SOUTH DELTA WATER AGENCY

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Via e-mail

Mr. John Kirlin, Executive Director
c/o Delta Vision Blue Ribbon Task Force
650 Capitol Mall, 5th Floor
Sacramento, CA 95814

Dear Mr. Kirlin:

Attached hereto via electronic version is the document entitled *Comprehensive Water Management Plan* submitted by the South Delta Water Agency and the Central Delta Water Agency. This document is a working draft, which we hope to improve with additional information and analysis in the near future.

We are submitting this Plan for consideration at the October 25-26 Blue Ribbon Task Force meeting as part of the Delta Vision process. The Plan is both a combination of previously submitted "Vision" documents as well as further comment and improvement to those earlier submittals. It is our understanding that the Task Force is looking for such comments to previous submitals as it moves toward adopting a plan or vision under its mandate.

For our presentation before the Task Force, we will produce a Power Point presentation which will allow us to better explain our Plan, the reasons why it should be adopted and why it is superior to other proposals. At our earliest convenience, we will forward the Power Point presentation to you.

Please feel free to contact me if you have any questions.

Very truly yours,

JOHN HERRICK

Enclosures

cc: Ms. Sunne Wright McPeak
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Mr. Alex Hildebrand
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Mr. Russ Brown

WORKING DRAFT
10-15-07

A COMPREHENSIVE WATER MANAGEMENT PLAN THAT PROTECTS THE DELTA WHILE MEETING OTHER NEEDS

Proposed by the South and Central Delta Water Agencies, and
the Delta Water Users Association in Consultation with other Parties

INTRODUCTION

This Comprehensive Water Management Plan (CWMP) addresses all the beneficial needs of the Delta and Central Valley. Other plans that have been proposed would only meet some needs at the expense of other needs. Those other plans have largely ignored the interrelation among Delta and upstream hydrology, upstream diversions, and various kinds and locations of storage. Other plans make no provision to increase the inadequate developed water supply. The CWMP builds on the work of the In-Delta Group, a subgroup of the Delta Vision Stakeholder process. Specifically, it is a follow-on to the In-Delta Group's "Water Plan for the 21st Century" that was presented by Tom Zuckerman to the Delta Vision Blue Ribbon Task Force. The CWMP adds specificity regarding proposed implementation measures that will preserve the Delta while increasing the multi-year developed water supply.

BASIC FEATURES OF THE PLAN

The Plan has the following basic features which are further explained below:

- It builds on the In-Delta Group's Plan which proposes that the regions that import water from the Delta should become more self-sufficient in part by regional measures that enable them to import little or no water in years of water shortage but import more water in years when that water is surplus to what is needed to protect the Delta and comply with the Delta Protection Statutes, water right priorities and area of origin rights.
- It routes in-Delta flows by incorporating the Russ Brown *Delta Corridors* proposal as now being analyzed.
- It requires that there be a minimum flow of the San Joaquin River into the South Delta of 1,000 to 1,200 cfs, and states how that flow should be provided.
- It proposes that brief peak flood flow rates into the South Delta should be largely prevented by (1) a system of early releases from tributary dams prior to major storms when there is adequate snowpack for refill, and (2) restoration of flood overflow onto existing wildlife refuges and other dedicated wetlands in the Los Banos area.

- It proposes that remaining San Joaquin flow should be conveyed safely to the central Delta per the South Delta Water Agency's South Delta Flood Conveyance Plan.
- It proposes that the flood flow capacity of channels and bypasses be increased and maintained, and cites examples of where this is needed.
- It avoids structures and channel closures that would impede flood flows. [A peripheral canal structure would be a barrier to flood flows.]
- It provides a number of listed fishery benefits, including a major benefit to San Joaquin fishery due to the *Delta Corridors* proposal and associated measures.
- Instead of just deploring the fragility of the Delta, the CWMP would reduce the fragility and provide the means to cope with failures should they occur.

THIS PLAN ADDRESSES THE FOLLOWING NEEDS

To be effective, any plan must address all of the perceived Delta problems and protect the beneficial uses in ways which comply with existing needs and laws. The CWMP addresses all those needs.

- It conveys flood flows without levee breaks that can't be repaired in a timely manner, and without major damage to infrastructure, and without serious disruption of water exports.
- It minimizes the risk of damaging delays in restoration of fresh water in Delta channels if seismic levee failures could cause a surge of Bay water into the Delta.
- It protects the Delta; including its agricultural production of food, its fishery, its navigation, its recreation, its transportation corridors, etc. It does this in both wet and dry years.
- It complies with water rights law and the Delta Protection Act, Area of Origin Statutes, and salinity and dissolved oxygen standards.
- It maximizes the water supply that is available for export in excess of water needed to protect the Delta. This will require less export in dry years, such as 2007, but substantially more can be exported in wet years. Flexibility in dry and wet year exports will require continuing increases in regional groundwater and surface water storage. These are measures such as have been made in southern California, and in some degree by the proposed Los Vaqueros expansion, the Kern County Water Bank, etc. The overall effect is to capture and retain more wet year water for beneficial use.
- It is able to accommodate a three foot rise in sea level. (If the rise is eventually greater than this more drastic measures will be needed in many coastal and Bay areas and those measures may interrelate with Delta measures).
- It includes the restoration, improvement, and maintenance of flood flow capacity, particularly in shallow channels and bypasses.
- It includes upstream measures to reduce brief peak flood flows, particularly in the San Joaquin watershed.

- Fresh water inflow to the Delta has been greatly reduced from the San Joaquin, Mokelumne, and Calaveras watersheds. Sacramento water must continue to commingle with water throughout the Delta channels, which are collectively the common pool, in order to avoid a damaging rise in salinity of Delta waters.
- It maintains the basic pattern of channels and land uses in the Delta.
- It does not allow stagnant channel reaches in which salinity, dissolved oxygen, and exotic aquatic plants can not be controlled.
- It precludes deep flooding of Delta islands. Such flooding of islands causes seepage into adjoining levees and lands thereby increasing the risk of levee failure. The resulting large open water bodies increase the fetch for wind generated waves which will erode the interior of the levees of the flooded islands and greatly increase the risk to adjoining island levees.
- It minimizes the potential for damaging unintended consequences. It avoids irreversible measures with uncertain benefits.
- It costs less than a peripheral canal and can be implemented in much less time with beneficial results commencing as implementation progresses.

PRINCIPLES AND FACTUAL UNDERSTANDINGS THAT UNDERLIE THIS PLAN

- Contrary to speculation by other parties, the salinity of water in the Delta pool (the collective water resident in Delta channels) has increased except in critical years since 1900 and is typically higher than it has been in centuries.
- There is a contention by some parties that the Delta is doomed to become a salt water bay, so it might as well be abandoned now in favor of a peripheral canal which would assure that result. This position ignores the fact that the canal would do nothing to increase the overall state water supply. If billions of dollars are not spent to build, operate, and maintain a peripheral canal, a lesser amount of money can be used to successfully protect the Delta and the multiple needs discussed above. It is not true that the fresh water Delta cannot be preserved.
- During each decade the state's population is increasing by about six million people. The water needed for consumptive use to house, produce food and create jobs for those people must be made available, but the state's current Water Plan makes almost no provision for increasing the developed water supply to accommodate increased consumptive use of water while protecting the Delta. The CWMP addresses that need to significant degree.
- Any acceptable plan should comply with the Delta Protection Act, Area of Origin statutes and water rights law, as well as the currently existing salinity and dissolved oxygen standards
- The protection of the Delta should not rely on the good faith of an agency that is subject to special interest or political pressures.

SPECIFIC MEASURES THAT ARE INCLUDED IN THIS PLAN

A. Minimum San Joaquin Inflow to the Delta

In order for the *Delta Corridors* proposal to work and in order to meet water salinity, water depth, and dissolved oxygen needs in South Delta channels, there must be an adequate minimum Vernalis flow. [Vernalis is the point at which the San Joaquin River enters the South Delta; the River runs south to north.] Under current regulations, minimum flows are only periodically required during some "fish-sensitive" months. The River flow is sometimes less than diversion needs in the South Delta. Furthermore, any summer flow that arrives at Vernalis contains a very substantial load of salt that drains into the San Joaquin River from the CVP's westside service area. The elevation of South Delta channels, due in part to sedimentation, is such that when water levels are reduced by export pumping and inflow is low, some channels have at times been sucked dry. South Delta salinity standards are sometimes exceeded all summer, such as in 2007. The CWMP proposes that there be an enforceable minimum flow and maximum salinity at Vernalis to correct this problem. A flow of approximately 1000 to 1200 cfs at Vernalis is required. This can be provided by releasing water from the Delta Mendota Canal through existing "wasteways" to the river. This has been demonstrated in several tests occurring in August 2004 and in August and early September 2007. Those tests used the Newman Wasteway. A test in 1977 used the Westley wasteway. An inflow of low salinity water into the South Delta can also be provided in part by using fish friendly, low lift pumps to augment the capture of water by South Delta tidal barriers. [There is currently a program which yearly installs rock barriers in certain South Delta channels to "hold" incoming tidal flows as a means of partially mitigating the exports pumps effects on those channel water levels. The tidal flow could be augmented with the suggested low-lift pumps.] The extra pumping required to provide this recirculation release can happen concurrently or water can be borrowed from San Luis Dam or elsewhere, such as by exchanges or delays in deliveries to other surface or subsurface storage, and replaced later if that is better for fishery.

B. *Delta Corridors* Proposal

The CWMP incorporates the basic features of the *Delta Corridors* Proposal to Reconnect the San Joaquin River to the Estuary. The *Delta Corridors* proposal separates the San Joaquin fishery from export operations. In combination with the above minimum Vernalis flow it (a) reduces salinity in exported water, (b) helps restore a salt balance in the CVP service area, (c) conveys the imported CVP salt load that drains to the River back to the Bay, and (d) complies with all salinity and dissolved oxygen standards in Delta channels. Furthermore if a seismic event ever causes Bay water to enter the central Delta, that water could then be pumped back to the Bay via the Delta Corridor.

Attachment 1 from Jones and Stokes, describes the *Delta Corridors* changes in the existing Delta channels and provides a map (page 7 therein) and brief explanation of facilities and flows involved. It also describes the initial results of DSM2 modeling of the Delta Corridors Plan that demonstrate that CVP and SWP exports can be achieved with existing channels. The modeling indicates that some dredging of Middle River and Victoria Canal will be needed for high export conditions. Modeling also suggests that some new measures may be needed at Threemile Slough (above False River) to prevent the re-cycle of San Joaquin River water from the estuary corridor into the water supply corridor.

A monthly water supply evaluation was also made for the 1922 to 1993 CALSIM period, with the current Delta regulations (D-1641) and upstream reservoir operations. The water that was simulated to be pumped for the 2020 OCAP modeling (study 1 for D-1641 conditions) was compared with the remaining surplus Delta outflow and the unused pumping capacity. This evaluation indicates that there is usually considerable surplus Delta outflow that could be exported in most years during the months of October-March if there were increased storage facilities (surface water or ground water recharge and pumping capacity) and under certain flexible export operations. This simple evaluation indicates that only about 50 taf/year of additional water supply could be pumped by CVP because the Federal export pumping plant is generally already at capacity of 4,600 cfs. However evaluation indicates that there would be an average of about 340 taf/year that could be pumped at the SWP Banks pumping plant if the capacity were increased to 8,500 during the months of October-March. This would require additional storage for exported water in these months, because the simulated CALSIM pumping is limited by deliveries and simulated San Luis Reservoir storage. An additional water supply of 625 taf/year would be possible if SWP pumping capacity were increased to 10,300 cfs during the October-March period if this additional storage was provided. [Such increases in export rates would only occur when the effects of such increases on other beneficial uses are fully mitigated.]

C. Fishery Benefits of the CWMP

The CWMP will have several benefits for fishery

- Exports would be restricted in any given year to the amount that is excess to Delta needs. This will substantially reduce the proportion of the Delta inflow that is exported in dry and below normal years. This reduces impacts on fishery.
- The mixing zone or X2 should be maintained farther west than it currently is. This would require more Delta outflow but would help increase nutrients in the system and create additional habitat.
- The CWMP will provide adequate water depth and water circulation in all important channels at all times. Fish will, therefore, not be subjected to inadequate dissolved oxygen, or inadequate depth with high temperatures, or blankets of water hyacinth. Adequate dissolved oxygen in the Stockton Ship Channel would be provided.

- The *Delta Corridor* proposal will connect all resident and migrant fish in the San Joaquin River system and San Joaquin Delta channels to the western Delta. Those fish will not be subject to loss at export fish screens, or channel reaches with inadequate dissolved oxygen. There will be continuous net daily downstream flow all the way to the Bay, thereby getting smolts and salts in the San Joaquin River out to the Bay.

D. Measures to Reduce Peak Flood Flows

On the San Joaquin River, and perhaps elsewhere, a winter flood in a year like 1997 can include brief peak flows that are far above the background flood flow. The CWMP proposes two measures which would substantially reduce these brief peaks. If done prior to 1997, this would have avoided the levee breaks in that year.

The first method is to make early reservoir releases under certain conditions. Attachment 2 is a document authored by Mr. Joe Countryman, President of MBK Engineers, entitled *Reservoir Operations to Improve Flood Control Performance*. That document discusses the methodology and large potential benefit which can result from that reoperation, particularly as applied to Friant and Don Pedro Dams. It illustrates that peak releases from Friant during the 1997 flood could have been reduced from 63,000 cfs to about 34,000 cfs without any change in designated flood space, and even less if reasonable changes were made.

The other method is to restore the natural depth of overflow of flood waters onto lands that are now dedicated for wildlife refuges, and other wetlands in the Grasslands/Los Banos Area. This proposal was subjected to a Corps Reconnaissance Study at the request of the San Joaquin River Flood Control Association prior to the mid-90's. That study showed a potential overflow and transient storage of up to 200,000 acre feet of flood water.

E. Measures to Increase Flood Flow Capacity

The CWMP also incorporates the South Delta Water Agency's (SDWA) June 2004 South Delta Flood Conveyance Plan and its companion eco-document. Those documents will be put on the web for reference.

The U.S. Corps' "design" flood flow into the Delta at Vernalis is 52,000 cfs. The purpose of the South Delta Conveyance Plan is to safely convey that flow to the central Delta without levee failures. The measures required are as follows:

- The existing Paradise Cut flood bypass takes a substantial portion of the 52,000 cfs out of the San Joaquin channel and takes it to Old River near the channels that connect Old River to Grant Line Canal. This reduces flood stages in the San

Joaquin channel downstream of Vernalis. The Conveyance Plan would increase the flow through the Cut without an increase in flood stage in the Cut. This would be done by removing brush and obstacles in the Cut, reshaping the upper end of the Cut, providing a setback levee along the right side of the Cut, providing new habitat on the severed old levee, and dredging the channels that connect Old River to Grant Lineline Canal.

- The Corps raised the height of project levees in the South Delta in the 1960's, but the resulting levee cross-sections were variable and inadequate and had porous foundations in some places. Furthermore, the river brings in an average of about 250,000 cubic yards of sediment per year which settles out in the tidal channels and impedes flood flow. There has been no significant sediment removal and many miles of channel have as much as eight feet depth of deposited sediment in recent decades. The Conveyance Plan proposes that this sediment be removed and used to increase the cross-section on the land side of adjacent levees.
- The Conveyance Plan also proposes erosion control on river banks to protect levees and prevent bank erosion which then adds to sedimentation.
- The eco-document discusses ecological benefits associated with the Conveyance Plan.

The CWMP also includes the need to restore and consistently maintain channel and bypass flood flow capacity wherever it has been impaired. Examples include (a) the Tisdale bypass and in the vicinity of the Fremont weir, (b) the San Joaquin channel below the city of Grayson, (c) the bypasses and channels upstream of the mouth of the Merced on the San Joaquin River system, and (d) the aggraded channels in the South Delta as identified in the SDWA Flood Conveyance Plan.

The CWMP avoids structures or channel closures that could constrict channels or block the passage of flood flows. For example, the proposals for a peripheral canal alignment actually go through substantial portions of the Delta, and would be a barrier to major flood flows from south and east of the canal alignment. This would cause increased flood stages in flood plains that now include thousands of houses.

F. Measures to Reduce Levee Failures in the Delta.

This will be covered in greater detail in later drafts of the CWMP, but will include the following:

- Improve all levees to comply with the Corps' PL 84-99 level of protection. This will provide protection for the basic pattern of land and water.
- Improve all urban levees to provide 100-year level of protection and then move toward a higher level of protection.

- Improve the level of seismic protection for urban levees, and evacuation routes, and also in the western Delta west of Frank's Tract. The western Delta has the greatest seismic risk.
- Further consideration of a system of master levees with gates and other structures which would maintain the common pool, efficiently address sea level rise and facilitate emergency response and recovery.

G. Measures to Recover from Levee Failures.

This includes being prepared in advance to make repairs quickly. Later drafts of the CWMP will explain this in greater detail. It also includes the ability to flush Bay water out of Delta channels. As mentioned earlier, the *Delta Corridor* proposal makes it possible to pump bay water from the central Delta into the Old River Corridor which can then convey it through Old River to the Bay.

COMPARISON WITH OTHER PLANS

- Plans that propose that the water in Delta channels be made saltier and variable with time are promoting a salinity regime that has never before existed. The benefits of this are highly speculative. We now have about one half million acres of agricultural production of food on Delta lands. Assertions by the Public Policy Institute of California (PPIC")that agriculture could survive a proposed rise in salinity which would be higher than salinity standards throughout the Central Valley are seriously flawed.
- A peripheral canal would keep much of the remaining fresh water inflow out of the Delta. This would unavoidably and substantially increase salinity in Delta channels. Delta farmers would be put out of business and Agricultural Code 411 would be violated. A simple mass balance of the salt and water inflow and outflow and in-Delta consumptive use is all that is needed to show the salinity impact of a peripheral canal.
- Delta farmers are the primary maintainers of Delta levees. If those farmers are put out of business, levees will progressively fail. As they fail the tidal inflow of salty Bay water will increase. The pattern of lands and channels will be lost, and the Delta will convert to a salty open water bay.
- Proposals for dual conveyance (part through the Delta and part by a peripheral conveyance) are not sustainable. Exporters will export as much as possible through the peripheral conveyance. This will increase the salinity of Delta waters particularly in years of low Sacramento flow. The exporters will then not want to export the salty Delta water and will therefore increase the conveyance capacity of the peripheral conveyance to convey all exports. Farmers will be salted out of business, and the Delta will become a salty open bay. A salty open bay then could not be restored to a fresh water Delta.

