L A D M NO. 1130-2-5

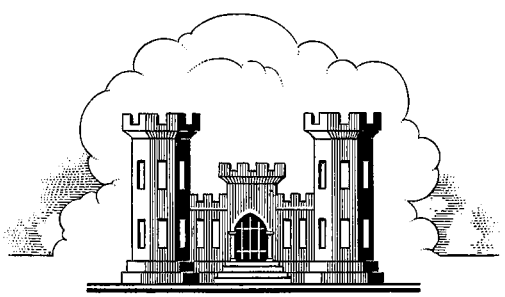
OPERATION AND MAINTENANCE MANUAL

FOR

MOJAVE RIVER DAM
MOJAVE RIVER BASIN

IN

SAN BERNARDINO COUNTY, CALIFORNIA



DEPARTMENT OF THE ARMY LOS ANGELES DISTRICT
CORPS OF ENGINEERS
OCTOBER 1972

000009

LADM NO. 1130-2-5

DEPARTMENT OF THE ARMY, LOS ANGELES
DISTRICT, CORPS OF ENGINEERS
OCTOBER 1972

FOREWORD

1. This manual prescribes standard procedures for the operation and maintenance of the federally constructed Mojave River Dam, Mojave River Basin, San Bernardino County, California.

2. The Operations Branch of the Construction-Operations Division is responsible for the preparation of this manual and for keeping the manual up-to-date. Suggestions for revisions should be forwarded through channels to that branch.

3. All exhibits not attached to this manual may be found in the Operations Branch, Construction-Operations Division.

H. McK. ROPER, JR.
COLONEL, CE
District Engineer

MOJAVE RIVER DAM. **Aerial view; relocated** Arrowhead Lake road in left foreground, saddle dike in center, dam and spillway above.

TABLE OF CONTENTS

EXHIBITS

NO.	TITLE	
A.	Project Location.....	2 Sheets
B.	Drawings Half-Size (Unattached).....	
C.	Inspection Check List.....	1 Sheet
D.	Dam and Appurtenances - Embankment Instrumentation.....	1 Sheet
E.	Saddle Dike Instrumentation.....	1 Sheet
F.	Mojave River Recreational Facilities- General Plan.....	1 Sheet

OPERATION AND MAINTENANCE MANUAL

FOR

MOJAVE RIVER DAM

MOJAVE RIVER BASIN

SAN BERNARDINO COUNTY, CALIFORNIA

PART I - GENERAL

Introduction

1. Authority.-- This manual was prepared pursuant to ER 1130-2-304 which directs the preparation and prescribes the coverage of operation and maintenance manuals for completed civil works projects operated by the Corps of Engineers.

2. Purpose.-- The purpose of this manual is to provide guidance and instructions to the District personnel in the proper operation and maintenance of Mojave River Dam. These instructions will insure continuous maintenance of structures and equipment and their operation in such a manner and at such times as will obtain optimum benefits.

3. Parts of Manual.-- This manual has been prepared in two parts. Part I - gives a general description of the completed project. Part II- covers Operations and Maintenance instructions for the major and critical project equipment and facilities installed at Mojave River Dam.

4. Scope of Manual.-- The scope of this manual is limited to essential operation and maintenance instructions and describes the operating parts, their purpose and technique of operation in sufficient detail to insure proper operation.

Project Description

5. Authorization.-- The flood control project was authorized by Act of Congress, Public Law 645, 86th Congress, 2nd Session, approved 14 July 1960, authorizing the construction of certain public works on rivers and harbors for flood control and other purposes. The project for the Mojave River Dam on the Mojave River, California was authorized in House Document No. 164, 86th Congress.

6. Project location.-- The project which is in San Bernardino County, California, is about 14 miles south of the City of Victorville and 8 miles southeast of the Town of Hesperia. (See Exhibit A.) The Mojave River damsite is located on the Mojave River just below the confluence of West Forks and Deep Creek and on the southern edge of the Mojave Desert at the foot of the San Bernardino Mountains. State Highway No. 173 connects the project with Interstate Highway 15, which is the main east-west highway servicing the area.

7. Description of project.-- The principle construction features of Mojave River Dam are:

a. Reservoir.-- The construction of Mojave River Dam forms a reservoir to provide storage for flood control only. At spillway crest, elevation 3,134, the reservoir has a gross capacity of 89,700 acre-feet, including an allowance of 11,000 acre-feet for sediment storage. The reservoir regulates the standard project (reservoir design) flood from a peak inflow of 94,000 cubic feet per second to a peak outflow of 23,500 cubic feet per second. (See drawing 341/145 of Exhibit B.)

b. Embankment.-- The embankment is a zoned rolled earthfill structure with an upstream slope of 1 vertical and 2.5 horizontal, faced with 18 inches of Type I stone. The downstream slope is 1 vertical and 2.2 horizontal, faced with 12 inches of Type I stone, with a protective toe of 5'6" thick and 10 feet high of Type I stone. (See drawing 341/146 of Exhibit B.)

c. Spillway.-- A detached, broadcrested spillway with a crest elevation of 3,134 feet, and a crest length of 200 feet is located on the right abutment of the dam. The spillway channel is a reinforced concrete rectangular section founded in rock. (See drawing 341/159 of Exhibit B.)

d. Outlet works.-- The outlet works is located in the left abutment of the dam, and it consists of an approach channel with log rack, and ungatted-lined tunnel, and an outlet channel. (See drawing 341/168 of Exhibit B.)

(1) Approach Channel.-- The approach channel is 34 feet wide and 200 feet long. It consists of 101 feet of unlined trapezoidal channel, 99 feet of reinforced concrete trapezoidal channel, and a steel log rack with 9 by 11.83-foot openings. (See drawing 341/173 of Exhibit B.)

(2) Tunnel.-- The tunnel is a concrete-lined D-Section bore with an inside width of 19 feet, height of 17.75 feet, and a length of 1,002 feet (including inlet transition). The invert elevation of the tunnel is 2,988 feet at the inlet portal and 2,966.72 feet at the outlet portal. (See drawings 341/174 and 341/175 of Exhibit B.)

e. Saddle dike.-- The saddle dike is a zoned rolled earthfill structure with an upstream slope of 1 vertical and 2.5 horizontal faced with 2 feet of Type II stone over 1-foot layer of Type I stone. The downstream slope is 1 vertical and 2.2 horizontal faced with 1-foot of Type I stone. The toe of the upstream and downstream slopes are protected by extending the facing stone 10 feet horizontally where the slope intercepts the existing ground surface. (See drawing 341/153 of Exhibit B.)

8. Access roads.-- Access to the project is provided by Arrowhead Lake Road and State Highway No. 173. Access for maintenance and inspection of the dam, saddle dike and spillway is provided by a paved road (see drawing 341/145 of Exhibit B). This road extends from Arrowhead Lake Road over the saddle dike and dam to the spillway, then down along the downstream slope of the right abutment paralleling the spillway to an existing unimproved road. Access to the inlet portal of the tunnel is from a branch road running down the upstream slope of the dam and paralleling the left abutment to the inlet portal. A branch road to the outlet portal of the tunnel leaves the dam access road at approximate station 22+50 crossing along and down the slop of the dam to the outlet portal and then continuing on to State Highway No. 173. Turnouts are provided along the top of dam and saddle dike. Also, turnarounds and parking areas are provided at both ends of the dam and saddle dike. Access for the U. S. Forestry Service fire-fighting equipment and the forestry flume trail, east of the spillway is provided by the paved road crossing the saddle dike and dam.

