

VII - WATER CONTROL PLAN

7-01 General Objectives. San Antonio Dam was originally designed and built as a single purpose flood-control facility. Flood protection is provided for the downstream cities of Upland, Claremont, Montclair, Pomona, Ontario, and Chino. Normally, San Antonio Dam is operated independently of other flood-control facilities within the Santa Ana watershed. Floodwaters are released as soon as available downstream channel capacity permits. In addition to flood-control, San Antonio Dam is operated for water conservation during periods of favorable weather and runoff forecasts. The channel capacities are schematically illustrated on pl. 4-12. Allocation of storage is depicted on pl. 7-01.

7-02 Major Constraints. The following constraints impact the regulation of San Antonio Dam and Reservoir:

a. Inadequate Downstream Channel Capacity.

(1) In 1966 the San Bernardino County Flood Control District requested that they be allowed to connect the West State Street Drain to San Antonio Creek. The Corps required that the SBCFCD agree to have the Pomona Valley Protective Association (PVPA) divert 900 cfs from San Antonio Creek during times of flood releases to compensate for the West State Street Drain's additional flows to San Antonio Creek. The minutes of December 19, 1966 of the San Bernardino County Board of Supervisors assures the Corps of Engineers that "the gates controlling the diversions of 600 cfs and 300 cfs into San Antonio spreading grounds will be kept open at all times during the occurrence of the channel design flood and to maintain capacity of the spreading grounds at all times to provide said flow".

(2) The Los Angeles District Hydrology Section's San Antonio Creek and Chino Creek Channel Updated Hydrologic Study, dated 1 April 1986, has demonstrated that, due to the increased urbanization downstream of San Antonio Dam, portions of the downstream channel are no longer capable of carrying either the 100-year or SPF flood events. The information developed was used for formulating policy regarding allowances of additional drains into the channels of San Antonio and Chino Creeks. At this writing the San Bernardino County Flood Control District is preparing a Master Drainage Plan for San Antonio and Chino Creeks. One of the primary purposes of the Master Drainage Plan is to accurately identify which portions of the channel are currently undersized so that corrective measures can be undertaken.

b. Roll Waves. A series of roll waves will form at low to moderate releases (i.e., releases 2,000 cfs). The roll waves cause over pressures to form at the (Sta. 1030+00) water-conservation diversion structure. This diversion should be monitored for damage during and after releases. Should damage occur to the diversion or channel an assessment should be made on the effects of future releases from San Antonio Dam.

7-03 Overall Plan for Water Control. Exhibit B is the Reservoir Regulation Schedule for San Antonio Dam. San Antonio Dam is operated to protect the communities along San Antonio and Chino Creeks from floods. In general, the

operational emphasis is to release stored water as quickly as possible without exceeding downstream channel capacity, thereby maintaining the greatest amount of flood-control space available for subsequent storm events. Reservoir releases for water conservation will be made in coordination with Los Angeles County Flood Control District, who co-ordinate requests from water agencies, between elevations 2,164 and 2,176 ft., whenever the forecasted reservoir stage will not exceed elevation 2,176 ft., and the weather and runoff forecasts are favorable. Reservoir releases from the debris pool will be made consistent with PVPA's capability to recharge the releases for water conservation through groundwater recharge.

Water conservation regulation between 2,176 ft and 2,164 ft is permitted because the reservoir storage space required for flood control can be recovered very quickly if needed to control subsequent inflows. With an average release of 8,000 cfs, the reservoir can be drawn down from 2,176 to 2,164 in 1-1/2 hours, assuming no inflow.

During the early stages of an inflow event, the stand-by setting of 0.3 ft, is maintained until a debris pool is formed at elevation 2,164 ft. From 2,164 ft. to 2,170 ft., the gates are opened as indicated on Exhibit B, increasing the outflow from 80 cfs to 5,030 cfs. Above elevation 2,170 ft., an average release of 7,500 cfs is maintained with the maximum release capped at 8,000 cfs. During falling stages the schedule is followed in reverse to elevation 2,176 ft., at which time a decision can be made to continue flood-control releases or go off-schedule for water-conservation regulation (Exhibit B). During water conservation operations, releases from San Antonio Dam are coordinated with the Los Angeles County Flood Control District. The determination to either commence or cease incidental water conservation operations is made by the LAD.

The Santa Ana River Real-Time (SARRT) runoff forecast model can be used to aid LAD personnel in determining the appropriateness of continuing scheduled flood control releases or commencing water conservation operations.

7-04 Standing Instructions to the Project Operator. The standing instructions to the project operator for regulation of San Antonio Dam and Reservoir are given in Exhibit A. During periods of normal communications, the dam tender will receive operating instructions from the Reservoir Operation Center, located at the District Office in Los Angeles. In the event that communications with the ROC are interrupted, the dam tender should follow the standing instructions in Exhibit A.