- Plans to isolate conveyance of export water through Delta channels instead of through a new isolated conveyance facility would create most of the same problems.
- The PPIC and similar plans propose substantial conversion of farmlands to wetlands and to flooded islands. They seem to be unaware that surface evaporation from flooded lands consumes significantly more water than is consumed by farming those lands. Wetlands consume even more water, which must then be taken from other needs or provided by increasing the developed water supply.
- The above plans also imply a belief that there is no social need to maintain and increase the agricultural production of food as the population grows. Modern agriculture requires that there be support services which will not be available if the regional need for those services is insufficient to support such things as food processing plants, farm equipment suppliers, special types of transportation equipment, grain storage and shipping facilities, etc, etc. Displacement of agriculture by urban sprawl is already putting some services in jeopardy. Conversion of a significant portion of Delta farmland to other uses would put in jeopardy the availability of support services needed to sustain the remaining farm operations.
- The CWMP is the only plan that

    1) complies with Delta Protection Statutes, area of origin and water rights laws, and existing salinity and dissolved oxygen standards, and Agricultural Code 411,
    2) protects the Delta while combining with regional measures to increase the multiyear availability of water for export;
    3) isolates San Joaquin fishery from impacts caused by exporting Delta water;
    4) retains the basic pattern of Delta lands and waters;
    5) maintains the agricultural production of food in the Delta;
    6) avoids creation of stagnant channel reaches with loss of salinity and dissolved oxygen control;
    7) continues to commingle Sacramento fresh water with Delta channel water throughout the Delta, except in far Western Delta channels; and
    8) prevents conversion of the Delta into an open salty Bay.

CONCLUSION

No plan can completely satisfy competing interests. However, we believe that the CWMP would provide significant improvement for each of the listed needs in a compatible manner. We believe it is superior to other plans in terms of water supply, flood conveyance, protection of fishery, protection of the fresh water Delta, and compliance with Delta Protection Act, Area of Origin statutes, other water rights law, and salinity standards. The CWMP will continue to be improved and detailed, just as all competing plans should receive further analyses before any selection is made.

Attachment One

Initial DSM2 Modeling of the Delta Corridors Plan
Prepared by Jones & Stokes
For South Delta Water Agency and Central Delta Water Agency
October 10, 2007

The Delta Corridors (DC) Plan has been suggested to the Bay Delta Conservation Plan (BDCP) and Delta Vision (DV) stakeholder groups as an alternative for Delta fish protection and water quality improvements that would allow the in-Delta and exported water supply to be conveyed from the Sacramento River to the south Delta pumps using the existing Delta channel network without constructing a Peripheral Canal (PC). The entire San Joaquin River would be diverted into the head of Old River and be separated from the export pumping with a "river bridge" over Victoria canal to allow the SJR water to flow down Old River to Franks Tract. The locations of the major components of the Delta Corridors plan are shown in Figure 1.

Jones & Stokes has modified the DSM2 model geometry and other input data files to allow the Delta Corridors Plan to be accurately simulated. The major changes in the modeled Delta channels and gate operations are:

(1) A barrier and flood-gate across the SJR just downstream of the head of Old River will be opened for flood control when the Vernalis flow exceeds 10,000 cfs.

(2) A pump with a capacity of 250 cfs is simulated to provide an upstream flow from the SJR into the head of Old River near Lathrop.

(3) The SDIP-planned tidal gates on Old River at DMC and Middle River upstream of Victoria Canal will be operated year-round unless the Vernalis flow is greater than 10,000 cfs. Fish-friendly pumps (250 cfs each) will be required to increase the upstream flow at these tidal gates. A pump will also be needed at Tom Paine Slough.

(4) Old River between Fabian Tract and Coney Island will be divided to allow the SJR to flow down Old River and around Coney Island while the water supply flows upstream from West Canal to the DMC intake and tidal gate on Old River.

(5) Old River between Victoria Canal and West Canal will be divided and a "river bridge" will be constructed to allow the SJR to flow along the north end of Coney Island and continue down Old River while the water supply flows under the river bridge from Victoria Canal to West Canal.

(6) Rock barriers with boat locks will be constructed on Woodward Canal, Santa Fe Canal, and Connection Slough. These barriers will separate the water supply corridor along Middle River from the SJR-estuary corridor along Old River. The barriers can be located at the east or west end of the channels, depending on the selected levee to divide the estuary from the water supply corridor. Pumps may be

needed to supply agricultural diversions or flush agricultural drainage located along these channels.

(7) A rock barrier with a flood-gate will be placed across the mouth of Old River, separating Franks Tract from the San Joaquin River. The flood-gate will be opened in months when the SJR flow at Vernalis is greater than 10,000 cfs. An additional barrier may be needed on Fisherman's Cut.

(8) The CCF gates will be opened during most of the tidal cycle. The CCF gates will be closed only if the CCF elevation is greater than outside (West Canal).

(9) The DCC gates will be opened unless the Mokelumne River inflows are greater than 5,000 cfs. The greater diversions from the Sacramento River are needed to reduce the flows from the Sacramento River around Sherman Island (reverse QWEST flows) that may cause salinity intrusion and fish entrainment impacts.

DSM2 Model Evaluation Topics

Results from these initial DSM2 simulations will demonstrate the tidal flow and EC changes that are likely to result from the DC plan and may identify possible weaknesses in the DC plan. Some of the major issues and potential weaknesses of the DC plan include the following:

(1) The tidal flows in Middle River upstream of Santa Fe Cut may not be sufficient to transport the water supply with sufficient tidal elevation to allow full CVP and SWP pumping (11,000 cfs). The existing channel capacity must be determined, so that any required dredging can be estimated. The existing channel cross-section data will be reviewed and evaluated. Increased tidal flow capacity after dredging can be evaluated with additional model runs.

(2) The maximum summer diversions are about 1,000 cfs in the south Delta (including 300 cfs between Vernalis and the head of Old River) must be satisfied by flows with adequate salinity (less than 700 uS/cm) from the SJR-estuary corridor along Old River and Grant Line Canal. The possible effects from relocating some agricultural diversions and drainage discharges can be evaluated with additional model runs.

(3) The simulated maximum agricultural diversions along Old River between DMC and Doughty Cut are about 300 cfs, and the Tom Paine Slough and Paradise Slough diversions are about 275 cfs. The Middle River diversions are about 235 cfs. Additional model runs will evaluate the amount of pumping from the water supply corridor that will be needed to satisfy these south Delta diversions.

(4) Flood flow conditions must be carefully evaluated. This can be done initially with DSM2, although some of the channel geometry information should be

updated to include higher elevations for upstream sections (the DSM2 model assumes walls at the top of levees, rather than overflowing sections). More detailed evaluations can be made with HEC-RAS modeling.

(5) Salinity conditions will be carefully evaluated. The benefits from separating the SJR from the water supply should be easily demonstrated with the initial model runs, but possible effects from salinity intrusion or SJR recycle around Webb Tract from False River should be fully evaluated with additional model runs. Some reduction in CVP and SWP pumping to prevent this SJR recycle may be required in some months. The possible need for a tidal gate on Threemile Slough to control salinity intrusion by increasing the net flow from the Sacramento River can be investigated with additional model runs.

Initial Tidal Hydraulic Results

The Delta Corridors changes have been simulated using the DSM2 tidal hydraulic and salinity (EC) model, using monthly inflows for the 1976-1991 period. The 2020 OCAP modeling results (simulated by Reclamation in 2005) were used for the baseline Delta inflows and exports. These are different from historical inflows and exports, and reflect current reservoir operations and Delta objectives (D-1641). The 16-year period allows the full range of Delta hydrology (flows) and salinity (EC) conditions to be evaluated.

However, only results from August 1975 with full exports and agricultural diversions are shown in this report to introduce the simulated tidal conditions and demonstrate the feasibility of using the Middle River corridor to convey the full allowable CVP pumping (4,600 cfs) and SWP pumping (6,680 cfs) to the south Delta. The simulated Sacramento River inflow was 16,000 cfs and the San Joaquin River inflow was 2,000 cfs for August 1975.

The simulated tidal conditions along the SJR-Old River-Franks Tract estuary corridor will be described first, and then the simulated tidal conditions along the Sacramento-Mokelumne River-Middle River water supply corridor will be described. The ability of the Middle River corridor to convey the full exports will be described, and the possibility of dredging along Middle River and Victoria Canal to increase the conveyance capacity and reduce the required water surface gradient (i.e., drawdown) will be discussed.

Figure 2 shows the simulated tidal elevations (i.e., stage) and tidal flows in the San Joaquin River-Old River-Grant Line Canal estuary corridor. The DC plan would block the SJR below the head of Old River and divert the entire SJR flow into Old River and Grant Line Canal. The SJR flow would remain separated from the SWP and CVP pumping flow with a divided channel between the mouth of Grant Line Canal and Coney Island and then by crossing over Victoria Canal (river bridge) and flowing down the Old River channel past the CCWD Los Vaqueros intake to Franks Tract. The simulated head of Old River minimum tidal stage remained above 3 feet. The simulated minimum tidal stage in Old River at the CCWD Los Vaqueros intake was about 0 feet msl, but the simulated tidal stage at the mouth of Grant Line Canal remained above 1 feet msl because of the SJR inflow effects on the tidal water elevation.

The simulated SJR flow of about 2,000 cfs is augmented at the head of Old River with 250 cfs pumped from the San Joaquin River (upstream flow from Stockton). Maximum summer irrigation diversions were simulated along these channels. The average flow at the mouth of Grant Line Canal was about 1,850 cfs, so about 400 cfs was simulated to be consumed (i.e., diversions minus drainage) for agricultural uses in the south Delta channels. The average simulated flow in Old River at Bacon Island (entering Franks Tract) was about 1,325 cfs, so an additional 500 cfs was simulated consumed in the central Delta from Old River and connecting channels for agricultural uses. Additional pumping from the Middle River water supply corridor may be needed in some months to provide adequate salinity for these central Delta diversions. The simulated tidal flows in Grant Line Canal were about 2,000 cfs more or less than the average flow, and the tidal flows at the LV intake (SR 4) were about 4,000 cfs more or less than the average flow.

Figure 3 shows the simulated tidal elevations and tidal flows in the vicinity of Franks Tract. The simulated minimum tidal elevation was about –1 feet msl during the month. The maximum tidal elevation was about 3.5 feet msl. The tidal range (maximum tide elevation minus minimum tide elevation) was considerably less during some days of the month. These tidal fluctuations are controlled by the Ocean tidal conditions that change through the month with the spring-neap tidal cycle. The tidal variations in the San Joaquin River at False River are only slightly less than the full variation observed at the Golden Gate bridge.

Figure 3 shows that False River was simulated to carry the majority of tidal flow (about 40,000 cfs more or less than the average flow) because the mouth of Old River will be blocked with a barrier (and flood-gate) to separate the water supply corridor from the estuary habitat in Franks Tract. The Dutch Slough tidal flows were about 8,000 cfs more or less than the average flow. The Old River tidal flows at Bacon Island were about 10,000 cfs more or less than the average flow. Most of the tidal flows at False River and Dutch Slough were filling and draining Franks Tract and surrounding channels. Only about 10,000 cfs of the tidal flows were flowing past Franks Tract to fill and drain the Old River-Grant Line Canal corridor.

Figure 4 shows the simulated tidal elevations and tidal flows in the San Joaquin River upstream of Turner Cut in the vicinity of Stockton. The DC plan would allow full tidal flows into the DWSC and upstream to Brandt Bridge. An upstream average flow of 250 cfs would be pumped into the head of Old River to transport the Stockton regional wastewater into the Old River-estuary corridor. The simulated minimum tidal elevation at Brandt Bridge was about –1.5 feet msl during the month. The maximum tidal elevation was about 4 feet msl. The tidal range is slightly greater than at Franks Tract because of the narrowing San Joaquin River channel upstream of Stockton.

Figure 4 shows that the simulated tidal flows upstream of Turner Cut were about 10,000 cfs, and the simulated tidal flows at the Garwood Bridge (SR 4) near the Stockton wastewater discharge were about 3,000 cfs. All of the tidal flows in the Stockton DWSC and Stockton channels (e.g., Weber Point, Smith, Calaveras) would be water diverted from the Sacramento River, so the new Stockton water supply would divert from the water supply corridor, and the low DO conditions in the DWSC would no longer occur.

Figure 5 shows simulated tidal elevations and tidal flows in the Sacramento River near Walnut Grove. The DCC and Georgiana Slough diversions from the Sacramento River to the water supply corridor along Mokelumne River and Middle River channels depend on the tidal elevation differences between the Sacramento River at Walnut Grove and the Mokelumne River at New Hope Landing. The minimum simulated tide elevation at Ryde (downstream of Georgiana Slough) was about 0.5 feet msl and the maximum simulated tide elevation was about 4 feet msl. The tidal elevations at Ryde were higher than the corresponding elevations at the DCC at low tide and during flood tide (rising tide elevation), causing a simulated upstream Sacramento River flow with a maximum of about –5,000 cfs during the high tide period of each day. The simulated tidal flows in the DCC and Georgiana Slough were highest during flood tide when upstream tidal flow from Ryde meets the downstream river flow and "squeezes" water into the diversion channels. For this example month of August 1975, the simulated Freeport flow was about 16,000 cfs and diversion flows ranged from about 2,500 cfs to 12,500 cfs with an average diversion of about 7,250 cfs.

Figure 6 shows the simulated Sacramento River flow upstream of Walnut Grove and the diversion flows into the DCC and Georgiana Slough. The simulated DCC flows were greater than the simulated Georgiana Slough flows, because the DCC has a larger simulated cross section. The DCC diversion flows ranged from about 2,000 cfs to about 8,000 cfs, with an average of 4,500 cfs, while the Georgiana Slough diversion flows ranged from about 1,500 cfs to about 4,500 cfs with an average of 2,750 cfs. The Sacramento River flow upstream of the DCC ranged from about 6,000 cfs to about 15,000 cfs with an average of about 11,000 cfs. About 3,000 cfs was diverted into Sutter Slough and about 1,800 cfs was diverted into Steamboat Slough, both upstream of the DCC. These strong tidal flows in the vicinity of Walnut Grove will require fairly large fish screens to maintain approach velocities of less than 0.25 ft/sec for protection of Delta smelt and other small (juvenile) fish. The DC plan includes fish screens for DCC and Georgiana Slough that will allow 7,500 cfs diversion flow. Some dredging of Georgiana Slough or some tidal gate operation of the DCC gates may be required to reduce the flow variation of these diversions.

Figure 7 shows the simulated tidal elevations and tidal flows in the Middle River channels that connect with the San Joaquin River channel. The simulated tidal elevations range from about –1 feet msl to about 4 feet msl during the month. The tidal elevations are nearly identical at the mouth of Middle River, at Columbia Cut, and at Turner Cut. There is a slight tidal lag of less than an hour between the mouth of Middle River ant Turner Cut, located about 10 km upstream on the San Joaquin River. The simulated tidal flows at the mouth of Middle River are about 20,000 cfs more or less than the average flow of about -6,500 cfs (upstream) because these tidal flows fill and drain the flooded Mildred Island (1,000 acres) and surrounding channels. The simulated tidal flows at the mouth of Columbia Cut are about 2,000 cfs more or less than the average flow of about –2,500 cfs (upstream). The simulated tidal flows at the mouth of Turner Cut are also about 2,000 cfs more or less than the average flow of about –2,500 cfs (upstream). Slightly more than half of the simulated average flows enter the water supply corridor at the mouth of Middle River, and about 25% enter at Columbia Cut and Turner Cut. Additional evaluations may show that dredging of Columbia Cut or Turner Cut would improve the conveyance of the Middle River corridor.

Figure 8 shows the simulated tidal elevations and tidal flows in Middle River between Santa Fe Cut and Victoria Canal. The simulated tidal elevations at the Santa Fe Cut range from about –1.5 feet msl to about 3.5 feet msl during the month. The simulated tidal elevations are about the same at the Woodward Canal. The simulated tidal elevations at Victoria Canal are about 0.5 to 1.0 feet below the tidal elevations at Woodward canal, suggesting that the Middle River channel in this reach has a limited cross section that requires some dredging. The simulated tidal flows in Middle River varies from about –4,000 cfs to about –20,000 cfs with an average flow of –11,250 at Victoria Canal.

Figure 9 shows the simulated tidal elevations and tidal flows in Victoria Canal and West Canal leading to the CCF intake and the DMC intake. The simulated tidal elevations drop by about 1.5 to 2.0 feet in Victoria Canal. This suggests that Victoria Canal may require dredging to more easily convey the full export pumping flow of 11,280 cfs. The simulated minimum tidal elevations in West Canal at the CCF intake ranged from –2.5 feet msl to –3.5 feet msl, with a daily range of only about 1 foot. The corresponding minimum elevation in CCF ranged from about –2.5 feet msl to about -3.5 feet msl with very little daily range. The CVP pumping was 4,400 cfs and the simulated minimum tidal elevation at the Jones pumping plant was about –4 feet msl. These initial simulations of the DC plan held the CCF gate open whenever the CCF elevation was less than the tidal elevation in West Canal.

The simulated drawdown along Middle River and Victoria Canal to provide the full 6,680 cfs SWP pumping was greater than under existing conditions. For existing conditions the export flows are transported upstream in both Old River and Middle River channels. In addition, the CCF gates are closed during the flood tide prior to higher-high tide each day to allow the south Delta channels to be tidally filled once each day. Additional evaluation of dredging in Victoria Canal and possible tidal gate operation of CCF may allow the elevation in CCF to be raised during maximum pumping of 6,680 cfs.

