II - DESCRIPTION OF PROJECT

2-01 Location. Seven Oaks Dam is located at a narrowing of the Upper Santa Ana Canyon about 1 mile upstream from the canyon mouth, and is 8 miles northeast of the city of Redlands in San Bernardino County, California. The geographic coordinates of the dam are 34°07'04" North Latitude and 117°05'52" West Longitude. Plate 2-01 shows the general location of the dam.

2-02 Purpose. Seven Oaks Dam serves as a principal regulating structure located on the upper Santa Ana River. It was constructed for the purpose of providing flood control protection to portions of San Bernardino, Riverside, and Orange Counties, California. It has a design storage capacity of 147,970 acre-feet at the spillway crest elevation of 2,580 feet, NGVD, of which 32,000 acre-feet is allocated for 100 years of estimated sediment accumulation. Its flood control plan is designed to work in conjunction with the flood control plan of Prado Dam, a Corps owned project, located 36.7 miles downstream on the Santa Ana River within the Lower Santa Ana Canyon.

2-03 Physical Components. The Seven Oaks Dam project consists of an embankment, outlet works (multi-level intake structure, high level intake structure, minimum discharge line, gate chamber, outlet tunnel and exit channel, and plunge pool), spillway, and reservoir. General plans for these specific features are shown on Plate 2-02. The following paragraphs provide a brief description of specific components of the project.

a. Embankment. The embankment is a zoned earth-and-rock-fill dam with a maximum height of 550 feet above the pre-existing streambed at the dam axis and 650 feet above the lowest foundation bedrock contact. The dam crest is 40-feet wide, 2,760-feet long and has a minimum crest elevation of 2,610 feet, NGVD. The dam crest incorporates a 3-foot maximum camber in anticipation of crest settlement. The upstream slope of the dam is 1V on 2.2H, and the downstream slope is 1V on 1.8H, except where the slopes were made locally steeper to 1V:1.5H for the access roads across the embankment faces. The alignment of the embankment arches upstream to provide suitable abutment contacts to bedrock while optimizing the embankment geometry at the dam site.

Photo 2-1. Embankment Construction

The embankment section is designed to produce a conservatively safe dam while utilizing the materials available at the site (Photo 2-1). The impervious central core extends from bedrock to within 10 feet of the crest of the dam. The top width of the core is 16 feet and the base width is approximately one-third of the maximum hydrostatic head. Upstream of the core is a filter zone of minus 2-inch well-graded cohesionless alluvium to seal internal cracks which might develop due to differential settlement. The upstream shell consists of free-draining minus 12-inch alluvial materials processed from the downstream pervious borrow area, with an outer layer of oversized stones. The downstream transition zone consists of unprocessed rock excavated from the spillway and Government Canyon Ridge (photo 2-2), with an outer layer of oversized stones from the pervious borrow area. Embankment zoning provides resistance to concentrated leaks by placing high strength and erosion resistant materials at the outer shells. Embankment sections and details are shown on Plates 2-03 and 2-04.

Photo 2-2. Looking Upstream from Top of Intake Tower towards Government Canyon Ridge

b. <u>Outlet Works</u>. The outlet works is located in the left abutment (looking downstream) and includes the following features: intake structure, upstream outlet tunnel, mid-tunnel gate control chamber with emergency and service slide gates, downstream outlet tunnel and exit channel, access structure, plunge pool, valve structure, minimum discharge line (MDL), and MDL extension line (MDLE). The general plan and profile of the outlet works are shown on Plate 2-05. Plate 2-05A shows the plan view of the system layout of the entire outlet works.

(1) <u>Intake Structure</u>. The inclined concrete intake structure is approximately 200 feet high and consists of a high-level intake on the left side (looking downstream) and a multilevel intake on the right side. Other components of the intake structure are: 1) access bridge, 2) high-level intake and trash structure, 3) main wet well, 4) maintenance bulkhead gate, 5) aggregate sluice gate, 6) multilevel withdrawal system (MWS), 7) MWS trashracks, 8) MWS intake ports, 9) MWS stoplogs, 10) MWS stoplog lifting beam, 11) aggregate access passage, 12) maintenance bulkhead gate, 13) accelerograph chamber, 14) regulating outlet (RO) air vent, 15) minimum discharge line (MDL) air vent, 16) wet well inspection beam, 17) MDL bulkhead gate, and 18) anchorage system. Details of the intake structure are shown on Plate 2-06.

i. Main Level Intake Structure (MLS). Also known as the high level intake structure, the MLS is a tower with a 36-foot inside diameter wet well and is designed for passing flows at high reservoir pool elevations during the initial life of the project. Flows enter the wet well through a trash structure at the top of the tower. As the expected sediment deposition in the forebay rises to elevation 2265 feet, NGVD, the multilevel withdrawal intake structure (MWS) will no longer be functional and the MLS will be used for all discharges. The MLS is shown on Photo 2-3.

