration of the premises and certain benefits and advantages accruing hereunder to affected local interests, it is hereby agreed as follows:

1

The hydrologic situation is shown on Plate 1, attached hereto and made a part of this agreement, which depicts the general location of the Lucky Peak, Arrowrock, and Anderson Ranch Reservoirs, herein referred to collectively as the reservoir system, Diversion Dam, the New York Canal headworks, and Lake Lowell.

2

The plan of operation hereinafter set forth is limited to the flood control operation phase of the respective general operating plans of the parties hereto and shall be used during the period commencing with the actual operation of Lucky Peak Reservoir.

3

To attain the maximum benefits from the reservoir system, the total capacity of 1,084,000 acre-feet will be utilized as follows:

a. 983,000 acre-feet (418,000 acre-feet in Anderson Ranch, 285,000 acre-feet in Arrowrock Reservoir, and

280,000 acre-feet in Lucky Peak Reservoir) will be operated primarily in the interests of irrigation and flood control and secondarily in the interests of power, as governed by forecasts of runOff. The allocation of flood control space is shown on Plate 2.

b. 5,000 acre-feet in Anderson Ranch Reservoir will be used exclusively for power production.

c. 96,000 acre-feet (70,000 acre-feet in Anderson Ranch and 26,000 acre-feet in Lucky Peak Reservoirs) will be reserved for dead storage and allocated exclusively to the maintenance of minimum power head, maintenance of permanent pools for the preservation and propagation of fish and wildlife and for silt control.

The above-designated 983,000 acre-feet or any part thereof in storage at the end of each flood season will be primarily considered as available for irrigation except as such amount must be reduced by evacuation requirements for flood control.

4

No reregulation of storage or annual exchange of storage as provided in this plan shall, however, deprive any entity of water accruing to it under existing rights in Arrowrock, Anderson Ranch, and Lake Lowell Reservoirs.

5

The Chief of Engineers, the Commissioner of Reclamation, and the watermaster, having agreed upon acceptable methods of

forecasting seasonal volumes of runoff for the Boise River above Diversion Dam, will periodically during the period from January 1 to June 30 of each year, determine the volume of runoff that may be expected in the drainage area tributary to the Boise River above Diversion Dam. Any differences in forecasted amounts shall be reconciled to arrive at a common forecast within 48 hours after basic data for forecasts are available. To facilitate forecasting of runoff, mutually satisfactory arrangements will be made among the Chief of Engineers, the Commissioner of Reclamation, and the State of Idaho, after consultation with the interested water users' organizations, to expand the existing hydrologic network and to establish and operate continuously a system for the efficient assembly, analysis, and exchange of the basic data.

6

Beginning with the first year this plan is put into operation, the system will be operated, through close collaboration with all agencies concerned on the basis of periodic sequential forecasted runoffs made during each year, as nearly as practicable in accordance with the following particular terms and provisions:

a. The storage space to be allocated to flood control for each year is defined as follows:

It is the combined reservoir space which, using the governing forecast of flood runoff for the year, is required to control the forecasted flood volume,

from the time in that year that the natural flow as determined at Diversion Dam exceeds the allowable release through the succeeding July 31. The governing forecast of flood volume for each year is the forecast made as of the date the natural flow, as determined at Diversion Dam, first exceeds the allowable flow at that point and this date is usually about April 15. Allowable releases from the reservoir system during the period from the date of the governing forecast to the succeeding July 31 will be such that the flow in the river channel below Diversion Dam will not exceed 6,500 second-feet, in so far as this control can be accomplished with a total system capacity of 983,000 acre-feet together with the diversion to the New York Canal of an average of 1,365 second-feet during March and of 2,820 second-feet from April 1 through July 31, except that, due to decreased irrigation demand, diversions to the New York Canal may infrequently be reduced below the diversion figures indicated above. When the above decreased diversions are required, it may be necessary to increase flow in Boise River below Diversion Dam.

b. Attached hereto as Plate 2 is a scale figure depicting flood storage allocation parameters representing runoff volume anticipated at Diversion Dam between the

forecast date and July 31. These parameters were empirically derived from floods of record and are enveloping curves of the storage requirements for various volumes of total forecasted runoff from any given date to July 31. The total reservoir capacity required to control a flood to a discharge of 6,500 second-feet (or less) in the river channel past Diversion Dam is indicated by the ordinate of the parameter corresponding to the forecasted runoff on the date of the governing forecast.

