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Hydroelectric Facility Reoperation Investigation

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Integrated
Storage
Investigation

CALFED
BAY-DELTA
PROGRAM

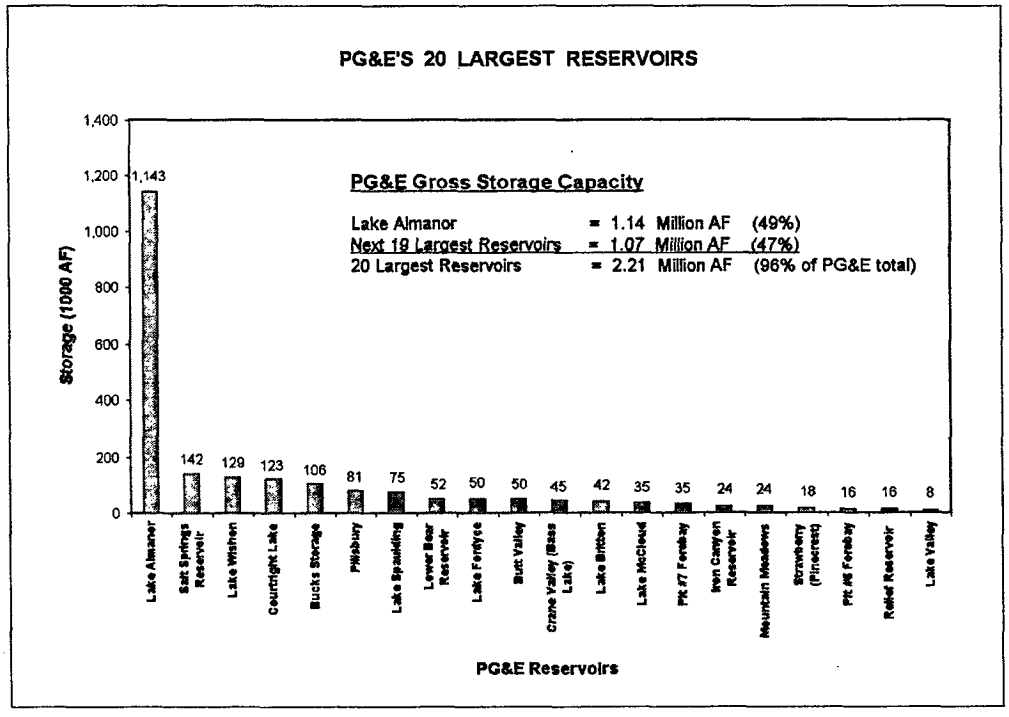
Summary

One of the many parts of the CALFED Integrated Storage Investigation is the potential to meet CALFED Bay-Delta Program objectives from reoperation of existing facilities originally constructed and operated to generate hydroelectric power. In 1996, California adopted a plan to restructure the regulation of the State's electric industry to establish a more competitive electric system. This lead to evaluations by the electric utilities of potential divestitures of their existing hydroelectric generation facilities and associated reservoirs. It also created interest by many other groups, including CALFED, to potentially operate the hydroelectric reservoirs differently then they had been operated historically to produce new water resources and ecosystem benefits.

The focus of this report is to explore, at a broad level of detail, how reoperation of hydroelectric reservoirs could help CALFED meet its objectives to improve water supply reliability for all water users including the environment. Since PG&E owns the majority of hydroelectric facilities in river basins tributary to the Delta, CALFED focused its initial studies on the Pacific Gas and Electric Company (PG&E) facilities.

Pacific Gas and Electric's Hydroelectric System

PG&E is the largest single non-SWP/CVP owner of both reservoir storage and hydroelectric capacity, with 2.32 million acre-feet of reservoir storage and 2,200 MW (3,890 MW with partnerships) of hydroelectric capacity. CALFED focused on Lake Almanor since it contains approximately half of the PG&E storage. Much of the base information needed for the CALFED evaluation was provided by PG&E.



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CALFED Study Approach

Like other CALFED evaluations, this study of potential reoperation of the PG&E reservoirs was conducted at a broad programmatic level of detail. The study began with Lake Almanor in the Feather River basin, since it by far the largest PG&E reservoir, with almost half of the storage of the entire PG&E system.

None of the modeling scenarios are proposals. They are simply trial scenarios that could maximize water supply or environmental benefits. They are not intended to balance all resource values at this time but are designed only to show maximum potential. The evaluations do not attempt to deal with all the institutional issues. The scenarios were designed to determine the general range of potential benefits and allow CALFED to decide if more detailed studies are warranted.

The study looked at three potential benefits of reservoir reoperation:

- Increase CALFED system-wide water reliability
- Changes in timing of flows for environmental enhancement
- Local water supply reliability

CALFED used a simple planning model (spreadsheet) to simulate operation of Lake Almanor and DWRSIM to quantify changes in the system resulting from reoperation of Lake Almanor.

Conclusions

In general, the studies show that reoperation of the PG&E hydroelectric facilities would provide little benefit towards meeting the CALFED goals.

Reoperation for Bay-Delta system wide water supply could provide up to 20 to 40 thousand acre-feet of additional dry year water supply. However, the actual water supply benefit could be significantly less when other resource needs are considered in more detail. Therefore, CALFED does not propose to further study PG&E hydropower reoperation for system wide water supply.

Reoperation for Bay-Delta system wide ecosystem benefits could provide up to 60 to 80 thousand acre-feet of flow at times needed by the Environmental Water Account. The actual environmental benefit could be less when other resource needs are considered in more detail. This basically provides opportunity to change the timing of flow for environmental uses without negatively impacting water supply. To be successful, the Environmental Water Account needs access to storage. The advantage of the reoperation of the hydroelectric reservoirs is that the reservoirs are currently in place and could be used relatively soon, without the long-lead time required for permitting and construction of new reservoirs. They could be available for use following environmental documentation and contractual arrangements. CALFED believes that

the potential for reoperation for environmental purposes should remain an option for CALFED use. CALFED will consider more detailed studies, subject to better defined needs of the Environmental Water Account.

Reoperation for local water supply could provide up to 40 thousand acre-feet of dry year supply. CALFED does not intend to take the lead in pursuing more-detailed evaluations of local water supply opportunities. However, the reoperation of certain hydroelectric reservoirs has the potential to provide local water supply benefits, and CALFED is supportive of others evaluating and pursuing such opportunities, to the extent that the reoperation does not conflict with CAFED objectives. Local water interests are in the best position to conduct any such evaluations due to their intimate knowledge of their own supply needs, their existing and other potential water supplies, environmental needs and of related local issues and constraints.

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1. Introduction

The purpose of this report is to evaluate the broad potential for benefits that might result from reoperation of existing reservoirs associated with hydroelectric facilities in the river basins tributary to the San Francisco Bay - Sacramento/San Joaquin Delta estuary (Bay-Delta). The hydroelectric reservoirs, for the most part, were originally constructed and operated for the primary purpose of generating hydroelectric power. The evaluations included in this report are preliminary and are intended to provide an order of magnitude of potential benefits. This report includes a summary of CALFED evaluations of hydroelectric reservoir reoperation to provide local water supply benefits and system-wide benefits for water supply and environmental flows.

The evaluation of the hydroelectric reservoir reoperation potential is one part of CALFED's Integrated Storage Investigation (ISI).

Of the river basins that are tributary to the Delta, those basins that contain considerable non-State Water Project (SWP) and non-Central Valley Project (CVP) hydroelectric facilities are shown on the figure on the following page. Because the purpose of this report is to look at potential reoperation of hydroelectric facilities that are operated primarily for power generation, those river basins that have minimal or no power utility-owned facilities are not included. Similarly, basins that have power utility-owned facilities but have minimal associated reservoir storage are also not included.

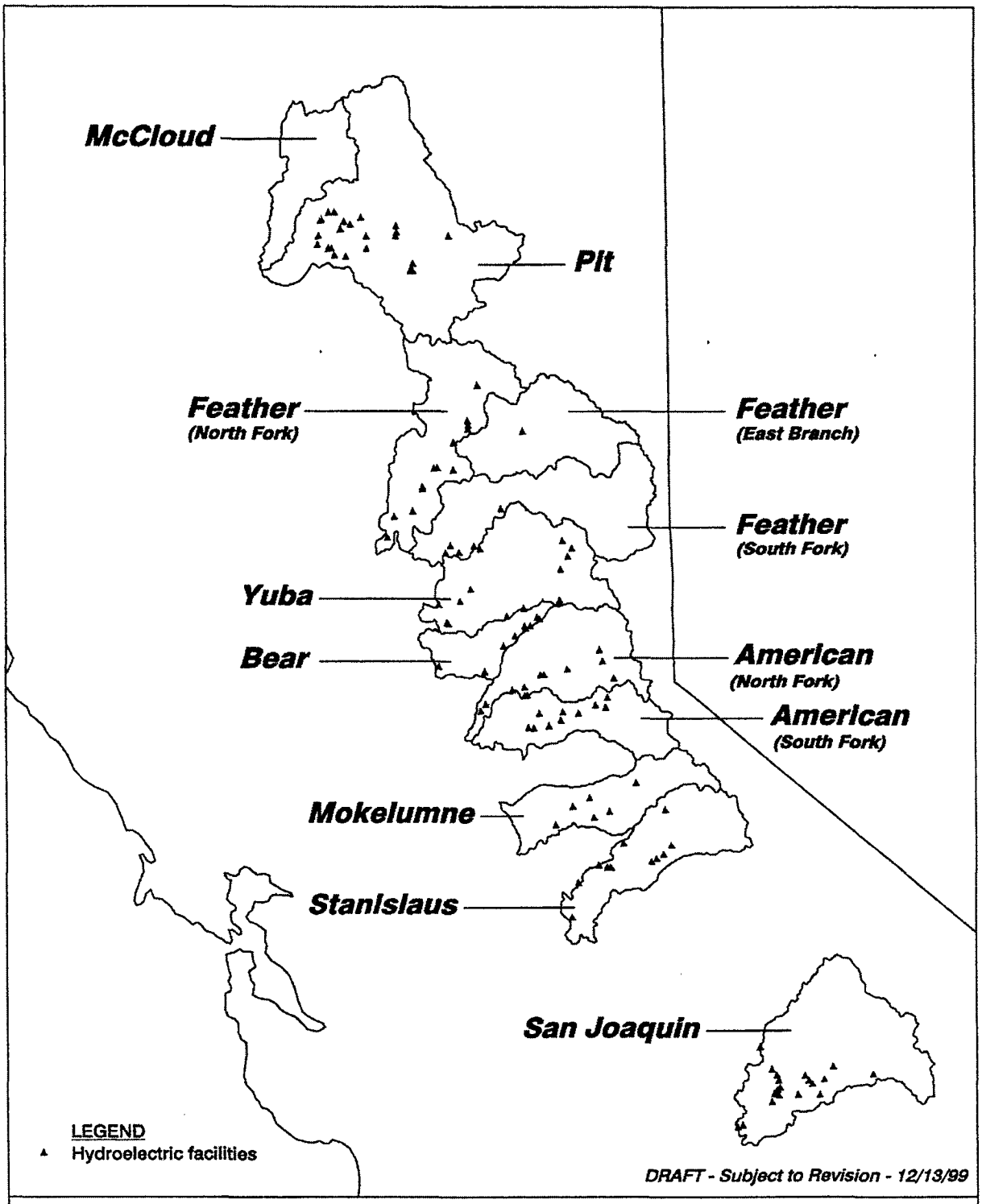
CALFED's Integrated Storage Investigation

CALFED is developing a water management strategy as part of its efforts to resolve water management and environmental issues related to the Bay-Delta system. One of a number of different water management approaches being evaluated is water storage. To help determine the appropriate role of storage as part of the overall water management strategy, CALFED is conducting an Integrated Storage Investigation (ISI). The ISI will include evaluations of:

- Groundwater storage
- Surface storage
- Fish barrier removal
- **Hydroelectric facility reoperation**

The ISI will initially focus on programmatic, system-wide interrelationships. CALFED then intends to work with the involved parties in developing more detailed system-wide, regional, and local evaluations.

A summary of the non-SWP/CVP hydroelectric facilities within these basins is shown in the table on the following pages. The total capacity of non-SWP/CVP facilities is about 6.1 million acre-feet of reservoir storage, and about 5,200 MW of hydroelectric power. Within these basins, electric utilities own nearly half of the reservoir storage and about three fourths of the hydroelectric capacity. The remaining reservoir storage is owned by water agencies and is operated primarily for water supply purposes, with the hydroelectric power generated at these facilities being incidental to their primary water supply operations. A more detailed inventory of hydroelectric facilities is provided in Appendix A.



River Basins Considered in Reoperation Evaluations

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OF INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS BY RIVER BASIN

River Basin	Owner	Total Storage (Acre-Feet)	Hydro Facility Capacity (MW)
Pit / McCloud River	BVMWC	5,500	0.0
	HSVID	77,000	0.0
	PG&E	159,109	767.0
	SFID	23,000	0.0
	USFWS	11,100	0.0
Total		**275,709**	**767.0**
Feather River	CSC	0	23.5
	OWID	172,100	94.0
	PG&E	1,340,486	733.8
Total		**1,512,586**	**851.3**
Yuba / Bear River	NID	282,490	86.4
	PG&E	144,550	202.0
	SSWD	104,000	6.8
	USCE	70,000	0.0
	YCWA	966,100	361.0
Total		**1,577,311**	**656.2**
American River	EID	38,697	20.2
	GDPUD	20,000	0.0
	PCWA	346,978	241.8
	PG&E	3,139	7.0
	SMUD	425,175	683.4
Total		**833,989**	**952.4**
Mokelumne River	CPUD	3,450	0.2
	EBMUD	627,000	39.5
	PG&E	224,956	208.5
Total		**855,406**	**248.2**
Stanislaus River	CCWD	186,348	266.1
	O&SSJID	230,500	112.7
	PG&E	49,446	100.0
Total		**466,294**	**478.8**
San Joaquin River	PG&E	50,240	221.7
	SCE	575,581	999.6
Total		**625,821**	**1,221.3**
Total All Basins		**6,147,116**	**5,175**

SUMMARY
OF INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS
BY OWNER

River Basin	Owner	Total Storage (Acre-Feet)	Hydro Facility Capacity (MW)
Total All Basins	BVMWC	5,500	0.0
	CCWD	186,348	266.1
	CPUD	3,450	0.2
	CSC	0	23.5
	EBMUD	627,000	39.5
	EID	38,697	20.2
	GDPUD	20,000	0.0
	HSVID	77,000	0.0
	NID	282,490	86.4
	O&SSJID	230,500	112.7
	OWID	172,100	94.0
	PCWA	346,978	241.8
	PG&E	1,971,926	2,240.0
	SCE	575,581	999.6
	SFID	23,000	0.0
	SMUD	425,175	683.4
	SSWD	104,000	6.8
	USCE	70,000	0.0
	USFWS	11,100	0.0
	YCWA	966,100	361.0
Total		**6,136,945**	**5,175.2**

Abbreviations:

BVMWC	Big Valley Mutual Water Company
CCWD	Calaveras County Water District
CPUD	Calaveras Public Utility District
CSC	City of Santa Clara Electric Department
EBMUD	East Bay Municipal Utility District
EID	El Dorado Irrigation District
GDPUD	Georgetown Divide Public Utilities District
HSVID	Hot Spring Valley Irrigation District
NID	Nevada Irrigation District
O&SSJID	Oakdale & South San Joaquin Irrigation District
OWID	Oroville-Wyandotte Irrigation District
PCWA	Placer County Water Agency
PG&E	Pacific Gas & Electric Company
SCE	Southern California Edison
SFID	South Fork Irrigation District
SMUD	Sacramento Municipal Utility District
SSWD	South Sutter Water District
USCE	U.S. Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
YCWA	Yuba County Water Agency

Within these basins, PG&E is the largest single non-SWP/CVP owner of both reservoir storage and hydroelectric capacity, with nearly 2.0 million acre-feet of reservoir storage (or about one third of the total) and 2,200 MW (3,890 MW with partnerships) of hydroelectric capacity (or about 45 percent of the total). Since PG&E owns such a large portion of the facilities within this area, the analyses of system benefits in this report are limited to reoperation of PG&E facilities. While the PG&E hydroelectric system totals 2.32 million acre-feet, CALFED focused on Lake Almanor since it contains approximately half of the PG&E storage.

Power industry deregulation has caused many in California to look at the potential of reoperation of the hydroelectric facilities for other benefits. See Appendix A for a listing of existing hydroelectric facilities on tributaries to the Bay-Delta.

CALFED decided to focus the initial study only on the technical issues relating to reservoir reoperation. The evaluations do not attempt to deal with all the institutional issues. The ultimate owner of these facilities is not considered in this assessment.

Power Industry Deregulation

In 1996, California adopted an aggressive plan to restructure regulation of the state's electric industry by enacting Assembly Bill 1890 (AB 1890). Its goal is to establish a more competitive electric system. AB 1890 requires that utility generation be transitioned from a regulated status to an unregulated status. This law establishes a transition period, by year 2002, during which electric utilities may recover certain costs associated with this changeover. California's utilities are required by the end of 2001 to place a market value on all of their generation assets, including hydroelectric assets.

As a result of AB 1890, Pacific Gas and Electric Company (PG&E), intends to divest all of its non-nuclear generation assets. PG&E has already completed the sale of six of its fossil-fueled plants, and expects to complete the sale of a geothermal plant later this year. PG&E has stated its intent to divest all of its hydroelectric generation facilities, including the associated reservoirs. PG&E has proposed the transfer of these facilities to U.S. Generating Company, which is an unregulated, wholly-owned subsidiary of Pacific Gas and Electric Corporation. Pacific Gas and Electric Corporation is the parent company of PG&E.

The California legislature conducted hearings to address issues related to the potential hydroelectric asset divestitures of both PG&E and Southern California Edison. The legislature considered several ownership options for these hydroelectric facilities, and is interested in the potential impacts or opportunity divestiture of the associated reservoirs may have.

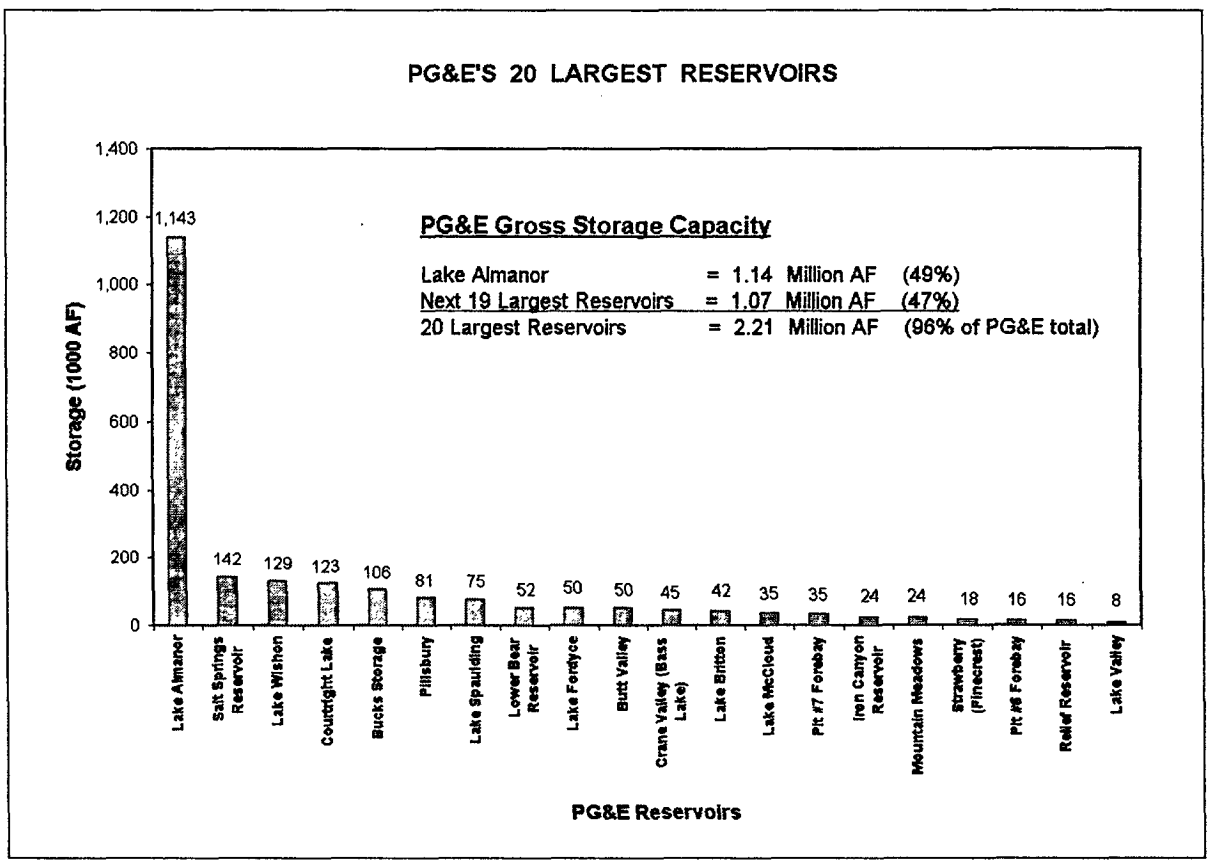
CALFED looked at three potential benefits of hydroelectric reservoir reoperation: 1) increase CALFED system-wide water reliability, 2) changes in timing of flows for environmental enhancement, and 3) local water supply reliability. The study began with Lake Almanor in the Feather River basin, since it by far the largest PG&E reservoir, with almost half of the storage of the entire PG&E system.

2. PG&E Hydroelectric Generation Facilities

To benefit water management and environmental issues related to the Delta, CALFED's interest in reoperation of hydroelectric generation facilities is generally limited to those facilities located in river basins tributary to the Delta. Since PG&E owns the majority of hydroelectric facilities within this area, the analyses of system benefits in this report are limited to reoperation of PG&E facilities as a first look at the potential value of hydropower reoperation.

Physical Description

PG&E's hydroelectric system is located mostly in California's Sierra Nevada mountain range along 16 river basins, extending nearly 500 miles over the northern two-thirds of the state from Redding to Bakersfield. The generation facilities (see Appendix B) consist of 110 generating units at 68 powerhouses, with a total generating capacity of 3,890 megawatts. In 1997, these facilities supplied about 15 percent of the electricity PG&E generated. Other facilities associated with the powerhouses include 99 reservoirs, 76 diversions, 174 dams, 184 miles of canals, 44 miles of flumes, 135 miles of tunnels, 19 miles of pipe, five miles of natural waterways, and 136,000 acres of land.



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PG&E's 99 reservoirs have a total gross storage capacity of 2.32 million acre-feet. The largest of these reservoirs is Lake Almanor, with a total storage of 1.14 million acre-feet (MAF). This reservoir alone holds 49 percent of the storage of all 99 reservoirs. The next largest reservoir, Salt Springs Reservoir, has a gross storage capacity of 0.14 MAF, or almost an order of magnitude less storage than Lake Almanor. The largest 20 reservoirs have a combined storage capacity of 2.22 million acre-feet, or 96 percent of the total storage (see figure on previous page). The remaining 79 reservoirs are relatively small, having a combined storage capacity of only 100,000 acre-feet. The largest of these 79 reservoirs stores less than 8,000 acre-feet, and 64 of that number store less than 2,000 acre-feet each.

The dams at PG&E's reservoirs were constructed over a number of years, with some constructed as long ago as the 1850's and some as recently as the mid-1960's. Those dams constructed in the last half of the 1800's, after the discovery of gold in California, were built primarily to provide water for mining activities. By the turn of the century, as mining activities diminished and the need for electrical power developed, hydropower facilities were added at existing reservoirs and water previously used in mining was used to generate power. As the need for power continued to increase, additional reservoirs and hydroelectric facilities were built, with the majority of PG&E's dams and reservoirs constructed from about 1910 through the 1940's.

The size of these reservoirs was dictated by the economics of the purposes for which they were built, i.e., to provide water supply for mining and to generate hydroelectric power. As a result, these reservoirs are generally undersized relative to the size of a reservoir in the same location if it were sized to provide a reliable long-term water supply. For example, most of PG&E's reservoirs have a smaller storage capacity than the average annual flow of the river or stream on which the dam is located. This means that, even if beginning the year with a completely empty reservoir, most of these reservoirs would fill and spill in an average or wetter year. And in fact, most of these reservoirs are characterized by frequent spills, spilling an average of one or two years out of every three. Reservoirs like these that normally empty and fill each year present limited reoperation potential for new water supply.

There are a few exceptions to this general reservoir undersizing, most notably at Lake Almanor. The storage capacity at Lake Almanor is about 65 percent greater than the average annual flow of the North Fork Feather River. As a result, Lake Almanor has some limited ability to carry over water from one year for use in the next year if needed. It is the only PG&E reservoir that is regularly operated with multi-year carryover as a consideration.

Typical Reservoir Operations

Lake Almanor has some ability for water carryover from year to year. The remaining reservoirs in PG&E's hydroelectric system were built and are operated to generally serve two primary purposes. The first is to provide seasonal storage, i.e., to temporarily store water for release later that same year. In these reservoirs, water is stored during times of high runoff but low power demand, generally in the winter and spring. This water is then released from these reservoirs and run through hydroelectric generation units during times of low natural runoff but high power demand, generally in the summer and fall. This maximizes the economic value of the power generated from a given quantity of water. This seasonal storage operation is also typical of water supply reservoirs.

Regulation of Reservoirs

PG&E's hydroelectric system is regulated by the Federal Energy Regulatory Commission (FERC) and the California Public Utilities Commission. FERC issues operating licenses which establish operational, environmental, and recreation requirements. PG&E currently holds 26 FERC licenses for its reservoirs. Some of these licenses include requirements for multiple reservoirs.

The California Department of Water Resources (DWR) has jurisdiction over dam safety and may limit the amount of water that can be stored in certain reservoirs.

PG&E has some existing water delivery obligations associated with its hydroelectric facilities. In addition, PG&E has several informal agreements regarding operations at some of its reservoirs (for example, with the California Department of Fish and Game for minimum instream flow requirements downstream of some of its facilities; and with local and recreation interests at Lake Almanor, primarily regarding lake levels).

The second primary purpose of PG&E reservoirs is to provide a pool of water upstream of the generation units. This pool serves several purposes, primarily increased head and daily or weekly river regulation and peaking. Head (i.e., the difference in elevation between the water surface from which water is diverted and the generation unit) is increased when water upstream of the generation unit is backed up along a river or stream; the higher the elevation of the water pool surface relative to the generation unit, the higher the head. A higher head increases the amount of power generated from a given quantity of water. A pool of water also allows the flow of the river to be regulated over the course of a day or week. In this type of operation, water is stored in the pool when power demand is low, generally at night and in the early morning, and is released through the generation units when power demand is higher, generally in mid-day except on weekends. This daily/weekly peaking operation, as with the seasonal storage operation described above, increases the economic value of the power generated from a given quantity of water. Most of these reservoirs have storage capacities that are quite small relative to the annual flow of the river on which they are located. These provide little ability to regulate flows and are essentially run of river facilities.

About half of PG&E's reservoirs generally serve the purposes of both seasonally storing water and increasing head. Most of PG&E's largest reservoirs are included in this group. The other half of PG&E's reservoirs serve only the second purpose of providing increased head and daily peaking.

Water Rights

PG&E has 94 contracts for water rights and 163 statements of water diversion and use associated with its hydroelectric facilities. The statements of diversion and use apply to pre-1914 and riparian water rights. The other water rights are appropriative rights issued by the State Water Resources Control Board (SWRCB) or its predecessor agency.

PG&E's water rights are of two general types. The first is a direct diversion right, in PG&E's case for power purposes. Under this right, water may be diverted from a stream, run through hydroelectric generation units, and then returned to the stream. This right does not include a right to consumptive use of the water. The second type of right is a right to divert water to storage. Storage rights are further categorized by the use of the water. Stored water for power purposes can be diverted to temporary storage and then later released to produce power. This right does not include a right to consumptive use of the water. Stored water for domestic and irrigation purposes can be diverted to storage and later delivered for consumptive use. Direct diversion and diversion to storage rights are limited by specified diversion rates and may be further limited by dates during the year when such diversions may be made. Storage rights are further limited by an annual quantity of water that may be stored.

Most of PG&E's water rights are direct diversion and diversion to storage rights for power purposes and not for consumptive use. As such, the water eventually makes its way downstream and is generally used to meet downstream water user and environmental needs. PG&E's water rights for consumptive use are relatively small (about 200,000 acre-feet per year) and are generally to meet its existing delivery obligations; most are contracts with water agencies.

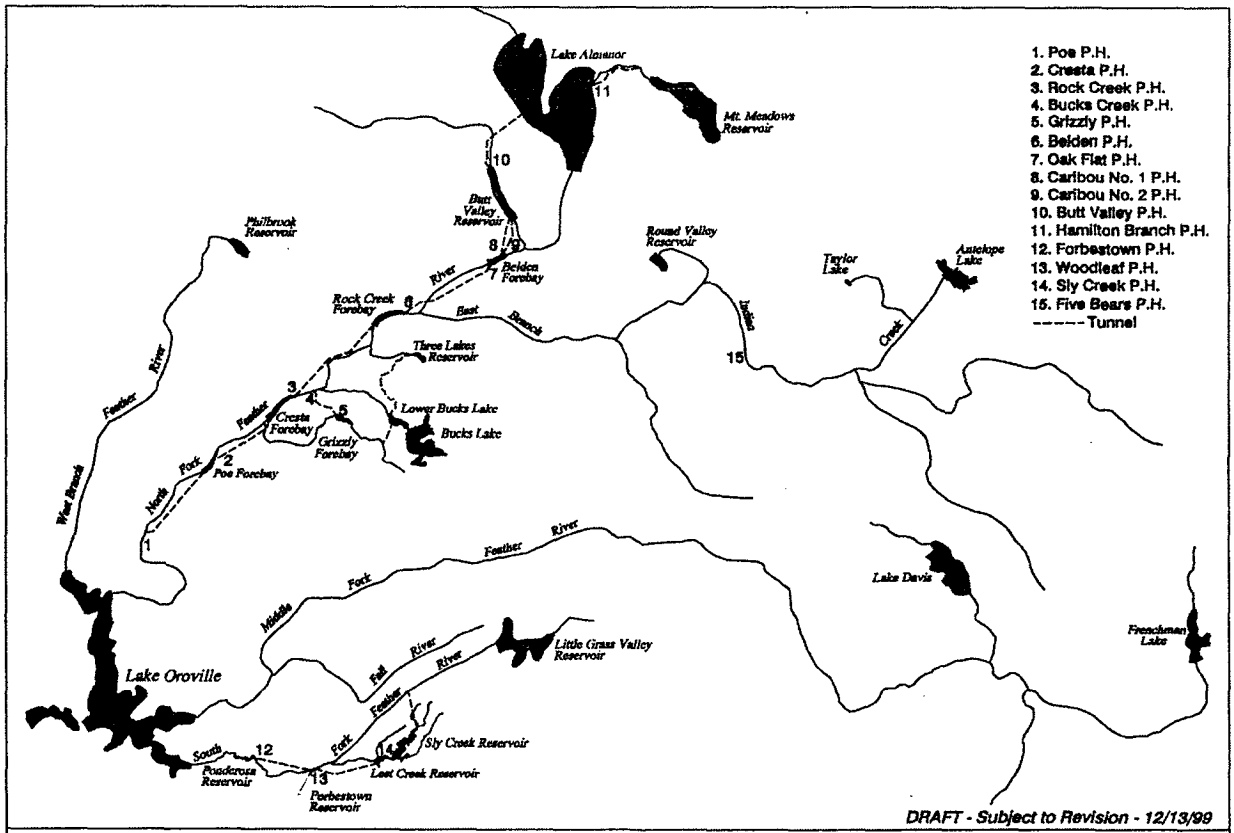
There currently is some uncertainty regarding PG&E's water rights for storage at Lake Almanor. A complaint was filed with the SWRCB alleging that PG&E lacked sufficient water rights at Lake Almanor. PG&E has three petitions before the SWRCB to resolve this issue. Related to this controversy, a petition to appropriate water for storage in Lake Almanor was filed by California Trout, Inc. 1985.

3. System Benefits

Focus of Analyses

PG&E's hydroelectric generation facilities include 99 reservoirs spread out over 16 river basins. A detailed analysis of reoperation of all these facilities would require considerable time and resources and may be unnecessary considering the actual system. In order to quickly complete a preliminary analysis and get an idea of the order of magnitude of potential benefits, the system analyses in this report are focused on Lake Almanor. Lake Almanor is by far the largest PG&E reservoir, with almost half the storage capacity of all of PG&E's reservoirs combined. If Lake Almanor is found to provide only minor potential for CALFED benefits then looking at the other PG&E reservoirs is likely not justified at this time.

Potential benefits for the remainder of PG&E's hydroelectric facilities are then assessed qualitatively, using the quantitative results from the Lake Almanor analyses as a guide. The qualitative assessments focus on those reservoirs which, along with Lake Almanor, make up the 20 largest PG&E reservoirs. After Lake Almanor, the 19 next largest reservoirs have a combined storage capacity of about 46 percent of PG&E's total storage capacity.



Detail of Feather River Basin

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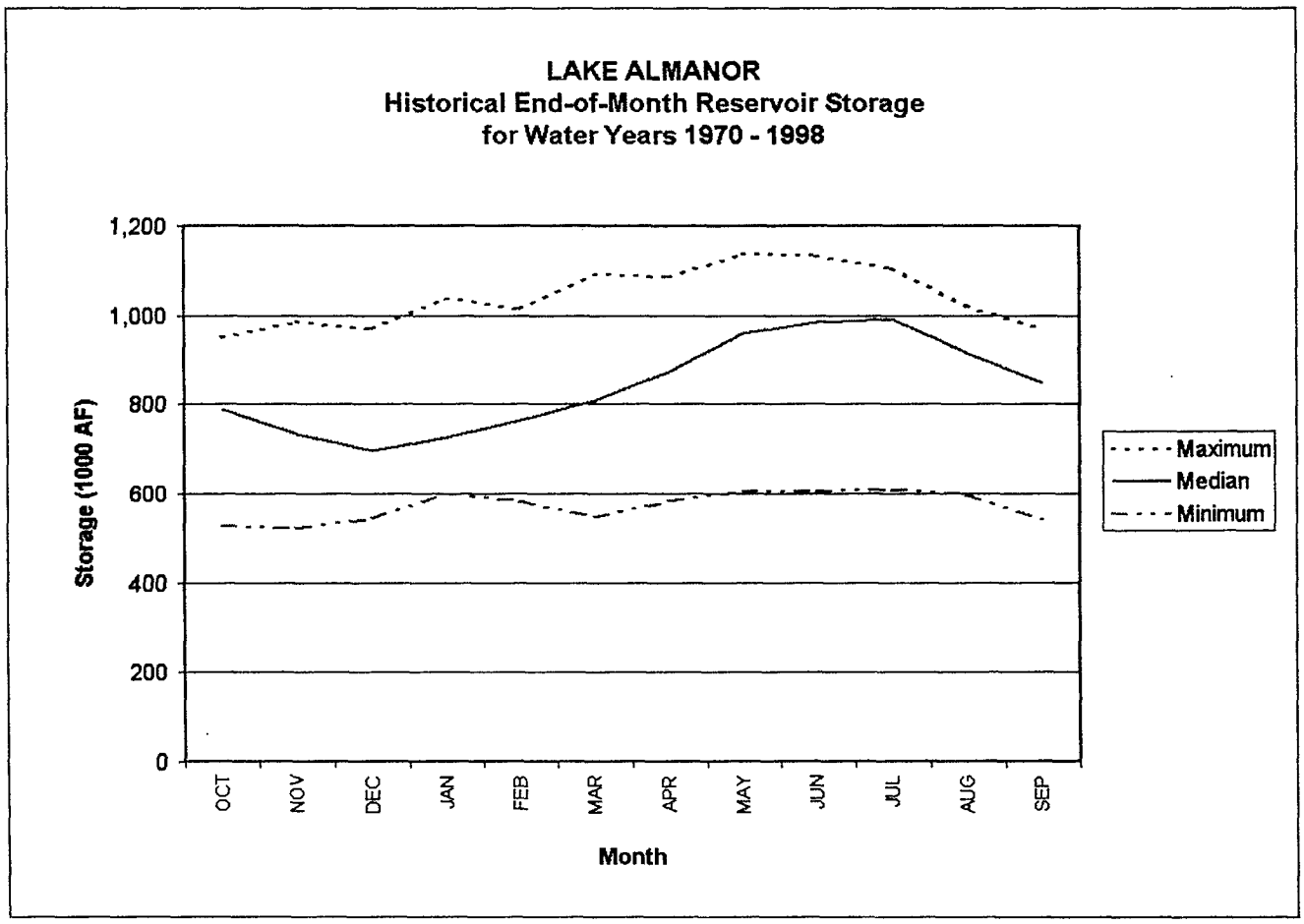
Existing Lake Almanor Operations

Lake Almanor is located on the North Fork Feather River. The dam was constructed in 1913 with a storage capacity of 220,000 acre-feet. The dam was incrementally enlarged in 1927 and 1962 to its current capacity of 1,312,000 acre-feet. However, storage behind the dam is limited by the DWR Dam Safety office to a maximum allowable storage of 1,143,000 acre-feet (about 6 feet and 170,000 acre-feet lower than the reservoir's emergency spillway crest). There is no flood control storage allocated at Lake Almanor. The combined capacity of its controlled outlet works (i.e., the powerhouse and river outlet) totals about 4,200 cubic feet per second.

In normal years, PG&E generally operates to a target minimum storage of about 700,000 acre-feet. Under dry conditions, and after informal consultation with a committee of local and recreation interests, PG&E may draw the storage down below this level. However, under its FERC license, PG&E attempts to maintain a minimum storage of at least 500,000 acre-feet at Lake Almanor in all years. The existing operation to increase recreational values results in a decrease in power values.



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Inflow to Lake Almanor comes from its 491 square mile watershed, mainly in the winter and spring. This inflow comes both from direct, surface runoff of rain and snowmelt and, on a delayed basis, from subsurface aquifer flow into the reservoir. Average annual inflow to Lake Almanor is approximately 700,000 acre-feet per year. Inflow in the winter and spring is generally stored and is then released to generate power in the summer and fall when power demands are high. The figure on the previous page shows historic storage levels at Lake Almanor from 1970 through 1998. Typically, storage has reached its peak in May or June, and has been drawn down to its low point by the end of December.

Releases for power are made from Lake Almanor through the Prattville Tunnel and Butt Valley Powerhouse to Butt Valley Reservoir. The capacity through Butt Valley Powerhouse is 2,200 cubic feet per second. These releases subsequently flow through five additional PG&E powerhouses downstream: Caribou, Belden, Rock Creek, Cresta, and Poe. Flows through the powerhouses generally vary during the day, peaking at mid-day during hours of higher power demand. In addition to power releases, PG&E must release under its FERC license a minimum of 35 cubic feet per second year round to provide fish flows below the dam. The capacity through this river outlet is about 2,000 cubic feet per second.

PG&E coordinates the operation of Lake Almanor with its other North Fork Feather River facilities to maximize power production from all these facilities. Of the total inflow to the North Fork Feather River, approximately one-third is regulated by Lake Almanor, about one-third flows from the largely unregulated East Branch North Fork Feather River (a tributary downstream of Lake Almanor), and the remaining third flows in from tributaries downstream of the East Branch. Three of the North Fork Feather River powerhouses (Rock Creek, Cresta, and Poe) are located downstream of the confluence of the East Branch. In the high runoff winter and spring months, the unregulated flows from the East Branch are generally high enough that flows through the three downstream powerhouses are running at capacity, without any releases being made from Lake Almanor. Therefore, any releases made from Lake Almanor in these high runoff months would generally have to bypass these downstream powerhouses, and any releases from Lake Almanor's river outlet would also bypass the two powerhouses between Lake Almanor and the East Branch confluence. Any such releases would result in a loss of power.

As a result of these considerations, PG&E draws down Lake Almanor as far as it reasonably can by the end of each year. In determining the amount of drawdown that is reasonable, PG&E must also consider the risk of not filling the reservoir by the next summer and adversely impacting power production and recreation at the lake.

