NEW RIVER DAM

GILA RIVER BASIN

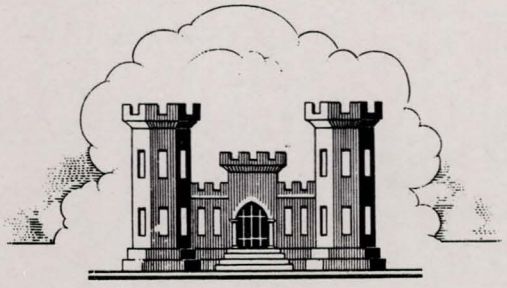
PHOENIX, ARIZONA AND VICINITY

DAM, OUTLET WORKS AND SPILLWAY

PERIODIC INSPECTION

REPORT NO. I

MARCH 1985



U.S. ARMY ENGINEER DISTRICT, LOS ANGELES

CORPS OF ENGINEERS

TEAM INSPECTION OF NEW RIVER DAM
Periodic Inspection Report No. 1
Dated March 1985

Contents

TEAM INSPECTION OF NEW RIVER DAM

1. INSPECTION TEAM. On 21 March 1985, the first periodic team inspection of New River Dam was made as required by ER 1110-2-100. The inspection team consisted of the following personnel:

OCE		SPD	
Frank Linney	Con Ops Div.	Carl Kress	Oper. Br.
Richard Davidson	Geo-Tech Br.	Dan Parrillo	Geo-Tech Br.
		Jim Chang	Geo-Tech Br.

LAD		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
Bill Zeigler	Design Br	Dan Sagramosa	Gen Manager
Bill Halczak	Mat'ls. Sect.	Bob Payett	Con-Ops Div
Ted Ingersoll	Soils Sect.	Paul DiPierro	Maintenance Br
Bob Thurman	Geology Sect.	Warren Anderson	Chief Insp. C&O
Charles Holt	Oper. Br	Steve Williams	Maricopa Co.
Lowell Flannery	Oper. Br		
Bob Conley	Structural Gr.	ARIZONA DEPT. OF WATER RESOURCES	
Ed Chew	Hydraulics Sect.	Ken Hussain	Civil Engr.
Neil Erwin	Resident Engr.		

2. PROJECT CONDITIONS.

a. The weather was clear and sunny with a high temperature of 90°.

b. The reservoir was dry with no flow through the outlet works.

3. MAXIMUM WATER SURFACE ELEVATIONS. No appreciable amount of water had been impounded by the dam prior to the inspection.

4. INSPECTION RESULTS.

a. Embankment.

(1) Crest. The crest of the dam was clean and free of weeds and brush (photo 1). The asphalt pavement was in excellent condition. There was no evidence of cracking or erosion on the crest. On the embankment for a distance of 300 feet along the upstream edge of the crest near the left abutment the riprap is about 6 to 12 inches below the shoulder of the asphalt pavement, leaving the shoulder material unsupported. Riprap should be added to the same elevation as the shoulder of the asphalt pavement.

(2) Abutment contacts. The abutment contacts were in excellent condition. (Photo 2)

(3) Upstream and downstream slopes. The embankment slopes were in excellent overall condition (photos 3 and 4). There was no evidence of differential settlement, cracks or erosion. The stone on the upstream slope was in good condition.

(4) Upstream and downstream toes. No signs of erosion, seepage, undermining or settlement was observed at the toes.

b. Dike No. 1 and 2.

(1) Dike No. 1 (photo 5). The crest, upstream and downstream slopes, embankment toes and abutment contacts were all in excellent condition. It is noted that the portions of landscaping which includes 8 inches of top soil may erode easily and therefore be a maintenance problem. Future repairs in the top soil areas should be backfilled with compatible riprap material.

(2) Dike No. 2 (photos 6 and 7). The crest, upstream and downstream slopes, embankment toes and abutment contacts were all in excellent condition.

c. Spillway.

(1) Approach channel. The approach channel was in good condition (photo 8). The channel was clean and unobstructed.

(2) Control section (photo 9). Concrete in the sill was in good condition. There was only minor raveling of the excavated slopes.

(3) Outlet channel. The outlet channel was in good condition (photo 10). There was only minor raveling of the excavated slopes. The channel was clean and unobstructed.

d. Outlet Works.

(1) Approach channel (photo 11). The approach channel was free of debris and unobstructed.

(2) Trash rack structure (photo 12). The concrete side walls and the steel in the structure were in good condition.

(3) Conduit. Concrete in the conduit was sound with no signs of structural inadequacy or distress.

(4) Energy dissipator (photos 13 and 14). Concrete in the stilling basin walls, invert and dentates was in good condition.

(5) Outlet channel (photo 15). The stone facing on the side slopes and invert of the trapezoidal channel was in good condition. At some localized areas of the outlet channel, the type III stone placed within the channel had been eroded by a flow of about 2 feet in depth.

(6) Gaging station bridge (photo 16). The bridge was in good condition with no signs of structural distress.

e. Instrumentation.

The instrumentation installed at New River Dam is described and locations are shown in Appendix III.

f. Settlement Monuments.

At the time of the inspection settlement monuments had been installed at the dam. The initial survey of the monuments has not been completed. When the survey is completed in a few months a supplement to this periodic inspection shall be provided.

5. CONCLUSIONS.

a. Details of the supplemental survey control data indicated in paragraph 4f. Will be sent to the flood control district when completed.

b. Pertinent design documents along with as-built drawings will be provided to the flood control district when the as-built drawings are completed.

c. The following is the current status of the "As-Built" drawings for Dreamy Draw Dam, Cave Buttes Dam, Adobe Dam, and New River Dam.

(1) Dreamy Draw Dam - the As-Builts have been completed and a set given to the flood control district.

(2) Cave Buttes Dam - the As-Built drawings were destroyed in a fire at the resident office. A set of the contract drawings along with other pertinent material has been sent to the flood control district.

(3) Adobe Dam - the As-Built drawings are currently being completed a set will be sent to the flood control district when finished.

(4) New River Dam - the As-Built marked up drawings have not been sent from the resident office. Work on the As-Builts for the New River Dam will be started as soon as the marked up drawings are received.

d. The area of unsupported shoulder indicated in paragraph 4a.(1) has been corrected to match the rest of the dam crest shoulder area.

e. This inspection report will serve as a recommendation to the flood control district to use compatible riprap material to replace landscape top soil on Dike #1 (indicated in paragraph 4b.(1)) as required.

f. The area under the type III stone which was eroded in the outlet channel was considered a localized construction problem and has subsequently been repaired by the contractor. Future flows will be observed to determine the overall performance of the type III stone remaining in the channel.

6. REQUIRED ACTION.

(1) Put together supplemental survey portion of the periodic inspection when available.

(2) Send As-Built drawings for Adobe Dam and New River Dam to the flood control district.

7. FUTURE INSPECTIONS.

(1) Future inspections of New River Dam will be conducted by the Flood Control District of Maricopa County with participation by staff from the Corps of Engineers and the State of Arizona. The date of the next inspection will be May 1986.

Photo 1. Crest of dam taken toward left abutment from area near right abutment.

Photo 2. Downstream toe area showing access road, left abutment and landscaping on face of dam.

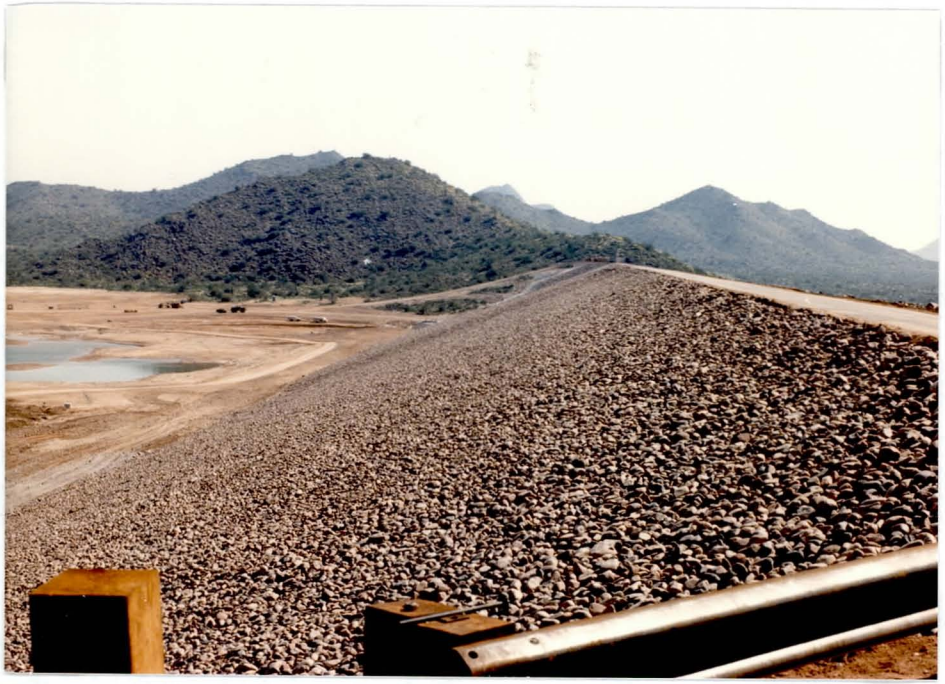


Photo 3. Upstream face of dam taken toward the left abutment.

Photo 4. Downstream face of dam showing landscape sand and stone with desert varnish.

Photo 5. Dike #1 looking north downstream face with landscaping on left.

Photo 6. Upstream face of Dike #2. This is a freeboard dike therefore no rip rap, short duration of water contact.

Photo 7. Crest of Dike #2 looking toward right abutment.

Photo 8. Approach channel to spillway taken from crest.

Photo 9. Control section of grout. Note minor raveling of cut slope, this is within expected amount and will be observed.

Photo 10. Discharge channel for spillway taken from crest.

Photo 11. Approach channel to intake structure.

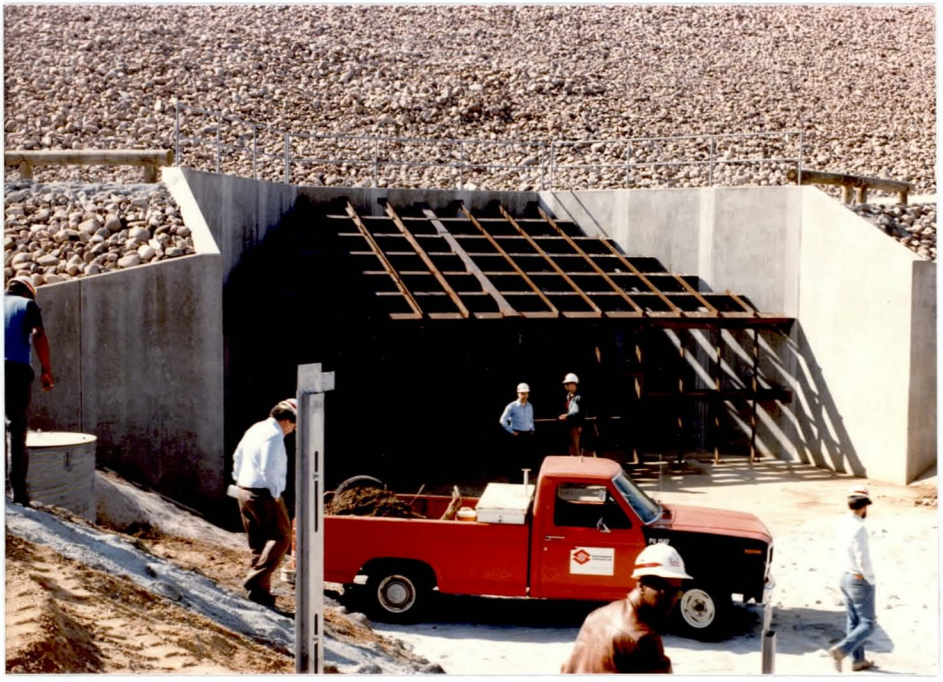


Photo 12. Intake structure and trash rack.

Photo 13. Outlet energy dissipater and dentates.

Photo 14. Upstream view of parabolic energy dissipater and dentates.

Photo 15. Downstream view of outlet channel. Note erosion area of type III stone near end of channel. The area has since been repaired by the contractor.

Photo 16. Downstream view of outlet channel and gaging station bridge. Taken from end of energy dissipator.

DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
630 Sansome Street, Room 1216
San Francisco, California 94111

REPLY TO
ATTENTION OF:

12 APR 1985

SPDED-G

SUBJECT: Periodic Inspection - New River Dam

Commander, Los Angeles District
ATTN: SPLED-DA

The inclosed SPD comments are for your information and use in preparing the report the subject inspection. DAEN-ECE comments will be forwarded when received.

FOR THE COMMANDER:

for A. E. WANKET
Chief, Engineering Division

1 Incl
as

SPD COMMENTS ON
NEW RIVER DAM, PHOENIX, ARIZONA

1. The project in general was in good condition. All systems will operate as intended.

2. On the main embankment for a distance of 300 feet along the upstream edge of the crest near the left abutment, the riprap elevation is about 6 to 12 inches below the elevation of the shoulder of the asphalt pavement, leaving shoulder material unsupported. The riprap should be built up to the same elevation as the shoulder of the asphalt pavement along the upstream edge of the crest.

3. For beautification purposes on Dike No. 1, many areas on the downstream slope were covered with 8 inches of top soil for seeding and planting. The top soil is subject to erosion and will be a problem for future maintenance. For future repair due to erosion in the planting areas on the downstream slope use compatible riprap instead of backfilling the similar erodible top soils.

4. At some localized areas of the outlet channel, the Type III stone (6 inch maximum and 60% to 100% passing 4 inch) placed within the channel had been eroded by a flow of about 2 feet in depth. The progress of erosion should be monitored.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

DAEN-ECE-G

1 May 1985

SUBJECT: Trip Report, New River Dam, Arizona

Commander, South Pacific Division
ATTN: SPDED

Enclosed is a copy of the subject trip report. Please note the subject of as-built drawings discussed in paragraph 5d. This matter needs your attention.

FOR THE COMMANDER:

Jack R. Thompson
for WILLIAM N. McCORMICK, JR.
Chief, Engineering Division
Directorate of Engineering and
Construction

1 Encl
as

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
DAEN-ECE-G	Trip Report - Periodic Inspection, New River Dam, AZ (SPL, SPD)

TO	FROM	DATE	CMT 1
1. DAEN-ECE	DAEN-ECE-G	16 April 1985	
2. DAEN-ECC	DAEN-ECC-C	DAVIDSON/fmb/28683	
3. DAEN-ECE-BB			

1. Place and Date - New River Dam, Phoenix, Arizona, on 21 March 1985.

2. Purpose - To participate in the periodic inspection of the subject project.

3. Attendance - See Enclosure 1. Personnel from the local flood control district and the State of Arizona participated in the inspection.

4. Background - New River Dam is a normally dry flood control dam located just north of Phoenix, Arizona. It is part of a system of dams that includes Cave Buttes Dam (completed in 1980) and Adobe Dam (completed 1982). Like Cave Buttes and Adobe Dams, New River Dam will be turned over to the Flood Control District of Maricopa County for operation and maintenance. New River Dam is essentially complete, although the contractor is still at the site. The project consists of the main dam, two saddle dikes, an uncontrolled outlet works, and an uncontrolled spillway in rock. The outlet works consists of an intake structure with a trash rack, a 6.25 foot wide by 9.5 foot high conduit, and an energy dissipator.

5. Observations/Recommendations -

a. Inspection: No significant structural deficiencies were noted in any of the features. There were some minor items remaining for the contractor to complete, however.

b. Instrumentation: Due to the nature of the project, the instrumentation is limited. It consists of three foundation piezometers and four crest settlement monuments. The three piezometers have just been installed, but due to the great depth to groundwater (approximately 400 feet), they are not expected to show any pressure. The crest settlement monuments have not been surveyed. The details of the instrumentation, along with a copy of the survey control, should be furnished to the flood control district.

c. Dam Safety: There was a copy of an initial reservoir filing plan at the contruction office that included inundation maps of the downstream area. Once the project is turned over to the flood control district, the primary responsibility for dam safety will be theirs. Arizona has an active dam safety program, and the flood control district will have to meet the state requirements, including obtaining the necessary permits. There will not be further periodic inspections by the Corps of Engineers, but the Los Angeles District does plan to participate in future inspections by the flood control district. There will be no permanent office at the site where design records can be stored. SPL personnel indicated that it was their intent to furnish copies of the pertinent design documents to the flood control district.

d. As-Built Drawings: Their appears to be a problem in the Los Angeles District in completing as-built drawings in a timely manner. The flood control district personnel noted that they must submit copies of as-built drawings to the state before they can receive a final operating permit. They indicated that they have not received the as-built drawings for Cave Buttes Dam, even though they have requested them more than once. Timely completion of as-built drawings is required by ER 1110-2-1200. Five years to complete the record drawing on a relatively simple project is excessive, particularly, where the user has indicated a bona fide need for them.

R.F.D.

1 Encl
as

RICHARD F. DAVIDSON
Chief, Soil Mechanics Section
Geotechnical and Civil Branch
Engineering Division

FRANK LINNEY
Chief, Construction Policy Section
Planning and Contracts Branch
Construction Division

VISITORS REGISTER

DATE & TIME IN	DATE & TIME OUT	NAME (Please print)	POSITION TITLE	GRADE	ORGANIZATION	PURPOSE OF VISIT
3/19/85		BOB THURMAN	GEOLOGIST		SPLED-GG	DAM INSPECTION
"		TED INGERSOLL	CIV. ENG.		SPLED-GD	"
1200	1415	[redacted]				
3/21/85		Carl Kress	Civ Engr		SPDCC-OR	Navigation Insp.
3/21/85		WILLIAM J. ZEIGLER	CIV ENGR		SPLED-DA	" "
3/21/85		Bill Halcomb	"		SPLED-GE	" "
"		Frank Linney	Civil Engr		CE ECC-G	" "
"		K. M. Hussain	"		AZ Dept of Water Rs.	" "
"		L. CHEW	HYDR. ENGR.		LAD HH	" "
		Dan Parrillo	Geotech Br		SPDED-G.	" "
"		W. C. Anderson	Constr. Engr.		FCDMCO.	" "
"		P DiPierro	O&M		"	" "
"		Jim Chang	~~SPDED~~ Civil Eng		SPDED	" "
"		DAN SAGRAMOSO	GEN. MANAGER		FLOOD CONTROL DISTRICT	" "
"		Richard Davidson	Civ. Eng		DAEN ECE-G	
"		CHUCK HOLT	Chief of Ops.		SPLOO-O	" "
		Frank Linney			DAEN-	" "

SPD Form 179-R
1 Aug 79

(Replaces SPL Form 693, 1 Mar 79, which will be used)

AGENDA
FOR INSPECTION OF
NEW RIVER DAM

Wednesday - 20 March 1985

Travel to Phoenix, Arizona. SPD and OCE to obtain own transportation. LAD will make hotel reservations for all members of inspection teams.

Thursday - 21 March 1985

0730 - Team members will meet in hotel lobby to leave for dam.

0740 - Depart for New River Dam.

0820 - 0930 - Arrive at New River Dam inspection briefing.

0830 - Inspect project.

1230 - Lunch.

1400 - Return to airport for travel to duty stations..

APPENDIX III

NEW RIVER DAM

GENERAL PROJECT DESCRIPTION

PURPOSE AND SCOPE. This report is prepared in accordance with ER 1110-2-100, entitled "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures" and dated 28 February 1983, which defines objectives, assigns functions, and establishes procedures by which the Corps of Engineers carries out its responsibilities for assuring the continuing structural integrity and operational adequacy of its major civil works structures in service. Periodic evaluation of constructed structures is accomplished by periodic inspection for the purpose of detecting conditions of significant structural distress and to provide a basis for timely initiation of corrective measures to be taken when necessary.

New River Dam was designed and constructed by the Corps of Engineers. The responsibility for operation and maintenance of the project has been transferred to the Maricopa County Flood Control District (M.C.F.C.D.). In accordance with ER 1110-2-100, the operating entity is also responsible for the periodic inspections and observations necessary for assuring the continuing structural integrity and operational adequacy of the structure. The M.C.F.C.D. should conduct the inspections and prepare the inspection reports. The Corps of Engineers should be invited to participate in the inspections. The initial inspection was conducted by the Los Angeles District and the report was prepared by the Los Angeles District. Subsequent inspections should be made at one-year intervals for the next 4 years, at 2-year intervals for the following 4 years, and then may be extended to each 5 years if warranted by the results of the previous inspections.

NEW RIVER DAM

New River Dam has been constructed on the New River about 8 miles upstream from the confluence with Skunk Creek. The main embankment is a compacted-earthfill structure with a maximum height of about 104 feet above streambed. The crest of the embankment (el. 1486.7, exclusive of settlement allowance) is 2320 feet long. Dike No. 1 about 7400 feet northwest of the right abutment of the main embankment has been constructed along the west edge of the detention basin area to confine the design flood. The dike has a crest length of 7464 feet and a maximum height of about 36 feet. An unlined spillway, 700 feet west of the right abutment of the main embankment, is trapezoidal in cross section and 75 feet wide at the crest (el. 1456.2). The spillway, in conjunction with the outlet works, will pass a peak discharge of 33,000 ft^3/s with 5.6 feet of freeboard.

The 2320 feet long earthfill dam will control the standard project flood with a basin capacity of 43,540 acre-feet at the spillway crest. It will provide flood protection to residences, businesses, and other land uses along the New and Agua Fria Rivers by detaining the floodwaters and releasing them through an uncontrolled outlet. The decrease in peak inflow will offset the effect of diverting flows from the Cave Creek drainage area to the New River when the Arizona Canal diversion channel is constructed.

The outlet works consist of an inlet structure, conduit, and an energy dissipator. The rectangular (9.5-foot x 6.25-foot) conduit, which has an inlet elevation of 1389.25 feet is 433 feet long and capable of releasing up to 2665 ft^3/s when the water surface is at spillway crest. At the downstream end of the conduit, an energy dissipator has been constructed to reduce the velocity of discharge prior to entering the natural stream.

The detention basin has a gross capacity of 43,520 acre-feet, of which 4920 acre-feet will be for the accumulation of sediment over a 100-year period and 38,600 acre-feet will be for flood control. The detention basin will reduce the SPF with a peak inflow of 45,000 ft^3/s to an outflow of 2665 ft^3/s.

The primary objective is flood control. The project was designed to control standard project flood at spillway crest elevation and to contain a 100-year allowance for sediment. Considering a fully operational outlet and reservoir pool at spillway crest, the project was designed to safely pass a probable maximum flood and provide sufficient embankment and dike freeboard to prevent overtopping by wind-induced wave action. It reduces peak inflows, including standard project flood, to a nondamaging outflow capable of being accommodated within the unimproved downstream channel. By reducing peak discharges to a nondamaging discharge on the New River, the New River Dam complements the operation of Dreamy Draw, Cave Buttes, and Adobe Dams, allowing flows diverted by the ACDC to be accommodated within existing streambeds without increasing the "without project" SPF floodplain.

Major Feature Elements and Background Information

DAM EMBANKMENT

The main embankment is a zoned, earthfill structure, consisting of core, transition and pervious shell materials obtained from onsite borrow areas, located on New River 8.2 miles upstream from the Skunk Creek confluence. The east abutment is founded on granitic bedrock. The west abutment is founded on steeply dipping volcanic (andesite) bedrock. The control portion of the main embankment is partially on bedrock and partially on alluvial materials. Core materials have been taken from near surface materials (1 to 6 feet) immediately upstream and downstream from the damsite near the east abutment. Pervious shell and transition materials, which have been taken at depths from 3 to 13 feet, have been obtained from immediately upstream to about 6500 feet upstream from the damsite. Drain materials have been obtained from crushed and screened pervious shell material. Slope protection has been processed from the borrow area.

