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Name of Dam: Sunset Flood Retarding-Az. Dam No. (7-49)

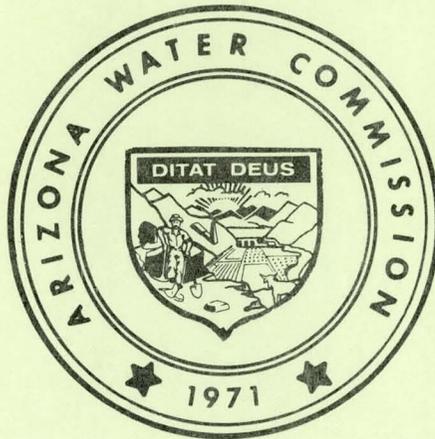
County and State: Maricopa, Arizona

Inventory Number:

# PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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STATE OF ARIZONA



OFFICE OF THE STATE WATER ENGINEER

Prepared by: Arizona Water Commission  
Supervision of Dam Safety  
Phoenix, Arizona

For: Los Angeles District Corps of Engineers

Date: January 1979

FIR-05-2-9-01179

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PHASE I REPORT

National Dam Safety Program

Name of Dam: Sunset Dam (7-49)

State Located: Arizona

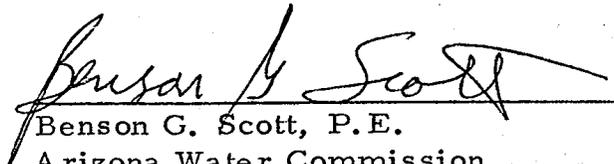
County Located: Maricopa

Stream: Sunset Wash

Date of Inspection: June 5, 1978

This small flood retarding dam is in excellent condition. It is conservatively designed, adequately maintained and under jurisdiction of the State's Division of Safety of Dams. There is no need for further investigation, but the Commission should obtain missing records not presently in their files. The aspect of downstream damage from spillway operation should be investigated.

Submitted by,



Benson G. Scott, P.E.  
Arizona Water Commission  
Chief, Supervision of Dam Safety  
Arizona Registration No. 8169

## Sunset Dam (7-49)

### Phase I Inspection

Introduction: The purpose of this report is to evaluate the safety of a non-federal dam in accordance with the National Dam Inspection Act, Public Law 92-367.

Since 1971, all nonfederal dams in Arizona 25 feet or more in height or storing more than 50 acre-feet of water have been under jurisdiction of the State Water Engineer for the protection of life and property from the consequences of a failure or malfunction of a dam. Experienced professional engineers of the Arizona Water Commission carry out the program for safety of dams by review and approval of designs for new dams or major repair to existing dams, supervision of construction for all new dams and for repair to existing dams, and surveillance of existing dams by periodic inspection and evaluation.

Sunset Dam was designed and constructed and has been operated under the regulatory control of the Commission as documented in this report. Attached as part of the report are photographs, drawings and data sheets.

1. Location. The Sunset Dam and Reservoir are located on Sunset Wash, a tributary to the Hassayampa River in the northeast corner of Section 11, Township 7N, Range 5W, G & SR B&M. This is in the eastern portion of the town of Wickenburg less than a mile from the center of the community.

2. Description. Sunset Dam is a small earthfill structure with a crest length of 488 ft., a crest width of 14 ft., upstream slope of 3:1, downstream slope of 2:1, a dam height of 30.5 ft. and a reservoir capacity of 55 acre-feet to the spillway crest. It is a homogeneous dam with an internal chimney drain and horizontal drainage blanket. A reinforced concrete conduit through the central portion of the dam at streambed level conveys reservoir discharges to a manhole structure at the downstream toe. An intake at the upstream end of the conduit permits discharge through a slide gate protected by a trash screen. The intake structure also functions as a drop inlet with an open top to permit discharge for flows in excess of normal reservoir operating storm. A reinforced concrete spillway structure has been constructed over the dam embankment.

3. Hazard Potential. With a capacity of 55 acre-feet and a height of 20 feet the dam and reservoir are classified as small. Lying immediately below the dam and along both sides of the wash as it meanders down through the community of Wickenburg are numerous residences including a church. This flood control dam provides total flood protection to the area downstream for events up to the 100-year flood by conveying such discharges to the Hassayampa River in a pipeline.

Even though the reservoir is of small capacity, sudden release of stored water in the event of a dam failure would cause severe property damage and significant loss of life. The hazard potential is high.

4. Project Documentation. An application to construct the Sunset Flood Control Dam was filed on June 25, 1975 by the Maricopa County Flood Control District, owner of the dam. The United States Soil Conservation Service, under the authority of Public Law 566, acted as engineer for the owner.

