Initial Sensitivity Evaluation of Operational Parameters and Storage Capacities Using the CALFED Post-Processing Operations Model

Upstream of Delta Off-Stream Storage Facilities

AGRICULTURAL AND URBAN WATER SUPPLY EVALUATION

Introduction

Environmental water supply benefits from new upstream of Delta storage facilities would be achieved by releasing the water from storage to meet agricultural and urban needs. This water would be released for use during periods of need and maintain protection for the ecosystem. The capacity of the new storage facility, rules governing diversions into storage, and operational goals (e.g. maximum normal period supply or maximum dry period supply) all affect the magnitude of potential agricultural and urban water supply benefits.

The CALFED spreadsheet operations model was used to evaluate effects of various operational rules and physical capacities of new upstream of Delta storage facilities on potential agricultural and urban water supply benefits. A sensitivity analysis was conducted by individually exercising the operational parameters through reasonable ranges with a set upstream of Delta maximum storage capacity of 3.0 maf and inflow/outflow conveyance capacities of 5,000 cfs, devoted exclusively to agricultural and urban water supply. These ranges were defined using input from agency represetnatives, stakeholders, and previous analysis. Information from this phase of the evaluation was then used to develop eight operation conditions which collectively bracket the range of potential operations. These eight operations conditions define two operational goals implemented under four external conditions.

The first operational goal modeled is to maximize supplies over normal hydrologic periods. This goal is achieved by imposing no storage carryover requirement and releasing water from storage whenever unmet demand exists. A by-product of this type of operation is that supplies in storage are often depleted when entering critically dry periods. The second operational goal is to maximize supplies in the driest years of normal hydrologic sequences. This goal is achieved by reducing the amount of water delivered from storage in any given year through methods such as imposing carryover requirements. While this type of operation usually results in relatively larger quantities of water in storage for use during extended dry periods, overall long-term water deliveries are diminished.

Input from agency representatives, and stakeholders suggested a need to maintain certain flow events to protect geomorphological processes along the upper un-leveed portion of the Sacramento River and biological processes in the river and in the San Francisco\San Joaquin Bay-Delta prior to diverting flows for any new storage facilities. A one month volume in combination with an equivalent two month volume is used in

Table NA-1
Bracketing Operational Conditions

Condition	Description
A	Existing Banks PP Capacity/Low S.R. Flow Event Targets -- Normal Period Supply Operation. This condition assumes existing Banks Pumping Plant capacity is in operation and diversions to upstream of Delta storage are limited by low Sacramento River flow event targets. The storage facility is operated to provide maximum supplies over normal hydrologic periods.
B	Existing Banks PP Capacity/Low S.R. Flow Event Targets -- Dry Period Supply Operation. This condition assumes existing Banks Pumping Plant capacity is in operation and diversions to upstream of Delta storage are limited by low Sacramento River flow event targets. The storage facility is operated to provide maximum supplies in critically dry years.
C	Expanded Banks PP Capacity/Low S.R. Flow Event Targets -- Normal Period Supply Operation. This condition assumes increased Banks Pumping Plant capacity as proposed in the Department of Water Resources Interim South Delta Improvement Plan is in operation and diversions to upstream of Delta storage are limited by low Sacramento River flow event targets. The storage facility is operated to provide maximum supplies over normal hydrologic periods.
D	Expanded Banks PP Capacity/Low S.R. Flow Event Targets -- Dry Period Supply Operation. This condition assumes increased Banks Pumping Plant capacity as proposed in the Department of Water Resources Interim South Delta Improvement Plan is in operation and diversions to upstream of Delta storage are limited by low Sacramento River flow event targets. The storage facility is operated to provide maximum supplies in critically dry years.
E	Existing Banks PP Capacity/High S.R. Flow Event Targets -- Normal Period Supply Operation. This condition assumes existing Banks Pumping Plant capacity is in operation and diversions to upstream of Delta storage are limited by high Sacramento River flow event targets. The storage facility is operated to provide maximum supplies over normal hydrologic periods.
F	Existing Banks PP Capacity/High S.R. Flow Event Targets -- Dry Period Supply Operation. This condition assumes existing Banks Pumping Plant capacity is in operation and diversions to upstream of Delta storage are limited by high Sacramento River flow event targets. The storage facility is operated to provide maximum supplies in critically dry years.
G	Expanded Banks PP Capacity/High S.R. Flow Event Targets -- Normal Period Supply Operation. This condition assumes increased Banks Pumping Plant capacity as proposed in the Department of Water Resources Interim South Delta Improvement Plan is in operation and diversions to upstream of Delta storage are limited by high Sacramento River flow event targets. The storage facility is operated to provide maximum supplies over normal hydrologic periods.
H	Expanded Banks PP Capacity/High S.R. Flow Event Targets -- Dry Period Supply Operation. This condition assumes increased Banks Pumping Plant capacity as proposed in the Department of Water Resources Interim South Delta Improvement Plan is in operation and diversions to upstream of Delta storage are limited by high Sacramento River flow event targets. The storage facility is operated to provide maximum supplies in critically dry years.

Table NA-2
Statistical Measures of Ag & Urban water Supply Benefits

Measure	Description
1	71-Year Average Annual Environmental Delta Outflow. Annual average over the historical hydrologic sequence used in the model simulations.
2	1928-34 Critical Dry Period Average Annual Environmental Delta Outflow. Annual average over the seven year critical dry period.
3	Average Dry Year Environmental Delta Outflow. Annual average over the sixteen water years classified as dry years within the 71-year hydrologic sequence.
4	Average Critically Dry Year Environmental Delta Outflow. Annual average over the eleven water years classified as critically dry years within the 71-year hydrologic sequence.
5	Minimum Annual Environmental Delta Outflow. The minimum annual quantity that occurs over the 71-year hydrologic sequence.

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this evaluation to limit diversions to storage. In addition, for this evaluation, the Sacramento River flow event target is considered a recurring annual target. Beginning each October this flow target in addition to existing in-stream and/or navigation requirements must be met prior to diverting any flows to storage. Once the target is met for the current water year only existing in-stream and/or navigation requirements must be met prior to diverting subsequent flows to storage during the water year. An initial sensitivity evaluation (described below) indicates the Sacramento River flow event target has negligible effects on storage operations below a flow event target of 500 taf and minimal effects on storage operations above a flow event target of 1,000 taf. For subsequent analysis the Sacramento River flow event target was considered an external condition to be applied in conjunction with existing or expanded Banks Pumping Plant capacity.

The four external conditions considered in this evaluation address the capacity of Banks Pumping Plant, the State Water Project Delta pumping facility and Sacramento River flow event target. Under the first external condition, existing Banks Pumping Plant capacity is assumed in conjunction with low Sacramento River flow event targets. Under the second external condition, an expanded Banks Pumping Plant capacity as proposed in the Department of Water Resources South Delta Improvements Plan is assumed in conjunction with low Sacramento River flow event targets. Under the third external condition, existing Banks Pumping Plant capacity is assumed in conjunction with high Sacramento River flow event targets. Under the fourth external condition, an expanded Banks Pumping Plant capacity as proposed in the Department of Water Resources South Delta Improvements Plan is assumed in conjunction with high Sacramento River flow event targets. The eight operation conditions defined by the two operational goals under these four external conditions are described in Table NA-1.

Once defined, each of the eight operation conditions were input to the CALFED spreadsheet operations model. Potential agricultural and urban water supply benefits were evaluated for maximum storage capacities ranging from 100 taf to 5.0 maf. In this evaluation, south of Delta SWP and CVP demands were used as a as a surrogate for agricultural and urban water supply demands. In actual practice, agricultural and urban water supply benefits from upstream of Delta storage might be designated to a subset of SWP and CVP users, other south of Delta agricultural and urban water users, or upstream of Delta users through a water exchange program. Five statistical measures of agricultural and urban water supply benefits are included in this analysis, as described in Table NA-2.

Agricultural and urban water supply benefits, as described by these five statistical measures, were estimated for each of the eight sets of operation conditions over the range of maximum storage volumes. While this information should not be considered definitive, this evaluation illustrates the potential for agricultural and urban water supply benefits from upstream of Delta storage facilities and the effects of various external conditions and operational goals. The information developed in this evaluation may be

used to provide an initial refinement of the range of storage volumes of potential upstream of Delta storage facilities which should be considered in future studies.

Summary

This evaluation provides initial quantitative information on agricultural and urban water supply benefits that might be provided by new upstream of Delta storage facilities. Additional information on water quality benefits, interaction with environmental water supply opportunities, interactions with other potential new storage and conveyance facilities, costs of new storage facilities, and environmental acceptability of new storage facilities must all be considered in a further refinement of agricultural and urban water storage facilities.

Summary results of this initial evaluation are presented in Figures NA-1 thorugh NA-4. These charts display net increases in 71-Year Average Annual Environmental Delta Outflow and Minimum Annual Agricultural and Urban Water Supply Benefits, respectively, under the eight operation conditions described in Table NA-1 for storage volumes ranging from 100 taf to 5.0 maf. The charts allow comparison of the range of potential benefits under various Banks Pumping Plant capacities, Sacramento River flow event targets, operational goals, and storage capacities.

As evidenced by the ranges between the curves of Figures NA-1 through NA-4, this initial evaluation demonstrates the importance of operating assumptions on the outcome of water supply evaluations. As water supply benefits over normal hydrologic periods are emphasized, 71-Year Average Agricultural and Urban Water Supply Benefits are maximized at a cost to the Minimum Annual Agricultural and Urban Water Supply Benefits. As water supply benefits over dry hydrologic periods are emphasized, Minimum Annual Agricultural and Urban Water Supply Benefits are maximized at costs to other statistical measures of Agricultural and Urban Water Supply Benefits.

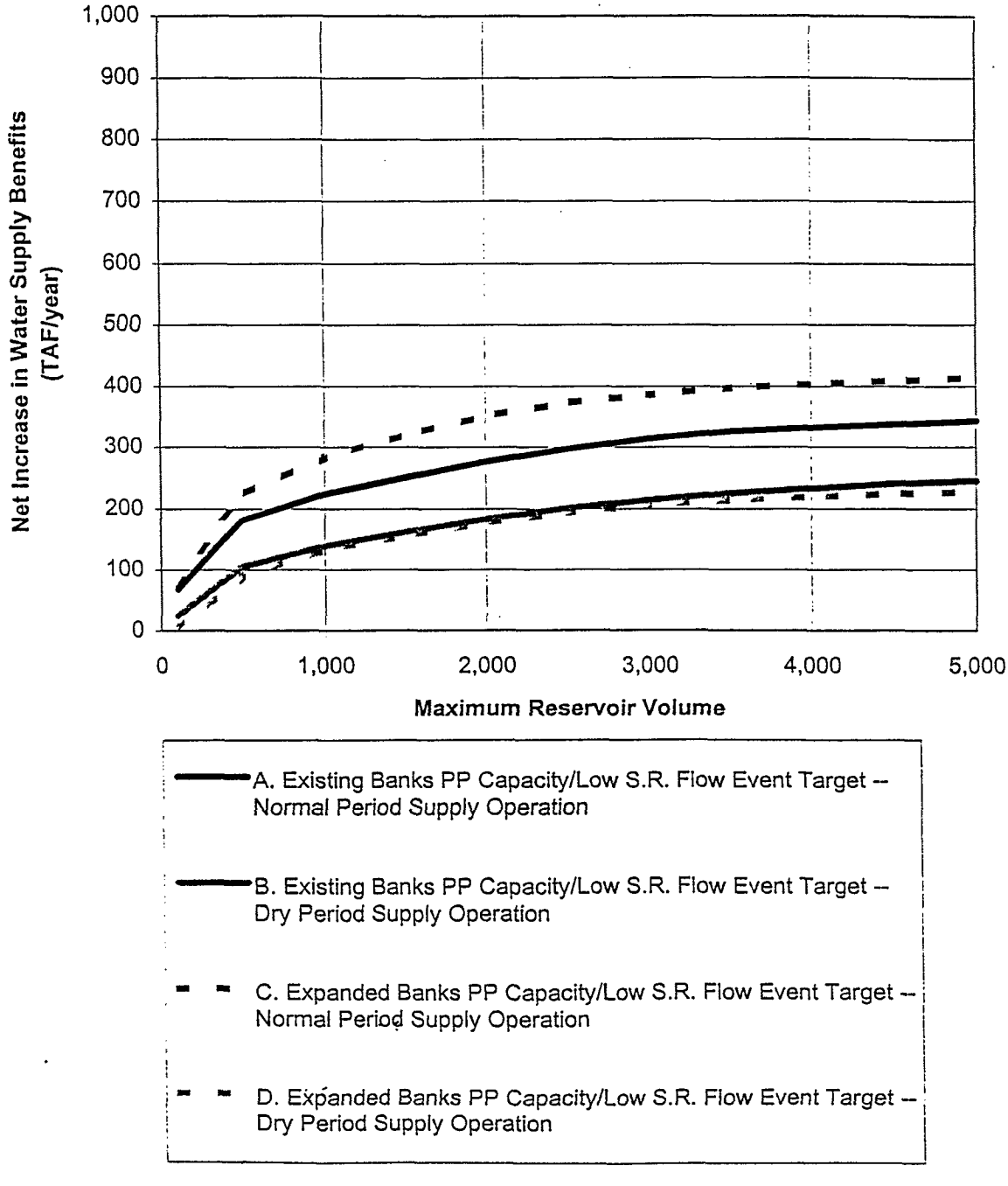
This is illustrated by comparing the curves in Figures NA-1 and NA-2. In Figure NA-1, Expanded Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition C) reaches a net increase of about 400 taf for 71-Year Average Agricultural and Urban Water Supply Benefits at a storage volume of 4.0 maf, and the Expanded Banks Pumping Plant Capacity -- Dry Period Supply Operation (Condition D) reaches a net increase of about 220 taf for 71-Year Average Agricultural and Urban Water Supply Benefits at a storage volume of 4.0 maf. In Figure NA-2, Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition A) reaches a maximum net increase of about 800 taf for Minimum Annual Agricultural and Urban Water Supply Benefits at a storage volume of 3.5 maf, and the Existing Banks Pumping Plant Capacity -- Dry Period Supply Operation (Condition B) reaches a net increase of about 950 taf for Minimum Annual Agricultural and Urban Water Supply Benefits at a storage volume of 3.5 maf.

Banks Pumping Plant has varying effects on Agricultural and Urban Water Supply Benefits. This is illustrated by comparing the curves in Figures NA-1 and NA-2. In Figure NA-1, Expanded Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition C) reaches a net increase of about 400 taf for 71-Year Average Agricultural and Urban Water Supply Benefits at a storage volume of 4.0 maf, and the Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition A) reaches a net increase of about 330 taf for 71-Year Average Agricultural and Urban Water Supply Benefits at a storage volume of 4.0 maf. In Figure NA-2, Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition A) reaches a maximum net increase of about 685 taf for Minimum Annual Agricultural and Urban Water Supply Benefits at a storage volume of 3.0 maf, and the Expanded Banks Pumping Plant Capacity -- Normal Period Supply Operation (Condition C) reaches a net increase of about 375 taf for Minimum Annual Agricultural and Urban Water Supply Benefits at a storage volume of 3.0 maf.

Increasing the Sacramento River flow event target has varying effects in reducing Agricultural and Urban Water Supply Benefits. This is illustrated by comparing the curves in Figures NA-2 and NA-4. In Figure NA-4, the maximium net increase of about 200 taf for Minimum Annual Agricultural and Urban Water Supply Benefits is reached at a storage volume of 1.5 maf and does not increase beyond this amount for any operational condition. In Figure NA-2, the minimum net increase of about 375 taf for Minimum Annual Agricultural and Urban Water Supply Benefits is reached at a storage volume of 1.0 maf and increases significantly beyond this amount for all operational conditions as storage volume is increased.

Figure NA-1

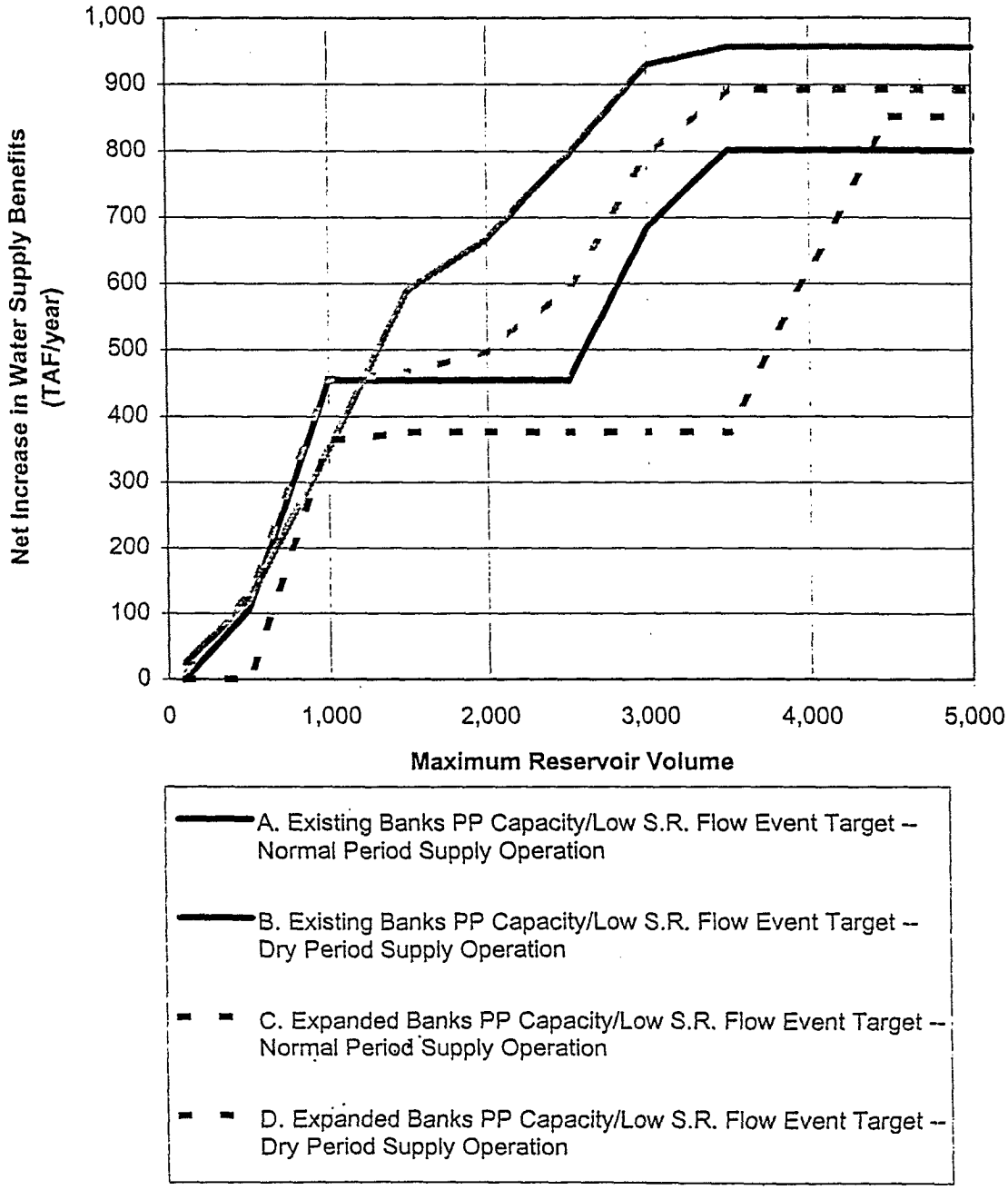
Upstream of Delta Off-Stream Storage
Net increase in 71-Year Average Ag & Urban Water Supply Benefits versus Maximum Storage Volume



NA_RVSM.XLS: Net 71-Yr Avg Chart 3/27/97

Figure NA-2

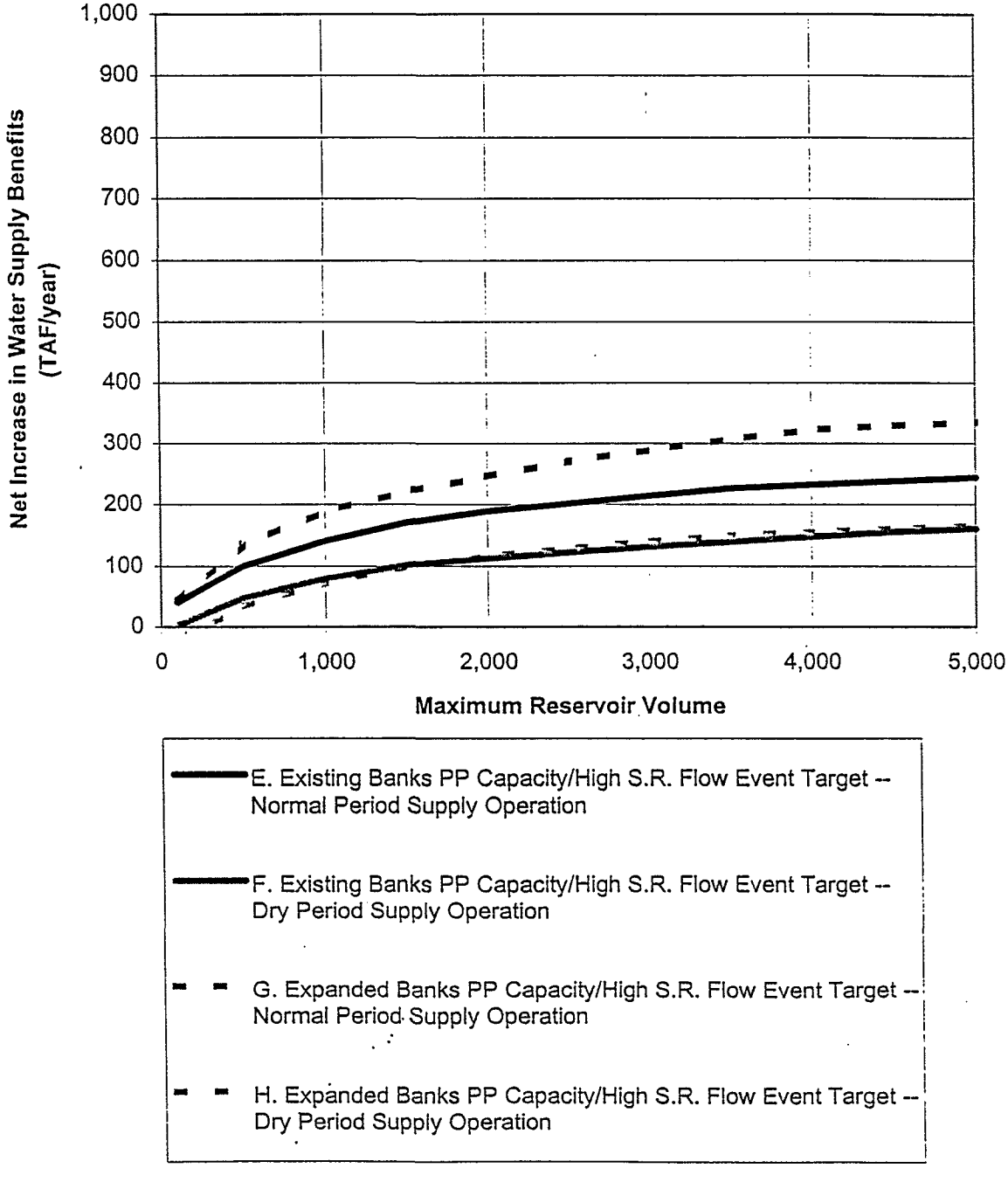
Upstream of Delta Off-Stream Storage
Net Increase in Minimum Annual Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM.XLS: Net Min Annual Chart 3/27/97

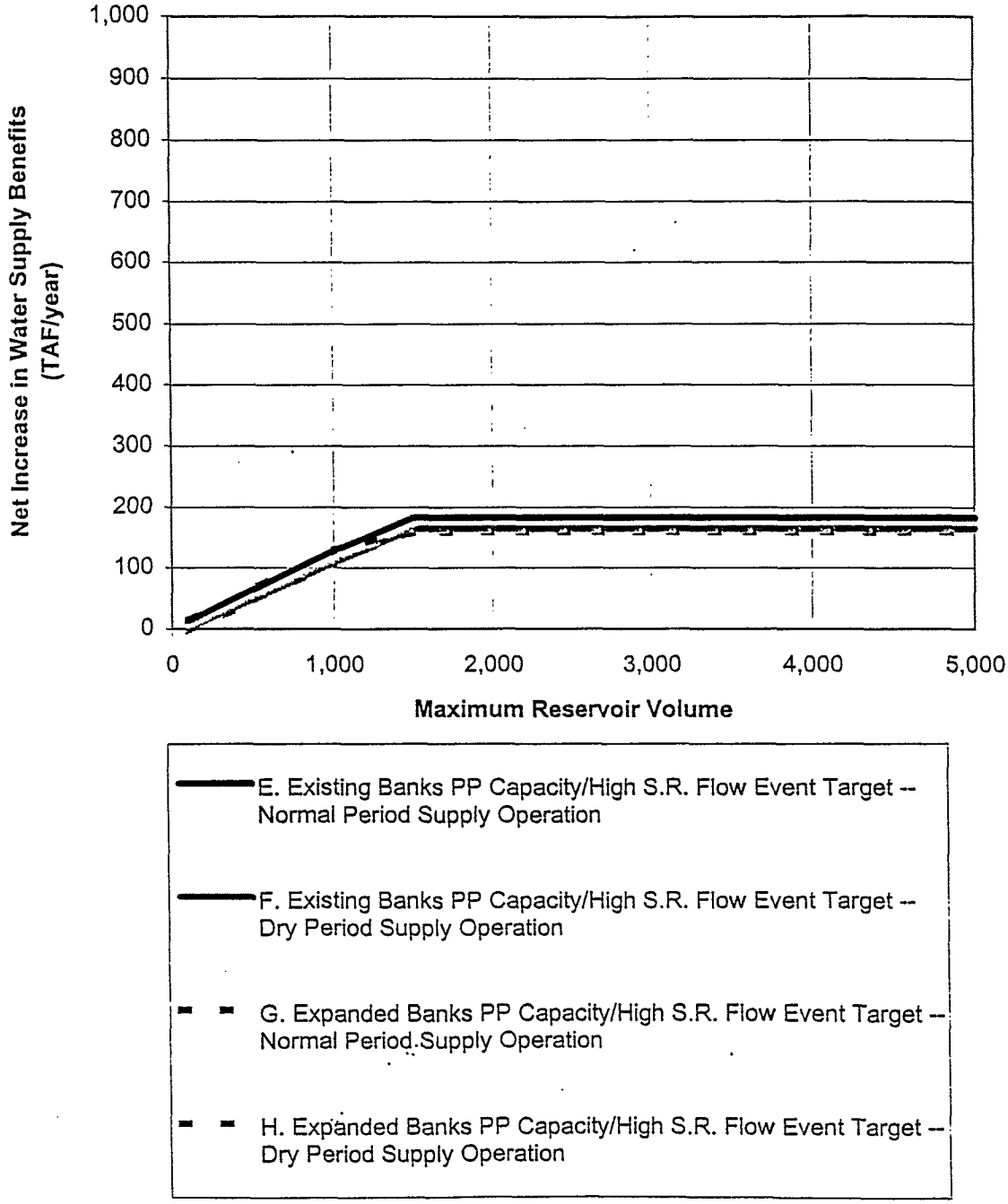
Figure NA-3

Upstream of Delta Off-Stream Storage
Net increase in 71-Year Average Ag & Urban Water Supply Benefits versus Maximum Storage Volume



NA_RVSM2.XLS: Net 71-Yr Avg Chart 3/27/97

Figure NA-4
Upstream of Delta Off-Stream Storage
Net Increase in 1928-34 Dry Period Annual Average Ag & Urban
Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM2.XLS: Net 1928-34 Chart 3/27/97

Agricultural and Urban Water Supply Benefits versus Storage Carryover Factor

Background

The storage carryover factor is an operational parameter designed to provide a means of reserving water supplies for use throughout extended dry periods. In practice, complex reservoir storage carryover rules may be devised to take into account runoff forecasting, variable demand, current storage volume, and other criteria. In this model, a simple storage carryover function has been included which allows the user to set a fraction of end-of-September storage from the previous water year that will be required to remain in storage at the end of the current water year. For example, if 100 taf are in storage at the end of September of the current year, with a storage carryover factor of 50 percent, the storage facility must maintain at least 50 taf by the end of September of the following year. While implementing conservative carryover rules in reservoir operations will increase available supplies during dry periods, total deliveries over normal hydrologic periods will be reduced in comparison to more aggressive reservoir operations.

Model Runs

Storage carryover factors ranging from 0 to 70 percent were varied in a set of model runs to evaluate effects on water supply benefits 1) with and without expanded Banks Pumping Plant capacity 2) with varied Sacramento River flow event targets (described below) and 3) with varied unmet demand targets. These model runs are described in Table NA-3 and summary results are displayed in Table NA-4. For comparability, all results are measured using total south of Delta SWP and CVP water supply deliveries.

Evaluation -- Sensitivity Analysis

Varying the storage carryover factor results in substantive effects (difference between the minimum and maximum) for the Critically Dry Year Average and Minimum Annual Ag & Urban Water Supply Benefits with existing Banks Pumping Plant capacity. Minimum Annual values increase up to 9 percent as Critically Dry Year Average declines up to 9 percent as the storage carryover factor is increased. Less than 2-percent differences are seen in 71-Year Average, 1928-34 Dry Period Average, and Dry Year Average Ag & Urban Water Supply Benefits throughout the range of storage carryover factors evaluated. Increasing the Sacramento River flow event target and reducing the unmet demand target has the effect of reducing Ag & Urban Water Supply Benefits between 3 and 7 percent. Increasing both the Sacramento River flow event target and the unmet demand target has the effect of reducing Ag & Urban Water Supply Benefits between 0 and 16 percent. Charts displaying the five statsitical measures of Ag & Urban Water Supply Benefits, described in Table NA-2, are shown in Figures NA-5 through NA-8. These figures display Ag & Urban Water Supply Benefits versus storage carryover factor for the existing Banks Pumping Plant capacity.

Similar effects occur in runs with expanded Banks Pumping Plant capacity. Varying the storage carryover factor results in substantive effects (difference between the minimum and maximum) for the Critically Dry Year Average and Minimum Annual Ag & Urban

Water Supply Benefits with expanded Banks Pumping Plant capacity. Minimum Annual values increase up to 8 percent as Critically Dry Year Average declines up to 8 percent as the storage carryover factor is increased. Less than 2-percent differences are seen in 71-Year Average, 1928-34 Dry Period Average, and Dry Year Average Ag & Urban Water Supply Benefits throughout the range of storage carryover factors evaluated. Increasing the Sacramento River flow event target and reducing the unmet demand target has the effect of reducing Ag & Urban Water Supply Benefits between 3 and 7 percent. Increasing both the Sacramento River flow event target and the unmet demand target has the effect of reducing dry period Ag & Urban Water Supply Benefits between 0 and 13 percent and increasing 71-Year Average and 1928-34 Dry Period Average less than 1 percent. Less than 6-percent differences occur between runs with existing Banks Pumping Plant capacity and expanded Banks Pumping Plant capacity. Charts displaying the five statistical measures of Ag & Urban Water Supply Benefits, described in Table NA-2, are shown in Figures NA-9 through NA-12. These figures display Ag & Urban Water Supply Benefits versus storage carryover factor for the expanded Banks Pumping Plant capacity.

The storage carryover factor has minimal effect in increasing minimum annual water supplies. The incremental increase/decrease (percent change between Agricultural and Urban Water Supply Benefits for single incremental change in carryover factor are primarily less than 1 percent, and always less than 2 percent.

The Minimum Annual Environmental Delta Outflow benefits are maximized with the total unmet demand target set at SWP unmet Demands only, Sacramento River flow event target set at 0 taf, and storage carryover factor set at 50 percent. A notable side effect is that as Minimum Annual Ag & Urban Water Supply Benefits are increased, Critically Dry Year Average Ag & Urban Water Supply Benefits tend to decrease.

The 71-year Environmental Delta Outflow benefits are maximized with the total unmet demand target set at SWP and CVP unmet demands, Sacramento River flow event target set at 0 taf, and storage carryover factor set at less than 30 percent.

Table NA-3

Upstream of Delta Off-Stream Storage
Model Runs for Evaluation of Storage Carryover Factor

Run Results Workbook	Evaluation Workbook	Model Run Identifiers	Storage Carryover Factor	Common Assumptions
OUT_NA01.XLS	NA_CO1.XLS	NA101	0%	3.0 maf Maximum Storage Volume
		NA102	10%	5,000 cfs Inflow/Outflow Capacity
		NA103	20%	Existing Banks PP Capacity
		NA104	30%	Total Unmet Demand = SWP and CVP Unmet Demand
		NA105	40%	S.R. Flow Event (1 Month) Target = 0 TAF
		NA106	50%	S.R. Flow Event (2 Month) Target = 0 TAF
		NA107	60%	
		NA108	70%	
OUT_NA01.XLS	NA_CO2.XLS	NA109	0%	3.0 maf Maximum Storage Volume
		NA110	10%	5,000 cfs Inflow/Outflow Capacity
		NA111	20%	Existing Banks PP Capacity
		NA112	30%	Total Unmet Demand = SWP-only Unmet Demand
		NA113	40%	S.R. Flow Event (1 Month) Targe = 1,500 TAF
		NA114	50%	S.R. Flow Event (2 Month) Target = 2,650 TAF
		NA115	60%	
		NA116	70%	
OUT_NA01.XLS	NA_CO3.XLS	NA117	0%	3.0 maf Maximum Storage Volume
		NA118	10%	5,000 cfs Inflow/Outflow Capacity
		NA119	20%	Existing Banks PP Capacity
		NA120	30%	Total Unmet Demand = SWP-only Unmet Demand
		NA121	40%	S.R. Flow Event (1 Month) Target = 0 TAF
		NA122	50%	S.R. Flow Event (2 Month) Target = 0 TAF
		NA123	60%	
		NA124	70%	
OUT_NA01.XLS	NA_CO4.XLS	NA125	0%	3.0 maf Maximum Storage Volume
		NA126	10%	5,000 cfs Inflow/Outflow Capacity
		NA127	20%	Existing Banks PP Capacity
		NA128	30%	Total Unmet Demand = SWP and CVP Unmet Demand
		NA129	40%	S.R. Flow Event (1 Month) Targe = 1,500 TAF
		NA130	50%	S.R. Flow Event (2 Month) Target = 2,650 TAF
		NA131	60%	
		NA132	70%	
OUT_NA01.XLS	NA_CO5.XLS	NA133	0%	3.0 maf Maximum Storage Volume
		NA134	10%	5,000 cfs Inflow/Outflow Capacity
		NA135	20%	SDI Banks PP Capacity
		NA136	30%	Total Unmet Demand = SWP and CVP Unmet Demand
		NA137	40%	S.R. Flow Event (1 Month) Target = 0 TAF
		NA138	50%	S.R. Flow Event (2 Month) Target = 0 TAF
		NA139	60%	
		NA140	70%	
OUT_NA01.XLS	NA_CO6.XLS	NA141	0%	3.0 maf Maximum Storage Volume
		NA142	10%	5,000 cfs Inflow/Outflow Capacity
		NA143	20%	SDI Banks PP Capacity
		NA144	30%	Total Unmet Demand = SWP-only Unmet Demand
		NA145	40%	S.R. Flow Event (1 Month) Targe = 1,500 TAF
		NA146	50%	S.R. Flow Event (2 Month) Target = 2,650 TAF
		NA147	60%	
		NA148	70%	
OUT_NA01.XLS	NA_CO7.XLS	NA149	0%	2.0 maf Maximum Storage Volume
		NA150	10%	3,500 cfs Inflow/Outflow Capacity
		NA151	20%	SDI Banks PP Capacity
		NA152	30%	Total Unmet Demand = SWP-only Unmet Demand
		NA153	40%	S.R. Flow Event (1 Month) Target = 0 TAF
		NA154	50%	S.R. Flow Event (2 Month) Target = 0 TAF
		NA155	60%	
		NA156	70%	
OUT_NA01.XLS	NA_CO8.XLS	NA157	0%	3.0 maf Maximum Storage Volume
		NA158	10%	5,000 cfs Inflow/Outflow Capacity
		NA159	20%	SDI Banks PP Capacity
		NA160	30%	Total Unmet Demand = SWP and CVP Unmet Demand
		NA161	40%	S.R. Flow Event (1 Month) Targe = 1,500 TAF
		NA162	50%	S.R. Flow Event (2 Month) Target = 2,650 TAF
		NA163	60%	
		NA164	70%	

NA_COSM.XLS: Runs

Table NA-4

Upstream of Delta Off-Stream Storage
Agricultural and Urban Water Supply vs. Storage Carryover Factor
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Run Identifiers:	NA101	NA102	NA103	NA104	NA105	NA106	NA107	NA108	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,236	6,235	6,234	6,231	6,226	6,219	6,210	6,196	6,196	6,236	0.6%
1928-34 Dry Period Average	4,372	4,371	4,370	4,370	4,374	4,372	4,358	4,332	4,332	4,374	1.0%
Dry Year Average	5,751	5,754	5,755	5,766	5,774	5,779	5,782	5,777	5,751	5,782	0.6%
Critically Dry Year Average	4,235	4,215	4,187	4,142	4,097	4,045	3,979	3,897	3,897	4,235	8.7%
Minimum Annual	2,892	2,866	2,842	2,880	2,909	2,913	2,916	2,927	2,842	2,927	3.0%

Run Identifiers:	NA109	NA110	NA111	NA112	NA113	NA114	NA115	NA116	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,068	6,067	6,066	6,063	6,058	6,053	6,046	6,038	6,038	6,068	0.5%
1928-34 Dry Period Average	4,094	4,094	4,094	4,091	4,089	4,083	4,075	4,061	4,061	4,094	0.8%
Dry Year Average	5,540	5,546	5,552	5,557	5,560	5,562	5,562	5,556	5,540	5,562	0.4%
Critically Dry Year Average	3,877	3,868	3,858	3,828	3,796	3,761	3,720	3,677	3,677	3,877	5.4%
Minimum Annual	2,532	2,575	2,608	2,631	2,645	2,675	2,719	2,752	2,532	2,752	8.7%

Run Identifiers:	NA117	NA118	NA119	NA120	NA121	NA122	NA123	NA124	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,156	6,156	6,155	6,150	6,144	6,136	6,126	6,112	6,112	6,156	0.7%
1928-34 Dry Period Average	4,367	4,366	4,365	4,363	4,359	4,352	4,337	4,309	4,309	4,367	1.3%
Dry Year Average	5,651	5,657	5,660	5,661	5,671	5,675	5,677	5,674	5,651	5,677	0.5%
Critically Dry Year Average	4,256	4,244	4,233	4,202	4,145	4,088	4,020	3,932	3,932	4,256	8.2%
Minimum Annual	3,009	3,018	3,044	3,073	3,107	3,136	3,097	2,962	2,962	3,136	5.9%

Run Identifiers:	NA125	NA126	NA127	NA128	NA129	NA130	NA131	NA132	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,136	6,135	6,133	6,131	6,127	6,122	6,116	6,105	6,105	6,136	0.5%
1928-34 Dry Period Average	4,101	4,101	4,100	4,098	4,095	4,090	4,082	4,070	4,070	4,101	0.7%
Dry Year Average	5,609	5,613	5,615	5,621	5,627	5,630	5,630	5,622	5,609	5,630	0.4%
Critically Dry Year Average	3,890	3,867	3,840	3,806	3,771	3,734	3,700	3,659	3,659	3,890	6.3%
Minimum Annual	2,532	2,536	2,545	2,562	2,588	2,628	2,669	2,698	2,532	2,698	6.5%

Run Identifiers:	NA133	NA134	NA135	NA136	NA137	NA138	NA139	NA140	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,555	6,555	6,553	6,551	6,548	6,543	6,535	6,521	6,521	6,555	0.5%
1928-34 Dry Period Average	4,406	4,406	4,405	4,405	4,405	4,404	4,402	4,395	4,395	4,406	0.2%
Dry Year Average	6,174	6,178	6,181	6,185	6,187	6,193	6,195	6,176	6,174	6,195	0.3%
Critically Dry Year Average	4,154	4,126	4,097	4,067	4,036	3,990	3,941	3,887	3,887	4,154	6.9%
Minimum Annual	2,560	2,609	2,645	2,671	2,673	2,700	2,735	2,764	2,560	2,764	8.0%

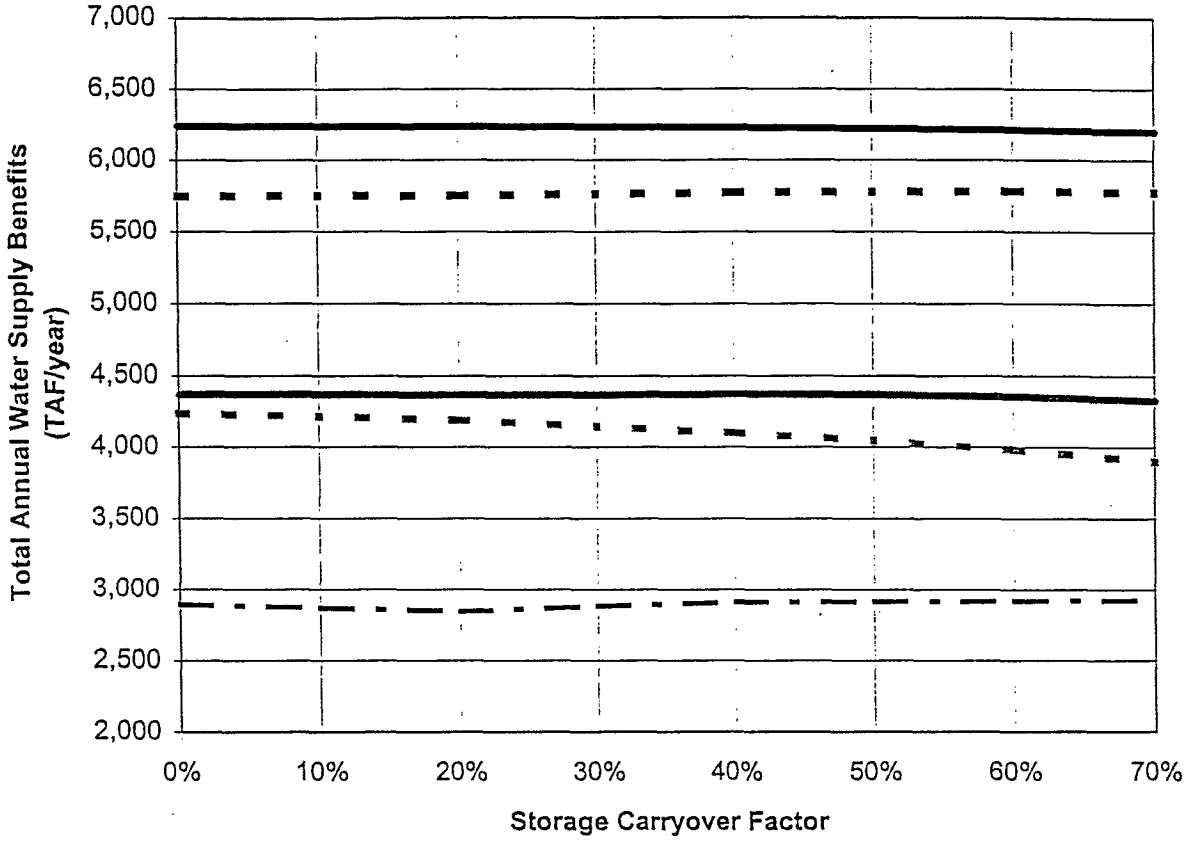
Run Identifiers:	NA141	NA142	NA143	NA144	NA145	NA146	NA147	NA148	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,315	6,314	6,312	6,309	6,305	6,299	6,293	6,285	6,285	6,315	0.5%
1928-34 Dry Period Average	4,198	4,198	4,198	4,196	4,193	4,188	4,180	4,167	4,167	4,198	0.7%
Dry Year Average	5,884	5,888	5,894	5,898	5,901	5,899	5,898	5,893	5,884	5,901	0.3%
Critically Dry Year Average	3,909	3,902	3,889	3,859	3,828	3,801	3,764	3,721	3,721	3,909	5.1%
Minimum Annual	2,547	2,585	2,614	2,634	2,638	2,671	2,722	2,754	2,547	2,754	8.2%

Run Identifiers:	NA149	NA150	NA151	NA152	NA153	NA154	NA155	NA156	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,381	6,380	6,380	6,376	6,371	6,365	6,358	6,345	6,345	6,381	0.6%
1928-34 Dry Period Average	4,411	4,411	4,411	4,413	4,416	4,423	4,424	4,397	4,397	4,424	0.6%
Dry Year Average	5,950	5,959	5,971	5,981	5,988	5,993	5,995	5,992	5,950	5,995	0.8%
Critically Dry Year Average	4,221	4,207	4,185	4,146	4,104	4,058	4,004	3,922	3,922	4,221	7.6%
Minimum Annual	3,037	3,043	3,040	2,976	2,911	2,920	2,900	2,892	2,892	3,043	5.2%

Run Identifiers:	NA157	NA158	NA159	NA160	NA161	NA162	NA163	NA164	Minimum Value	Maximum Value	Percent Difference
Storage Carryover Factor	0%	10%	20%	30%	40%	50%	60%	70%			
71-Year Average	6,458	6,458	6,456	6,454	6,450	6,444	6,436	6,417	6,417	6,458	0.6%
1928-34 Dry Period Average	4,193	4,193	4,192	4,191	4,189	4,186	4,180	4,170	4,170	4,193	0.6%
Dry Year Average	6,035	6,037	6,043	6,052	6,058	6,055	6,043	5,984	5,984	6,058	1.2%
Critically Dry Year Average	3,898	3,875	3,844	3,813	3,783	3,756	3,727	3,701	3,701	3,898	5.3%
Minimum Annual	2,547	2,548	2,555	2,571	2,594	2,621	2,651	2,686	2,547	2,686	5.5%

[1]See Table NA-1 for description of operational conditions.

