UPPER PAYETTE RESERVOIR

ACTIVE STORAGE

CALCULATION

IDAHO DEPARTMENT OF WATER RESOURCES

J. WESTRA & S. HORNBAKER
6/2/93

UPPER PAYETTE RESERVOIR

PURPOSE

The primary purpose of the project was to determine active storage volumes at any given reservoir level height. Allowances for evaporation, seepage and other sources of shrinkage were not considered in the calculations. The results will be utilized for future water management of the Payette River system.

BACKGROUND

The upper Payette Reservoir is a mountain reservoir located north of McCall in the Payette National Forest. Originally, the reservoir was part of a natural lake on the North Fork of the Payette River, draining into "Big" Payette Lake. A radial gate dam was constructed on the south end in 1953, raising the lake 8 feet in height. The active storage is utilized for irrigation in the lower Payette River Valley below.

PROCEDURE

Several sources of information and field data were incorporated into the volume calculations for the reservoir. Due to the natural lake (dead pool) portion of the reservoir, a detailed survey of the reservoir would have involved a great deal of time and resources. It was felt that by incorporating the use of existing contour maps, survey field data, and the computer, a credible calculation of volume could be found. USGS bench marks had been established on the right dam abutment and at the north road bridge, all elevations were referenced to these bench marks. The USGS contour maps of the reservoir also referenced the reservoir at the high water line elevation of 5555 ft., which outlined the reservoir border at full elevation. In late October of 1992 after several drought seasons, the reservoir had reached dead pool level. A field survey was completed at that time, tying the dead pool elevation and slope to the full reservoir elevation, 5555 ft.. Survey data was obtained at key geological features such as shore points, incoming creek tributaries, and bench marks that could be referenced on the USGS map. The data points were then plotted for the dead pool on an expanded version of the contour map. Data points from the reservoir full elevation and dead pool were loaded into the computer utilizing Surfer-Version 4 software, which inturn plotted a new contour map of the reservoir with contour elevations at 1 foot intervals. Surface areas were also calculated at each elevation of the reservoir as part of the software. The volume for each 1 foot of reservoir elevation was then computed by the pyramid frustrum equation:

$$V = h/3(A_1 + A_2 + \sqrt{A_1 A_2})^1$$

where V= Volume (Ac-Ft.)
h= contour height (ft.)
A = upper surface area (Ac-Ft)
A = lower surface area (Ac-Ft)

ACCURACY/ERROR

Although, the utmost care was taken in obtaining and collecting data, there is always some error involved in field data, maps, and computer plotting. Close attention was paid to the calmness of the dead pool during the survey to obtain accurate elevations, but some movement is unavoidable. At the reservoir dead pool level, the north end of the reservoir becomes a wetland grass habitat, and the ground surface is very uneven with several creek tributaries coming in. In being practical, some interpolation had to be done in plotting this particular area. By plotting the data manually on an expanded map, using a planometer, the surface areas found were reasonably close to the computer calculated areas. Generally, the accuracy of other types of water measurements are credible within 5 to 10 percent, the volumes determined in this case would safely fall within this percentage.

SPECIFICATIONS/FACTS

Reservoir Location: Parts of Sec. 36, 25, T21N, 3E
Sec. 31, 30, 19, T21N, 4E
Valley County, ID.

Dam: 4 - 8ft.(height) X 10 ft.(wide) radial gates.

Drainage: 42 square miles.

Surface Area: 321 acres

Water Right: #65-2918 (Decreed)

Owner: Lake Reservoir Co., Payette, ID.