The freeboard for New River Dam was determined by adding the maximum wave runup to the wind setup. Because the embankment is located in seismic zone 2, no additional freeboard allowance has been made for earthquake considerations. The wave runup was calculated by means of the procedures outlined in ETL 1110-2-221. The effective fetch for the main embankment would be 1.96 miles. The significant wave would result from a wind velocity of 49.6 mi/h (overland) having a duration of 25.0 minutes. The wave height would be 3.60 feet and the maximum runup would be 5.5 feet. The freeboard for the main embankment has been set at 5.6 feet.

DIKE NUMBER 1

Dike 1, which is approximately 1.7 miles northeast of the main embankment, is required to control the standard project flood (SPF) and probable maximum flood (PMF) reservoir pools. The lowest elevation of the upstream toe of dike 1 is approximately 1450.0 feet above msl and the SPF reservoir pool is 1456.2 feet above msl. The dike runs roughly parallel to Lake Pleasant Road, extending north from the West Wing Mountains. The dike is a zoned earthfill structure consisting of core, transition, and pervious shell materials. Most of the dike embankment is founded on caliche cemented sandy gravel. However the south abutment is founded on andesite bedrock. Materials have been obtained from the same borrow area as the materials for the main embankment. Slope protection also has been obtained from the same source as the main embankment.

The effective fetch for dike 1 is 1.63 miles. The one minute and one hour overland wind velocities from the northeast are 65 and 40 miles per hour, respectively. The significant wave heights for a design wind velocity of 59 miles per hour and a duration of 22.5 minutes would be 3.4 feet. The wave runup would be 4.9 feet. The wave setup would be 0.3 foot. Total freeboard for dike number 1 is 5.2 feet.

DIKE NUMBER 2

Dike 2, which is approximately 0.6 mile northeast of the main embankment, is required to control the PMF reservoir pool only. The lowest elevation of the usptream toe is approximately 1457.0 feet, msl. The dike has been constructed entirely of pervious shell obtained from the borrow area. The upstream slope has been flattened to 6 horizontal on one vertical, precluding the need for slope protection designed on the basis of wave action. The dike is founded on alluvium and weathered granitic bedrock.

This dike is located northeast of the left abutment of the dam embankment and has an effective fetch of 1.26 miles. The one minute and one hour overland wind velocities from the northwest are 70 miles per hour and 45 miles per hour. The significant wave height for a design wind velocity of 71.1 miles per hour and a duration of 17 minutes would be 3.37 feet. The wave runup on the one horizontal to 6 vertical slope would be 2.74 feet. The wave set up would be 0.2 foot. Total freeboard for dike number 2 is 2.9 feet.

SPILLWAY

The detached, unlined spillway approximately 700 feet west of the dam embankment was excavated through an existing saddle to a maximum depth of 75 feet. The excavated materials were composed predominantly of andesite bedrock with minor amounts of flow breccia and tuff. Although some of the excavation was accomplished by ripping with a D9H dozer, most of the rock was loosened by blasting prior to excavation. Presplit (controlled) blasting techniques were not successful at the final grade lines so alternative techniques were employed. Final slope trimming was accomplished using a dozer slopeboard.

The crest length is 75 feet. The spillway approach channel is about 175 feet long. The first 100 feet of the approach channel, upstream from the crest, has an adverse slope of 0.040. The remainder of the approach channel is at elevation 1452.2 with zero slope. The spillway excavation downstream from the crest is about 550 feet long, with an invert slope of 0.020. Final location of the crest was established based on minimum excavation criteria. The peak spillway discharge at the maximum water surface (el. 1481.1) would be 29,850 ft^3/s with critical depth at 16.4 and velocity at 23.2 ft/s.

OUTLET WORKS

The outlet works is near the left abutment and founded along most of its length on granitic bedrock. The upstream inlet elevation is approximately 12 feet below the existing bedrock surface. An approach channel has been excavated in bedrock, upstream from the inlet structure. The drainage conduit is a concrete rectangular section placed at an elevation to fully drain the reservoir pool. A concrete rectangular energy dissipator has been constructed to a depth approximately 20 feet below the bedrock surface. The outlet channel, which has been excavated both in bedrock and alluvium at a near flat grade in order to develop a backwater condition for the energy dissipator, is trapezoidal and lined with grouted stone downstream from the energy dissipator, then lined with Type III stone for a distance of about 700 feet, and terminated in a grouted-stone trapezoidal section with a grouted-stone cut-off. A low-flow channel has been excavated to daylight from the outlet-channel terminus to the main streambed.

INLET STRUCTURE. The inlet structure is an open rectangular section 30.68 feet long measured along the centerline. The walls, which transition toward the rectangular conduit, range in height from 13.3 to 17.9 feet. Vertical walls of the inlet structure have been designed as "L" or "U" type, depending on the wall height versus the base width. These walls have been designed for two loading conditions: Condition I (reservoir empty) and Condition II (reservoir full). For Condition I loading, earth pressure on the back of the wall has been determined in accordance with EM 1110-2-2502.

A structural steel trash rack is provided at the inlet structure to catch any large trash that may reach the entrance. The openings between the trash rack members are less than two-thirds the least dimension of the conduit. The structure has been designed to withstand a differential hydraulic head of 5 feet.

CONDUIT. In accordance with EM 1110-2-2902, the rectangularly shaped conduit has been designed for Condition II or Condition III loading. The loading is as follows: (a) the vertical pressure equals 1.5 times the height of the fill times the unit weight of the embankment and (b) the horizontal pressure equals 0.5 times the height of fill times the unit weight of the embankment. The loading assumptions for the design of the conduit takes into consideration the water pressure over the conduit on the upstream side of the embankment.

ENERGY DISSIPATOR. The energy dissipator is a rectangular section, varying in width from 6.25 to 31 feet and varying in height from 14.0 to 22.0 feet maximum. The energy dissipator walls have been designed as either "L" or "U" type. Uplift forces have been considered in the design of the

stilling basin slab and high impact forces have been considered in the design of the baffle blocks. In addition, a sump has been added to facilitate dewatering. Design conditions are the same as described under the heading "Inlet Structure."

ACCESS ROAD

The access road enters the project from the southeast, providing access along 67th Avenue to Jomax Road, then west along a 40-foot easement on State of Arizona lands to 75th Avenue, and then north to the project limits. The route was chosen to provide the most direct route from the metropolitan Phoenix area, and to the greatest extent practical, all-weather access. The road is an unpaved two-lane roadway from 67th Avenue to a point south of the east abutment and then a paved two-lane roadway to the embankment and spillway. The road crosses the outlet works at the location of minimum span near the toe of the embankment. Designed for a travel speed of 30 mph, the road follows criteria and design procedures set forth in TM 5-822-2, General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas, dated April 1977, for class E roads. The unpaved road follows geometric design criteria and procedures described above and uses a cross section requested by the Flood Control District of Maricopa County. Plates 12 and 13 show the plan, profile, and cross sections for the access road.

ESTHETIC TREATMENT

Portions of the downstream slope of dike 1 have been covered with topsoil in sufficient quantity to fill the voids of the slope protection and seeded with a mixture of native plant materials. Plant materials have been chosen that are drought resistant. Topsoil has been obtained from materials stripped from the foundation area of project structures. The downstream slope of the main dam embankment is sparsely vegetated and covered with light colored, gravelly pavement and desert varnished andesite rock from the spillway excavation.

REGIONAL GEOLOGY

The rock types found in the mountainous areas that border the project consist of: (1) an igneous and metamorphic basement complex composed predominantly of Precambrian granite and related crystalline rocks with lesser amounts of schist and gneiss; (2) Cretaceous to Tertiary intrusive igneous rocks, consisting mainly of granite and monozonite; and (3) Tertiary volcanic rocks in the form of basalt and andesite with local accumulations of tuff, flow breccia and agglomerate. The basement complex is extensively exposed along the eastern and southeastern margins of the project. Elsewhere, particularly along the southwestern margin of the project, Tertiary age lava flows rest uncomfortably upon the basement complex. Exposures of intrusive igneous rocks are limited, occurring mainly in the mountains to the east.

Older sediments that constitute the valley fill are Quaternary in age and are composed mainly of poorly- to well-consolidated gravel, sand, silt and clay, representing several environments of deposition. The constituent materials were eroded from the adjacent mountain masses by stream and sheet

runoff. Calcium carbonate cementation is common and considerable caliche is present near the mountain fronts. Recent (Quaternary) alluvium, consisting mainly of unconsolidated sand and gravel, fills and channels of the main stream courses and the tributaries associated with floodplain washes. The total thickness of the alluvial materials varies from zero along the mountain fronts to depth exceeding 1,200 feet under the valley interior.

LOCAL GEOLOGY

The dam is located in Maricopa County, Arizona, approximately, 22 miles northwest of Phoenix and about 6 miles west of Interstate 17 (Black Canyon Highway). The dam spans the New River between the West Wing Mountains, which form the right abutment, and Keefer Hill, a westward projection of the East Wing Mountains, which form the left abutment. The valley is approximately 2000 feet wide at the project site. The geological formations present within the project area consist generally of (1) Precambrian granitic rocks, (2) Tertiary volcanic rocks, and (3) Quaternary alluvial deposits.

The Precambrian age granitic rocks, composed primarily of granite, diorite, and related crystalline rocks, are extensively exposed in the East Wing Mountains, including Keefer Hill, and underlie the outlet works and a portion of the dam foundation on the east side of the valley. These rocks can be collectively referred to as the Precambrian basement complex. Granite and diorite are dominant rock types present.

Tertiary-age volcanic rocks, composed of andesite, several varieties of tuff, flow breccia and agglomerate are extensively exposed in the West Wing Mountains. The dominant rock type, a light to medium dark gray andesite, is present on the right abutment of the dam and in the spillway excavation and also underlies a portion of the dam foundation on the west side of the valley. A reddish-brown to pinkish-gray andesite outcrops in the northwestern part of the mountains and underlies the south abutment of dike no. 1.

The Quaternary-age alluvium can generally be designated as either older poorly- to well-consolidated valley fill, alluvial fan and floodplain deposits, or younger unconsolidated stream channel and tributary wash deposits. The older Quaternary alluvium also includes the usually thin spotty veneer of residual soil and slope wash found on the slopes of the East and West Wing Mountains. The valley floor is covered principally by fine-grained floodplain deposits consisting mostly of sand and silts which attain a maximum thickness of approximately 9 feet. The underlying coarser-grained valley fill deposits, consisting mainly of clays, sands and gravels with numerous layers and lenses of older stream channel cobbles and boulders present to a depth of about 25 feet, extends down to bedrock, which is at a known maximum depth of 136 feet beneath the dam foundation near the center of the valley. Erratic, near-surface zones of caliche cementation are common on the east side of the valley above the shallow granitic bedrock pediment.

FOUNDATION EXCAVATION AND TREATMENT

Dam Embankment

STREAMBED

After clearing and grubbing, which required the removal of about 9 inches of surficial soil material, foundation materials were excavated that would have exhibit undesirable settlement properties and would have had a low shear strength. A core trench, with a variable base width and sideslopes no steeper than 1.0V to 1.5H, has been excavated through pervious foundation materials and into relatively impervious foundation materials or bedrock. Between the left abutment and station 21+06 along the centerline of the embankment, the core trench has been excavated to treatable granitic bedrock. Between stations 21+06 and 29+64, the core trench has been excavated to elevation 1365 and has 15-foot benches at elevation 1370 upstream and downstream of the core. Between station 29+64 and the right abutment, the core trench has been excavated to treatable volcanic bedrock.

The contract documents provide for inspection of the core trench walls and bottom for open-work gravel lenses and nested boulders. No such materials were observed. The bottom and sides of the core trench and bottom of the foundation excavation were scarified, moistened as required and compacted with eight passes of a 50-ton rubber-tired roller. Where bedrock was exposed in the core trench, all loose rock was removed and the surface cleaned by air blasting. Grouting of those portions of the core trench bottom excavated into bedrock consisted of a single line of grout holes spaced approximately 10 feet apart, forming a grout curtain 50 to 75 feet in depth along the dam centerline. This was essentially a foundation investigative grouting program. Pervious zones existing in the foundation were grouted to refusal using the split-spacing method. Depressions not accessible to rubber tired equipment compaction were backfilled with dental concrete.

Suitable materials from the excavation were stockpiled or used directly in the construction of the dam. The initial lifts of core material at the rock-core contract were compacted wet of optimum moisture content.

ABUTMENTS

Left Abutment

The entire left abutment was initially excavated to an average depth of approximately 1 foot. The core and transition contact zones were then excavated approximately 5 feet to treatable granitic bedrock and all loose rock removed and the surface cleaned by air blasting. A single line of grout holes on 10 foot centers were drilled and grouted to depths of 25 or 50 feet along the dam centerline. This was essentially a foundation investigative grouting program. Pervious zones existing in the foundation were grouted to refusal using the split-spacing method. In areas where core material could not be readily placed and compacted with rubber-tired equipment, or to protect weathered intact rock from possible degradation caused by compaction equipment, dental concrete was used to form a uniform surface on which to place fill material. Core materials at the abutment contact were compacted wet of optimum moisture content.

Right Abutment

The right abutment core and transition contact zones were excavated approximately 3 feet to treatable andesite bedrock. The pervious shell contact zone was excavated to an average depth of 1 foot. In the core and transition zones all loose rock was removed and the surface cleaned by air blasting. The grouting program was similar to that described for the left abutment. Open or filled surface fractures and joints were cleaned to a minimum depth of three times their width and sealed with grout slurry to prevent seepage paths along the abutment contact. In areas where core material could not be readily placed and compacted with rubber tired equipment, dental concrete was used to form a uniform surface on which to place fill material. The core materials at the abutment contact were compacted wet of optimum moisture content.

DIKE NO. 1

After stripping and wasting the surficial materials from beneath the entire embankment down to andesite bedrock or the caliche cap, an exploration trench was then excavated along the centerline of the dike to an average depth of 5 feet. The exploration trench is founded on caliche from stations 10+00 to 78+65 and on andesite bedrock from stations 78+65 to 84+75. The exploration trench has a base width of approximately 12 feet and sideslopes no steeper than 1.0V to 1.5H. The caliche layer, which has a maximum thickness of about 18 inches, was removed from the portion of the embankment foundation beneath the upstream shell. The bottom and walls of the exploration trench were inspected for open-work gravel lenses and nested cobbles which were not found. The bottom and walls of the exploration trench and portion of the embankment foundation upstream from the exploration trench were scarified, moistened to optimum moisture; and compacted with eight passes of a 50-ton rubber-tired roller. In the bedrock portion of the exploration trench, all loose rock was removed and the surface cleaned by air blasting. In areas were core material could not be readily placed, dental concrete was used to form a uniform surface on which to place fill material. The initial lifts of core material at the rock-core contact were compacted wet of optimum moisture content.

DIKE NO. 2

Foundation treatment for Dike No. 2 consisted of stripping about 1 foot of material.

SETTLEMENT AND SUBISDENCE

DAM EMBANKMENT

Settlements were determined from the compressive characteristics of the embankment and foundation materials. The estimated total settlement at the maximum embankment section and foundation is less than 2.6 feet. Maximum post-construction settlement was estimated to be less than 1.1 feet.

The foundation treatment required removal of the foundation soils that were susceptible to undergoing large magnitudes of settlement during construction. The settlements of foundation materials were determined by analyzing the compressibility of the soils assuming a saturated foundation and an in-situ density of about 85-percent relative density. Total foundation settlement under the maximum embankment section loading and of the point of deepest alluvium was estimated to be 0.8 foot.

Settlements in the embankment will be greatest in the core zone. To minimize settlements in the core zone, the core materials were compacted to 101 percent of maximum density (ASTM 698-70) near optimum moisture content. In order to obtain uniform moisture distribution, pre-wetting of the core borrow areas was required. Total settlement of the maximum embankment section is estimated to be 1.8 feet. The pervious shell materials consist of coarse-grained soils. Settlements in the shell materials are minimal with most of the settlement occurring during construction. The configuration of the core would minimize the effects of any differential settlements between the core and pervious shell.

Minor post-construction differential settlements that are due to the loading of the foundation are anticipated because of the abrupt changes in bedrock profile existing below streambed in the west (right) half of the valley. The core materials are protected from eroding, should transverse cracking of the core occur, by the cohesionless transition zones that are constructed downstream and upstream from the core. The cohesionless sandy gravel material used in the transition zones are not susceptible to cracking nor are the pervious shell materials.

DIKE NO. 1

Settlements were determined from the compressive characteristics of the embankment and foundation materials. The estimated settlement of the maximum embankment section is 0.3 foot. Maximum post-construction settlement was estimated to be less than 0.16 foot. Total foundation settlement under the maximum embankment section was estimated to be 0.4 foot with most of the settlement occurring during construction. The total settlement, therefore, is estimated to be 0.7 foot and the total post-construction settlement is estimated to be less than 0.16 foot.

Post-construction differential settlements because of loading of the foundation are not anticipated due to the presence of bedrock and well indurated caliche.

DIKE NO. 2

Because of the characteristics of the embankment materials, settlement for Dike No. 2 was not determined. Foundation settlements and subsidence due to groundwater decline were not addressed because the embankment is founded on rock.

INSTRUMENTATION

DAM EMBANKMENT

Twenty-two settlement monuments have been installed at the upstream edge of the crest of the dam to determine the rate and magnitude of post-construction settlement. Seven settlement monuments are located on the upstream slope of the dam. The monuments were installed and measured at the end of embankment construction. Subsequent measurements of the settlement monuments will be made at intervals consistent with periodic inspections.

DIKE NO. 1

Twenty-one settlement monuments have been installed at the upstream edge of the crest of Dike No. 1 to determine the rate and magnitude of post-construction settlement. The monuments were installed and read at the end of embankment construction. Subsequent readings of the settlement monuments will be made at intervals consistent with periodic inspections.

DIKE NO. 2

No settlement monuments were installed for Dike No. 2.

INSTRUMENT HOUSE

An instrument house, constructed of 6-inch reinforced concrete and designed in accordance with current Uniform Building Code requirements, has been provided on the turnaround and parking area at the east end of the dam embankment to house the battery operated hydrogages, recorders, and the Geostationary Operational Environmental Satellite (GOES) data collection platform.

PRECIPITATION AND RESERVOIR WATER SURFACE RECORDING SYSTEM

A rain gage has been installed on the roof of the instrument house. A battery operated hydrogage with gas purge system and dual strip chart recorder records reservoir water surface and rainfall data. The hydrogage has been interconnected by a 2-inch galvanized steel conduit to the intake sump near the intake structure.

DOWNSTREAM GAGING STATION AND RECORDING SYSTEM

An outflow gaging station has been provided below the dam. A battery-operated hydrogage with gas purge system and strip chart recorder has been interconnected by a 2-inch galvanized steel conduit to the gaging station control section. The control section, which includes a bridge, has been located about 40 feet downstream from the energy dissipator where the flow of water is stabilized.

GOES DATA COLLECTION PLATFORM

The precipitation and reservoir water surface recording system and the outflow gaging station recording system have been connected to a GOES data collection platform (DCP). The DCP provides real-time hydrologic data from these gages through the GOES Data Collection System (DCS).

RESERVOIR STAFF GAGES

Adjustable staff gages, consisting of 5-foot sections, have been installed from the invert elevation of the outlet works approach channel to the top of the dam so as to be readable from the top of the dam. They will be painted wood gages with enameled iron markings attached to 6-inch galvanized channels with galvanized bolts. The channels, which have been set in concrete, are slotted to permit quick and economical adjustments of the staff gages to mean sea level datum should settlement occur in the earthfill dam.

SEDIMENT STAFF GAGES

Sediment staff gages have been installed to determine quantities and patterns of sediment accumulation and to determine the need for topographic mapping. Gages have been established in a grid pattern throughout the basin generally within the estimated areal extent of sediment accumulation. They are on centers approximately 2000 feet apart and of very similar design to those provided at Adobe Dam. These will provide a steel pipe and flange with welded bead elevation marks. Monitoring will be performed on an as-needed basis.

GAGING STATION BRIDGE

A prestressed concrete foot bridge has been constructed across the outlet channel downstream from the energy dissipator. The 4-foot wide bridge has a span of about 90 feet.

INSPECTION CHECKLIST

a. Embankment
   (1) Crest
   (2) Abutment contacts
   (3) Upstream and downstream slopes
   (4) Upstream and downstream toes

b. Spillway
   (1) Approach channel
   (2) Control section
   (3) Outlet channel

c. Outlet Works
   (1) Approach channel
   (2) Trash rack structure
   (3) Conduit
   (4) Energy dissipator
   (5) Outlet channel
   (6) Gaging station bridge

d. Dike Number 1
   (1) Crest
   (2) Abutment contacts
   (3) Upstream and downstream slopes
   (4) Upstream and downstream toes

e. Dike Number 2
   (1) Crest
   (2) Abutment contacts
   (3) Upstream and downstream slopes
   (4) Upstream and downstream toes

Pertinent Data New River Dam

Feature Description	Unit	Data
Drainage area	sq. mi.	164
Type of dam	--	Compacted earthfill
Main embankment:		
Crest elevation	ft, msl	1486.7
Maximum height above streambed	ft	104
Crest Length	ft	2320
Freeboard	ft	5.6
Dikes No. 1 and 2:		
Dike No. 1		
Crest elevation	ft, msl	1486.3
Crest length	ft	7464
Freeboard	ft	5.2
Max. height	ft	36
Dike No. 2		
Crest elevation	ft, msl	1484.0
Crest length	ft	256
Freeboard	ft	2.9
Max. height	ft	9
Spillway:		
Crest elevation	ft, msl	1456.2
Crest width	ft	75
Max. water surface elevation	ft, msl	1481.1
Max. spillway outflow	ft^3/s	29,850
Outlet conduit:		
Interior dimension	ft	9.5 H x 6.25 W
Length	ft	433
Inlet elevation	ft, msl	1389.25
Outlet elevation	ft, msl	1386.31
Max. Outlet Outflow	ft^3/s	3,150
Energy dissipator:		
Length	ft	60.98
Width	ft	31.0
Floor elevation	ft, msl	1372.0
Wall height	ft	22.0
Outlet Channel:		
Base width	ft	16.0
Sideslope	--	2.5H on 1V
Levee height	ft	1.0 - 8.0
Length	ft	730.32

Feature Description	Unit	Data
Reservoir area:		
Spillway crest	acres	1780
Max. water surface	acres	2900
Capacity (gross):		
Spillway crest	ac ft	43,520
Max. water surface	ac ft	102,520
Storage allocation below spillway crest:		
Flood control (net)	ac ft	38,600
Sedimentation	ac ft	4,920
Standard project flood:		
Total volume	ac ft	49,300
Peak inflow	ft^3/s	45,000
Peak outflow	ft^3/s	2,665
Probable maximum flood:		
Total volume	ac ft	105,000
Peak inflow	ft^3/s	144,000
Peak outflow	ft^3/s	33,000

NEW RIVER DAM

Plates	*From Design Drawings
1	General Plan.
2	General Site Geology and Diamond Drill Hole Plan of Exploration.
3	Dike No. 1 Geology and Plan of Exploration.
4	Dam Embankment Plan and Profile.
5	Dam Embankment Cross Sections.
6	Dam Embankment Cross Section and Details.
7	Dam Embankment Cross Section and Details.
8	Dam Embankment Cross Sections.
9	Dam Embankment Typical Sections.
10	Dike No. 1 Plan and Profile Sta. 84+75 to Sta. 52+00.
11	Dike No. 1 Plan and Profile Sta. 52+00 to Sta. 22+00.
12	Dike No. 1 Plan and Profile Sta. 22+00 to Sta. 10+00 and Drainge Details.
13	Dike No. 1 Cross Sections and Typical Sections.
14	Dike No. 2 Plan and Profile and Typical Section.
15	Spillway Plan and Profile.
16	Spillway Cross Sections Sill Sections and Details.
17	Outlet Works Plan and Profile Sta. 24+00 to Sta. 10+50.
18	Outlet Works Plan and Profile Sta. 10+50 to Sta. 1+73.
19	Outlet Works Cross Sections.
20	Outlet Works Cross Sections and Details - Outlet Channel.
21	Outlet Works Intake Structure.
22	Monuments and Sediment Staff Gage Locations.

