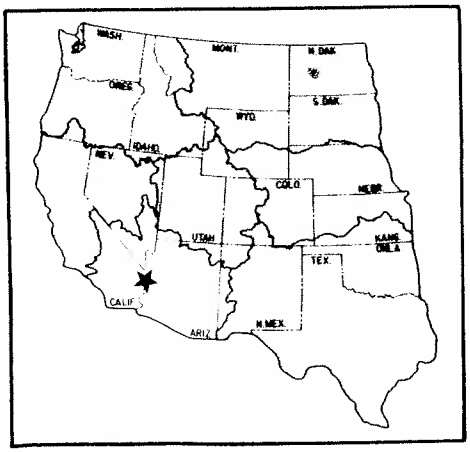
Parker-Davis Project

Arizona: Mohave and Yuma Counties
California: San Bernardino County
Nevada: Clark County

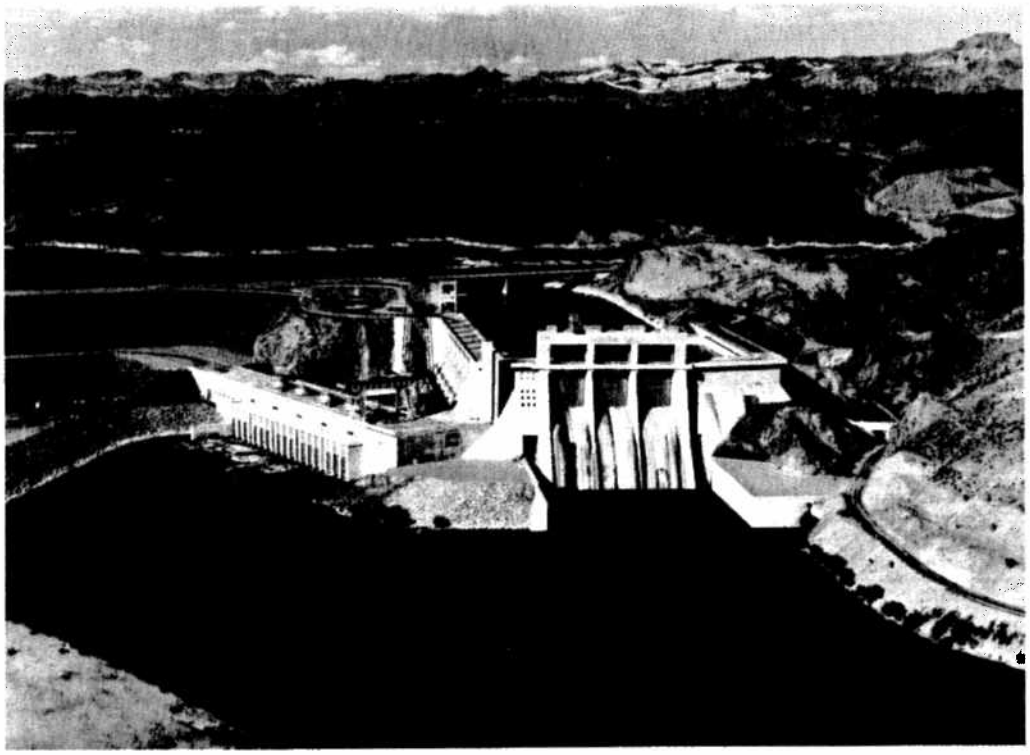
Lower Colorado Region
Water and Power Resources Service



