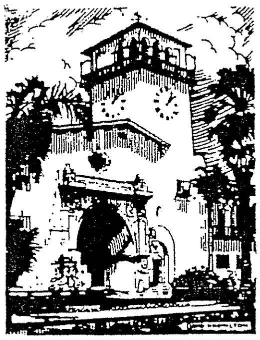


COURT HOUSE

Santa Barbara County Water Agency

Robert B. Almy
Water Agency Manager

122 W. Figueroa St., Ste. B
Santa Barbara, California 93101
(805) 568-3540
Telecopier: (805)568-3549

TO: All Interested Persons

FROM: Santa Barbara County Water Agency

DATE: August 26, 1992

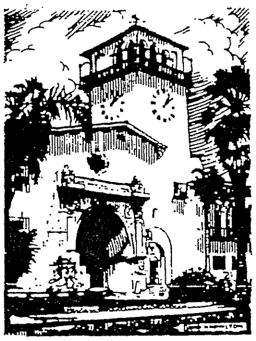
RE: Santa Maria Groundwater Basin Analysis

DISCUSSION:

This analysis was performed at the request of the Santa Barbara County Board of Supervisors by the Santa Barbara County Water Agency senior hydrologist Jon Ahlroth. It is a reconnaissance level modelling of the groundwater basin designed to give order of magnitude indications of present and possible future conditions in the basin.

This the third assessment of groundwater conditions in Santa Maria Valley conducted by the Water Agency. The first assessment is the 1977 "Adequacy" Report published by the Agency in November, 1977 and referenced in this analysis. The second assessment did not result in a published document, but was part of a joint Water Agency - Department of Water Resources (State of California) study on the conjunctive use of Santa Maria groundwater with State project water, which was presented in Santa Maria in 1986. This third assessment is an expansion of the 1986 analysis.

Please direct any questions regarding this analysis to Mr. Ahlroth or Mr. Almy at the Water Agency.



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(805) 568-3540
Telecopier: (805)568-3549

SANTA MARIA GROUND WATER BASIN BUDGET STATUS

By Jon Ahlroth, Senior Hydrologist
Santa Barbara County Water Agency (SBCWA)

August 26, 1992

I. PURPOSE OF REPORT

Concerns of Santa Maria Valley residents regarding the adequacy of groundwater supplies, and what effect imported water will have upon these supplies, prompted the following basin water budget analysis. This report was prepared at the request of the Santa Barbara County Board of Supervisors by the Santa Barbara County Water Agency (SBCWA) in order to provide a quantitative estimate of ground water basin overdraft. Since the Santa Maria area is currently dependent on groundwater for virtually its entire water supply, this information is of interest to all major water users. The water budget model runs presented herein are not offered as precise changes necessary to bring the basin into balance, but as an indicator of basin storage response to various groundwater extraction scenarios.

This analysis is an update of a presentation to the Santa Maria City Council in 1986.

II. HISTORIC WATER BUDGET MODEL METHODOLOGY

In order to assess the present condition of the Santa Maria groundwater basin as to overdraft or surplus, a hydrologic model for the basin was developed. The model assesses basin inflows and discharges over a number of years "base period" representing long term average climatic conditions. The model is calibrated against observed changes in basin storage over the base period based upon water well levels and storage coefficients estimated for the various subareas of the ground water basin. This model uses a "budget" approach as opposed to simulating the actual physical groundwater basin as is done with calibrated finite difference models.

In order to establish the framework for our model we first select a base period in which there are reasonably good data and there is overall, an average rainfall and stream flow. Included in that base period are very wet and very dry sequences of years. The 1935 through 1979 (45 year) period was selected for this purpose in the Santa Maria basin. Figures 1 and 2 display the rainfall and accumulated deviation of this rainfall from long term (100 year) mean conditions. Note that the overall deviation from 1935 through 1979 is about zero (see Fig. 2). Although future climatic cycles may bring wetter or dryer conditions than our selected base period, for this analysis we assume that our 45 year period is typical of what we may expect to see in future years. The "budget model" approach assumes that in the long term, recharge minus discharge equals change in storage. The success of this modeling method therefore depends on reasonably good data for these three elements (e.e. recharge, discharge and change in storage). These elements are discussed below.

ELEMENTS OF DISCHARGE

The elements of discharge include municipal and industrial (M & I) pumpage, agricultural pumpage, and subsurface underflow out to the Pacific Ocean.

Figures 4 and 5 display estimated agricultural and M & I pumpage for the base period. In Figure 4, 1935 through 1958 agricultural pumpage estimates are based upon both water duty factor and electric power record methods. The 1975 figure is based upon the 1975 Santa Barbara County Water Agency (SBCWA) Agricultural Land Use survey and water duty factors supplied by the cooperative extension. Interpolated values between 1958 and 1975 assume a decreasing basin wide average annual water duty factor along with an increasing total basin irrigated acreage (see Figure 3 for irrigated acres). Figure 5 displays gross M & I pumpage estimates made by the Geological Survey (1966) and others. The interpolated values between years of published estimates are linear interpolations. The third type of basin discharge which must be accounted for over the base period is, underflow to the ocean. This basin loss is discussed in Geological Survey Publications by Worts (1951, pp. 93-97) and Miller (1966, pp. A12 - A14). The SBCWA developed a function imitating this loss for use in the water budget model (Figure 11).