General Analysis Methodology

None of the modeling scenarios are proposals. They are simply trial scenarios that could maximize water supply or environmental benefits. They are not intended to balance all resource values at this time but are designed only to show maximum potential. If these studies show significant potential then CALFED will continue with more detailed studies.

Both the system water supply and the system environmental benefit analyses were using the monthly system simulation model, DWRSIM, to quantify changes in the system resulting from reoperation of Lake Almanor. In DWRSIM, operations on the Feather River start with inflows to and operation of Lake Oroville, which is located downstream of Lake Almanor. Because DWRSIM does not model Lake Almanor directly, a change in Almanor operations can be reflected in DWRSIM by a change in inflows to Oroville.

To determine how the inflows to Lake Oroville would change with reoperation of Lake Almanor, a simple planning model (spreadsheet) was developed to simulate operation of Lake Almanor. Using this model, a base case operations scenario was developed to maximize hydroelectric generation, consistent with current PG&E operating criteria. Using the same model, alternate scenarios were developed to achieve different operating objectives, i.e., increased water supply or environmental flows. The differences in Lake Almanor releases (which flow downstream and become Lake Oroville inflow) between these alternate scenarios and the base case scenario were then used to modify the inflows to Lake Oroville for subsequent DWRSIM.

The DWRSIM studies used as base cases, i.e., for pre-reoperation of Lake Almanor, for these analyses are the current CALFED No Action studies. These studies use year 2020 level hydrology, and to model a range of uncertainty, two different water management criteria (Criterion A and Criterion B from the draft Programmatic EIS/EIR. The criteria in the first study include the highest environmental water requirements and the lowest Delta exports, while the second study includes the lowest environmental requirements and the highest Delta exports (DWR's DWRSIM studies 785 and 786, respectively and the CALFED website htp://wwwhydro.water.ca.gov/calfed.html).

The system benefits evaluated in this section are: (1) benefits to system water supply and (2) system environmental benefits. For the sole purpose of a convenient point of measurement, system water supply benefits are evaluated as the increase in Delta exports for the State Water Project (SWP) and the Central Valley Project (CVP). System environmental benefits are evaluated as the increased ability to change flow timing for environmental benefit.

System Water Supply Benefit

Lake Almanor Analysis

Methodology: As noted above, system water supply benefits resulting from reoperation of Lake Almanor were evaluated using DWRSIM. CALFED's DWRSIM studies 785 and 786 were used as base cases to evaluate maximum potential supply benefits. The supply analysis was conducted as follows:

1. Using a spreadsheet planning model of Lake Almanor, a simulation was developed in which Lake Almanor was operated for maximum hydroelectric generation, consistent with current PG&E operating criteria. The operational objectives were to achieve a target end-of-year storage level while maximizing summer releases and minimizing unscheduled releases and spills.

2. Using the same Lake Almanor model, a second simulation was developed in which Lake Almanor was operated for maximum, dry period releases. The operational objective for this reoperation scenario was to enter dry and critical years with high storage in Lake Almanor. During a sequence of dry and critical years, storage at Lake Almanor was then drawn down to its minimum storage level.

3. The difference in Lake Almanor outflows between the maximum hydroelectric generation simulation from Step 1 and the maximum dry period release simulation from Step 2 was then applied to the Lake Oroville inflow used in CALFED's DWRSIM studies 785 and 786.

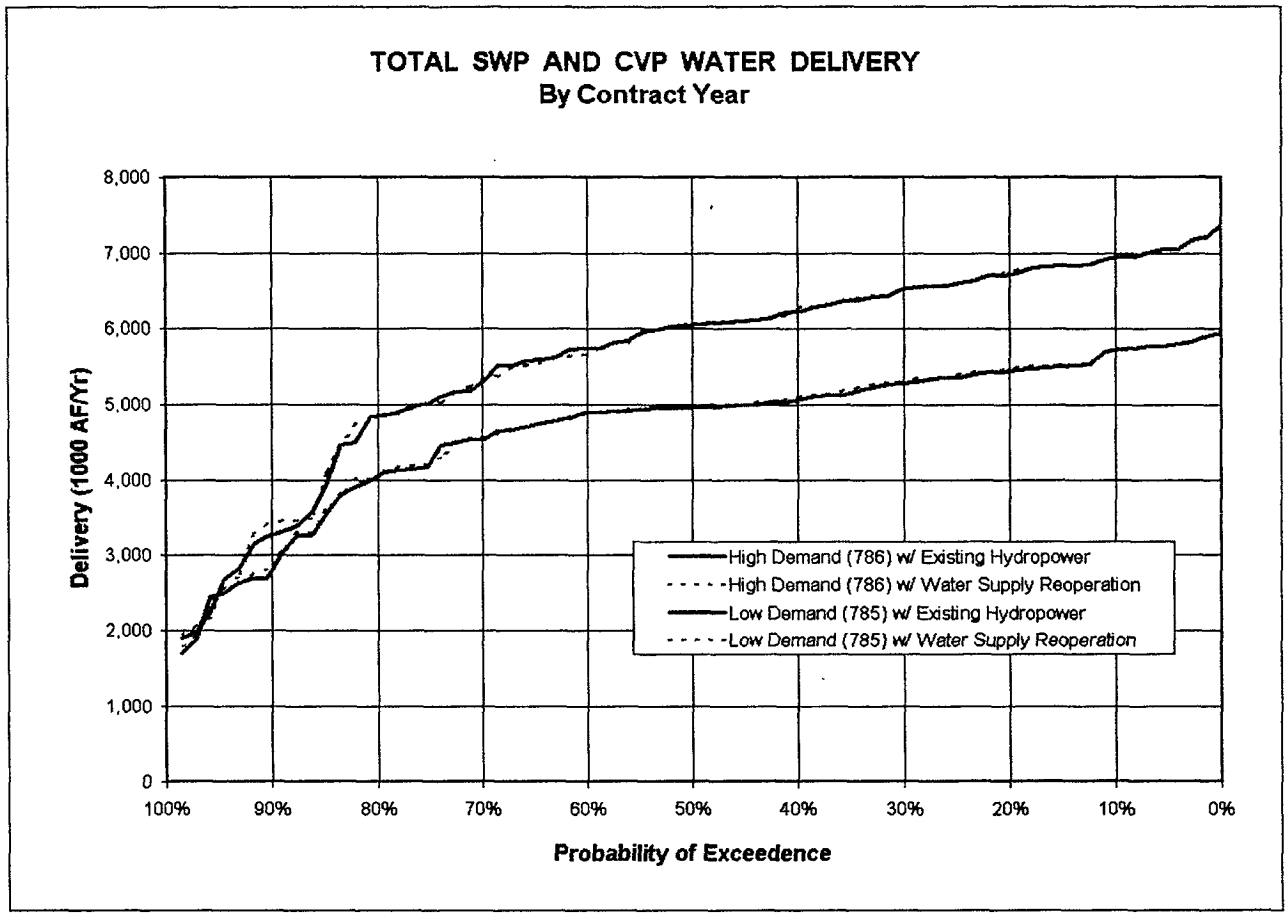
4. Both of these DWRSIM studies were then rerun, with the only change being the inflow to Lake Oroville. These studies were then compared to the original CALFED studies 785 and 786 to determine the system changes resulting from this Lake Almanor reoperation.

Specific assumptions used in the Lake Almanor simulations are included in Appendix C.

Supply Benefits: System supply benefits are evaluated in this analysis as an increase in Delta exports for the SWP and CVP. The reoperation of Lake Almanor in this evaluation produced only a small system supply benefit, increasing Delta exports in critical dry periods by an average of 15 to 30 thousand acre-feet per year (see following figure for exceedence curve). As is discussed further below, the reason for such small system improvement is that while Lake Almanor is currently operated primarily to generate hydroelectric power, its operation already provides an incidental water supply benefit and additional opportunities to increase this benefit are limited.

Typical operation of a water supply reservoir is to store water in times of high runoff but low water demand, and release it in times of low natural runoff but high water demand. This includes seasonal storage, which in California generally means storing water in the winter and spring and releasing it in the summer and fall, and multi-year storage, or storing water in wet years and

holding it in storage for use in dry years. Because seasonal water and power demands in California generally track each other (i.e., they are low at the same time of year, and high at the same time later in the year), the seasonal storage operation at Lake Almanor is essentially the same as if Lake Almanor was operated exclusively for water supply purposes. In other words, water supply is already being developed at Lake Almanor as an incidental benefit of its current seasonal hydroelectric operations. The water from Lake Almanor is for the most part not consumptively used, but is merely stored and released later in the year. This water is available for use downstream, either for diversion and consumptive use by water users or for environmental uses, and is generally already being put to such uses.



As noted previously in, Lake Almanor is one of the few PG&E reservoirs sized large enough that its capacity is greater than the average annual flow of the river on which it is located. Therefore, it is one of the few reservoirs with any multi-year storage capability, and is the only PG&E reservoir currently operated with this as a consideration. As a result, current Lake Almanor operation already provides at least some dry year supply benefit. The only opportunities to improve dry year supplies are to keep the reservoir storage higher in anticipation of a future dry year, and/or to draw storage down further during a dry year sequence. Both of these changes were made in the Lake Almanor reoperation simulation in this analysis. However, this reoperation can cause adverse impacts, as is discussed in more detail below.

Impacts: Under the reoperation scenario, storage at Lake Almanor is generally kept higher so that water will be in storage when a dry period occurs. This operation greatly increases the frequency and magnitude of spills from Lake Almanor. Such spilling would also increase flows downstream of Lake Almanor on the Feather River, and further downstream along the Sacramento River and through the Delta, increasing the frequency and magnitude of high flow and potential flooding situations.

As noted previously, the emergency spillway crest at Lake Alamnor is located six feet higher in elevation than the maximum storage allowed by DWR. Maintaining higher storage levels at Lake Almanor thus increases the risk of water being higher than this maximum. Since the reoperation scenario analyzed in this study would increase this risk, such reoperation would likely be considered unacceptable. A reoperation scenario where reservoir storage is maintained at somewhat lower levels would lower such risk, but would also reduce the potential dry year supply benefit.

In this reoperation, power production would be reduced in several ways. Keeping water in storage for dry year supply means releasing less water in non-dry years. This results in less power production in years that are not dry or critical. Increased spills would further reduce power production, by forcing releases which must bypass generation facilities and/or by forcing releases at times when power demand is low and of less value. Releases in some years would be higher, increasing potential power production in those years. CALFED estimates that the lost power value (considering variable power value throughout the year) may be in the range of 10 to 15 percent loss.

Recreation in non-dry years at Lake Almanor would be improved by generally increased reservoir storage levels and less summer drawdown. In dry and critical years, however, increased reservoir drawdown would negatively impact recreation.

PG&E System Assessment

Methodology: The potential system water supply benefits from the rest of PG&E's reservoirs are assessed qualitatively in this report, based on the quantitative results from the more detailed Lake Almanor supply analysis described above. The qualitative assessment focuses on those reservoirs which, along with Lake Almanor, make up the 20 largest PG&E reservoirs.

In general, most of the 20 largest reservoirs are already operated to provide seasonal storage. As discussed in the Lake Almanor analysis above, while this seasonal operation is primarily for power generation purposes, it is essentially the same operation as for a water supply reservoir and already provides an incidental water supply benefit downstream. Since these reservoirs fill nearly every year, the primary opportunity to improve dry year supplies is to draw reservoir storage down further during a dry year.

More specifically, the assessment was conducted as follows:

1. Eliminate from further evaluation those reservoirs that cannot improve system dry-year water supplies, including:

    - Reservoirs on rivers that are not tributary to the Delta,
    - Reservoirs operated primarily for daily peaking, and
    - Reservoirs with no additional dry year drawdown capability.

2. Determine the potential additional dry year drawdown of the remaining reservoirs.

3. Determine additional system water supply benefit, based on Lake Almanor analysis.

Of the 19 largest reservoirs after Lake Almanor, 13 were eliminated from further evaluation under Step 1 above (see table on following page). Three reservoirs are located on rivers that are not tributary to the Delta. Four additional reservoirs are essentially daily peaking reservoirs located on the Pit River system, a tributary to Lake Shasta. These reservoirs have very little storage capacity relative to the significant runoff from the large watershed upstream, each with a storage capacity less than five percent of the annual flow of the river at the dam location. Because of the high runoff on the Pit River, the hydroelectric generation units associated with these reservoirs produce a lot of power, and any small change in reservoir operations can have a relatively large impact on the amount and economic value of hydroelectric power generation at these facilities. Given the potentially significant power costs associated with the small potential for water supply benefit from these four reservoirs, they were eliminated from further evaluation.

Based on a review of historic 1970 through 1998 operations of the remaining reservoirs, an additional six reservoirs were eliminated from further evaluation because they are already drawn down to very low storage levels in dry and critical years.

With these eliminations, the assessment of potential system supply benefit was narrowed to six PG&E reservoirs (Bucks Storage, Lake Spaulding, Butt Valley, Crane Valley, Iron Canyon, and Strawberry). Given the historic operation of these reservoirs from 1970 through 1998, the additional dry year drawdown potential was estimated to be about 80 thousand acre-feet. This was based on a review of dry and critical year operations and an estimate of the typical, or median, low point in storage in those years, and an estimate of how much further these reservoirs might be drawn down in a future dry or critical year.

DRAWDOWN POTENTIAL FOR SYSTEM WATER SUPPLY BENEFIT FROM PG&E'S 20 LARGEST RESERVOIRS

PG&E RESERVOIRS (20 Largest)	STORAGE	BASIN / RUNOFF			OPERATIONS		ELIMINATION				POTENTIAL
Reservoir	Gross Storage Capacity (TAF)	Basin	Water Year Unimpaired Runoff * (TAF)	Regulation Factor **	Median Max Storage (TAF)	Dry/Crit Yr Median Min Stor (TAF)	Not Tributary to Delta	Reg. Factor < 0.10	Median Min Stor < 15% of Capacity	Meet Elimination Criteria	Additional Dry/Crit Yr Drawdown (TAF)
Lake Almanor	1,143	De Sabla / Feather R.	702	1.63	991	720					200
Salt Springs	142	Mokelume R	371	0.38	138	9			x	x	
Lake Wishon	129	Kern / Kings / Merced / San Joaqu	312	0.41	127	44	x			x	
Courtright Lake	123	Kern / Kings / Merced / San Joaqu	61	2.02	102	34	x			x	
Bucks Storage	106	De Sabla / Feather R.	90	1.17	96	48					33
Pillsbury (Scott Dam)	81	Eel R.	470	0.17	79	22	x			x	
Lake Spaulding	75	South Yuba	274	0.27	71	15					8
Lower Bear Reservoir	52	Mokelume R.	91	0.57	49	5			x	x	
Lake Fordyce	50	South Yuba	100	0.50	43	5			x	x	
Butt Valley	50	De Sabla / Feather R	76	0.66	46	38					28
Crane Valley Res. (Bass Lake)	45	Kern / Kings / Merced / San Joaqu	55	0.83	44	22					10
Lake Britton	42	Pit / McCloud	2,230	0.02	37	31		x		x	
Lake McCloud	35	Pit / McCloud	803	0.04	32	18		x		x	
Pit #7 Forebay	35	Pit / McCloud	3,067	0.01	33	33		x		x	
Iron Canyon Reservoir	24	Pit / McCloud	31	0.78	17	8					3
Mountain Meadows	24	De Sabla / Feather R.	115	0.21	20	1			x	x	
Strawberry (Pinecrest Lake)	18	Stanislaus R	58	0.32	18	4					1
Pit #6 Forebay	16	Pit / McCloud	2,735	0.01	15	14		x		x	
Relief Reservoir	16	Stanislaus R.	43	0.36	15	1			x	x	
Lake Valley	8	South Yuba	12	0.66	7	1			x	x	
Total	2,213									w/ Lake Almanor	283
										w/o Lake Almanor	83

* Operational unimpaired runoff not adjusted for lake evaporation.

** Reservoir Regulation Factor is ratio of total reservoir gross storage capacity to average annual flow of river at dam location.

Supply Benefits: In the Lake Almanor analysis described previously, a critical dry-period supply benefit of about 15 to 30 thousand acre-feet was developed by a Lake Almanor reoperation which essentially consisted of drawing the reservoir down by an additional amount of about 200 thousand acre-feet during a dry-year sequence. The additional drawdown in the system from the other PG&E reservoirs of about 80 thousand acre-feet is 40 percent of the additional drawdown at Lake Almanor. Based on this, the other PG&E reservoirs should develop about 40 percent of the system supply benefit determined in the Lake Almanor analysis, or about six to 12 thousand acre-feet of dry-period supply. Including Lake Almanor, this would result in a total system supply benefit from all of PG&E's reservoirs of approximately 20 to 40 thousand acre-feet of dry-period supply.

It should be noted that this estimate of water supply benefit is probably an upper bound. In estimating the additional drawdown potential for this preliminary assessment, reservoir-specific operational constraints, minimum flow requirements, or recreation restrictions were not reviewed. Any such constraints would likely reduce the drawdown potential that estimated here. In addition, this assessment assumes that system supply benefits from these other PG&E reservoirs are additive and in proportion to those from Lake Almanor. If, for example, releases

from the other PG&E reservoirs resulted in reaching additional system supply constraints, then the system supply developed (i.e., the additional supply able to be exported from the Delta) would likely be reduced.

Impacts: The impacts that would result from reoperation of these other PG&E reservoirs are similar to the impacts previously discussed in the Lake Almanor system supply ananlysis. To the extent storage at these reservoirs is held a bit higher in case the next year is dry, the frequency and magnitude of reservoir spills might be slightly higher. If these reservoirs are drawn down lower in critically dry years, there would be an increased risk of not meeting instream flow or other downstream requirements late in the year or the following year. Reoperation of these reservoirs would likely result in loss of power value.

Any recreation at these reservoirs might receive slight improvements in non-dry years, to the extent storage is maintained a bit higher. In dry and critical years, however, adverse impacts would be severe because the reservoirs would be drawn down to very low storage levels.

System Environmental Benefit

Lake Almanor Analysis

Methodology: As noted above, system environmental benefits resulting from reoperation of Lake Almanor were evaluated using DWRSIM. CALFED's DWRSIM study 786 was used as a base case to evaluate maximum potential environmental benefits. ERP Delta outflow targets were calculated for study 786 using the ERP postprocessor used in other CALFED analyses. The environmental analysis in this report was conducted as follows:

1. Using a spreadsheet planning model of Lake Almanor, a simulation was developed in which Lake Almanor was operated for maximum hydroelectric generation, consistent with current PG&E operating criteria. The operational objectives were to achieve a target end-of-year storage level while maximizing summer releases and minimizing unscheduled releases and spills. The maximum hydroelectric generation simulation used in this environmental analysis is the same simulation as that used in the system water supply analysis above.

2. Using the same Lake Almanor spreadsheet model, a second simulation was developed in which Lake Almanor was operated to make releases to meet ERP flow targets for Delta outflow. The Delta outflow targets occurred in March and May, with the majority occurring in May. After making releases to meet ERP targets, Lake Almanor was otherwise operated to meet the objectives of preserving system water supply deliveries to the same level as before reoperation and, with any remaining operational flexibility, maximizing hydroelectric generation.

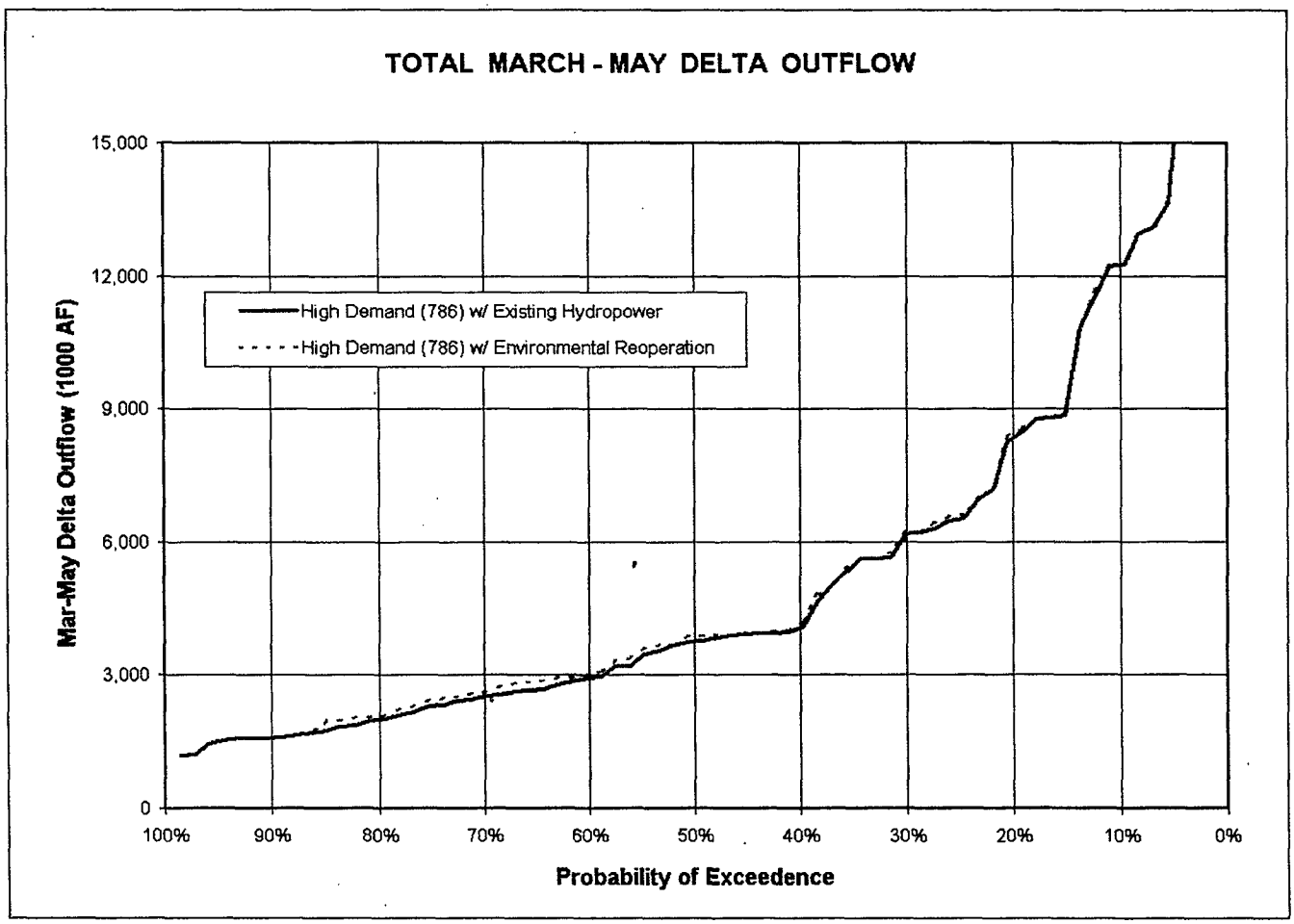
3. The differences in Lake Almanor outflows between the maximum hydroelectric generation

simulation from Step 1 and the ERP flow target simulation from Step 2 was then applied to the Lake Oroville inflow used in CALFED's DWRSIM study 786.

4. This DWRSIM study was then rerun, with the only change being the inflow to Lake Oroville. This study was then compared to the original CALFED study 786 to determine the system changes resulting from the Lake Almanor reoperation scenario.

Specific assumptions used in the Lake Almanor environmental simulations are included in Appendix D.

Environmental Benefits: System environmental benefits are evaluated as the increased ability to meet ERP flow targets for Delta outflow. The reoperation of Lake Almanor in this analysis produced a small system environmental benefit, averaging about 40 to 60 thousand acre-feet per year (see following figure for exceedence curve). The analysis as conducted resulted in a slight reduction in system water supplies (i.e., reduced SWP and CVP Delta exports) which, in any further analysis, would need to be evaluated in more detail and minimized.



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Relative to base case Delta outflows, the additional Delta outflow resulting from Lake Almanor reoperation results in a small increase in Delta outflow, averaging about a one percent increase for March through May outflows, and less than one half of one percent for the year. Releases from Lake Almanor to meet ERP Delta outflow targets occur in about half of the years, generally in years that are neither extremely wet nor extremely dry (i.e., primarily in dry, below normal, and above normal year types).

The ERP Delta outflow targets calculated for study 786 average about 100 thousand acre-feet per year, with about 90 percent of that total occurring in May and the remainder in March. May outflow targets occur in more years than March targets, and are generally larger in magnitude. Under the reoperation scenario, releases from Lake Almanor are able to meet all of the March Delta outflow targets, but only about one third to one half of the May targets due to generation unit capacity limitations. To meet these targets, releases from Lake Almanor are generally shifted during the year, with increased releases mostly in May with smaller increases in March, and decreased releases mostly in June, September, and October. Of the average annual increase in Delta outflow from Lake Almanor, about 85 percent occurs in May, and the remainder occurs in March.

The base case used in this environmental analysis (DWRSIM 786) is the CALFED No-Action study which includes the lowest environmental water requirements and the highest Delta exports. Therefore, the potential environmental benefits identified in this analysis are the maximum that might be achieved under the conditions assumed. A similar analysis using the other No-Action study (DWRSIM 785), which includes the highest environmental water requirements and the lowest Delta exports, was not completed. Because that study already includes high environmental flows, any increase in environmental flows as a result of Lake Almanor reoperation would be less than the potential environmental benefits identified in this analysis using DWRSIM 786.

Impacts: As noted above, the analysis as conducted resulted in a slight reduction in system water supplies. If reoperation for system environmental benefit is pursued beyond this preliminary analysis, any adverse system supply impacts would need to be evaluated in more detail. Should a more detailed evaluation result in a need for a change in reoperation or in other mitigation, some reduction of the environmental benefits determined in this preliminary analysis would likely result.

Both the economic value of power produced and the amount of power produced would be reduced under the reoperation scenario due to the shifting of releases from summer and fall to spring. This shifting results in a reduction in hydroelectric power production in the high power demand months of summer and early fall, which would have to be replaced with other more expensive power sources; and an increase in power production in the low demand months of March and May, when that power has a lesser economic value. Also, as noted earlier in this Section in the discussion on Lake Almanor operations, any releases from Lake Almanor in March and May would generally have to bypass the generation units at three downstream North Fork Feather River powerhouses. This generation unit bypass is due to the largely unregulated

flows from the East Branch North Fork Feather River (a tributary downstream of Lake Almanor), which are generally high enough in these months that flows through the three downstream powerhouses are already running at unit capacity, without any releases from Lake Almanor. Any powerhouse bypasses would result in a loss of power production from these releases. CALFED estimates that the lost power value (considering variable power value throuhout the year) may be in the range of 10 to 15 percent loss.

The reoperation would have a varying impact on recreation at Lake Almanor. In those years in which Lake Almanor releases are made to meet ERP Delta outflow targets, reservoir storage levels are generally lower through the summer recreation season, resulting in an adverse recreation impact in those years. In these years, the March and May releases would result in Lake Almanor starting the summer at a somewhat lower storage and elevation. Decreased releases in June would somewhat offset this, but only partially, and this lower storage would continue through August. Decreased September and October releases would generally bring reservoir storage more or less back to levels as they would have been without reoperation. In years in which no ERP releases are made, Lake Almanor storage levels are generally slightly higher throughout the year, including the summer recreation season, and so would have a positive impact on recreation in those years.

PG&E System Assessment

Methodology: As was indicated at the beginning of this Section, the potential system environmental benefits from the rest of PG&E's reservoirs are assessed qualitatively in this report, based on the quantitative results from the more detailed Lake Almanor environmental analysis described above. The qualitative assessment focuses on those reservoirs which, along with Lake Almanor, make up the 20 largest PG&E reservoirs.

In general, most of the 20 largest reservoirs are operated to provide seasonal storage, storing water in the high runoff but low power demand winter and spring months, and releasing it in low runoff but high power demand summer and fall months. As in the Lake Almanor analysis, system environmental benefits in this assessment are evaluated as the increased ability to meet ERP flow targets for Delta outflow. Since these outflow targets occur in March and May, the primary opportunity to provide additional system environmental benefits is to assess the ability to shift to these spring months some of the releases that would otherwise be made in the summer and fall.

More specifically, the assessment was conducted as follows:

1. Estimate how much of the typical summer/fall release might be shifted for release in a spring month to improve Delta outflow.

2. Determine how much of the ERP Delta outflow target from the Lake Almanor analysis was not met from Lake Almanor.

3. Determine how much of the unmet Delta outflow from Step 2 could be met from the remaining PG&E reservoirs, limiting the amount those reservoirs could contribute to the amount estimated in Step 1.

The amount of summer and fall release from these PG&E reservoirs that could be shifted to spring is estimated by looking at historic operations from 1970 through 1998. Median monthly reservoir storage during this time period are assumed to be representative of typical operations, so the typical annual drawdown at each reservoir is estimated as the difference between the median monthly maximum and minimum storage at these reservoirs. This annual drawdown typically occurs over a four to six or seven month period in the summer and fall. The amount of this total annual drawdown that could be shifted to a spring month is assumed in this assessment to be one fourth of the annual drawdown. Excluding Lake Almanor and those three of PG&E's 20 largest reservoirs which are located on rivers not tributary to the Delta, the total additional monthly release amount from the remaining PG&E reservoirs is estimated to be about 100 thousand acre-feet (see table below).

DRAWDOWN POTENTIAL FOR SYSTEM ENVIRONMENTAL BENEFIT FROM PG&E'S 20 LARGEST RESERVOIRS

PG&E RESERVOIRS (20 Largest)	STORAGE	BASIN		OPERATIONS			POTENTIAL
Reservoir	Gross Storage Capacity (TAF)	Basin	Tributary to Delta	Median Max Storage (TAF)	Median Min Storage (TAF)	Median Annual Drawdown (TAF)	Monthly Shifting for ERPP (Ann'l Drwdn/4) (TAF)
Lake Almanor	1,143	De Sabla / Feather R.	x	991	696	295	74
Salt Springs	142	Mokelume R.	x	138	15	123	31
Lake Wishon	129	Kern / Kings / Merced / San Joaquin		127	36	91	
Courtright Lake	123	Kern / Kings / Merced / San Joaquin		102	40	62	
Bucks Storage	106	De Sabla / Feather R.	x	96	51	45	11
Pillsbury (Scott Dam)	81	Eel R.		79	24	55	
Lake Spaulding	75	South Yuba	x	71	20	51	13
Lower Bear Reservoir	52	Mokelume R.	x	49	7	42	11
Lake Fordyce	50	South Yuba	x	43	5	38	10
Butt Valley	50	De Sabla / Feather R.	x	46	40	6	2
Crane Valley Res. (Bass Lake)	45	Kern / Kings / Merced / San Joaquin	x	44	22	22	6
Lake Britton	42	Pit / McCloud	x	37	32	5	1
Lake McCloud	35	Pit / McCloud	x	32	19	13	3
Pit #7 Forebay	35	Pit / McCloud	x	33	33	0	0
Iron Canyon Reservoir	24	Pit / McCloud	x	17	4	13	3
Mountain Meadows	24	De Sabla / Feather R.	x	20	2	18	5
Strawberry (Pinecrest Lake)	18	Stanislaus R.	x	18	5	13	3
Pit #6 Forebay	16	Pit / McCloud	x	15	15	0	0
Relief Reservoir	16	Stanislaus R.	x	15	1	14	4
Lake Valley	8	South Yuba	x	7	2	5	1
Total	2,213					w/ Lake Almanor	176
						w/o Lake Almanor	102

Environmental Benefits: As was noted previously in the Lake Almanor environmental analysis, Lake Almanor was able to meet all of the March Delta outflow targets and about one third to one half of the May targets, on average. Therefore, the *unmet* portion of the ERP Delta outflow target is about one half to two thirds of the May target. The amount of this unmet May outflow target that the remaining PG&E reservoirs might meet is estimated by looking at all of the unmet May targets and limiting the amount these reservoirs can contribute to the additional monthly release capability of 100 thousand acre-feet estimated above. This results in an estimate of the additional system environmental benefit that averages about 20 thousand acre-feet per year. Including the results of the Lake Almanor analysis, this would result in a total system environmental benefit from all of PG&E's reservoirs that averages approximately 60 to 80 thousand acre-feet per year.

It should be noted that the environmental benefit determined in this preliminary assessment is a gross estimate. Other operation scenarios for environmental flow may prove to be more beneficial as the needs of the Environmental Water Account are more fully developed. A more refined assessment would need to consider more detailed reservoir-specific operations and constraints, any minimum flow or recreation requirements, and potential adverse impacts on system water supplies, among other factors. Consideration of these factors would likely reduce the estimated environmental benefit determined above.

Impacts: The impacts that would result from reoperation of these other PG&E reservoirs are similar to the impacts previously discussed in the Lake Almanor system environmental ananlysis. Potential impacts of this reoperation on system water supplies were not addressed in this assessment, and would need to be evaluated if further analysis is pursued. Should there be any adverse supply impacts, modified reoperation or mitigation would be required, which would likely reduce the estimated system environmental benefit.

As in the Lake Almanor analysis, the economic value of power produced would be reduced under the reoperation scenario due to the shifting of releases from summer and fall to spring. This shifting results in a reduction in hydroelectric power production in the high power demand months of summer and early fall, which would have to be replaced with other more expensive power sources; and an increase in power production in the low demand month of May, when that power has a lesser economic value.

The reoperation would have an adverse impact on any recreation at these PG&E reservoirs. In those years in which May releases are made to meet ERP Delta outflow targets, these reservoirs would start the summer recreation season at lower storage and elevation levels, resulting in an adverse recreation impact in those years. The duration of this adverse impact would depend on when releases would be decreased to offset the earlier release in May. It is likely that lower storage and continued adverse impacts would continue through much of the summer because of the higher value of power in the hot summer months than in the fall. Because of this, it would likely be September or October before reservoir storage would be back to the levels they would have been without reoperation.

4. Local Supply Benefits

Assessment Limitations

The purpose of this report is to evaluate potential benefits at a preliminary, programmatic level of analysis. As a result, on a system-wide basis, this report includes only a rough, order-of-magnitude level of assessment for the potential of the reoperation of hydroelectric generation reservoirs to provide supply benefits to local water users. The report does, however, also include examples of a few site-specific assessments of local supply opportunities that have been conducted by others.

CALFED does not intend to take the lead in pursuing more-detailed evaluations of local water supply opportunities. However, the reoperation of certain hydroelectric reservoirs has the potential to provide local water supply benefits, and CALFED is supportive of others evaluating and pursuing such opportunities, to the extent that the reoperation does not conflict with CAFED objectives. Local water interests are in the best position to conduct any such evaluations due to their intimate knowledge of their own supply needs, their existing and other potential water supplies, environmental needs and of related local issues and constraints.

PG&E Reservoirs Assessment

An upper bound on potential local water supply benefits can be estimated by looking at the additional reservoir release potential and assuming that it is all released and available for use during a critical dry period.

The potential additional reservoir drawdown during a critical dry period from PG&E's 20 largest reservoirs was estimated to be about 280 thousand acre-feet. About 260 thousand acre-feet, or over 90 percent, of this total additional drawdown is from reservoirs located on the Feather River, with about 200 thousand acre-feet of this from Lake Almanor. Of the remaining potential drawdown, about 10 thousand acre-feet is located on the upper San Joaquin River, and most of the rest is located on the South Yuba River.

If all of this 280 thousand acre-feet of water is released over a seven-year dry period, and assuming that there is a local demand for this water and that all of the water would be available to benefit local users, the local supply benefit during that dry period would average about 40 thousand acre-feet per year. Most of this would be in the Feather River basin. This estimate is a best case, upper bound of potential local supply benefits. There is no attempt in this report to assess local water needs and whether there is demand for this water locally.

Upper San Joaquin Analysis

A study was conducted by the U.S. Bureau of Reclamation (USBR) to evaluate the possible benefits that could be achieved from coordinated operation of Millerton Lake and upstream San Joaquin River reservoirs. Millerton Lake is a CVP reservoir currently operated for flood control and water supply. Six upstream reservoirs are owned by various power utilities (including Crane Valley Reservoir owned by PG&E) and are primarily operated for hydroelectric power generation. One of the objectives of the study was to find ways to reduce the flood releases that result from current Millerton Lake operations by coordinating its operation with the operation of the six upstream reservoirs. Millerton Lake has a storage capacity of about 520 thousand acre-feet, and the six upstream reservoirs have a combined storage capacity of about 580 thousand acre-feet.

To evaluate various operations scenarios, the USBR used a daily operations simulation model, the Upper San Joaquin Water Supply and Flood Control Model (USAN). USAN was used to develop a Base Plan which simulates current reservoir operations. The model was then used to evaluate five different reoperation scenarios, the results of which were compared to the Base Plan. The five reoperation scenarios are as follows:

- Increased power generation (Plan A).
- Increased carryover storage in upstream reservoirs during wet years (Plan B).
- Fill upstream reservoirs early in wet years (Plan C).
- Decreased rain flood space requirement in Millerton Lake (Plan D).
- Increased carryover storage in upstream reservoirs in wet years and maximum drawdown in dry years (Plan E).

The USBR's model results showed that Plan E would result in the greatest water supply increase, averaging approximately 9,000 acre-feet per year. The ranges of increases and decreases, presented according to the amount of Base Plan water supply, are shown in the following figure.

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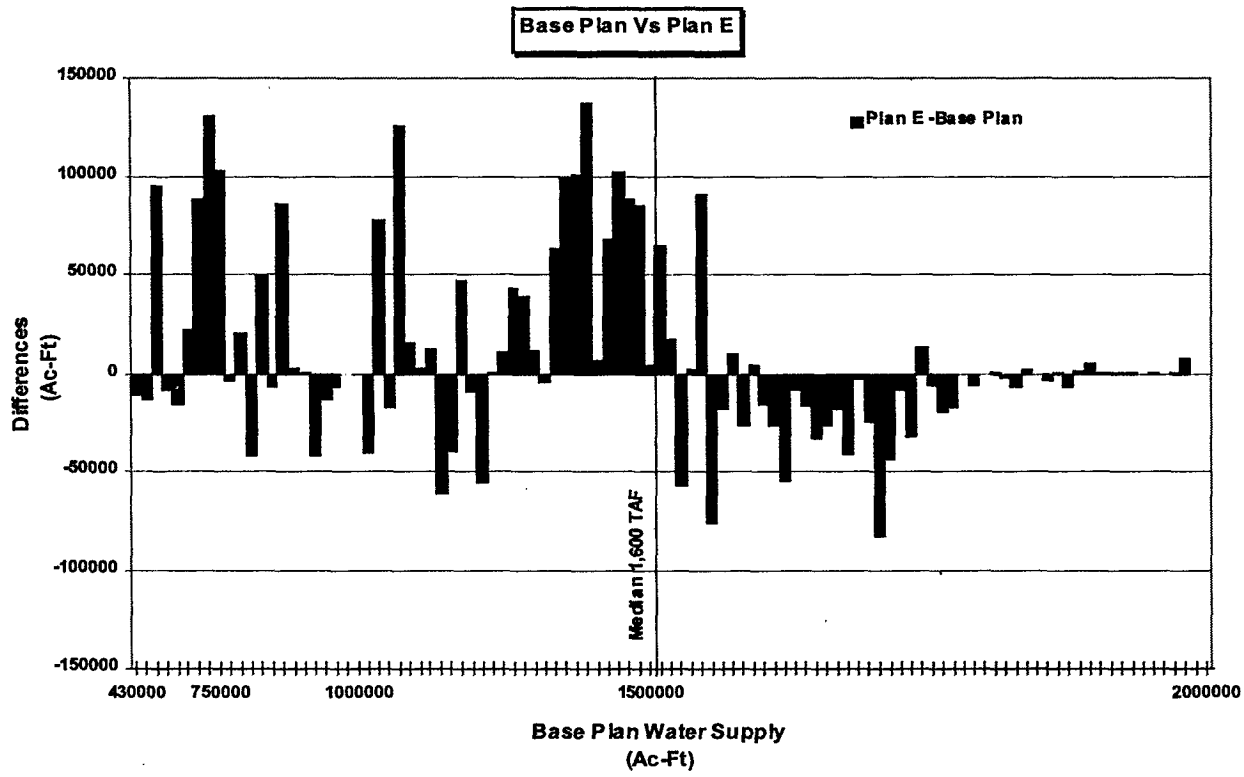

Other Hydroelectric Facilities

There are many other private and water agency hydroelectric facilities that might provide local and other water supply benefits from reoperation. Evaluation of these were beyond the scope of the CALFED study. As mentioned previously, CALFED believes that local water interests are in the best position to conduct any such evaluations due to their intimate knowledge of their own supply needs, their existing and other potential water supplies, environmental needs and of related local issues and constraints. Following are a few examples of site specific evaluations conducted by others.