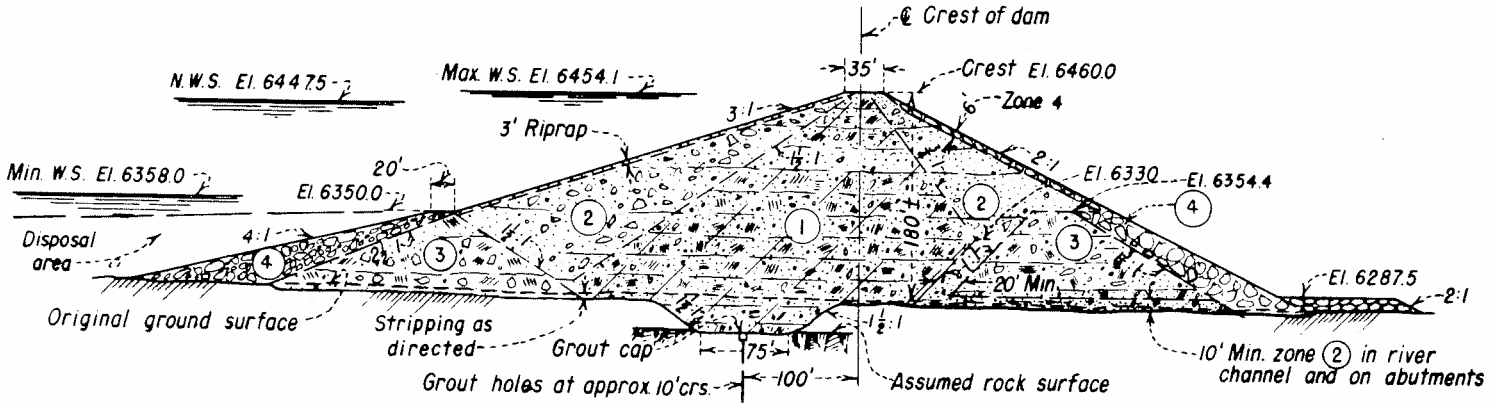
PLAN

In 1954, the Parker Dam Power Project and the Davis Dam Project were consolidated to form the Parker-Davis Project. The major works include Davis (originally named "Bullshead") Dam and Powerplant, Parker Dam and Powerplant, a high-voltage transmission system, and substations which sectionalize the long transmission lines. The original capacity of the Davis Powerplant was 225,000 kilowatts. In 1973, generator replacement of stator windings was initiated. Completed in 1976, the new windings increased the capacity of the powerplant to 240,000 kilowatts. The rated capacity of the Parker plant is 120,000 kilowatts. The transmission system includes 1,609.2 miles of high-voltage transmission lines and 31 substations. Parker Dam and Davis Dam are located on the Colorado River, 155 miles and 67 miles, respectively, downstream of Hoover Dam.

Lake Havasu, formed by Parker Dam, provides a forebay and desilting basin from which the Metropolitan Water District pumps water into its Colorado River Aqueduct. Parker Dam Powerplant was added to provide low-cost electrical energy to Arizona and southern California. Davis Dam provides reregulation of the Colorado River below Hoover Dam and facilitates water delivery beyond the boundary of the United States as required by treaty with Mexico. The Davis Dam portion of the project also provides for production and transmission of electrical energy, contributes to flood control, irrigation and municipal water supplies, navigation improvement, recreation, and wild waterfowl protection and related conservation purposes.



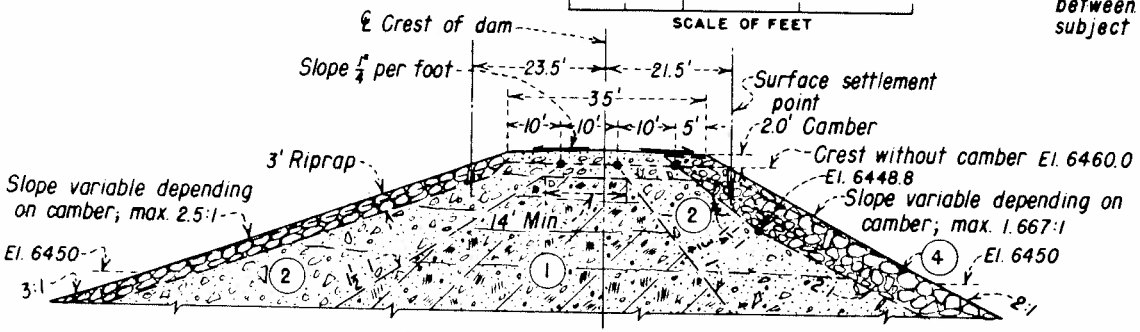
Davis Dam



MAXIMUM SECTION

100 0 100 200
SCALE OF FEET

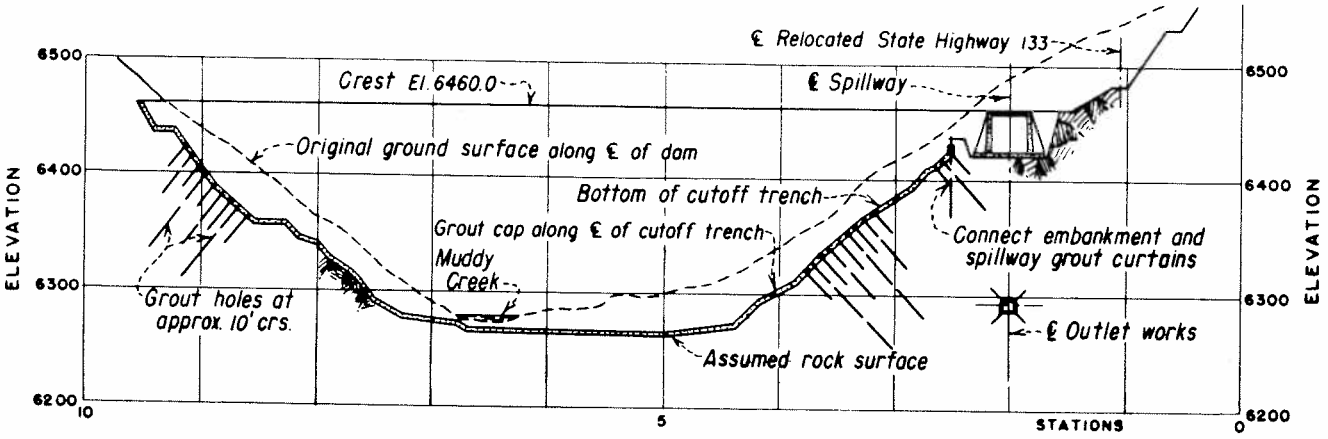
NOTE: Slopes of the division lines between zones are tentative and subject to variation.