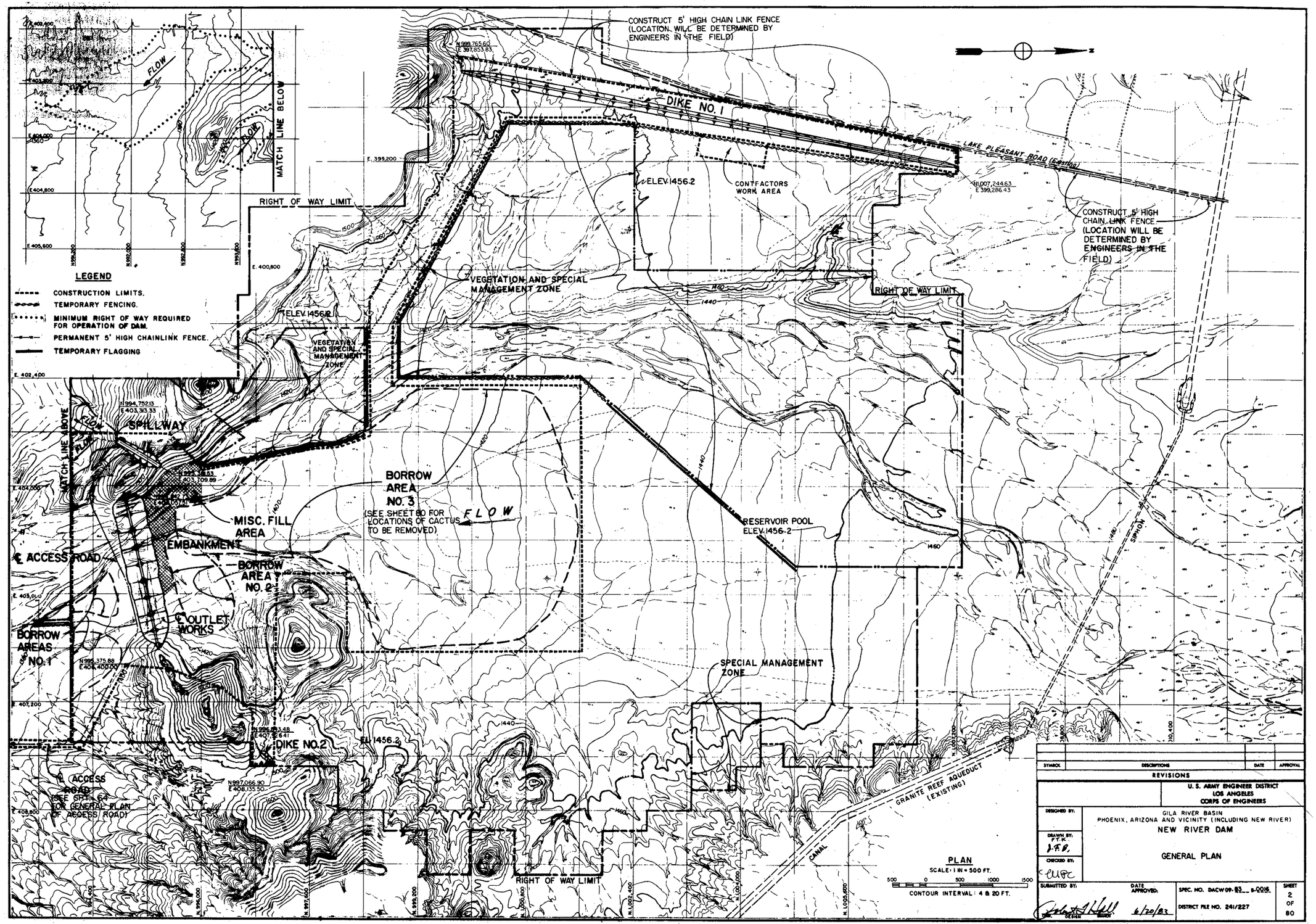
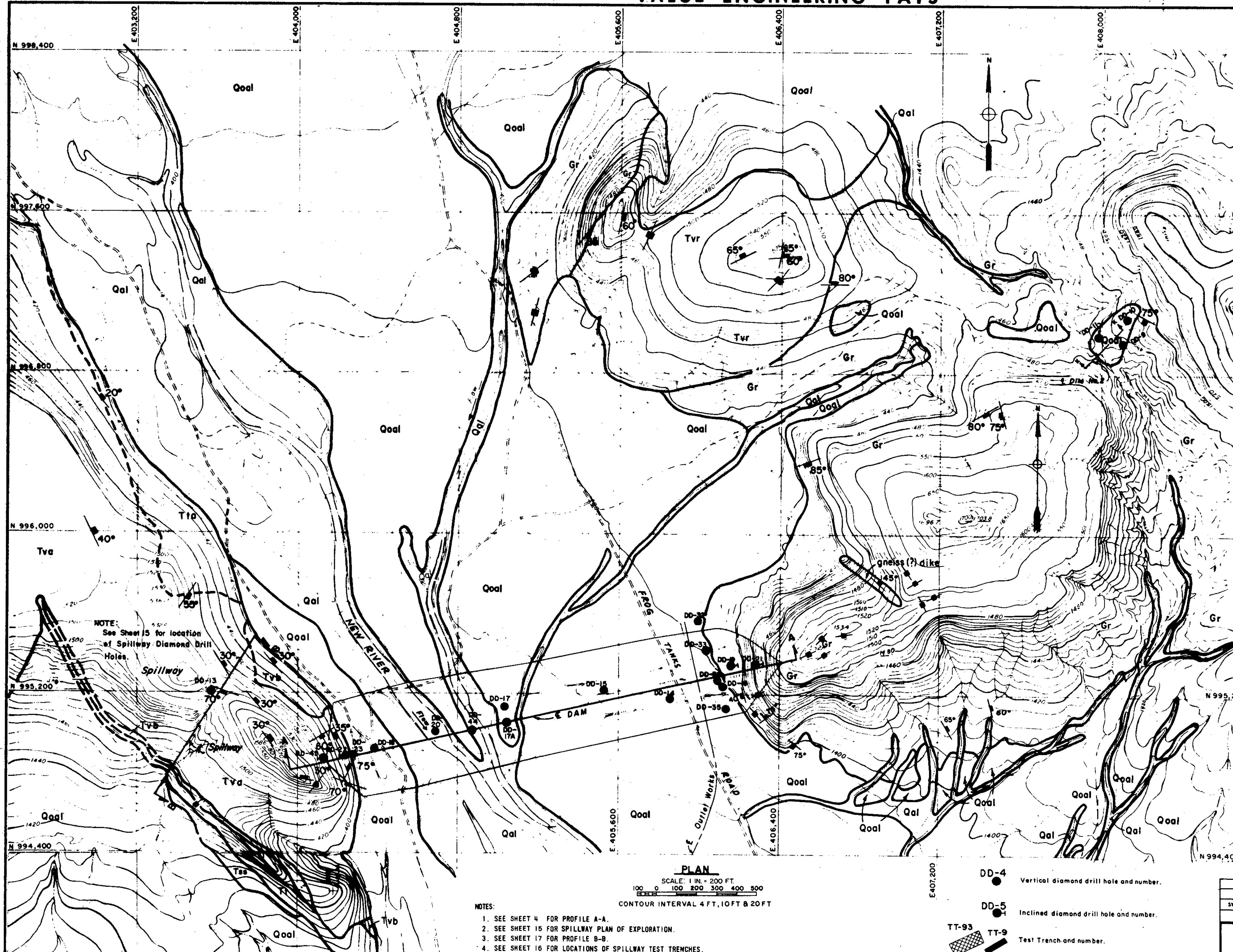

CONSTRUCT 5' HIGH CHAIN LINK FENCE (LOCATION WILL BE DETERMINED BY ENGINEERS IN THE FIELD)
N999,765.60
E397,853.83
DIKE NO. 1
LAKE PLEASANT ROAD (existing)
N1,007,244.63
E399,286.43
CONSTRUCT 5' HIGH CHAIN LINK FENCE (LOCATION WILL BE DETERMINED BY ENGINEERS IN THE FIELD)
ELEV. 1456.2
CONTRACTORS WORK AREA
RIGHT OF WAY LIMIT
VEGETATION AND SPECIAL MANAGEMENT ZONE
ELEV. 1456.2
VEGETATION AND SPECIAL MANAGEMENT ZONE
RIGHT OF WAY LIMIT
MATCH LINE BELOW
FLOW
MATCH LINE ABOVE
SPILLWAY
N995,385.53
E403,709.89
BORROW AREA NO. 3
(SEE SHEET 80 FOR LOCATIONS OF CACTUS TO BE REMOVED)
FLOW
MISC. FILL AREA
EMBANKMENT
BORROW AREA NO. 2
ACCESS ROAD
OUTLET WORKS
BORROW AREAS NO. 1
N995,375.88
E404,400.00
RESERVOIR POOL
ELEV. 1456.2
SPECIAL MANAGEMENT ZONE
N998,983.48
E407,264.1
DIKE NO. 2
EL. 1456.2
ACCESS ROAD
(SEE SHEET 64 FOR GENERAL PLAN OF ACCESS ROAD)
N997,066.90
E406,135.50
RIGHT OF WAY LIMIT
GRANITE REEF AQUEDUCT (EXISTING)
CANAL
SIPHON
LEGEND
CONSTRUCTION LIMITS.
TEMPORARY FENCING.
MINIMUM RIGHT OF WAY REQUIRED FOR OPERATION OF DAM.
PERMANENT 5' HIGH CHAINLINK FENCE.
TEMPORARY FLAGGING
PLAN
SCALE: 1 IN = 500 FT.
500 0 500 1000 1500
CONTOUR INTERVAL: 4 & 20 FT.
SYMBOL
DESCRIPTIONS
DATE
APPROVAL
REVISIONS
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS
DESIGNED BY:
DRAWN BY: F.T.K.
CHECKED BY:
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
GENERAL PLAN
SUBMITTED BY:
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/227
SHEET 2 OF 80

PLATE 1



PLAN

SCALE: 1 IN. = 200 FT.

100 0 100 200 300 400 500

CONTOUR INTERVAL 4 FT, 10 FT & 20 FT

NOTES:

1. SEE SHEET 4 FOR PROFILE A-A.
2. SEE SHEET 15 FOR SPILLWAY PLAN OF EXPLORATION.
3. SEE SHEET 17 FOR PROFILE B-B.
4. SEE SHEET 16 FOR LOCATIONS OF SPILLWAY TEST TRENCHES.
5. SEE SHEET 7 FOR LOCATIONS OF OUTLET WORKS TEST TRENCHES.
6. SEE SHEET 7 FOR LOCATIONS OF EMBANKMENT TEST TRENCHES.
7. SEE SHEET 7 FOR PROFILE (I-I) OF OUTLET WORKS.
8. SEE SHEET 13 FOR DIKE No. 1 PLAN OF EXPLORATION.
9. SEE SHEET 14 FOR PROFILE K-K.
10. SEE SHEETS 5,6,12,14 FOR GEOLOGIC LOGS OF DIAMOND DRILL HOLES.
11. SEE SHEETS 13 AND 20 FOR LOCATIONS OF SEISMIC SURVEY LINES.
12. SEE SHEET 7 FOR LOCATIONS OF LEFT ABUTMENT TEST TRENCHES.
13. DIAMOND DRILL HOLE LOCATIONS ARE SURVEYED.
14. SEE SHEET 16 FOR DETAILED GEOLOGY OF SPILLWAY AND RIGHT ABUTMENT.
15. SEE SHEET 7 FOR DETAILED GEOLOGY OF LEFT ABUTMENT.

LEGEND

QUATERNARY:

Qal — RECENT ALLUVIUM: Streambed deposits, clay, silt, sand gravel, cobbles and occasional boulders, unconsolidated.

QUATERNARY:

Qoal — OLDER ALLUVIUM: Floodplain deposits, colluvium, residual soil, slope wash, older stream channel deposits, clay, silt, sand, gravel, cobbles and occasional boulders; poorly to well consolidated, locally caliche cemented.

TERTIARY:

Tta — VOLCANICS: TUFFACEOUS AGGLOMERATE: Angular to subangular, gray and reddish-brown vesicular andesite fragments in a brown, tuffaceous matrix.

Tva — VOLCANICS: ANDESITE: Gray, hard, platy to blocky, with occasional flow lineations; andesite is altered and brecciated near flow breccia contacts.

Tvr — VOLCANICS: RHYOLITE: Pinkish-brown, hard, platy, with distinct flow banding; rhyolite is glassy at granite contacts.

Tvb — VOLCANICS: FLOW BRECCIA: Angular to subangular, altered, maroon-purple-gray andesite fragments well cemented in a reddish-brown, partially clayey, slightly vesicular fine grained groundmass.

Tt — TUFF: Pinkish-brown to purple-gray, banded, glassy, fine to coarse grained, hard.

Tss — SANDSTONE: Pink to white-gray, tuffaceous, moderately soft to moderately hard; underlain by a brown to white-gray, moderately soft, fine to coarse grained sandstone.

PRECAMBRIAN:

Gr — GRANITE: White-gray to reddish-brown, undifferentiated, fine to coarse grained, moderately soft to hard; associated rocks include dioritic gneiss (?) granite pegmatite and vein quartz.

DD-4 — Vertical diamond drill hole and number.

DD-5 — Inclined diamond drill hole and number.

TT-93, TT-9 — Test Trench and number.

Approximate contact between geologic units, dashed where inferred.

45° — Strike and dip of layering.

30° — Strike and dip of bedding.

75° — Strike and dip of joint.

Strike of vertical joint.

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RLT
DRAWN BY: LBA
CHECKED BY:

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

GENERAL SITE GEOLOGY AND DIAMOND DRILL HOLE PLAN OF EXPLORATION

SUBMITTED BY: [signature] CHIEF, GEOTECHNICAL BRANCH

DATE APPROVED:

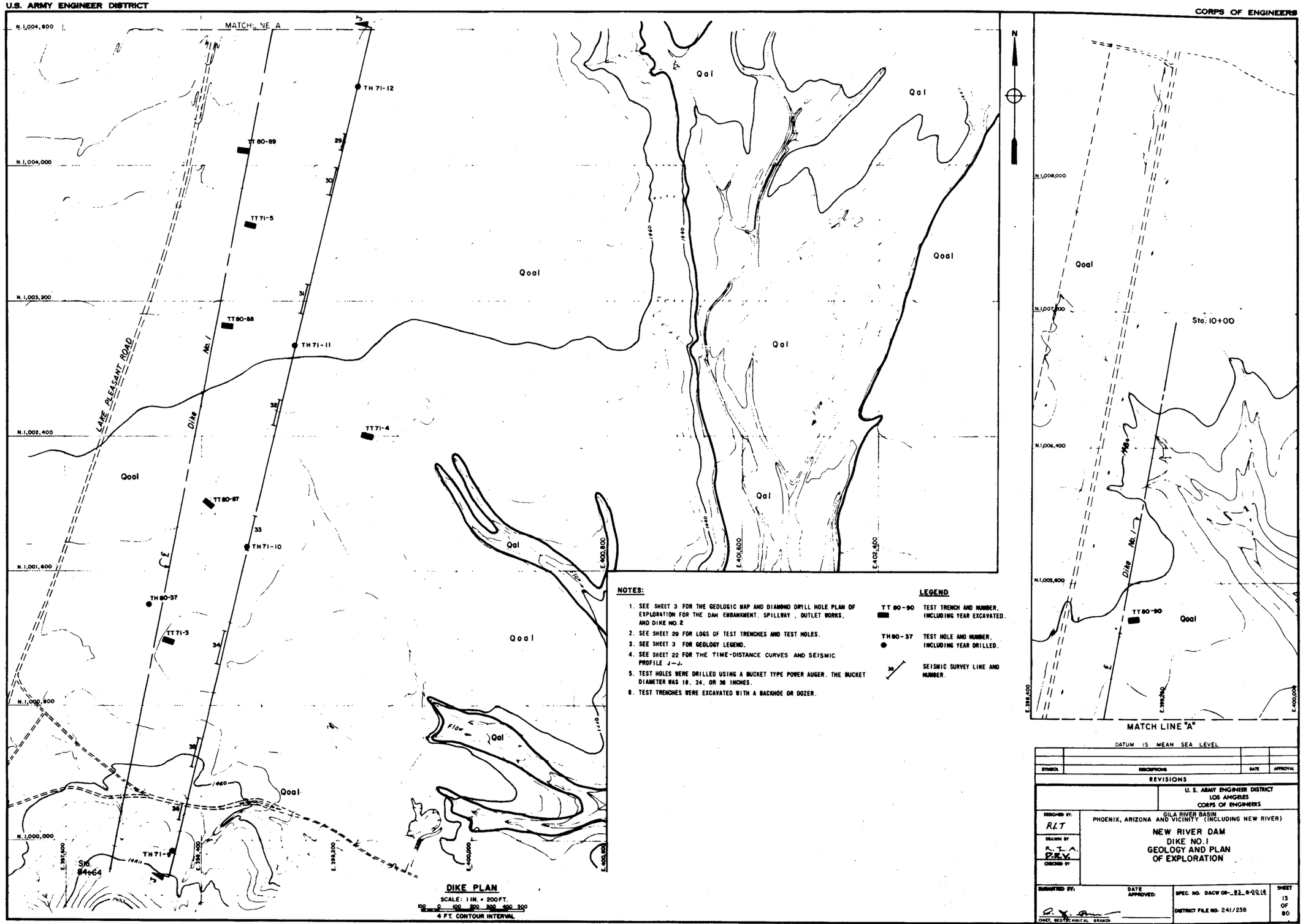
SPEC. NO. DACW09-83-B-0016

DISTRICT FILE NO. 241/228

SHEET 3 OF 80

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: R.L.T.
DRAWN BY: R.L.A. P.E.V.
CHECKED BY:

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

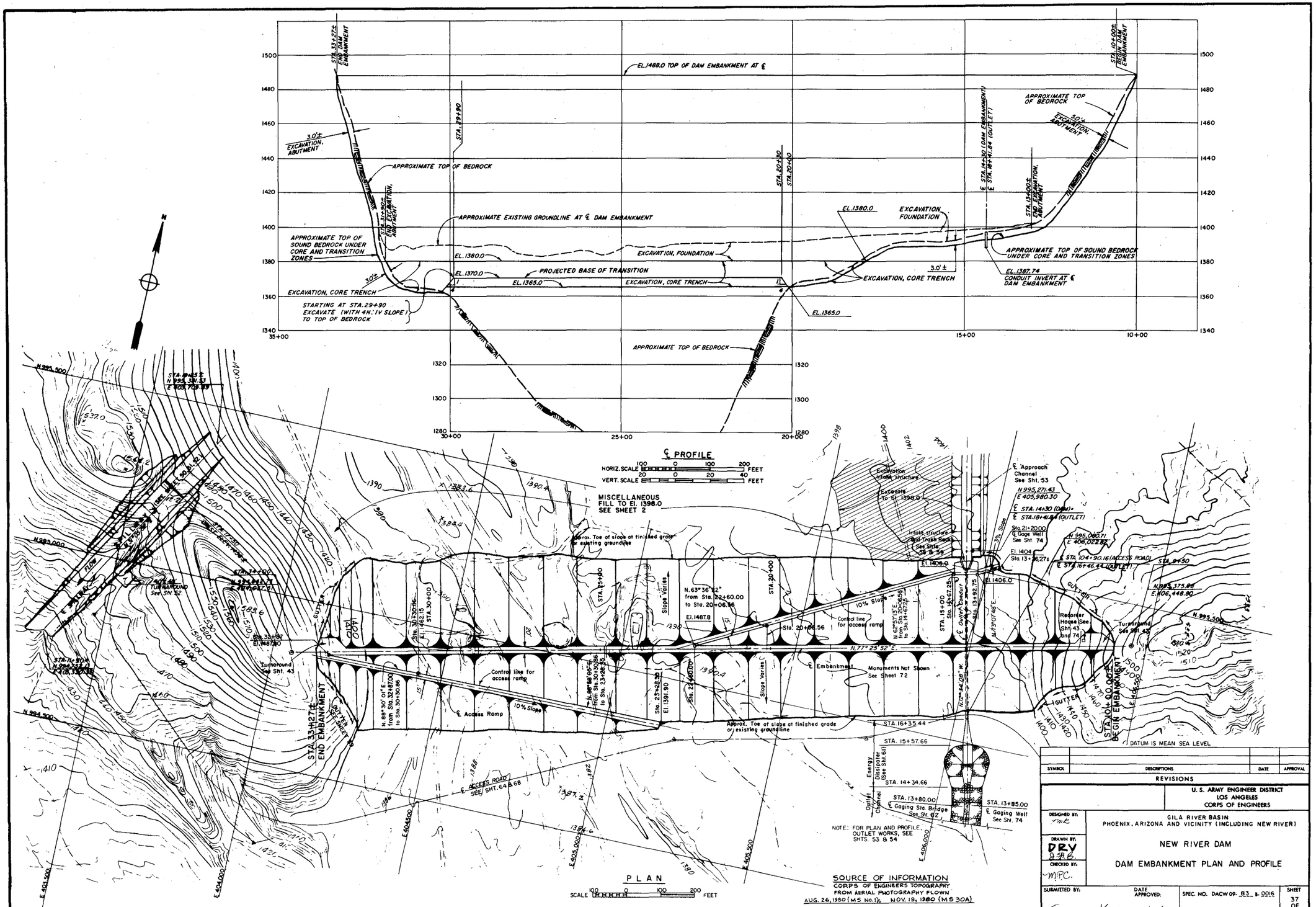
NEW RIVER DAM
DIKE NO. 1
GEOLOGY AND PLAN OF EXPLORATION

SUBMITTED BY: DATE APPROVED:
CHIEF, GEOTECHNICAL BRANCH

SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/236

SHEET 13 OF 80

PLATE 3



SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: MPC
DRAWN BY: DRV JAB
CHECKED BY: MPC

