UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION

WATER RESOURCES PROBLEMS AND OPPORTUNITIES

This document presents water resources problems and opportunities that will be addressed in the Upper San Joaquin River Basin Storage Investigation. It describes which water resources problems could be directly addressed by the development of additional surface storage in the Upper San Joaquin River Basin and identifies other water resources opportunities that could also be addressed by the development of additional surface storage.

The definition of problems for this investigation began with the broad objectives included in the CALFED Record of Decision (ROD). The ROD recommended that additional storage be developed in the Upper San Joaquin River Basin to provide water for three primary purposes. These include flow for ecosystem restoration in the San Joaquin River, water quality in the San Joaquin River, and enhanced conjunctive use and water exchanges for the delivery of high quality water to urban areas, which is one way to improve water supply reliability. Stakeholder input, provided during the first workshop, was used to further identify and define problems and opportunities to be considered.

WATER RESOURCES PROBLEMS

It is anticipated that initial project plans will be developed to address one or more of the following water resources conditions revealed three problems in the Eastern San Joaquin Valley.

- San Joaquin River Ecosystem Restoration
- San Joaquin River Water Quality
- Water Supply Reliability

A summary of each problem is provided in the following sections. For each problem, the current and anticipated future conditions are presented, followed by a discussion of how additional storage could affect the issue is described, and a summary of how accomplishments would be identified.

SAN JOAQUIN RIVER ECOSYSTEM RESTORATION

Problem Description

The reach of the San Joaquin River from Friant Dam to the confluence with the Merced River does not support a continuous natural riparian ecosystem. Since completion of Friant Dam in 1945, most of the water supply in the River has been diverted with the exception of releases to satisfy riparian water rights upstream of Gravelly Ford and flood releases. The reach from Gravelly Ford to Mendota Pool is often dry. Flows from the Mendota Pool to Sack Dam contain DMC flows for delivery to San Luis Canal Company and the State and federal refuges. Groundwater seepage is the primary source of flow below Sack Dam prior to the confluence with Salt Slough. The reach from Sack Dam to Bear Creek benefits from managed wetland development, whereas marshes have been drained between Bear Creek and the Merced River. The lack of reliable flows and water quality in the San Joaquin River results in ecosystem conditions that are generally considered unhealthy.

During the past few decades, societal views towards ecosystem health of rivers in the Central Valley and elsewhere in the nation have changed. Today, many people would prefer a sustainable ecosystem along the upper San Joaquin River. This shift in viewpoint is evident in the numerous programs that are addressing ecosystem restoration in the Central Valley and along the San Joaquin River, and ongoing litigation between a coalition of environmental interests represented by the Natural Resources Defense Council (NRDC) and the Bureau of Reclamation and the Friant Water Users Authority (FWUA) *(NRDC* v. *Rodgers)*.

Future Condition Assumptions

NRDC and FWUA have been discussing various river restoration ideas for several years that could be used as part of a settlement of *NRDC* v. Rodgers. The Court has not issued a decision that flows must be increased in the San Joaquin River, or that the river must be restored. Resolution *NRDC* v. *Rodgers* may include some degree of river restoration, including a flow requirement in the San Joaquin River below Friant Dam. At this time, however, a flow requirement cannot be determined because the restoration objective has not been established. It is also not known how existing water uses would change if a flow requirement for river restoration is established, or what additional facilities and operational changes would be required to accomplish the restoration objective, how such a project would be financed, or when it would be implemented.

It is recognized that the future condition could include a new demand on the Friant system for river restoration, but no quantified flow will be assumed in this investigation. This assumption is consistent with the CALFED ROD, which directs that this investigation consider how additional storage could be used to provide water supplies to support restoration of the San Joaquin River.

How Additional Storage Could Improve Ecosystem Conditions

Additional storage in the Upper San Joaquin River watershed could lead to an increased frequency, magnitude, or duration of river flows that would support ecosystem conditions in the San Joaquin River. Although specific ecosystem objectives have not yet been established, potential increments of beneficial effects could include:

- Improved riparian or wetland habitat
- Improved aquatic ecosystem suitable for resident fishery

- Improved aquatic ecosystem suitable for hatchery bred anadromous fishery
- Improved aquatic ecosystem suitable for naturally reproducing anadromous fishery

How Potential Ecosystem Restoration Opportunities Will be Identified and Measured

To identify the extent that additional storage could support ecosystem restoration objectives, a set of flow requirements would be needed for various levels of ecosystem improvement. It is possible that the addition of storage alone would not be adequate to meet some restoration objectives.