Photo 2-3. Intake Tower - MLS (on left) and MWS (on right)

ii. Multilevel Withdrawal System (MWS). The MWS consists of a wetwell with multiple levels of ports (as shown on Photo 2-3) to pass flows at low elevations and avoid dead storage prior to the expected sediment deposition reaching elevation 2265 feet, NGVD. There are 18 pairs of MWS ports and each port measures 27 inches in diameter. The port pairs are spaced vertically at 10-foot intervals starting at centerline elevation 2104.24 feet, NGVD. Over the life of the project, the ports will be blocked with stoplogs (stoplogged) as the sediment deposition level rises in order to minimize the amount of sediment entering the outlet works. The design documents recommend stoplogging the ports that are within 20 feet to 30 feet of the current sedimentation level. The stoplogs are designed to be removable, thus providing the capability of dewatering the sediment pool after each flood season. Prior to the flood season of 2000, the first two rows of ports were stoplogged. The invert of the next row of ports is at elevation 2120.24 feet, NGVD, so the initial sediment pool is about 20 feet deep. A 6-foot x 6-foot rectangular passage controlled by a sluice gate connects the MLS wet well and the MWS wet well at their invert elevations (see Plate 2-07).

iii. Wet Well Sluice Gate. The wet well sluice gate is located in the multilevel withdrawal system wet well at the entrance to the 6'x6' passage that leads to the main wet well. The sluice gate was incorporated into the design of the outlet works to minimize the amount of sediment entering the main tunnel. The steel MDL pipeline was designed to carry the majority of sediment laden flows, thus preserving the invert of the main tunnel. When the MDL is being used and releases from the main outlet gates (LF and RO gates) are not necessary, water is prevented from entering the main tunnel by the sluice gate. The sluice gate is to be open when the pool is below the high level intake (El 2265 feet, NGVD) and the required discharges are greater than 90 cfs. It is intended to be either fully closed or fully opened and it not designed for throttling. Section 7-06.b. outlines the procedures for operating the sluice gate prior to and after the use of the main tunnel for releases. Plate 2-08 shows the details of the sluice gate. (**Note:** *The sluice gate is operated only when no more than 2.5 feet of head differential exists between the MWS and MLS* *wet wells. Piezometer readings in each wet well are used to determine when the required head differential is achieved to operate the sluice gate, see Section 7-06.a.)*

(2) Gate Area. The gate area consists of a 50-foot diameter concrete gate chamber dome and the gate passages beneath it. This area is located in the bedrock of the abutment about 1,117 feet downstream of the intake. The main components in the gate area are: (1) RO passages, (2) main RO gates, (3) emergency RO gates, (4) low-flow trashracks, (5) low-flow passage, (6) low-flow main gate, (7) low-flow emergency gate, (8) MDL ball valve, (9) upstream outlet tunnel fill line, (10) airshaft, (11) airshaft access door, (12) 10-ton bridge crane, (13) 5-ton monorail hoist, (14) hydraulic power unit, (15) motor control center, and (16) drainage system. The gate chamber is shown in detail on Plates 2-09 to 2-10. Components relevant to water control operation are described as follows:

i. Regulating Outlet Gates (RO Gates). Flows from the main pressure conduit are regulated by the RO gates and/or the low flow gate. Each of the two hydraulically operated service RO slide gates each control a gate passage that measures 5 feet wide by 8.5-feet high. Upstream of each service RO gate is an identical emergency RO gate that controls the same passage. The minimum gate opening for the service RO gates is 9 inches (0.75 ft) in order to eliminate the possibility of vibration damage due to shifting control at the gate lip caused by high velocities at low openings. Conversely, a maximum gate opening of 6.8 feet (roughly 80 percent opening) is required in order to maintain control at the gate and to minimize the possibility of pressurizing the downstream passage and causing cavitation damage to the concrete. A single service RO gate can pass approximately 58 percent of the 8,000 cfs design discharge with reservoir surface at elevation 2580 feet, NGVD at the maximum gate opening of 80 percent. The service RO gates are used for discharges ranging between 500 cfs to 8,000 cfs. The emergency RO gates are intended to either be fully open or completely closed. Plates 2-09A and 2-11 show the details of the RO gates.