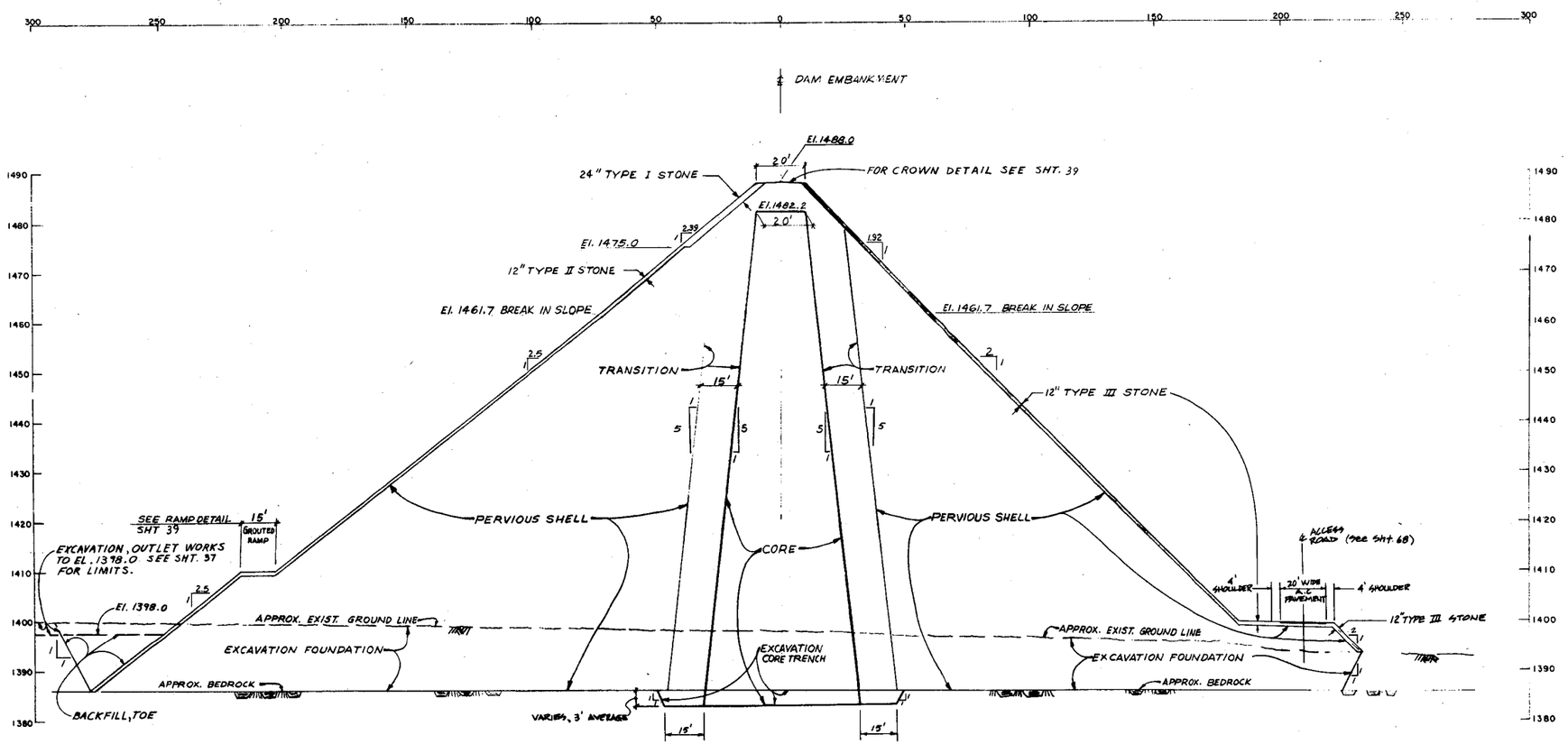
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM

DAM EMBANKMENT PLAN AND PROFILE

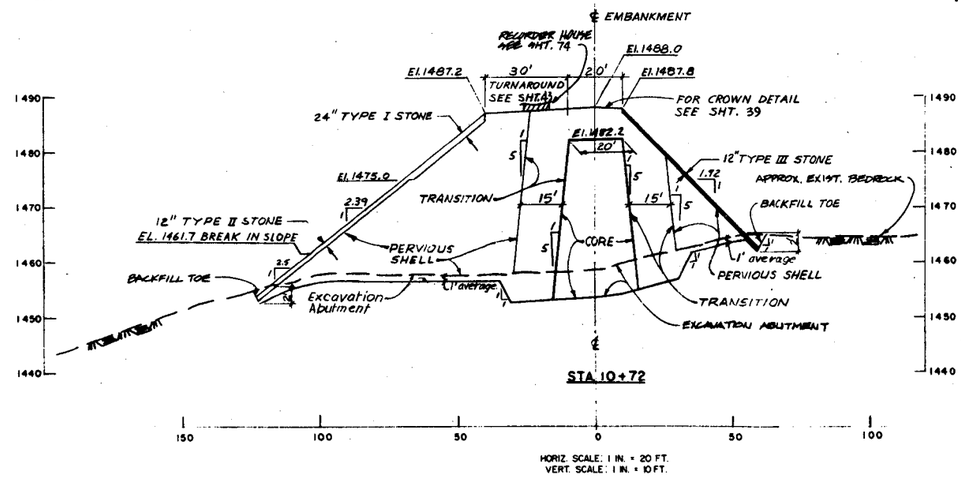
SUBMITTED BY: Robert J. Hall, CHIEF, DESIGN BRANCH
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/262
SHEET 37 OF 80

PLATE 4



STA. 15+00

HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.



STA. 10+72

HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.

NOTE: VIEW OF CROSS-SECTIONS ARE LOOKING TOWARD DECREASING STATIONS.

VERT. SCALE: 1 IN. = 10 FT.
10 0 10 20 30

HORIZ. SCALE: 1 IN. = 20 FT.
10 0 10 20 30 40 50

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RMK
DRAWN BY: H.G.
CHECKED BY: MPC

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

DAM EMBANKMENT
CROSS SECTIONS

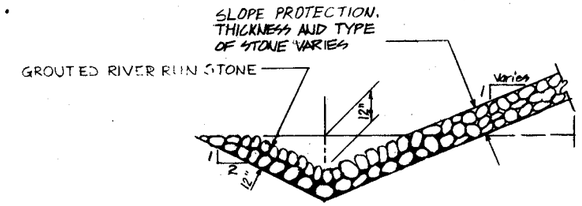
SUBMITTED BY: Robert S. Hall
CHIEF, DESIGN BRANCH

DATE APPROVED: 6/20/03

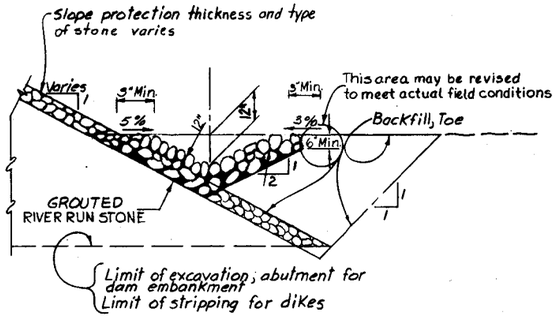
SPEC. NO. DACW09-03-B-0016

DISTRICT FILE NO. 241/263

SHEET 36 OF 80

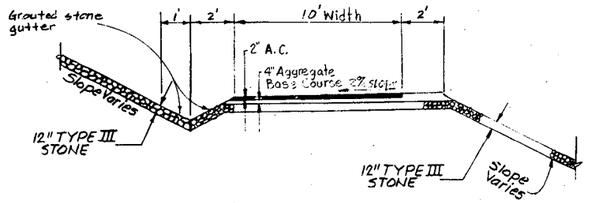


IN BEDROCK

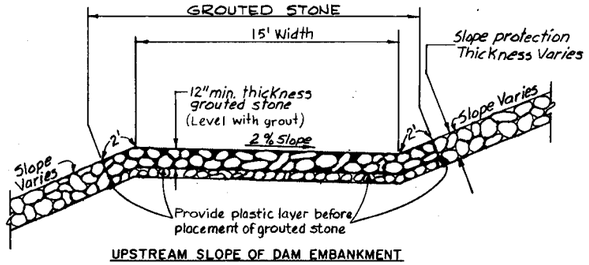


IN ALLUVIUM

GUTTER DETAILS
SCALE: 1 IN. = 2 FT.

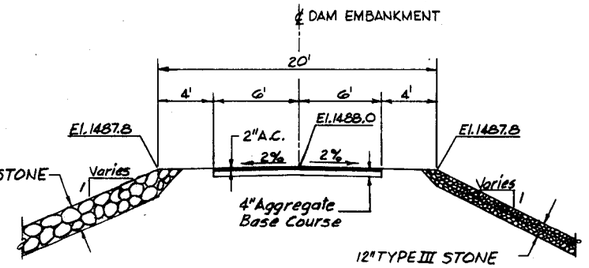


DOWNSTREAM SLOPE OF DAM EMBANKMENT
NOT TO SCALE

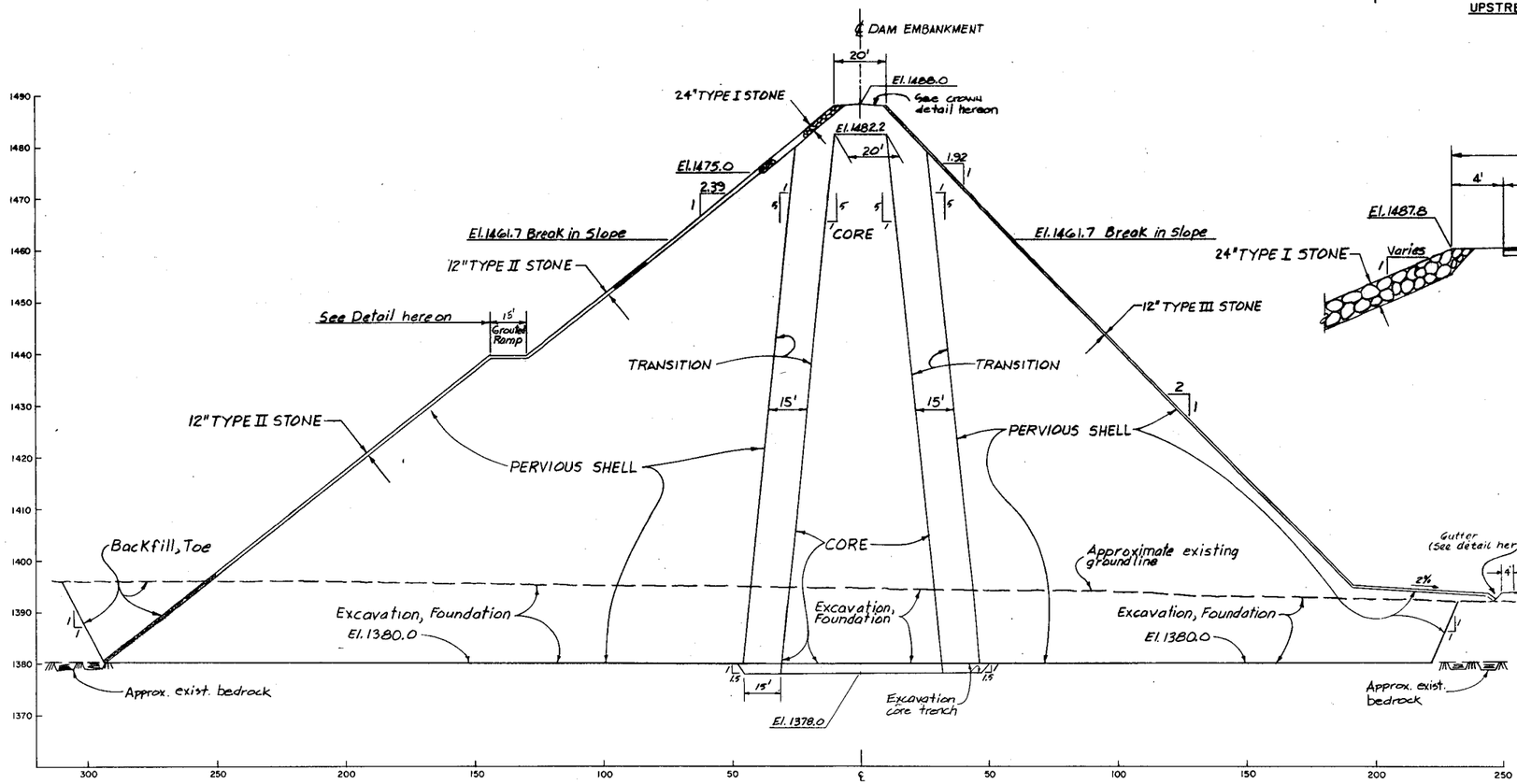


UPSTREAM SLOPE OF DAM EMBANKMENT

RAMP DETAILS
NOT TO SCALE



CROWN DETAIL
SCALE: 1 IN. = 4 FT.



STA. 18+00
HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.

SCALE: 1 IN. = 2 FT.
0 1 2 3 4 5

SCALE: 1 IN. = 4 FT.
0 5 10

SCALE: 1 IN. = 10 FT.
0 10 20 30

SCALE: 1 IN. = 20 FT.
0 10 20 30 40 50

NOTE: VIEW OF CROSS-SECTION IS LOOKING TOWARD DECREASING STATIONS.

DATUM IS MEAN SEA LEVEL

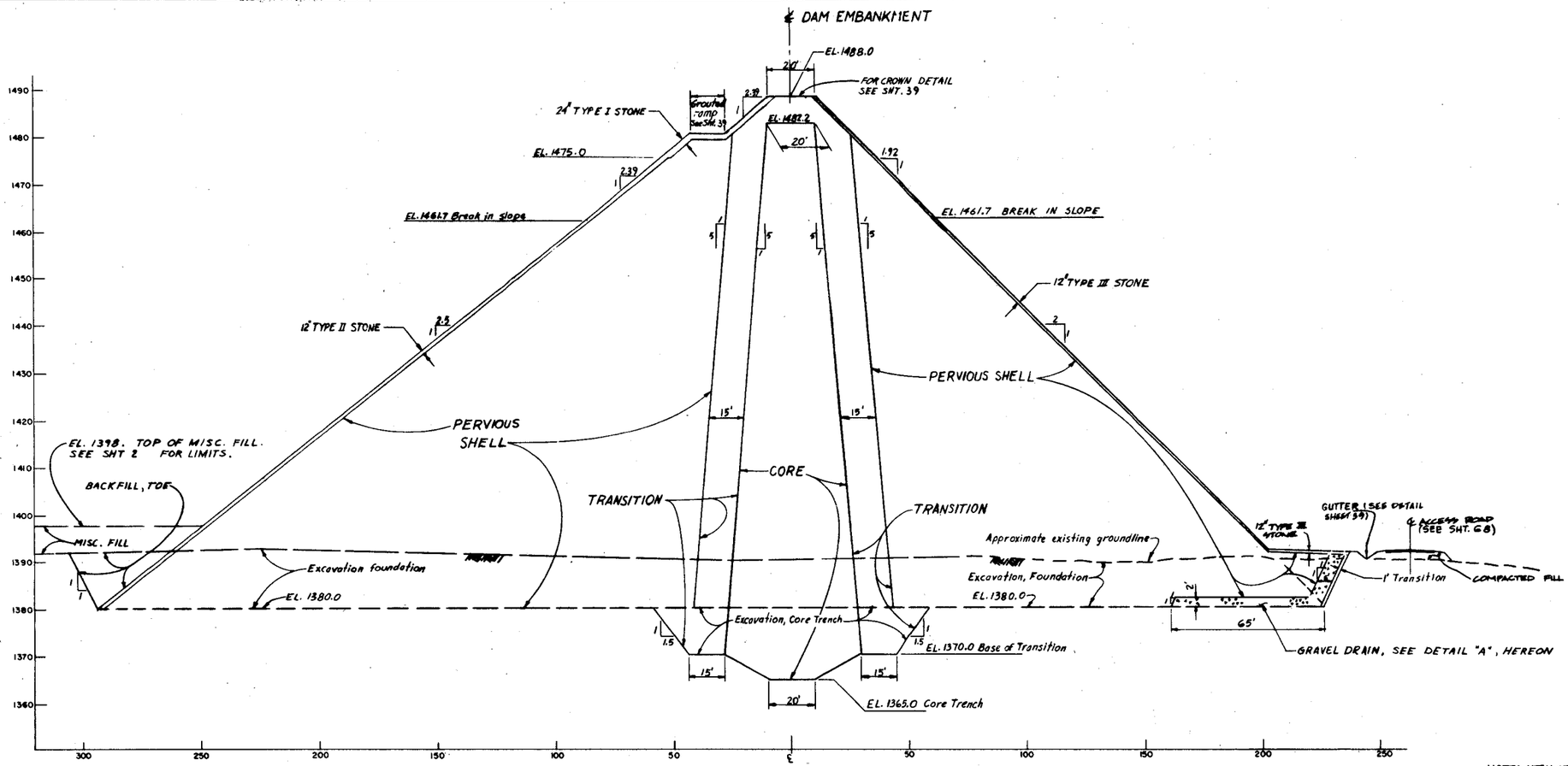
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RMR
DRAWN BY: DRV
CHECKED BY: WPC

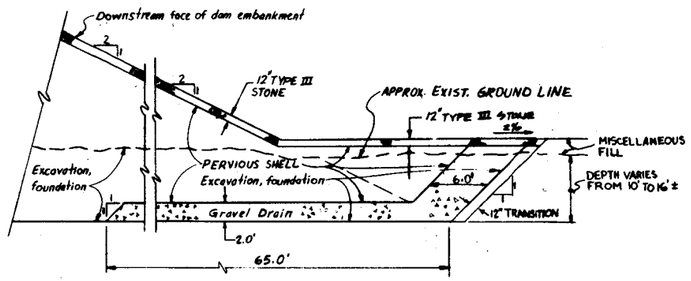
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
DAM EMBANKMENT
CROSS SECTION AND DETAILS

SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/22/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/264
SHEET 39 OF 80

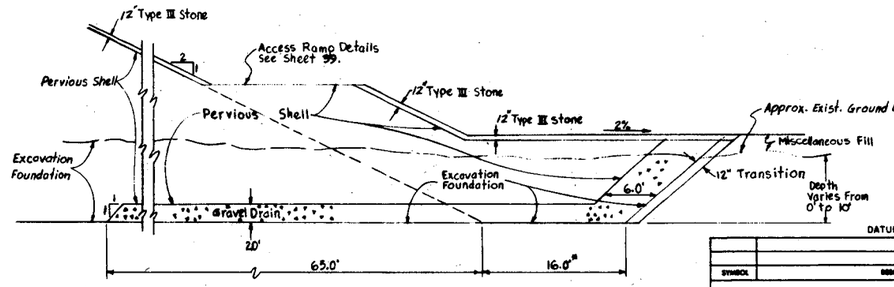


STA. 21+50
HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.

NOTE: VIEW OF CROSS-SECTION IS LOOKING TOWARD DECREASING STATIONS.



DETAIL "A": GRAVEL DRAIN
STA. 19+00 TO STA. 23+30
SCALE: 1 IN. = 6 FT.



"Varies from 0' at Sta. 23+30 to 16' at Sta. 29+30.

DETAIL "B" GRAVEL DRAIN
STA. 23+30 TO STA. 31+00
SCALE: 1 IN. = 6 FT.

SCALE: 1 IN. = 6 FT.
5 0 5 10 15
SCALE: 1 IN. = 10 FT.
10 0 10 20 30
SCALE: 1 IN. = 20 FT.
10 0 10 20 30 40 50

DATUM IS MEAN SEA LEVEL

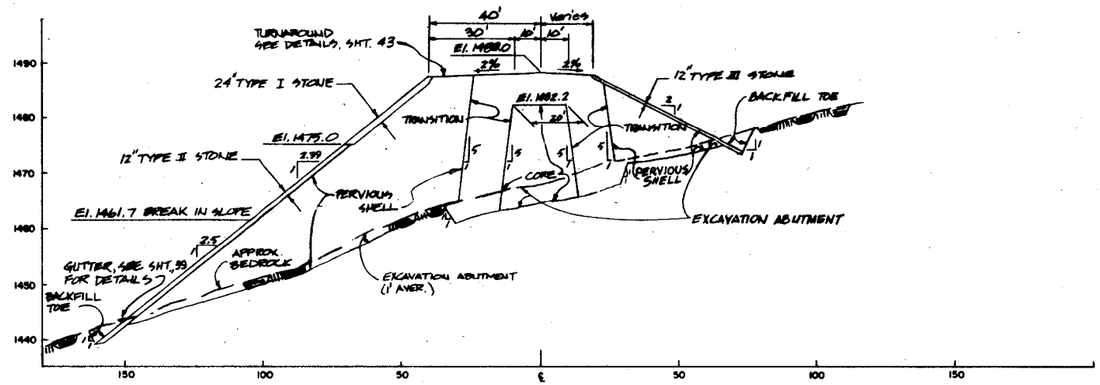
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

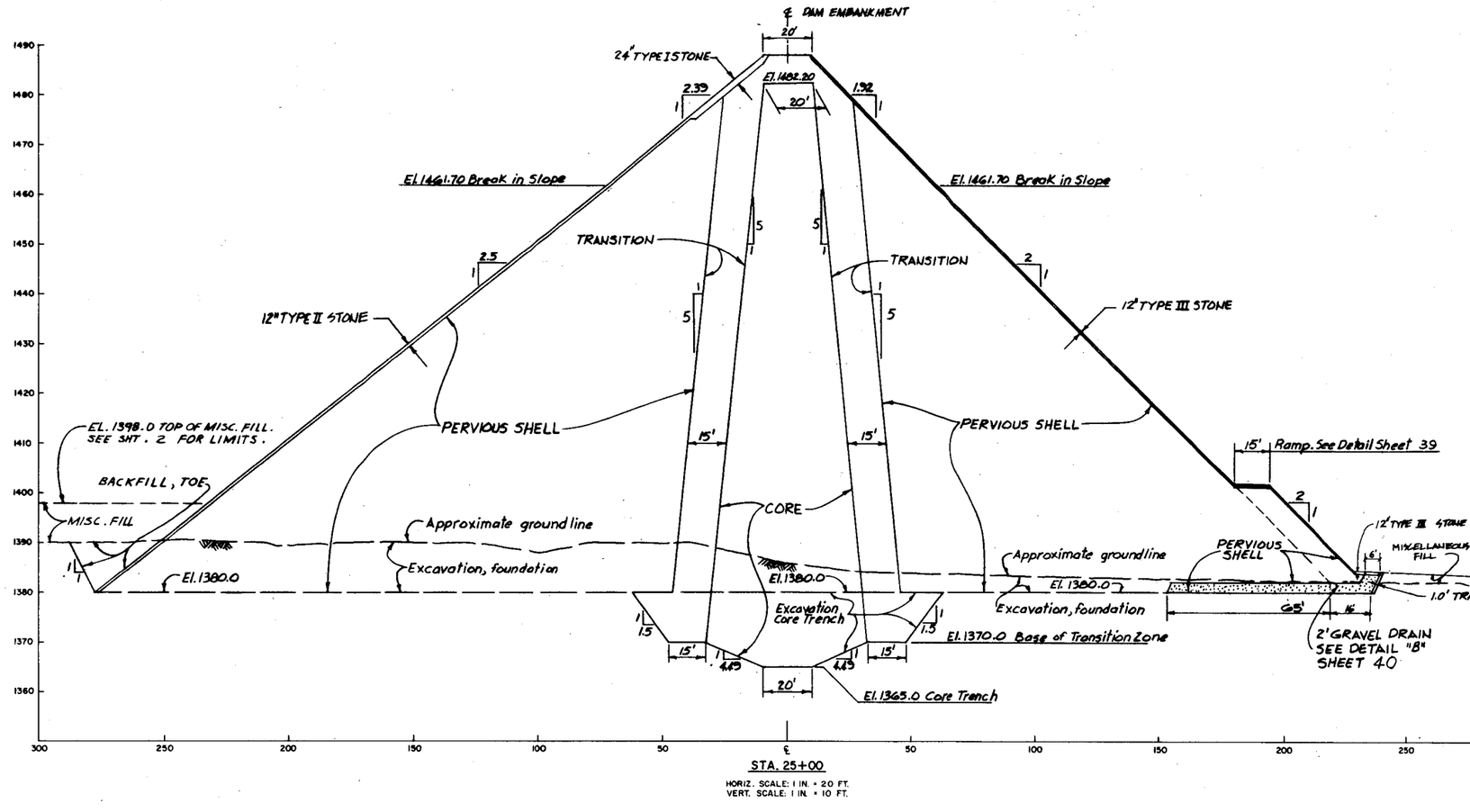
DESIGNED BY: R. M. K.
DRAWN BY: D. W.
CHECKED BY: MPC

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
DAM EMBANKMENT
CROSS SECTION AND DETAIL

SUBMITTED BY: Robert A. Hall, CHIEF, DESIGN BRANCH
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-R-0019
DISTRICT FILE NO. 241/266
SHEET 40 OF 80



STA. 33+00
HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.



STA. 25+00
HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.

SCALE: 1 IN. = 10 FT.

SCALE: 1 IN. = 20 FT.

