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REPORT ON RESULTS
OF
INVESTIGATIONS OF THE GROUND WATERS
IN
SAN PASQUAL VALLEY

(1922)

W. P. Rowe

F. E. Green.

38

November
-22-
1922.

Los Angeles, California,

Mr. J. B. Lippincott, Chief Engineer,
San Dieguito Mutual Water Co.,

and

San Diego County Water Co.,
1104 Central Building,
Los Angeles, California.

Dear Sirs:-

We are handing you herewith a joint report made
on the investigation of the ground water in the San Pasqual
Valley during this past summer. This investigation was
made at your request for the San Diego County Water Company
and the San Dieguito Mutual Water Company.

Respectfully submitted,

(Signed) W. P. Rowe

" F. E. Green

ENGINEERING OFFICES
J. B. LIPPINCOTT
LOS ANGELES, CAL.

November 22, 1922.

INVESTIGATIONS OF THE GROUND WATERS IN
SAN PASQUAL VALLEY - - 1922

The Santa Ysabel River is known by this name in its upper reaches. In the foothills south of Escondido it is sometimes called the "Bernardo", and in its lower course near the sea it is commonly known as the "San Dieguito". The Santa Ysabel River rises in the Volcan Mountains at elevations of 5000 feet and flows in a general westerly direction, passing through the Sutherland Damsite at an elevation of 1910 feet. There are 53 square miles of drainage area above this Sutherland Damsite. The San Diego County Water Company propose to construct this dam. A gaging station has been maintained at this point since 1913.

Below the Sutherland Damsite, at an elevation of 980 feet, is what is known as the Pamo Dam and Reservoir site. Including the Sutherland area mentioned above, there are 110 square miles of drainage area above this Pamo Damsite. The River flows through a narrow, rocky canyon from the Pamo Damsite to the San Pasqual Valley, which has an elevation at its upper end of 450 feet. Below this Valley the River is again confined between rolling foothills. It passes through the Hodges Damsite at an elevation of 200 feet, with a total

drainage area of 317 square miles. This reservoir has a storage capacity of 37,500 acre feet. At this place the River is in a narrow, box-like canyon which has been eroded in an intrusive volcanic dike. Below this canyon the River again broadens out and passes through what is known as the San Dieguito Valley, emptying into the sea just north of Del Mar.

The San Pasqual Valley floor consists of deposits of fine sand and silt, which have been laid down by the River during its flood stages. The Valley contains 3057 acres of tillable land. It is surrounded by abrupt hills. Wells have been put down, according to Lee, to a maximum depth of 150 feet, but as far as known, none of them have reached bedrock. This Valley was settled in the early fifties. It is irrigated by a main canal called the East San Pasqual Ditch, which diverts its water at the extreme eastern end of the Valley. It was built in 1887.

The West San Pasqual Ditch, built in 1853, and which irrigates the area north of the River, had its headworks just below the mouth of the Guejito Creek. It was in a position to irrigate practically all of the flat lands on the north side of the Valley. Because of litigation and poor engineering construction, the headworks of the West San Pasqual Ditch at the present time are abandoned.

Although the San Pasqual Valley fill has a high percentage of porosity and absorbs water readily, the sand particles

have a small effective size and do not yield their water as readily by pumping, as, for instance, some of the wells in the San Bernardino and San Gabriel Valleys. For this reason, none of the wells have a large yield. Most of the pumping plants have their suction connected with two or more wells. The most common method of drilling wells is to carry gravel down along the outside of the casing while the well is being sunk. This improves the porosity of the material adjacent to the well and thus increases the freedom of the movement of the water into it. The casing of these wells is usually perforated before being sunk, so that the water may enter at any depth. The gravel acts as a screen and keeps the fine material from running through the perforations and filling the casing. Due to the slight yearly fluctuations in the water plane, centrifugal pumps are used and placed near the high water line in pits or shafts. Horizontal centrifugal pumps, direct connected to electric motors, are the latest practice in pumping installation in this neighborhood. The accompanying Table No. 2 gives the detailed data with reference to the various pumping plants in the Valley, the amounts pumped and the chemical quality of the water, which is uniformly good. Water containing less than seventy-five parts per hundred thousand of mineral matter are generally accepted as satisfactory for domestic or irrigation use. The wells of this Valley range from 26 to 67 parts per hundred thousand. Well No. 1 belonging to G.J. Bach, at the mouth of Bach Creek, is really outside of the floor

of the Valley and not typical of its ground water conditions. The lifts from these wells, with the plant operating, generally range from 30 to 40 feet. This is one of the largest and best underground reservoir sites in San Diego County.

The Valley is primarily devoted to dairying, with a few orchards in the upper end of it. Because of the dairying industry, there is a large acreage of corn and similar fodder crops requiring relatively little irrigation water, together with other substantial areas of alfalfa upon which depths as great as 6-1/2 feet are applied annually, as indicated in Table No. 2.

Riparian Lands and Ownerships: Two maps are included, showing the present owners of land in the San Pasqual Valley and the riparian lands. The ownership map for 1922 is from the records in the San Diego County Assessor's office and is substantially correct. There are two exceptions, however. Mr. E. H. Webb, is farming the Elbert Ward property, and we are informed that he has purchased this property. Mr. W. Worthington informed us that he owned 60 acres and was farming the land to the north of his place as shown on the map. The map gives the area of the Worthington property as 45 acres, and if the Casson Ranch of 15 acres is included, it will make the 60 acres he claims to own. The riparian lands map is the result of a search of the County records of ownerships from 1870 to date. It is based on the theory that land that is once separated from its riparian rights by purchase or gift does not regain those rights even if the original owner should subsequently acquire them.

Definition: Riparian lands in this report are considered as lands that touch either the thread of the normal flow of the stream or the lower banks thereof. They do not include adjacent lands not touching the thread of the normal flow of the river or the banks thereof, under which lands the ground waters of the San Pasqual Valley percolate.

New Diversions and Old: In 1922 there were only five ditch diversions made. The uppermost is the old Harris ditch with riparian rights. The second ditch is the old East San Pasqual, which has a well established right by appropriation and adverse use. The third ditch is the upper Webb ditch. This was constructed about 1917 and irrigates riparian land. In 1922 Webb estopped the West San Pasqual Ditch from transporting water across his land as he has an old contract, dating from the time of the construction of the ditch, specifying that he can do so if the West San Pasqual Ditch should become obnoxious to him. The Superior Court of San Diego County, within the past year, sustained him when he denied the West San Pasqual Company the right to continue to operate their canal across his land. For this reason the West San Pasqual Ditch was not operated during the past year.

The fourth ditch is the Webb lower ditch. It has a large cross-sectional area, but with such a flat grade that it can carry about 25-inches (0.5 sec. feet) of water only. It is a new diversion made in 1922 and irrigates riparian land.

The fifth and lowest ditch is the Hall ditch. This is on the south side of the River but crosses to the north side

at Hall's Ranch in a steel pipe siphon. It is used to irrigate riparian land but has its intake on land that does not belong to Hall. It was first used in 1922. Hall formerly irrigated from the West San Pasqual Ditch.

The remaining ditches formerly used as the West San Pasqual and the Myars Ditch did not divert any water this year (1922), as their headgates were washed out in December 1921 and have not been replaced.

To summarize: None of the ditches in the San Pasqual Valley have extended the areas served, but rather the reverse is true, with the exception of the Hall Ditch, which is unimportant and which is furnishing riparian lands, and the lower Webb ditch, also unimportant.

Irrigated Areas: Attached to this report are three maps depicting the areas of the different irrigated crops for 1911, 1917 and 1922. The areas shown on the first two maps are taken from old maps made for the Volcan Land & Water Company by Mr. T. P. Ellis (now deceased), in the respective years, while the map for 1922 is the result of investigations made for you by W. P. Rowe and F. B. Green. The areas for 1922 are also shown in tabulated form (Table No. 2). A glance at the maps will show the area irrigated before the 1916 flood to be larger than the area in 1917, the year after the flood. Even in 1922 the Valley had not recovered from the effects of the 1916 flood.

Until some extensive work is done to relieve the damage of the periodic floods, there probably will be no extensive

improvements made in the Valley floor. At present there is a tendency toward irrigating the higher and more valuable lands by means of pumping plants.

H. G. Fenton this year started pumping water to 30 acres of non-riparian land in Sec. 3 T 13 S R I W. This land has not previously been irrigated. This is shown on Map No. 3-B and 4-C.

There is an extensive stretch of non-riparian high land on the north side of the Valley that is susceptible to irrigation with pumps, that has not yet been irrigated. This land, being on a good slope with southern exposure, may be adapted for citrus fruit and early vegetables. Mr. Henry Johnson's place at the head of the Valley is an example of what can be done under similar conditions.

The floods of 1916 and the winter of 1921-22 have eroded portions of the Valley and have spread sands over a considerable area of the agricultural land.

Duty of Water: The areas of land in the San Pasqual Valley above the Bernardo Ranch line and excluding Bach's land, are classified for 1922 as follows:

Alfalfa	338	acres
Corn	259	"
Orchard	62	"
Truck & Misc.	10	"
Grain	273	"
Farmyard & Pasture	1269	"
Willow & Streambed	846	"
Total arable land	3057	"

The land irrigated in 1922 is classified as follows:

Alfalfa	375	acres, including Bach & San Pasqual Ranch
Corn	218	"
Orchard	62	"
Truck	10	"
Total -	665	"

There were 16 acres of alfalfa and 41 acres of corn on the Wood place that were not irrigated in 1922, and these have been excluded above. There are also 58 acres of alfalfa (Hall, Fenton and Judson) land that is used for pasture but could have been irrigated with ditch water that are not included above.

The total amount of water diverted and pumped from April to October 18, 1922, is as follows:

Ditch diversion at Intake	1605	ac. ft.
Pumped	1016	" "
T o t a l	2621	" "
Acres irrigated	665	acres
Water used	2621	acre feet
Average duty of water, all crops	3.9	acre feet.

In the case of this water that is diverted and spread upon the Valley, an unknown portion is lost by surface evaporation. The pumping extraction of 1016 acre feet will lower the water plane. As these lands are very porous, however, it is believed that the greater portion of this water that is pumped returns to the water plane.

The above amounts of diverted water and pumped water are for the period from April to October 18, 1922, assuming that there were no diversions prior to June 15th. Mr. F.E.Green

observed no diversion prior to this date. Earlier diversions from the River were prevented because of the headworks being washed out.