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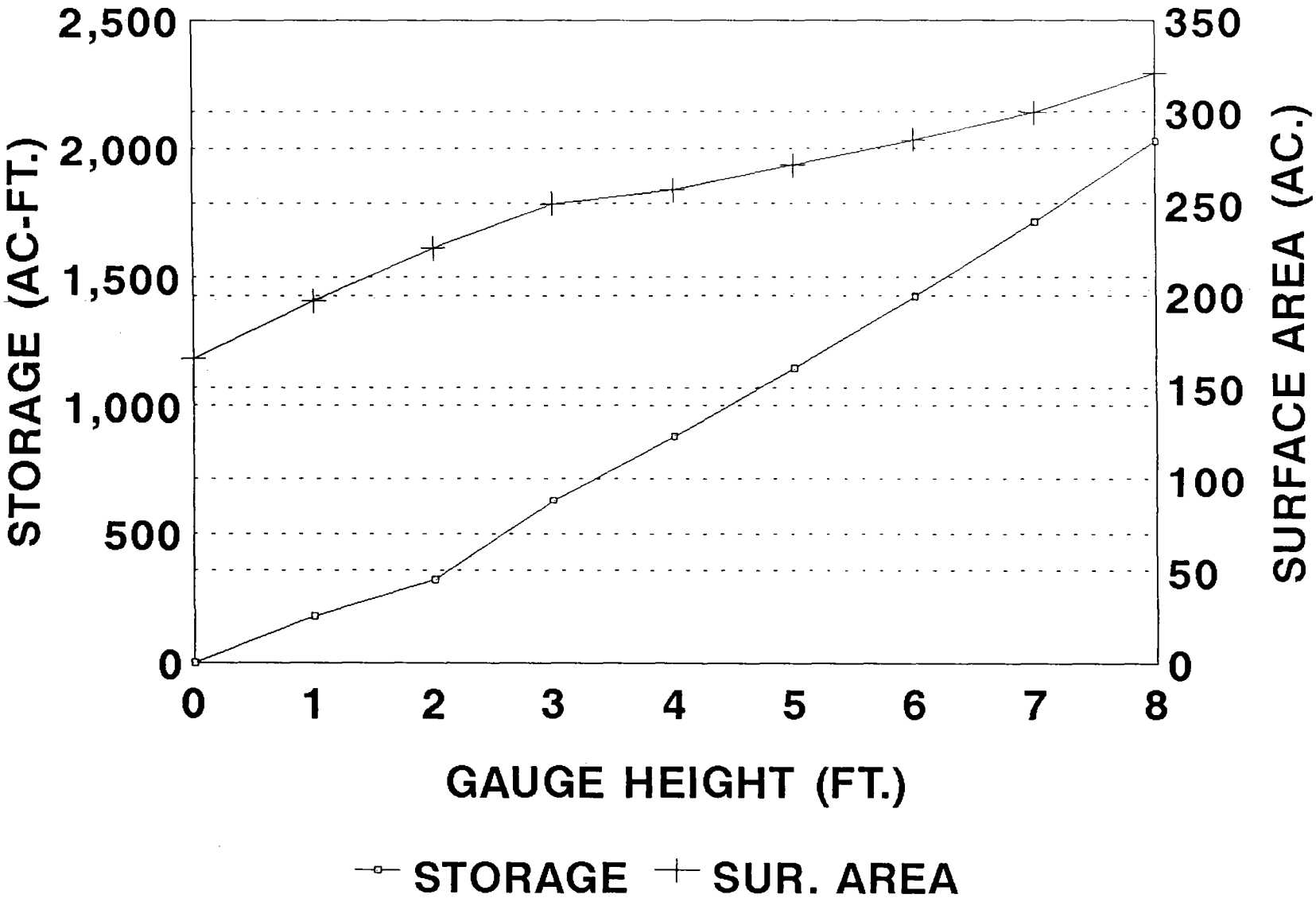
1. Davis, Foote, Kelly; Surveying- Theory & Practice, 5th Ed. Page 784.

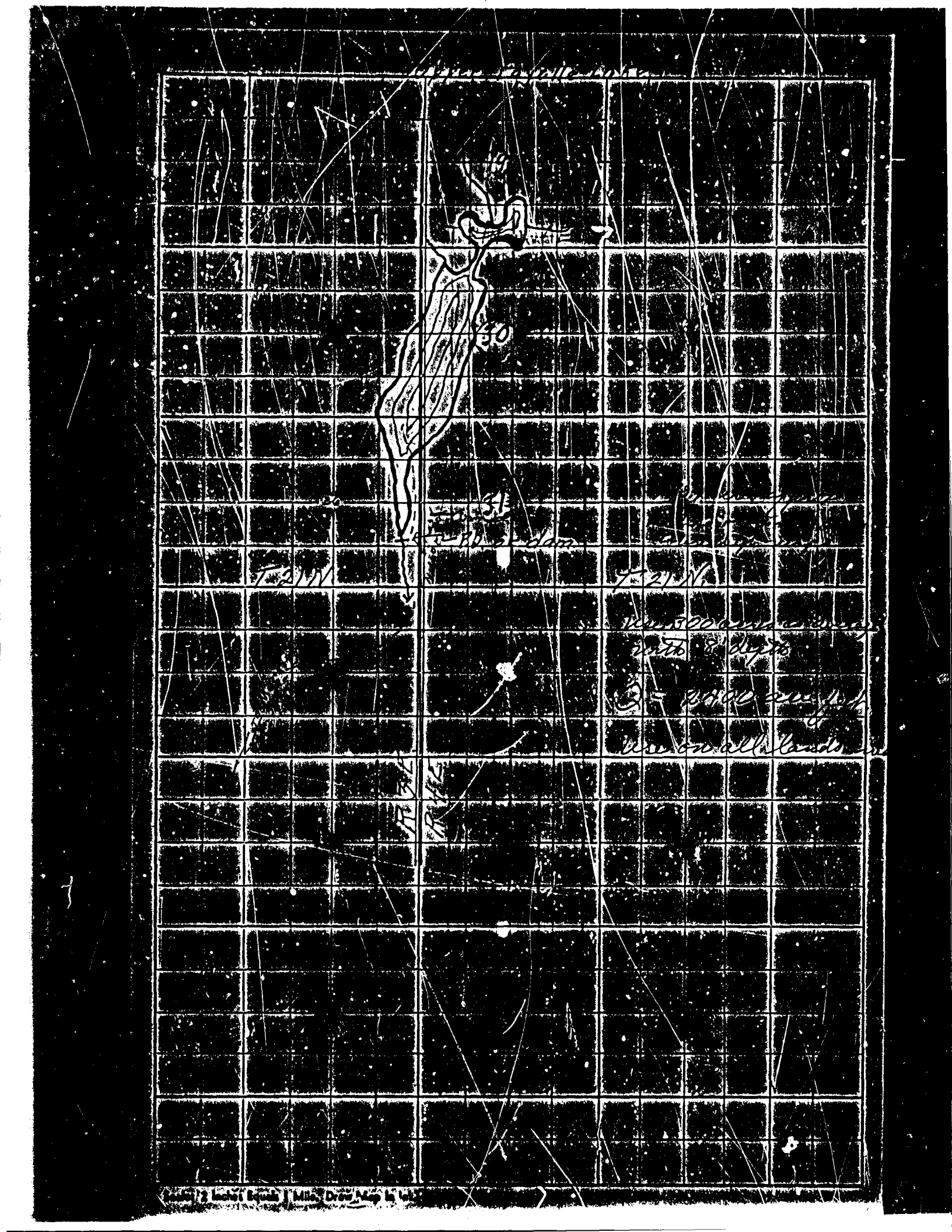
UPPER PAYETTE RESERVOIR LAKE STORAGE CHART