Photo 2-4. RO and LF Gates - Hydraulic Cylinders Inside the Gate Chamber

ii. <u>Low Flow Gate (LF Gate)</u>. The service low flow gate is a hydraulically operated slide gate controlling a passage that measures 2 feet wide by 3.5 feet high. The service low flow gate is designed to eliminate the need to operate the service RO gates at less than their required minimum opening of 9 inches (0.75 ft). In addition, the service low flow gate provides flexibility in gate operation since it can be used with the MDL for release during low flows. An identical low flow emergency gate is located in the same passage immediately upstream of the service low flow gate. The minimum gate opening for the service low flow gate is 6 inches, and its maximum opening is limited to 3.0 feet. The reasons for the minimum and maximum gate openings are the same as those given for the RO gates above. The low flow gate is intended to discharge flows ranging from 90 cfs to 500 cfs. Plates 2-09A and 2-12 show the details of the low flow gate.

iii. <u>Minimum Discharge Line (MDL)</u>. The MDL is used for small discharge rates. The pipe component of the minimum discharge line is a 3-foot-diameter steel pressure pipe originating at the invert of the MWS wet well. The MDL is regulated by two, fixed cone valves (an 8-inch and a 14-inch) housed in a valve structure located at the downstream end of the MDL on the left side (looking downstream) of the exit chute. The MDL passes discharges up to a maximum of 90 cfs. A 24-inch-diameter ball valve is provided in the mid-tunnel gate chamber to provide emergency closure and to dewater the downstream portion of the conduit prior to inspection and/or maintenance. Refer to section 7-06.d. for procedures to dewater the MDL conduit downstream of the ball valve. Plates 2-09A, 2-13 and 2-14 show the layout and details of the MDL conduit.

iv. Upstream Outlet Tunnel Fill Line (Recharge Line). This is a 12-inch diameter steel pipe between the MDL and the upstream outlet tunnel. The line is opened and closed with a 12-inch diameter manual butterfly valve, which is located within the upstream portion of the gate chamber (Photo 2-5). The fill line is used to fill the upstream tunnel and the main intake wet well in order to balance the head between the MWS and MLS for sluice gate operation (refer to Section 7-06.b. for operating the sluice gate). The Fill Line is also used to equalize pressure for the maintenance bulkhead gate installation. Plate 2-09A shows the recharge line.