From the above we have arrived at the following duties of water from the San Pasqual Valley for the entire irrigation season of 1922 -

Alfalfa	375 acres	6.2 ac. ft.	=	2325
Corn	218 "	2.0 "	" "	654
Orchard	62 "	3.0 "	" "	186
Truck	10 "	6.2 "	" "	62

3227 Ac. Ft.

The above results are based on the duty for alfalfa and truck under pumped water. The duties for orchard and corn are assumed, although there were large areas of corn which received no irrigation whatever, the areas of which are included above. Using the land under the East San Pasqual Ditch as a basis, we obtain much lower duties, but part of this is attributed to the wasting of water and the transmission losses in the ditches. The use of water under the ditches is excessive. The loss of water in transit in the ditches was not measured but is believed to be large.

The total diversion during 1922 of 1605 acre feet is considerably under the maximum seasonal diversion shown in our records of 3180 acre feet during 1913, although there was a long continuous flow in the river this year.

Hydrographic Map: The hydrographic contours on Map No. 5 show the direction of movement of the underflow of the San Pasqual Valley. They indicate a feed coming in from the Guejito Creek and also one from Bach's Creek, but we do not

have sufficient data to draw the contours in the Santa Maria Creek delta. At the mouth of Bach's Creek there is a ponded condition, the slope of the water table being from the San Pasqual toward the lakes and the feed from Bach's Canyon also being toward the lakes. This ponded condition results in the feed from San Pasqual being cut off from Well No. 1, although it undoubtedly helps maintain the water level in the well through back pressure of the feed from Bach's Canyon.

Table No. 2 of the wells of the Valley also shows the physical characteristics of the various pumping plants and of the quality of the water extracted from them. The wells east of the San Pasqual Bridge at the upper end of the Valley are not only more productive, but the temperature of the water is lower and the salt content lower than the wells west thereof. The hydrographic (Map 5) contours at the junction of Guejito Creek with the Santa Ysabel are indicative of a restriction or barrier of some kind, as is shown by their being closer together than either to the east or west. This barrier may be the result of a fault extending down Guejito Creek and crossing the San Pasqual Valley, or may be due to the delta of Guejito Creek, which may have been built up through heavy floods from Guejito basin with insufficient floods in the Santa Ysabel to carry away the fine, tight material deposited. We were informed by a Mr. Boyle that Well No. 41 in the direct path of this barrier or dike, can only pump to capacity for six hours when it draws air and has to be shut down to await

the return of the water. This is the only place along the River where there is any definite evidence of a dike. In dry years, when the water plane is lower and there is more contrast to supply and use, the hydrographic contours may bring to light other conditions that are not apparent this year on account of the saturation of the Valley floor.

The area of the saturated Valley floor, as shown on Map No. 5, is about 2430 acres. By averaging the fluctuation of the wells for different groups to avoid several wells in a compact group outweighing an isolated well, we get an average drop in the water plane from July 19th to October 21th of 1.43 feet. This, assuming 30% voids, after the water is extracted, would give a loss of 1045 acre feet. There was only a small inflow into the Valley during this period, as the East San Pasqual Ditch diverted practically all of the water. A study of the fluctuation in three test wells on which we have long time records, shows that the average drop in the water plane from its highest elevation in the spring of 1922 to July 18th was 0.8 feet. This would make the total drop for the season 2.23 feet, with a consequent loss of 1625 acre feet, using 30% voids. During this period when the observations were made on the fluctuations of the water levels in the wells, there was diverted by the East San Pasqual Ditch and spread over the eastern portion of the Valley 930 acre feet, as shown in Table No. 2. This, if added to the 1625 acre feet of loss as indicated by the drop of levels in the wells alone, would make a total of 2555 acre feet. In addi-

tion to this, however, prior to the repair of the headworks of the East San Pasqual Ditch in the first part of June, water was entering the Valley through the natural channel of the River and flowing the entire length thereof through the sandy channel of the River, tending to counteract the evaporation losses indicated by the drop of the levels in the wells. The amount of this absorption can not be definitely determined, but it was probably quite substantial because of the relatively large volume of water flowing in the stream at that time.

Due to the dike or barrier at the mouth of the Guejito Creek, the underflow rises and flows on the surface at this point and this rising water supplied the Webb and the Hall ditches. The approximate amounts of these diversions is shown in Table No. 2.

Conclusions:

First - The San Pasqual Valley is seriously injured by the proximity of the water plane to the surface of the Valley floor.-

- (a) Because the land becomes water logged
- (b) Because of consequent deposition of alkali resulting therefrom.

The Valley would be decidedly benefitted by the impounding of the flood flows above it, because this would prevent erosion and the deposition of sands over cultivated areas. It would also be improved by pumping operations which would remove the surplus water, resulting in the lowering of the water plane below the influence of evaporation.

Second - The effect of Lake Hodges on the slope of the water plane will not be felt above the east line of the Bernardo Ranch (see diagram 8)

Third - The only underground barrier found by our study in the San Pasqual Valley is at the mouth of Guejito Creek. The more valuable land at present lies above this. Extractions made from the westerly portion of the Valley below this point would not affect water levels above it.

Fourth - The actual riparian land is not very extensive. It includes only those forty acre tracts that are riparian at the present time with a few exceptions in the lower end of the Valley.

Fifth - If the ditches are limited to the amount of water put to beneficial use for the past five years, their respective rights would be greatly decreased due to the decrease in irrigated areas since 1916 (Table 2).

Sixth - The duty of water as found is approximately:

6.2	Ac.	Ft.	for alfalfa and garden truck
2.0	"	"	" corn
3.0	"	"	" orchards.

Seventh - The only new ditch diversions made in 1922 were on riparian land and the amount diverted was small. Attention, however, is called to the new pumping plant of H. G. Fenton for the irrigation of 30 acres of alfalfa in Sec. 3 on the south side of the Valley.

Eighth - The amount of water diverted and pumped in

1922 was a minimum due to the excess of water in the Valley and the washing out of diversion dams. When the flow of the River is above normal in the spring, the diversions are generally made later, after the flow is stable.

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FLOW IN ACRE FEET, SAN PASQUAL DITCHES

Y E A R 1 9 2 2 .

Month	Timm	Harris	East San Pasqual	West San Pasqual	WEBB	Myers	Hall
June (15 to 30)		9	111		18		18
July		25	500		22		44
August		20	284		0		44
September		18	22		0		0
October		13	91		0		0
November (1 to 18)		10	208		0		0
TOTAL	0	95	1216	0	40	0	84
					322		
					Up- per		
					Lower		

NOTE: No other diversions were made than as listed above.

SAN PASQUAL DITCH DIVERSIONS

Acre Feet

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
Jan.	0	E 154 W 63	E 0 W 133	W 52	0	x	x	x	B 120 E 180	x	x
Feb.	0	E 393 W 115	E 0 W 295	W 138	0	x	x	x	M 90 E 500	B 120 E 400	0
Mar.	E 285 W 505	E 224 W 314	E 700 W 389	W 81	0	x	x	x	E 400	M 100 B 180 E 200	0
Apr.	E 238 W 504	E 231 W 254	E 400 W 248	W 245	0	x	x	x	E 500 W 120 M 105	W 120 M 105	0
May	E 155 W 360	E 243 W 24	E 200 W 229	W 95	0	x	x	x	M 50 E 600 W 360	x	0
June	E 118 W 120	E 98 W 1	E 200 W 68	W 228	0	x	x	x	E 180 W 300	0	296
July	E 30 W 8	0	0	W 360	0	x	x	x	0	0	744
Aug.	0	0	0	0	0	x	x	x	0	0	326
Sept.	0	0	0	0	0	x	x	x	0	0	50
Oct.	0	0	0	0	0	x	x	x	0	0	109
Nov.	0	W 18	x	0	x	E 26	x	x	0	0	220
Dec.	0	W 37	x	0	x	E 210	x	x	0	0	x
Tptal	E 826 W 1497	E 1343 W 826	E 160 W 1362	E *500 W 1197					B *600 E 2360	B 300 E 600	Total of all ditch: es
TOT. For year	2323	2169	1522	1697	0				3985	1225	1747

E = East San Pasqual Ditch
W = West " " "
B = Webb "
M = Myars "
x = No Record
* Estimated

For years 1912-15 there is no record of any other ditches than the East San Pasqual and West San Pasqual, although there were probably other diversions.

CHARACTERISTICS AND PROPERTIES OF PUMPING PLANTS IN SAN PASQUAL VALLEY

OCTOBER 1934

Plant No.	Elev. at Pump	Elev. at Well	Depth of Well	Diameter of Well	Type of Well	H.P. at Pump	K.W. at Pump	Total Pump-HP	No. of Pumps	Plant No.	Depth	Description of Material Encountered in Well	Remarks
1	1450	1350	10	15	14520	55	0.8	4.7	51%	1	10	Well - gravel - bottom (100)	
2	1500	1400	10	10	1500	50%	-	-	-	2	20	Well - gravel - bottom (100)	
3	1600	1500	10	12	26270	27	1.0	4.1	31%	3	30	Well - sand - mud	
4	1700	1600	10	12	3150	35%	1.5	5.0	38%	4	40	Well - fine sand - mud	
5	1800	1700	10	12	4200	32	1.1	4.9	31%	5	50	Well - sand - silt	
6	1900	1800	10	12	4950	50%	1.1	4.7	31%	6	60	Well - sand - gravel - bottom (100)	
7	2000	1900	10	12	1024	30%	-	-	-	7	70	Well - fine sand	
8	2100	2000	10	12	6850	31	1.6	5.5	38%	8	80	Well - gravel - silt - bottom (100)	
9	2200	2100	10	12	-	-	-	-	-	9	90	Well - sand - silt - bottom (100)	
10	2300	2200	10	12	2680	30%	-	-	-	10	100	Well - coarse at bottom (100)	
11	2400	2300	10	12	9200	36	1.4	5.8	38%	11	110	Well - sand - gravel - silt	
12	2500	2400	10	12	660	30%	-	-	-	12	120	Well - fine sand - mud	
13	2600	2500	10	12	21340	39	1.8	6.5	37%	13	130	Well - all the way	
14	2700	2600	10	12	2200	45%	-	-	-	14	140	Well - all the way except at bottom	
15	2800	2700	10	12	9200	45%	-	-	-	15	150	Well - all the way except at bottom	

TABLE SHOWING PROPERTIES OF PUMPING PLANTS IN SAN PASQUAL VALLEY
OCTOBER 1933

-1-

Plant No.	Date	H.P.	K.W.	Total Lift	Total Pumped	HP re-quired	Plant No.	Depth	Class of material encountered in well
15	10-15	15	14520	55	0.8	4.7	51%	12-30	fine sand-mud
16	10-15	15	1530	50%	-	-	-	12-30	fine sand-mud
17	10-15	15	26270	37	1.0	4.1	51%	12-30	fine sand-mud
18	10-15	15	3050	55%	1.5	5.0	55%	12-30	fine sand-mud
19	10-15	15	4250	22	1.1	2.9	51%	12-30	fine sand-mud
20	10-15	15	4950	50%	1.4	4.7	51%	12-30	fine sand-mud
21	10-15	15	1024	50%	-	-	-	12-30	fine sand-mud
22	10-15	15	5060	31	1.6	5.5	55%	12-30	fine sand-mud
23	10-15	15	2680	30%	-	-	-	12-30	fine sand-mud
24	10-15	15	9200	35	1.4	5.6	55%	12-30	fine sand-mud
25	10-15	15	550	30%	-	-	-	12-30	fine sand-mud
26	10-15	15	21340	39	1.5	5.5	55%	12-30	fine sand-mud
27	10-15	15	9200	45%	-	7.0	55%	12-30	fine sand-mud

SUMMARY OF IRRIGATED LANDS, PUMPING PLANTS & DITCH DIVERSIONS

SAN PASQUAL VALLEY

October 1922

PUMPING PLANTS AND OWNERS

CLASSIFICATION OF LAND

Duty of water
Ac. ft. per ac.