Gauge Height (Ft.)	Remaining Active Storage (Ac-Ft.)	Surface Area (Acres)
0.0	0.0	165.5
1.0	181.0	197.0
2.0	320.0	225.6
3.0	629.0	249.6
4.0	882.0	257.2
5.0	1146.0	270.8
6.0	1423.0	284.6
7.0	1715.0	299.4
8.0	2026.0	321.2

UPPER PAYETTE RESERVOIR

ACTIVE STORAGE





Form 23

STATE OF IDAHO

DEPARTMENT OF RECLAMATION

BOISE, IDAHO

REPORT OF ENGINEER

Permit No. R-473

This proof is for Completion of Works & Beneficial Use In Water District No. 64

1. Name of applicant C. O. Fickas, Pres. Lake Reservoir Company
2. Source of water supply: No. Fk. Payette River
3. Location of point of diversion: Is in the NW¼SW¼ of Section 31
T. 21 N. R. 4 E.B.M. County of Valley
4. Describe works as they exist, giving dimensions and capacities of same: A concrete structure has been placed across the channel some distance below the lake proper. It has an overflow spillway as indicated by the plans. Structure is 45 feet back to back and is set in earth embankments extending to high ground on either side. Storage depth is 8.0' High Water Lake Gage 13.52 as reported by Forest Service in McCall Idaho
5. Water is used for: irrigation, domestic and power purposes
6. State whether or not water has been turned into works of diversion: Yes
7. List legal subdivisions of lands to be irrigated. If proof is for beneficial use, give exact number of acres under cultivation in each forty-acre tract. (Describe manner and place of use if other than irrigation.):

All lands lying under and being irrigated by Emmett Irrigation District, Letha Irrigation Co., Enterprise Ditch Co., Farmers Cooperative Irrigation Co., Lower Payette Ditch Co., and Payette Heights Irrigation District, embracing approximately 60,500 acres.

The irrigation of said lands began 6-11-14

(Submit map on attached plat, showing location and details of above description.)

8. What large stream would the water here appropriated finally reach?

Remarks:

Structure is of concrete with 3 gates operated by water power developed on this plant.

This was a complete inspection of the dam and spillway.

This examination was made on the 26 day of Oct 1939

(Signed) C. F. Hansen

STATE OF IDAHO

DEPARTMENT OF RECLAMATION

BOISE, IDAHO

REPORT OF ENGINEER

Permit No. [illegible]

This proof is for completion of [illegible] Water District No. [illegible]

1. Name of applicant: [illegible] Reservoir Company.
2. Source of water supply: [illegible] Payette River.
3. Location of point of diversion: It is the [illegible] NW¼ SW¼ of Section 31,
T. 21 N. R. [illegible] E.B.M., County of Valley.
4. Describe works as they exist, giving dimensions and capacities of same: [illegible]
5. Water is used for: Irrigation, domestic and power purposes.
6. State whether or not water has been turned into works of diversion: Yes.
7. List legal subdivisions of lands to be irrigated. If proof is for beneficial use, give exact number of acres under cultivation in each forty acre tract. (Describe manner and place of use if other than irrigation.)

[illegible] lands lying [illegible] and being irrigated by Emmett Irrigation District, [illegible] Irrigation Co., Enterprise Ditch Co., Farmers Cooperative Irrigation Co., Lower Payette Ditch Co., and Payette Heights Irrigation District, embracing approximately 68,500 acres.

[illegible]

(Submit map on attached plat showing location and details of above description.)