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

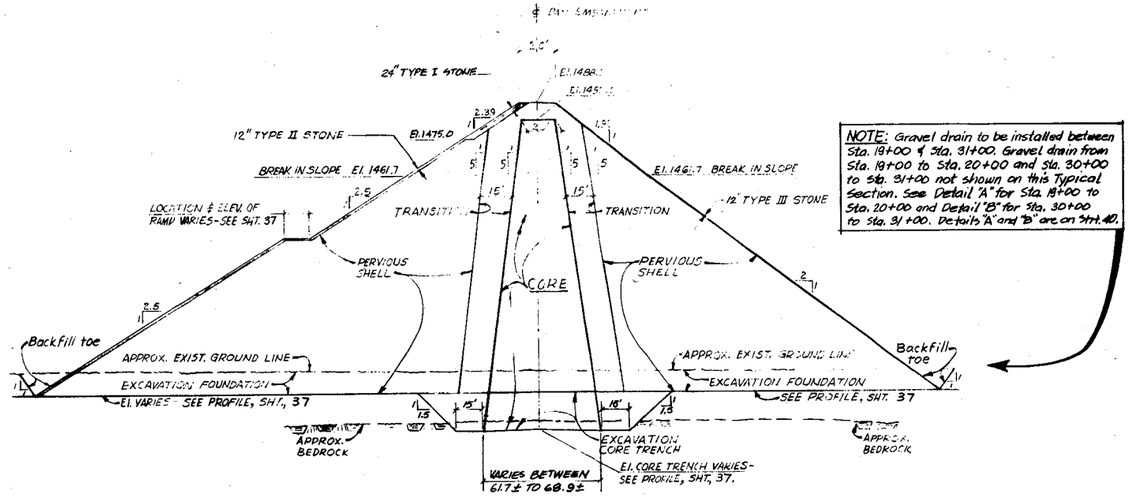
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: R.M.K.
DRAWN BY: DRV
CHECKED BY: MJPC

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

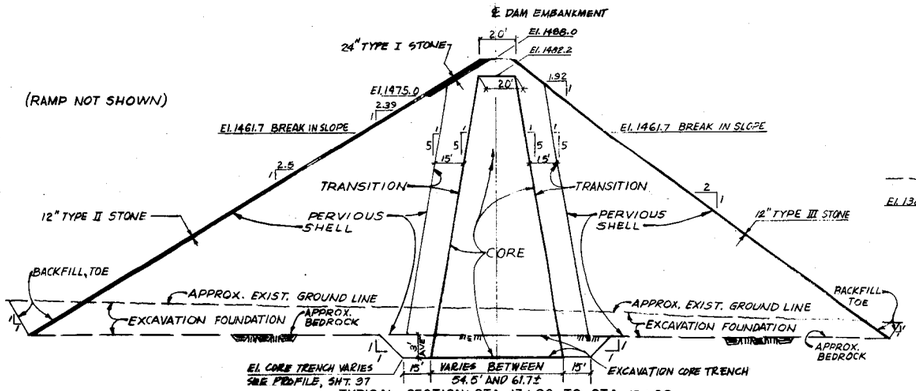
DAM EMBANKMENT
CROSS SECTIONS

SUBMITTED BY: Chief, Design Section
DATE APPROVED: 6/20/83
SPEC. NO. DACW09- 83 B-0015
DISTRICT FILE NO. 241/266
SHEET 41 OF 80

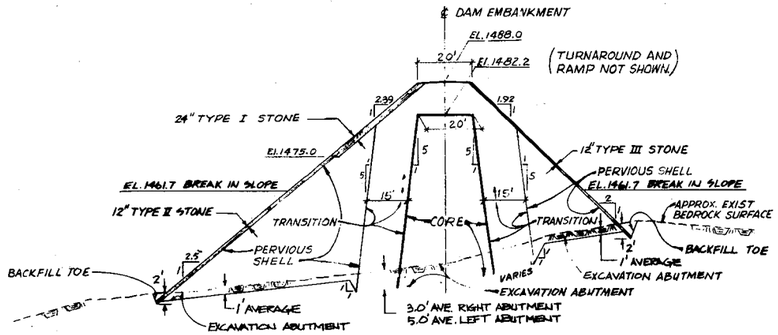


NOTE: Gravel drain to be installed between Sta. 19+00 & Sta. 31+00. Gravel drain from Sta. 19+00 to Sta. 20+00 and Sta. 30+00 to Sta. 31+00 not shown on this Typical Section. See Detail "A" for Sta. 19+00 to Sta. 20+00 and Detail "B" for Sta. 30+00 to Sta. 31+00. Details "A" and "B" are on Sht. 40.

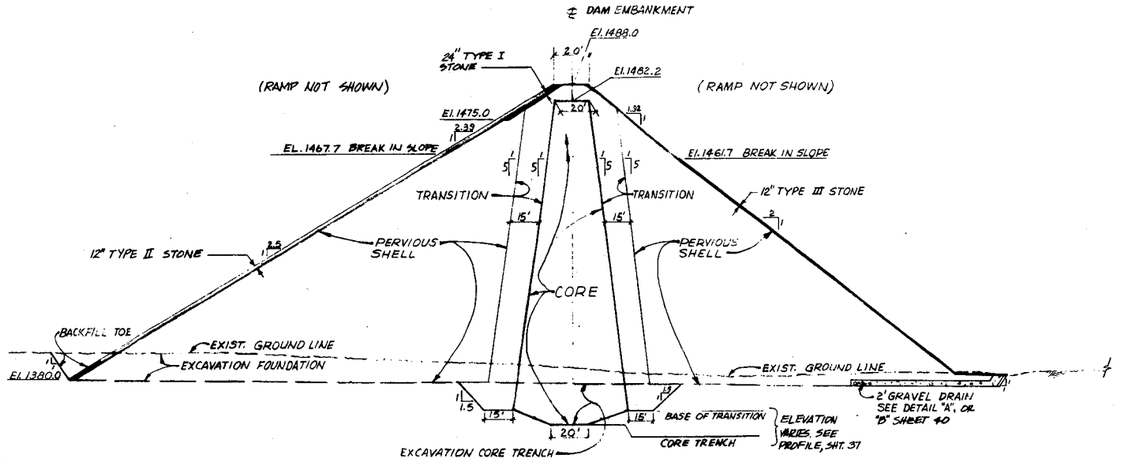
TYPICAL SECTION: STA. 18+00 TO STA. 20+00
STA. 30+00 TO STA. 31+90
NOT TO SCALE



TYPICAL SECTION: STA. 13+00 TO STA. 18+00
NOT TO SCALE



TYPICAL SECTON: LEFT AND RIGHT ABUTMENTS
STA. 10+00± TO STA. 13+00
STA. 31+90± TO STA. 33+27±
NOT TO SCALE



TYPICAL SECTION: STA. 20+00 TO STA. 30+00 ±
NOT TO SCALE

NOTE: VIEW OF CROSS-SECTIONS ARE LOOKING TOWARD DECREASING STATIONS.

GENERAL NOTES

1. For gutter location and details at East and West abutments, see shts. 37 and 39.
2. Landscape plan and planting schemes of downstream slope of dam embankment not shown. For details see shts. 78 and 79.
3. For gravel drain details, see sht 40.
4. For embankment crown details, see sht 39
5. For ramp details, see sht 39
6. Misc. fill area and excavation upstream of dam embankment not shown on typical sections. See sheet 2 For location and limits.

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

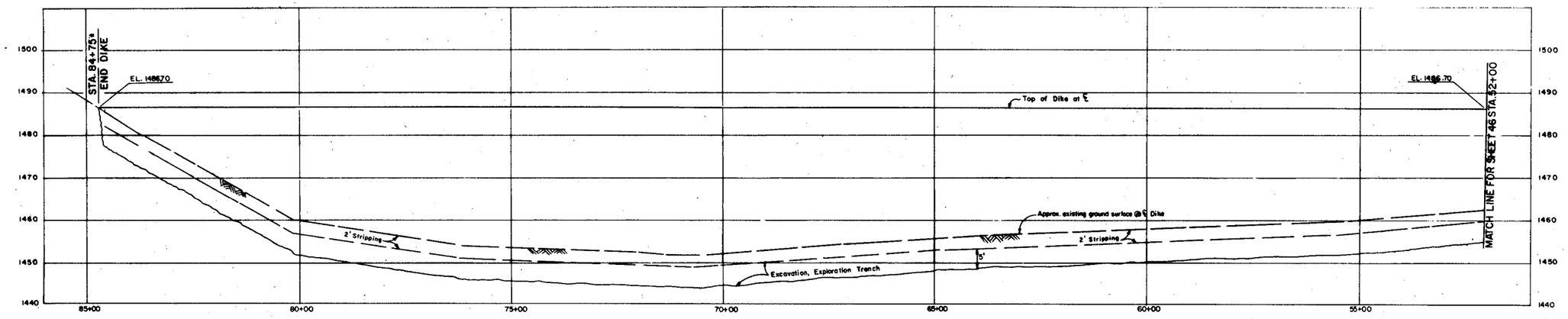
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: R.M.K.
DRAWN BY: H.G.
CHECKED BY: MPC

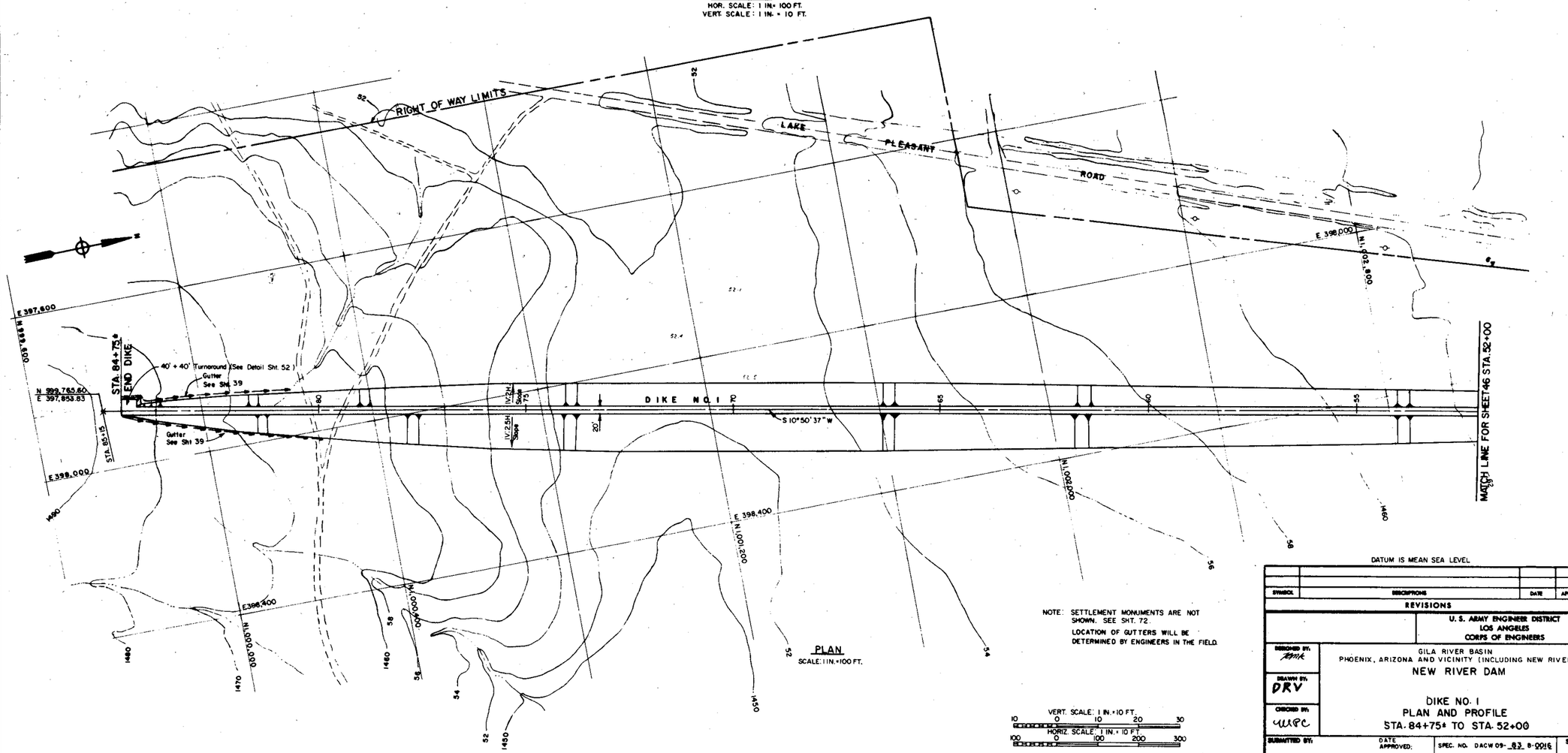
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

DAM EMBANKMENT
TYPICAL SECTIONS

SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/267
SHEET 42 OF 80



PROFILE
HOR. SCALE: 1 IN.= 100 FT.
VERT. SCALE: 1 IN. = 10 FT.



PLAN
SCALE: 1 IN.=100 FT.

NOTE: SETTLEMENT MONUMENTS ARE NOT SHOWN. SEE SHT. 72.
LOCATION OF GUTTERS WILL BE DETERMINED BY ENGINEERS IN THE FIELD.

VERT. SCALE: 1 IN.=10 FT.
10 0 10 20 30
HORIZ. SCALE: 1 IN.=100 FT.
100 0 100 200 300

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

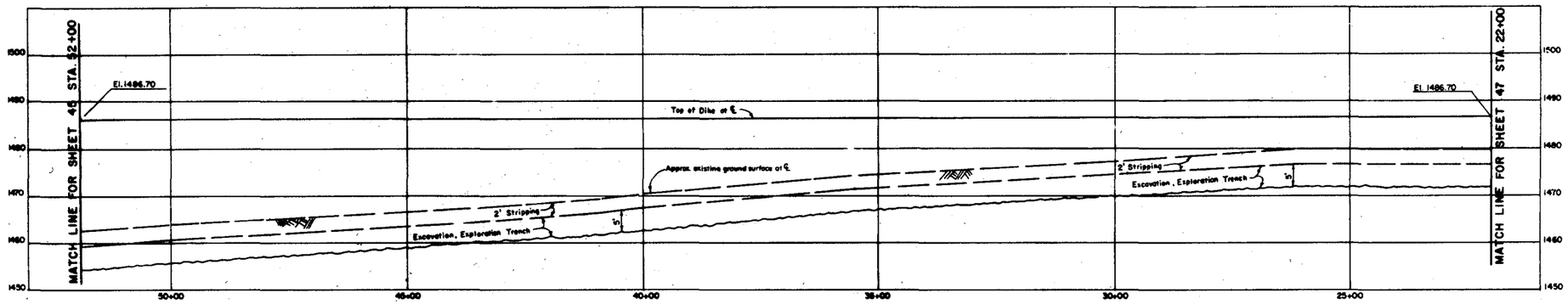
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RMK
DRAWN BY: DRV
CHECKED BY: WRC

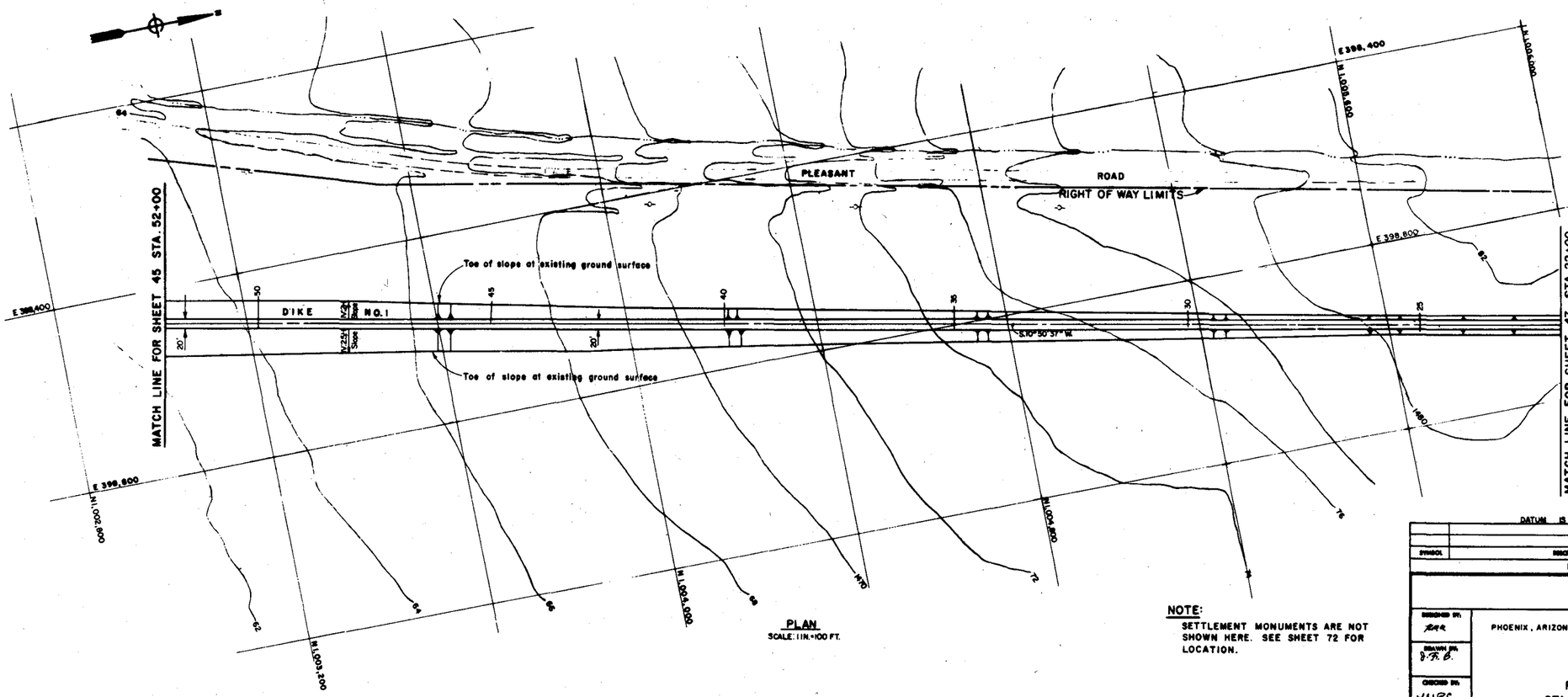
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

DIKE NO. 1
PLAN AND PROFILE
STA. 84+75* TO STA. 52+00

SUBMITTED BY: CHIEF, DESIGN BRANCH
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/270
SHEET 45 OF 80



PROFILE
HOR. SCALE: 1 IN. = 100 FT.
VERT. SCALE: 1 IN. = 10 FT.



PLAN
SCALE: 1 IN. = 100 FT.

NOTE:
SETTLEMENT MONUMENTS ARE NOT SHOWN HERE. SEE SHEET 72 FOR LOCATION.

VERT. SCALE 10 0 10 20 30 FEET
HOR. SCALE 100 0 100 200 300 FEET

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

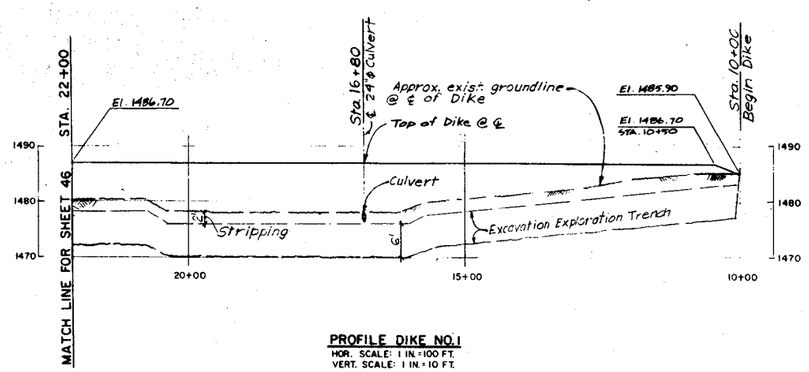
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RAR
DRAWN BY: D.F.B.
CHECKED BY: WPC

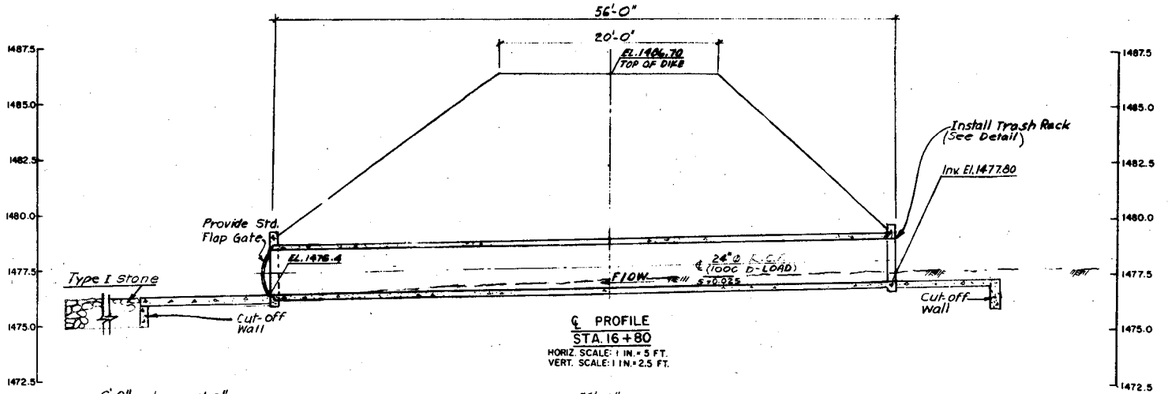
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM

DIKE NO. 1
PLAN AND PROFILE
STA. 52+00 TO STA. 22+00

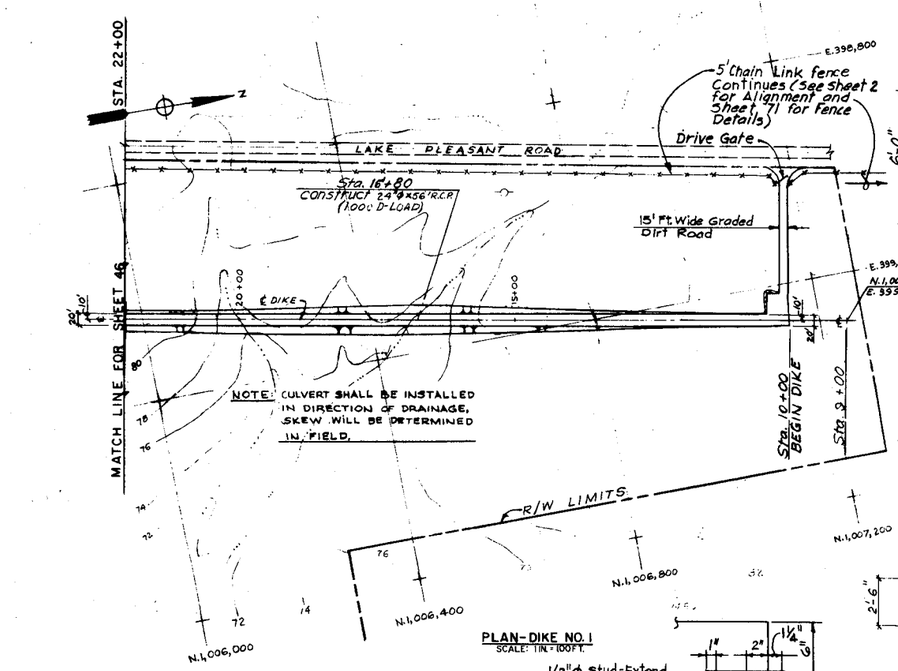
SUBMITTED BY: [signature] CHIEF, ENGINEERING DIVISION
DATE APPROVED: 6/20/80
SPEC. NO. DACW09-..-83-B-0015
DISTRICT FILE NO. 241/271
SHEET 46 OF 80



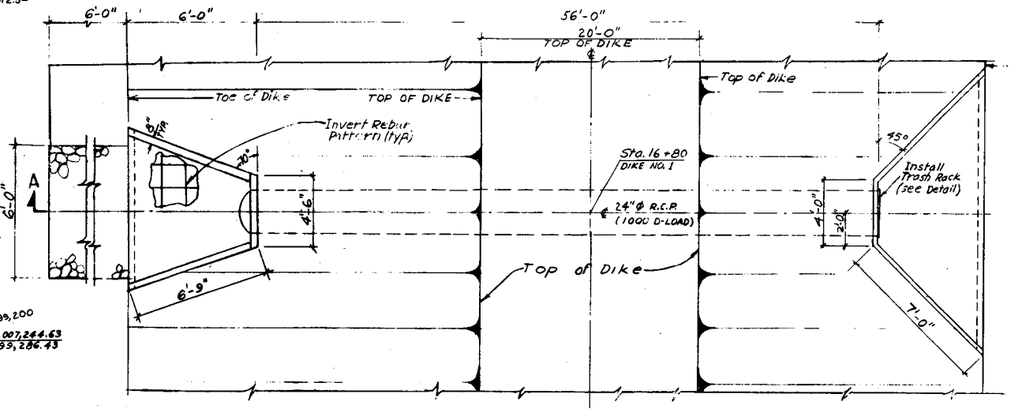
PROFILE DIKE NO. 1
HOR. SCALE: 1 IN.=100 FT.
VERT. SCALE: 1 IN.=10 FT.