These initial DSM2 simulations of the DC plan for August 1975 conditions with full CVP and SWP pumping demonstrate that the DC plan to separate the SJR from the water supply corridor along Middle River would be feasible even with the existing Middle River channel geometry. Because the simulated tidal elevations decline only between Woodward Canal and West Canal, it is likely that dredging along this portion of Middle River and Victoria Canal will allow the full export pumping to be conveyed to West canal with a minimum CCF water surface elevation of –2 feet msl.

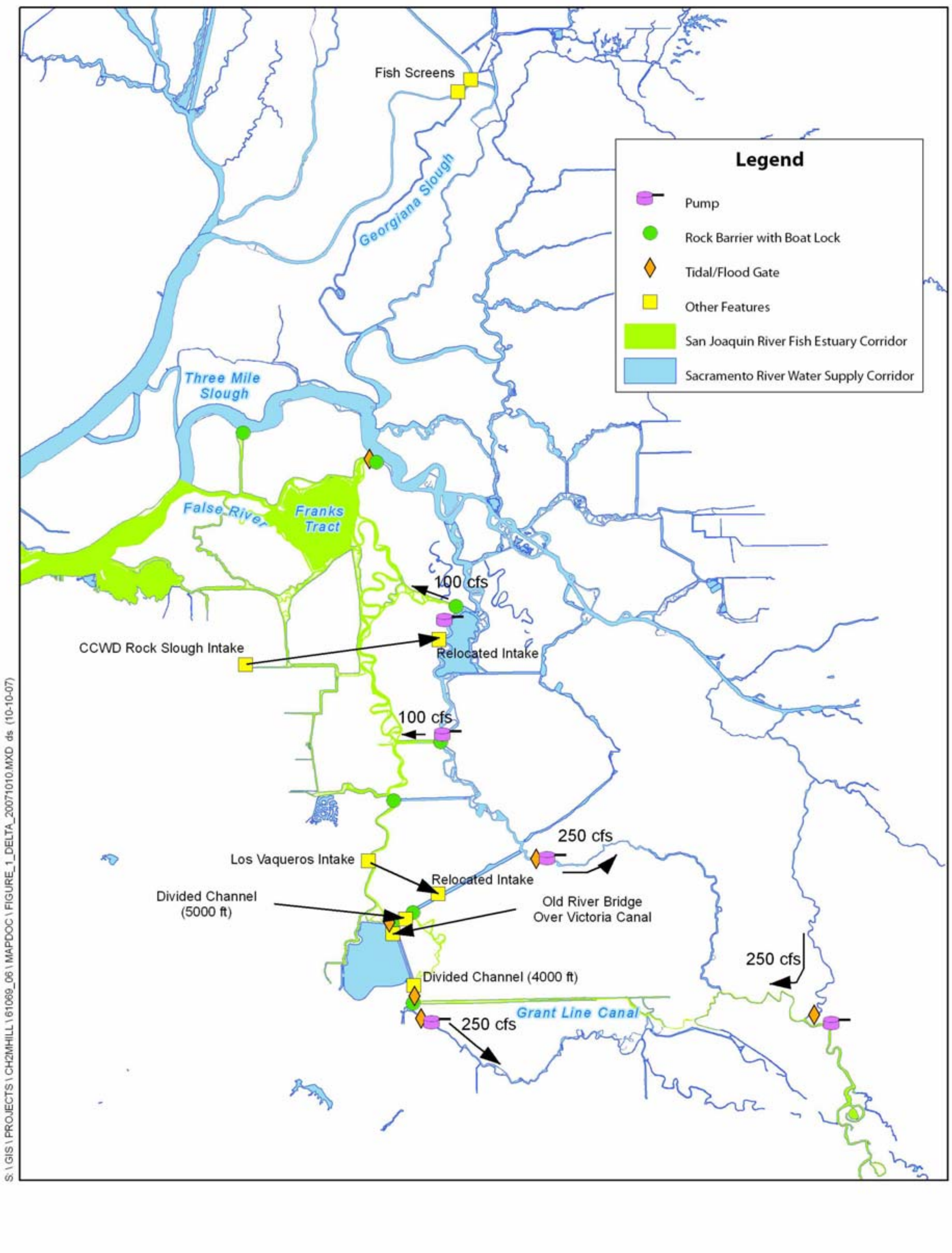


Figure 1. Locations for the major components of the Delta Corridors Plan.

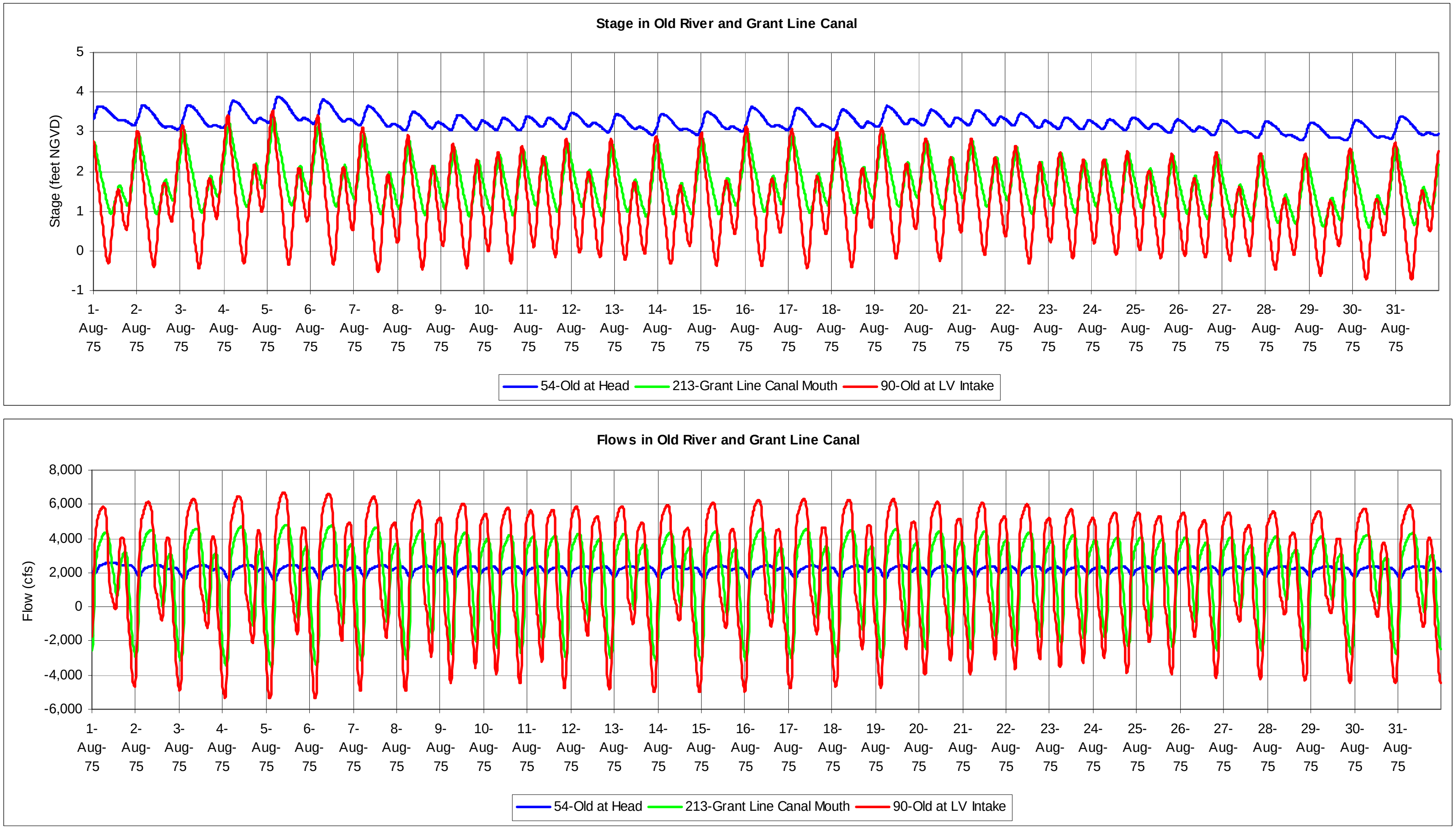


Figure 2. Simulated tidal elevations (stage) and tidal flows along the San Joaquin River-Old River estuary corridor during August 1975 for the Delta Corridors Plan.

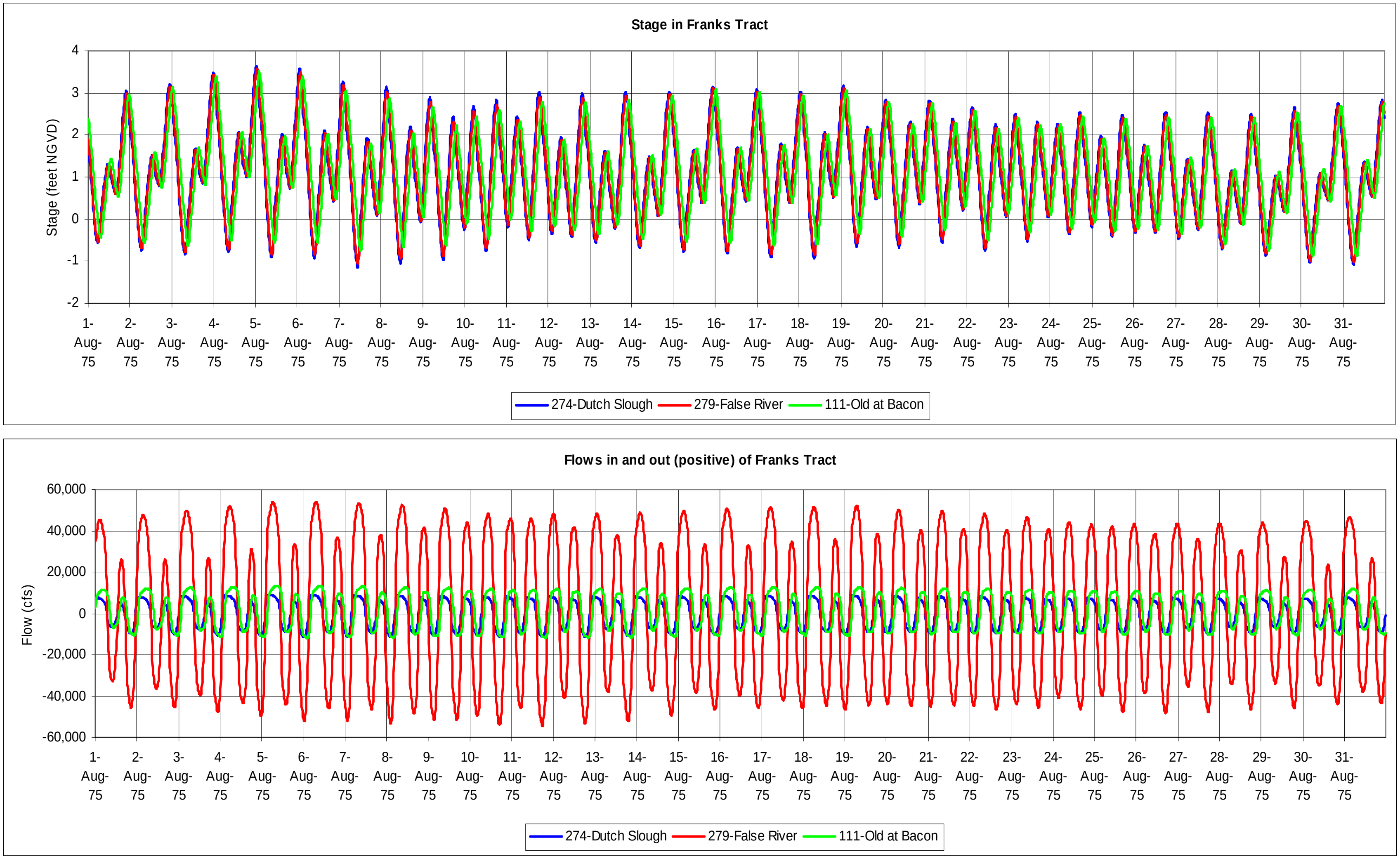
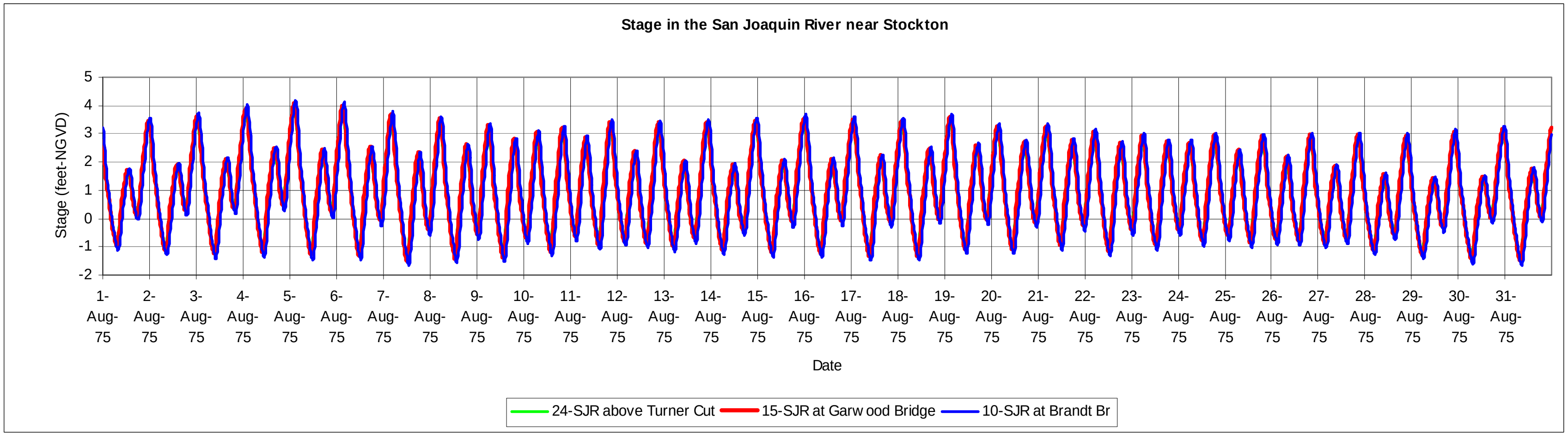


Figure 3. Simulated tidal elevations and tidal flows in the vicinity of Franks Tract during August 1975 for the Delta Corridors Plan.



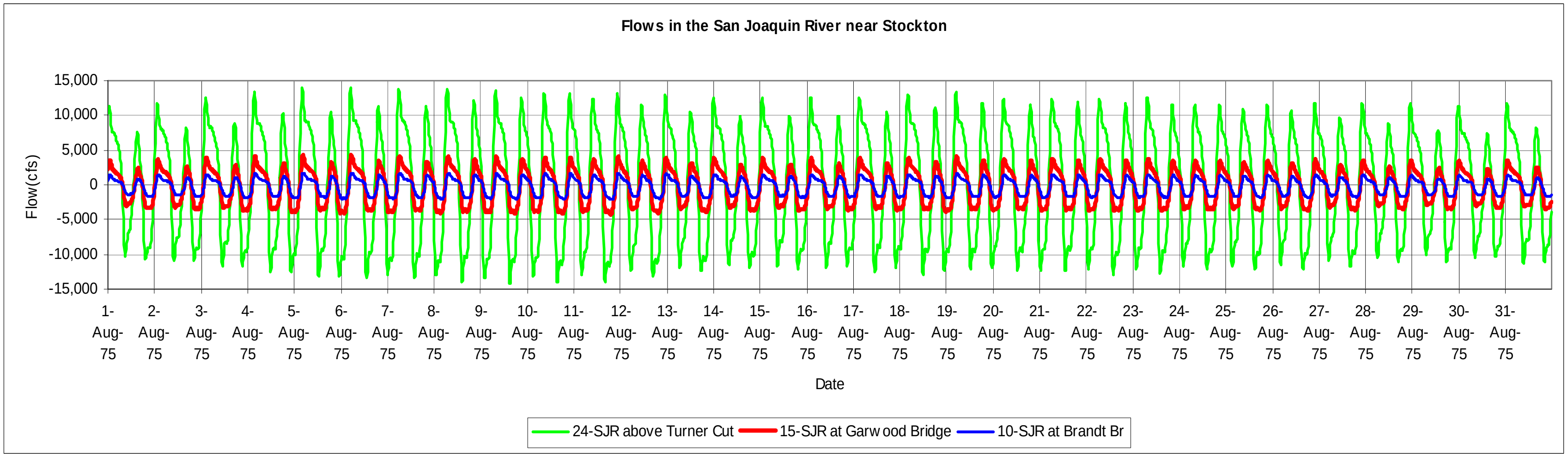


Figure 4. Simulated tidal elevations and tidal flows in the San Joaquin River near Stockton during August 1975 for the Delta Corridors Plan.