Placer County Water Agency – The Placer County Water Agency (PCWA) evaluated the potential of their Middle Fork Project to provide dry year water for sale "out of county" after meeting all PCWA demands. The project has a storage capacity of about 340,000 acre-feet with a local consumptive demand limited to 120,000 acre-feet. While the FERC license allows minimum storage at 50,000 acre-feet in a dry year and about 15,000 acre-feet in a critically dry year, the project can meet the PCWA and power needs with a minimum storage of 150,000 acre-feet. In its reoperation studies, PCWA found that lowering the reservoirs below 150,000 acre-feet could generate "new water" for sale during the 18 percent driest years of up to 47,000 acre-

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feet. The opportunity for this reoperation is unique to this project and cannot be extrapolated to other projects. The study concluded that there would be a slight increase in hydroelectric generation in dry years and a slight decrease in generation in other years. The opportunity for the "new water" comes from three basic characteristics of the Middle Fork Project; 1) there is no flood control storage, 2) there are relatively light consumptive demands by agreement, and 3) PG&E has found that it does not need to lower storage below 150,000 acre-feet to optimize power benefits.

Amador County – Amador County evaluated reoperation of the existing PG&E's Lower Bear River Reservoir and an enlargement of the reservoir to determine the water supply that could be developed for use within the County. While the evaluation acknowledges the results of the initial study are highly dependent on the County's ability to obtain water rights and on instream flow releases below Camanche Reservoir, the evaluation concludes that a firm local water supply of approximately 18,000 to 19,200 acre-feet per year may be available from reoperation. The evaluation assumed water rights from assignment of 22,000 acre-feet of the 27,000 acre-foot Calaveras County Mokelumne River reservation.

El Dorado County – A proposal by El Dorado County agencies demonstrates that obtaining consumptive rights in hydroelectric projects is not simple. Since 1991, local agencies in El Dorado County have been trying to obtain additional consumptive water supplies from a hydroelectric project located in the South Fork American River Basin, FERC Project No. 184. Almost nine years later, that effort remains mired in controversy and litigation. According to the El Dorado entities, they have no desire or intent to reoperate Project 184; rather, they propose to make consumptive use of waters that are already released from reservoirs or otherwise made available by Project 184's hydroelectric operations. Upstream counties, recreational interests, environmental groups, and the California Department of Fish & Game have vigorously opposed this proposal. In their view, Project 184's past operations are too inconsistent and ill-defined to support El Dorado's assertion that their consumptive needs will not change those operations in the future. Opponents also see the addition of inelastic consumptive uses to Project 184 as a threat to recreation and the environment in dry years. The State Water Resources Control Board's initial approval of El Dorado's water rights applications for the project in 1996 imposed reservoir level standards that benefit recreation, but reduce the project's operating flexibility and consumptive yield. The SWRCB then took the decision under reconsideration (where it remains today) to consider whether to impose stricter reservoir standards and standard Term 91 for Delta water quality.

5. Conclusions

In general, CALFED believes that there reoperation of the PG&E hydroelectric facilities would provide little benefit towards meeting the CALFED goals.

Reoperation for Bay-Delta system wide water supply could provide up to 20 to 40 thousand acre-feet of additional dry year water supply. However, the actual water supply benefit could be significantly less when other resource needs are considered in more detail. Therefore, CALFED does not propose to further study PG&E hydropower reoperation for system wide water supply.

Reoperation for Bay-Delta system wide ecosystem benefits could provide up to 60 to 80 thousand acre-feet of flow at times needed by the Environmental Water Account. The actual environmental benefit could be less when other resource needs are considered in more detail. This basically provides opportunity to change the timing of flow for environmental uses without negatively impacting water supply. To be successful, the Environmental Water Account needs access to storage. The advantage of the reoperation of the hydroelectric reservoirs is that the reservoirs are currently in place and could be used relatively soon, without the long-lead time required for permitting and construction of new reservoirs. They could be available for use following environmental documentation and contractual arrangements. CALFED believes that the potential for reoperation for environmental purposes should remain an option for CALFED use. CALFED will consider more detailed studies, subject to better defined needs of the Environmental Water Account.

Reoperation for local water supply could provide up to 40 thousand acre-feet of dry year supply. CALFED does not intend to take the lead in pursuing more-detailed evaluations of local water supply opportunities. However, the reoperation of certain hydroelectric reservoirs has the potential to provide local water supply benefits, and CALFED is supportive of others evaluating and pursuing such opportunities, to the extent that the reoperation does not conflict with CAFED objectives. Local water interests are in the best position to conduct any such evaluations due to their intimate knowledge of their own supply needs, their existing and other potential water supplies, environmental needs and of related local issues and constraints.

APPENDIX A

INVENTORY OF HYDROELECTRIC FACILITIES BY RIVER BASIN

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Appendix A

Inventory of Hydroelectric Facilities

The following tables provide an inventory of non-SWP/CVP hydroelectric facilities located in river basins that are tributary to the Delta. Because the purpose of this report is to look at potential reoperation of hydroelectric facilities that are operated primarily for power generation, those river basins that have minimal or no power utility-owned facilities are not included (e.g., the Tuolumne and Merced River basins). Similarly, basins that have power utility-owned facilities but have minimal associated reservoir storage are also not included (e.g., the Cow and Battle Creek Basin, Butte Creek Basin, and the West Fork of the Feather River).

The inventory provides a listing of hydroelectric generation facilities and associated reservoirs by river basin, including facility owners and generation and storage capacities. The information included in these tables has been pulled from various sources and may in some instances be incomplete or not quite accurate. However, for the purposes of this preliminary report, the tables provide a good indication of the locations, owners, numbers, and capacities of hydroelectric facilities in the basins tributary to the Delta.

SUMMARY
OF INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS
BY RIVER BASIN

River Basin	Owner	Total Storage (Acre-Feet)	Hydro Facility Capacity (MW)
Pit / McCloud River	BVMWC	5,500	0.0
	HSVID	77,000	0.0
	PG&E	159,109	767.0
	SFID	23,000	0.0
	USFWS	11,100	0.0
Total		**275,709**	**767.0**
Feather River	OWID	171,188	85.0
	PG&E	1,340,486	733.8
Total		**1,511,674**	**733.8**
Yuba River	NID	209,450	4.5
	PG&E	128,135	29.1
	USCE	70,000	0.0
	YCWA	966,100	361.0
Total		**1,373,685**	**394.6**
Bear River	NID	67,485	38.1
	PG&E	8,964	127.5
	SSWD	104,000	6.8
Total		**180,449**	**172.4**
American River	EID	37,597	20.0
	GDPUD	20,000	0.0
	PCWA	344,000	149.5
	PG&E	3,139	7.0
	SMUD	425,175	683.0
Total		**829,911**	**859.5**
Mokelumne River	CPUD	3,450	0.2
	PG&E	224,956	208.5
Total		**228,406**	**208.7**
Stanislaus River	CCWD	186,348	386.1
	O&SSJID	162,100	78.5
	PG&E	40,446	100.0
	Other	9,584	0.0
Total		**398,478**	**444.6**
San Joaquin River	PG&E	50,240	221.3
	SCE	575,581	868.0
Total		**625,821**	**1,089.3**

SUMMARY
OF INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS
BY OWNER

River Basin	Owner	Total Storage (Acre-Feet)	Hydro Facility Capacity (MW)
Total All Basins	BVMWC	5,500	0.0
	CCWD	186,348	386.1
	CPUD	3,450	0.2
	EID	37,597	20.0
	GDPUD	20,000	0.0
	HSVID	77,000	0.0
	NID	276,935	42.6
	O&SSJID	162,100	78.5
	OWID	171,188	85.0
	PCWA	344,000	149.5
	PG&E	1,955,475	2,194.2
	SCE	575,581	868.0
	SFID	23,000	0.0
	SMUD	425,175	683.0
	SSWD	104,000	6.8
	USCE	70,000	0.0
	YCWA	966,100	361.0
	Other	9,584	0.0
Total		**5,407,533**	**4,874.9**

Abbreviations:

BVMWC	Big Valley Mutual Water Company
CCWD	Calaveras County Water District
CPUD	Calaveras Public Utility District
EID	El Dorado Irrigation District
GDPUD	Georgetown Divide Public Utilities District
HSVID	Hot Spring Valley Irrigation District
NID	Nevada Irrigation District
O&SSJID	Oakdale & South San Joaquin Irrigation District
OWID	Oroville-Wyandotte Irrigation District
PCWA	Placer County Water Agency
PG&E	Pacific Gas & Electric Company
SCE	Southern California Edison
SFID	South Fork Irrigation District
SMUD	Sacramento Municipal Utility District
SSWD	South Sutter Water District
USCE	U.S. Corps of Engineers
YCWA	Yuba County Water Agency

INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

PIT / MCCLOUD RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
Big Sage Reservoir	77,000		HSVID			
Dorris Reservoir	11,100		USFWS			
Hat Creek #1 Diversion	48	2661	PG&E	Hat Creek Powerhouse No. 1	8.5	PG&E
Hat Creek #2 Diversion	629	2661	PG&E	Hat Creek Powerhouse No. 2	8.5	PG&E
Iron Canyon Reservoir	24,241	2106	PG&E	James B. Black Powerhouse	172.0	PG&E
Lake Britton	41,907	233	PG&E	Pit Powerhouse No. 3	70.0	PG&E
Lake McCloud	35,234	2106	PG&E			
Pit Diversion 5	327	233	PG&E			
Pit Forebay 1	3,212	2687	PG&E	Pit Powerhouse No. 1	61.0	PG&E
Pit Forebay 4	1,970	233	PG&E	Pit Powerhouse No. 4	95.0	PG&E
Pit Forebay 6	15,886	2106	PG&E	Pit Powerhouse No. 6	80.0	PG&E
Pit Forebay 7	34,611	2106	PG&E	Pit Powerhouse No. 7	112.0	PG&E
Pit Open Conduit 5	1,044	233	PG&E	Pit Powerhouse No. 5	160.0	PG&E
Roberts Reservoir	5,500		BVMWC			
West Valley Creek Reservoir	23,000		SFID			
Summary by Owner						
	5,500		BVMWC		0.0	BVMWC
	77,000		HSVID		0.0	HSVID
	159,109		PG&E		767.0	PG&E
	23,000		SFID		0.0	SFID
	11,100		USFWS		0.0	USFWS
Total Pit / McCloud	**275,709**				**767.0**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

FEATHER RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
North Fork Feather River						
Belden Forebay	2,477	2105	PG&E	Beldon Powerhouse	125.0	PG&E
Bucks Lake	105,605	619	PG&E			
Butt Valley Reservoir	49,897	2105	PG&E	Caribou Powerhouses No. 1 & 2	195.0	PG&E
Cresta Forebay	4,140	1962	PG&E	Cresta Powerhouses No. 1 & 2	69.8	PG&E
Grizzly Forebay	1,112	619	PG&E	Bucks Creek Powerhs No. 1 & 2	66.0	PG&E
Lake Almanor	1,142,964	2105	PG&E	Butt Valley Powerhouse	40.0	PG&E
" "				Oak Flat Powerhouse	1.3	PG&E
Lower Bucks Lake (Bucks Div.)	5,843	619	PG&E			
Mountain Meadows Reservoir	23,942	Unlicensed	PG&E	Hamilton Branch Pwrhs No. 1 & 2	4.8	PG&E
Poe Forebay	1,204	2107	PG&E	Poe Powerhouse	120.0	PG&E
Rock Creek Forebay	1,500	1962	PG&E	Rock Creek Powerhs No. 1 & 2	112.0	PG&E
Round Valley Lake	1,196	803	PG&E			
Three Lakes Reservoir	606	619	PG&E			
Total North Fork	**1,340,486**				**733.8**	
South Fork Feather River						
Forbestown Reservoir	358	2088	OWID	Forbestown Powerhouse	27.0	OWID
Little Grass Valley Reservoir	94,700		OWID			
Lost Creek Reservoir	5,680	2088	OWID	Woodleaf Powerhouse	49.0	OWID
Ponderosa Reservoir	4,750		OWID			
Sly Creek Reservoir	65,700	2088	OWID	Sly Creek Powerhouse	9.0	OWID
Total South Fork	**171,188**				**85.0**	
Summary by Owner						
	171,188		OWID		85.0	OWID
	1,340,486		PG&E		733.8	PG&E
Total Feather River	**1,511,674**				**733.8**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

YUBA RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
Bowman Lake	68,500	2266	NID	Bowman Powerhouse	3.6	NID
Culbertson Lake	3,150	2310	PG&E			
Deer Creek Forebay	16	2310	PG&E	Deer Creek Powerhouse	5.7	PG&E
Deer Creek Reservoir	1,400		NID			
Englebright Lake	70,000	1403	USCE	Narrows Powerhouse No. 1	12.0	PG&E
" "		2246		Narrows Powerhouse No. 2	49.0	YCWA
Faucherie Lake	3,740		NID			
Fordyce Lake	49,903	2310	PG&E			
French Lake	13,800		NID			
Jackson Lake	1,000		NID			
Jackson Meadows Reservoir	69,200		NID			
Lake Spaulding	74,773	2310	PG&E	Spaulding Powerhouse No. 1	7.0	PG&E
" "		2310		Spaulding Powerhouse No. 2	4.4	PG&E
Lower Lindsey Lake	293	2310	PG&E			
Milton Reservoir	270		NID			
New Bullards Bar Reservoir	966,100	2246	YCWA	Colgate Powerhouse	312.0	YCWA
Sawmill Lake	3,040		NID			
Scotts Flat Reservoir	48,500	5930	NID	Scots Flat Powerhouse	0.9	NID
Summary by Owner						
	209,450		NID		4.5	NID
	128,135		PG&E		29.1	PG&E
	70,000		USCE		0.0	USCE
	966,100		YCWA		361.0	YCWA
Total Yuba	**1,373,685**				**394.6**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

BEAR RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
Alta Forebay	38	2310	PG&E	Alta Powerhouse	2.0	PG&E
Drum Afterbay	341	2310	PG&E	Dutch Flat Powerhouse No. 1	22.0	PG&E
Drum Forebay	621	2310	PG&E	Drum Powerhouses No. 1 & 2	103.5	PG&E
Dutch Flat Afterbay	1,300	2981	NID			
Dutch Flat Forebay	185	2981	NID	Dutch Flat Powerhouse No. 2	26.0	NID
Lake Valley Reservoir	7,964	2310	PG&E			
New Camp Far West Reservoir	104,000	2997	SSWD	Camp Far West	6.8	SSWD
Rollins Reservoir	66,000	2981	NID	Rollins Powerhouse	12.1	NID
Summary by Owner						
	67,485		NID		38.1	NID
	8,964		PG&E		127.5	PG&E
	104,000		SSWD		6.8	SSWD
Total Bear	**180,449**				**172.4**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

AMERICAN RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
Middle North Fork American River						
Buck Island Reservoir	1,070	2101	SMUD			
French Meadows Reservoir	136,400	2079	PCWA	French Meadows Powerhouse	17.0	PCWA
Gerle Reservoir	1,200	2101	SMUD	Robbs Peak Powerhouse	22.0	SMUD
Hell Hole Reservoir	207,600	2079	PCWA	Hell Hole Powerhouse	0.5	PCWA
" " "				L.J. Stephenson (Middle Fork) PH	132.0	PCWA
Loon Lake Reservoir	76,500	2101	SMUD	Loon Lake Powerhouse	78.0	SMUD
Rubicon Reservoir	1,450	2101	SMUD			
Stumpy Meadows Lake	20,000		GDPUD			
Total Middle Fork	**444,220**				**249.5**	
South Fork American River						
Brush Creek Reservoir	1,530	2101	SMUD			
Camino Reservoir	275	2101	SMUD	Camino Powerhouse	150.0	SMUD
Caples Lake	21,581	184	EID			
Chili Bar Reservoir	3,139	2155	PG&E	Chili Bar Powerhouse	7.0	PG&E
Echo Lake (Truckee River Basin)	1,890	184	EID			
El Dorado Forebay	472	184	EID	El Dorado Powerhouse	20.0	EID
Ice House Reservoir	46,000	2101	SMUD	Jones Fork Powerhouse	10.0	SMUD
Junction Reservoir	3,250	2101	SMUD	Jaybird Powerhouse	152.0	SMUD
Lake Aloha	5,064	184	EID			
Silver Lake	8,590	184	EID			
Slab Creek Reservoir	16,600	2101	SMUD	White Rock Powerhs No. 1 & 2	224.0	SMUD
Union Valley Reservoir	277,300	2101	SMUD	Union Valley Powerhouse	47.0	SMUD
Total South Fork	**385,691**				**610.0**	
Summary by Owner						
	37,597		EID		20.0	EID
	20,000		GDPUD		0.0	GDPUD
	344,000		PCWA		149.5	PCWA
	3,139		PG&E		7.0	PG&E
	425,175		SMUD		683.0	SMUD
Total American River	**829,911**				**859.5**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

MOKELUMNE RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
North Fork Mokelumne River						
Electra Afterbay	40	137	PG&E			
Electra Diversion	36	137	PG&E			
Lower Bear River Reservoir	52,025	137	PG&E			
Lower Blue Lake	5,091	137	PG&E			
Meadow Lake	5,656	137	PG&E			
Salt Springs Reservoir	141,857	137	PG&E	Salt Springs Powerhouse	44.0	PG&E
Tabeaud Forebay	1,259	137	PG&E	Electra Powerhouse	92.0	PG&E
Tiger Creek Afterbay	2,607	137	PG&E	West Point Powerhouse	14.5	PG&E
Tiger Creek Forebay	39	137	PG&E	Tiger Creek Powerhouse	58.0	PG&E
Tiger Creek Regulator Reservoir	533	137	PG&E			
Twin Lake	1,207	137	PG&E			
Upper Bear River Reservoir	7,306	137	PG&E			
Upper Blue Lake	7,300	137	PG&E			
Total North Fork	**224,956**				**208.5**	
Middle Fork Mokelumne River						
Middle Fork Reservoir	1,700	7506	CPUD	Middle Fork Powerhouse	0.2	CPUD
Total Middle Fork	**1,700**				0.2	
South Fork Mokelumne River						
Jeff Davis Reservoir	1,750		CPUD			
Total South Fork	**1,750**				0.0	
Summary by Owner						
	3,450		CPUD		0.2	CPUD
	224,956		PG&E		208.5	PG&E
Total Mokelumne	**228,406**				**208.7**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

STANISLAUS RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
North Fork Stanislaus River Basin						
Lake Alpine	4,120					
McKay's Point Reservoir	1,928	2409	CCWD	Collierville Powerhouse	260.3	CCWD
New Spicer Meadow Reservoir	184,300	2409	CCWD	New Spicer Meadow Powerhouse	5.8	CCWD
NF Stanislaus River Diversion	120		CCWD			
Union Reservoir	3,130					
Utica Reservoir	2,334					
Total North Fork	**195,932**				**266.1**	
Middle Fork Stanislaus River						
Beardsley Lake	97,800	2005	O&SSJID	Beardsley Powerhouse	11.0	O&SSJID
Donnell Lake	64,300	2005	O&SSJID	Donnells Powerhouse	67.5	O&SSJID
Relief Reservoir	15,554	2130 (?)	PG&E			
Stanislaus Afterbay	32	2130	PG&E			
Stanislaus Forebay	320	2130	PG&E	Stanislaus Powerhouse	91.0	PG&E
Total Middle Fork	**178,006**				**169.5**	
South Fork Stanislaus River						
Lyons Reservoir	6,228	1061	PG&E	Phoenix Powerhouse	2.0	PG&E
Pinecrest Lake (Strawberry Lake)	18,312	2130	PG&E	Spring Gap Power Plant	7.0	PG&E
Total South Fork	**24,540**				**9.0**	
Summary by Owner						
	186,348		CCWD		386.1	CCWD
	162,100		O&SSJID		78.5	O&SSJID
	40,446		PG&E		100.0	PG&E
	9,584		Other		0.0	Other
Total Stanislaus	**398,478**				**444.6**	

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INVENTORY OF HYDROELECTRIC FACILITIES FOR RESERVOIRS IN THE

SAN JOAQUIN RIVER BASIN

Reservoir	Total Storage (Acre-Feet)	FERC License	Reservoir Owner	Hydro Facility	Hydro Facility Capacity (MW)	Hydro Facility Owner
Upper San Joaquin River Basin						
Bear Diversion Reservoir	103		SCE			
Florence Lake	64,600	2174	SCE	Portal Powerhouse No. 1	10.5	SCE
Lake Thomas A. Edison	125,000		SCE			
Mono Diversion Reservoir	45		SCE			
Total Upper Basin	**189,748**				**10.5**	
Lower San Joaquin River Basin						
Balsam Meadows Forebay	2,040	?	SCE	Eastwood Pump/Gen	207.0	SCE
Bass Lake	45,410	1354	PG&E	Crane Valley Powerhouse	0.9	PG&E
Big Creek No. 6 Reservoir	993	120	SCE	Big Creek Powerhouse No. 3	181.9	SCE
Chilkoot	310	1354	PG&E			
Corrine Lake	69	1354	PG&E	Wishon Powerhouse	20.0	PG&E
Huntington Lake	89,800	2175	SCE	Big Creek Powerhouse No. 1	82.9	SCE
Kerckhoff Reservoir	4,252	96	PG&E	Kerckhoff Powerhouse No. 1	38.0	PG&E
" "				Kerckhoff Powerhouse No. 2	155.0	PG&E
Mammoth Pool Reservoir	123,000	2085	SCE	Mammoth Pool Powerhouse	187.0	SCE
Manzanita Lake	168	1354	PG&E			
Redinger Lake	35,000	2017	SCE	Big Creek Powerhouse No. 4	100.2	SCE
San Joaquin #2 Forebay	11	1354	PG&E	San Joaquin Powerhouse No. 2	3.2	PG&E
San Joaquin #3 Forebay	20	1354	PG&E	San Joaquin Powerhouse No. 3	4.2	PG&E
Shaver Lake	135,000	67	SCE	Big Creek Powerhouse No. 2A	98.5	SCE
Total Lower Basin	**436,073**				**1,078.8**	
Summary by Owner						
	50,240		PG&E		221.3	PG&E
	575,581		SCE		868.0	SCE
Total San Joaquin	**625,821**				**1,089.3**	

D—014001

APPENDIX B

SELECTED DATA ON PG&E HYDROELECTRIC FACILITIES

Appendix B

Selected Data on PG&E Facilities

The following tables show selected data on PG&E facilities. This information was provided by the Pacific Gas and Electric Company.

PG&E's 99 Reservoirs
Ranked by Gross Storage Capacity(1,000 AF)

Rank	Reservoir	Ranked Gross Storage
1	Lake Almanor	1,142.964
2	Salt Springs Reservoir	141.857
3	Lake Wishon	129.118
4	Courtright Lake	123.286
5	Bucks Storage	105.605
6	Pillsbury	86.785
7	Lake Spaulding	74.773
8	Lower Bear Reservoir	52.025
9	Lake Fordyce	49.903
10	Butt Valley	49.897
11	Crane Valley Res. (Bass Lake)	45.410
12	Lake Britton	41.907
13	Lake McCloud	35.234
14	Pit 7 Forebay	34.611
15	Iron Canyon Reservoir	24.241
16	Moutain Meadows	23.942
17	Strawberry	18.312
18	Pit 6 Forebay	15.886
19	Relief Reservoir	15.554
20	Lake Valley Reservoir	7.964
21	Upper Bear Reservoir	7.306
22	Upper Blue Lake	7.300
23	Lyons	6.228
24	Bucks Diversion	5.843
25	Meadow Lake (Mokelumne)	5.656
26	Lower Blue Lake	5.091
27	Philbrook	5.009
28	Meadow Lake (So. Yuba)	4.935
29	Kerckhoff	4.252
30	Cresta	4.140
31	Pit 1 Forebay	3.212
32	Culbertson Lake	3.150
33	Chili bar	3.139
34	Tiger Creek Afterbay	2.607
35	Belden (Cribou Afterbay)	2.477
36	Pit 4 Forebay	1.970
37	Lake Sterling	1.764
38	Upper Peak Lake	1.736
39	Kidd Lake	1.505
40	Rock Creek	1.500
41	Black Rack (Balch Diversion)	1.260
42	Lake Tabeau	1.259
43	Twin Lakes	1.207
44	Poe	1.204
45	Round Valley	1.196
46	Blue Lake	1.163
47	Fuller Lake	1.127
48	Grizzly Forebay	1.112
49	Middle Lindsey Lake	1.100
50	North Battle Creek Res.	1.090
51	Pit 5 open conduit	1.044
52	Upper Feeley Lake	0.739
53	Merced Falls	0.678
54	Rucker Lake	0.648
55	Hat Creek No. 2 (Baum Lake)	0.629
56	Drum Forebay	0.621
57	Three Lakes	0.606
58	White Rock Lake	0.570
59	Rock Creek	0.548
60	Tiger Creek Regulator	0.533
61	Lower Peak Lake	0.484
62	Macumber	0.430
63	Van Arsdale	0.390
64	Drum Afterbay	0.341
65	Kelly Lake	0.336
66	Pit 5 Intake	0.327
67	Stanislaus Forebay	0.320
68	Balch Afterbay	0.318
69	Chilkoot	0.310
70	Lower Lindsey Lake	0.293
71	Halsey forebay	0.240
72	Upper Rock Lake	0.207
73	Crystal Lake	0.190
74	De Sabla	0.188
75	Upper Lindsey Lake	0.180
76	Manzanita Lake	0.168
77	Kunkle	0.154
78	Lower Feeley Lake (Carr Lake)	0.150
79	Christian Valley (Halsey Afterbay	0.106
80	Coleman Forebay	0.076
81	Corrinne Lake (Wishon Forebay)	0.069
82	Hat Creek No. 1 Diversion	0.048
83	Lower Rock Lake	0.048
84	Lake Grace	0.047
85	Electra Afterbay	0.040
86	Tiger CreekForebay	0.039
87	Alta Forebay	0.038
88	Electra Diversion	0.035
89	Wise Forebay	0.032
90	Kilarc Forebay	0.030
91	Kern Canyon Diversion	0.026
92	San Joaquin #3 Forebay	0.020
93	Deer Creek Forebay	0.016
94	Cow Creek Forebay	0.015
95	Lake Nora	0.015
96	San Joaquin #2 Forebay	0.011
97	Pit 1 Diversion	0.000
98	Pit 7 Afterbay	0.000
99	Tule Diversion	0.000

Gary Freeman, Water Management, GPM 5/23/9

PG&E's 20 Largest Reservoirs****

All water values in thousands of acre-feet (TAF)

Reservoir	Basin	Res. Capacity	Regulation Factor**	April-July Unimpaired Roff*	Water Year Unimpaired Roff*	Drainage Area(Sq Mi)	Average AF/Sq. Mi./yr	Average Annual Exports from Drainage	Average Annual Imports to Drainage
Lake Almanor	Feather	1,143.0	1.63	279	702	491	1.4	no, but significant lake evaporation	no
Salt Springs	Mokelumne	141.9	0.38	276	371	169	2.2	no	no
Lake Wishon	Kings	129.1	0.41	259	312	177	1.8	no	no
Courtright Res	Kings	123.3	2.02	53	61	39.7	1.5	no	no
Bucks storage	Feather	105.6	1.17	45	90	28.6	3.1	no	yes prior.t to Jan '97
Lk Pillsbury	Eel	80.6	0.17	83	470	289	1.6	no	
Lk Spaulding	So Yuba	74.8	0.27	156	274	118	2.3	no	yes, Bowman Spaulding Cnl
Lower Bear	Mokelumne	52.0	0.57	61.4	91	37.0	2.5	no	yes, Cole Creek Diversion
Lake Fordyce	So Yuba	49.9	0.50	75	100	31.7	3.2	no	no
Butt Valley	Feather	49.9	0.66	36	76	83.5	0.9	Small Divrsn (Wallace Ditch)	yes
Bass Lake	San Joaquin	45.4	0.82	26	55	50.4	1.1	no	Yes, Browns Ditch prior to Jan '97
Lake Britton	Pit	41.9	0.02	738	2,230	4,606	0.5	no	no
Lake McCloud	McCloud	35.2	0.04	294	803	396	2.0	no	no
Pit #7 Fby	Pit	34.1	0.01	1,008	3,067	4,897	0.6	no	yes, McCloud/Iron Canyon Tunnel
Iron Canyon Res	Pit	24.2	0.78	13	31	11.0	2.8	no	yes, McCloud/Iron Canyon Tunnel
Mountain Mdws	Feather	23.9	0.21	46	115	148	0.8	no, but significant lake evaporation	no
Strawberry	Stanislaus	18.3	0.32	45	58	26.6	2.2	no	no
Pit #6 Forebay	Pit	15.6	0.01	899	2,735	4,770	0.6	no	yes, McCloud/Iron Canyon Tunnel
Relief Reservoir	Stanislaus	15.6	0.36	43.4	43.4	24.3	1.8	no	no
Lake Valley	American	8.0	0.67	9	12	4.5	2.7	no	no

* Operational Unimpaired Runoff Not Adjusted for Lake Evaporation

** Reservoir Regulation Factor is the ratio of the total storage capacity of a reservoir to the average annual flow of the river at the dam location

*** Includes total drainage contribution to reservoir

**** PG&E also has storage rights to 30 TAF in Nevada Irrig. District's Rollins Reservoir(Bear River)

Compiled by Gary Freeman, Water Management, GPM 5/5/99

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NF1 LAKE ALMANOR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	770.14	886.30	889.90	873.14	914.70	927.50	938.50	999.01	1053.00	1021.00	937.51	864.83
1970/1971	820.11	771.78	759.40	748.86	726.62	761.27	851.20	997.97	1076.23	1039.16	955.46	886.91
1971/1972	791.32	729.14	696.41	644.86	623.36	710.69	781.65	834.29	868.74	842.25	780.94	758.70
1972/1973	792.74	733.50	680.02	699.55	679.57	726.39	802.47	919.19	980.53	953.43	915.69	893.33
1973/1974	860 96	941.29	968.68	1039.15	1013.79	1069.99	1073.22	1128.09	1132.95	1084.96	1010.15	968.42
1974/1975	920.66	849.28	804.60	805.55	842.00	901.50	877.56	994.35	1035.74	1003.41	935.99	905.97
1975/1976	904.98	824.19	739.95	653.19	582.28	546.13	581.66	605.61	604.55	608.80	615.21	578.75
1976/1977	575.43	575.43	582.91	599.90	621.00	631.14	643.11	653.34	671.77	656.49	598.21	541.69
1977/1978	526.05	519.90	543.09	626.38	675.77	757.77	832.84	935.49	1004.44	1029.45	956.97	893.32
1978/1979	835.25	807.70	771.55	717.03	670.44	701.60	748.72	817.96	822.75	767.33	713.62	686.96
1979/1980	666.21	644.85	627.89	706.21	781.17	837.17	902.49	980.96	1030.28	1015.35	984.30	962.31
1980/1981	918.94	881.49	873.15	865.32	872.17	871.43	871.19	866.42	838.63	804.84	765.23	707.71
1981/1982	692.80	822.99	924.69	925.94	986.36	1070.30	1085.72	1134.85	1130.52	1075.88	991.26	923.44
1982/1983	907.71	902.74	915.93	900.50	918.43	954.69	900.01	959.00	1080.66	1080.13	1015.61	980.02
1983/1984	950.36	983.79	968.42	915.93	917.18	1004.19	1075.61	1105.50	1081.20	1025.79	974.55	923.44
1984/1985	899.27	905.97	864.10	815.57	764.53	714.75	764.76	770.37	748.49	675.56	649.02	635.70
1985/1986	596.94	627.24	661.34	705.89	895.05	1009.11	1043.62	1102.55	1061.55	999.01	925.44	841.04
1986/1987	764.99	710.88	719.53	758.00	803.89	862.86	911.44	962.31	984.30	991.00	1000.04	957.48
1987/1988	890.12	798.19	740.64	712.25	741.10	775.77	813.66	841.77	862.64	841.53	810.08	754.06
1988/1989	698.09	677.12	656.93	684.27	686.51	805.80	869.62	942.80	933.23	864.20	821.07	799.14
1989/1990	782.12	733.96	686.51	727.08	753.36	795.58	835.49	868.50	883.95	858.25	813.42	765.00
1990/1991	702.73	694.38	671.33	692.35	713.39	762.20	795.82	836.70	850.72	812.23	765.93	699.11
1991/1992	673.11	688.31	696.41	715.89	756.15	795.11	841.76	866.30	869.23	852.66	801.75	739.48
1992/1993	702.72	690.10	687.85	691.00	684.94	774.35	873.14	1021.87	1065.26	996.94	911.94	847.08
1993/1994	789.43	733.50	693.70	730.75	764.06	808.89	843.70	878.30	882.23	850.24	807.94	756.61
1994/1995	707.49	715.66	695.05	791.56	844.67	972.77	998.24	1097.74	1130.80	1104.97	1019.27	953.93
1995/1996	918.44	868.50	874.13	899.76	994.62	1033.64	1047.57	1128.63	1068.39	1022.92	952.92	897.53
1996/1997	838.87	797.01	873.39	917.94	843.46	879.28	932.22	986.90	953.17	926.20	856.31	813.66
1997/1998	751.27	700.47	624.23	707.94	784.71	850.72	916.44	1064.20	1115.97	1096.27	1021.87	953.17

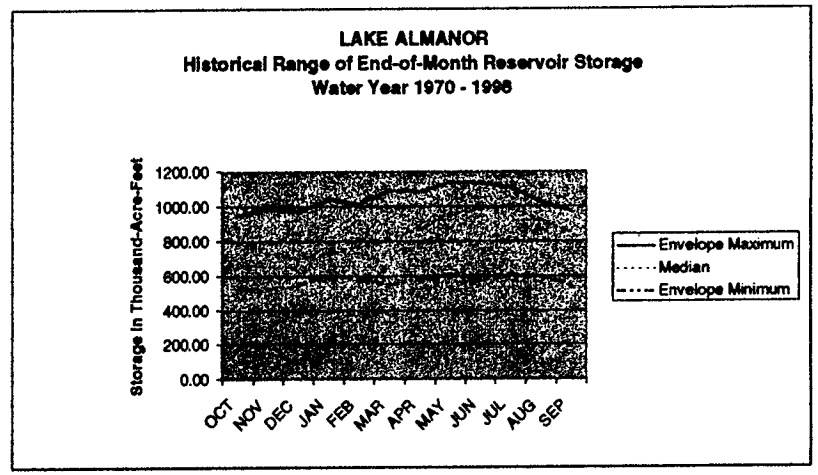
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Envelope Maximum	950.36	983.79	968.68	1039.15	1013.79	1069.99	1085.72	1134.85	1132.95	1104.97	1021.87	968.42
Median	789.43	733.50	696.41	727.08	764.53	808.89	873.14	959.00	984.30	991.00	915.69	847.08
Envelope Minimum	526.05	519.90	543.09	599.90	582.28	546.13	581.66	605.61	604.55	608.80	598.21	541.69

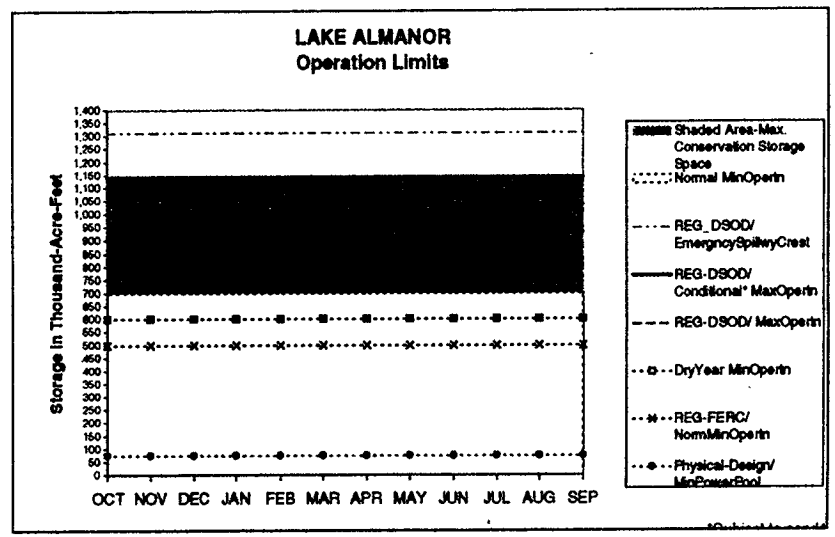
LAKE ALMANOR

Operation Limitations: License, Permit, Contractual, Legal, etc

OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG _DSOD/ EmergncySpillwyCrest	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00	1,312 00
REG-DSOD/ Conditional* MaxOpertn	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00
REG-DSOD/ MaxOpertn	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00	1,036.00
Shaded Area-Max. Conservation Storag	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00	1,143.00
Normal MinOpertn	700.00	700.00	700.00	700.00	700.00	700.00	700.00	700.00	700.00	700.00	700.00	700.00
DryYear MinOpertn	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
REG-FERC/ NormMinOpertn	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
Physical-Design/ MinPowerPool	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00.	75.00	75.00

* Subject to conditions stated in DSOD letter dated June 21, 1976





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M12 SALT SPRINGS RESERVOIR

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	72.90	52.37	47.37	99.06	94.32	82.83	89.12	140.32	141.28	124.81	105.52	89.99
1970/1971	65.99	49.84	29.49	23.10	15.12	14.29	35.89	108.43	141.86	125.36	94.80	74.58
1971/1972	44.01	25.79	17.95	3.61	7.10	35.45	55.67	140.61	137.37	117.53	97.91	81.15
1972/1973	62.02	43.29	36.29	31.47	22.28	10.07	40.79	137.46	139.46	116.46	98.81	77.24
1973/1974	54.16	75.68	70.59	77.46	59.68	56.88	68.60	137.84	141.18	127.56	99.47	77.17
1974/1975	56.75	34.33	12.23	3.94	4.89	6.66	6.40	102.56	141.86	127.47	97.25	70.66
1975/1976	58.37	44.35	22.81	4.87	3.63	11.87	24.62	56.31	47.31	36.85	33.84	27.47
1976/1977	19.14	17.80	12.08	4.89	3.56	4.26	11.78	20.09	25.22	15.81	10.54	4.22
1977/1978	4.21	5.10	9.27	5.94	5.17	26.31	46.85	130.70	141.67	130.51	100.55	89.68
1978/1979	69.66	41.06	17.95	11.84	8.61	21.15	40.20	137.65	138.98	124.00	106.46	87.79
1979/1980	66.35	46.16	26.80	72.90	73.92	60.41	85.52	141.18	141.28	137.18	124.81	112.59
1980/1981	95.45	69.38	41.65	13.29	3.24	13.13	54.79	117.08	123.45	105.12	88.49	69.59
1981/1982	45.87	64.20	93.19	79.41	101.55	94.80	136.61	138.70	139.36	130.61	112.07	102.22
1982/1983	116.55	102.64	89.20	67.89	57.53	58.70	55.80	121.91	138.79	141.38	123.63	104.33
1983/1984	83.67	113.03	118.42	100.97	81.07	72.54	80.24	139.84	141.09	115.75	86.85	72.10
1984/1985	53.23	41.22	22.11	16.44	10.70	5.82	58.37	130.14	131.35	114.61	93.19	76.05
1985/1986	60.21	37.11	28.02	35.84	84.98	120.21	137.08	137.08	141.09	127.93	109.20	95.78
1986/1987	81.07	55.10	26.80	12.23	9.85	13.74	54.98	90.15	81.60	61.68	42.36	28.15
1987/1988	23.94	19.86	14.29	8.62	11.48	21.79	46.27	72.97	71.74	56.69	45.42	33.10
1988/1989	26.98	20.91	15.47	10.96	14.42	67.19	124.45	139.46	136.89	121.37	105.35	89.83
1989/1990	82.98	67.12	44.63	28.89	21.79	31.66	77.69	99.23	104.92	89.44	73.92	54.54
1990/1991	26.85	18.76	11.05	8.64	7.19	18.10	38.56	105.77	138.03	125.45	110.85	93.99
1991/1992	72.70	46.50	22.78	9.81	14.81	23.00	75.16	94.04	87.50	73.55	55.98	43.51
1992/1993	30.14	20.95	11.22	17.91	12.97	33.06	61.62	135.00	139.84	136.32	105.18	84.13
1993/1994	62.03	43.52	21.63	7.98	7.70	22.64	61.08	109.74	103.91	84.44	69.09	47.71
1994/1995	28.78	28.21	14.51	30.60	30.96	62.67	85.32	132.97	134.98	141.29	126.28	100.41
1995/1996	70.07	51.41	41.79	46.28	78.70	78.72	107.06	135.11	141.00	124.60	99.06	72.47
1996/1997	56.90	47.63	58.17	130.90	113.27	110.49	131.66	141.57	136.88	118.38	92.18	70.70
1997/1998	47.54	24.79	10.12	17.37	21.43	33.84	52.50	87.80	133.12	137.65	110.41	85.52
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Envelope Maximum	116.55	113.03	118.42	130.90	113.27	120.21	137.08	141.57	141.86	141.38	126.28	112.59
Median	58.37	43.52	22.81	17.37	14.81	31.66	58.37	130.70	138.03	124.00	98.81	77.17
Envelope Minimum	4.21	5.10	9.27	3.61	3.24	4.26	6.40	20.09	25.22	15.81	10.54	4.22