Figure NA-5
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
Unmet Demand Target = SWP & CVP
S.R. Flow Event (1 month) Target = 0 taf
S.R. Flow Event (2 month) Target = 0 taf

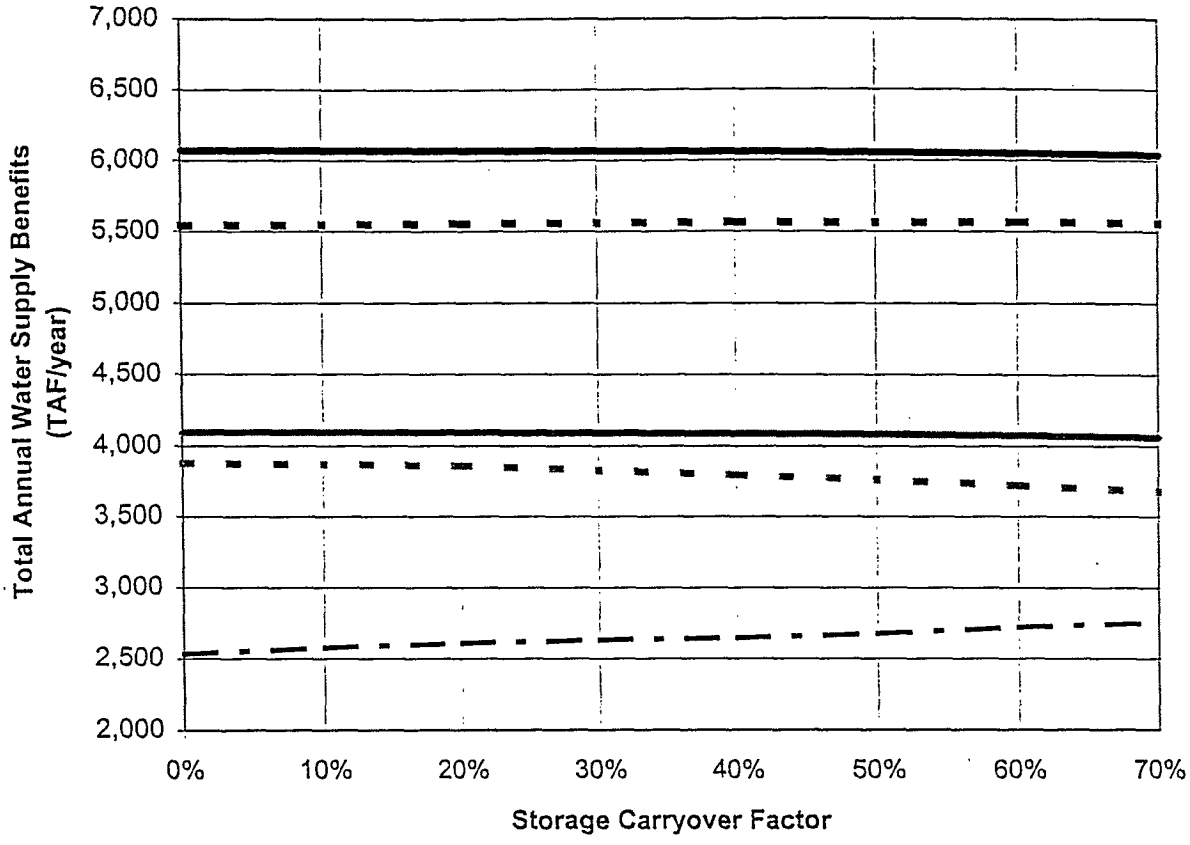
71-Year Average
1928-34 Dry Period Average
Dry Year Average
Critically Dry Year Average
Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,236	6,196
1928-34 Dry Period Average:	4,372	4,332
Average of all Dry Years:	5,751	5,777
Average of all Crit. Dry Years:	4,235	3,897
Minimum Annual:	2,892	2,927

NA_CO1.XLS: XY-Tot Chart 1 3/27/97

Figur NA-6
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

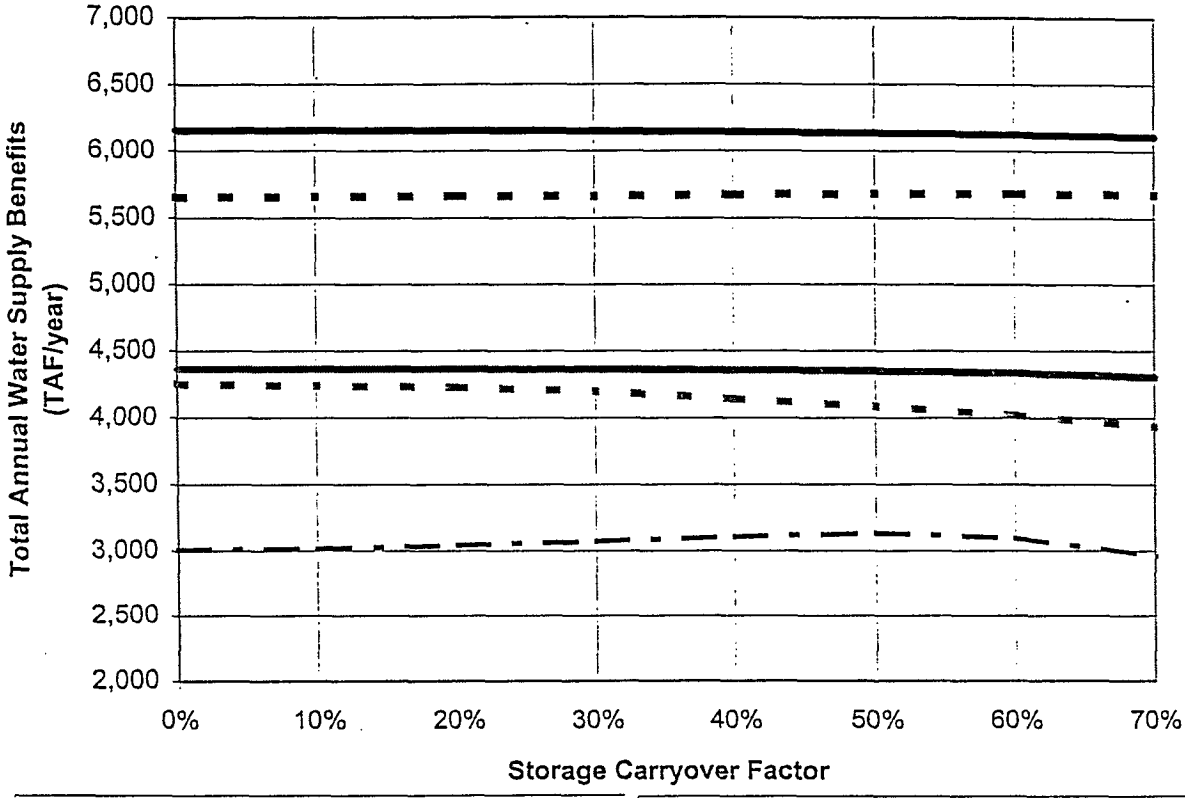
- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,068	6,038
1928-34 Dry Period Average:	4,094	4,061
Average of all Dry Years:	5,540	5,556
Average of all Crit. Dry Years:	3,877	3,677
Minimum Annual:	2,532	2,752

NA_CO2.XLS: XY-Tot Chart 1 3/27/97

Figure NA-7
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 0 taf
S.R. Flow Event (2 month) Target = 0 taf

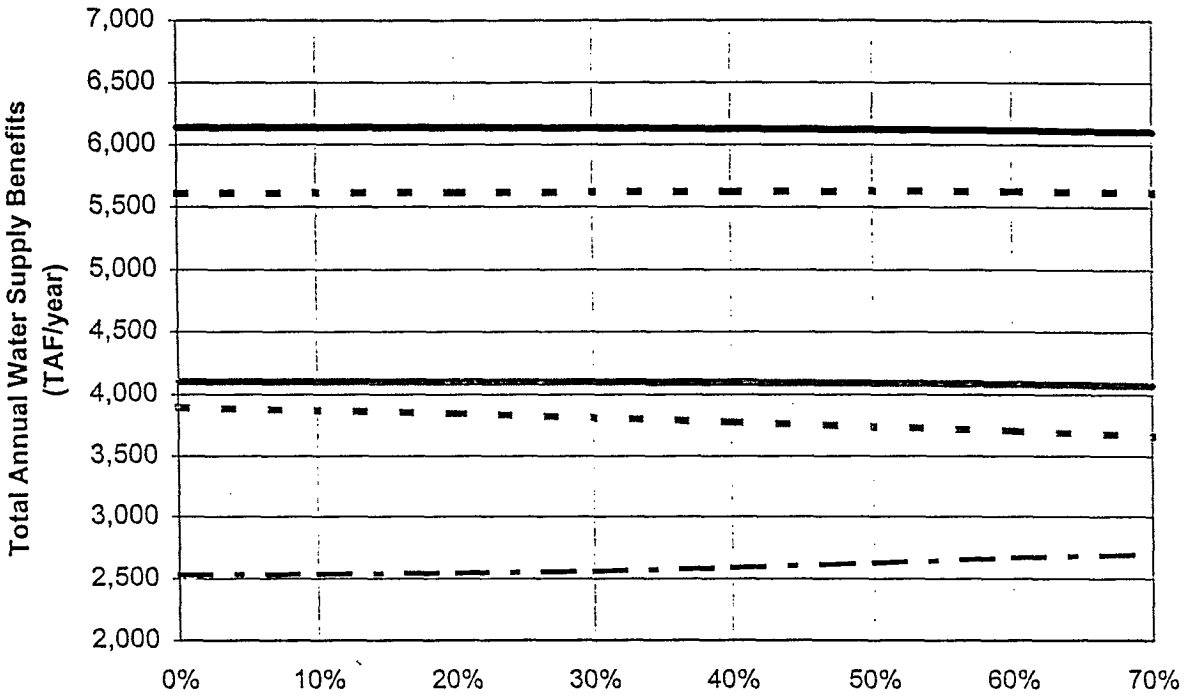
71-Year Average
1928-34 Dry Period Average
Dry Year Average
Critically Dry Year Average
Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,156	6,112
1928-34 Dry Period Average:	4,367	4,309
Average of all Dry Years:	5,651	5,674
Average of all Crit. Dry Years:	4,256	3,932
Minimum Annual:	3,009	2,962

NA_CO3.XLS: XY-Tot Chart 1 3/27/97

Figure NA-8
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
Unmet Demand Target = SWP & CVP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

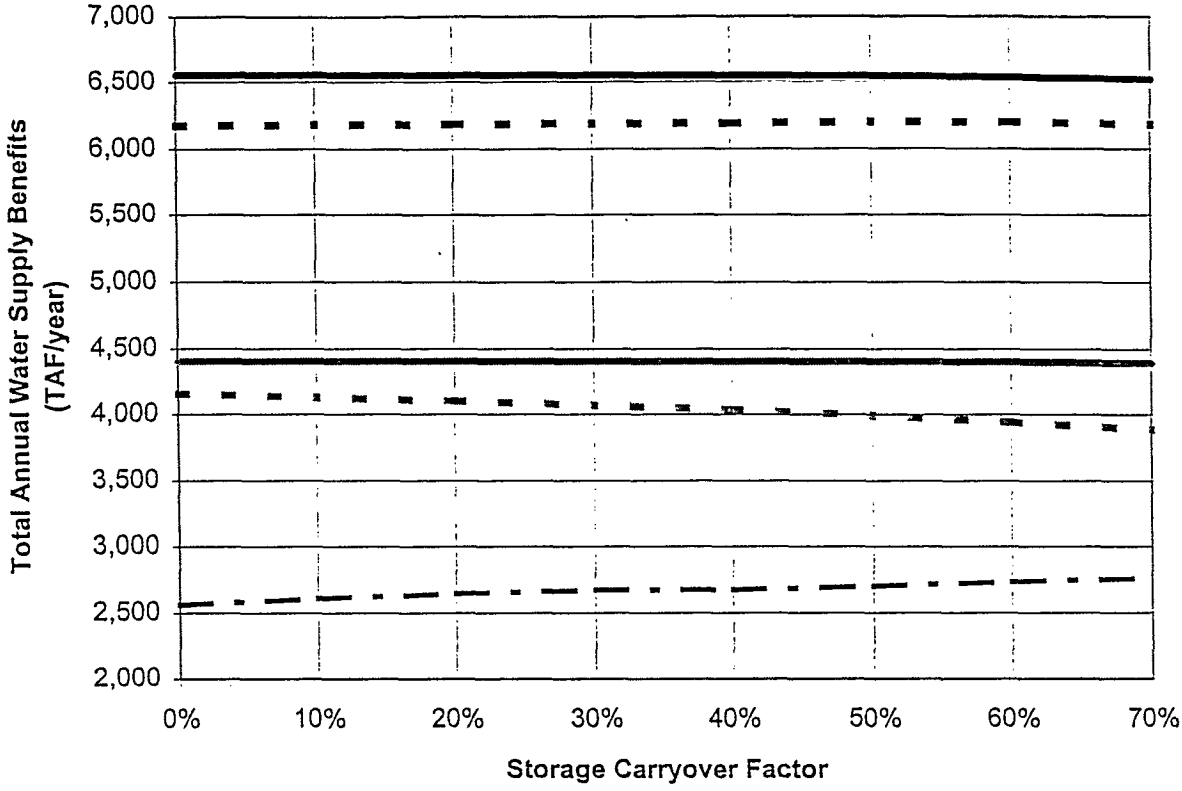
71-Year Average
1928-34 Dry Period Average
Dry Year Average
Critically Dry Year Average
Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,136	6,105
1928-34 Dry Period Average:	4,101	4,070
Average of all Dry Years:	5,609	5,622
Average of all Crit. Dry Years:	3,890	3,659
Minimum Annual:	2,532	2,698

NA_CO4.XLS: XY-Tot Chart 1 3/27/97

Figure NA-9
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
Unmet Demand Target = SWP & CVP
S.R. Flow Event (1 month) Target = 0 taf
S.R. Flow Event (2 month) Target = 0 taf

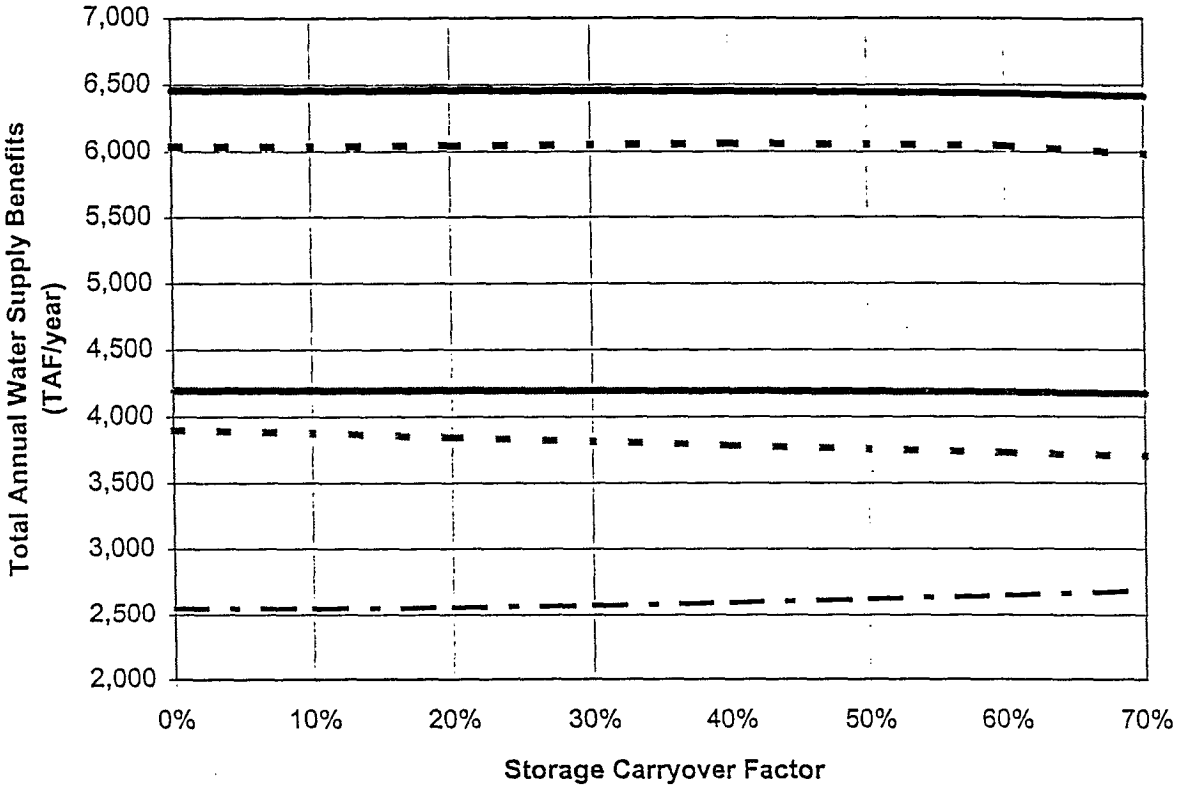
71-Year Average
1928-34 Dry Period Average
Dry Year Average
Critically Dry Year Average
Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,555	6,521
1928-34 Dry Period Average:	4,406	4,395
Average of all Dry Years:	6,174	6,176
Average of all Crit. Dry Years:	4,154	3,887
Minimum Annual:	2,560	2,764

NA_CO5.XLS: XY-Tot Chart 1 3/27/97

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
Unmet Demand Target = SWP & CVP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

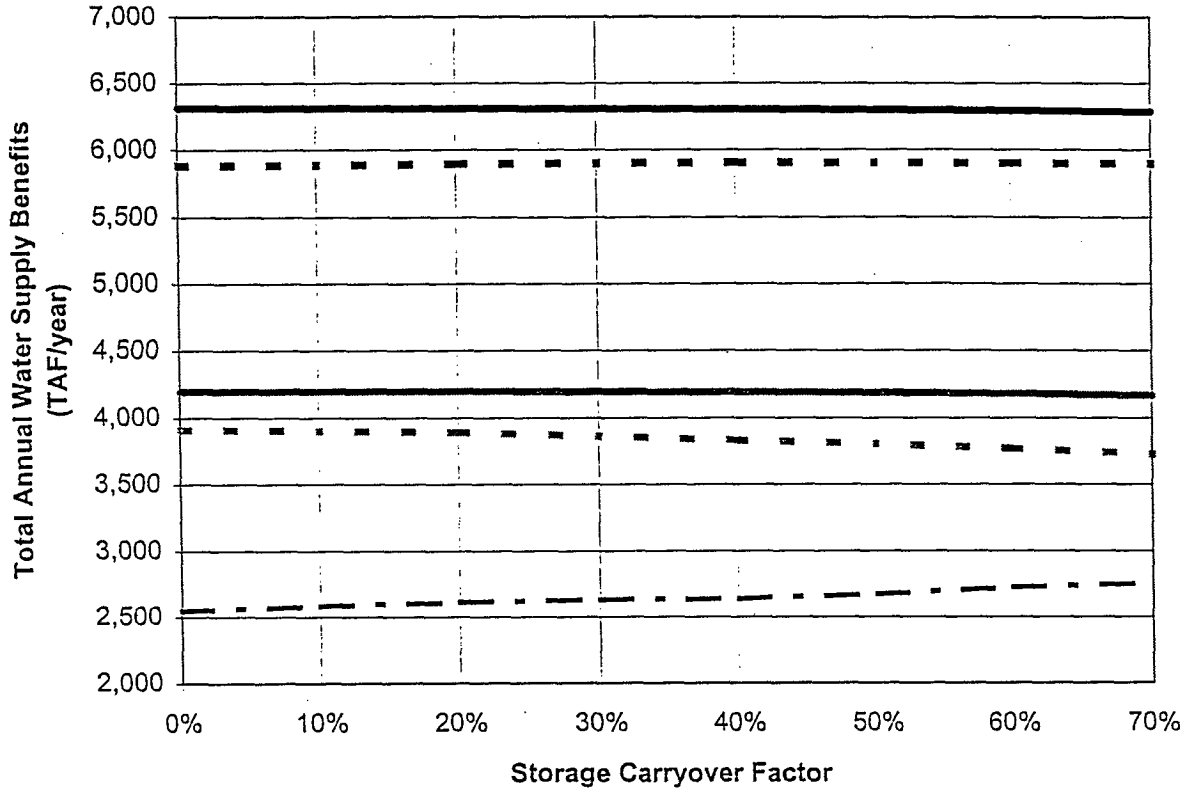
Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,458	6,417
1928-34 Dry Period Average:	4,193	4,170
Average of all Dry Years:	6,035	5,984
Average of all Crit. Dry Years:	3,898	3,701
Minimum Annual:	2,547	2,686

NA_CO8.XLS: XY-Tot Chart 1

3/27/97

Figure NA-11
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

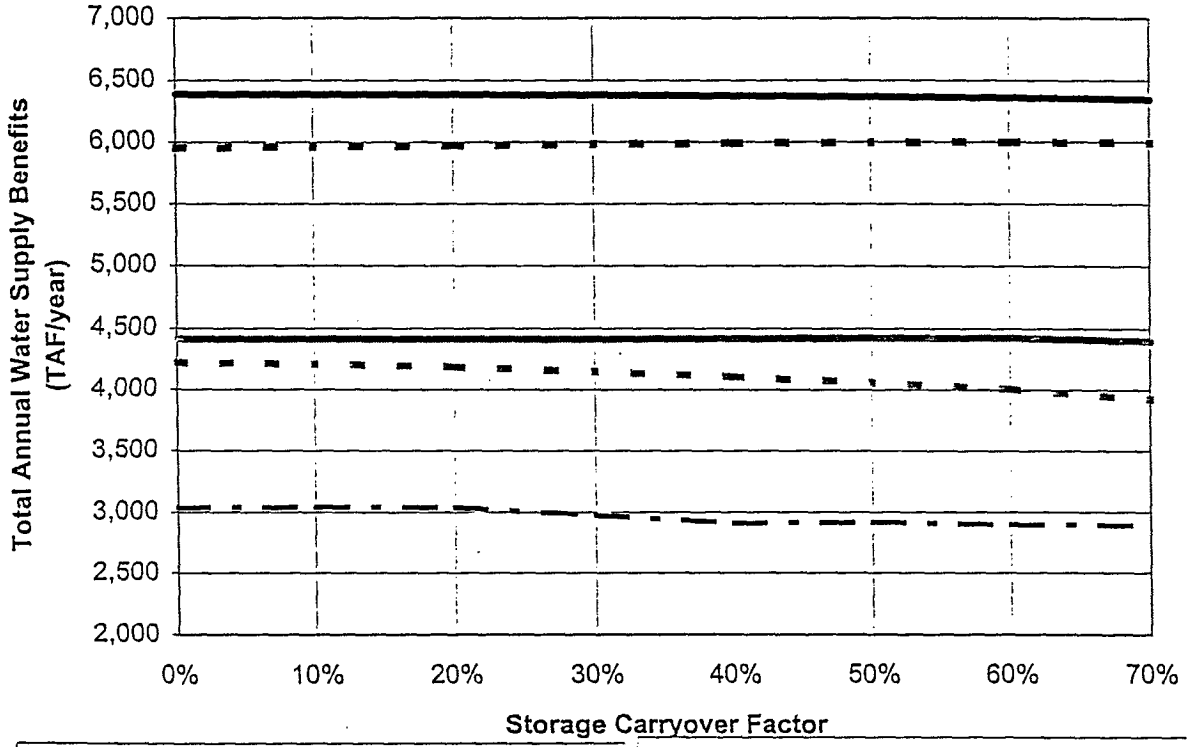
- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,315	6,285
1928-34 Dry Period Average:	4,198	4,167
Average of all Dry Years:	5,884	5,893
Average of all Crit. Dry Years:	3,909	3,721
Minimum Annual:	2,547	2,754

NA_CO6.XLS: XY-Tot Chart 1 3/27/97

Figure NA-12
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Storage Carryover Factor



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 0 taf
S.R. Flow Event (2 month) Target = 0 taf

71-Year Average
1928-34 Dry Period Average
Dry Year Average
Critically Dry Year Average
Minimum Annual

Total Water Supply Benefits (TAF/yr)

Storage Carryover Factor:	0%	70%
71-Year Average:	6,381	6,345
1928-34 Dry Period Average:	4,411	4,397
Average of all Dry Years:	5,950	5,992
Average of all Crit. Dry Years:	4,221	3,922
Minimum Annual:	3,037	2,892

NA_CO7.XLS: XY-Tot Chart 1 3/27/97

Water Supply Benefits versus Unmet Demand Target

Background

Unmet south of Delta SWP and CVP demands are used in this evaluation as a surrogate for agricultural and urban water demands. Higher demand levels deplete reservoir storage more often, resulting in higher average deliveries over normal hydrologic periods but reduced deliveries during extended dry periods.

Model Runs

Unmet demand targets ranging from SWP-only unmet demand to combined SWP and CVP unmet demand were varied in a set of model runs to evaluate effects on water supply benefits 1) with and without expanded Banks Pumping Plant capacity 2) varied Sacramento River flow event targets (described below) and 3) varied storage carryover factors. These model runs are described in Table NA-5 and summary results are displayed in Table NA-6. For comparability, all results are measured using total south of Delta SWP and CVP water supply deliveries.

Evaluation-- Sensitivity Analysis

Moderate effects of varying unmet demand targets are observed in runs with existing Banks Pumping Plant capacity. Less than a 2-percent increase (between the minimum and maximum) in 71-Year Average Annual Agricultural and Urban Water Supply Benefits is observed while up to 10-percent increases (between the minimum and maximum) occur in Minimum Annual Agricultural and Urban Water Supply Benefits as the unmet demand target is reduced from combined SWP and CVP unmet demand to SWP-only unmet demand. Negligible effects are seen in dry and critical year averages, all within a 3-percent range. Increasing both the Sacramento River flow event target and the storage carryover factor has the effect of reducing Ag & Urban Water Supply Benefits between 2 and 12 percent. Increasing the Sacramento River flow event target and reducing the storage carryover factor has the effect of reducing Ag & Urban Water Supply Benefits between 2 and 22 percent. Bar charts of the five statistical measures of Agricultural and Urban Water Supply Benefits for various unmet demand targets for the existing Banks Pumping Plant capacity condition are shown in Figures NA-13 through NA-16.

Similar effects are also observed in runs with expanded Banks Pumping Plant capacity. Increases of up to 3 percent occur in 71-Year Averages Annual Agricultural and Urban Water Supply Benefits. Increases of up to 19 percent (between the minimum and maximum) in Minimum Annual Agricultural and Urban Water Supply Benefits result as the unmet demand target is reduced from combined SWP and CVP unmet demand to SWP-only unmet demand. Increasing both the Sacramento River flow event target and the storage carryover factor has the effect of reducing Ag & Urban Water Supply Benefits between 2 and 14 percent difference between the minimum and maximum. Increasing the Sacramento River flow event target and reducing the storage carryover factor has the effect of reducing Ag & Urban Water Supply Benefits between 2 and 16 percent. Less than 8-percent differences occur between runs with existing Banks

Pumping Plant capacity and expanded Banks Pumping Plant capacity. Plots of the five statistical measures of Agricultural and Urban Water Supply Benefits versus unmet demand target for the expanded Banks Pumping Plant condition are shown in Figures NA-17 through NA-20.

This operational parameter has a significant effect on Minimum Annual Agricultural and Urban Water Supply Benefits, and the effects increase with expanded Banks Pumping Plant capacity in place. Effects on 71-Year Average Annual Agricultural and Urban Water Supply Benefits are negligible. The largest effects occur as unmet demand is reduced and Sacramento River pulse flow requirement is set at 0 taf. The incremental increase/decrease (percent change between Agricultural and Urban Water Supply Benefits for single incremental change in carryover factor are generally less than 2 percent, however this incremental difference increases up to 19 percent due to the large differences between increments.

The Minimum Annual Agricultural And Urban Water Supply Benefits are maximized with the total unmet demand target set at CVP-only unmet demands, Sacramento River flow event target set at 0 taf, and storage carryover factor set at 50 percent.

The 71-year Agricultural And Urban Water Supply Benefits are maximized with the total unmet demand target set at combined SWP and CVP unmet demands, Sacramento River flow event target set at 0 taf, and storage carryover factor set at 0 percent.

Table NA-5

Upstream of Delta Off-Stream Storage
Model Runs for Evaluation of Total Unmet Demand

Run Results Workbook	Evaluation Workbook	Model Run Identifiers	Total Unmet Demand	Common Assumptions
OUT_NA02.XLS	NA_DE1.XLS	NA201 NA202 NA203	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0.0 S.R. Flow Event (1 Month) Target = 0 TAF S.R. Flow Event (2 Month) Target = 0 TAF
OUT_NA02.XLS	NA_DE2.XLS	NA204 NA205 NA206	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0.5 S.R. Flow Event (1 Month) Target = 1,500 TAF S.R. Flow Event (2 Month) Target = 2,650 TAF
OUT_NA02.XLS	NA_DE3.XLS	NA207 NA208 NA209	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0.5 S.R. Flow Event (1 Month) Target = 0 TAF S.R. Flow Event (2 Month) Target = 0 TAF
OUT_NA02.XLS	NA_DE4.XLS	NA210 NA211 NA212	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0.0 S.R. Flow Event (1 Month) Target = 1,500 TAF S.R. Flow Event (2 Month) Target = 2,650 TAF
OUT_NA02.XLS	NA_DE5.XLS	NA213 NA214 NA215	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0.0 S.R. Flow Event (1 Month) Target = 0 TAF S.R. Flow Event (2 Month) Target = 0 TAF
OUT_NA02.XLS	NA_DE6.XLS	NA216 NA217 NA218	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0.5 S.R. Flow Event (1 Month) Target = 1,500 TAF S.R. Flow Event (2 Month) Target = 2,650 TAF
OUT_NA02.XLS	NA_DE7.XLS	NA219 NA220 NA221	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0.5 S.R. Flow Event (1 Month) Target = 0 TAF S.R. Flow Event (2 Month) Target = 0 TAF
OUT_NA02.XLS	NA_DE8.XLS	NA222 NA223 NA224	SWP & CVP SWP Only CVP Only	3.0 maf Maximum Storage Volume 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0.0 S.R. Flow Event (1 Month) Target = 1,500 TAF S.R. Flow Event (2 Month) Target = 2,650 TAF

NA_DESM.XLS: Runs

Table NA-6

Upstream of Delta Off-Stream Storage
Total Ag & Urban Water Supply Benefits vs. Unmet Demand Target
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Run Identifiers:	NA201	NA202	NA203	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,236	6,156	6,149	6,149	6,236	1.4%
1928-34 Dry Period Average	4,372	4,367	4,354	4,354	4,372	0.4%
Dry Year Average	5,751	5,651	5,602	5,602	5,751	2.7%
Critically Dry Year Average	4,235	4,256	4,201	4,201	4,256	1.3%
Minimum Annual	2,892	3,009	3,009	2,892	3,009	4.0%

Run Identifiers:	NA204	NA205	NA206	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,122	6,053	6,048	6,048	6,122	1.2%
1928-34 Dry Period Average	4,090	4,083	4,072	4,072	4,090	0.4%
Dry Year Average	5,630	5,562	5,513	5,513	5,630	2.1%
Critically Dry Year Average	3,734	3,761	3,744	3,734	3,761	0.7%
Minimum Annual	2,628	2,675	2,704	2,628	2,704	2.9%

Run Identifiers:	NA207	NA208	NA209	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,219	6,136	6,128	6,128	6,219	1.5%
1928-34 Dry Period Average	4,372	4,352	4,338	4,338	4,372	0.8%
Dry Year Average	5,779	5,675	5,595	5,595	5,779	3.3%
Critically Dry Year Average	4,045	4,088	4,072	4,045	4,088	1.1%
Minimum Annual	2,913	3,136	3,211	2,913	3,211	10.2%

Run Identifiers:	NA210	NA211	NA212	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,136	6,068	6,060	6,060	6,136	1.2%
1928-34 Dry Period Average	4,101	4,094	4,077	4,077	4,101	0.6%
Dry Year Average	5,609	5,540	5,513	5,513	5,609	1.7%
Critically Dry Year Average	3,890	3,877	3,816	3,816	3,890	1.9%
Minimum Annual	2,532	2,532	2,638	2,532	2,638	4.2%

Run Identifiers:	NA213	NA214	NA215	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,555	6,381	6,430	6,381	6,555	2.7%
1928-34 Dry Period Average	4,406	4,411	4,402	4,402	4,411	0.2%
Dry Year Average	6,174	5,950	5,902	5,902	6,174	4.6%
Critically Dry Year Average	4,154	4,221	4,193	4,154	4,221	1.6%
Minimum Annual	2,560	3,037	3,037	2,560	3,037	18.6%

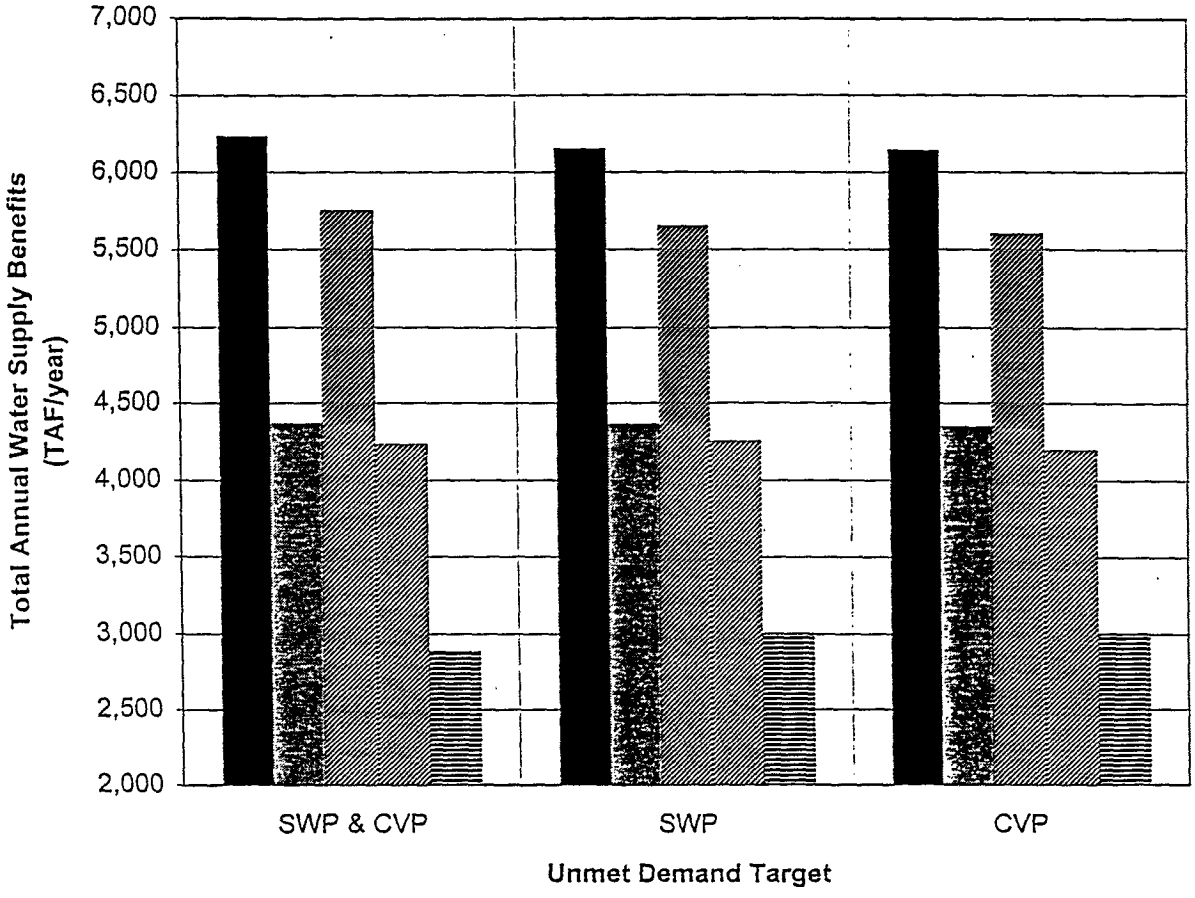
Run Identifiers:	NA216	NA217	NA218	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,444	6,299	6,342	6,299	6,444	2.3%
1928-34 Dry Period Average	4,186	4,188	4,175	4,175	4,188	0.3%
Dry Year Average	6,055	5,899	5,861	5,861	6,055	3.3%
Critically Dry Year Average	3,756	3,801	3,771	3,756	3,801	1.2%
Minimum Annual	2,621	2,671	2,661	2,621	2,671	1.9%

Run Identifiers:	NA219	NA220	NA221	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,543	6,365	6,416	6,365	6,543	2.8%
1928-34 Dry Period Average	4,404	4,423	4,432	4,404	4,432	0.6%
Dry Year Average	6,193	5,993	5,935	5,935	6,193	4.3%
Critically Dry Year Average	3,990	4,058	4,052	3,990	4,058	1.7%
Minimum Annual	2,700	2,920	2,963	2,700	2,963	9.7%

Run Identifiers:	NA222	NA223	NA224	Minimum Value	m Value	Percent Difference
Unmet Demand Target:	SWP & CVP	SWP	CVP			
71-Year Average	6,458	6,315	6,355	6,315	6,458	2.3%
1928-34 Dry Period Average	4,193	4,198	4,175	4,175	4,198	0.6%
Dry Year Average	6,035	5,884	5,861	5,861	6,035	3.0%
Critically Dry Year Average	3,898	3,909	3,856	3,856	3,909	1.4%
Minimum Annual	2,547	2,547	2,547	2,547	2,547	0.0%

[1]See Table NA-1 for description of operational conditions.

