III - HISTORY OF PROJECT

3-01 Authorization. San Antonio Dam and the San Antonio and Chino Creek Improvements Project was authorized by P.L. 761 of the 75th Congress, 3rd Session which was approved on 28 June 1938. Under Section 4 of P.L. 761, the Act reads:

SANTA ANA RIVER BASIN

> The project for flood control in the Santa Ana River Basin of California, authorized by the Act of June 22, 1936 (Public, Numbered 738, Seventy-fourth Congress), is hereby modified to provide for the control of floods on San Antonio Creek and Chino Creek in accordance with plans approved by the Chief of Engineers pursuant to preliminary examinations and surveys authorized by the Act of August 28, 1937 (Public, Numbered 406, Seventy-fifth Congress), and for the initiation and partial accomplishment of these plans there is hereby authorized $6,500,000.

3-02 Planning and Design. Historically San Antonio Creek has been noted for its flash floods that transport large quantities of debris. Prior to authorization of the San Antonio Dam by Congress, the Corps (District Engineer) conducted a public hearing at Riverside, California, on February 25, 1938. Representatives from San Bernardino, Riverside, and Orange Counties as well as representatives from other interested agencies attended the hearing. The purpose of this public forum was to obtain the views of the local interests on the nature of protection to be included in the project. A preliminary plan was formulated that called for debris control with some channel improvement having an estimated cost of $1,260,000. On March 2, 1938, only five days after this public meeting a major storm hit the area inflicting damages estimated at $1,687,000 and disrupting the mainflow of east-west traffic for a period of 30 to 60 days. This storm demonstrated the need for more extensive and costly improvements than those proposed by the local interests. The June 28, 1938, authorization by Congress provided $6,500,000 for the initial and partial development of flood control plans, design, and construction. Subsequently, through a series of public hearings (June 17, 1939 at Ontario, California, November 21, 1939 at San Bernardino, and February 21, 1940 at Ontario) the essential elements of the current flood control plan were developed. Both the Los Angeles and San Bernardino County Flood Control Districts participated in the planning process.

Planning, analyses, and design activities slowed appreciably during the years of World War II. By 1951 preliminary planning and analyses were completed and a cost was submitted to Congress. In 1952 a revised cost estimate incorporating some minor changes was submitted to Congress. By June of 1953 ninety-nine (99) percent of planning and design were completed. Contract plans and specifications for the embankment, spillway, and outlet works were also finalized at this time.

3-03 Construction. Construction of the Dam (outlet works) was initiated in April 1952. The embankment, outlet works and spillway were essentially completed by November 1, 1955. The Dam was officially completed on May 1, 1956. The funds appropriated for completing the Dam were $8,351,000. Construction on the San Antonio and Chino Creek channels started in 1956 and was completed in 1960. The appropriation for completion of the channel improvements was $11,473,000.

3-04 Related Projects. San Antonio Dam was authorized as part of the Santa Ana River Basin flood protection program. Other Corps projects (pl. 3-01) which aid in flood-control within the Santa Ana River Basin included Prado Dam, Carbon Canyon Dam, and Villa Park Dam. Prado and Carbon Canyon Dams are Corps projects. Villa Park Dam is maintained and operated by OCEMA. Prado Dam is the largest and most directly related to San Antonio Dam. Floodflows released from San Antonio Dam join Chino Creek and flow into Prado Reservoir. Releases from San Antonio Dam are therefore coordinated with the operation of Prado Dam during flood periods. Another basin east of San Antonio Creek that contributes to the Prado Reservoir inflow is the Cucamonga Creek Basin, (see figs. 3-01 and 3-02). A Corps project the flood control improvements for Cucamonga Creek and its tributaries Demens Creek, Deer Creek, Hillside, and San Antonio Diversion System consist of ten debris basins and about 27 miles of concrete lined rectangular, and trapezoidal channels. A debris basin was constructed at the headwater of Cucamonga Creek, Demens Creek, Deer Creek and at Hillside, and six debris basins were provided at the canyons consists of 54,800 feet of rectangular channel, 20,700 feet of concrete-lined trapezoidal channel and 1,700 feet of covered double box section under the Ontario International Airport. The Demens Creek channel is rectangular in cross section and approximately two miles in length. Deer Creek (8-mile-long) and its tributary Hillside Channel (one-mile-long) are also rectangular in cross section with reinforced concrete lining. The diversion channel of the San Antonio Heights Diversion System is also a reinforced rectangular channel with a length of approximately one mile.