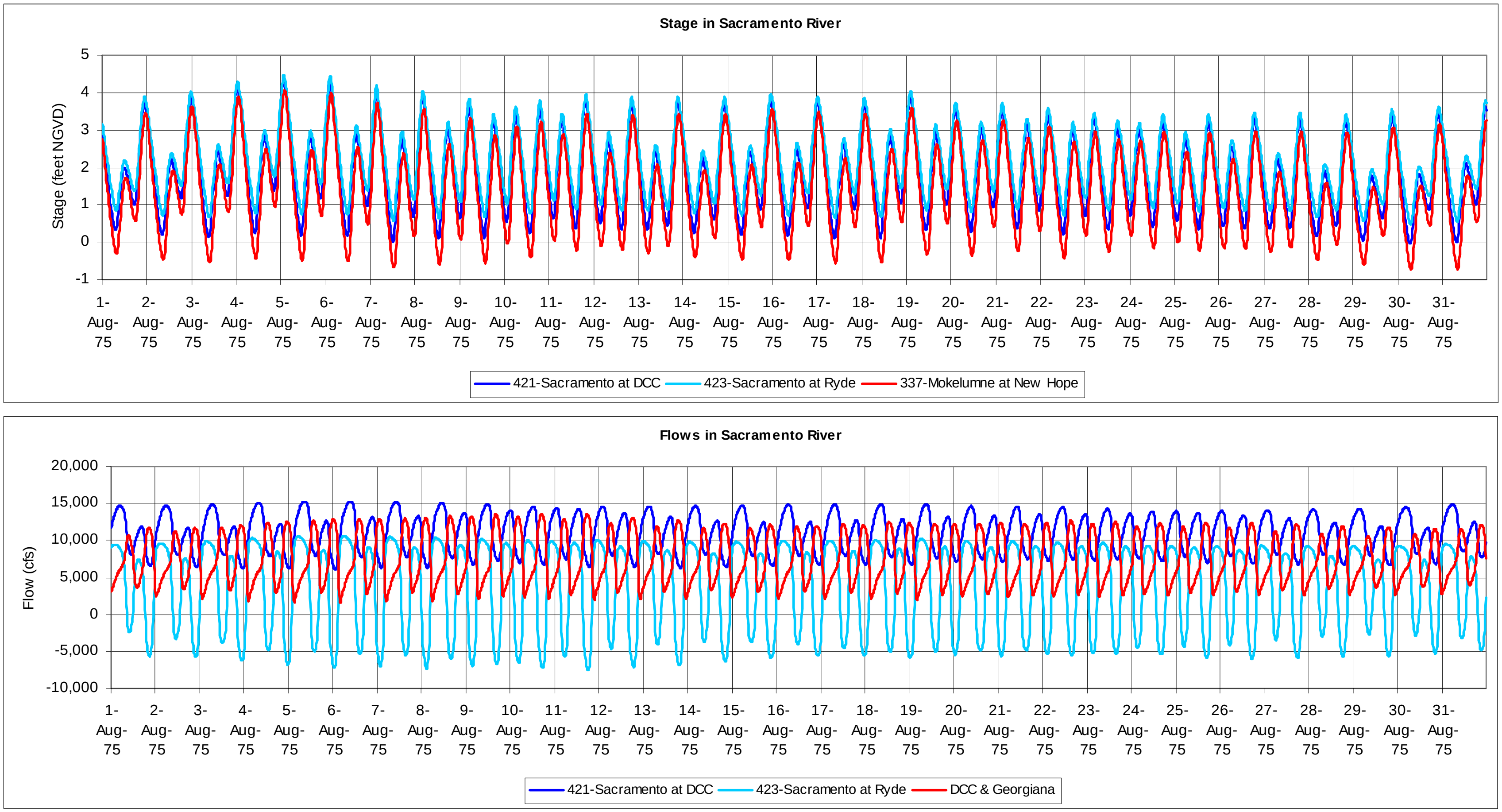


Figure 5. Simulated tidal elevations and tidal flows in the Sacramento River, Delta Cross Channel and Georgiana Slough near Walnut Grove during August 1975 for the Delta Corridors Plan.

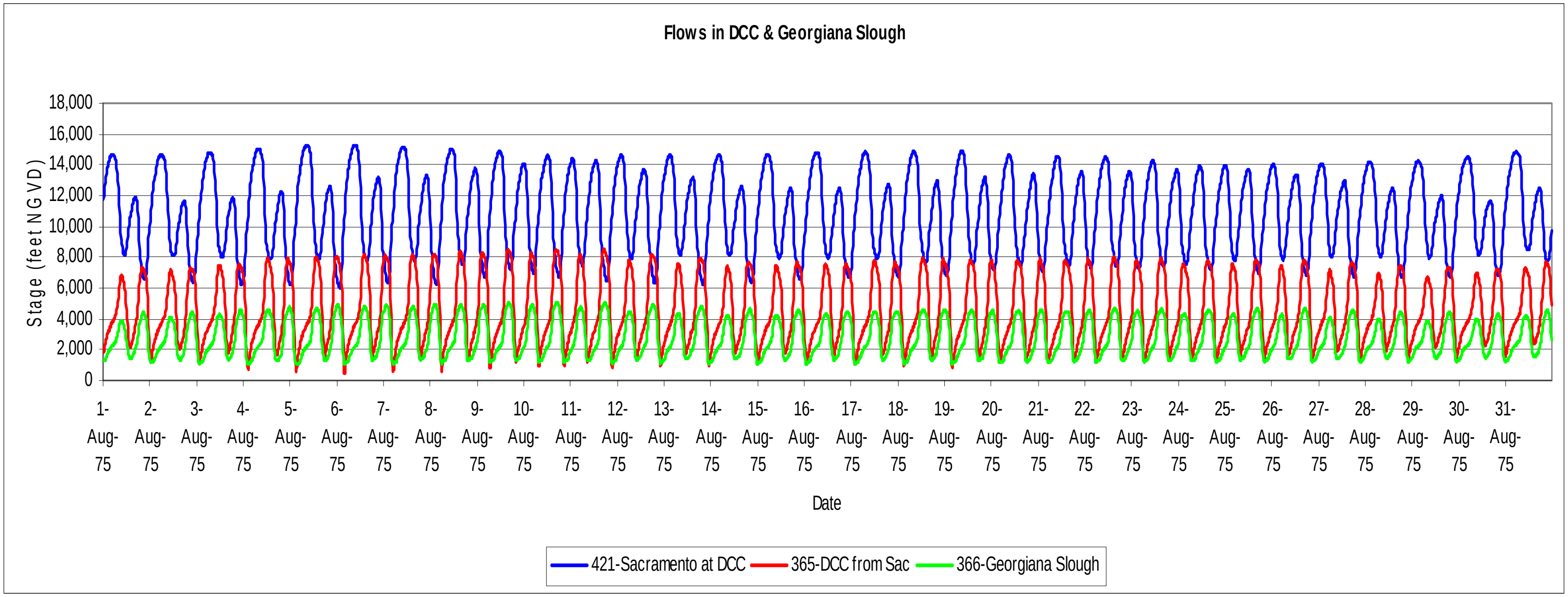
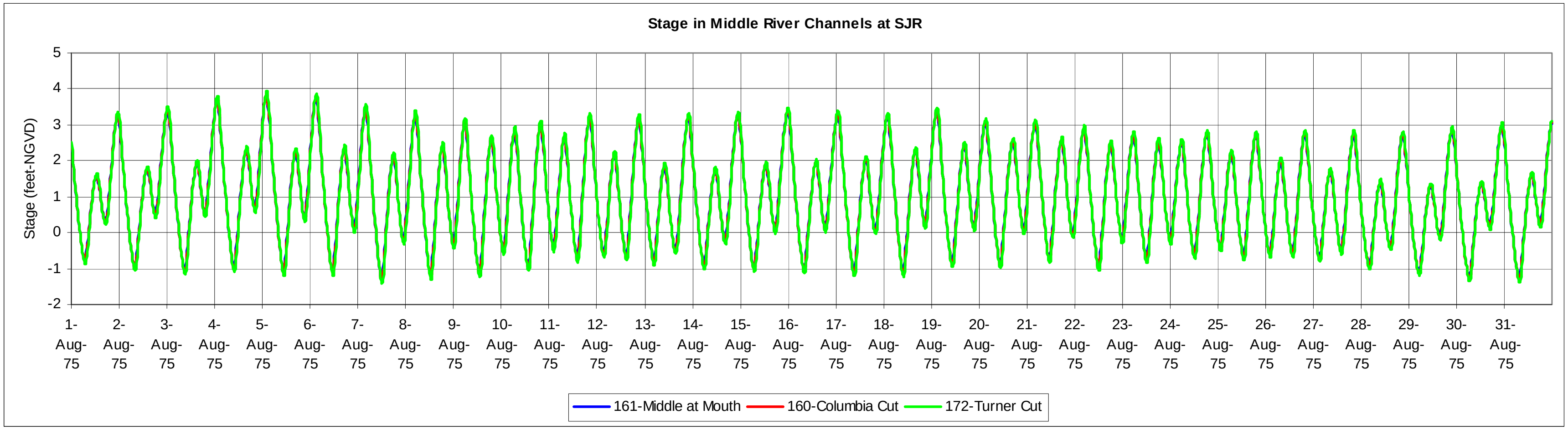


Figure 6. Simulated tidal flows in the Sacramento River and simulated diversion flows in the Delta Cross Channel and Georgiana Slough during August 1975 for the Delta Corridors Plan.



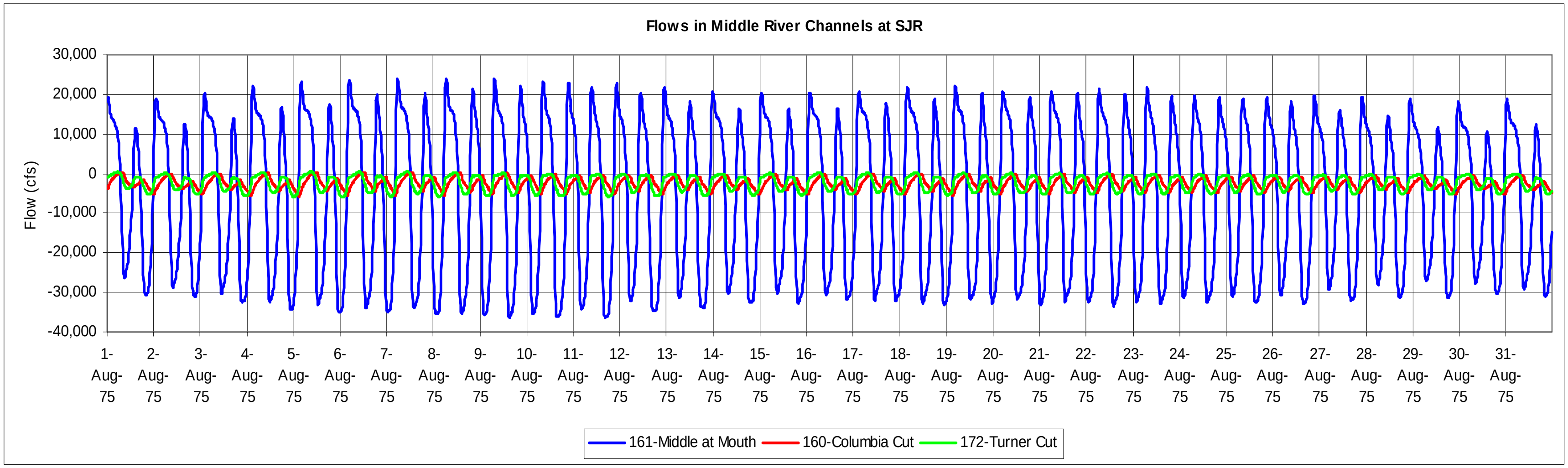


Figure 7. Simulated tidal elevations and tidal flows in the Middle River channels at the San Joaquin River during August 1975 for the Delta Corridors Plan.

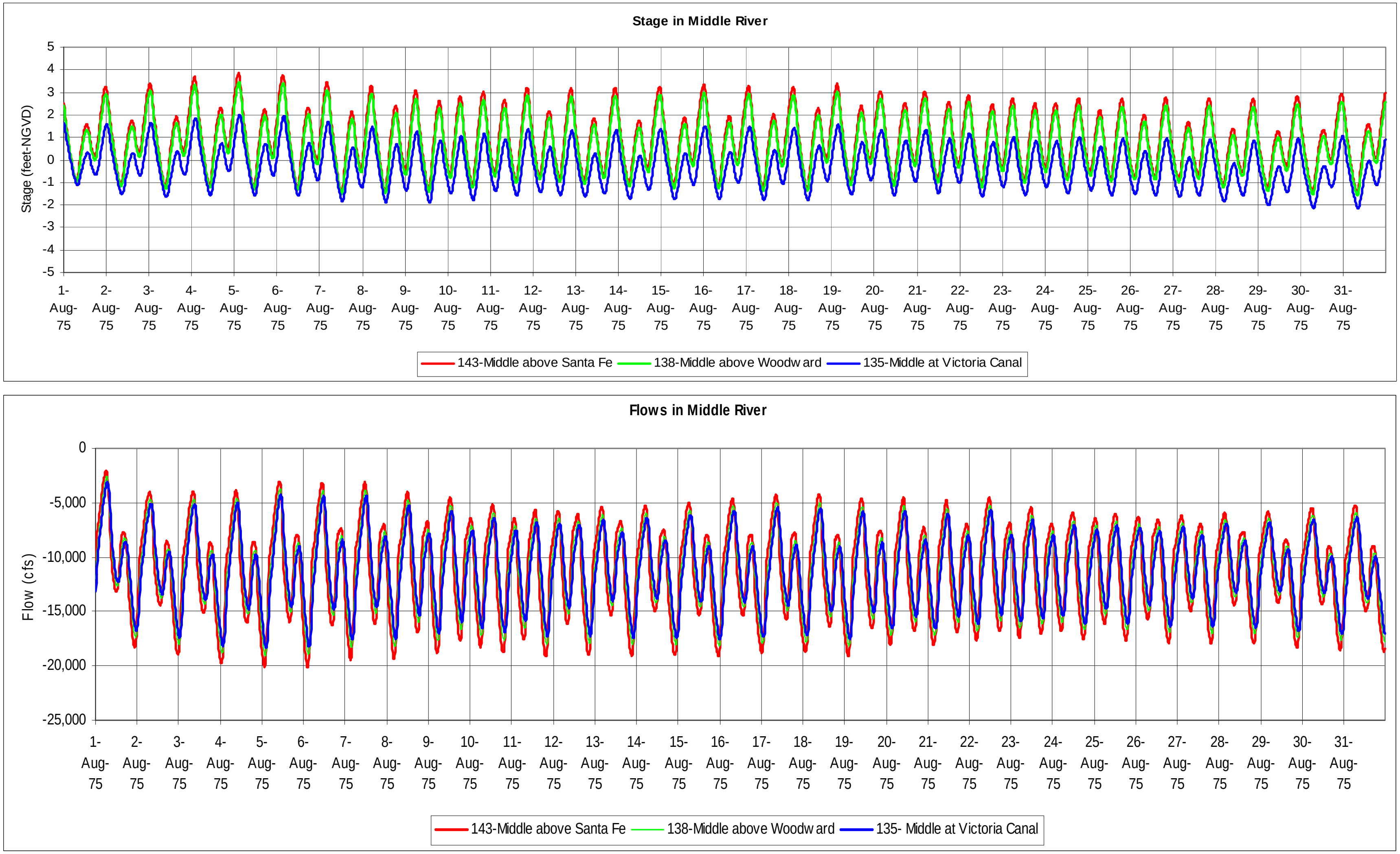
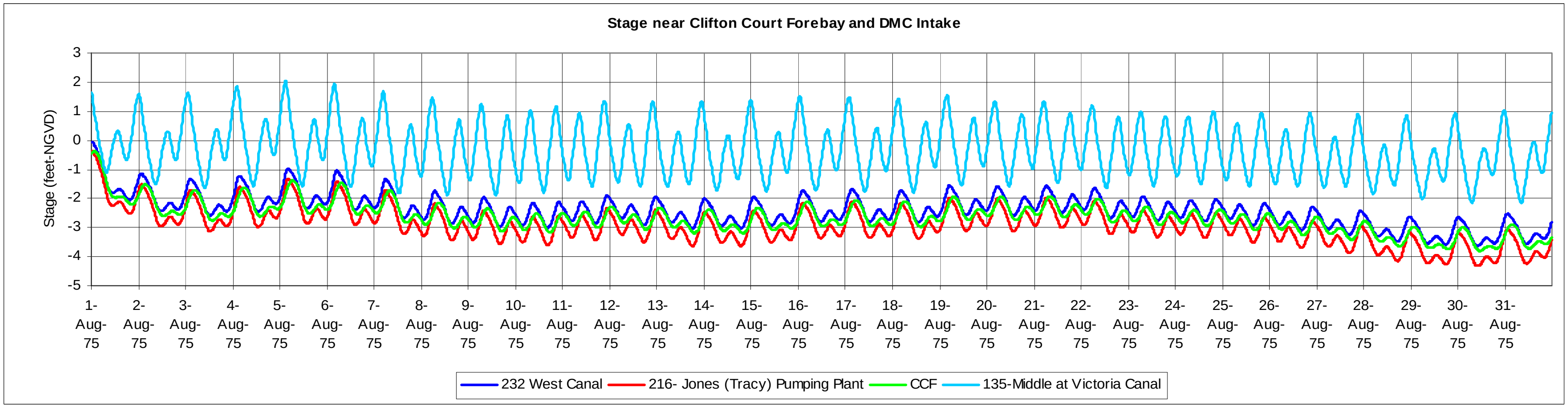


Figure 8. Simulated tidal elevations and tidal flows in Middle River during August 1975 for the Delta Corridors Plan.



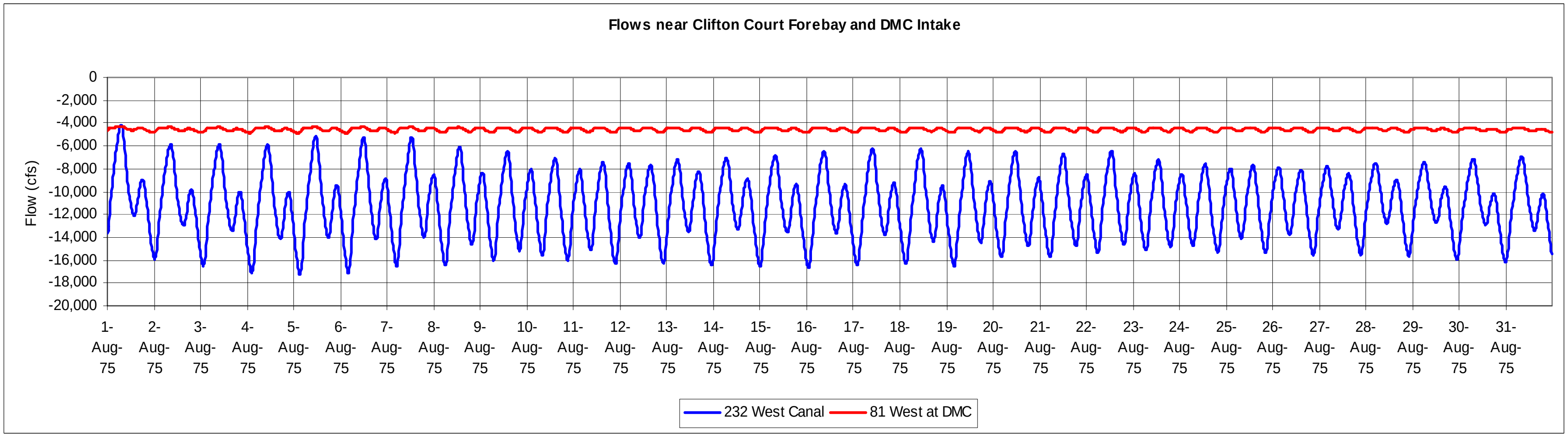


Figure 9. Simulated tidal elevations and tidal flows in the vicinity of the Clifton Court Forebay and DMC Intake during August 1975 for the Delta Corridors Plan.