Figure NA-13
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



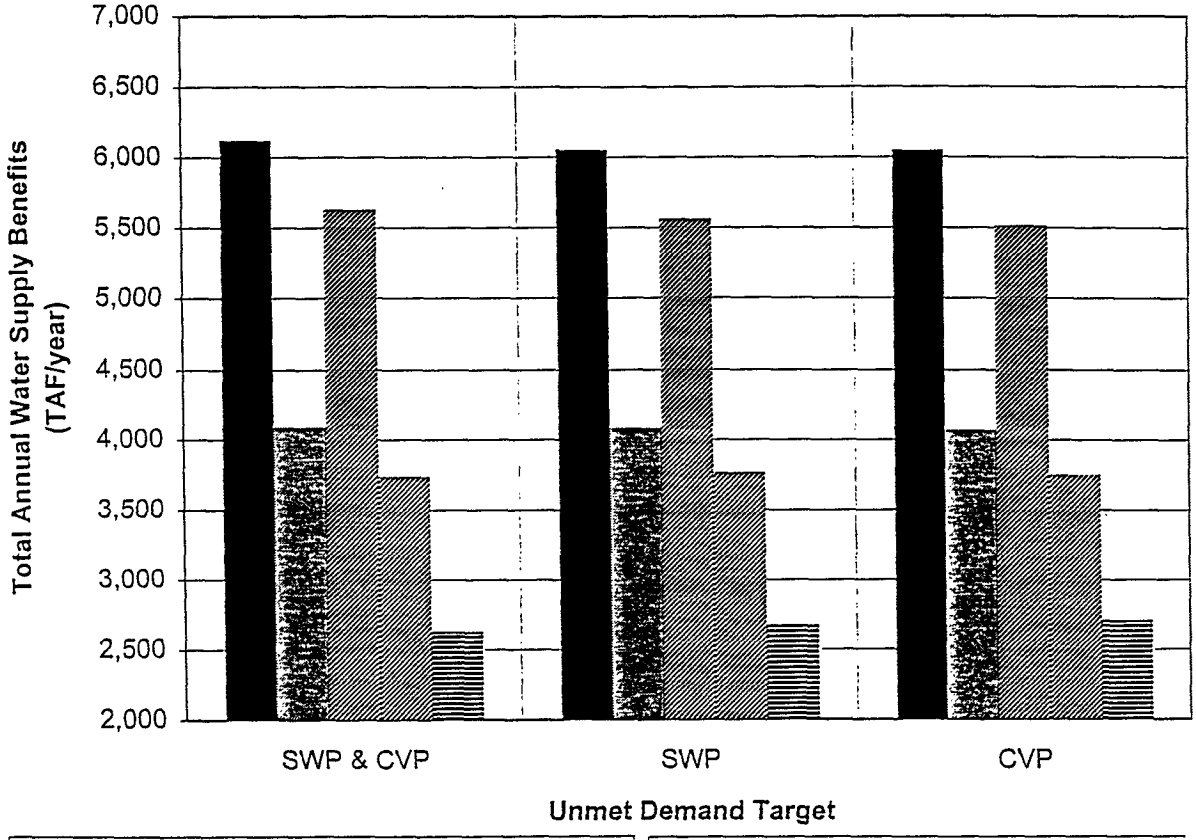
Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
Existing Banks PP Capacity	■ Dry Year Average
A&U Storage Carryover Factor = 0%	■ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 0 taf	■ Minimum Annual
S.R. Flow Event (2 month) Target = 0 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,236	6,156	6,149
1928-34 Dry Period Average:	4,372	4,367	4,354
Average of all Dry Years:	5,751	5,651	5,602
Average of all Crit. Dry Years:	4,235	4,256	4,201
Minimum Annual:	2,892	3,009	3,009

NA_DE1.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-14
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



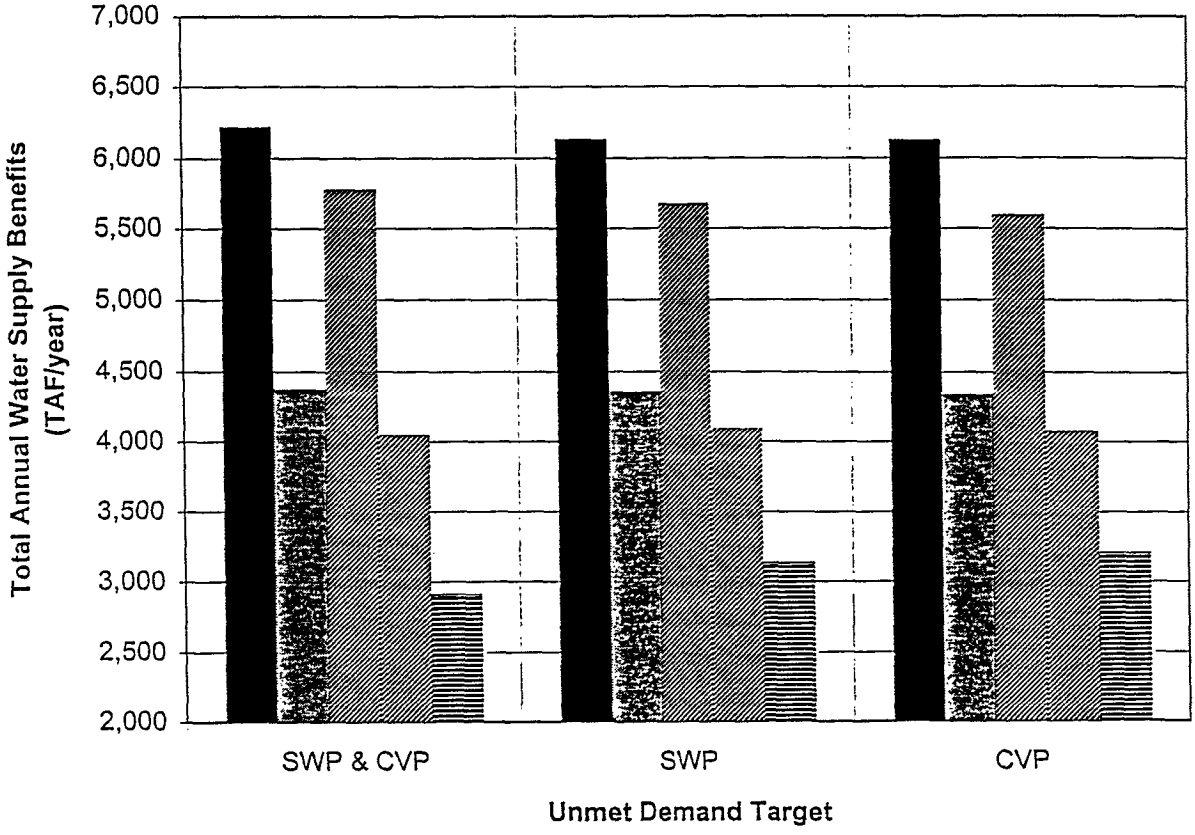
Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
Existing Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 50%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 1,500 taf	≡ Minimum Annual
S.R. Flow Event (2 month) Target = 2,650 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,122	6,053	6,048
1928-34 Dry Period Average:	4,090	4,083	4,072
Average of all Dry Years:	5,630	5,562	5,513
Average of all Crit. Dry Years:	3,734	3,761	3,744
Minimum Annual:	2,628	2,675	2,704

NA_DE2.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-15
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



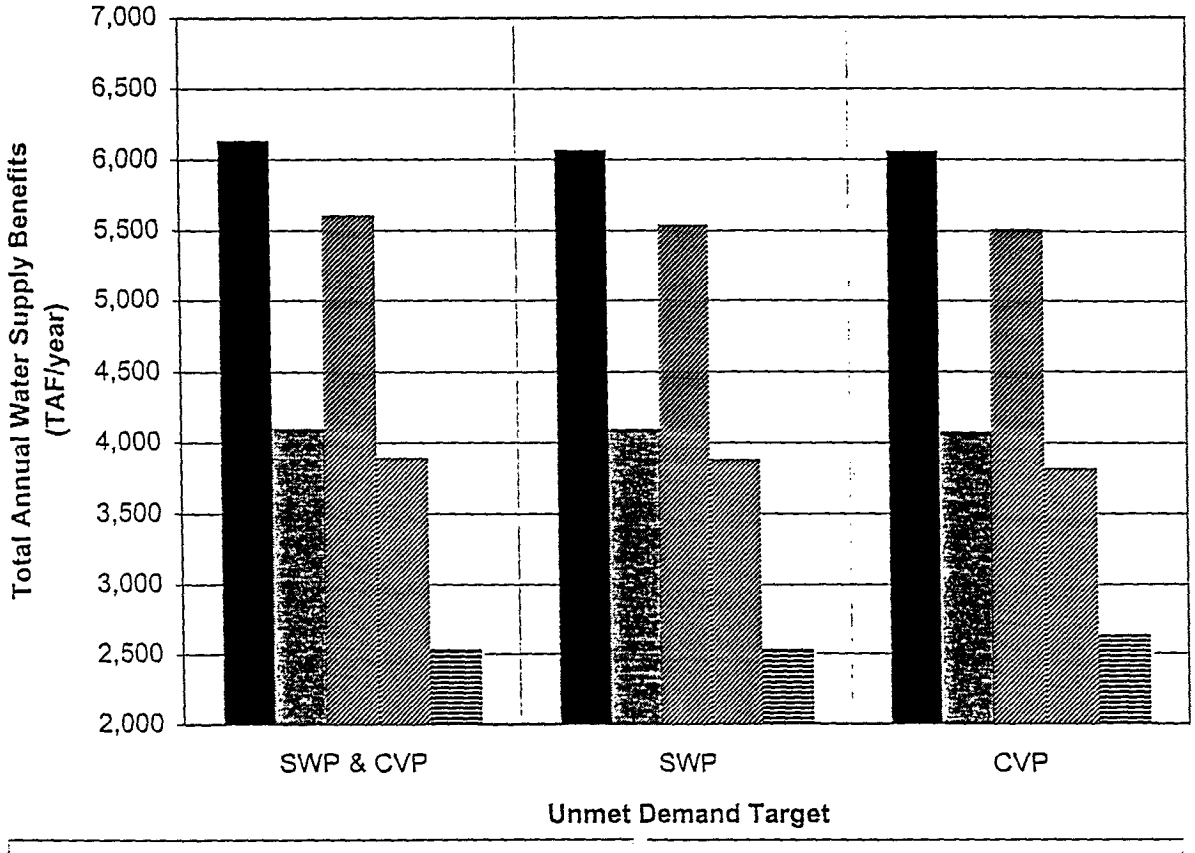
Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
Existing Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 50%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 0 taf	▤ Minimum Annual
S.R. Flow Event (2 month) Target = 0 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,219	6,136	6,128
1928-34 Dry Period Average:	4,372	4,352	4,338
Average of all Dry Years:	5,779	5,675	5,595
Average of all Crit. Dry Years:	4,045	4,088	4,072
Minimum Annual:	2,913	3,136	3,211

NA_DE3.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-16
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	▨ 1928-34 Dry Period Average
Existing Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 0%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 1,500 taf	≡ Minimum Annual
S.R. Flow Event (2 month) Target = 2,650 taf	

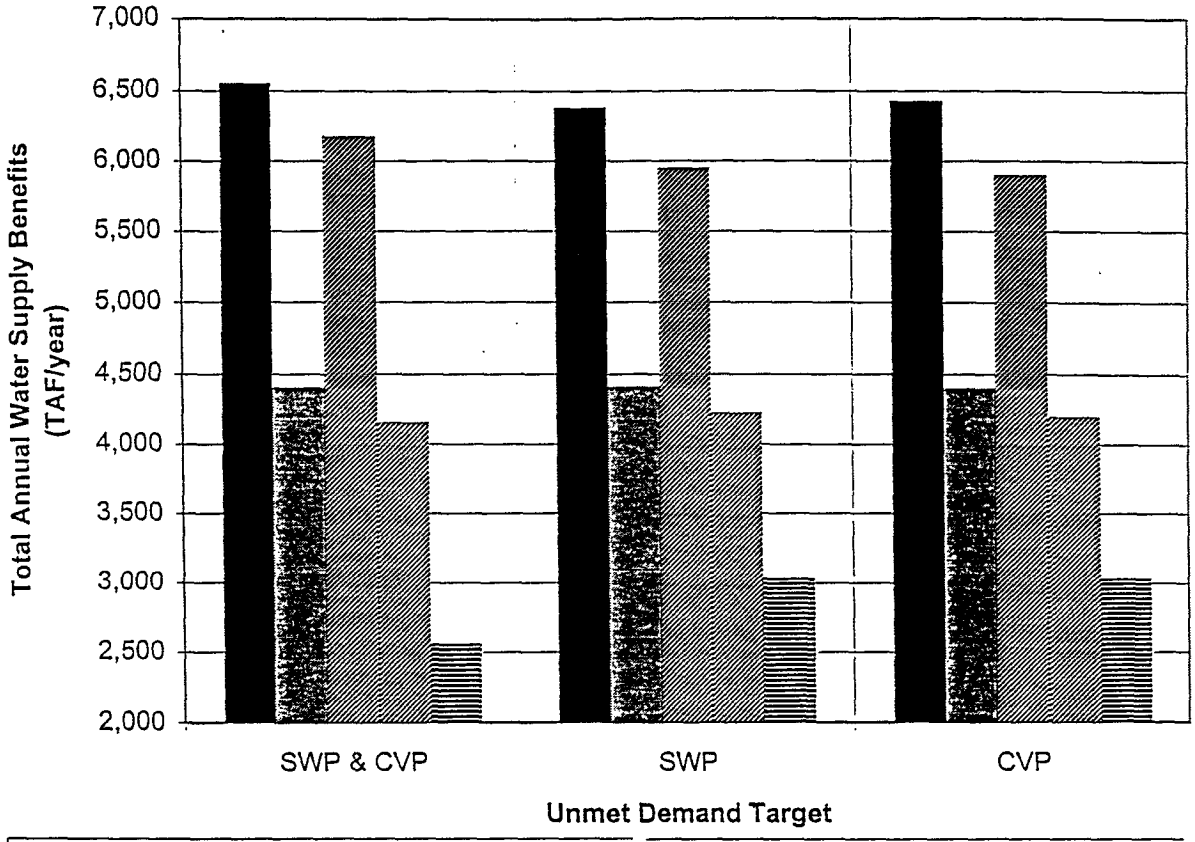
Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,136	6,068	6,060
1928-34 Dry Period Average:	4,101	4,094	4,077
Average of all Dry Years:	5,609	5,540	5,513
Average of all Crit. Dry Years:	3,890	3,877	3,816
Minimum Annual:	2,532	2,532	2,638

NA_DE4.XLS: Bar-Tot Chart 1

3/27/97

Figure NA-17
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



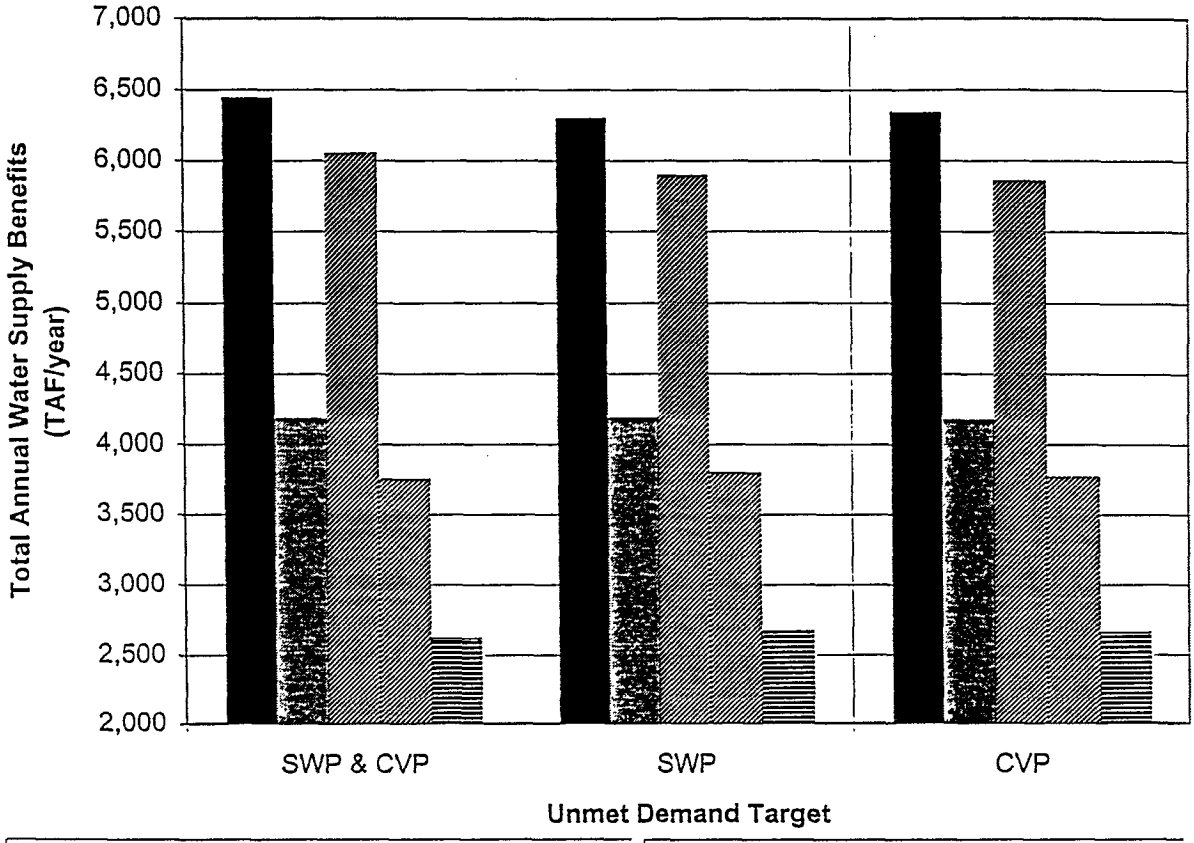
Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
SDI Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 0%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 0 taf	≡ Minimum Annual
S.R. Flow Event (2 month) Target = 0 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,555	6,381	6,430
1928-34 Dry Period Average:	4,406	4,411	4,402
Average of all Dry Years:	6,174	5,950	5,902
Average of all Crit. Dry Years:	4,154	4,221	4,193
Minimum Annual:	2,560	3,037	3,037

NA_DE5.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-18
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



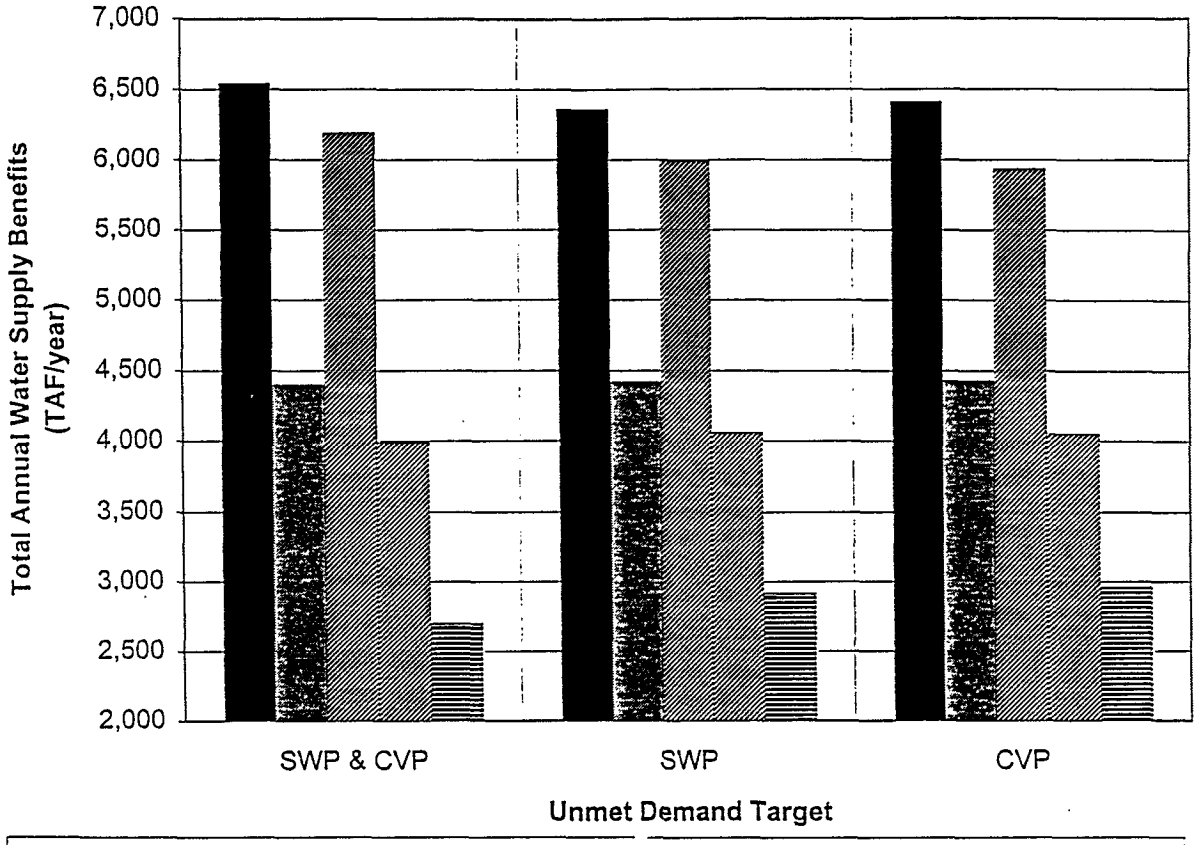
Assumptions	
Storage Volume = 3.0 MAF	71-Year Average
Conveyance Capacity = 5,000 cfs	1928-34 Dry Period Average
SDI Banks PP Capacity	Dry Year Average
A&U Storage Carryover Factor = 50%	Critically Dry Year Average
S.R. Flow Event (1 month) Target = 1,500 taf	Minimum Annual
S.R. Flow Event (2 month) Target = 2,650 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,444	6,299	6,342
1928-34 Dry Period Average:	4,186	4,188	4,175
Average of all Dry Years:	6,055	5,899	5,861
Average of all Crit. Dry Years:	3,756	3,801	3,771
Minimum Annual:	2,621	2,671	2,661

NA_DE6.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-19
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



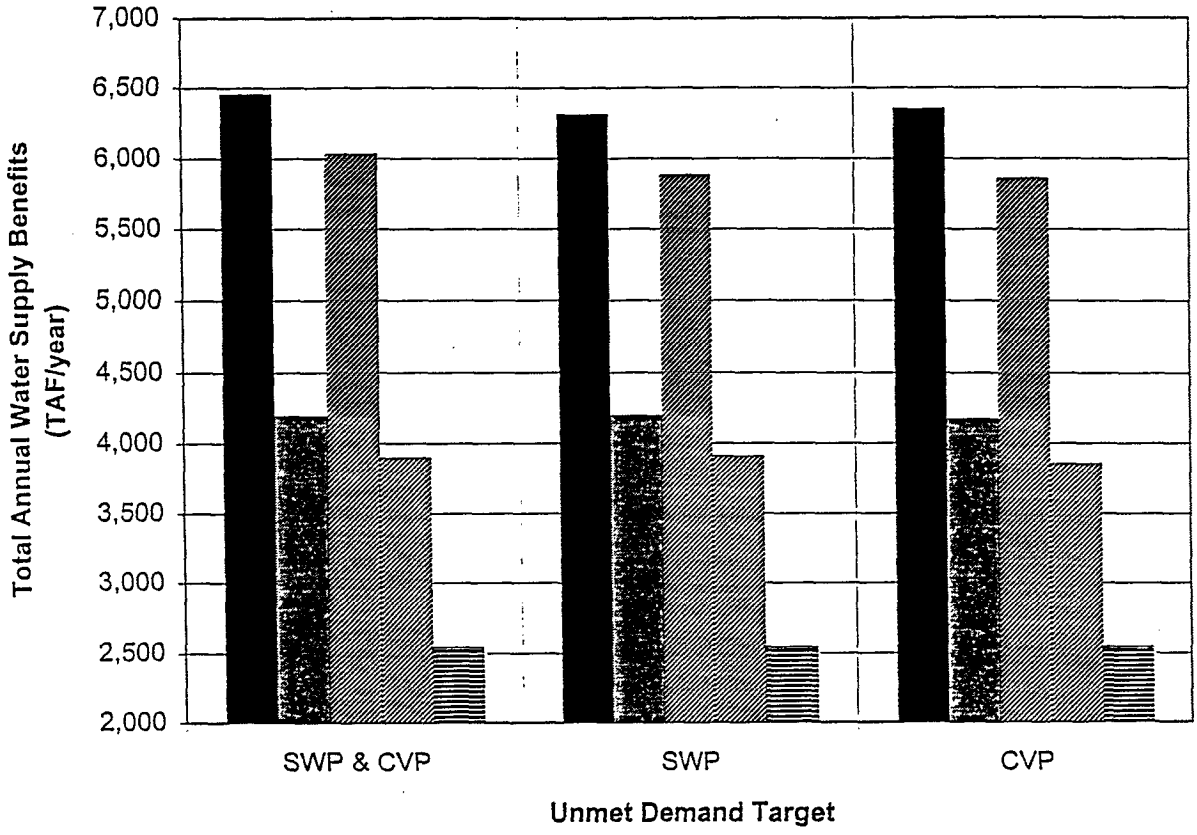
Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
SDI Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 50%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 0 taf	≡ Minimum Annual
S.R. Flow Event (2 month) Target = 0 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,543	6,365	6,416
1928-34 Dry Period Average:	4,404	4,423	4,432
Average of all Dry Years:	6,193	5,993	5,935
Average of all Crit. Dry Years:	3,990	4,058	4,052
Minimum Annual:	2,700	2,920	2,963

NA_DE7.XLS: Bar-Tot Chart 1 3/27/97

Figure NA-20
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus Unmet Demand Target



Assumptions	
Storage Volume = 3.0 MAF	■ 71-Year Average
Conveyance Capacity = 5,000 cfs	■ 1928-34 Dry Period Average
SDI Banks PP Capacity	▨ Dry Year Average
A&U Storage Carryover Factor = 0%	▨ Critically Dry Year Average
S.R. Flow Event (1 month) Target = 1,500 taf	≡ Minimum Annual
S.R. Flow Event (2 month) Target = 2,650 taf	

Total Water Supply Benefits (TAF/yr)

Unmet Demand Target:	SWP & CVP	SWP	CVP
71-Year Average:	6,458	6,315	6,355
1928-34 Dry Period Average:	4,193	4,198	4,175
Average of all Dry Years:	6,035	5,884	5,861
Average of all Crit. Dry Years:	3,898	3,909	3,856
Minimum Annual:	2,547	2,547	2,547

NA_DE8.XLS: Bar-Tot Chart 1 3/27/97

Water Supply Benefits versus Sacramento River Flow Event Target

Background

Input from agency representatives, and stakeholders suggested a need to maintain certain flow events to protect geomorphological processes along the upper un-leveed portion of the Sacramento River and biological processes in the river and in the San Francisco\San Joaquin Bay-Delta prior to diverting flows for any new storage facilities. A flow of 60,000 cfs was suggested as the seasonal flushing flow necessary in addition to existing in-stream and/or navigation requirements prior to diversions from the Sacramento River. Because, the CALFED spreadsheet operations model uses a monthly time step, this peak flow rate must be related to a monthly volume. An initial evaluation of historical records was made to provide a relationship between monthly volumes and peak flows. Charts displaying this information are shown in Figures NA-21 and NA-22. Continuing evaluation of the historical record suggests that the peak flow may occur such that an equivalent two month volume is more reflective of the conditions under which such a peak flow occurs. A one month volume in combination with an equivalent two month volume is used in this evaluation to limit diversions to storage. In addition, for this evaluation, the Sacramento River flow event target is considered a recurring annual target. Beginning each October this flow target in addition to existing in-stream and/or navigation requirements must be met prior to diverting any flows to storage. Once the target is met for the current water year only existing in-stream and/or navigation requirements must be met prior to diverting subsequent flows to storage during the water year.

Model Runs

Sacramento river flow event (1 month) targets ranging from 0 to 1,500 taf (and equivalent 2 month flow events) were varied in a set of model runs to evaluate effects on water supply benefits 1) with and without expanded Banks Pumping Plant capacity, 2) varied storage carryover factors, and 3) varied unmet demand targets. These model runs are described in Table NA-7 and summary results are displayed in Table NA-8. For comparability, all results are measured using total south of Delta SWP and CVP water supply deliveries.

Evaluation -- Sensitivity Analysis

Varying the Sacramento River flow event target results in varying effects for the majority of runs with existing Banks Pumping Plant capacity. Up to 2-percent decreases in 71-Year Annual Average Ag & Urban Water Supply Benefits (difference between the minimum and maximum) and up to 19-percent decreases in Minimum Annual Ag & Urban Water Supply Benefits (difference between the minimum and maximum) occur as the Sacramento River flow event target is increased from 0 to 1,500 taf. Maximum decreases in Minimum Annual Ag & Urban Water Supply Benefits occur with the unmet demand target set at SWP-only, and Sacramento River flow event target set above 1,000 taf. Variable effects occur in dry and critical year averages, between 3 and 9 percent. Charts displaying the five statistical measures of Ag & Urban Water Supply

Benefits versus Sacramento River flow event targets for the existing Banks Pumping Plant capacity condition are shown in Figures NA-23 through NA-26.

Similar effects occur in model runs with expanded Banks Pumping Plant capacity. Up to 2-percent decreases in 71-Year Annual Average Ag & Urban Water Supply Benefits (difference between the minimum and maximum) and up to 20-percent decreases in Minimum Annual Ag & Urban Water Supply Benefits (difference between the minimum and maximum) occur as the Sacramento River flow event target is increased from 0 to 1,500 taf. Maximum decreases in Minimum Annual Ag & Urban Water Supply Benefits occur with the unmet demand target set at SWP-only, and Sacramento River flow event target set above 1,000 taf. Charts displaying the five statistical measures of Ag & Urban Water Supply Benefits versus Sacramento River Flow event target for the expanded Banks Pumping Plant capacity condition are shown in Figures NA-27 through NA-30.

The Minimum Annual Ag & Urban Water Supply Benefits benefits are maximized with the unmet demand target target set at SWP-only, Sacramento River flow event target less than 600 taf, and storage carryover factor set at 50 percent.

The 71-year Ag & Urban Water Supply Benefits benefits are maximized with the unmet demand target set at combined SWP and CVP unmet demand, Sacramento River flow event target less than 800 taf, and storage carryover factor set at 0 percent.

As indicated on the charts in Figures NA-23 through NA-30, a Sacramento River flow event target of up to 500 taf does not reduce benefits for any statistical measure. At or below this level, the existing in-stream and navigation requirements provide more restrictive diversion requirements. In addition, decreases in benefits do not increase significantly beyond Sacramento River flow event targets of 1,000 taf. The incremental increase/decrease (percent change between Agricultural and Urban Water Supply Benefits for single incremental change in Sacramento River flow event target are primarily less than 1 percent for flow events less than 400 taf, and increase up to 9 percent for flow events greater than 800 taf.

Sacramento River Flow Data
Ord Ferry Station

Jan 1948 Through Feb 1997

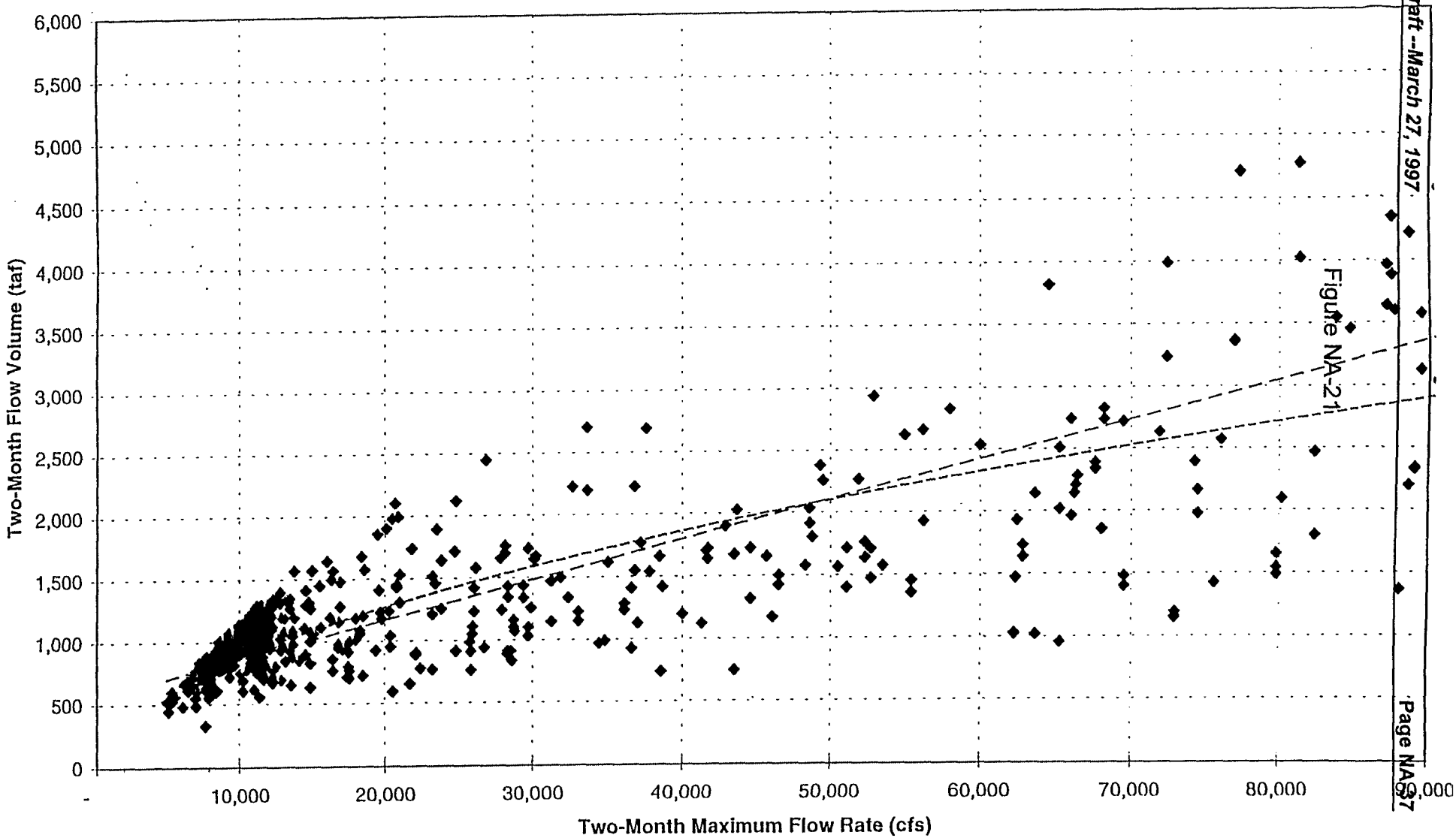


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Figure NA-21

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3/11/97

Sacramento River Flow Data

Ord Ferry Station

Only Flows < 70,000 cfs

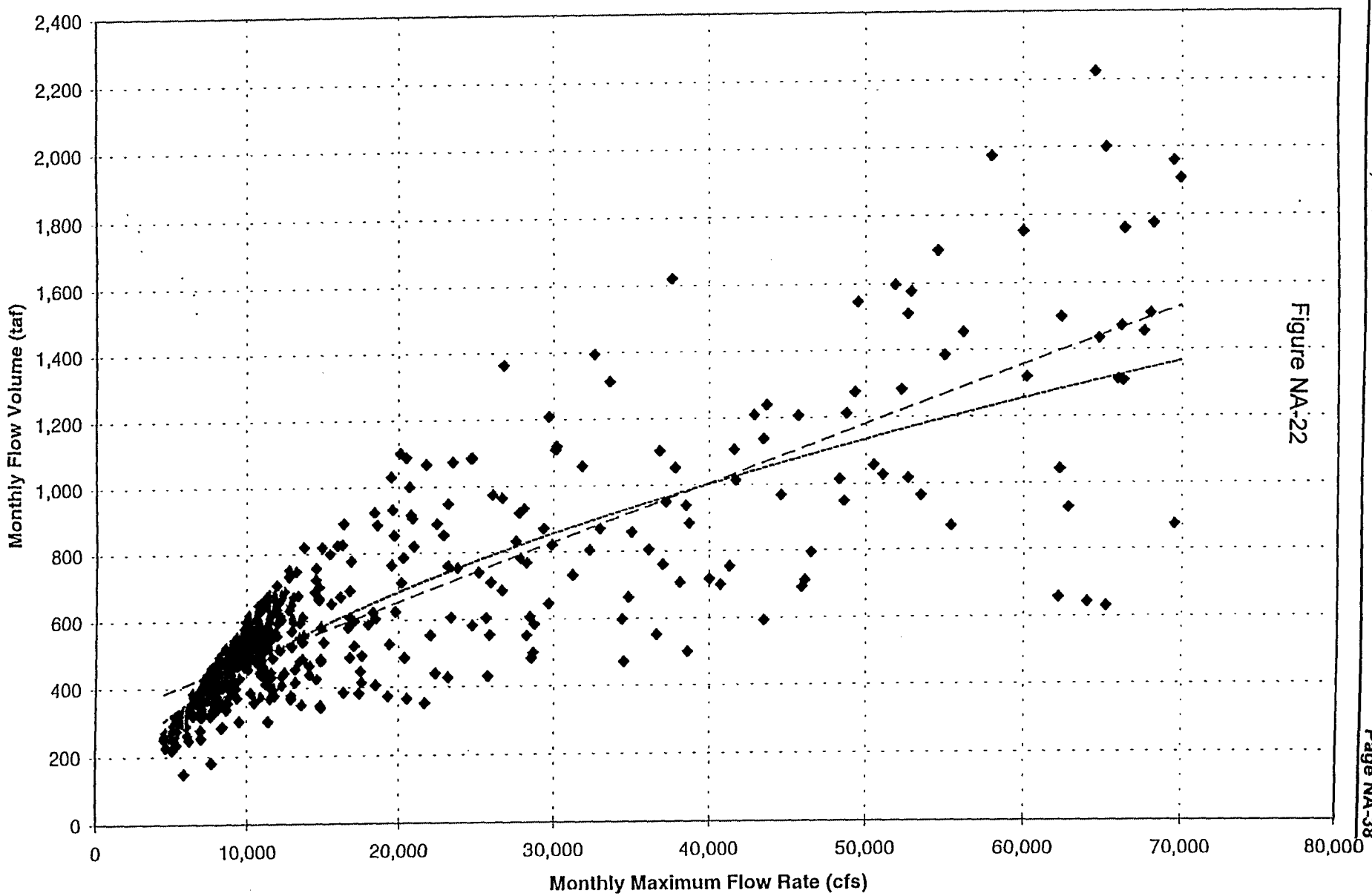


Figure NA-22

Table NA-7

Upstream of Delta Off-Stream Storage
Model Runs for Evaluation of S.R. Flow Event Target (1 and 2 Month Values)

Run Results Workbook	Evaluation Workbook	Model Run Identifiers	S.R. Flow Event Target (1 Month)	S.R. Flow Event Target (2 Month)	Common Assumptions
OUT_NA04.XLS	NA_SR1.XLS	NA401	0	0	3.0 maf Maximum Storage Volume
		NA402	200	400	5,000 cfs Inflow/Outflow Capacity
		NA403	400	750	Existing Banks PP Capacity
		NA404	600	1200	Total Unmet Demand = SWP and CVP Unmet Demand
		NA405	800	1450	Storage Carryover Factor = 0.0
		NA406	1000	1800	
		NA407	1200	2150	
		NA408	1500	2650	
OUT_NA04.XLS	NA_SR2.XLS	NA409	0	0	3.0 maf Maximum Storage Volume
		NA410	200	400	5,000 cfs Inflow/Outflow Capacity
		NA411	400	750	Existing Banks PP Capacity
		NA412	600	1200	Total Unmet Demand = SWP Unmet Demand Only
		NA413	800	1450	Storage Carryover Factor = 0.5
		NA414	1000	1800	
		NA415	1200	2150	
		NA416	1500	2650	
OUT_NA04.XLS	NA_SR3.XLS	NA417	0	0	3.0 maf Maximum Storage Volume
		NA418	200	400	5,000 cfs Inflow/Outflow Capacity
		NA419	400	750	Existing Banks PP Capacity
		NA420	600	1200	Total Unmet Demand = SWP Unmet Demand Only
		NA421	800	1450	Storage Carryover Factor = 0.0
		NA422	1000	1800	
		NA423	1200	2150	
		NA424	1500	2650	
OUT_NA04.XLS	NA_SR4.XLS	NA425	0	0	3.0 maf Maximum Storage Volume
		NA426	200	400	5,000 cfs Inflow/Outflow Capacity
		NA427	400	750	Existing Banks PP Capacity
		NA428	600	1200	Total Unmet Demand = SWP and CVP Unmet Demand
		NA429	800	1450	Storage Carryover Factor = 0.5
		NA430	1000	1800	
		NA431	1200	2150	
		NA432	1500	2650	
OUT_NA04.XLS	NA_SR5.XLS	NA433	0	0	3.0 maf Maximum Storage Volume
		NA434	200	400	5,000 cfs Inflow/Outflow Capacity
		NA435	400	750	SDI Banks PP Capacity
		NA436	600	1200	Total Unmet Demand = SWP and CVP Unmet Demand
		NA437	800	1450	Storage Carryover Factor = 0.0
		NA438	1000	1800	
		NA439	1200	2150	
		NA440	1500	2650	
OUT_NA04.XLS	NA_SR6.XLS	NA441	0	0	3.0 maf Maximum Storage Volume
		NA442	200	400	5,000 cfs Inflow/Outflow Capacity
		NA443	400	750	SDI Banks PP Capacity
		NA444	600	1200	Total Unmet Demand = SWP Unmet Demand Only
		NA445	800	1450	Storage Carryover Factor = 0.5
		NA446	1000	1800	
		NA447	1200	2150	
		NA448	1500	2650	
OUT_NA04.XLS	NA_SR7.XLS	NA449	0	0	2.0 maf Maximum Storage Volume
		NA450	200	400	3,500 cfs Inflow/Outflow Capacity
		NA451	400	750	SDI Banks PP Capacity
		NA452	600	1200	Total Unmet Demand = SWP Unmet Demand Only
		NA453	800	1450	Storage Carryover Factor = 0.0
		NA454	1000	1800	
		NA455	1200	2150	
		NA456	1500	2650	
OUT_NA04.XLS	NA_SR8.XLS	NA457	0	0	3.0 maf Maximum Storage Volume
		NA458	200	400	5,000 cfs Inflow/Outflow Capacity
		NA459	400	750	SDI Banks PP Capacity
		NA460	600	1200	Total Unmet Demand = SWP and CVP Unmet Demand
		NA461	800	1450	Storage Carryover Factor = 0.5
		NA462	1000	1800	
		NA463	1200	2150	
		NA464	1500	2650	

NA_SRSM.XLS: Runs

Table NA-8

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply vs. S.R. Flow Event Target
Under Various Operational Conditions[1]
(Values in thousands of acre-feet)

Run Identifiers:	NA401	NA402	NA403	NA404	NA405	NA406	NA407	NA408	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,236	6,236	6,233	6,221	6,203	6,161	6,152	6,136	6,136	6,236	1.6%
1928-34 Dry Period Average	4,372	4,372	4,354	4,321	4,235	4,101	4,101	4,101	4,101	4,372	6.6%
Dry Year Average	5,751	5,751	5,748	5,714	5,711	5,666	5,657	5,609	5,609	5,751	2.5%
Critically Dry Year Average	4,235	4,235	4,222	4,197	4,106	3,914	3,895	3,890	3,890	4,235	8.9%
Minimum Annual	2,892	2,892	2,875	2,749	2,543	2,532	2,532	2,532	2,532	2,892	14.2%

Run Identifiers:	NA409	NA410	NA411	NA412	NA413	NA414	NA415	NA416	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,136	6,136	6,135	6,128	6,112	6,073	6,067	6,053	6,053	6,136	1.4%
1928-34 Dry Period Average	4,352	4,352	4,352	4,327	4,242	4,092	4,087	4,083	4,083	4,352	6.6%
Dry Year Average	5,675	5,675	5,674	5,655	5,644	5,589	5,588	5,562	5,562	5,675	2.0%
Critically Dry Year Average	4,088	4,088	4,085	4,062	3,983	3,816	3,790	3,761	3,761	4,088	8.7%
Minimum Annual	3,136	3,136	3,136	3,122	3,065	2,826	2,771	2,675	2,675	3,136	17.2%

Run Identifiers:	NA417	NA418	NA419	NA420	NA421	NA422	NA423	NA424	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,156	6,156	6,154	6,145	6,128	6,088	6,082	6,068	6,068	6,156	1.5%
1928-34 Dry Period Average	4,367	4,367	4,350	4,317	4,233	4,104	4,095	4,094	4,094	4,367	6.7%
Dry Year Average	5,651	5,651	5,648	5,615	5,606	5,570	5,566	5,540	5,540	5,651	2.0%
Critically Dry Year Average	4,256	4,256	4,245	4,233	4,144	3,934	3,908	3,877	3,877	4,256	9.8%
Minimum Annual	3,009	3,009	3,009	3,009	3,009	3,009	2,749	2,532	2,532	3,009	18.8%

Run Identifiers:	NA425	NA426	NA427	NA428	NA429	NA430	NA431	NA432	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,219	6,219	6,218	6,206	6,189	6,148	6,138	6,122	6,122	6,219	1.6%
1928-34 Dry Period Average	4,372	4,372	4,365	4,326	4,235	4,090	4,090	4,090	4,090	4,372	6.9%
Dry Year Average	5,779	5,779	5,778	5,757	5,738	5,684	5,679	5,630	5,630	5,779	2.6%
Critically Dry Year Average	4,045	4,045	4,037	3,996	3,930	3,760	3,739	3,734	3,734	4,045	8.3%
Minimum Annual	2,913	2,913	2,909	2,876	2,824	2,701	2,648	2,628	2,628	2,913	10.8%

Run Identifiers:	NA433	NA434	NA435	NA436	NA437	NA438	NA439	NA440	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,555	6,555	6,555	6,552	6,540	6,493	6,479	6,458	6,458	6,555	1.5%
1928-34 Dry Period Average	4,406	4,406	4,406	4,394	4,347	4,197	4,193	4,193	4,193	4,406	5.1%
Dry Year Average	6,174	6,174	6,174	6,172	6,159	6,103	6,099	6,035	6,035	6,174	2.3%
Critically Dry Year Average	4,154	4,154	4,154	4,143	4,093	3,913	3,898	3,898	3,898	4,154	6.6%
Minimum Annual	2,560	2,560	2,560	2,560	2,560	2,547	2,547	2,547	2,547	2,560	0.5%

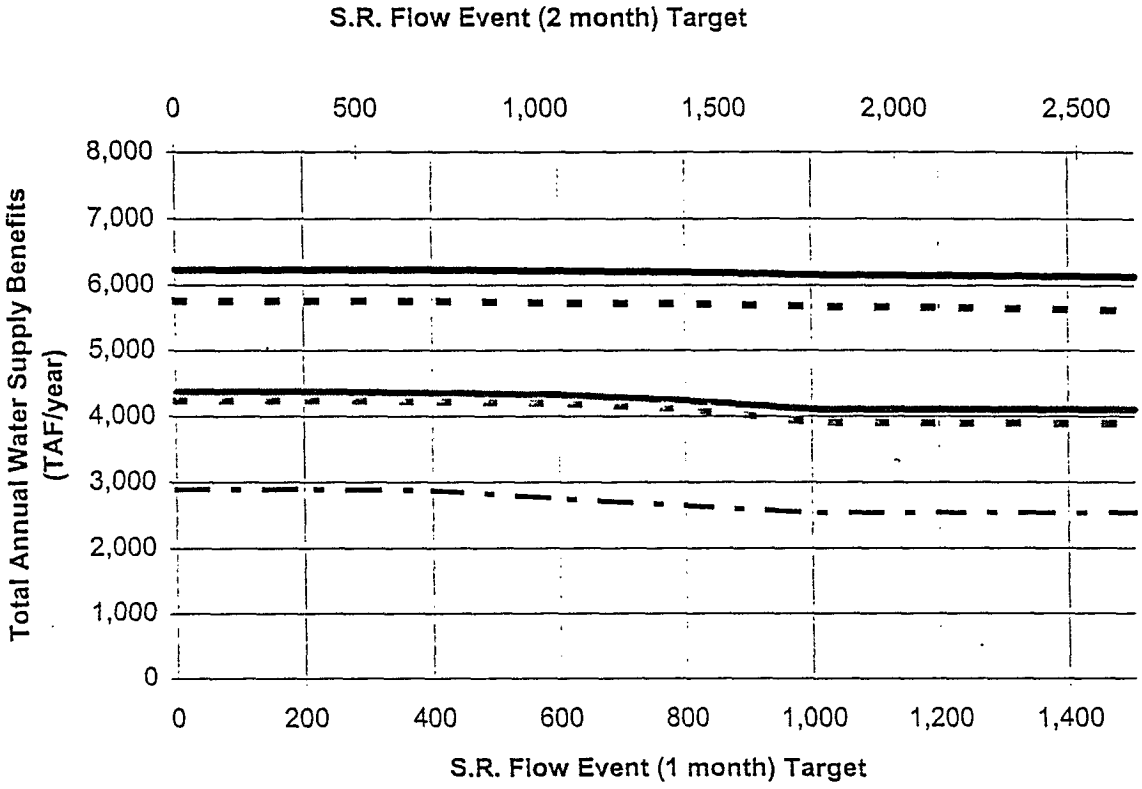
Run Identifiers:	NA441	NA442	NA443	NA444	NA445	NA446	NA447	NA448	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,365	6,365	6,365	6,364	6,356	6,317	6,313	6,299	6,299	6,365	1.0%
1928-34 Dry Period Average	4,423	4,423	4,423	4,412	4,382	4,201	4,193	4,188	4,188	4,423	5.6%
Dry Year Average	5,993	5,993	5,993	5,991	5,980	5,919	5,926	5,899	5,899	5,993	1.6%
Critically Dry Year Average	4,058	4,058	4,058	4,053	4,018	3,852	3,826	3,801	3,801	4,058	6.8%
Minimum Annual	2,920	2,920	2,920	2,920	2,913	2,815	2,752	2,671	2,671	2,920	9.3%

Run Identifiers:	NA449	NA450	NA451	NA452	NA453	NA454	NA455	NA456	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,381	6,381	6,381	6,379	6,371	6,331	6,328	6,315	6,315	6,381	1.0%
1928-34 Dry Period Average	4,411	4,411	4,411	4,399	4,352	4,210	4,199	4,198	4,198	4,411	5.1%
Dry Year Average	5,950	5,950	5,950	5,950	5,950	5,903	5,906	5,884	5,884	5,950	1.1%
Critically Dry Year Average	4,221	4,221	4,221	4,214	4,162	3,966	3,941	3,909	3,909	4,221	8.0%
Minimum Annual	3,037	3,037	3,037	3,037	3,037	2,760	2,547	2,547	2,547	3,037	19.2%

Run Identifiers:	NA457	NA458	NA459	NA460	NA461	NA462	NA463	NA464	Minimum Value	Maximum Value	Percent Difference
S.R. Flow Event (1 Month) Targe	0	200	400	600	800	1,000	1,200	1,500			
S.R. Flow Event (2 Month) Targe	0	400	750	1,200	1,450	1,800	2,150	2,650			
71-Year Average	6,543	6,543	6,543	6,540	6,525	6,479	6,465	6,444	6,444	6,543	1.5%
1928-34 Dry Period Average	4,404	4,404	4,404	4,392	4,341	4,189	4,186	4,186	4,186	4,404	5.2%
Dry Year Average	6,193	6,193	6,193	6,194	6,178	6,125	6,123	6,055	6,055	6,194	2.3%
Critically Dry Year Average	3,990	3,990	3,990	3,976	3,929	3,776	3,758	3,756	3,756	3,990	6.2%
Minimum Annual	2,700	2,700	2,700	2,689	2,683	2,661	2,628	2,621	2,621	2,700	3.0%

[1]See Table NA-1 for description of operational conditions.

