

SAN DIEGO, CALIFORNIA, February 19, 1918

Col. Ed Fletcher,  
MGR V L & W Co.

Dear Sir:-

Subject: Cost to Deliver Water From Warners to District -  
Oceanside to Escondido.

I have spent some little time in the field and office, studying the merits of various routes over which to convey water, the distances and the costs of the proposed Warner - Merriam Development and a main distributing line through the proposed district - Oceanside to Escondido.

Without having a complete survey, I believe the following preliminary estimate will cover the maximum cost of construction for the entire system, including the power development. This does not include the cost of rights of way and reservoir lands in the Merriam Section estimated at \$20,000, nor a price for any of the lands in the Warner Section.

Construction Cost of Monarch - Merriam Canal System

(1)	Warner Dam (including tunnel & weir basin)-----	\$ 360,000
(2)	Monarch Canal: 13.7 miles Gunite canal (including tunnels, syphons and trestles) -----	450,000
(3)	Hellhole Power Plant: 2,000 K.W. plant, complete in place -----	168,000
(4)	Merriam Dam (including earth dike) -----	182,000
(5)	Merriam Conduit: 13.5 miles Gunite Canal (including tunnels, syphons and trestles) -----	400,000
(6)	Merriam Power Plant: 900 K.W. plant, complete in place -----	80,000
(7)	Distribution System -----	<u>460,000</u>
	Total -----	\$2,100,000

(15% overhead included)



The relative advantages of this selection are as follows:

(1) The water will be conveyed by direct route to the central part of the territory to be served. Here a ready market will dissipate the supply so that a more circuitous route would have no additional advantages.

(2) The Merriam Reservoir exists below both power plants, thereby conserving the constantly discharging waters when the irrigation demand is low. This reservoir is located at a sufficiently high elevation to afford good pressure through economic distribution mains, and is particularly advantageous in that it is sufficiently large (6500 ac.ft.) to take care of a 4 or 5 months discharge of water for power purposes from Warner Reservoir during the winter months.

(3) Both conduit sections dominate the range traversed. This not only shortens the distance, but makes it possible on the Merriam line to supply water to the valleys on either side of the line as well as to the proposed district which lies to the west.

(4) It eliminates the use of the Escondido Mutual Water Company system which would need considerable expenditure to make it an asset to both companies. The ditch elevation is too high to obtain the maximum head at the Hellhole Power Plant and its length is excessive in comparison. The Bear Valley Reservoir is isolated from the proposed district and its elevation does not work in so conveniently for a lower power and distribution scheme. It is an open question whether the joint use of this system would prove good policy.

(5) With a duty of water of eight-tenths of an acre foot per acre per year, the net safe yield of Warner Reservoir for a purely irrigation supply alone will irrigate a maximum of 35,000 acres. There can be a uniform draft of 34 second feet for power purposes the year round while a pure irrigation use can still be maintained from the storage in Merriam Reservoir.

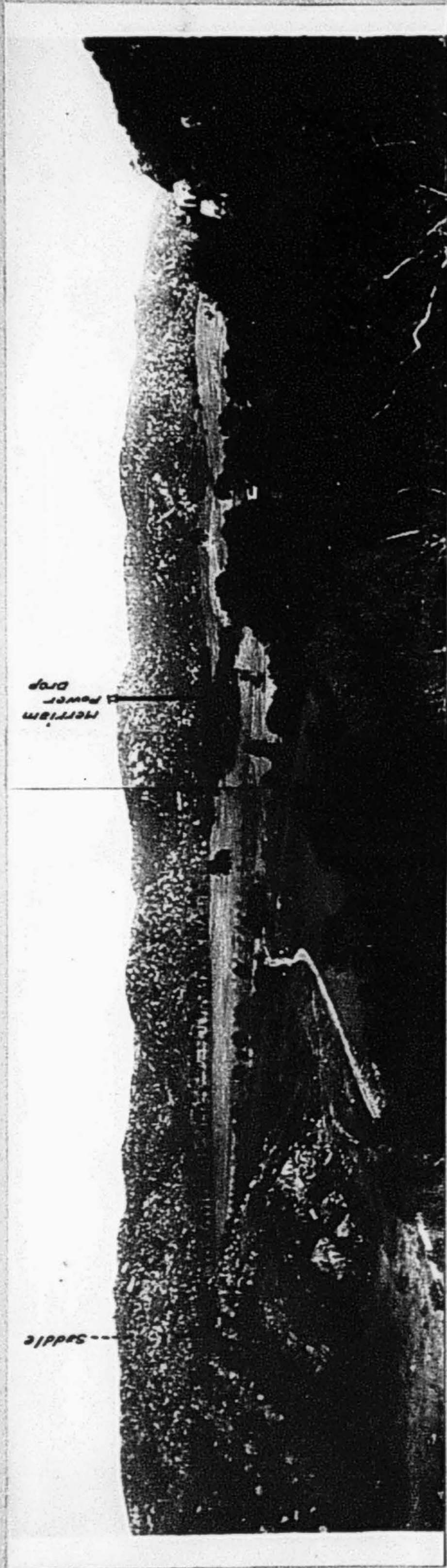
(6) As near as can be determined without completing the actual surveys, the power head at Hellhole Canyon will be 910 feet and 460 feet at Merriam. Based on a continuous flow of 34 second feet, this will give at the Hellhole plant approximately 1800 K.W. and at the Merriam plant 900 K. W.