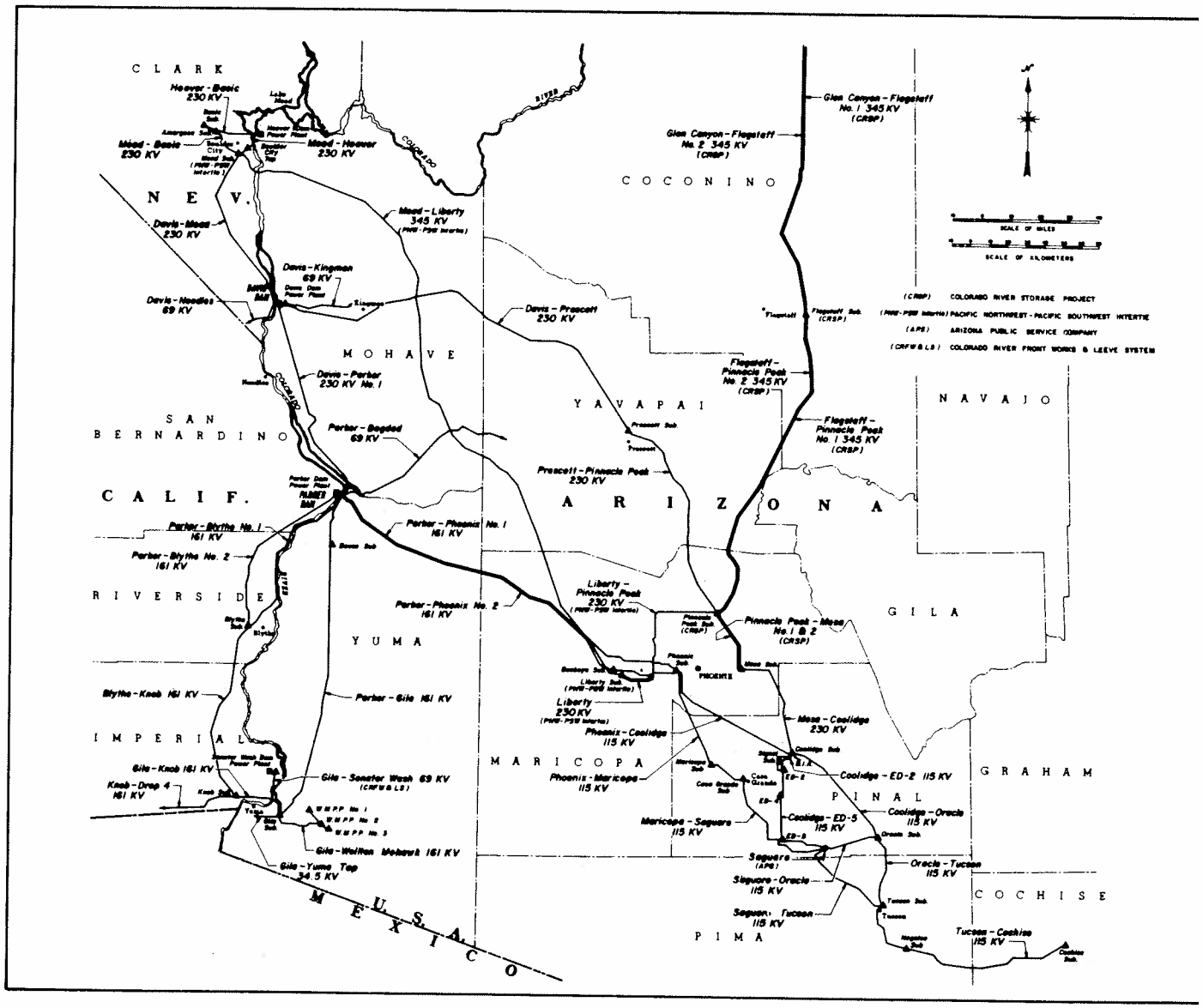
CREST DETAILS AT MAXIMUM CAMBER

EMBANKMENT EXPLANATION

(1) Selected clay, silt, sand, and gravel compacted by tamping rollers to 6-inch layers.
(2) Selected sand, gravel, and cobbles compacted by crawler type tractor to 12-inch layers
(3) Selected miscellaneous material compacted by tamping roller to 12-inch layers.
(4) Rock fill.



PROFILE ON ℄ CREST OF DAM



Parker-Davis Project

Parker Dam, Powerplant, and Reservoir

Parker Dam is a concrete arch structure with a structural height of 320 feet, and a volume of 380,000 cubic yards. At its crest, the dam is 856 feet long and is controlled by five 50-foot-square gates.

