

IV - INTERIM WATER CONTROL PLAN DURING CONSTRUCTION

4-01 General. During the entire construction period, Prado Dam will be operated to meet the following objectives in order of priority: 1) preserve dam safety; 2) provide flood control; 3) provide water conservation; and 4) facilitate construction inside the basin and in Reach 9 of the Santa Ana River project downstream. The operation during the entire construction period is divided into two main plans; Plan A - Using the Existing Outlet Works, and Plan B - Using the New Outlet Works. The progress of construction will dictate the activation of each plan as shown on the construction schedule on Figure 3-1. This document currently contains Plan A, which will be effective during construction stages 1, 2A, 2B and 2C. The document will be updated to contain Plan B prior to the start of construction stage 3.

The condition of the Santa Ana River channel downstream and possible construction activities occurring at the same time as the construction of Prado Dam could pose constraints to the operation of the dam. As a result, flexibility is included in the interim plan to allow the appropriate operation of the dam under any downstream condition. Section 4-02 describes the known possible causes of constraints.

4-02. Possible Downstream Channel Limitations. Possible limitations within the downstream Santa Ana River during the effective period of this interim plan are as follows:

a. Existing Santa Ana River Interceptor Line (SARI). The SARI line is a regional sewer pipeline that serves Orange, Riverside and San Bernardino Counties. Orange County Sanitation District (OCSD) owns and maintains the lower (downstream) 23 miles of the pipeline, from the Orange/San Bernardino County Line to the OCSD sewage treatment plant in Fountain Valley. The upstream most four miles of the OCSD's segment of the pipeline was constructed under the Santa Ana River, from the county line to the eastern boundary of the SAVI Ranch. The OCSD has reported that this segment may be damaged when outflows from Prado Dam into the lower Santa Ana River exceed

5,000 cfs. Outflows greater than 5,000 cfs will require monitoring of the downstream channel and the SARI line by OCSA, and adjustments to Prado Dam releases will be made as appropriate. Chapter 5 of this document contains the necessary notifications and coordination between the Corps and the local agencies.

b. Possible Construction Activities –Lower Santa Ana River Project (Reach

9). During some stages of the Prado Dam construction period, the final phase of the Lower Santa Ana River Project (Reach 9) could also be under construction. The channel capacity during this period could be limited and will vary depending on the progress of the Reach 9 construction. Critical outflow rates will be determined in each phase of the downstream construction, and adjustments to the Prado Dam releases will be made as appropriate.

c. Possible Construction Activities during the relocation of the SARI line.

The Orange County Sanitation District and the Santa Ana Watershed Project Authority are currently considering improvements to and realignment of the existing SARI line. Construction activities to implement these modifications could occur during the effective period of this interim plan. The channel capacity during this period may be limited and will likely vary depending on the progress of the SARI line construction. Critical outflow rates will be determined in each phase of the SARI line construction, and adjustments to the Prado Dam releases will be made as appropriate.

d. Bank Protection and Bridges within the Santa Ana River between Prado Dam and Weir Canyon Road. As a result of the recent completion of the lower Santa Ana River construction (Reach 1 to Reach 8), the available downstream channel capacity has increased from a minimum of 37,000 cfs starting at Weir Canyon Road up to a maximum of 47,000 cfs at its most downstream reach. This new capacity is more than sufficient to convey the outflow that can be physically made from the existing Prado Dam outlet works. However, in its current state, the Santa Ana River from Prado Dam to Weir Canyon Road (Reach 9) has never carried more than a 6,000 cfs release from Prado Dam and most likely would begin to suffer damage if flows were to exceed 5,000 cfs.