ELEMENTS OF RECHARGE

The elements of recharge include stream seepage, infiltration of rainfall, and subsurface underflow into the ground water basin. Figure 6b through 10b show recharge estimates for rain infiltration, stream seepage, and underflow into the basin under historic and other conditions. The SBCWA has developed rain infiltration curves for irrigated and non irrigated lands based on studies by Blaney (1933). Using these curves along with Santa Maria City rainfall values (times 1.04 to achieve agreement with USGS infiltration values), rain infiltration values were developed for the "historic conditions". These agree with the United States Geological Survey (USGS) estimates presented by Miller (1966, pg. A11). Irrigated agricultural acreage values (see Figure 3) are used in the annual calculation of rainfall infiltration. The greater the irrigated acreage, the greater is the calculated rainfall infiltration. This is because the soil moisture content of irrigated lands is greater than for non irrigated lands (due to the irrigation). Figure 6b shows the estimated rainfall infiltration based upon the estimated historic irrigated acreage shown on Figure 3.

Estimates of natural river percolation are shown in Table 6b for water years 1935 through 1979. The values for 1935 through 1943 are from Worts (1951, pg. 69). The values for 1944 through 1979 are derived from USGS stream gaging stations, a number of which began recording in 1944 (please see Figure 12 for the stream gaging record). Beginning with water year 1962, the augmentation of stream seepage attributable to the Twitchell project has been subtracted from the historic seepage, leaving the estimated unaugmented levels of seepage shown in Figure 6b (4th column), and in Figure 12 (last column).

Utilizing an 18 year daily model of Twitchell reservoir, developed by the SBCWA, a tabulation of the historic contribution to stream seepage due to the operation of the Twitchell project during the period 1962 through 1979 (see Figure 12, 2nd to last column; and Figure 6b, 5th column) has been developed. Using this data in the model allows an assessment of the augmentation of stream seepage provided by the Twitchell project.

Subsurface inflow ("UNDR Q-IN column 6 in Figures 6b - 10b) is given a variable value instead of fixed value as done in a previous analysis by Jones et.al. (1977, pg. 24). This variable is 1000 AFY if basin storage is at 3 million acre feet above sea level (very full basin), and it increases to 6000 AFY if basin storage is at or below 2 million acre feet above sea level (approximately present conditions). This is because lower pressure in basin aquifers implied by lower storage induces greater subsurface inflow.

CALIBRATION

To calibrate the model, historic water well levels were employed with aquifer storage coefficients (specific yields in unconfined conditions) to give estimates for the basin storage above sea level at the beginning of the base period and at critical points throughout the period. First, a tabulation (see Figure 6b) of all inflows and discharges from the groundwater basin under estimated historic circumstances is made. Then the return flow rates of the M & I and agricultural gross pumpage are adjusted so that the last column of Figure 6 agrees at critical storage points (relative storage lows and highs) with the (above sea level) basin storage estimates developed from water level-specific yield methods. The circled points on Figure 6a show estimated basin storage (based upon historic water well level-specific yield type calculations) above sea level at storage critical points from 1935 to the present (1991). Storage levels were also calculated for 1984 and 1991 to show recent basin storage conditions since the end of the 45 year base period.

The modelled historic storage plot shows good agreement with the water level-specific yield storage estimates over the 45 year base period. This calibration was achieved by varying the M & I and agricultural return flow rates over the base period. The M & I pumpage (see Figure 5) return's were set at 30% in 1935 and gradually increased so the returns were 40% in 1979. The agricultural return flows were varied as a function of the applied water per acre (feet per acre). They were highest in 1958 (50%) and lowest in 1935 (16.3% returns). The returns in 1975 were 29.5% of the applied water which was estimated at 2.37 ft. per acre, basin wide average (see Figure 14 for the agricultural return flow function used in the water budget model for both historic and other conditions).

The "historic conditions" water budget model run is displayed in Figures 6a and 6b. Note that the historic recharge from 1935 through 1961 was not augmented by the Twitchell Project. Also note that the 45 year average annual basin dewatering with the "historic condition" scenario is 6,233 AFY (2,490,000 AF starting storage minus 2,209,504 AF ending storage divided by 45 years....see Figure 6b.)

III. USING THE WATER BUDGET MODEL/ PRESENT AND OTHER CONDITIONS

Having calibrated our "historic conditions" water budget model we may now proceed to perform calculations over the same 45 year base period using estimated present (circa 1990) or hypothetical future conditions of irrigated acreage, agricultural pumpage, and M & I pumpage. For the purposes of this analysis the base period elements of recharge are identical to the "historic conditions" model with the following modifications:

a) The Twitchell project augmentation has been estimated and is included as an element of recharge for the years 1935 through 1961. (see Figure 13 for Twitchell function).

b) Any changes from the historic irrigated acreage will result in changes in the amount of calculated rainfall infiltration.

c) Changes from historic basin storage levels will change the year to year and base period average values for underflow into the basin, and for subsurface outflow from the basin to the Pacific Ocean.

SCENARIO 1 - Current Conditions

Current conditions utilize the same data as the "historic conditions" run, with the exceptions noted above. The Santa Maria groundwater basin estimated storage scenario under present (cira 1990) conditions of land use, M & I and agricultural pumpage is shown in Figures 7a and 7b. The starting storage point has been set to the same beginning 1935 storage level as the historic scenario. (see Figure 7a). For this "current conditions" scenario the following parameters were fixed over the base period:

a) M & I pumpage fixed at 27,827 AFY with 40% return flows (see 9/91 Cosby Report - Table 4). Net pumpage = 16,696 AFY.

b) Agricultural irrigated acreage set to 50,000 acres.

c) Agricultural basin wide average applied water duty facto set to 2.43 feet per acre (the model then calculates return flows at about 31%).
Net pumpage = 83,887 AFY.