Yours very truly,

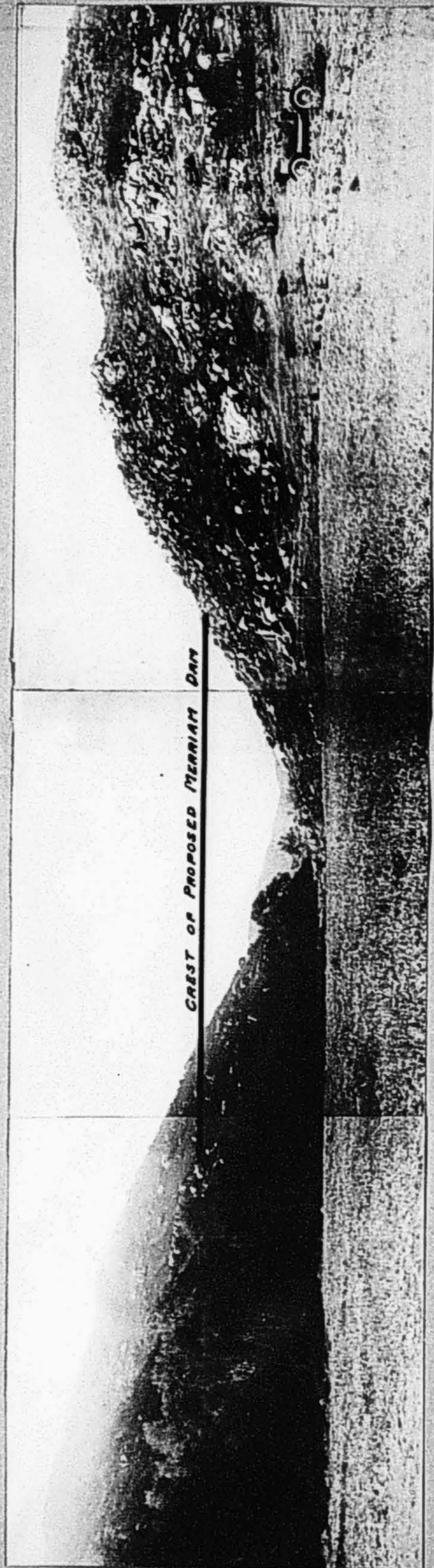
TPE:K

*Thos. P. Ellis.*

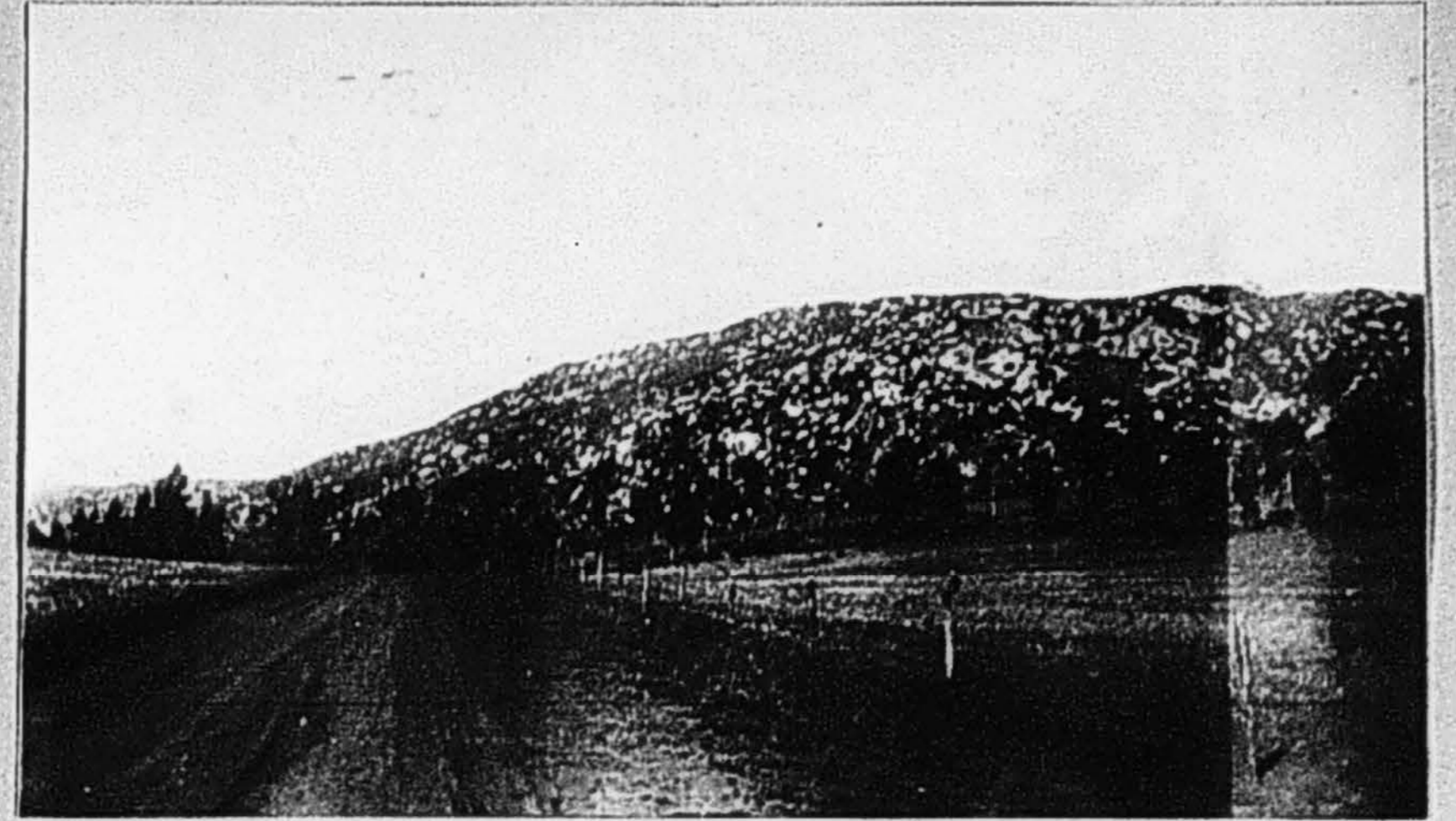