In addition to the items discussed in 4-02 above, areas where damage may occur include the reaches of existing bank protection, which is to be upgraded as part of the Reach 9 Santa Ana River Project, and the bridge crossing within the Green River Golf Course.

e. Construction of the Groundwater Replenishment System (GWRS)

Pipeline. This is a proposed joint project between the Orange County Water District and the Orange County Sanitation District to construct a facility for high quality recycled wastewater from the Advanced Water Treatment Facility in Fountain Valley south of the 405 freeway, to the Kraemer and Miller recharge basins lying northerly of Miraloma in Anaheim. This project proposes to install a steel pipeline, varying in size from 60-inch to 78-inch diameter and approximately 13 miles long. The groundwater recharge pipeline will be constructed in the westerly levee of the Santa Ana River for its entire length from the Advanced Water Treatment Facility to Highway 91, and along the Carbon Canyon Diversion Channel to the recharge basins. The estimated completion time for this project is in 2007. Currently, it is in the design phase.

4-03 Interim Water Control Plan. This interim water control plan (Plan A) was developed using the existing outlet works and is to be effective during construction stages 1, 2A, 2B and 2C. During construction stage 3, the plan will be updated to utilize the dam's new outlet works (Plan B).

a. Plan A - Using the Existing Outlet Works. This operation plan was developed based on the following: 1) the current approved water control plan as contained in the Prado Dam Water Control Manual, dated September 1994, 2) the April 1995 cooperative agreement signed by the Corps of Engineers, Orange County Water District and the U.S. Fish and Wildlife Service regarding seasonal additional water conservation, 3) the USFWS' Biological Opinion titled "Section 7 Consultation on the Prado Basin Water Conservation and Water Control Operations Project, Prado Basin, Riverside and San Bernardino Counties, California (1-6-99-F-75)", dated February 10, 2000, and 4) the construction activities as contained in the Santa Ana River - Phase II GDM, Volume II, Prado Dam, dated August 1988. Provisions were also made in

consideration of the possible construction activities and the condition of the lower Santa Ana River discussed in Section 4-02 above. This operation plan will be in effect during Prado Dam construction stages 1, 2A, 2B, and 2C (see Figure 3-1), during which time, the dam will be operated using the existing outlet works to provide water conservation benefits and flood control protection. Protection of the new outlet construction is to be provided by a cofferdam with a top elevation of 525 feet, NGVD. Overtopping the cofferdam would result in inundation of the new outlet works construction area.

Plate 4-01 shows the release schedule for Plan A - Using the Existing Outlet Works. Under “normal conditions”, the release rate is determined by the water control manager at the Reservoir Operation Center (ROC), Los Angeles District after close examination of the current hydrometeorologic conditions, the weather and runoff forecasts for the Santa Ana River Basin, the condition of the downstream channel, and the state of the on-going construction activities both at the dam and in the downstream channel. Available forecast methods are outlined in Chapter 6 of the current Prado Dam Water Control Manual, dated September 1994. It should be noted that the upper water surface elevations for each release range are “target” water surface elevations. Since weather and runoff forecasts are rarely 100% accurate, it is anticipated that the target water surface elevations will, at times, be exceeded without a corresponding change in release. Whether or not the water control manager deems it necessary to implement the next release recommended in the schedule will depend upon the magnitude of the encroachment into the next elevation range, the current weather and runoff forecast, and concurrent downstream conditions. The following paragraphs detail the operation schedule shown on Plate 4-01.

(1) WSE 460.0 - 490.0 (Debris Pool). (Release range: 0-600 cfs) The debris pool is allowed to fill prior to flood control releases in order to prevent debris from entering and plugging the outlet works. There are no seasonal restrictions for inundation of the debris pool. Releases from the debris pool are normally coordinated with the OCWD and are set equal to the spreading capacity of the downstream groundwater recharge facility.

(2) **WSE 490.0 - 494.0*/505.0 (Buffer Pool)**. (Release range: 200/500 - 5,000 cfs). The purpose of the buffer pool is 1) to ease the transition between small debris pool releases and relatively large flood control releases, 2) to facilitate downstream water conservation through groundwater recharge when it will not impact flood protection, 3) to simplify the lengthy notification process, and 4) to buy some time for downstream activities and interests to prepare for and recover from larger releases.

Due to the increasing need for water conservation and the presence of the endangered Least Bell's vireo (LBVI) within the Prado Flood Control Basin, buffer pool regulation differs during the winter flood season and the non-flood season as described below.