5. Geology. The geologic setting is described as being within the Sonoran Desert section of the Basin and Range Physiographic Province. Geologic materials at this site consists of Tertiary alluvial deposits of silty, gravelly sand which is dense and which is cemented to various degrees to form a caliche type material. Within this material are some zones with little or no cementation. The same material forms the abutments for the dam and underlies the thin mantle of Recent alluvium in the floodplain area. Topographic features have been considerably modified by excavations and filling within the area. The courses of the washes have been changed. Some have been filled and are no longer distinguishable at the surface. Foundation conditions in the dam and potential borrow sources were examined by both test pits and test holes.

6. Seismicity. There are no known active faults in the immediate vicinity of the damsites and there have been no recorded earthquakes in the immediate vicinity during the recorded seismic history of Arizona. However, 17 earthquakes have occurred in historic time within a radius of 100 miles of the sites. The largest of these was a 5.1 magnitude event that occurred in 1976 in Chino Valley about 55 miles northeast of the damsites; this resulted in an intensity of IV on the Modified Mercalli Scale (MM) at Wickenburg. The closest historic earthquakes occurred about 35 miles east at New River in 1974 with magnitudes of 2.5 and 3.0, and also about 35 miles northwest in 1967 with a magnitude of 3.8.

Based on present knowledge of the geology and seismic history of the area, the damsites could experience an expected maximum probable intensity of VI-VII MM. A seismic coefficient of 0.1g is considered conservative for stability analysis.

7. Foundation Conditions. Conditions on the right abutment and in the channel section indicated up to 12 feet of Recent alluvial deposits of low density. Caliche underlying the Recent alluvium are dense and strong. The left abutment consists of stratified, alluvial deposits of gravelly, fine-to-coarse grained sands with variable silt content and the debris from an old dump. The left abutment presented a potential seepage problem. Foundation conditions for the appurtenances presented no problem.

8. Foundation Treatment. Loose, unconsolidated alluvial material was removed from the entire dam foundation, except the left abutment, to expose firmly-

cemented caliche. A key trench 12 feet wide was excavated an additional 2 feet in depth. Up to 12 feet of alluvial material was removed. No suitable cutoff was available in the left abutment so the key trench, excavated to caliche, was extended in an upstream direction approximately 400 feet parallel to the left bank of the reservoir.

9. Embankment. The dam was designed as a modified homogeneous dam with a vertical drain zone just downstream of the centerline. Zone 1 forming the bulk of the dam was constructed of clayey sands and silty sands with some gravelly clayey sand. The 6-foot wide vertical drain extends from four feet above spillway level to the top of the outlet conduit. Gradation of the drain material, permitted no more than 5 percent of minus 200 material. A 12-foot wide berm of sandy, gravelly material was added to the upstream toe to increase stability. Embankment stability was analysed and found to be adequate under conventional loading conditions. Six-inch, perforated asbestos-cement pipes were placed at the bottom of the vertical drain running from each abutment to the outlet conduit where they connect to 6-inch nonperforated outfall pipe. Since no water is to be permanently stored in the reservoir, there is no riprap protection for wave-wash erosion. Compaction was to 95 percent of standard AASHO at optimum moisture.

10. Outlet Works. The 30-inch reinforced concrete outlet conduit is founded on firm inplace material through the upstream portion of the center of the dam and on compacted fill in the downstream one third of the dam. The pipe is bedded in a concrete cradle to the springing line for its entire length. Five antiseep collars spaced at 16 feet on centers are on the conduit upstream of the dam centerline. Flow into the pipe is controlled by a reinforced concrete intake tower with the screened intake at approximately stream level and an uncontrolled drop inlet at the top of the tower, approximately at spillway crest level. Discharge through the conduit enters a manhole at the downstream toe of the dam from whence flow is conveyed via the pipeline to an outfall in the Hassayampa River, approximately one and a half miles away. There is a provision for overflow from the manhole into the natural stream channel below the dam. These features were reviewed and found satisfactory for anticipated loading conditions. Hydraulically, the outlet works is designed to empty the flood control pool, accumulated during a 100-year storm in 10 days. Under normal operating conditions, the outlet conduit will not flow full as it is controlled by an 18-inch slide gate on the intake tower which limits the flow until a flood greater than the 100-year storm occurs.

11. Spillway. The spillway is a reinforced concrete structure constructed on top of the dam embankment. It consists of an entrance control structure, a straight chute and a stilling basin with baffle blocks. The design is a standard Soil Conservation Service type from their design handbook. The 40-foot wide spillway drops 26 feet in a horizontal distance of 89 feet. The design discharge is 3,400 cubic feet per second with no freeboard on the dam. The chute is designed for the same discharge but the stilling basin is designed for only 2,300 cubic feet per second. Placing a chute spillway on top of an

embankment dam increases the vulnerability of the structure to malfunction. The design satisfactorily provides for interception and conveyance of any seepage getting under the slab. Additional spillway data is provided on data sheets elsewhere in this report.