MOJAVE RIVER DAM

PERTINENT DATA

Drainage area:	sq. mile	215
Dam (rolled earthfill)		
Crest elevation	ft. m. s. l.	3,172
Streambed elevation	ft. m. s. l.	2,972
Max. height above streambed	ft.	200
Crest length	ft.	2,200
Freeboard	ft.	6.6
Spillway (detached, broadcrested):		
Crest elevation	ft. m. s. l.	3,134
Crest length	ft.	200
Elevation of max. water surface	ft.	3,165.4
Outlet works:		
Tunnel		
Length	ft.	650
Intake invert elevation	ft. m. s. l.	2,988
Outlet invert elevation	ft. m. s. l.	2,966.72
Saddle dike:		
Length	ft.	1,250
Crest elevation	ft. m. s. l.	3,172
Max. height above existing ground	ft.	106
Reservoir:		
Area at--		
Spillway crest	ac.	1,980
Max. water surface	ac.	3,135
Dam crest	ac.	3,390
Capacity (gross) at--		
Spillway crest	ac.-ft.	89,700
Max. water surface	ac.-ft.	169,400
Dam crest	ac.-ft.	191,000
Storage allocation below spillway crest:		
Flood control	ac.-ft.	78,700
Sedimentation	ac.-ft.	11,000
Standard project flood:		
Total volume 3 days	ac.-ft.	154,000
Peak inflow	c. f. s.	94,000
Peak outflow	c. f. s.	23,500
Drawdown time (to empty)	days	2.33
Maximum probable flood:		
Total volume 5 days	ac.-ft.	383,000
Peak inflow	c.f.s.	186,000
Peak outflow	c.f.s.	131,300
Drawdown time (to spillway crest)	day	1

9. Project Contracts.-- Construction of Mojave River Dam was accomplished by the following contracts:

a. Foundation Exploration (Spillway, Dam Foundation, Abutment)

Contractor:	Fred Cannon
Contract No:	64-146
Specification:	64-29
Work Started:	15 June 1964
Work Completed:	17 August 1964

b. Borrow Area Exploration

Contractor:	Paul Hubbs Construction Co.
Contract No:	65-157
Specification:	65-31
Work Started:	24 May 1965
Work Completed:	23 August 1965

c. Foundation Exploration (Abutments & Foundation of Dam, Tunnel, and Spillway)

Contractor:	Fred Cannon
Contract No:	65-147
Specification:	65-28
Work Started:	15 April 1965
Work Completed:	24 August 1965

d. Foundation Exploration (Spillway, Tunnel)

Contractor:	Fred Cannon
Contract No:	67-C-0018
Specification:	67-B-0010
Work Started:	14 November 1966
Work Completed:	3 March 1967

e. Foundation Exploration (By tunnel and approach exc.)

Contractor:	Carl L. Craft
Contract No:	67-C-0020
Specification:	67-B-0015
Work Started:	28 November 1966
Work Completed:	23 February 1967

f. Arrowhead Lake Road Relocation

Contractor:	So-Cal Construction Inc. & C. K. Evans, Inc.
Contract No:	67-C-0073
Specification:	67-B-0032
Work Started:	10 July 1967
Work Completed:	12 February 1971

g. Dam and Appurtenances

Contractor:	Kasler, Ball & Yeager
Contract No:	68-C-0028
Specification:	68-B-0012
Work Started:	25 March 1968
Work Completed:	18 November 1971

10. Construction History.-- The construction of Mojave River Dam began in July 1967 with the relocation of Arrowhead Road. In March 1968, the general overall construction of Mojave River Dam began with the excavation of the outlet works channel and overlook area, clearing and grubbing of reservoir, the placement of rock bolting and wire netting around tunnel inlet. The second phase of construction started in mid-summer and involved the excavation and lining of tunnel, relocation of sewer line and the diversion of West Fork and Deep Creek Channel away from tunnel inlet. During this phase of construction major slides occurred at the inlet and outlet faces of the tunnel; which required the tunnel to be lengthened and backfilled. The third phase of construction involved excavation of cut-off trench to streambed, spillway excavation, and abutment excavation. The fourth phase of construction began by diverting water from cut-off diversion through tunnel, construction of cofferdam, excavation of cut-off trench, abutment and spillway and the grouting above and below streambed. The embankment was topped out in December 1970 and the concrete placement of the spillway was completed April 1971. Mojave River Dam was transferred for Operation and Maintenance in May 1971.

PART II - OPERATION AND MAINTENANCE

General

1. Information.-- Special terms used in this manual are:

a. "Flood Season" - refers to periods October through April (general winter storms) and July and August (local and general summer storms).

b. "Emergency Flood Conditions" - refers to periods during which the reservoir water surface reaches elevation 3,134 -spillway crest.

c. All elevations refer to "mean sea level" datum.

2. Reference drawings and manuals.-- Drawing file numbers in this manual refer to "as-constructed" drawings; half-size reductions are included as Exhibit B and are separately bound.

3. Functions of the Construction-Operations Division.-- Operation and maintenance and all inspections are under the supervision of the Construction-Operations Division, which assigns this responsibility to the Operations Branch. The general duties include the following:

a. The Operations Branch shall train key personnel in order that regular inspection, operation, and maintenance work will be performed efficiently and to insure that unexpected problems related to flood-control may be handled in an expeditious and orderly manner. The men shall become familiar with the provisions of this manual, the supplements A, B, and C of LAD OM 500-1-1, and the "as-constructed" drawings.

b. The Operations Branch shall report violations of outgrant terms to Real Estate Division for official action when they cannot be handled informally.

c. The Operations Branch prepares and executes all flood-fighting plans, and maintains records of reservoir stages, inflow to the reservoir, outflows through the outlet structure, and spillway flow.

d. The Reservoir Regulation Section, Operations Branch is responsible for the inspection, servicing, and maintenance of all hydrographic installations and radio installations.

e. Periodic inspections shall be made by the Engineering Evaluation and Maintenance Section, Operations Branch, in order to determine maintenance measures necessary to insure serviceability of the flood project in time of flood. Such inspections shall be made immediately following each major highwater period, at intervals not to exceed six months, and at such other times as may be necessary. Immediate steps shall be taken to correct dangerous conditions disclosed by such inspections, and regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Chief, Operations Branch. All repairs shall be made in accordance with standard engineering practice to line, grade, and quality and in accordance with relevant details shown on "as-constructed" drawings, Exhibit B.

f. The Engineering Evaluation and Maintenance Section, Operations Branch, reviews plans and furnishes comments to Real Estate Division on requests from public or private interests for collateral use of land and water areas and performs inspections during construction to assure compliance with approved plans.

g. The Engineering Evaluation and Maintenance Section, Operations Branch, shall establish a file of all reports and records concerning the maintenance and operation of the project works.

4. Functions of the Engineering Division.--

a. Conducts or participates in periodical condition surveys of the project with representatives from Construction-Operations Division, South Pacific Division, and Office of the Chief of Engineers. These surveys serve a two-fold purpose: (1) ascertain the condition of the various parts of the project; and (2) see that all repairs and improvements have been carried out that were previously recommended.

b. Performs engineering review of plans of proposed development on project land or water areas, as requested by the Construction-Operations Division.

c. Furnishes engineering comments on request of public or private interests for collateral use of land and water areas as requested by Construction-Operations Division.

d. Reports to Construction-Operations Division all trespass or violation of outgrants discovered by Engineering Division personnel.

5. Functions of the Real Estate Division.--

a. Processes all permits, licenses, easements, or leases through appropriate channels and administers completed instruments.

b. Insures compliance through periodic inspections and acts upon all violations of outgrants.

c. Furnishes the Construction-Operations Division copies of all permits, licenses, easements, or leases.

6. Functions of the Department of Interior Geological Survey.-- By agreement with the Corps of Engineers, the IGS services the outflow gaging stations below the dam on the Mojave River and the inflow gaging stations above the dam on Deep Creek. The IGS makes discharge measurements and compiles and publishes the pertinent records in the U. S. Geological Water Supply papers.

