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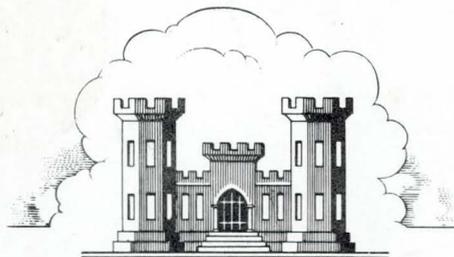
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PERIODIC INSPECTION

REPORT NO.1

FEBRUARY 1974

PIR-1



U.S. ARMY ENGINEERS DISTRICT, LOS ANGELES

CORPS OF ENGINEERS

A203.904



DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2711
LOS ANGELES, CALIFORNIA 90053

SPLED-DD

30 May 1974

SUBJECT: Periodic Inspection and Continuing Report No. 1 - Dreamy Draw Dam

Division Engineer, South Pacific
ATTN: SPDED-G

Inclosed are two (2) copies of the subject report.

FOR THE DISTRICT ENGINEER:

1 Incl (dup)
as

John M. Bird
GARTH A. FUQUAY
Chief, Engineering Division

SPDED-G (30 May 1974) 1st Ind

SUBJECT: Periodic Inspection and Continuing Report No. 1 - Dreamy
Draw Dam

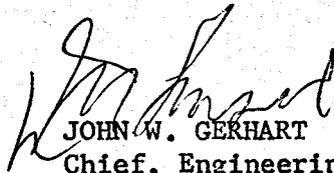
DA, South Pacific Division, Corps of Engineers, 630 Sansome Street
Room 1216, San Francisco, California 94111 1 July 1974

TO: District Engineer, Los Angeles ATTN: SPLED-DD

Subject report approved.

FOR THE DIVISION ENGINEER:

Incls wd



JOHN W. GERHART

Chief, Engineering Division

TEAM INSPECTION OF DREAMY DRAW DETENTION BASIN
PERIODIC INSPECTION REPORT NO. 1
DATED FEBRUARY 1974

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TEAM INSPECTION OF DREAMY DRAW DETENTION BASIN

1. INSPECTION TEAM. In accordance with FR 1110-2-100, "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures" the first team inspection of Dreamy Draw Detention Basin was conducted on 13 February 1974. The team consisted of the following personnel:

LAD		SPD
V. Cox	T. Dobrovolny	B. Godwin
D. Gutschow	C. Hoopaw	A. O'Neill
R. Oddone	F. Turner	
J. Wong		

2. PROJECT CONDITIONS. The project was in excellent condition. The reservoir was dry. The weather was sunny, slightly humid, and the temperature 70 degrees. The dam was completed six months previously and had experienced little rainfall in the interim; however, vandalls had done considerable damage as described under Instrumentation.

3. MAXIMUM WATER SURFACE ELEVATIONS FOR PRIOR YEARS. There are no maximum water surface elevations of record. To date, no water has been impounded by the dam, and the recorder had not been installed at the time of the inspection.

4. INSPECTION RESULTS.

a. Embankment

(1) Crest - The bituminous roadway surface along the crest was in excellent condition with no evidence of settlement or cracking. The shoulders of the roadway were clean and straight; however, off-road vehicles had started to wear away the shoulder of the crest near the right abutment of the main embankment.

(2) Abutment contacts - There were no cracks, slides or other signs of instability, nor any erosion of the exposed abutment surfaces.

(3) Upstream and downstream slopes - The embankment slopes were in good condition. There was no erosion or evidence of burrowing animals on the slopes. The riprap on the slopes showed no evidence of decomposition.

(4) Upstream and downstream toes - The toes of the embankments were in good condition. There was no erosion, undermining, settlement or sloughing at the toes.

b. Saddle dikes

(1) Crest - Condition similar to main embankment.

- (2) Abutment contacts - No evidence of erosion or cracking.
- (3) Upstream and downstream slopes - Condition identical to main embankment.
- (4) Upstream and downstream toes - No evidence of erosion or settlement observed.

c. Spillway

- (1) Approach channel - The approach channel was in good condition. There was no sloughing or raveling of the excavated slopes and the channel was clean and unobstructed.
- (2) Control section - Concrete in the sill was in good condition with no evidence of reactive aggregate. The excavated slopes above the sill remain stable.
- (3) Outlet channel - The outlet channel was clean and unobstructed with no sloughing or raveling of the excavated slope.

d. Outlet works

- (1) Approach channel - The approach channel was free of debris and unobstructed.
- (2) Trash rack structure - Concrete in the trash rack structure was in good condition with no evidence of reactive aggregate. There was no debris in the area of the trash rack structure.
- (3) Conduit - Concrete in the conduit was sound with no signs of structural inadequacy or distress.
- (4) Outlet structure - The concrete appeared sound with no evidence of popouts or reactive aggregate. The metal pedestal in the stilling basin showed no signs of deterioration or structural distress.

e. Instrumentation

- (1) Recorder - A battery operated, hydro-gage driven Stevens A-35 recorder has been installed in the recorder house. The recorder will operate 24 hours a day. Batteries will be replaced every six months.
- (2) Recorder house - Vandals had destroyed the 3 inch concrete roof overhang on two sides of the roof. In addition several holes had been knocked in the outer skin of the metal door, and the latch had been partially destroyed.
- (3) Settlement monuments - Five settlement monuments and two reference monuments were surveyed on 17 January 1974. One reference

monument had been destroyed, and several settlement monuments displayed signs of having been disturbed. It was noted that one of the monuments had been pushed off line and grade. Six 3-inch x 8-inch x 6-foot guard posts had been pulled out and thrown on the upstream slope of the embankment.

(4) Staff gages - One screw attaching the number plates to the 2-inch x 10-inch board was missing.

(5) All reflectors on the reflector assembly had been removed or destroyed.

5. CONCLUSION. Cross country vehicular use of the haul roads up to and crossing the crest near the right abutment of the main embankment is responsible for the beginning of erosion of the crest shoulder. Should such traffic continue it is certain that periodic maintenance of the crest shoulder will be a necessity. Attention is directed to the vandalism discussed in the previous paragraph. Except for these two conditions the project is in excellent condition.

6. REQUIRED ACTION.

a. Eliminate unauthorized vehicular access to the dam crest by dumping rock across trails accessible to four-wheeled vehicles.

b. Place "Penalty for destruction of government property" signs in strategic places.

c. Replace cable barricade with a barricade more readily seen and less apt to cause injury in an accident.

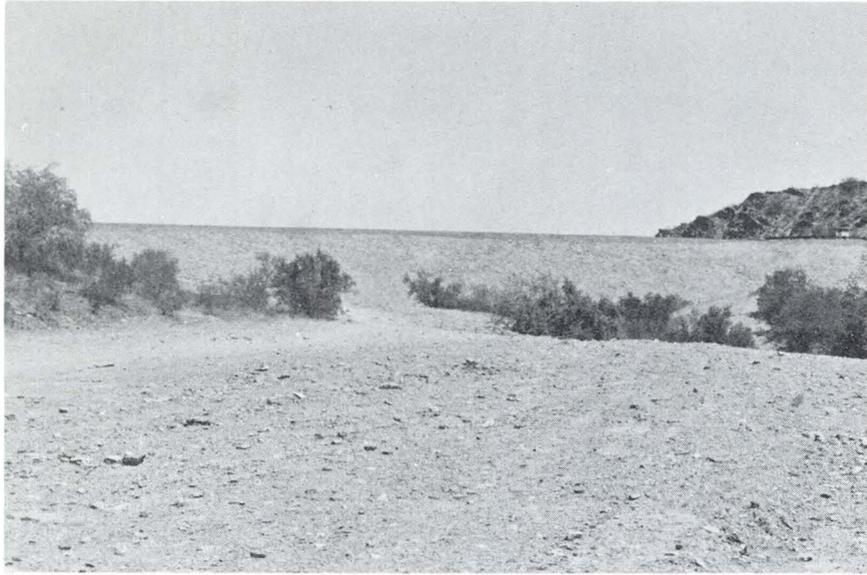
d. Reset monuments so that protective caps are 3-inches below the surface. Resurvey and reference location of all monuments.

e. Reset staff gauges where necessary, then draw a line with a metal scribe or punch marks across adjusting slots so the gauges can be reset readily. Finally, rivet or weld threads of staff gauge bolts, and plug the screw slots on the staff gauge number plate screws.

f. Saw the overhang on the recorder house roof flush with the walls.

g. Resurface recorder house door with a single heavy gage sheet metal welded over the damaged surface. Repair latch and locking assembly.

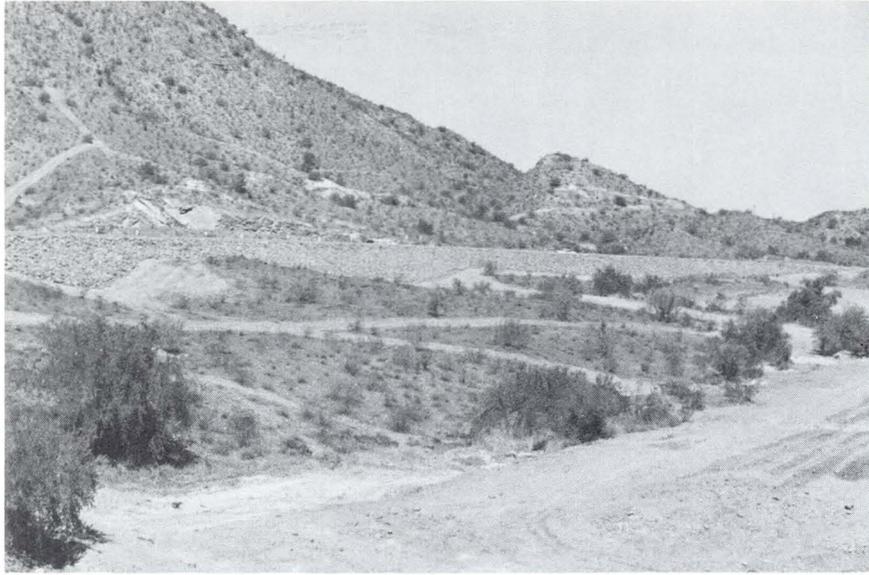
7. FUTURE INSPECTIONS. The next inspection will be in February 1975.