Attachment Two

San Joaquin River Flood Control Operations

Reservoir Operation Opportunities to Improve Flood Control Performance

Prepared for Presentation to the

San Joaquin River Flood Control Association

June 2005 rev Sept 2007

MBK ENGINEERS

By

Joseph D. Countryman PE, D. WRE
MBK Engineers

San Joaquin River Flood Control Operations

Reservoir Operation Opportunities to Improve Flood Control Performance

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Introduction

Typically, the flood rules for reservoirs call for release decisions to be made based on actual measured reservoir inflow and stage. Improvements in forecasting technology and data communications have allowed for reservoir inflow forecasts to become more accurate and available than when these flood rules were developed many years ago. As such, it is now possible to make operational flood decisions based on these forecasts, in addition to measured inflow and storage at the reservoirs.

The useful forecasts include runoff forecasts for rainfloods and water supply forecasts. In water years that have a large snow pack, it is likely that reservoirs will fill from snowmelt runoff. During these years there exists a possibility of releasing water to create additional flood space, thereby enhancing the reservoir's ability to control a large flood and reduce peak flood flows downstream. Forecast-based Operations has the potential for allowing greater reservoir storage when the space is not needed for flood control. This methodology may also lead to more efficient water supply operation and increased water supply yields. In addition, the flood space requirement can be dependent upon available space in upstream reservoirs and this in turn would provide greater flexibility in flood operations. Folsom Dam has implemented an operation based on upstream space availability that has significantly improved the dam's flood control capability without impacting water conservation uses.

This report examines the potential for improved flood operations for Friant and Don Pedro Dams in the San Joaquin Valley, CA. Operating alternatives that proactively make flood releases, implement slight modifications to operating rules and include provisional increases in flood space based on forecasts has the potential to significantly decrease peak flood flows on the San Joaquin River flood control system.

Methodology

The 1997 flood was the largest recorded event in over 100 years of measurements for the San Joaquin and Tuolumne River watersheds. The 1997 flood was chosen as the basis for this preliminary flood analysis. According to the U.S. Army Corps of Engineers (Corps), the 1997 event had an annual exceedence probability (chance of being exceeded in a given year) for a 3-day duration of 1.5% (1 in 67) at Friant and 0.9% (1 in 111) at Don Pedro (Corps, 2002).

Historical Operations

This scenario represents the historical flood operations as they actually occurred at Friant and Don Pedro during the 1997 flood event.

Figures 1a-b show the historical operations of both Friant and Don Pedro, respectively, during the 1997 flood event. As these graphs illustrate, reservoir outflows well in excess of the normal maximum releases (8,000 cfs and 9,000 cfs for Friant and Don Pedro, respectively) were made during this severe flood event. The peak release from Friant was approximately 63,000 cfs, and the peak outflow from Don Pedro was approximately 59,000 cfs.

Operational Scenarios Evaluated

Several operational scenarios were evaluated to help determine the potential for alternative flood operations to reduce peak outflow from both Friant and Don Pedro dams.

Scenario 1 – Proactive Flood Operations

The flood space at both Friant and Don Pedro were encroached (flood space partially occupied) prior to the main flood wave in 1997. This scenario evaluates the flood control operations assuming the reservoirs were not encroached entering the 1997 flood event. The starting storage was set to the bottom of the flood space several days before the event occurred. The essence of this scenario is a very aggressive flood release operation whenever the possibility exists that a major storm may strike California.

Figures 2a and 2b show what the impact of the proactive operation scenario would have had at both Friant and Don Pedro reservoirs during the 1997 flood event. The peak outflow from Friant would have been reduced from 63,000 cfs to 34,000 cfs (46% reduction), and the Don Pedro peak outflow would have been reduce from 59,000 to 35,000 cfs (41% reduction) under this operational scenario.

Scenario 1 (Proactive Flood Operations) is promising because it does not rely on changing existing flood control rules. However, it may not always be possible to evacuate encroached flood space prior to a flood event due to large inflow volumes and/or reduced channel capacity downstream of the reservoirs because of tributary flows.

Scenario 2 – Scenario 1 plus a Change in Downstream Release Targets

This operation scenario includes the scenario 1 operational emphasis and changes the location of the current downstream flow targets for both Friant and Don Pedro dams. This would potentially allow for additional water to be released in advance of a flood. The current rules require a reduction in outflows from the dams to allow for flows from unregulated tributaries that originate downstream from the dam. By moving the location of the flow target to just below each dam, the dam operators can effectively meet targets without having to allow for forecasted flows on the tributaries and therefore they will be better able to preserve flood space in the reservoirs.

At Friant, scenario 2 moves the 8,000 cfs flow target from below Little Dry Creek to Friant Dam itself. Figure 3a shows the effect of this operation. Scenario 2 would reduce the peak outflow from 63,000 cfs to 31,000 cfs (51% reduction).

At Don Pedro, the 9,000 cfs maximum flow target moves from below Dry Creek in Modesto (24 hour flow time from Don Pedro dam) to below Don Pedro dam. This allows releases from Don Pedro dam to reach 9,000 cfs without having to account for the flow in Dry Creek. The City of Modesto is not expected to experience flooding until Tuolumne River flows exceed 20,000 cfs. The flow target alteration is not anticipated to result in flooding in the Modesto area. Rural areas downstream from Modesto would experience an increase in flows for frequent flood events but a reduction for major flood events like occurred in 1997. Figure 3b shows the effect that this operation would have had at Don Pedro during the 1997 flood event. As these results show, the peak outflow was reduced from 59,000 cfs to 31,000 cfs (47% reduction) under this operational scenario.

Scenario 3 - Forecast-Based Operation with Additional Flood Space

This scenario assumes that Scenarios 1 and 2 are implemented as a base condition. It is also assumed that an acceptable operation plan could be developed that would produce 25,000 acre-feet of additional flood space in each reservoir prior to the onset of the flood. To test the sensitivity of the level of flood protection it was also tested with 50,000 and 100,000 acre-feet of additional space.

Figures 4a-b, 5a-b and 6a-b show the flood flow reductions for the three increased flood space scenarios analyzed. Tables 1a and 1b summarize the results of the analysis.

Table 1a. Comparison of Peak Friant Outflow from the Analyzed Flood Operation Scenarios (1997 Flood)

	Friant Dam		
Operational Scenario	**%** of Conservation Space Used	**Peak Outflow** [cfs]	**Flow Reduction** [%]
Historical	0	63,000	---
Scenario 1 Proactive	0	34,000	46%
Scenario 2 Target	0	31,000	51%
Scenario 3 25 TAF	6	27,000	57%
50 TAF	11	16,000	75%
100 TAF	23	8,000	87%

Table 1b. Comparison of Peak Don Pedro Outflow from the Analyzed Flood Operation Scenarios

	Don Pedro Dam		
Operational Scenario	**%** of Conservation Space Used	**Peak Outflow** [cfs]	**Flow Reduction** [%]
Historical	0	59,000	---
Scenario 1 Proactive	0	35,000	41%
Scenario 2 Target	0	31,000	47%
Scenario 3 - 25 TAF	1	30,000	49%
50 TAF	3	24,000	59%
100 TAF	6	22,000	64%

Conclusion

All three scenarios would significantly reduce the peak outflows from these reservoirs. Tables 1a-b show the peak outflows and percentage reduction in peak outflow (as compared with the historical operations) from both Friant and Don Pedro, respectively. Based on this analysis, a very aggressive operation to maintain the specified flood space is a very effective method of improving flood protection. In the case of Don Pedro dam, it will be necessary to change the location of the objective flow target in order to achieve this benefit. The studies show that operational changes that do not include increasing the designated federal flood space in the reservoirs are very effective and can reduce flood spills by approximately 50%.

It was originally anticipated that a 72-hour advance release operation, releasing stored water up to 72 hours in advance of a large forecast reservoir inflow, would be of use at each of these reservoirs. However, the limited channel capacities downstream of each of these reservoirs does not allow for a significant increase in outflow volume shortly before such a large flood. This is because the outflow would already be at its maximum allowed level without exceeding the channel capacities for both Friant and Don Pedro 72 hours prior to the largest inflows such as occurred in 1997. One potential operational means of enhancing the flood protection at these reservoirs is to create additional flood space. Since this increase of flood space would require the evacuation of conservation storage, implementation would require careful consideration of the impacts to water conservation objectives. An operational strategy that is highly likely to maintain existing conservation supplies or even enhance those supplies would have the best chance of reaching community consensus on any changes. These strategies could include crediting upstream storage space and the use of long range forecasts that include an evaluation of refill capability because of accumulated snow pack.

Since Don Pedro reservoir has over three times the storage capacity of Friant reservoir different strategies for the two reservoirs should be considered. Although the option of increased flood space is highly effective, implementation of the option may be very difficult.

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USACE (United States Army Corps of Engineers), 1980. Report on Reservoir Regulation for Flood Control, Friant Dam and Millerton Lake, San Joaquin River, California, Department of the Army, Sacramento District, Sacramento, CA.

USACE (United States Army Corps of Engineers), 2002. Sacramento and San Joaquin River Basins Comprehensive Study Technical Studies Documentation, Department of the Army, Sacramento District, Sacramento, CA.

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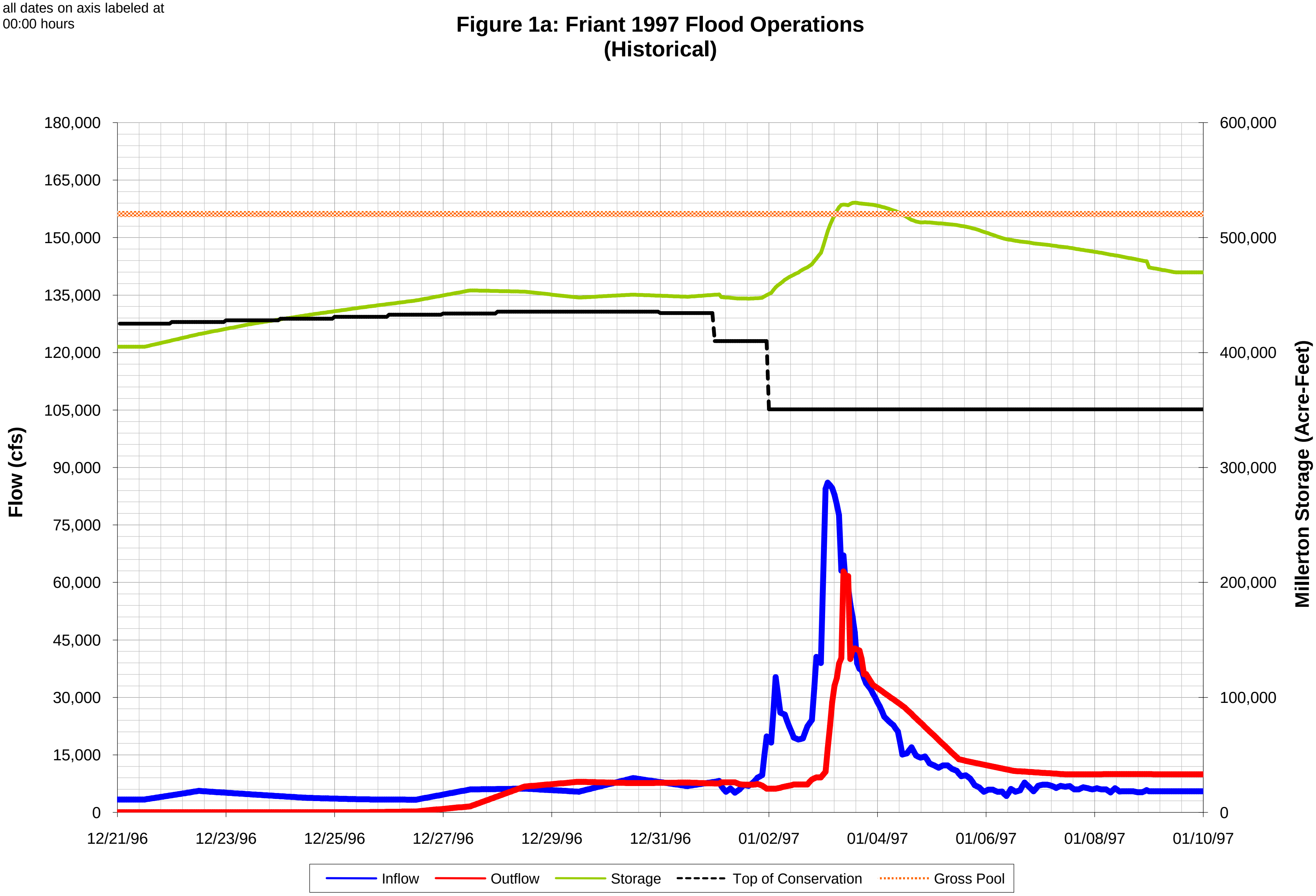

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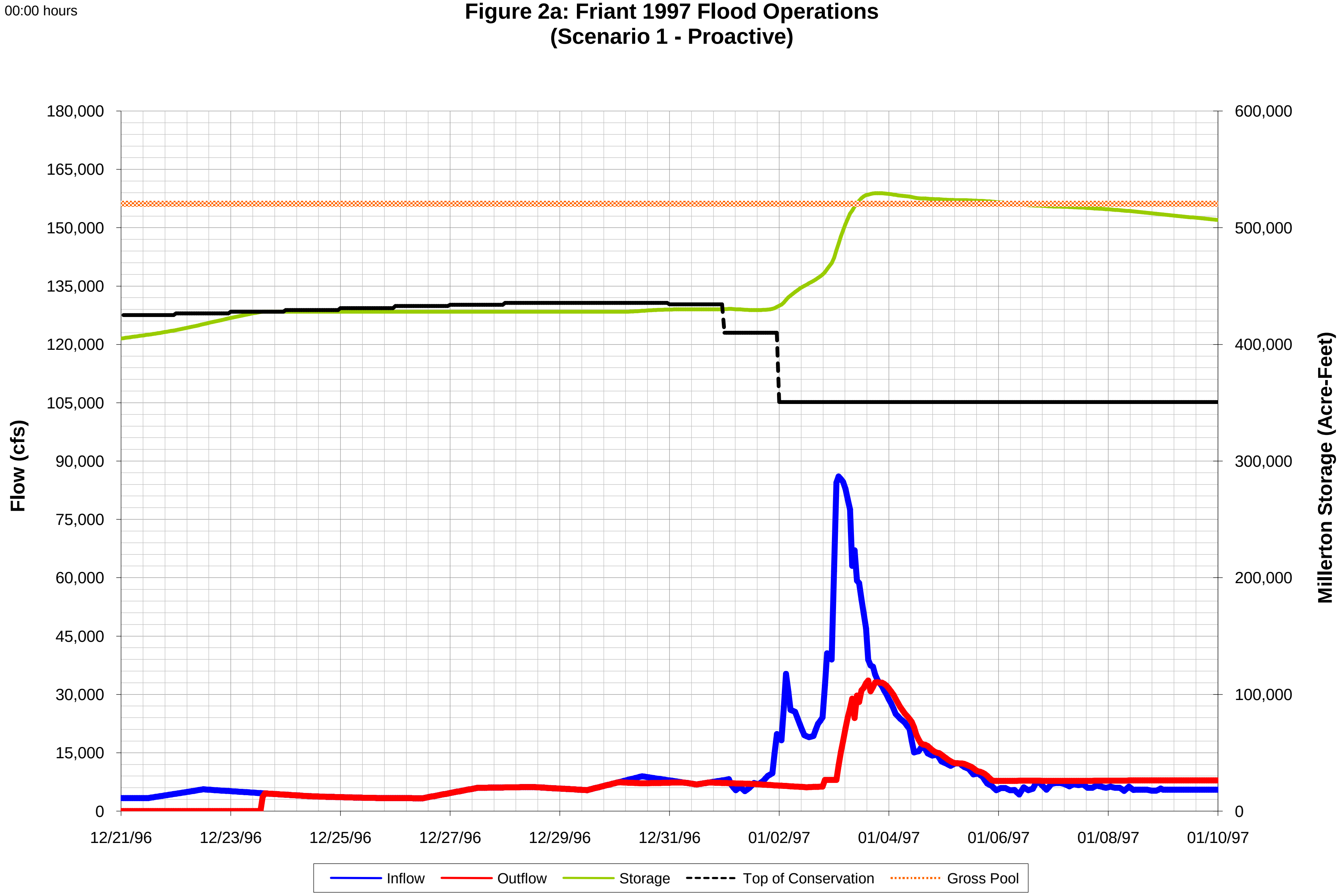