According to Corps of Engineers classification criteria, Sunset Dam is a small structure with a high downstream hazard. The recommended spillway design flood for this classification ranges from one half the Probable Maximum Flood (PMF) to the PMF.

A local six hour Probable Maximum Storm was developed for the watershed using procedures outlined in HMR-49, "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages," dated September 1977, prepared by the National Oceanic and Atmospheric Administration. This storm was routed through the structure using the Soil Conservation Service watershed modeling program "TR-20." The routing was performed with an initial water surface at spillway crest elevation. The spillway is capable of passing 100 percent of the PMF with 0.3 feet of residual freeboard.

12. Specifications. The specifications governing construction of the dam were developed from standard Soil Conservation Service specifications with the addition of the special sections to cover those features pertinent to this dam. Commission review concerned itself with foundation preparation, embankment placement, embankment moisture condition, embankment density, control of drain fill, installation of filter drain pipe, structural backfill, and control over concrete. With the exception of a few minor points the construction specifications were satisfactory to the Commission.

13. Construction History. The application for construction was approved by the State Engineer on September 5, 1975, but the contract for construction was not awarded until March 22, 1976. The first foundation inspection by Water Commission engineers was on May 3, 1976 which was the beginning of the foundation preparation. The only major change from the approved plans was the addition of a buttress fill along the left bank of the reservoir extending from the dam to 600 feet. Treatment in this area consisted of a cutoff trench along the abutment toe in an upstream direction that was filled with the most plastic embankment material. The same material was used to blanket the abutment in order to prevent seepage around the dam. Quality control and construction supervision for the project were done by Engineers Testing Laboratories under a contract with the Soil Conservation Service. Construction of the dam was by M. M. Sundt Construction Company. Quality control was in accordance with the specifications, but records of test are not available in Commission files. There were no unusual problems associated with construction and all work was completed and accepted on September 15, 1976.

14. Data on File. The following data is on file with the Commission:

1. As-built plans
2. Construction specifications

3. Preliminary design report
4. Geologic investigation report
5. Inspection reports with photographs by Commission engineers covering construction of the project. Inspection reports with photographs by Commission engineers since completion of the project.

Items 1 thru 4 are also in the permanent records of the Soil Conservation Service.

15. Instrumentation. There is no instrumentation on this project.

16. Surveillance.

A. Inspections: The dam is inspected annually by Commission engineers. The dam was inspected in October 1976, April 1977, and June 1978. At the time of the most recent inspection engineers from the Commission inspected the dam with representatives of the Maricopa County Flood Control District, owner of the dam. There was evidence of impoundment from the recent floods in March 1978 to gage height 20 on the intake tower. There was flow through the outlet works but none through the spillway. Since completion of the project, it appears that two feet of siltation above the intake invert has occurred. There was no seepage flows through the dam or its foundation during or after the recent floods. There were shallow erosion channels observed on the upstream slope. There were no visible signs of cracks or settlement on the crest or the slopes. Condition of concrete in the structures was good. There are no surveillance monuments installed on this dam. According to the Flood Control District, the gate mechanism was recently serviced and is believed to be in operable condition.

During construction, the perforated riser on the intake tower, designed to permit drainage of the reservoir, was partially backfilled with "pervious" material. Specifications permitted up to 10 percent fines in this material and in all probability it was as impervious as the core of the dam. This fill had to be removed from the perforated riser after the first storage in 1976 to permit drainage.

The Maricopa County Flood Control District is able to adequately perform all operation and maintenance required for the various flood control facilities including this dam.

B. Future Activity: There is some likelihood that the under drainage system will operate if water is impounded for more than the 10-day period for which the project is designed. If the low-level 18-inch gate were to be closed or if the perforated riser were to become plugged, seepage could develop through the Zone 2 material of the dam.

It will probably be necessary after a number of years to remove silt buildup from around the low-level intake and also to repair erosion gullies as they

become more prominent. Should the spillway ever discharge, it will do substantial damage to downstream property located along the wash and in some cases in the wash. There is presently a residence directly in line with and at the same elevation as the discharge channel of the spillway.

17. Appraisal of the Project.

A. Conclusions: The proposed project is in satisfactory condition with no problems other than some routine maintenance to correct erosion of the embankment surface. There is no evidence of any problem that will affect the safety of the dam. The structure has been conservatively designed and constructed in accordance with practices acceptable within the profession. The dam is capable of operating under the most severe condition up to and including a flood from the probable maximum precipitation. Operation and maintenance is above normal. There is no need for any further investigation beyond this Phase I report.

B. Recommendations: Construction quality control records presently not in the Commission files should be acquired for completion of the record. The present operational surveillance plan should be continued. Because the dam is unattended and because discharge from the emergency spillway could cause damage downstream, it might be well for the Flood Control District to consider the installation of a warning system to alert local emergency services people in time of extreme floods.