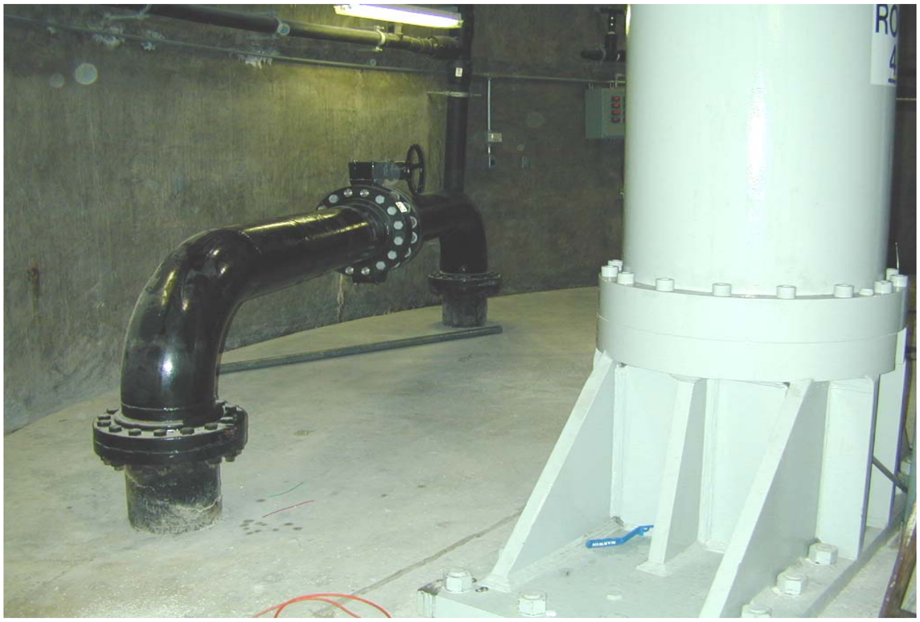

Photo 2-5. Upstream Outlet Tunnel Fill Line

(3) Upstream Outlet Pressure Conduit, Mid-Tunnel Gate Passages (RO and LF Conduits). The tunnel conduit upstream of the gates is designed for an internal hydrostatic pressure due to an SPF event at El. 2575. The conduit transitions from a 7-foot-wide by 13.5-foot-high section at the intake tower to an 18-foot-diameter section over a length of 60 feet. The 18-foot-diameter circular portion has a total length of 875 feet. The conduit then transitions to an 18-foot-high by 23-foot-wide modified horseshoe section over 45 feet to the upstream ends of the splitter piers that separate the RO and low flow gate passages. At the maximum design discharge of 8,000 cfs, the average velocity in the 18-foot-diameter conduit is 31.4 feet per second. The absolute roughness value used for the design was 0.0005 feet. The two 5.5-foot-wide splitter piers divide the flow symmetrically into two 8.5-foot-high by 5-foot wide RO passages on the outsides and one 3.5-foot high by 2-foot wide low flow passage in the center over a length of 38.5 feet. Conventional one on three elliptical curves were used for the roof and inner side curves on the entrances to the gate passages. These curves form the pier end curves. The service RO gates are 34.5 feet downstream of the upstream end of the piers. The main outlet tunnel profile is shown on Plate 2-15. The upstream outlet conduit features are shown on Plate 2-16.

(4) Downstream Conduit. Downstream of the RO gates, the main tunnel conduit transitions from a 24-foot-wide by 10-foot-high channel to an 18-foot-wide 9-foot-high channel over a length of 120 feet. From this point the 18-foot-wide by 9-foot-high downstream conduit extends 540 feet. At station 28+60, the roof of the downstream conduit ends and the exit channel continues to station 30+80 where it terminates and the flow passes though baffle blocks before dropping into the plunge pool energy dissipator. Details of the downstream outlet conduit and exit channel are shown on Plates 2-17 to 2-19.

(5) Access Structure. The concrete access structure is located above the downstream outlet tunnel at the tunnel portal. This structure is 22-feet wide by 30-feet long, and 10.5-feet high, and serves as the entrance to the gate chamber via the access way. It also houses the intake and filters for the gate chamber ventilation system; project power distribution panel boards; a remote control cabinet for remote operation of the RO gates, the LF gates, the MDL cone valves, and the MDLE ball valve; electric incinerating toilet, and other electrical control and communication items. The entrance door may be opened up to 8 feet wide to install or remove large items if necessary. The access structure is shown on Plate 2-18.

(6) Energy Dissipator. The energy dissipator consists of 1) a plunge pool apron located immediately downstream of the exit channel (Plate 2-19), and 2) a preformed plunge pool located immediately downstream of the plunge pool apron. The exit channel ends with an 8.7 foot vertical drop to the top of the plunge pool apron. From this point the 105 foot wide plunge pool apron slopes downwards on a 1V on 3H slope in the direction of flow. It is designed to prevent the undercutting of the outlet channel. A vertical wall at the toe of the apron extends from elevation 1,990 feet, NGVD to 1,980 feet, NGVD to prevent the undermining of the apron from return flows (see Plate 2-21). The preformed plunge pool was designed based on a maximum discharge of 8,000 cfs. It is composed of a roughly hemispherical excavation partially lined with 5-foot to 6-foot diameter rock protection. The rock protection covers the bottom and sideslopes of the plunge pool and extends from the apron downstream for about 100 feet. The protection has a blanket thickness of 10 to 12 feet from elevation 1986 feet, NGVD to 1974 feet, NGVD. Downstream of the rock protection, the preformed plunge pool runs for approximately 250 feet on a 1V to 10H slope, then daylights with the natural river channel. The left and right bank of the plunge pool between elevations 2,000 and 2,020 feet, NGVD are lined with a 4-foot thick layer of 1-foot to 3-foot diameter riprap stone from the apron top to the point of daylight with the natural river. The plunge pool apron and the plunge pool are shown on Plates 2-20 to 2-22.