Figure NA-23
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



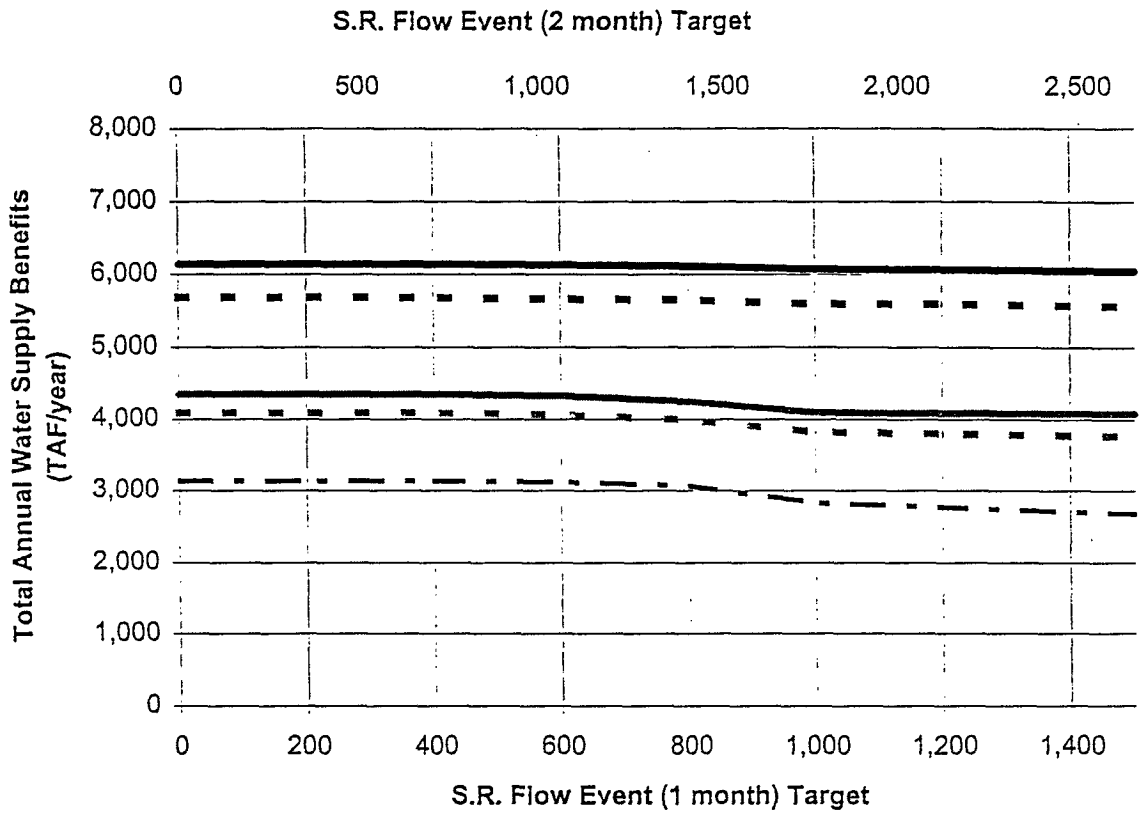
Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP & CVP

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)		
S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,236	6,136
1928-34 Dry Period Average:	4,372	4,101
Average of all Dry Years:	5,751	5,609
Average of all Crit. Dry Years:	4,235	3,890

NA_SR1.XLS: XY-Tot Chart 1 3/27/97

Figure NA-24
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



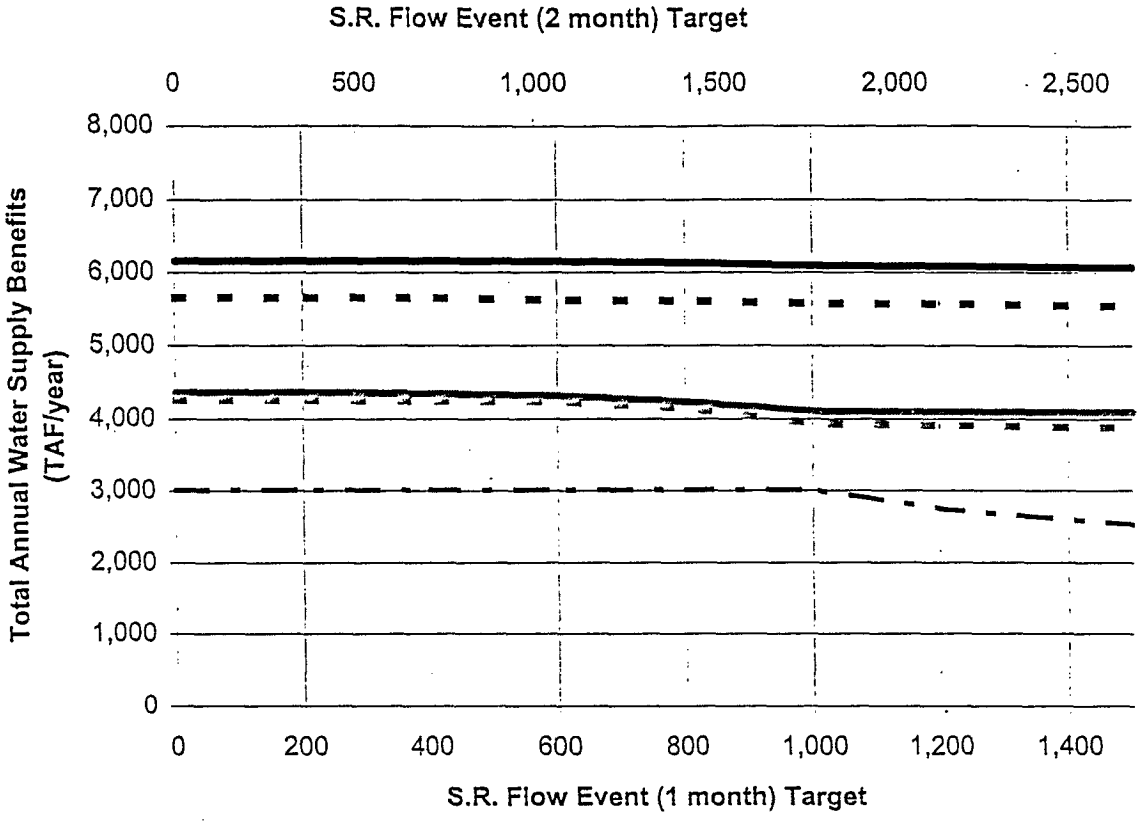
Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)		
S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,136	6,053
1928-34 Dry Period Average:	4,352	4,083
Average of all Dry Years:	5,675	5,562
Average of all Crit. Dry Years:	4,088	3,761

NA_SR2.XLS: XY-Tot Chart 1 3/27/97

Figure NA-25
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP

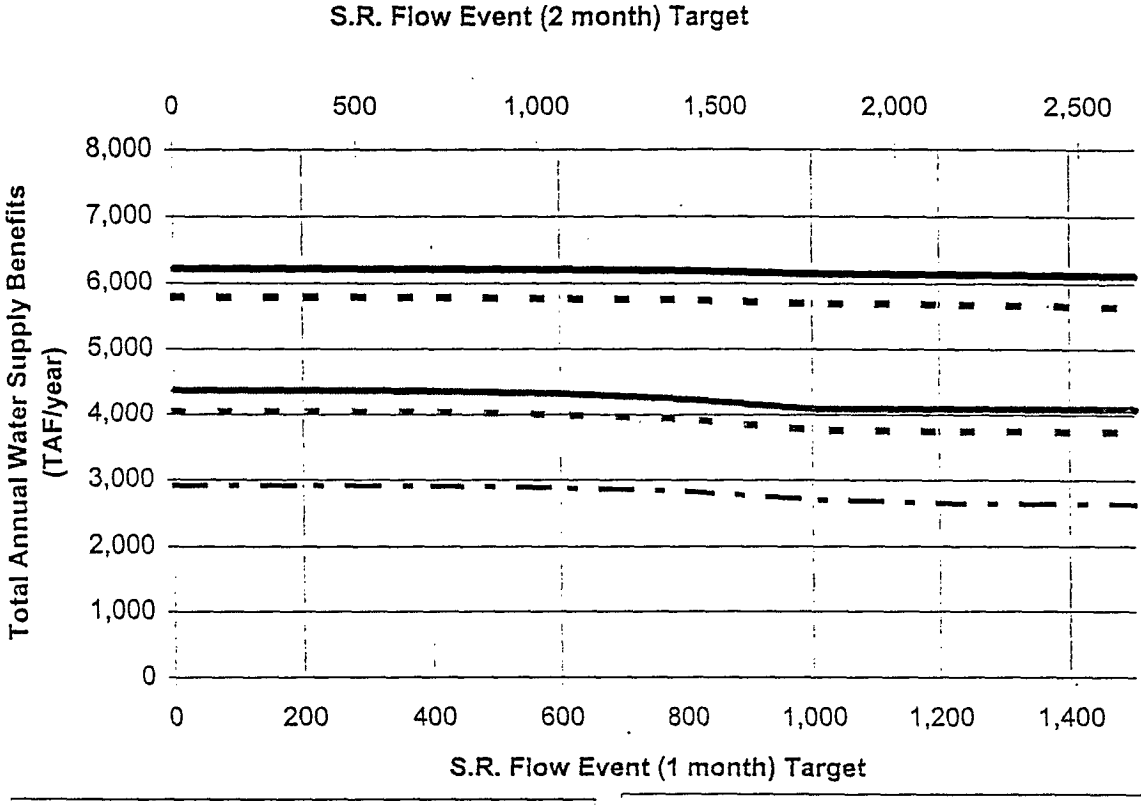
- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,156	6,068
1928-34 Dry Period Average:	4,367	4,094
Average of all Dry Years:	5,651	5,540
Average of all Crit. Dry Years:	4,256	3,877

NA_SR3.XLS: XY-Tot Chart 1 3/27/97

Figure NA-26
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
Existing Banks PP Capacity
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP & CVP

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

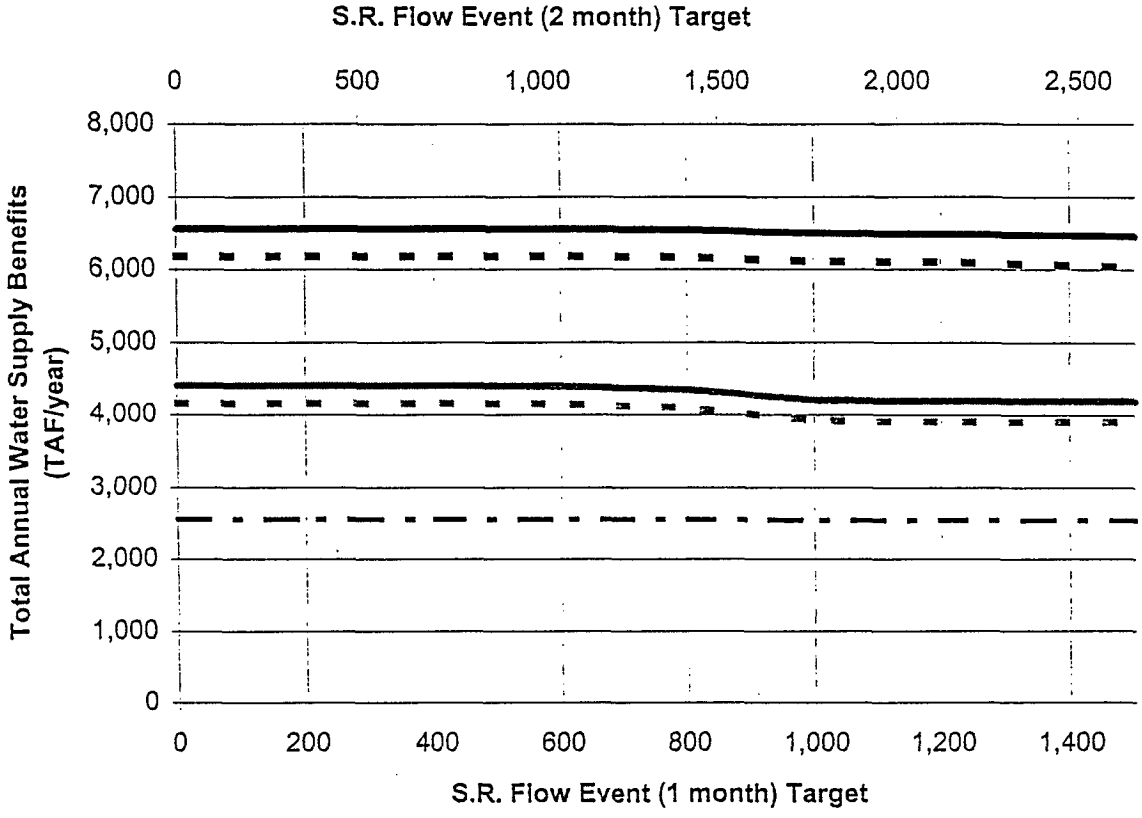
Total Water Supply Benefits (TAF/yr)

S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,219	6,122
1928-34 Dry Period Average:	4,372	4,090
Average of all Dry Years:	5,779	5,630
Average of all Crit. Dry Years:	4,045	3,734

NA_SR4.XLS: XY-Tot Chart 1

3/27/97

Figure NA-27
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP & CVP

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

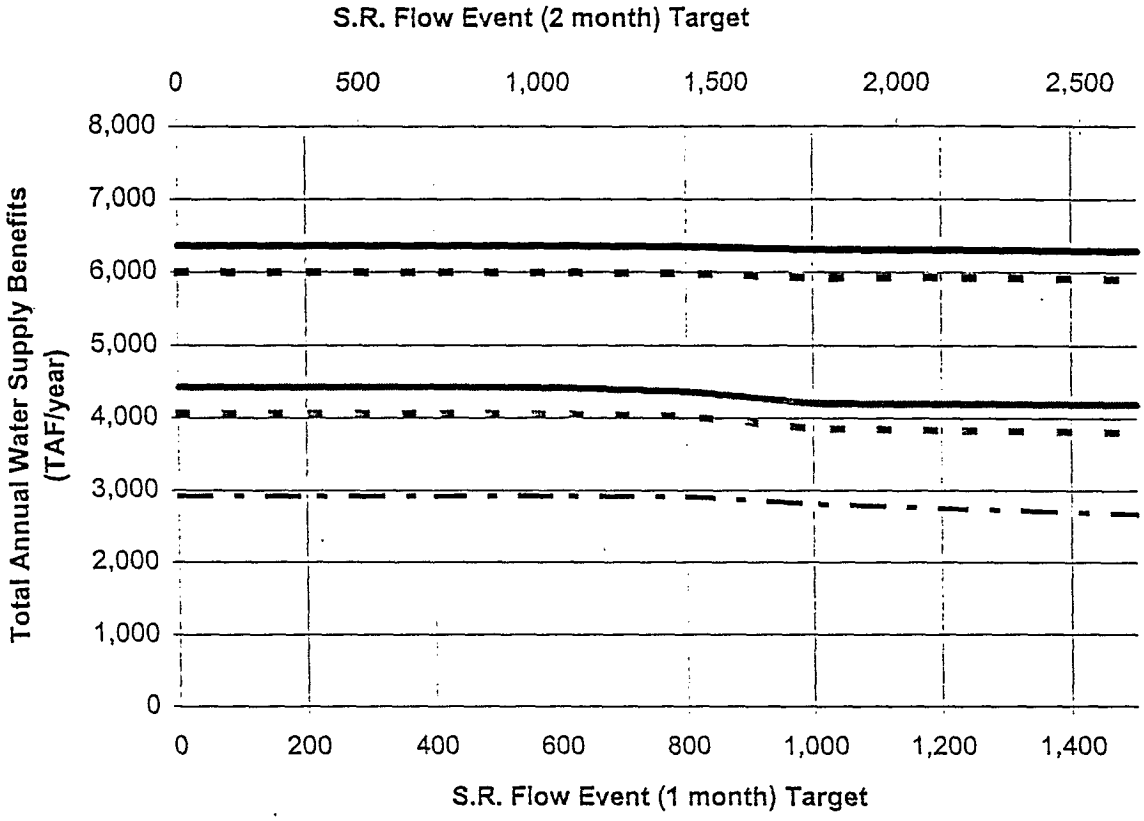
Total Water Supply Benefits (TAF/yr)		
S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,555	6,458
1928-34 Dry Period Average:	4,406	4,193
Average of all Dry Years:	6,174	6,035
Average of all Crit. Dry Years:	4,154	3,898

NA_SR5.XLS: XY-Tot Chart 1 3/27/97

D-005914

Figure NA-28

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP

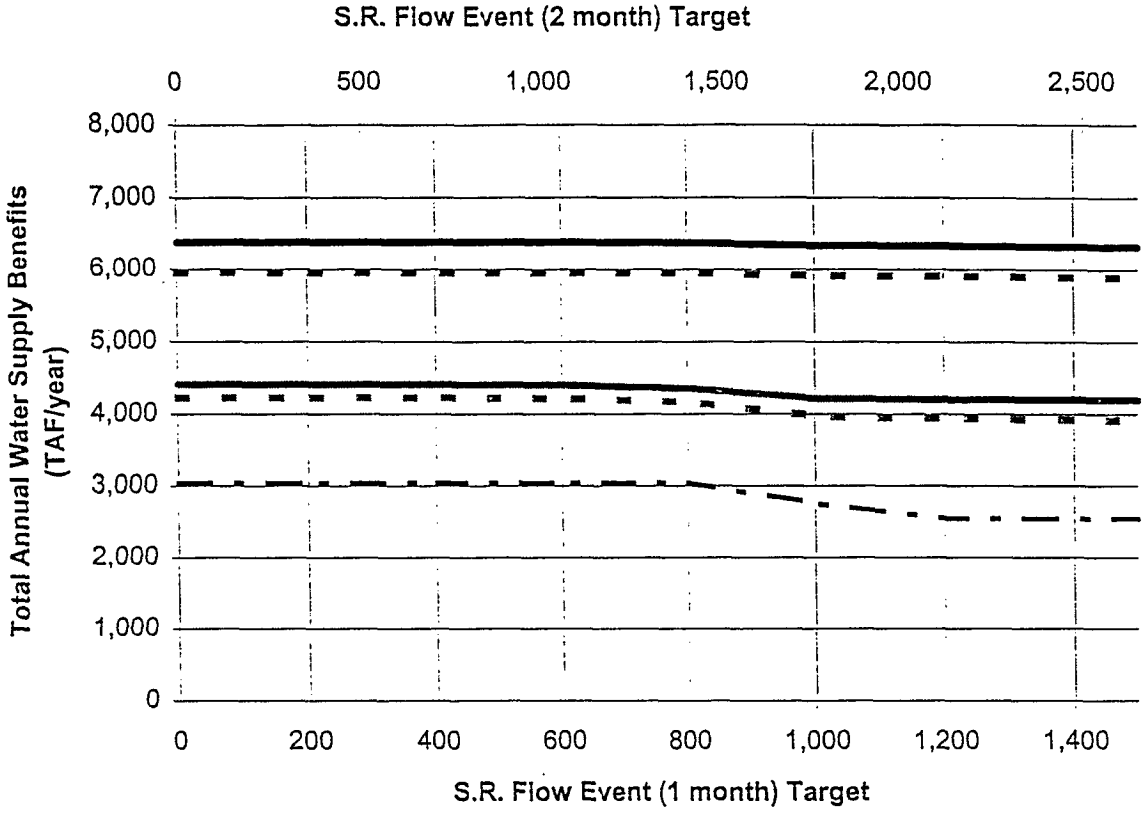
- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,365	6,299
1928-34 Dry Period Average:	4,423	4,188
Average of all Dry Years:	5,993	5,899
Average of all Crit. Dry Years:	4,058	3,801

NA_SR6.XLS: XY-Tot Chart 1 3/27/97

Figure NA-29
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP

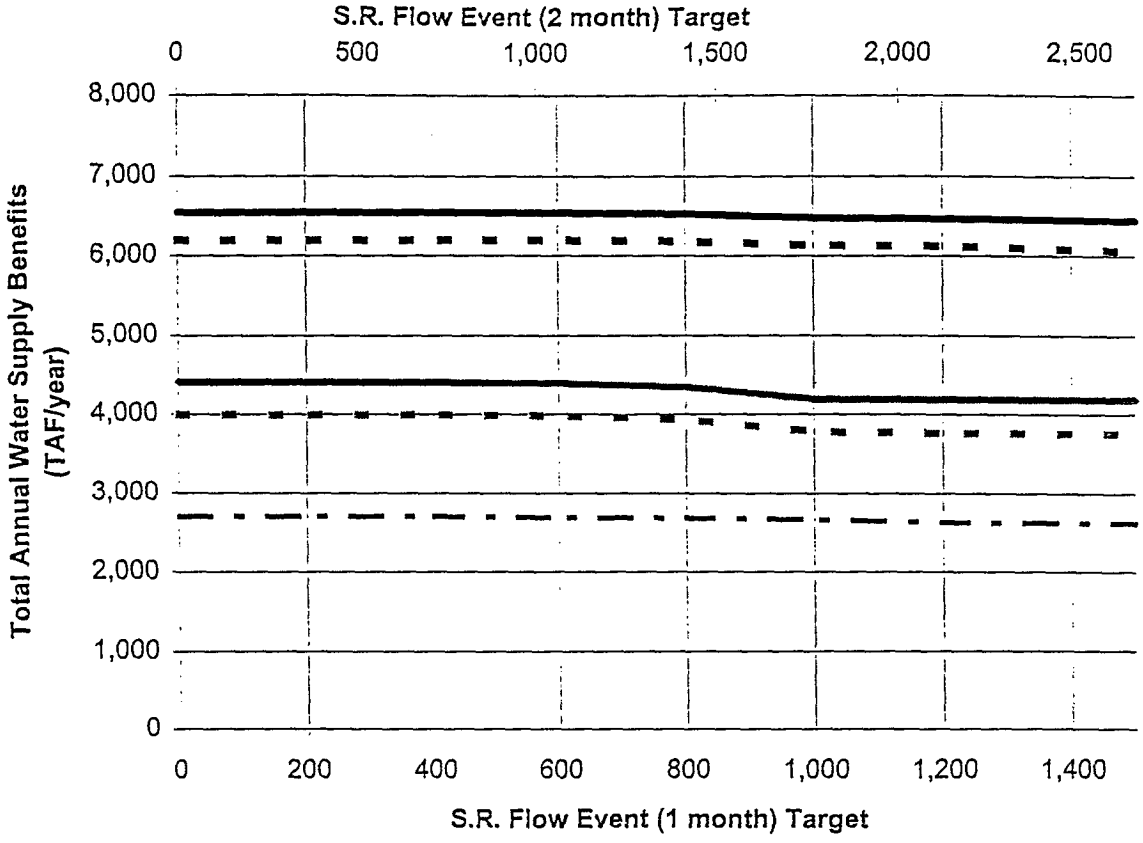
- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,381	6,315
1928-34 Dry Period Average:	4,411	4,198
Average of all Dry Years:	5,950	5,884
Average of all Crit. Dry Years:	4,221	3,909

NA_SR7.XLS: XY-Tot Chart 1 3/27/97

Figure NA-30
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits versus S.R. Flow Event Target



Assumptions
Storage Volume = 3.0 MAF
Conveyance Capacity = 5,000 cfs
SDI Banks PP Capacity
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP & CVP

- 71-Year Average
- 1928-34 Dry Period Average
- Dry Year Average
- Critically Dry Year Average
- Minimum Annual

Total Water Supply Benefits (TAF/yr)

S.R. Flow Event (1 month) Target:	0 taf	1,500 taf
S.R. Flow Event (2 month) Target:	0 taf	2,650 taf
71-Year Average:	6,543	6,444
1928-34 Dry Period Average:	4,404	4,186
Average of all Dry Years:	6,193	6,055
Average of all Crit. Dry Years:	3,990	3,756
Minimum Annual:	2,700	2,621

NA_SR8.XLS: XY-Tot Chart 1 3/27/97

Selection of Bracketing Operational Parameter Sets

As described in the previous sections, sensitivity analyses were conducted using the CALFED spreadsheet operations model to identify the effects of various operational parameters on environmental water supply benefits. Using the information developed through this process, operational parameters were selected to represent the eight bracketing operation conditions described in Table NA-1.

Parameter sets which maximized 71-year Average Annual Ag & Urban Water Supply Benefits were chosen for the Normal Period Supply Operation conditions. Emphasizing this long-term average clearly results in the largest quantity of total water supply deliveries over the 71-year hydrologic period. Developing a rational for selecting parameter sets for Dry Period Supply Operation conditions is more complex. Several sets of operational parameters resulted in relatively large Average Dry Year, Average Critically Dry Year, or 1928-34 Critical Dry Period Average Annual Environmental Delta Outflows. When examined in detail, however, it was found the large averages are often due to a particularly large storage release in one or two years, while no benefits are provided during many other critical years. Because of this, operational parameters which maximized Minimum Annual Ag & Urban Water Supply Benefits were selected with more conservative operating criteria (higher storage carryover requirements and lower unmet demand targets); however, maximizing minimum annual deliveries may not be a cost-effective operational goal for agricultural and urban water supply benefits. To provide a reasonable bracketing operation condition, it was decided to use a 50 percent storage carryover factor with existing Banks Pumping Plant capacity, a 30 percent storage carryover factor with expanded Banks Pumping Plant capacity and SWP-only unmet demand target for Dry Period Supply Operations. This set of operation parameters provides a more uniform distribution of water supply benefits in dry and critically dry years.

Parameter sets for Normal Period Supply Operation and Dry Period Supply Operation were selected for the four external conditions considered in this evaluation, existing Banks Pumping Plant capacity with low Sacramento River flow event target, existing Banks Pumping Plant capacity with high Sacramento River flow event target, expanded Banks Pumping Plant capacity with low Sacramento River flow event target, and expanded Banks Pumping Plant capacity with high Sacramento River flow event target. The resulting operational parameters for each of the eight bracketing operation conditions are detailed in Table NA-9.

Table NA-9

Upstream of Delta Off-Stream Storage
Selected Parameter Sets for Bracketing Operation Conditions

External Condition	Operational Parameters
A. Existing Banks PP Capacity S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 400 taf	– Normal Period Supply Operation Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP
B. Existing Banks PP Capacity S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 400 taf	– Dry Period Supply Operation Storage Carryover Factor = 50% Unmet Demand Target = SWP-only
C. Expanded Banks PP Capacity S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 400 taf	– Normal Period Supply Operation Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP
D. Expanded Banks PP Capacity S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 400 taf	– Dry Period Supply Operation Storage Carryover Factor = 30% Unmet Demand Target = SWP-only
E. Existing Banks PP Capacity S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf	– Normal Period Supply Operation Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP
F. Existing Banks PP Capacity S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf	– Dry Period Supply Operation Storage Carryover Factor = 50% Unmet Demand Target = SWP-only
G. Expanded Banks PP Capacity S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf	– Normal Period Supply Operation Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP
H. Expanded Banks PP Capacity S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf	– Dry Period Supply Operation Storage Carryover Factor = 30% Unmet Demand Target = SWP-only

Comparison of Bracketing Operation Conditions

Model Runs

Model runs were completed for each of the four operation conditions using the operational parameter described in Table NA-9. For comparative purposes, maximum storage volume was set at 3.0 maf with a 5,000 cfs inflow/outflow capacity. Table NA-10 compares the total and net increased Agricultural and Urban Water Supply Benefits under each operation condition.

Evaluation

The Normal Period Supply and Dry Period Supply Operation conditions bracket the range of potential storage operations. Normal Period Supply Operation maximizes total average water supply benefits, as measured by the 71-Year Average Annual Agricultural and Urban Water Supply Benefits. Dry Period Supply Operation maximizes water supply benefits in extremely dry years, as measured by the Minimum Annual Agricultural and Urban Water Supply Benefits. Contrasting these bracketing operations for the existing Banks Pumping Plant capacity condition with low Sacramento River flow event target, Normal Period Supply Operation (Condition A) results in a net benefit of 315 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 215 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits under Dry Period Supply Operation (Condition B). Conversely, Condition B results in a net benefit of 930 taf in Minimum Annual Agricultural and Urban Water Supply Benefits, compared to a net benefit of 685 taf in Minimum Annual Agricultural and Urban Water Supply Benefits with Condition A.

Similar benefits are achieved under the expanded Banks Pumping Plant capacity conditions with low Sacramento River flow event target. Contrasting the bracketing Operation Conditions C and D, Normal period Supply Operation (Condition C) results in a net benefit of 385 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 207 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits under Dry Period Supply Operation (Condition D). Conversely, Condition D results in a net benefit of 790 taf in Minimum Annual Agricultural and Urban Water Supply Benefits, compared to a net benefit of 685 taf in Minimum Annual Agricultural and Urban Water Supply Benefits with Condition C.

The benefits of the operation goals are similar, although slightly reduced, under the high Sacramento River flow event target conditions. Contrasting the bracketing Operation Conditions E and F which include existing Banks Pumping Plant capacity, Normal Period Supply Operation (Condition E) results in a net benefit of 215 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 130 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits under Dry Period Supply Operation (Condition F). Conversely, Condition F results in a net benefit of 470 taf in Minimum Annual Agricultural and Urban Water Supply Benefits, compared to a net benefit of 325 taf in Minimum Annual Agricultural

and Urban Water Supply Benefits under Condition E. Contrasting the bracketing Operation Conditions G and H which include expanded Banks Pumping Plant capacity, Normal Period Supply Operation (Condition G) results in a net benefit of 290 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 140 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits under Dry Period Supply Operation (Condition H). Conversely, Condition H results in a net benefit of 450 taf in Minimum Agricultural and Urban Water Supply Benefits, compared to a net benefit of 363 taf in Minimum Annual Agricultural and Urban Water Supply Benefits under Condition G.

A high Sacramento River flow event target results in reduced benefits with existing or expanded Banks pumping plant capacity. Contrasting the bracketing Operation Conditions A and E, Condition A (low Sacramento River flow event target) results in a net benefit of 315 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 215 taf in 71-Year Average Annual Agricultural and Urban Water Supply Benefits under Condition E (high Sacramento River flow event target). Contrasting the bracketing Operation Conditions B and F, Condition B (low Sacramento River flow event target) results in a net benefit of 930 taf in Minimum Annual Agricultural and Urban Water Supply Benefits, as compared to a net benefit of 469 taf in Minimum Annual Agricultural and Urban Water Supply Benefits under Condition E (high Sacramento River flow event target).

Figures NA-31 through NA-34 compare the relative effects of the eight operation conditions on an annual basis. In these charts, bars represent the total Agricultural and Urban Water Supply Benefits for the 71 years used in the model simulations, sorted from minimum to maximum. For comparison, base case Agricultural and Urban Water Supply Benefits is represented with a line in each chart. In each chart Normal Period Supply Operations are compared to Dry Period Supply Operations for a given set of external conditions. In each case, Dry Period Supply Operations result in benefits during the very driest years, while Normal Period Supply Operations offer increased benefits during average and above average water years. More significant differences between operations are seen with low Sacramento River flow event targets (Figures NA-31 and 32) compared to high Sacramento River flow event targets (Figures NA-33 and 34).

Figure NA-31 compares Normal Period Supply and Dry Period Supply Operations (Conditions A and B) for the existing Banks Pumping Plant capacity condition with low Sacramento River flow event target. While, substantive benefits are seen during the driest years under Dry Period Supply Operation (Condition B), benefits during average-type water years are reduced in comparison to Normal Period Supply Operations. Similarly, Figure NE-32 compares Normal Period Supply and Dry Period Supply Operations (Conditions C and D) for the expanded Banks Pumping Plant capacity condition with low Sacramento River flow event target. Increased benefits occur during the very driest years under Dry Period Supply Operation (Condition D) in comparison to

Normal Period Supply Operation (Condition C); however, benefits during average-type water years are significantly reduced in comparison to Normal Period Supply Operation (Condition C). Figure NA-33 compares Normal Period Supply and Dry Period Supply Operations (Conditions E and F) for a high Sacramento River flow event target condition. Reduced benefits are seen during the driest years under Dry Period Supply Operation (Condition F) in comparison to Condition B. Benefits during average-type water years are also reduced. Figure NA-34 compares Normal Period Supply and Dry Period Supply Operations (Conditions G and H) for the expanded Banks Pumping Plant capacity condition with high Sacramento River flow event target. Reduced benefits occur during the very driest years under Dry Period Supply Operation (Condition H) in comparison to Condition D. Benefits during average-type water years are once again reduced in comparison to Normal Period Supply Operation (Condition G and Condition C).

Figure NA-35 presents the same data used in Figures NA-31 and NA-32 in a frequency-of-exceedence format. In this chart, total annual Agricultural and Urban Water Supply Benefits for the base case and four operation conditions is plotted against frequency of exceedence. As described above, substantial benefits in average-type years are shown with Normal Period Supply Operation, and substantial net gains in drier years under Dry Period Supply Operation.

Figure NA-36 presents the same data used in Figures NA-33 and NA-34 in a frequency-of-exceedence format. In this chart, total annual Agricultural and Urban Water Supply Benefits for the base case and four operation conditions is plotted against frequency of exceedence. As described above, substantial benefits in average-type years are shown with Normal Period Supply Operation, and smaller net gains in drier years under Dry Period Supply Operation. Comparing to Figure NA-29, the overall benefits with a higher Sacramento River flow event target are less than the overall benefits with a lower Sacramento River flow event target.

To provide a better understanding of the year-to-year operations that occur under the eight bracketing operation conditions, Figures NA-37 through NA-44 display the simulated storage releases that occur throughout the 71-year hydrological sequence. In each chart, bars represent annual volumes of storage releases and a solid line represents the annual volume of water required to fully meet the total south of Delta SWP and CVP unmet demands. A dashed line represents the annual volume of water required to meet the SWP and CVP unmet demand target. As can be seen in these charts, under Normal Period Supply Operations (Conditions A, C, E and G) larger annual volumes of water are released frequently during the 71-year hydrologic sequence. Under Dry Period Supply Operations (Conditions B, D, F and H), annual releases are much smaller, and occur on a much less frequent basis for normal type years, but more frequently during dry type years. The overall lower values and reduced frequency under all conditions is a result of the higher Sacramento River flow event target.

Simulated end-of-month storage volumes for the eight bracketing operation conditions are shown in Figures NA-45 through NA-52. As expected, storage volumes show much larger variability under Normal Period Supply Operations (Conditions A, C, E and G) in comparison to Dry Period Supply Operations (Conditions B, D, F and H). Under Condition B (Existing Banks Pumping Plant -- Dry Period Supply Operation), the storage volume is not emptied in any year of the 71-year hydrologic sequence. Under Condition F (Existing Banks Pumping Plant -- Dry Period Supply Operation) with high Sacramento River flow event target, the minimum storage volume is reached during 5 periods of the the 71-year hydrologic sequence. Under Condition A and E (Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation), the 3.0 maf storage volume empties periodically during historical dry periods of the 71-year hydrologic sequence.

Table NA-10

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits vs. Operational Condition
for 3.0 MAF Maximum Storage Capacity

(Values in thousands of acre-feet)

Ag & Urban Water Supply Benefits	Base 1	Base 2	Operation Condition A NA501		Operation Condition B NA502		Operation Condition C NA503		Operation Condition D NA504	
	Base Case with Existing Banks PP Capacity	Base Case with SDI Banks PP Capacity	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit
71-Year Average	5,921	6,169	6,236	315	6,136	215	6,555	386	6,376	207
1928-34 Dry Period Average	3,918	4,033	4,372	454	4,352	434	4,406	372	4,413	379
Dry Year Average	5,374	5,635	5,751	377	5,675	302	6,174	538	5,981	345
Critically Dry Year Average	3,421	3,480	4,235	814	4,088	667	4,154	674	4,146	667
Minimum Annual	2,206	2,184	2,892	685	3,136	930	2,560	377	2,976	792

Ag & Urban Water Supply Benefits	Base 1	Base 2	Operation Condition E NA505		Operation Condition F NA506		Operation Condition G NA507		Operation Condition H NA508	
	Base Case with Existing Banks PP Capacity	Base Case with SDI Banks PP Capacity	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit	Ag & Urban Water Supply Benefits	Net Benefit
71-Year Average	5,921	6,169	6,136	215	6,053	132	6,458	289	6,309	140
1928-34 Dry Period Average	3,918	4,033	4,101	183	4,083	165	4,193	160	4,196	162
Dry Year Average	5,374	5,635	5,609	235	5,562	188	6,035	400	5,898	263
Critically Dry Year Average	3,421	3,480	3,890	469	3,761	340	3,898	419	3,859	379
Minimum Annual	2,206	2,184	2,532	326	2,675	469	2,547	363	2,634	450

[1]See Table NA-1 for description of operational conditions.

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions

A. Existing Banks PP Capacity -- Normal Period Supply Operation

B. Existing Banks PP Capacity -- Dry Period Supply Operation

Base Case (No Storage, Existing Banks Cap.)

Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	A	B
71-Year Average:	6,236	6,136
1928-34 Dry Period Average:	4,372	4,352
Average of all Dry Years:	5,751	5,675
Average of all Crit. Dry Years	4,235	4,088
Minimum Annual:	2,892	3,136

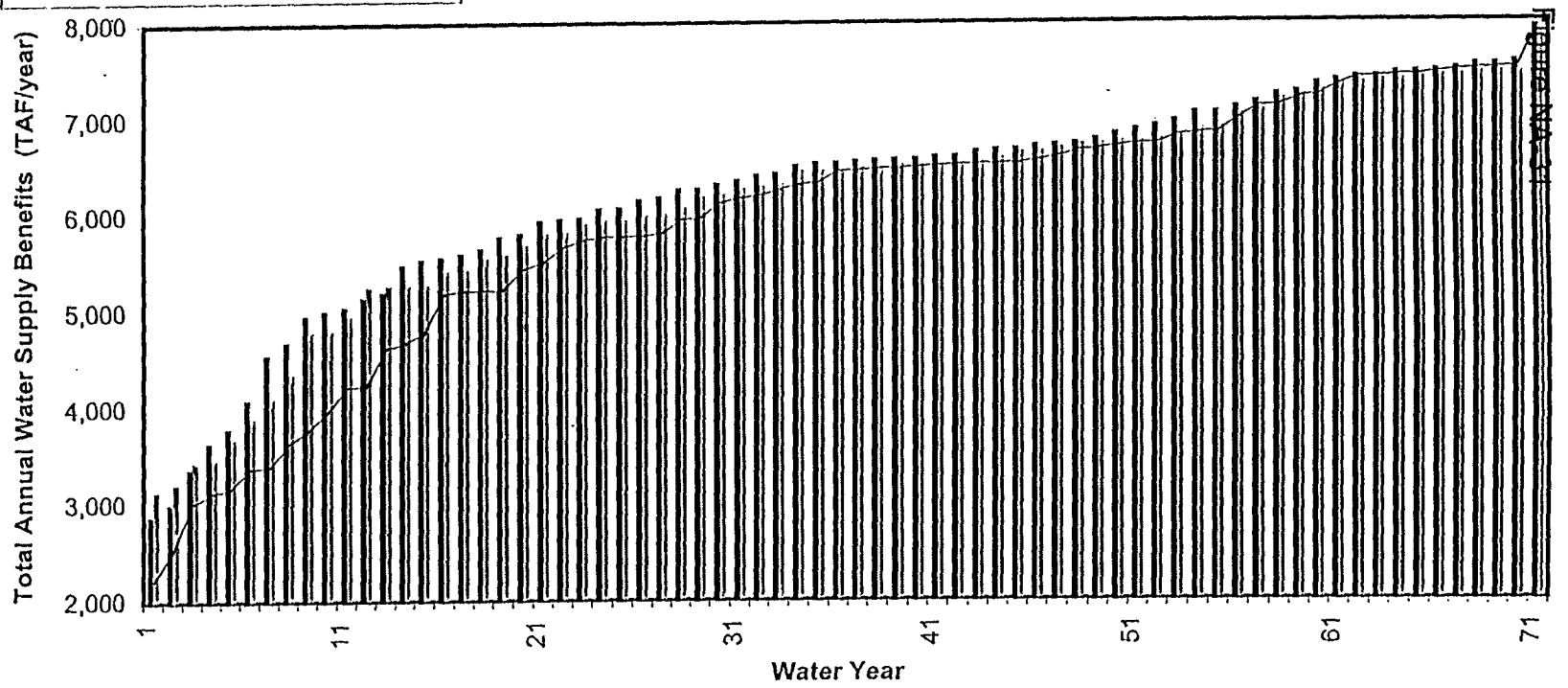


FIGURE NA-31

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions

- C. Expanded Banks PP Capacity -- Normal Period Supply Operation
- D. Expanded Banks PP Capacity -- Dry Period Supply Operation
- Base Case (No Storage, SDI Banks Cap.)

Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	C	D
71-Year Average:	6,555	6,376
1928-34 Dry Period Average:	4,406	4,413
Average of all Dry Years:	6,174	5,981
Average of all Crit. Dry Years	4,154	4,146
Minimum Annual:	2,560	2,976

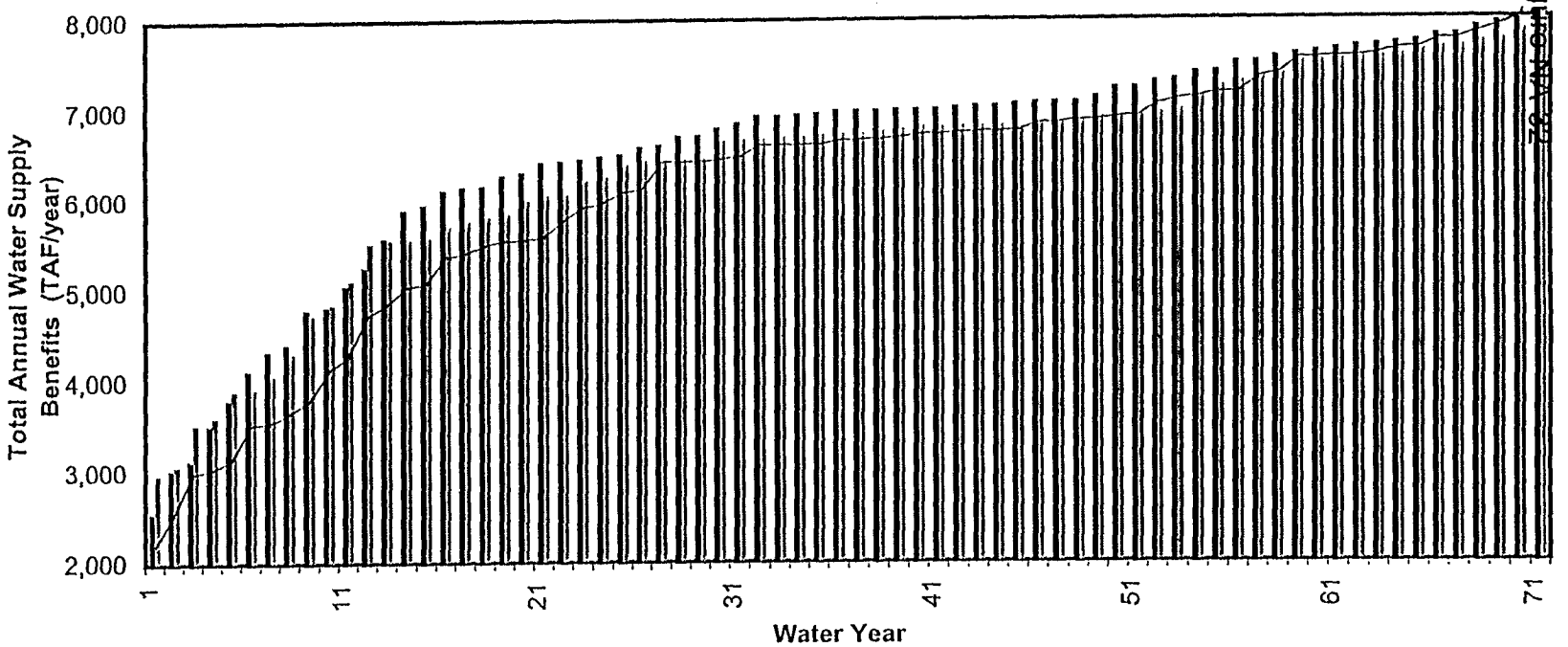


Figure NA-22

D—005926

D-005926

NA-C2\ XLS: Sort-Tot Chart 2

3/27/97

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions

- E. Existing Banks PP Capacity -- Normal Period Supply Operation
- F. Existing Banks PP Capacity -- Dry Period Supply Operation
- Base Case (No Storage, Existing Banks Cap.)

Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	E	F
71-Year Average:	6,136	6,053
1928-34 Dry Period Average:	4,101	4,083
Average of all Dry Years:	5,609	5,562
Average of all Crit. Dry Years	3,890	3,761
Minimum Annual:	2,532	2,675

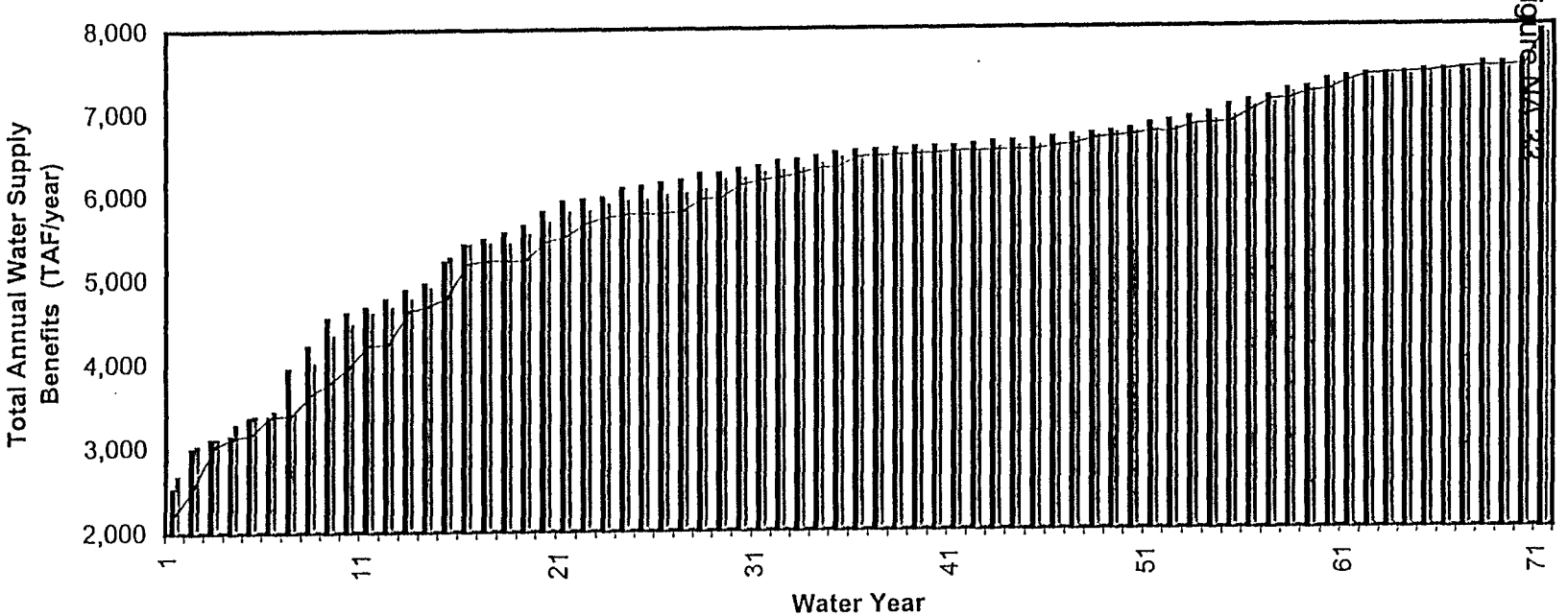


Figure NA-22

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions

- G. Expanded Banks PP Capacity -- Normal Period Supply Operation
- H. Expanded Banks PP Capacity -- Dry Period Supply Operation
- Base Case (No Storage, SDI Banks Cap.)

Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	G	H
71-Year Average:	6,458	6,309
1928-34 Dry Period Average:	4,193	4,196
Average of all Dry Years:	6,035	5,898
Average of all Crit. Dry Years	3,898	3,859
Minimum Annual:	2,547	2,634

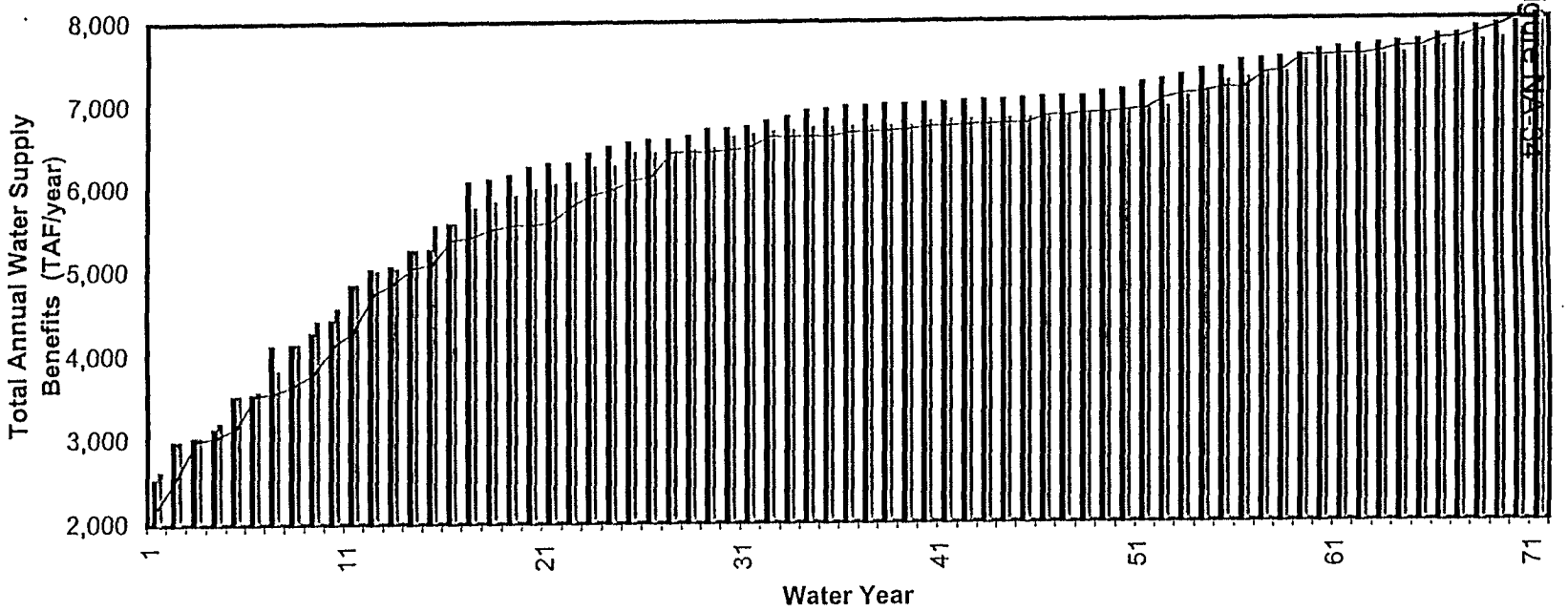
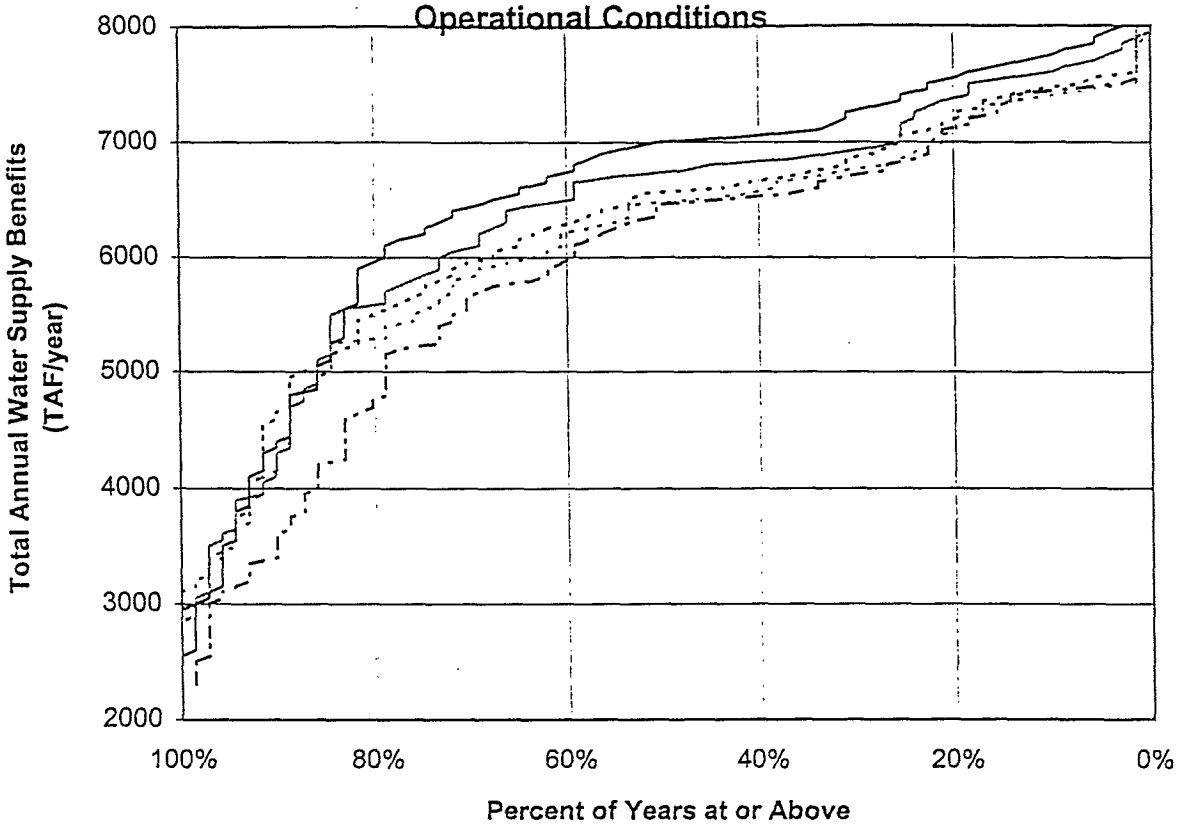


Figure NA-34

NA_OP2.XLS: Sort-Tot Chart 2

3/27/97

Figure NA-35
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions



Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

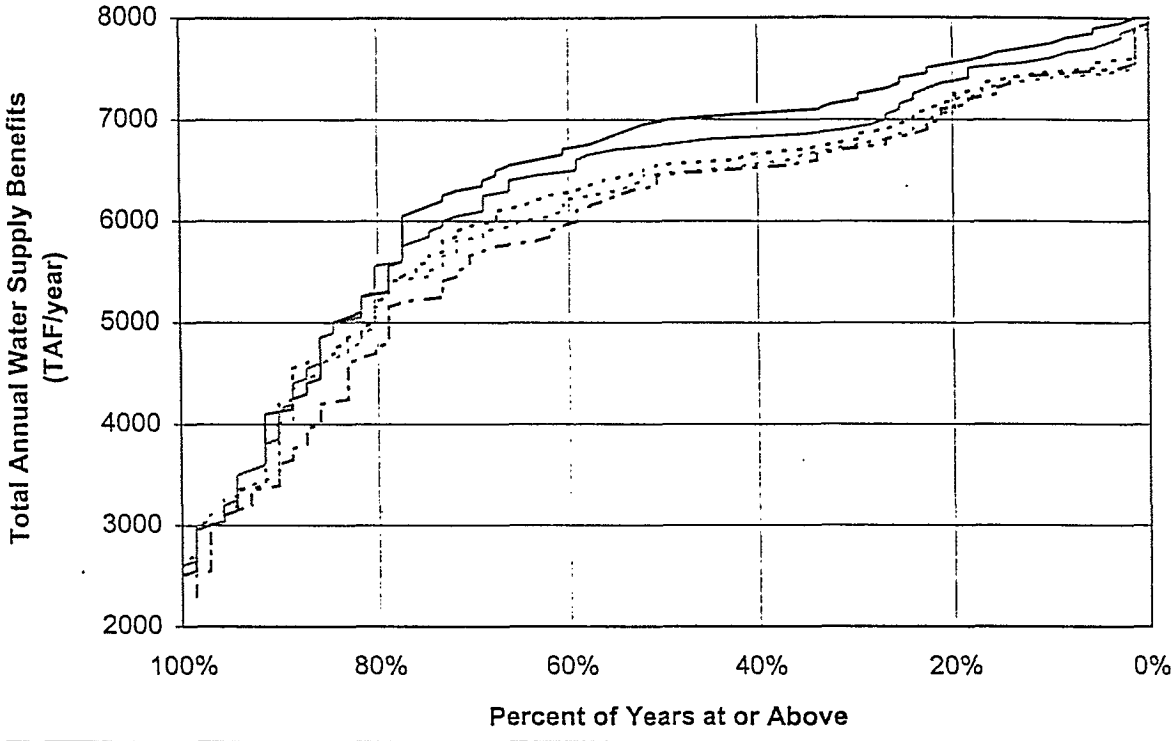
- - - - Base Case (No Storage, Existing Banks Cap.)
. . . . . A. Existing Banks PP Capacity -- Normal Period Supply Operation
. . . . . B. Existing Banks PP Capacity -- Dry Period Supply Operation
——— C. Expanded Banks PP Capacity -- Normal Period Supply Operation
——— D. Expanded Banks PP Capacity -- Dry Period Supply Operation

Total Water Supply Benefits (TAF/yr)

Operation Condition:	A	B	C	D
71-Year Average:	6,236	6,136	6,555	6,376
1928-34 Dry Period Average:	4,372	4,352	4,406	4,413
Average of all Dry Years:	5,751	5,675	6,174	5,981
Average of all Crit. Dry Years:	4,235	4,088	4,154	4,146
Minimum Annual:	2,892	3,136	2,560	2,976

NA_OP1.XLS: Freq-Tot Chart 1 3/27/97

Figure NA-36
Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under a Range of Operational Conditions



Assumptions

Maximum Storage Volume =3,000 taf
Conveyance Capacity = 5,000 cfs
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

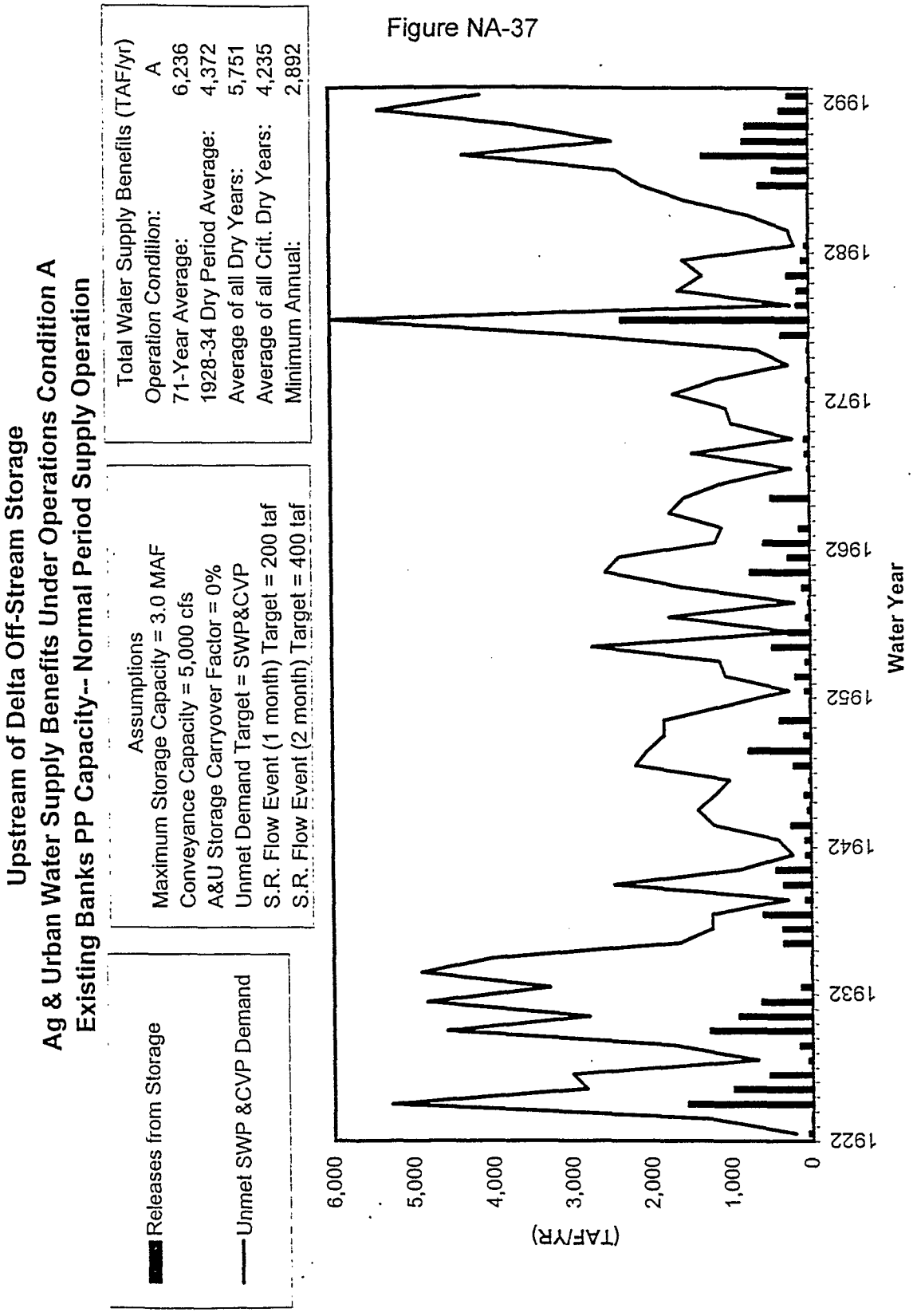
- · — · Base Case (No Storage, Existing Banks Cap.)
- · · · · · · E. Existing Banks PP Capacity -- Normal Period Supply Operation
- · · · · · · F. Existing Banks PP Capacity -- Dry Period Supply Operation
- ——— G. Expanded Banks PP Capacity -- Normal Period Supply Operation
- ——— H. Expanded Banks PP Capacity -- Dry Period Supply Operation

Total Water Supply Benefits (TAF/yr)

Operation Condition:	E	F	G	H
71-Year Average:	6,136	6,053	6,458	6,309
1928-34 Dry Period Average:	4,101	4,083	4,193	4,196
Average of all Dry Years:	5,609	5,562	6,035	5,898
Average of all Crit. Dry Years:	3,890	3,761	3,898	3,859
Minimum Annual:	2,532	2,675	2,547	2,634

NA_OP2.XLS: Freq-Tot Chart 1 3/27/97

Figure NA-37



3/27/97

NA_OP1.XLS: Outflow Plot A

D—005931

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition B
Existing Banks PP Capacity -- Dry Period Supply Operation

Releases from Storage

Unmet SWP Demand

Unmet SWP &CVP Demand

Assumptions
Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

Total Water Supply Benefits (TAF/yr)	
Operation Condition:	B
71-Year Average:	6,136
1928-34 Dry Period Average:	4,352
Average of all Dry Years:	5,675
Average of all Crit. Dry Years:	4,088
Minimum Annual:	3,136

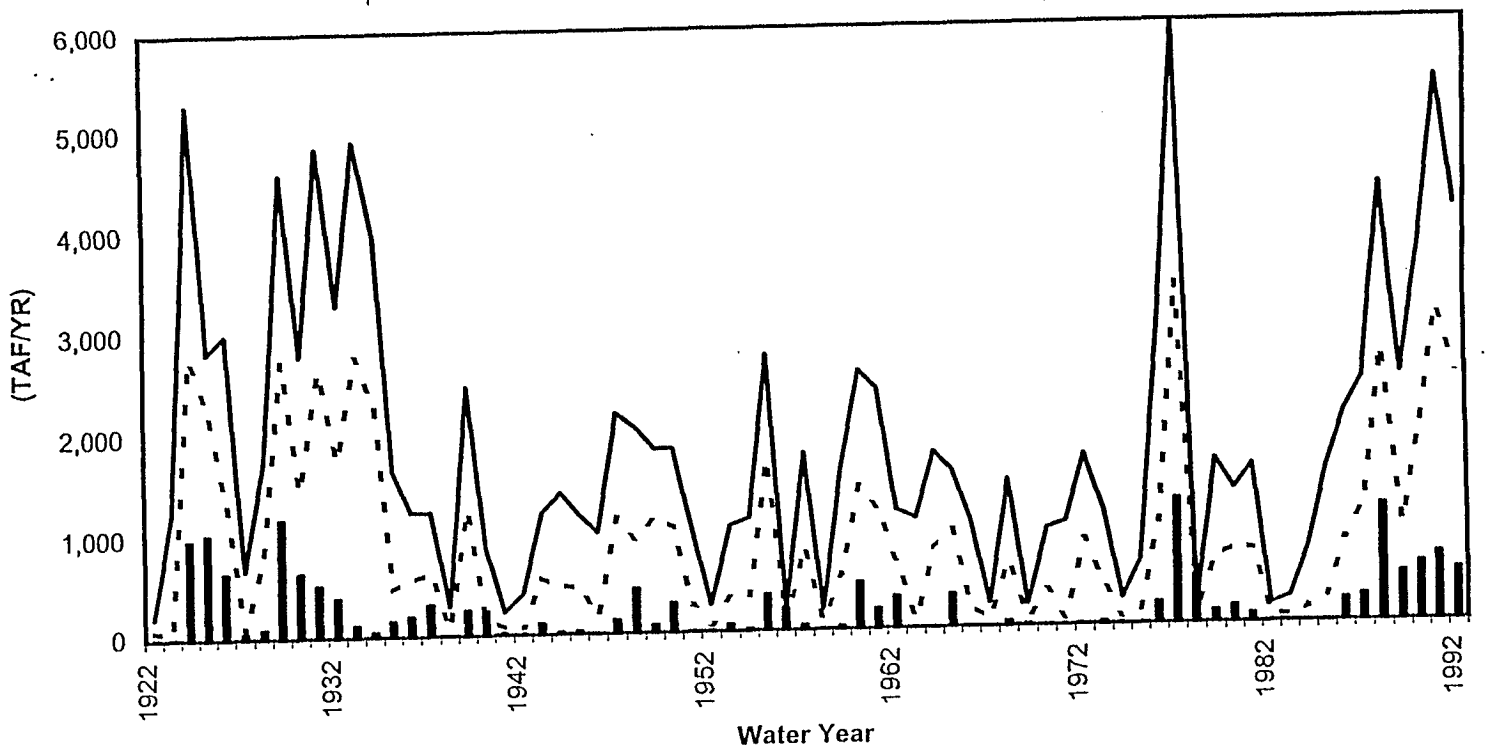


Figure NA-38

NA_OP1.XLS: Outflow Plot B

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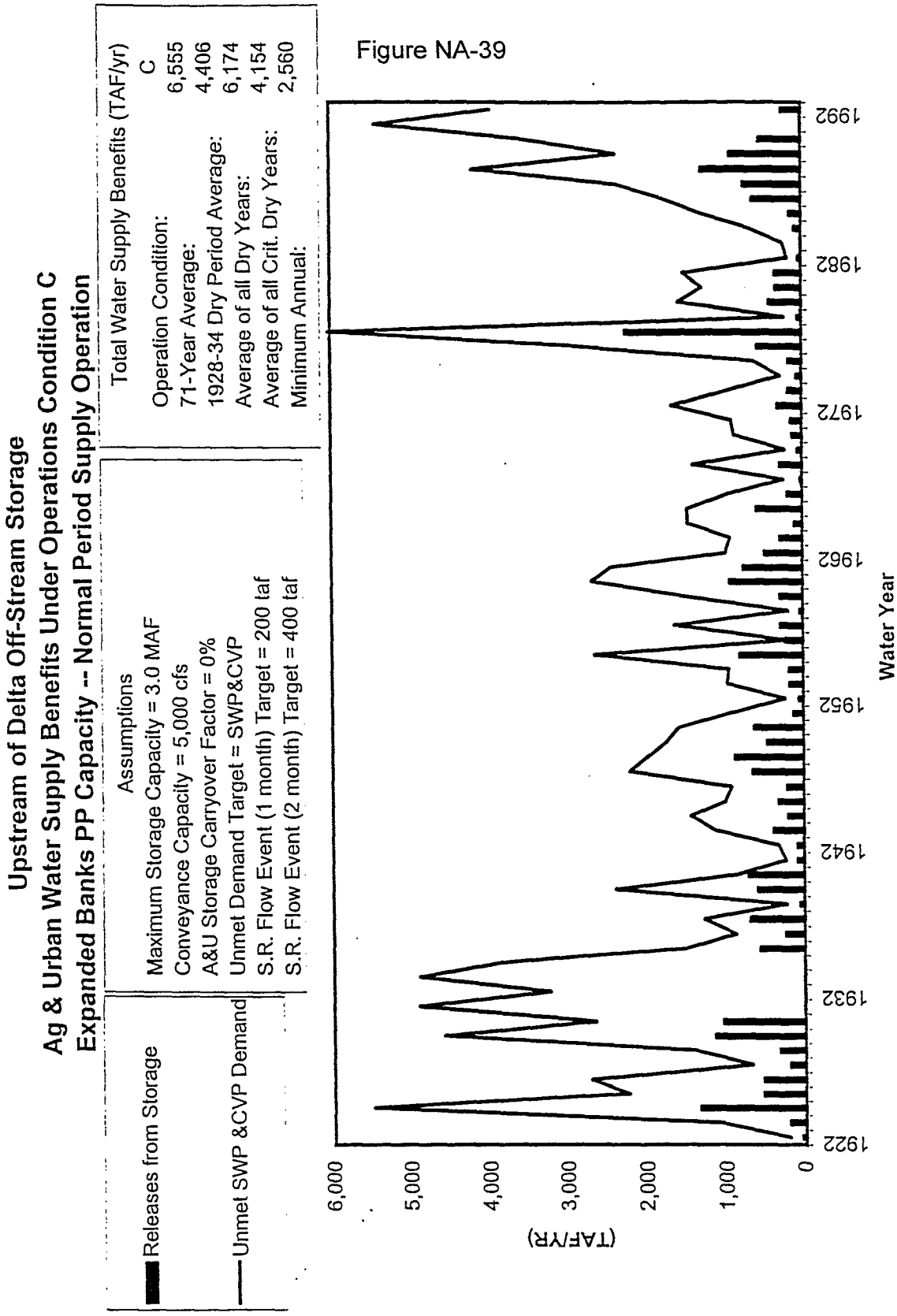
Figure NA-39



3/27/97

NA_OP1.XLS: Outflow Plot C

D-005933

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition D
Expanded Banks PP Capacity -- Dry Period Supply Operation

Releases from Storage

Unmet SWP Demand

Unmet SWP &CVP Demand

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 30%
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	D
71-Year Average:	6,376
1928-34 Dry Period Average:	4,413
Average of all Dry Years:	5,981
Average of all Crit. Dry Years:	4,146
Minimum Annual:	2,976

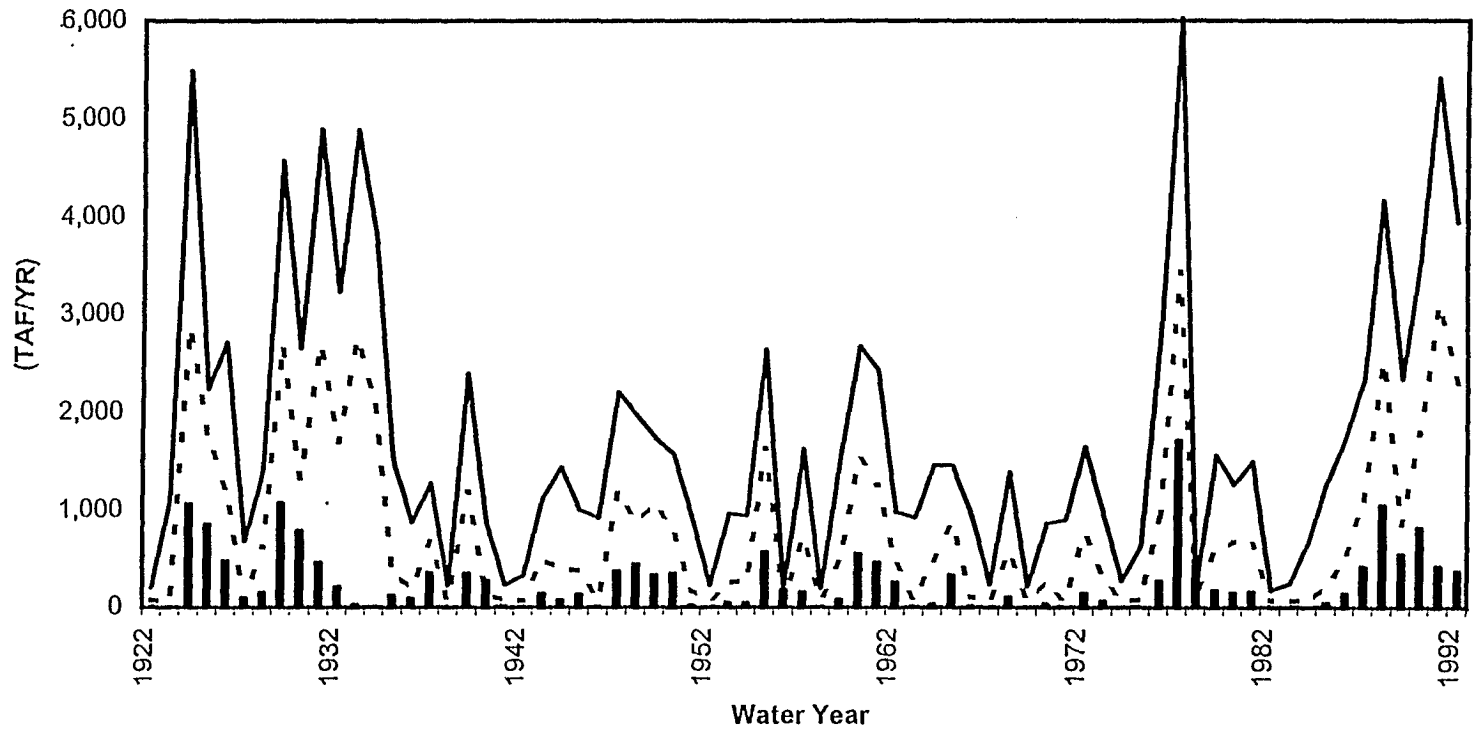


Figure NA-40

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition E
Existing Banks PP Capacity-- Normal Period Supply Operation

Releases from Storage

Unmet SWP &CVP Demand

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP&CVP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	E
71-Year Average:	6,136
1928-34 Dry Period Average:	4,101
Average of all Dry Years:	5,609
Average of all Crit. Dry Years:	3,890
Minimum Annual:	2,532

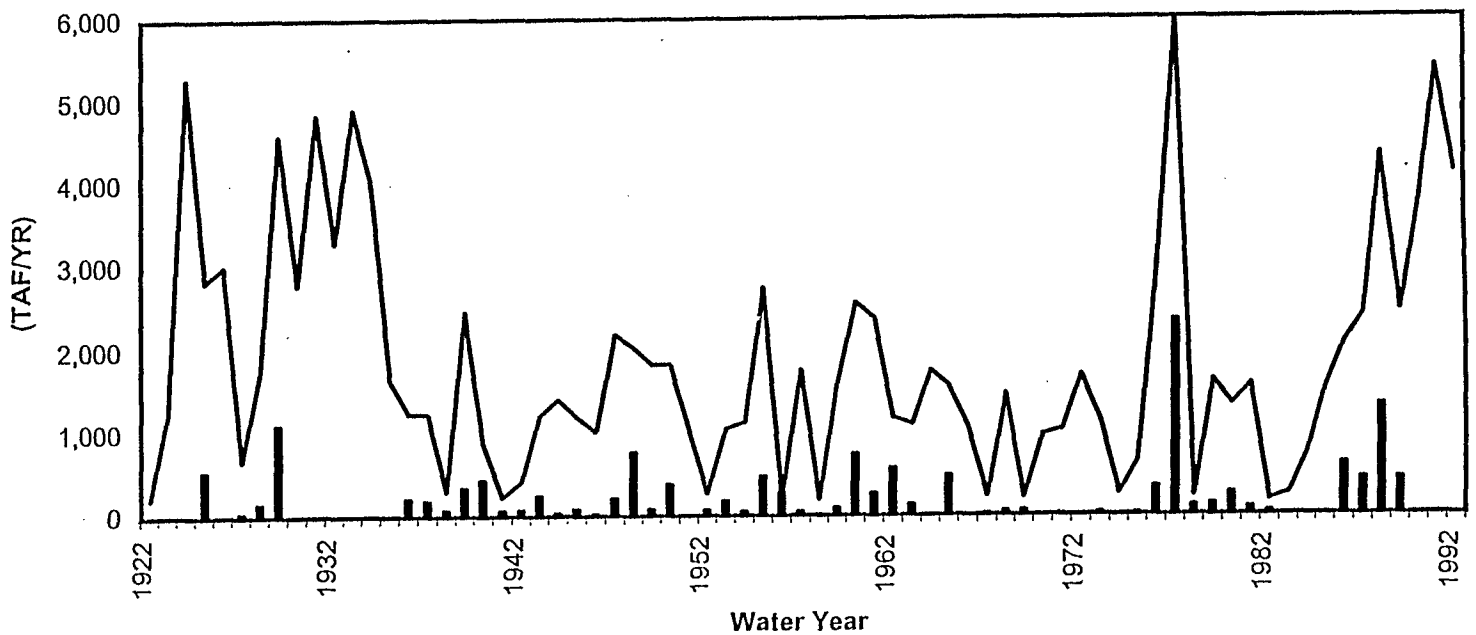


Figure NA-41

NA_OP2.XLS: Outflow Plot E

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D-005935

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition F
Existing Banks PP Capacity -- Dry Period Supply Operation

Releases from Storage

Unmet SWP Demand

Unmet SWP &CVP Demand

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 50%
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	F
71-Year Average:	6,053
1928-34 Dry Period Average:	4,083
Average of all Dry Years:	5,562
Average of all Crit. Dry Years:	3,761
Minimum Annual:	2,675

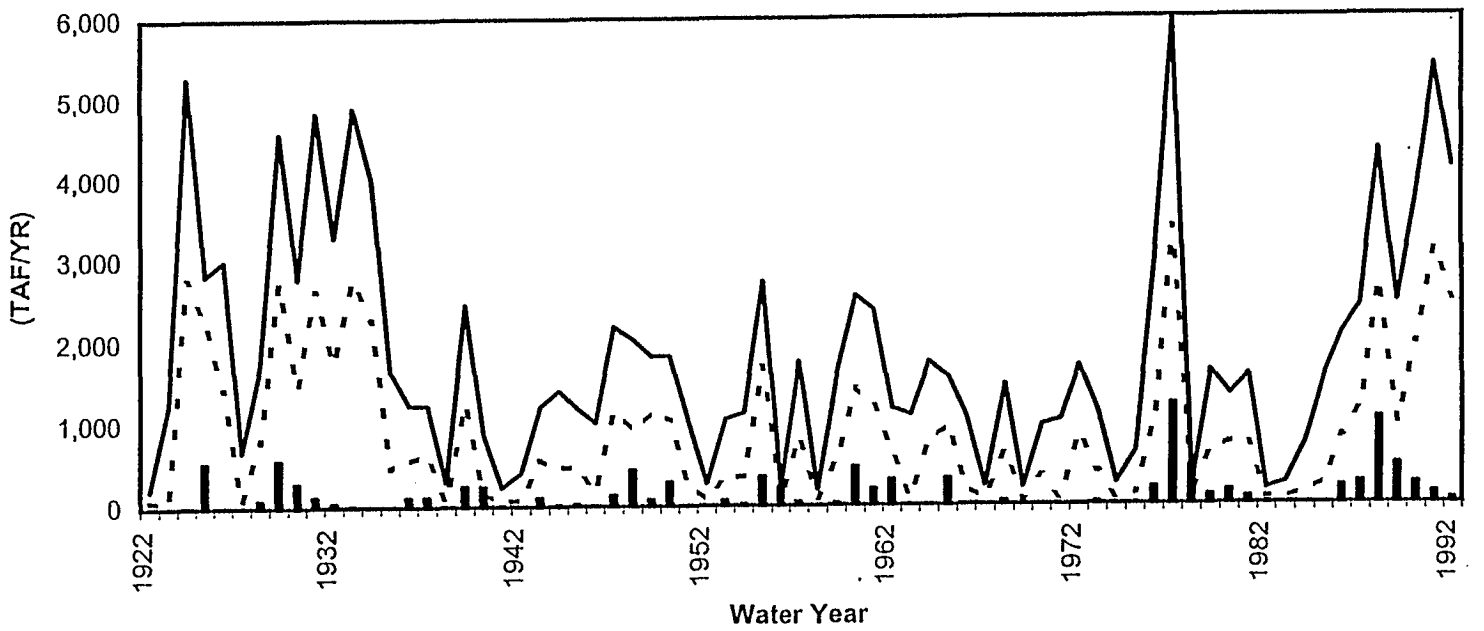

Figure NA-42

NA_OP2.XLS: Outflow Plot F

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Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition G
Expanded Banks PP Capacity -- Normal Period Supply Operation

Releases from Storage

Unmet SWP &CVP Demand

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP&CVP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	G
71-Year Average:	6,458
1928-34 Dry Period Average:	4,193
Average of all Dry Years:	6,035
Average of all Crit. Dry Years:	3,898
Minimum Annual:	2,547

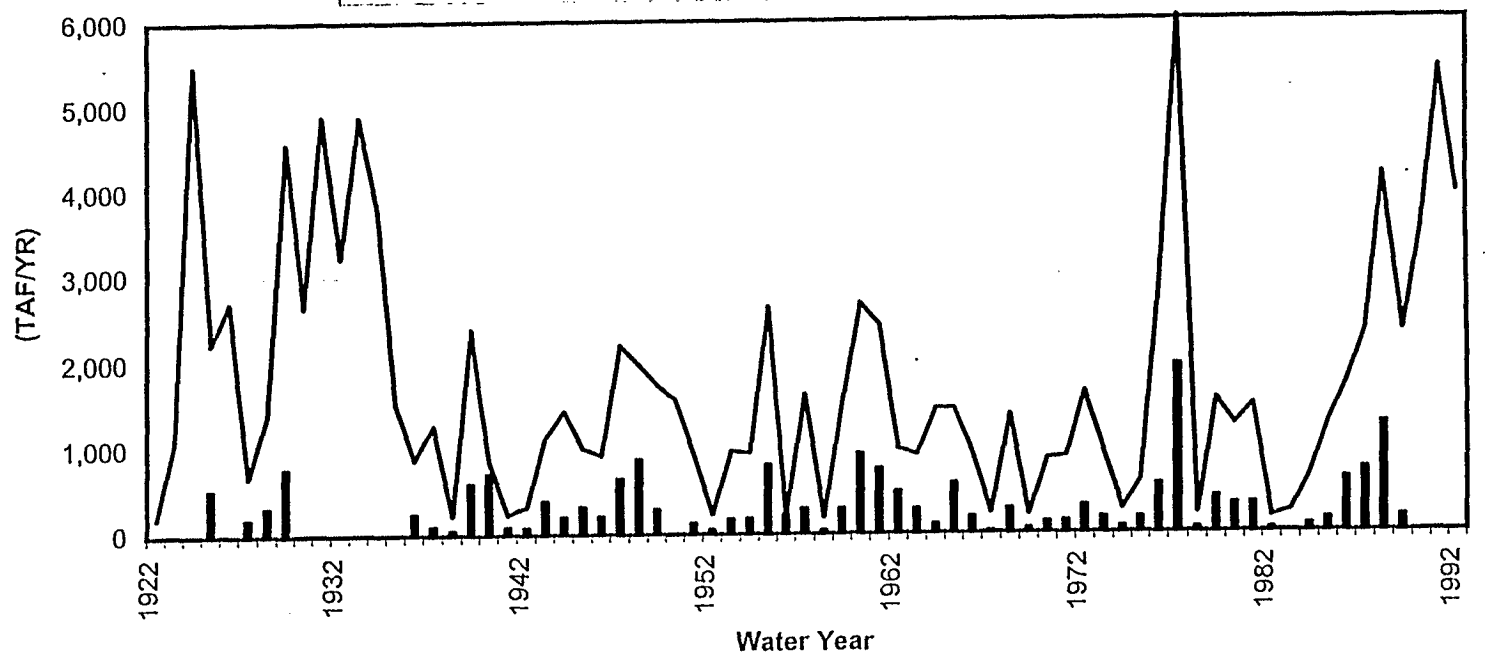

Figure NA-43

NA_OP2.XLS: Outflow Plot G

3/27/97

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits Under Operations Condition H
Expanded Banks PP Capacity -- Dry Period Supply Operation

Releases from Storage

Unmet SWP Demand

Unmet SWP &CVP Demand

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 30%
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

Total Water Supply Benefits (TAF/yr)

Operation Condition:	H
71-Year Average:	6,309
1928-34 Dry Period Average:	4,196
Average of all Dry Years:	5,898
Average of all Crit. Dry Years:	3,859
Minimum Annual:	2,634