T SPRINGS RESERVOIR

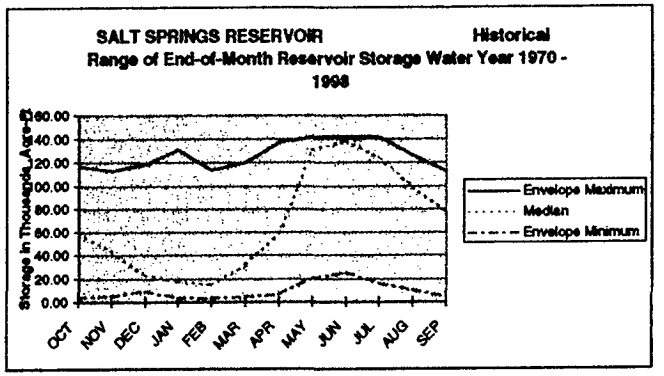
:: License, Permit, Contractual, Legal, etc

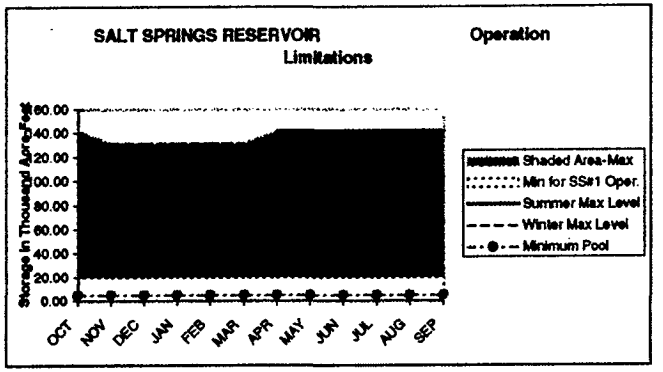
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Summer Max Level	141.86						141.86	141.86	141.86	141.86	141.86	141.86
Winter Max Level		131.44	131.44	131.44	131.44	131.44						
Shaded Area-Max	141.86	131.44	131.44	131.44	131.44	131.44	141.86	141.86	141.86	141.86	141.86	141.86
Min for SS#1 Oper.	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
Minimum Pool	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99

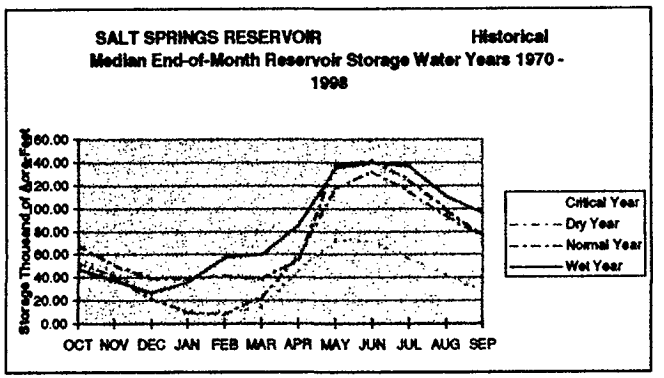
T SPRINGS RESERVOIR

ian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	58.37	44.35	22.81	8.62	9.85	13.74	46.27	72.97	71.74	56.69	42.36	28.15
Dry Year	53.23	41.22	21.63	9.81	7.69	22.64	58.37	117.08	131.35	114.61	93.19	76.05
Normal Year	67.83	50.62	39.04	38.87	40.98	39.02	54.69	137.56	141.14	124.71	98.94	75.87
Wet Year	47.54	37.11	26.80	35.84	57.52	60.41	85.32	135.00	139.36	136.32	110.41	95.78







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KI19 WISHON RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	89.71	61.82	28.97	24.73	24.14	18.37	27.08	116.79	125.76	110.47	79.48	56.80
1970/1971	43.31	36.12	27.10	21.98	10.85	20.18	31.12	79.67	124.29	105.52	76.27	53.15
1971/1972	38.89	39.76	30.88	18.86	13.65	31.66	52.30	97.72	121.60	122.10	101.79	81.43
1972/1973	57.66	39.69	30.34	21.07	11.19	11.03	20.33	115.18	125.81	119.86	113.80	126.63
1973/1974	121.60	114.97	103.53	80.29	48.33	26.44	14.76	86.81	121.64	100.51	107.88	99.85
1974/1975	89.80	87.76	88.03	61.95	35.49	11.70	10.40	85.70	124.42	115.31	113.32	104.54
1975/1976	78.64	50.63	34.15	40.09	19.63	14.87	26.67	60.27	73.79	68.50	64.33	63.77
1976/1977	63.42	57.31	53.14	49.04	49.09	44.17	87.47	110.60	115.37	100.93	87.16	79.79
1977/1978	70.40	63.95	68.19	38.99	11.28	12.83	8.30	43.18	117.77	127.48	120.53	100.41
1978/1979	50.84	25.42	20.19	21.90	23.31	16.26	15.13	96.66	125.64	106.51	54.96	24.63
1979/1980	22.46	21.84	18.09	18.41	16.47	12.25	19.41	52.23	121.71	121.57	122.66	109.40
1980/1981	57.05	24.02	15.44	10.57	12.70	12.37	29.24	88.68	102.15	87.56	64.90	25.88
1981/1982	16.95	16.92	15.09	12.14	24.99	12.26	33.99	84.81	120.52	124.38	98.10	88.15
1982/1983	115.07	115.93	99.66	57.18	18.00	17.53	23.42	69.34	120.99	127.37	107.06	66.36
1983/1984	42.26	49.57	48.79	44.42	41.47	51.34	74.69	122.14	117.92	115.92	115.18	91.57
1984/1985	111.13	81.65	55.22	50.35	50.71	50.99	90.70	112.10	102.39	76.69	69.92	45.26
1985/1986	54.13	50.13	56.06	53.43	61.24	56.11	60.21	84.15	125.83	118.80	96.93	83.22
1986/1987	70.18	87.44	71.62	64.75	73.54	46.91	72.93	104.19	95.47	75.82	80.34	73.93
1987/1988	88.09	85.12	77.63	69.09	69.50	59.30	78.73	87.87	88.07	59.34	49.65	57.16
1988/1989	53.86	59.07	69.59	48.22	65.61	53.98	76.50	104.70	80.06	69.34	41.92	45.00
1989/1990	48.00	45.80	42.17	44.04	42.85	53.18	59.36	56.18	43.98	41.56	38.06	41.15
1990/1991	46.21	46.44	41.84	42.08	45.17	41.09	42.37	47.89	75.14	45.96	46.05	92.11
1991/1992	104.38	50.07	44.93	44.45	41.84	53.88	79.16	47.95	42.55	47.28	41.67	49.54
1992/1993	41.78	40.13	46.97	44.61	41.18	42.66	40.79	90.34	124.78	115.66	89.26	78.41
1993/1994	62.65	64.17	66.43	51.47	52.26	52.74	88.80	102.14	77.70	51.28	36.19	37.75
1994/1995	44.45	42.25	38.13	41.67	37.54	47.04	45.70	52.67	97.19	124.29	118.65	89.41
1995/1996	82.74	66.22	51.92	57.37	67.19	43.06	73.78	118.70	117.68	118.49	109.56	105.81
1996/1997	94.23	89.57	85.10	84.15	42.14	28.91	57.03	123.62	119.64	103.10	106.15	118.77
1997/1998	80.96	49.78	35.57	45.09	36.57	36.11	39.47	36.97	103.94	121.47	114.66	106.22
Envelope Maximum	121.60	115.93	103.53	84.15	73.54	59.30	90.70	123.62	125.83	127.48	122.66	126.63
Median	62.65	50.13	46.97	44.45	41.18	36.11	42.37	87.87	117.77	106.51	89.26	79.79
Envelope Minimum	16.95	16.92	15.09	10.57	10.85	11.03	8.30	36.97	42.55	41.56	36.19	24.63

WISHON RESERVOIR

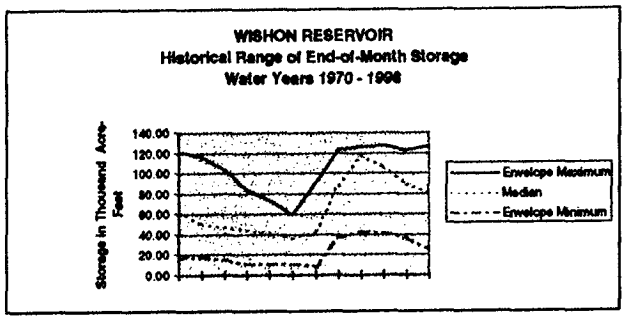
ons: License, Permit, Contractual, Legal, etc.

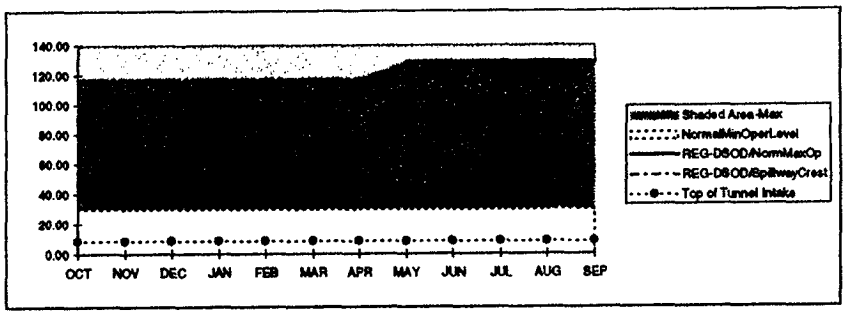
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp								129.12	129.12	129.12	129.12	129.12
REG-DSOD/SpillwayCrest	117.62	117.62	117.62	117.62	117.62	117.62	117.62					
Shaded Area-Max	117.62	117.62	117.62	117.62	117.62	117.62	117.62	129.12	129.12	129.12	129.12	129.12
NormalMinOperLevel	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Top of Tunnel Intake	8.32	8.32	8.32	8.32	8.32	8.32	8.32	8.32	8.32	8.32	8.32	8.32

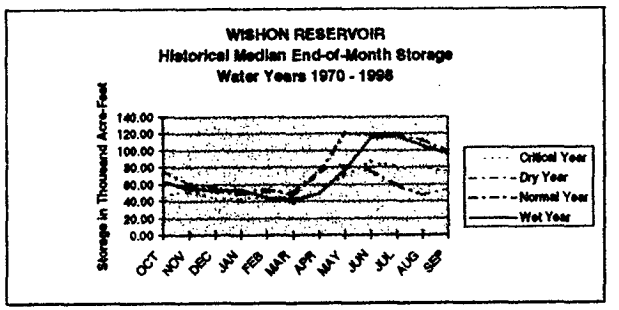
WISHON RESERVOIR

ledian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	46.88	51.69	43.96	42.40	44.29	37.45	50.57	70.87	87.05	79.65	80.35	74.83
Dry Year	75.65	60.28	55.60	47.31	51.12	50.54	75.51	82.96	75.57	58.11	47.15	53.93
Normal Year	62.50	57.89	50.36	50.89	54.33	47.20	74.24	120.42	117.80	117.20	112.37	98.69
Wet Year	63.11	54.37	52.37	53.79	43.73	42.17	48.64	77.55	114.28	116.66	105.13	95.21







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KI15 COURTRIGHT RESERVOIR

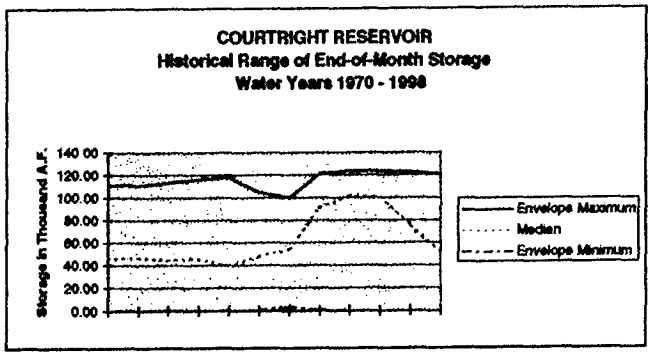
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	21.25	17.47	13.96	10.92	8.11	6.42	3.65	1.84	0.00	0.00	0.00	0.00
1970/1971	0.00	0.59	1.53	2.45	3.95	6.39	16.10	35.30	46.09	46.59	46.27	45.78
1971/1972	45.50	46.06	47.16	48.00	48.60	53.92	61.81	75.16	72.14	54.75	49.98	50.09
1972/1973	50.06	50.83	51.72	52.10	52.92	55.70	60.50	101.63	117.66	100.19	77.73	59.95
1973/1974	50.98	52.78	54.25	56.23	57.31	60.50	67.96	103.18	115.74	115.54	80.25	60.47
1974/1975	60.10	59.92	60.36	60.80	61.98	63.54	65.22	92.66	115.45	108.86	78.88	61.02
1975/1976	61.95	62.11	62.19	49.40	49.99	50.91	54.42	50.50	35.03	34.68	34.39	34.85
1976/1977	34.83	34.72	34.59	34.74	34.93	35.21	7.08	1.11	1.04	1.02	0.98	0.92
1977/1978	0.91	0.95	0.51	0.59	0.70	0.64	4.18	41.52	91.30	103.68	74.70	71.46
1978/1979	71.35	64.13	51.23	29.46	6.31	0.63	4.35	39.74	25.93	0.23	0.21	0.19
1979/1980	0.58	0.74	0.77	0.80	0.77	0.83	10.30	40.46	75.94	82.47	36.52	1.03
1980/1981	1.02	1.03	0.73	0.69	0.84	0.79	10.60	29.81	33.04	32.89	32.51	32.22
1981/1982	32.32	33.58	35.16	36.92	39.09	42.00	57.80	98.84	123.19	123.19	122.10	117.82
1982/1983	111.15	110.58	113.12	115.81	117.95	82.56	41.68	41.55	97.01	123.24	121.16	120.65
1983/1984	108.88	98.90	101.91	103.32	105.04	104.31	83.57	116.29	101.92	78.79	43.77	31.20
1984/1985	0.99	29.55	55.19	55.65	56.49	58.08	65.83	107.41	111.92	113.43	94.77	96.25
1985/1986	63.20	60.24	52.63	54.30	56.83	47.66	43.76	117.03	122.07	109.08	105.37	90.29
1986/1987	72.09	38.49	40.58	42.35	35.06	66.54	82.56	103.52	115.70	114.48	81.29	64.29
1987/1988	34.19	37.14	36.66	38.12	39.59	65.74	83.86	121.39	121.48	107.02	67.24	50.72
1988/1989	51.54	44.37	32.76	54.99	37.68	64.69	99.77	116.72	113.30	72.44	57.61	50.37
1989/1990	45.83	47.71	51.05	50.96	54.88	56.75	60.01	70.43	65.74	52.88	40.78	36.21
1990/1991	29.70	26.86	32.69	32.62	29.98	30.95	40.31	100.21	121.23	117.25	93.48	39.61
1991/1992	14.35	57.12	60.86	49.55	44.62	36.83	54.20	108.56	93.21	59.48	39.83	22.86
1992/1993	30.78	33.68	28.92	29.24	20.73	8.16	11.89	80.02	120.28	116.61	103.93	71.84
1993/1994	61.65	47.11	34.23	36.22	35.22	45.54	46.99	90.85	104.22	89.82	63.45	44.50
1994/1995	43.32	50.49	44.70	34.68	29.52	15.99	8.30	30.71	88.97	120.05	102.79	88.54
1995/1996	58.06	58.34	68.18	60.66	61.96	72.79	68.32	114.98	121.32	100.59	78.52	60.46
1996/1997	53.81	46.22	27.33	45.81	51.31	57.37	67.21	116.36	119.86	118.92	90.10	39.84
1997/1998	34.74	46.42	56.54	51.52	46.14	35.52	15.00	43.43	93.46	121.74	95.74	73.52
Envelope Maximum	111.15	110.58	113.12	115.81	117.95	104.31	99.77	121.39	123.19	123.24	122.10	120.65
Median	45.50	46.22	44.70	45.81	39.59	47.66	54.20	90.85	101.92	100.59	74.70	50.37
Envelope Minimum	0.00	0.59	0.51	0.59	0.70	0.63	3.65	1.11	0.00	0.00	0.00	0.00

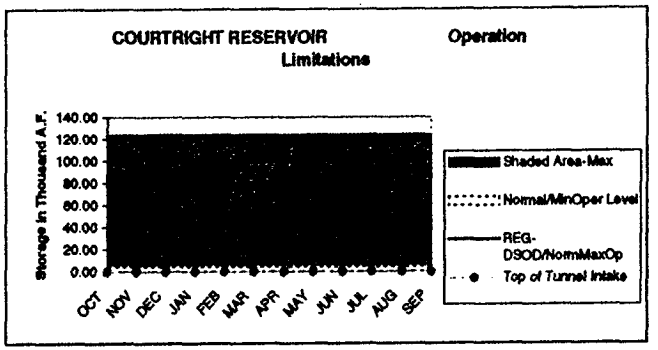
COURTRIGHT RESERVOIR
ons: License, Permit, Contractual, Legal, etc.

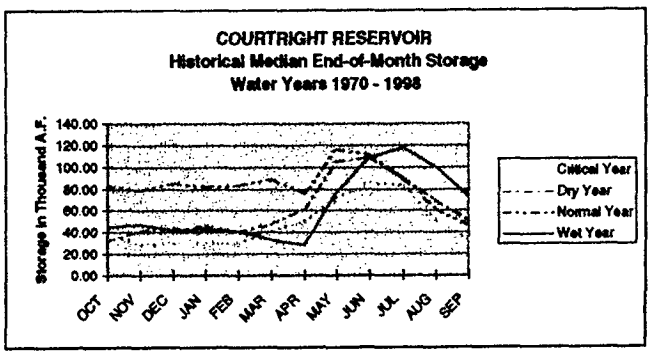
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29
Shaded Area-Max	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29	123.29
Normal/MinOper Level	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43
Top of Tunnel Intake	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26

COURTRIGHT RESERVOIR
Median End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	39.50	28.98	30.80	31.37	30.24	41.37	50.96	71.47	85.79	83.28	52.86	33.84
Dry Year	31.65	41.36	43.15	45.81	40.50	47.22	61.42	104.75	108.78	90.48	69.83	50.72
Normal Year	83.47	78.62	85.04	81.99	83.50	88.55	75.94	115.64	111.62	89.69	61.14	45.83
Wet Year	45.17	47.41	42.02	43.11	40.91	32.94	28.23	77.51	108.93	117.26	99.59	72.81







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NF16 BUCKS LAKE

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	47.59	39.30	46.85	85.21	85.22	81.06	83.91	96.33	101.34	95.69	79.55	64.73
1970/1971	51.35	51.61	52.66	46.13	36.37	42.98	54.35	80.96	102.67	94.25	80.05	69.08
1971/1972	55.14	51.35	50.73	45.46	44.48	56.65	69.01	83.87	88.41	83.45	73.43	65.50
1972/1973	67.34	60.91	55.56	55.03	55.53	50.92	51.62	81.57	90.55	81.65	67.04	59.31
1973/1974	60.00	83.46	90.55	103.20	100.47	101.93	101.56	105.24	105.24	100.83	84.79	70.20
1974/1975	62.30	59.54	62.30	57.27	60.92	64.95	57.12	78.05	103.21	98.48	84.45	70.20
1975/1976	61.22	51.82	42.75	35.23	37.00	42.48	47.42	52.69	54.16	53.71	53.28	48.96
1976/1977	43.97	43.56	43.02	43.70	45.34	45.34	47.70	50.24	50.53	49.81	43.56	36.62
1977/1978	36.87	37.38	44.24	55.19	50.96	55.93	60.00	76.72	95.61	91.54	80.22	71.65
1978/1979	58.18	49.81	49.11	44.79	36.62	40.49	48.54	70.36	78.55	70.84	61.07	56.23
1979/1980	48.96	41.68	33.62	58.78	75.57	77.05	85.48	96.32	103.58	95.79	84.96	73.93
1980/1981	62.92	53.42	49.25	50.24	56.82	62.92	72.46	82.58	79.72	78.55	77.38	67.80
1981/1982	56.53	80.05	98.48	92.60	99.74	102.11	103.94	105.05	103.58	91.37	76.39	64.95
1982/1983	56.38	53.42	54.60	55.48	62.61	80.39	81.73	101.56	104.68	101.56	89.80	77.55
1983/1984	66.53	71.49	82.75	80.22	77.72	74.25	76.23	90.14	93.48	81.40	67.48	53.86
1984/1985	43.16	36.36	35.48	37.64	40.36	44.38	54.89	64.79	68.84	60.61	53.28	48.40
1985/1986	43.83	45.34	42.62	53.86	96.50	101.74	101.93	104.68	102.84	93.66	87.54	79.55
1986/1987	75.73	61.99	52.98	55.34	60.30	70.52	78.88	83.26	84.11	79.55	67.80	54.16
1987/1988	44.92	45.20	45.47	43.97	45.75	50.96	58.78	66.69	69.55	68.91	64.95	57.43
1988/1989	45.61	42.89	43.70	45.75	47.42	72.30	91.19	101.93	97.04	89.80	81.06	77.22
1989/1990	75.57	69.71	56.23	54.01	56.82	61.99	69.07	76.06	80.22	78.21	68.75	65.74
1990/1991	65.74	58.63	47.56	48.40	50.24	60.00	66.21	77.55	82.92	83.94	83.77	83.77
1991/1992	79.55	71.49	58.63	51.82	57.57	61.07	73.60	79.55	80.39	79.72	76.23	67.64
1992/1993	60.00	57.27	52.69	51.10	46.30	55.63	70.20	102.11	104.50	96.68	87.89	85.48
1993/1994	73.44	66.84	63.86	64.79	68.91	72.95	81.06	89.62	91.19	85.65	80.05	70.36
1994/1995	63.70	56.23	45.61	57.27	54.45	85.13	95.97	104.87	104.68	98.84	84.62	71.81
1995/1996	65.74	57.27	66.37	74.75	88.75	89.27	99.20	103.39	103.03	96.68	81.40	69.71
1996/1997	59.09	54.60	79.72	103.39	96.50	99.02	100.83	99.56	101.38	98.48	90.67	77.88
1997/1998	64.64	55.04	45.61	57.73	62.77	64.48	65.58	89.97	104.68	99.20	84.96	75.07
Envelope Maximum	79.55	83.46	98.48	103.39	100.47	102.11	103.94	105.24	105.24	101.56	90.67	85.48
Median	60.00	54.60	50.73	55.03	56.82	64.48	72.46	83.87	95.61	89.80	80.05	69.08
Envelope Minimum	36.87	36.36	33.62	35.23	36.62	40.49	47.42	50.24	50.53	49.81	43.56	36.62

BUCKS LAKE

ons: License, Permit, Contractual, Legal, etc.

OPERATION

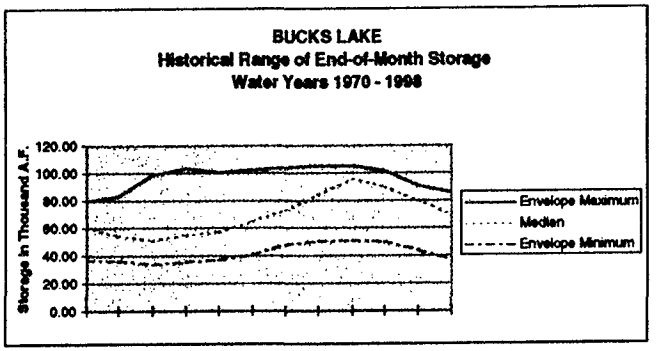
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG_DSOD/NormMaxOp							105.61	105.61	105.61	105.61	105.61	105.61
DSOD - Spillway Crest	101.93	101.93	101.93	101.93	101.93	101.93						
Shaded Area-Max	101.93	101.93	101.93	101.93	101.93	101.93	105.61	105.61	105.61	105.61	105.61	105.61
Shaded Area-Min	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	60.00	60.00	60.00	35.00
RecSeasonMinOperLevel									60.00	60.00	60.00	
NormalMinOperLevel	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00				35.00

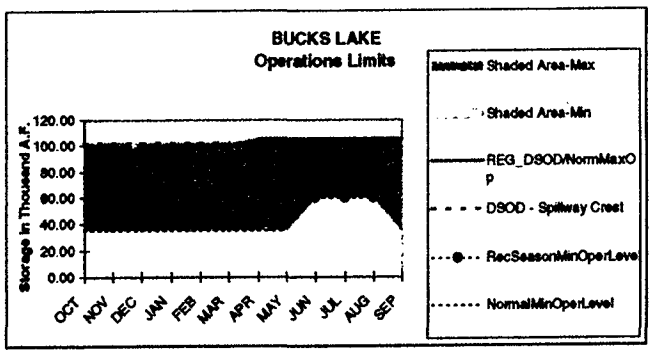
BUCKS LAKE

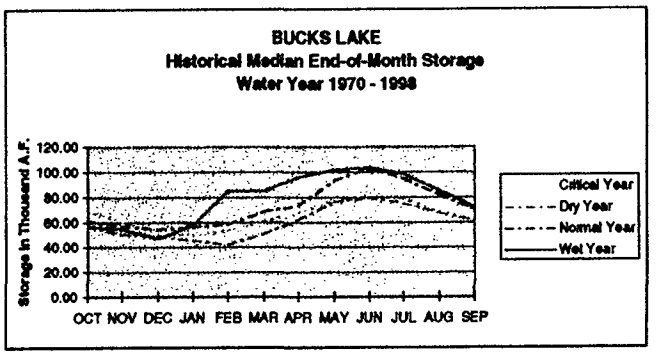
dian End-of-the-Month Storage

WATER

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	69.59	60.31	50.27	50.11	53.53	60.53	67.64	76.80	80.30	78.88	68.27	61.58
Dry Year	56.66	50.58	49.18	45.13	42.42	50.51	61.95	76.47	79.13	74.69	67.25	60.87
Normal Year	61.15	57.27	54.13	56.15	58.22	68.63	73.21	93.23	102.85	95.02	81.23	69.96
Wet Year	56.53	54.60	46.85	57.73	85.22	85.13	95.97	101.56	103.58	98.48	84.79	71.81







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E1 LAKE PILLSBURY

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	23.00	9.55	67.00	68.58	67.48	67.72	75.16	77.06	71.19	62.39	52.51	36.80
1970/1971	20.20	45.14	67.72	67.38	66.22	75.54	86.79	83.92	76.04	70.86	66.15	57.29
1971/1972	46.63	39.39	50.00	66.88	69.19	77.96	86.63	84.26	82.10	67.36	55.77	39.10
1972/1973	24.10	22.53	66.72	67.34	68.52	67.23	77.70	81.60	76.42	66.92	56.35	40.49
1973/1974	36.70	74.08	68.56	67.40	72.41	72.14	85.92	85.47	74.52	70.60	64.81	48.79
1974/1975	32.13	15.69	14.49	24.62	68.01	69.02	84.54	86.79	81.18	74.01	65.66	48.62
1975/1976	34.21	23.75	14.68	9.96	39.09	60.93	78.72	80.94	77.93	71.26	64.65	51.04
1976/1977	34.10	18.16	9.94	9.21	13.52	19.44	22.45	23.17	20.89	16.44	11.63	9.85
1977/1978	9.36	20.39	67.89	67.38	67.85	67.50	83.86	86.34	76.99	70.02	60.71	50.29
1978/1979	35.12	17.85	7.35	24.42	68.84	77.52	86.11	85.14	78.94	70.08	60.19	43.18
1979/1980	36.04	56.19	71.26	66.78	68.96	68.78	86.29	82.59	76.23	68.25	58.22	40.56
1980/1981	22.33	7.02	15.09	62.23	66.84	76.95	79.76	75.98	68.62	59.72	52.20	39.06
1981/1982	26.16	67.42	69.94	67.52	68.05	77.48	70.76	85.84	76.74	70.24	60.87	46.59
1982/1983	43.54	70.46	67.11	68.68	72.46	71.77	68.66	67.38	67.34	55.25	40.66	36.81
1983/1984	33.32	66.59	70.00	65.24	66.45	66.40	75.35	79.39	78.31	71.48	58.47	49.44
1984/1985	31.88	67.64	63.90	50.62	64.61	67.56	82.66	81.86	76.26	64.12	54.43	37.10
1985/1986	13.14	14.28	19.17	63.70	61.40	60.61	70.08	71.49	66.70	58.64	50.31	41.14
1986/1987	24.60	17.71	12.86	24.71	59.27	59.57	62.04	59.20	53.90	46.66	39.09	31.87
1987/1988	24.27	19.76	56.98	60.96	56.62	52.87	53.49	51.89	46.83	38.57	30.12	22.41
1988/1989	17.29	38.16	26.87	42.90	41.83	74.03	79.12	74.19	68.34	59.41	49.86	41.69
1989/1990	35.55	27.87	19.99	40.26	46.81	58.98	62.60	79.55	77.47	73.53	66.69	49.35
1990/1991	31.46	17.72	14.02	13.78	18.26	74.26	80.05	78.20	72.88	64.67	57.59	49.08
1991/1992	33.02	23.94	21.99	26.30	60.43	73.18	80.48	74.23	68.00	59.61	49.97	41.48
1992/1993	34.13	28.56	59.47	60.75	60.85	60.55	80.30	80.64	78.06	70.21	62.55	48.63
1993/1994	29.20	17.80	21.50	28.10	47.40	55.00	55.50	57.40	53.80	47.10	37.40	31.40
1994/1995	25.40	25.70	34.30	64.90	60.00	61.90	74.80	77.70	78.00	75.60	69.10	61.90
1995/1996	55.46	47.17	61.50	62.79	62.32	70.95	77.12	79.02	77.68	70.16	59.47	41.57
1996/1997	24.35	23.82	72.66	62.50	59.41	68.85	69.80	67.91	63.76	55.67	45.80	35.10
1997/1998	27.53	27.64	39.20	63.52	62.36	61.64	76.07	79.55	78.34	74.23	65.19	49.56
Envelope Maximum	55.46	74.08	72.66	68.68	72.46	77.96	86.79	86.79	82.10	75.60	69.10	61.90
Median	31.46	23.94	50.00	62.50	62.36	67.56	77.70	79.39	76.23	67.36	57.59	41.57
Envelope Minimum	9.36	7.02	7.35	9.21	13.52	19.44	22.45	23.17	20.89	16.44	11.63	9.85

LAKE PILLSBURY

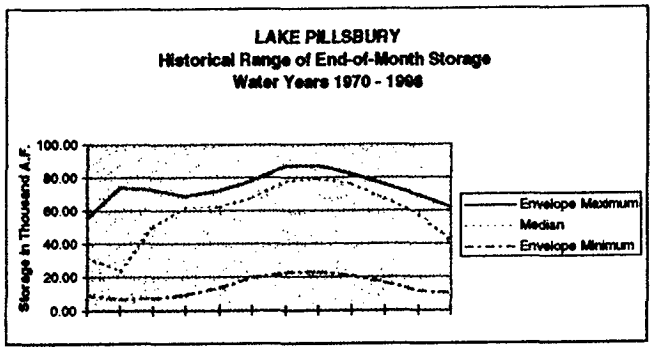
ons: License, Permit, Contractual, Legal, etc.

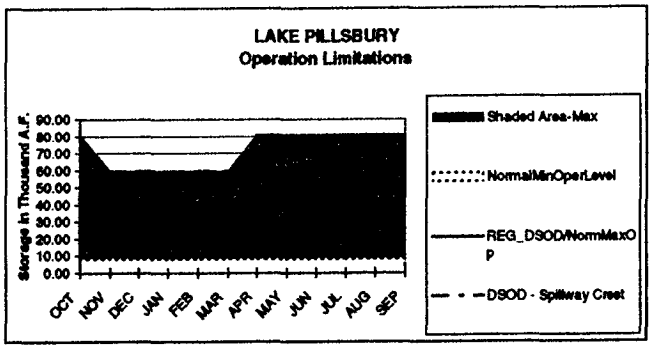
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG_DSOD/NormMaxOp	80.46						80.46	80.46	80.46	80.46	80.46	80.46
DSOD - Spillway Crest		59.47	59.47	59.47	59.47	59.47						
Shaded Area-Max	80.46	59.47	59.47	59.47	59.47	59.47	80.46	80.46	80.46	80.46	80.46	80.46
NormalMinOperLevel	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16

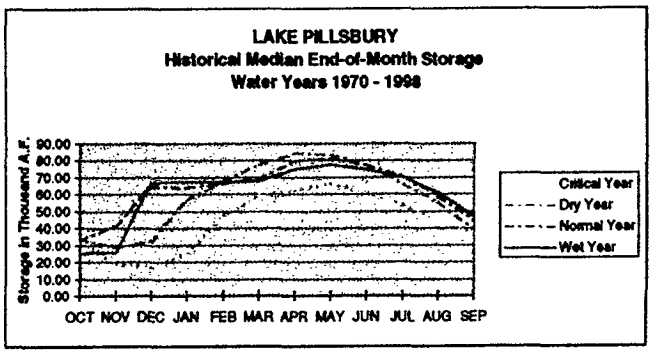
LAKE PILLSBURY

Median End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	32.24	18.96	17.33	25.51	47.11	59.27	62.32	66.71	60.95	53.35	44.53	36.68
Dry Year	33.50	28.62	32.54	56.43	67.84	77.24	84.39	83.06	77.60	65.74	55.10	39.08
Normal Year	32.72	41.65	64.11	64.02	66.34	68.90	79.71	81.12	77.05	70.19	58.97	44.16
Wet Year	25.40	25.70	67.11	67.38	67.48	67.50	74.80	77.70	74.52	70.02	60.71	46.59







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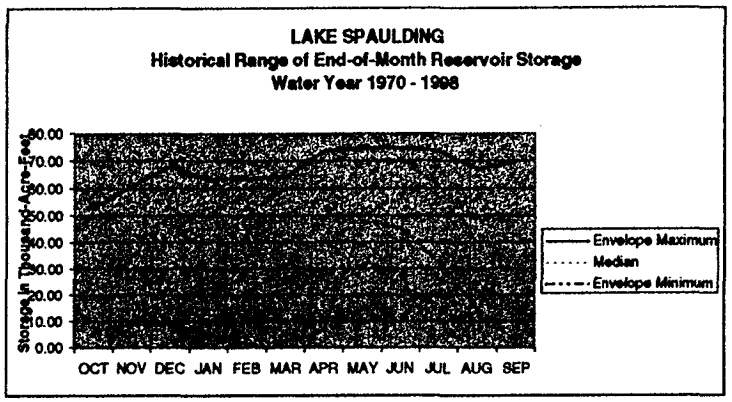
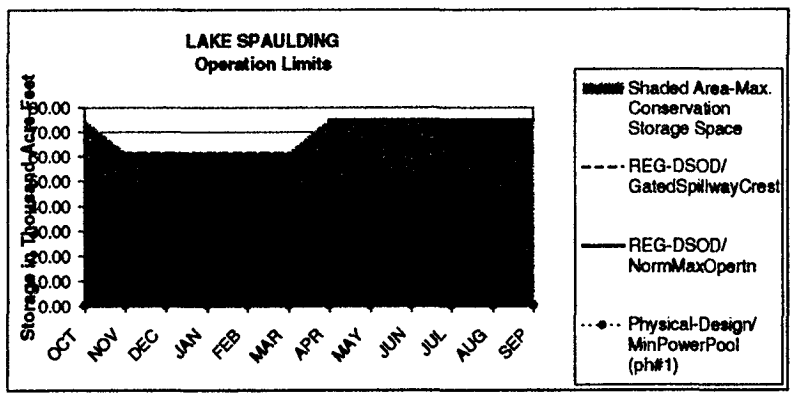
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	29.86	15.62	36.38	62.93	40.01	21.33	15.25	56.99	70.59	69.11	59.68	61.79
1970/1971	27.93	25.13	9.40	7.40	5.15	12.96	16.93	60.11	74.77	71.87	62.17	55.06
1971/1972	26.74	22.67	16.24	7.71	7.26	30.42	40.98	68.58	69.64	68.31	66.80	61.10
1972/1973	23.93	8.85	16.03	15.23	6.06	4.72	26.20	73.73	70.79	59.24	35.22	26.58
1973/1974	12.57	42.37	37.11	47.81	32.31	48.14	46.49	73.59	72.49	51.47	33.89	48.14
1974/1975	20.28	12.07	9.96	5.02	5.39	6.20	6.37	64.59	74.77	49.15	27.06	33.70
1975/1976	31.49	12.70	10.65	6.42	0.91	2.18	23.45	55.91	45.35	40.11	34.13	16.03
1976/1977	5.46	19.54	19.36	17.99	18.63	19.14	31.22	47.70	52.45	54.55	57.78	56.27
1977/1978	47.86	38.39	38.62	26.78	7.21	17.63	12.29	68.64	74.05	69.11	48.75	48.42
1978/1979	38.00	29.71	26.49	9.96	5.10	8.12	14.26	57.46	71.62	69.06	56.94	47.75
1979/1980	40.12	33.21	19.46	53.01	55.33	41.65	62.25	71.72	74.58	55.50	39.30	39.85
1980/1981	44.23	33.85	19.31	15.70	20.18	25.28	56.93	71.38	52.92	32.06	15.00	1.91
1981/1982	19.18	58.98	62.38	38.75	60.23	52.03	64.42	73.14	74.70	71.53	51.41	56.79
1982/1983	51.03	48.00	34.81	18.47	5.61	21.97	20.35	65.60	73.83	73.49	63.63	69.68
1983/1984	51.04	60.84	64.05	42.98	36.94	46.50	43.44	72.23	72.04	61.46	40.62	32.20
1984/1985	23.18	16.67	11.79	13.50	7.33	5.93	35.24	60.10	69.60	65.37	42.01	32.27
1985/1986	36.07	22.52	21.24	33.51	63.65	63.84	66.42	73.83	72.04	60.61	54.94	40.44
1986/1987	53.10	58.48	40.86	37.87	38.76	47.67	70.07	68.86	69.68	66.09	51.25	51.48
1987/1988	36.98	26.86	20.28	13.81	12.91	33.55	64.34	68.77	64.51	56.15	41.02	42.20
1988/1989	39.66	46.46	29.38	20.75	24.99	61.27	66.18	71.66	70.05	56.18	52.29	53.13
1989/1990	51.65	46.43	27.53	24.16	20.59	35.53	69.31	74.51	69.31	60.75	48.81	43.56
1990/1991	33.50	21.30	17.20	18.40	19.00	39.70	55.50	72.80	66.70	46.70	31.90	29.70
1991/1992	41.10	34.10	26.70	19.50	24.30	27.00	59.30	63.10	48.50	39.20	32.80	35.80
1992/1993	29.48	25.92	15.72	15.03	6.99	26.38	40.06	69.12	74.69	62.30	57.63	56.53
1993/1994	36.00	20.41	15.18	17.29	19.80	22.54	49.07	64.97	50.78	36.22	29.16	38.50
1994/1995	32.29	22.25	16.86	37.63	25.30	56.82	67.05	68.49	60.00	66.67	43.86	48.69
1995/1996	30.20	18.76	31.89	40.15	56.61	52.09	67.55	74.34	71.45	56.77	50.10	48.25
1996/1997	34.33	34.20	67.85	63.43	63.14	64.12	73.57	74.66	68.56	43.80	23.79	17.80
1997/1998	34.37	38.85	19.52	30.94	21.40	41.27	51.70	66.14	74.05	70.04	52.41	49.66
Envelope Maximum	53.10	60.84	67.85	63.43	63.65	64.12	73.57	74.66	74.77	73.49	66.80	69.68
Median	34.33	26.86	20.28	19.50	20.18	30.42	49.07	68.77	70.59	60.61	48.75	47.75
Envelope Minimum	5.46	8.85	9.40	5.02	0.91	2.18	6.37	47.70	45.35	32.06	15.00	1.91