Lake Havasu backs up behind the dam for 45 miles and covers over 25,000 acres. The total capacity of the reservoir is 648,000 acre-feet. The Metropolitan Water District's W. P. Whitsett Intake Pumping Plant for the Colorado River Aqueduct is located on the shore of Lake Havasu about 2 miles upstream from the dam. The aqueduct begins at the intake pumping plant and extends 242 miles to its terminus at Lake Mathews near Riverside, Calif. About half of the power generated at the Parker Powerplant is reserved by the district for pumping water along the aqueduct. The Bureau of Reclamation retains the other half of the power output. The contract limits the use of active storage in Lake Havasu to the uppermost 180,000 acre-feet.

The Parker Powerplant includes a penstock gate structure, four penstock tunnels, and a powerplant building housing four hydroelectric generating units. Each of the four tunnels and the penstocks conveying river water from the forebay at the left end of the dam to the turbines is 22 feet in diameter and has a water capacity of 5,575 cubic feet per second.

Davis Dam, Powerplant, and Reservoir

Davis Dam spans the Colorado River in Pyramid Canyon 67 miles downstream from Hoover Dam and 88 miles upstream from Parker Dam. The Mexican Treaty

Parker Dam

of 1944 required the United States to construct Davis Dam for regulation of water to be delivered to Mexico. The reservoir formed by the dam, Lake Mohave, is used for that purpose through integrated operations of Hoover and Davis Powerplants.

Davis Dam, rising 200 feet above the lowest point of the foundation and about 140 feet above the level of the river, is a zoned earthfill structure with concrete spillway, intake structure, and powerplant. It has a crest length of 1,600 feet, and a top width of 50 feet. Its reservoir, Lake Mohave, has a total storage capacity of 1,818,300 acre-feet, and at high-water stages extends 67 miles upstream to the tailrace of the Hoover Powerplant.

Almost 5 million cubic yards of rock and earth were excavated to form the diversion and forebay channel and foundations for the dam, spillway and intake structures, and powerplant. More than 3,642,000 cubic yards of earth and rockfill were required to form the dam, and about 600,000 cubic yards of concrete and 23 million pounds of reinforcing steel were placed in the spillway, powerplant, and other structures.

The semi-outdoor type Davis Powerplant is on the Arizona side of the river immediately downstream from the dam embankment. Water is delivered from the forebay to the powerplant through five 22-foot-diameter penstocks.

Transmission System

The transmission system includes 31 substations with a total capacity of 2,113,083 kilovolt-amperes, and 51 transmission lines with a total length of 1,609.2 miles. The high-voltage switchyards near the powerplants are the takeoff points for a system of transmission lines and substations which interconnect the Davis, Hoover, and Parker Powerplants, and extend to load centers in central and southern Arizona, southern Nevada, and southern California.

DEVELOPMENT

Investigations

Parker Dam. Population growth of municipalities within the greater Los Angeles area in California created a domestic water demand in excess of the supply from the local streams and the more remote Owens Valley source. After intensive investigations, it was determined that sufficient water could be obtained from the Colorado River. The construction of Hoover Dam, by virtue of the resulting river regulation and power generation, made feasible a plan to construct a dam on the Colorado River below the mouth of the Bill Williams River. Surveys initiated by the Bureau of Reclamation on June 25, 1934, established the best site for the location of Parker Dam.

Davis Dam. The Reclamation Service investigated a possible damsite at the lower end of Pyramid Canyon, 67 miles below Hoover Dam, as early as 1902-03. Until Hoover Dam controlled the Colorado River, however, a dam at the Davis site was not practicable.

In 1930, the Bureau of Reclamation made further investigations and explorations of the site in Pyramid Canyon, which led to authorization of the Davis Dam Project.

Authorization

The Parker-Davis Project was formed by the consolidation of the Parker Dam Power Project and the Davis Dam Project under the terms of the act of May 28, 1954 (68 Stat. 143). The Parker Dam Power Project was authorized by the Rivers and Harbors Act of August 30, 1935 (49 Stat. 1028). The Davis Dam Project was found feasible and authorized April 26, 1941, by the Secretary of the Interior under provisions of the Reclamation Project Act of 1939 (53 Stat. 1187).

On October 1, 1977, in conformance with Public Law 95-91, the Department of Energy Organization Act of August 4, 1977, the power marketing function of the Bureau of Reclamation, including operation and maintenance of transmission lines and attendant facilities, were transferred to the Department of Energy.

Construction

With funds advanced by the Metropolitan Water District of southern California, contracts were awarded by the Bureau of Reclamation and excavation for the Parker Dam and Powerplant commenced in October 1934. The dam was substantially completed in September 1938. Construction of the powerplant, consisting of four units, began in July 1939. Concurrently with construction of the powerplant, transmission lines and substations of the project were constructed and put into operation. Because of the onset of World War II, certain features were constructed with temporary materials or were omitted until proper materials could be made available and installed. Postwar work included replacement of temporary wood supporting structures with permanent steel structures in the substations.

A contract for the construction of Davis Dam and appurtenant works was awarded in June 1942. Work was halted after the War Production Board revoked priority ratings required to obtain the necessary materials for construction. Construction resumed in April 1946, and was completed in 1953.