DITCHES

Acres feet diverted

Name of Ditch	Well No.	Owner	Location	Date Bored	No. of Wells	Tem- per- ture	Solids per 100,000	Quantity Sec. Ft.	Horsepower Input	Total K. W. Hrs.	Acres pumped	CLASSIFICATION OF LAND										Duty of water Ac. ft. per ac.	DITCHES	Acres feet diverted				
												Total Acres	Alfalfa	Corn	Orchard	Grain	Misc.	Truck	Barren & Tillable	Alfalfa	Corn							
				(B)					(A)			80	8	64					8							No diversion 1922		
	23	Luis J. Finn	Sec. 31 T 123 R 1E									200	4	180	8	5			1	2	6.5	3				*75		
	32	E. R. Harris	Sec. 35 T 123 R 1W									50	26	152	33	26	28		6	58								
		P. Coarsson	Sec. 35 T 123 R 1W	1918	7		64	26	1.5	17	6060	64	380	77	152	33	26	28		6	58							
		C. G. Marchas	Sec. 35 T 123 R 1W									50	26	152	33	26	28		6	58								
		Ray Trussell	Sec. 35 T 123 R 1W	1921								80	26	152	33	26	28		6	58								
		F. A. Johnson	Sec. 35 T 123 R 1W	1919								181	2	160	3	14												
		Mary Jaden	Sec. 35 T 123 R 1W									3																
	31-5	Ande. Johnson	Sec. 35 T 123 R 1W	1919	1						1034	11	365	309	13	13	3											
	31	F. H. Johnson	Sec. 35 T 123 R 1W		6		64	32	1.4	14.7	4980	63	330	242	18	14	1											
													131		78	94	54	0	6	161							930	
	28	H. Johnson	Sec. 25 T 123 R 1W		2		65	32	1.2			121	3	106					3	4							*160	
	26	E. Peet	Sec. 35 T 123 R 1W	1919	3		67	46	1.1	12.5	4530	44	200	90	63	20	5											
		L. Rockwood	Sec. 36 T 123 R 1W									120	12	83	5													
		Trussell																										
	41	Myers Mt.	Sec. 34 T 123 R 1W		6		67	55			2580	29	262	106	42													
	44	H. E. Fenton	Sec. 34 T 123 R 1W	1918	8				1.4	17.7	1920	68	444	40	53	30												Alfalfa newly planted
		F. V. Washaw	Sec. 31 T 123 R 1W									743	200	343														
		B. J. Clearbrook	Sec. 27 T 123 R 1W									160	1	155														No irrigation 1922
	22	Upper Webb	Sec. 34 T 123 R 1W	1917	8				1.3	13	9100	100	390	140	80	82	32											
	18	Lower Webb	Sec. 35 T 123 R 1W	1918	5		68	50	1.3	13	9150	104	393	36	40	15	62											*40
		Louisa Dyer	Sec. 33 T 123 R 1W									160	25	129														No irrigation 1922
		Leah Dyer	Sec. 32 T 123 R 1W									40		20														
		S. M. Smith	Sec. 32 T 123 R 1W									3																
	14	H. Boyle	Sec. 32 T 123 R 1W	1917	4		68	66	1.0	13.1	25270	224	93		38	20												
		H. Boyle	Sec. 32 T 123 R 1W									10																
		H. Boyle	Sec. 32 T 123 R 1W									60		20														
	47	H. Boyle	Sec. 32 T 123 R 1W	1918	2						560	5	87	39	18													*84
		H. Boyle	Sec. 32 T 123 R 1W									228	2	13	16	41												No irrigation 1922
	5	H. Boyle	Sec. 32 T 123 R 1W	1918			2				1520	15	80	9	26	16												
		H. Boyle	Sec. 32 T 123 R 1W									20																
		H. Boyle	Sec. 30 T 123 R 1W									15		3	7													
	1	H. Boyle	Sec. 30 T 123 R 1W		6		68	95	8	15	14620	108			*17													*6.5
	3	H. Boyle	Sec. 31 T 123 R 1W	1914	2							*39	45		*6													*6.5
	48	H. Boyle	Sec. 31 T 123 R 1W	1917	5		68	67	1.5	24	21340	150			*40													
	55	H. Boyle	Sec. 7 T 123 R 1W		4																							No irrigation

Total K.W. Hrs - From April 1st to October 15th, 1922.
 Nearly all wells washed out in 1916 - replaced in years as given.
 Estimated
 Low Level - actual

MARCH APRIL MAY

Calendar grid for the first half of the year (March to June) with a large diagonal watermark reading '2011'.

JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Calendar grid for the second half of the year (July to December) with a large diagonal watermark reading '2011'.

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

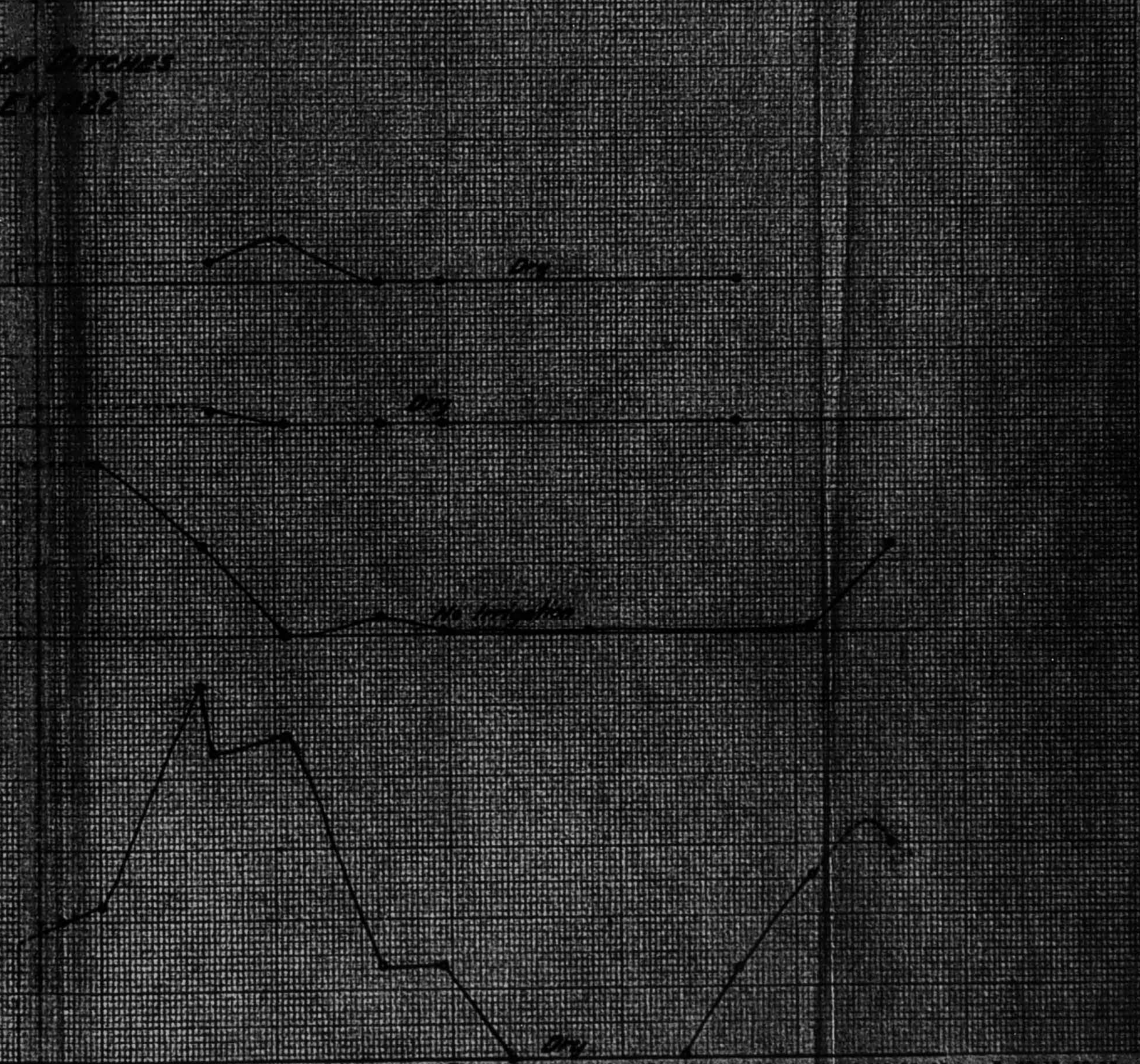
MEMORANDUM OF WORK FOR THE YEAR
SAN JOAQUIN VALLEY, CALIF.

WINTER

SPRING

SUMMER

FALL



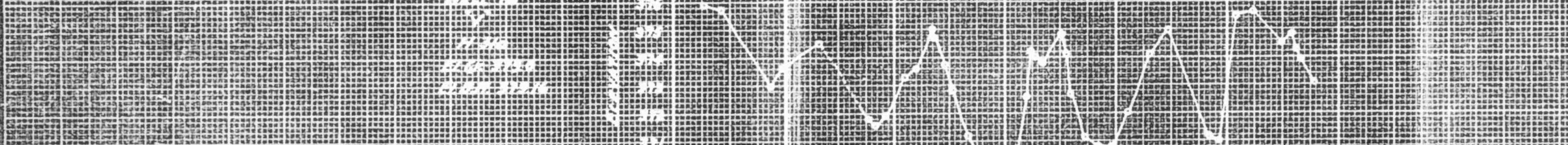
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Diagrams of Potentials of Heart and Motor Nerves

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200.