STATE OF ARIZONA  
ARIZONA WATER COMMISSION  
Supervision of Dam Safety

DATE: 12/13/78

- - Informational Summary Sheet - -

Name of Dam Sunset Flood Retarding Dam No. 7-49

Type of Dam Earthfill Use Flood Control Located in Maricopa County

Located on Sunset Wash (stream), A Tributary to Hassayampa River

NE  $\frac{1}{4}$  Sec. 11 Twp. 7N Range 5W, G & SR B&M

The attached location map is a portion of the Wickenburg USGS

(7 $\frac{1}{2}$  or 15') Quadrangle.

The following additional maps may be helpful \_\_\_\_\_

Special access problems? Yes \_\_\_ No X If Yes see comments on attached map.

DAM:

Height 20' U/S Slope 3:1 D/S Slope 2:1

Crest Elev. 2141.5 Crest Width 14' Crest Length 488'

Volume 69,000 Cubic Yards

SPILLWAY:

Crest Elev. 2131 Type Uncontrolled Concrete Capacity 3400 CFS (No freeboard)  
Chute

Freeboard 10.5' Width 40' Side Slopes Vertical

Flashboards? No If yes, Height \_\_\_\_\_

Controlled? No If yes, Describe \_\_\_\_\_

Concrete entrance structure, chute and stilling basin--constructed over the dam embankment. Underdrain system protects structure from seepage.

OUTLET:

Type, Size, Capacity \_\_\_\_\_ Cut and cover, 30" R/C Cylinder Pipe - 8.7 CFS

Controls Perforated trash guard permits discharge thur 18" slide gate at base

of R/C intake tower. Drop inlet structure above E1 21.

Gate controlled by stem and wheel on dam crest.

(over)

RESERVOIR:

Cap. @ Spwy Crest 55 A.F. Normal Capacity Empty

Drainage Area 0.6 mi<sup>2</sup> Normal W.S. Elev. N/A

Surface Area \_\_\_\_\_ Acres (at N. W. S.)

DOWNSTREAM HAZARD:

Nearest D/S City Wickenburg Distance Less than 1 mi Elev. 2100 ft.

Population 3,200 Damage would be \_\_\_\_\_

limited to areas along wash, affecting about 1/10 the population.

CONSTRUCTION:

Application Approved 9/5/75 Construction Completed 9/15/76

License Issued 2/22/77 Project Cost \$740,000

Subsequent Alterations None

RESTRICTIONS: No permanent storage permitted.

COMMENTS:

Sunset Dam



Photo 1 (September 8, 1976) - Downstream face of dam and emergency spillway.



Photo 2 (September 8, 1976) - Upstream face of dam, spillway and intake for outlet structure.

STATE OF ARIZONA  
ARIZONA WATER COMMISSION  
Supervision of Dam Safety

DATE: 12/13/78

- - Informational Summary Sheet - -

Name of Dam Sunset Flood Retarding Dam No. 7-49

Located NE  $\frac{1}{4}$  Sec. 11 Twp. 7N Range 5W, G & SR B&M

OWNER

ENGINEER

Name Maricopa County Flood Control Dist. Name Herbert P. Donald, Chief Engineer

Address 3225 West Durango Street Address Maricopa County FCD  
Phoenix, AZ 85009 Same

Phone 262-1501 Phone \_\_\_\_\_  
Emergency 273-1411

OTHER

IN EMERGENCY CONTACT:

Name Jack Leavitt, Operations Chief, Maricopa County FCD

Address 3225 West Durango Street Nearest Communication to Dam \_\_\_\_\_  
Phoenix, AZ 85009

Phone 262-1501  
Emergency 273-1411

LAW ENFORCEMENT

Maricopa County Sheriff Local Police \_\_\_\_\_

Address 102 W. Madison Avenue Address \_\_\_\_\_  
Phoenix

Phone 258-6941 Phone \_\_\_\_\_

STATE OF ARIZONA  
ARIZONA WATER COMMISSION  
SUPERVISION OF DAM SAFETY

FLOOD ESTIMATE AND SPILLWAY ANALYSIS

Name of Dam Sunset Type of Dam Earthfill Dam No. 7-49  
County Maricopa Hydrologic Class Size = Small/Hazard = High  
Located on Sunset Wash Tributary to Hassayampa River  
SE 1/4 Sec. 11 Twp. 7 N Range 5 W G & SR B & M  
USGS Quadrangle Wickenburg, AZ (7 1/2), 15' (Circle One)

I. DRAINAGE BASIN

1. Drainage Area - Sq. Mi. 0.6  
2. Channel Reach Length, Ft. 18700  
3. Maximum Elevation 2420  
4. Minimum Elevation 2116  
5. Avrg. Watershed slope, % 1.6  
6. Cover Density, %   
7. Cover Type,   
8. Soil Group   
9. Runoff Curve Number 78  
10. Impaired? no

II. DAM AND RESERVOIR

1. Reservoir Area @S/W. Ac. 8.6  
2. Res. Cap. to S/W A.F. 53.6  
3. Surcharge Storage-A.F. 115.1  
4. S/W Crest Elev. 2131.  
5. Dam Crest Elev. 2141.5  
6. Total Freeboard Ft. 10.5  
7. Max. Storage Level   
8. Gated or Ungated Ungated  
9. Max. S/W Q, -cfs 4100

Sketch of Spillway Attached, as per SCS As-Constructed Drawings Date

Remarks, Special Conditions, Etc.