DREAMY DRAW DAM, LOOKING AT DOWNSTREAM FACE.



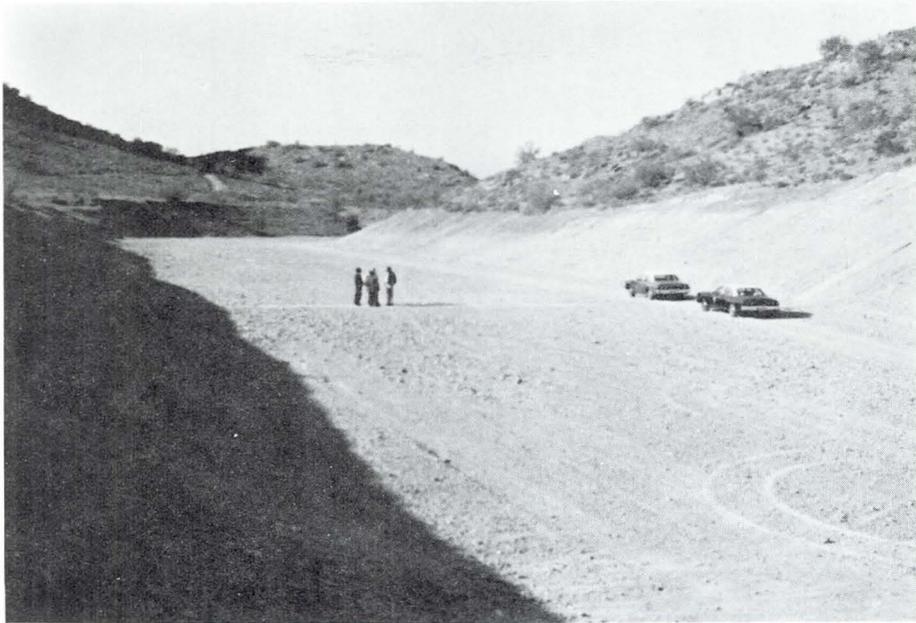
DREAMY DRAW DAM (LOOKING UPSTREAM).



DREAMY DRAW DIKE, LOOKING FROM DREAMY DRAW DAM.



DREAMY DRAW DAM, LOOKING FROM RIGHT ABUTMENT AT
UPSTREAM FACE.



LOOKING DOWNSTREAM AT SPILLWAY WITH
CONCRETE SILL IN MIDDLE GOUND

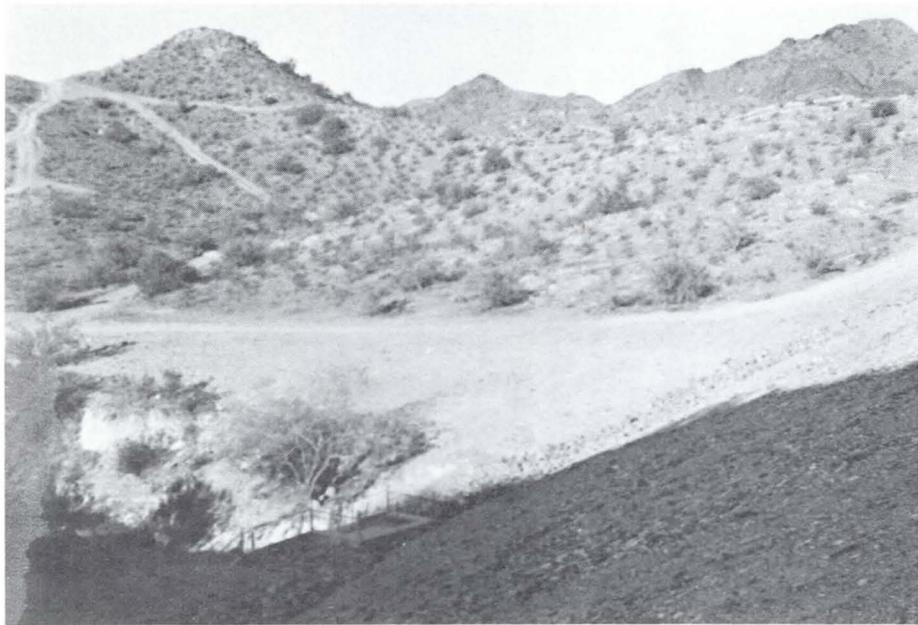
12



LOOKING AT DISTURBED SETTLEMENT MONUMENT.
NOTE WHEEL TRACK IN SHADOW AT THE BASE OF
THE PIPE.



INTAKE STRUCTURE VIEWED FROM CREST NEAR
THE RECORDER HOUSE. NOTE TRAILS CRISS -
CROSSING THE AREA.



TRAILS MADE BY OFF - ROAD VEHICLES. NOTICE
TRAIL CROSSING IN THE MIDDLE GROUND.



DAMAGE TO DOOR OF RECORDER HOUSE



DAMAGE TO ROOF OVERHANG OF RECORDER HOUSE

APPENDIX I
AGENDA FOR INSPECTION OF
DREAMY DRAW DAM
13 FEBRUARY 1974

MEMBERS

SPD

B. Godwin
A. O'Neill

LAD

A. Dobrovolny
D. Gutschow
C. Hooppaw
R. Oddone
F. Turner
J. Wong
V. Cox

ITINERARY

Tuesday, 12 Feb 1974. Members will arrive at Phoenix, Arizona. Single room reservations will be made for all members for 12 February 1974. The name and address of the hotel is:

Los Olivas Hotel
202 E. McDowell Road
Phoenix, Arizona 85004

Cost per room: \$13.13 including tax.
Arrangements for cars for travel from Phoenix to the dam sites will be made by LAD.

Wednesday, 13 Feb 1974.

0800 Leave motel for Dreamy Draw Detention Basin.
0830 Meet at water surface recorder house for briefing.
0900 Inspection of dam.
1200 Return to briefing area for open discussion.
1230 End of team inspection.

APPENDIX II
GENERAL PROJECT DESCRIPTION
APPENDIX TO INSPECTION REPORT

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1. **PURPOSE AND SCOPE.** This report is prepared in accordance with ER 1110-2-100, 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 where necessary.

2. **GENERAL.** The Dreamy Draw Dam is located within the city limits of Phoenix, Arizona. The project area is located in the southeastern part of the Phoenix Mountains. Dreamy Draw rises in the Phoenix Mountains and flows generally southwestward from the damsite to its confluence with Cave Creek in Phoenix. The lands are typically Arizona desert. Vegetation is sparsely scattered throughout the area, with cacti, creosote bush, sagebush and paloverde as the dominate desert plants. Animal life in the project area is also sparse because of the lack of water, limited vegetation cover, disturbance by man, and poor soil conditions for burrowing animals. The sparse wildlife includes small mammals, reptiles and birds. An archeological survey of the basin and spillway area uncovered no evidence of prehistoric occupation or use. Use of the basin area appeared to have been limited primarily to occasional horseback riding and hiking.

The principal features of the project (shown on pl. 1) include an earthfilled dam, a saddle dike, an outlet works, and a spillway.

a. The embankment, which is a zoned, compacted-earthfilled structure with crest elevation at 1,418 feet has a maximum height of 50 feet above streambed, a crest length of 450 feet, and a crest width of 20 feet. The upstream slope of the embankment is 1V on 2.75H, and the downstream slope is 1V on 2H. The upstream slope protection consists of 18 inches of facing stone, and extends from the top of dam to bedrock at the toe of the embankment. The top of the embankment is surfaced with 4 inches of base course material and 2 inches of asphalt concrete. See plate 4.

b. The saddle dike is a zoned, compacted-earthfill structure with a crest length of 1,060 feet, a crest width of 20 feet, and a maximum height of 20 feet above existing streambed. The upstream slope of the embankment is 1V on 2.75H and the downstream slope is 1V on 2H. The upstream slope protection consists of 18 inches of facing stone and extends from the top of the dam to bedrock at the toe of the embankment. The top of the embankment is surfaced with 4 inches of base course material and 2 inches of asphalt concrete. The slope of both the upstream and downstream side of the core is vertical.

c. The intake structure is a rectangular reinforced-concrete structure located at the upstream toe of the embankment. The top

of the structure is at elevation 1,382 feet, 12 feet above the invert elevation of the structure and 23 feet below the spillway crest elevation. The structure is 6 feet wide and 6 feet long (inside dimensions) with 2-foot-square openings regularly spaced horizontally and vertically. Grated openings are provided at the base and top of the structure for cleaning purposes.

d. A detached broadcrested spillway with a crest elevation of 1,405 feet and a crest length of 100 feet is located about 400 feet east of the left abutment. The spillway is of trapezoidal cross section excavated in rock, unlined, except for a concrete control sill. Excavated side slopes are 1V on 2H. The spillway channel is about 1,270 feet long.

e. The conduit consists of a concrete-encased reinforced concrete pipe about 264 feet long with an inside diameter of 36 inches. A concrete stilling basin structure, 15 feet wide and 20 feet 8 inches long, is provided at the downstream end of the conduit.

f. The service road providing access for maintenance and inspection of the dam and appurtenances extends from Northern Avenue, over the saddle-dike and dam, to the east abutment of the dam. A turnaround is provided at the east end of the embankment.

g. Safety provisions include guard rails provided at the turnaround and along the sharp curve of the access road between the saddle-dike and dam. A 4-foot chain-link fence is constructed on top of the outlet channel walls. Guide posts are provided along the top of dam and saddle-dike.

3. GEOLOGY. The Dreamy Draw Dam is located in the southeastern part of the Phoenix Mountains and lies in a canyon between North Mountain Park (elevation 2,104 feet) and Squaw Peak (elevation 2,608 feet). The canyon floor at the site is about 700 feet wide and is traversed by Northern Avenue on the west. The streambed elevation of the dam is about 1,370 feet. The rock formations in the vicinity of and at the damsite consist chiefly of pre-cambrian metamorphic rock. Schist is the predominant rock type, but quartzite, marble and slate are present locally. The schist is steel gray to brownish gray, soft to hard, fissile and platy, and slightly weathered near the surface. Older alluvium, which lies along the side slopes of the valley is of Quaternary age, and consists of consolidated gravelly silty sand. There are minor deposits of recent alluvium in the streambed consisting of uncemented silt, sand, gravel and boulders. There is evidence of ancient folding and some faulting in the rock formations in the vicinity of the dam. See plate 5.