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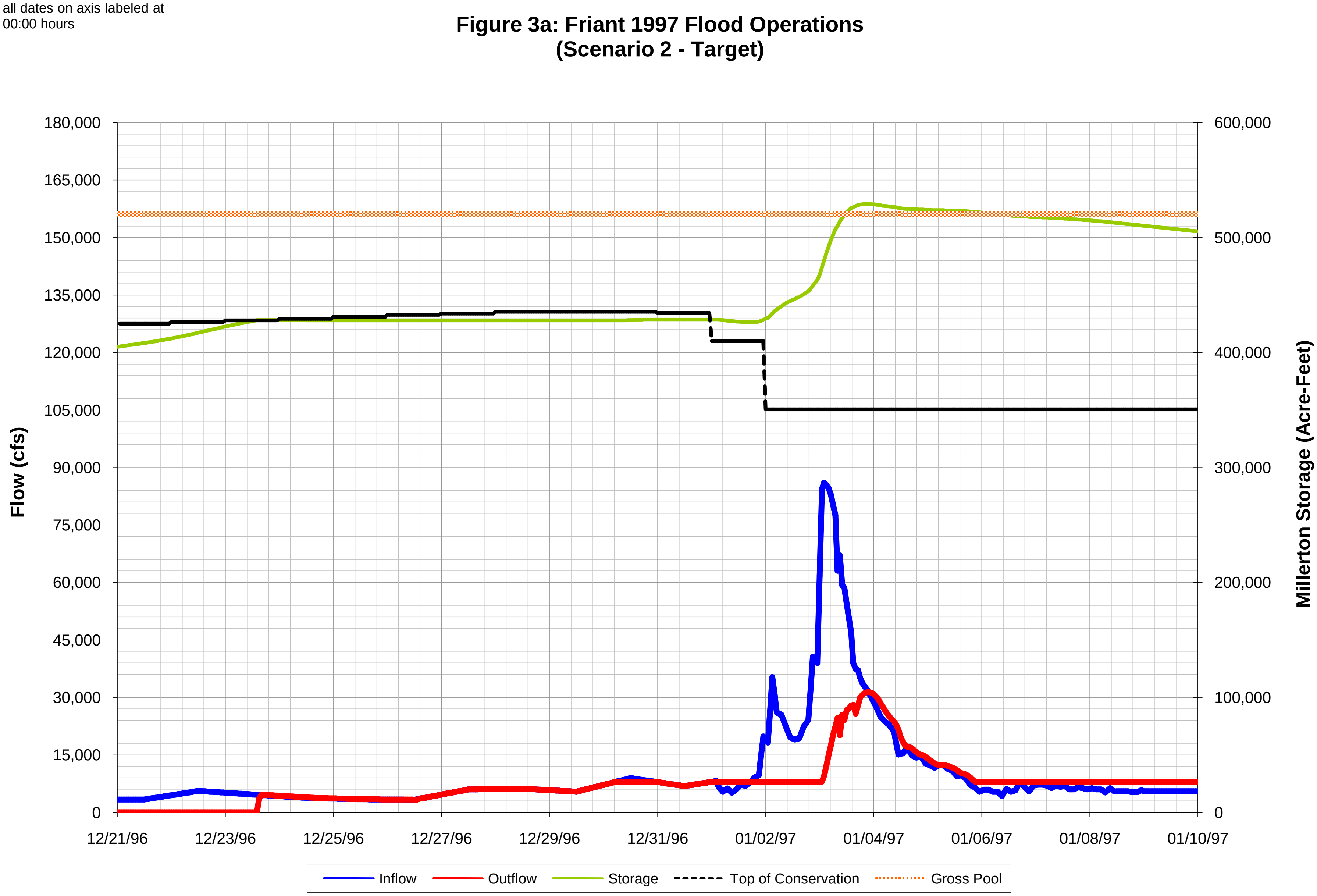

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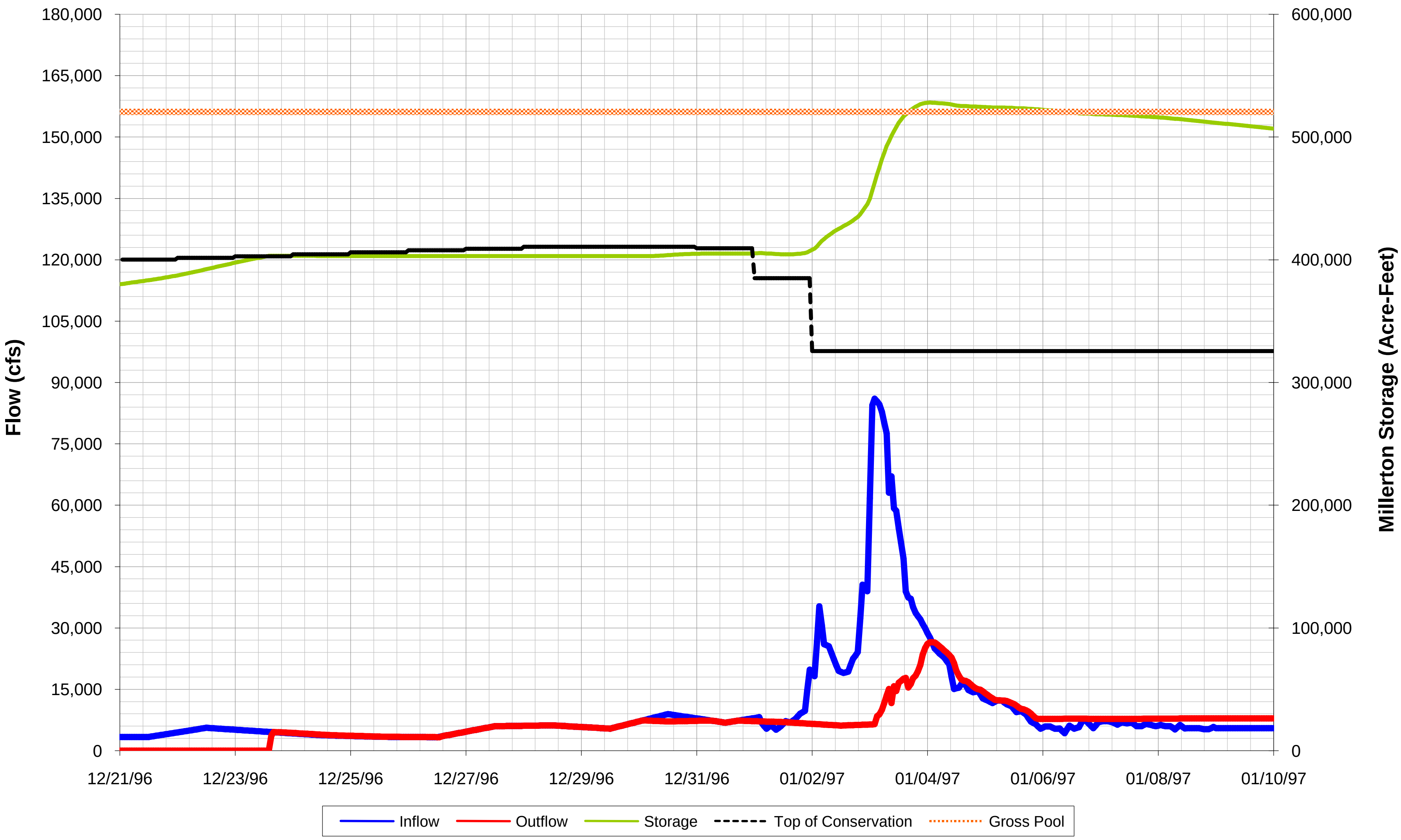
Figure 4a: Friant 1997 Flood Operations
(Scenario 3 - 25 TAF)



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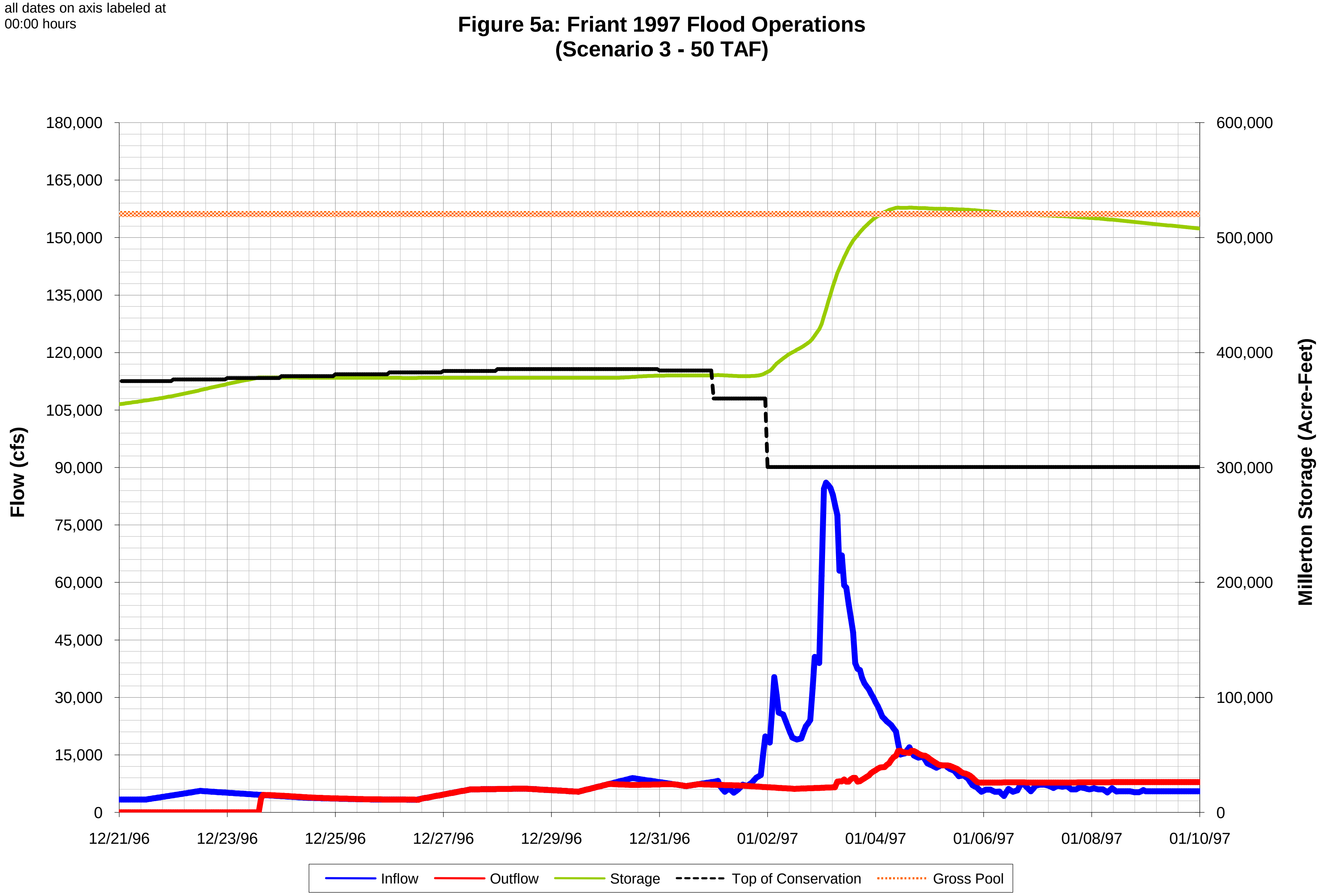

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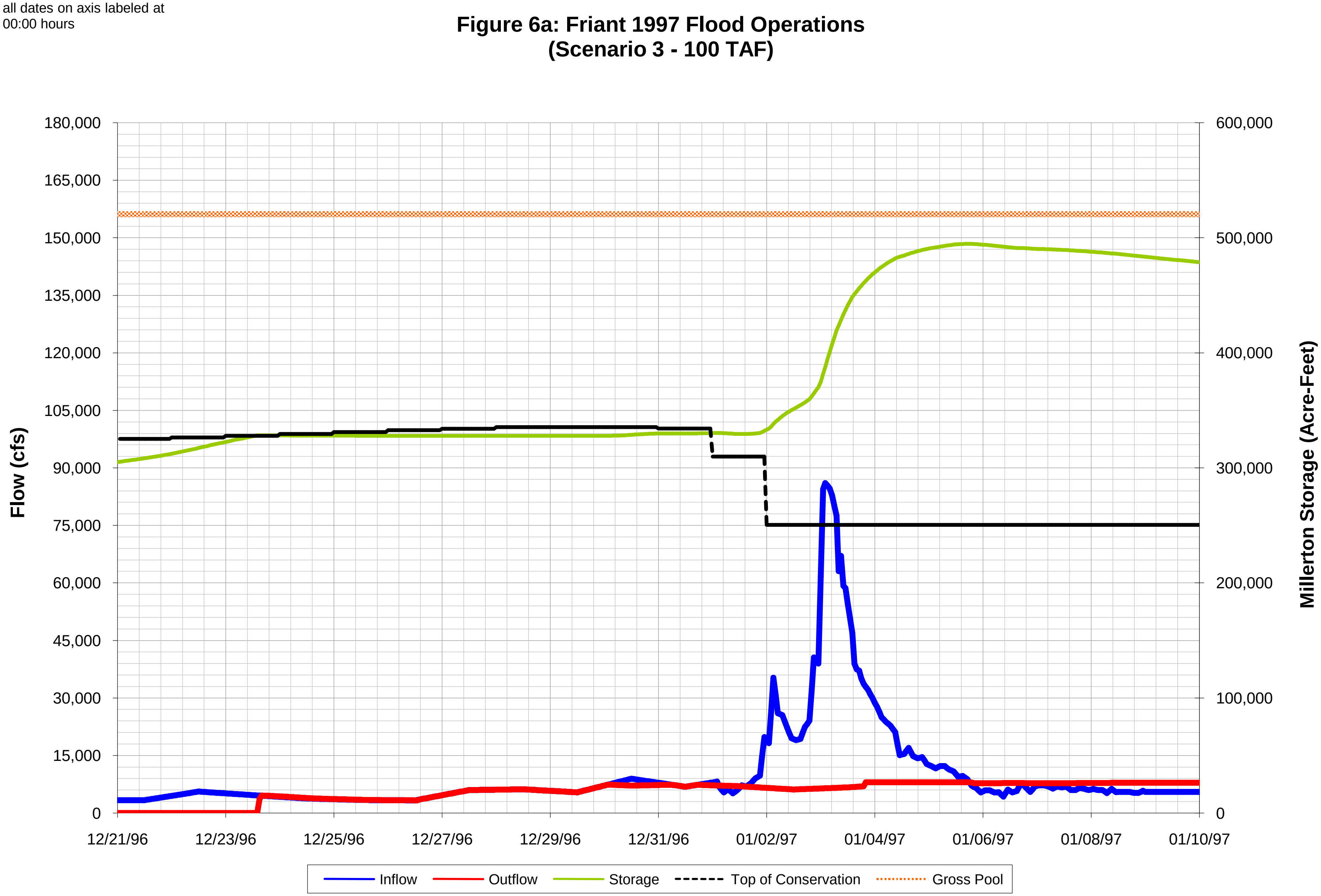

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Figure 1b: New Don Pedro 1997 Flood Operations (Historical)