Operating Agencies

The dams, hydroelectric powerplants, and attendant facilities are operated and maintained by the Bureau Reclamation. The Parker Dam and Davis Dam Field Division of the Parker-Davis Project and the Boulder Canyon Project (Hoover Dam) were combined in a si operating unit administered by the Lower Colorado Dams Project Office located at Hoover Dam. The marketing functions, including the operation and maintenance of the transmission lines and attendant facilities of the Parker-Davis Project, are administere the Boulder City Area Office of the Western Area Po Administration.

BENEFITS

Municipal and Industrial Water

Parker Dam diverts about 1,080 cubic feet per second water daily to the Colorado River Aqueduct for use in the metropolitan area of Los Angeles.

Hydroelectric Power

Davis, Hoover, and Parker Powerplants are interconnected. The electrical integration and interconnection o these Bureau of Reclamation powerplants provides ma imum generation of power with efficient use of water resources. The highly developed agricultural base and t complex industrialization of the Pacific Southwest bene greatly from Colorado River hydroelectric energy.

Flood Control

Just above Parker Dam, the Bill Williams River pours flash floods into Lake Havasu. These floods are trappe in the reservoir and the downstream lands are protected Parker Dam and Davis Dam both reregulate water releases from Lake Mead through the Hoover Powerpla for use downstream.

Recreation and Fish and Wildlife

Lake Havasu and most of the large marsh area extendin 10 miles above the reservoir are included in the Havasu National Wildlife Refuge. Cabin sites are available for lease. Principal activities are camping, picnicking, swimming, boating, and year-round fishing—primarily for large-mouth black bass, bluegills, and crappie. Migrator waterfowl hunting is permitted in season.

Lake Mohave is included in and administered as part of the Lake Mead National Recreation Area. Several concessions operate in the area with cabins, camping and

trailer parks, and boats for hire. Camping, picnicking, swimming, boating, and excellent year-round fishing are the major activities. From Hoover Dam downstream to Cottonwood Landing, where Lake Mohave begins to widen, rainbow trout fishing is good. Below Cottonwood Landing, bass, catfish, and bluegills predominate.

PROJECT DATA

Facilities in Operation

Storage dams	2	
Powerplants	2	
Transmission lines[1]	1,609.2	mi
Substations	31	

[1]The power marketing function, including the operation and maintenance of transmission lines and attendant facilities, was transferred to Western Area Power Administration, Department of Energy, in 1977.

Power Generation

Fiscal Year	Davis Powerplant (kWh)	Parker Powerplant (kWh)	Total
1968	912,961,000	433,611,000	1,346,572,000
1969	915,507,000	437,581,000	1,353,088,000
1970	926,879,000	434,108,000	1,360,987,000
1971	949,674,000	446,645,724	1,396,319,724
1972	972,116,000	455,856,000	1,427,972,000
1973	914,652,000	435,800,794	1,350,452,794
1974	997,680,000	477,109,291	1,474,789,291
1975	959,710,000	475,751,232	1,435,461,232
1976	961,381,000	478,940,452	1,440,321,452
1977	941,940,000	438,740,000	1,380,680,000

ENGINEERING DATA

Water Supply

COLORADO RIVER

(See Boulder Canyon Project for information on drainage area and discharge.)

Annual diversion at Parker Dam[2]		
Maximum (1977)	1,280,000	acre-ft
Minimum (1946)	80,400	acre-ft
Average	740,500	acre-ft

[2]Pumped by the Metropolitan Water District of Southern California.

Storage Facilities

DAVIS DAM

Type: Zoned earthfill		
Location: On the Colorado River, 32 mi west of Kingman, Ariz.		
Construction period: 1942-50		
Date of closure (first storage): January 1950		
Reservoir, Lake Mohave:		
Total capacity to El. 647	1,818,300	acre-ft
Active capacity, El. 533.39-647	1,810,000	acre-ft
Surface area	28,500	acres
Dimensions:		
Structural height	200	ft
Hydraulic height	140	ft
Top width	50	ft
Maximum base width	1,400	ft
Crest length	1,600	ft
Crest elevation	655.0	ft
Total volume	3,642,000	yd^3
Spillway: Concrete ogee weir in end of forebay channel at east end of dam, controlled by three 50-ft-square fixed-wheel gates.		
Elevation top of gates	647	ft
Crest elevation	597.0	ft
Capacity at El. 647	214,000	ft^3/s
Outlet works: Two openings, one on each side of spillway section, each controlled by one 22- by 19-ft radial gate.		
Capacity at El. 610	43,400	ft^3/s
Foundation: Badly fractured and faulted porphyric granite gneiss overlain by silt, sand, and gravel in river channel.		
Special treatment: Cement grout curtain under dam; intensive intermediate-zone grouting under concrete structures.		