These parameters are held constant so that this "present condition" of land use and pumpage can be tested through the same climatic base period used for the "historic conditions" run. Figure 7b shows the tabulation of recharge and discharge used for this run. Note how average rainfall infiltration for the base period is higher than for the "historic conditions" run. This is because irrigated acreage is higher (50,000 acres compared to Figure 3). The unaugmented river percolation remains the same. The Twitchell contribution, however, is extended back to 1935 (compare recharge bar chart of Figures 6a and 7a). Underflow into the basin is somewhat greater (4,860 AFY vs 4,032 AFY) and total recharge is greater (than "historic conditions" scenario) mainly because of the increased irrigated acreage and the increase in Twitchell contribution. The "current conditions" storage plot is shown on Figure 7a. The beginning minus-ending storage divided by the 45 year base period shows an average annual basin dewatering of 20,000 AFY (rounded).

If we shift the start of base period storage higher (than 2,490,000AF) then the 45 year period average groundwater basin (GWB) volume will increase, but so will the subsurface outflow to the ocean. The result will be an average annual base period dewatering (net over draft) of greater than 20,000 AFY. If we shift the start of base period storage lower (than 2,490,000AF) the subsurface outflow to the ocean will decrease and the net over draft will decrease (but at the expense of reaching very low levels of basin storage).

SCENARIO 2 - Perennial Yield (current storage)

Figures 8a and 8b display results of a "safe" or perennial yield run of the water budget model. The beginning storage for this run has been set to approximately present day storage (i.e. 2,000,000 AF above sea level). To achieve this condition "safe yield" (where base period ending storage equals beginning storage as in Figure 8a) M & I and agricultural pumpage were each reduced by the same proportion. Irrigated acres were reduced to 39,775, a 20.45% reduction. The agricultural duty factor (2.43 ft./year) was left alone, and therefor the agricultural pumpage also decreased by 20.45%. The M&I pumpage was also decreased by 20.45% (27,827 down to 22,136).

This change in culture left all recharge items alone except for rainfall infiltration which was reduced by 1,484 AFY because of the reduction in irrigated lands (12,168 minus 10,684 = 1,484....compare Figure 7b with Figure 8b), and except for underflow into the groundwater basin which increased by 593 AFY. Notice that for this run, the average basin storage is similar to the "current conditions" run of Figure 7 (2,053,846 Average Acre feet vs. 2,045,762 Average Acre feet).

SCENARIO 3 - Perennial Yield (increased storage)

In Figure 9a and 9b an alternative "safe yield" scenario is depicted. Here we move the starting (and ending) storage upward by 300,000 acre feet. In this scenario, the M & I and agricultural pumpage are reduced by 24.18%. This is achieved for agriculture by

reducing the irrigated acreage by the same 24.18% (to 37,910 acres from 50,000 acres). The elements of recharge remain the same except for a small further reduction in rainfall infiltration, and an 1,161 AFY decrease in underflow into the ground water basin. This alternative "safe yield" scenario (note that there is a continuous range of alternatives) shows a pumpage yield 5,570 AFY less than the Scenario 2, but an average basin storage level and subsurface out-flow considerably higher.
Compare Figure 9b to Figure 8b.

a) Gross pumpage yield reduction
= 118,789 AFY - 113,219 AFY = 5,570 AFY

b) Subsurface outflow increase
= 8,536 AFY - 6,216 AFY = 2,320 AFY

c) Total Recharge decrease
= 86,230 AFY - 84,798 AFY = 1,432 AFY

The great advantage of the Scenario 3 over Scenario 2 is the higher average basin storage and subsurface outflow. The 2,320 AFY increase in subsurface outflow means a significant improvement in the overall basin salt balance as well as lower pumping lifts and less threat of sea water intrusion into basin aquifers.

SCENARIO 4 - Supplemental Supplies

The last scenario we offer here uses the same M & I and agricultural demands as were employed in the "current conditions" run (please refer to Figure 10a and 10b).

In this 'run' the agricultural demand is met through pumping groundwater and the M & I demand is largely met with imported water (see quantities noted at the bottom of Figure 10a). The imported water return flows to the groundwater basin are 40% of the 22,650

AFY import, or 9,060 AFY. Note how the basin recharge is equal to the "current conditions" scenario recharge (87,121 AFY) plus the 'import returns' (9,060 AFY) less the reduced underflow in (4,860 - 4,264 = 596 AFY) giving 95,585 AFY recharge (compare Figure 10b with Figure 7b). The volume of imported water used in this run was selected to give the same beginning and ending basin storage as Scenario 3. Thus, this is seen to be a "safe yield" type of scenario (see Figure 10a storage plot).

Compare Figure 10b to Figure 8b

a) Gross pumpage yield increase
   = 126,677 - 118,789 = 7,888 AFY

b) Subsurface outflow increase
   = 8,592 - 6,216 = 2,376 AFY

c) Total recharge increase
   95,585 - 86,230 = 9,355 AFY

This is considered to be a "desirable" or "good conditions" scenario because groundwater basin storage is maintained at a "healthy" level, thus reducing average pumping lifts while maintaining high average subsurface outflow volumes (and thus higher salt exports) to the ocean. Because the imported water salt content is substantially lower than locally pumped groundwater for M & I uses, the return flows of M & I water will also contain substantially less salt with this scenario, and may with time, improve overall groundwater quality.