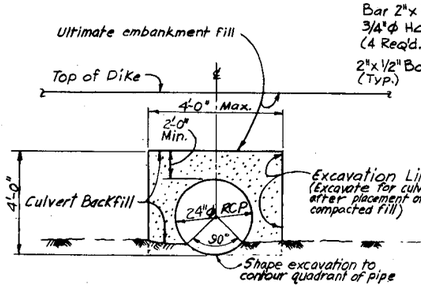
℄ PROFILE
STA. 16+80
HORIZ. SCALE: 1 IN.= 5 FT.
VERT. SCALE: 1 IN.=2.5 FT.



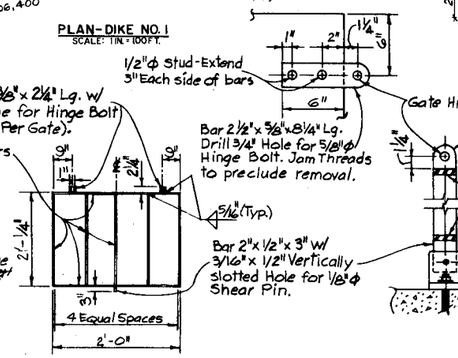
PLAN-DIKE NO. 1
SCALE: 1 IN = 100 FT.



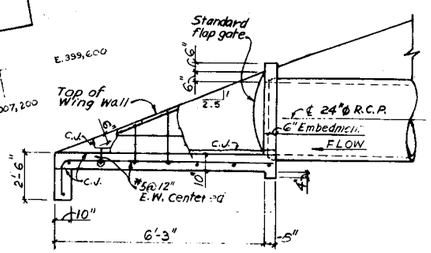
PLAN-CULVERT
NOT TO SCALE

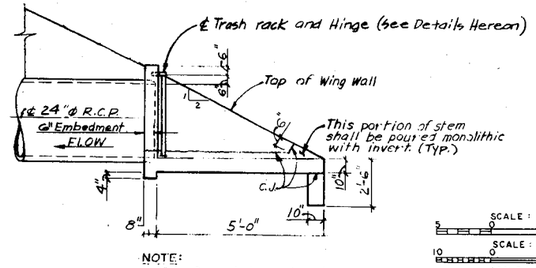


TYPICAL CULVERT INSTALLATION
NOT TO SCALE



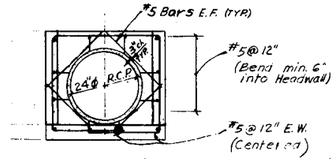
TRASH RACK AND HINGE DETAILS
NOT TO SCALE





NOTE:
See Downstream struct., for reinforcing details.

SECTION A-A
NOT TO SCALE



TYPICAL HEADWALL
NOT TO SCALE

SCALE: 1 IN. = 5 FT.
SCALE: 1 IN. = 10 FT.
SCALE: 1 IN. = 100 FT.

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

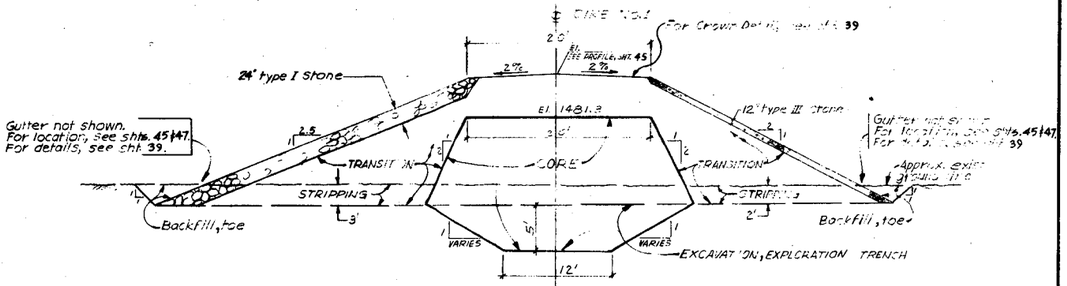
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: W. ZEIGLER
DRAWN BY: G. I. E. S.
CHECKED BY: WRC

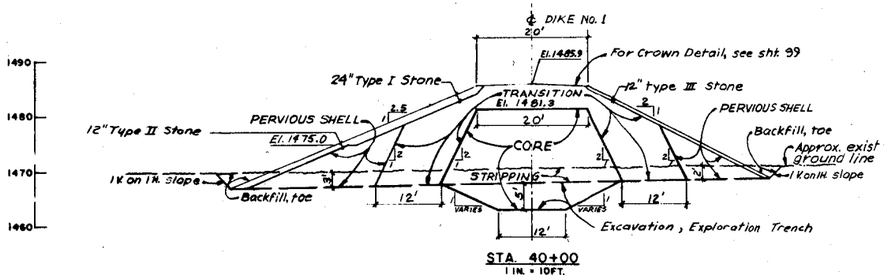
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
DIKE NO. 1
PLAN AND PROFILE
STA. 22+00 TO STA. 10+00
AND DRAINAGE DETAILS

SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/30/83
SPEC. NO. DACW09-83-B-0015
DISTRICT FILE NO. 241/272
SHEET 47 OF 80

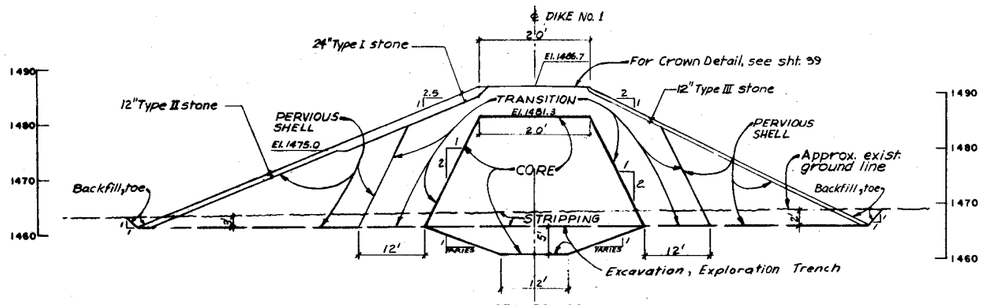
STRUCTURAL DETAILS



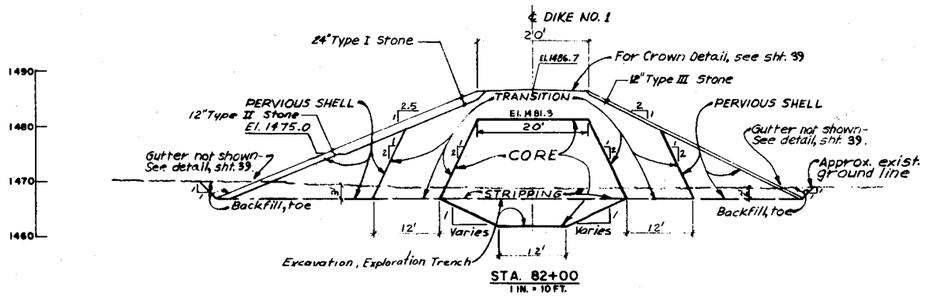
STA. 84+75± TO STA. 82+75
STA. 35+00 TO STA. 10+00±



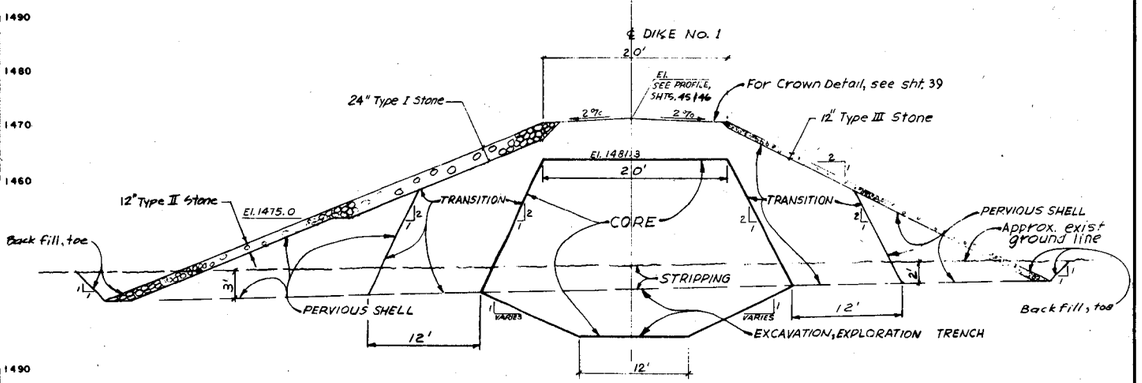
STA. 40+00
1 IN. = 10FT.



STA. 50+00
1 IN. = 10 FT.



STA. 82+00
1 IN. = 10 FT.

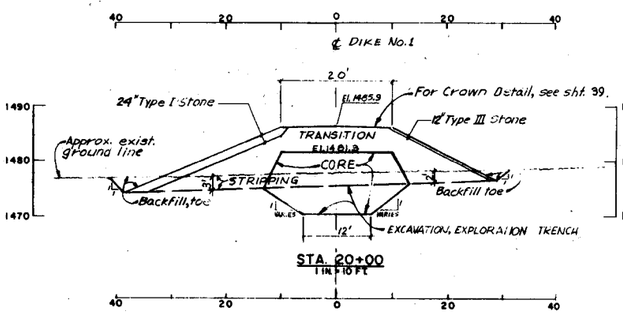


STA. 82+75 TO STA. 35+00

TYPICAL SECTIONS - DIKE NO. 1

NOT TO SCALE

NOTE: STRIPPING FOR DIKE NO. 1 TYPICALLY VARIES FROM 2' AT THE DOWNSTREAM TOE TRENCH TO 5' AT THE UPSTREAM TOE TRENCH.



STA. 20+00
1 IN. = 10 Ft.

SCALE: 1 IN. = 10 FT.

DATUM IS MEAN SEA LEVEL

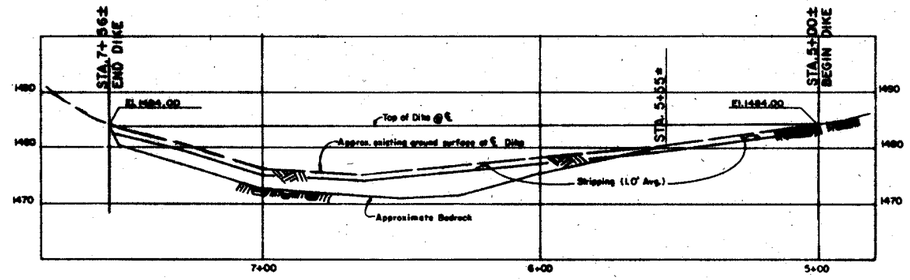
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

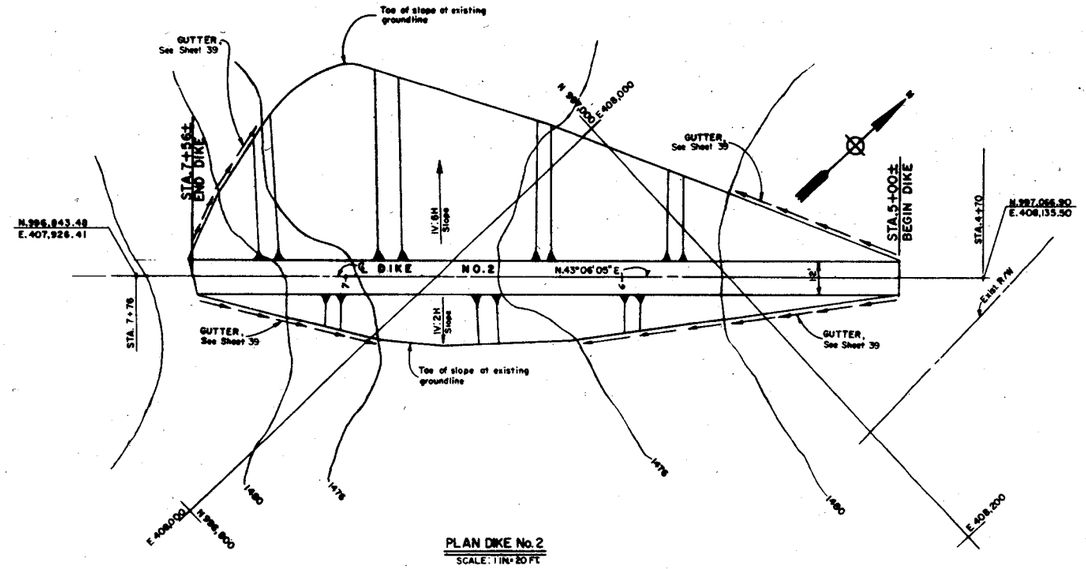
DESIGNED BY: R.M.K.
DRAWN BY: G.I.E.S.
CHECKED BY: M.R.C.

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
DIKE No. 1
CROSS SECTIONS AND TYPICAL SECTIONS

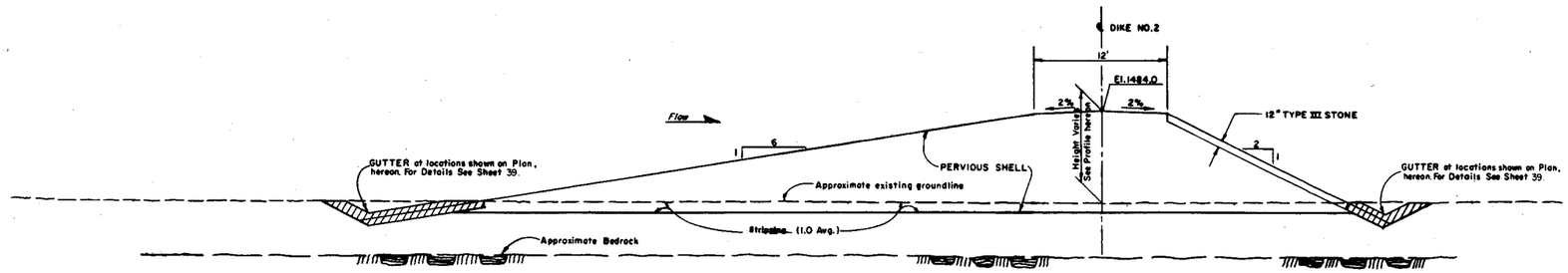
SUBMITTED BY: Chief, DESIGN BRANCH
DATE APPROVED: 6/29/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/273
SHEET 48 OF 80



PROFILE DIKE No. 2
HOR. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.



PLAN DIKE No. 2
SCALE: 1 IN. = 20 FT.



TYPICAL SECTION: DIKE NO. 2
SCALE: 1 IN. = 5 FT.

SCALE: 1 IN. = 5 FT.
5 0 5 10 15
SCALE: 1 IN. = 10 FT.
10 0 10 20 30
SCALE: 1 IN. = 20 FT.
10 0 10 20 30 40 50 60 70

DATUM IS MEAN SEA LEVEL

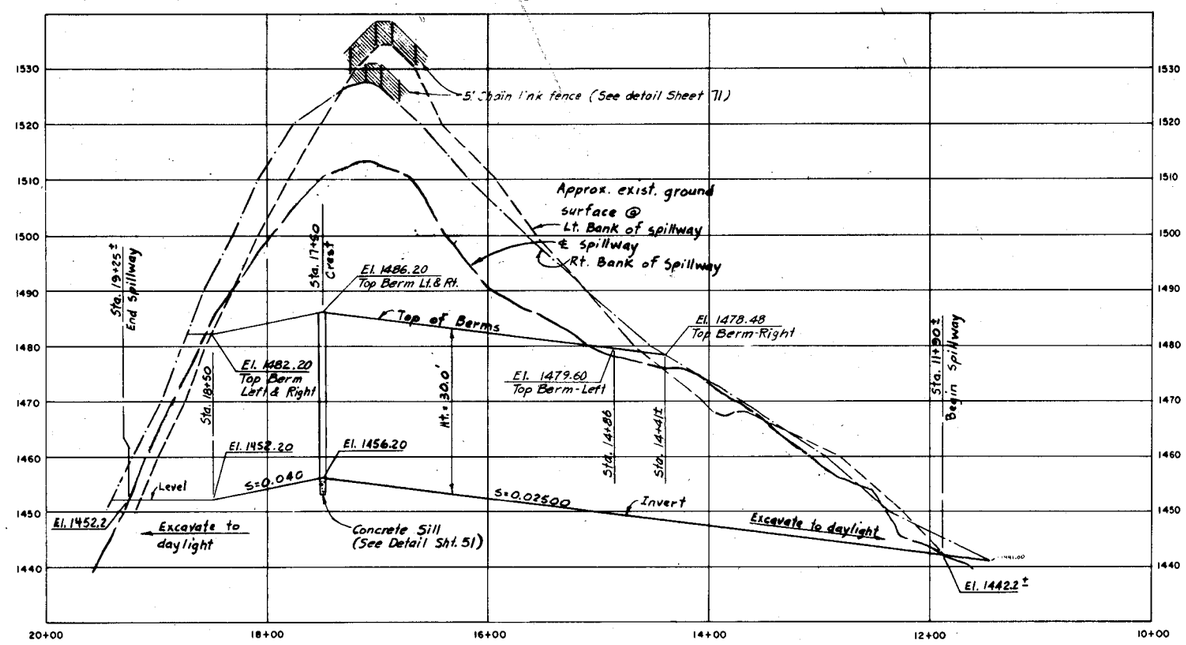
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.B.
DRAWN BY: DRV
CHECKED BY: MJPC

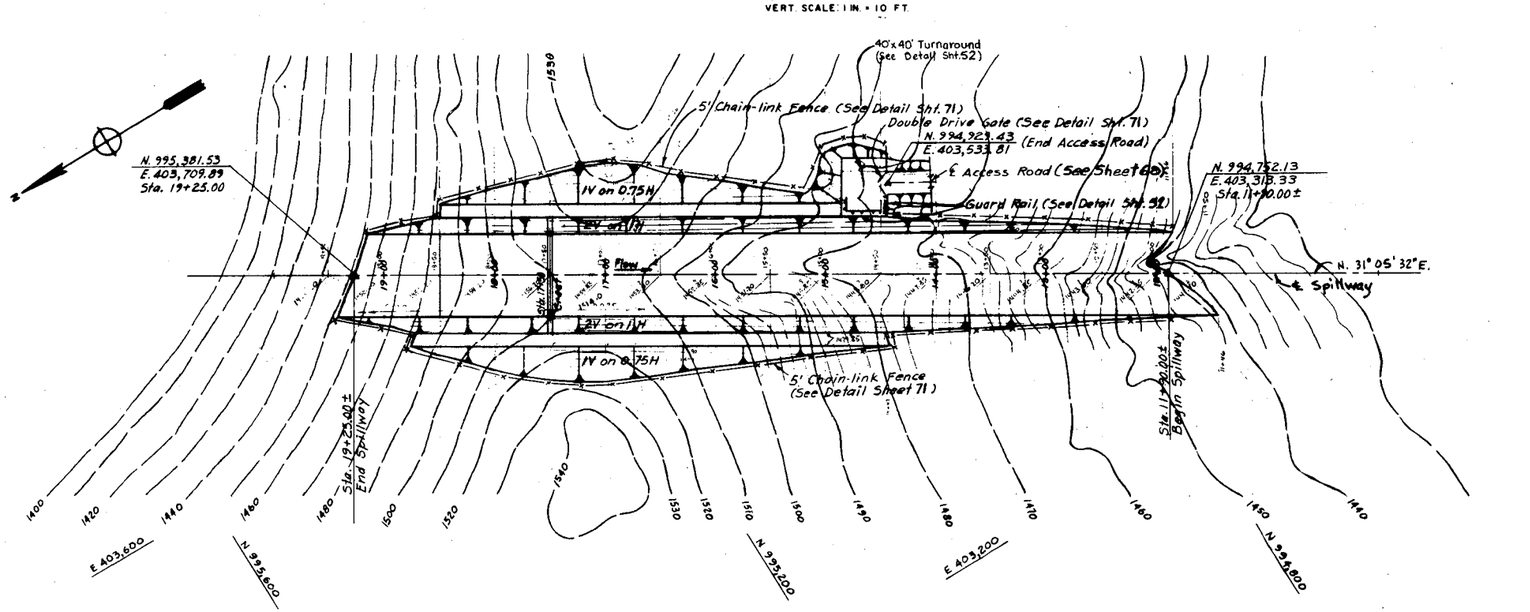
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
DIKE NO. 2
PLAN AND PROFILE AND TYPICAL SECTION

SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/20/03
SPEC. NO. DACW09-_93_-B-0016
DISTRICT FILE NO. 241/274
SHEET 49 OF 80



PROFILE

HORIZ. SCALE: 1 IN. = 50 FT.
VERT. SCALE: 1 IN. = 10 FT.



PLAN

SCALE: 1 IN. = 50 FT.
(CONTOUR INTERVALS 2 AND 10 FT.)

SCALE: 1 IN. = 10 FT.
10 0 10 20 30

SCALE: 1 IN. = 50 FT.
50 0 50 100 150

NOTE:
SEE SHEET 17 FOR GEOLOGIC SECTION

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.B.
DRAWN BY: J.W.
CHECKED BY: W.P.C.

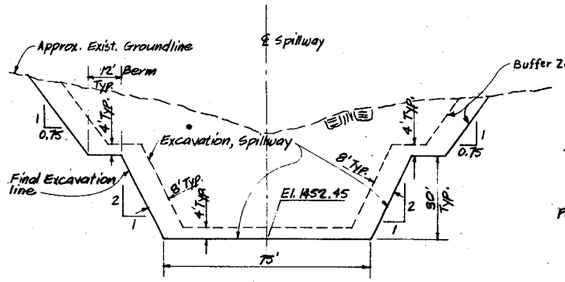
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM

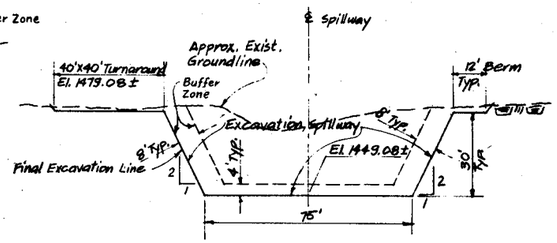
SPILLWAY

PLAN AND PROFILE

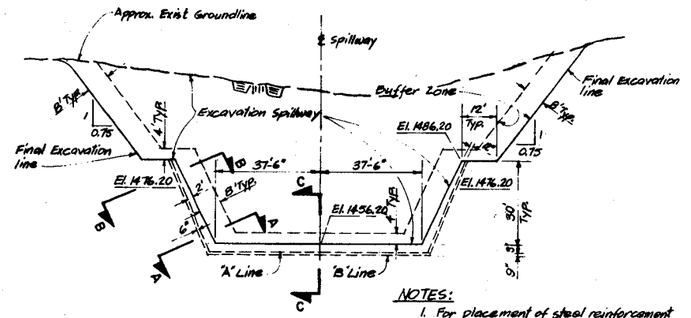
SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/30/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/275
SHEET 50 OF 80



STA. 16+00
SCALE: 1 IN. = 20 FT.