8. What large stream would the water here appropriated finally reach?

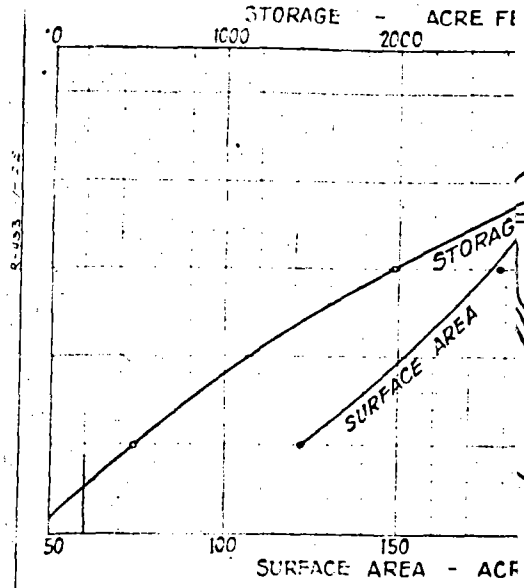
Remarks:

[illegible]

This examination was made on the [illegible] day of [illegible] 19[illegible]

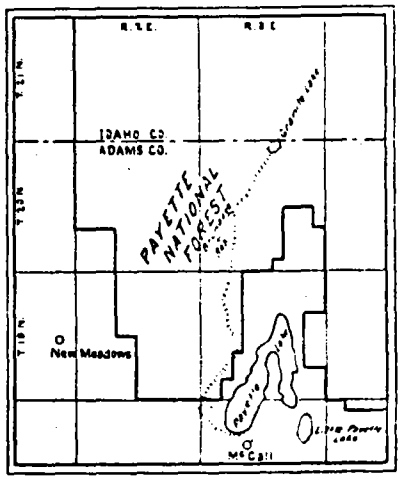
(Signed) [illegible]

Granite Lake.



ELEVATION EQUATION

Elev 100.00 = 6735 M.S.L.



VICINITY MAP

SCALE 1" = 4 MILES

To McCall

LAKES RESERVOIR CO.
RECONSTRUCTION
GRANITE LAKE DAM
TOOTHMAN-CHRONIC & ASSOCIATES CONSULTING ENGINEERS
1802 N. 33rd. ST. BOISE, IDAHO
APPROVED
LAKES RESERVOIR CO. C. L. [illegible] President Date 10-5-60
IDAHO DEPARTMENT OF RECLAMATION Engineer Date
U.S. FOREST SERVICE Date
DESIGNED BY N.W. DRAWN BY [illegible]
CHECKED BY D.C.T. DATE 10/3/60
SHEET 1 OF 4 REVISED 11/30/60 12/30/60