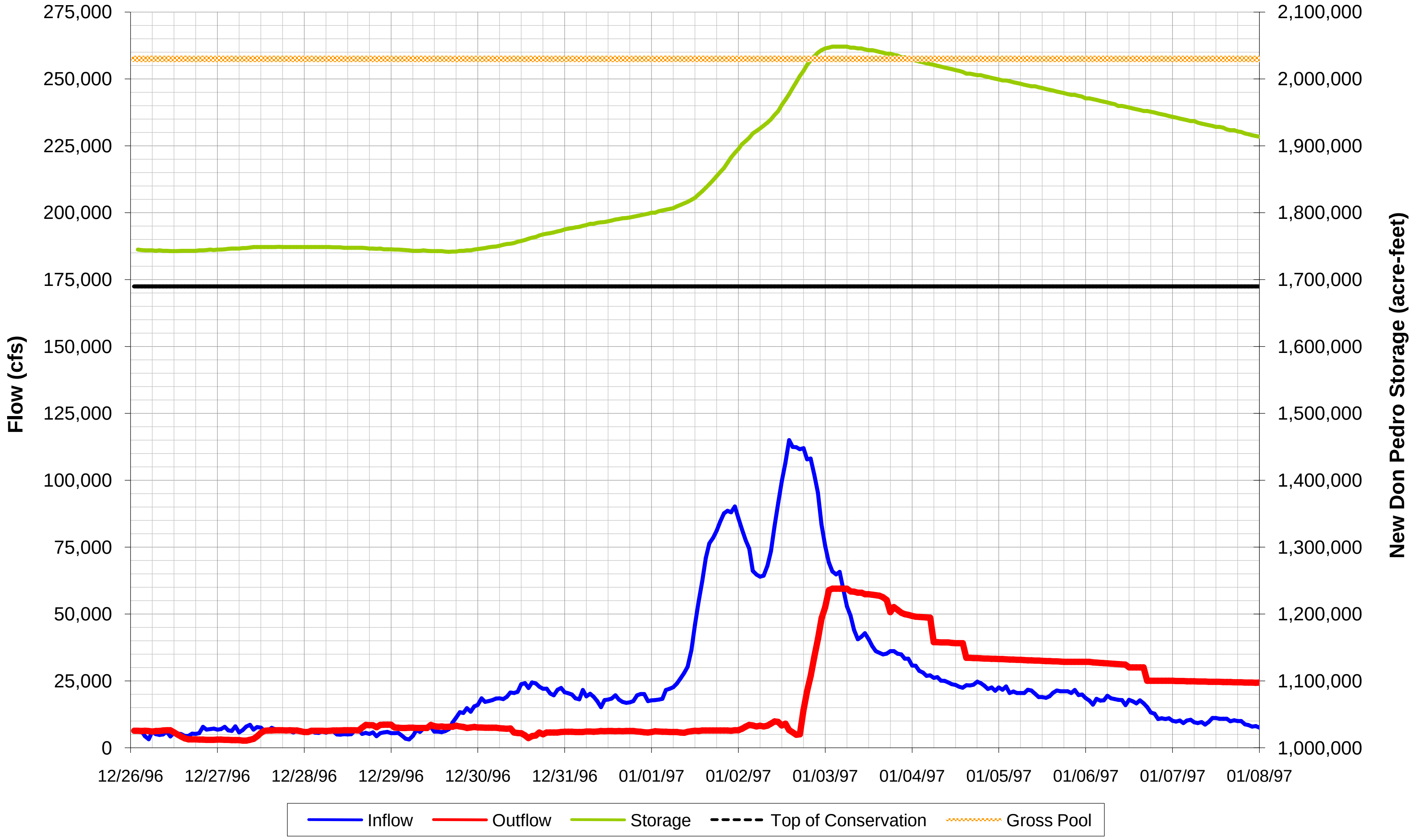

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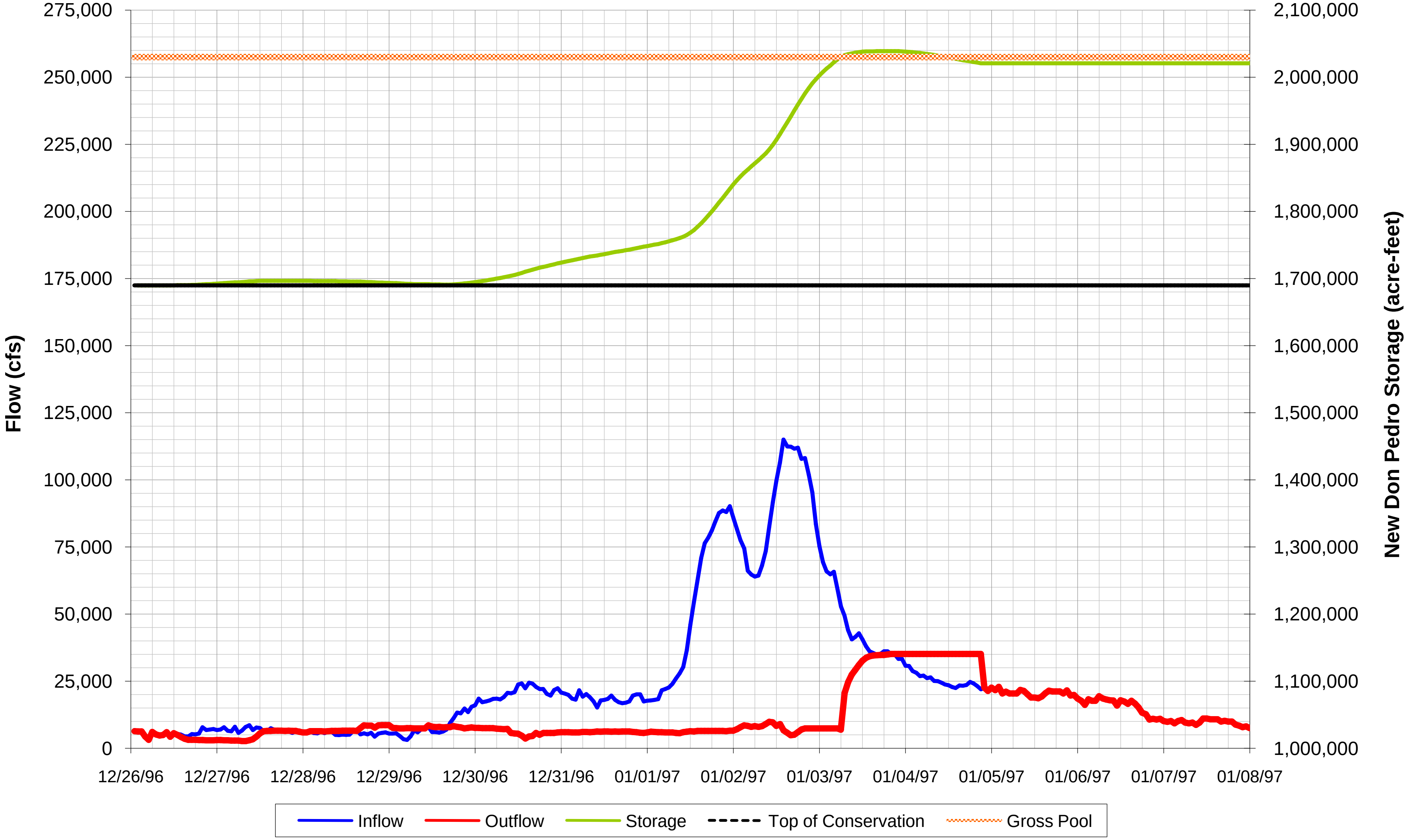
Figure 2b: New Don Pedro 1997 Flood Operations (Scenario 1 - Proactive)



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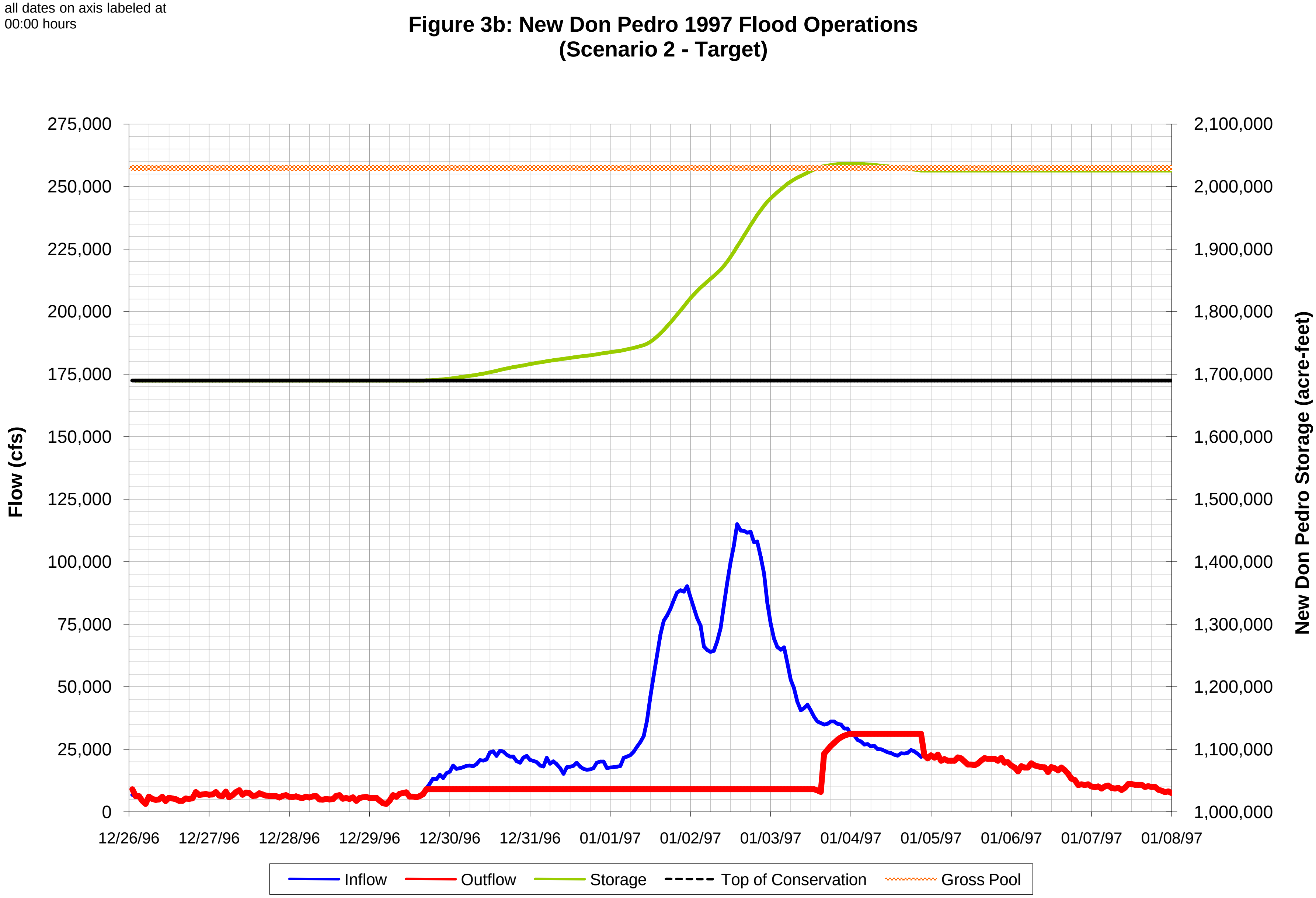

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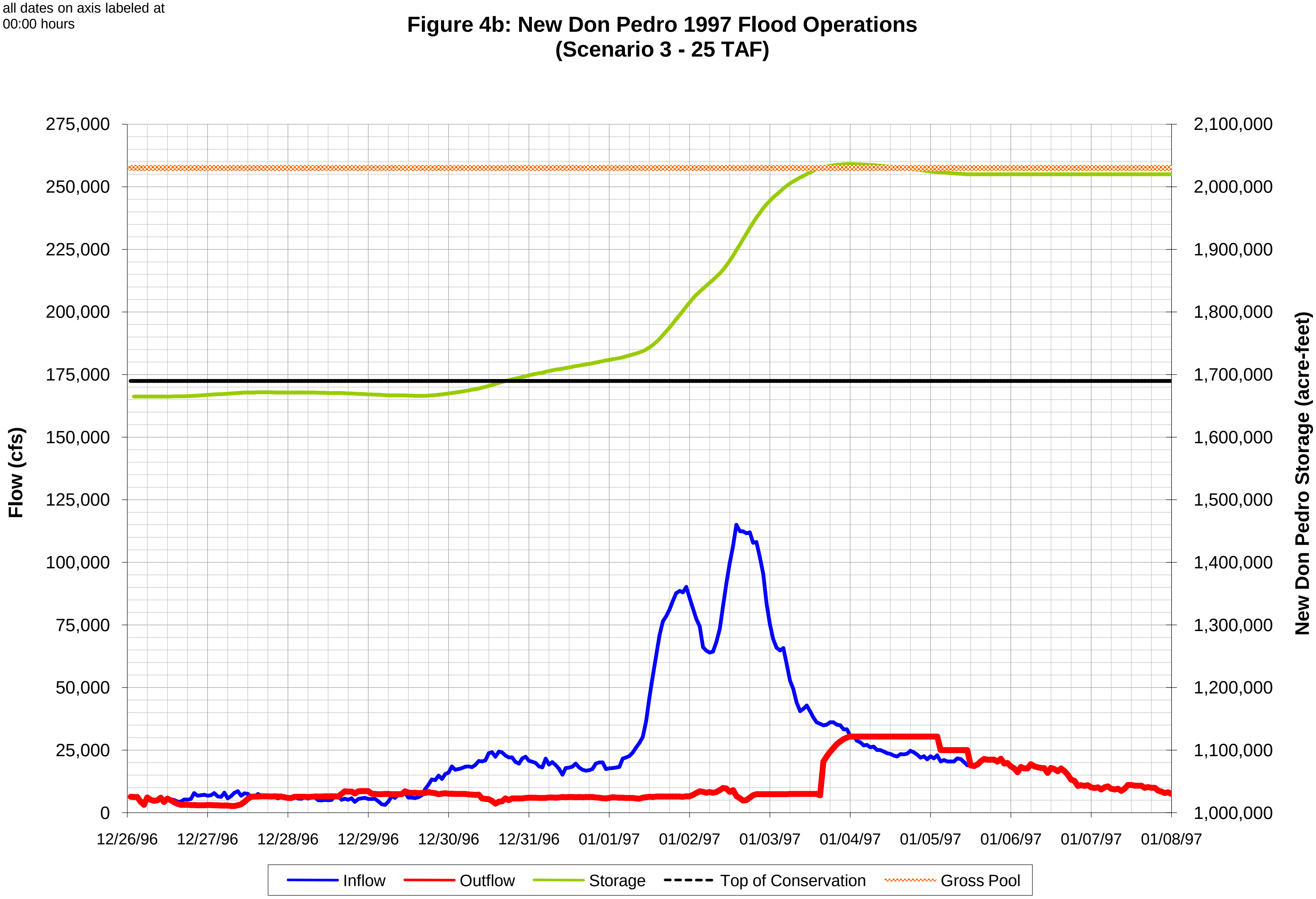

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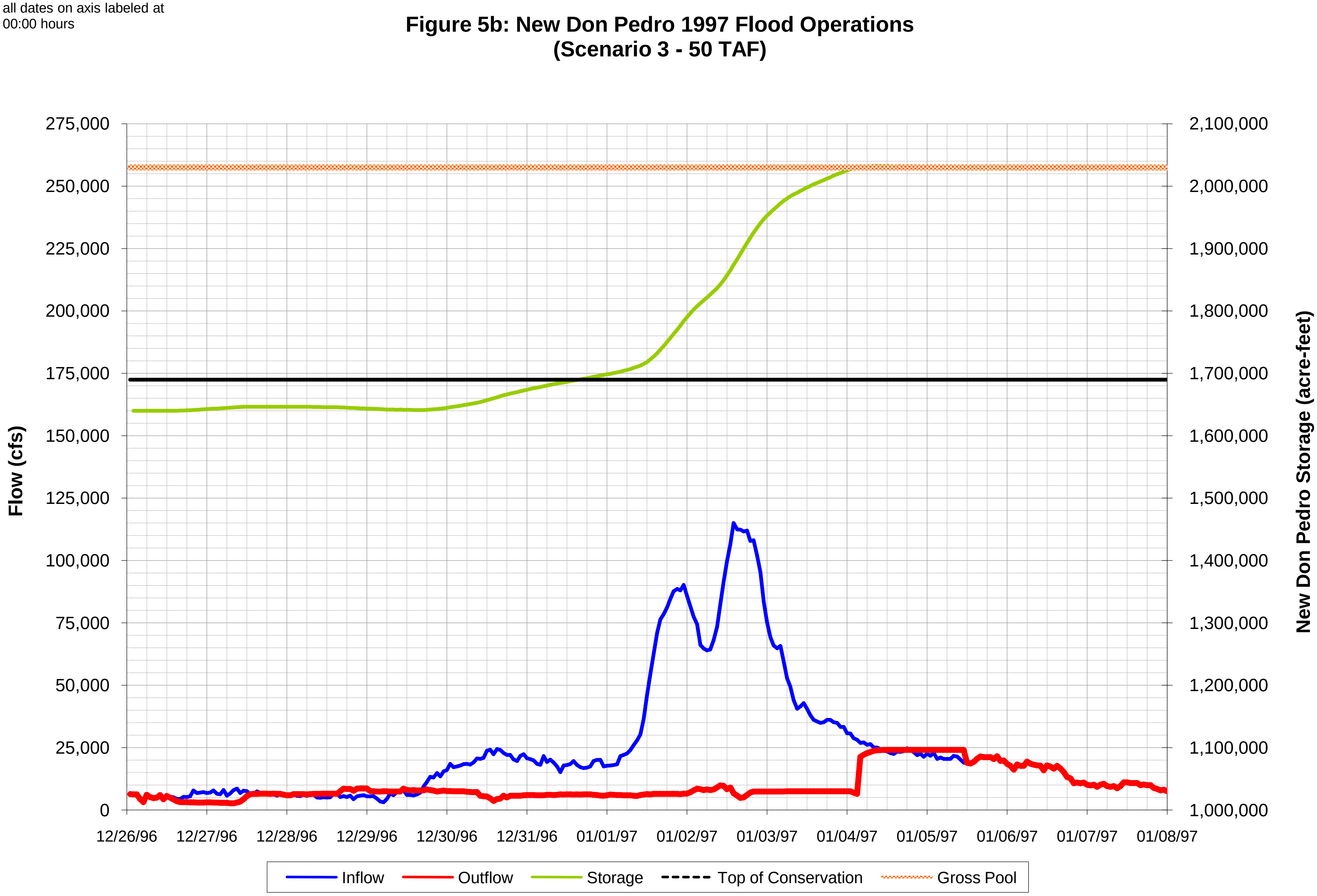

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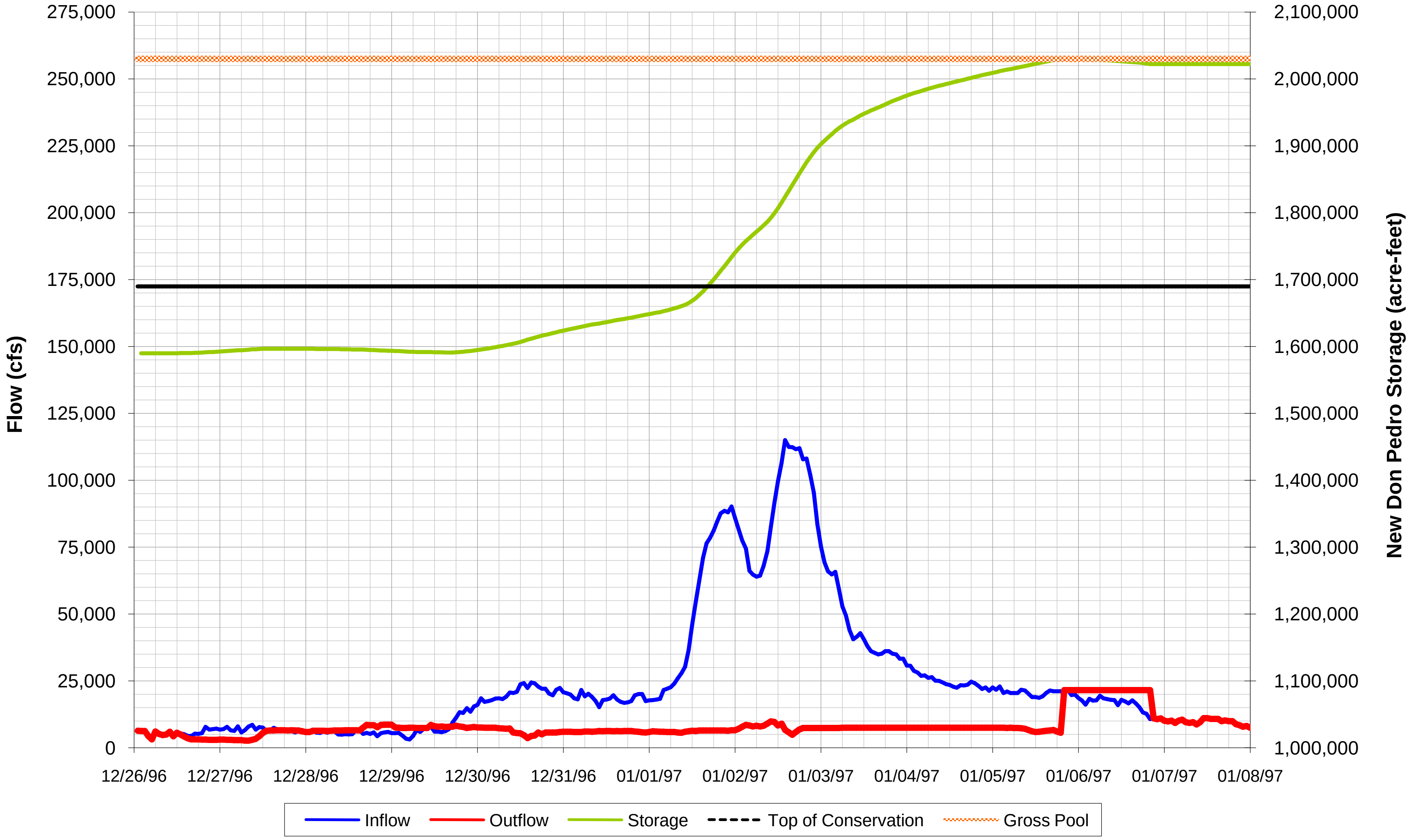
Figure 6b: New Don Pedro 1997 Flood Operations
(Scenario 3 - 100 TAF)