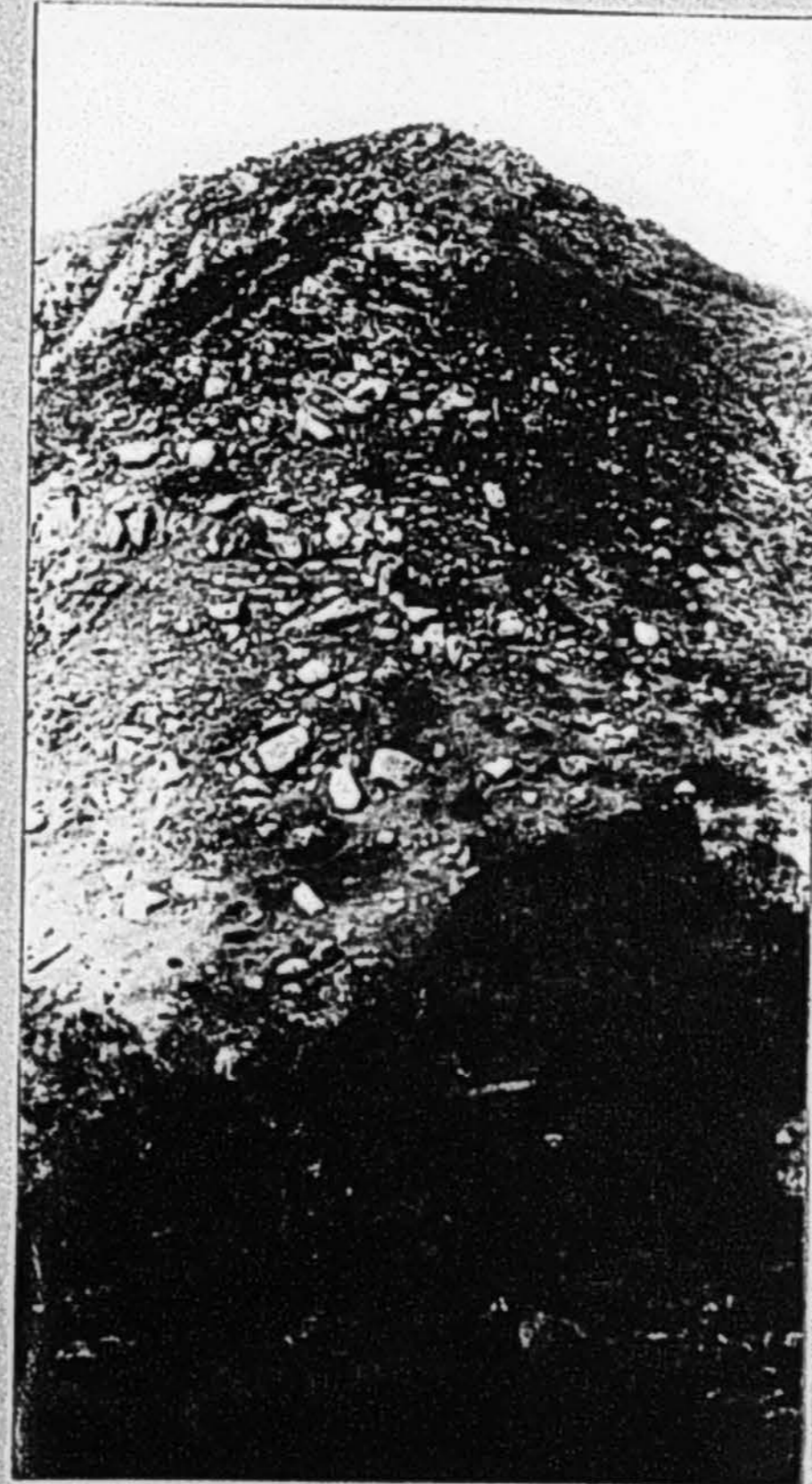
1. Reservoir Basin - Looking East from left bank of damsite.