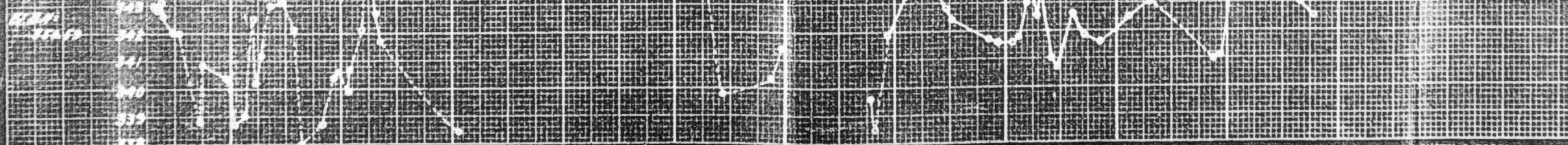
201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300.



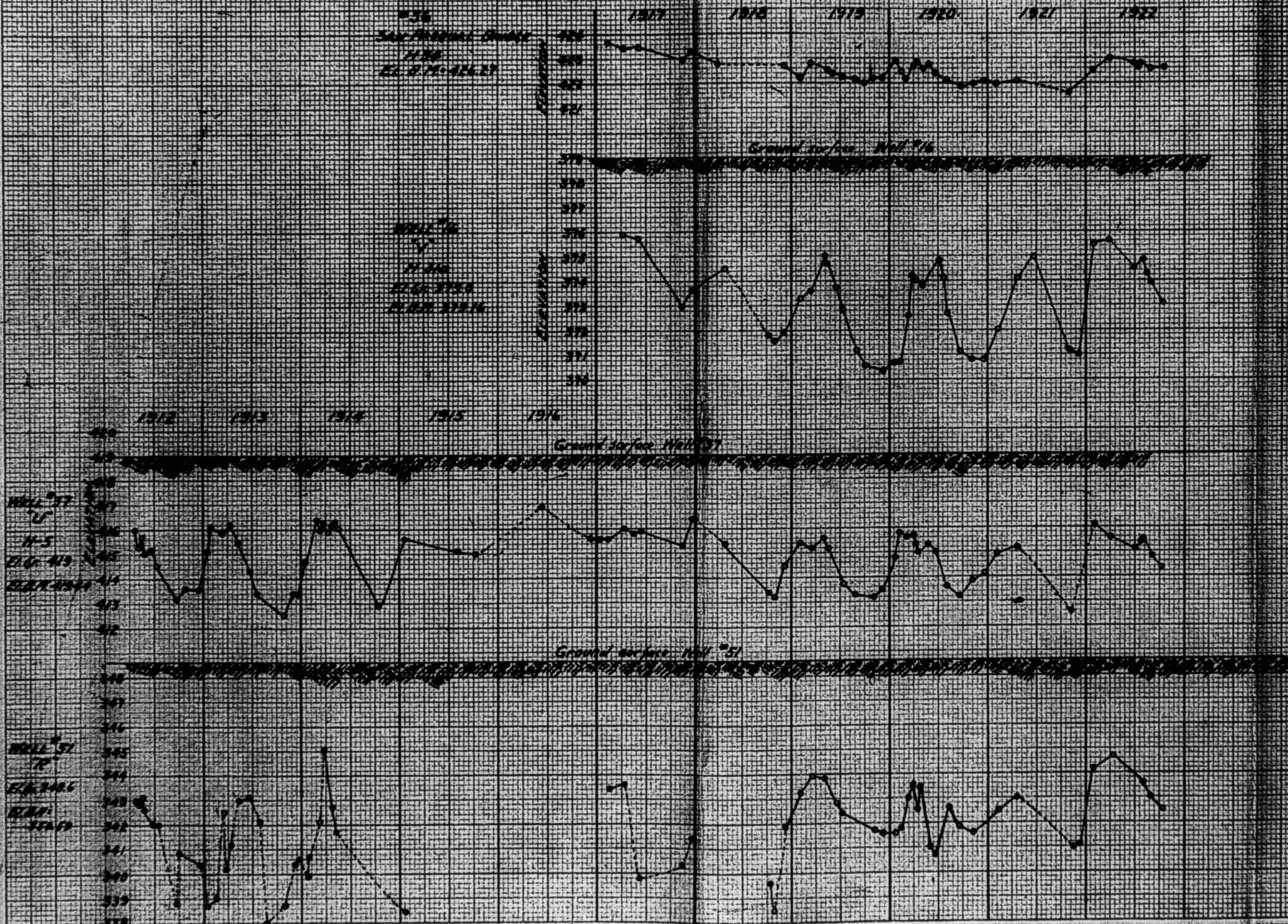
301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400.

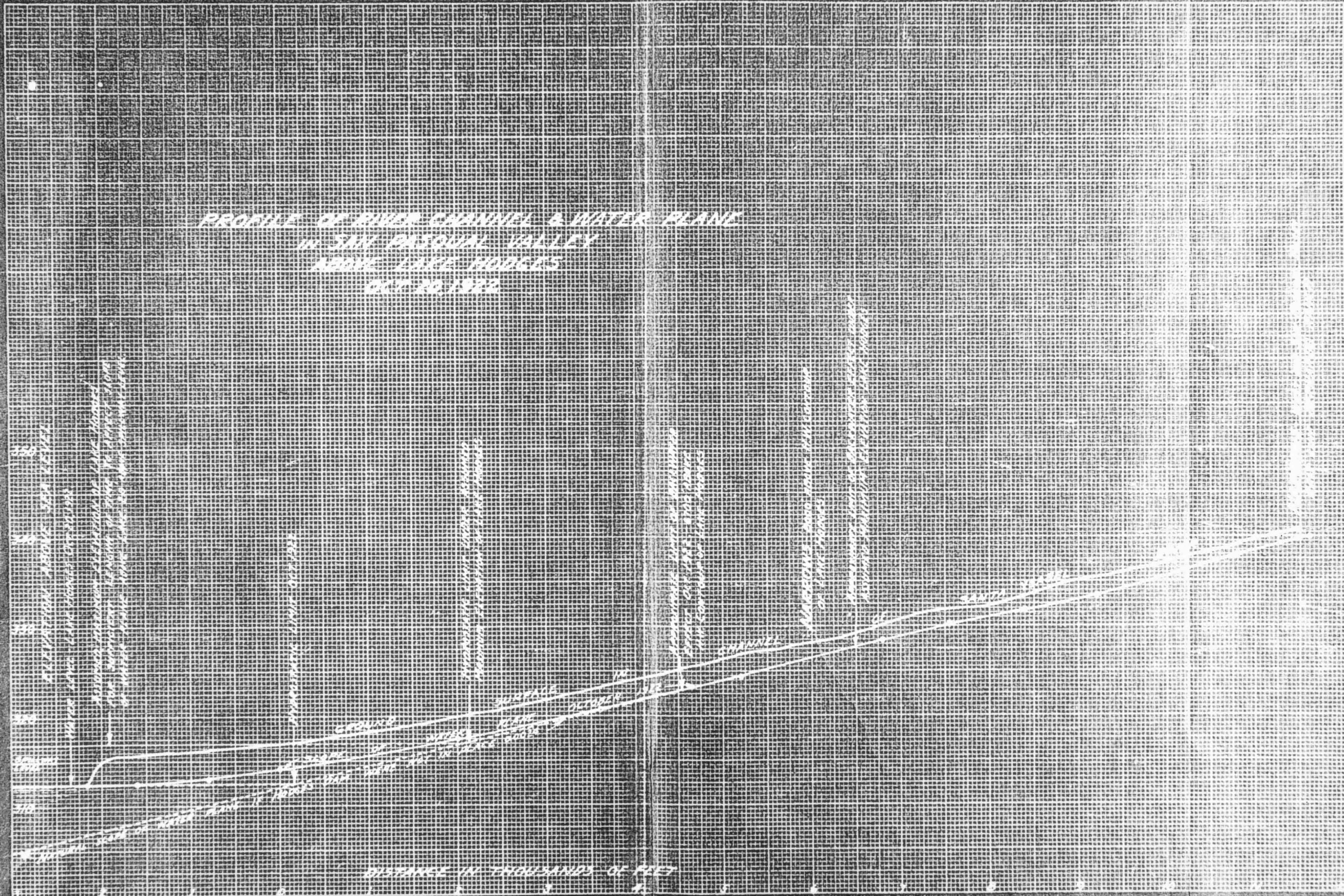


401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500.



*DIAGRAM OF FLUCTUATIONS OF WATER PLANE SHOWN BY WELLS
SAN PASQUAL VALLEY*





PROCEEDINGS OF THE CONFERENCE ON THE HISTORY OF THE UNITED STATES

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PROFILE OF RIVER CHANNEL & WATER PLANE IN SAN PASCUAL VALLEY ABOVE LAKE HODGES OCT 20, 1962

ELEVATION ABOVE SEA LEVEL
WATER LEVEL
CHANNEL
GROUND SURFACE
SLOPE OF CHANNEL BANK
SLOPE OF GROUND SURFACE

Approximate elevation of Lake Hodges
for comparison purposes in 1962 to project 1960
at which point some of the channel bank
was still in place.