(i) **Winter Flood Season**. (1 October to 28 February; Release Range 200 – 5,000 cfs). During the Winter Flood Season, the top of the buffer pool is at elevation 494 feet NGVD. Within this pool, the appropriate release rate is calculated based on a real-time forecast of inflow volume. If it is expected that the buffer pool space will not be needed for flood control, the pool may be allowed to fill and the release rate adjusted in coordination with the groundwater recharge efforts of OCWD, with a normal minimum release of 200 cfs. If it is expected that the buffer pool space will be needed for flood control, the buffer pool will be evacuated with a maximum release rate of 5,000 cfs. If there is significant construction activity downstream, the water control manager has the discretion to moderate releases based upon an evaluation of the impacts to the construction versus the effect upon the level of flood protection provided by the project. If releases are increased to flow rates that could impact construction activities in the downstream channel, coordination with personnel responsible for the construction project(s) will be made in order to minimize damages. Prior to making potentially

* With the acceptance of the latest Water Conservation Feasibility Study, elevation 494 ft, NGVD may be increased to 498 ft, NGVD during construction of new Prado. Water conservation operation up to elevation 498 feet will be able to commence after (1) the Assistant Secretary of the Army for Civil Works approves the Prado Basin Water Supply Feasibility Study final report-environmental impact statement and signs the Record of Decision, and (2) all of the environmental commitments and implementation requirements are in place.

damaging releases, a channel observation team will be dispatched to key locations of the downstream channel, the unprotected areas of the on-going construction activities, and other areas susceptible to damage during large flows.

(ii) Non-Flood Season. (1 March to 30 September; Release Range 500 – 5,000 cfs). As agreed upon in the MOA signed in 1993 by the Corps, the USFWS and OCWD to increase water conservation, the size and operation of the buffer pool are modified during the non-flood season. Beginning on the 1st day of March, the allowable maximum reservoir water surface elevation is increased from water surface elevation 494 feet, NGVD to water surface elevation 505 feet, NGVD by the 10th of March, at a rate of 1.1 feet/day, or higher, at the discretion of the water control managers within the Reservoir Operation Center (ROC). The decision will be based on, but not limited to, the following: 1) the condition of the dam, 2) the current reservoir status, 3) forecasted inflow, 4) the capacity/condition of the downstream channel, and 5) on-going construction activities both in the channel and at the dam site. The reservoir elevation may be maintained as high as WSE 505 feet, NGVD, until 31 August, provided that hydrologic forecasts and reservoir conditions do not indicate that reservoir elevation will rise above elevation 505 feet, NGVD. This operation helps to prevent the endangered least Bell's Vireo (LBVI) from nesting and rearing their young within the reservoir area below elevation 505 feet, NGVD. Nesting season for the LBVI usually starts in the middle of March and lasts until late summer. The operation of the dam in this range is dictated by the agreement among the USFWS, the Corps and the OCWD as contained in the 2000 Biological Opinion:

“Because the paragraph 9 of the 1995 Cooperative Agreement was found to be inconsistent with the physical and operational capabilities for Prado Dam, the Corps revised the minimum release rates during the non-flood season. During the period from March 1 – September 30, the release rates when the pool is between 494 feet and 505 feet may range from 350 cfs to 650 cfs provided the running average outflow is always greater than or equal to 500 cfs. Release rates tend to be higher at the

beginning of the season and taper off toward the end of the season. Therefore, the running average for the period from March 1 – September 30 when the pool is between 494 feet to 505 feet would tend to start above 500 cfs and gradually approach 500 cfs as the season progresses. In addition, when the OCWD spreading capacity exceeds 500 cfs, the outflow from the dam will be increased up to a level of the recharge capacity of the OCWD downstream recharge basins.”