Calculated by W. C. Jenkins Date

Checked by  Date

## FLOOD HYDROLOGY

Name of Dam Sunset

No. 7-49

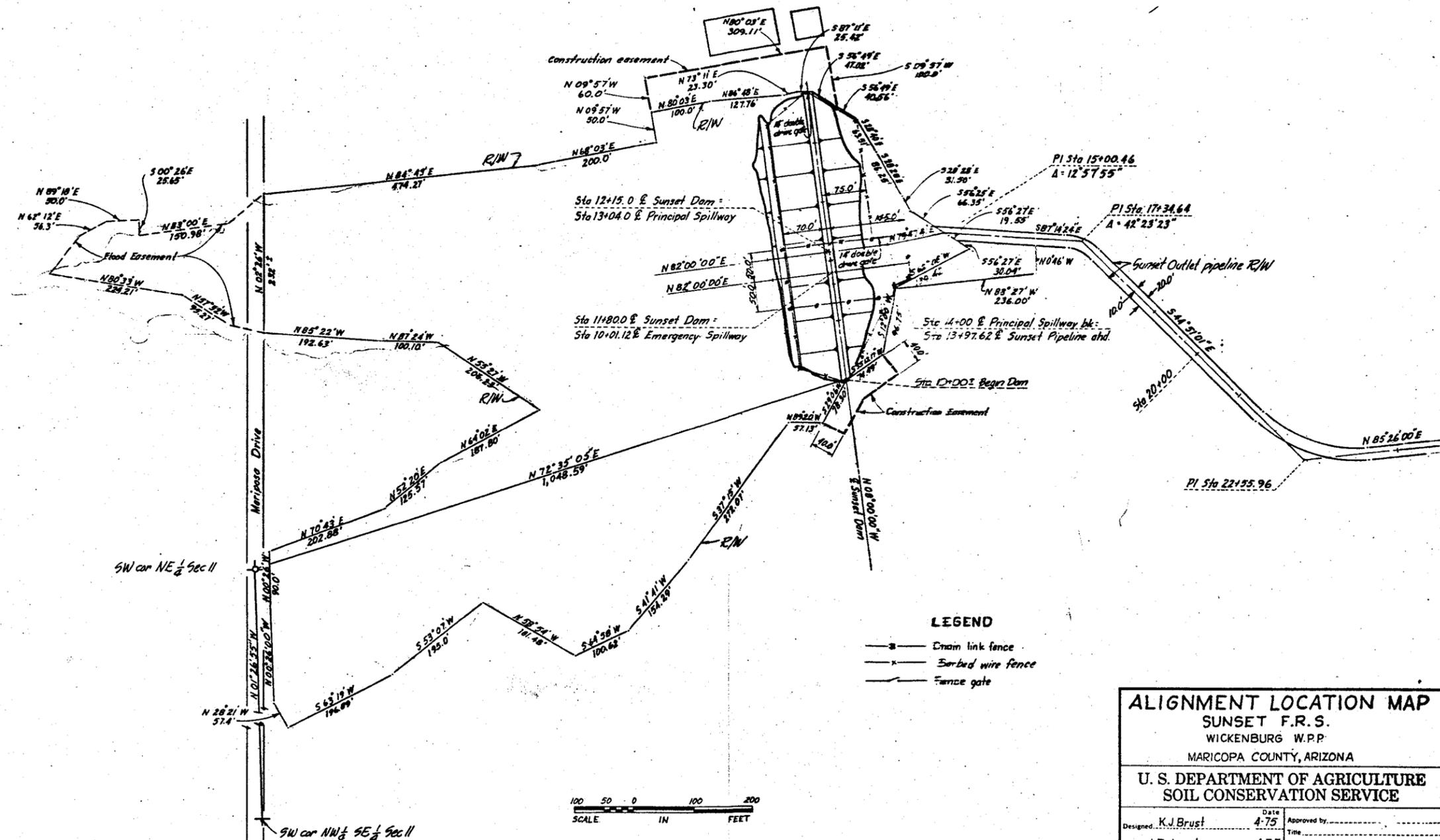
	Name of Dam Sunset			
	PMF*	PMF**		
1. Flood Type				
2. Storm Precip-In.	14.9	14.9		
3. Precip, Dur. - Hr.	6	6		
4. Peak Intensity - In/Hr.		11.5		
5. Time of Concentration - Hr.	0.33	0.33		
6. Peak Inflow - cfs	3393	7093		
7. Peak Inflow - csm	5655	11822		
8. Runoff - A.F.	384	394		
9. Runoff - In.	12.0	12.3		
10. Runoff Coeff.	78	78		
11. Routed?	yes	yes		
12. Peak Outflow - cfs	2381	3907		
13. Peak Outflow - csm	3968	6512		
14. Max. Water Surface Elev.	2138.3	2141.2		
15. Residual Freeboard	3.2	0.3		
16. Diverted Inflow, cfs				
17. Check Adopted Flood				