PARKER DAM

Type: Concrete arch		
Location: On the Colorado River 12 mi northeast of Parker, Ariz.		
Construction period: 1934-38		
Power plant constucted in 1939-42		
Date of closure (first storage): July 16, 1938		
Reservoir, Lake Havasu:		
Total capacity to El. 450	648,000	acre-ft
Available capacity, El. 400-450	180,000	acre-ft
Surface area	20,400	acres
Dimensions:		
Structural height	320	ft
Hydraulic height	75	ft
Top width	39	ft
Maximum base width	100	ft
Crest length	856	ft
Crest elevation	455.0	ft
Total volume	380,000	yd^3
Spillway: Overflow section at center of dam controlled by five 50-ft-square Stoney gates.		
Elevation top of gates	450.0	ft
Crest elevation	400.0	ft
Capacity at El. 455	400,000	ft^3/s
Outlet works: Four 22-ft-diameter steel penstocks through right abutment, each controlled by one 22- by 35-ft fixed-wheel gate.		
Capacity at El. 450	22,300	ft^3/s
Foundation: A hard, firm porphyric gneiss with subordinate masses of granite cut by several aplitic dikes; clay seams and fractured rock in right abutment.		
Special treatment: Cement grout curtain near axis of dam, supplemental grouting in abutments.		
Mass concrete: Natural aggregate from pit on Bill Williams River 3.5 mi from dam; low-heat portland cement; mixing and placing temperatures controlled, artificial cooling through embedded pipe system.		
Maximum size aggregate	6	in
Average net water-cement ratio (by weight)	0.58	
Cement content	1.09	bbl/yd^3

Power Facilities

Parker Powerplant

Location: Parker Dam		
Year of initial operation: 1942		
Year last generator placed in operation: 1943		
Nameplate capacity	120,000	kW
Number and capacity of generators (4)	30,000	kW
Maximum head	78	ft

Davis Powerplant

Location: Davis Dam		
Year of initial operation: 1951		
Year last generator placed in operation: 1951		
Nameplate capacity[3]	240,000	kW
Number and capacity of generators (5)	48,000	kW
Maximum head	136	ft

Substations[4]

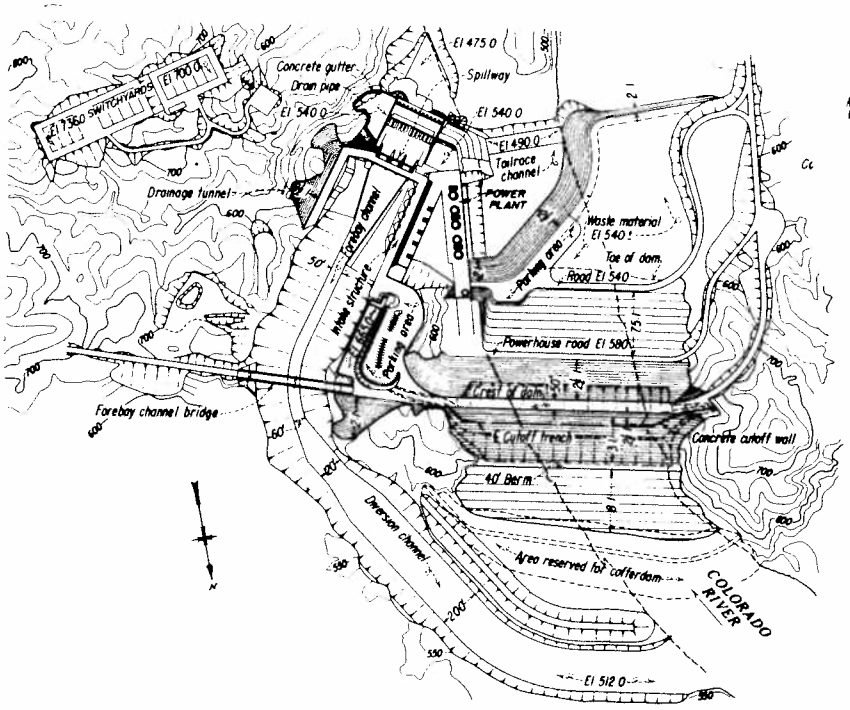
Number in operation	31	
Total capacity of transformers	2,113,083	kVA

Transmission Lines[4]

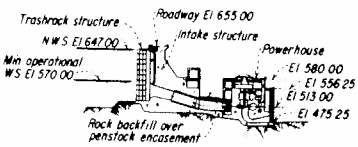
Total number of lines	51
Total circuit miles	1,609.2