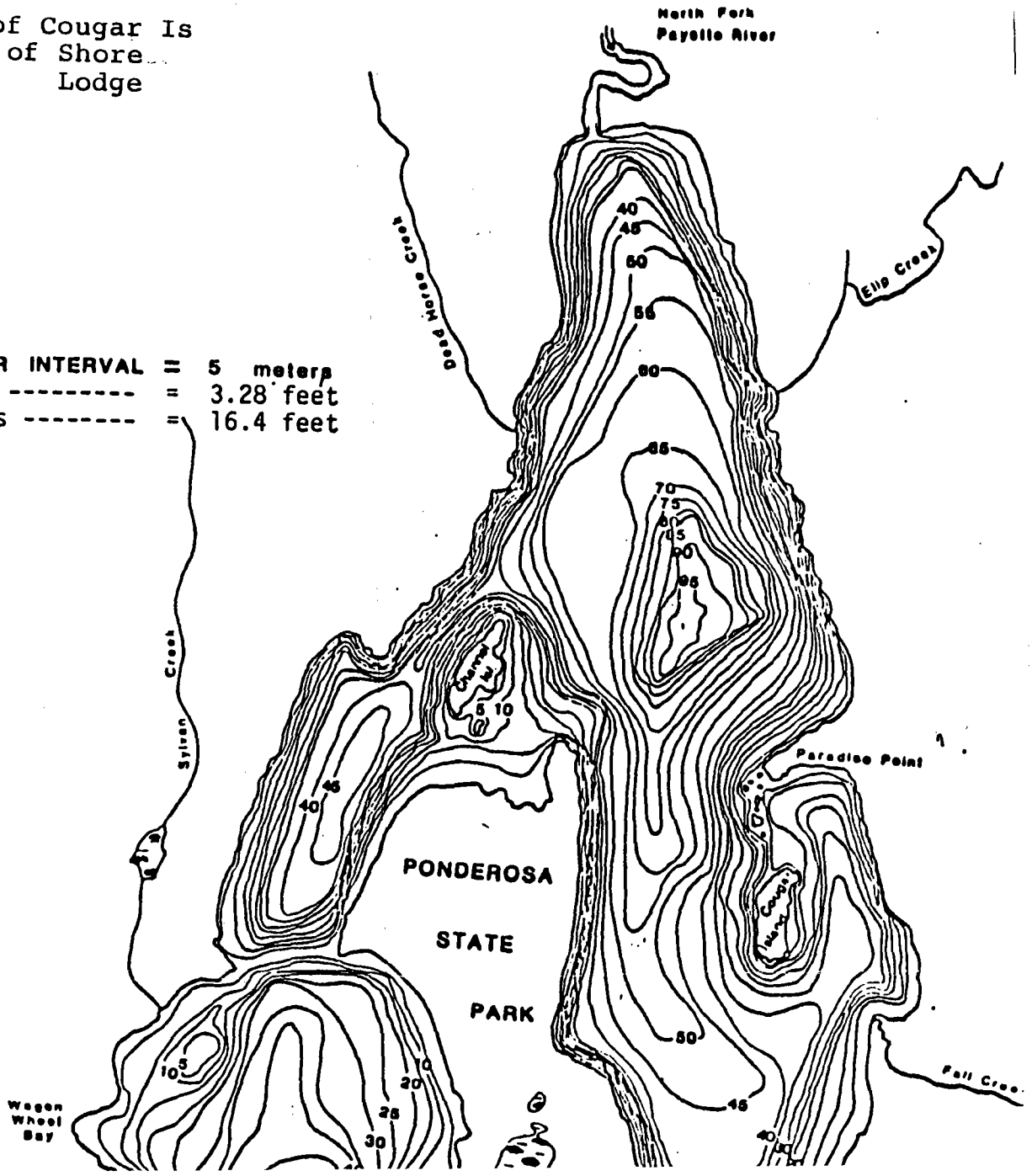
APPROVED JULY [illegible] 1961

10/12/60

Big

PAYETTE LAKE DEPTH

327' deep - E. of Cougar Is
229' deep - (NE of Shore Lodge

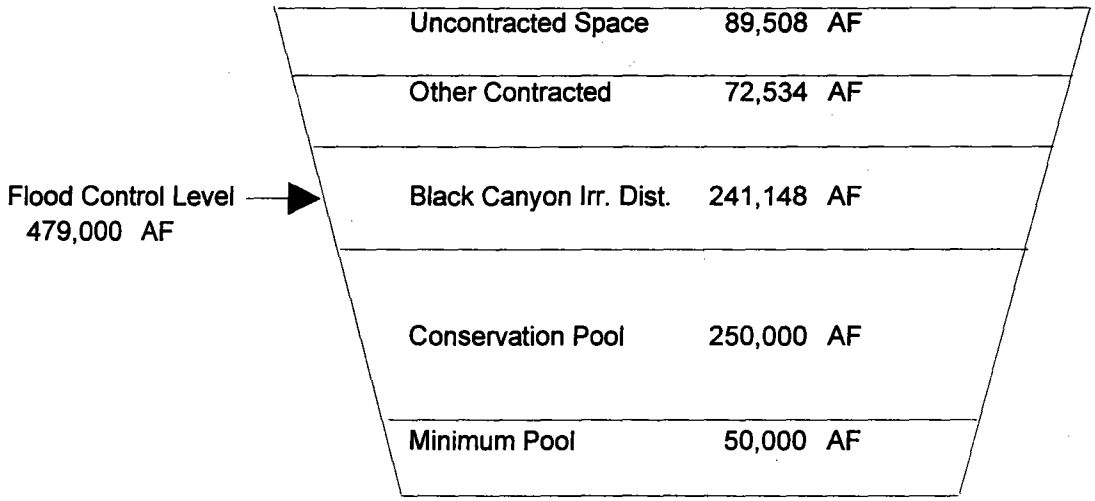


Cascade Reservoir
Storage Space and Possible 1995 Scenario

	Acre Feet
Minimum Pool	50,000
Conservation Pool	250,000
Black Canyon Preferred	125,000
Black Canyon Regular	116,148
Other Contractors	72,534
Uncontracted Space	89,508
Total Space	703,190

Possible 1995 Scenario:

	Acre Feet
Full Reservoir Space	703,190
Irrigation Needs	(88,000)
Fish Flush	(96,726)
Evaporation	(29,394)
Possible Reservoir Level - 10/95	489,070



Cascade Reservoir									
Possible Refill Scenarios									
Given Certain Assumptions							1977	1977	
	1995	1995	1995	1995	1996	Refill	Refill	1996*
	Totals	In Basin	Out Basin	Evap. Chg	Carryover	Space	1st Fill	Last Fill	Fill
Dead Pool	50,000				50,000				50,000
Conservation Pool	250,000				250,000				250,000
Black Canyon Preferred	125,000				125,000	0			125,000
Uncontracted	89,508		74,230	15,278	0	89,508	15,278		15,278
Black Canyon	116,148	88,000		10,852	17,296	98,852	14,559		31,855
Farmer's	38,893		13,012	1,750	24,131	14,762	1,750		25,881
Noble	10,050		4,417	452	5,181	4,869	452		5,633
Lower Payette	10,050		5,067	452	4,531	5,519	452		4,983
Emmett	10,050			452	9,598	452	452		10,050
Other	3,491			157	3,334	157	157		3,491
Total Space	703,190	88,000	96,726	29,394	489,070	214,120	33,100	0	522,170
Active Capacity	653,190				439,070				472,170
Note: Evaporation charges are proportionately distributed according to total space.									
* Assuming a 1977 snow pack during the winter of 1995-96, this would be the 1996 storage accounts as of 6-1-96									