Photo 2-6. Looking Downstream at the Plunge Pool from Top of Embankment

(7) Valve Structure. The concrete valve structure is located on the left (looking downstream) side of the end of the downstream exit channel. It is 20-feet wide by 23-feet long and houses the two MDL cone valves. The interior of the valve structure can be accessed by a steel stairway on the exterior of the building or by a roof hatch. The valve structure is shown on Plate 2-23.

(8) Minimum Discharge Line Extension (MDLE). The MDLE extends the MDL from the retaining wall next to the valve structure to the MDL energy dissipation structure which is located downstream of the plunge pool. The components of the MDLE are: (1) MDLE extension pipeline, (2) MDLE 24-inch ball valve (3) MDLE orifices, and (4) MDLE dissipation structure. The MDLE allows flows to be diverted around the plunge pool. The 24-inch ball valve will either be fully open or fully closed, and cannot be operated like the cone valves for setting desired controlled releases. The MDLE ball valve shall not be operated for flood control.

(9) Hydraulic Instrumentation. Two systems of hydraulic instrumentation are installed at Seven Oaks Dam, namely: 1) operational instrumentation and 2) prototype testing instrumentation. The operational instrumentation system provides information that is used in real-time operation, while the prototype testing instrumentation system is used to collect information for a testing program developed to monitor and evaluate the hydraulic performance of the outlet works, and at the same time, verify the parameters used in its design. Both instrumentation systems consist of a combination of pressure transducers and piezometers. The pressure transducers measure pressure fluctuations with flush-mounted electronic pressure transmitters. The pressure transducers are installed in steel mounting boxes embedded flush with the concrete surface of the outlet conduit. The piezometers, which are connected to a manifold located in the gate chamber, measure piezometric head. The piezometer taps are installed in steel mounting plates embedded flush with the mass concrete of the outlet works. In some locations the shape of the piezometer mounting plate matches the shape of the curved concrete surface. The taps are connected to the piezometer manifold with ½-inch conduits.

During testing of the outlet releases, the transmitters for the prototype testing would be connected to a portable processing unit that is brought to the site by the Corps Research and Development Center (ERD-WES) personnel. The operational instrumentation transmitters are connected to digital display panels in the access structure in the valve structure and also relayed to the displays on the remote control cabinet (RCC) in the access structure for real-time operation. The layout for both operational and testing instrumentation system is shown on Plate 2-24.

i. Operational Hydraulic Instrumentation. The operational hydraulic instrumentation consists of eight piezometers connected to pressure transducers, and two of the pressure transducers are connected directly to the MDL immediately upstream of the cone valves. The piezometers measure the piezometric head in the forebay, the main wet well, the MWS wet well, and in the main conduit upstream of the RO and the low flow gates. The pressure transducers measure hydrostatic pressure immediately upstream of both cone valves in the MDL. As stated in the previous paragraph, readings obtained by the pressure transducers are transmitted to a digital display panel located in the gate chamber and in the remote control cabinet located in the access structure. Pressure transducer readings can be obtained from readouts in the valve structure and also in the remote control cabinet in the access structure. The operational instruments are listed on Table 2-1.

Table 2-1. Operational Instrumentation Facilities
Seven Oaks Dam Outlet Works

Instrument Number	Type of Instrument *	Location	Station	Elevation (Tap Inlets)	Elevation (Instrumentation)
O-1	Z	Forebay, Outside Face of Tower	11+47	2260	2099.1
O-2	Z		11+32.5	2190	2097.2
O-3	Z		11+05	2120	2099.1
O-4	Z	Main Wet Well	11+15	2120	2097.2
O-5	Z	MWS Wet Well	11+16	2120	2097.2
O-6	Z	ROG 1	21+87.0	2083.4	2099.1
O-7	Z	LF 1	21+82.5	2078.4	2097.2
O-8	Z	ROG 2	21+87.0	2083.4	2099.1
O-9	PT	@ 8-inch Valve	-	2048.4	2048.4
O-10	PT	@ 14-inch-Valve	-	2048.4	2048.4
* Z denotes piezometers. PT denotes pressure transducers.					