IV. CONCLUSIONS

The Basic conclusions of the previous (1986) analysis have not changed; however details such as the precise results of the overdraft calculation do vary. These conclusions are the result of reconnaissance level modelling. Substantial work would be required to perform a more sophisticated and detailed analysis. However the following general conclusions may be stated.

1. For climatic conditions similar to the 1935 through 1979 base period, the Santa Maria

Groundwater Basin, under present cultural conditions and with Twitchell Reservoir in operation, is in a state of overdraft.

2. The overdraft under these climatic and cultural conditions is roughly 20,000 AFY.

3. The overdraft may be ameliorated or eliminated by either a long term change in the future climate to a wetter condition, by a reduction in M & I and agricultural pumpage, by introducing imported water, or by a combination of the above.

4. The overdraft may also be reduced by operating the basin at substantially lower water levels than have occurred historically. This, however, may be an undesirable basin management policy for the following reasons:

a) Increased likelyhood of seawater intrusion into the aquifers.

b) Decreased subsurface outflow and reduced export of basin salts.

c) Increased pumping lifts.

d) Increased frequency of wells going dry.

e) Increased likelyhood of poor quality waters entering the groundwater supplies.

f) Possibly some land subsidence in some areas.

LIMITATIONS OF THE ANALYSIS

5. This analysis is based upon a 45 year water budget model which is calibrated to estimated groundwater basin storage levels based upon historic water well level-aquifer specific yield type measurements. A few observations on this type of model are in order here.

a) The 45 year historic M & I and agricultural pumpage should be as complete as possible. Figure 4 and Figure 5 show where there are gaps in this information. Improvements in this information would improve the calibration of the model.

b) The correct historic irrigated acreage is important for estimating infiltration of rainfall. While we have used the best information available, the data are incomplete (see Figure 3).

c) The stream seepage estimates for both the historic and other conditions runs are probably fairly good. Extensive stream gauging has occurred in Santa Maria Valley; some going back to 1929. Stream seepage estimates prior to 1944 (see Figure 12) may be found in Worts (1951, pg. 69). The estimates of stream seepage related to the Twitchell Project should also be quite good because of relationships derived from an 18 year daily Twitchell model developed by the SBCWA (see Figure 13).

d) Underflow into the Santa Maria Groundwater Basin is an unknown quantity. The function used in the water budget model (varying from 1900 AFY to a maximum of 6,000 AFY) may serve as a useful calibration device, but a full groundwater basin modeling effort (as performed by the U.S. Geological Survey and other private consultants) would be required to get any handle on this hydrologic item.

e) All in all, the groundwater budget model presented herein may serve as an approximate, order of magnitude indicator of basin conditions. The results of these

REFERENCES:

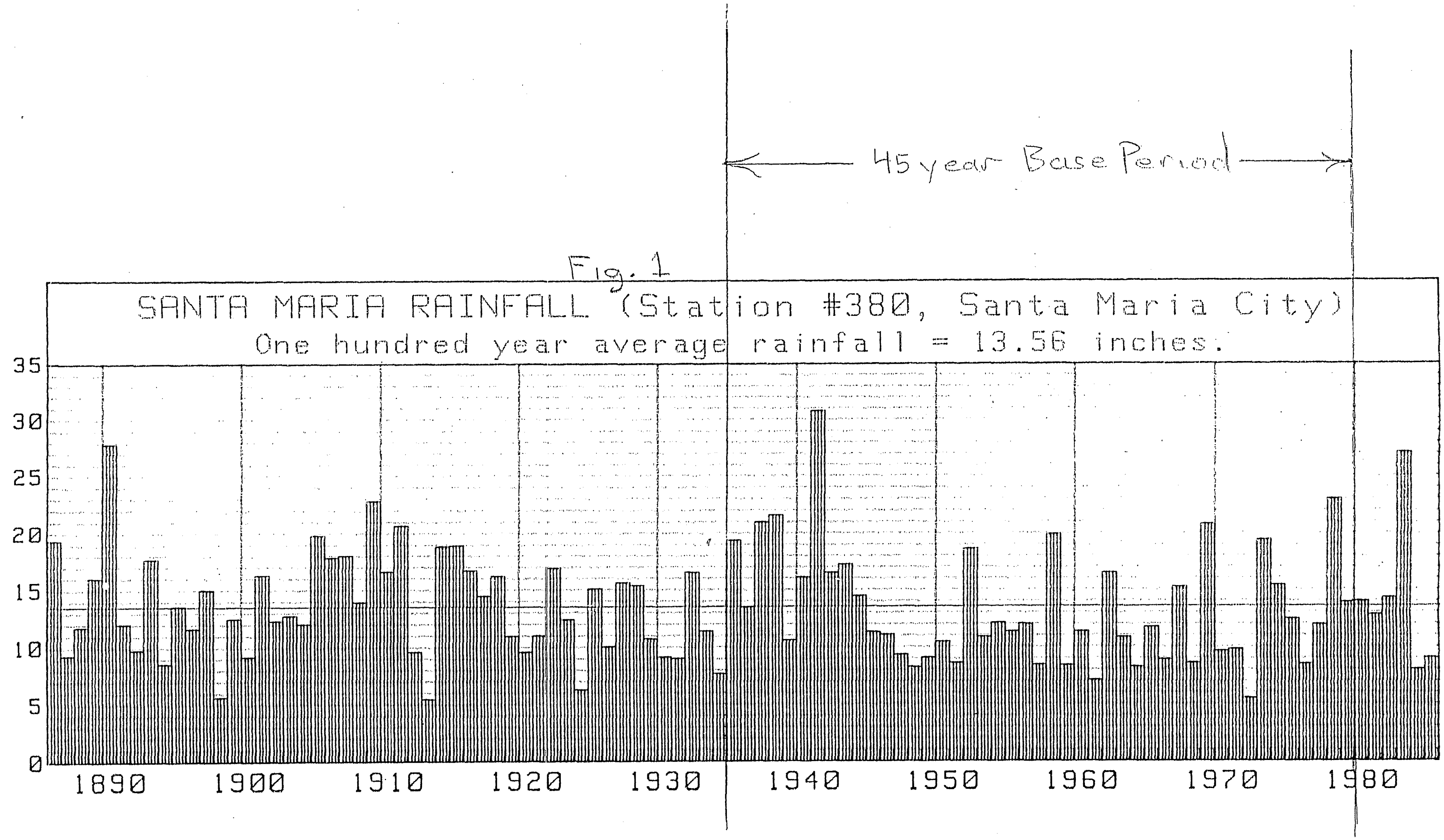
1. Blaney, H.F.; 1933: "Rainfall Penetration in Ventura County Investigations"; California Department of Public Works Bulletin 46, pp. 82-91.