Cascade Reservoir Possible Refill Scenarios Given Certain Assumptions	Totals	1995 In Basin	1995 Out Basin	1995 Evap. Chg	1995 Carryover	1996 Space	1994 Refill 1st Fill	1994 Refill Last Fill	1996* Fill
Dead Pool	50,000				50,000				50,000
Conservation Pool	250,000				250,000				250,000
Black Canyon Preferred	125,000				125,000	0			125,000
Uncontracted	89,508		74,230	15,278	0	89,508	15,278	28,093	43,371
Black Canyon	116,148	88,000		10,852	17,296	98,852	98,852		116,148
Farmer's	38,893		13,012	1,750	24,131	14,762	1,750	4,925	30,805
Noble	10,050		4,417	452	5,181	4,869	452	1,672	7,304
Lower Payette	10,050		5,067	452	4,531	5,519	452	1,918	6,900
Emmett	10,050			452	9,598	452	452		10,050
Other	3,491			157	3,334	157	157		3,491
Total Space	703,190	88,000	96,726	29,394	489,070	214,120	117,393	36,607	643,070
Active Capacity	653,190				439,070				593,070
Note: Evaporation charges are proportionately distributed according to total space.									
* Assuming a 1994 snow pack during the winter of 1995-96, this would be the 1996 storage accounts as of 6-1-96									

Cascade Reservoir									
Possible Refill Scenarios									
Given Certain Assumptions							1992	1992	
		1995	1995	1995	1995	1996	Refill	Refill	1996*
	Totals	In Basin	Out Basin	Evap. Chg	Carryover	Space	1st Fill	Last Fill	Fill
Dead Pool	50,000				50,000				50,000
Conservation Pool	250,000				250,000				250,000
Black Canyon Preferred	125,000				125,000	0			125,000
Uncontracted	89,508		74,230	15,278	0	89,508	15,278	54,723	70,001
Black Canyon	116,148	88,000		10,852	17,296	98,852	98,852		116,148
Farmer's	38,893		13,012	1,750	24,131	14,762	1,750	9,593	35,473
Noble	10,050		4,417	452	5,181	4,869	452	3,256	8,889
Lower Payette	10,050		5,067	452	4,531	5,519	452	3,735	8,718
Emmett	10,050			452	9,598	452	452		10,050
Other	3,491			157	3,334	157	157		3,491
Total Space	703,190	88,000	96,726	29,394	489,070	214,120	117,393	71,307	677,770
Active Capacity	653,190				439,070				627,770
Note: Evaporation charges are proportionately distributed according to total space.									
* Assuming a 1992 snow pack during the winter of 1995-96, this would be the 1996 storage accounts as of 6-1-96									

Cascade Reservoir									
Possible Refill Scenarios									
Given Certain Assumptions							1988	1988	
		1995	1995	1995	1995	1996	Refill	Refill	1996*
	Totals	In Basin	Out Basin	Evap. Chg	Carryover	Space	1st Fill	Last Fill	Fill
Dead Pool	50,000				50,000				50,000
Conservation Pool	250,000				250,000				250,000
Black Canyon Preferred	125,000				125,000	0			125,000
Uncontracted	89,508		74,230	15,278	0	89,508	15,278	56,795	72,073
Black Canyon	116,148	88,000		10,852	17,296	98,852	98,852		116,148
Farmer's	38,893		13,012	1,750	24,131	14,762	1,750	9,956	35,837
Noble	10,050		4,417	452	5,181	4,869	452	3,380	9,012
Lower Payette	10,050		5,067	452	4,531	5,519	452	3,877	8,860
Emmett	10,050			452	9,598	452	452		10,050
Other	3,491			157	3,334	157	157		3,491
Total Space	703,190	88,000	96,726	29,394	489,070	214,120	117,393	74,007	680,470
Active Capacity	653,190				439,070				630,470
Note: Evaporation charges are proportionately distributed according to total space.									
* Assuming a 1988 snow pack during the winter of 1995-96, this would be the 1996 storage accounts as of 6-1-96									