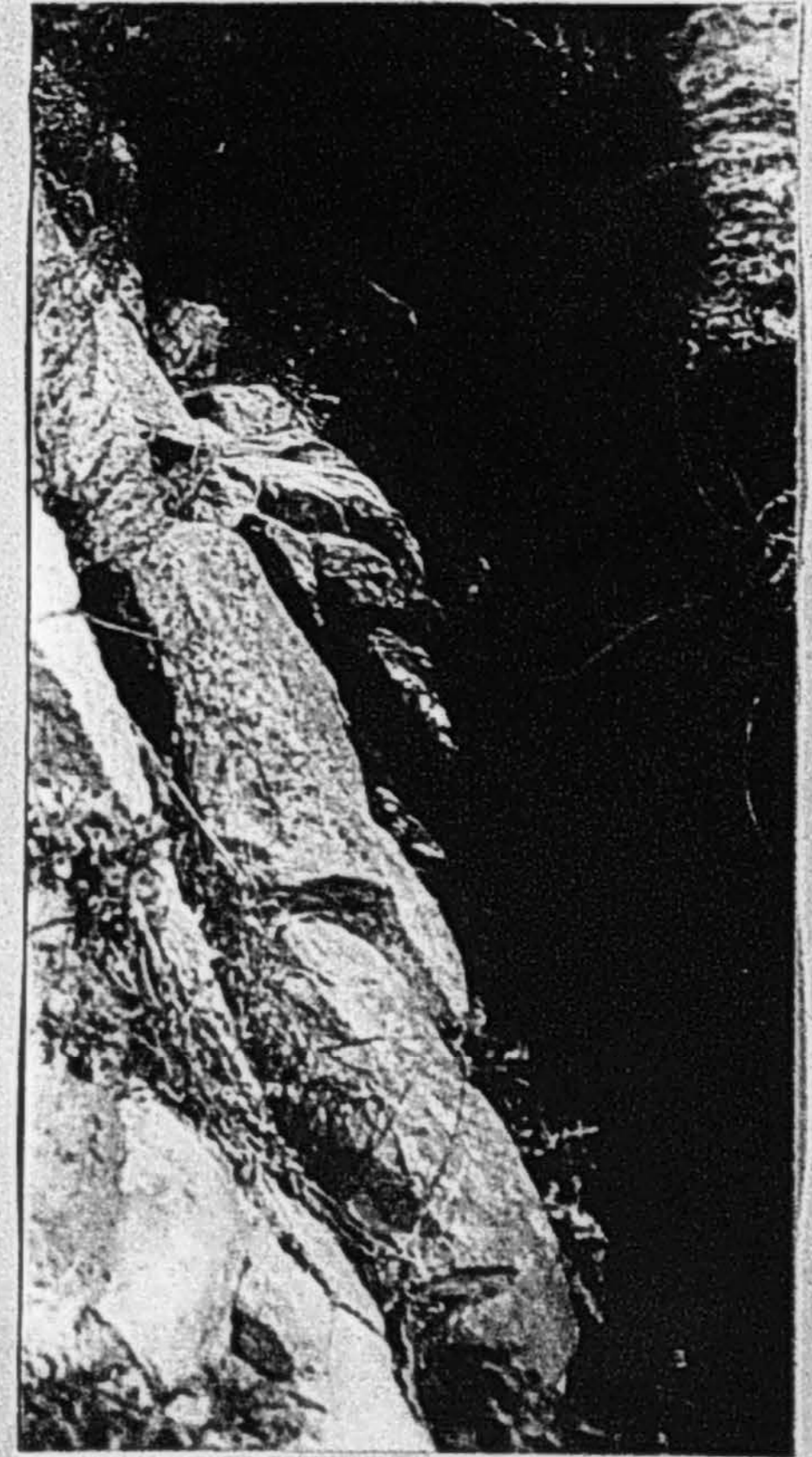
2. General View of Damsite.



3. View showing saddle where dike is required.



4. Right bank of damsite.



5. Nature of bedrock.



R4W

R3W

R2W

RIW

SB

PAUMA

BONSALL

GUAJOME

San Luis Rey

SAN LUIS REY RIVER

Oceanside

South Oceanside

Carlsbad

AGUA

ROAD

HEDIONDA

SAN MARCOS LATERAL

6.5 MI.

Lacosta

Merle

BUENA VISTA

VISTA

MAIN DISTRIBUTION LINE

0 MI. 5/8 MI.

PIPE

TWIN OAKS

RR

PIPE

RICHLAND

LATERAL

PIPE

6 MI.

SAN MARCOS

San Marcos

VALLECITOS

RICHLAND

VALLEY CENTER

MERRIAM RESERVOIR  
MERRIAM POWER DROP

MERRIAM CANAL

HIGHWAY

SAN PASQUAL L.I.R.