7-05 Flood-Control. The regulation of San Antonio Dam for flood control is described in this section. After major flood events, the reservoir regulation schedule should be reevaluated to determine if modifications to the schedule should be made to better protect the downstream communities and avoid spillway flows.

The reservoir regulation schedule, presented in para. 7-03 and Exhibit B, was formulated to pass inflow through the dam as quickly as possible, without exceeding the downstream channel capacity of 8,000 cfs. In this manner flood control storage space is maintained at a maximum in order to handle succeeding

flood inflow events. Reservoir releases will be reduced whenever downstream channel capacity is exceeded, or anticipated to be exceeded, due to the combination of reservoir release and locally heavy precipitation and runoff downstream of the dam. Specific actions related to the downstream channel capacity are:

a. The downstream gage on Chino Creek (ALERT Gage 819) should be monitored during flood releases. The channel design capacity at the gage is 17,000 cfs. If this flow is exceeded, releases from San Antonio Dam should be reduced accordingly.

b. Any reports of bank overtopping along San Antonio and Chino Creeks should be heeded and releases from San Antonio Dam reduced accordingly.

c. The SARRT water control system can be used by ROC personnel to forecast inflows to San Antonio Dam. Using the forecast information, operational decisions regarding current or anticipated releases from San Antonio Dam can be enhanced.

San Antonio Dam is a component of the Santa Ana River watershed. Releases from San Antonio Dam flow into Prado Reservoir located 15.7 miles downstream. The two reservoirs are normally regulated independently of each other. During extreme events, such as the 1980 flood, San Antonio Dam was operated off-schedule so as to achieve the basin-wide flood-control objectives of the entire Santa Ana River Reservoir system.

In the event of imminent spillway flow, the dam tender should be requested to report to the ROC with reservoir stage (staff) observations at frequent intervals. The operational objective at this point is to maintain a total combined release (outlet plus spillway) releases of 8,000 cfs. When the spillway flow from the dam exceeds 8,000 cfs, all gates should be closed.

The reservoir regulation schedule (Exhibit B) is applicable for the rising and falling limb of a flood event. Below elevation 2,176 feet the ROC has the option of going off-schedule, for the purpose of cooperating with PVPA water conservation operations, if runoff and weather conditions are favorable.

7-06 Recreation. There is no allocation of storage for recreation within San Antonio Dam and hence there are no recreation related releases scheduled for San Antonio Dam. The downstream channel is a rectangular concrete lined channel and is not suitable for recreational use.

7-07 Water Quality. San Antonio Creek upstream of San Antonio Dam drains the undeveloped, rugged, and mountainous San Antonio Canyon. Although the water quality of the runoff is relatively free of man-made pollutants, the runoff does carry a substantial debris load. Debris sizes vary from fines to boulders, which are carried down the canyon.

The Corps does not monitor the water quality in or through the San Antonio basin. San Antonio Reservoir does not normally maintain a pool except during flood events.

7-08 Fish and Wildlife. San Antonio Reservoir maintains no fisheries or wildlife sanctuary. The absence of a permanent pool and the on-going maintenance activity within the reservoir precludes the existence of either a fishery or wildlife sanctuary.

7-09 Water Supply-Drought Contingency Plan. The only Congressionally authorized purpose for San Antonio Dam is flood-control. It is, however, the policy of the Corps to assist local agencies in the conservation of water to the maximum extent possible without compromising the flood-control mission of a project. In the enclosure to accompany the Survey Report for San Antonio Creek and Chino Creek, California, Flood Control, April 15, 1938, paragraph 28, page 28, of the basis of design reads as follows:

"28. Water Conservation.--The use of the San Antonio Basin to assist in water conservation is anticipated. It is proposed to provide two outlets in the dam for diversion to the spreading grounds on each side of the channel downstream from the dam."

During water conservation operation, releases are coordinated with the Los Angeles County Flood Control District. Chino Basin Water Conservation District and PVPA operate spreading grounds downstream of San Antonio Dam in both Los Angeles and San Bernardino Counties. The operation of San Antonio Dam for water conservation augments the quantity of water available to the Chino Basin member agencies. The Corps, however, does not control the quantity of water diverted by the PVPA nor does it control the end use of the diverted water. PVPA has and continues to have the option of diverting or not diverting water at any time except during an extreme flood event, as per San Bernardino County Flood Control District's commitment (See Section 7-02-a-(1)). In May 1991 we contacted the Pomona Valley Protection Agency to update the water spreading capacity of their facilities. Their head of operation, Mr. Cecil McAlister, informed us that their 1983 operation experience indicated that their basin infiltration capacity is limited to 450 cfs on the east side and is limited to 200 cfs on the west side of the San Antonio Channel. The major limiting factor is groundwater percolating into the aquifer from the backyards of nearby residential homes.