4. EMBANKMENT.

a. The embankment is a rolled-earthfill section consisting of three zones, a core, an upstream select random and a random zone, with a gravel drain at the downstream toe of the main embankment.

(1) The core zone is located on bedrock. The material for the core zone consists of clayey gravelly sands and silty gravelly sands obtained from designated core borrow areas (pl. 1). The top of the core is five feet below the crest elevation of the embankment. It has a top width of 10 feet and side slopes of 2.5V on 1H on the upstream side and vertical on the downstream side. The core zone permits possible future recreation pool storage and at the same time protects against through seepage from coarse material layering of exterior upstream zones.

(2) The select random zone, beginning from the right abutment, is located on bedrock for about 300 feet. The remaining 150 feet is located on older alluvium. The material for the select random zone consists of unweathered rock obtained from the spillway excavation. The top of the select random zone is 5 feet below the crest of the embankment and is 10 feet wide to accommodate placement by equipment. The zone serves as a transition and filter zone between the stone protection and the random zone. The select random zone allows faster drainage of the upstream main embankment slope under anticipated drawdown conditions.

(3) The random zone beginning from the right abutment, is located on bedrock for the first 300 feet. The remaining 150 feet is located on older alluvium. The material for the random zone consists of material obtained from required excavation and designated borrow areas (pl. 1). The material contains no stone larger than 3/4 of the layer thickness. Plan and profile of the embankment are shown on plate 2. Cross sections of the embankment are shown on plate 4.

b. A subdrainage system is provided to prevent concentrated flow of infiltrated water at the downstream toe, and to direct any flow to a controlled outlet. The drain extends about 50 feet upstream from the toe and terminates at elevation 1,380 feet on each abutment.

c. Stone erosion control gutters are provided at the abutment contacts, both upstream and downstream. See plate 2.

d. The stability of the embankment slopes was analyzed for end of construction conditions, sudden drawdown and drained condition during earthquakes.

(1) For the end of construction condition the infinite slope method of analysis was found to be most critical. In that the embankment was constructed under arid conditions, "S" strengths were used in slope stability computations. Results of analyses indicated safety factors of 1.4 for the downstream slope and 1.9 for the upstream slope.

(2) For sudden drawdown, the effect of routing the standard project flood is applicable. The routing curve shows the reservoir would fill to the spillway crest about 3 hours and would drawdown in about 19 hours (basin empty). The duration of drawdown corresponds to an average of 55 feet per day with a rate exceeding 3 feet per hour during the final 15 feet of drawdown. For application to stability, sudden drawdown was applied with the assumption that the upstream random zone become completely saturated during the filling of the reservoir. The results proved to be less critical for deep failure planes analyzed within the central portion of the embankment than for those planes near or parallel to the slope. A block and wedge analysis was used in analyzing stability for drawdown. "Bishop's Modified Method" was employed and thus resulted in a critical plane that nearly parallels the dam face. For emptying the reservoir the resulting minimum safety factors for drawdown from maximum pool and from spillway crest are 1.07 and 1.23, respectively.

(3) The damsite is located in seismic zone 2. Analyses of stability utilizing the corresponding seismic coefficient of 0.10 proved the infinite slope analysis to be most critical. Respective safety factors for the upstream and downstream slopes are 1.45 and 1.1.

e. The upstream slope protection for the embankment and the dike consists of 18-inches of facing stone, and extends from the top of the slope to bedrock at the toe of the embankment. The gradation of the processed material follows:

Weight of pieces (in pounds)	Percent smaller by weight
150	100
100	50-100
50	30-70
25	15-50
5	0-15
1	0-5

A graded filter was not required beneath the riprap.

f. The downstream slope protection of the embankment consists of eight inches of blended alluvium and weathered bedrock in approximately equal proportions. The material will accommodate planting, and ultimately, a natural effect in vegetal growth. Large platy rock with a maximum dimension of 8 inches was used as it occurred. The downstream slope protection for the dike consists of 8-inches of excavated bedrock (gray schist) from the spillway, having a maximum dimension of 6 inches.

g. Seepage studies, utilizing transient flow nets, have proven that complete saturation of the upstream random zone would

not occur during normal operations. The use of the core permits effective control of through seepage in the event that prolonged pool retention occurs. In order to control concentration of flow due to through seepage and infiltration of runoff water at the abutments, the downstream gravel drain has been provided.

5. FOUNDATION CONDITIONS.

a. The project site consists of moderate slopes of metamorphic rock overlain by alluvium. Schist is the predominant rock type and the alluvium consists of clayey gravelly sand and silty gravelly sand. At the main embankment site, a veneer of alluvium covers the right abutment and alluvium covers the left abutment to a depth of about 18 feet. Major portions of the streambed channel are exposed rock with minor depressions filled with gravelly sand.

b. The spillway was excavated in older alluvium consisting of gravelly sand, silty gravelly sand and clayey gravelly sand overlying bedrock. The thickness of the alluvium varies from 8 feet at the approach channel to about 1 foot at the spillway crest. The bedrock is steel gray to brownish gray schist, soft to hard, fissile and platy and slightly weathered near the surface. There are numerous thin intersecting quartz and calcite veins, and occasional seams of clay in the schist.

c. The saddle-dike is located where older alluvium with an average thickness of 1.5 feet is underlain by bedrock.

6. FOUNDATION TREATMENT.

a. Embankment stripping was extended a minimum of 2 feet or to bedrock whichever was less. The estimated average depths of stripping were 2 feet for the left abutment, 1 foot for the right abutment, and 1.5 feet for the streambed. Slopes resulting from the stripping operation were no steeper than 2V on 1H. A cutoff trench, about 150 feet long, was excavated in the left abutment for the core zone. The depth of the trench varied from 2 feet to 21 feet. The average width of the trench is 28 feet. The cutoff trench was air blasted to remove all loose rocks. A continuous grout curtain was provided along the core contact. A total of 31 holes drilled at a spacing of 1.3 feet to 32 feet, according to the grout take, were required to fill the numerous small caves resulting from the dissolving of limestone lenses in the schist formation. See plate 5. Upon completion of foundation grouting, slush grout was used to fill exposed cracks, joints and depressions where core material could not be satisfactorily placed. The soil was scarified to a depth of 6 inches, wetted, and rolled with 8 passes of a 50 tone rubber-tired roller.

b. The spillway was excavated in older alluvium and highly fractured platy schist bedrock. Side slopes were cut on a 1V and

2H slope. A horizontal control sill was constructed at the crest of the spillway (Station 7+15). The concrete sill is embedded approximately 5 feet into hard resistant schist bedrock.

c. Foundation treatment of the dike consisted of stripping an average depth of 1 foot to bedrock.

7. OUTLET-WORKS. Principal features of the outlet works include the intake, the conduit, and the stilling basin.

a. The intake structure is located on schist bedrock. It is a reinforced concrete intake structure 12 feet high, 9 feet wide and 9 feet in length. The structure has 10 openings, 2 feet square, a 6 by 6 foot grated opening in the roof, and a 3 foot 6 inch by 4 foot 8 inch grated opening in the upstream face at invert level. The intake structure was checked for two conditions of loading: Condition I, when the reservoir is empty with earthquake loading and Condition II, when the reservoir is full to spillway crest elevation with no earthquake loading. It was determined that Condition II would be the critical design. Earthquake loading was not included because the possibility of an earthquake occurring simultaneously with Condition II is remote.

b. The conduit is a 36 inch concrete-encased reinforced concrete pipe about 264 feet long. It is founded upon bedrock throughout its length. The pipe is designed to discharge a flow of 224 cubic feet per second when the water surface is at spillway crest. The conduit was designed for a loading condition wherein the vertical earth pressure equalled 1.5 times the weight of the fill directly above the conduit, and the horizontal pressure equalled 0.5 times the vertical earth pressure.

c. The concrete stilling basin is 15 feet wide and 20 feet 8 inches long. It was designed to reduce the discharge velocity from 28 feet per second to 8 feet per second. The energy dissipating wall located at mid-length and extending across the basin was designed to withstand a water force of 10.5 kips acting 2 feet 9 inches above the invert. The side walls were designed for a loading condition when the channel was empty. Backfill behind the side walls consists of sand, gravelly sand, silty sand, sandy silts, clayey sands and sandy clays.

8. SPILLWAY. The spillway is an unlined trapezoidal channel excavated in bedrock. It has a base width of 100 feet and a length of 1,270 feet. The side slopes are 1V on 2H. The invert of the spillway is steel gray, moderately hard to hard, fissile, and platy schist bedrock. The side slopes are older alluvium consisting of silty sand with gravel and occasional cobbles. A concrete sill at the spillway crest protects it from erosion. The spillway is designed to pass a maximum discharge of 7,000 cubic feet per second at the maximum water surface elevation of 1,413

feet. For this discharge, the critical depth would be 5 feet and the velocity would be 12 feet per second.

9. **SADDLE-DIKE.** The saddle-dike is a zoned compacted-earthfill embankment located on schist bedrock and has a crest width of 20 feet and a length of 1,060 feet. The upstream slope is 1V on 2.75H and is protected by 18 inches of facing stone. The downstream slope is 1V on 2H and is protected by 8 inches of excavated bedrock. The dike consists of a core zone, a 10 foot select random on the upstream face and a random zone. The materials for each zone are similar to the material in the main embankment. Erosion control gutters are provided at the downstream end of the abutment contacts. A 24 inch C.M.P. culvert is located at Station 8+60 to connect with the existing 24 inch C.M.P. culvert under Northern Avenue for drainage.