Description	Voltage, kV	Conductors and supporting structures		Circuit miles	Year placed in service
Parker-Davis No. 1	230	795	Steel	69.9	1951
Davis-Mead	230	795	Steel	60.7	1951
Davis-Davis Switchyards 1 through 5	230	CU 500	Steel	1.5	1951
Davis-Prescott	230	795	Steel	142.5	1951
Hoover-Basic (North Basic Line)	230	CU 500	Steel	15.0	1942
Mead-Basic	230	795	Steel	12.8	1942
		CU 500	Steel		
Mead-Hoover States	230	795	Steel	8.5	1942
		CU 500	Steel		
Mesa-Coolidge	230	795	Steel	39.9	1951
Parker-Gene (MWD)	230	795	Steel	1.7	1947
Prescott-Pinnacle Peak	230	795	Steel	74.9	1951
Blythe-Knob	161	477	Wood-H	64.4	1951
Gila-Knob	161	CU 300	Wood-H	20.2	1943
Gila-Wellton-Mohawk (P.P. No. 2)	161	397.5	Wood-H	12.7	1956
Parker Powerplant-Parker 161-kV Switchyard (Nos. 1 through 4)	161	CU 300	Steel	0.5	1942-
Parker-Blythe No. 1	161	CU 300	Wood-H	64.6	1943-
		477	Wood-H		
Parker-Blythe No. 2	161	954	Wood-H	63.9	19
Parker-Gila	161	CU 300	Wood-H	116.5	19
		477	Wood-H		
Parker 161-kV-Parker 230-kV (Trans. 5 & 6)	161	477	Steel	0.5	1947-
Parker-Phoenix No. 1[5]	161	CU 300	Wood-H	136.9	19
Parker-Phoenix No. 2	161	477	Wood-H	139.8	19
Knob Tap-Drop 4 Tap	161	CU 300	Wood-H	28.6	19
Coolidge-BIA Coolidge	115	CU 4/0	Wood-H	0.4	19
Coolidge-Elect. District No. 2 (via Signal)	115	336.4	Wood-H	12.2	19
Coolidge-Oracle	115	CU 4/0	Wood-H	44.7	19
Coolidge-Saguaro	115	795	Wood-H	47.1	1948-
		336.4	Wood-H		
Maricopa-Saguaro	115	336.4	Wood-H	58.5	1948-
		795	Wood-H		
Oracle-Tucson	115	CU 4/0	Wood-H	25.0	19
		CU 4/0	Wood-P		
Phoenix-Coolidge	115	CU 4/0	Wood-H	52.5	1943-
		336.4	Wood H		
Phoenix Maricopa	115	336.4	Wood-H	36.1	1943-
		CU 4/0	Wood-H		
Saguaro-Oracle	115	795	Wood-H	19.0	19
Saguaro-Tucson	115	795	Wood-H	35.4	1948-
		336.4	Wood-H		
Tucson-Cochise	115	336.4	Wood-H	79.7	19
Davis Powerplant-Davis 69-kV Switchyard	69	3/0	Steel	0.2	19
Davis-CPU Tap (Needles)[6]	69	2/0	Wood-H	12.2	1946-
		4/0	Wood-H		
		CU No. 2	Wood-H		
Davis-CUC Tap (Kingman)	69	2/0	Wood-H	27.3	19
Parker Powerplant-Parker 69-kV (Transf. 3)	69	CU 250	Wood-H	0.1	19
Parker Powerplant-Parker 69-kV (Transf. 4)	69	CU 250	Wood-H	0.1	19
Parker-Bagdad[7]	69	CU No. 2	Wood-H	64.3	19
Gila-Yuma Tap	34.5	CU 2/0	Wood-P	9.8	19
Parker (Indian Service)-Parker Dam Camp	34.5	CU No. 2	Wood-P	0.2	19
Wellton-Mohawk-Wellton-Mohawk P.P. No. 1	34.5	266.8	Wood-P	4.9	19
Wellton-Mohawk-Wellton-Mohawk P.P. No. 3	34.5	336.4	Wood-P	3.5	19
Parker LV-Colorado (APS)	13.2	795	Wood-P	0.2	19

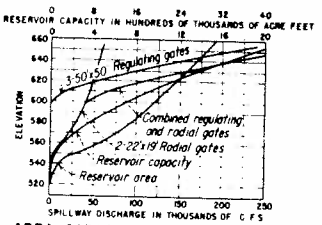
[3]In 1976, the new winding of generators increased the capacity from 225,000 to 240,000 kW.
[4]See footnote 1.
[5]To be replaced and upgraded to 230 kV as part of the Granite Reef Aqueduct transmission system of the Central Arizona Project.
[6]To be transferred to the Bureau of Indian Affairs.
[7]Planet Tap to the Cyprus Tap section (57.1 mi) to be sold to the Mohave Electric Cooperative, Inc.



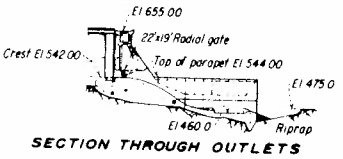
GENERAL PLAN



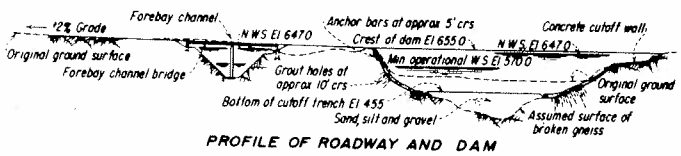
SECTION THROUGH INTAKE STRUCTURE AND POWERHOUSE