c. During the period of each year from the date of the first forecast, about January 1, to the date that natural flow of Boise River at Diversion Dam first exceeds allowable releases, herein designated as the evacuation period, the reservoir system will be operated in such a manner that the reservoir levels on the date of the governing forecast as determined by the parameters on Plate 2, can be attained with the minimum practicable rates and fluctuations of discharge. The rate of discharge during the evacuation period will be determined as far as practicable in the following manner: The combined total reservoir space required on or about April 15 (approximate date of the governing forecast) will be estimated by use of the parameters

on Plate 2 and an April 15 forecast, which would be derived by deducting from the forecast made on any periodic forecast date probable average inflows, as determined from Plate 3, or measured inflow for the intervening period from the date of periodic forecasts to April 15. The required reservoir capacities thus estimated would comprise tentative allocations of flood control space at which to aim the evacuation procedure. The rate of discharge at Lucky Peak Reservoir then will be selected as that required to release the probable average inflow, as determined from Plate 3, or measured inflow for the period between the date of forecast and April 15, plus the evacuation necessary to attain the required total reservoir capacity indicated by the latest tentative allocation.

d. The evacuation of the active capacity in the reservoirs will be made in the following order: First, from Lucky Peak; second, from Arrowrock; and last, from Anderson Ranch. At least forty thousand (40,000) acre-feet of vacant space will be maintained in Lucky Peak Reservoir from November 1 to January 1 of every year, and from January 1 to May 24 of every year, except when forecasted amount of runoff between date of forecast

and July 31 is less than six hundred thousand (600,000) acre-feet and except that storage space in Anderson Ranch Reservoir may be considered partially to fulfill this requirement in Lucky Peak Reservoir to the extent of forty percent (40%). Power operation from Anderson Ranch storage will be so limited that, to the extent possible as to space allocated to flood control for any year, at least sixty percent (60%) thereof will be provided in Lucky Peak and Arrowrock Reservoirs. Filling of the three reservoirs will follow the reverse of the evacuation schedule to the extent that water is available at each of the respective sites. In the event Anderson Ranch or Arrowrock Reservoirs are not filled by reason of having evacuated water for flood control, storage in Lucky Peak will be considered as belonging to Arrowrock and Anderson Ranch storage rights to the extent of the space thus remaining unfilled at the end of the storage season but not to exceed the amount evacuated for flood control.

e. From the date of the governing forecast each year through July 31 of that year, herein designated as the filling period, the reservoir system will be operated in such a manner that the combined reservoir content, as determined from the parameter chart (Plate 2), will be

maintained except when irrigation requirements necessitate a drawdown below such total content, but will not be exceeded except when total storage above such content is required to limit the releases to allowable flows (as determined by downstream channel capacity and irrigation diversions) at Diversion Dam. However, when the forecasted runoff indicates extraordinary flood flows, requiring storage capacity for flood control in excess of the total active storage capacity of the reservoir system (983,000 acre-feet), temporary releases at Lucky Peak in excess of the allowable flows may be required but such releases will be made at a rate so as to minimize the peak rate of flow in the river channel below the Diversion Dam. The rate of such releases shall be specified by the Chief of Engineers after consultation with the Commissioner of Reclamation to the extent consistent with paragraph 6g herein.

f. Release of water for irrigation will be made from Lucky Peak Reservoir at such times and at such rates, pursuant to rights established under law, as requested by the owners thereof, or by officials or agencies authorized to make such requests. Flood control releases prescribed by the Chief of Engineers will be made in such a manner as to cause minimum practicable short-time

fluctuations in the flow of the Boise River below Lucky Peak Reservoir. Arrangements will be made to notify the State Watermaster, and other officials upon request, of contemplated significant changes in rate of release from Lucky Peak Reservoir.

g. The Chief of Engineers and the Commissioner of Reclamation may establish operating rules and regulations for the purpose of protecting from damage the dams and reservoirs being operated under their respective supervision but such rules and regulations shall, to the greatest extent practicable, avoid interference with the delivery of water accruing to rights established under law.

h. In order to enhance the recreational value of Lucky Peak Reservoir after recession of the flood each year, that reservoir will be filled, if not already full from flood water storage or natural flow, by transfer of water from Arrowrock storage, and will be held full through September 15 each year except when Arrowrock Reservoir has been drawn down to a level from which it can no longer supply the irrigation requirements prior to that date, in which case irrigation releases will be made as required from Lucky Peak storage. In no case will storage be released from Anderson Ranch

Reservoir for the purpose of holding Lucky Peak Reservoir full for recreational purposes.

7

If operating experience indicates the desirability therefor or if justified by future changes or improvements in the Boise River system, the Chief of Engineers and the Commissioner of Reclamation or their duly authorized representatives, after consultation with the Reclamation Engineer of the State of Idaho or his authorized representative, the Watermaster, Boise River, and the Project Manager, Boise Project Board of Control, may, within the general objectives of this agreement, modify from time to time the operating plan herein described with respect to allowable releases and the amount of space allocated each year to flood control on the basis of advanced forecasts of runoff. However, no modification which would affect in any substantial way any storage rights in the reservoir system and Lake Lowell, shall be made without the concurrence of all entities having rights in the reservoir system and Lake Lowell.

8

If and when a power plant is installed at Lucky Peak Dam, it shall be operated in a manner consistent with this operating plan and in subordination to any water rights validly established under law.