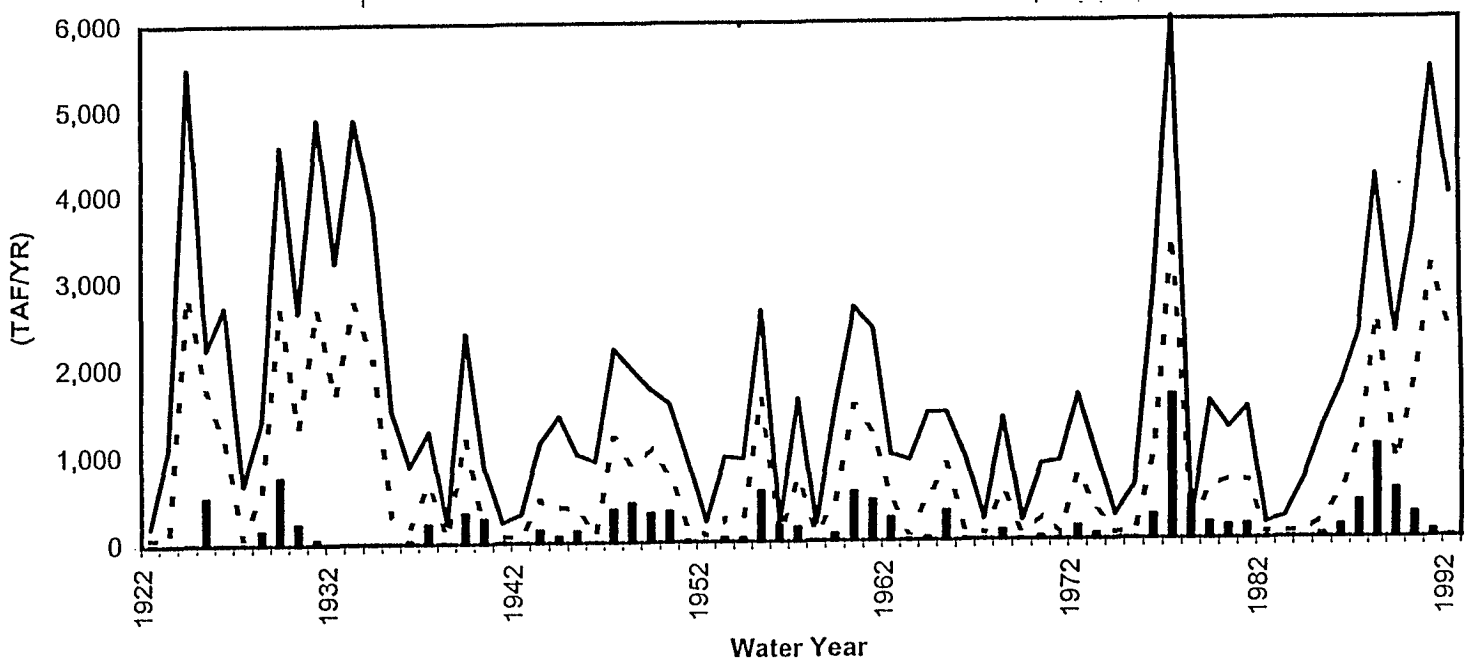

Figure NA-44

NA_OP2.XLS: Outflow Plot H

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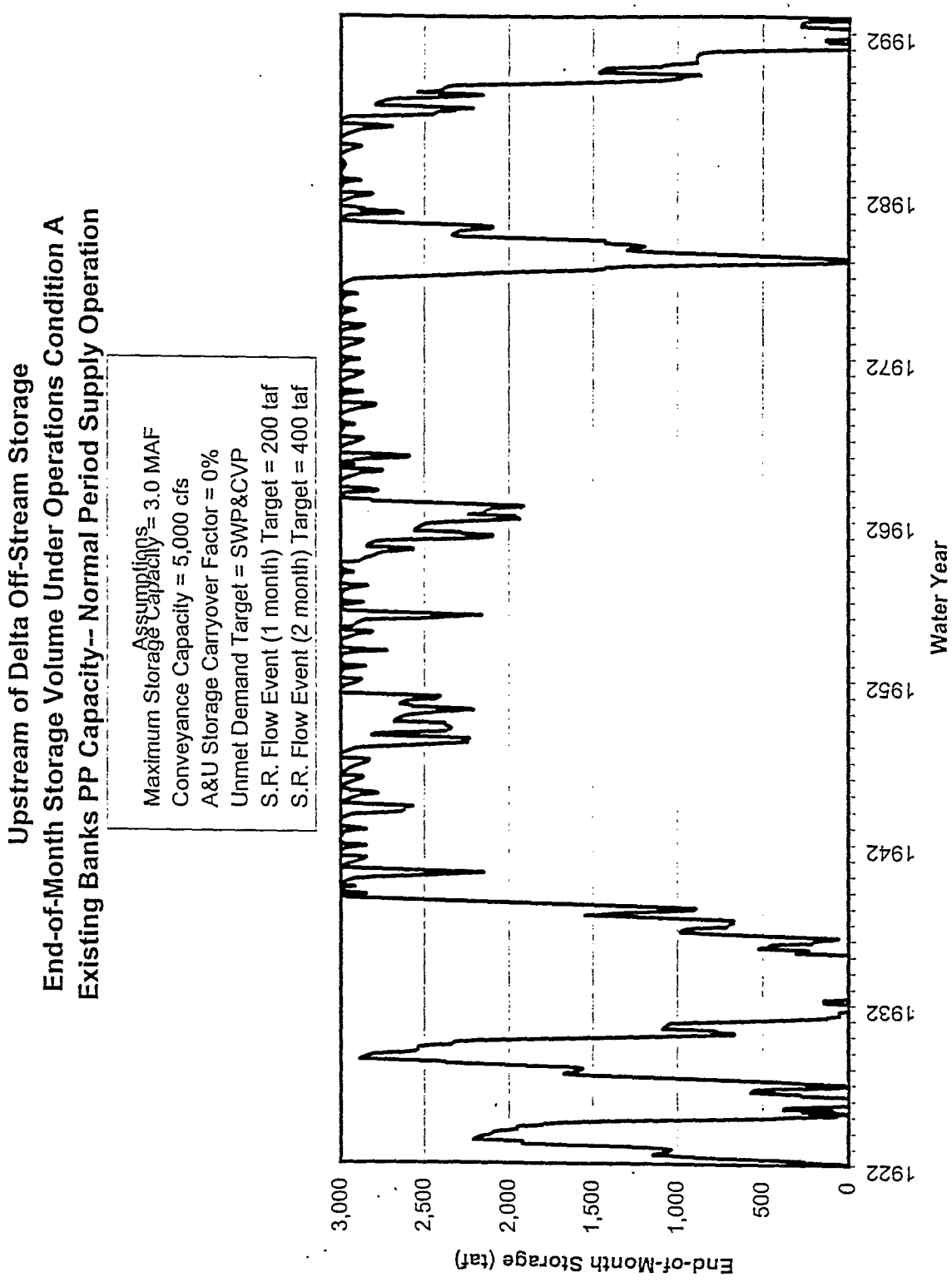
Figure NA-45



NA_OP1.XLS: EOM Storage A

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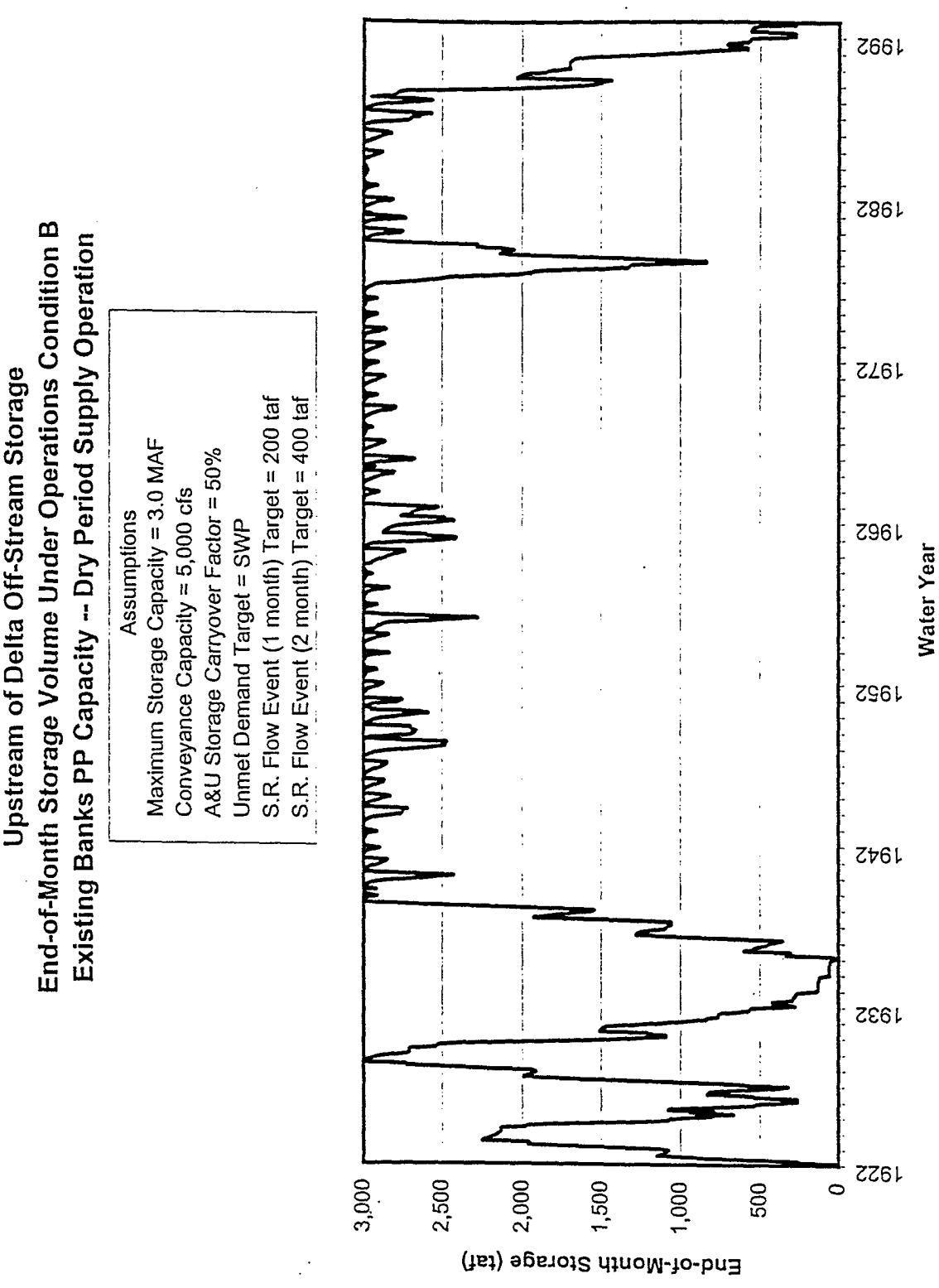
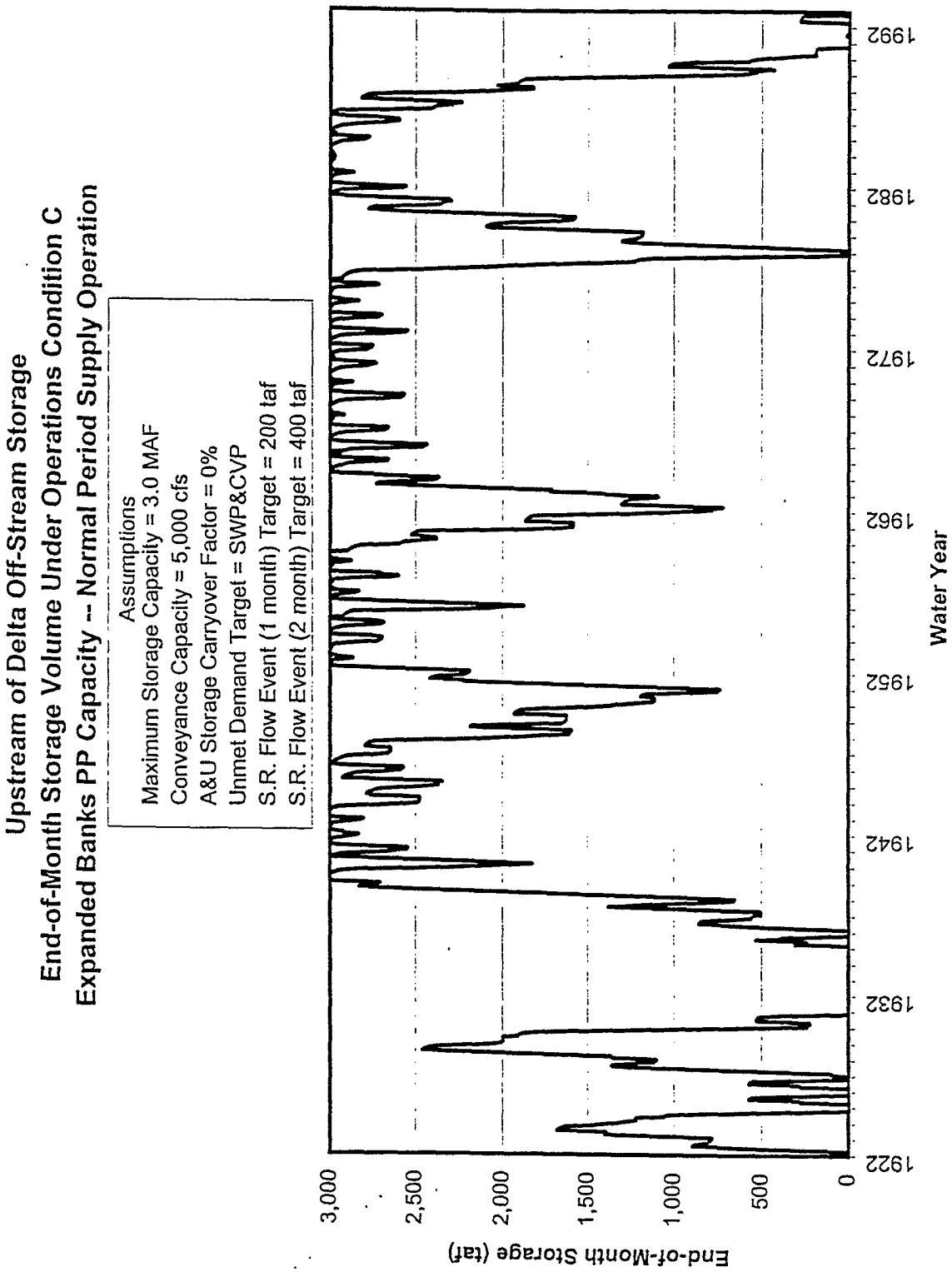
Figure NA-46



NA_OP1.XLS: EOM Storage B

Figure NA-47


Upstream of Delta Off-Stream Storage
End-of-Month Storage Volume Under Operations Condition C
Expanded Banks PP Capacity -- Normal Period Supply Operation
Assumptions
Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP&CVP
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf
End-of-Month Storage (taf)
3,000
2,500
2,000
1,500
1,000
500
0
1922
1932
1942
1952
1962
1972
1982
1992
Water Year

Upstream of Delta Off-Stream Storage
End-of-Month Storage Volume Under Operations Condition D
Expanded Banks PP Capacity -- Dry Period Supply Operation

Assumptions
Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 30%
Unmet Demand Target = SWP
S.R. Flow Event (1 month) Target = 200 taf
S.R. Flow Event (2 month) Target = 400 taf

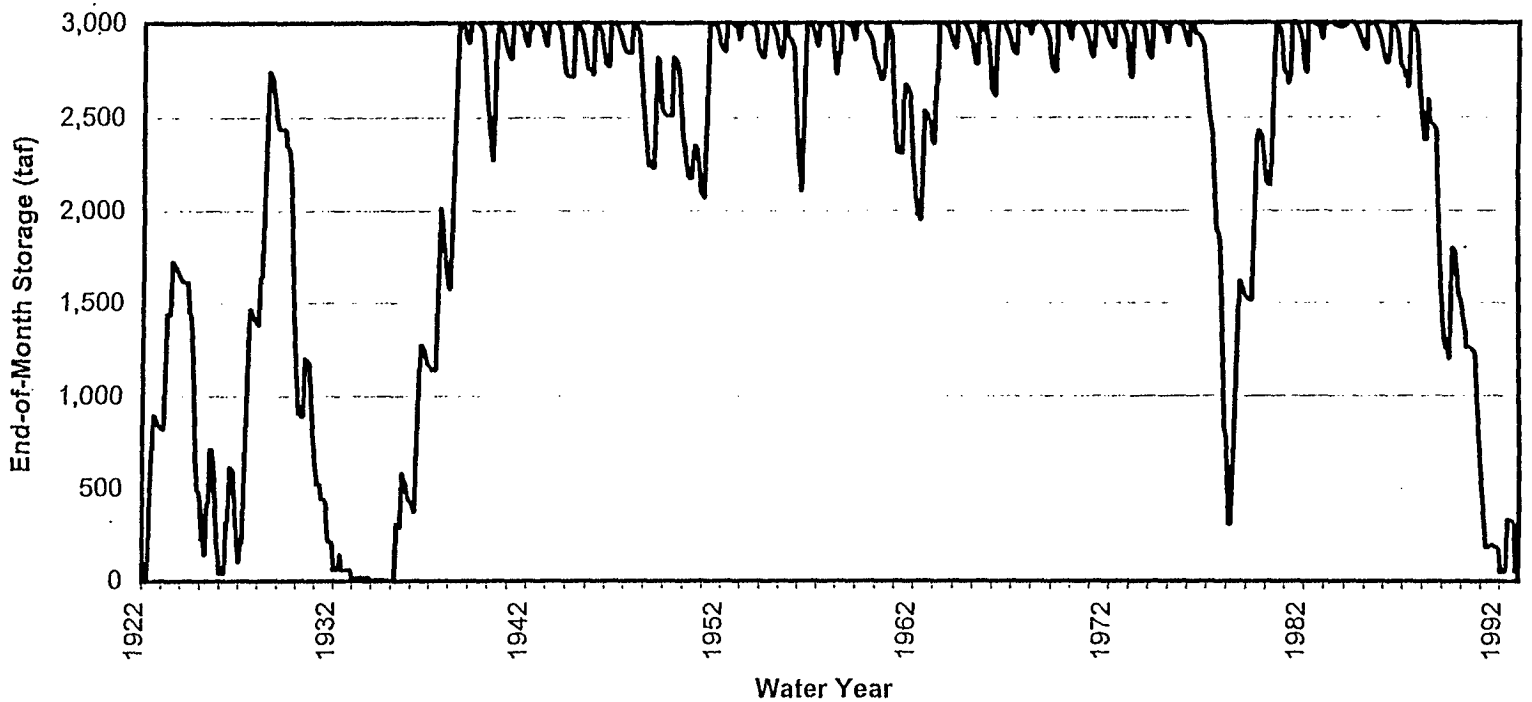


Figure NA-48

Upstream of Delta Off-Stream Storage
End-of-Month Storage Volume Under Operations Condition E
Existing Banks PP Capacity-- Normal Period Supply Operation

Assumptions

Maximum Storage Capacity = 3.0 MAF
Conveyance Capacity = 5,000 cfs
A&U Storage Carryover Factor = 0%
Unmet Demand Target = SWP&CVP
S.R. Flow Event (1 month) Target = 1,500 taf
S.R. Flow Event (2 month) Target = 2,650 taf

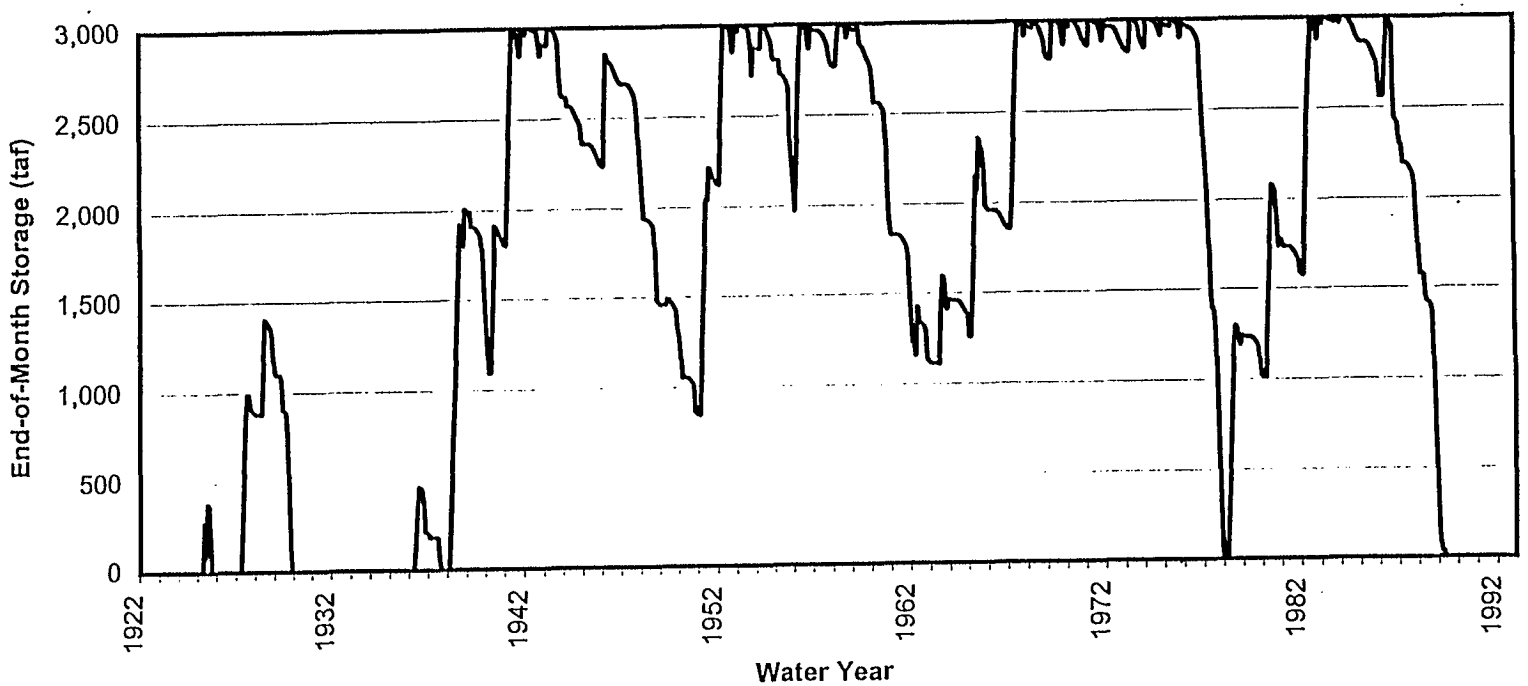
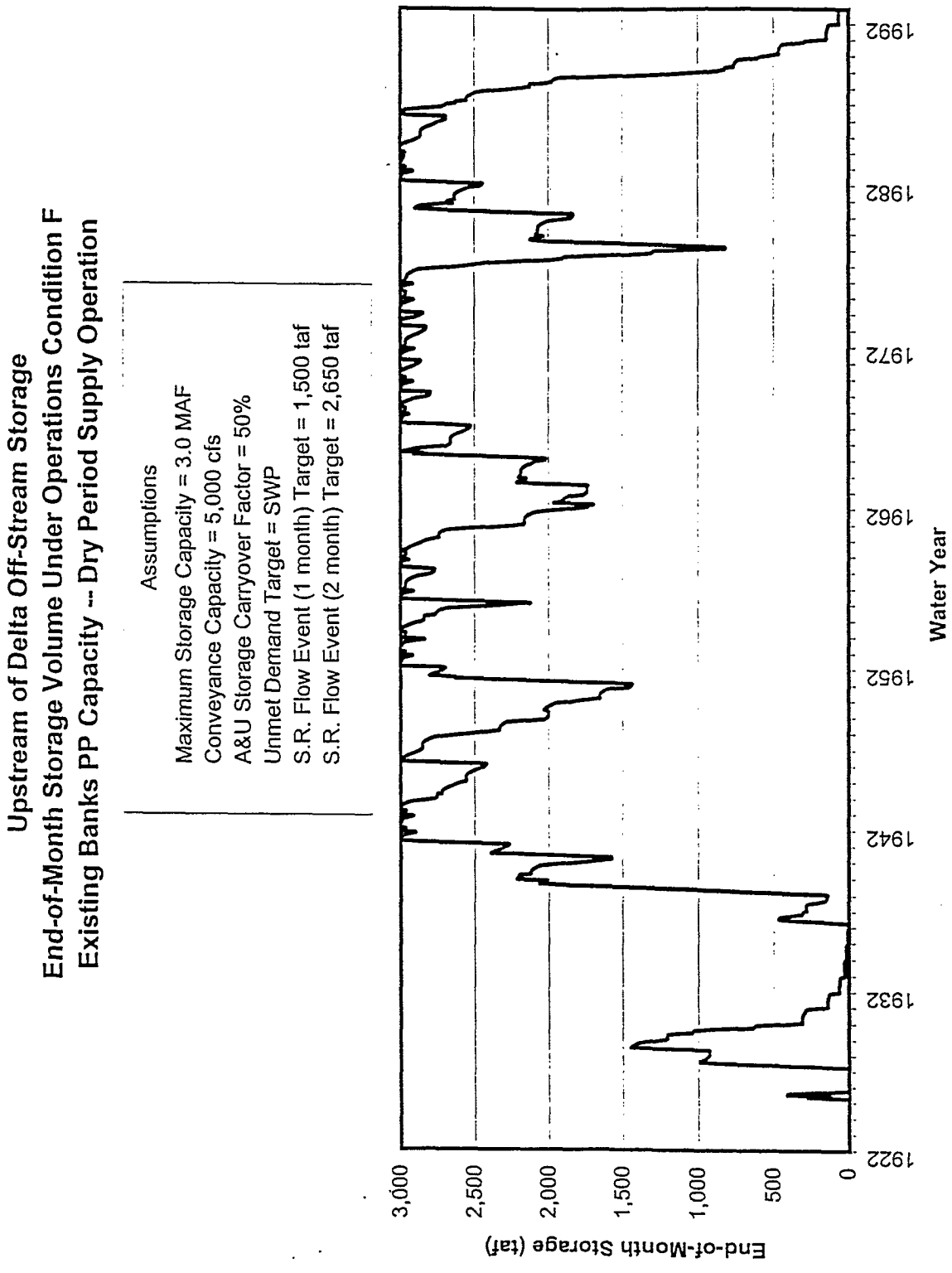


Figure NA-49

3/27/97

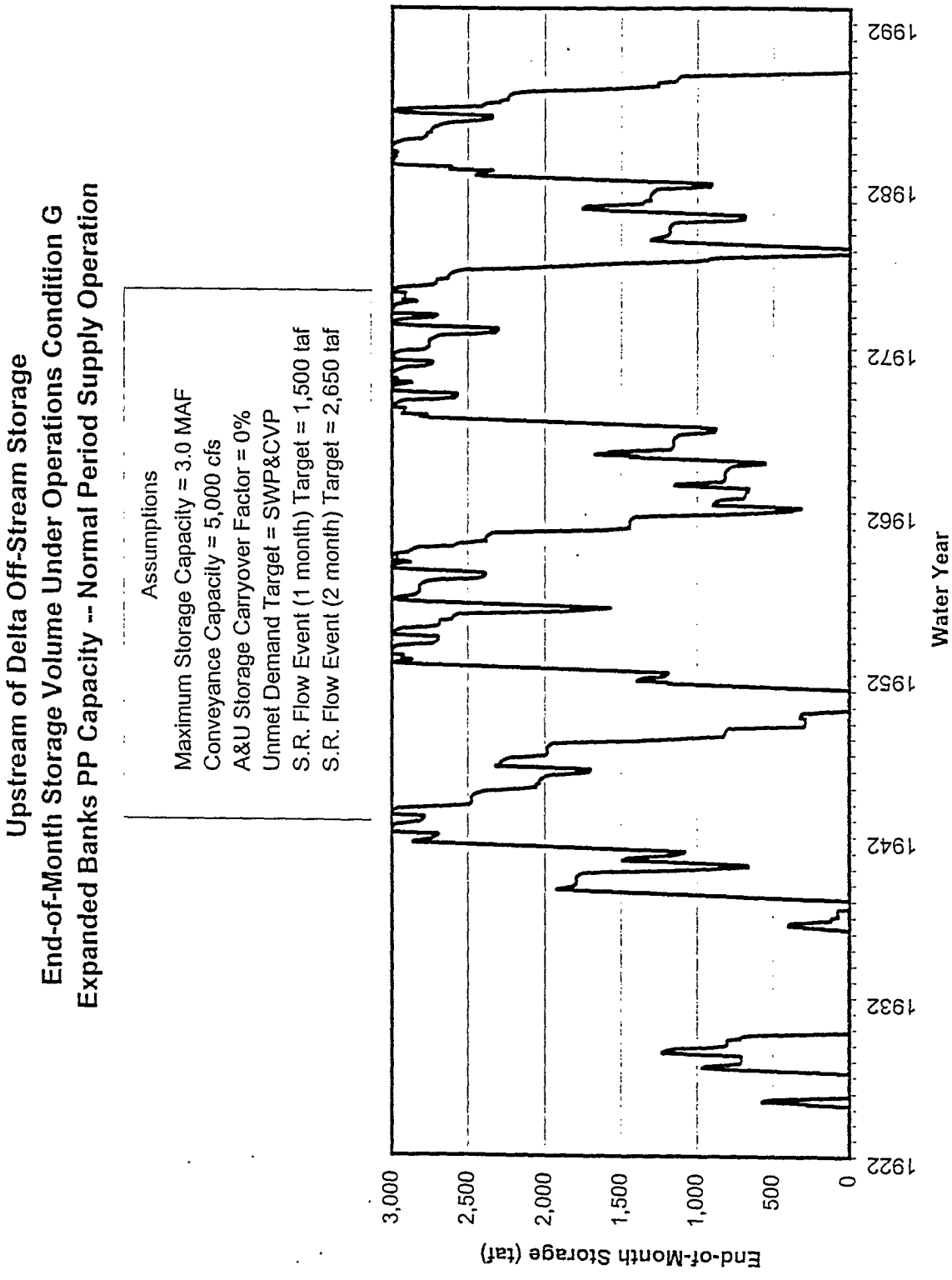
Figure NA-50



NA_OP2.XLS: EOM Storage F

3/27/97

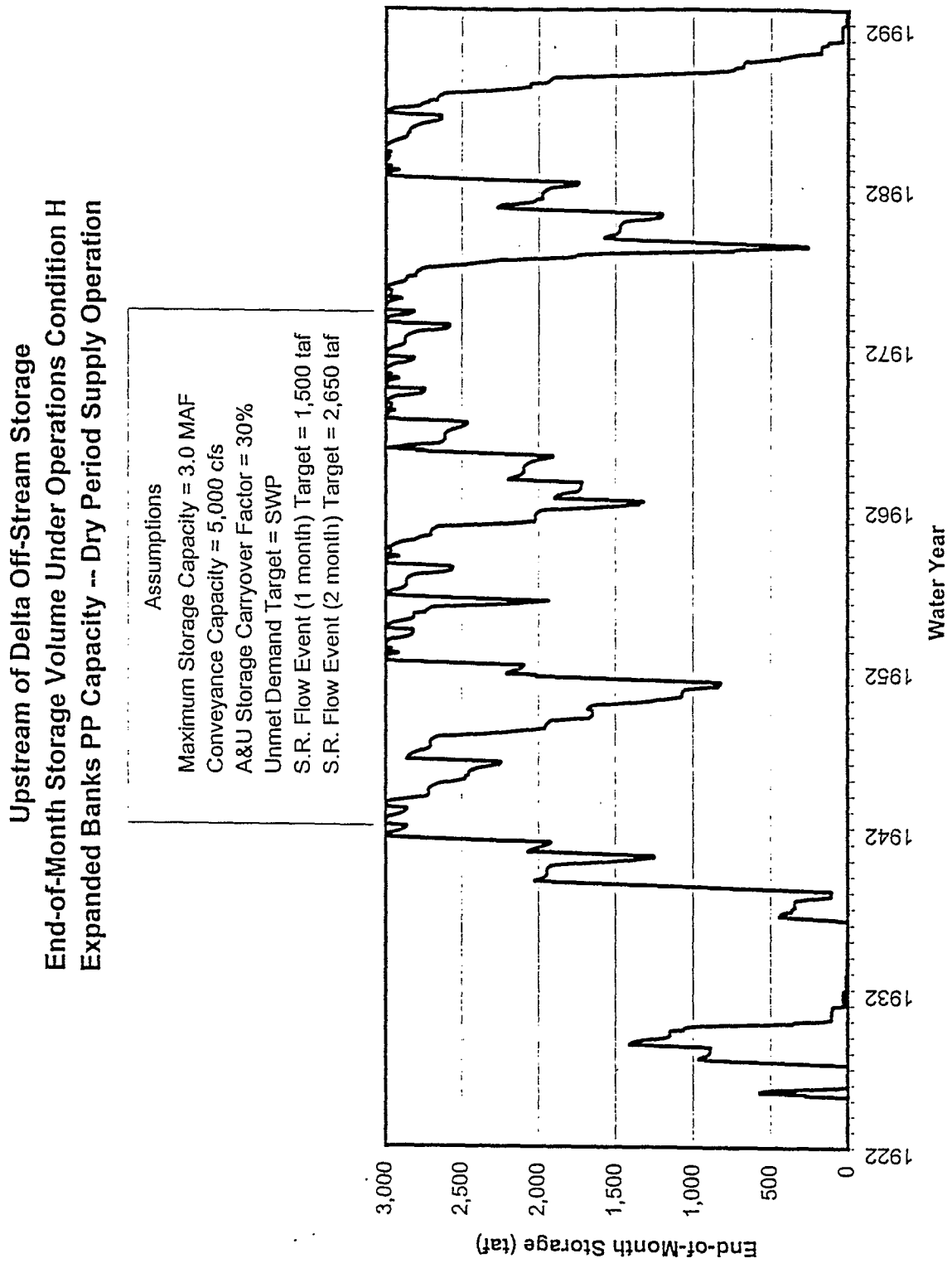
Figure NA-51



NA_OP2.XLS: EOM Storage G

3/27/97

Figure NA-52



NA_OP2.XLS: EOM Storage H

B020

Water Supply Benefits versus Maximum Storage Volume

Model Runs

Maximum storage volumes ranging from 100 taf to 5.0 maf were varied in a set of model runs that simulated the eight bracketing operation conditions described previously. These model runs are described in Table NA-11 and summary results are displayed in Tables NA-12 through NA-15. For comparability, all results are measured using the total south of Delta SWP and CVP water deliveries.

Evaluation

Tables NA-12 and NA-14 display the five statistical measures of total Agricultural and Urban Water Supply Benefits achieved over the range of maximum storage volumes studied for each of the bracketing operation conditions. Tables NA-13 and NA-15 display net increases in Agricultural and Urban Water Supply Benefits for the same range of maximum storage volumes and operation conditions. Figures NA-53 through NA-62 display plots of total Agricultural and Urban Water Supply Benefits versus maximum storage volumes. Figures NA-63 through NA-72 display plots of net increases in Agricultural and Urban Water Supply Benefits versus maximum storage values. The wide range of benefits seen in these plots between operation conditions for any given maximum reservoir volume indicates the varability in benefits for the operation conditions considered in this evaluation.

Figures NA-53 and NA-63 show that maximum 71-Year Average Annual Agricultural and Urban Water Supply Benefits is achieved under Condition C (Expanded Banks Pumping Plant Capacity -- Normal Period Supply Operation) with low Sacramento River flow event target. Under this operating condition, 71-Year Average Annual Agricultural and Urban Water Supply Benefits continue to increase with diminishing incremental benefit throughout the range of maximum storage volumes evaluated. With a maximum storage volume of 5.0 maf, the largest maximum storage volume evaluated, a net increase of 415 taf is observed in 71-Year Average Annual Agricultural and Urban Water Supply Benefits. About 70-percent of this net benefit, a 280 taf increase in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, is achieved with a maximum storage volume of only 1.0 maf.

Under Condition A (Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation) with low Sacramento River flow event target, 71-Year Average Annual Agricultural and Urban Water Supply Benefits increase through about 5.0 maf maximum storage capacity, but with smaller gains in comparison to Condition C. With a maximum storage volume of 5.0 maf, a net increase of 345 taf occurs in 71-Year Average Annual Agricultural and Urban Water Supply Benefits. About 65 percent of this benefit, or 225 taf is achieved with a 1.0 maf maximum storage volume.

Figures NA-57 and NA-67 indicate the largest Minimum Annual Agricultural and Urban Water Supply Benefits are achieved under Condition B (Existing Banks Pumping Plant Capacity -- Dry Period Supply Operation) with low Sacramento River flow event target.

Under this operating condition, Minimum Annual Agricultural and Urban Water Supply Benefits increase dramatically between maximum storage volumes of 500 taf and 1.5 maf. Additional net benefits with decreased incremental gains occur between 1.5 and 3.0 maf. A maximum net benefit of 960 taf in Minimum Annual Agricultural and Urban Water Supply Benefits is observed with a maximum storage volume of 3.5 maf. About 60 percent of this net benefit, or 590 taf is achieved with a 1.5 maf maximum storage.

Under Condition D (Expanded Banks Pumping Plant Capacity -- Dry Period Supply Operation), a net increase in Minimum Annual Agricultural and Urban Water Supply Benefits of 892 taf is observed with a maximum storage volume of 3.5 maf.

Figures NA-58 and NA-68 show that maximum 71-Year Average Annual Agricultural and Urban Water Supply Benefits is achieved under Condition C (Expanded Banks Pumping Plant Capacity -- Normal Period Supply Operation) with high Sacramento River flow event target. Under this operating condition, 71-Year Average Annual Agricultural and Urban Water Supply Benefits continue to increase with diminishing incremental benefit throughout the range of maximum storage volumes evaluated. With a maximum storage volume of 5.0 maf, the largest maximum storage volume evaluated, a net increase of 335 taf is observed in 71-Year Average Annual Agricultural and Urban Water Supply Benefits. About 65-percent of this net benefit, a 225 taf increase in 71-Year Average Annual Agricultural and Urban Water Supply Benefits, is achieved with a maximum storage volume of only 1.5 maf.

Under Condition E (Existing Banks Pumping Plant Capacity -- Normal Period Supply Operation) with high Sacramento River flow event target, 71-Year Average Annual Agricultural and Urban Water Supply Benefits increase through about 5.0 maf maximum storage capacity, but with smaller gains in comparison to Condition G. With a maximum storage volume of 5.0 maf, a net increase of 335 taf occurs in 71-Year Average Annual Agricultural and Urban Water Supply Benefits. About 65 percent of this benefit, or 225 taf is achieved with a 1.0 maf maximum storage volume.

Figures NA-62 and NA-72 indicate the largest Minimum Annual Agricultural and Urban Water Supply Benefits are achieved under Condition F (Existing Banks Pumping Plant Capacity -- Dry Period Supply Operation) with high Sacramento River flow event target. Under this operating condition, Minimum Annual Agricultural and Urban Water Supply Benefits increase dramatically between maximum storage volumes of 500 taf and 1.5 maf. Additional net benefits with decreased incremental gains occur between 1.5 and 3.0 maf. A maximum net benefit of 831 taf in Minimum Annual Agricultural and Urban Water Supply Benefits is observed with a maximum storage volume of 4.5 maf. About 65 percent of this net benefit, or 550 taf is achieved with a 3.5 maf maximum storage.

Under Condition H (Expanded Banks Pumping Plant Capacity -- Dry Period Supply Operation), a net increase in Minimum Annual Agricultural and Urban Water Supply Benefits of 810 taf is observed with a maximum storage volume of 4.5 maf.

Table NA-11

Upstream of Delta Off-Stream Storage
Model Runs for Evaluation of Maximum Storage Volume

Run Results Workbook	Evaluation Workbook	Model Run Identifiers	Maximum Reservoir Volume (taf)	Common Assumptions
OUT_NA06.XLS	NA_RV1.XLS	NA601	100	A. Existing Banks PP Capacity/Low S.R. Flow Event Target – Normal Period Supply Operation 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 200 taf
		NA602	500	
		NA603	1,000	
		NA604	1,500	
		NA605	2,000	
		NA606	2,500	
		NA607	3,000	
		NA608	3,500	
		NA609	4,000	
		NA610	4,500	
		NA611	5,000	
OUT_NA06.XLS	NA_RV2.XLS	NA612	100	B. Existing Banks PP Capacity/Low S.R. Flow Event Target – Dry Period Supply Operation 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 50% Unmet Demand Target = SWP-only S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 200 taf
		NA613	500	
		NA614	1,000	
		NA615	1,500	
		NA616	2,000	
		NA617	2,500	
		NA618	3,000	
		NA619	3,500	
		NA620	4,000	
		NA621	4,500	
		NA622	5,000	
OUT_NA06.XLS	NA_RV3.XLS	NA623	100	C. Expanded Banks PP Capacity/Low S.R. Flow Event Target – Normal Period Supply Operation 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 200 taf
		NA624	500	
		NA625	1,000	
		NA626	1,500	
		NA627	2,000	
		NA628	2,500	
		NA629	3,000	
		NA630	3,500	
		NA631	4,000	
		NA632	4,500	
		NA633	5,000	
OUT_NA06.XLS	NA_RV4.XLS	NA634	100	D. Expanded Banks PP Capacity/Low S.R. Flow Event Target – Dry Period Supply Operation 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 30% Unmet Demand Target = SWP-only S.R. Flow Event (1 month) Target = 200 taf S.R. Flow Event (2 month) Target = 200 taf
		NA635	500	
		NA636	1,000	
		NA637	1,500	
		NA638	2,000	
		NA639	2,500	
		NA640	3,000	
		NA641	3,500	
		NA642	4,000	
		NA643	4,500	
		NA644	5,000	
OUT_NA06.XLS	NA_RV5.XLS	NA645	100	E. Existing Banks PP Capacity/High S.R. Flow Event Target – Normal Period Supply Operation 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf
		NA646	500	
		NA647	1,000	
		NA648	1,500	
		NA649	2,000	
		NA650	2,500	
		NA651	3,000	
		NA652	3,500	
		NA653	4,000	
		NA654	4,500	
		NA655	5,000	
OUT_NA06.XLS	NA_RV6.XLS	NA656	100	F. Existing Banks PP Capacity/High S.R. Flow Event Target – Dry Period Supply Operation 5,000 cfs Inflow/Outflow Capacity Existing Banks PP Capacity Storage Carryover Factor = 50% Unmet Demand Target = SWP-only S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf
		NA657	500	
		NA658	1,000	
		NA659	1,500	
		NA660	2,000	
		NA661	2,500	
		NA662	3,000	
		NA663	3,500	
		NA664	4,000	
		NA665	4,500	
		NA666	5,000	
OUT_NA06.XLS	NA_RV7.XLS	NA667	100	G. Expanded Banks PP Capacity/High S.R. Flow Event Target – Normal Period Supply Operation 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 0% Unmet Demand Target = SWP and CVP S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf
		NA668	500	
		NA669	1,000	
		NA670	1,500	
		NA671	2,000	
		NA672	2,500	
		NA673	3,000	
		NA674	3,500	
		NA675	4,000	
		NA676	4,500	
		NA677	5,000	
OUT_NA06.XLS	NA_RV8.XLS	NA678	100	H. Expanded Banks PP Capacity/High S.R. Flow Event Target – Dry Period Supply Operation 5,000 cfs Inflow/Outflow Capacity SDI Banks PP Capacity Storage Carryover Factor = 30% Unmet Demand Target = SWP-only S.R. Flow Event (1 month) Target = 1500 taf S.R. Flow Event (2 month) Target = 2650 taf
		NA679	500	
		NA680	1,000	
		NA681	1,500	
		Na682	2,000	
		NA683	2,500	
		NA684	3,000	
		NA685	3,500	
		NA686	4,000	
		NA687	4,500	
		NA688	5,000	

Table NA-12

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits vs. Maximum Storage Volume
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Operation Condition A. Existing Banks PP Capacity/Low S.R. Flow Event Target -- Normal Period Supply Operation

Run Identifiers:	Base 1	NA601	NA602	NA603	NA604	NA605	NA606	NA607	NA608	NA609	NA610	NA611	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	5,921	5,989	6,103	6,146	6,171	6,197	6,218	6,236	6,248	6,254	6,259	6,265	6,265	344	5.8%
1928-34 Dry Period Average	3,918	3,969	4,062	4,126	4,192	4,258	4,321	4,372	4,372	4,372	4,372	4,372	4,372	454	11.6%
Dry Year Average	5,374	5,459	5,630	5,659	5,660	5,726	5,751	5,751	5,750	5,750	5,748	5,748	5,751	377	7.0%
Critically Dry Year Average	3,421	3,462	3,631	3,796	3,960	4,032	4,132	4,235	4,273	4,312	4,348	4,385	4,385	964	28.2%
Minimum Annual	2,206	2,206	2,311	2,661	2,661	2,661	2,661	2,892	3,009	3,009	3,009	3,009	3,009	802	36.4%

Operation Condition B. Existing Banks PP Capacity/Low S.R. Flow Event Target -- Dry Period Supply Operation

Run Identifiers:	Base 1	NA612	NA613	NA614	NA615	NA616	NA617	NA618	NA619	NA620	NA621	NA622	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	5,921	5,945	6,026	6,060	6,083	6,105	6,123	6,136	6,147	6,154	6,161	6,166	6,166	245	4.1%
1928-34 Dry Period Average	3,918	3,949	4,044	4,105	4,168	4,231	4,292	4,352	4,382	4,382	4,382	4,382	4,382	464	11.8%
Dry Year Average	5,374	5,429	5,570	5,613	5,640	5,661	5,671	5,675	5,679	5,679	5,679	5,676	5,679	305	5.7%
Critically Dry Year Average	3,421	3,460	3,598	3,708	3,807	3,911	4,008	4,088	4,149	4,198	4,245	4,279	4,279	858	25.1%
Minimum Annual	2,206	2,231	2,326	2,558	2,797	2,874	3,000	3,136	3,163	3,163	3,163	3,163	3,163	957	43.4%

Operation Condition C. Expanded Banks PP Capacity/Low S.R. Flow Event Target -- Normal Period Supply Operation

Run Identifiers:	Base 2	NA623	NA624	NA625	NA626	NA627	NA628	NA629	NA630	NA631	NA632	NA633	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	6,169	6,246	6,393	6,452	6,490	6,521	6,543	6,555	6,567	6,573	6,578	6,584	6,584	415	6.7%
1928-34 Dry Period Average	4,033	4,070	4,150	4,214	4,279	4,346	4,406	4,406	4,406	4,406	4,406	4,406	4,406	372	9.2%
Dry Year Average	5,635	5,721	5,939	6,047	6,080	6,120	6,173	6,174	6,172	6,164	6,164	6,164	6,174	538	9.5%
Critically Dry Year Average	3,480	3,507	3,605	3,760	3,927	4,034	4,076	4,154	4,198	4,235	4,273	4,311	4,311	832	23.9%
Minimum Annual	2,184	2,184	2,184	2,547	2,560	2,560	2,560	2,560	2,560	2,806	3,037	3,037	3,037	853	39.0%

Operation Condition D. Expanded Banks PP Capacity/Low S.R. Flow Event Target -- Dry Period Supply Operation

Run Identifiers:	Base 2	NA634	NA635	NA636	NA637	NA638	NA639	NA640	NA641	NA642	NA643	NA644	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	6,169	6,171	6,258	6,302	6,325	6,346	6,363	6,376	6,384	6,389	6,394	6,397	6,397	228	3.7%
1928-34 Dry Period Average	4,033	4,052	4,129	4,192	4,258	4,323	4,383	4,413	4,413	4,413	4,413	4,413	4,413	379	9.4%
Dry Year Average	5,635	5,678	5,870	5,926	5,947	5,968	5,979	5,981	5,979	5,978	5,976	5,967	5,981	345	6.1%
Critically Dry Year Average	3,480	3,508	3,631	3,761	3,882	3,980	4,067	4,146	4,200	4,235	4,269	4,304	4,304	824	23.7%
Minimum Annual	2,184	2,199	2,310	2,639	2,651	2,682	2,777	2,976	3,076	3,076	3,076	3,076	3,076	892	40.9%

[1]See Table NA-1 for description of operational conditions.