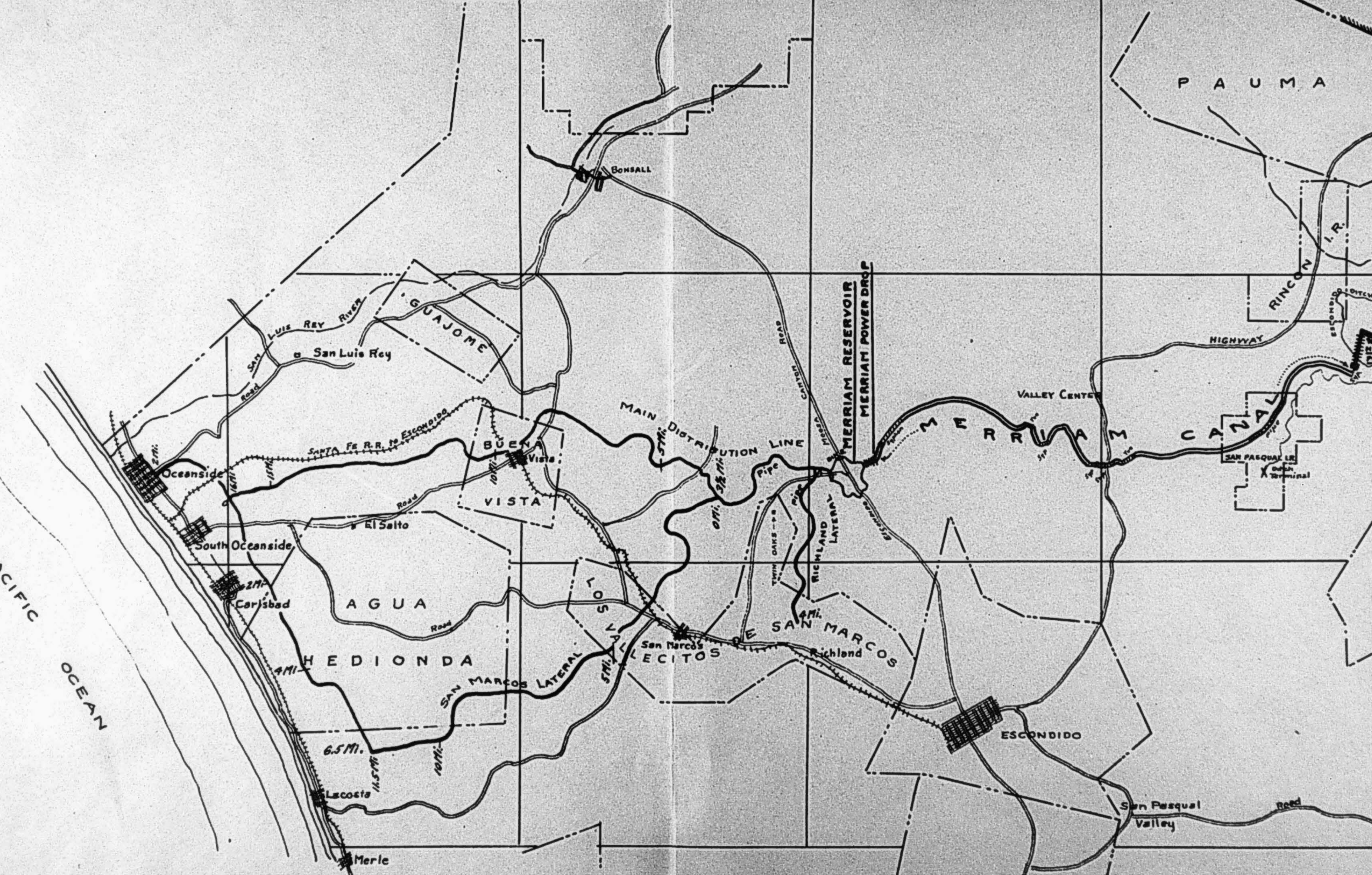
SAN PASQUAL L.I.R.