- The extent to which water supplies developed with additional storage would enable the flow objectives to be met would be identified.

The release of water from Friant Dam to the San Joaquin River for ecosystem restoration would also provide other benefits, depending on the timing and magnitude of the flows. Benefits could include:

- Improved San Joaquin River Water Quality. Releases to improve ecosystem conditions would also increase water quality in several reaches of the River. If a portion of the flow is used to meet demands at Mendota Pool, delivered water quality to agricultural users and refuges would increase and discharged water quality would also improve. If flows continue below Sack Dam, it is likely that flow and quality conditions between the Merced River and the Delta would improve.

- Increased water supply reliability to south of Delta water users. If a portion of the flow is used to meet demands at Mendota Pool, the water that would have otherwise been used by the Exchange Contractors from the Delta would increase water supply reliability for other south of Delta water users.

- Increased water supply reliability to CVP contractors on the Stanislaus River. If flows in the San Joaquin River above the confluence with the Stanislaus River increase because of releases from Friant Dam, the water quality in this reach would also improve. This could result in a reduction of water releases necessary from New Melones Reservoir to meet water quality objectives at Vernalis, thereby increasing water supply reliability to CVP Stanislaus River contractors.

- Increased water supply reliability to VAMP parties. If flows in the San Joaquin River at Vernalis increase because of releases from Friant Dam, the flow deficit to be met by the VAMP parties could be reduced, thereby increasing water supplies to VAMP parties.

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SAN JOAQUIN RIVER WATER QUALITY

Problem Description

The Central Valley Regional Water Quality Control Board (CVRWQCB) has adopted the Water Quality Control Plan for the Sacramento River and the San Joaquin River Basin (Basin Plan) as the regulatory reference for meeting the state and federal requirements for water quality control that are consistent with the designated uses of water. The latest version was adopted in 1998. The Basin Plan lists the existing and potential beneficial uses of the Lower San Joaquin River including agricultural uses, municipal and industrial uses, recreation, fishery migration and spawning, and wildlife habitat. Specific water quality standards associated with the Lower San Joaquin River include boron, molybdenum, selenium, dissolved oxygen, pH, pesticides, salinity, and temperature. The Basin Plan is currently under its triennial review process for beneficial use and water quality standard updates.

One of the high priority issues of the review is the regulatory guidance for Total Maximum Daily Load (TMDL) standards along the San Joaquin River. Section 303(d) of the Federal Clean Water Act (Act) requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards, or are considered impaired, and then prioritized in the 303(d) list. The Act further requires the development of a TMDL for each listing.

The current list, approved by the USEPA, is the 1998 303(d) list, in which Mud and Salt Sloughs and the Lower San Joaquin River from Mendota Pool downstream to the Airport Way Bridge near Vernalis were listed as impaired water bodies. The pollutants or stressors include boron, chlorphrifos, DDT, diazinon, electrical conductivity, Group A pesticides,[1] selenium and other unknown toxics. A list of final dates for meeting TMDLs and implementing associated programs are expected to be considered by the CVRWQCB; at this time the dates are generally set at year 2011.[2]

CVRWQCB staff reports on the selenium TMDL and the salt and boron TMDL were completed in August 2001 and January 2002, respectively. The final report on organophosphorus TMDL is expected in June 2002. The TMDL for salt and boron identifies load limits that were developed to attain water quality objectives in the San Joaquin River at Vernalis for irrigation and non-irrigation months. The TMDL includes a base load that would be associated with the lowest expected flow for a given month and water year type, and a real-time relaxation approach that could be applied when river flows exceed the assumed minimum levels. Implementation of the real-time relaxation criteria would require flow and quality monitoring at additional locations and the development of a coordinated operations plan for discharges from nearly 300,000 acres of irrigated agricultural land.