Table NA-13

Upstream of Delta Off-Stream Storage
Net Increase in Ag &Urban Water Supply Benefits vs. Maximum Storage Volume
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Operation Condition A, Existing Banks PP Capacity/Low S.R. Flow Event Target – Normal Period Supply Operation											
Run Identifiers:	NA601	NA602	NA603	NA604	NA605	NA606	NA607	NA608	NA609	NA610	NA611
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	68	181	225	250	276	297	315	327	333	338	344
1928-34 Dry Period Average	51	144	208	274	340	403	454	454	454	454	454
Dry Year Average	86	257	285	287	352	377	377	377	376	374	374
Critically Dry Year Average	41	210	375	539	611	711	814	852	891	927	964
Minimum Annual	0	105	455	455	455	455	685	802	802	802	802

Operation Condition B, Existing Banks PP Capacity/Low S.R. Flow Event Target – Dry Period Supply Operation											
Run Identifiers:	NA612	NA613	NA614	NA615	NA616	NA617	NA618	NA619	NA620	NA621	NA622
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	24	105	139	162	184	202	215	225	233	240	245
1928-34 Dry Period Average	31	126	187	250	313	374	434	464	464	464	464
Dry Year Average	55	196	239	267	288	297	302	305	305	305	303
Critically Dry Year Average	39	178	287	386	490	587	667	728	777	824	858
Minimum Annual	24	119	352	591	668	794	930	957	957	957	957

Operation Condition C, Expanded Banks PP Capacity/Low S.R. Flow Event Target – Normal Period Supply Operation											
Run Identifiers:	NA623	NA624	NA625	NA626	NA627	NA628	NA629	NA630	NA631	NA632	NA633
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	77	224	283	321	352	374	386	398	404	409	415
1928-34 Dry Period Average	37	116	181	246	312	372	372	372	372	372	372
Dry Year Average	85	304	412	445	485	537	538	537	529	529	529
Critically Dry Year Average	28	125	281	447	554	596	674	718	756	794	832
Minimum Annual	0	0	363	377	377	377	377	377	622	853	853

Operation Condition D, Expanded Banks PP Capacity/Low S.R. Flow Event Target – Dry Period Supply Operation											
Run Identifiers:	NA634	NA635	NA636	NA637	NA638	NA639	NA640	NA641	NA642	NA643	NA644
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	2	89	133	156	177	194	207	215	220	225	228
1928-34 Dry Period Average	18	95	159	224	290	350	379	379	379	379	379
Dry Year Average	43	235	291	312	332	343	345	344	343	341	331
Critically Dry Year Average	29	151	281	402	501	587	667	720	755	790	824
Minimum Annual	15	126	455	467	499	593	792	892	892	892	892

[1]See Table NA-1 for description of operational conditions.

Table NA-14

Upstream of Delta Off-Stream Storage
Ag & Urban Water Supply Benefits vs. Maximum Storage Volume
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Operation Condition E. Existing Banks PP Capacity/High S.R. Flow Event Target -- Normal Period Supply Operation

Run Identifiers:	Base 1	NA645	NA646	NA647	NA648	NA649	NA650	NA651	NA652	NA653	NA654	NA655	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	5,921	5,961	6,022	6,063	6,092	6,110	6,123	6,136	6,148	6,154	6,160	6,166	6,166	245	4.1%
1928-34 Dry Period Average	3,918	3,931	3,983	4,047	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	183	4.7%
Dry Year Average	5,374	5,403	5,500	5,562	5,581	5,581	5,581	5,609	5,633	5,633	5,633	5,633	5,633	259	4.8%
Critically Dry Year Average	3,421	3,429	3,488	3,572	3,690	3,772	3,853	3,890	3,894	3,930	3,967	4,005	4,005	585	17.1%
Minimum Annual	2,206	2,206	2,298	2,532	2,532	2,532	2,532	2,532	2,532	2,532	2,591	3,009	3,009	802	36.4%

Operation Condition F. Existing Banks PP Capacity/High S.R. Flow Event Target -- Dry Period Supply Operation

Run Identifiers:	Base 1	NA656	NA657	NA658	NA659	NA660	NA661	NA662	NA663	NA664	NA665	NA666	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	5,921	5,923	5,968	6,001	6,023	6,034	6,044	6,053	6,061	6,069	6,077	6,082	6,082	161	2.7%
1928-34 Dry Period Average	3,918	3,920	3,967	4,027	4,083	4,083	4,083	4,083	4,083	4,083	4,083	4,083	4,083	165	4.2%
Dry Year Average	5,374	5,382	5,465	5,522	5,545	5,552	5,557	5,562	5,562	5,562	5,562	5,562	5,562	188	3.5%
Critically Dry Year Average	3,421	3,431	3,478	3,543	3,614	3,662	3,711	3,761	3,814	3,868	3,915	3,951	3,951	530	15.5%
Minimum Annual	2,206	2,231	2,326	2,549	2,574	2,602	2,639	2,675	2,752	2,874	3,037	3,037	3,037	831	37.7%

Operation Condition G. Expanded Banks PP Capacity/High S.R. Flow Event Target -- Normal Period Supply Operation

Run Identifiers:	Base 2	NA667	NA668	NA669	NA670	NA671	NA672	NA673	NA674	NA675	NA676	NA677	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	6,169	6,211	6,304	6,357	6,391	6,415	6,440	6,458	6,476	6,492	6,499	6,505	6,505	335	5.4%
1928-34 Dry Period Average	4,033	4,047	4,099	4,163	4,193	4,193	4,193	4,193	4,193	4,193	4,193	4,193	4,193	160	4.0%
Dry Year Average	5,635	5,645	5,758	5,889	5,965	5,993	6,007	6,035	6,074	6,091	6,091	6,091	6,091	456	8.1%
Critically Dry Year Average	3,480	3,480	3,515	3,597	3,670	3,753	3,834	3,898	3,930	3,942	3,980	4,015	4,015	535	15.4%
Minimum Annual	2,184	2,184	2,184	2,322	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	363	16.6%

Operation Condition H. Expanded Banks PP Capacity/High S.R. Flow Event Target -- Dry Period Supply Operation

Run Identifiers:	Base 2	NA678	NA679	NA680	NA681	NA682	NA683	NA684	NA685	NA686	NA687	NA688	Maximum Total Value	Maximum Net Value	Maximum Increase (percent)
Max. Storage Volume (taf)	0	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000			
71-Year Average	6,169	6,147	6,202	6,242	6,269	6,285	6,298	6,309	6,318	6,324	6,329	6,335	6,335	165	2.7%
1928-34 Dry Period Average	4,033	4,029	4,078	4,142	4,196	4,196	4,196	4,196	4,196	4,196	4,196	4,196	4,196	162	4.0%
Dry Year Average	5,635	5,623	5,740	5,825	5,868	5,879	5,888	5,898	5,898	5,898	5,898	5,898	5,898	263	4.7%
Critically Dry Year Average	3,480	3,482	3,534	3,610	3,695	3,754	3,809	3,859	3,921	3,957	3,990	4,024	4,024	545	15.7%
Minimum Annual	2,184	2,199	2,276	2,552	2,560	2,567	2,581	2,634	2,724	2,829	2,994	2,994	2,994	810	37.1%

[1]See Table NA-1 for description of operational conditions.

Table NA-15

Upstream of Delta Off-Stream Storage
Net Increase in Ag &Urban Water Supply Benefits vs. Maximum Storage Volume
Under Various Operational Conditions[1]

(Values in thousands of acre-feet)

Operation Condition E. Existing Banks PP Capacity/High S.R. Flow Event Target – Normal Period Supply Operation											
Run Identifiers:	NA645	NA646	NA647	NA648	NA649	NA650	NA651	NA652	NA653	NA654	NA655
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	40	101	142	171	189	202	215	227	233	239	245
1928-34 Dry Period Average	13	65	129	183	183	183	183	183	183	183	183
Dry Year Average	29	126	188	208	208	208	235	259	259	259	259
Critically Dry Year Average	8	67	151	269	351	433	469	473	509	546	585
Minimum Annual	0	92	326	326	326	326	326	326	326	385	802

Operation Condition F. Existing Banks PP Capacity/High S.R. Flow Event Target – Dry Period Supply Operation											
Run Identifiers:	NA656	NA657	NA658	NA659	NA660	NA661	NA662	NA663	NA664	NA665	NA666
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	2	47	80	102	113	123	132	140	148	156	161
1928-34 Dry Period Average	2	49	109	165	165	165	165	165	165	165	165
Dry Year Average	9	91	148	171	178	183	188	188	188	188	188
Critically Dry Year Average	10	57	122	193	241	290	340	394	447	494	530
Minimum Annual	24	119	342	368	396	433	469	546	668	831	831

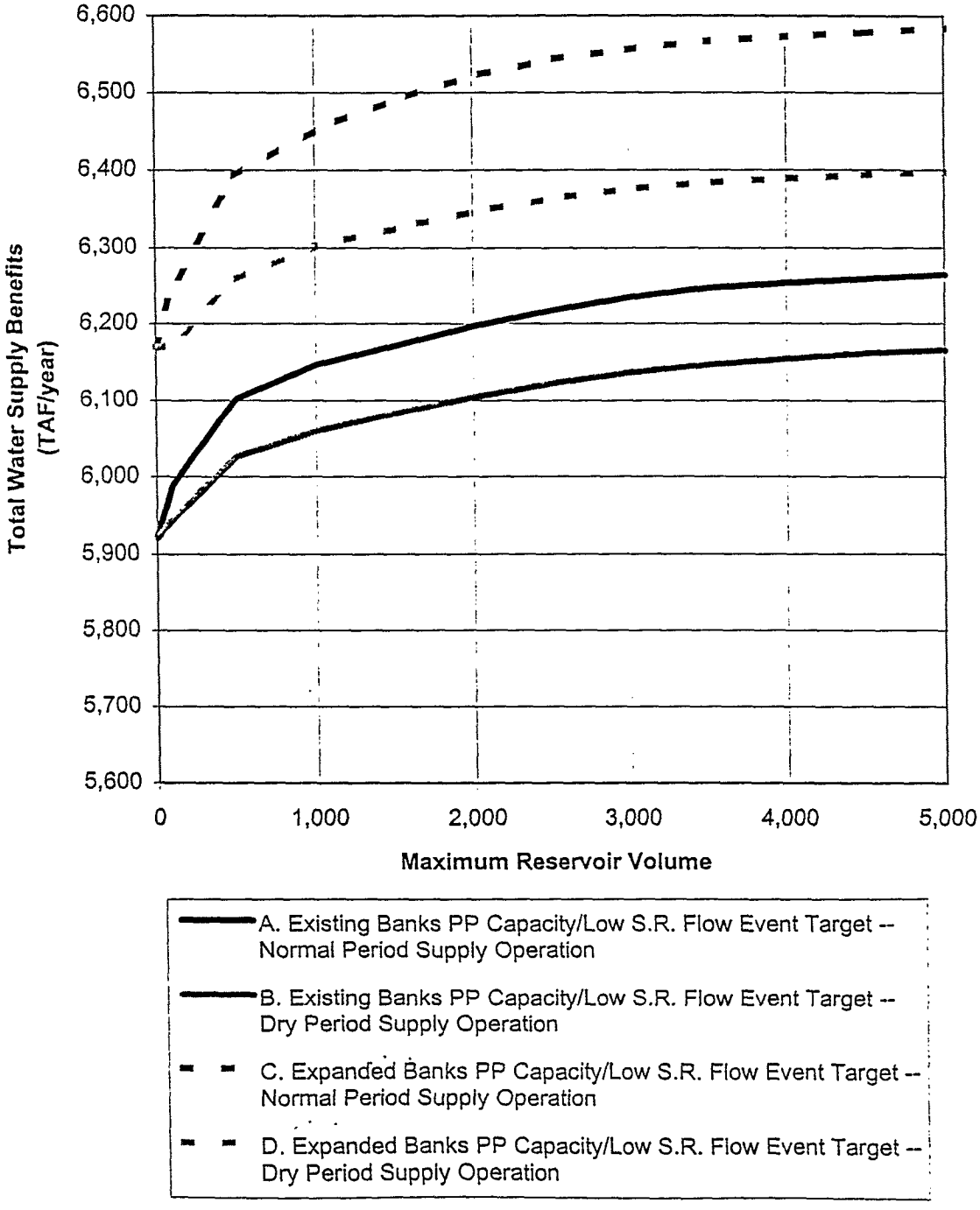
Operation Condition G. Expanded Banks PP Capacity/High S.R. Flow Event Target – Normal Period Supply Operation											
Run Identifiers:	NA667	NA668	NA669	NA670	NA671	NA672	NA673	NA674	NA675	NA676	NA677
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	42	135	188	222	246	271	289	307	323	330	335
1928-34 Dry Period Average	13	66	130	160	160	160	160	160	160	160	160
Dry Year Average	10	122	254	329	357	371	400	438	456	456	456
Critically Dry Year Average	0	35	117	190	273	355	419	450	463	500	535
Minimum Annual	0	0	138	363	363	363	363	363	363	363	363

Operation Condition H. Expanded Banks PP Capacity/High S.R. Flow Event Target – Dry Period Supply Operation											
Run Identifiers:	NA678	NA679	NA680	NA681	NA682	NA683	NA684	NA685	NA686	NA687	NA688
Max. Storage Volume (taf)	100	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
71-Year Average	-22	33	72	100	116	129	140	149	155	160	165
1928-34 Dry Period Average	-5	45	108	162	162	162	162	162	162	162	162
Dry Year Average	-13	105	190	233	244	252	263	263	263	263	263
Critically Dry Year Average	3	54	131	215	275	330	379	441	477	511	545
Minimum Annual	15	92	368	376	383	397	450	540	645	810	810

[1]See Table NA-1 for description of operational conditions.

Figure NA-53

Upstream of Delta Off-Stream Storage
71-Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

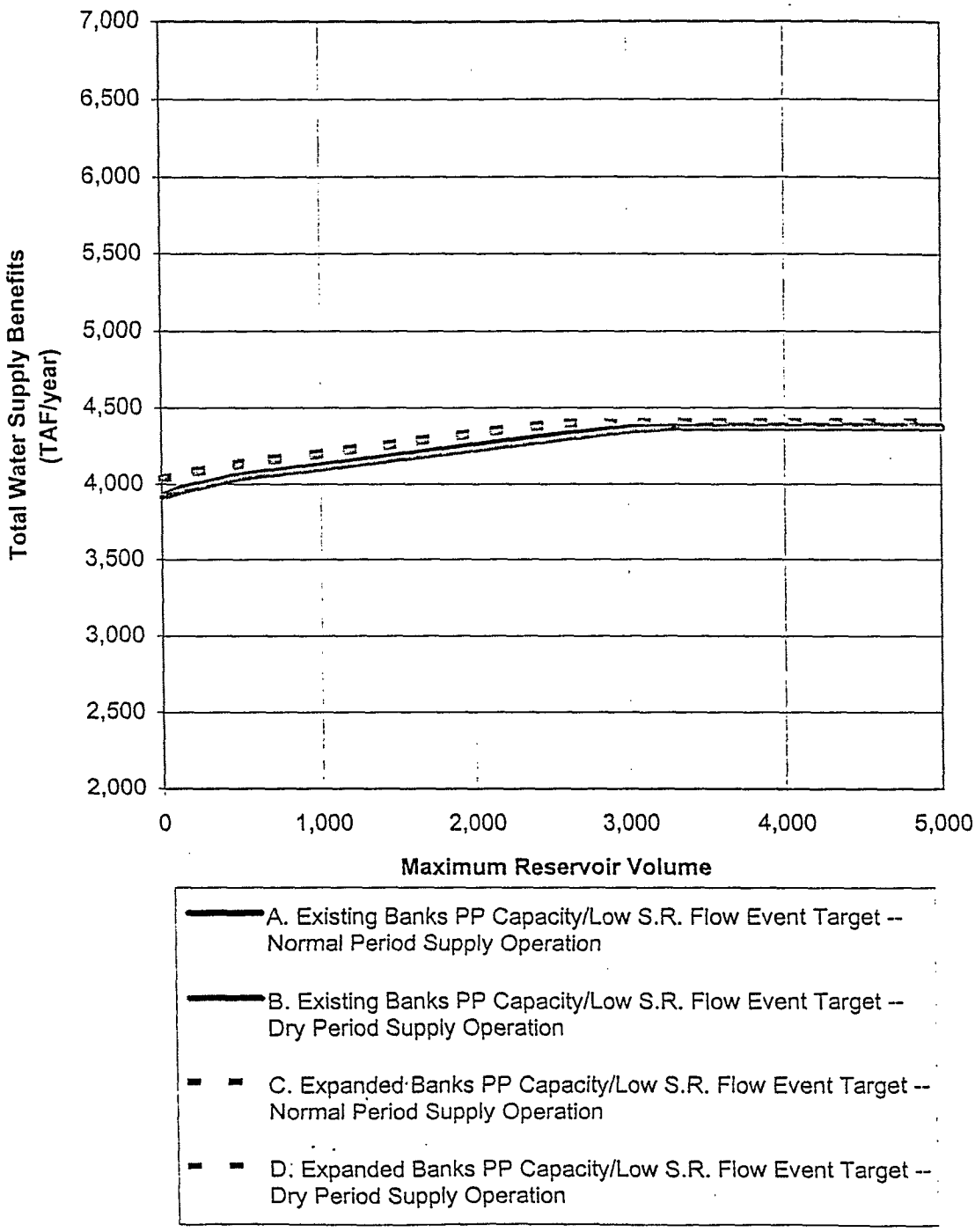


NA_RVSM.XLS: 71-Yr Avg Chart (2)

3/27/97

Figure NA-54

Upstream of Delta Off-Stream Storage
1928-34 Dry Period Annual Average Ag & Urban Water Supply Benefits versus Maximum Storage Volume

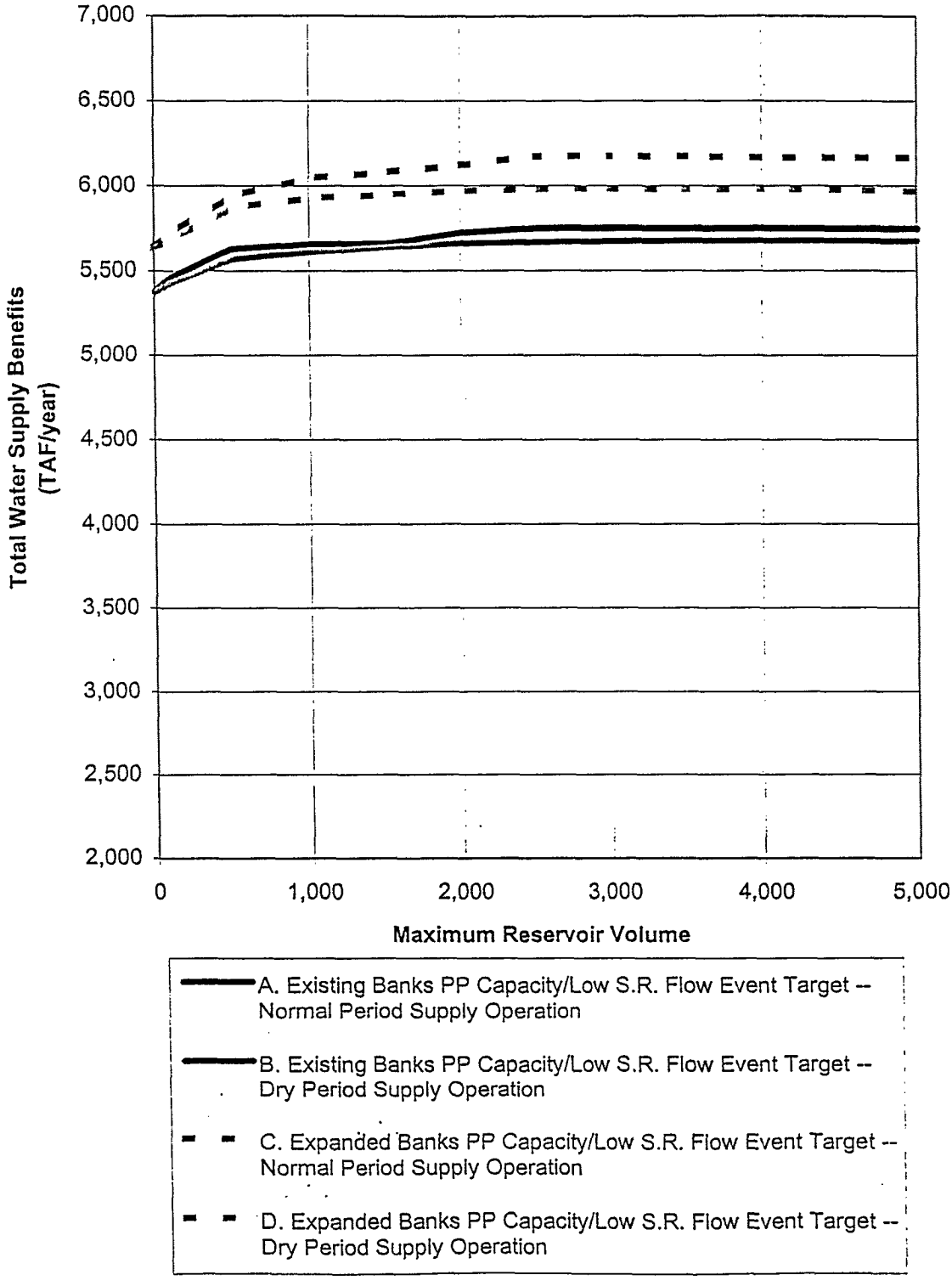


NA_RVSM.XLS: 1928-34 Chart 3/27/97

D-005955

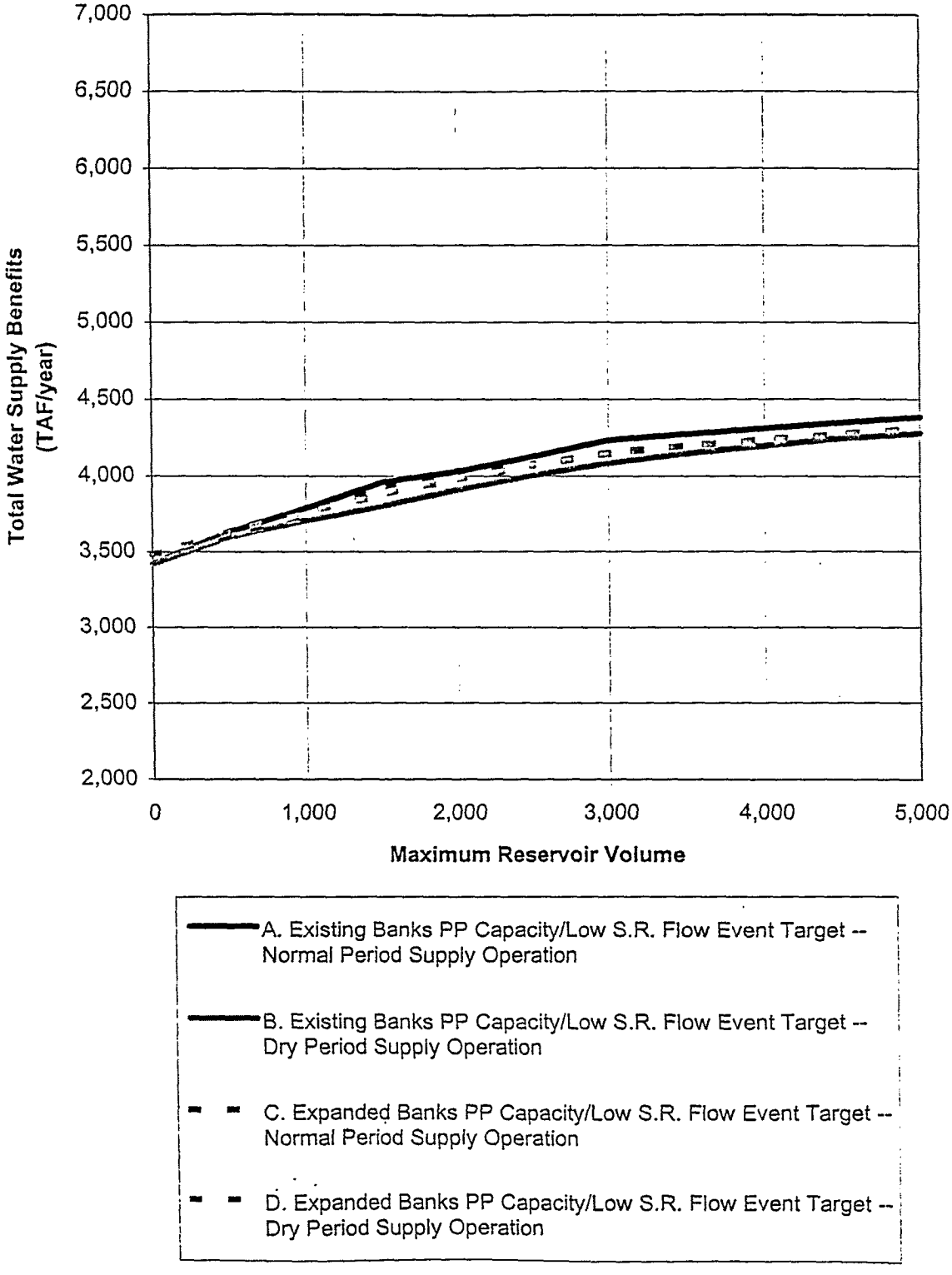
Figure NA-55

Upstream of Delta Off-Stream Storage
Dry Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM.XLS: Dry Years Chart 3/27/97

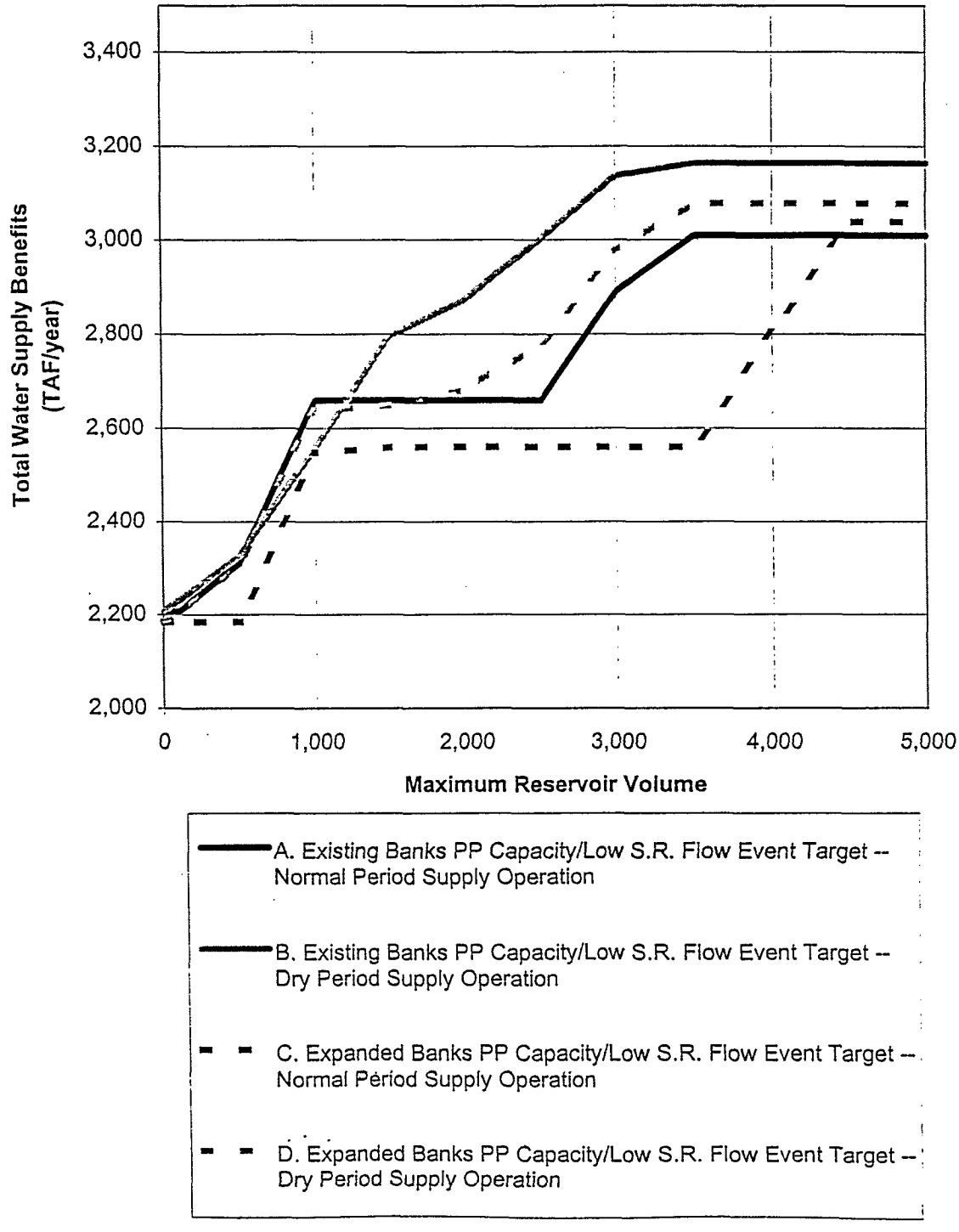
Figure NA-56
Upstream of Delta Off-Stream Storage
Critical Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM.XLS: Crit Years Chart 3/27/97

Figure NA-57

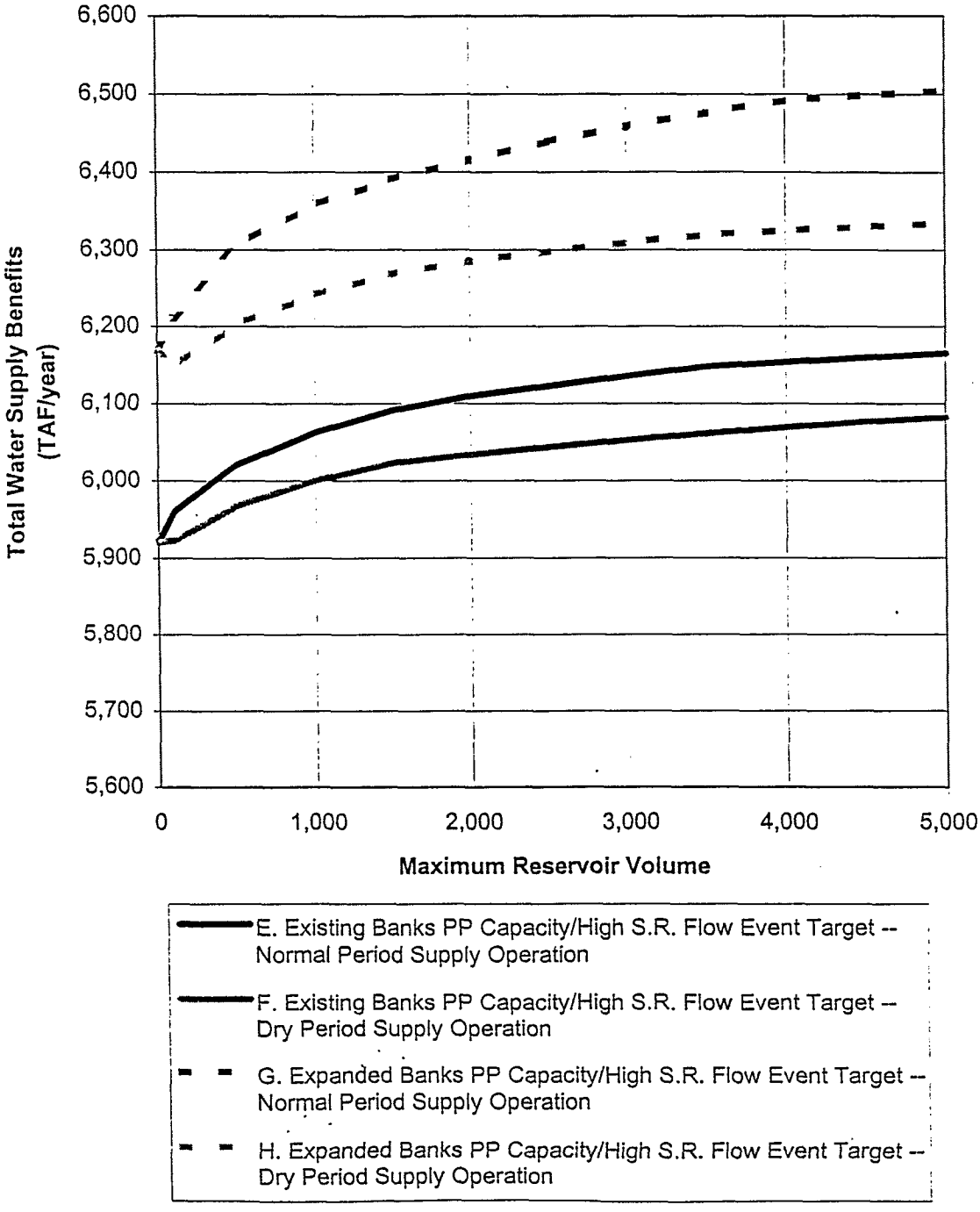
Upstream of Delta Off-Stream Storage
Minimum Annual Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM.XLS: Min Annual Chart (2) 3/27/97

Figure NA-58

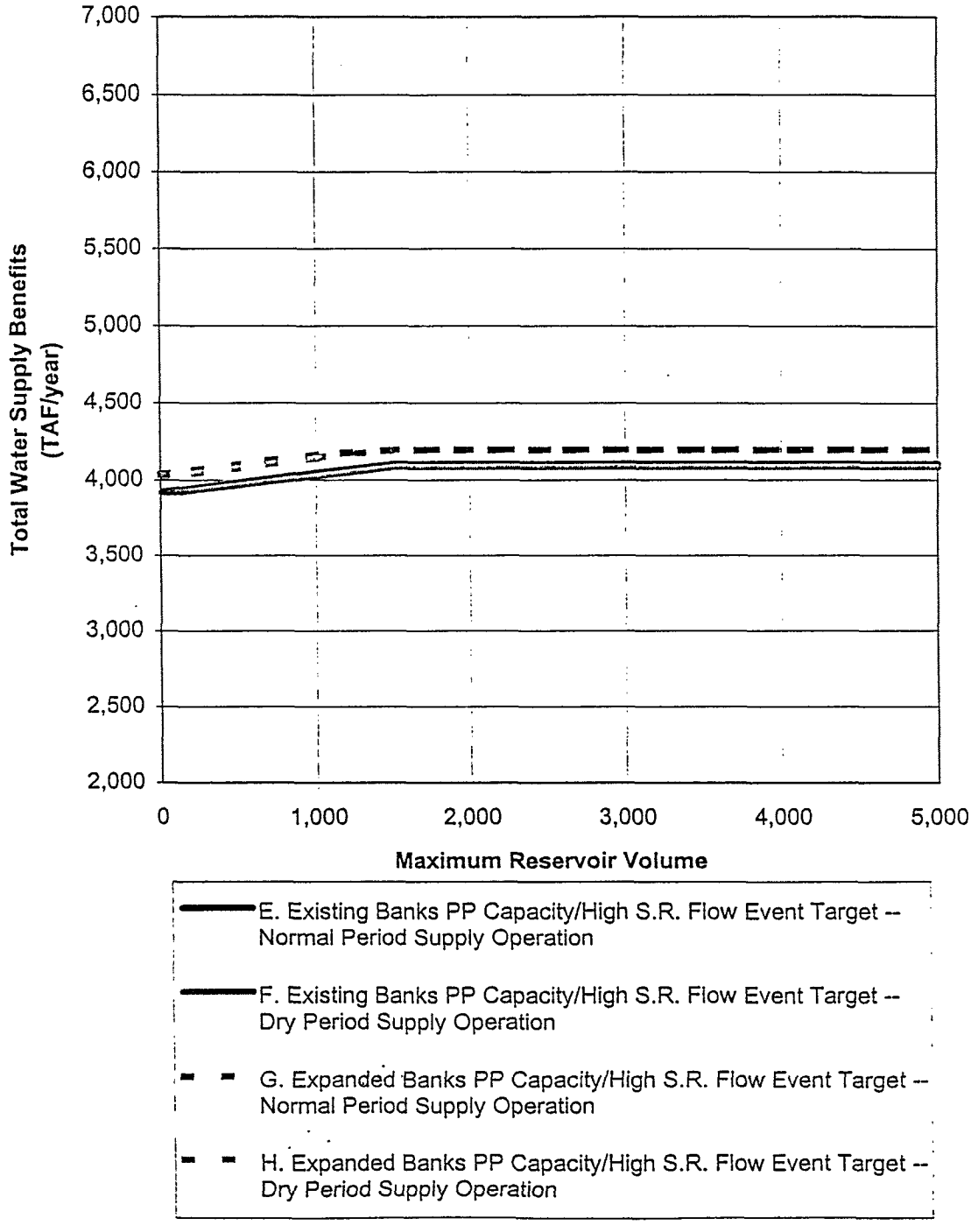
Upstream of Delta Off-Stream Storage
71-Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM2.XLS: 71-Yr Avg Chart (2) 3/27/97

Figure NA-59

Upstream of Delta Off-Stream Storage
1928-34 Dry Period Annual Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

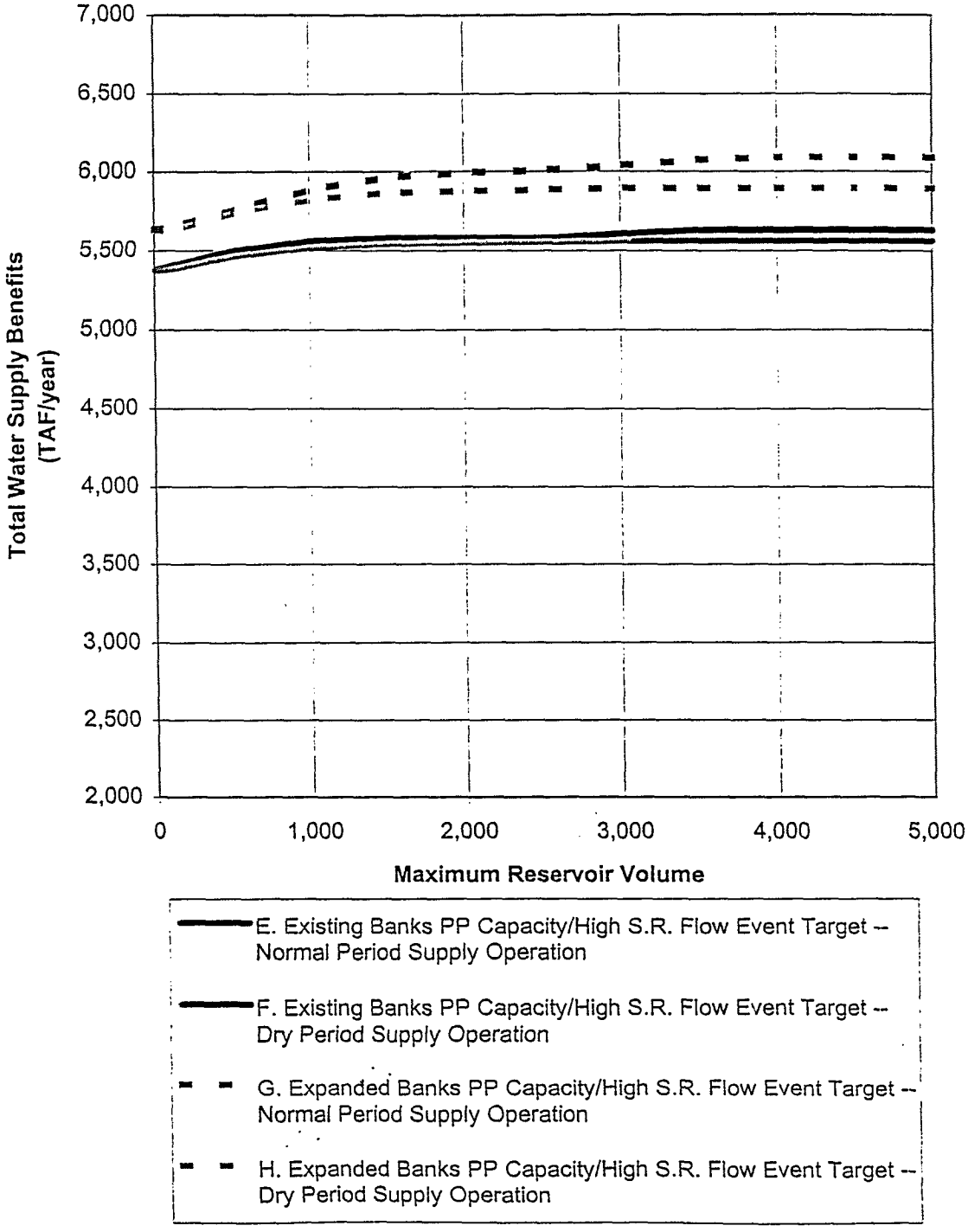


NA_RVSM2.XLS: 1928-34 Chart

3/27/97

Figure NA-60

Upstream of Delta Off-Stream Storage
Dry Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

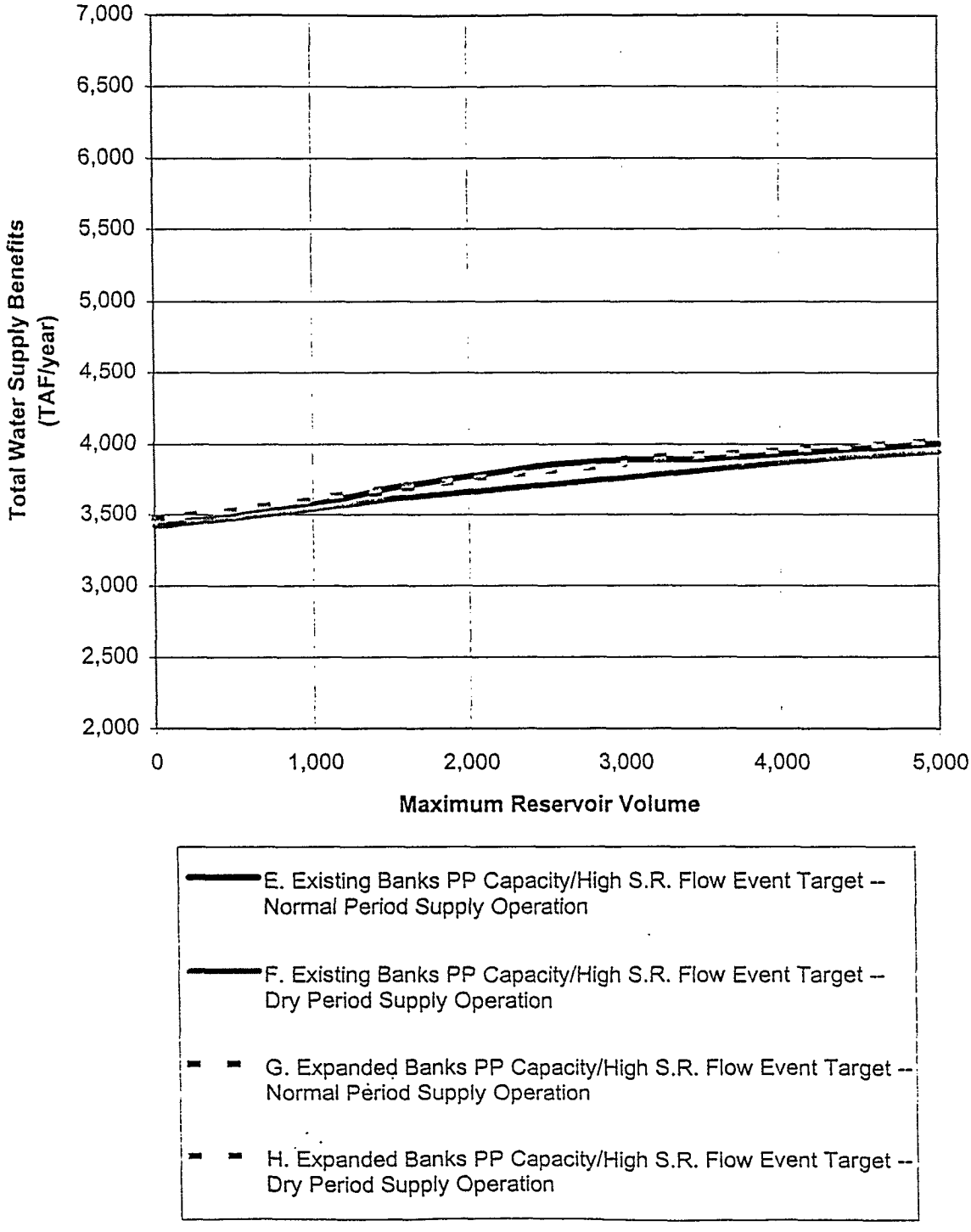


NA_RVSM2.XLS: Dry Years Chart 3/27/97

D-005961

Figure NA-61

Upstream of Delta Off-Stream Storage
Critical Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