The piezometer pressure transmitters are located in the gate chamber and installed in two rows (Photo 2-7), the first row at elevation 2097.2 feet, NGVD, and the second row at 2099.1 feet, NGVD. These are the reference elevations of transmitters. Each transmitter is connected to the operational piezometer manifold by heavy Tygon tubing. The transmitter converts water pressure from the piezometer into digital data which is relayed by an electrical circuit to the electronic display panel. When a piezometer tap is not submerged, the digital display panel shows the reference elevation of the pressure transmitter for that particular piezometer. Once a piezometer tap is submerged during flood events, the digital display panel reads the measured piezometric head at that point in outlet works where the piezometer tap is located.

The fluctuation of the water level above and below a piezometer tap location could trap air in the piezometer line. Pockets of air will cause an error in the pressure reading and must be bled from the line prior to taking the initial piezometer reading. This procedure is called "Bleeding the Piezometer Lines" and is described in Exhibit E.

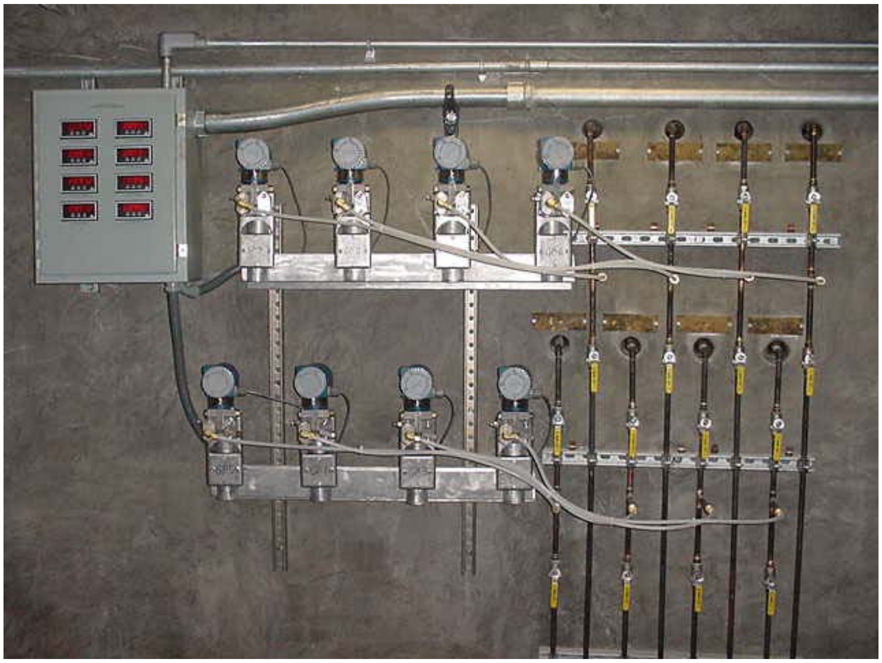

Photo 2-7. Piezometer Pressure Transmitters within Gate Chamber

ii. <u>Prototype Testing Instrumentation</u>. The second system of instrumentation is used in the prototype testing program developed and conducted by the Corps' Waterways Experiment Station personnel. This instrumentation will allow the evaluation of the hydraulic performance of Seven Oaks Dam and to verify the parameters used in its design. The prototype testing instrumentation measures peizometric head, pressure fluctuations, air demand, and gate vibration in key locations of the outlet works structure. The layout of the prototype testing instrumentation is also shown on Plate 2-24. Exhibit F contains details of the prototype hydraulic instrumentation and the testing program.

c. <u>Spillway</u>. The spillway is 500-feet wide and 1,400-feet long, excavated into rock in a natural saddle on the east side of the dam. The trapezoidal spillway is unlined except for a 10-foot-wide by 10-foot-deep concrete control sill constructed transverse to the flow located 1,040 feet from the downstream end along the centerline. The sill is recessed across the spillway invert and extends up each side slope to elevation 2,610 feet, NGVD. The sill provides a control surface and a defense against degradation of the spillway invert in the event of spillway flow. The top of control sill across the invert is at elevation 2,580 feet, NGVD with an upstream approach channel adverse slope of 0.025 and a downstream channel slope of 0.02. The peak water surface elevation during a Probable Maximum Flood (PMF) event is estimated at elevation 2,604.7 feet, NGVD, which would produce a surcharge depth of 24.7feet. Plate 2-25 shows the spillway plan, profile and sections.