Remarks:

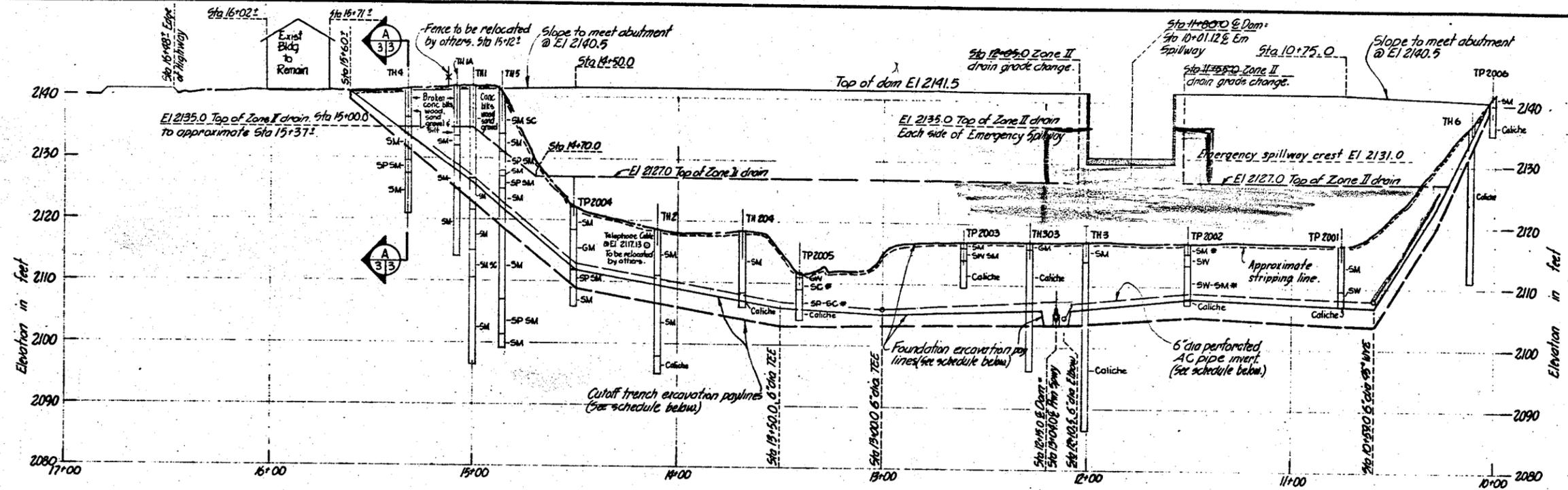
Initial reservoir water surface at spillway crest, outlet presumed plugged.

\* Precipitation time distribution per SCS 6-hour storm.

\*\* Precipitation time distribution per HMR-49 thunderstorm criteria.



SCALE 1 IN = 100 FEET



PROFILE ON E DAM  
(Looking downstream)

SCHEDULES

STATION	ELEVATION
10+00 ±	2140.5
10+30	2123.0
10+59	2107.0
11+50	2108.0
12+06.4	2106.0
12+09	2103.4
12+21	2103.4
12+23.6	2106.0
13+00	2105.0
13+50	2106.0
14+50	2112.0
15+00	2126.0
15+60 ±	2140.5

± Elevation at E of Dam.