10. **CONSTRUCTION HISTORY.** Construction of Dreamy Draw Dam project was completed in September 1973 under one contract awarded 21 September 1972 to:

Ducon, Inc.
Harn and Sloan
A Joint Venture
13165 E. Garvey Ave.
Baldwin Park, Calif. 91706

11. **ENGINEERING DATA.** Engineering data for the project are stored in the office of the Flood Control District of Maricopa County, 3325 West Durango Street, Phoenix, Arizona 85009. The following items are included:

- a. Design Memorandum No. 1 - January 1972
- b. As constructed drawings
- c. Operation and Maintenance Manual
- d. Latest Periodic Inspection and Continuing Evaluation Report

12. **CHECK LIST.** The following elements of the major features of the project are listed as guidance for periodic inspections and continuing evaluation:

a. Embankment

- (1) Crest
- (2) Upstream and downstream slopes
- (3) Upstream and downstream toes
- (4) Abutment contacts

b. Outlet Works

- (1) Intake structure
- (2) Conduit
- (3) Stilling basin

c. Spillway

- (1) Approach channel
- (2) Concrete sill

d. Saddle-dike

- (1) Crest
- (2) Upstream and downstream slopes
- (3) Upstream and downstream toes
- (4) Abutment contacts

13. INSTRUMENTATION.

a. **Hydrologic Facilities.** The hydrologic facilities will provide water surface and precipitation records that are presently unavailable at the site. The facilities include a reservoir water surface recorder system, reservoir staff gages and a precipitation station. The water surface recorder system consists of a 50-inch battery operated servo monometer, a water surface recorder and an intake sump inter-connected by a 2-inch conduit. An instrument house is provided to house the servo monometer and the water surface recorder. Nine adjustable staff gages between elevations 1,370 and 1,415 feet were installed on the left abutment. A precipitation station consisting of a weekly recording rain gage will be installed near the dam.

b. **Monument.** Five settlement monuments are located about 8.5 feet upstream from the centerline of the dam between Stations 21+50 and 24+10. The settlement surveys will provide information on settlement due to compression of the embankment. Two reference monuments are located on the access road on the right abutment. Monument details are shown on plate 3.

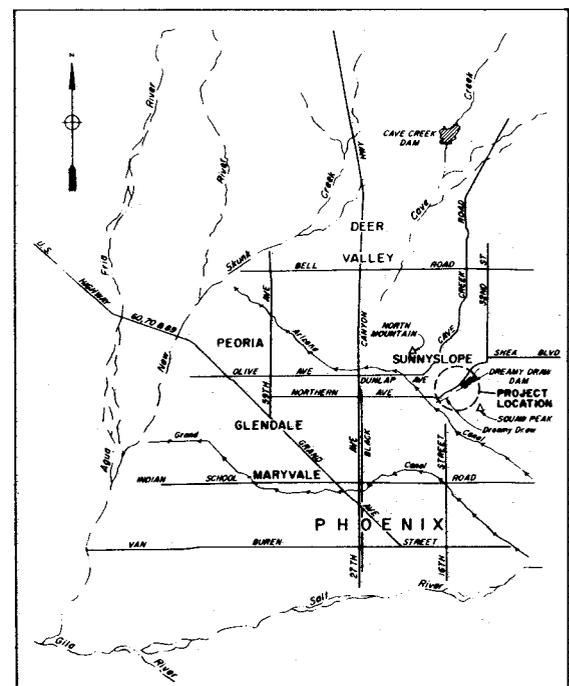
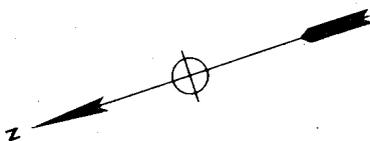
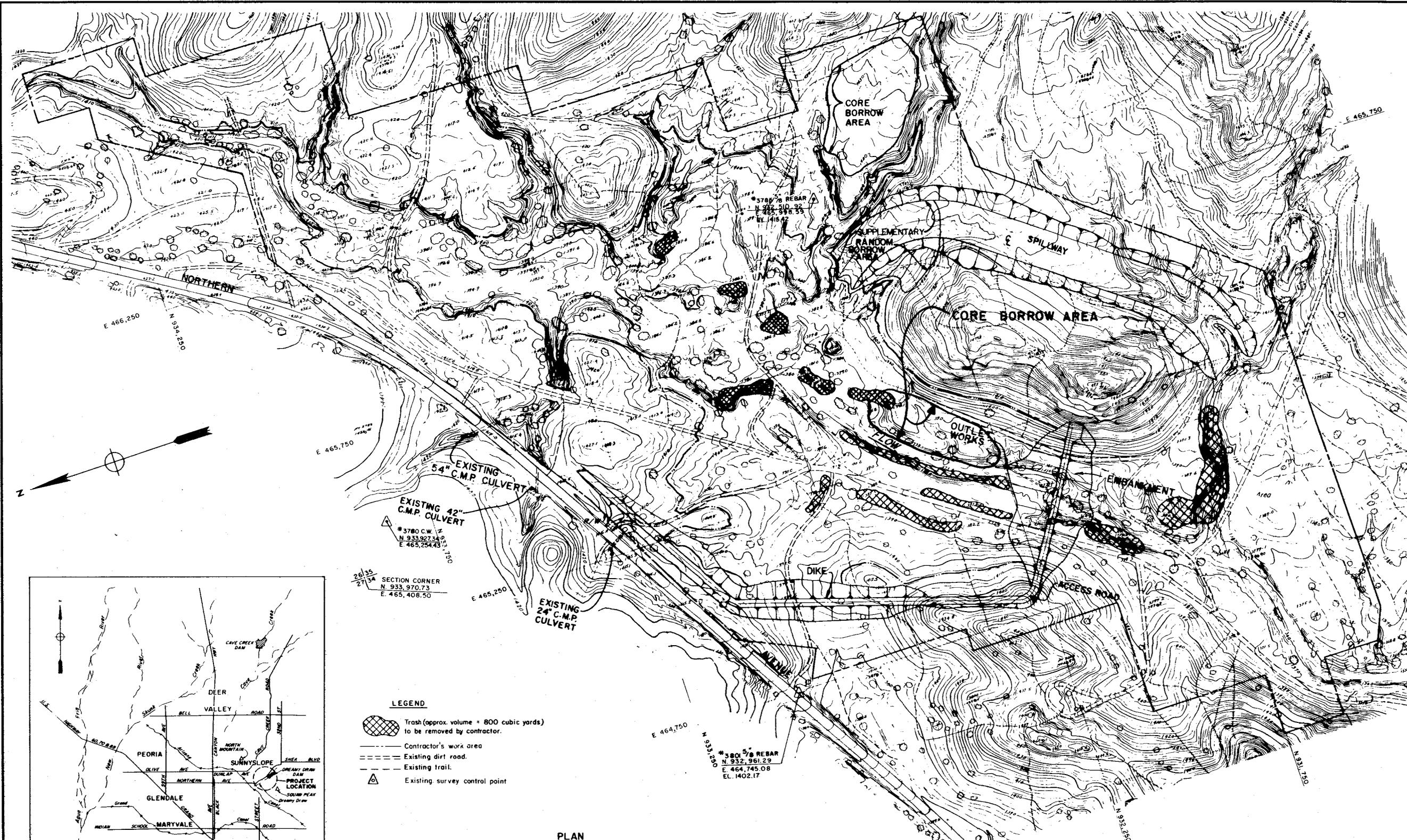
14. PERTINENT DATA

Drainage area	sq. mile	1.3
Dam (rolled earthfill)		
Crest elevation	ft. (m.s.l.)	1,418
Max. height above streambed	ft.	50
Crest length	ft.	450
Freeboard	ft.	5
Spillway (detached, broadcrested)		
Crest elevation	ft. (m.s.l.)	1,405
Crest length	ft.	100
Elevation of max. water surface	ft. (m.s.l.)	1,413
Outlet works (ungated conduit)		
Length	ft.	264
Intake elevation	ft.	1,371
Outlet elevation	ft. (m.s.l.)	1,365
Saddle-dike		
Crest elevation	ft. (m.s.l.)	1,418
Crest length	ft.	1,060
Max. height above existing ground	ft.	20
Reservoir		
Area at--		
Spillway crest	acre	27
Max. water surface	acre	39
Dam crest	acre	48
Capacity (gross) at--		
Spillway crest	acre-feet	317
Max. water surface	acre-feet	577
Dam crest	acre-feet	793
Storage allocation below spillway crest		
Flood control	acre-feet	281
Sedimentation	acre-feet	36
Standard-project flood		
Total volume (6 hours)	acre-feet	320
Peak inflow	cfs	3,600
Peak outflow	cfs	224
Drawdown time	hours	16.8
Maximum-probable flood		
Total volume (10 hours)	acre-feet	770
Peak inflow	cfs	11,000
Peak outflow	cfs	7,000
Drawdown time (to spillway crest)	hours	7.5

15. PLATES

Title

1. General plan.
2. Embankment - plan and profile.
3. Subdrainage system, monument and miscellaneous details.
4. Embankment - cross sections.
5. Foundation grouting.