7. Functions of the Safety Office.-- All functions involving safety are under the supervision of the Chief, Safety Office. The Safety Office shall perform periodic inspections to insure compliance with appropriate safety codes and standards of all activities in the project area.

Embankment and Reservoir Area

8. Inspection and maintenance.-- The Chief, Engineering Evaluation and Maintenance Section shall perform periodic inspections and maintenance and shall complete inspection check list as shown in Exhibit C. Maintenance work is described in the following paragraphs:

a. Embankment.-- Maintenance methods for repair or reconstruction of the embankments shall depend upon the nature and extent of the damaged section. If the embankment damage is small, sand and gravel or other coarse granular material may be placed in 6-inch layers to restore the embankment. If the damage is large, the fill shall be made in the same manner as the original construction; homogenous material from borrow pits approved for the project shall be placed in uniform horizontal layers not more than 6 inches in depth and compacted to a density equal to the original embankment section. (See Exhibit B.)

b. Riprap.-- Riprap on the upstream and downstream side and the toes and rock-paved gutters shall be repaired promptly. An indication of settlement, uplift, or failure of the riprap structures shall be reported to Chief, Operations Branch, for recommendation on remedial action.

c. Burrowing animals.-- Burrowing animals in or near the dam shall be exterminated. Their runways and dens shall be opened, backfilled and the backfill thoroughly compacted. Trapping and poisoning may be used for extermination of burrowing animals. Information about the best methods of animal extermination may be obtained from the County agricultural agent.

d. Access and service roads.-- Access and service roads shall be adequately maintained for vehicular travel so that maintenance of the project and flood-fighting operations will be facilitated.

e. Fences.-- Maintenance of the safety guard fences shall include:

(1) Line posts to be firmly set and gates hung in good alignment.

(2) Barbed wire tight and broken strands repaired.

(3) Corner posts, gate posts, and braces firmly set.

(4) Chains and locks attached to all gates.

f. Hazardous obstructions.-- Dam area used by authorized personnel shall be kept free from obstructions that may cause injury or impede

inspection, maintenance, or flood-fighting operations. Material and equipment shall be stored in such a way that they are not hazardous to personnel.

Outlet Works and Spillway

9. Inspection and maintenance.-- The Chief, Engineering Evaluation and Maintenance Section or his assistant shall inspect periodically the full length of the outlet tunnel and shall complete an inspection check list shown as Exhibit C. Any cracks in the tunnel lining shall be reported in relation to the nearest station marker. Damaged concrete or riprap structures shall be reported and repaired. Broken concrete surfaces and exposed reinforcement steel shall be thoroughly cleaned by chipping or sand sandblasting and shall be restored to the original dimensions. Any indication of settlement, uplift, failure of concrete structure, or sloughing of the rock-cut slopes at the portal of the tunnel shall be immediately reported to the Chief, Operations Branch. Channels shall be kept reasonably free of driftwood, trash, silt, and other debris. Driftwood, brush, weeds, and other combustible trash on the project, especially around the entrance to the intake structure, shall be removed from the intake structure. Non-combustible accumulation shall be hauled away and dumped in approved disposal areas.

Communications Facilities

10. Radio facilities.-- A remote control transmitting radio unit is provided in the recorder house. The radio unit is a link between the recorder house and the Reservoir Regulation Section to interrogate the telemarks. The radio unit is battery powered and is recharged by electrical service provided by Southern California Edison.

11. Maintenance of radio facilities.-- The maintenance of radio facilities, including periodic inspection, testing and servicing is the responsibility of the Reservoir Regulation Section, Operations Branch.

Hydrographic Installations

12. General.-- Hydrographic installations include a reservoir water surface recorder, gaging stations, telemark installation, reservoir staff gages, precipitation stations, sedimentation ranges, and public utilities. Information on the hydrographic facilities is given in the following paragraphs:

a. Reservoir water-surface recorder.-- A concrete block recorder house is located on the left abutment which is provided to house a bubble gage installation to be used to obtain the water level. The installation consists of a 120-inch mercury servomonometer, water-surface recorder, telemark, gas purge system with storage tank, and

three one-fourth-inch lines, one terminating at the invert, one about 60 feet above the invert and the third about 120 feet above the invert. An automatic switching device is also provided.

b. Gaging stations.-- Two outflow gaging stations are provided below the dam, each consisting of an instrument shelter which house a 32" mercury servomonometer, water-level recorder, and a gas purge system with storage tank and one-fourth-inch line to the sump at the invert. One low flow gaging station is located at the outlet of the tunnel, the other about one mile downstream of the dam toe.

c. Telemark installation.-- A telemark, from which reservoir water-surface elevations can be obtained is provided at the dam and is interrogated by radio from the Reservoir Regulation Section.

d. Reservoir staff gages.-- The reservoir staff gage system, consists of 38 five-foot sections which are installed along the slope of the dam adjacent to the east abutment.

e. Precipitation station.-- A long term recording precipitation gage is installed at the recorder house located on the left abutment of the dam. An existing weekly recording gage in the West Fork drainage area is located at Summit.

f. Monumented sedimentation ranges.-- A series of six sedimentation ranges are established in the reservoir area.

Foundation and Materials Instrumentation

13. Instrumentation provided at Mojave River Dam.-- The instrumentation at Mojave River Dam consists of two slope indicators located along the crest of the dam 10 feet downstream from the axis; 20 settlement monuments located at the top of the dam along the crest of the upstream and downstream slopes; four recording strong-motion accelerographs, two are located at the toe and crest of the main embankment opposite station 21+50, one on the crest of the saddle dike opposite station 3+47 and another located approximately 150 feet east of the right abutment of the saddle dike. (See Exhibits D and E.) A brief description and the function of each instrument is presented in the following sub-paragraphs:

a. The slope indicators are precision instruments used primarily for measuring horizontal movement of the embankment. A specially grooved aluminum casing is installed in a bore hole which extends below the anticipated zones of movement. The casing is sufficiently flexible to displace laterally as the embankment moves. The measurements are accomplished by lowering a special instrument, consisting of a pendulum-actuated conventional Wheatstone Bridge circuit, down the grooved casing and taking inclination readings at frequent intervals.

The slope indicator casings are installed with slip couplings at five-foot intervals from elevation 1170 to the top of the dam. The couplings provide a six-inch gap to allow the casings to adjust to vertical movements of the embankment. Measurement of settlement of the embankment are obtained by observing the changes in the gap between casings.

b. The settlement monuments provide data to determine the total vertical movement of the embankment and the horizontal movement at the crest of the dam. The measuring points are protected by four-inch steel pipes and caps. Permanent reference points for both vertical and horizontal control are placed near each abutment.

c. The four recording strong-motion accelerographs start operating automatically at the onset of seismic activity. Each instrument is equipped with a digital counter that records each time the instrument is triggered. When triggered, the accelerographs start a five-second-minimum recording cycle that causes a filing strip to be exposed as it advances into a take-up magazine.

14. Observation schedule.-- Slope indicator measurements will be taken at monthly intervals for the first year. Thereafter, measurements will be taken twice each year. The settlement monuments will be surveyed after completion of the dam and then once each year for five years. Thereafter, the settlement monuments will be surveyed every five years. The accelerographs will be checked monthly by Corps of Engineers personnel and quarterly by the Department of Commerce, Seismological Field Survey (CSFS) personnel. Additional readings of all instruments will be taken following periods of strong seismic activity, after rapid changes in water-surface elevations, after periods of water impoundment to a height greater than the half-height of the dam or at any time where detrimental movements may be suspected.