However, if, based on observed precipitation, hydrologic forecasts and reservoir conditions indicate that the WSE will exceed 505 feet because high inflow, the water control manager at the ROC will match inflow with outflow, up to 5,000 cfs to prevent the reservoir from exceeding elevation 505 feet, or an elevation within 3 feet of the elevation of the lowest occupied vireo nest located lower than 505 feet. OCWD shall furnish the elevation of the lowest located vireo nest to the Corps Reservoir Regulation Section and shall update this information as necessary throughout the vireo nesting season (15 March – 31 July). If vireo nests can be relocated to a higher position, the level of the water surface can be raised to an elevation no higher than 3 feet below the elevation of the lowest located nest, to a maximum elevation of 505 feet. If no occupied nest exists below 505 feet, water can be held to 505 feet as long as the lowest vireo nest is located no lower than 506 feet. If a pool elevation of 505 feet is exceeded, the dam releases at the maximum non-damaging rate (i.e., 5,000 cfs) will be maintained until the pool level has declined to 505 feet.

Typically, if sufficient inflow is available, the water conservation pool is incrementally raised (per 1994 Water Control Plan and adjusted operations for water conservation) from 494 feet to 505 feet between March 1 and March 10. However, if the reservoir is empty and an impending storm may fill the water conservation pool after March 10, the

Corps will contact the Service and OCWD to coordinate the movement of vireo nests, if necessary.

The months of July, August and September are designated for maintenance purposes. However, if summer flood runoff occurs during these months, the dam can be operated to store water for water conservation up to WSE 505 feet, provided that the impoundment does not interfere with the maintenance requirements.”

(3) WSE 494.0/505.0 - 520.0. (Nominal Release: Up to 10,000 cfs).

Within this pool, the appropriate release rate is calculated based on a real-time forecast of inflow volume. If the water surface elevation within the reservoir is not forecast to reach elevation 543 feet NGVD, then releases will match inflow up to 5,000 cfs with the goal being to have the reservoir pool at the top of the buffer pool at the end of any forecast flood event. However, if inflow forecasts indicate that the reservoir water surface may reach spillway crest (543 feet, NGVD), releases will be increased up to 10,000 cfs. Prior to making releases greater than 5,000 cfs, channel observation and hydraulic verification teams will be dispatched to key locations of the downstream channel, areas of concern within the on-going construction activities, and other areas susceptible to damage during large flows. Although protecting the downstream construction is of secondary importance, the water control manager has the discretion to adjust releases based upon an evaluation of the impacts to downstream interests versus the effect upon the risk to construction protected by the cofferdam within the basin and the overall level of flood protection provided by the project.

If necessary, a dam safety inspection team will be dispatched to monitor the condition of the dam embankment and the cofferdam. During recession, the resulting maximum release shall be maintained for as long as necessary in order to safely evacuate the excess reservoir pool as quickly as possible. Note that the design capacity of the stilling basin is 10,000 cfs.

(4) WSE 520.0 – 525.0 feet, NGVD (Nominal Release: Up to 10,000 cfs). Within this elevation range, the appropriate release is calculated based on real-time forecast of inflow volume. If the water surface elevation is forecast not to exceed 525 feet and overtop the cofferdam, limit the release to a maximum of 5,000 cfs. However, if the forecast indicates that the water surface elevation will exceed 525 feet while outflow is kept at 5,000 cfs, the water control managers will need to evaluate the benefits and risks and consider increasing the outflow as necessary to prevent overtopping the cofferdam. Prior to making releases greater than 5,000 cfs, channel observation and hydraulic verification teams should be dispatched to key locations of the downstream channel, areas of concern within the areas of on-going construction site, and other areas susceptible to damage during large flows. Although protecting the downstream construction is of secondary importance, the water control manager has the discretion to adjust releases based on the evaluation of the impacts to downstream interests versus the risk to construction protected by the cofferdam within the basin and the overall level of protection provided by the project.

The maximum design capacity of the existing Prado outlet works is 10,000 cfs. If a decision is made to exceed this release rate, extreme caution should be used. A dam safety inspection team should be present at the site to monitor the condition of the outlet works and dam embankment whenever releases greater than 10,000 cfs are made. Note that the maximum possible release rate within this elevation range is dictated not by the outlet gates, but by the two conduits, and it ranges from 14,140 cfs at elevation 520 feet, NGVD to 14,800 cfs at 525 feet, NGVD. During recession, the resulting maximum release shall be maintained for as long as necessary in order to safely evacuate the excess reservoir pool as quickly as possible.