2. Worts, G.F.; 1951: "Geology and Ground-Water Resources of the Santa Maria Valley Area, California"; USGS Water-Supply Paper 1000.

3. Miller, G.A. and Evenson, R.E.; 1966: "Utilization of Ground Water in the Santa Maria Valley Area, California"; USGS Water-Supply Paper 1819-A.

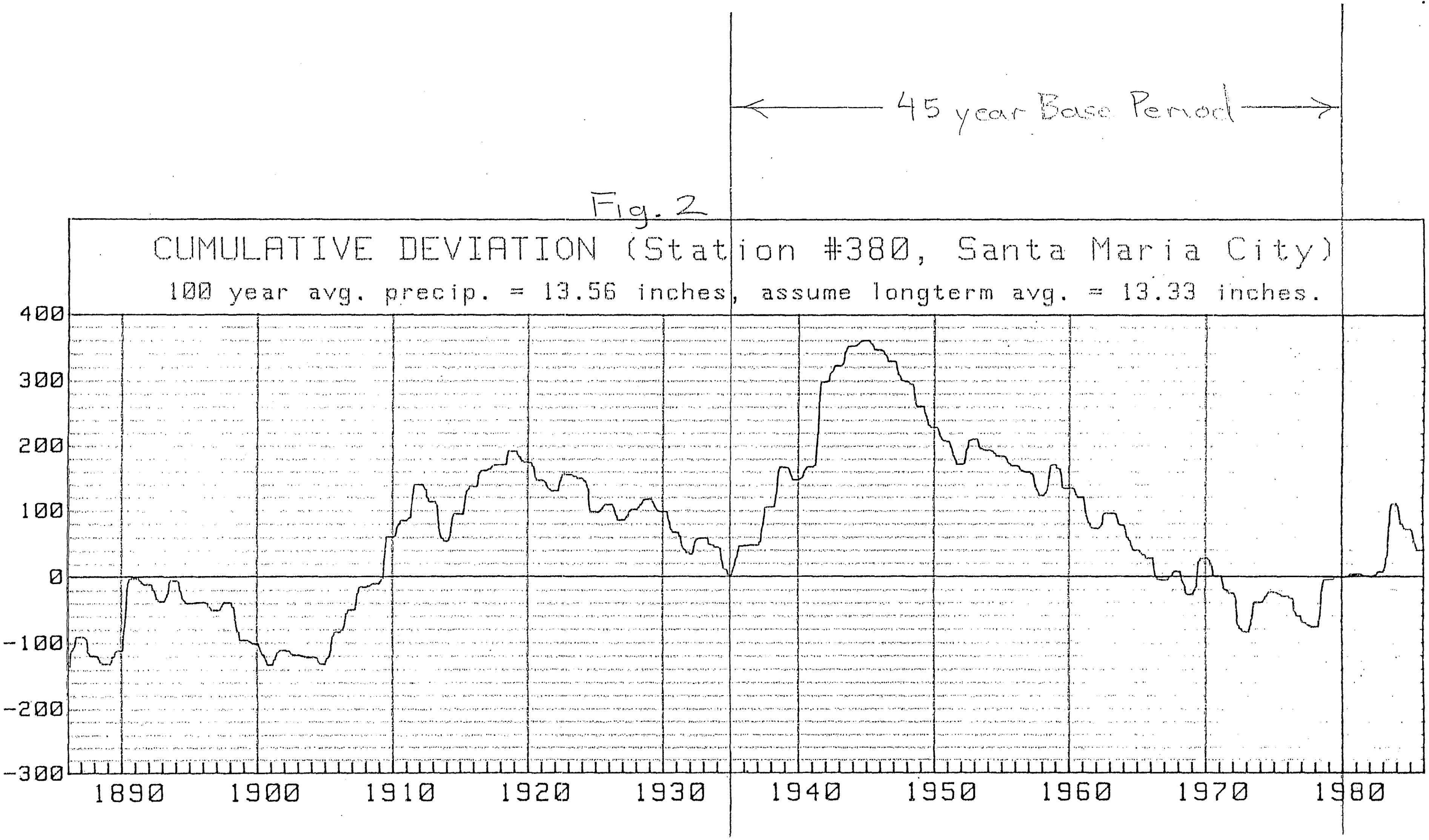
4. Jones, K.; Lawrance; Ahlroth; and MacDonald, 1977: "Adequacy of the Santa Maria Groundwater Basin"; Santa Barbara County Water Agency, November, 1977.