Cascade Reservoir									
Possible Refill Scenarios									
Given Certain Assumptions							1987	1987	
	1995	1995	1995	1995	1996	Refill	Refill	1996*
	Totals	In Basin	Out Basin	Evap. Chg	Carryover	Space	1st Fill	Last Fill	Fill
Dead Pool	50,000				50,000				50,000
Conservation Pool	250,000				250,000				250,000
Black Canyon Preferred	125,000				125,000	0			125,000
Uncontracted	89,508		74,230	15,278	0	89,508	15,278	59,558	74,836
Black Canyon	116,148	88,000		10,852	17,296	98,852	98,852		116,148
Farmer's	38,893		13,012	1,750	24,131	14,762	1,750	10,440	36,321
Noble	10,050		4,417	452	5,181	4,869	452	3,544	9,177
Lower Payette	10,050		5,067	452	4,531	5,519	452	4,065	9,048
Emmett	10,050			452	9,598	452	452		10,050
Other	3,491			157	3,334	157	157		3,491
Total Space	703,190	88,000	96,726	29,394	489,070	214,120	117,393	77,607	684,070
Active Capacity	653,190				439,070				634,070
Note: Evaporation charges are proportionately distributed according to total space.									
* Assuming a 1987 snow pack during the winter of 1995-96, this would be the 1996 storage accounts as of 6-1-96									

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WATER DISTRICT 65 - PAYETTE RIVER DIVERSION DATA - AUG 27, 1995

28-AUG-95

	DIVERSION	CFS DIVN	CFS STOR	AF USED	AF RMNG		DIVERSION	CFS DIVN	CFS STOR	AF USED	AF RMNG		DIVERSION	CFS DIVN	CFS STOR	AF USED	AF RMNG
1	S DOBSON	1	1	78	-78	31	CURTIS-MCCONNEL	1	1	39	-39	61	PATTON-RIGGS	2	0	0	0
2	E K ALLEN	0	0	11	-11	32	D HEFFNER	0	0	35	-35	62	NOBLE	175	0	43	-43
3	DBL DIAMOND #1	1	1	62	-62	33	R HUNTER	0	0	15	-15	63	ROSEBURY	10	0	0	0
4	HEFFNER	1	1	54	-54	34	MACGREGOR #4	0	0	0	0	64	STEWART	18	0	0	0
5	DOBSON-OLIVER	2	2	107	-107	35	MACGREGOR #3	0	0	0	0	65	NICHOLS	14	6	364	-364
6	J HASBROUCK	0	0	11	-11	36	MACGREGOR #2	0	0	0	0	66	PULLEY	4	0	0	0
7	D & L REAY	0	0	6	-6	37	MACGREGOR #1	0	0	0	0	67	PULLEY PUMP	1	0	2	-2
8	DRAKE #1	1	1	27	-27	38	EMMETT IRR DIST	366	0	99	-99	68	RASMUSSEN	32	1	105	-105
9	DRAKE #2	0	0	16	-16	39	SS EMMETT ID (1)	72	0	0	0	69	COOPER	4	0	0	0
10	DBL DIAMOND #2	2	2	104	-104	40	BLACK CANYON IRR	1151	827	38303	-38303	70	UPPER ACCORD	9	1	82	-82
11	FRY & SONS	2	2	93	-93	41	LAST CHANCE	96	0	0	0	71	ACCORD PUMP	2	0	0	0
12	BOISE CASCADE P	2	1	70	-70	42	FOWLER	0	0	0	0	72	LOWER ACCORD	14	0	0	0
13	CITY OF HS BEND	2	2	89	-89	43	HODGINS	0	0	19	-19	73	NESBITT-MCFARLND	17	6	353	-353
14	DBL DIAMOND #3	2	2	85	-85	44	BROWN #1	1	0	0	0	74	BARKER	3	0	0	0
15	J FRY	0	0	1	-1	45	BROWN #2	0	0	0	0	75	WOOKEY-BURT	2	0	0	0
16	C COOPER	0	0	6	-6	46	FARMERS COOP	379	0	0	0	76	PENCE	4	0	0	0
17	D SHOEMAKER	0	0	7	-7	47	NEBEKER-STOKELY	0	0	19	-19	77	LOWER PAYETTE	267	0	0	0
18	G BROWN	0	0	1	-1	48	GILL SLOUGH	10	0	0	0	78	EAGLE ISL FARMS	30	0	16	-16
19	MONTOUR FARMERS	20	0	0	0	49	BOISE CASCADE	5	0	0	0	79	JOHNSON-NIGBY	25	0	0	0
20	B JENKINS SOUTH	0	0	24	-24	50	SMITH	8	6	342	-342	80	SIMPLOT	50	0	0	0
21	E GATFIELD	0	0	33	-33	51	ENTERPRISE	45	0	0	0	81	FISH AND GAME	0	0	0	0
22	L MCCONNEL	0	0	27	-27	52	BILBREY	17	0	0	0	82	SHELTON	0	0	0	0
23	B JENKINS NORTH	0	0	10	-10	53	ROGERS	0	0	0	0	83	B MAY	3	0	0	0
24	W SHOBEL	0	0	9	-9	54	REED	44	0	182	-182	84	FOILES	0	0	0	0
25	MCDONOUGH-NEWELL	0	0	15	-15	55	KESGARD-TSCHUDY	14	2	196	-196	85	MOGENSEN	1	0	0	0
26	N CANADAY	1	1	39	-39	56	O'TURLEY	4	0	0	0	86	JACKSON	1	0	0	0
27	J SAAD	0	0	6	-6	57	SEITZ	17	0	0	0	87	DAWS	1	0	0	0
28	H GATFIELD	0	0	33	-33	58	WOODS	4	0	1	-1	88	SWANSON	0	0	0	0
29	H FROST	0	0	0	0	59	PAYETTE R RANCH	2	0	0	0	89	WASHOE	28	0	0	0
30	F CHARTERS	0	0	1	-1	60	399 PUMPS (2)	44	44	0	0						