15. Responsibility for instrumentation measurements.-- The Reservoir Regulation Section, Operations Branch is responsible for reading the slope indicators and slope instrumentation. All measurements taken by the Operations Branch personnel will be transmitted to the Foundation and Materials Branch. The Survey Branch will perform all vertical and horizontal movement surveys upon request by the Operations Branch.

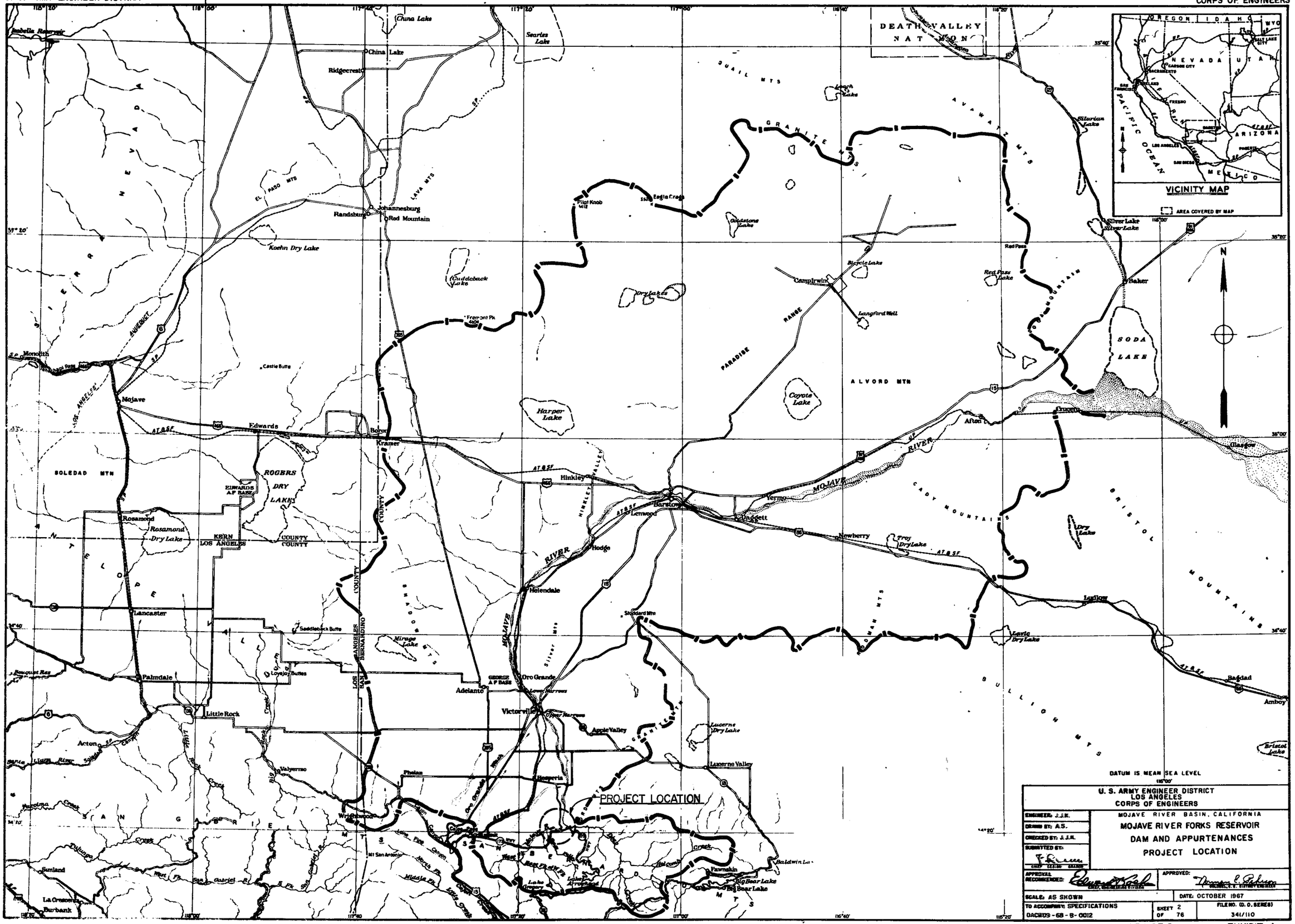
16. Instrumentation data analysis and reports.-- All instrumentation data processing and analysis of results, excepting seismic and survey data, will be performed by the Foundation and Materials Branch. Seismic data analysis will be performed by CSFS and survey data reduction will be done by the Survey Branch. The data will be put in report form and transmitted to Design Branch, Engineering Division.

Coordination with Other Agencies

17. Archeology.-- The National Park Service has two archeological sites at the Mojave River Dam. One on Deep Creek designated as 4-SBr-272 and one below the dam designated as 4-SBr-176. Any excavation within these general areas shall be coordinated with the National Park Service. (See Exhibit F.)

U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



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

ENGINEER: J.J.K.
DRAWN BY: A.S.
CHECKED BY: J.J.K.
SUBMITTED BY:
CHIEF DESIGN BRANCH

MOJAVE RIVER BASIN, CALIFORNIA

MOJAVE RIVER FORKS RESERVOIR

DAM AND APPURTENANCES

PROJECT LOCATION

APPROVAL RECOMMENDED:
CHIEF, ENGINEERING DIVISION

APPROVED: Norman E. Pehrson
COLONEL, C.E. DISTRICT ENGINEER

SCALE: AS SHOWN

DATE: OCTOBER 1967

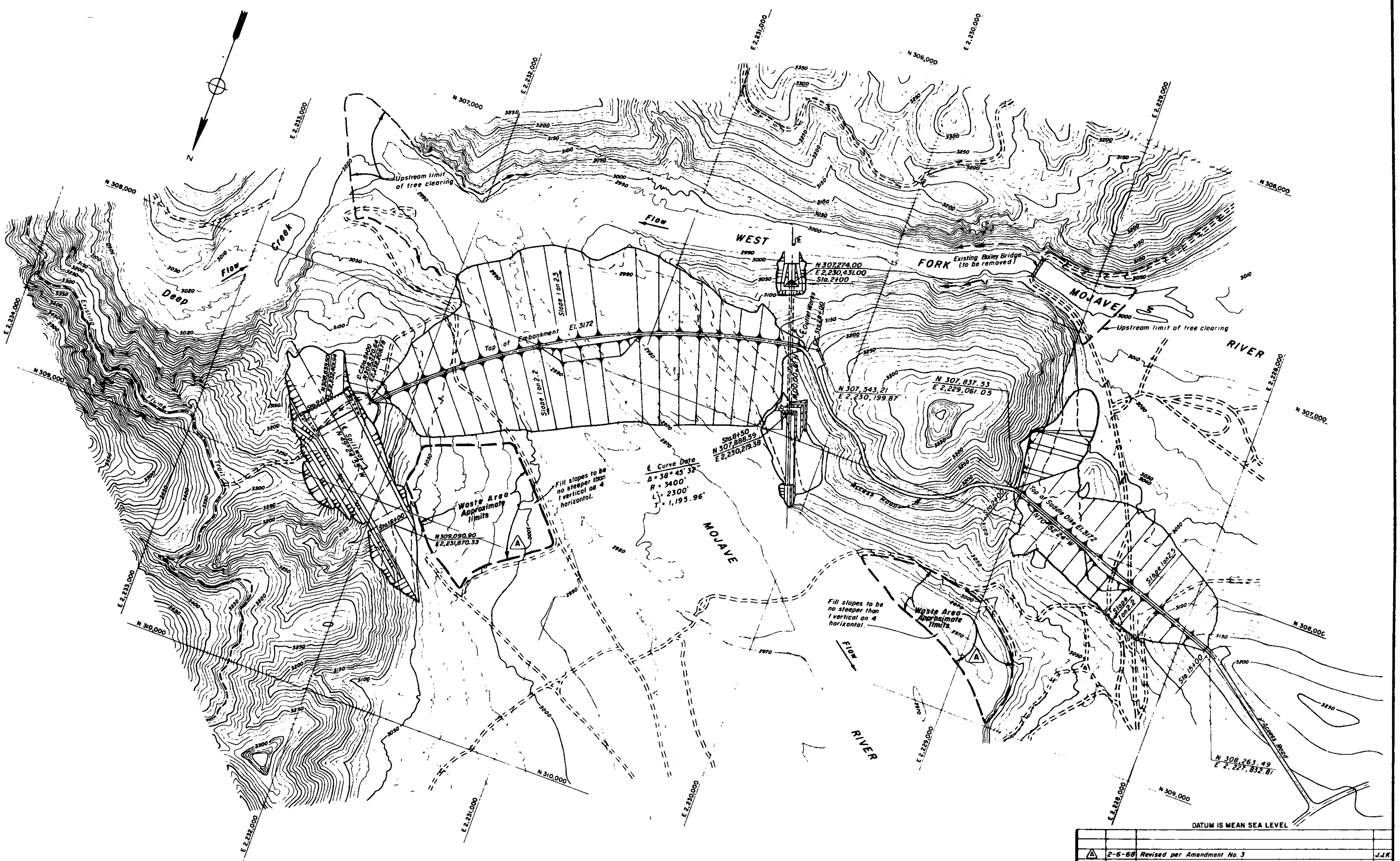
TO ACCOMPANY: SPECIFICATIONS
DACW09-68-B-0012