Fig. 1



RAINFALL VALUES IN INCHES; TIME SCALE = SEP-AUG WATER YEARS.

Fig. 2



DEVIATION FROM MEAN IN %; TIME SCALE = SEP-AUG WATER YEARS.

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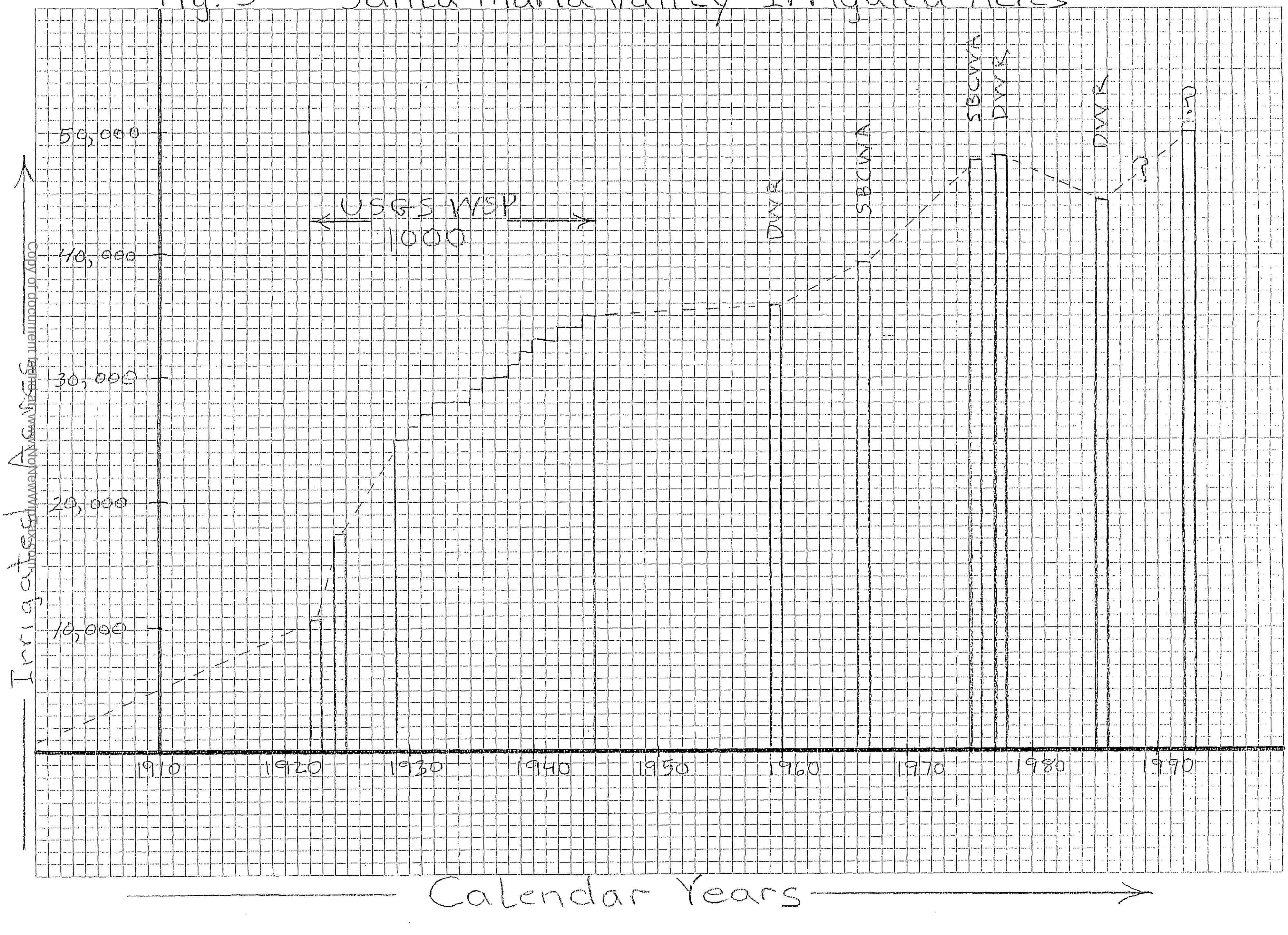
Fig. 3 Santa Maria Valley Irrigated Acres