(1) STORAGE USE COMBINED WITH NS ENMETT (2) STORAGE USE COMBINED WITH SS BLACK CANYON

008
ID WATER RESOURS
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WATER DISTRICT 65 - PAYETTE RIVER FLOW ACCOUNTING - AUG 27, 1995 28-AUG-95

	REACH FLOWS IN CFS		ACTUAL DATE	NATURAL FLOW	ACTUAL FLOW	RMAINING NAT FLOW	POWER FLOW	STORED FLOW	RESRVOIR EVAP	NATURAL FLOW DIV	TOTAL RCH DIV	REACH GAIN	LAST RIGHT
1	SOUTH FORK AT LOWMAN		AUG 25	512.	512.	512.	0.	0.	0.	0.	0.	512.	19380919
2	DEADWOOD BLW DEADWOOD		AUG 25	117.	556.	117.	0.	439.	20.	0.	0.	117.	19380919
3	PAYETTE NR BANKS	*	AUG 26	969.	1408.	969.	0.	439.	0.	0.	0.	340.	19380919
11	UPPER NORTH FORK	*	AUG 24	20.	20.	20.	0.	0.	0.	0.	0.	20.	19380919
4	NORTH FORK AT MCCALL		AUG 24	100.	157.	100.	0.	57.	0.	0.	0.	80.	19380919
5	AT MCCALL TO CASCADE		AUG 25	324.	782.	124.	200.	458.	174.	0.	0.	224.	19380919
6	N FORK CASCADE TO BANKS	*	AUG 26	456.	914.	456.	0.	458.	0.	0.	0.	132.	19380919
7	BANKS TO HORSESHOE BEND		AUG 26	1460.	2352.	1460.	0.	892.	0.	0.	6.	36.	19380919
8	HORSESHOE BEND TO EMMETT		AUG 26	1529.	796.	746.	0.	50.	0.	783.	1622.	68.	19380919
9	EMMETT TO MID SLOUGH	*	AUG 26	1729.	350.	309.	0.	41.	0.	638.	647.	201.	19380919
13	COMBINED WASTE		AUG 26	75.	31.	75.	0.	-44.	0.	0.	44.	75.	19380919
12	BELOW 7 MILE SLOUGH	*	AUG 26	1804.	169.	0.	135.	34.	0.	249.	256.	0.	19380919
10	LETHA TO PAYETTE		AUG 27	2607.	468.	485.	0.	-17.	0.	453.	461.	803.	19990102

* - INDICATES FLOW ESTIMATED, NOT MEASURED TOTALS 2122. 3034. 2607.

	RESERVOIR	PREV CONT (AF)	CURR CONT (AF)	CHNG CONT (CFS)	ACCR STOR (CFS)	TOTL STOR (AF)	TOTL EV (AF)
1	DEADWOOD	133251.0	132292.0	-483.5	0.0	161900.0	960.4
2	UPPER LAKES	6500.0	6500.0	0.0	0.0	6500.0	0.0
3	PAYETTE	35300.0	35000.0	-151.2	0.0	26470.0	0.0
4	CASCADE	628054.0	626200.0	-934.7	0.0	653190.0	10596.3
5	BLACK CANYON	30456.0	30445.0	-5.5	0.0	0.0	0.0
	TOTAL	833561.0	830437.0	-1575.0	0.0	848060.0	11556.8

PRIORITY	RESERVOIR	RIGHT (AF)	STORED (AF)
1	PAYETTE	27750.0	26470.0
2	DEADWOOD	116800.0	116800.0
3	UPPER LAKES	2400.0	2400.0
4	UPPER LAKES	2600.0	2600.0
5	UPPER LAKES	1300.0	1300.0
6	CASCADE	570439.0	570439.0
7	UPPER LAKES	200.0	200.0
8	DEADWOOD	45100.0	45100.0
9	CASCADE	82751.0	82751.0
	TOTAL	849340.0	848060.0

	CHANGE IN CONTENT	ABV LETHA STORAGE USED	PASSING LETHA STORED	ABV LETHA DIVERTED	UNACCT STORED
YEAR-TO-DATE AF	458652.0	40792.9	4970.5	159714.7	37956.0

7 MILE SLOUGH AT HEAD CFS - 343. AT END CFS - 47.
COMBINED WASTE TO 7 MILE SLOUGH CFS - 31.
COMBINED WASTE BLW 7 MILE SLOUGH CFS - 11.
UPPER 7 MILE COEF - 1.02 LOWER 7 MI COEF - 1.02