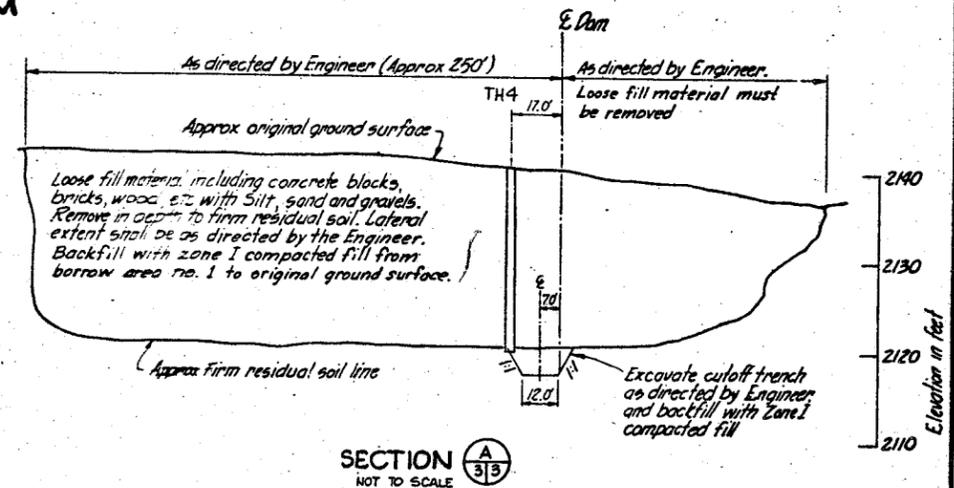
STATION	ELEVATION
10+00 ±	2139.0
10+30	2121.0
10+59	2104.0
11+50	2105.0
12+00	2103.4
13+50	2103.0
14+50	2109.0
15+00	2124.0
15+60 ±	2139.0

± Elevation at 7.0' upstream from E of Dam.

STATION	ELEVATION	REMARKS
10+30.0	2124.0	Plug beginning end with mortar, or AC cap
10+59.0	2108.0	CI 45° WYE, 6" dia non-perf AC outlet pipe.
11+50.0	2109.0	Plug beginning ends with mortar (2 ends) or AC caps
12+06.4	2107.0	Grade change, 45° CI Elbow
12+10.5	2106.3	CI 90° Elbow to 6" dia non-perf AC outlet pipe.
12+15.0	2107.1	Plug beginning end with mortar, or AC cap
13+00.0	2106.0	CI TEE to 6" dia non-perf AC outlet pipe.
13+50.0	2107.0	Grade change.
14+50.0	2113.0	Grade change.
15+00.0	2127.0	Grade change.
15+20.0	10' Above foundation excavation line approved by Engineer.	Plug beginning end with mortar, or AC cap

± Elevation at 10.0' downstream from E of Dam.

± All elevations and stations are approximate and may be adjusted by the Engineer during construction.