Approximate elevation of Lake Hodges

Approximate elevation of ground surface

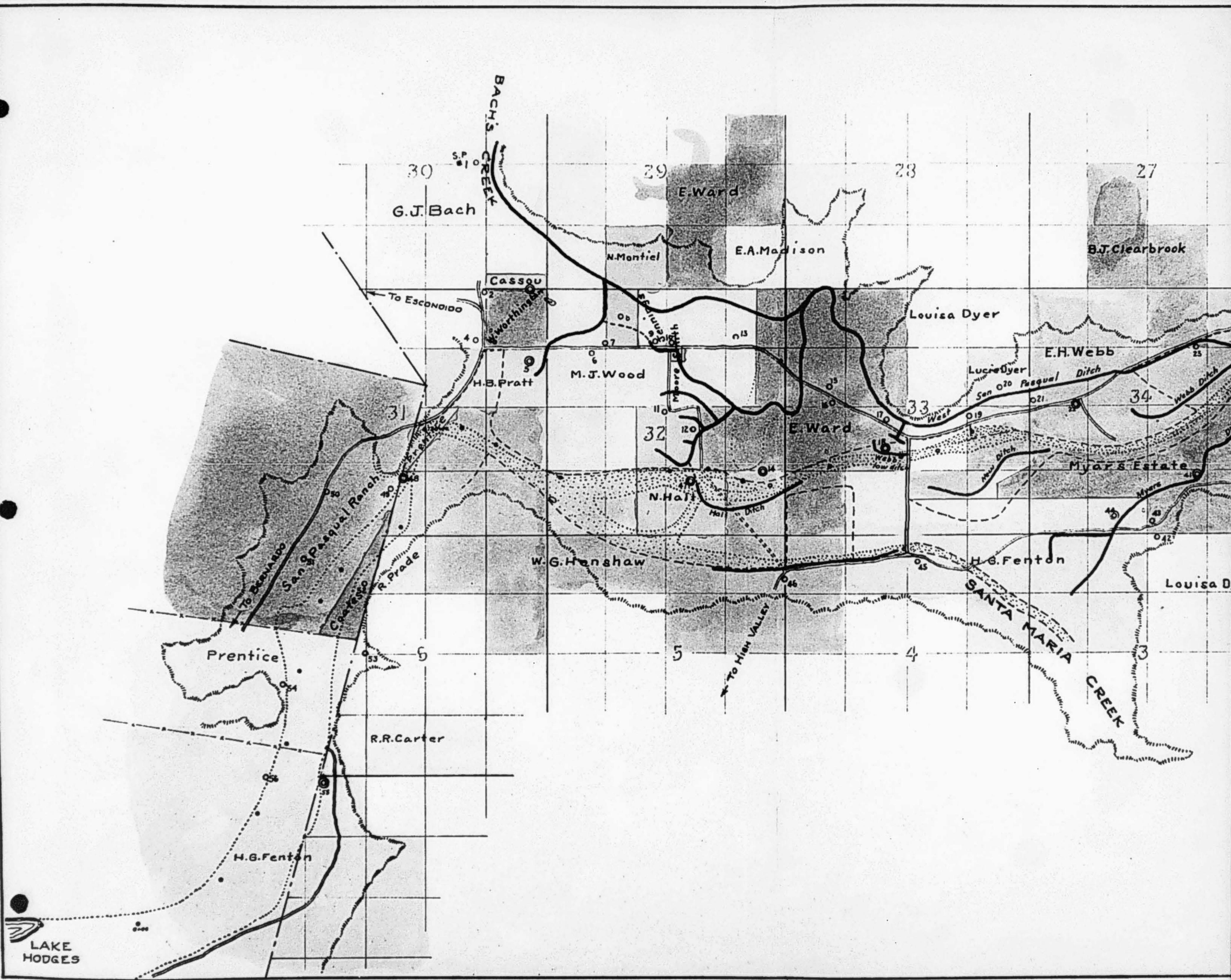
Approximate date of measured
surface of 1962, 1960 point
with contour of lake Hodges

Approximate date of measured
surface of 1962, 1960 point
with contour of lake Hodges

Approximate date of measured
surface of 1962, 1960 point
with contour of lake Hodges