LAKE SPAULDING

Operation Limitations: License, Permit, Contractual, Legal, etc

OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG_DSOD/ EmergncySpillwyCrest												
REG-DSOD/ GatedSpillwayCres	61.54	61.54	61.54	61.54	61.54							
REG-DSOD/ NormM:	74.77						74.77	74.77	74.77	74.77	74.77	74.77
USCE FLOOD CONTROL												
Shaded Area-Max. C	74.77	61.54	61.54	61.54	61.54	61.54	74.77	74.77	74.77	74.77	74.77	74.77
USCE-Conditional Flood Control												
Contractual/ Critical Irrigation												
REG-FERC/ MinPool-Fish												
Physical-Design/ Min	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
REG-FERC(Art.44)/ MinFish & wildLife												
Physical-Design/ MinPowerPool												



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M47 LOWER BEAR RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	12.10	5.43	12.80	36.75	37.84	35.30	35.43	49.08	47.43	41.53	36.37	27.41
1970/1971	18.63	12.56	10.61	7.64	9.44	6.08	14.49	41.93	49.77	41.80	30.66	22.03
1971/1972	14.32	9.47	4.14	4.67	4.48	15.80	27.19	49.44	45.93	43.84	35.62	26.31
1972/1973	15.22	9.11	8.56	11.76	3.96	3.61	16.66	49.59	47.35	42.95	34.07	26.97
1973/1974	18.25	22.73	21.04	24.68	18.39	20.64	30.22	49.74	48.07	41.60	30.33	16.57
1974/1975	7.46	4.80	4.27	4.67	4.64	6.58	4.59	45.72	51.65	41.26	27.53	14.02
1975/1976	5.26	4.95	4.39	3.64	4.59	8.82	15.18	30.69	34.50	32.18	24.73	16.52
1976/1977	15.18	6.47	5.10	5.12	5.82	5.86	11.13	23.77	27.14	29.00	17.82	7.26
1977/1978	7.02	6.67	5.21	8.98	6.02	8.65	19.01	50.32	51.73	45.16	36.06	25.00
1978/1979	16.75	16.84	16.57	16.66	12.72	3.75	16.34	50.62	46.28	43.22	34.13	25.70
1979/1980	21.75	20.64	10.37	29.87	32.54	27.64	42.34	50.32	52.03	45.79	37.78	24.04
1980/1981	13.73	10.11	6.51	7.09	6.60	7.19	24.62	48.57	46.14	34.50	25.94	16.98
1981/1982	11.87	21.19	35.56	30.16	43.70	42.54	47.35	50.32	51.80	48.71	40.33	33.27
1982/1983	33.82	28.37	22.78	16.87	11.17	13.94	13.16	46.85	50.69	51.73	44.12	36.89
1983/1984	24.33	36.82	45.79	39.54	34.00	35.62	41.80	51.50	49.74	40.99	28.03	15.71
1984/1985	7.81	10.34	7.19	7.34	5.54	5.26	22.78	48.50	47.42	44.05	35.31	26.31
1985/1986	13.28	10.54	9.32	15.36	37.46	46.92	47.14	49.37	50.03	43.02	37.33	24.36
1986/1987	12.44	7.07	7.05	3.71	6.36	13.65	29.81	46.21	43.22	35.24	29.23	18.89
1987/1988	10.34	7.05	4.62	4.20	6.40	15.18	31.34	43.49	38.04	30.10	18.77	10.54
1988/1989	3.87	4.54	6.90	7.71	6.08	34.93	50.84	51.58	46.07	35.75	25.81	15.98
1989/1990	13.48	9.91	7.21	8.02	8.10	16.66	42.20	50.99	42.88	34.37	24.09	14.40
1990/1991	10.37	10.20	8.34	8.08	4.41	7.95	23.98	51.43	48.79	40.53	28.83	16.52
1991/1992	9.72	10.37	8.02	7.83	6.66	10.14	30.89	42.76	40.70	32.67	21.29	13.32
1992/1993	9.69	8.93	8.55	10.07	6.70	16.61	34.75	51.58	51.58	44.88	36.25	27.98
1993/1994	18.29	11.98	7.17	7.64	5.16	9.59	26.64	45.72	42.81	39.60	29.46	20.39
1994/1995	9.17	10.20	6.76	9.78	11.10	19.65	29.52	50.32	51.22	50.92	43.29	35.31
1995/1996	26.29	16.45	14.92	17.68	30.07	33.11	44.65	51.58	49.06	43.07	35.04	35.30
1996/1997	24.35	17.41	29.02	44.15	39.28	35.11	42.43	51.59	45.18	35.94	28.71	20.19
1997/1998	12.72	6.08	5.19	6.04	6.19	19.45	28.09	42.93	49.90	49.08	38.24	31.22
Envelope Maximum	33.82	36.82	45.79	44.15	43.70	46.92	50.84	51.59	52.03	51.73	44.12	36.89
Median	13.28	10.20	8.02	8.08	6.70	15.18	29.52	49.44	47.43	41.60	30.66	22.03
Envelope Minimum	3.87	4.54	4.14	3.71	3.96	3.61	4.59	23.77	27.14	29.00	17.82	7.26

.OWER BEAR RESERVOIR

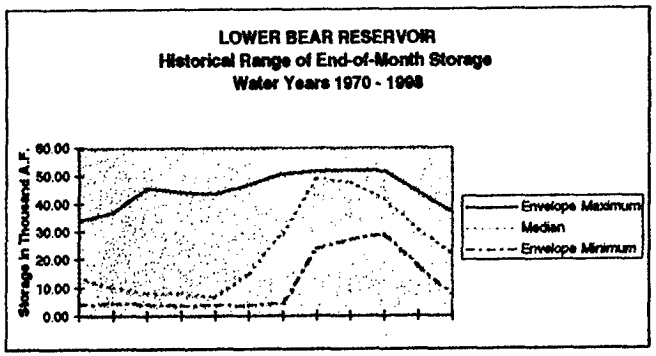
ons: License, Permit, Contractual, Legal, etc.

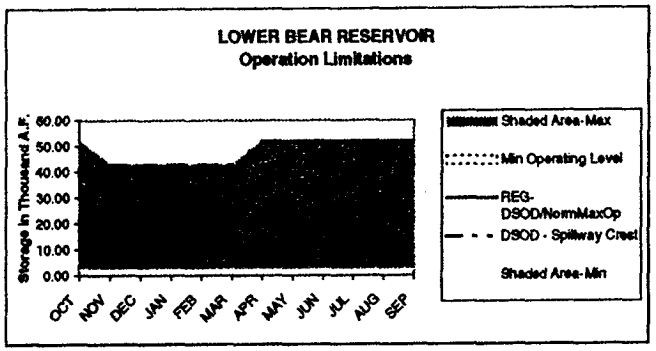
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	52.03						52.03	52.03	52.03	52.03	52.03	52.03
DSOD - Spillway Crest		42.75	42.75	42.75	42.75	42.75						
Shaded Area-Max	52.03	42.75	42.75	42.75	42.75	42.75	52.03	52.03	52.03	52.03	52.03	52.03
Shaded Area-Min	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
Min Operating Level	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15

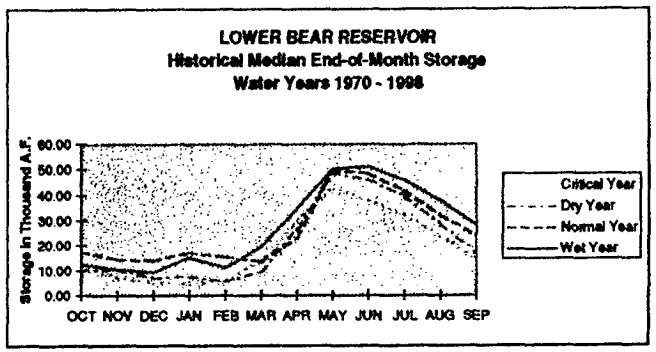
.OWER BEAR RESERVOIR

lodian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	12.44	7.05	5.10	4.20	6.36	13.65	29.81	43.49	38.04	32.18	24.09	14.40
Dry Year	10.37	10.20	7.17	7.64	5.54	9.59	26.64	48.57	46.07	39.60	28.83	16.98
Normal Year	17.50	14.51	13.86	17.17	15.55	13.61	23.44	49.66	48.56	41.70	32.36	23.87
Wet Year	12.72	10.54	9.32	15.36	11.17	19.65	34.75	50.32	51.22	45.79	37.78	27.98







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YB24 LAKE FORDYCE

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	3.88	5.12	7.15	30.74	31.67	33.67	39.24	46.66	46.62	37.43	22.16	9.93
1970/1971	3.32	5.27	3.68	9.28	8.65	7.33	10.27	31.08	46.28	37.69	10.62	2.09
1971/1972	5.44	6.19	6.90	7.69	9.10	14.74	19.71	46.66	46.66	33.49	9.10	4.05
1972/1973	5.64	8.00	11.62	10.43	7.03	5.53	10.55	44.43	38.59	15.74	4.05	5.84
1973/1974	5.21	21.83	24.31	33.37	24.59	10.04	12.16	35.90	46.66	41.70	28.53	10.23
1974/1975	6.70	4.81	4.78	5.28	6.16	5.20	5.40	29.80	46.22	45.88	33.71	29.79
1975/1976	11.84	4.39	8.00	8.54	8.90	11.22	17.65	30.60	29.46	30.60	25.50	24.71
1976/1977	23.68	5.42	5.13	4.99	5.05	5.89	10.91	18.04	16.11	8.35	5.15	4.85
1977/1978	4.57	4.47	6.78	5.11	6.80	10.80	20.03	34.37	46.67	30.81	13.19	5.86
1978/1979	2.86	2.79	2.94	4.87	5.66	4.92	9.73	42.57	36.90	13.32	1.56	1.32
1979/1980	0.25	5.34	8.19	26.60	21.10	9.55	15.19	40.23	46.64	46.28	41.12	18.18
1980/1981	4.47	3.49	3.83	4.52	8.00	10.38	23.86	38.55	31.24	29.63	27.97	27.15
1981/1982	15.42	29.05	39.80	37.09	37.01	35.87	35.40	40.00	49.55	34.99	15.82	3.28
1982/1983	11.62	4.91	7.37	3.07	5.22	3.93	3.51	20.68	42.02	49.80	33.55	14.31
1983/1984	10.98	26.68	35.19	38.90	23.64	7.94	15.48	46.20	49.85	28.47	10.44	4.06
1984/1985	5.54	7.60	3.68	4.54	5.69	5.50	21.49	42.07	30.15	8.76	3.79	6.10
1985/1986	3.72	4.44	5.52	5.96	23.03	39.76	40.90	47.24	45.43	26.03	12.04	6.38
1986/1987	7.69	7.41	7.10	7.07	8.30	10.71	27.17	37.10	21.10	6.88	6.13	3.24
1987/1988	2.95	2.80	4.44	5.29	6.85	12.36	22.21	31.62	33.07	16.55	6.23	6.15
1988/1989	4.65	6.01	6.63	6.87	8.02	21.04	37.39	49.77	45.47	21.60	6.20	6.54
1989/1990	5.20	4.88	5.82	8.12	9.06	13.30	29.38	38.21	37.49	15.39	5.99	7.46
1990/1991	8.73	7.86	7.97	7.21	7.93	7.88	15.63	34.80	41.30	19.27	10.99	10.01
1991/1992	9.33	9.47	9.29	7.15	8.02	12.40	29.10	35.50	28.60	12.40	4.58	5.12
1992/1993	6.35	5.17	5.94	7.48	7.55	10.30	22.25	41.95	49.57	35.47	18.76	17.00
1993/1994	7.64	6.01	5.61	5.17	5.02	7.05	18.57	32.81	25.39	14.80	4.93	3.33
1994/1995	5.21	5.35	5.41	10.30	12.54	24.92	28.88	41.60	42.00	46.26	41.96	25.62
1995/1996	19.32	12.45	19.98	23.68	33.96	33.21	39.46	48.76	42.79	20.46	5.55	1.69
1996/1997	2.11	8.99	24.20	37.86	39.14	31.20	40.20	49.74	42.67	31.57	23.12	17.86
1997/1998	12.35	7.17	13.10	10.07	11.31	11.96	17.81	30.17	45.46	46.89	32.81	25.36
Envelope Maximum	23.68	29.05	39.80	38.90	39.14	39.76	40.90	49.77	49.85	49.80	41.96	29.79
Median	5.54	5.42	6.90	7.48	8.30	10.71	20.03	38.55	42.67	29.63	10.99	6.38
Envelope Minimum	0.25	2.79	2.94	3.07	5.02	3.93	3.51	18.04	16.11	6.88	1.56	1.32

LAKE FORDYCE

ons: License, Permit, Contractual, Legal, etc.

OPERATION

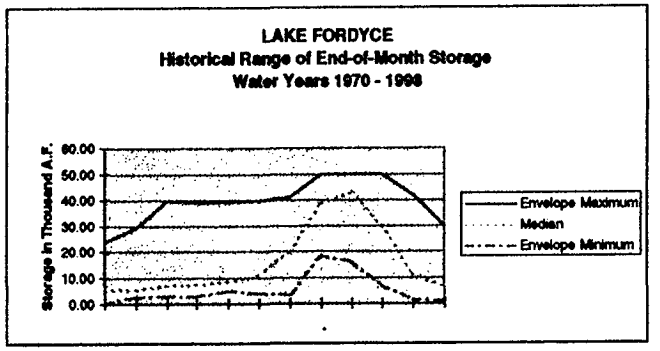
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	49.90						49.90	49.90	49.90	49.90	49.90	49.90
Radial Gate open		39.02	39.02	39.02	39.02	39.02						
Shaded Area-Max	49.90	39.02	39.02	39.02	39.02	39.02	49.90	49.90	49.90	49.90	49.90	49.90
Shaded Area-Min	3.00	4.51	4.51	4.51	4.51	4.51	3.00	3.00	3.00	3.00	3.00	3.00
Normal MinOper Level		4.51	4.51	4.51	4.51	4.51						
Allowable Minimum	3.00						3.00	3.00	3.00	3.00	3.00	3.00

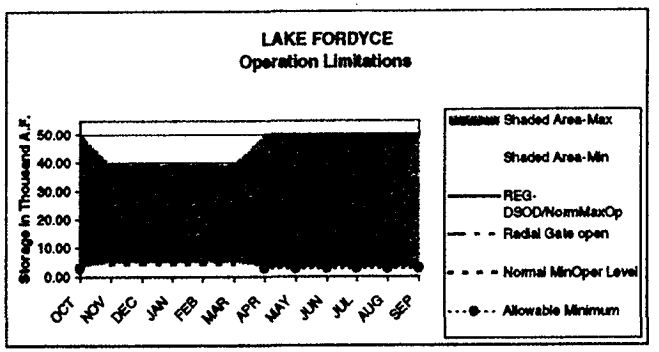
LAKE FORDYCE

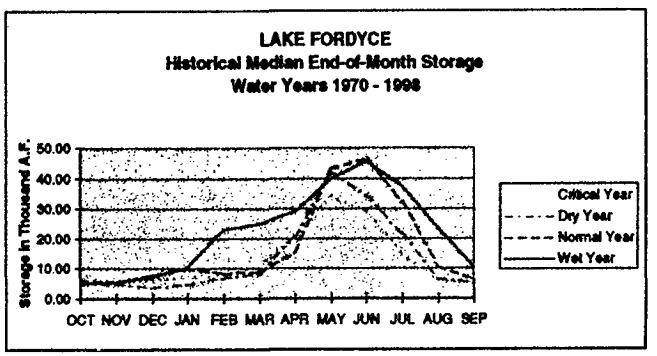
ledian End-of-Month Storage

WATER

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	8.21	5.71	6.46	7.11	7.97	10.96	20.39	33.80	29.03	15.09	6.06	5.64
Dry Year	4.95	4.84	3.75	4.71	6.85	7.94	20.60	42.32	34.07	21.47	6.45	5.08
Normal Year	6.00	5.68	7.41	9.86	8.34	8.75	15.34	43.19	46.25	31.97	10.53	6.19
Wet Year	5.21	5.35	7.37	10.30	23.03	24.92	28.88	40.00	45.46	37.43	23.12	10.23







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NF8 BUTT VALLEY RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	40.40	35.20	41.09	39.79	41.54	38.74	46.04	46.75	46.67	48.67	44.46	30.72
1970/1971	32.33	32.80	30.79	33.30	32.16	43.31	47.49	49.16	47.84	48.51	36.95	43.78
1971/1972	35.48	34.68	32.59	31.31	36.36	43.00	47.78	48.99	48.17	48.02	48.49	40.25
1972/1973	42.85	40.71	37.99	37.10	39.49	36.44	47.30	49.05	45.10	47.22	45.34	45.88
1973/1974	41.70	40.40	41.47	44.79	45.49	45.18	45.02	45.96	42.08	43.00	38.82	34.39
1974/1975	47.07	25.79	34.46	35.85	37.55	36.58	39.12	47.38	44.55	43.31	48.25	40.71
1975/1976	47.70	43.93	41.85	44.32	48.41	47.86	45.02	46.43	46.91	46.04	45.41	47.54
1976/1977	47.78	46.91	47.46	47.54	47.07	47.94	47.15	47.54	47.22	45.49	39.04	46.75
1977/1978	47.62	47.30	42.70	44.09	42.85	43.34	41.93	47.22	47.46	47.62	47.30	48.33
1978/1979	47.54	48.49	46.83	45.73	41.85	43.85	48.97	46.99	47.30	48.02	48.17	48.33
1979/1980	46.43	45.26	30.82	42.00	46.51	40.25	48.97	48.17	47.86	46.99	48.49	47.94
1980/1981	47.46	47.07	47.30	48.02	44.79	46.75	44.63	42.85	47.54	47.78	47.30	47.62
1981/1982	48.49	48.17	45.81	40.32	45.02	31.31	44.09	47.54	48.25	47.30	47.15	48.41
1982/1983	42.85	42.00	39.64	46.75	44.17	44.55	40.25	44.94	46.36	46.28	45.96	46.83
1983/1984	44.01	39.42	41.77	41.24	46.28	48.97	25.12	51.70	52.10	52.10	48.73	47.15
1984/1985	40.63	41.24	42.62	43.78	38.74	41.93	43.62	46.75	46.99	45.73	47.15	46.99
1985/1986	42.93	47.30	41.16	46.83	41.70	38.89	38.07	47.07	45.34	46.12	46.99	42.23
1986/1987	41.54	40.86	42.70	35.77	33.16	33.45	40.48	40.10	39.19	42.16	42.93	42.70
1987/1988	41.62	38.74	36.36	30.25	35.04	40.02	40.10	36.51	31.03	32.73	33.31	36.44
1988/1989	34.61	38.14	40.10	39.95	38.67	48.49	44.09	45.18	46.28	46.43	45.41	47.38
1989/1990	40.02	40.48	41.24	40.63	38.67	39.57	40.48	37.92	35.70	35.56	36.07	36.44
1990/1991	36.36	36.07	36.07	33.45	37.92	33.09	36.74	37.32	41.32	41.77	40.93	25.43
1991/1992	29.21	29.00	35.85	34.61	35.56	36.66	41.70	43.93	44.01	39.57	43.39	40.99
1992/1993	36.23	35.77	37.55	31.66	30.75	26.47	42.85	45.67	44.24	44.79	46.04	40.40
1993/1994	34.24	33.45	33.31	31.66	30.75	34.10	38.44	44.71	45.89	45.02	45.18	44.48
1994/1995	43.16	37.84	37.47	46.36	36.58	40.71	42.46	45.89	44.17	45.26	46.75	44.17
1995/1996	35.85	29.21	32.80	43.78	33.45	33.31	15.81	4.49	4.43	4.41	4.41	4.39
1996/1997	4.39	4.43	7.98	12.40	4.41	4.32	4.41	4.42	4.37	4.37	4.35	18.11
1997/1998	38.53	49.48	39.80	37.18	34.83	42.70	44.17	45.88	44.79	39.64	44.32	45.18
Envelope Maximum	48.49	49.48	47.46	48.02	48.41	48.97	48.97	51.70	52.10	52.10	48.73	48.41
Median	41.62	40.40	39.80	40.32	38.67	40.25	42.85	45.96	45.89	45.73	45.41	44.17
Envelope Minimum	4.39	4.43	7.98	12.40	4.41	4.32	4.41	4.42	4.37	4.37	4.35	4.39

BUTT VALLEY RESERVOIR

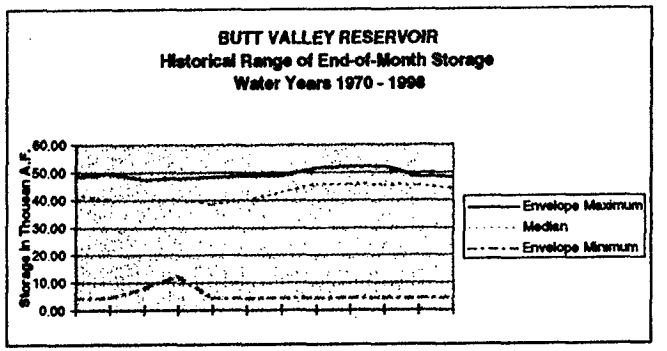
Operation Limitations: License, Permit, Contractual, Legal, etc.

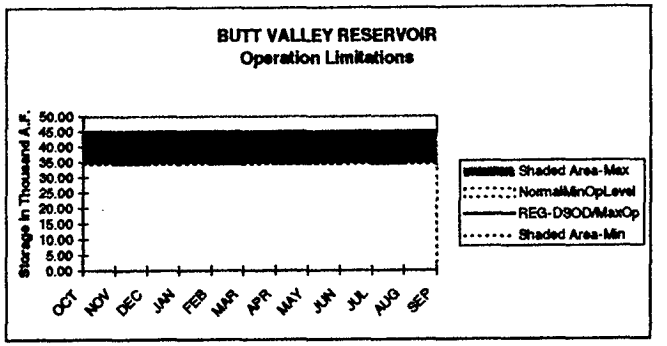
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/MaxOp	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02
Shaded Area-Max	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02	45.02
Shaded Area-Min	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46
NormalMinOpLevel	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46

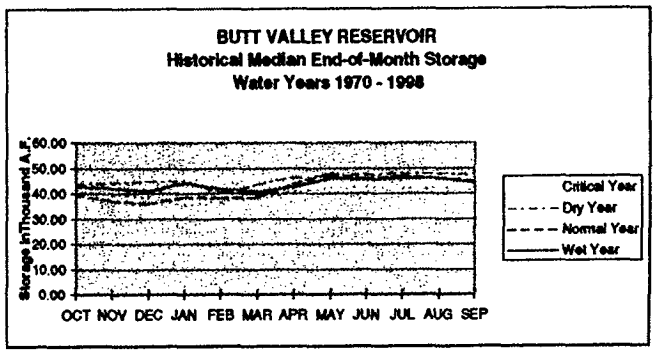
BUTT VALLEY RESERVOIR

Median End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	40.78	39.61	38.80	35.19	36.74	38.11	40.48	42.02	42.66	41.96	41.93	41.84
Dry Year	44.05	44.15	44.72	44.75	40.30	43.43	46.21	46.87	47.42	47.90	47.74	47.30
Normal Year	39.54	36.96	36.00	38.52	38.11	38.42	43.47	47.78	45.69	46.71	45.73	44.83
Wet Year	42.85	42.00	41.09	44.09	41.70	40.71	42.46	45.96	45.34	46.12	45.96	44.17







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W2 CRANE VALLEY RESERVOIR (BASS LAKE)

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	24.13	20.04	19.24	26.92	30.87	35.83	41.88	44.98	44.03	38.11	30.81	24.27
1970/1971	19.89	22.32	20.45	18.95	18.46	24.73	33.07	42.30	44.35	38.06	30.61	23.59
1971/1972	20.16	19.94	20.53	18.63	20.89	27.60	32.38	36.42	37.62	34.54	29.43	26.43
1972/1973	22.80	21.20	18.79	20.28	23.72	24.05	28.26	42.00	44.57	38.65	35.88	29.01
1973/1974	22.52	22.19	21.16	23.59	21.57	28.61	39.67	44.89	43.57	42.33	37.52	29.19
1974/1975	22.70	20.31	18.77	19.53	25.28	29.01	30.00	41.33	44.56	42.19	34.90	26.45
1975/1976	22.40	21.90	18.19	17.52	20.66	25.03	29.34	32.28	32.15	31.25	29.45	23.38
1976/1977	21.20	18.50	18.22	19.17	19.96	20.90	21.49	23.15	23.89	23.42	22.33	17.70
1977/1978	17.48	17.36	24.27	30.76	32.54	34.17	37.86	42.60	45.41	42.32	35.27	32.61
1978/1979	25.69	23.32	23.53	25.73	24.53	28.40	33.85	42.40	45.08	40.61	31.90	26.61
1979/1980	22.21	22.36	21.33	33.68	33.98	33.45	34.58	41.59	44.98	40.37	31.74	23.04
1980/1981	17.93	18.62	19.53	22.55	26.16	32.36	39.21	44.49	42.24	37.43	30.81	26.73
1981/1982	23.50	21.95	23.93	25.37	31.35	37.70	39.96	44.64	45.34	40.90	33.34	25.58
1982/1983	25.04	31.54	33.55	33.99	34.30	34.25	36.24	41.22	45.25	44.80	38.85	34.79
1983/1984	31.71	32.78	34.11	31.34	32.06	33.01	34.92	39.90	41.58	38.52	30.69	24.27
1984/1985	21.39	24.40	24.47	25.06	28.52	32.11	39.89	44.90	43.25	38.13	30.20	26.21
1985/1986	22.96	22.55	24.37	26.75	34.17	34.21	41.98	45.38	44.77	38.70	32.35	30.78
1986/1987	24.03	20.51	21.60	23.19	26.43	31.99	36.50	39.00	39.37	36.60	32.06	31.67
1987/1988	32.01	32.73	26.25	23.04	25.88	29.68	34.54	38.57	39.93	32.08	30.43	29.11
1988/1989	27.53	26.93	25.53	23.85	25.51	32.27	37.44	40.79	41.58	34.93	26.28	26.68
1989/1990	27.13	23.42	23.31	25.12	27.26	32.82	39.31	42.58	42.97	36.64	28.92	27.94
1990/1991	26.28	22.71	22.91	23.60	24.17	31.76	39.84	44.51	42.43	34.78	30.47	29.99
1991/1992	26.92	20.23	21.33	22.67	26.74	31.96	40.40	43.82	44.18	39.74	30.99	27.51
1992/1993	23.54	23.87	26.87	33.48	33.85	34.09	39.36	44.47	44.64	40.12	32.33	29.54
1993/1994	23.05	23.65	22.60	23.68	26.38	30.36	34.63	39.83	40.46	37.80	32.69	27.16
1994/1995	22.80	23.68	23.62	33.87	33.76	34.16	41.82	43.37	45.35	43.48	38.92	37.74
1995/1996	29.16	22.07	22.79	27.59	33.83	33.89	40.25	44.14	42.78	36.36	35.06	34.73
1996/1997	32.07	29.87	34.69	34.70	33.85	33.94	40.07	44.33	43.37	40.29	38.21	31.23
1997/1998	22.56	19.33	16.44	19.92	26.77	30.37	34.92	44.70	45.12	43.82	39.21	36.40
Envelope Maximum	32.07	32.78	34.69	34.70	34.30	37.70	41.98	45.38	45.41	44.80	39.21	37.74
Median	23.05	22.32	22.79	23.85	26.77	32.11	37.44	42.58	43.57	38.52	31.90	27.51
Envelope Minimum	17.48	17.36	16.19	17.52	18.46	20.90	21.49	23.15	23.89	23.42	22.33	17.70

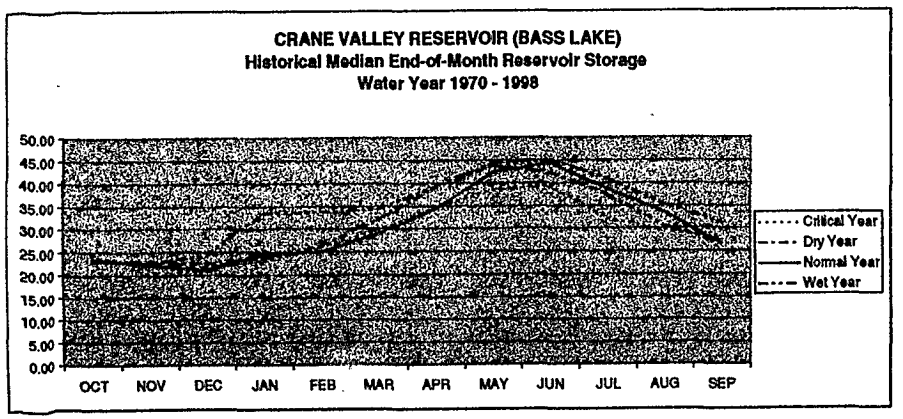
W2

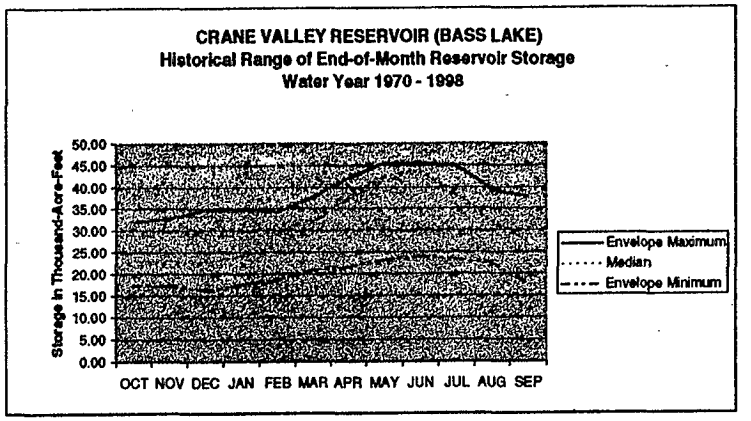
CRANE VALLEY RESERVOIR (BASS LAKE)
Operation Limitations: License, Permit, Contractual, Legal, etc

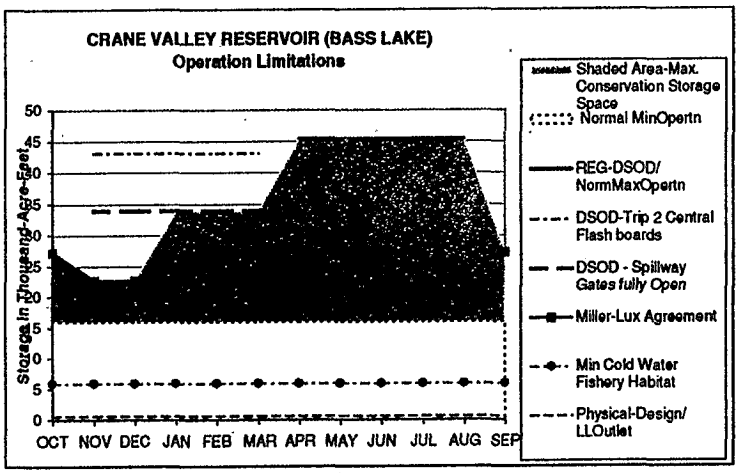
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DSOD - Spillway Gates fully Op	33.96	33.96	33.96	33.96	33.96	33.96						
DSOD-Trip 2 Central Flash boa	43.11	43.11	43.11	43.11	43.11	43.11						
REG-DSOD/ NormMaxOpertn							45.41	45.41	45.41	45.41	45.41	
Miller-Lux Agreemen	27.246	22.705	22.705									27.246
Shaded Area-Max. C	27.246	22.705	22.705	33.96	33.96	33.96	45.41	45.41	45.41	45.41	45.41	27.246
Normal MinOpertn	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Min Cold Water Fish	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Physical-Design/ LL(	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
										0.33		

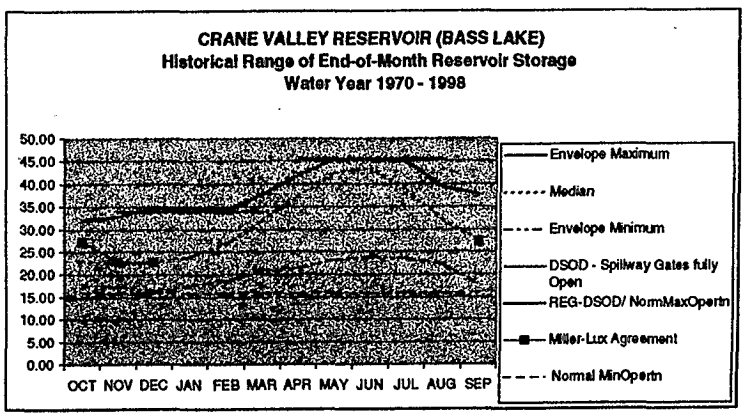
CRANE VALLEY RESERVOIR (BASS LAKE)
Median End-of-Month Reservoir Storage in TAF

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	24.03	21.90	21.60	23.04	25.88	29.68	34.54	38.57	39.37	32.08	29.45	27.94
Dry Year	23.05	22.71	22.60	23.60	26.16	31.96	39.21	43.82	42.24	37.43	30.47	26.73
Normal Year	23.47	22.13	20.80	24.66	24.89	28.81	34.38	42.35	44.19	38.59	33.40	28.53
Wet Year	22.96	22.55	24.27	33.48	33.85	34.16	39.36	44.33	45.12	40.90	35.27	31.23









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PH37 LAKE BRITTON

WATER YR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969-70	30.07	29.91	33.89	40.65	35.92	35.10	30.12	29.70	37.96	30.92	33.11	34.24
1970-71	30.23	35.74	30.14	35.74	33.95	40.00	36.83	36.16	36.32	35.51	38.69	39.50
1971-72	31.40	34.24	29.03	33.10	39.62	35.51	32.38	37.77	33.44	38.50	35.39	37.65
1972-73	32.94	30.38	36.99	28.52	35.10	30.02	28.83	36.51	36.15	37.59	34.58	39.87
1973-74	32.94	30.38	32.22	36.21	36.04	40.63	35.92	32.88	39.50	36.33	35.22	36.75
1974-75	40.50	32.55	32.22	28.53	35.74	37.23	38.01	36.69	38.75	35.27	38.57	38.63
1975-76	29.65	26.85	30.76	31.51	37.23	31.83	40.00	40.12	36.45	37.23	37.89	34.29
1976-77	32.83	32.55	30.55	34.98	31.40	30.60	35.50	37.35	36.03	37.89	36.63	36.63
1977-78	34.58	33.22	29.04	28.48	29.71	35.04	37.16	27.44	35.27	38.87	36.21	37.41
1978-79	31.89	32.11	32.99	31.46	30.49	28.28	37.41	35.27	37.65	38.63	36.45	37.04
1979-80	31.67	30.28	31.51	34.12	38.01	35.62	36.69	34.98	39.62	35.86	39.18	30.60
1980-81	36.51	30.28	33.44	32.88	29.86	31.35	35.80	39.31	37.89	34.75	38.63	36.92
1981-82	31.46	36.09	38.26	28.53	37.77	37.35	37.59	35.45	36.87	37.41	37.71	35.74
1982-83	32.49	34.46	34.35	37.47	39.12	39.81	37.65	37.35	32.83	37.77	38.26	36.51
1983-84	36.21	37.10	39.24	34.81	36.98	37.29	36.45	34.81	33.44	34.52	35.39	35.50
1984-85	30.92	37.35	29.86	29.24	28.63	32.44	32.86	31.13	35.62	36.75	34.98	36.86
1985-86	29.86	29.04	32.33	33.33	39.37	36.33	35.04	34.69	37.65	35.27	38.01	41.01
1986-87	29.24	28.99	29.81	30.60	30.81	29.97	34.01	33.27	34.92	28.13	38.01	32.05
1987-88	28.48	28.03	26.95	30.49	34.12	31.24	34.63	38.26	35.15	39.37	28.33	28.08
1988-89	32.33	29.04	31.89	34.46	41.59	41.91	34.98	35.50	33.27	38.81	35.45	36.20
1989-90	31.67	30.55	28.94	33.72	36.69	28.73	35.15	36.57	37.10	38.75	34.63	37.65
1990-91	33.95	29.19	35.27	36.63	35.15	29.97	38.69	35.10	37.41	37.47	37.53	37.89
1991-92	29.29	30.60	37.77	36.57	37.77	37.83	35.86	39.93	39.74	35.27	37.83	32.88
1992-93	31.40	34.40	35.70	35.70	36.50	37.80	37.10	36.00	30.10	35.50	36.00	29.80
1993-94	38.63	37.04	34.98	38.63	37.89	34.18	35.86	36.15	37.65	40.37	36.45	33.95
1994-95	38.56	33.44	32.16	40.37	36.09	38.63	40.25	39.99	34.46	38.26	36.69	37.89
1995-96	37.77	38.20	32.00	38.13	38.63	39.99	39.49	39.49	38.56	36.09	35.04	38.38
1996-97	36.24	32.31	40.10	40.25	40.37	39.87	39.62	31.56	37.71	35.21	36.69	39.12
1997-98	33.55	35.50	33.84	38.63	38.20	38.75	39.99	39.62	39.62	36.21	37.29	35.15
Envelope Maximum	40.50	38.20	40.10	40.65	41.59	41.91	40.25	40.12	39.74	40.37	39.18	41.01
Median	32.33	32.31	32.22	34.46	36.50	35.62	36.45	36.15	37.10	36.75	36.63	36.86
Envelope Minimum	28.48	26.85	26.95	28.48	28.63	28.28	28.83	27.44	30.10	28.13	28.33	28.08

LAKE BRITTON

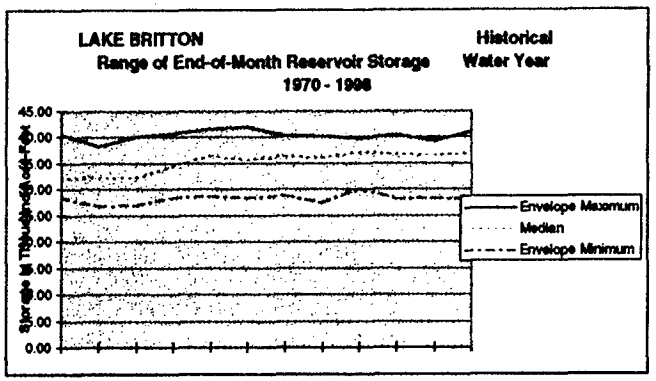
ons: License, Permit, Contractual, Legal, etc