7-10 Hydroelectric Power. There are no hydroelectric power plants at San Antonio Dam.

7-11 Navigation. The San Antonio Creek is not suitable for any navigation.

7-12 Other.

a. Debris Removal Operation. The original design sediment inflow rate for San Antonio Dam was 67 ac-ft/yr. The July 1969 survey indicated that for the period from May 1956 to July 1969 the actual inflow sediment rate was 119 ac-ft/yr (i.e., 78 percent greater than expected). In an effort to compensate for lost flood-control storage due to the actual sediment inflow, a debris removal operation was begun in 1972. Based on 1990 survey data, the storage volume at top of dam elevation (2,260 ft.) is 11,992 ac-ft compared with the 1956 data of 12,719 ac-ft. The net capacity is that storage level at which the sediment allowance (2,000 ac-ft) is completely filled. Plate 7-02 compares the original gross and net storage capacities with the 1990 survey data for the San Antonio Reservoir.

The debris removal operator projects removal of an additional 1,860 ac-ft of material over the next 4 years. This would reflect a 24 percent increase in flood-control storage. It should be noted that these projections do not account for any debris inflows over the next 4 year period.

b. High Groundwater. A series of years with above average precipitation and runoff produces high groundwater conditions in the communities immediately downstream of San Antonio Dam.

The degree to which local spreading operations have contributed to the high groundwater problem has been an item of contention. It should be noted that although the water used in the spreading operations is diverted from San Antonio Creek, the Corps does not control the quantity of water diverted or the end use of the diverted water. The PVPA controls the diversion of flows leaving the San Antonio Dam.

7-13 Deviation from Normal Regulation. As previously discussed in Sections 7-05 and 7-09, deviations from the reservoir regulation schedule as presented in Exhibit B may be desirable or necessary at times. In addition to the previously discussed situations the following deviations can also be considered by the ROC.

a. Emergencies. Emergencies may take the form of drownings or other accidents, chemical spills, and failure of operation facilities. Necessary action should be taken immediately, so long as this does not create a worsened overall condition. In any action taken, assessment of the situation by the dam tender should rely on his knowledge of the dangers involved. The Reservoir Operation Center, LAD, and the Water Control Center of South Pacific Division should be informed of any deviations due to emergencies as soon as practical.

b. Unplanned Minor Deviations. Instances arise where there is a need for minor deviations from the normal regulation of the reservoir, although they are not considered emergencies. Construction activities are the primary source of these deviations. Downstream maintenance of culverts and channel sections are another reason for minor regulation changes. Each request is analyzed on its own merits. Consideration is given to the potential of flooding and possible alternative measures. Approval for these minor deviations should be obtained from the Reservoir Operation Center, LAD, and should also be coordinated with approval from SPD.

c. Planned Deviations. There are planned instances which require deviations from normal regulation. Each condition is to be judged on its own merits. One possible deviation may involve impounding water for the purpose of making test releases to correlate the gate rating curves with measured outflow. Request for planned deviations would most likely originate from either the Reservoir Operations Center, LAD or the San Bernardino County Flood Control District. Any planned deviations would require the approval of the Reservoir Operations Center, LAD, as well as approval by the Water Control Center of South Pacific Division.

7-14 Rate of Release Change. The outlet gates consist of three 5'8" x 10'0" rectangular slide gates operated by hydraulic cylinders. The adopted design

is an improved design based on results of the full scale tests made by the Corps of Engineers at Norfolk Dam in April 1948. These tests indicated that if the gate leaf and liners were shaped as shown on Drawing, O.C.E. 72/2 (Rev. 20 Aug. 1947), "Typical Slide Gate Details", gate chatter at partial openings would be reduced to a minimum. Further stabilization of movement of the gate leaf has been assured by specifying tight fitting piston rings and careful finishing of the inside of the hoist cylinder, and by adding a counterbalance valve to the oil lines between the upper and lower ends of the cylinders. The weight of the moving parts of one gate is around 14,000 pounds. The three hydraulic gates at San Antonio Dam move at a rate of 1 ft/min. The dam tender can operate one gate at a time in succession, operating controls on one until the desired setting is reached, then operating the adjacent gate. The concrete lining of the downstream channel precludes concern over bank erosion or sloughing, or rate of change of outflow.

7-15 Water Control Planning Tools. Specific planning tools have been utilized in the development of the water control plan. These tools are also used to evaluate and regulate planned deviations, and also facilitate operation of the dam during emergencies and unplanned deviations. Water control planning tools used for San Antonio Dam include:

- a. Outlet Rating Curves (pl. 2-05).
- b. Spillway Discharge Curve (pl. 2-08).
- c. Area-Capacity Tables (pl. 2-11).
- d. Downstream Channel Capacity Plate (pl. 4-12).
- e. SARRT Water Control System (Sec. 6-02; pl. 6-02, 6-03).