Terminal

ESCONDIDO

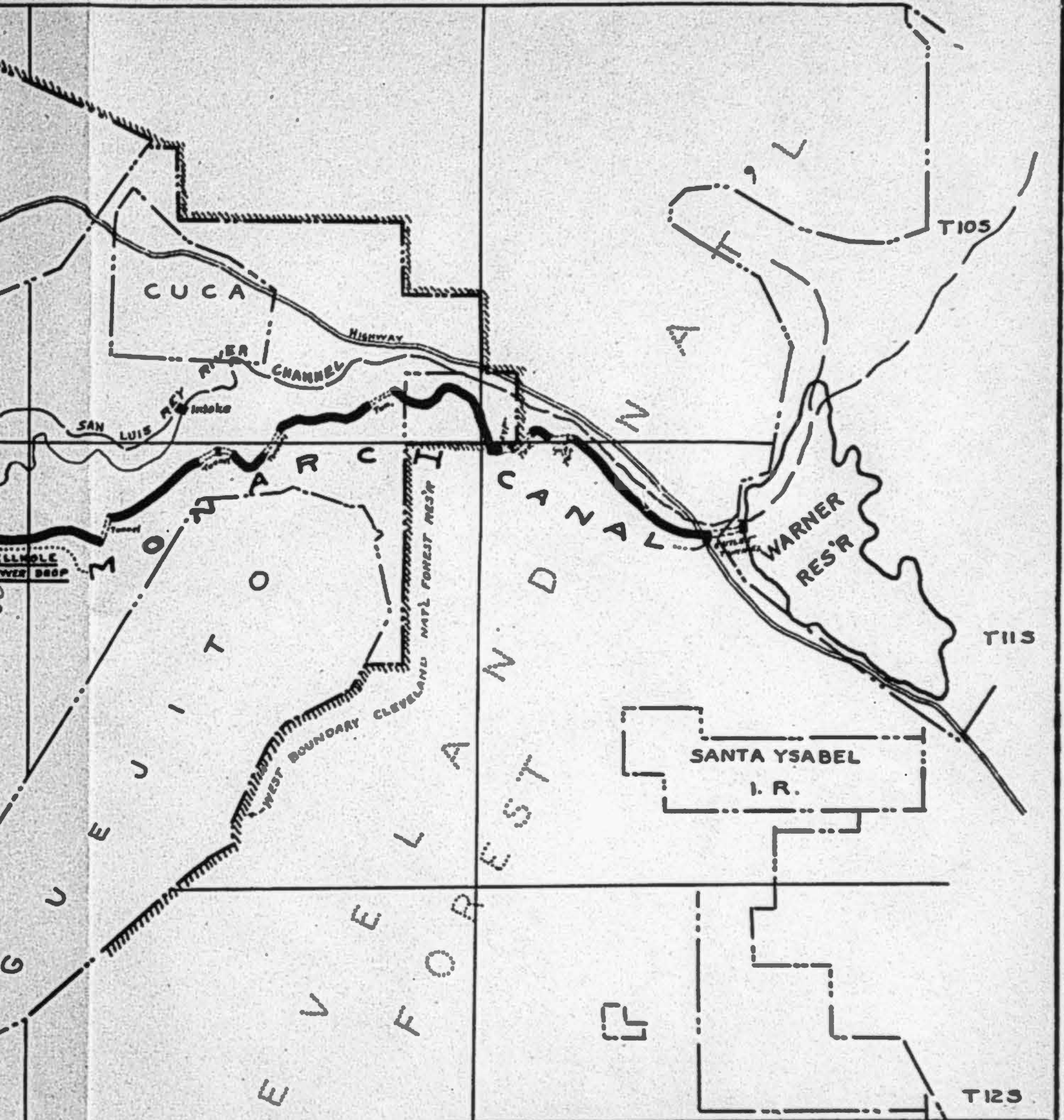
San Pasqual Valley

PACIFIC OCEAN





SBM. R1E R2E



**VOLCAN LAND & WATER CO.**

**MINIATURE MAP ACCOMPANYING LETTER**

**MONARCH-MERRIAM HYDRO-ELECTRIC POWER PROJECT**

**SCALE 1 IN = 2 Mi.**

THOS. P. ELLIS, ASST. ENGR.