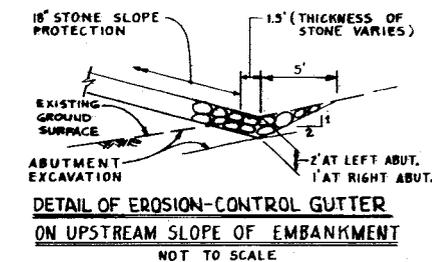
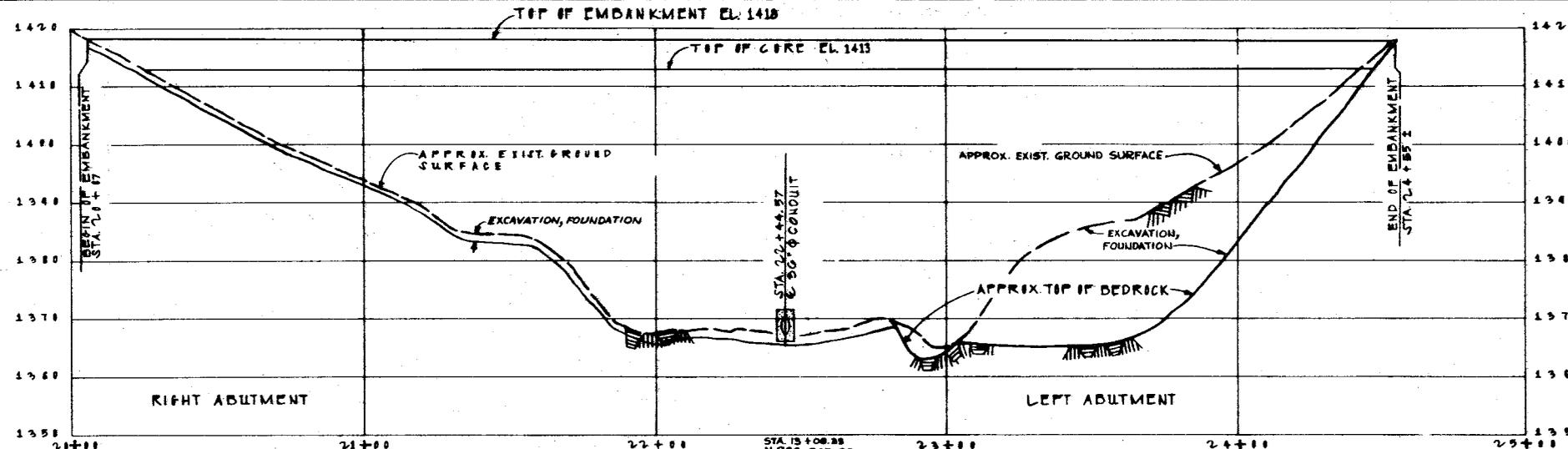
VICINITY MAP
SCALE 0 1 2 3 4 MILES

SECTION CORNER
N 933,970.73
E 465,408.50

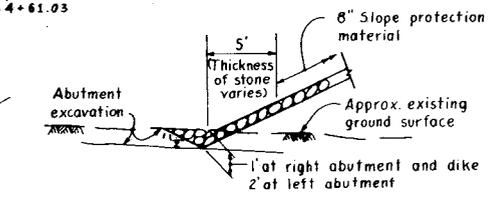
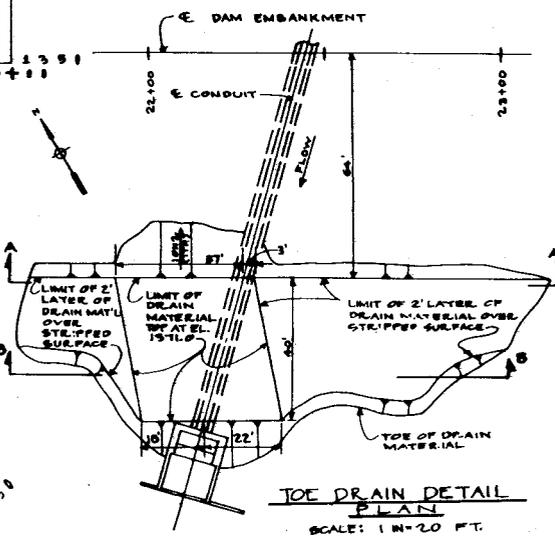
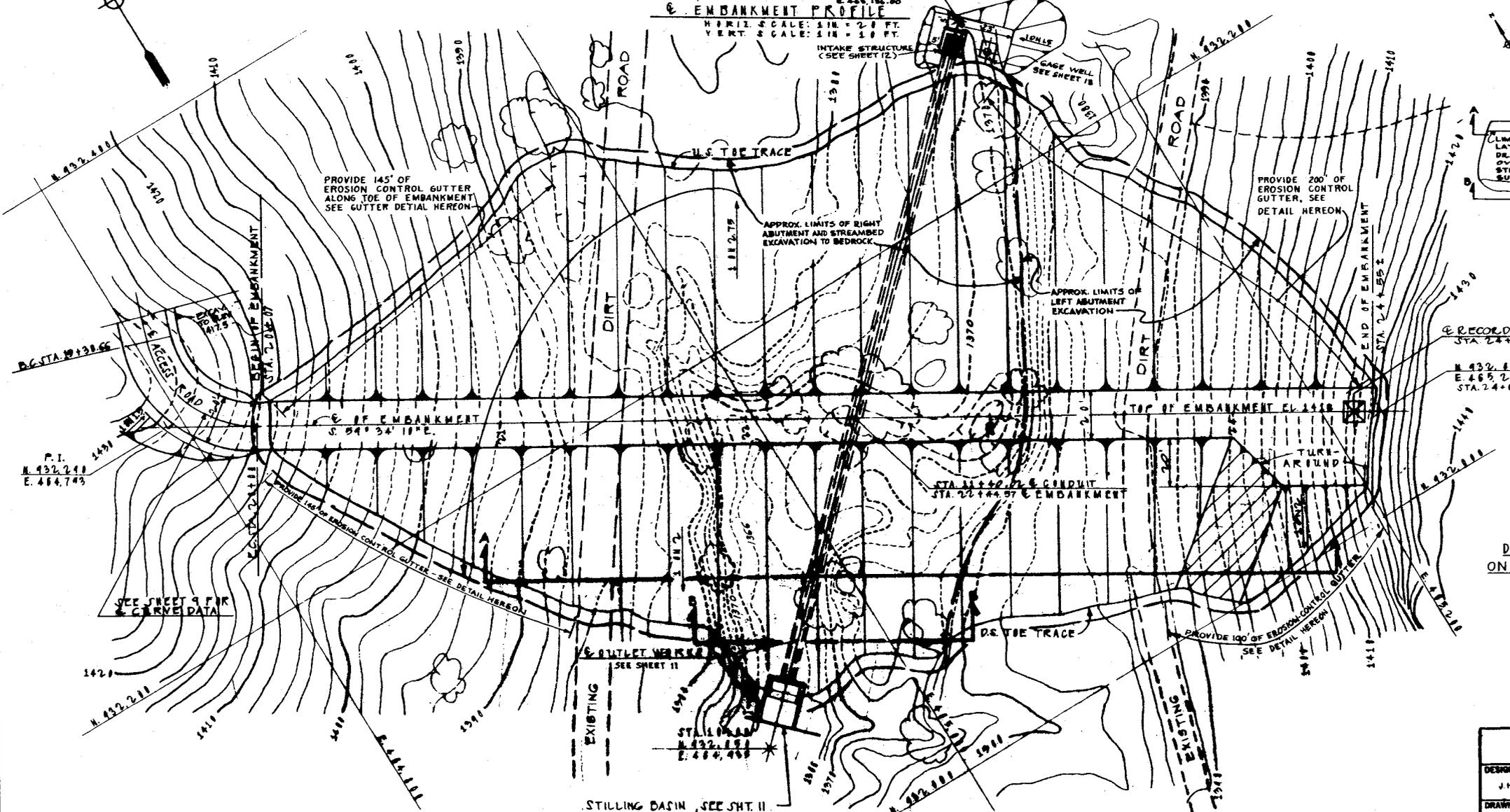
- LEGEND**
- Trash (approx. volume = 800 cubic yards) to be removed by contractor.
 - Contractor's work area.
 - Existing dirt road.
 - Existing trail.
 - Existing survey control point.

PLAN
SCALE 1 IN. = 100 FT
0 100 200 300

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS		
DESIGNED BY: J. H. W.	GILA RIVER BASIN NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA	
DRAWN BY: J. Y.	DREAMY DRAW DAM	
CHECKED BY: J. H. W.	GENERAL PLAN	
SUBMITTED BY: <i>[Signature]</i>	SPEC. NO.	SHEET
DATE:	DRAWING NUMBER	
	DISTRICT FILE NO.	



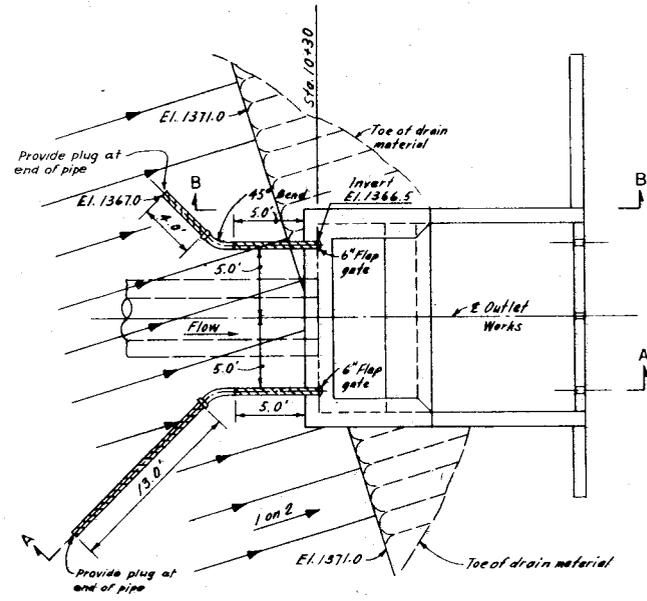
EMBANKMENT PROFILE
 HORIZ. SCALE: 1 IN = 20 FT.
 VERT. SCALE: 1 IN = 10 FT.



PLAN
 SCALE: 1 IN = 20 FT.

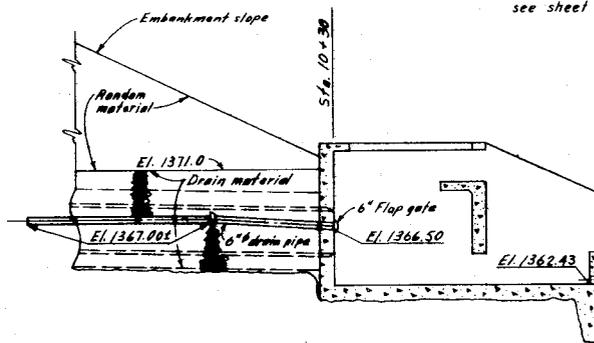
NOTE:
 FOR SECTIONS A-A AND B-B
 SEE SHT. 8

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS		
DESIGNED BY: J.H.W.	GILA RIVER BASIN NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA	
DRAWN BY: R.L.A.	DREAMY DRAW DAM	
CHECKED BY: R.R.K. J.A.	EMBANKMENT - PLAN AND PROFILE	
SUBMITTED BY: <i>[Signature]</i>	SPEC. NO.	SHEET
DATE: FEBRUARY 1971	DRAWING NUMBER	DISTRICT FILE NO.