This memorandum of agreement shall become effective when it has been formally accepted by the water users having storage rights in the reservoir system and Lake Lowell and after a revised allocation report for the Boise Project, supplemental to the report and finding of June 25, 1940, by the Secretary of the Interior (H. Doc. No. 916, 76th Cong., 3d Sess.), reflecting the flood control benefits based on the operating plan herein set forth, has been transmitted to the Congress.

10.

Except for the original execution thereof, this agreement shall be administered on behalf of the Department of the Army by the Chief of Engineers, representing the Corps of Engineers, and on behalf of the Department of the Interior by the Commissioner of Reclamation, representing the Bureau of Reclamation, or their duly authorized representatives.

IN WITNESS WHEREOF, this memorandum of agreement has been executed as of the date first above stated.

DEPARTMENT OF THE ARMY Nov. 20 1953

By /s/ Robert T. Stevens
Secretary of the Army

DEPARTMENT OF THE INTERIOR Oct 30 1953

By /s/ Fred G. Aandahl
Assistant Secretary of the Interior

MEMORANDUM OF UNDERSTANDING
for
CONFIRMATION, RATIFICATION, AND ADOPTION OF
WATER CONTROL MANUAL
BOISE RIVER RESERVOIRS, BOISE RIVER, IDAHO

This Memorandum of Understanding is made and entered into by and between the Department of Army represented by the Division Engineer, Corps of Engineers, the authorized representative of the Chief of Engineers, hereinafter referred to as Corps, and the Department of Interior represented by the Regional Director, Pacific Northwest Region, Bureau of Reclamation, the authorized representative of the Secretary of Interior, hereinafter referred to as Bureau.

WITNESSETH

WHEREAS, the Boise River reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) have been regulated in accordance with a general operating plan and procedures developed by the parties pursuant to Article 6 of Memorandum of Agreement for Flood Control Operation of Boise River Reservoirs, dated 20 November 1953; and

WHEREAS, Article 7 of said Memorandum of Agreement provides that the operating plan and procedures may be changed or modified if operating experience indicates the desirability therefor, and future changes and improvements in the Boise River system are justified within the general objectives of the Agreement; and

WHEREAS, Department of the Army Engineer Regulation (ER) 1110-2-240, Engineering and Design, Water Control Management, 8 October 1982, and Engineer Technical Letter (ETL) 1110-2-251, Engineering and Design, Preparation of Water Control Manuals, 14 March 1980, prescribe that water control plans for such Federal projects be continually reviewed and adjusted to ensure that the best use is made of available water resources; and

WHEREAS, the Bureau and Corps, after consultation with the State of Idaho, Boise River Watermaster, and Project Manager of the Boise Project

Board of Control, have agreed based on past operating experiences that revision of the operating plan and procedures is needed to reflect current conditions, needs, and technology and have worked jointly to develop a Water Control Manual; and

WHEREAS, a final revision of the Water Control Manual has now been completed, reviewed, and approved by the Bureau, Corps, and State of Idaho.

NOW THEREFORE, the parties hereby confirm, ratify, and adopt Water Control Manual dated April 1985 as an integral part of "Memorandum of Agreement for Flood Control Operation of Boise River Reservoirs," dated 20 November 1953, and further agree that:

a. The Water Control Manual shall constitute the current operating plan and procedures until further changed or modified by the parties in accordance with Article 7 of the Memorandum of Agreement and paragraph e. hereof.

b. The Bureau, as project owner, shall be responsible for the operation and maintenance of the Anderson Ranch and Arrowrock Dams and related facilities subject to the reservoir regulation objectives established by the Water Control Manual in paragraph a.

c. The Corps, as project owner, shall be responsible for the operation and maintenance of the Lucky Peak Dam and related facilities subject to the regulation objectives established by the Water Control Manual in paragraph a.

d. The Bureau and the Corps shall regulate Anderson Ranch, Arrowrock, and Lucky Peak Dams jointly as a system in accordance with regulation criteria and procedures within the Water Control Manual for Boise River reservoirs.

e. Portions of the Water Control Manual for Boise River reservoirs may be updated from time to time as conditions warrant. Any portion of this manual which is revised shall be labeled as revised and shall show the date of revision. Either party may propose revisions to the Water Control Manual, but such proposed revision shall not be adopted or become

f. All terms and provisions of Memorandum of Agreement dated 20 November 1953 not inconsistent with this Memorandum of Understanding and the Water Control Manual shall remain in full force and effect.

THIS AGREEMENT shall become effective on the date of the last-dated signature hereto.

L. W. Lloyd
Regional Director
Pacific Northwest Region
Bureau of Reclamation
Authorized Representative of
the Secretary of Interior

DATE 9/25/85

George R. Robertson
Brigadier General, Corps of Engineers
Division Engineer
North Pacific Division
Authorized Representative of
the Chief of Engineers

DATE 21 JUN 85