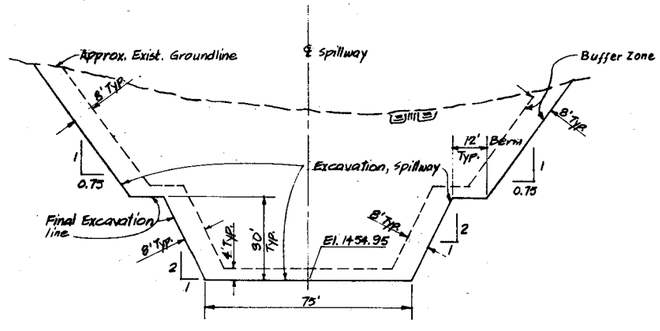


STA. 14+65
SCALE: 1 IN. = 20 FT.

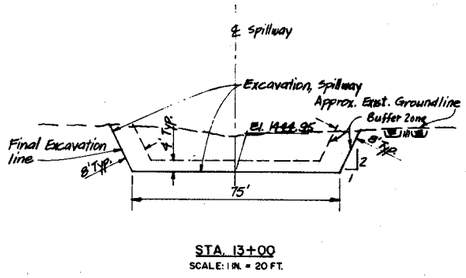


STA. 17+50
SCALE: 1 IN. = 20 FT.

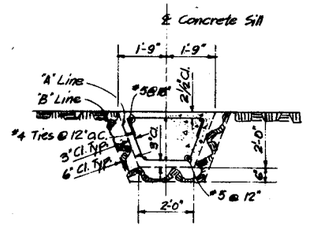
NOTES:
1. For placement of steel reinforcement see Detail "B" and Section A-A, B-B, and C-C this sheet.
2. See Section A-A, B-B, and C-C this sheet.
3. A buffer zone is required for all spillway rock excavation by blasting. See buffer zone details on Sections and Detail "A".



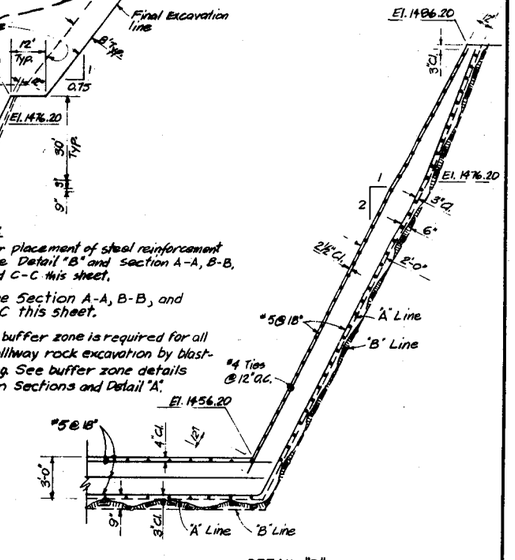
STA. 17+00
SCALE: 1 IN. = 20 FT.



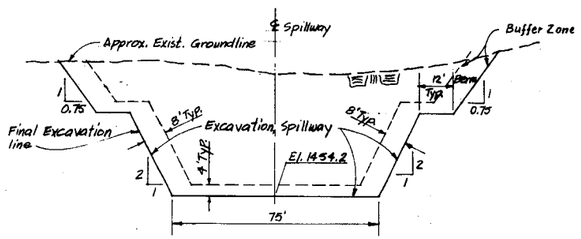
STA. 13+00
SCALE: 1 IN. = 20 FT.



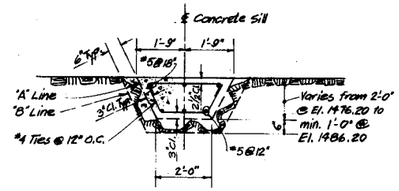
SECTION A-A
(SPILLWAY CREST TO El. 1476.20)
SCALE: ½ IN. = 1 FT.



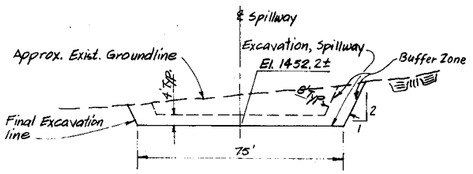
DETAIL "B"
SCALE: ¼ IN. = 1 FT.



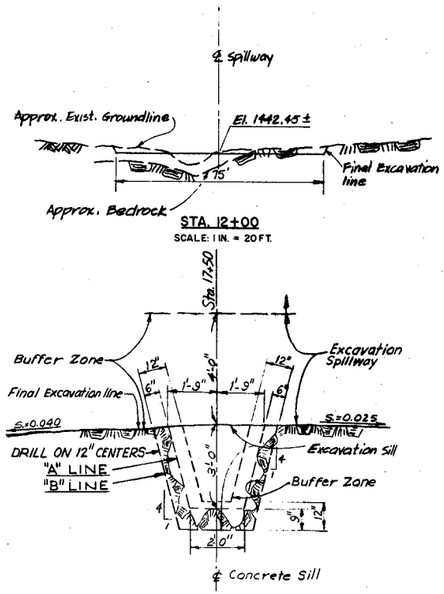
STA. 18+00
SCALE: 1 IN. = 20 FT.



SECTION B-B
(El. 1476.20 TO El. 1486.20)
SCALE: ½ IN. = 1 FT.

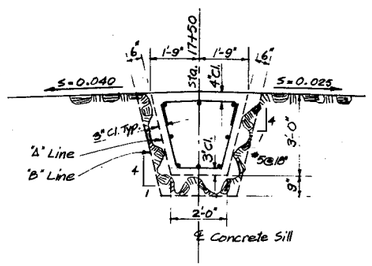


STA. 19+00
SCALE: 1 IN. = 20 FT.



STA. 12+00
SCALE: 1 IN. = 20 FT.

DETAIL "A"
TYPICAL SECTION
SPILLWAY SILL EXCAVATION
SCALE: 1/2 IN. = 1 FT.



SECTION C-C
(SPILLWAY CREST)
SCALE: ½ IN. = 1 FT.

SCALE: ¼ IN. = 1 FT.
SCALE: ½ IN. = 1 FT.
SCALE: 1 IN. = 20 FT.
DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

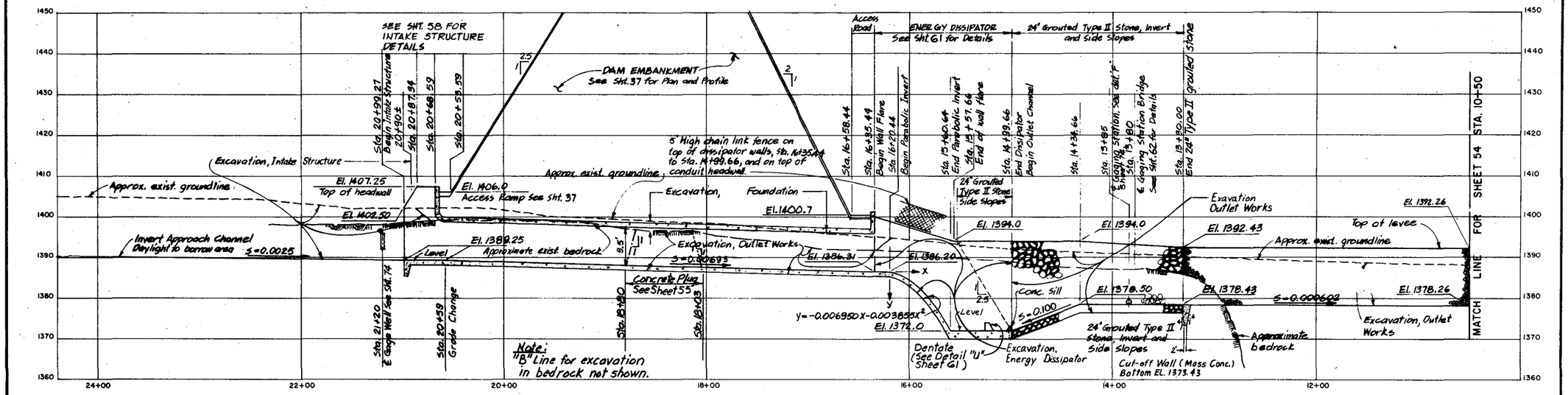
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: A. H.
DRAWN BY: P. PENEUETA
CHECKED BY: WHC

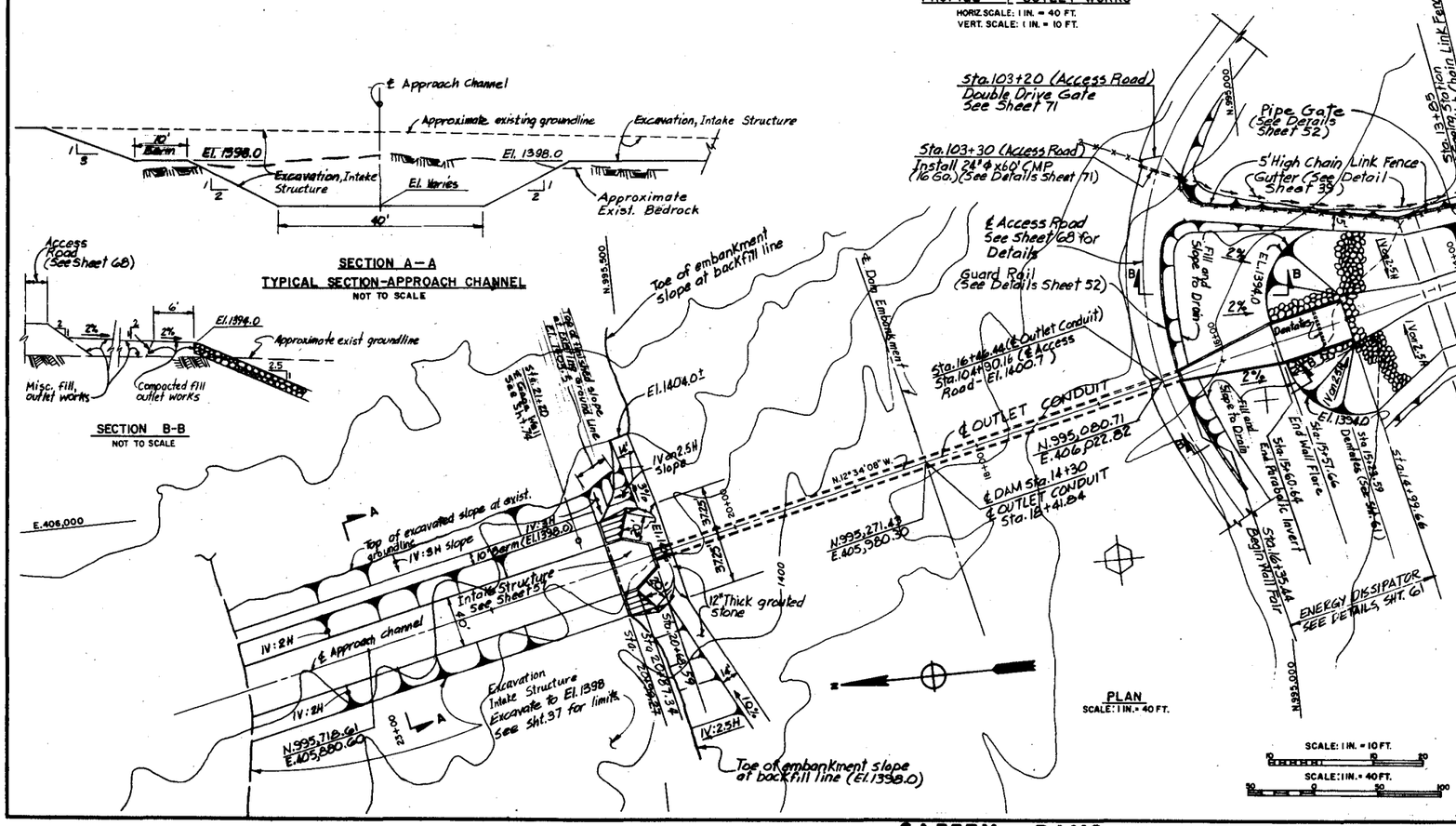
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM
SPILLWAY
CROSS SECTIONS, SILL SECTIONS AND DETAILS

SUBMITTED BY: CHIEF, DESIGN BRANCH
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/276
SHEET 51 OF 80



PROFILE — ℄ OUTLET WORKS
HORIZ. SCALE: 1 IN. = 40 FT.
VERT. SCALE: 1 IN. = 10 FT.



Note: See sheet 78 for Landscape Plan and Details.

DATUM IS MEAN SEA LEVEL

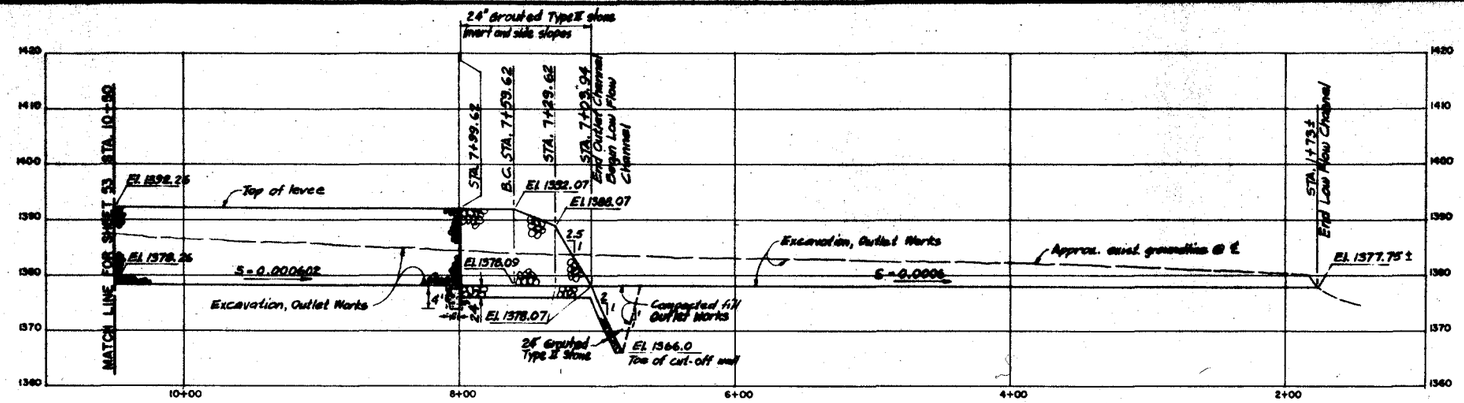
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: JS/R.K.
DRAWN BY: DRV
CHECKED BY: W.F.C.

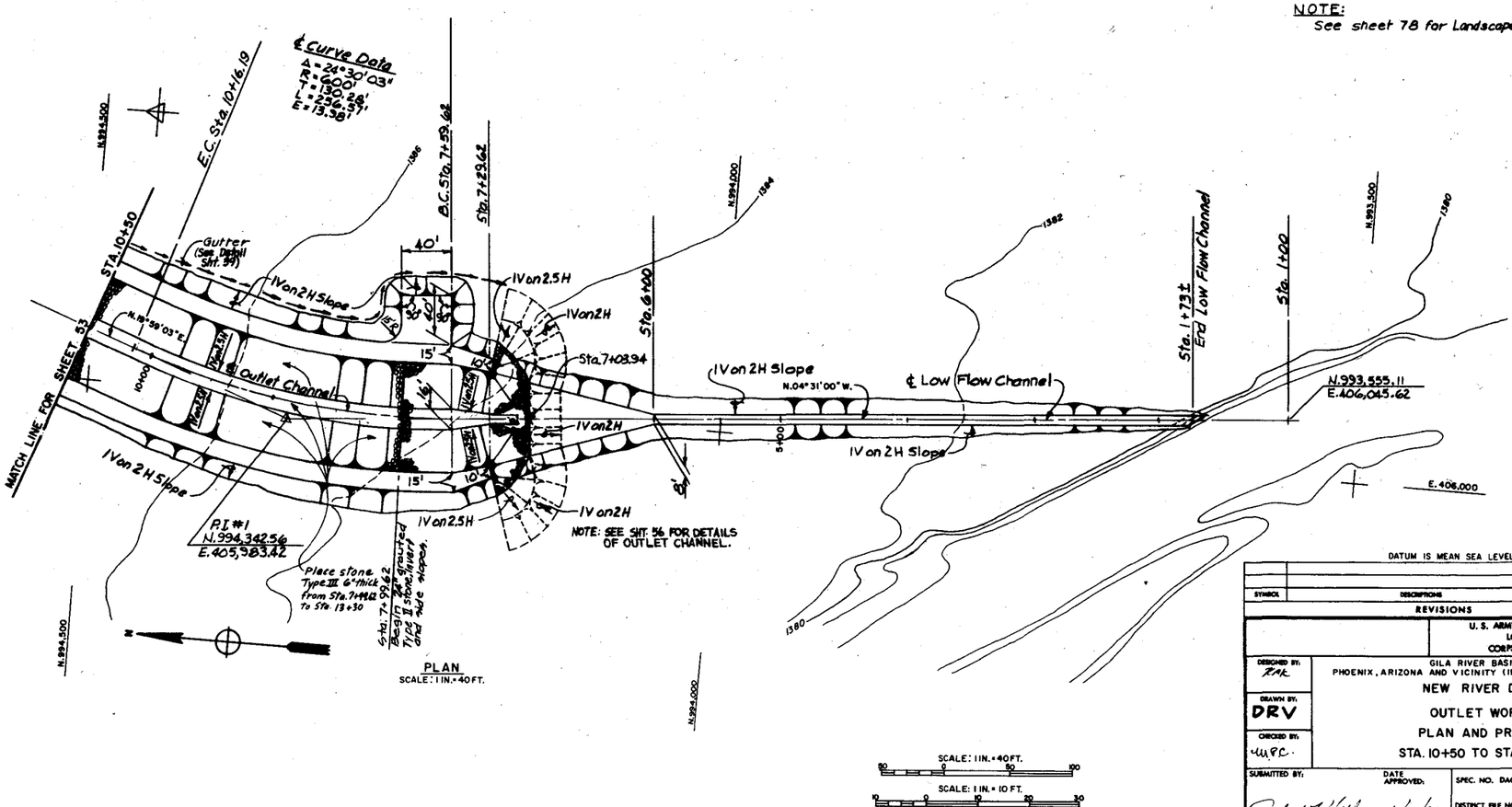
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
OUTLET WORKS
PLAN AND PROFILE
STA. 24+00± TO STA. 10+50

SUBMITTED BY: CHIEF, DESIGN SECTION
DATE APPROVED: 6/26/63
SPEC. NO. DACW09-_63_-8-0015
DISTRICT FILE NO. 241/278
SHEET 53 OF 80



℄ PROFILE
HORIZ. SCALE: 1 IN. = 40 FT.
VERT. SCALE: 1 IN. = 10 FT.

NOTE:
See sheet 78 for Landscape Plan and Details.



PLAN
SCALE: 1 IN. = 40 FT.

SCALE: 1 IN. = 40 FT.
50 0 50 100
SCALE: 1 IN. = 10 FT.
10 0 10 20 30

DATUM IS MEAN SEA LEVEL

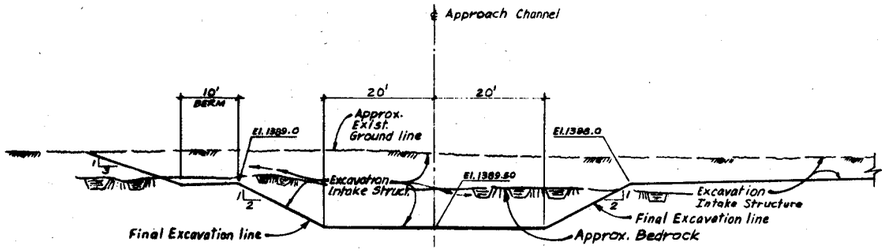
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

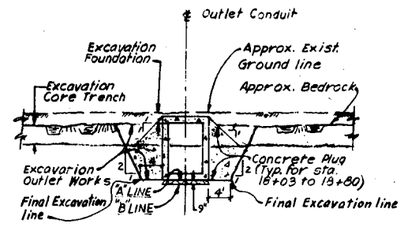
DESIGNED BY: RAK
DRAWN BY: DRV
CHECKED BY: MWC

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
OUTLET WORKS
PLAN AND PROFILE
STA. 10+50 TO STA. 1+73±

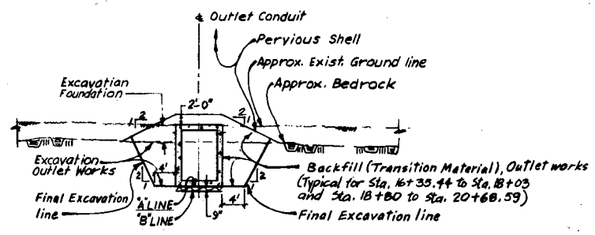
SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/279
SHEET 54 OF 80



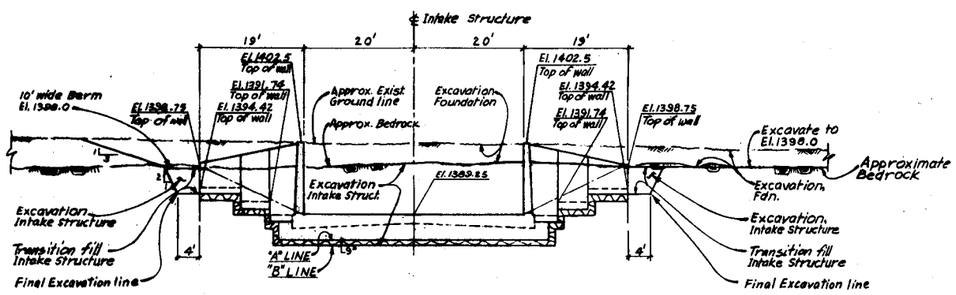
STA. 22+00
SCALE: 1 IN.=10 FT.



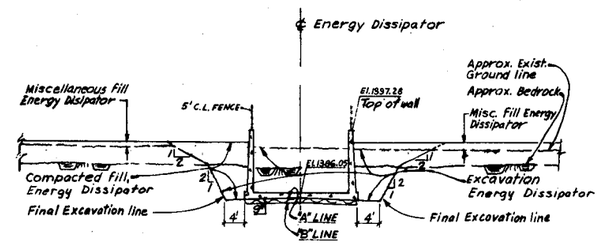
STA. 18+41.84
SCALE: 1 IN.=10 FT.



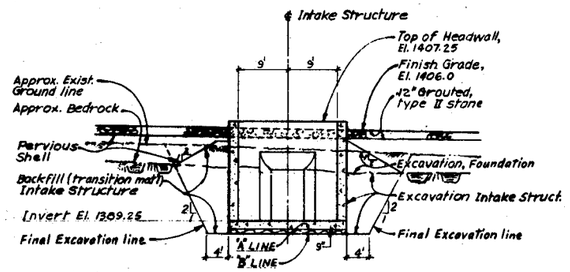
STA. 17+00
SCALE: 1 IN.=10 FT.



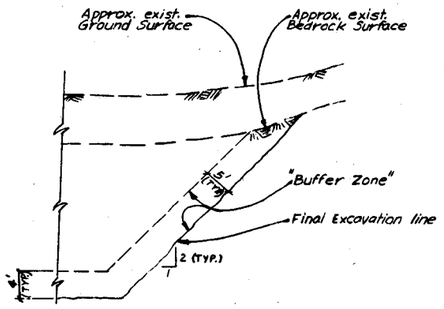
STA. 20+99.27
SCALE: 1 IN. = 10 FT.