SHEET 2
OF 76

FILE NO. (D. O. SERIES)
341/110

SHEET 1 OF 2

EXHIBIT A



A	2-6-68	Revised per Amendment No. 3	J.J.K.
REVISION	DATE	DESCRIPTION	BY

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

DESIGNED BY: J.J.K.
DRAWN BY: S.W.W.
CHECKED BY: J.J.K. J.A.
SUBMITTED BY:
CHIEF DESIGN BRANCH

MOJAVE RIVER BASIN, CALIFORNIA

MOJAVE RIVER FORKS RESERVOIR
DAM AND APPURTENANCES
GENERAL PLAN
EMBANKMENT, SADDLE DIKE AND APPURTENANCES

APPROVAL RECOMMENDED: [signature] CHIEF, ENGINEERING DIVISION
APPROVED: [signature] COLONEL, CE DISTRICT ENGINEER

OCE CATEGORY:	SCALE:	SPEC. NO:	SHEET NO
SPECIFICATIONS	AS SHOWN	DACW09-68-B-0012	37 OF 76
REFERENCE SHEET NO:	DATE: OCTOBER, 1967	DIST FILE NO 341/145 REV "A"	

DRAWING HALF-SIZE

(Unattached)

EXHIBIT B

CONDITION SURVEY OF DAMS

(Complete in duplicate)

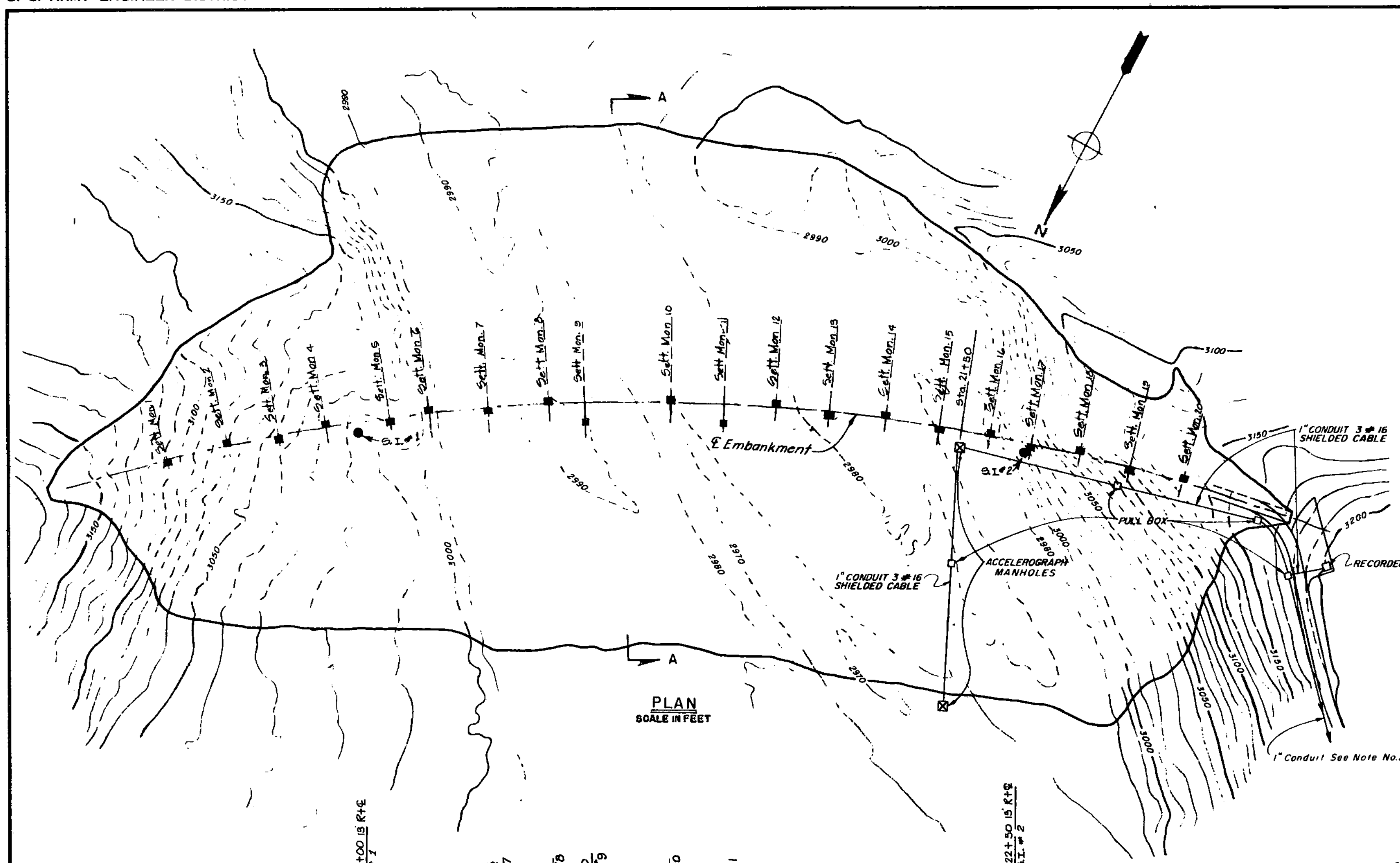
INSPECTED BY	PROJECT
	DATE

After each item indicate one of the following:
(NA) Not Applicable; (S) Satisfactory; (U) Unsatisfactory (If Unsatisfactory, circle deficiency and explain on reverse side giving Item Number)