3-05 Modifications of Regulation. Plans for regulating flows at San Antonio dam have not changed significantly over the life of the project. The following sections discuss the initial (ultimate) plan, an interim plan, and the current plan. (Exhibit B.)

a. 1951 Initial (Ultimate) Plan. The ultimate plan of operation to regulate floodflows was prepared and presented in "Definite Project Report on San Antonio and Chino Creeks, San Antonio Dam", October 1951. The plan was proposed for use after the completion of the San Antonio and Chino Creeks improvements. The plan called for controlling the flood inflows up to the spillway crest with a maximum release of 8,000 cfs (downstream channel capacity). Under the plan, a debris pool is developed to elevation 2,164 by limiting releases. Above 2,164 the outflow is gradually increased until at elevation 2,185 a discharge of 8,000 cfs is reached. This discharge is maintained at high pool levels by gradually closing the gate outlets, thereby transferring the flow to the spillway. During falling stages, the gate setting for the maximum elevation attained (up to the spillway crest) remains unchanged until elevation 2,164 is reached. At this elevation the gates are adjusted so that outflow is approximately equal to inflow.

b. 1951 Interim Plan. In order to minimize flood damage, an interim plan was formulated for use until the downstream San Antonio Creek and Chino Creek channel improvements were completed. Under this plan, a debris pool would be maintained to elevation of 2,164 (gross storage 1,590 acre-feet). At that level, outflow would approximately equal inflow until an inflow of 480 cubic feet per second occurred. At this point, the gate operation schedule would be followed. In this schedule, outflows would be increased to 1,000 cubic feet per second at elevation 2,166. This outflow would be maintained up to elevation 2,234. At this elevation, the outflow would be increased to 3,000 cubic feet per second and maintained as long as possible. Above elevation 2,238, the gated outlets would be closed gradually, transferring flow to the spillway. During falling stages, the gate setting for the maximum water surface attained, up to the setting at spillway crest, would remain unchanged until the water surface fell to elevation 2,164. At elevation 2,164, the gates would be operated so that outflow equals inflow. Deviations from the fixed schedule could be made to secure better operation as indicated by forecasts or to reduce flows due to unforeseen circumstances downstream.

c. 1957 Revision. Additional hydrologic information and the development of refinements in hydrologic methods resulted in the development of a revised reservoir design and spillway design floods. These revised design floods caused the "ultimate plan" to change slightly. Instead of reaching a maximum discharge of 8,000 cfs at WSE 2,185 feet, the 1957 revision reached the maximum design discharge of 8,000 cfs at WSE 2,175 feet. The "ultimate plan" would go into effect only after the completion of the San Antonio and Chino Creeks Improvement Project (i.e., Dec. 1960).

Meetings between the Corps and LACFCD, SBCFCD, and the PVPA resulted in the creation of a water-conservation operation plan. The water-conservation plan consisted of (1) a separate three step gate schedule for use below the debris pool (WSE 2,164 feet) and (2) the allowance of water-conservation storage between the debris pool and WSE 2,176 during the receding limb of a flood event; and when weather and runoff forecasts are favorable. The storage corresponding to a water surface elevation of 2,176 is approximately 10 percent of the flood-control storage space.

d. 1982 Operation Schedule. The operation schedule established in 1982 required zero releases up to elevation 2164. Between 2169 and 2170 all gates were gradually opened to release between 600 to 5030 cubic feet per second (cfs). Above elevation 2170 the flood control releases are adjusted between 7500 to 8500 cfs. All gates are slowly lowered as the dam experiences spillway flow such that total outflow does not exceed 8500 cfs.

e. 1991 Operation Schedule. With the extensive urbanization in the drainage basin downstream of San Antonio Dam maximum releases are limited to 8,000 cfs from San Antonio Dam. Controlling releases to the exact 8,000 cfs channel capacity of San Antonio and Chino Creeks Channel is needed for protection of downstream urban areas where side inflows from new storm drains impact upon freeboard space in some reaches of the channel. Therefore, the 1982 reservoir regulation has been altered such that releases above elevation 2170 are limited to between 7,000 and 8,000 cfs. The 1991 Operations Schedule is shown on Exhibit B.

An SPF flood routing was performed with the 1991 operation schedule and the original net storage data. This routing resulted in a maximum water surface elevation of 2231.92, which is about 6 feet below the spillway crest (2238 ft). Based on 1990 survey data this 6 feet of space translates to 866 ac-ft available for emergency flood control.

3-06 Principal Regulation Problems. Following are some past, existing, and/or potential problems associated with regulating the flow at San Antonio Dam:

a. Following the high precipitation and runoff years of 1978-1983, high groundwater was a problem for downstream communities. The downstream communities have, in the past, associated high groundwater conditions with the Corps alleged groundwater recharge activities. It should be noted that the Corps does not operate any recharge facilities. Any water diverted from San Antonio Creek Channel for any purpose is done by either the PVPA or the Chino Basin Water Conservation District. The Corps has no jurisdiction in controlling the quantity of water diverted from San Antonio Creek Channel.

b. An updated Hydrology Report (April 1986) prepared by the Corps indicates that the downstream San Antonio Creek Channel and Chino Creek Channel have less than 100-year flood protection capacity. This deficiency is due to increased urban runoff from the highly urbanized areas below the dam. In the event of a major flood event, flood releases from San Antonio Dam may need to be cut back to avoid or minimize downstream flooding.