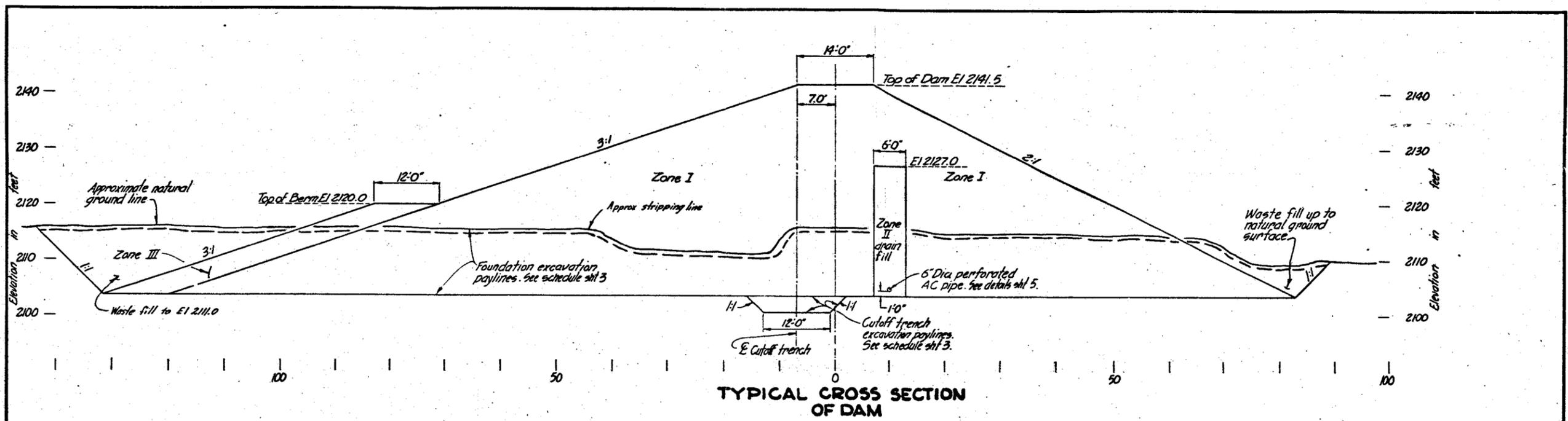


SECTION A-3/B  
NOT TO SCALE

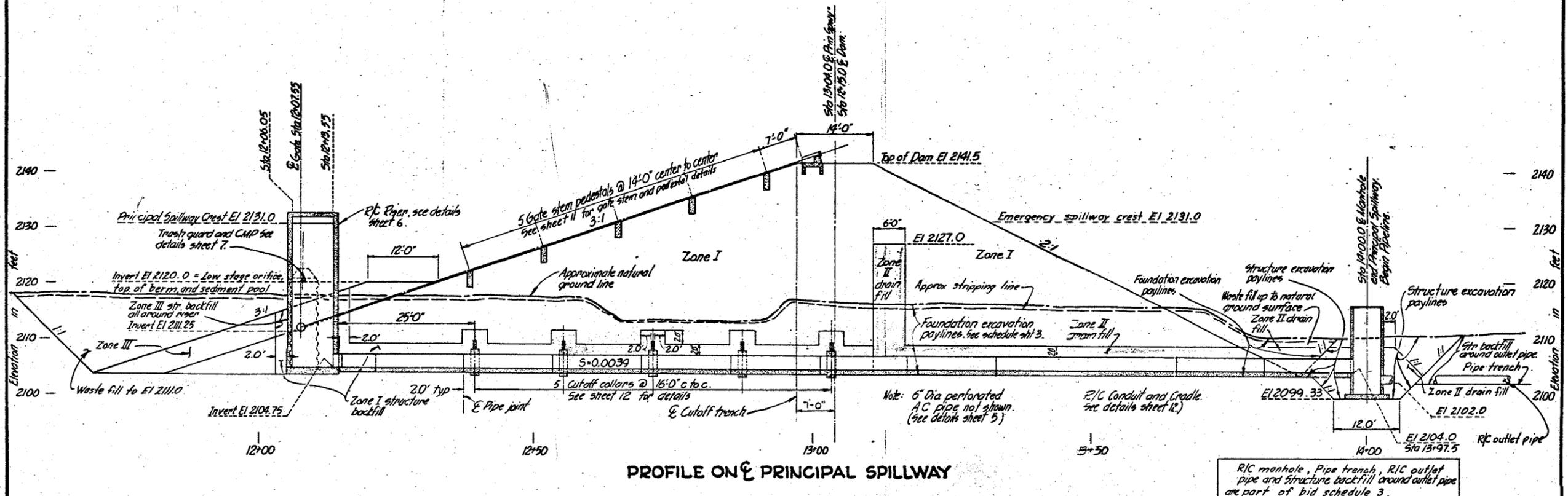
Notes:

- Unified soil descriptions are based on field identifications except where an asterisk is shown the classification has been based on laboratory analysis.
- Complete field logs, laboratory test data and geologic report are available for review in the project office at Wickenburg, Arizona.
- For locations of test pits and test holes see sheet 2.

<b>PROFILE ON E DAM AND EXCAVATION SCHEDULES</b> SUNSET F.R.S. WICKENBURG W.P.P. MARICOPA COUNTY, ARIZONA	
<b>U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE</b>	
Designed: Greg Cunningham Drawn: Jack Land Traced: _____ Checked: _____	Date: 9-75 Title: _____ Drawing No.: 7-E-23089

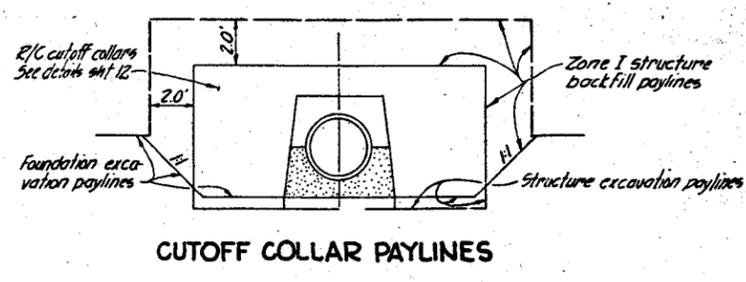
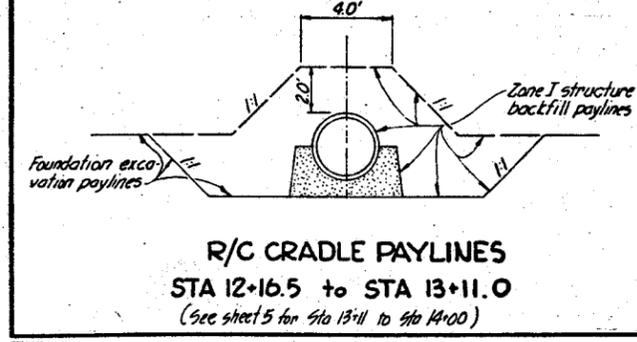


TYPICAL CROSS SECTION OF DAM



PROFILE ON E PRINCIPAL SPILLWAY

R/C manhole, pipe trench, R/C outlet pipe and structure backfill around outlet pipe are part of bid schedule 3.



PROFILE ON E PRINCIPAL SPILLWAY AND TYPICAL CROSS SECTION OF DAM			
SUNSET F.R.S WICKENBURG W.P.P. MARICOPA COUNTY, ARIZONA			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
Designed Greg. Cunningham	Date 3-75	Drawn Jack Land	Date 3-75
Traced	Checked	Sheet No. 4	Drawing No. 7-E-23089
		of 25	