	ITEMS TO BE INSPECTED AND DEFICIENCIES TO LOOK FOR	NA, S, OR U
RESERVOIR	1. BASIN - dumping, floatable debris, dead brush, trees or logs, trespassing	
	2. ACCESS ROADS - rough, need blading, weed clearing, surfacing, slides, settlement, ruts, washouts, obstructions, damaged guard posts, barricades, lights, signs, eroded or plugged culverts	
	3. CHANNEL IN BASIN - concrete, grouted stone side slopes, stabilizers, rock toe, levee erosion, toe drains, subdrainage, manholes, side drains, gaging station	
EMBANKMENT	4. CREST - erosion, bituminous surfacing, slope to drain toward upstream facing, weeds, brush	
	5. SLOPES - erosion, loss of filter, cracks in grouted stone, wet areas or seepage in downstream slope, burrowing animals, weeds or brush	
	6. TOE DRAIN - seepage, drainage, relief wells, drainage ditches, plugging, silting of toe extension	
	7. GALLERY - concrete, seepage through joints, settlement, steelwork, rust, paint, padlocks	
SPILLWAY	8. APPROACH CHANNEL - sloughed or eroded banks, drainage ditches, deposit of sediment, weeds, brush	
	9. CONCRETE - width and extent of cracks, popouts, expansion joints, alinement of joints, subdrains	
	10. GATE OPERATING CHAMBER - lights, waterlines and valves, electric conduits, oil pressure lines, gate position indicators, gate pit joint or manhole leakage, float chamber leakage, float mechanism	
	11. DRAINAGE GALLERY (Hansen Dam) - malfunctioning of foundation drain holes, floor drains, drain outlet, drain manhole	
	12. BUCKET OR STILLING BASIN - accumulation of trash and debris, degradation of downstream channel, subdrains, weepholes, pools of stagnant water	
OUTLET WORKS	13. APPROACH CHANNEL - potential slides, sloughed areas, accumulation of trash and debris, rubbish, weeds, stone blanket, disintegration of rock, weepholes	
	14. INTAKE - cracks in concrete, spalled joints, seepage thru joints, displacement due to settlement, float recorder intake, missing wire screens, clogging of inlet, rusty ladder rungs, mud, sand or silt in float well, trash racks, vent pipes, diversion structure	
	15. CONCRETE - width, extent of cracks, popouts, alinement of joints, expansion joints, subdrainage	
	16. CONDUIT - trash and debris, concrete popouts, seepage thru joints, concrete abrasion areas	
	17. BUCKET OR STILLING BASIN - accumulation of trash and sediment, concrete, stagnant water, subdrainage	
	18. OUTLET CHANNEL - change in grade or alinement, obstructions, subdrainage, erosion, grouted stone	
	19. SERVICE BRIDGE - alinement, pier settlement, expansion joints, handrails, curbs, concrete, lights, paint	
GATES & HOISTS	20. GATES - corrosion, distortion of leaves, plates or frames, gate creep, missing bolts or nuts, oil leakage, tightness of seals, clean sealing surfaces, lubrication, paint	
	21. HOISTING EQUIPMENT - hoist cables, function of chains and sprockets, vibration of gear boxes, drive shafts, lubrication, gate stem, excessive wear, corrosion, rust, paint	
	22. HYDRAULIC SYSTEM - piping leaks, control system, pumps & motors, lubrication, sparking, excessive heat	
	23. ELECTRICAL EQUIPMENT - motors, heaters, gate position indicators, panels, loose wires, insulation, switchboard, defective parts, burnt fuses, broken switches, sparking, overheating, cleanliness	
CONTROL	24. HYDROMETRIC EQUIPMENT - correlate settings, automatic recordings, clocks, tape, ink in pens, charts	
	25. TELEPHONE-RADIO - defects in radio or telephone communication system, volume, audible howlers	
	26. FLOOD LIGHTS - condition, check lamps, conductor cable and terminal plug	
	27. ELEVATOR - malfunctioning, start, run and stop, brakes, paint, lubrication, cleanliness	
MISC	28. FENCING - damaged fabric, wires, posts, cables, chains, gates, missing fencing accessories, alinement, paint	
	29. STAFF GAGES - damage, displacement, legibility, concrete footing, paint	
	30. VANDALISM - report evidence	

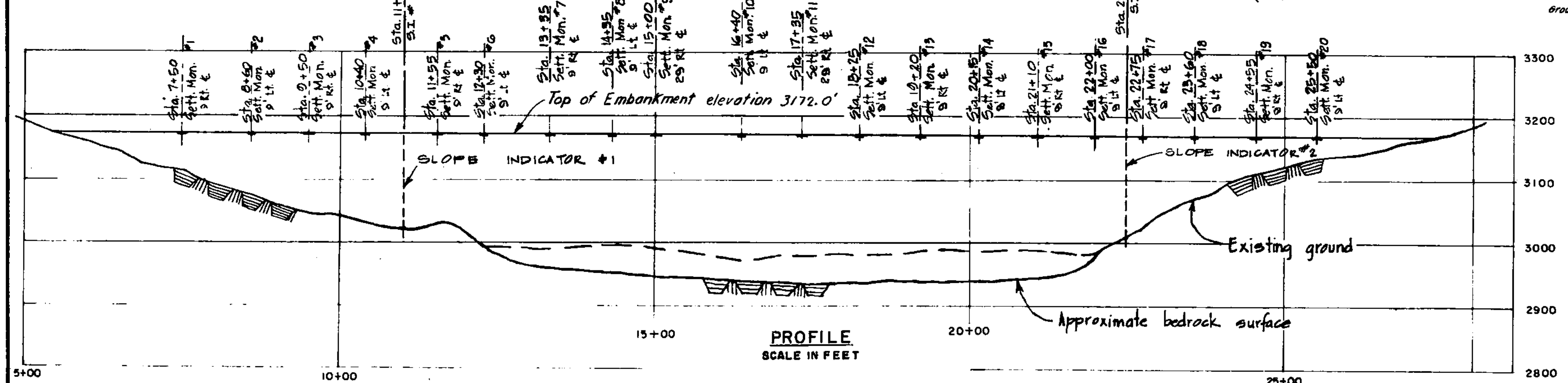
ITEM NO.	DESCRIPTION OF DEFICIENCY AND RECOMMENDED REPAIRS	DATE REPAIR COMPLETED

One checklist to be submitted to the Chief, Maintenance Section, who will route it to the Design Branch, Engineering Div., and one checklist to be submitted to the Chief, Operations Branch, Construction Div.