Future Condition Assumptions

CRWQCB Resolution No. 5-01-236 regarding control of discharges from irrigated lands (dated September 7, 2001) stipulates that the CVRWQCB will evaluate the available information and make recommendations as to whether to proceed to adopt a new waiver with conditions or to control discharges through a more formal regulatory approach prior to 2003. Through the triennial review process, the CVRWQCB is preparing an amendment to the Basin Plan to further regulate the water quality upstream of Vernalis. The major changes in water quality standards in the San Joaquin River are expected from the implementation of TMDL allocation process.

[1] Group A pesticides include aldrin, dieldrin, chlordance, endrin, heptachlor heptachlor epoxide, hexachlorocyclohexane (including lindane), endosulfan and toxaphene.

[2] A delay of the final dates to year 2015 are proposed in the December 2001 report prepared by the CVRWQCB on the revision of the current 303(d) list. The report is currently under review by the SWRCB.

Regulatory trends over the past several decades show that standards generally become more stringent as our understanding of pollutant effects increases and technology advances. The Basin Plan (including TMDL allocation) is subject to future review and revision. Although it is likely that future versions will address more restrictive water quality objectives than the current version, the existing water quality objectives will be used for this planning study.

How Additional Storage Could Improve San Joaquin River Water Quality

Additional storage in the Upper San Joaquin River watershed could result in an increased frequency, magnitude, or duration of river flows below Friant Dam to support water quality in the San Joaquin River. Water released from Friant Dam could improve water quality in the San Joaquin River in one of two ways.

Improve Water Quality at Mendota Pool

Water released from Friant Dam would flow into Mendota Pool, where it would be diverted for delivery to the Exchange Contractors and wildlife refuges.

Potential beneficial effects:

- Improve water quality delivered from Mendota Pool. This would result in an improvement in the quality of agricultural and refuge land tailwater discharged to the San Joaquin River.

- Increased water supply reliability to south-of-Delta water users. This would result as demands for water from the Delta for the Mendota Pool are reduced because additional San Joaquin River water is delivered to Mendota Pool.

- Improved water supply reliability to CVP contractors that receive water from New Melones Reservoir. This could result if water quality in the San Joaquin River upstream of the Stanislaus is improved, thereby reducing the amount of water that would be released from New Melones to meet Vernalis water quality objectives.

Provide High Quality Water Directly to the River

Water released from Friant Dam could be diverted upstream of the Mendota Pool through the Chowchilla Canal and Eastside Bypass and returned to the San Joaquin River downstream of Sack Dam. This would directly improve water quality in the San Joaquin River without modifying water deliveries from the Mendota Pool.

Potential beneficial effects:

- If a flow of known quantity and quality were added to the San Joaquin River, the Exchange Contractors and other agricultural dischargers may be able to implement the real-time relaxation provision of the TMDL. This may result in improved water quality at Vernalis. If water quality at Vernalis is improved, the potential benefits to CVP New Melones contractors and VAMP parties would also apply.

- If the operation results in additional flows to meet water quality objectives at Vernalis, the amount of water that would be released by the Vernalis Active Management Plan (VAMP) parties to meet pulse flow requirements could be reduced. This would result in an increase in water supply reliability to the VAMP parties.

How Potential Water Quality Accomplishments Will be Identified and Measured

Estimates of water quality changes will be made using existing capabilities of the CALSIM II and DSM2 models. Model output will be compared to identify:

- Changes in water quality at various locations along the San Joaquin River
- Change in frequency of out-of-compliance water quality in the San Joaquin River at Vernalis.

SURFACE WATER SUPPLY RELIABILITY

Problem Description

The San Joaquin Valley groundwater basin experiences overdraft in most years, i.e., more groundwater is pumped out than is replenished either naturally or artificially. The long-established problem existed prior to the construction of Friant Dam and has been reported to be over 1 million acre-feet per year for the entire San Joaquin Valley. Over the past few decades, increased demands coupled with the implementation of several environmental protection actions has resulted in reduced water supply reliability to Delta export water users, including users in the San Joaquin Valley. Some CVP contractors that rely on Delta exports do not receive their full contractual entitlement in al years. Generally, water users compensate for surface water supply deficiencies by pumping more groundwater, leading to additional groundwater problems.