Attachment Three

The South Delta Water Agency

A Comprehensive Flood Conveyance and Eco-system Restoration Plan for the South Delta

A Plan for Flood Control

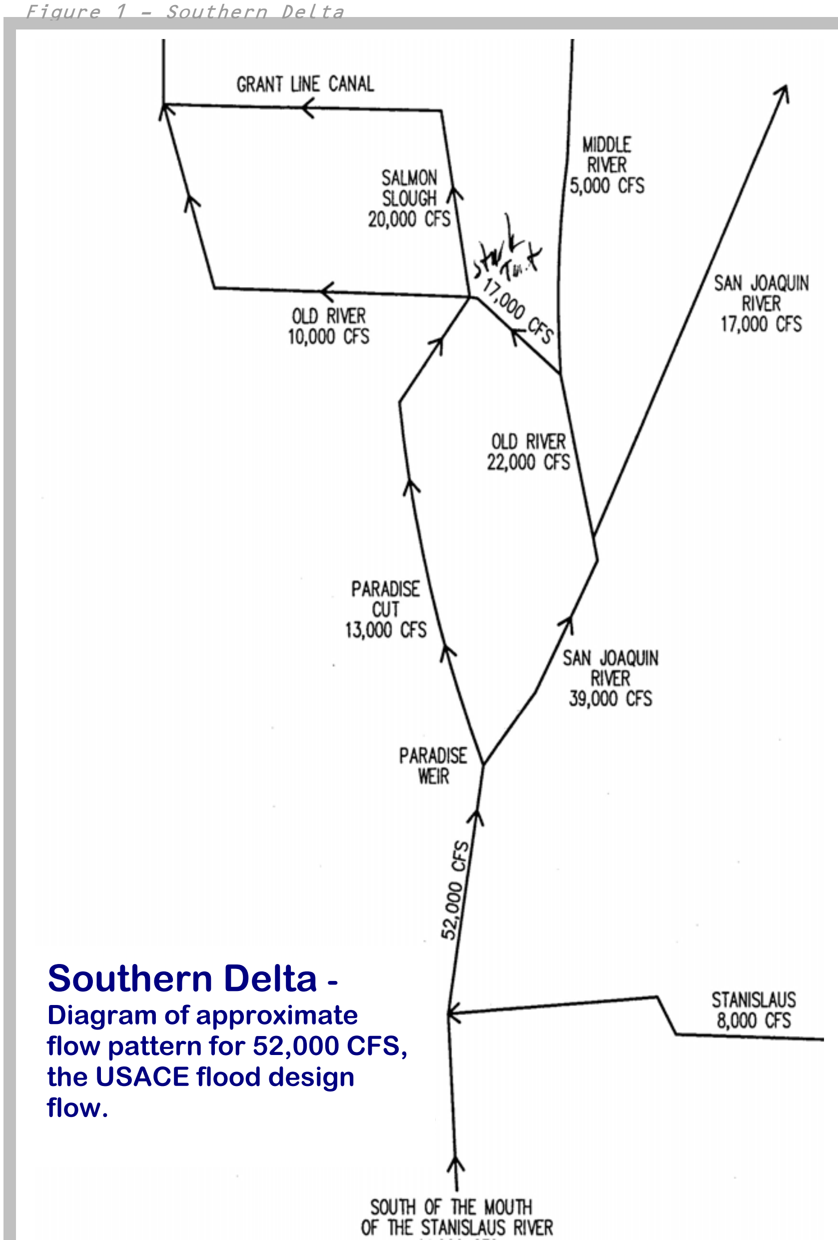
Created as an extension of the
Sacramento and San Joaquin River Basins, California,
USACE Comprehensive Study, Interim Report
For
South Delta Water Agency
15 October 2007

Introduction: A Plan for Flood Control

The South Delta Water Agency (SDWA) Flood Conveyance and Eco-system Restoration Plan outlines a comprehensive proposal for both flood conveyance and eco-system restoration for the South San Joaquin Delta. The Plan's overall resource management objectives are:

- Reduction of peak flows to 52,000cfs, the original design flow for the federal flood control project on the San Joaquin River. This reduction can be achieved by altering the management of upstream dams and restoring flood over flows on to existing dedicated wetlands;
- Storage of flood waters in excess of 52,000 cfs. for future use and export if possible;
- Dredging of aggraded channels, removing six to eight feet of sediment;
- Use of the dredge spoils to strengthen adjacent levees;
- Erosion control and bank stabilization;
- Reconstruction, improvement and expansion of aquatic and terrestrial habitat in Paradise Cut and other suitable areas.

Figure 1 – Southern Delta



Southern Delta - Diagram of approximate flow pattern for 52,000 CFS, the USACE flood design flow.

IT ALL STARTS WITH A PLAN OF FLOOD CONTROL – this plan is consistent with the recently published "WATER PLAN FOR THE 21ST CENTURY".

"In order to deal with "Flood Conveyance" there needs to exist a real flood management plan for the Central Valley which addresses both the current situation and plans for the results of global warming. Until the "design flood" is determined, a system cannot be designed to contain it. It is important that such a plan anticipate future climate change possibilities so that "room for the rivers" and appropriate flood works expansions can be reserved in flood management plans. Second, it must recognize that meeting water needs in the Central Valley will be dependent upon controlling and conserving portions of these flood flows for future use. "

An excerpt from "A WATER PLAN FOR THE 21ST CENTURY: REGIONAL SELF-SUFFICIENCY SCENARIO",PRESENTED July 2007 by Tom Zuckerman FOR THE INDELTA GROUP.

The South Delta Water Agency Flood Conveyance and Eco-system Restoration Plan was developed in response to a request by the U.S. Army Corps of Engineers for input and ideas from local stakeholders on approaches to flood control. The Corps made the request following the 1997 flood events, which resulted in levee failures in 27 locations along the San Joaquin River alone. Flooding in the South Delta has historically resulted from sustained flows during spring and early summer snowmelts and from short duration peak flows during rainfall flood events.

Floods resulting from snowmelt have not historically exceeded the 52,000 cfs design flow on the San Joaquin River at Vernalis. Snowmelt floods can be of a long duration, with the 1983 flood lasting from January until August. Winter rainfall floods can produce higher flows, but peak flows higher than 52,000 cfs are short lived, typically lasting much less than a week. Because snowmelt floods tend to result in lower flows than 52,000 cfs, strengthening existing levees which were designed to pass 52,000 cfs, should minimize the risk of levee failure from snowmelt floods.

The flood flow model diagram (Fig. 1.) illustrates the design flow for the 52,000 cfs event. During a 52,000 cfs event, 13,000 cfs is diverted from the San Joaquin River into the Paradise Cut Bypass via the Paradise weir. Another 22,000 cfs is diverted into Old River, thus reducing down stream flows in the San Joaquin River by 17, 000 cfs. Middle River accepts 5,000 cfs from Old River. Doughty Cut / Salmon Slough takes 20,000 cfs from Old River and Paradise Cut and feeds it through Grant Line Canal.

This Flood Conveyance and Eco-system Restoration Plan suggests several major improvements that are described in more detail in the following Project Overview. The widening of Paradise Cut Bypass is proposed as a key component of the conveyance system. Modification of dam releases is also critical to the plan as is the use of over flow areas and dredging.

Coupling the flood protection improvements with eco-system restoration is also important to the Plan. In stream island habitat purchase opportunities in Paradise Cut and the lower San Joaquin along with Mitigation Banks and like associated projects will be spawned by levee improvements. Environmentally friendly levee stabilization techniques may be used to increase both aquatic and terrestrial habitat opportunities in an affordable manner that can be achieved without increasing flood risks.

Project Overview

The South Delta Water Agency Flood Conveyance and Eco-system Restoration Plan combines a variety of strategies to provide a more natural and sustainable flood abatement program while protecting agricultural and urban infrastructure in the South Delta area. These strategies include:

- Prereleases from dams to make room for peak inflows when snow packs are large and warm storms are forecasted;
- Restoration of natural overflows upstream from Vernalis to existing dedicated wetlands and into aquifer recharge basins to provide transient storage of 100,000 to 200,000 acre feet of flood waters;
- Dredging to increase channel flow capacity throughout the system with the use of dredge spoils to buttress and strengthen existing levees;
- Levee setbacks in Paradise Cut to restore floodplain connectivity;
- Eco-friendly levee stabilization techniques where viable to prevent erosion and to increase, restore and enhance natural habitat opportunities and values.

Specific projects under these strategies were identified by the original South Delta Water Agency, *South Delta Flood Conveyance Plan* (June 2004) and *Eco-system Restoration Opportunities-South Delta Flood Conveyance Plan* (July 2005) developed by Alex Hildebrand and Darryl Foreman. Detailed descriptions of individual projects will be available on the future SDWA web site.

Photo

Existing Paradise Cut Weir at the Junction of the San Joaquin River

The Plan downstream of Vernalis is intended to be implemented by individual Reclamation Districts such as RD 2062, located adjacent to Paradise Cut. To avoid brief peak flows exceeding 52,000 cfs, upstream measures beyond Vernalis must be coordinated and implemented by the State and should be considered as part of the “Delta Vision Plan”. Each activity, constructed from downstream to upstream should be considered integral yet separate. When completed, they will form part of an overall work plan and strategy to be considered in its entirety as part of a State Plan of Flood Control. [SB5-Machado/Wolk]

The activities, beginning in the North, include:

- Channel dredging to improve flood conveyance to the central Delta, use of dredge spoils to strengthen existing levees, construction of levee setbacks in Paradise Cut, and conducting habitat improvements where feasible along Doughty Cut, Salmon Slough, Old River, and Grant Line Canal.

- Removal of shoaling sediment bars, the set back of the right bank levee and dredging of Paradise Cut and nearby portions of the San Joaquin River channel; use of dredge spoils to strengthen levees, and conduct habitat improvements where feasible.

- Dredge aggraded portions of the San Joaquin River channel upstream of the mouth of the Stanislaus River and between Vernalis and Mossdale, use of dredge spoils to strengthen existing levees, and conduct habitat improvements where feasible.

Photo

Paradise Cut Twin Bridges

Photo

River Dredging Barge

For example, Paradise Cut is an over flow channel and existing flood control bypass connecting the San Joaquin River and Old River systems. It was designed to divert excess waters from the San Joaquin River during flood events, thereby reducing downstream flood levels on the San Joaquin River for the urban areas of Stockton and Lathrop. In order for this bypass to operate as originally intended, improvements in Paradise Cut should accompany restoration of downstream channels such that the bypass water is safely conveyed through the system.

The downstream channel flow capacity has been reduced by years of sediment build up. The San Joaquin River is estimated to carry an average of 250,000 yards of sediment into the Delta annually. During the past few decades, channels in the South Delta are estimated to have had as much as eight feet of sediment deposited. Preliminary studies indicate dredging could remove an average of six feet of sediment that could then be used to strengthen levees.

Paradise Cut at the Twin Bridges

There are nearly 1.2 million cubic yards of site-specific dredging improvements that can be made in Old River, Middle River, Salmon Slough, and Grant Line Canal. Conducting this step will permit increasing flood flows down Paradise Cut, and achieve peak flow reduction in the San Joaquin River as indicated in *Figure 1*. *(Pg 1).*

San Joaquin River in Flood 1997

Erosion Protection Techniques

Based on past experience, channels within the South Delta require riverbank protection to:

- Protect levees;
- Stop the erosion and loss of riverside berms and the corresponding loss of habitat;
- Stabilize the river configuration so that the location of erosion points does not shift and then require new bank protection.

Eco-friendly techniques can be used when they provide desired flood protection without increased cost to the Reclamation Districts, to control and stop levee erosion and loss of riverside berms. This will simultaneously provide for enhancement and restoration of habitat values for both terrestrial and aquatic species. Mid channel islands can be redesigned and constructed as specialty wildlife mitigation banks and preserves.

Photo

Doughty Cut and Salmon Slough Islands

Photo

Little Tinsley Island

Doughty Cut at low tide

RD – 001 and RD – 2089 Land levee

Full page Center Fold Photo Map

Air Photo Map of the SDWA Rec. Districts to East
Show location of levee system improvements and dredging areas

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San Joaquin River Project Area –
Vernalis to Stockton

Sand benches within Paradise Cut just downstream of the San Joaquin River wier currently impede the flow of water into Paradise Cut during a flood event preventing more water from entering the bypass. As a result, more water remains in the San Joaquin River than what was originally intended by the Corps, thus impacting downstream urban areas. A proposal currently exists to remove the excess sediment and to set back the levees on the north side of Paradise Cut by 200-900 feet to accommodate the increased flows. This significant levee setback would allow increased water flows through Paradise Cut without increasing flood stages from Vernalis to Stockton. This can be done without an increase in flood stages by a combination of measures that facilitate the bypass flow. The measures include:

- Increasing the flow area of Paradise Cut below the weir by removing sand benches and setting back the right bank of Paradise Cut upstream of Interstate 5;
- Reducing flow restrictions at Interstate 5 and 205;
- Setting back levees along the right bank of Paradise Cut downstream of UPRR to minimize impacts downstream;
- Dredging the channels connecting Old River, Paradise Cut and Grant Line Canal.

The abandoned levee remnants adjacent to the setback levees will be converted to wildlife habitat islands that will provide high ground refuge during a flood event.

Figure 2.

Color Map of 1997 Levee Breeches and Flood Areas

Siegfried Engineering 1997 Flood Event Map

San Joaquin River levees from Vernalis through the South Delta were originally designed to safely convey a flow of 52,000 cfs as measured at Vernalis while maintaining three feet of clearance from overtopping. While the levee height and freeboard are generally adequate, levee design sections in some locations are substandard. Some levee slopes are too steep and levee tops are too narrow. Recent flood events such as 1997 [Fig.2.] show some levees are unable to withstand flows of 52,000 cfs, resulting in levee failures at less than 52,000 cfs. (See California Office of Emergency Services - FEMA).

The following interrelated levee, channel and eco-restoration improvements could be financed using Proposition 84 and 1E funding:

- Dredging the San Joaquin River from the Stockton ship channel south to Interstate 5 and 205 and use of the dredge spoils to raise and strengthen adjacent levees, Include eco-friendly levee stabilization and erosion control measures where feasible.

- Dredging the San Joaquin River from Intestate 5 south to the southern boundary of RD 2064 at the Stanislaus River mouth and use of the spoils to widen and strengthen existing levee sections.

- Dredging six to eight feet of material from the Stanislaus River one mile upstream from the confluence with the San Joaquin River and use of the spoils to raise and strengthen existing levees on the right bank.

Eco-Restoration in Conjunction with Levee Improvements

The following endangered and threatened species inhabit the San Joaquin River and its adjacent banks and islands. Levee and channel improvements can be constructed in a manner that can contribute to habitat preservation, restoration and improvement if taken into consideration through design.

Riparian Brush Rabbit

Delta Smelt

Wood Rat

Shaded Salmon Riverine Aquatic Habitat

Recent design innovations in flood control and levee improvement projects demonstrate that habitat enhancement and restoration can be designed as an integral part of levee improvements, providing ancillary benefits including erosion and sediment control. Projects sponsored by US Fish and Wildlife Service, the State Department of Water Resources, CalFed and California Fish and Game are being initiated throughout the Primary Delta. Lessons learned through those interrelated projects can easily be applied to this Conveyance and Eco-system and Eco-restoration Plan, especially in and south of Paradise Cut.

The CALFED Bay-Delta Program Multi-Species Conservation Strategy (July 2000) was reviewed to determine special-status wildlife and plant species and communities that are known to exist or could potentially exist within the South Delta area. The West Lathrop Specific Plan EIR identified 18 other special-status species that could potentially occur (nest, forage, over winter, etc.) along the San Joaquin River and Paradise Cut.

Thus, there are numerous opportunities within Paradise Cut, the San Joaquin River and Old River and the islands above Grant Line Canal for special-status species as part of the channel dredging and levee improvements. Species such as the wood rat and/or riparian brush rabbit, or plant species such as Elderberry shrubs for the Valley Elderberry Longhorn Beetle would be located so as not to interfere with the ongoing flood control maintenance requirements and in cooperation with the local Reclamation Districts. Programmatic safe harbor agreements would be compiled for Reclamation Districts and private landowners who participated, similar to the programmatic safe harbor agreement for VELB in the Lower Mokelumne River Watershed.

Valley elderberry long-horn beetle

Valley Elderberry Mitigation Bank Shrubs

Islands within Paradise Cut could become Mitigation Opportunities

Conclusion

The hurricane Katrina disaster has brought more awareness to California policy makers regarding the potential flood risk along the central valley rivers and in the Delta. Only a comprehensive plan which is designed to carry anticipated flood flows from the upper watersheds down and through the Delta will provide the necessary protection to the people and the property of the state. We believe this South Delta Water Agency Flood Conveyance and Eco-system Restoration Plan can provide the necessary guidance. Through the financing provided with “Propositions 50, 84 and 1E” a comprehensive plan integrating off-river floodwater storage, channel dredging and maintenance, levee flood control improvements and eco-restoration projects, such as outlined in the **South Delta Water Agency Flood Conveyance and Eco-system Restoration Plan,** can be implemented. It is the comprehensive plan that will provide the necessary flood protection, levee enhancement and stabilization desperately needed in the South Delta as well as address habitat concerns for threatened and endangered species**:** “A PLAN OF FLOOD CONTROL” combined with “A PLAN FOR ECO-RESTORATION”

South Delta Levees and the San Joaquin River System

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