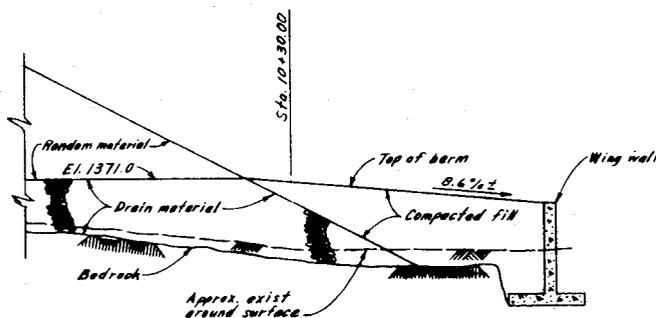


PLAN

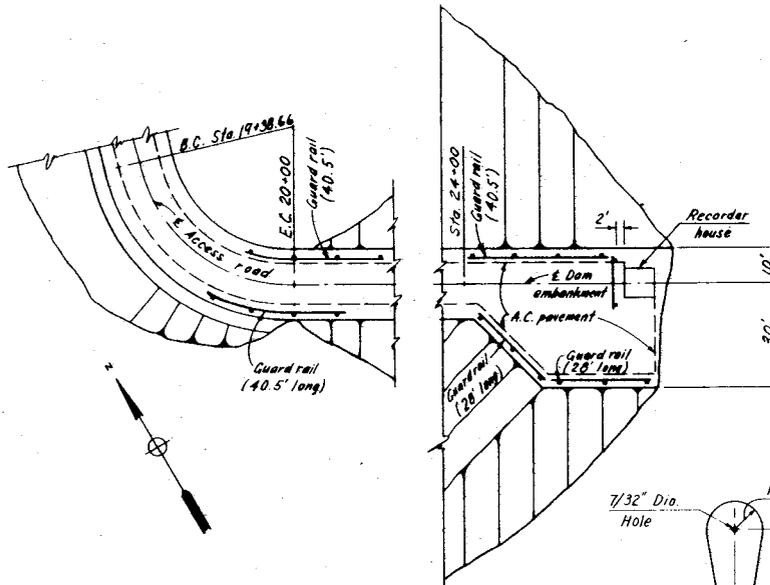
- Notes:
1. 6" Collector pipe shall be perforated.
 2. Flap gates shall be automatic drainage, Armo Model 100 or equal.
 3. For extent of drain material, see sheet 7.



SECTION A-A

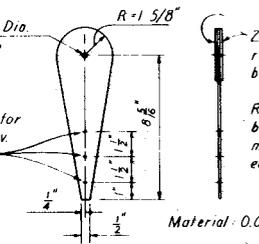


SUBDRAINAGE SYSTEM DETAILS
NOT TO SCALE



PLAN

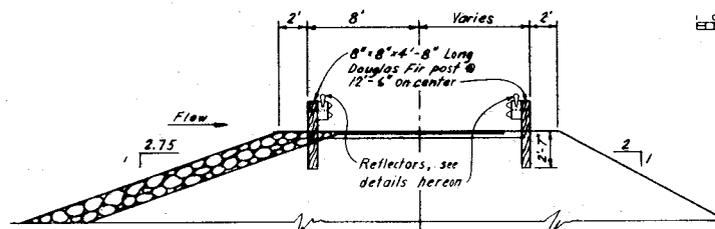
SCALE: 1" = 20'



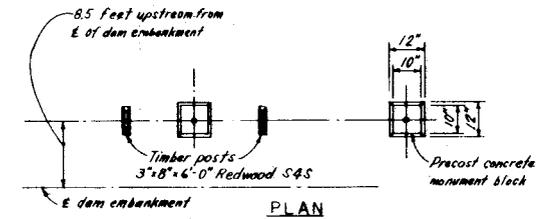
FRONT VIEW SIDE VIEW

REFLECTOR ASSEMBLY

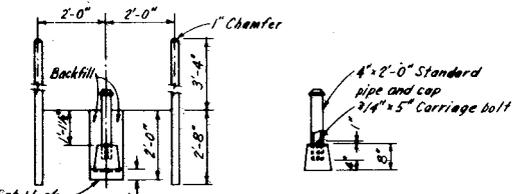
SCALE: 1/4" = 1"



TYPICAL SECTION
GUARD RAIL DETAILS
SCALE: 1" = 5'



PLAN



ELEVATION

MONUMENT INSTALLATION

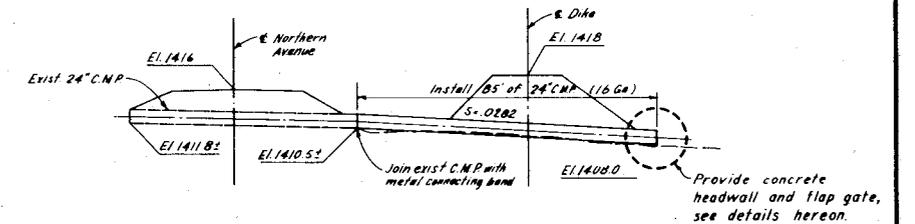
MONUMENT DETAILS

SETTLEMENT AND REFERENCE MONUMENTS

NOT TO SCALE

Notes:

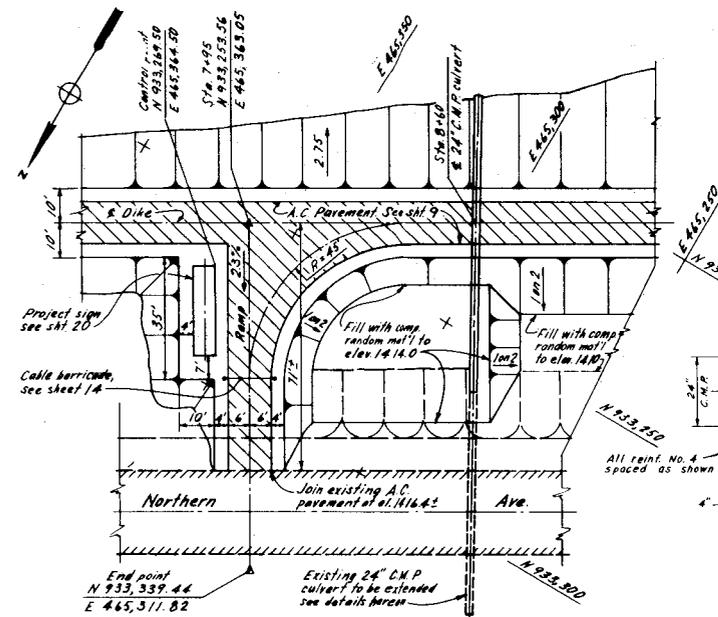
1. Five settlement monuments shall be installed 8.5 feet UCS from E of dam embankment at stations 21+50, 22+00, 22+50, 23+50 and 24+10.
2. Two reference monuments are located on the access road on the right abutment.
3. Monuments shall be installed after the recorder house and traffic control facilities are completed.



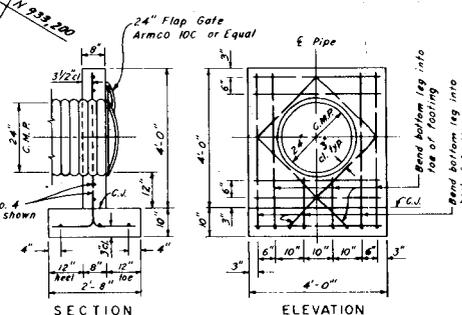
PROFILE OF 24-INCH CULVERT EXTENSION

HORIZ SCALE: 1 IN = 20 FT

VERT SCALE: 1 IN = 10 FT



RAMP DETAIL
SCALE: 1" = 20'

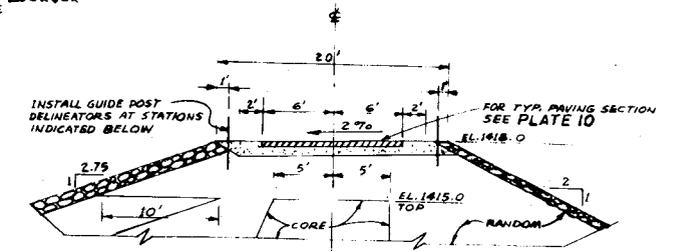
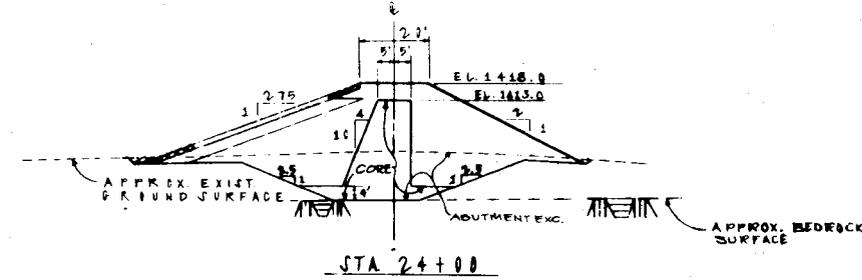
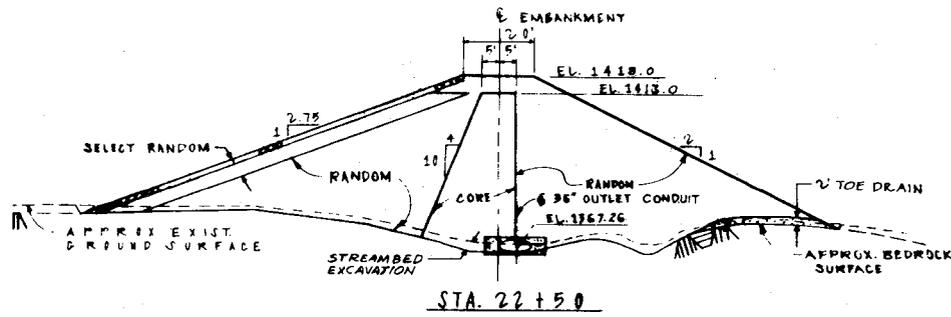


