



MAP SHOWING  
 COMPARATIVE PLANS FOR POWER DEVELOPMENT  
 WATER FROM  
 WARNER AND SUTHERLAND RESERVOIRS  
 LETTER OF SEPT. 25, 1917

LEGEND:  
 ESTIMATE #1 ——— BAUM  
 " #2 - - - - - POST  
 " #3 - - - - - ELLIS

Thos. P. Ellis



MAP SHOWING  
 COMPARATIVE PLANS FOR POWER DEVELOPMENT  
 WATER FROM  
 WARNER AND SUTHERLAND RESERVOIRS  
 LETTER OF SEPT. 25, 1917

Thos. P. Ellis

LEGEND:  
 ESTIMATE #1 ——— BAUM  
 " #2 ——— POET  
 " #3 ——— ELLIS

Letter  
POWER DEVELOPMENT  
 incidental to the use of  
IRRIGATION and DOMESTIC WATER  
 on the  
VOLCAN SYSTEM

T.P. Ellis  
 Sept. 25, 1917

September 25, 1917

Col. Ed Fletcher,  
Office.

Dear Sir:-

I herewith submit preliminary survey maps covering the proposed Warner-Sutherland Power Conduit via the Warner-Temescal long tunnel, south along the east side of Pamo Valley and along the north side of Santa Ysabel Creek. A two head penstock is provided for a power house just east of the Holland farm house, discharging into Site E Pamo Reservoir.

#### Conduit

The Warner Conduit, after leaving the Temescal Tunnel Portal, traverses very rough hillside and construction would be very difficult for five or six miles of the way to the power drop. The balance of the line would involve the conduit from Sutherland. Two miles of this is also rough but the construction would not be so difficult as on the Warner portion of the line.

#### Tunnels

The Warner end of the conduit requires two tunnels with total length of 19,600 feet, and the Sutherland end 820 feet of tunnel.

#### Power Drop

The power penstocks are located upon a prominent ridge and provide heads of 1,542 feet for the high pressure and 849 feet for the low pressure drop, with outlet at the 1,045 foot elevation.

Col. Ed Fletcher,  
Page 2.

#### Site E Pamo Reservoir

This site offers no exceptional features for a good dam. The location is much better, however, than Site D immediately below and, volume for volume, will hold more water per yard of material used in construction. (See tables)

This location is objectionable in that

(1) Thirty feet of head is lost in the power house location.

(2) The foundation is of a silty nature and may require a great deal of preparatory work.

(3) The cost of a dam would be excessive compared to the amount of water impounded.

#### Estimate

(1) The cost of the above mentioned conduit installation will be \$848,000.

(2) The independent plants at Pine Mountain and Kerr Mountain as per Post's estimate (1912-1914) is \$652,000.

(3) The cost of a long tunnel through to Black Canyon, which is recommended instead of the first mentioned installation to obtain the same result, will cost \$844,000.

The unit costs used are based upon the February 1917 report of W.S. Post and Francis L. Sellow and should be considered 20% low at this time.

A one-hundred foot earth dam at Site E, Pamo, capable of impounding 14,754 acre feet (4,810 million gallons), will cost about \$1,000,000.

Recommendations

In view of the fact -

(a) That a two head power house is cheaper to maintain and operate than two independent plants.

(b) That 85 feet additional head in one case and a 58 foot in the other can be obtained by a power drop on the north side of Santa Ysabel Creek into Pamo Reservoir.

(c) That a long tunnel conduit is cheaper to maintain and operate than this hillside pipe line although the first cost will be practically the same.

(d) That the distance is shortened about three and a quarter miles.

(e) That the runoff of Black Canyon can be utilized for power purposes (5700 ac.ft. per annum).

(f) That the pressure head of the reservoir may be utilized in the Black Canyon tunnel economically and without costly inlet.

(g) That the Pamo Reservoir can be enlarged to store its own runoff with the addition of one-half of the Warner storage, thus saving a part of the loss from evaporation in Warners and utilizing it for power by throwing it into Pamo before June first, thereby decreasing the height of Warners Dam.

I therefore recommend that the Black Canyon tunnel survey be made; that the Pamo Reservoir contours be obtained up to elevation 1015, to give a 200 ft. dam with capacity to exceed 100,000 acre feet; that the entire layout be re-figured for wood stave or other pressure

pipe; that, if possible, a large storage be provided at San Clemente to allow taking out of additional power between this reservoir and Pamo, the idea being to utilize every foot of head for power by dropping the water to lower reservoirs as quickly as possible and still have elevation enough to utilize all for irrigation purposes.

Respectfully submitted,

Assistant Engineer,  
Volcan Land & Water Company

E:K

ESTIMATE NO. 1

WARNER-SUTHERLAND POWER CANAL

(Pamö Valley long Conduit)

Conduit and Pressure Pipes

Warner End Complete

Bench	32,100 at 4.00	-----	128,400	
Tunnel	19,600 at 16.00	-----	313,600	
Penstock	4,460 at 19.00	-----	84,740	
Cut	1,000 at 8.00	-----	8,000	
Syphon Trestle	1,600 at 10.00	---	<u>16,000</u>	550,740

Sutherland End Complete

Bench	33,498 at 4.00	--	134,000	
Tunnel	820 at 14.00	--	11,480	
Penstock	2,250 at 10.00	--	22,500	
Cut	225 at 8.00	--	1,800	
Syphon Trestle	1,690 at 10.00	--	<u>16,900</u>	<u>186,680</u>

Overhead 15%	-----		<u>737,420</u>	
			<u>110,613</u>	

\$848,033

**Ed Fletcher Papers**

**1870-1955**

**MSS.81**

**Box: 36 Folder: 11**

**Business Records - Reports - Ellis, Thomas P -  
"Letter: Power Development incidental to the use of  
irrigation and domestic water on the Volcan System"**



**Copyright:** UC Regents

**Use:** This work is available from the UC San Diego Libraries. This digital copy of the work is intended to support research, teaching, and private study.

**Constraints:** This work is protected by the U.S. Copyright Law (Title 17, U.S.C.). Use of this work beyond that allowed by "fair use" requires written permission of the UC Regents. Permission may be obtained from the UC San Diego Libraries department having custody of the work (<http://libraries.ucsd.edu/collections/mscl/>). Responsibility for obtaining permissions and any use and distribution of this work rests exclusively with the user and not the UC San Diego Libraries.