Although the Friant Project was authorized and has been operated to reduce groundwater overdraft in the Eastern San Joaquin Valley, the general downward trend of groundwater levels highlights the need for additional surface water supplies in the San Joaquin Valley. The continued decline of groundwater levels also present an unsustainable situation resulting in increased pumping cost, abandonment of shallow wells, and potential land subsidence.

Future Condition Assumptions

Future operations of the Friant Project are anticipated to be similar to existing operations, although an additional demand for river restoration flows may be required (see San Joaquin River Ecosystem Restoration). Although the development of additional groundwater recharge capacity may increase conjunctive use of water, there will be continued groundwater overdraft and associated problems. Water supply reliability in the Central Valley will continue to be less than historical levels and less than contract amounts. The future without project assumptions for the ongoing CALFED studies include projected demand levels for the year 2030, which includes projected urban growth in the San Joaquin Valley and Southern California.

How Additional Storage Could Improve Surface Water Supply Reliability

1. Increased reliability for Friant water users.

Additional storage in the Upper San Joaquin River Basin could lead to increased reliability of surface water deliveries to CVP Friant Division contractors. The increased reliability would result from more frequent delivery of full contract amounts, and more surface water deliveries in years when full contract amounts are not delivered. Increased delivery quantities and reliability would allow Friant water users to reduce groundwater pumping and reduce the severity of groundwater overdraft in the Eastern San Joaquin Valley.

Potential beneficial effects:

- Greater longevity of groundwater resources,
- Reduced potential for ground subsidence,
- Reduced energy use for groundwater pumping.

2. *Increased reliability for south-of-Delta water users resulting from urban exchange or transfer.*

Additional storage in the Upper San Joaquin River Basin could lead to transfers to or water exchanges with south-of-Delta urban water users to improve the quality of the urban water supplies. The displaced supplies could then be available to other south-of-Delta water users, thereby increasing their water supply reliability.

3. *Increased reliability for south-of-Delta water users resulting from increased Mendota Pool supplies.*

Additional storage in the Upper San Joaquin River Basin could lead to increased flows arriving at Mendota Pool via the San Joaquin River. This could result from increased releases from Friant Dam for the purposes of improving the ecosystem or water quality of the San Joaquin River. The increased flows to Mendota Pool could in turn reduce required deliveries of water to the Mendota Pool that come through the Delta-Mendota Canal. In turn this could increase the reliability of CVP water supplies that are taken from the Delta.

How Potential Water Supply Accomplishments Will be Identified and Measured

1. Increased frequency of Class 2 deliveries to CVP Friant Unit water users.

2. Displaced flows from other sources to urban water exchangers.

3. More water available to Delta export contractors due to reduced water exports required to meet Mendota Pool demands.

OTHER WATER RESOURCES OPPORTUNITIES

The development of additional storage in the Upper San Joaquin River Basin to address the problems identified above would create opportunities to address other water resources needs. The following opportunities could be created by the development of a new or enlarged storage facility or could result from providing water to address the problems discussed above.

- Flood Damage Reduction
- Hydropower Generation
- Recreation
- Delta Inflow

FLOOD DAMAGE REDUCTION

Friant Dam is operated to for flood control and water supply purposes. Flood operations are based on anticipated precipitation and snowmelt runoff and the operations of upstream reservoirs. During flood operations, releases from Friant Dam are maintained when possible at flows that could be safely conveyed through the San Joaquin River and Eastside Bypass. Generally, an objective release at or below 8,000 cfs is targeted during flood operations.

Major storms during the past two decades have demonstrated that Friant Dam, among many other dams in the Central Valley, may not provide the same level of flood damage reduction that was intended at the time that the flood management system was designed. In January 1997, uncontrolled releases from Friant Dam resulted in levee failures and extensive flooding in downstream areas.

Recent evaluations completed as part of the USACE/DWR Sacramento and San Joaquin River Basins Comprehensive Study (Comprehensive Study) suggest that Friant Dam is capable of regulating flows for up to the 1 in 25 year storm event, but that larger events would likely result in uncontrolled releases to the river. These evaluations also suggest that the addition of approximately 100,000 acre-feet of storage space devoted to flood regulation would allow Friant Dam to regulate flows up to the 1 in 50 year storm event at existing objective flows. The possible increase in the flood control reservation for Friant Dam is being considered by the Corps of Engineers. Addition of surface storage in the Upper San Joaquin River Basin solely for the purpose of flood damage reduction does not appear feasible. However, new storage for water supply would provide an opportunity to capture additional flood volume when the water supply storage space is vacated.