SECTION ELEVATION

HEADWALL DETAILS

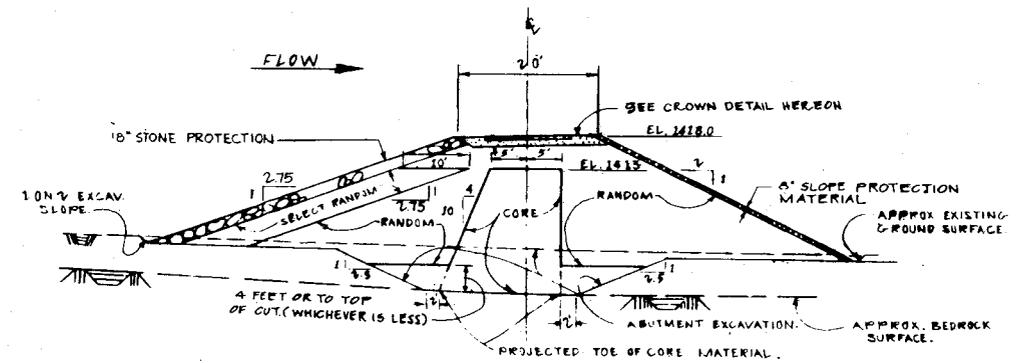
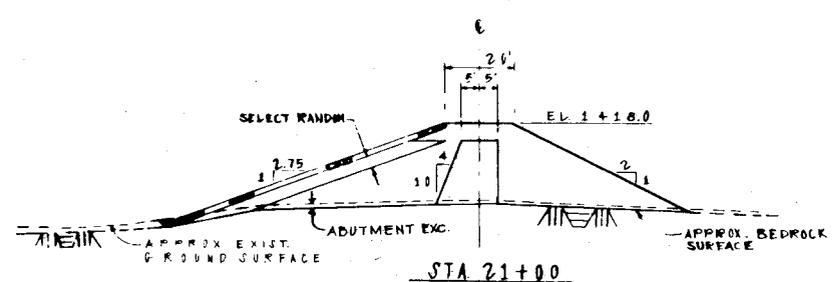
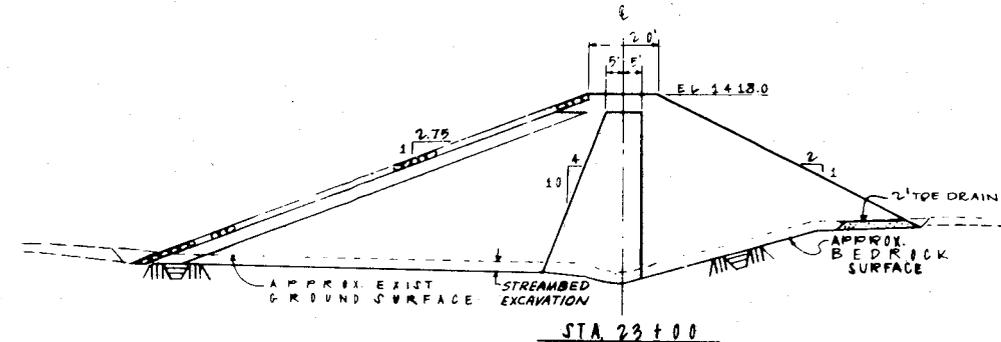
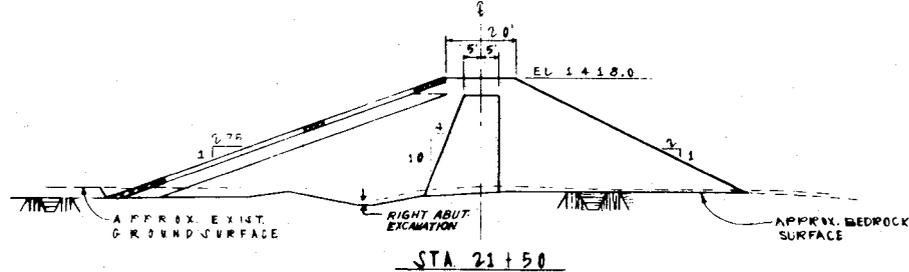
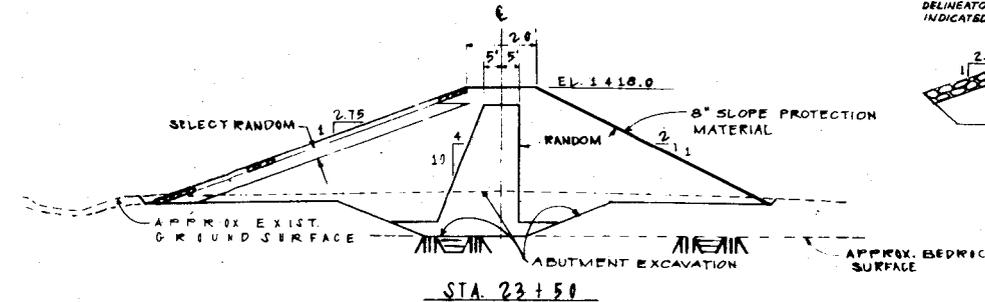
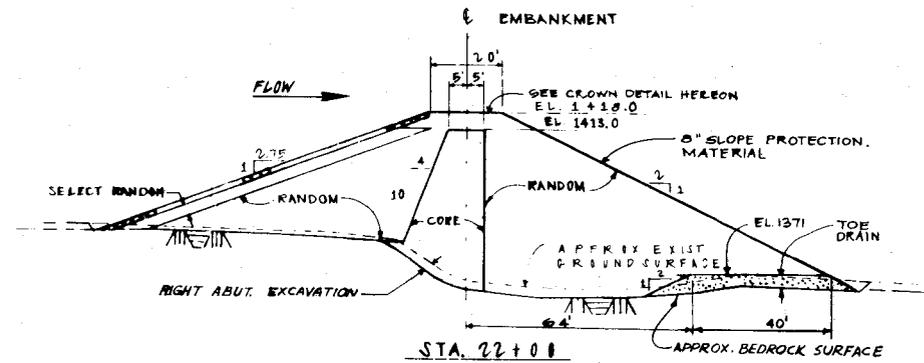
SCALE: 1/2" = 1 FT

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS		
DESIGNED BY: J. H. W.	GILA RIVER BASIN NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA	
DRAWN BY: J. Y.	DREAMY DRAW DAM SUBDRAINAGE SYSTEM, MONUMENT AND MISCELLANEOUS DETAILS	
CHECKED BY: J. A.		
SUBMITTED BY: <i>E. L. Washburn</i>	SPEC. NO.	SHEET
DATE: FEBRUARY 1972	DRAWING NUMBER	
	DISTRICT FILE NO.	

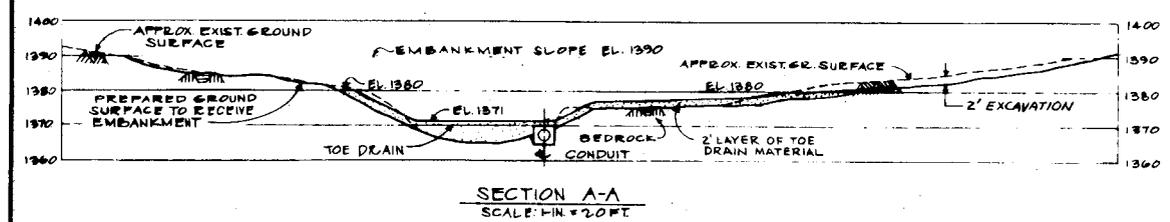
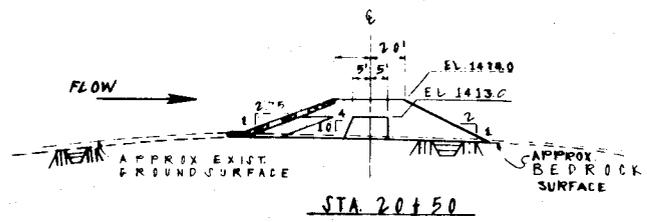


CROWN DETAIL
1" = 6' FT.

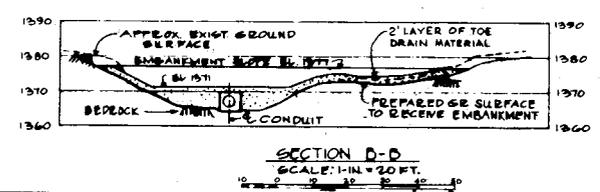
LOCATION OF GUIDE POSTS	
24 + 00	BOTH SIDES OF EMBANKMENT
23 + 00	
22 + 00	
21 + 00	NORTH SIDE
20 + 30	
20 + 20	
19 + 70	WEST SIDE
19 + 50	



EMBANKMENT SECTION WITH CUTOFF TRENCH
(NOT TO SCALE)