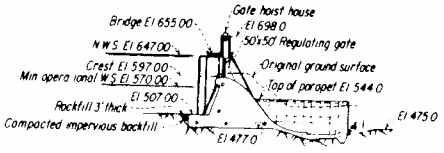
AREA-CAPACITY-DISCHARGE CURVES



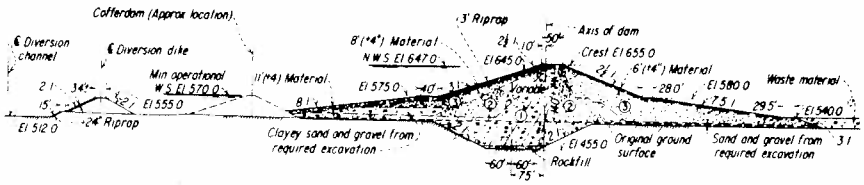
SECTION THROUGH OUTLETS



PROFILE OF ROADWAY AND DAM



SECTION THROUGH SPILLWAY



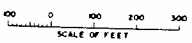
MAXIMUM SECTION THROUGH DAM

EMBANKMENT EXPLANATION

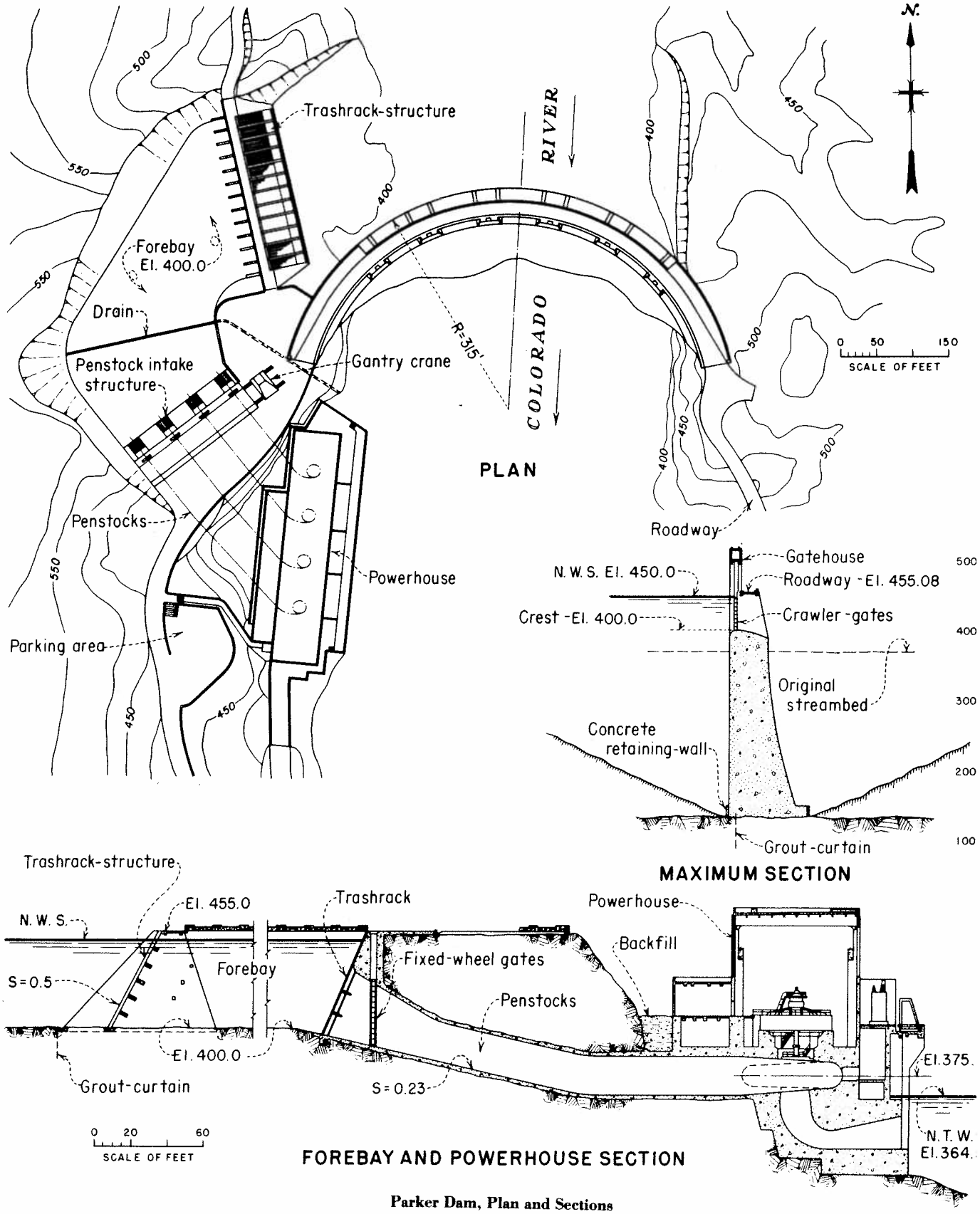
① Impervious material of selected clay, sand and gravel rolled in 6-inch compacted layers

② Rock screenings from required excavation rolled in 12-inch compacted layers

③ Rock fill from required excavation grouvated from fine material adjacent to zone ② to coarse material at outer slopes



Davis Dam, Plan and Sections



Parker Dam, Plan and Sections