Preliminary evaluations completed by the Comprehensive Study will be reviewed to identify how flood storage space created by the addition of conservation storage for water supply, water quality, or ecosystem restoration purposes could reduce the frequency of potential flooding.

HYDROPOWER

Hydropower has long been an important element of the power supply to California. Because of the ability to rapidly increase and decrease power generation rates, hydropower has often been used to support peak power loads in addition to base power loads. As reservoir operations have changed

during the past two decades to accommodate environmental needs, the ability to rely on hydropower for meeting peak demands has been reduced.

Recent power supply problems in California suggest that there is a shortage of peak electricity production capacity. As population increases and economic development continues, electricity demands are expected to increase. It is reasonable to expect that some new power generation capacity will come on-line in the future, and that additional generation capacity will be required.

Additional storage in the Upper San Joaquin River watershed could provide opportunities to increase hydroelectric energy production capacity. Increasing the height of Friant Dam, or the construction of other dams, would increase potential head for hydropower generation and in some cases create opportunities for pump-storage operation. Although it is likely that a hydropower-only project would not be feasible, the development of new storage for water supply, water quality, and ecosystem restoration creates opportunities for the addition of hydropower features. A net increase in hydropower generation capacity would help address current and anticipated future problems in meeting peak and base loads.

Potential hydropower opportunities will be identified as a range of facility sizes and a description of how the facility would be operated. More specific hydropower opportunities that would be consistent with storage alternatives will be identified later in the planning process.

RECREATION

Demands for water-oriented recreational opportunities in the San Joaquin River Basin are high. Some of these demands are served by reservoirs on several rivers on the eastern slope of the Sierra Nevada Mountains. As population increases in the San Joaquin Valley, recreational demands are expected to increase.

Additional storage in the Upper San Joaquin River watershed could provide opportunities to increase water-oriented recreation facilities, such as swimming, access points for various types of boating, and trail use. In addition, the release of water from Friant Dam to the San Joaquin River for ecosystem restoration or water quality objectives could also increase recreation opportunities along the river.

Opportunities to increase recreation will depend upon site-specific conditions of potential or existing reservoirs as well as river flows associated with operational scenarios. Specific recreational features that would be consistent with storage alternatives will be identified later in the planning process.

DELTA INFLOWS

The San Joaquin River terminates at the Sacramento-San Joaquin Delta, through which most of California's surface water passes. Many competing demands are placed on the water that flows into the Delta, including water supplies for CVP and SWP users, water supplies for in-Delta and Bay Area users, and flows for ecological function and water quality in the Bay-Delta estuary. From the perspective of many interests which depend upon the Delta, available flows in many years and at many times of the year are below desired levels.

The primary goal of the CALFED program is to improve ecosystem conditions in the Bay-Delta and water supplies in California. Several actions would be needed to accomplish this goal, including

increasing Delta inflow. Although new storage in the Upper San Joaquin River Basin would not likely be operated specifically to meet Delta flow and water quality objectives, water released from Friant Dam to meet other purposes, such as water quality or river restoration, would also provide potential benefits to the Delta. It is assumed in the future that the Vernalis Adaptive Management Plan will continue and that existing reservoirs in the San Joaquin River Basin will be operated in accordance with existing criteria.

Additional storage in the Upper San Joaquin River watershed could lead to increased magnitude, duration, or frequency of inflows to the Delta resulting from releases intended to improve the San Joaquin River ecosystem or water quality in the San Joaquin River. Potential effects would be estimated by comparing changes in San Joaquin River flows at Vernalis. Increased flow at Vernalis would change conditions in the Delta resulting in both potential ecosystem and ancillary water supply reliability benefits. Ecosystem benefits include increased flow and water quality in South Delta channels. Ancillary water supply benefits include potential increased Delta exports and their reliability, improved Delta export water quality, and a reduction in water releases to meet VAMP requirements.