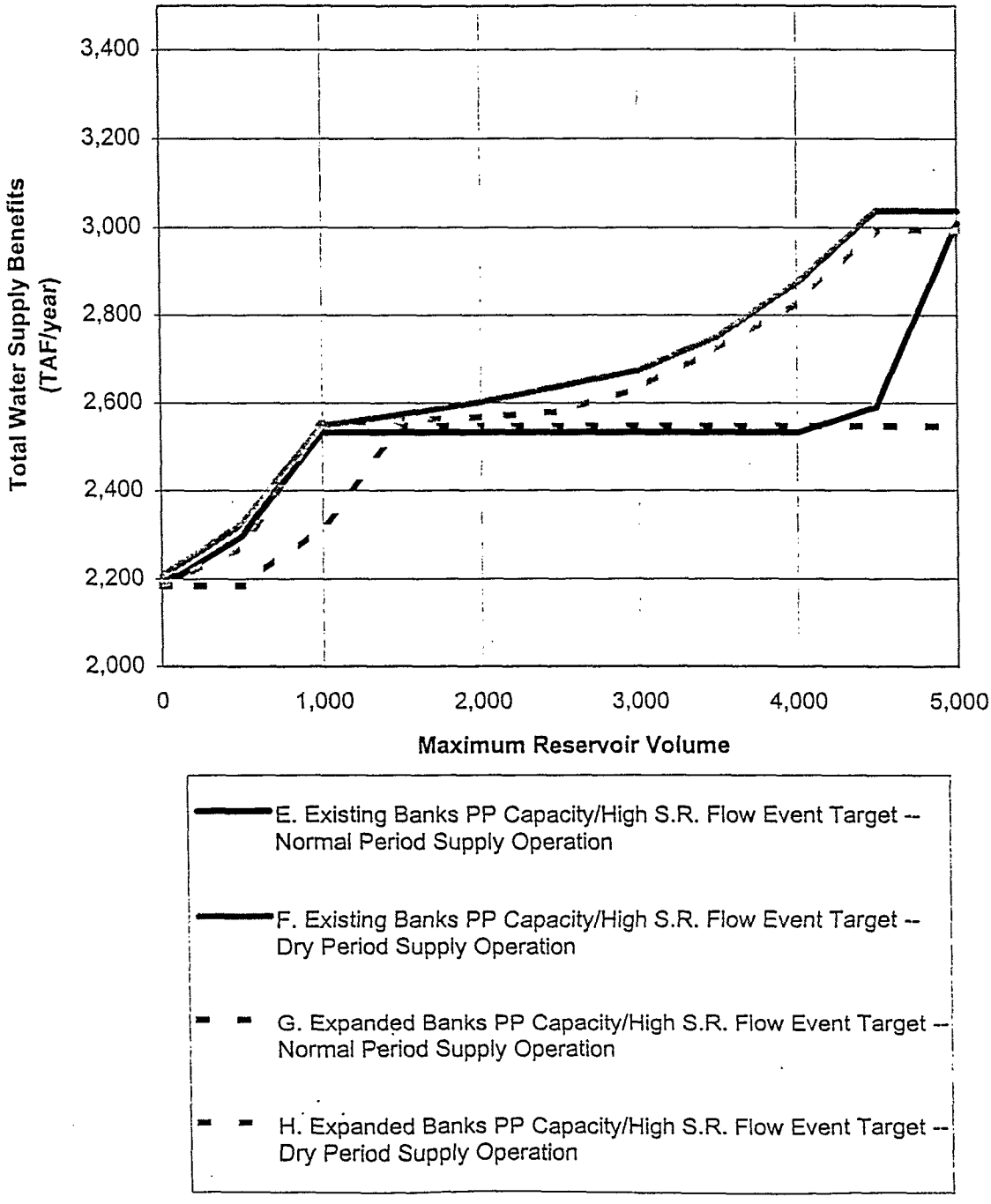


NA_RVSM2.XLS: Crit Years Chart 3/27/97

D-005962

Figure NA-62

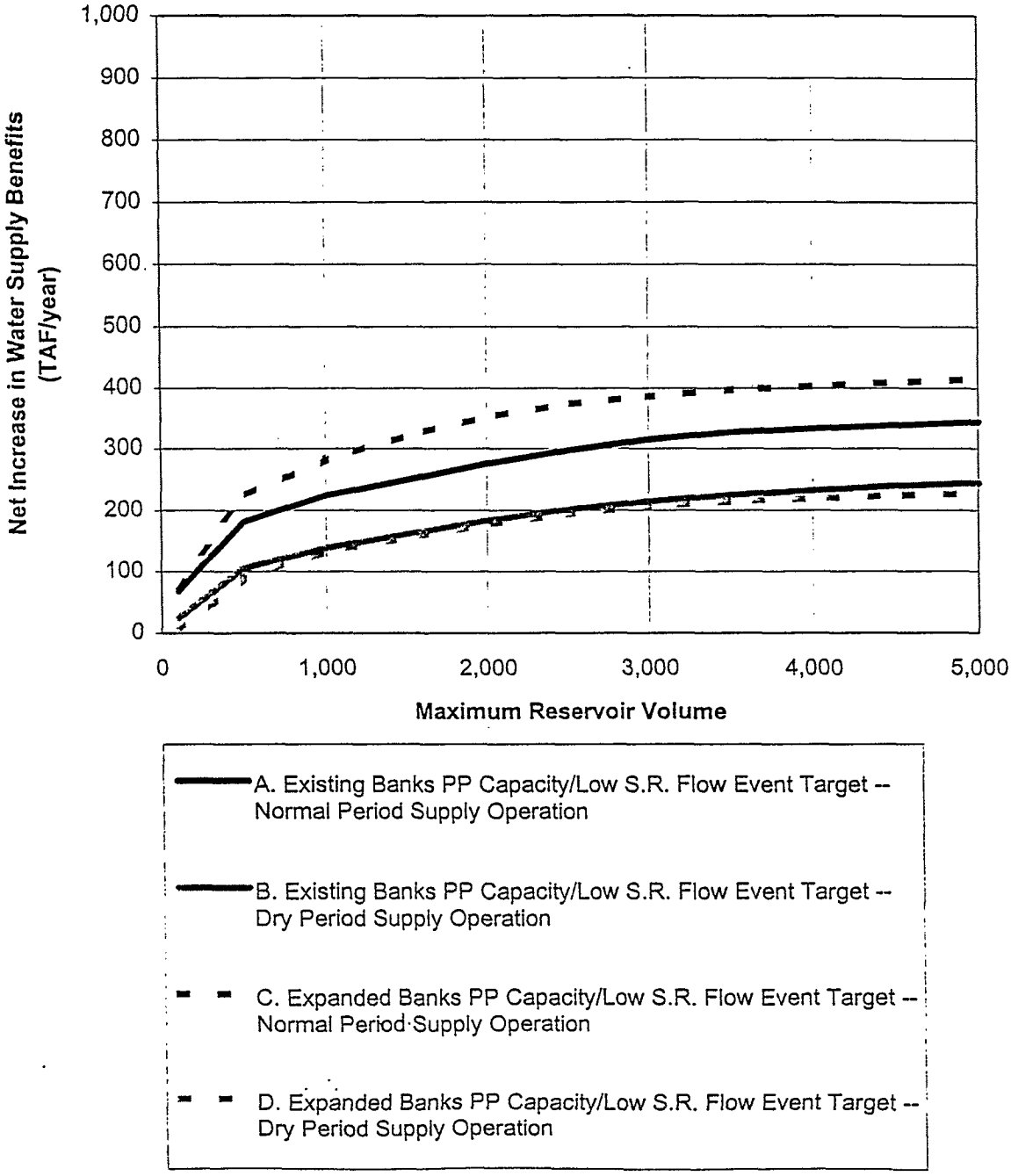
Upstream of Delta Off-Stream Storage
Minimum Annual Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM2.XLS: Min Annual Chart (2) 3/27/97

Figure NA-63

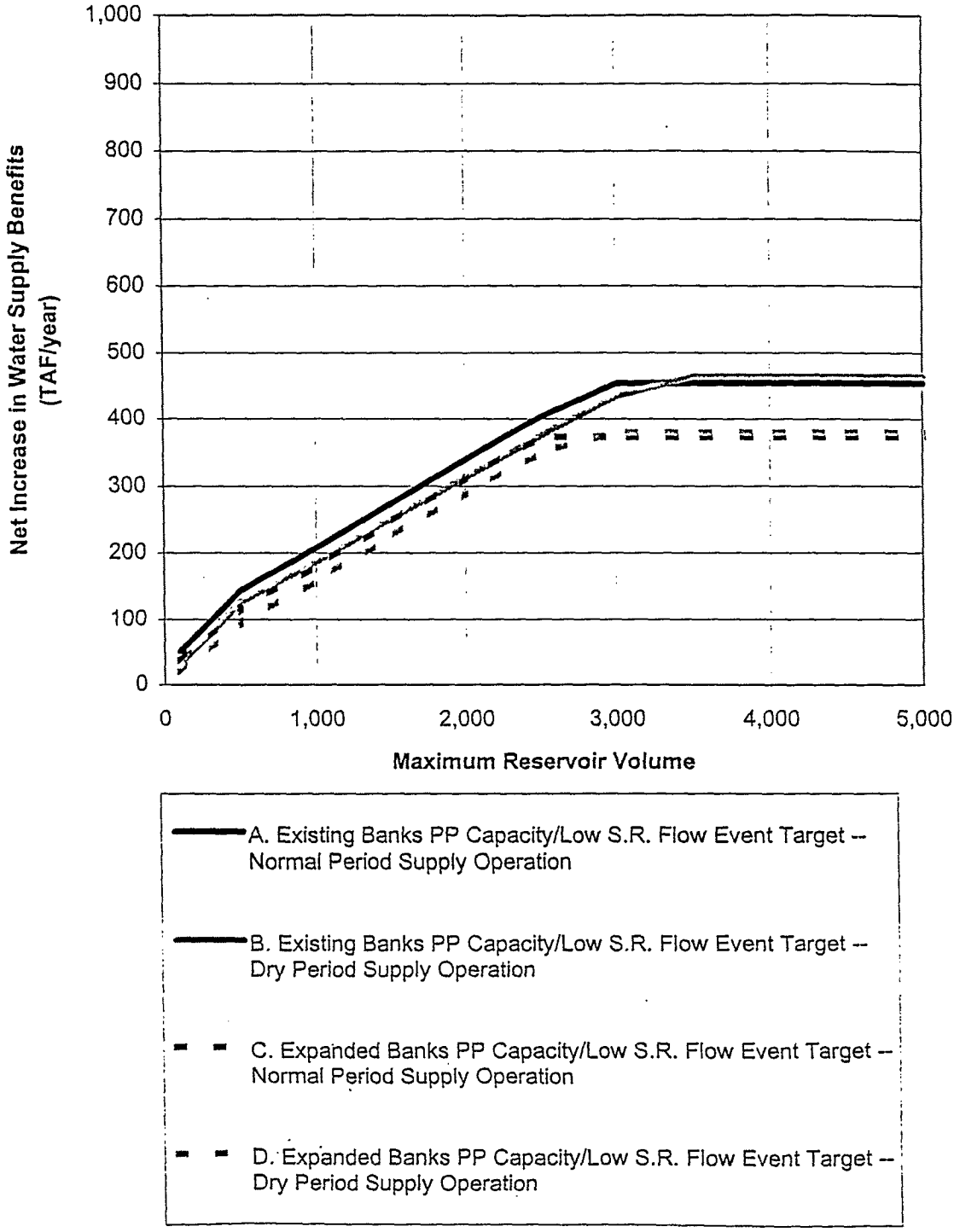
Upstream of Delta Off-Stream Storage
Net increase in 71-Year Average Ag & Urban Water Supply Benefits versus Maximum Storage Volume



NA_RVSM.XLS: Net 71-Yr Avg Chart 3/27/97

Figure NA-64

Upstream of Delta Off-Stream Storage
Net Increase in 1928-34 Dry Period Annual Average Ag & Urban
Water Supply Benefits
versus Maximum Storage Volume

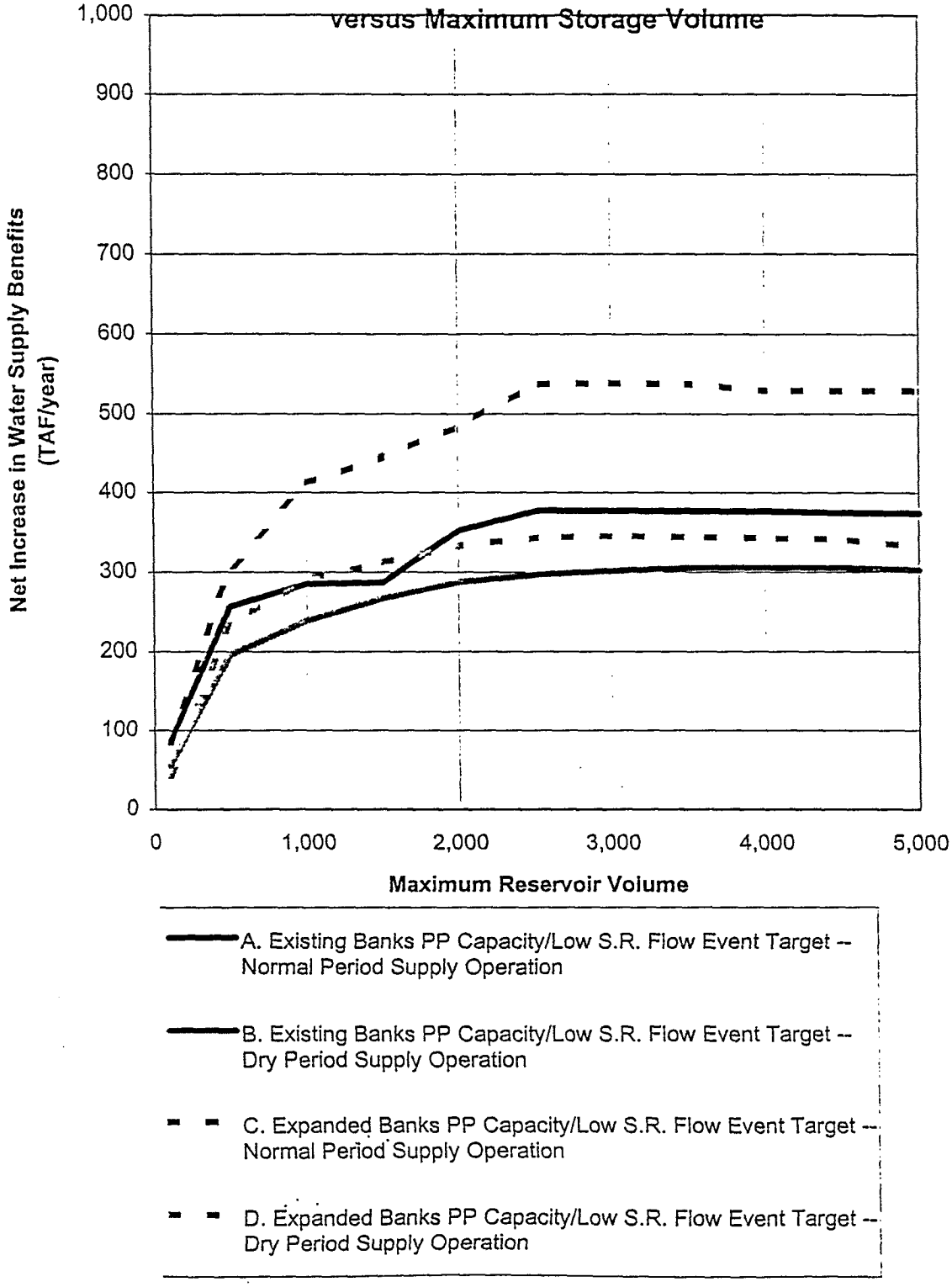


NA_RVSM.XLS: Net 1928-34 Chart

3/27/97

Figure NA-65

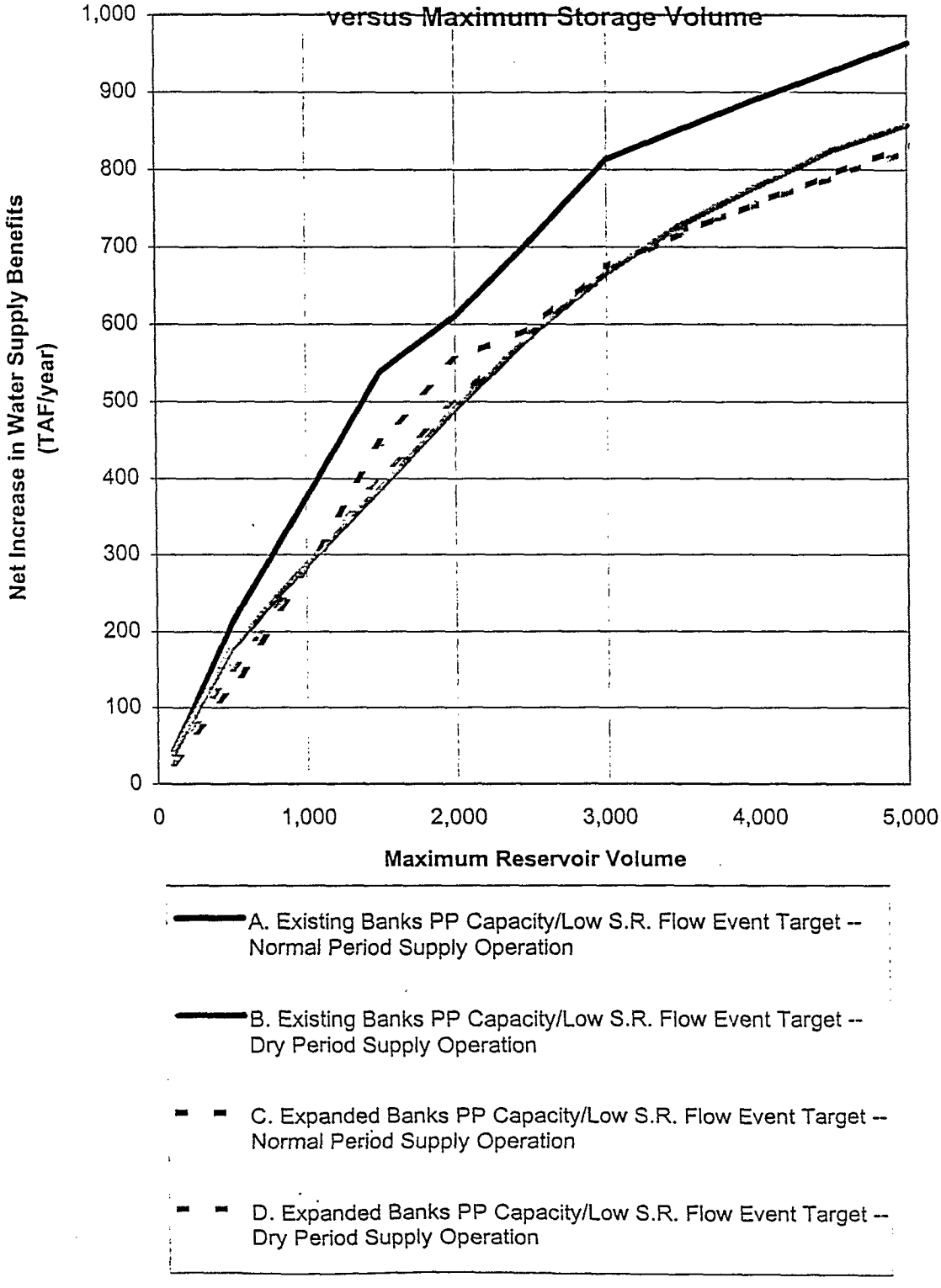
Upstream of Delta Off-Stream Storage
Net Increase in Dry Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM.XLS: Net Dry Years Chart 3/27/97

Figure NA-66

Upstream of Delta Off-Stream Storage
Net Increase in Critical Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

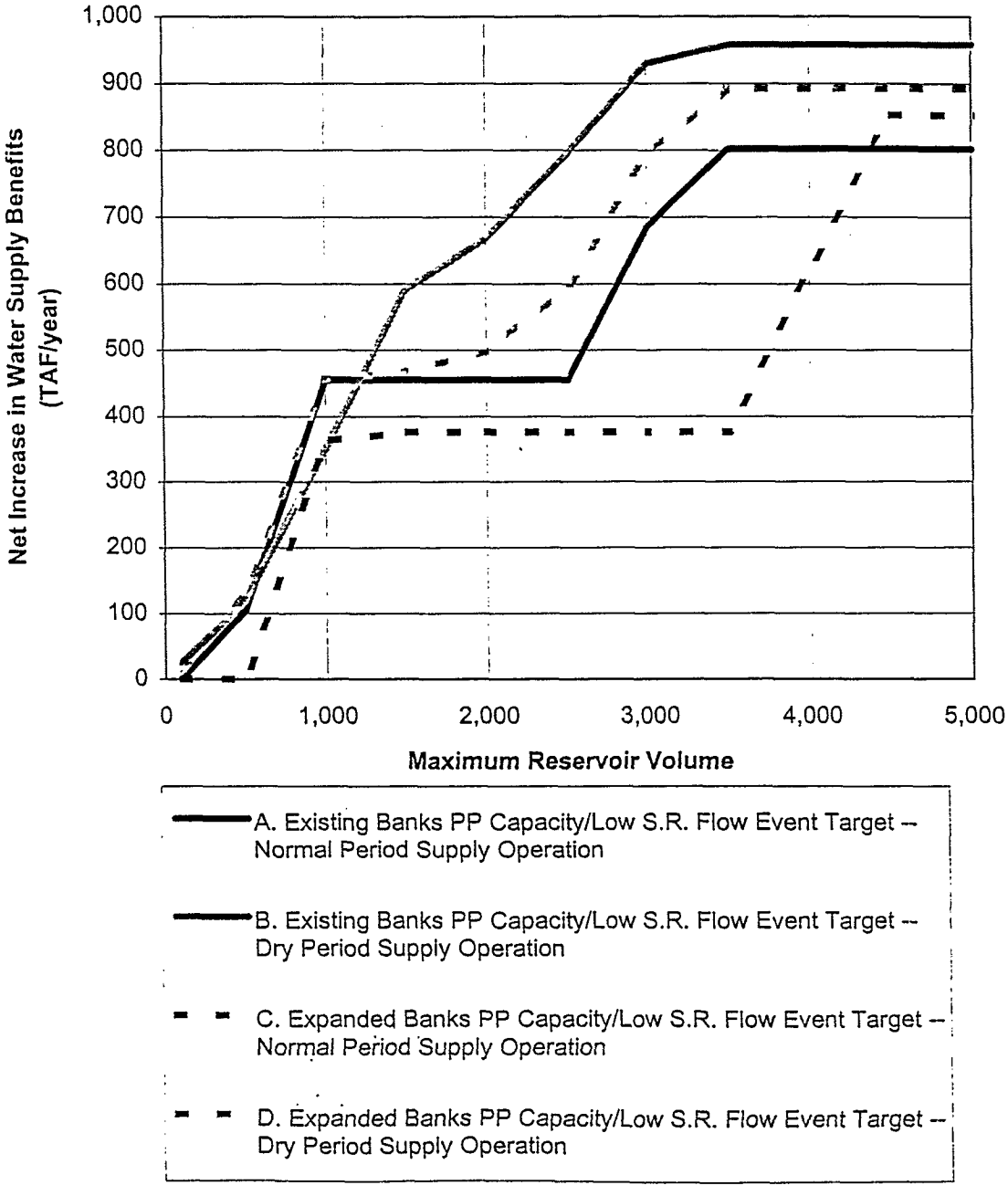


NA_RVSM.XLS: Net Crit Years Chart

3/27/97

Figure NA-67

Upstream of Delta Off-Stream Storage
Net Increase in Minimum Annual Ag & Urban Water Supply Benefits versus Maximum Storage Volume

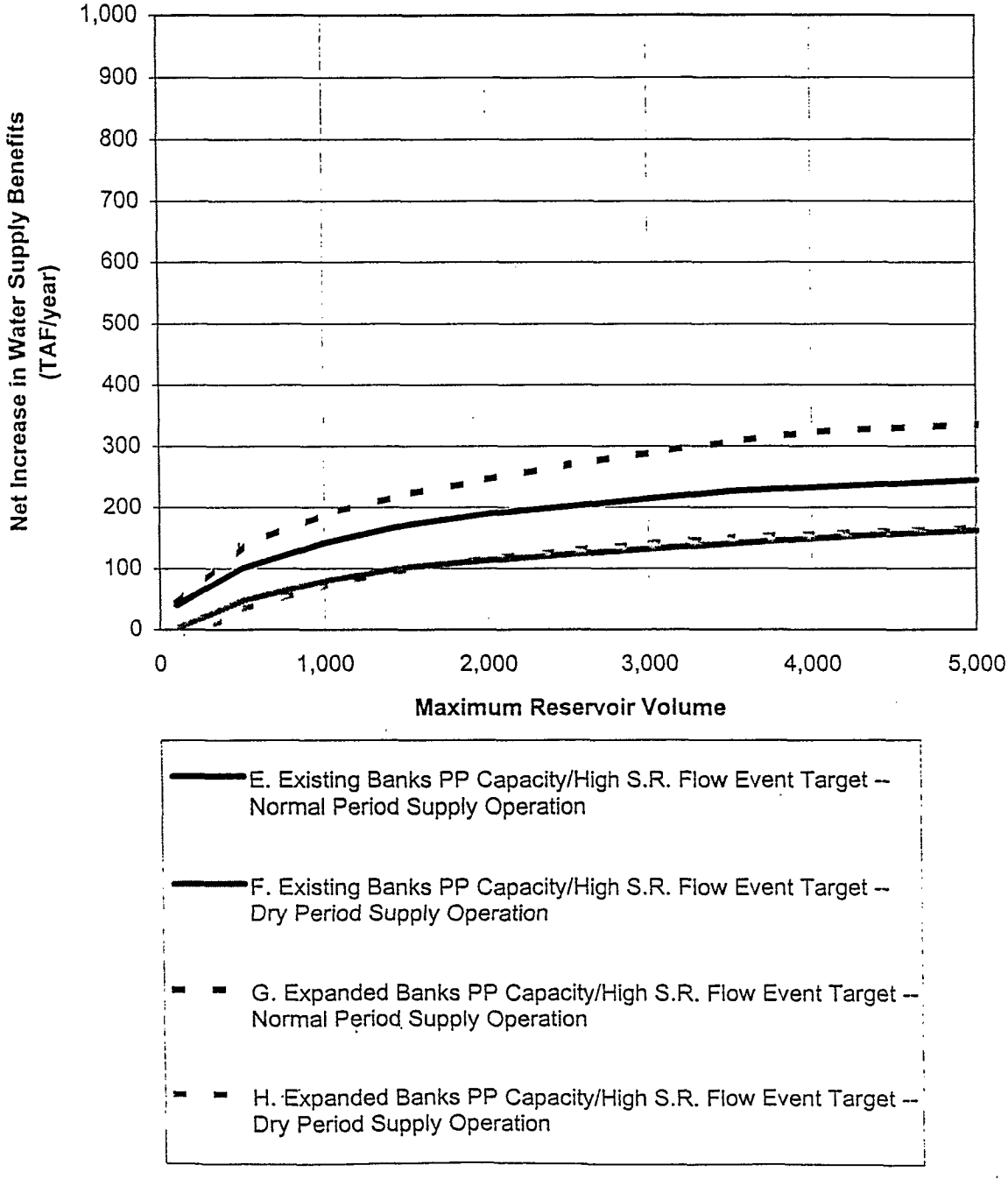


NA_RVSM.XLS: Net Min Annual Chart

3/27/97

Figure NA-68

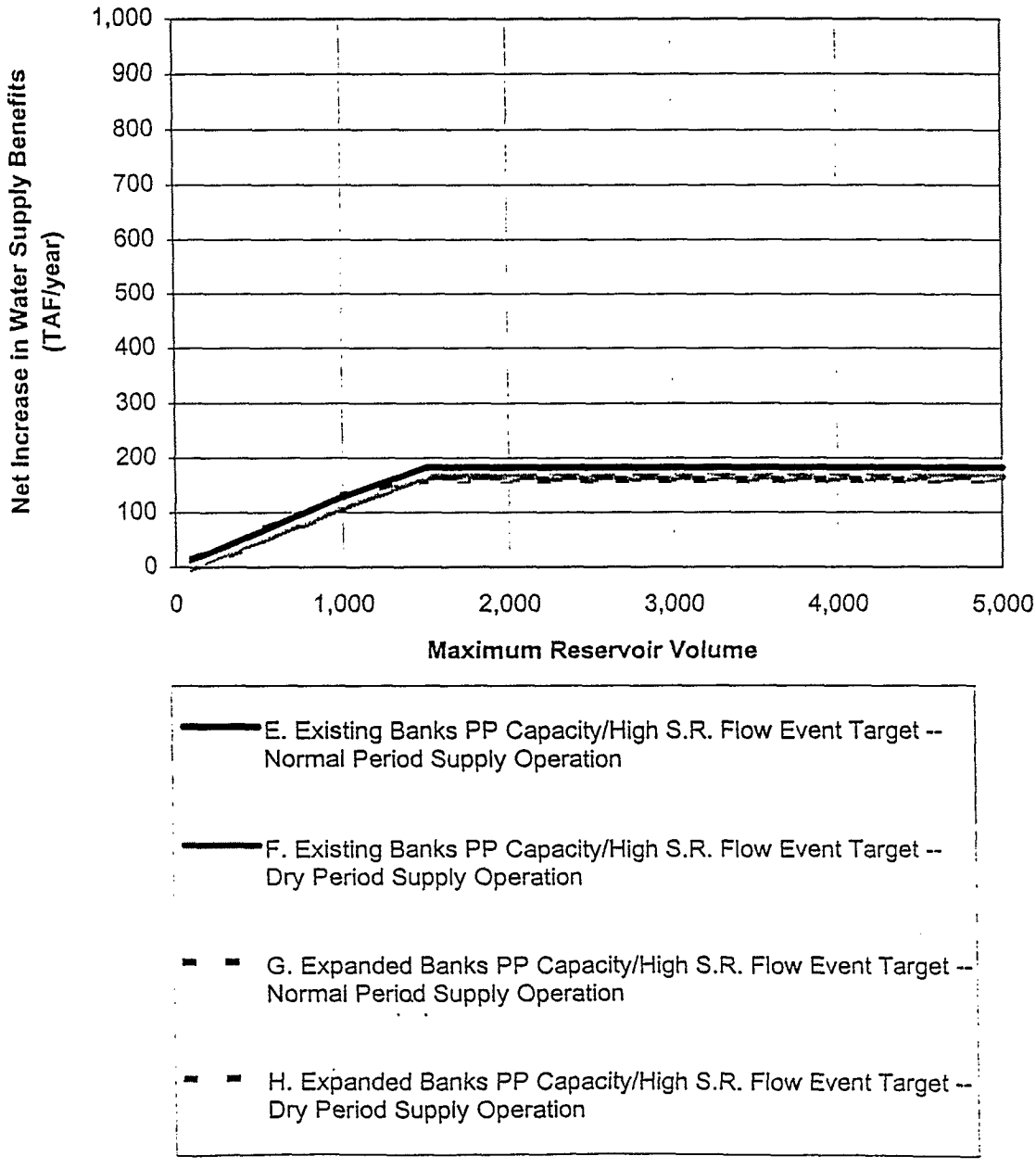
Upstream of Delta Off-Stream Storage
Net increase in 71-Year Average Ag & Urban Water Supply Benefits versus Maximum Storage Volume



NA_RVSM2.XLS: Net 71-Yr Avg Chart 3/27/97

Figure NA-69

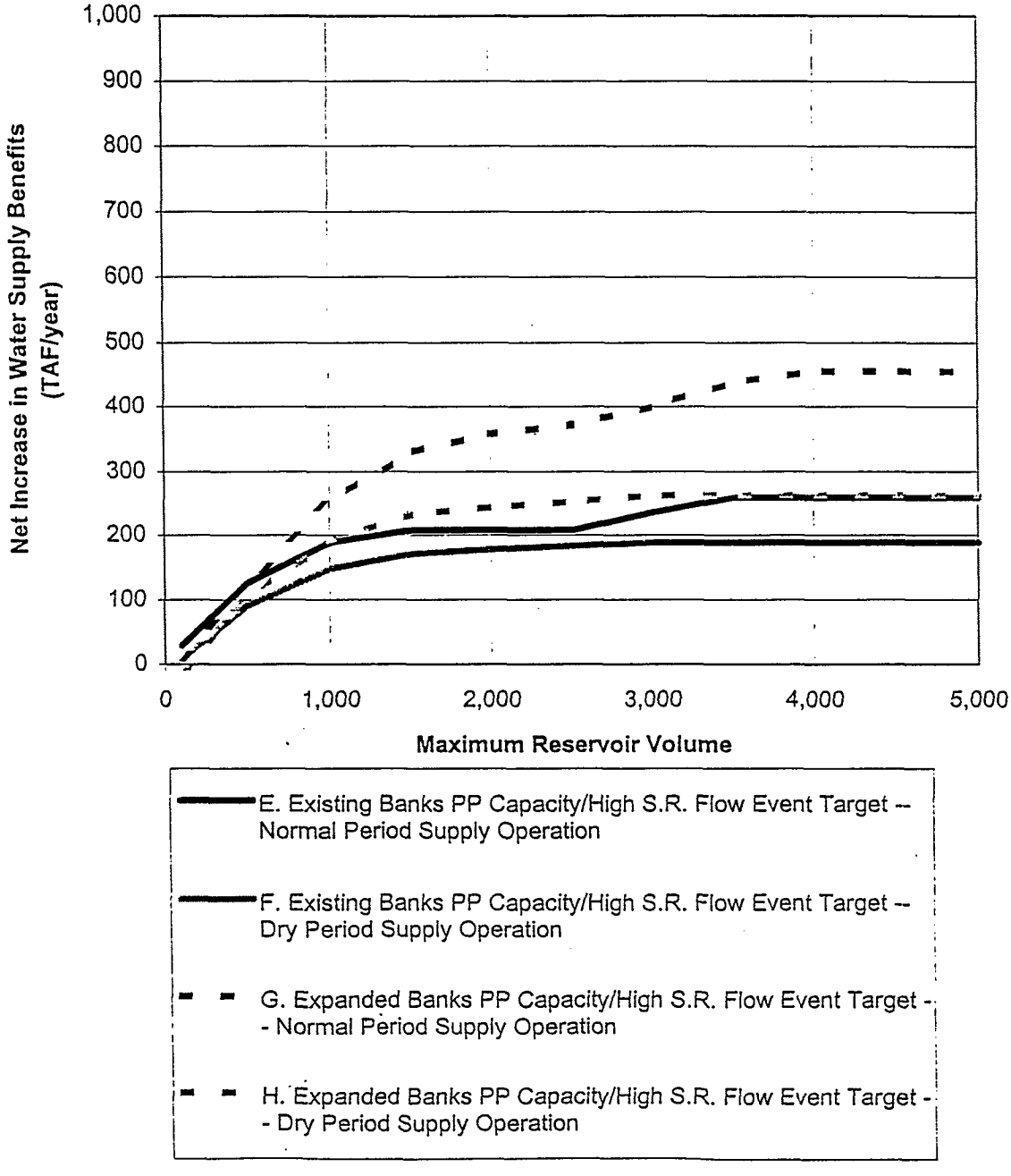
Upstream of Delta Off-Stream Storage
Net Increase in 1928-34 Dry Period Annual Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume



NA_RVSM2.XLS: Net 1928-34 Chart 3/27/97

Figure NA-70

Upstream of Delta Off-Stream Storage
Net Increase in Dry Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

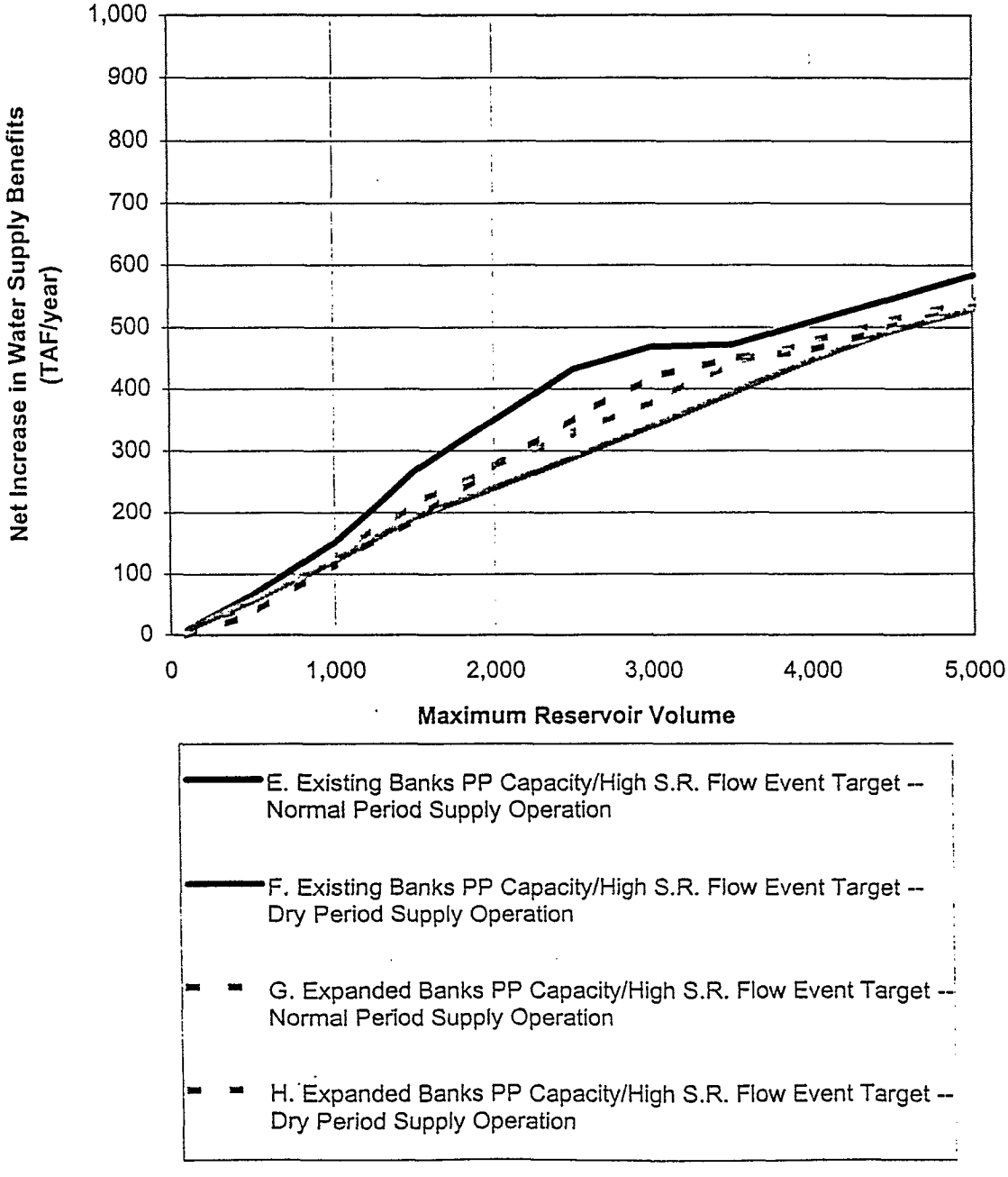


NA_RVSM2.XLS: Net Dry Years Chart

3/27/97

Figure NA-71

Upstream of Delta Off-Stream Storage
Net Increase in Critical Year Average Ag & Urban Water Supply Benefits
versus Maximum Storage Volume

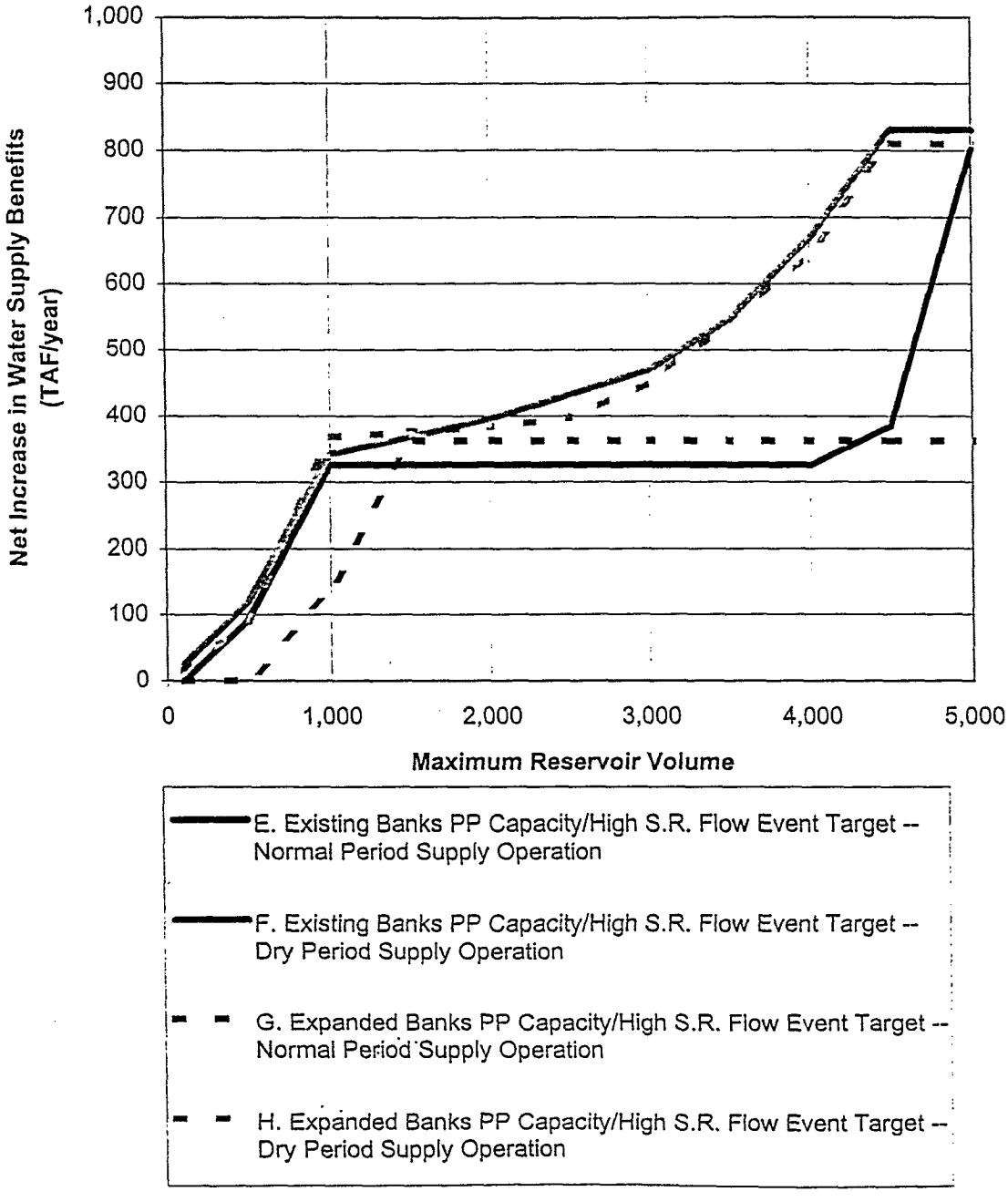


NA_RVSM2.XLS: Net Crit Years Chart

3/27/97

Figure NA-72

Upstream of Delta Off-Stream Storage
Net Increase in Minimum Annual Ag & Urban Water Supply Benefits versus Maximum Storage Volume



NA_RVSM2.XLS: Net Min Annual Chart

3/27/97