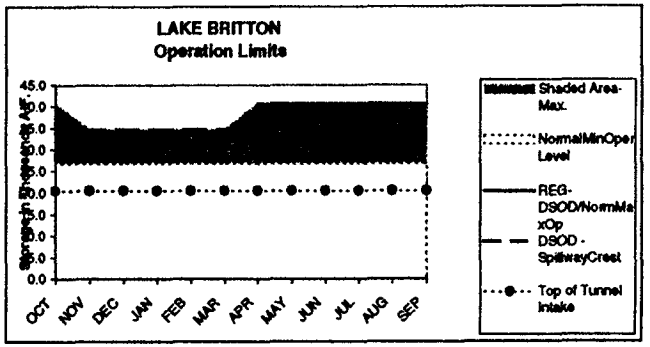
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	40.63						40.63	40.63	40.63	40.63	40.63	40.63
DSOD - SpillwayCrest		34.58	34.58	34.58	34.58	34.58						
Shaded Area-Max.	40.63	34.58	34.58	34.58	34.58	34.58	40.63	40.63	40.63	40.63	40.63	40.63
NormalMinOperLevel	26.85	26.85	26.85	26.85	26.85	26.85	26.85	26.85	26.85	26.85	26.85	26.85
Top of Tunnel Intake	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50

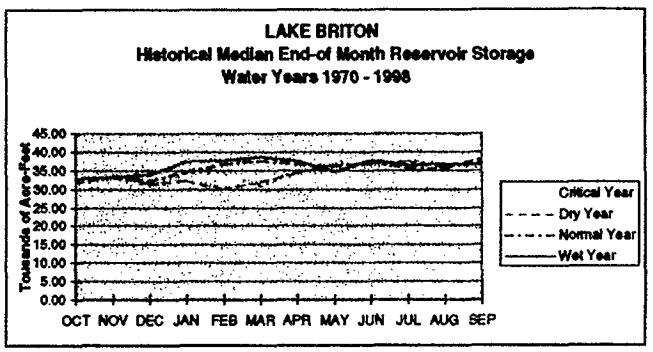
LAKE BRITTON

ledian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	30.66	29.87	30.55	34.35	34.64	30.60	35.50	37.34	36.24	37.68	37.08	35.46
Dry Year	31.64	33.17	31.32	32.17	30.18	31.89	34.23	36.52	36.64	37.62	35.92	36.98
Normal Year	32.63	33.47	32.11	34.64	36.74	37.54	36.76	36.08	37.24	35.68	35.72	38.29
Wet Year	32.94	33.22	33.84	37.47	37.77	38.62	37.59	34.69	37.65	36.33	36.68	36.75







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MC6 MC CLOUD RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	29.17	26.87	32.11	35.34	32.99	31.47	23.87	30.66	30.47	31.91	30.42	27.67
1970/1971	24.15	24.52	19.13	29.40	26.18	35.23	34.98	35.03	28.89	31.28	31.19	29.35
1971/1972	19.24	25.79	16.55	17.14	21.38	24.32	25.24	30.42	33.95	28.12	23.87	17.34
1972/1973	19.06	19.82	24.52	25.15	33.75	26.83	28.98	30.52	32.40	26.66	22.98	19.85
1973/1974	20.00	34.46	31.72	34.15	30.76	34.10	34.10	34.46	32.20	33.55	33.24	23.22
1974/1975	20.07	18.68	19.17	19.31	21.42	33.95	34.05	34.92	32.85	33.80	33.04	28.66
1975/1976	16.81	16.21	16.98	16.85	21.00	18.54	28.39	32.70	33.39	30.71	22.46	20.55
1976/1977	18.61	18.16	18.19	18.09	18.05	17.85	22.42	32.70	33.14	32.65	29.63	24.90
1977/1978	18.22	19.17	22.47	30.12	33.09	34.67	32.15	30.42	33.85	29.77	23.38	20.33
1978/1979	17.58	17.68	17.65	16.95	19.03	25.88	32.15	31.52	33.75	27.09	21.69	17.98
1979/1980	18.85	18.47	18.96	25.58	34.98	25.83	24.82	29.95	33.45	31.09	25.75	21.38
1980/1981	18.40	18.12	17.54	20.33	24.36	29.63	29.72	32.65	31.72	26.57	20.74	14.33
1981/1982	14.72	32.30	32.50	18.26	34.26	29.77	34.98	34.41	31.81	30.14	19.93	16.88
1982/1983	18.89	19.53	24.73	34.77	35.03	34.92	34.92	34.87	34.98	33.04	30.66	23.66
1983/1984	19.93	26.52	34.92	30.76	28.12	34.92	32.50	32.94	28.94	25.75	24.40	21.23
1984/1985	17.95	20.66	16.75	16.49	17.21	17.78	21.57	31.96	33.29	26.57	20.93	20.48
1985/1986	17.34	16.62	16.68	22.39	34.92	34.92	25.88	29.26	32.45	33.50	25.45	19.38
1986/1987	17.48	17.65	17.21	18.92	18.05	23.95	24.07	27.85	31.62	26.00	20.93	18.05
1987/1988	16.78	16.81	16.68	17.85	18.07	21.84	29.81	32.45	30.33	25.24	24.24	20.04
1988/1989	17.75	17.71	17.44	17.58	18.33	34.67	21.49	26.26	30.71	26.87	23.83	19.56
1989/1990	20.74	17.65	18.82	17.65	17.92	20.29	27.72	34.31	32.01	28.16	24.28	20.89
1990/1991	18.82	18.16	18.43	19.10	18.99	22.90	30.05	31.62	29.49	27.01	24.77	22.07
1991/1992	19.24	18.64	19.85	19.24	21.88	25.41	31.09	29.63	28.57	26.87	26.18	22.31
1992/1993	18.75	18.26	18.05	17.48	17.54	34.82	31.57	31.19	28.57	28.25	27.18	24.73
1993/1994	21.00	18.96	18.96	19.96	18.99	22.94	28.44	31.04	29.95	29.35	26.57	23.62
1994/1995	20.48	20.37	20.81	26.92	19.89	34.20	34.67	33.60	31.96	31.47	31.76	29.54
1995/1996	20.26	16.91	17.28	16.72	33.85	27.98	29.17	34.10	29.58	34.67	29.35	24.28
1996/1997	23.46	24.19	34.56	34.05	26.22	24.82	25.66	33.70	32.11	32.70	28.89	26.05
1997/1998	22.00	22.94	21.00	33.39	32.99	34.15	34.92	34.20	34.61	33.45	33.45	25.96
Envelope Maximum	29.17	34.46	34.92	35.34	35.03	35.23	34.98	35.03	34.98	34.67	33.45	29.54
Median	18.89	18.68	18.96	19.31	21.88	27.98	29.72	32.45	32.01	29.77	25.45	21.38
Envelope Minimum	14.72	16.21	16.55	16.49	17.21	17.78	21.49	26.26	28.57	25.24	19.93	14.33

MC CLOUD RESERVOIR

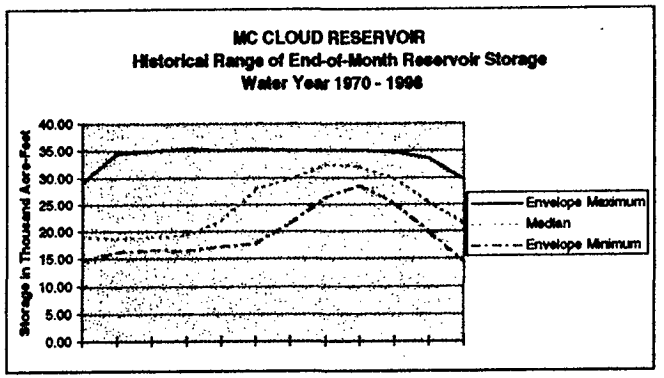
ons: License, Permit, Contractual, Legal, etc

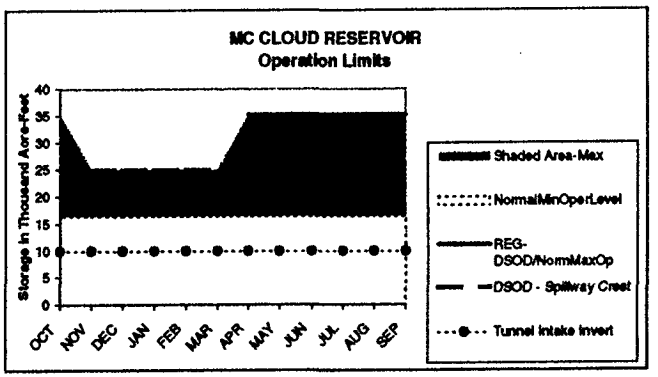
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	35.23						35.23	35.23	35.23	35.23	35.23	35.23
DSOD - Spillway Crest		24.94	24.94	24.94	24.94	24.94						
Shaded Area-Max	35.23	24.94	24.94	24.94	24.94	24.94	35.23	35.23	35.23	35.23	35.23	35.23
NormalMinOperLevel	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42
Tunnel Intake Invert	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

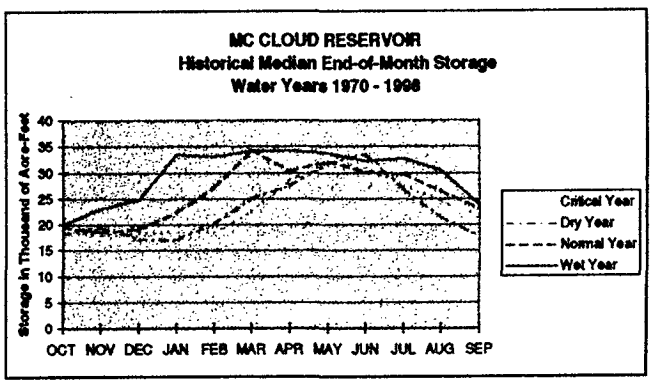
MC CLOUD RESERVOIR

ledian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	18.71	17.9	18.31	18.5	18.53	22.37	28.41	32.03	30.98	27.58	24.52	21.48
Dry Year	18.17	19.39	17.15	17.04	20.2	25.1	27.48	31.74	33.52	26.83	21.31	17.66
Normal Year	19.49	18.57	19.06	22.23	27.15	34.31	30.37	32.06	30.14	29.67	26.46	22.83
Wet Year	20.00	22.94	24.73	33.39	32.99	34.15	34.10	33.70	32.20	32.70	30.42	23.66







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PH59 PIT NO.7 RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	32.76	33.22	32.58	32.99	33.54	32.31	33.22	33.03	28.12	33.49	30.19	28.41
1970/1971	28.00	32.90	33.17	32.62	25.74	31.81	34.14	32.53	31.77	31.23	30.14	32.31
1971/1972	32.44	32.80	33.77	31.68	32.80	33.45	33.49	32.44	33.35	33.82	31.77	31.37
1972/1973	33.68	33.91	29.63	33.35	33.77	24.35	31.99	33.35	33.72	33.45	33.22	33.91
1973/1974	33.22	33.72	33.68	33.86	30.40	33.35	34.14	32.67	33.17	33.63	28.62	29.59
1974/1975	33.08	33.08	33.96	33.91	30.36	33.91	33.77	32.49	22.00	29.29	29.29	27.03
1975/1976	29.50	28.87	33.17	19.67	33.63	33.77	34.00	33.63	33.40	33.45	33.86	33.68
1976/1977	33.91	33.96	33.91	33.77	33.68	33.91	33.63	33.72	32.94	33.12	33.12	33.22
1977/1978	33.45	33.77	32.71	32.80	32.04	33.45	33.45	33.68	33.54	32.85	33.96	33.91
1978/1979	33.82	33.86	33.91	20.69	33.26	33.91	33.91	33.22	33.82	33.91	33.82	33.91
1979/1980	33.72	20.99	32.94	33.77	33.91	33.91	33.58	33.22	33.91	33.86	33.91	33.22
1980/1981	33.86	33.96	33.86	33.96	33.86	33.91	33.91	33.82	33.86	33.91	33.26	32.80
1981/1982	33.91	33.91	33.86	33.45	33.72	33.54	33.91	33.63	24.50	33.77	33.58	33.40
1982/1983	33.63	33.77	33.49	33.96	33.86	33.96	33.96	33.35	33.54	33.22	30.06	31.41
1983/1984	33.54	32.22	33.82	33.77	33.54	33.40	34.00	33.22	33.72	33.86	33.72	32.13
1984/1985	33.63	27.23	32.67	32.90	32.32	34.00	32.67	33.63	33.40	32.04	33.40	33.68
1985/1986	33.40	33.17	33.22	33.31	33.22	33.40	31.59	29.37	33.35	32.22	32.99	31.99
1986/1987	33.40	33.82	33.72	33.63	32.31	31.81	33.68	33.58	33.68	29.71	33.45	33.08
1987/1988	33.35	33.54	33.63	33.03	33.49	24.72	33.35	33.63	33.68	33.58	33.72	33.40
1988/1989	33.72	33.31	23.37	32.99	30.27	33.91	33.58	27.03	32.22	32.62	33.31	32.99
1989/1990	32.90	33.22	33.22	22.69	31.01	33.17	33.31	32.40	32.94	33.49	33.03	32.58
1990/1991	33.31	33.03	33.49	33.54	23.98	33.17	33.17	32.67	32.58	32.76	32.35	32.80
1991/1992	32.40	33.40	33.22	33.31	21.76	33.72	33.03	33.17	32.62	32.99	33.31	32.04
1992/1993	33.12	32.67	32.08	32.90	31.99	33.86	32.13	33.22	32.80	32.71	32.90	32.62
1993/1994	33.58	33.77	32.99	33.26	32.67	31.90	33.45	33.08	33.03	30.01	32.08	33.40
1994/1995	33.22	33.49	33.03	33.68	31.54	33.96	33.77	31.95	29.97	20.44	33.12	33.45
1995/1996	33.54	33.54	33.68	33.49	33.86	32.35	32.22	32.94	32.76	33.22	33.72	33.68
1996/1997	33.63	33.58	33.72	33.82	31.86	33.22	33.08	26.01	30.71	33.40	33.68	33.72
1997/1998	33.35	28.29	32.71	33.91	33.96	34.00	30.49	33.54	31.59	32.49	32.62	32.35
Envelope Maximum	33.91	33.96	33.96	33.96	33.96	34.00	34.14	33.82	33.91	33.91	33.96	33.91
Median	33.40	33.40	33.22	33.35	32.80	33.45	33.49	33.22	33.03	33.22	33.22	32.99
Envelope Minimum	28.00	20.99	23.37	19.67	21.76	24.35	30.49	26.01	22.00	20.44	28.62	27.03

PIT NO.7 RESERVOIR

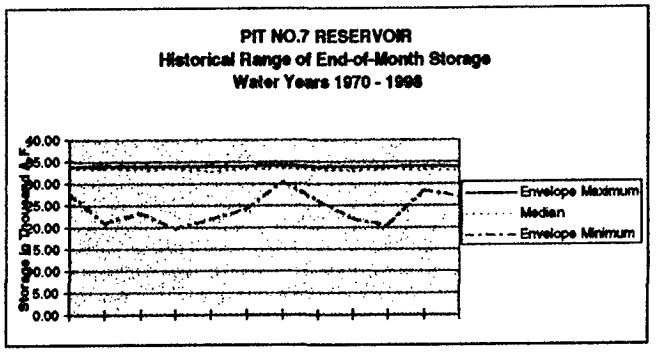
is: License, Permit, contractual, Legal, etc.

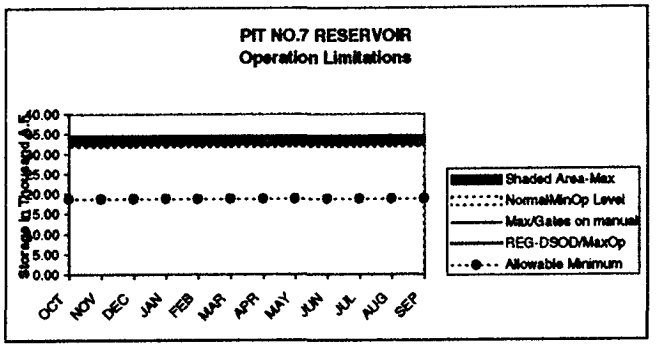
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Max/Gates on manual	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61
REG-DSOD/MaxOp	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91
Shaded Area-Max	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91	33.91
Shaded Area-Min	31.87	31.87										
NormalMinOp Level	31.87	31.87	31.87	31.87	31.87	31.87	31.87	31.87	31.87	31.87	31.87	31.87
Allowable Minimum	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78

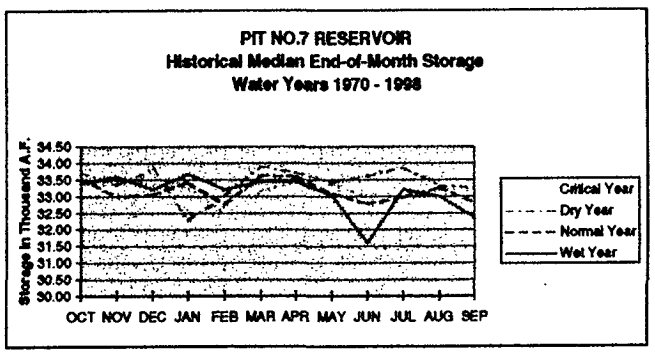
PIT NO.7 RESERVOIR

dian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	33.33	33.47	33.35	33.28	32.49	33.17	33.40	33.38	32.99	33.06	33.22	33.15
Dry Year	33.72	33.33	33.82	32.29	33.03	33.91	33.70	33.42	33.61	33.86	33.33	33.24
Normal Year	33.54	32.99	33.06	33.42	32.76	33.63	33.58	33.08	32.78	32.96	33.26	32.80
Wet Year	33.40	33.58	33.22	33.68	33.22	33.45	33.45	33.03	31.59	33.22	32.99	32.35







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MC9 IRON CANYON RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	12.75	17.38	4.43	3.97	3.57	3.40	5.52	13.41	13.44	17.58	11.65	12.56
1970/1971	13.04	9.16	4.54	7.49	4.25	3.44	4.79	4.07	7.87	14.47	15.48	13.74
1971/1972	9.00	13.04	5.25	3.32	3.44	3.31	4.91	15.89	18.49	13.31	12.15	8.02
1972/1973	9.50	7.90	8.69	3.63	3.45	6.76	3.30	9.40	16.78	10.99	10.73	9.21
1973/1974	8.67	3.45	3.44	3.54	3.43	4.51	3.42	3.35	4.74	11.47	10.99	4.96
1974/1975	4.87	4.91	4.83	4.93	3.40	3.39	3.42	3.44	8.92	12.40	15.04	14.19
1975/1976	5.73	4.69	5.32	5.98	7.57	6.89	14.57	21.66	20.50	15.37	9.40	9.61
1976/1977	9.05	8.59	8.62	8.85	8.54	9.24	15.63	22.08	22.22	23.00	17.91	13.01
1977/1978	10.91	10.64	5.98	3.85	12.59	3.61	3.82	8.21	16.94	12.94	11.44	8.69
1978/1979	8.95	9.16	9.03	8.17	7.38	10.11	14.33	17.74	23.29	14.05	11.38	10.19
1979/1980	10.56	10.19	10.64	4.35	3.52	4.37	5.01	13.27	20.41	16.70	14.97	11.02
1980/1981	9.48	10.42	8.62	6.59	8.59	6.76	11.87	19.92	21.33	15.48	10.64	5.90
1981/1982	8.69	3.61	3.54	4.87	3.93	3.54	3.52	3.62	12.15	11.20	5.38	6.56
1982/1983	7.08	7.47	3.47	3.52	3.89	3.81	3.53	3.79	3.44	7.66	11.05	5.52
1983/1984	3.49	3.40	3.65	5.03	3.51	3.53	3.44	6.95	7.92	9.40	8.12	7.08
1984/1985	4.81	5.98	4.28	5.03	6.13	4.37	8.46	20.68	18.62	11.29	9.56	9.29
1985/1986	7.68	7.29	7.17	3.99	3.38	3.43	5.03	12.33	16.70	15.97	9.67	11.56
1986/1987	7.31	8.59	7.20	8.74	6.78	6.59	11.80	16.90	21.14	12.11	11.68	8.31
1987/1988	9.16	8.56	7.40	7.08	9.05	11.83	18.28	21.19	18.87	17.26	15.22	11.20
1988/1989	10.70	8.29	10.36	9.40	8.41	3.66	6.04	16.55	20.28	17.02	14.57	11.53
1989/1990	8.24	9.89	10.82	10.19	9.00	11.41	19.57	6.63	21.10	16.90	14.68	12.27
1990/1991	11.32	11.17	11.99	12.08	11.05	14.90	19.26	21.10	21.01	17.95	17.58	14.26
1991/1992	11.14	13.21	13.47	12.40	10.30	15.48	18.75	21.01	20.46	17.62	16.51	14.15
1992/1993	12.56	12.15	11.35	9.75	7.68	3.51	3.78	9.00	15.11	15.78	16.43	14.75
1993/1994	12.08	10.56	10.28	8.95	9.16	12.24	17.42	20.68	21.05	21.66	18.87	15.97
1994/1995	13.37	12.94	12.94	4.46	6.23	3.66	3.79	4.98	10.00	15.89	17.58	15.26
1995/1996	8.24	7.87	7.29	8.12	3.65	3.73	6.28	7.59	16.35	19.88	13.01	12.75
1996/1997	12.98	7.40	7.00	3.31	3.34	5.25	10.00	18.75	16.82	19.35	15.08	15.08
1997/1998	9.37	8.51	8.59	3.79	3.75	3.57	6.86	7.38	7.11	11.11	13.24	9.29
Envelope Maximum	13.37	17.38	13.47	12.40	12.59	15.48	19.57	22.08	23.29	23.00	18.87	15.97
Median	9.16	8.59	7.29	5.03	6.13	4.37	6.04	13.27	16.94	15.48	13.01	11.20
Envelope Minimum	3.49	3.40	3.44	3.31	3.34	3.31	3.30	3.35	3.44	7.66	5.38	4.96

ION CANYON RESERVOIR

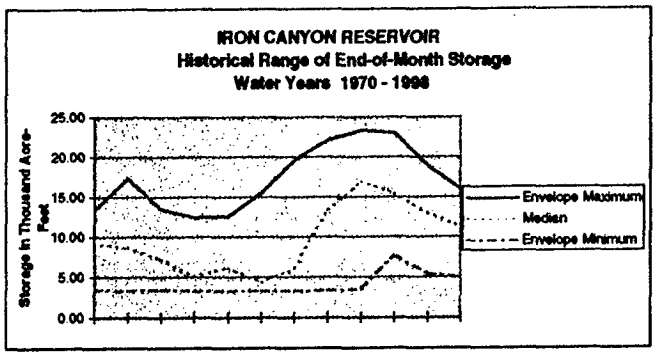
ons: License, Permit, Contractual, Legal, etc.

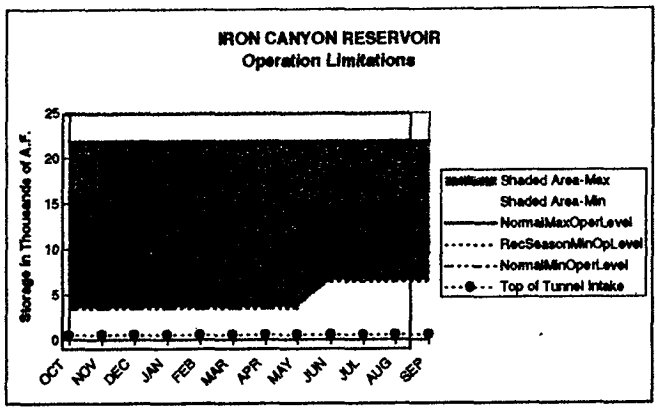
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
NormalMaxOperLevel	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80
Shaded Area-Max	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Shaded Area-Min	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	6.38	6.38	6.38	6.38
RecSeasonMinOpLevel									6.38	6.38	6.38	6.38
NormalMinOperLevel	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44				
Top of Tunnel Intake	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56

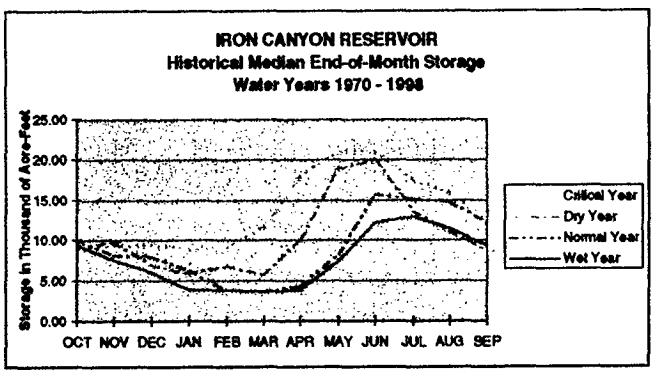
ION CANYON RESERVOIR

ledian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	9.11	9.24	9.44	8.90	9.03	11.62	17.85	21.05	21.03	17.44	15.86	12.64
Dry Year	8.98	9.79	6.93	5.81	6.76	5.56	10.16	18.83	19.97	13.68	11.01	8.65
Normal Year	10.03	8.09	7.99	6.26	3.82	3.60	4.29	6.29	15.73	15.12	14.77	12.14
Wet Year	9.37	7.47	5.98	3.85	3.75	3.61	3.82	7.38	12.14	12.94	11.44	9.29







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NF43 MOUNTAIN MEADOWS RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	2.40	2.06	4.39	6.88	5.38	7.28	12.46	19.30	16.56	7.65	2.02	2.41
1970/1971	2.45	2.36	4.10	4.95	3.89	17.12	23.21	23.95	23.78	18.25	9.93	1.93
1971/1972	1.82	2.73	3.08	3.84	7.65	15.23	22.53	22.98	14.70	5.04	2.32	2.98
1972/1973	2.09	1.82	2.75	2.34	3.87	7.80	20.37	21.35	13.98	3.58	2.33	2.82
1973/1974	2.61	7.06	12.19	8.90	8.11	17.22	18.77	23.94	22.86	17.27	11.00	4.29
1974/1975	4.42	4.29	2.82	3.08	2.82	8.62	17.47	20.75	23.54	13.80	6.52	3.15
1975/1976	8.82	5.69	2.49	2.18	4.44	3.82	5.47	4.29	2.61	1.33	0.59	0.08
1976/1977	0.00	0.01	0.02	0.03	2.13	3.12	2.38	1.85	1.05	0.35	0.05	0.02
1977/1978	0.02	0.03	3.65	2.75	3.13	11.17	18.56	23.37	18.67	10.95	3.12	3.78
1978/1979	3.03	2.18	2.13	1.39	1.83	7.80	14.75	21.02	9.80	2.97	1.61	0.55
1979/1980	2.15	2.89	3.48	4.73	7.80	5.82	12.92	20.21	14.18	3.39	2.97	2.04
1980/1981	2.26	2.68	2.94	1.79	5.18	8.23	11.97	14.03	5.18	2.58	1.49	0.74
1981/1982	2.92	6.81	6.98	3.78	7.24	15.23	25.45	23.31	21.85	15.13	10.06	3.89
1982/1983	5.72	5.09	3.94	6.56	6.42	5.95	19.35	23.66	23.71	20.37	17.94	12.73
1983/1984	8.70	6.01	8.23	4.17	5.24	6.42	11.88	17.37	13.29	5.60	3.56	2.18
1984/1985	2.62	4.70	2.61	2.91	3.28	6.77	12.06	3.54	0.81	0.05	0.02	0.09
1985/1986	0.52	0.43	2.99	5.85	8.11	6.88	13.32	16.21	8.07	3.48	3.10	5.50
1986/1987	3.71	2.49	4.27	5.57	4.10	10.61	14.13	6.88	2.58	0.41	0.00	0.00
1987/1988	0.00	0.02	0.10	0.59	4.60	6.66	6.66	4.84	2.70	0.00	0.00	0.00
1988/1989	0.00	2.36	1.11	0.76	6.77	16.97	22.58	15.87	7.06	3.34	2.29	2.06
1989/1990	4.00	2.62	3.04	3.91	4.10	8.66	11.22	10.44	6.88	2.78	0.25	0.00
1990/1991	0.03	0.04	0.18	0.29	1.60	9.27	15.33	17.89	15.04	9.31	6.01	4.24
1991/1992	3.54	3.48	3.65	3.34	6.56	4.84	5.66	3.91	2.41	1.00	0.20	0.07
1992/1993	0.05	0.02	0.37	1.69	4.81	11.17	19.03	21.57	20.53	13.89	9.23	0.10
1993/1994	2.65	2.51	5.18	4.05	4.76	6.06	8.74	8.70	3.96	2.30	0.89	0.58
1994/1995	0.42	0.88	2.28	8.39	7.73	8.03	24.86	21.13	22.80	22.86	22.86	15.92
1995/1996	4.29	5.04	6.01	5.69	6.49	12.73	18.77	22.58	20.91	17.22	12.42	6.12
1996/1997	4.57	4.81	14.37	6.66	6.01	7.09	17.99	23.14	21.85	17.63	14.27	13.10
1997/1998	2.99	5.44	4.95	6.25	5.54	11.43	17.47	22.07	22.52	17.37	12.73	6.81
Envelope Maximum	8.82	7.06	14.37	8.90	8.11	17.22	25.45	23.95	23.78	22.86	22.86	15.92
Median	2.61	2.62	3.08	3.84	5.18	8.03	15.33	20.21	14.18	5.04	2.97	2.18
Envelope Minimum	0.00	0.01	0.02	0.03	1.60	3.12	2.38	1.85	0.81	0.00	0.00	0.00

MOUNTAIN MEADOWS RESERVOIR

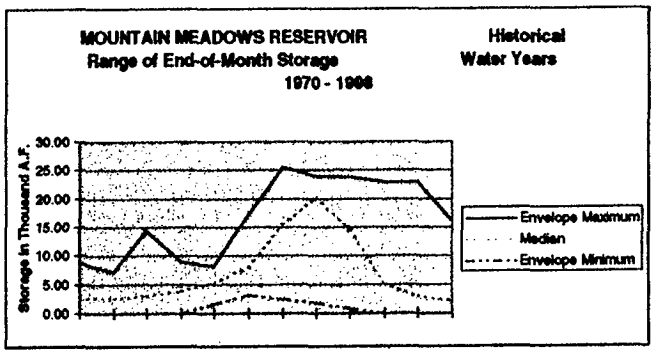
Operation Limitations: License, Permit, Contractual, Legal, etc.

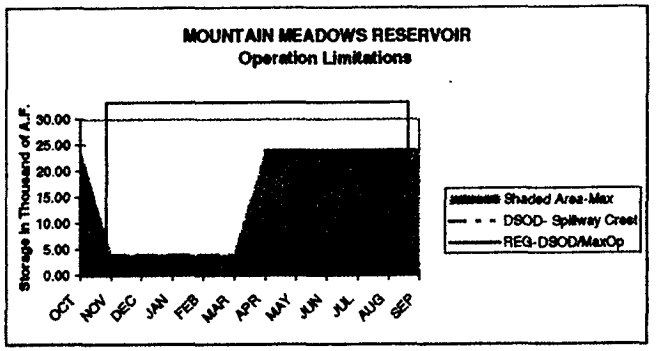
OPERATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/MaxOp	23.94						23.94	23.94	23.94	23.94	23.94	23.94
DSOD- Spillway Crest		4.05	4.05	4.05	4.05	4.05						
Shaded Area-Max	23.94	4.05	4.05	4.05	4.05	4.05	23.94	23.94	23.94	23.94	23.94	23.94

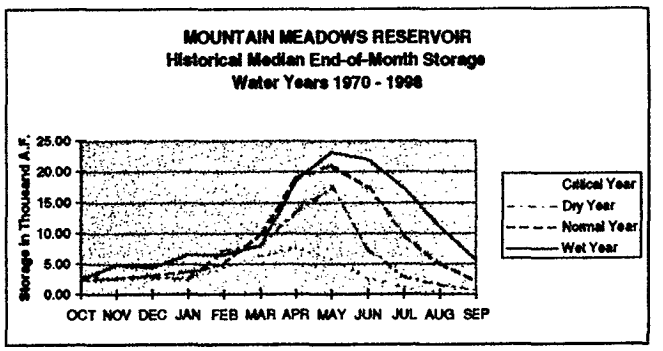
MOUNTAIN MEADOWS RESERVOIR

Median End-of-Month Storage

WATER	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	3.10	2.50	2.77	2.76	4.27	6.37	7.70	5.86	2.65	1.17	0.23	0.04
Dry Year	2.44	2.71	2.78	2.35	7.23	8.02	13.40	17.53	7.49	2.78	1.55	0.65
Normal Year	2.30	2.63	3.15	3.63	5.02	9.90	18.90	21.05	17.35	9.70	5.04	2.12
Wet Year	2.61	4.81	4.39	6.56	6.42	8.03	18.56	23.14	21.85	17.27	11.00	5.50







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S5 PINECREST LAKE (STRAWBERRY RESERVOIR)

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	9.47	6.63	5.85	12.12	13.38	15.27	17.09	17.75	18.02	16.43	14.03	8.91
1970/1971	4.06	3.60	4.39	4.66	4.91	5.72	10.99	17.73	18.17	17.35	13.59	8.34
1971/1972	4.83	4.57	4.17	3.71	3.51	9.45	15.06	18.31	18.31	17.01	14.06	10.15
1972/1973	6.25	5.16	5.45	2.78	1.73	1.68	8.12	17.43	18.31	16.34	14.14	9.14
1973/1974	5.49	11.59	11.92	12.86	11.87	12.84	16.40	17.72	18.31	17.55	15.27	11.04
1974/1975	5.68	3.74	3.64	3.29	2.66	1.56	1.52	17.58	18.31	17.69	14.51	10.57
1975/1976	8.58	6.27	3.97	3.76	3.85	5.82	10.30	18.31	17.58	15.75	13.52	11.94
1976/1977	9.40	8.72	7.40	6.54	6.62	7.58	12.25	17.09	18.31	17.61	15.03	12.71
1977/1978	10.00	9.50	10.80	9.98	9.21	10.60	15.19	17.49	18.31	18.31	16.46	16.65
1978/1979	12.12	9.46	8.34	8.19	7.17	8.28	12.61	17.61	18.31	16.87	14.19	10.25
1979/1980	5.62	4.26	3.18	12.15	14.06	14.37	18.10	17.88	18.16	18.31	15.83	12.12
1980/1981	8.55	5.05	3.37	2.87	3.85	3.65	13.15	18.31	17.32	15.49	13.62	11.19
1981/1982	8.51	13.12	16.62	16.13	16.65	16.50	16.87	17.81	17.96	18.25	15.49	14.59
1982/1983	16.70	15.73	14.53	13.07	11.94	12.25	12.61	18.16	18.16	18.31	17.93	15.89
1983/1984	13.33	16.51	16.65	15.43	14.32	15.22	17.81	18.02	18.25	16.13	13.43	12.86
1984/1985	9.30	8.12	5.10	5.13	4.56	3.63	14.24	18.25	17.43	15.49	14.22	11.11
1985/1986	8.00	6.62	6.23	8.10	13.72	16.81	17.99	18.10	18.25	17.49	15.33	11.97
1986/1987	8.14	5.47	4.30	4.00	4.71	5.61	14.27	18.31	17.06	16.21	14.66	10.39
1987/1988	7.11	6.98	5.01	4.15	4.37	8.46	15.09	18.31	17.99	16.07	15.25	12.00
1988/1989	7.89	6.46	4.87	4.44	4.98	12.51	17.81	18.22	18.19	16.13	15.25	12.48
1989/1990	9.64	9.21	5.11	4.06	3.32	5.11	13.67	18.31	17.61	16.51	15.25	10.34
1990/1991	6.10	4.76	4.44	3.99	3.21	5.69	9.04	18.16	18.31	17.06	16.10	12.45
1991/1992	7.82	7.47	4.46	3.65	4.69	5.52	16.71	18.28	17.59	17.23	16.52	12.26
1992/1993	7.83	5.50	3.85	5.15	3.87	8.70	16.24	18.10	18.24	18.21	17.22	13.32
1993/1994	10.24	7.69	4.88	3.48	3.24	4.58	12.12	18.38	17.57	16.62	14.67	13.39
1994/1995	12.20	10.75	5.21	5.50	6.43	10.82	16.56	17.78	17.78	18.22	17.81	14.52
1995/1996	11.32	8.12	6.17	4.95	10.28	13.64	18.21	18.16	18.03	17.63	16.63	13.68
1996/1997	9.54	9.89	9.92	16.03	13.43	12.61	0.06	18.31	17.93	17.26	16.32	13.38
1997/1998	8.62	5.92	4.27	7.51	4.46	7.54	12.34	17.52	17.80	18.31	16.26	14.56
Envelope Maximum	16.70	16.51	16.65	16.13	16.65	16.81	18.21	18.38	18.31	18.31	17.93	16.65
Median	8.55	6.98	5.10	5.13	4.91	8.46	14.27	18.10	18.16	17.23	15.25	12.12
Envelope Minimum	4.06	3.60	3.18	2.78	1.73	1.56	0.06	17.09	17.06	15.49	13.43	8.34

PINECREST LAKE

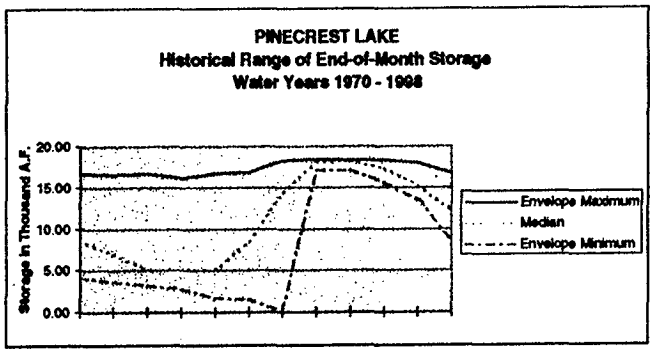
ons: License, Permit, Contractual, Legal, etc.