Photo 2-8. Looking Upstream During Spillway Excavation

d. Reservoir. The top of dam elevation of 2610 feet, NGVD was derived from routing the spillway design flood with the starting water surface elevation set at 50% of the flood control pool (EL 2604.4 feet, NGVD), plus 5 feet of freeboard. The calculated wave runup and wind setup were 3.6 feet, and 0.03 feet, respectively. The maximum fetch calculated for determining the wave runup was 1.10 miles long, resulting from a 72 mph wind of 15-minute duration. Based on the latest data (1999 survey), at the top of dam elevation of 2,610 feet, NGVD, the reservoir has a calculated area of approximately 1,066 acres and a gross capacity of approximately 174,609 acre-feet. Up to the spillway crest elevation of 2,580 feet, NGVD, the reservoir covers an area of approximately 801 acres, and has a calculated gross capacity of approximately 147,970 acre-feet. The gross capacity is the total reservoir storage capacity including the storage capacity allocated for sediment accumulation throughout the life of the project. The 100-year sediment allowance volume is approximately 32,000 acre-feet, which was determined based on data obtained from geomorphically similar areas within the San Gabriel Mountains. Plate 2-26 shows the Seven Oaks Dam reservoir, and Plate 2-27 shows the area and capacity curves computed based on the latest survey (1999). The latest storage capacity and area tables are included as part of Exhibit B.

2-04 **Related Control Facilities**. Big Bear Dam is the only existing structure that could affect flood flows in the Seven Oaks watershed. Big Bear Lake is a water conservation reservoir, owned by the Big Bear Municipal Water District. The lake has a drainage area of about 38 square miles and has storage of about 8,600 acre-feet between the top of the conservation pool and the top of the dam.

During times of low flow (generally the summer months), inflow and baseflow into the Seven Oaks reservoir can also be affected by the existing hydropower facilities located in the vicinity of the dam and reservoir. These facilities, which are owned and operated by Southern California Edison, include a system of flumes and hydropower plants, an access road, and transmission lines. At Edison Power House Number 1, the Santa Ana River flows upstream of Seven Oaks Dam are diverted into a new 42" dia. pressurized steel pipe buried 4 feet beneath the streambed upstream of the dam. At the dam, this flume line runs through the left abutment at elevation 2314 inside an existing Edison tunnel and daylights out downstream of the dam's embankment. Flows diverted through this pipeline bypass the dam and discharge at Edison Power House Number 3. When Southern California Edison does not divert water through this flume upstream of the dam, the flow is then received by the Seven Oaks reservoir. The diversion capacity of this flume is about 120 cfs.

2-05 Real Estate Acquisition. Approximately 2,736 acres of private land and 982 acres of Government lands were acquired for the overall project. The reservoir covers approximately 800 acres nearly all within the San Bernardino National Forest. A perpetual flowage easement that covers the reservoir and the area downstream of the spillway was acquired. It encumbers approximately 953 total acres, 892 of which are Government land owned by the U.S. Forest Service, and the balance of 61 acres are in three private ownerships. The approximate elevation at which the lands are owned in fee is 2599.3 feet, NGVD. The approximate taking line is at elevation 2603.9 feet, NGVD. All necessary lands for the flood control reservoir were acquired by a special use permit from the Forest Service without any transfer of accountability. The reservoir boundary is shown on Plate 2-26.

2-06 Public Facilities. Currently studies on recreational development at Seven Oaks Dam are not considered. This position is consistent with the U.S. Forest Service's Land and Resource Management plan. In the future, if there are any changes in the design operation and maintenance, especially in the even t of a water conservation pool being developed behind the dam, a re-evaluation of National Forest Management objectives within the project area will be undertaken.

The existing recreation setting of Seven Oaks is a relatively pristine natural area located within the San Bernardino National Forest. Recreational use of the canyon in the past has been low to moderate due to its restricted access. The site offers opportunities for hunting, fishing hiking, picnicking, backpacking and equestrian uses. The USFS recreation opportunities that will be compatible with the proposed design of an earth and rock filled dam with a seasonally operated debris pool. USFS prefers development with no hard structures such as picnic facilities and restrooms. The USFS plan emphasizes an ideal "natural" or "wilderness" recreation, accessible by foot traffic only. This bare minimum accessible trail will lead the public to hiking, fishing, and camping opportunities.