STA. 16+00
SCALE: 1 IN.=10 FT.



STA. 20+68.59
SCALE: 1 IN. = 10 FT.



BUFFER ZONE DETAIL
TYPICAL SECTION
NOT TO SCALE

NOTE:
1. A Buffer Zone is required for all outlet works rock excavation by blasting. See Buffer Zone Detail hereon.
2. View of cross sections are looking downstream.

SCALE: 1 IN. = 10 FT
10 0 10 20 30

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

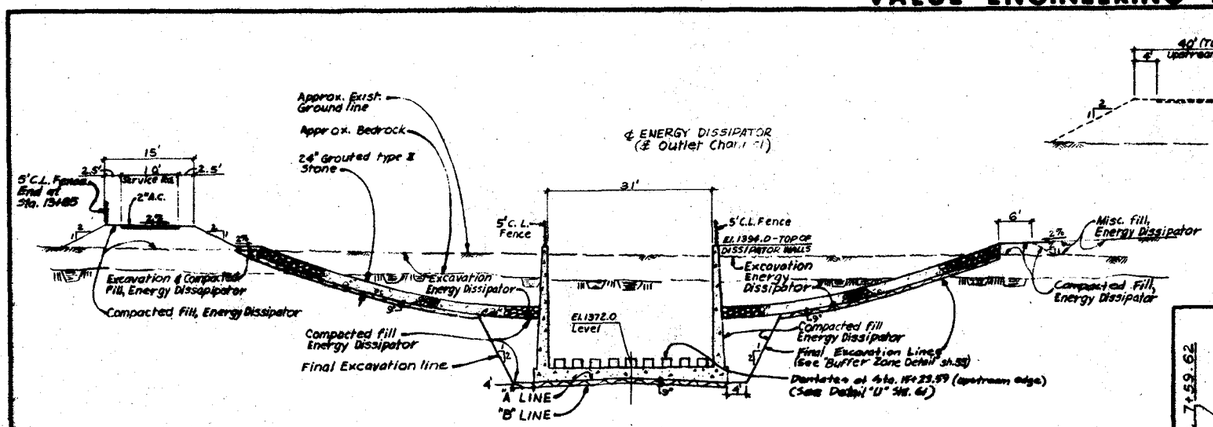
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: R.K.
DRAWN BY: H.G.I.E.S
CHECKED BY: C.W.P.C.

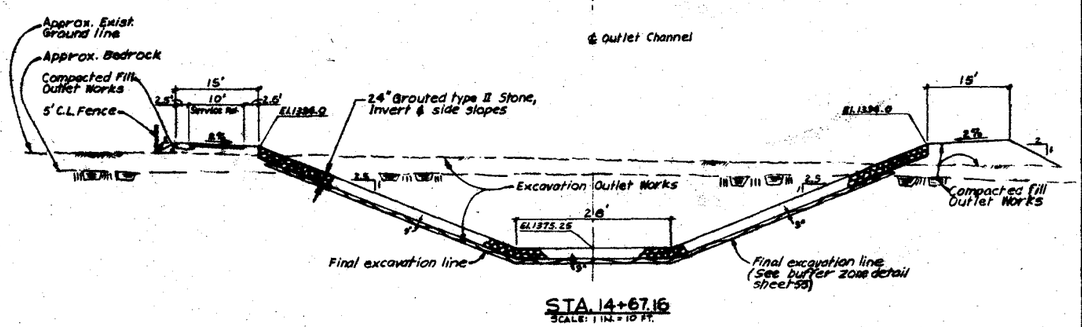
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
OUTLET WORKS
CROSS SECTIONS

SUBMITTED BY: Chief, Engineering Division
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0018
DISTRICT FILE NO. 241/280
SHEET 55 OF 80

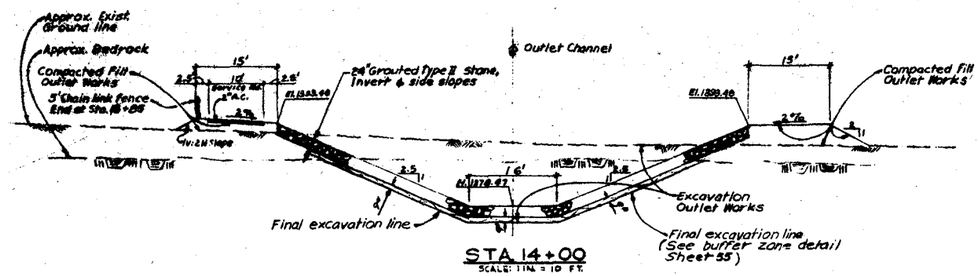
PLATE D



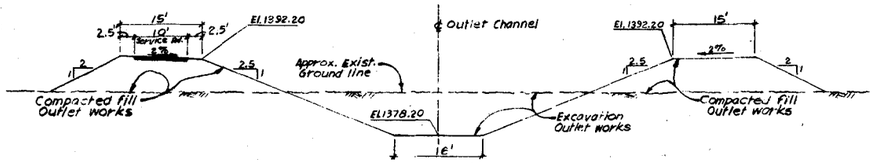
STA. 15+27.16
SCALE: 1 IN. = 10 FT.



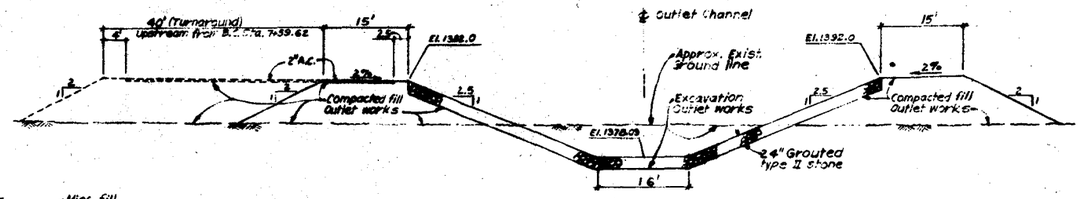
STA. 14+67.16
SCALE: 1 IN. = 10 FT.



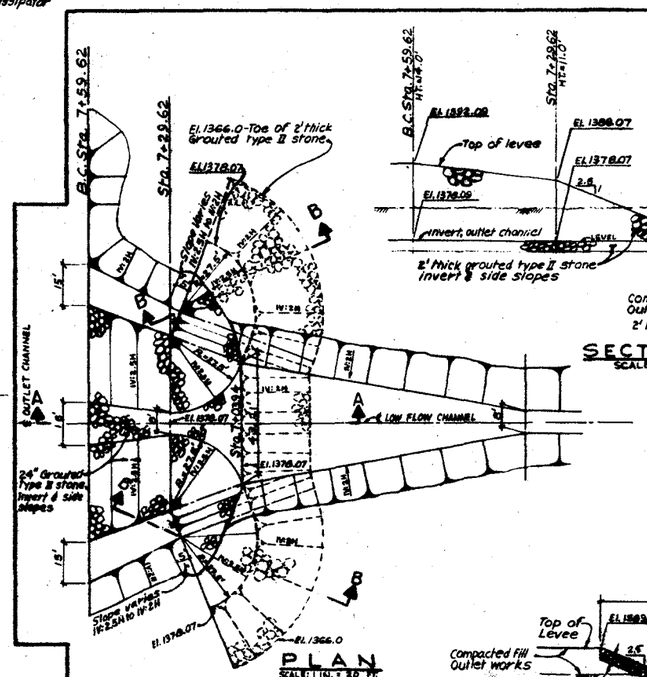
STA. 14+00
SCALE: 1 IN. = 10 FT.



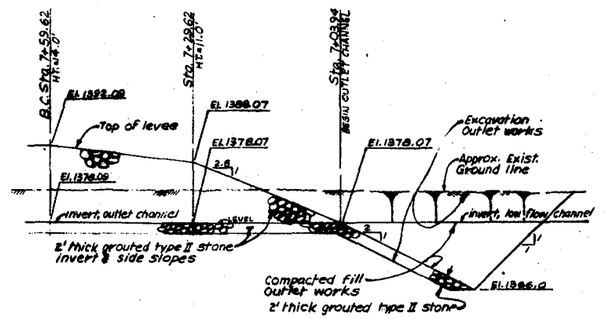
STA. 9+35



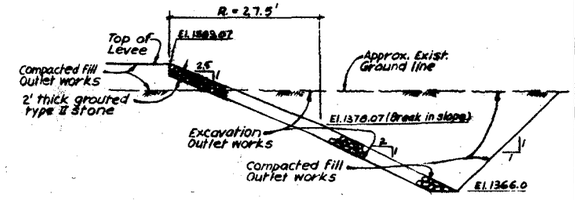
B.C. STA. 7+59.62



PLAN
SCALE: 1 IN. = 30 FT.

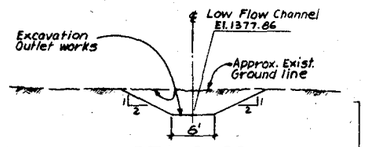


SECTION A-A
SCALE: 1 IN. = 10 FT.



SECTION B-B
SCALE: 1 IN. = 10 FT.

DETAILS - OUTLET CHANNEL
B.C. STA. 7+59.62 TO STA. 6+00



STA. 3+60
SCALE: 1 IN. = 10 FT.

SCALE: 1 IN. = 10 FT.

SCALE: 1 IN. = 20 FT.

DATUM IS MEAN SEA LEVEL

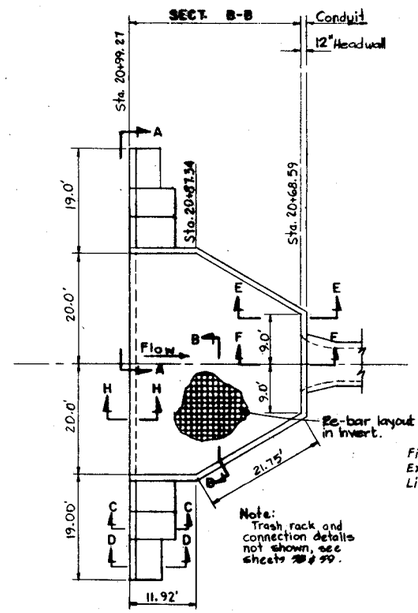
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

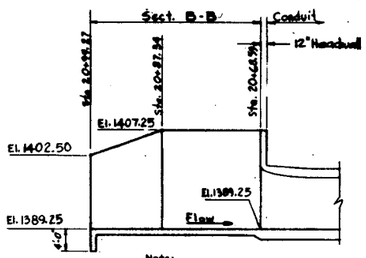
DESIGNED BY: R.K.
DRAWN BY: H.GILES
CHECKED BY: WPC

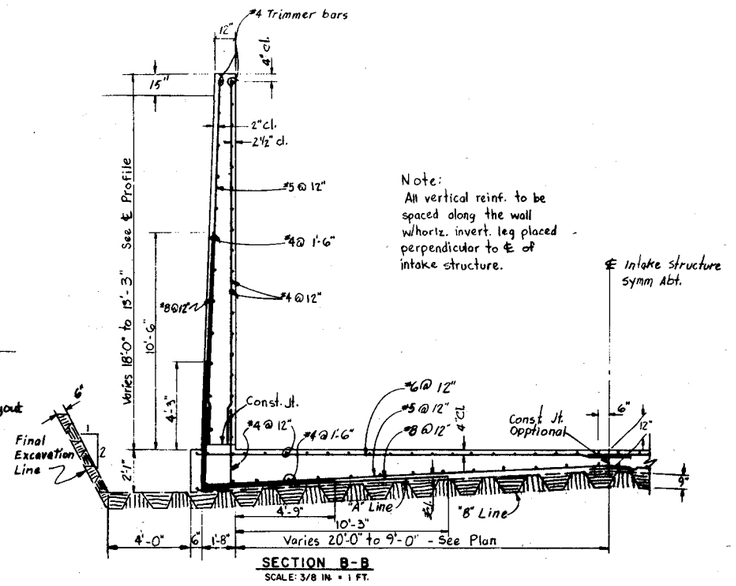
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
NEW RIVER DAM
OUTLET WORKS
CROSS SECTIONS
AND
DETAILS-OUTLET CHANNEL

SUBMITTED BY: Chief, Design Branch
DATE APPROVED: 6/20/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/281
SHEET 56 OF 80

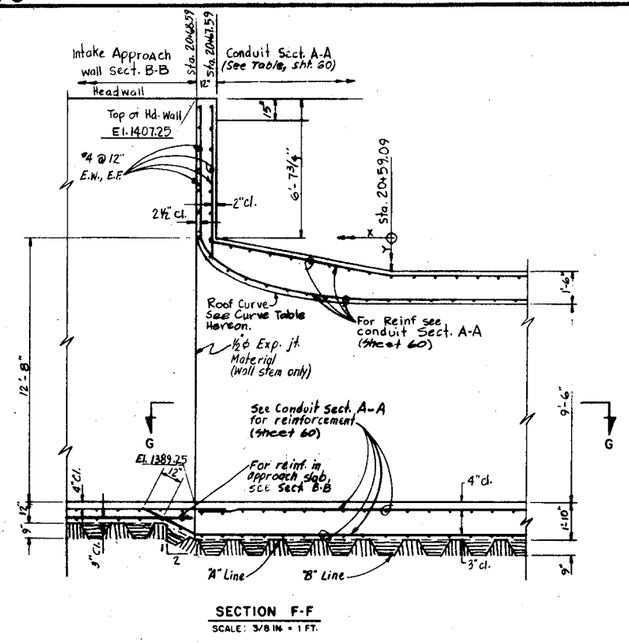


PLAN
SCALE: 1 IN. = 10 FT.





SECTION B-B
SCALE: 3/8 IN. = 1 FT.

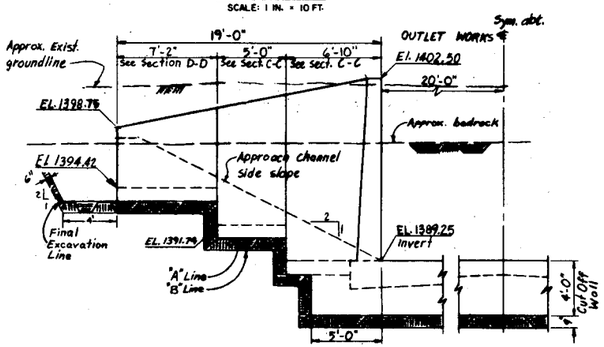


SECTION F-F
SCALE: 3/8 IN. = 1 FT.

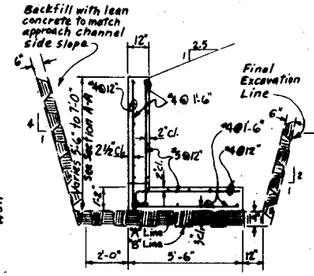
Roof Curve

$$\frac{X^2}{(9.5)^2} + \frac{Y^2}{(9.5/3)^2} = 1$$

ORDINATES OF CURVE	
X (Ft.)	Y (Ft.)
0	3.167
1	3.149
2	3.095
3	3.004
4	2.872
5	2.692
6	2.485
7	2.140
8	1.707
9	1.013
9.5	0

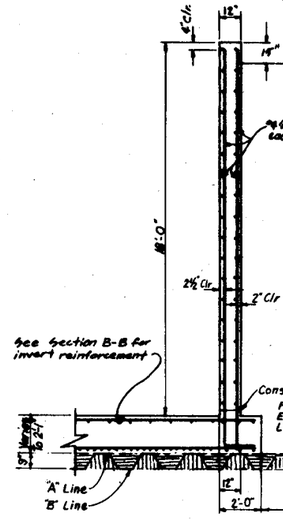


SECTION A-A
SCALE: 1/8 IN. = 1 FT.

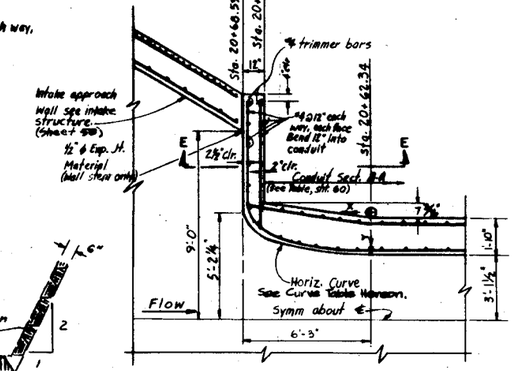


SECTION D-D
SCALE: 3/8 IN. = 1 FT.

SECTION H-H
SCALE: 3/8 IN. = 1 FT.



SECTION E-E
SCALE: 3/8 IN. = 1 FT.



SECTIONAL PLAN G-G
SCALE: 3/8 IN. = 1 FT.

HORIZ. CURVE

$$\frac{X^2}{(6.25)^2} + \frac{Y^2}{\left(\frac{6.25}{3}\right)^2} = 1$$

ORDINATES OF HORIZ. SIDE CURVE	
X (Ft.)	Y (Ft.)
0	2.062
1	2.056
2	1.973
3	1.827
4	1.600
5	1.249
6	0.583
6.25	0

SCALE: 3/8 IN. = 1 FT.
SCALE: 1 IN. = 10 FT.
SCALE: 1/4 IN. = 1 FT.

NOTES:
FOR GENERAL NOTES AND MISCELLANEOUS DETAILS ..... SEE SHT. 60
FOR PLAN AND PROFILE ..... SEE SHTS. 53 & 54
FOR SPLICE LENGTH OF REINF. BARS ..... SEE SHT. 60
FOR WALL OFFSET ..... SEE SHT. 60

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

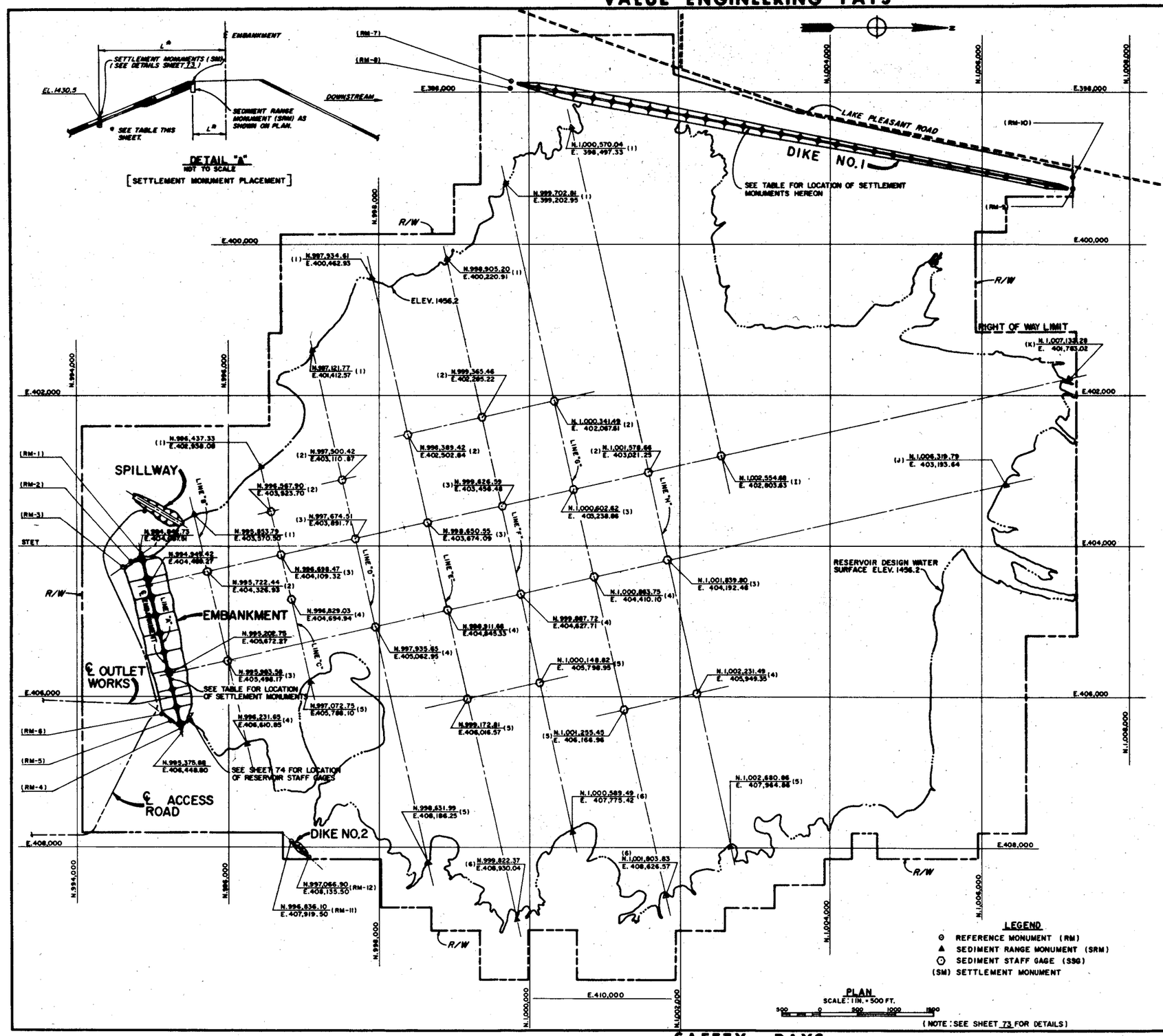
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: G.S.
DRAWN BY: J.W.D.
CHECKED BY: M.P.C.

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM
OUTLET WORKS
INTAKE STRUCTURE

SUBMITTED BY: Robert H. Hall, Design Chief
DATE APPROVED: 6/20/63
SPEC. NO. DACW09-_83_-8-0016
DISTRICT FILE NO. 241/282
SHEET 57 OF 80



	LOCATION OF SETTLEMENT MONUMENTS		
	MONUMENT IDENTIFICATION NO.	EMBANKMENT STATION	*L (ft.)
DAM EMBANKMENT	SM-1	10+50	8.0
	SM-2	11+00	8.0
	SM-3	11+50	8.0
	SM-4	12+00	8.0
	SM-5	12+50	8.0
	SM-6	13+00	8.0
	SM-7	16+00	8.0
	SM-8	19+50	150.0
	SM-9	20+00	8.0
	SM-10	21+00	8.0
	SM-11	21+50	150.0
	SM-12	22+50	8.0
	SM-13	23+00	8.0
	SM-14	23+50	150.0
	SM-15	24+00	8.0
	SM-16	25+00	8.0
	SM-17	25+50	150.0
	SM-18	26+00	8.0
	SM-19	27+00	8.0
	SM-20	27+50	150.0
	SM-21	28+00	8.0
	SM-22	29+00	8.0
	SM-23	29+50	150.0
	SM-24	30+00	8.0
	SM-25	30+50	150.0
	SM-26	31+00	8.0
	SM-27	32+00	8.0
	SM-28	32+50	8.0
	SM-29	33+00	8.0
DIKE NO. 1	SM-30	83+00	8.0
	SM-31	81+00	8.0
	SM-32	79+00	8.0
	SM-33	77+00	8.0
	SM-34	75+00	8.0
	SM-35	73+00	8.0
	SM-36	71+00	8.0
	SM-37	69+00	8.0
	SM-38	65+00	8.0
	SM-39	61+00	8.0
	SM-40	57+00	8.0
	SM-41	53+00	8.0
	SM-42	49+00	8.0
	SM-43	45+00	8.0
	SM-44	41+00	8.0
	SM-45	37+00	8.0
	SM-46	33+00	8.0
	SM-47	29+00	8.0
	SM-48	25+00	8.0
	SM-49	20+00	8.0
	SM-50	15+00	8.0

(*SEE DETAIL "A" HEREON)

DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RK
DRAWN BY: DRV
CHECKED BY: MJPC

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM

MONUMENTS AND SEDIMENT STAFF GAGE LOCATIONS

SUBMITTED BY: Robert F. Hall
DATE APPROVED: 6/30/83
SPEC. NO. DACW09-83-B-0016
DISTRICT FILE NO. 241/297
SHEET 72 OF 80