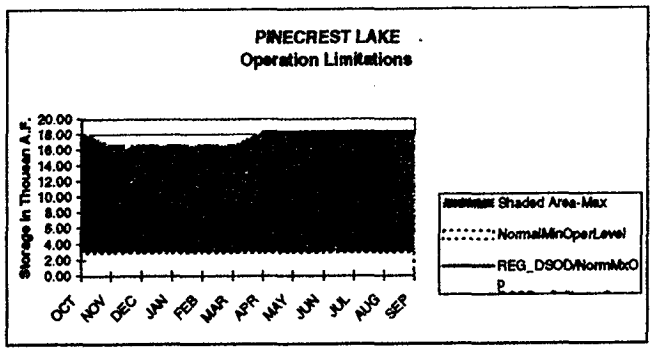
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG_DSOD/NormMxOp	18.31						18.31	18.31	18.31	18.31	18.31	18.31
DSOD - Spillway Crest		16.59	16.59	16.59	16.59	16.59						
Shaded Area-Max	18.31	16.59	16.59	16.59	16.59	16.59	18.31	18.31	18.31	18.31	18.31	18.31
NormalMinOperLevel	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

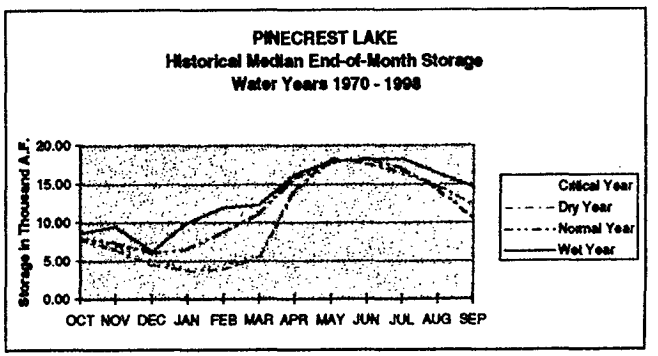
PINECREST LAKE

n End-of-Month Reservoir Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	8.58	6.98	5.01	4.06	4.37	5.82	13.67	18.31	17.61	16.21	15.03	11.94
Dry Year	7.89	6.46	4.46	3.71	3.85	5.52	14.24	18.28	17.59	16.62	14.66	12.26
Normal Year	7.86	7.37	6.01	6.57	8.72	11.14	15.73	17.74	18.31	16.94	14.16	10.41
Wet Year	8.62	9.50	6.23	9.98	11.94	12.25	16.24	17.88	18.16	18.25	16.32	14.52







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PH58 PIT NO.6 RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	14.01	14.43	11.99	14.20	15.49	14.28	14.08	15.04	11.83	14.20	13.11	13.98
1970/1971	13.59	12.45	14.28	13.47	9.88	14.35	15.51	14.30	9.90	10.42	9.82	9.96
1971/1972	14.88	15.11	14.53	13.27	14.01	14.28	14.86	12.35	14.91	14.76	14.41	14.43
1972/1973	14.41	14.28	14.58	13.91	14.28	7.46	14.35	14.81	15.17	14.76	15.46	15.43
1973/1974	13.83	15.15	15.41	15.38	15.25	14.97	14.41	13.66	14.30	14.91	14.51	11.94
1974/1975	15.33	14.66	15.51	15.12	11.63	15.33	15.36	14.63	13.96	14.35	14.48	15.15
1975/1976	14.53	14.33	13.66	15.07	14.53	14.48	15.51	15.36	14.94	14.76	15.43	15.41
1976/1977	15.33	15.28	15.46	14.25	15.25	15.46	14.99	14.97	12.91	13.01	12.63	13.11
1977/1978	15.25	15.12	14.79	15.25	14.10	14.30	14.51	14.33	14.66	14.25	15.07	15.49
1978/1979	15.46	15.46	15.38	14.56	14.48	15.51	15.49	14.58	15.49	15.49	15.25	15.51
1979/1980	11.43	15.04	14.08	15.43	15.49	15.49	14.68	14.73	15.54	15.25	15.43	12.05
1980/1981	15.07	15.46	15.49	15.49	12.63	15.20	15.49	15.17	15.43	15.43	15.57	14.81
1981/1982	13.91	14.84	15.51	15.07	15.33	15.36	15.43	14.89	14.48	15.30	15.33	15.43
1982/1983	15.38	14.13	14.79	15.41	15.38	15.49	15.46	15.65	15.30	15.07	15.57	15.54
1983/1984	15.04	14.36	15.51	14.89	14.76	14.89	15.54	15.12	15.49	15.23	14.43	15.12
1984/1985	15.04	9.26	14.76	15.43	13.86	15.51	15.15	14.61	13.89	15.43	14.94	15.43
1985/1986	13.91	15.41	15.38	15.33	15.54	15.28	14.84	14.10	15.43	14.71	14.73	9.74
1986/1987	14.46	13.13	14.99	15.49	12.17	9.78	14.94	14.10	15.15	15.50	15.20	14.94
1987/1988	14.76	10.39	14.91	8.02	15.07	15.10	14.73	15.33	15.12	15.04	15.20	14.41
1988/1989	15.36	14.74	15.12	10.35	13.66	15.41	14.68	14.38	15.33	15.15	15.12	14.79
1989/1990	14.84	15.02	14.89	15.46	13.13	14.97	15.10	15.12	14.30	15.25	15.28	12.59
1990/1991	12.35	14.48	14.91	10.88	15.04	15.25	15.20	13.44	14.91	14.51	13.78	14.38
1991/1992	14.51	14.97	15.02	14.89	14.99	10.67	14.48	15.36	15.41	15.15	14.63	9.44
1992/1993	12.82	12.91	12.26	14.84	12.54	14.97	12.47	15.15	13.69	14.84	14.89	12.66
1993/1994	12.63	15.15	14.76	15.20	7.41	14.86	15.12	14.97	15.49	15.51	14.89	14.99
1994/1995	15.28	14.86	15.30	15.43	14.58	15.46	15.38	14.58	11.83	13.66	15.33	15.15
1995/1996	15.28	14.99	15.38	13.93	15.25	14.13	14.84	14.08	9.88	14.61	15.25	15.20
1996/1997	15.36	15.23	14.08	15.41	13.73	14.91	14.30	11.78	14.33	15.04	15.15	14.35
1997/1998	15.57	14.08	14.84	15.30	15.38	15.36	14.73	15.10	14.56	15.07	14.73	14.23
Envelope Maximum	15.57	15.46	15.51	15.49	15.54	15.51	15.54	15.65	15.54	15.51	15.57	15.54
Median	14.84	14.84	14.91	15.07	14.53	14.97	14.94	14.73	14.91	15.04	15.07	14.79
Envelope Minimum	11.43	9.26	11.99	8.02	7.41	7.46	12.47	11.78	9.88	10.42	9.82	9.44

PIT NO.6 RESERVOIR

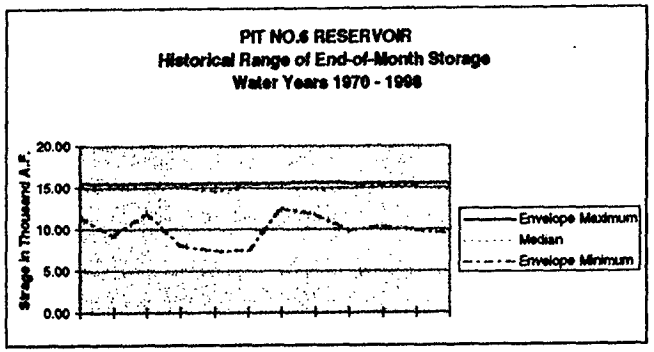
s: License, Permit, Contractual, Legal, etc.

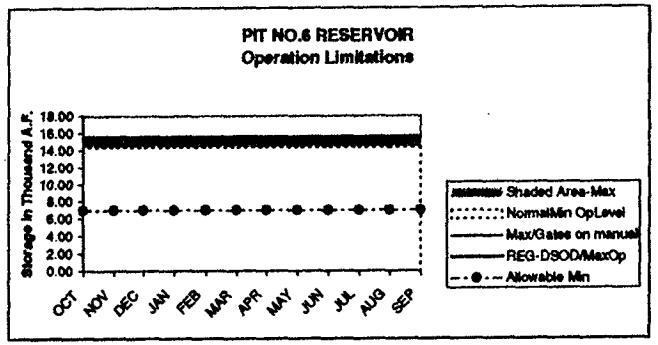
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Max/Gates on manual	15.62	15.62	15.62	15.62	15.62	15.62	15.62	15.62	15.62	15.62	15.62	15.62
REG-DSOD/MaxOp	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49
Shaded Area-Max	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49	15.49
Shaded Area-Min	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33
NormalMin OpLevel	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33
Allowable Min	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01

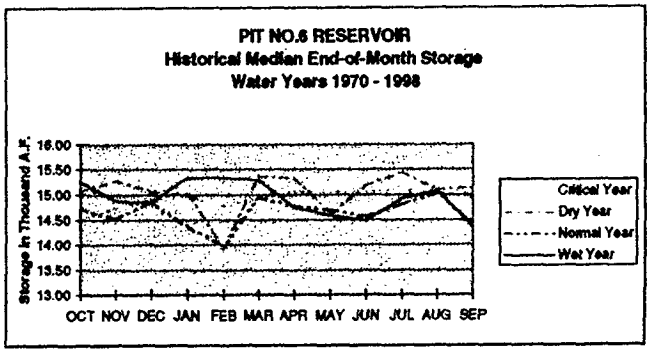
PIT NO.6 RESERVOIR

dian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	14.52	14.72	14.91	14.98	14.76	14.91	15.04	15.04	15.03	15.10	15.04	14.39
Dry Year	15.06	15.28	15.06	15.00	13.93	15.36	15.32	14.59	15.17	15.43	15.10	15.12
Normal Year	14.73	14.52	14.85	14.38	13.97	14.93	14.76	14.68	14.56	14.80	15.01	14.95
Wet Year	15.25	14.86	14.84	15.33	15.33	15.28	14.73	14.58	14.48	14.91	15.07	14.35







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S1 RELIEF RESERVOIR

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	0.00	1.08	2.16	4.45	4.78	6.66	10.25	15.40	15.56	15.40	6.29	0.75
1970/1971	0.28	1.77	3.27	4.76	6.26	6.77	8.81	15.00	15.55	15.38	12.60	11.27
1971/1972	0.93	1.39	1.85	2.31	3.77	5.23	7.32	15.56	15.55	14.45	10.60	4.68
1972/1973	1.00	0.93	0.86	0.79	0.79	0.79	3.75	14.35	15.02	12.48	6.82	3.64
1973/1974	0.40	4.36	1.12	1.12	0.98	1.12	6.26	14.49	15.12	15.11	4.86	2.37
1974/1975	0.55	0.00	0.00	0.25	0.32	0.32	0.32	14.23	15.06	15.46	9.28	1.00
1975/1976	0.00	1.49	1.66	1.66	1.66	3.17	4.75	13.34	1.40	0.00	0.00	0.00
1976/1977	0.00	0.03	0.03	0.00	0.00	0.00	2.89	6.39	12.84	8.06	3.44	0.67
1977/1978	0.00	0.15	0.44	0.44	0.44	4.98	4.98	14.21	15.32	15.28	10.28	3.45
1978/1979	0.70	0.78	0.97	0.97	0.97	0.61	6.46	14.23	15.25	11.85	4.04	0.59
1979/1980	0.02	1.84	2.41	5.37	7.67	0.75	3.10	14.21	15.25	15.14	12.45	4.90
1980/1981	0.31	0.14	0.66	0.96	1.86	1.70	8.86	15.30	15.34	6.85	0.02	0.09
1981/1982	1.36	3.60	2.60	2.79	4.00	5.50	9.68	14.17	15.26	15.50	12.30	6.25
1982/1983	3.30	1.78	3.04	2.48	1.25	2.99	4.40	13.80	14.74	15.44	15.55	7.09
1983/1984	0.00	3.04	4.35	7.09	7.24	3.00	3.09	14.92	15.42	13.10	5.31	0.00
1984/1985	0.44	1.86	2.04	2.22	2.58	1.95	4.20	15.34	15.07	7.60	0.95	0.71
1985/1986	0.55	0.30	0.91	2.31	4.40	7.40	15.30	14.72	15.42	15.56	5.92	0.95
1986/1987	0.50	0.29	0.12	0.03	0.18	0.80	6.80	15.32	14.74	9.15	3.19	2.74
1987/1988	2.47	1.26	0.62	2.01	2.45	3.60	8.56	14.13	13.60	9.75	4.44	2.27
1988/1989	1.94	1.63	1.46	1.45	1.78	4.63	14.10	13.86	15.56	9.84	2.05	1.95
1989/1990	1.38	0.90	1.38	1.44	1.84	2.82	7.60	11.38	9.29	9.02	6.93	4.55
1990/1991	1.16	0.88	0.75	0.25	0.27	0.71	3.70	12.86	15.55	15.18	8.49	3.35
1991/1992	0.00	2.22	1.44	1.02	1.37	2.37	9.95	12.69	12.73	11.67	5.36	2.08
1992/1993	1.82	2.08	1.59	1.61	1.42	1.69	2.71	14.12	15.42	15.53	11.98	5.34
1993/1994	1.62	0.93	0.93	0.93	0.93	2.20	7.99	12.92	12.66	10.53	6.91	2.05
1994/1995	1.97	0.05	0.49	0.55	0.53	0.54	0.31	14.93	14.97	15.35	15.07	6.07
1995/1996	0.98	0.90	0.90	0.91	3.60	0.98	13.31	15.36	15.58	15.22	11.24	4.83
1996/1997	1.40	2.53	2.13	11.84	9.89	10.36	0.06	15.45	15.53	14.80	11.41	7.68
1997/1998	1.61	1.36	1.24	1.47	1.79	1.41	2.51	3.21	15.18	15.24	13.86	6.86
Envelope Maximum	3.30	4.36	4.35	11.84	9.89	10.36	15.30	15.56	15.58	15.56	15.55	11.27
Median	0.70	1.26	1.24	1.45	1.78	2.20	6.26	14.23	15.25	14.80	6.91	2.74
Envelope Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.06	3.21	1.40	0.00	0.00	0.00

RELIEF RESERVOIR

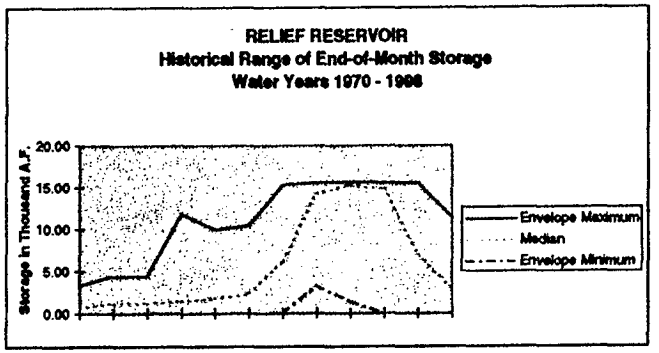
ons: License, Permit, Contractual, Legal, etc.

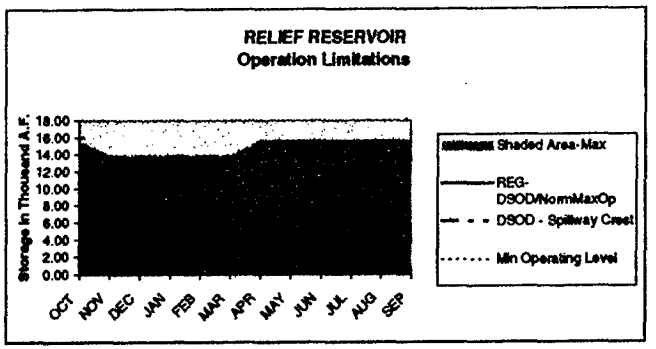
OPERATION LIMITATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	15.55						15.55	15.55	15.55	15.55	15.55	15.55
DSOD - Spillway Crest		13.80	13.80	13.80	13.80	13.80						
Shaded Area-Max	15.55	13.80	13.80	13.80	13.80	13.80	15.55	15.55	15.55	15.55	15.55	15.55
Min Operating Level	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18

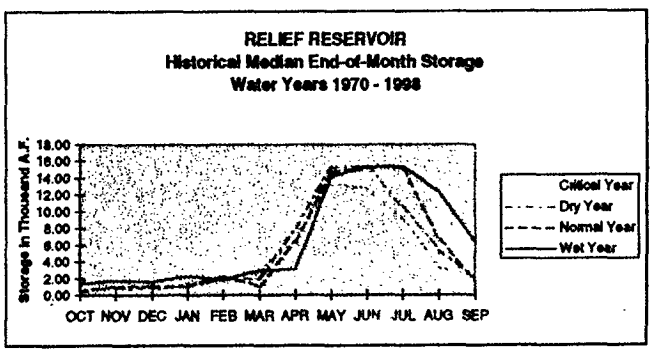
RELIEF RESERVOIR

ledian End-of-Month Storage

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	0.50	0.90	0.62	1.44	1.66	2.82	6.80	13.34	12.84	9.02	3.44	2.27
Dry Year	0.44	0.93	0.93	0.96	1.86	1.95	7.99	15.30	15.34	10.53	5.36	2.05
Normal Year	0.48	1.01	1.05	1.05	2.29	1.05	6.36	14.70	15.33	15.16	6.56	1.69
Wet Year	1.40	1.78	1.59	2.31	1.79	2.99	3.10	14.21	15.26	15.35	12.30	6.25







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YB27 LAKE VALLEY RESERVOIR

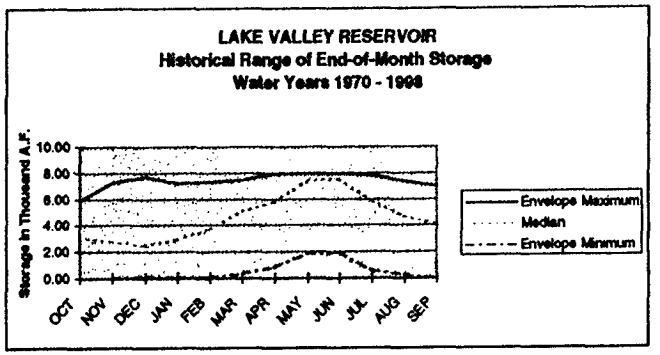
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969/1970	2.28	0.69	3.08	7.22	7.22	7.22	7.90	7.96	6.98	5.51	3.74	2.41
1970/1971	0.74	0.25	1.52	2.90	4.83	6.09	6.47	7.58	7.93	6.36	4.01	2.88
1971/1972	2.02	0.16	0.16	0.30	0.98	3.64	5.36	7.96	7.07	5.25	2.76	2.55
1972/1973	1.05	0.55	1.62	4.37	5.76	6.14	6.92	7.96	7.49	5.50	3.02	2.52
1973/1974	0.25	2.80	2.44	5.51	5.25	5.67	7.22	7.67	7.58	5.87	4.35	3.55
1974/1975	1.35	0.23	0.28	0.30	0.55	0.61	3.69	7.43	7.96	6.55	4.72	3.57
1975/1976	2.21	0.78	0.50	0.53	0.77	1.00	2.07	2.91	2.87	2.70	2.59	1.55
1976/1977	0.24	0.17	0.13	0.12	0.12	0.36	0.86	1.81	1.92	0.58	0.24	0.24
1977/1978	0.14	0.07	1.77	3.75	3.75	4.84	6.22	7.55	7.39	6.74	5.78	5.21
1978/1979	3.43	2.57	1.59	1.35	1.30	1.36	2.71	6.70	6.93	5.27	4.63	4.42
1979/1980	3.34	2.59	2.47	7.22	7.22	5.87	5.80	7.22	6.79	4.59	2.17	0.00
1980/1981	0.00	0.01	0.22	0.35	1.25	1.94	3.48	4.95	4.89	4.62	4.39	4.18
1981/1982	3.98	7.25	7.22	5.01	7.05	5.67	7.22	7.76	7.80	7.15	5.21	4.06
1982/1983	3.51	4.12	4.34	3.33	3.75	5.40	5.64	7.25	7.89	6.91	4.57	3.67
1983/1984	2.65	6.79	7.23	6.37	5.29	5.42	6.02	7.69	7.81	5.90	4.04	3.04
1984/1985	2.68	3.16	1.85	2.22	1.73	1.10	3.69	5.45	5.59	5.34	5.06	5.00
1985/1986	3.66	2.34	2.35	4.56	7.31	7.43	7.43	7.96	7.82	7.49	6.64	5.41
1986/1987	5.32	5.13	3.42	1.46	1.73	3.10	4.56	5.25	4.92	3.75	2.73	2.27
1987/1988	2.11	2.03	1.85	1.41	1.54	2.61	4.00	4.95	5.05	4.26	3.98	3.51
1988/1989	3.03	3.63	3.10	2.18	2.18	6.41	7.77	7.91	7.80	7.46	7.06	6.81
1989/1990	5.86	4.30	2.57	2.29	1.15	2.48	4.38	5.42	5.77	5.46	5.11	4.66
1990/1991	4.20	4.08	3.05	2.62	2.68	3.19	4.72	7.19	7.96	7.53	5.72	4.72
1991/1992	3.18	2.92	2.71	2.38	2.90	4.15	6.16	6.50	6.29	5.98	5.57	5.22
1992/1993	4.12	3.23	3.22	4.24	4.92	6.69	7.66	7.93	7.96	7.69	7.29	6.39
1993/1994	4.18	3.15	2.53	2.23	1.56	2.26	3.94	5.45	5.34	4.98	4.59	4.02
1994/1995	2.96	2.69	2.44	5.29	5.78	7.17	7.48	7.45	7.89	7.79	7.36	6.96
1995/1996	5.68	4.08	3.72	4.21	5.53	5.54	7.31	7.86	7.83	6.90	5.72	4.82
1996/1997	3.77	3.57	7.71	7.17	6.33	6.03	7.51	7.82	7.76	7.19	5.72	4.75
1997/1998	4.11	3.59	3.20	4.62	4.44	5.11	5.52	7.45	7.90	7.59	6.48	5.36
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Envelope Maximum	5.86	7.25	7.71	7.22	7.31	7.43	7.90	7.98	7.96	7.79	7.36	6.96
Median	3.03	2.80	2.47	2.90	3.75	5.11	5.80	7.45	7.49	5.90	4.63	4.06
Envelope Minimum	0.00	0.01	0.13	0.12	0.12	0.36	0.86	1.81	1.92	0.58	0.24	0.00

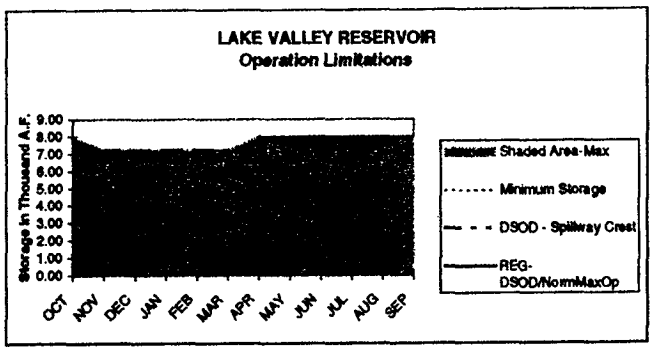
AKE VALLEY RESERVOIR
ns: License, Permit, Contractual, Legal, etc.
OPERATION

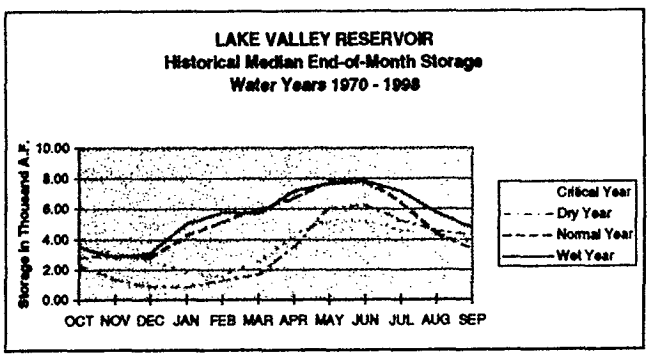
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REG-DSOD/NormMaxOp	7.96						7.96	7.96	7.96	7.96	7.96	7.96
DSOD - Spillway Crest		7.22	7.22	7.22	7.22	7.22						
Shaded Area-Max	7.96	7.22	7.22	7.22	7.22	7.22	7.96	7.96	7.96	7.96	7.96	7.96
Minimum Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AKE VALLEY RESERVOIR
ledian End-of-Month Storage
WATER

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Critical Year	3.68	3.04	2.55	1.85	1.55	2.55	4.19	5.33	5.20	4.62	4.29	3.76
Dry Year	2.35	1.36	0.91	0.85	1.28	1.65	3.58	6.08	6.26	5.26	4.51	4.30
Normal Year	2.84	2.91	2.78	4.22	5.11	5.98	6.70	7.78	7.82	6.46	4.38	3.31
Wet Year	3.51	2.80	3.08	5.01	5.78	5.67	7.22	7.67	7.80	7.15	5.72	4.75







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D-014025

HYDROELECTRIC POWERHOUSES AS OF DECEMBER 31, 1998 (R-1)

NAME	FERC NO.	UNITS	NORMAL MAX. GROS HEAD (FT)	FLOW CFS (1)	MVA RATING	NORMAL MW OPERATING CAPACITY	AVERAGE ENERGY RATE KWH/AF	AVERAGE ENERGY YEAR GWH (2)
PG&E Watersheds								
MC CLOUD PIT								
Hat Creek #1	2661	1	213	545	12.5	8.5	182	39.8
Hat Creek #2	2661	1	198	580	12.5	8.5	169	58.5
Pit #1	2687	2	455	1,900	77.0	61.0	360	308.2
Pit #3	233	3	315	3,315	89.1	70.0	264	434.9
Pit #4	233	2	382	3,700	115.0	95.0	312	563.7
Pit #5	233	4	615	3,580	175.6	160.0	496	947.9
James B. Black	2106	2	1,226	2,000	187.4	172.0	1,041	661.7
Pit #6	2106	2	155	6,470	88.0	80.0	132	376.9
Pit #7	2106	2	205	7,440	122.0	112.0	170	515.4
TOTAL		19			879.1	767.0		3,907.0
COW-BATTLE CREEK								
Volta #1	1121	1	1,264 1,216	115	9.5	9.0	871	52.1
Volta #2	1121	1	125	115	1.1	0.9	110	6.5
South	1121	1	516	190	7.5	7.0	438	48.6
Inskip	1121	1	383	270	8.5	8.0	338	51.6
Coleman	1121	1	482	340	13.5	13.0	425	82.1
Kilarc	606	2	1,192	43	3.0	3.2	840	19.8
Cow Creek	606	2	715	50	1.8	1.8	492	12.4
TOTAL		9			44.9	42.9		273.1
DE SABLA SYSTEM								
Toadtown	803	1	185	134	1.9	1.5	133	5.9
De Sabla	803	1	1,530	171	20.5	18.5	1,308	119.1
Centerville	803	2	590	183	6.4	6.4	420	38.1
Lime Saddle	--	2	462	87	2.0	2.0	300	9.9
Coal Canyon	--	1	350	45	1.0	0.9	240	6.6
TOTAL		7			31.8	29.3		179.6
FEATHER								
Hamilton Branch	--	2	410	200	6.5	4.8	288	23.0
Butt Valley	2105	1	362	2,118	44.4	41.0	243	158.9
Caribou #1	2105	3	1,151	1,114	82.1	75.0	859	174.0
Caribou #2	2105	2	1,150	1,464	131.0	120.0	972	441.7
Oak Flat	2105	1	137	140	1.6	1.3	112	6.6
Belden	2105	1	770	2,410	131.0	125.0	613	392.8
Rock Creek	1962	2	535	2,880	138.6	112.0	448	529.4
Bucks Creek	619	2	2,558	384	72.6	65.0	2,050	240.2
Cresta	1962	2	290	3,510	82.0	70.0	230	334.4
Poe	2107	2	488	3,700	149.4	120.0	384	596.4
TOTAL		18			839.2	734.1		2,897.4
NORTH YUBA								
Narrows #1	1403	1	240	730	12.0	12.0	192	44.5
EEL								
Potter Valley	77	3	478	331	12.1	9.2	350	52.7
SOUTH YUBA								
Spaulding #3	2310	1	318	270	8.5	5.8	256	37.5
Spaulding #2	2310	1	344	200	4.1	4.4	254	13.3
Deer Creek	2310	1	837	110	6.9	5.7	612	22.3
Spaulding #1	2310	1	197	550	8.8	7.0	121	33.4
Drum #1	2310	4	1,373	643	61.5	54.0	1,004	135.2
Drum #2	2310	1	1,370	505	59.0	49.5	1,150	261.1
Alta	2310	2	648	56	2.0	2.0	432	5.5
Dutch Flat #1	2310	1	643	490	27.5	22.0	507	80.9
Halsey	2310	1	327	495	17.0	11.0	270	66.1
Wise	2310	1	519	393	17.0	14.0	390	87.0
Wise #2	2310	1	519	80	3.2	3.1	450	15.6
Newcastle	2310	1	415	392	14.1	11.5	325	35.9
TOTAL		16			229.6	190.0		793.8
AMERICAN								
Chili Bar	2155	1	60	1,500	7.8	7.0	48	33.6
MOKELUMNE								
Salt Springs Unit #1	137	1	257	600	14.5	11.0	181	34.2
Salt Springs Unit #2	137	1	2,113	218	33.0	33.0	1,755	191.0
Tiger Creek	137	2	1,219	750	64.0	58.0	968	317.1
West Point	137	1	312	675	16.0	14.5	250	93.8
Electra	137	3	1,272	1,130	112.8	98.0	1,020	427.9
TOTAL		8			240.3	214.5		1,064.0

1) Flow @ Normal Operating Capacity @ Normal Maximum Gross Head

2) 25 Year Actual Average (1973-1997)

File: PHData98.xls

HYDROELECTRIC POWERHOUSES AS OF DECEMBER 31, 1998 (R-1)

NAME	FERC NO.	UNITS	NORMAL MAX. GROS HEAD (FT)	FLOW CFS (1)	MVA RATING	NORMAL MW OPERATING CAPACITY	AVERAGE ENERGY RATE KWH/AF	AVERAGE ENERGY YEAR GWH (2)
STANISLAUS								
Spring Gap	2130	1	1,865	59	7.5	7.0	1,428	40.0
Stanislaus	2130	1	1,525	830	91.0	91.0	1,282	387.1
Phoenix	1061	1	1,187	25	2.0	2.0	900	15.3
TOTAL		3			100.5	100.0		442.4
MERCED								
Merced Falls	2467	1	26	1,750	4.0	3.5	19	15.3
SAN JOAQUIN								
Crane Valley	1354	1	128	160	1.1	0.9	70	3.6
San Joaquin #3	1354	1	405	164	5.0	4.2	300	15.9
San Joaquin #2	1354	1	307	148	3.6	3.2	228	12.9
San Joaquin #1-A	1354	1	42	167	0.4	0.4	27	1.7
Wishon	1354	4	1,412	235	16.0	20.0	1,040	67.6
Kerckhoff	96	3	350	1,735	42.6	38.0	267	129.4
Kerckhoff #2	96	1	421	5,100	155.0	155.0	366	464.2
TOTAL		12			223.7	221.7		695.3
KINGS								
Helms	2735	3	1,744	9,000	1,170.0	1,212.0		56.7 *
Haas	1988	2	2,444	825	155.7	144.0	2,016	517.8
Balch #1	175	1	2,379	213	33.0	34.0	1,850	109.6
Balch #2	175	2	2,389	630	114.0	105.0	2,016	512.3
Kings River	1988	1	798	990	54.0	52.0	660	205.6
TOTAL		9			1,526.7	1,547.0		1,402.0
TULE								
Tule River	1333	2	1,544	66	8.5	6.4	1,152	26.4
KERN								
Kern Canyon	178	1	264	750	10.6	11.5	192	69.1
PG&E TOTAL		110			4,170.8	3,896.1		11,896.2
IRRIGATION DISTRICTS AND WATER AGENCIES (ID&WA)								
OWID								
Sly Creek	2088	1	225	700	14.7	13.2	182	33.3
Woodleaf	2088	1	1,495	515	65.5	55.0	1,236	248.8
Forbestown	2088	1	822	660	40.5	39.7	700	156.3
Kelly Ridge	2088	1	668	210	11.0	10.0	519	67.0
TOTAL		4			131.7	117.9		505.4
YCWA								
Colgate	2246	2	1,391	3,400	350.0	340.0	1,130	1,204.6
Narrows #2	2246	1	235	3,450	55.0	55.0	192	222.8
TOTAL		3			405.0	395.0		1,427.4
SID								
Monticello	2780	3	220	719	12.9	11.9	198	46.6
NID								
Dutch Flat #2	2266	1	604	610	27.3	26.0	516	108.0
Chicago Park	2266	1	480	1,080	44.5	38.0	384	159.5
Rollins	2266	1	213	879	13.5	13.0	177	68.9
TOTAL		3			85.3	77.0		336.4
PCWA								
French Meadows	2079	1	654	375	17.0	17.0	528	65.7
Middle Fork	2079	2	2,096	950	129.0	136.0	1,656	523.4
Ralston	2079	1	1,344	935	88.0	86.0	1,104	376.1
Oxbow	2079	1	90	1,020	7.0	6.0	67	29.8
TOTAL		5			241.0	245.0		995.0
TRI-DAM								
Donnells	2005	1	1,481	623	67.5	67.5	1,260	316.4
Beardsley	2005	1	261	545	11.1	11.0	196	56.8
Tulloch	2067	2	149	1,700	19.0	18.0	120	95.6
TOTAL		4			97.6	96.5		468.8
MID								
Exchequer	2179	1	462	2,620	105.0	94.5	350	294.7
Mc Swain	2179	1	55	2,650	10.0	10.0	41	37.0
TOTAL		2			115.0	104.5		331.7
ID&WA TOTAL		24			1,088.5	1,047.8		4,111.3

*Based on natural inflow into Courtright Reservoir

1) Flow @ Normal Operating Capacity @ Normal Maximum Gross Head

2) 25 Year Actual Average (1973-1997)

File: PHData98.xls

PG&E

Reservoirs: De Sabla and Feather River Water Systems

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Belden (Caribou Afterbay) FERC No. 2105	97-120	Plumas	26 N	7 E	25,26	1958	2985.7U	616	42.4	2,421	2,477	Rock Fill Clay Core	2988.0P 2998.2U	853	30	150	640	2.5:1	2:1	90 23 Siphon	27.5 12.5 12.5	37,000 16,000	0 13	Belden P.H.
Bucks Diversion FERC No. 619	94	Plumas	24 N	7 E	28,29,32, 33	1928	5025.5U	31.2	136	5,819	5,843	Concrete Arch	5032.0P 5035.5U*	500	6	99	27	Variable		100 100	10.0 8.0	14,600	1	Power
Bucks Storage FERC No. 619	94-2	Plumas	24 N 23 N	7 E 7 E	22,27,28, 33,34,35 1,2,3,4, 10	1928	5160.5U	28.6	1,852	105,327	105,605	Rock Fill Conc. Face	5169.5P 5173.0U	1,320	12	123	320	1.4:1	1.5:1	100	14.5	7,000 15,000	6.5 1	Power
Butt Valley FERC No. 2105	93	Plumas	26 N 27 N	7 E 7 E	2,3,13, 12,11,35, 34,27	1924	4142.3U	83.5	1,600.0	49,897	49,897	Hydraulic Fill Riprapped	4144.0P 4154.2U	1,520	27	80	380	3.5:1	2:1	150	11.9	15,800 20,000	2 0	Caribou Plants
Cresta FERC No. 1962	93-6	Plumas	23 N 24 N 24 N	5 E 5 E 6 E	1 36 30,31	1949	1681.2U	1,880	95.0	4,140	4,140	Conc. Grav. Overflow	1680.0P 1690.2U	378	40	114	127	Vert	Var	248 22.5	37.0 24.0	132,000 4,700 200,000	10 10 0	Cresta P.H.
De Sabla FERC No. 803	97-5	Butte	23 N	3 E	2,11	1903 Rebuilt 1962	2755.0U 2732.0P	0.25	14.9	188	188	Earth Fill	2735.0P 2758.0U	1,079	20	52	256	3.5:1	2:1	43.6	3.0	305 590	1 0	De Sabla P.H.
Grizzly Forebay FERC No. 619	94-3	Plumas	24 N	6 E	34,35	1928	4319.5U	14.6	38	1,109	1,112	Conc. Arch	4327.0P 4330.5U	520	6	98	22	Variable		100	11.0	3,200	7	Bucks Cr. P.H.
Kunkle Unlicensed	97-7	Butte	22 N	4 E	31	1906	1440.5U	-	17	154	154	Earth Fill	1446.0P 1449.0U	1,040	24	48	164	2:1	1:1 2:1	41.9	6.6 10.0	100	3.3	Lime Saddle P.H.

\# Full capacity limited by agreement with Western Pacific Railroad.
4,958.84 Red River Lumber Co. datum
* Includes 3.0 feet parapet wall.
** Includes 0.5 feet parapet wall.

@ Spillway crest is at elevation 4510.2U providing an ultimate storage of 1,309,102 A.F. gross and 1,300,154 A.F. usable.

D-014028

D-014028

Reservoirs: De Sabla and Feather River Water Systems
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Crest Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Free-Board (11)	Primary Use
Lake Almanor (Canyon Dam) FERC No 2105	93-3	Plumas	27 N	8 E	28 (Dam Only)	1913 1927 1962	4504.2U @	491	27,064	1,129,016	1,142,964	Hydraulic Fill Riprapped	4515 0P 4525 2U	1,750	75	130	1,350	3 1	3 1 2 1	500	15 0	40,500 70,000	6 0	Bull Valley P H & F R Storage
Mt Meadows (Indian Ole Dam) Unlicensed	97-113	Lassen	28 N	8 E	13 (Dam Only)	1965	5042 6U ##	148	5,748	23,942 #	23,942 #	Steel Frame Timber Face	5035 7P 5046 0U	310	0	25	49	1:1	1 1	176	8 0 w/o Flashboard Face			Hamilton Br P H
Philbrook FERC No. 803	97-8	Butte	25 N 25 N	4 E 5 E	13 18	1926	5552.5U	5.0	173	5,009	5,009	Earth Fill	5424 0P 5556 4U	950 470	10 10	87 24	400 118	2 5 1 2 5 1	2 1 2 1	29 7 14 7	9 0 13 7	4,100	0	Power
Poe FERC No. 2107	93-5	Butte	23 N	5 E	28,32,33	1958	1391 2U	1,942	53 3	1,203	1,204	Conc. Gated Gravity	1390 0P 1400 2U	427	5	80	95	Vert	75 1	200 0 22 5 20 0	50 0 24 0 16 0	160,000 5,000 220,000	10 0	Poe P H
Rock Creek FERC No 1962	93-7	Plumas	25 N	6 E	23,24,26, 35	1950	2218 4	1,771	114	1,500 ***	1,500 ***	Conc Grav Overflow	2220 0P 2230 2U	567	10	128	144	Vert.	Var	248 22 5	42 0 29 0	132,000 4,700	15 15	Rock Creek P H
Round Valley FERC No. 803	97-9	Butte	26 N	5 E	30	1877	5651.1U	2.25	98	1,196	1,196	Earth Fill	5498 2P 5658 0U	850	8	29	150	2 5 1	2 1	40 0	4 9	1,100	1	Power
Three Lakes FERC No. 619	94-4	Plumas	24 N	7 E	4,5	1929	6080.0U	1.25	44	608	608	Rock Fill Conc Face	6080 5P** 6084 0U	584	10	30	80	1 25 1	1 5 1	24 0	6 2	500	4	Power

Full capacity limited by agreement with Western Pacific Railroad
4,958 84 Red River Lumber Co. datum.
* Includes 3.0 feet parapet wall.
** Includes 0 5 feet parapet wall.
*** Estimated

@ Spillway crest is at Elev 4510 2U, providing an ultimate storage of 1,309,102 A F gross and 1,300,154 A F. usable.