c. Roller waves set-up in the channel upstream of the diversion works for the San Antonio spreading grounds. The second westward PVPA diversion (2 gates at 4' x 4') is greatly impacted by the waves, especially at flows of around 2,000 cfs. The force of the waves hitting the headworks has created pressures large enough to blow off the diversion's manhole cover. The PVPA maintains that the wave problem has to do with channel design and all they can do when the waves set-up is request adjustment to the release rate of the dam.

d. Seepage Problems. Seepage and boils were observed along the downstream toe of San Antonio Dam during high pools in 1983. Similar problems had been observed before. Because of these conditions it was recommended, after proper evaluations, that a toe drain be designed and constructed along the downstream toe of the embankment to control underseepage and eliminate the boils. The toe drain was designed in 1983 and constructed in 1985. Three observation wells were also installed in 1985 to monitor and evaluate the performance of the toe drain.

e. Toe Drain Evaluation. Since completion of the toe drain the maximum water surface in the reservoir was at elevation 2156 feet which occurred on 21 February 1986. The gate sill elevation is 2125. Readings from the observation wells, were taken on the 21 February 1986, they indicate that the surface of the groundwater was below the invert of the toe drain which makes it impossible to evaluate performance of the toe drain due to the lack of hydrostatic head. It is estimated that seepage will occur in the toe drain when the reservoir pool is above elevation 2175 feet. For location of observation wells, see figures 5-01 through 5-05.

f. The San Antonio Land and Water Company's water lines passes through the east abutment of the Dam. A manhole cover, covering one of the standpipes, was removed by vandals prior to the 1980 flood. As floodwaters rose, the open standpipe filled causing problems downstream.

g. In December of 1966, a Mr. Scheller was killed as Moreno Road in Montclair was washed out when the PVPA spreading grounds spilled. PVPA was notified of releases from San Antonio Dam, but failed to act on the notification.

h. In December of 1966, the San Bernardino Board of Supervisors passed a resolution which requires the PVPA to accept 900 cfs through their diversion structures during a standard project flood. In exchange for this agreement, the Corps would allow the San Bernardino County Flood Control District to attach the west State Street drain to San Antonio Creek Channel. This agreement has never been acted upon by the Corps.

Currently, the PVPA is incapable of accepting 900 cfs during a standard project flood. Since releases from Corps projects should not contribute to downstream flooding, the Corps would not insist that the PVPA accept 900 cfs. In addition, informal conversation with PVPA officials have raised the question of the San Bernardino Board of Supervisor's authority in passing this resolution.

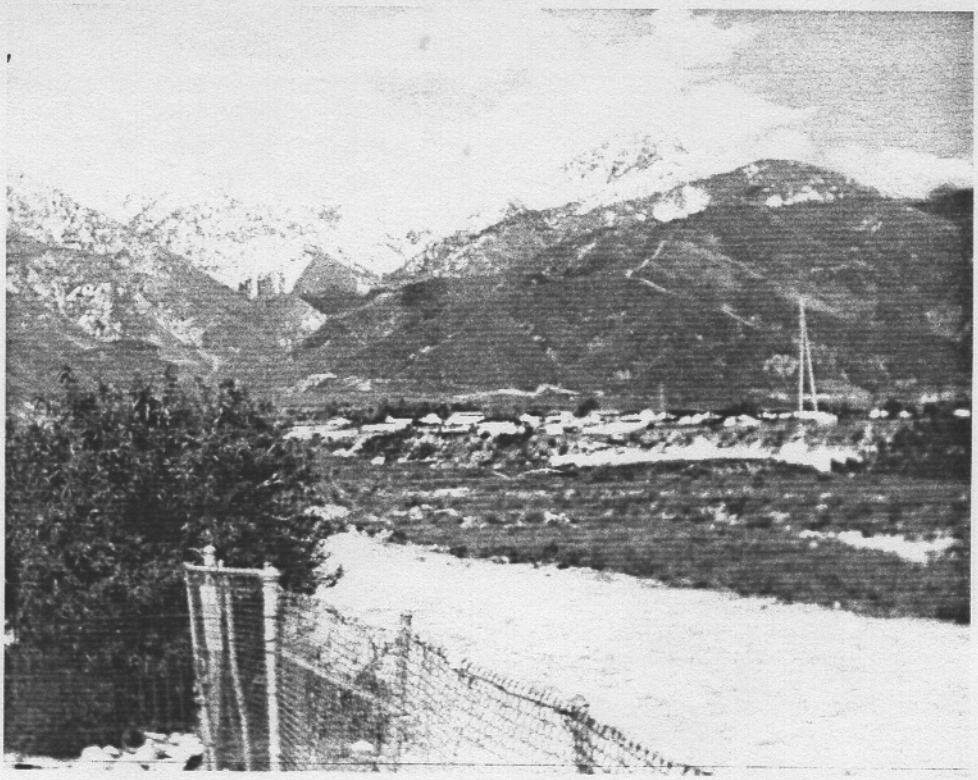

Figure 3-01 Cucamonga Peak and Canyon Just East of San Antonio Canyon. Looking Northeast.

Figure 3-02 Cucamonga Canyon Debris Basin. Looking Southeast.