DISTANCE IN THOUSANDS OF FEET



G.J. Bach

E. Ward

E.A. Madison

B.J. Clearbrook

Cassou

To Escondido

Louisa Dyer

E.H. Webb

M.J. Wood

San Pasqual Ditch

31

32

33

34

San Pasqual Ranch

N. Hall

Myer's Estate

W.G. Henshaw

H.G. Fenton

Louisa Dyer

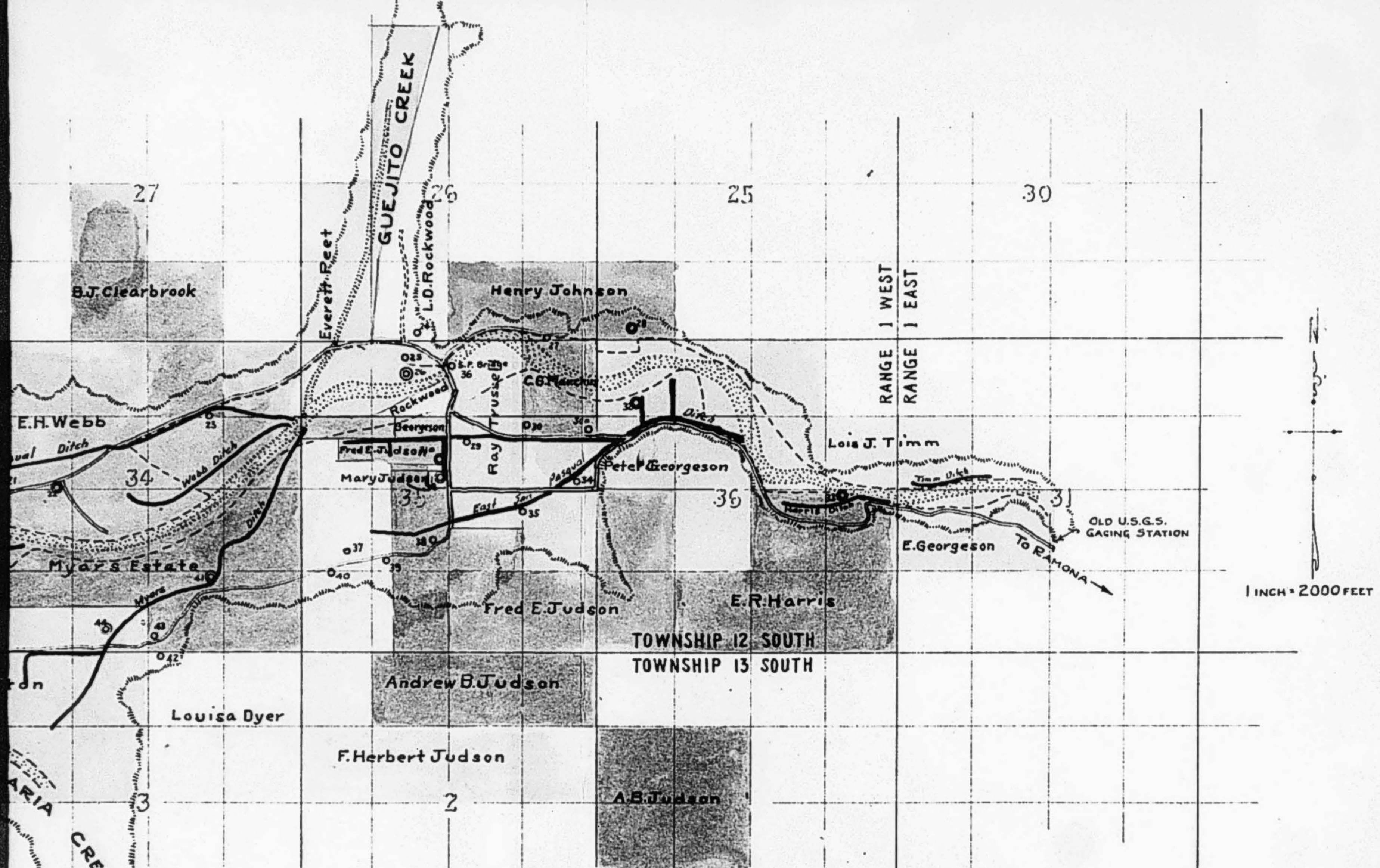
Prentice

R.R. Carter

H.G. Fenton

SANTA MARIA CREEK

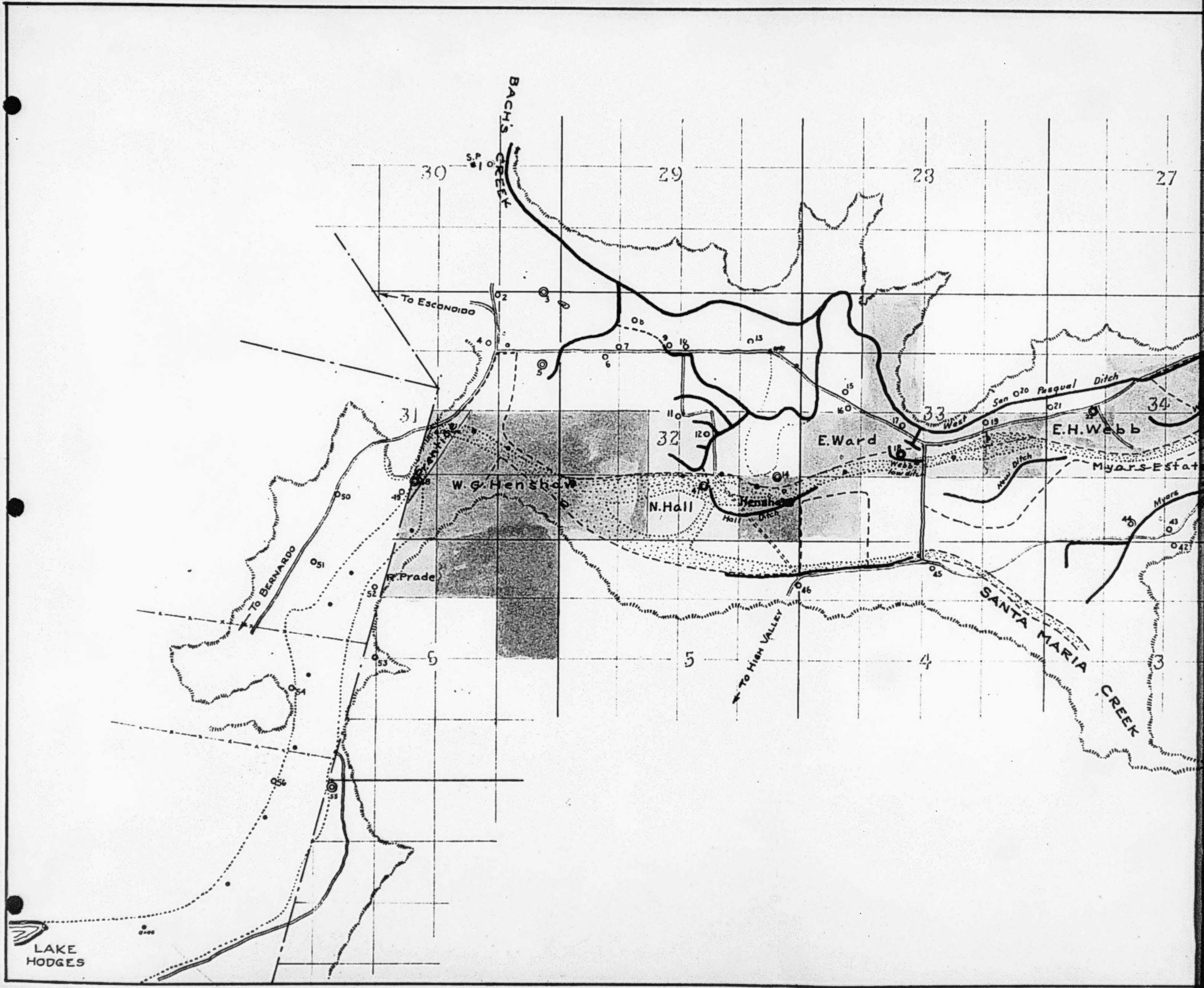
LAKE HODGES



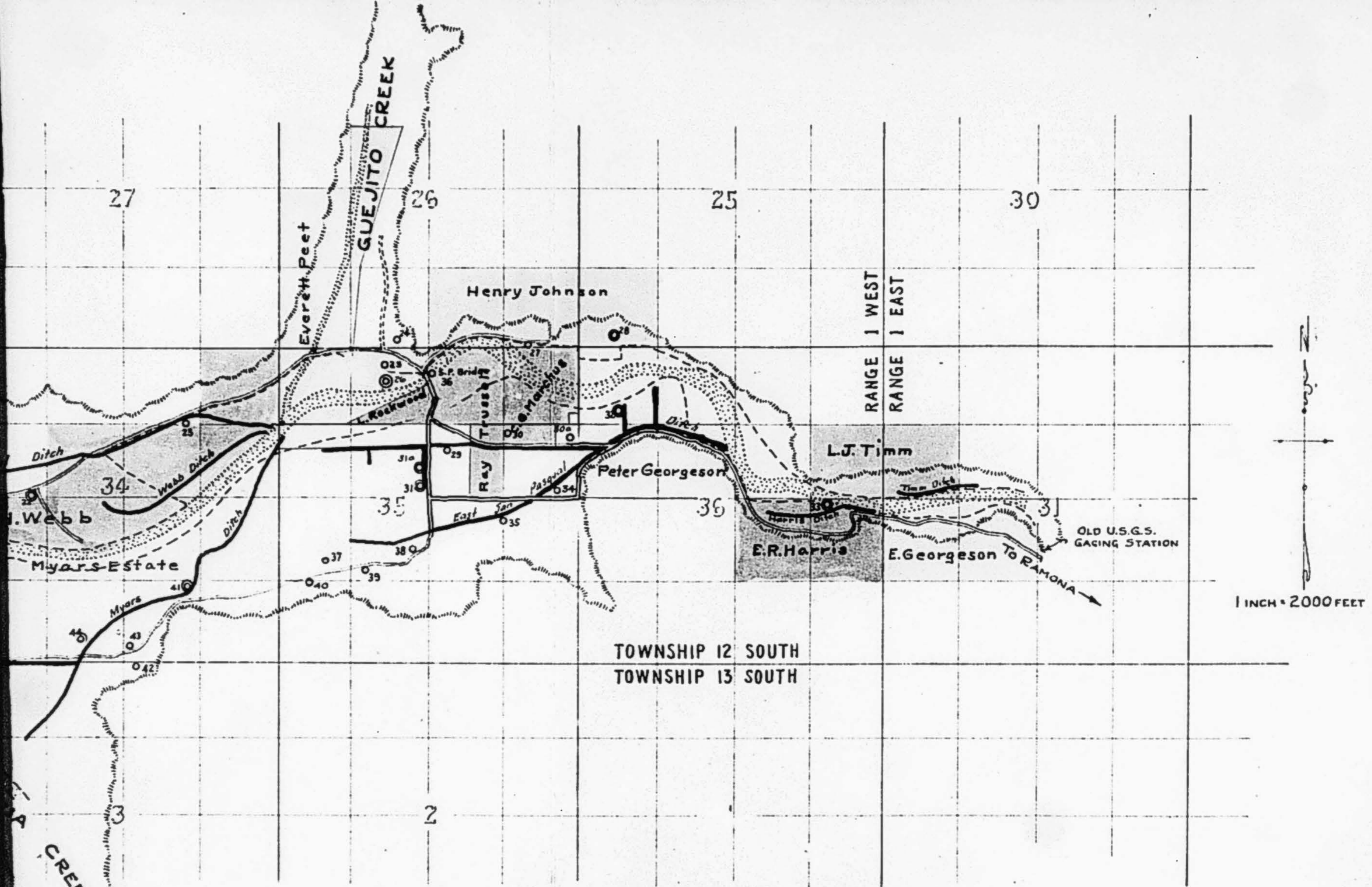
MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

LAND OWNERSHIPS 1922



LAKE
HODGES



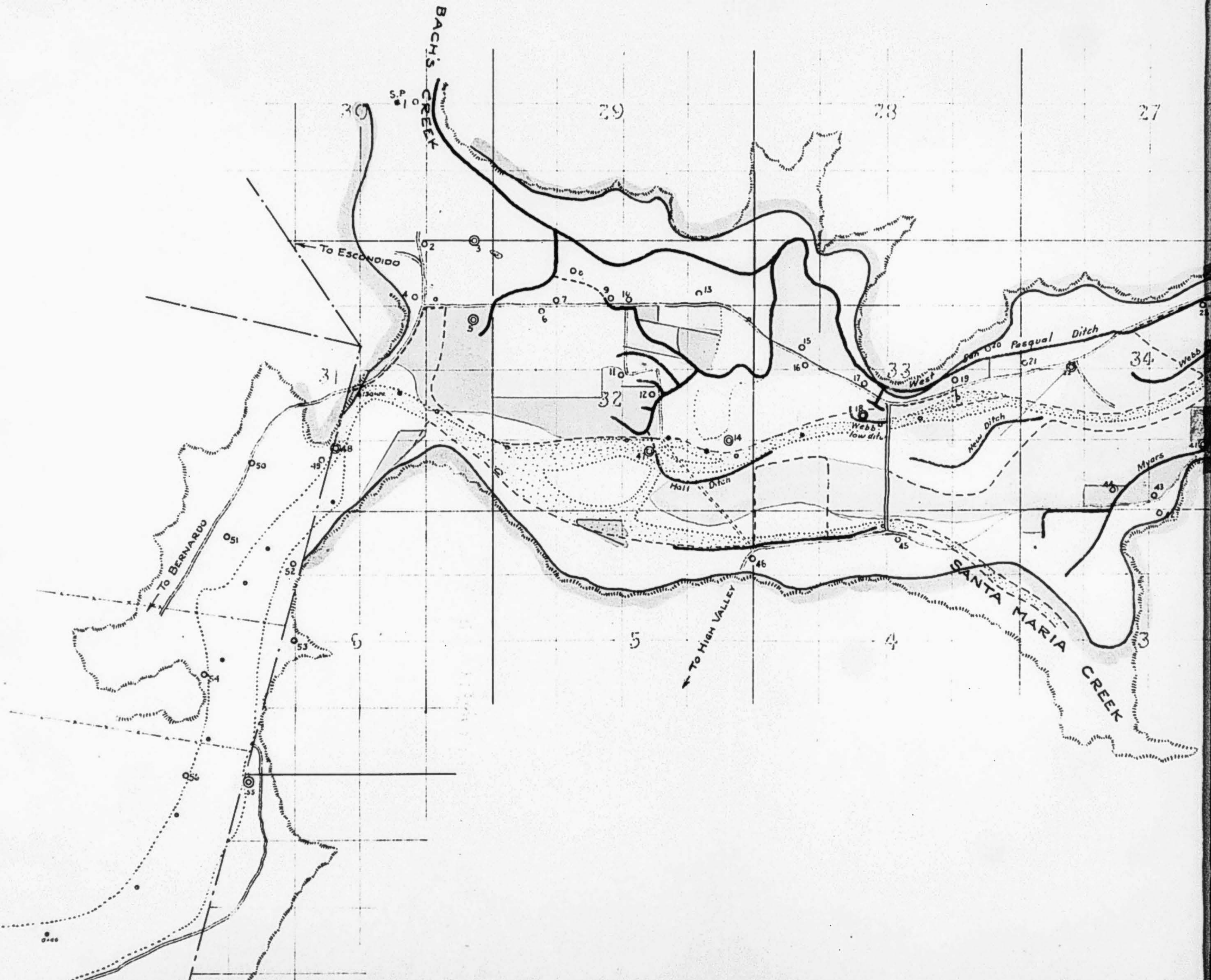
MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

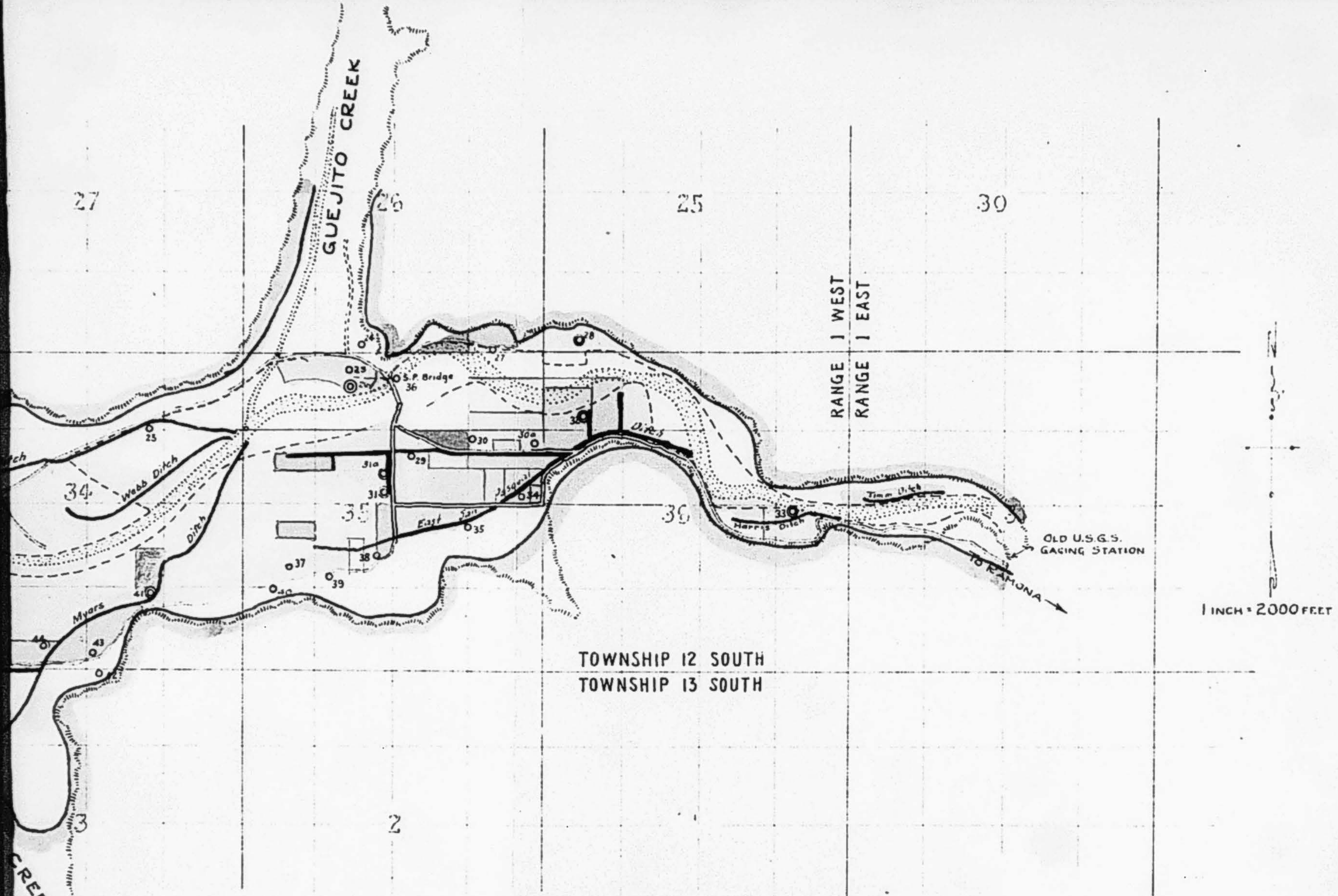
- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