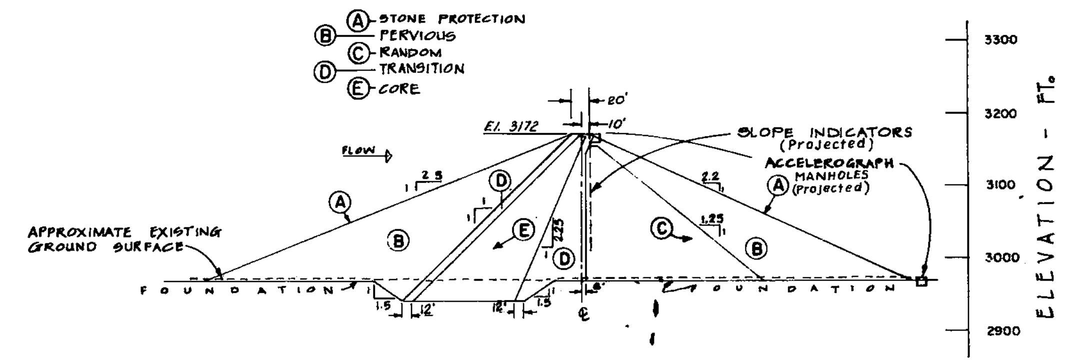
PLAN

SCALE IN FEET

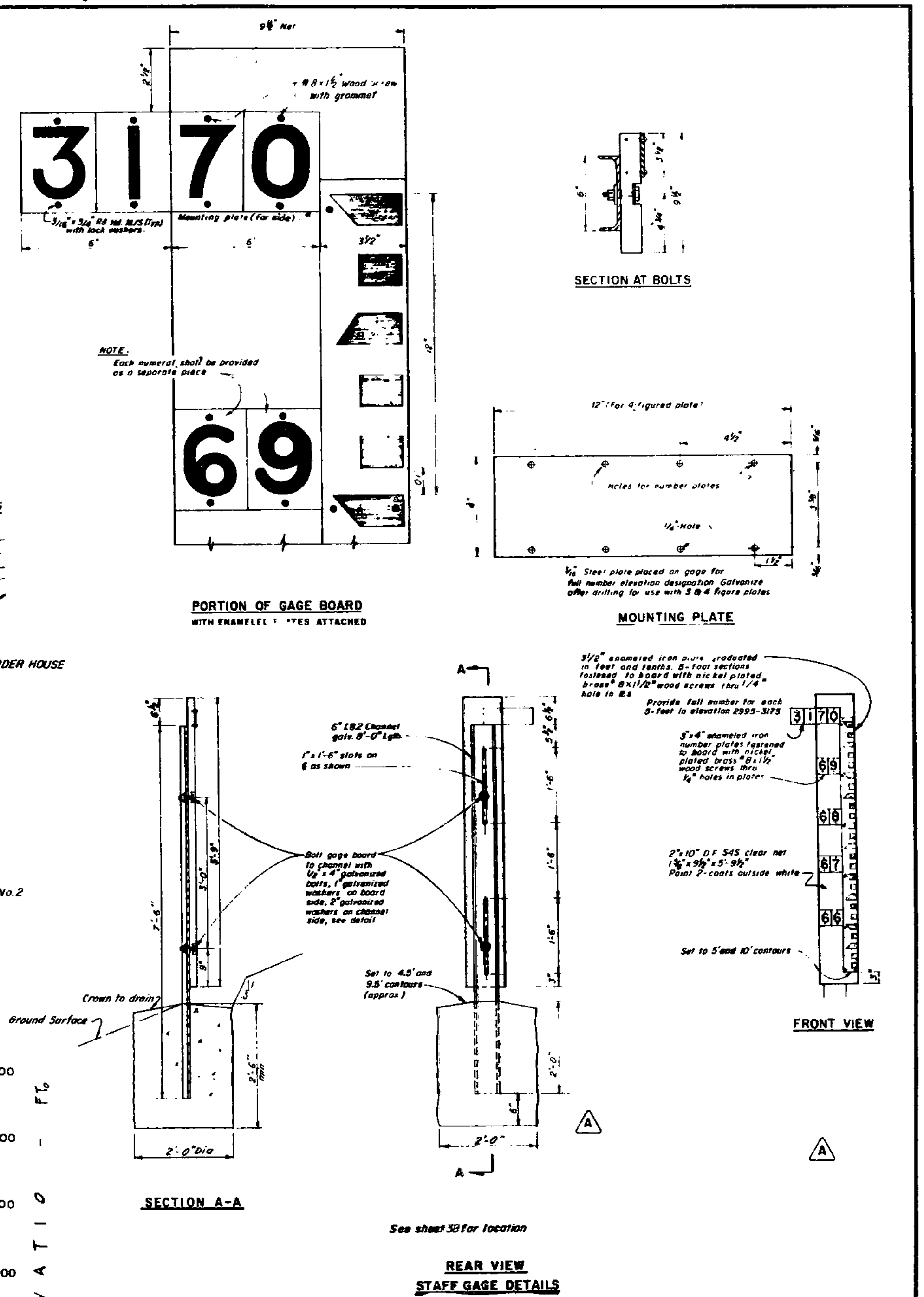


PROFILE

SCALE IN FEET



SECTION A-A



LEGEND

Set Mon. #1	SETTLEMENT MONUMENT.
S.I. #1	SLOPE INDICATOR.
⊠	ACCELEROGRAPH MANHOLE

NOTE:

1. Six reference monuments, one row of three each, shall be installed near each abutment. Locations shall be determined by Contracting Officer. Monuments shall be installed after access road and parking areas are completed.
2. Install 1" Conduit with 3 #16 Conductors (shielded) 3 feet of edge of pavement, 18 inches deep, from pull box near recorder house to accelerograph manhole in saddle dike. Pull boxes to be installed flush with grade at 300 foot intervals.

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY
A	2-6-68	Revised per Amendment No. 3	L.J.L.

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

ENGINEER: L.J.L.
DRAWN BY: G.E.D.
CHECKED BY: L.J.L.
SUBMITTED BY: [signature]
APPROVAL RECOMMENDED: [signature]
APPROVED: [signature]