DATE FEB. 4, 1918

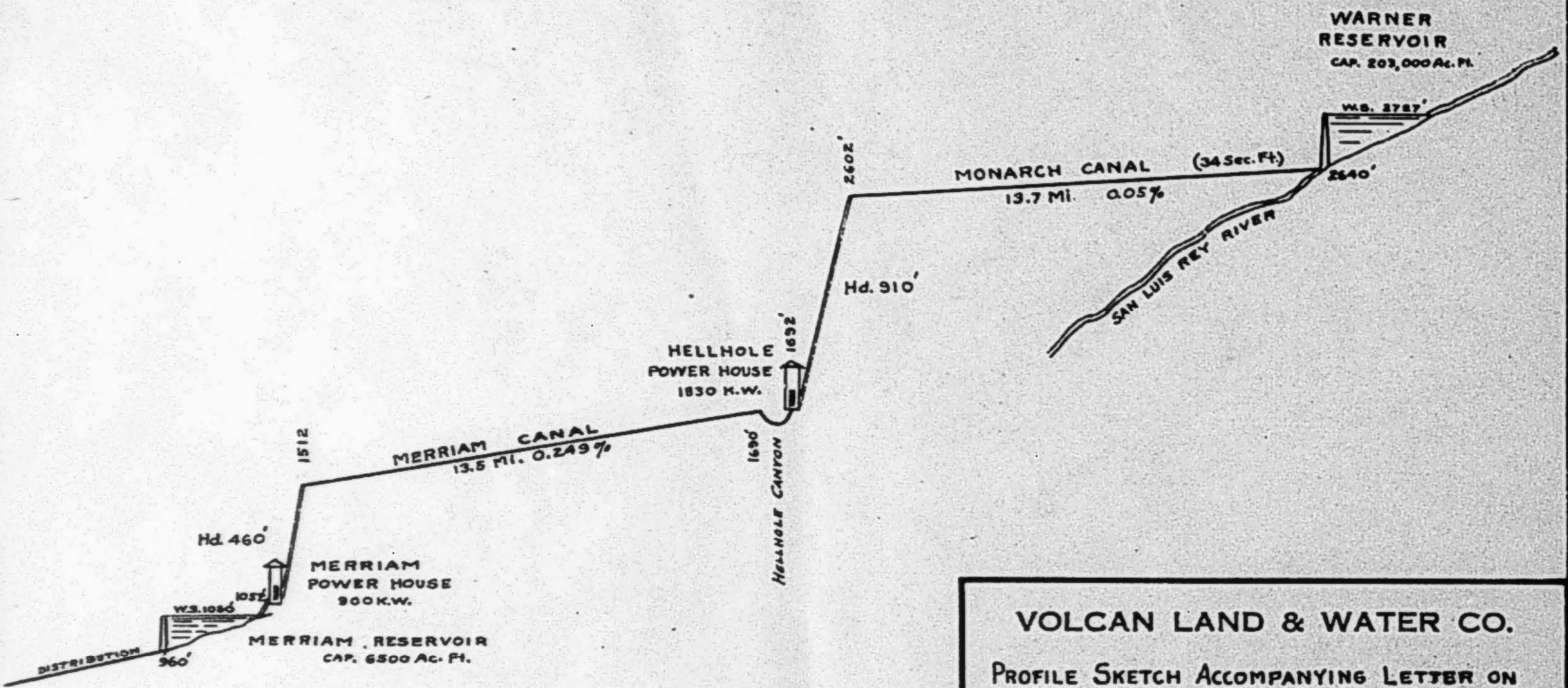
DRAWING No. 792 A

FILE No. T 2





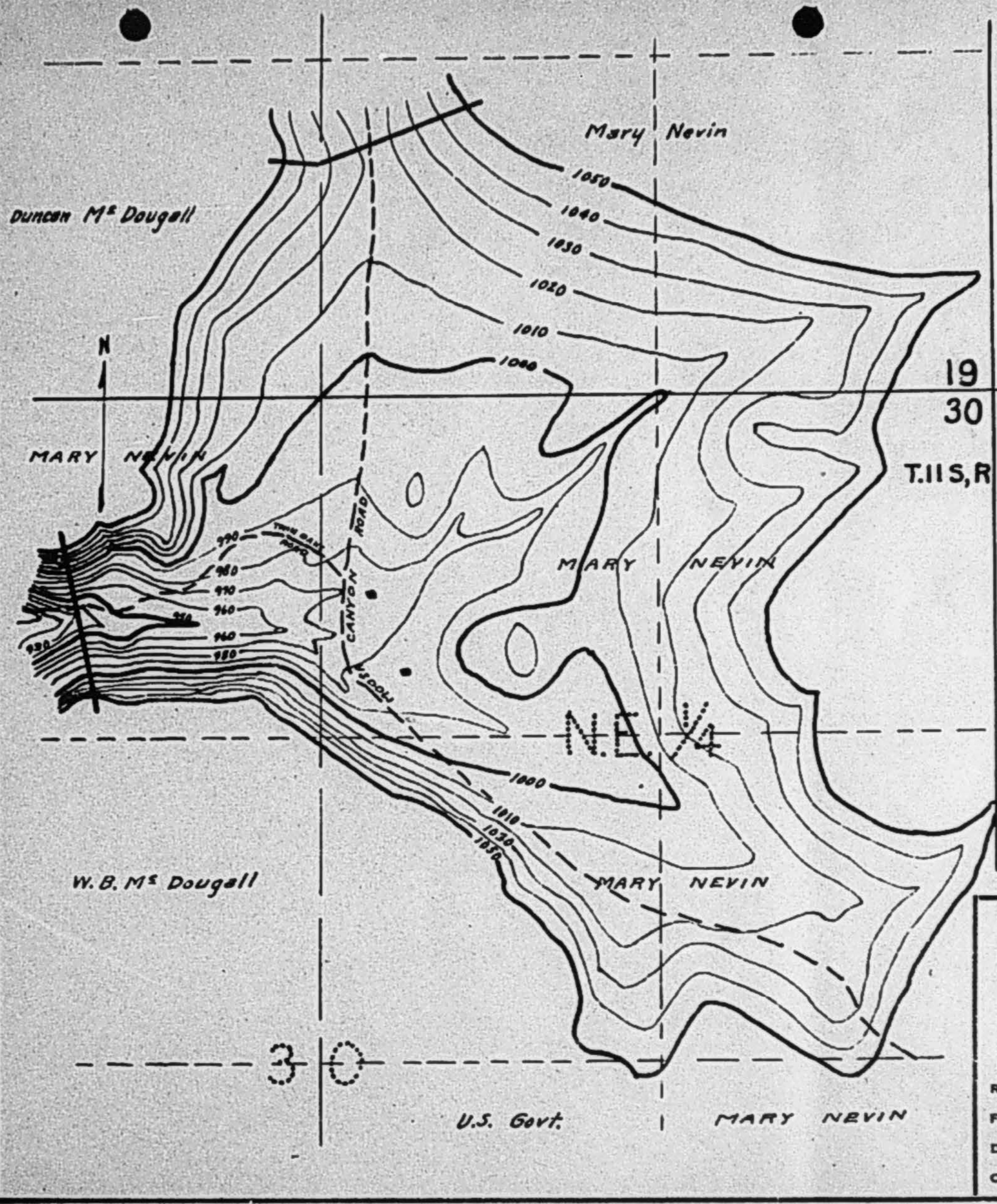




**VOLCAN LAND & WATER CO.**  
 PROFILE SKETCH ACCOMPANYING LETTER ON  
 MONARCH-MERRIAM HYDRO-ELECTRIC POWER PROJECT

T. F. ELLIS ASST. ENGR.  
 DATE FEB. 4, 1918

DRAWING No. 793A  
 FILE No. T 1



AREA AND CAPACITY TABLE

Contour	Depth	Acres	Ac. Ft. Cap.
930	0	0	0
940	10	0	0
950	20	0.7	3
960	30	3	21
970	40	5	61
980	50	11	141
990	60	23	311
1000	70	48	666
1010	80	76	1286
1020	90	106	2196
1030	100	133	3341
1040	110	158	4796
1050	120	176	6466

OUTLET  
**MERRIAM DAM (Multiple Arch)**  
 Earth-rock Fill to 1060' Contour, alternative  
 Top width 20'  
 Slopes { Upstream 2 1/2 to 1  
 Downstream 2 to 1  
 Volume 480,000 Cu. Yds.

**MERRIAM DIKE**  
 Earth fill to 1060' Contour.  
 Top width 20'  
 Slopes { Upstream 3 to 1  
 Downstream 2 1/2 to 1  
 Volume 85,580 Cu. Yds.

**VOLCAN LAND & WATER CO.**  
**MERRIAM RESERVOIR SITE**

(Miniature)  
 SCALE 1 IN = 600 FT. Approx.