D-014029

D-014029

PG&E

Reservoirs: South Yuba Water System
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Feeley Lake Lower (Carr Lake) FERC No. 2310	97-35	Nevada	18 N	12 E	28,29	1870-S (a)	6663.7U	0.49	16.9	150	150@	Earth & Rock Fill	6936.0P 6667.7U	185	8	19	80	2:1	2:1	40	4.0	340	2	Power
Fuller Lake FERC No. 2310	97-21	Nevada	17 N	12 E	8,17	1870 1922	5341.8U	0.55	68.9	1127	1127	Earth & Rock Fill Gunite Face	5380.1P 5344.5U##	410	10	39	150	1.4:1	2-1/4:1	Siphon 15	2.75 2.75	350 75	2	Spaulding No 3 P.H
Halsey Forebay FERC No 2310	97-23	Placer	13 N	8 E	13,24	1913-1916	1817.2U	None	18.	240	244	Earth Fill	1878.7P 1821.4U	850 1167	10 10	29 42	129 174	2-1/2:1 2-1/2:1	2:1 2:1	40	5.2			Halsey P.H
Kelly Lake FERC No. 2310	97-24	Placer	17 N	12 E	25	Rebuilt 1928	5907.3U	0.50	26	336	336@	Earth Fill Gunite Face	5910.0P 5911.3U	448	5	23	85	2:1	2:1	24	5.0	490	1	Power
Kidd Lake FERC No 2310	97-25	Placer	17 N	14 E	29	1950-1955	6627.6U	0.5	86	1505	1505@	Earth & Rock Fill Gunite Face	6772.5P 6631.1U	449 617	7 10	35 15	177 59	3:1 2:1	2:1 1-1/2:1	37	3.5	200	2	Power
Lake Fordyce FERC No 2310	97-26	Nevada	17 N 18 N	13 E 13 E	3,10 25,26 34,35,36	1937&81 1926 1960	6405.1U	31.7	772.	49,903	49,903	Rock Fill Conc. Face	6346.0P$ 6410.1U	1220	10	145	335	1:1	1:3:1	120 28	14.0 20.0	17,500	2	Power
Lake Spaulding FERC No. 2310	97-29	Nevada	17 N	12 E	10,15 16,20,21	1912 1917 1919	5014.6U	118.0	696.	74,773	74,773	Conc. Arch Conc. Grav. & Rock Fill	4878.5P$$ 5016.1U	800 309 613	11 4 6	276 42 91	186 35 210	16:100 3:100 Vert. Var.	Var	91.5 42 96 90	6.5 21.5 16.5 11.5	55,000	0	Spaulding No 1 & 2 P.H's

(a) Rebuilt in 1975
(b) Breached in 1976

$ Includes 1.5 parapet wall on Dams 1 & 2 Dam 3 has 5 feet parapet wall.
Includes 1.0 feet parapet wall
$$$ Includes 1.6 feet (maximum) parapet wall
@ Does not include natural lake
# Includes 2.2 feet parapet wall
$ Includes 3.5 feet parapet wall

D-014030
D-014030

PG&E

Reservoirs: South Yuba Water System
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Lake Sterling FERC No. 2310	97-30	Nevada	17 N	13 E	10,11	1877	6987.9U	1 02	111 6	1,764	1,764@	Rock Fill Gun Face	6702 3P 6990 2U$$$	228	11	32	70	1-1/4 1	1-1/3 1	12 7	7 3	400	2 3	Power
Lake Valley FERC No. 2310	97-32	Placer	17 N	12 E	25,26 35,36	1867-1911 1960	5784 9U	4.54	298.	7,964	7,964	Earth & Rock Fill	5855 5P 5789.9U	1035 525	30 20	75 26	417 150	1-3/4 1 4-3/4 1 1/1/4 1	2-1/2 1 2-1/2 1	100	7 5	1,400	4 5	Power
Lindsey Lake Upper FERC No. 2310		Nevada	18 N	12 E	21	About 1870	6482.6U	0.06	6	18	180@	Earth Fill & Rock Wall	6752 5 6485 4U	90	5	8	12	1:1	1/6 1	5	2 8	15	-	Power
Lindsey Lake Middle FERC No. 2310	97-41	Nevada	18 N	12 E	21	1870	6435.7U	0 41	23 9	110	1100@	Earth & Rock Wall Gunite Face	6705 5P 6438.2U	335	5	8	19	1 1	1/2 1	37	2 5	40	2	Power
Lindsey Lake Lower FERC No. 2310	97-36	Nevada	18 N	12 E	20,21	1870	6235 6U	0.81	29	293	293@	Earth & Rock Wall Gunite Face	6508.0P 6239.1U	487	5	16	34	5/6 1 1/4 1 1 1	1/2 1 3/4 1	42	3 5	240	2	Power
Meadow lake FERC No. 2310	97-40	Nevada	18N	13 E	14,15 22,23,27	1964	7281.8U	1.98	250	4,841	4,835@	Earth Fill & Rock Wall Gunite Face	7251.9P 7286 2U	840	40	38	130	2-1/2 1 1 5 1	1/8 1 1/2 1	65	4 4	570 1,360	2 4 0 5	Power
Peak Lake Upper (Cascade Lake) FERC No. 2310	97-47	Placer	17 N	14 E	29,32	1850	6607.4U	0 60	85.4	1,736	1,736@	Earth & Rock Fill	6752.0P 6611.4U	316	7	39	127	2 1	1-1/2 1	30	4 0	260 600	2 0 0 5	Power

(a) Rebuilt in 1975.
(b) Breached in 1978.

$$ Includes 1.5 parapet wall on Dams 1 & 2. Dam 3 has 5 feet parapet wall
Includes 1 0 feet parapet wall.
$$$ Includes 1.0 feet (maximum) parapet wall.
@ Does not include natural lake.
# Includes 2.2 feet parapet wall.
$ Includes 3.5 feet parapet wall.
** Gunited Upstream face in 1984

D-014031
D-014031

Reservoirs: South Yuba Water System
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Peak Lake Lower (Cascade Lake) FERC No 2310	97-37	Placer	17 N	14 E	29,30 31,32	1960	6581 9U	1 02	33 3	494	494@	Earth & Rock Fill Gunite Face	6725 0P 6685 4U	200 410	8 8	31 9	90 19	2 1 2 1,1 1	1 5 1 1/5 1	55	3 5	312	2	Power
Rock Creek FERC No 2310	97-43	Placer	13 N	8 E	28 33	1913-1916	1442.1U	2 40	55	548	548	Earth Fill Conc Mult Arch	1303 0P 1445 1U	611 795 1,020	4 10 -	8 14 36	28 75 -	2 1 2-1/2 1 1.1	2 1 2 1 -	60	3 0	400	1 0	Power
Rock Lake Upper FERC No 2310	97-49	Nevada	18 N	12 E	15	About 1855	6714 5U	0 23	21.1	207	207@	Earth Fill & Rock Wall	6985 0P 6717.1U	214	4	17	29	1 1 1-1/2 1	2/5 1 1/2 1	17	2 6	24	2	Power
Rock Lake Lower FERC No. 2310		Nevada	18 N	12 E	15,16	1855	6625 8U	0 36	8 7	48	48@	Earth & Rock Fill	6895 5P 6627 8U	110	5	10	15	1/2 1 1 1	1/2 1 1 1	30	2 0	33	1 5	Power
Rucker Lake FERC No. 2310	97-44	Nevada	17 N	12 E	8	1870	5464 2U	1.83	69 0	648	648@	Earth & Rock Fill	5499 5P 5468 2U	337 283	5 5	22 11	85 25	2 1 2 1	1-1/2 1 2 1 1/2 1	60	4 0	525	2	Power
White Rock Lake FERC No 2310	97-49	Nevada	18 N	14 E	14,15,22	1850	7820 0U	1.18	90	570	570@	Earth Fill & Rock Wall**	7752 5P 7824 0U	274	5	13	40	2 1 1-1/2 1	1/4 1 1-1/2 1	40	4 0	350	2	Power
Wise Forebay FERC No. 2310		Placer	12 N	8 E	4,9	1913-1916	1418 0U	None	6 3	32	32	Earth Fill	1200 0P 1422 0U	1,741	6	20	93	2-1/2 1	1-3/4 1	100	4 0	450	2	Wise P H Wise 2 PH

(a) Rebuilt in 1975.
(b) Breached in 1978.

$$ Includes 1 5 parapet wall on Dams 1 & 2 Dam 3 has 5 feet parapet wall
Includes 1 0 feet parapet wall.
$$$ Includes 1 8 feet (maximum) parapet wall
@ Does not include natural lake
# Includes 2 2 feet parapet wall
$ Includes 3 5 feet parapet wall.
** Gunited Upstream face in 1964

D-014032

D-014032

PG&E

Reservoirs: American River Water System

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Free-Board (11)	Primary Use
Echo Lake FERC No 184	97-52	El Dorado 	11 N 12 N	17 E 17 E	1 35,36	1992	7411 5U	4 9	338	1,890	1890@	Roller Compacted Concrete (RCC)	7415 0NGVD	282	12	14 5	31	1 1	1:1	30	9 5	3,410	0	Power
Medley Lakes (Lake Aloha) # FERC No 184	97-57	El Dorado 	12 N 12 N	16 E 17 E	24,25 20,29,30	1878 1917	8114 1U	3 36	630	5,083	5,083@	Rubble Masonry	8210 00P 8114 27U	113 #	3	20	17	Vert.	3/4 1	92 0 @@	0 2			Power
Silver Lake FERC No 184	97-58	Amador 	10 N 9 N	17 E 17 E	32,33 4,5,8	1878 1928	7261 1U	15 00	525	8,590	8,590@	Earth Fill & Rock Wall Gunite Face	7211 00P* 7265 07U*	280	30	32	95	2 1 1/4 1	1/5 1 1/2 1	29 5 12	14 75 10 0	2 840 3 650	4 0	Power
Caples Lake (Twin Lakes) FERC No. 184	97-59	Alpine 	10 N 10 N	17 E 18 E	22,23 19,20,30 18	1917 1923	7800 9U	13 5	600	21,581	21,581@	Earth, Conc. Core;Conc. Arch	7961 00P** 7905 9U	1,200 587	34 15	86 35	370 175	3 1 2 1 1 8 1 1 5 1	1 75 1 2 5 1 1 5 1	131 5 164 0	8 0 5 0	12,400	0 0	Power
El Dorado Forebay FERC No. 184	97-53	El Dorado	11 N	12 E	25	1923	3790 6U	0 26	23	472	472	Earth	3804 00P 3794.63U	836	15	91	518	3.1	2 5 1	20	7 0	450	2 4	El Dorado P H
Chili Bar FERC No 2155	97-125	El Dorado 	11 N 11 N	10 E 11 E	36,25 30,31,32	1964	997 5U	587	110	3,139	3,139	Concrete Gravity	1029.50U	375	18	120	100	Vert	0 7.1	170 0	31 0	100 000 130 000	3 5 0 0	Chili Bar P H

@ Does not include natural lake.
\# Also 11 auxiliary dams varying from 1.3' to 8.5' high, totalling 647' in length
@@ Over auxiliary Dam No. 6.

* Includes 2 0' parapet wall
** Includes 1.5' parapet wall

D-014033

D-014033

PG&E

Reservoirs: Mokelume River Water System

Revised: December 31, 1996

Name	State Dam Number	Location(1) County	Twp.	Rge	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Free-Board (11)	Primary Use
Bear River Upper FERC No 137	97-61	Amador	8 N	16 E	4,9	1900	5878 0U	28	173	6,806+	7,306	Rock Fill Gunite Face	5882.5U*	1,121	7	82	160	1/2 1 3/4 1	1/4 to 1.3 1	355 6	8 5 12 5	9 800 22 500	3 0	Power
Bear River Lower FERC No. 137	97-115	Amador	8 N	16 E	7,8,9,17 18,19,19 20	1952	5822.15U	37	746	48,725++	52,025	Rock Fill Conc. Face	5824.7P 5828.85U**	978 865	20 20	253 149	690 450	1 3 1 1 1	1 4 1 1 4 1	316 8	8 9 18	16 400 22,200	3 3 0 4	Salt Springs P H
Blue Lake Lower FERC No 137	97-62	Alpine	9 N	19 E	19,30	1895	8053 4U	4 63	198	5,091	5,091@	Earth & Rock	8055 4U 8040 7P	1083	25	40	101	1/2 1 2 1	1/2 1 2 1	48 12	5 1 6 8	1,150 2,200	2 0	Power
Blue Lake Upper FERC No 137	97-70	Alpine	9 N	18 E 19 E	12,13 18	1881	8137.5U	2 7	343	7,300	7,300@	Earth & Rock	8140 3U 8131 0P	837	21	31	74	2 1 Vert	1/2 1 2 1	51	4 4	573 1,100	2 0	Power
Electra Afterbay FERC No 137		Amador& Calaveras	6 N	12 E	32,33	1948	871.6U		20	20	40	Conc. Gravity	690 0P 692 6U	319	3	37	24	Vert	0 7 1	30 220	30 0 15 0			Electra P H
Electra Diversion FERC No. 137	97-114	Amador& Calaveras	7 N	13 E	33	1931	2029 6U	362	7	35	35 5	Conc. Gravity	2045 0P 2047.6U	188	4	50	37	Vert.	0 7 1	100	18 0			Power & Irrigation
Meadow Lake FERC No 137	97-63	Alpine	9 N	18 E	26,27	1903	7774 4U	5 5	140	5,656	5,656@	Rock Fill Gunite Face	7778 9U 7776 5P***	775	12	77	119	1/2 1 3/4 1	1/2 1 1 1	45	10	2,400 3,000	2 0	Power
Salt Springs FERC No 137	97-96	Amador& Calav	8 N 7 N 8 N 7 N	16 E 16 E 17 E 17 E	33,34,35 1,2 31 6	1931 1946 @@	3966.15U	169	983	136,864+++	141,857	Earth Fill Conc. Face	3964 5P 3966.65U#	1945	15	332	895	1 3:1	1 4 1	472 6 6	17 5 20 3	53,000 105,000	6 5 0	Salt Springs P H

\# Includes 6 0 feet parapet wall
Includes 2 0 feet parapet wall
\+ State Fish & Game requires minimum storage of 500 A.F.
++ State Fish & Game requires minimum storage of 3,300 A.F.
+++ State Fish & Game requires minimum storage of 4,993 A.F.

@ Does not include natural lake
@@ Spillway gates added

* Includes up to 4 3 feet parapet wall.
** Includes 4.0 feet parapet wall.

D-014034

D-014034

Reservoirs: Mokelume River Water System
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Tabeaud Forebay FERC No. 137	97-67	Amador	6 N	12 E	28	1901	1966 6U	0.75	44	1,246	1,259	Earth Fill	1968 0P 1970 6U	636	20	123	724	2-1/2 1 3 1	2-1/2 1	46	6	600 2,700	3 0	Electra P H
Tiger Creek Afterbay FERC No. 137	97-105	Amador & Calaveras	7 N	13 E	23,24	1931	2334.15U	357	70	2,607	2,607	Conc. Arch	2340 0P 2342.15U	448	8.5	100	24	Var.	Vert	295	20	72,000 68,000	4 0	West Point P H
Tiger Creek Forebay FERC No. 137	97-126	Amador	7 N	14 E	18	1931	3558.85U	None	2 3	39	39	Earth Fill	3559 15P 3561.30U	900	15	33		1 1	1 5 1	Siphons	2 45	675	2 45	Tiger Creek P H
Tiger Creek Regulator FERC No. 137	97-104	Amador	7 N	14 E	5,8	1931	3587.4U	9	13	522	533	Reinf. Conc. Slab & Buttr.	3590 15U 3588 0P##	510	6	100	125	1 1	1/4 1	Siphons Side	2 75	2800 Channel	1 Spill	Power
Twin Lakes FERC No. 137	97-89	Alpine	9 N	18 E 19 E	25 30	1898	8144 7U	.8	108	1,207 0++	1,207	Earth & Rock	8171.5P 8146.7U	1520	33	22	71	1/4 1 3 1	1/2 1 2 1	17	5	209	2 6	Power
Lyons FERC No. 1061	97-73	Tuol.	3 N	16 E	13,24	1930	4226.6U	66 8	184	6,224	6,228 *	Conc. Arch	4228 8P 4229.4U	535	6	132	32	Variable		80 204	12 8 6 8	21,000	1 8	Phoenix P H Irrig & Dam

Includes 6 0 feet parapet wall.
Includes 2 0 feet parapet wall.
+Low level outlet not allowed to be used, only outlet to powerhouse
++State Fish & Game requires no draft except 1 cfs fish release

@ Does not include natural lake
@@ Spillway gates added.

* Includes up to 4.3 feet parapet wall.
** Includes 4 0 feet parapet wall.
*** Includes 3 3 parapet wall.!

D-014035

D-014035

PG&E

Reservoirs: Stanislaus River Water System

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Crest Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Free-Board (11)	Primary Use
Stanislaus Forebay FERC No 2130	97-83	Tuol.	3 N	15 E	5,6	1908	2602 34U	None	18 3	320	320	Earth Fill Rock Ballast	2606 2U 2559 0P	1000 400	10 10	60 55	275 230	2-1/2 1 2-1/2 1	2 1 2 1	4 Siphons 33 5	3 9 3 9	540	2 2	Stanislaus P H
Stanislaus Afterbay FERC No. 2130		Tuol.	3 N	14 E	12	1963	1054 7U (c)	625	5.13	31.6	31 6	Conc. Slab with/ Superstructure	1013 0P 1060 2U	194		19	30	1 1	1/2 1			60,000 (d)		Stanislaus P H
Main Strawberry (Pinecrest Lake) FERC No. 2130	97-74	Tuol.	4 N	18 E	14,15 22,23	1916	5620 1U	26 6	298	18,266	18,312	Rock Fill Conc. Face	5623 5P 5626.1U	720	15	143	382	1 2 1	1 3 1	108	12 0	13,150 13,000	1 0	Power

(c) Bottom of notch.
(d) Elevation 1029P.

D-014036

D-014036

PG&E

Reservoirs: Kern, Kings, Merced, and San Joaquin River Water Systems

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Balch Afterbay FERC No 175	95-2	Fresno	12 S	26 E	1,12	1928 Rebuilt 1962	1704 0U	248	7	317	318	Conc Arch	1718 0U ⊙⊙	238	7	119	23	Vert	Var	233	14 0	40 000	0	Kings River P H
Black Rock (Balch Diversion) FERC No 175	95	Fresno	11 S 12 S	27 E 27 E	34 3	Rebuilt 1958	4098 0U	233	35	1,260	1,260	Conc. Arch	4108 0U	402	9	135	25	Var.	Var.	384	10 0	47,000	0	Balch P H No 1 & 2
Chilkoot FERC No 1354		Madera	6 S	23 E	17	1890	7497.20	3	57	308	310	Rock Crib	7499 0	118	4-10	7.7	24	1 1	1 1	7	1 8	30	0 5	Power
Corinne Lake (Wishon Forebay) FERC No 1354	95-4	Madera	9 S	23 E	7,8	1898	2401.00	0	7	69	69	Earth Fill	2403 5	1,572	10-40	15 0	45-80	Var	Var.	61 6	2 50	200	1 5	Wishon P H
Courtright Lake FERC No 1988	97-119	Fresno	9S 10 S	26 E 27 E 26 E 27 E	19,30,31 24,25,26 6,7 1,12	1958	8184.0U	39 7	1,632	119,200	123,286	Rock Fill Concrete Face with Partial u/s Blanket	8192 0U*	862	16	315	765	1.1 to 1.3 1	1 4 1	300	8 0	12 000 25 000	3 0	Helms P G P
Crane Valley (Bass Lake) FERC No 1354	95-3	Madera	7S	22 E	9,15,16 22,23,25 26	Rebuilt 1910	3376 76U ##	50 4 #	1,185	45,410	45,410	Earth & Rock	3380 86U	1,880	40-100	145	560	2 1	1 3 1 2 1	172 6	14 8	17 400 27,000	4 0	Crane Valley P H & S J Project Storage
Kerckhoff FERC No 96	95-8	Fresno Madera	9 S 9 S	22 E 23 E	13,24 18	1920	985.7U	1,461	160	4,252	4,252	Conc. Arch	994 5U	507	8	114 0	36	Var	Var	280	23 2	75,000	3	Kerckhoff P H 1 & 2
Kern Canyon Diversion FERC No 178		Kern	26 S	30 E	29	1921	948 0U	2,310	3	26	26	Concrete Overflow with Flashboards & Radial Gates	952 25U	150	6	27	6	Vert	Var	14 2 15 15 38 6 29 5 12 9	7 65 12 75 16 85 12 25 7 0 19 25	6 730	4 2	Kern Canyon P H

\# Not including Browns Creek Diversion.
⊙ Includes 1 25' parapet wall.
⊙⊙ Top of center pier

* Includes 4 0' parapet wall
** Also 4 auxiliary dams
Previous surveys indicate max water surface 3337.90 & 3376.40.

D-014037

D-014037

PG&E

Reservoirs: Kern, Kings, Merced, and San Joaquin River Water Systems

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Manzanita Lake (S.J. #2 Res.) FERC No 1354	95-12	Madera	8 S	22 E	12	1917	2817 7	61	26	164	168	Conc. Arch with Gravity Abut.	2817.7	205	3	30	6	Vert	1 12	10 9 7 9 7	6 3 4 7 2 7		1	Regulating Res San Joaquin P H #2
Merced Falls FERC No. 2467	95-10	Merced	5 S	15 E	4	Rebuilt 1930	344 0U	1,020	65	603	678	Earth Fill and Conc. Grav. (Levee) Overflow with Needle Crest	348 0U	1679	10	38	43	1 7 1	2 1	528 60 10	13 0 9'Nils 17 0 8 0	52,000 9,000 90	5 4 4	Merced Falls P H
San Joaquin #2 Forebay FERC No. 1354		Madera	8S	23 E	30	1917	2783.00	0 01	1	11	11	Masonry Arch Gunite Face ●	2785.14	189	3	26	8	Vert	1 8	60	4 0	170	2	San Joaquin P H #2 #**
San Joaquin #3 Forebay FERC No. 1354	95-6	Madera	8 S	22 E	11	1906	3218.77	0.02	3	19	20	Earth Fill	3225.00	450	10-15	40	140	Var	Var	42	8 2	170	5	San Joaquin P H #3
Lake Wishon** FERC No. 1988	97-118	Fresno	10 S 11 S	26 E 27 E 27 E 26 E	20,29,30 25,36 1 6	1958	6550 50U	177.00	1,025	129,078 Helms P G P. 89,100	129,118	Rock Fill Conc. Face	6554 0U*	3330 **	21	260	829	1.1 to 1 3 1	1 4 1 1 3 1	240	15 0	31,000	4	Haas P H & Helms P G P

Not including Browns Creek Diversion
● Includes 1.25' parapet wall
●● Top of center pier.

* Includes 4 0' parapet wall.
** Also 4 auxiliary dams
Previous surveys indicate max. water surface 3337.5 90 & 3376 40

D-014038

D-014038

PG&E

Reservoirs: Eel River Water System

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Location (1) Twp.	Location (1) Rge.	Location (1) Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Capacity Acre Feet (4) Gross	DAM Type	DAM Crest Elevation (5)	DAM Crest Length (6)	DAM Width (7)	DAM Height (8)	DAM Base Width (9)	DAM Slopes Upper	DAM Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Spillway Free-Board (11)	Primary Use
Pillsbury (Scott Dam,) FERC No. 77	97-101	Lake	18 N 18 N	10 W 9 W	1,2,3,10 11,12,13 14,23,24, 25 16,19,26 21	1921	1928.3U 1910.0P	289	2,290	80,558	80,643	Concrete Gravity Overflow	1924 6P 1842.9U @	8	402	134	130	Vert 1 10	0 62 1	402	24 6	137,000	3 1	Potter Valley P H
Van Arsdale (Cape Horn Dam) FERC No. 77	97-102	Mendocino	18 N	11 W	28,29,30, 33	1907	1494.3U @@	349	65	390	390	Earth Filled Conc. Grav. Overflow	1511.5P 1518.8U	520	10	90	290	3 1	2-1/2 1	283	26 5	115,000	4	Potter Valley P H

@ Includes 4.6 feet parapet wall.
@@ New USGS El. = 1.8 + Old USGS El.

D-014039

D-014039

PG&E

Reservoirs: Kilarc-Cow and North Battle Creek Water Systems

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Coleman Forebay FERC No 1121	97-87	Shasta	30 N	2 W	32	1911	937 9U	None	10 6	76 4	76 4	Earth Fill	868 9P 842 0U	2,604	11	20	69	1-1/2 1	1-1/2 1	103 5 10 0	4 1 8 1	500	3	Coleman P H
Cow Cr. Forebay FERC No 608		Shasta	32 N	1 W	31	1907	1537 2U	None	1	5 4	15.4	Earth Fill	1536 P 1538 9U	653	6	16	54	2-1/2 1	1-1/2 1	49 7	1 7	50	1 2	Cow Cr P H
Kilarc Forebay FERC No 608		Shasta	33 N	1 E	33	1903	3782 4U	None	4 5	30 4	30 4	Earth Fill	3840 0P 3785 4U	1,419	6	13	43	1-1/2 1	1-1/2 1	10	3 0	50	1 6	Kilarc P H
Lake Grace FERC No 1121		Shasta	30 N	1 E	4	1907	3478 2U	None	8 5	46 5	46.5	Earth Fill	3450 1P 3482 6U	1,688	10	16	67	1-1/2 1	1-1/2 1	15	4 4	185	2	Volta P H
Lake Nora FERC No 1121		Shasta	30 N	1 E	4	1900	3429 6U	None	3 5	14.9	14.9	Earth Fill	3403 8P 3432 6U	1,504	12	14	59	1-1/2.1	1-1/2 1	12 12	2 8 2 8	110	1 5	Volta P H
Macumber FERC No 1121	97-94	Shasta	31 N	2 E	10,15	1909	4084.5U	25 0	85	430.0	430.0	Masonry Earth Fill	4101 0P 4092.2U	187 2,238	8 13	27 13	32 52	1/6 1 1-1/2 1	Varies 1-1/2 1	165	7 7	8,500	2	Power
No Battle Creek FERC No 1121	97-96	Shasta	32 N	3 E	20,21, 28	1909	5563 2U	6 6	80	1,090.0	1,090.0	Rockfill Conc. Face	5250 2P* 5567.4U*	438	22	51	79	1/5 1	1/4 1	35 7	9 0	2,400	1 0	Power

*Includes 4 0 feet parapet wall.

D-014040

D-014040

PG&E

Reservoirs: Pit and McCloud Water Systems

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Hat Creek #1 Diversion FERC No 2661		Shasta	35 N	4 E	5	1935	3189 0U	577	17 6**	48**	48**	Conc. Slab & Buttress	3210 5P 3191.0U	231	1/2	12	11	1.1	1 12	50 4 101 3	4 0 2 0	2,020	0	Hat Creek #1 P H
Hat Creek #2 (Baum Lake) FERC No 2661	97-109	Shasta	36 N	4 E	29,32	1943	2975.7U	586	69	629	629	Conc. Grav. Earth Wing	2999 0P 2979 5U	42 8 50	7 10	29 18	22 66	Vert 2.1	1/2.1 2 1	Siphon 6 0	3 8 21 0	1,110 1,490	2	Hat Creek #2 P H
Iron Canyon Reservoir FERC No. 2106	97-124	Shasta	37 N	1 W	16,17,20 21,22	1965	2665.0U	11	500	24,197	24,241	Earth Fill	2675.0U	1,130	30	214	965	3 1	3 1	187-10	10 0	8,000	5	Black P H
Lake Britton (Pit 3) FERC No. 233	97-98	Shasta	37 N	3 E	30 (Dam Only)	1925	2738.5U	4,606	1,293 0	41,877	41,907	Concrete	2770 0P 2750.5U	494	10	130	106	Vert.	3/4 1	254	18 0	64 000 70 000	1 0	Pit 3 P H
Lake McCloud FERC No. 2106	97-123	Shasta	38 N	2 W	27 (Dam Only)	1965	2690.0U (a)	398	520	35,229	35,234	Earth & Rock Fill	2690 0U	630	35	241	1,150	2 1 3 1	2.1	81	32 0	30,000 50,000	10 0	Power
Pit #1 Diversion FERC No 2687	97-99	Shasta	37 N	4 E	25 (Dam Only)	1921	3305 1U	600+/-		@	@	Conc. Grav.	3327.0P 3306.8U	800	5	15	8	Vert	0 4 1	60	13	-	-	Pit 1 P H
Pit #1 Forebay FERC No. 2687	97-110	Shasta	37 N 37 N	4 E 5 E	24,25 19,30	1947	3304 8U	600+/-	222 0	2,451	3,212	Earth & Rock Fill	3332 0P# 3311 8U	586	20	44	320	2 1 3 1	2 1 3 1	45	22 0	8 000 13,000	7 0	Pit 1 P H
Pit #4 Forebay FERC No 233	97-110	Shasta	36 N	2 E	8,9	1927	2422.5U	4,643	105	1,970	1,970	Conc. Grav. Slab & Buttress	2,458 0P## 2,438.5U	415	10 4	108 58	67 130	Vert 1.78 1	0 7.1 1/2.1	136	30 5	69,000 77,000	3 0	Pit 4 P H

\# Includes 2.0 feet parapet wall
\## Includes 3.0 feet parapet wall

(a) Top of Gates are at elevation 2682 5.
(b) Bottom of V Notch.
@ Water surface to vary between 3303 8 and 3304 8 at different times of year by court decree

* Includes 2.8 feet parapet wall.
** Combination of Diversion Reservoir, Canal and Forebay
$ Top of Gates are at elev. 2044.8

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Reservoirs: Pit and McCloud Water Systems
(Continued)

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Depth (10)	Capacity C.F.S.	Free-Board (11)	Primary Use
Pit #5 Intake FERC No. 233	97-107	Shasta	36 N	1 E	9,10	1944	2040 5U $	4,810	32 0	314	327	Conc Grav Overflow	2075 0P 2055 5U	340	48	67	55	Vert	Var	200	37 0	62,000 132,000	15 0	Power
Pit #5 Open Conduit EMB FERC No. 233	97-108	Shasta	36 N	1 E	5,6 7,8	1944	2041.5U	4 3	48 0	1044	1044	Earth Fill	2065 0P 2045 5U	2,964	18	71	315	2-1/2 1 2 1	2 1	Siphon	4 0 3 4	4,000	3	Pit 5 P H
Pit #6 Forebay FERC No. 2106	97-121	Shasta	35 N	1 W	5 (Dam Only)	1965	1428.0U	4,770	268	15,605	15,886	Conc Grav.	1432 8U*	582	20	193	142	Vert	3/4:1	98 0	46 8	96,000 115,000	5 0	Pit 6 P H
Pit #7 Forebay FERC No. 2106	97-122	Shasta	35 N	1 W	32 (Dam Only)	1965	1271.0U	4,897	471	34,302	34,811	Conc Grav.	1277.8U*	907	20	228	176	Vert	3/4 1	98 0	46 8	96,000 115,000	5 0	Pit 7 P H
Pit #7 Afterbay FERC No. 2106		Shasta	35 N	1 W	31	1965	1036 0 (b)	-	69	0	0	Steel Reinf Rock Fill	1064 0U	732	20	30	120	2 1	2-1/4 1	560 1418&2	4 0, 6 28 0	-	-	Pit 7 P H

Includes 2 0 feet parapet wall.
Includes 3 0 feet parapet wall.

(a) Top of gates are at elevation 2682.5.
(b) Bottom of V notch.
@ Water surface to vary between 3303 8 and 3304 8 at different times of year by court decree.

* Includes 2 8 feet parapet wall.
** Combination of Diversion Reservoir, Canal and Forebay.
$ Top of Gates are at Elev. 2044.8U

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PG&E

Reservoirs: South Yuba Water System

Revised: December 31, 1996

Name	State Dam Number	Location (1) County	Twp.	Rge.	Section	Built	Maximum Water Surface Elev. (2)	Drainage Area Sq. Mi.	Flooded Area Acres (3)	Capacity Acre Feet (4) Usable	Gross	DAM Type	Crest Elevation (5)	Crest Length (6)	Crest Width (7)	Height (8)	Base Width (9)	Slopes Upper	Slopes Lower	Spillway Width	Spillway Depth (10)	Spillway Capacity C.F.S.	Free-Board (11)	Primary Use
Alta Forebay FERC No 2310		Placer	16 N	11 E	30	Rebuilt 1955	4240 0U	None	5 0	28 5	37 5	Earth Fill	4102 0P 4243 0U	150	12	12	84	3 1	3 1	8 5	3 0	50	1 5	Alta P H
Blue Lake FERC No 2310	97-12	Nevada	17 N	12 E	9	Before 1870	5931.6U	0 27	63.	1163	1163@	Earth Fill Rock Wall	5964 0P 5935 6U	262	25	21	59	3/4 1 1:1	4/5 1	12	4 0	100	2	Power
Christian Valley (Halsey Afterbay) FERC No 2310	97-15	Placer	13 N	8 E	25, 26	1913-1916	1496 0U	3 5	10.	96	106	Rock Fill	1358 2P 1501 2U#	300	8	40	75	1/2 1	1-1/4 1	47 5 24 5	5 2 7 2	2,250	1	Power
Culbertson Lake FERC No. 2310	97-17	Nevada	18 N	12 E	15,16 21,22	1852 1872 1922	6436 4U	0 44	70	953	3150	Earth/Rock Fill Gunite Face	6707 8P 6440 2U	255	8	20	77	1-3/4 1	1-2/3 1	23	3 8	165	2	Power
Deer Creek Forebay FERC No. 2310		Nevada	17 N	10 F	35	1907	4473.0U	None	3 3	15.7	15 7	Earth Fill	4500 0P 4475 0U	1175	9	14	55	2.1	1-1/2 1	40 7 4	2 0 6 0	120	1	Deer Creek P H
Drum Afterbay FERC No. 2310	97-126	Placer Nevada	16 N	11 E	18,17	1968	3383.2U	12.0	10.	341	341	Concrete Arch	3385 0P 3385 0U 4475 0U	356	7	102	18	Var.	Var	72 7 4	7 3 6 0	3 275 5,300	1 8 0	Dutch Flat #1 P H
Drum Forebay FERC No 2310	97-20	Placer	16 N	11 E	16	Rebuilt 1965	4762.5U	None	23.	621	621	Earth Fill	4768 5U	4107	12	65	325	3 1	1-1/2 1 3 1	100 7 4	5 0 6 0	700	4 0	Drum 1 PH Drum 2 PH
Feeley Lake Upper FERC No. 2310	97-45	Nevada	18 N	12 E	29	1870-1875	6723 6U	0 40	56.3	739	739@	Earth & Rock Fill	6996 0P 6727 6U 4475 0U	210	15	23	60	5/8 1	1-1/2 1	32 7 4	4 0 6 0	280	2	Power

(a) Rebuilt in 1975.
(b) Breached in 1978.

$$ Includes 1 5 parapet wall on Dams 1 & 2. Dam 3 has 5 feet parapet wall.
Includes 1 0 feet parapet wall
$$$ Includes 1 6 feet (maximum) parapet wall.
@ Does not include natural lake
# Includes 2 2 feet parapet wall
$ Includes 3 5 feet parapet wall

D-014043

D-014043

APPENDIX C

LAKE ALMANOR SYSTEM WATER SUPPLY BENEFIT ANALYSIS ASSUMPTIONS

Appendix C

Lake Almanor System Water Supply Benefit

Analysis Assumptions

This appendix describes the assumptions used in analyzing potential new system water supply benefits through reoperation of PG&E's Lake Almanor facility on the North Fork of the Feather River.

System

This analysis is being conducted in the context of current CALFED No Action studies using the statewide planning model DWRSIM. The CALFED 2020 Level No Action condition studies used to represent pre-reoperation conditions are DWR's DWRSIM studies 785 and 786. Inputs into DWRSIM are being adjusted to determine quantitative system benefits.

In the analysis, it is assumed, that hydroelectric generation benefits need not necessarily be preserved, however 2020 Level water supply benefits are to be preserved as existing prior to reoperation of this facility.

North Fork Feather River

1) In order to produce simulations of Lake Almanor, a 1922 through 1994 Lake Almanor inflow record had to be estimated. For every year of the period of record, some flow data exists on the North Fork of the Feather River, but data sufficient for a Lake Almanor unimpaired flow calculation only exists for the periods of 1937 through 1958 and 1981 through 1994. The remaining periods of 1922 through 1936 and 1959 through 1980 had to be estimated.

    a) For these periods, annual inflow (water year based) into Lake Almanor was estimated based on a linear regression between estimated annual inflow and partial year (October through April) cumulative precipitation at Chester, California, for 1937 through 1958 and 1981 through 1994 combined. The linear regression R^2 value is greater than 88 percent. A trend in the residuals from 1986 through 1992 indicate that there is a lagged flow component that may recede during a extended drought period. The resulting estimated annual inflow during the 1928 through 1934 period therefore is probably overestimated.

    b) Given the annual inflow estimate for 1922 through 1936 and 1959 through 1980 a pattern of inflow had to be estimated. A monthly pattern of flow was selected based upon the 1937 through 1958 and 1981 through 1994 record and applied to the 1922 through 1936 and 1959 through 1980 period. Doing this type of estimate is very coarse; possible spring inflow spikes and summer inflow lows are averaged away. A better estimate of inflow pattern could be developed based upon the timing of precipitation, air temperature and other assumptions regarding the morphology of the drainage basin (i.e., pumice deposits leading to sustained base flows, etc.). For this analysis, the conclusions are expected to be insensitive to the monthly distribution of Lake Almanor inflow.

2) For performing both Lake Almanor simulations, the following assumptions were made:

   a) Lake Almanor evaporation was taken from a table found in DWR-DOP files. It appears to be based on PG&E data. Evaporation rates are constant for all years. Total evaporation is based on the surface area determined from an assumed capacity – surface area relationship.

   b) Minimum storage in Lake Almanor is the FERC Minimum Pool requirement of 500 TAF (evaporation of course may draw it lower). Maximum storage is assumed at 1145 TAF at an elevation of 4494 feet above MSL (DWR DSOD allows storage above 4490 feet above MSL only under specific conditions).

   c) Lake Almanor minimum bypass flow is 35 cfs in all months.

   d) Belden Forebay minimum flow is on the following schedule. This flow can be met through releases through Butt Valley powerhouse.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CFS	60	60	60	80	140	140	140	140	80	60	60	60

   e) Maximum Butt Valley powerhouse flow is 2200 cfs.

3) For performing the "maximum" hydroelectric generation simulation the following additional assumptions were made:

   a) Annual low point in storage which occurs between the end of September and the end of December should be as near 650 TAF as possible in all types of years. An end of September target storage of 700 TAF was specifically targeted in the operation rules.

   b) A "forecast" calculation was performed each March. The sum of the remaining inflow expected from March through September was calculated (perfect foresight). To this sum the end of February storage was added and the end of September target was subtracted. In addition, an additional 110 TAF/YR was assumed to be lost to evaporation and bypass flow requirements.

   c) With the forecast assumed, the "scheduled" release was selected by linear interpolation off of the following table. The pattern of releases may represent more or less water than the actual forecast calculation represents.

	Forecast (TAF/YR):					
	0	250	500	750	1000	1500
	Flow (CFS):					
JAN	0	0	0	0	0	2200
FEB	0	0	0	0	0	2200
MAR	0	0	0	0	1100	2200
APR	0	0	0	550	2200	2200
MAY	0	0	0	2200	2200	2200
JUN	0	550	1650	2200	2200	2200
JUL	1100	2200	2200	2200	2200	2200
AUG	1100	2200	2200	2200	2200	2200
SEP	0	550	2200	2200	2200	2200
OCT	0	0	1100	2200	2200	2200
NOV	0	0	0	0	1650	2200
DEC	0	0	0	0	0	2200

d) The simulation was inspected to see if each year had nearly 150 TAF of stored water released pursuant to a 1967 PG&E DWR agreement for Western Canal diversions.

4) For performing the critical period water supply simulation the following additional assumptions were made:

a) The "forecast" calculation used in the hydroelectric generation simulation is used here as well.

b) With the forecast assumed, the "scheduled" release was selected by linear interpolation off of the following table:

	Forecast (TAF/YR):					
	0	250	500	750	1000	1500
	Flow (CFS):					
JAN	2200	0	0	0	0	0
FEB	2200	1100	0	0	0	0
MAR	2200	1100	0	0	0	0
APR	2200	2200	1100	0	0	0
MAY	2200	2200	1100	1100	0	0
JUN	2200	2200	2200	1100	1100	0
JUL	2200	2200	2200	2200	1650	0
AUG	2200	2200	2200	2200	1650	0
SEP	2200	2200	2200	1100	1100	0
OCT	2200	2200	1100	1100	0	0
NOV	2200	1100	1100	0	0	0
DEC	2200	1100	0	0	0	0

c) No low point target is actually desired, but one is assumed along with the release schedules that were assumed in order to get the desired effect on operations.

5) No other modifications to the DWRSIM studies 785 and 786 were made other than the change to the inflow to Lake Oroville.

APPENDIX D

LAKE ALMANOR SYSTEM ENVIRONMENTAL BENEFIT ANALYSIS ASSUMPTIONS

Appendix D

Lake Almanor System Environmental Benefit

Analysis Assumptions

This appendix describes the assumptions used in analyzing potential new system environmental benefits through reoperation of PG&E's Lake Almanor facility on the North Fork of the Feather River.

System

This analysis is being conducted in the context of a CALFED No Action study using the statewide planning model DWRSIM. The CALFED 2020 Level No Action condition study used to represent pre-reoperation conditions is DWR's DWRSIM study 786. Inputs into DWRSIM are adjusted to determine quantitative system benefits.

In the analysis, it is assumed that hydroelectric generation benefits need not necessarily be preserved, however 2020 Level water supply benefits are to be preserved as those existing prior to reoperation of this facility.

North Fork Feather River

The development of basic data general to all simulations, and the assumptions used to develop the "maximum" hydroelectric generation simulation are discussed in Appendix B, "Lake Almanor System Water Supply Benefit Analysis Assumptions."

The following assumptions pertain to specific considerations in the preparation of the additional simulation developed for analyzing potential environmental benefits:

1) For performing the environmental simulation the following additional assumptions were made:

   a) The "forecast" calculation used in the hydroelectric generation simulation is used here as well, but the forecast occurs at the end of May, after March and May releases for ERP have been accounted for.

   b) With the forecast assumed, the "scheduled" release was selected in the same manner as that used in the "maximum" hydroelectric generation simulation.

2) No other modifications to the DWRSIM study 786 was made other than the change to the inflow to Lake Oroville.

3) DWR simulation 786 was first run with the ERP postprocessor turned on. DWRSIM determines willing seller inflow requirements at various points in the system needed to accomplish the ERP target flows specified in the model input. Assuming <u>all</u> ERP flow targets, each willing seller location provides the additional amounts needed above the respective location. For this simulation, only the Delta Outflow seller contribution, limited to 2200 CFS, was scheduled for

release from Lake Almanor. All other ERP willing seller contributions apart from those met by Lake Almanor were considered in determining the Lake Almanor release schedule.

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