(5) WSE 525.0 - 543 feet, NGVD (Nominal Release: Up to 10,000 cfs). Pool elevations greater than 525 feet, NGVD overtop the cofferdam and subject the upstream construction site to flooding. If there is a reasonable expectation that spillway flow will occur, the resulting maximum release from the previous elevation range will be maintained in order to minimize the maximum forecasted spillway flow from the dam.

As with the lower pool elevation ranges, the water control manager maintains the discretion to adjust releases based upon an evaluation of the impacts to downstream interests versus the effect upon the risk to the overall level of flood protection provided by the project. The maximum release rate physically possible within this elevation range is from 14,100 cfs to 17,000 cfs.

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(6) WSE 543 and above (Spillway Flow). Once elevation 543 feet, NGVD is reached, the operation of the dam shifts to primarily minimize the possibility of overtopping the dam, which could lead to a dam failure. If overtopping of the embankment or dam break is not imminent at the low end of this elevation range, the outlet gates can be operated in conjunction with the spillway to maintain the resulting maximum outflow prior to spilling, in order to minimize flood damages downstream. With all gates closed, spillway flow discharge of 5,000 cfs is reached at water surface elevation 544.30 feet, NGVD; 9,200 cfs at elevation 545.00 feet, NGVD; and a discharge of 17,000 cfs at elevation 545.97 feet, NGVD. As the water level approaches the spillway crest elevation, frequent communication between the ROC and the dam tender is necessary so that gate adjustments can be made to transfer reservoir outflow from the outlet works to the spillway. Under the extremely remote circumstance that the embankment is in danger of overtopping, or if a dam failure is imminent, the outlet works gates are to be set to their maximum opening of 12 feet in order to minimize the possibility of a dam break.

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safety inspection team should be present at the site to monitor the condition of the outlet works and dam embankment whenever releases greater than 10,000 cfs are made. During recession, the resulting maximum release shall be maintained for as long as necessary in order to safely evacuate the excess reservoir pool as quickly as possible.

4-04. Channel Observation Teams. If it is expected that damaging releases will be made, channel observation teams will be dispatched by OCPF&RD and/or the Corps to observe the hydraulic performance of the channel and report channel conditions to the ROC. The water control manager at the ROC gives instructions and directs the channel observation teams to the channel reaches that need to be observed. As releases from the dam are cut back, the water control manager in the ROC will decide on when to terminate observation of the downstream channel.

4-05. Rate of Release Change. Based upon operational experience, the maximum permissible rate of release changes shown below are followed under normal operating conditions. Since the interim operation plan contained in this manual requires the presence of channel observation teams when critical releases are made from the dam, the permissible rate of release changes can be modified during flood operations, as necessary, depending on the observed condition of the channel. Each gate adjustment should be carefully coordinated with the channel observers.

**Table 4-1
Suggested Rate of Release Change
Prado Dam**

Current Rate of Release (cfs)	Maximum Rate of Release Change per ½ Hour (cfs)
0 – 300	100
300- 1,000	250
1,000 – 2,500	400
2,500 – 5,000	625
>5,000	750

4-06. Level of Protection. The highest water surface elevation ever recorded at Prado dam was at elevation 528 feet, NGVD in February 1980. During the construction of the new outlet works, a cofferdam with a crest elevation of 525 feet, NGVD will be constructed to provide a 40-year level of protection to the construction area.

4-07 Flood Emergency Action Plan. As stated in Design Memorandum No. 1, Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Volume 2 - Prado Dam, dated August 1988, in the event an evacuation of the downstream areas becomes necessary, the existing Flood Emergency Plan, dated November 1985, will be followed. This document also covers identification of impending and existing emergencies, notification of other parties about impending or existing emergencies, emergency operations and repairs, and post earthquake response procedures. Downstream areas potentially subject to inundation are identified by a set of inundation maps for the case of dam failure with the reservoir at full capacity. Further details on the Flood Emergency Action Plan are provided in section 5-02.