OUTLINE OF RIPARIAN LANDS
SHOWING PRESENT OWNERS

BASED ON THE ASSUMPTION THAT RIPARIAN
RIGHTS ONCE SEVERED ARE NOT RESTORED

LAKE
HODGES





1 INCH = 2000 FEET

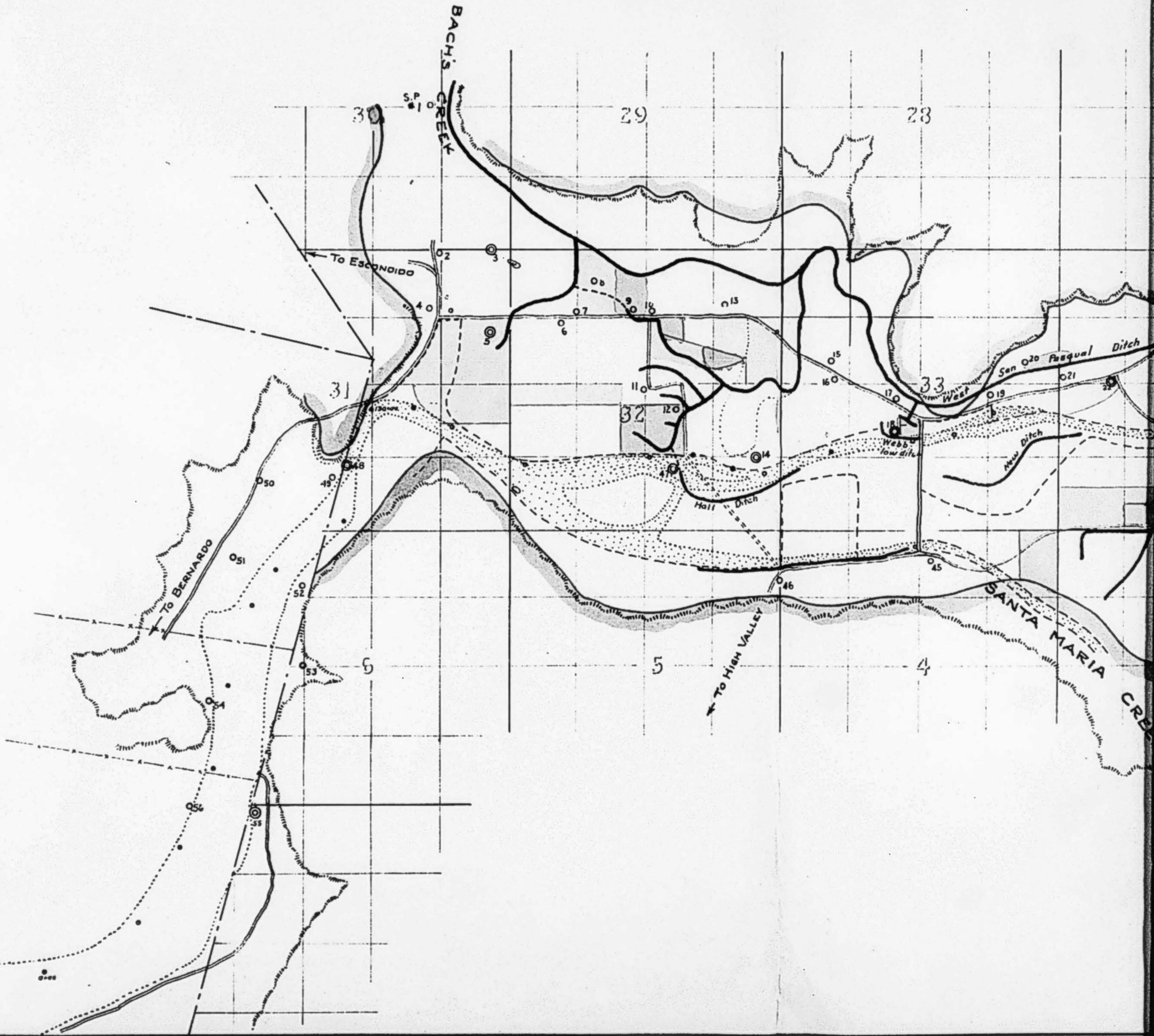
TOWNSHIP 12 SOUTH
TOWNSHIP 13 SOUTH

MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

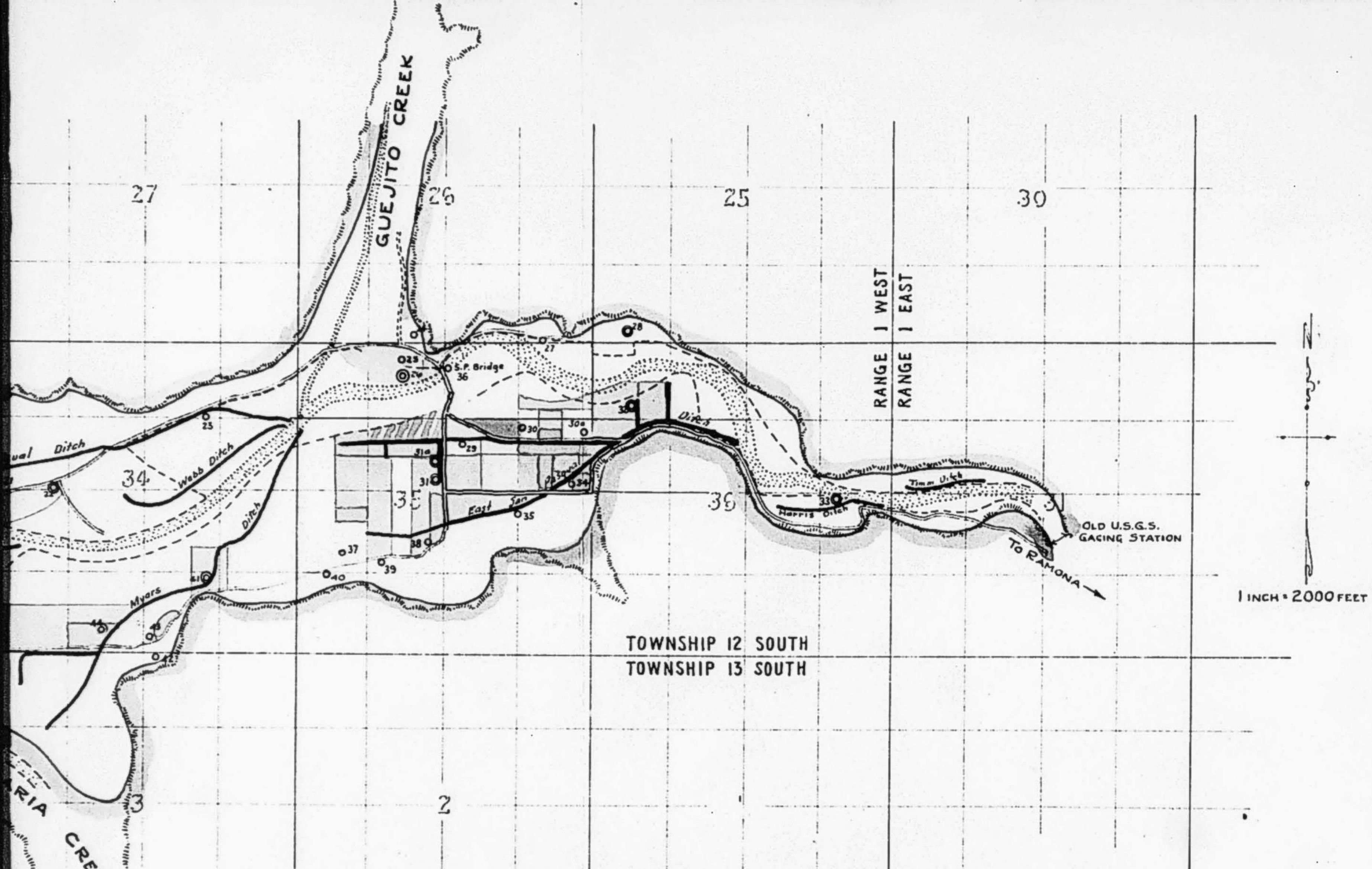
- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