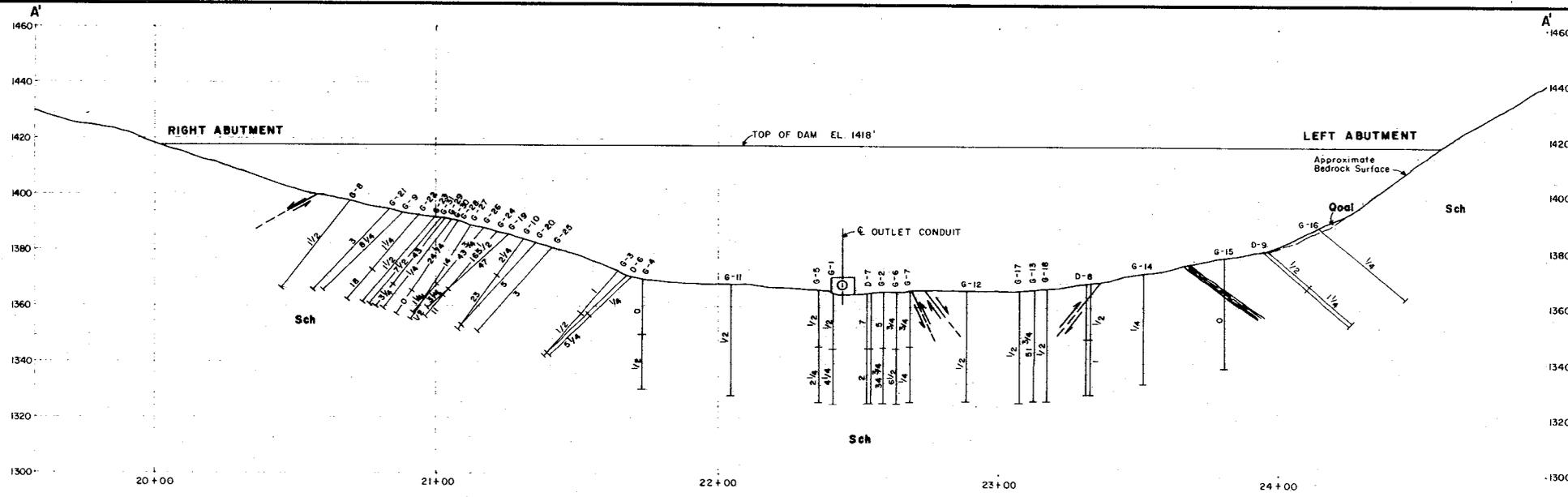


SECTION A-A
SCALE: 1/4" = 20 FT



SECTION B-B
SCALE: 1/4" = 20 FT

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS	
DESIGNED BY: JHW	GILA RIVER BASIN NEW RIVER & PHOENIX CITY STREAMS, ARIZONA
DRAWN BY: RLA ADP	DREAMY DRAW DAM
CHECKED BY: J.A. RRK	EMBANKMENT - CROSS SECTIONS
SUBMITTED BY: <i>[Signature]</i> DATE: FEBRUARY 1972	SPEC. NO. DRAWING NUMBER DISTRICT FILE NO.
	SHEET



SECTION A-A
GEOLGY ALONG EMBANKMENT
(AFTER EXCAVATION) SHOWING GROUT
AND EXPLORATORY GROUT HOLE LOCATIONS
 VERT. SCALE: 1 IN. = 20 FT.
 HORIZ. SCALE: 1 IN. = 20 FT.

LEGEND

Qool OLDER ALLUVIUM: Terrace deposits, talus debris, and slope wash; indurated.

Sch SCHIST: Steel gray to brownish gray; soft to hard; platy; numerous quartz and occasional calcite veins and lenses; occasional seams of clay; foliation dips 45° to 90° to the east and strikes N30-50°E.

Exploratory grout holes (NX), showing the two stages; number of sacks of grout take for each stage indicated beside hole.

Grout hole (EX), showing holes without stages and holes with two stages; number of sacks of grout take for each stage indicated beside hole.

Contact between formations (i.e. between bedrock and alluvium) - dashed where approximate.

Strike and dip of inclined foliation.

Strike of vertical foliation.

Strike and dip of inclined joint.

Strike of vertical joint.

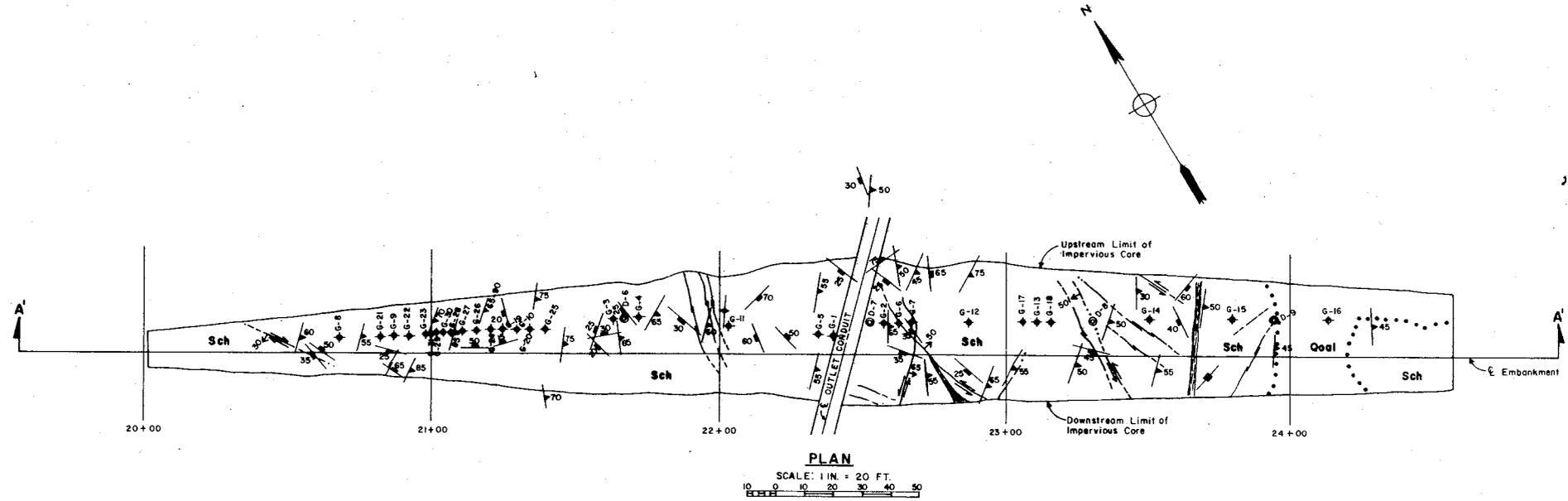
Fault - dashed where approximately located, dotted where hidden or buried; dip shown by short arrow; long arrows show direction of relative movement.

Vein material - mostly talc and quartz, with occasional iron oxide and limy veins and lenses.

Approximate interval of core loss.

DEPTH	PSI	GPM
10		
20.0'		
20		
30		
40.0'		
1.0		0.5

DEPTH - Number of feet below top of hole.
 PSI - Pounds per square inch water pressure.
 GPM - Gallons per minute, water loss.
 NO LOSS - No water loss at a certain pressure.



PLAN
 SCALE: 1 IN. = 20 FT.

GENERAL NOTES

- Bearing, inclination, spacing, and number of exploratory grout holes and grout holes were determined in the field according to number of sacks of grout which the preceding and adjacent holes took and also upon the bedrock conditions of the abutments.
- See sheet 3 for plan of exploration and additional legend.
- In area between G-8 and G-25 there are numerous limy veins and lenses exposed on ground surface.
- Exploratory grout hole and grout hole inclinations are measured from horizontal.
- Exploratory grout holes and grout holes are 40' deep, except D-6, which is 40.3'. Holes were drilled in stages as follows:

HOLE NO.	1ST STAGE	2ND STAGE
G-10	0 to 16'	16' to 40'
D-6 thru D-9 and G-1 thru G-7	0 to 20'	20' to Bottom
G-22 and G-26	0 to 26'	26' to 40'
G-19, 24, 27, 28, and 29.	0 to 35'	35' to 40'
G-8, 9, 11 thru 18, 20, 21, 23, 25, 30, and 31.	0 to 40'	-----
- Soil classifications shown on this sheet are visual.
- Section A'-A' is profile along embankment after excavation of core trench; it shows geology and location of grout and exploratory grout holes, as projected onto profile.

Depth	PSI	GPM
5		0.3
10		0.6
20		0.8
20.0'		
10		
20		
30		
40.3'		
15		5
10		0

D-6 (INCL. 45°)
 Elev. 1371.7'
 SCHIST: Steel to dark gray, moderately soft to hard, very fine grained. Fissile and platy. Numerous chlorite and quartz veins. Occasional calcite vugs. Foliations dip 45° to vertical and are lined with iron oxide. No drill water loss recorded from 20.0 to 40.3'.
 69.55 Recovery Feb. 1973

Depth	PSI	GPM
10		
20		
20.0'		
10		
20		
30		
40.0'		
1.0		0.5

D-7
 Elev. 1365.9'
 SCHIST: Light brown to gray, fine grained and hard. Chlorite and quartz abundant. Foliations dip 35 to 65°. Joints dip 30 and 70°, and are normal to foliations. Occasional iron oxide and calcite coated fractures. Brecciated from 24.0 to 25.3' and 38.5 to 33.2'. Fair water return 0.0 to 20.0'. Poor to no water return 20.0 to 40.0'.
 88.0% Recovery Feb. 1973

Depth	PSI	GPM
10		
20		
20.0'		
10		
20		
30		
40.0'		
1.0		0.5

D-8
 Elev. 1362.3'
 SCHIST: Steel gray to dark gray, moderately soft to hard, very fine grained. Brecciated from 10.0 to 12.0'. Altered to talc from 21.8 to 22.0' and 22.7 to 26.3'. Much iron oxide coating fractures 31.5 to 32.3'. Chlorite and quartz 32.3 to 33.3'. Foliations dip 45 to 60°. No drill water loss recorded from 0.0 to 40.0'.
 83.0% Recovery Feb. 1973

Depth	PSI	GPM
10		
20		
20.0'		
10		
20		
30		
40.0'		
1.0		0.5

D-9 (INCL. 40°)
 Elev. 1391.2'
 SCHIST: Steel gray to dark gray, moderately soft to hard, very fine grained. Occasional quartz and talc veins. Fissile and platy. Foliations dip 35 to 65°, but mostly 40 to 45°.
 23.3% Recovery Feb. 1973

Depth	PSI	GPM
10		
20		
20.0'		
10		
20		
30		
40.0'		
1.0		0.5

VERT. 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: <i>R.M.H.</i>	GILA RIVER BASIN NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA		
DRAWN BY: <i>R.L.A.</i>	DREAMY DRAW DAM		
CHECKED BY: <i>F.T.</i>	GEOLGY AND FOUNDATION EXPLORATION FOUNDATION GROUTING		
SUBMITTED BY:	APPROVED:	SHEET	
APPROVAL	SPEC. NO. DACW 09-	OF	
RECOMMENDED:	DISTRICT FILE NO.	SHEETS	