REFERENCE MAP 789 T3  
 FIELD BOOK No. \_\_\_\_\_  
 DRAWN BY: Ellis  
 CHECKED BY: \_\_\_\_\_

Thos. P. Ellis, Engr.  
 DATE Feb. 1918  
 DRAWING No. 791  
 FILE No. T 1

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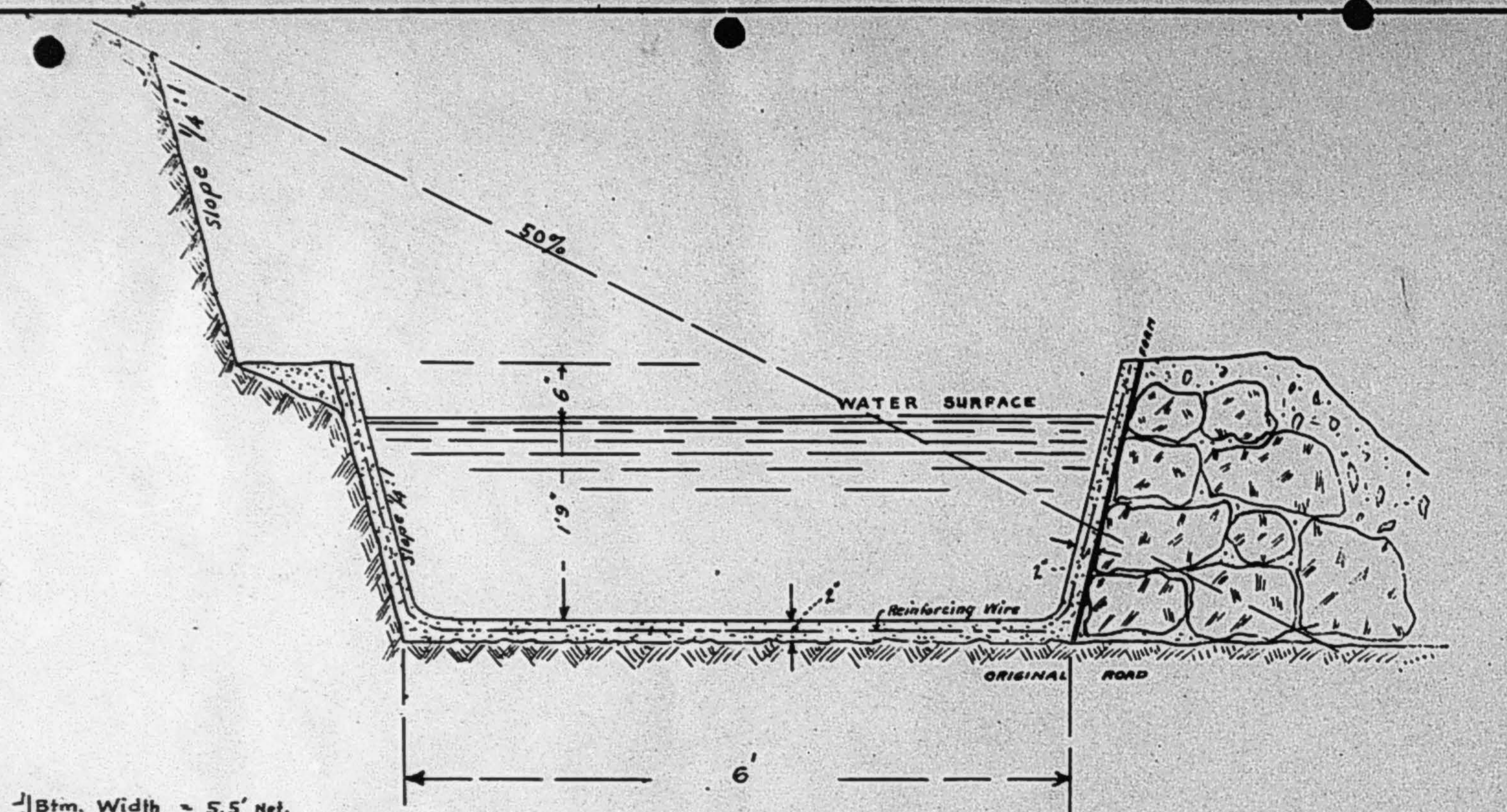
PLATE 5

VOLCAN LAND & WATER COMPANY

WARNER RESERVOIR CAPACITIES

July 17, 1917

Contour U S G S	Depth	Acres Flooded	Total Acre Feet
2620	0	0	0
2630	10	17	58
2640	20	58	433
2650	30	260	2,023
2660	40	875	7,698
2670	50	1,405	19,098
2680	60	1,822	35,233
2690	70	2,300	55,845
2700	80	2,960	82,145
2710	90	4,010	116,995
2715	95	4,560	138,420
2720	100	5,340	163,170
2727	107	6,080	205,140



MONARCH CANAL  
 Btm. Width = 5.5' Net.  
 W.S. " = 6.4' -  
 Top " = 6.65'  
 Hyd.  
 S = .001  
 n = .015  
 A = 10.4 Sq. ft.  
 P = 9.1  
 r = 1.14  
 V = 3.42 Ft/Sec.  
 Q = 35.60 Sec. Ft.

1:3 Gunite Canal  
 Cu. Yds. Mortar per lin. ft. = 0.067  
 1 Cu. Yd. mortar to 15 ft. of canal  
 1 Cu. Yd. Exca/Lin. ft. 50% slope  
 Reinforced with 12 1/2 g. 2x4 mesh

IDEAL TEST FOR SAND OR SCREENINGS  

% Passing	4	10	20	30	40	50	100	200	lbs. per B"
%	100	60	40	30	20	10	5	+	30 750 7400

 1 Sack cement 3 cu. ft. Sand = 2.95 cu. ft. plastic mortar.

**VOLCAN LAND & WATER CO.**  
 STYLE OF GUNITE CONDUIT PROPOSED FOR  
 MONARCH & MERRIAM CANALS  
 SCALE  $\frac{3}{4}$  IN = 1 FT. FT.  
 Thos. P. Ellis, Asst. Engr.  
 DATE Feb. 4, 1918  
 DRAWING No. 794  
 FILE No. TI

Page 9 PLATE 4



**Ed Fletcher Papers**

**1870-1955**

**MSS.81**

**Box: 36 Folder: 14**

**Business Records - Reports - Ellis, Thomas P - "Letter to Col. Ed Fletcher on the cost to deliver water from Warners to District - Oceanside to Escondido"**



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