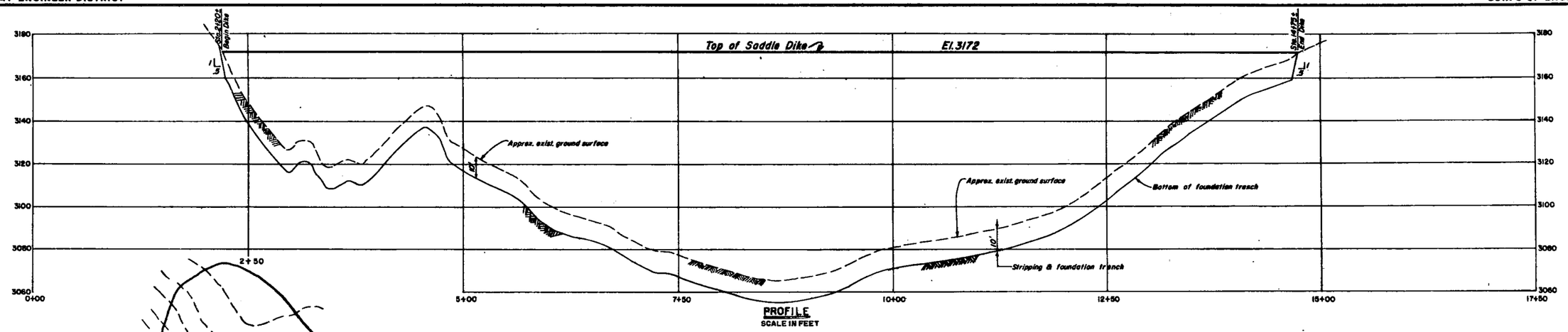
MOJAVE RIVER BASIN, CALIFORNIA

MOJAVE RIVER FORKS RESERVOIR
DAM AND APPURTENANCES
EMBANKMENT
INSTRUMENTATION

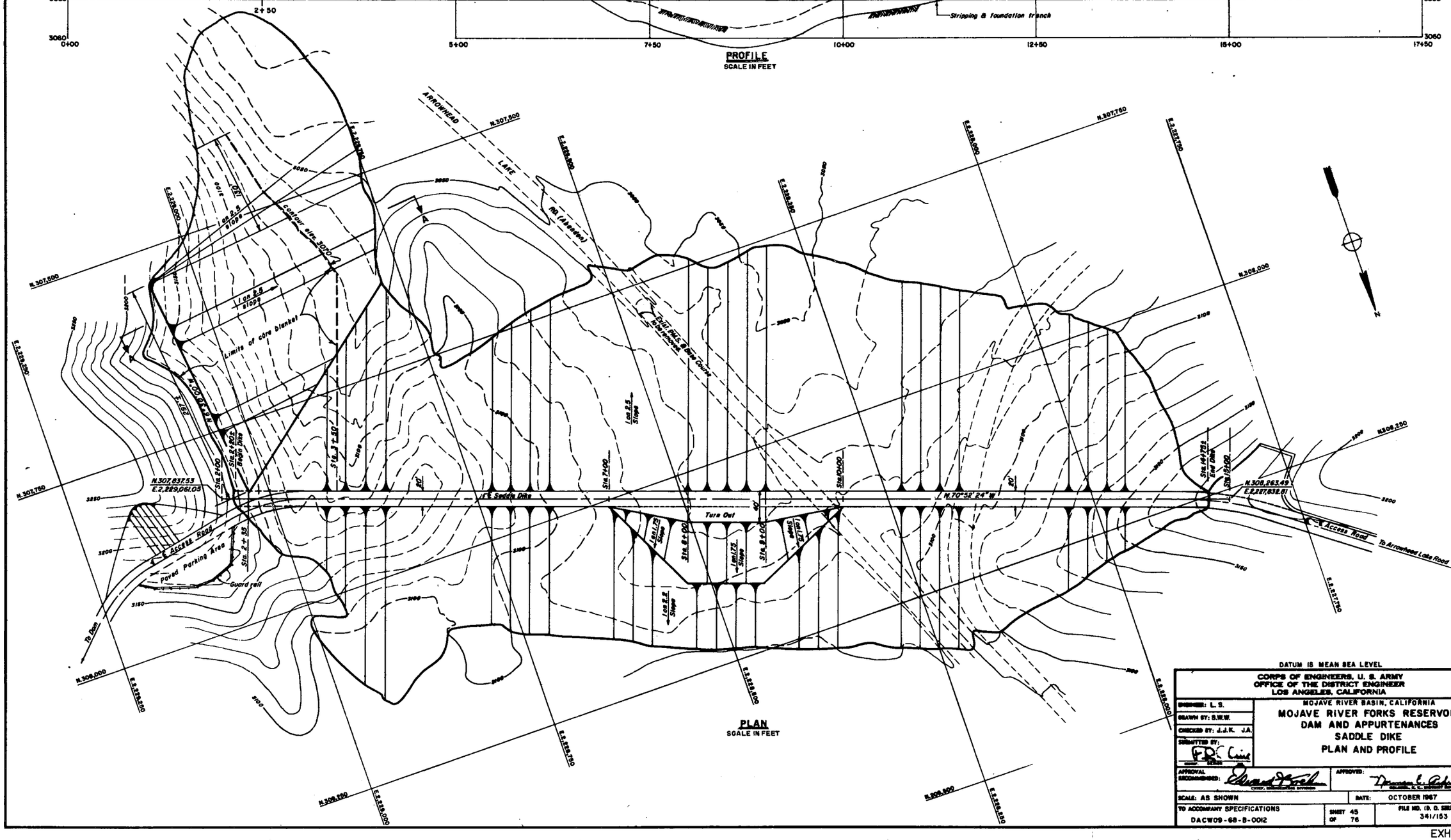
SCALE: AS SHOWN
DATE: OCTOBER 1967

TO ACCOMPANY SPECIFICATIONS DACW09-68-B-0012
SHEET 43 OF 76
FILE NO. (D. O. SERIES) 341/151 REV "A"

EXHIBIT D



PROFILE
SCALE IN FEET



PLAN
SCALE IN FEET

DATUM IS MEAN SEA LEVEL

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: L. S.
DRAWN BY: S.W.W.
CHECKED BY: J.J.K. J.A.
SUBMITTED BY: F.R.C. Cline
CHIEF, DESIGN

MOJAVE RIVER BASIN, CALIFORNIA
MOJAVE RIVER FORKS RESERVOIR
DAM AND APPURTENANCES
SADDLE DIKE
PLAN AND PROFILE

APPROVAL RECOMMENDED: Edward Fowl
CHIEF, ENGINEERING DIVISION

APPROVED: Norman E. Pehrson
COLONEL, C. E., DISTRICT ENGINEER

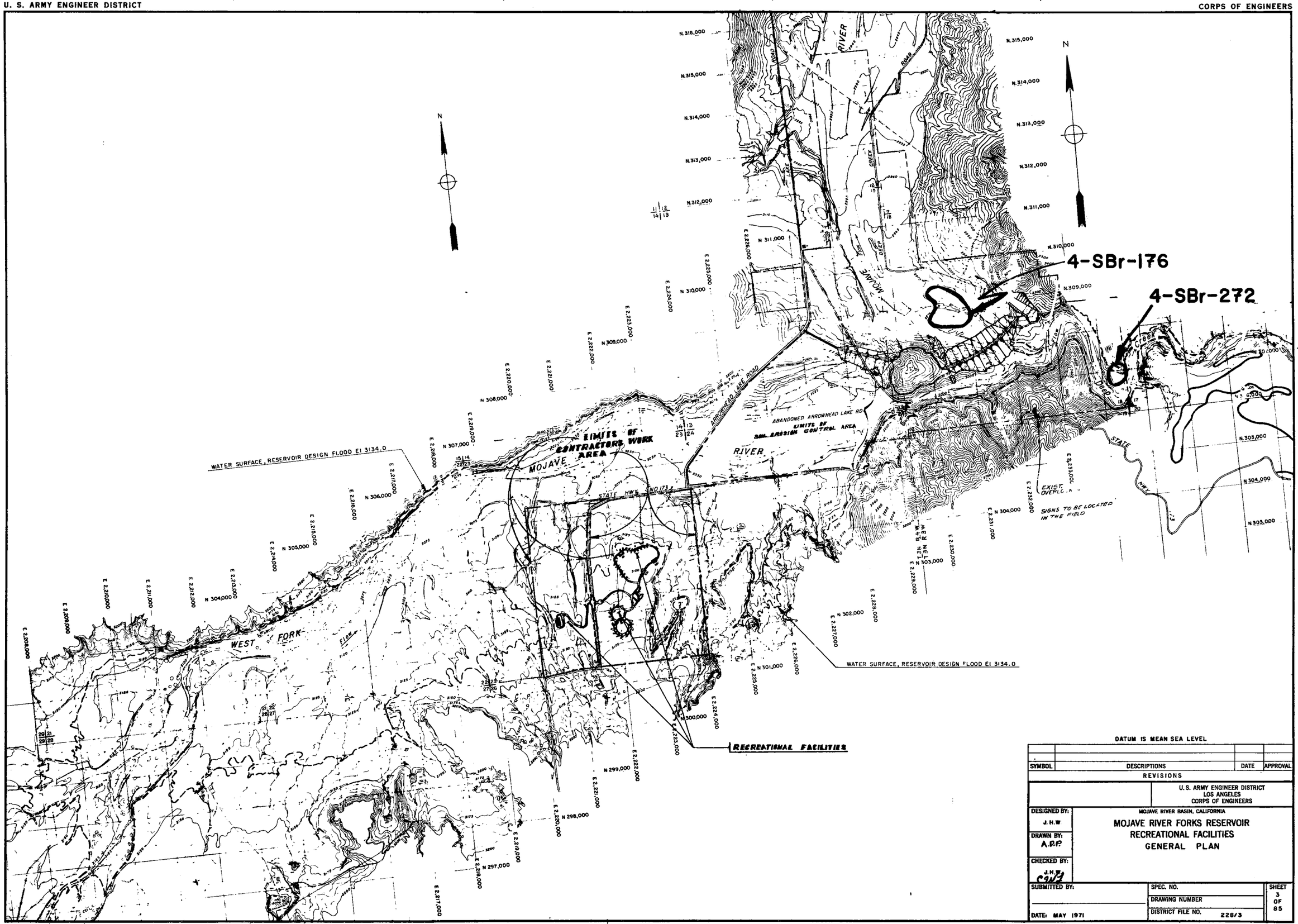
SCALE: AS SHOWN
DATE: OCTOBER 1967

TO ACCOMPANY SPECIFICATIONS
DACW09-68-B-0012

SHEET 45
OF 76

FILE NO. (D. O. SERIES)
341/153

EXHIBIT E



DATUM IS MEAN SEA LEVEL

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

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

MOJAVE RIVER BASIN, CALIFORNIA

MOJAVE RIVER FORKS RESERVOIR
RECREATIONAL FACILITIES
GENERAL PLAN

DESIGNED BY:	J.H.W
DRAWN BY:	A.P.P
CHECKED BY:	J.H.W
SUBMITTED BY:	
DATE:	MAY 1971
SPEC. NO.	
DRAWING NUMBER	
DISTRICT FILE NO.	226/3
SHEET	3 OF 85

D. O. SERIES

EXHIBIT F