IRRIGATED CROPPED AREA NOV. 1911

- | | | | |
|--|---------|---|----------------|
|  | ALFALFA |  | "FIELD" (CORN) |
|  | ORCHARD |  | TRUCK-MISC. |



LAKE HODGES



1 INCH = 2000 FEET

TOWNSHIP 12 SOUTH
TOWNSHIP 13 SOUTH

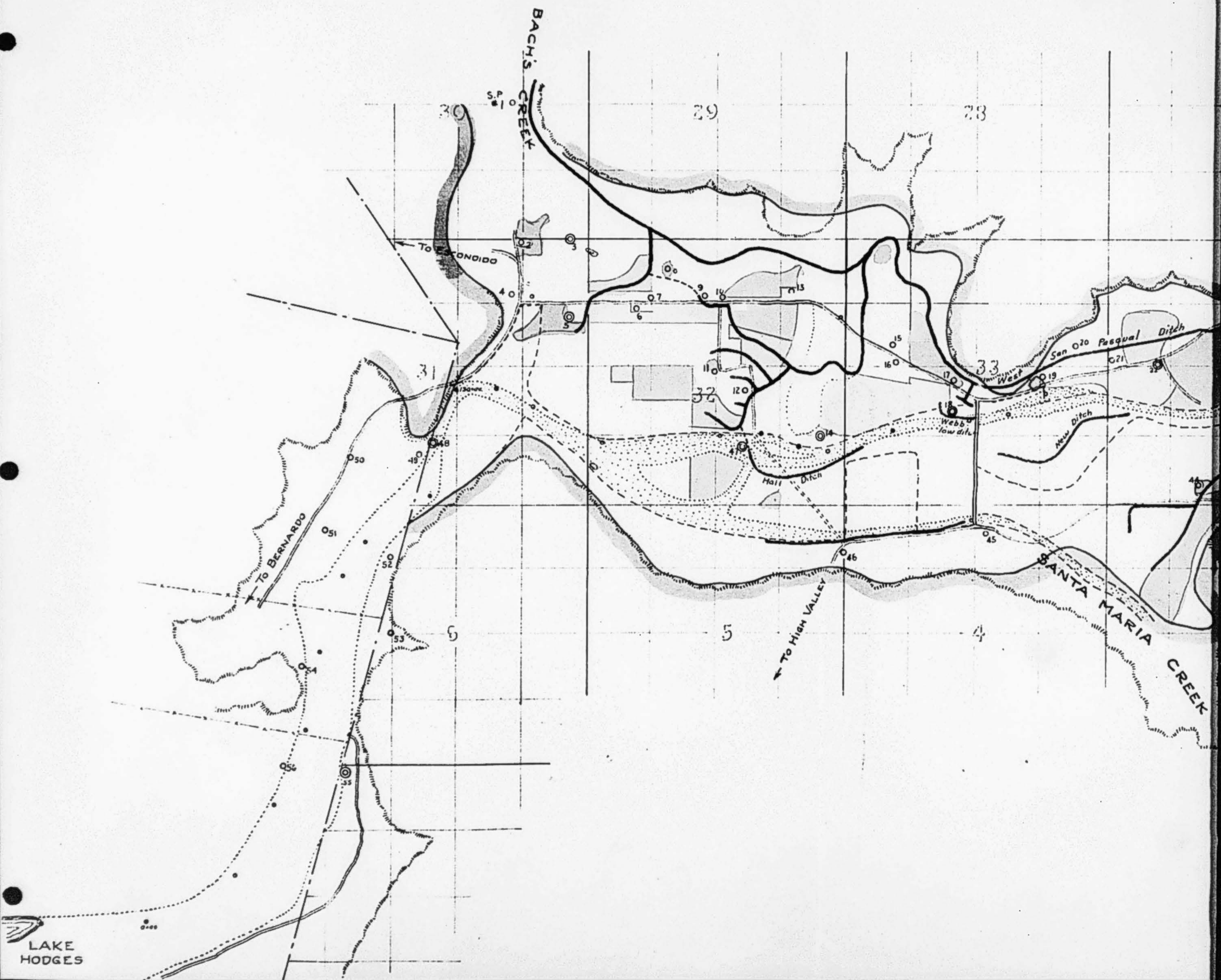
RANGE 1 WEST
RANGE 1 EAST

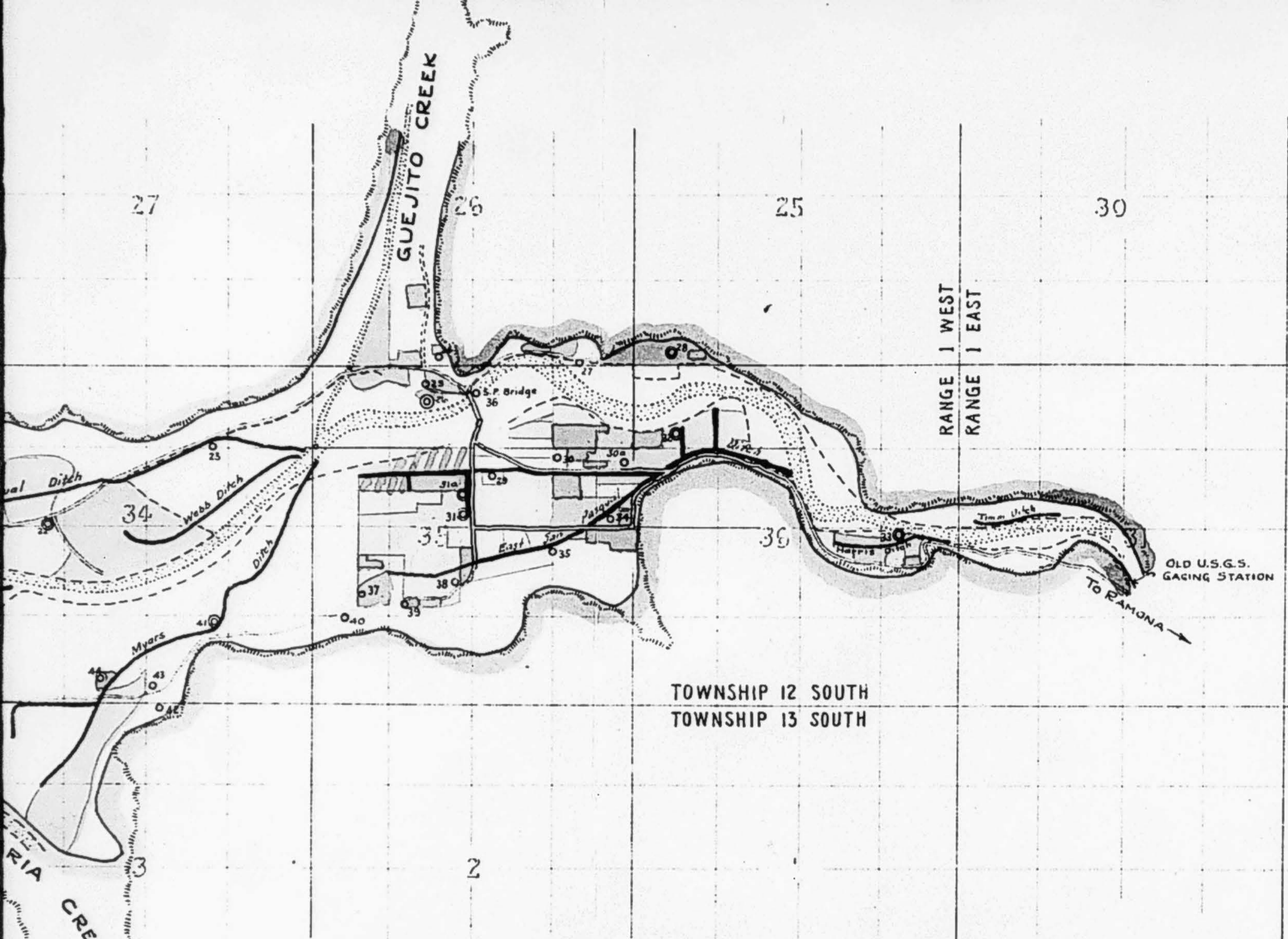
MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

IRRIGATED CROP AREA - 1917

- | | | | |
|--|---------|---|----------------|
|  | ALFALFA |  | "FIELD" (CORN) |
|  | ORCHARD |  | TRUCK-MISC. |





TOWNSHIP 12 SOUTH
TOWNSHIP 13 SOUTH

RANGE 1 WEST
RANGE 1 EAST

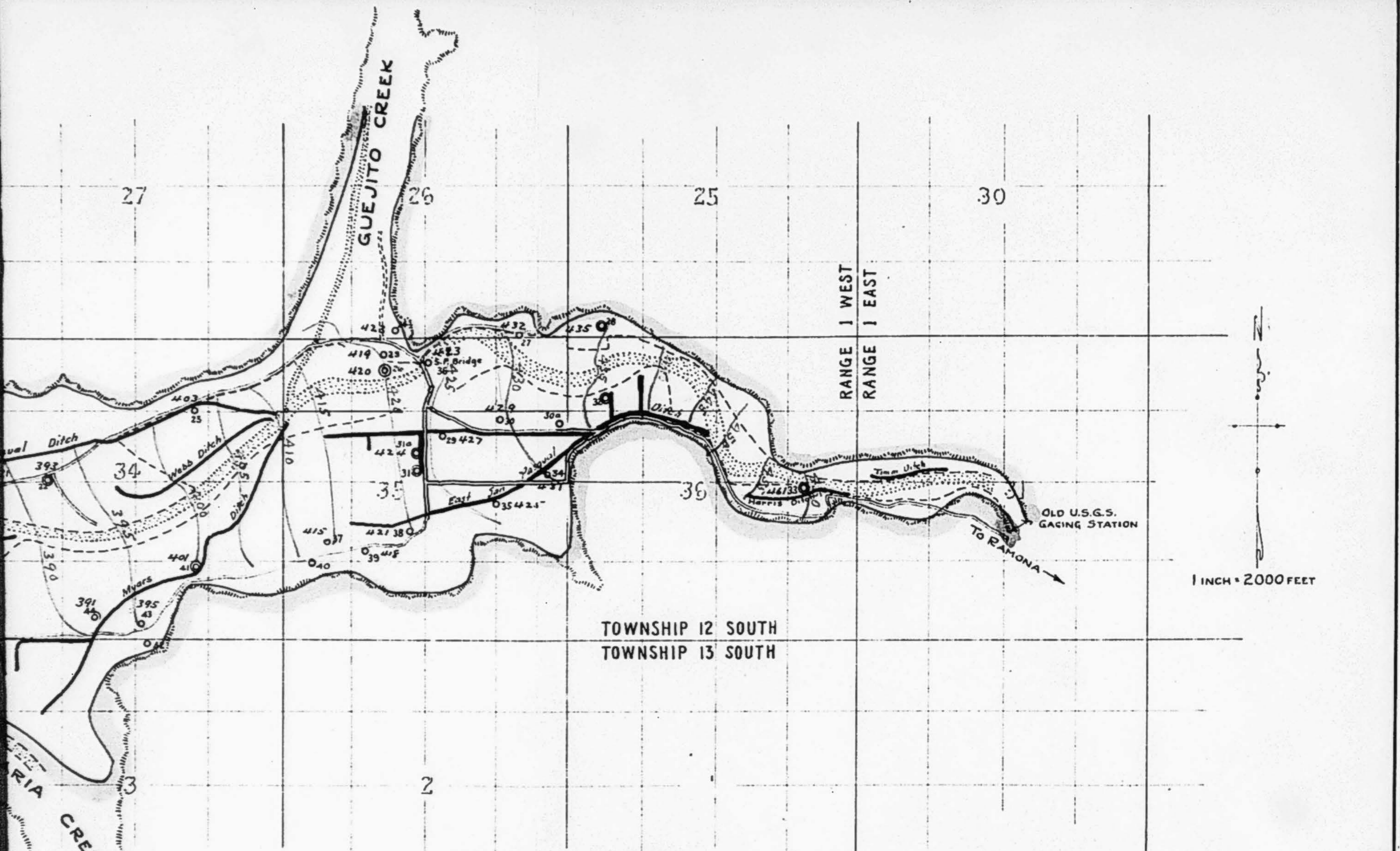
1 INCH = 2000 FEET

MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

IRRIGATED CROP AREA - OCT. 1922

- | | |
|---|---|
|  ALFALFA |  CORN |
|  ORCHARD |  TRUCK-MISC. |



MAP
OF
SAN PASQUAL VALLEY
SAN DIEGO COUNTY

- DOMESTIC WELL
- ⊙ PUMPING PLANT
- TEST HOLE

HYDROGRAPHIC CONTOURS - OCT. 1922

BLACK FIGURES = ELEV. W.P.

Ed Fletcher Papers

1870-1955

MSS.81

Box: 42 Folder: 1

**Business Records - Reports - Rowe, W.P.
- "Report on Results of Investigations of
the Ground Waters in San Pasqual Valley"**



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UC SAN DIEGO

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