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SANTA MARIA VALLEY Fig. 4

SBCWA 8/10/92

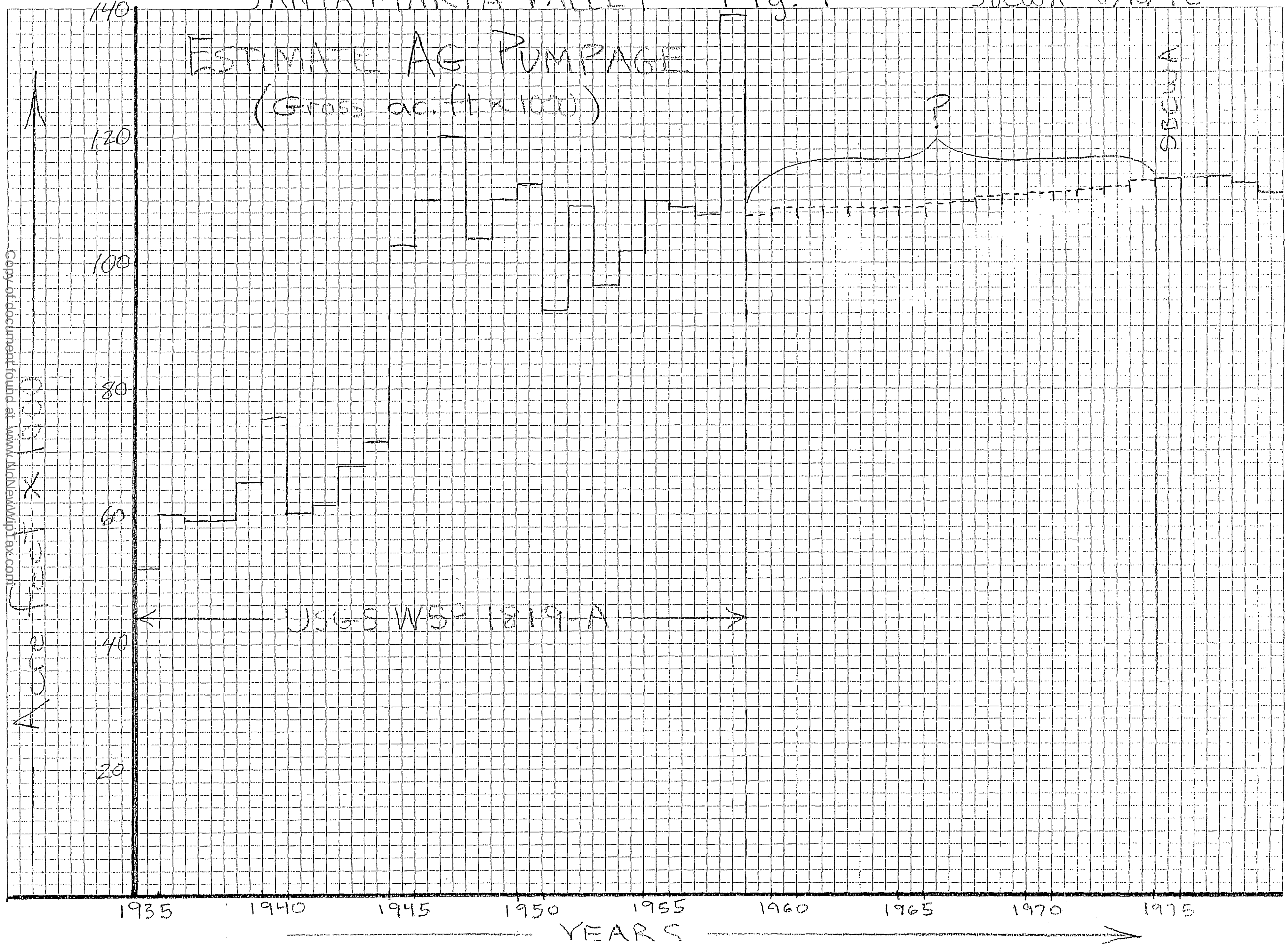

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Fig. 5 SANTA MARIA VALLEY

SBCWA: 8/10/92

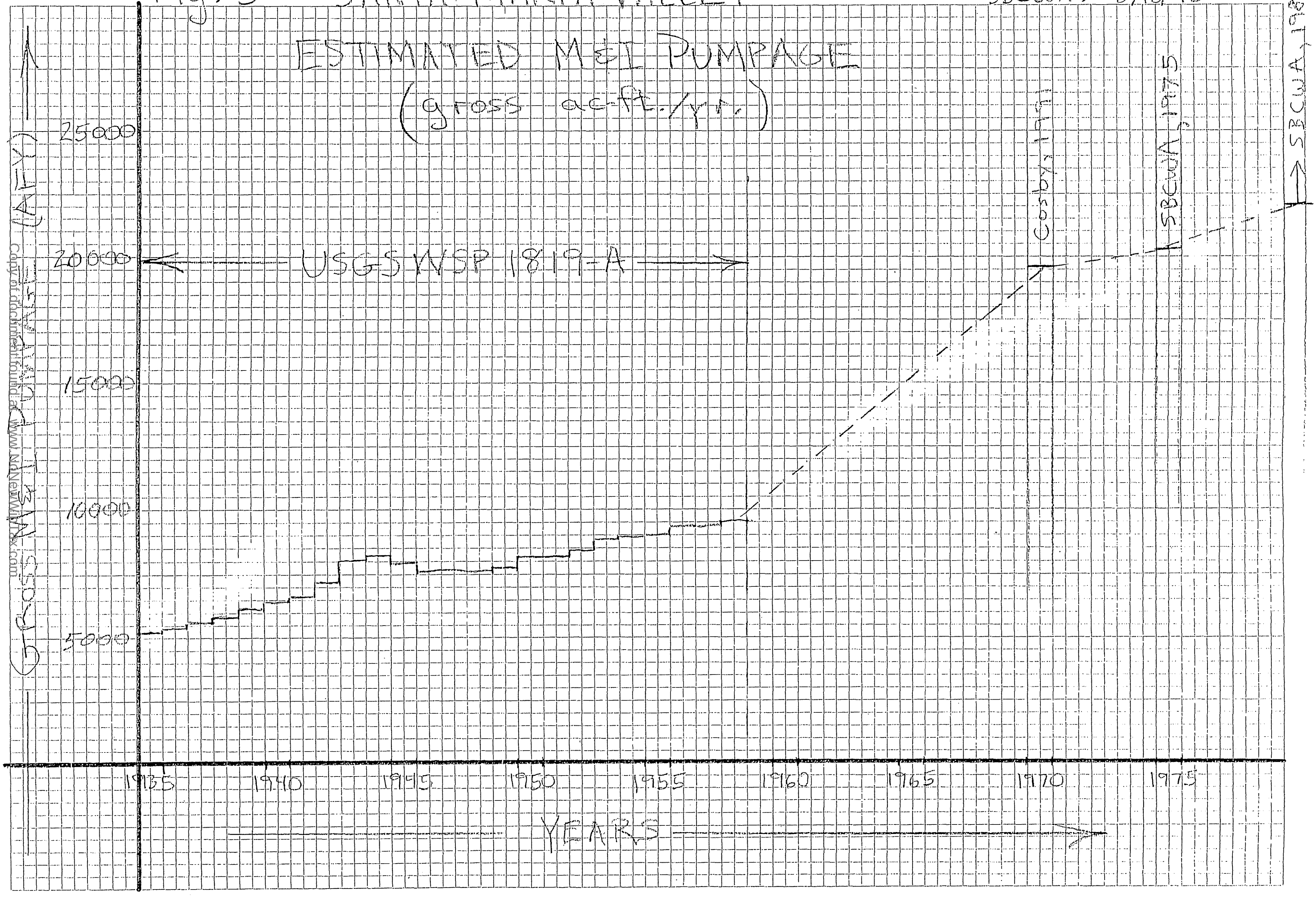
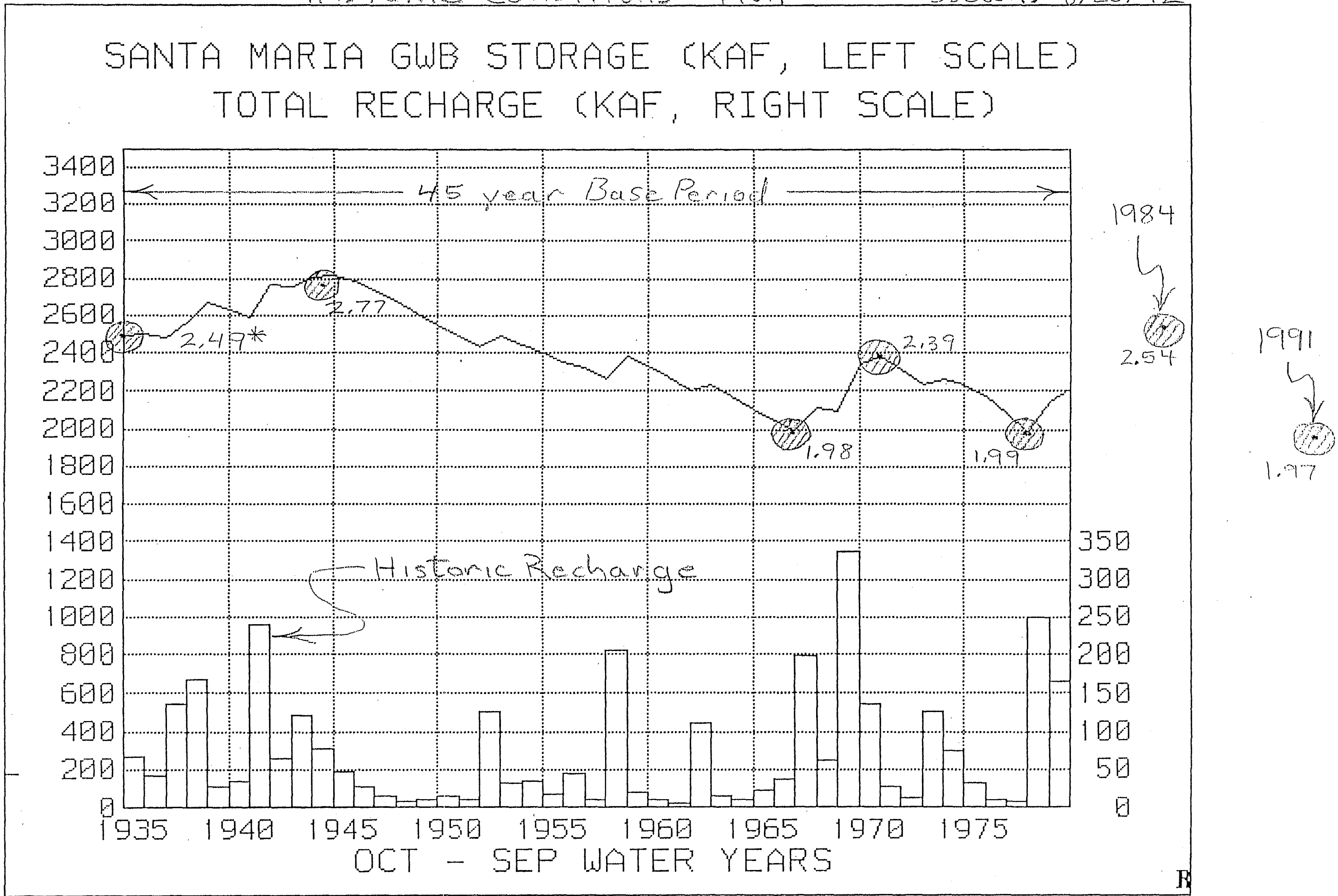


Fig. 6a

"HISTORIC CONDITIONS" RUN SBCWA: 8/20/92



* Storage above sea level estimates (in million acre feet) are hand plotted in the shaded discs, and are based upon historic water well measurements and specific yield values published by the USGS & by Toups (1975).

Fig. [illegible]

SBCWA 8/20/92

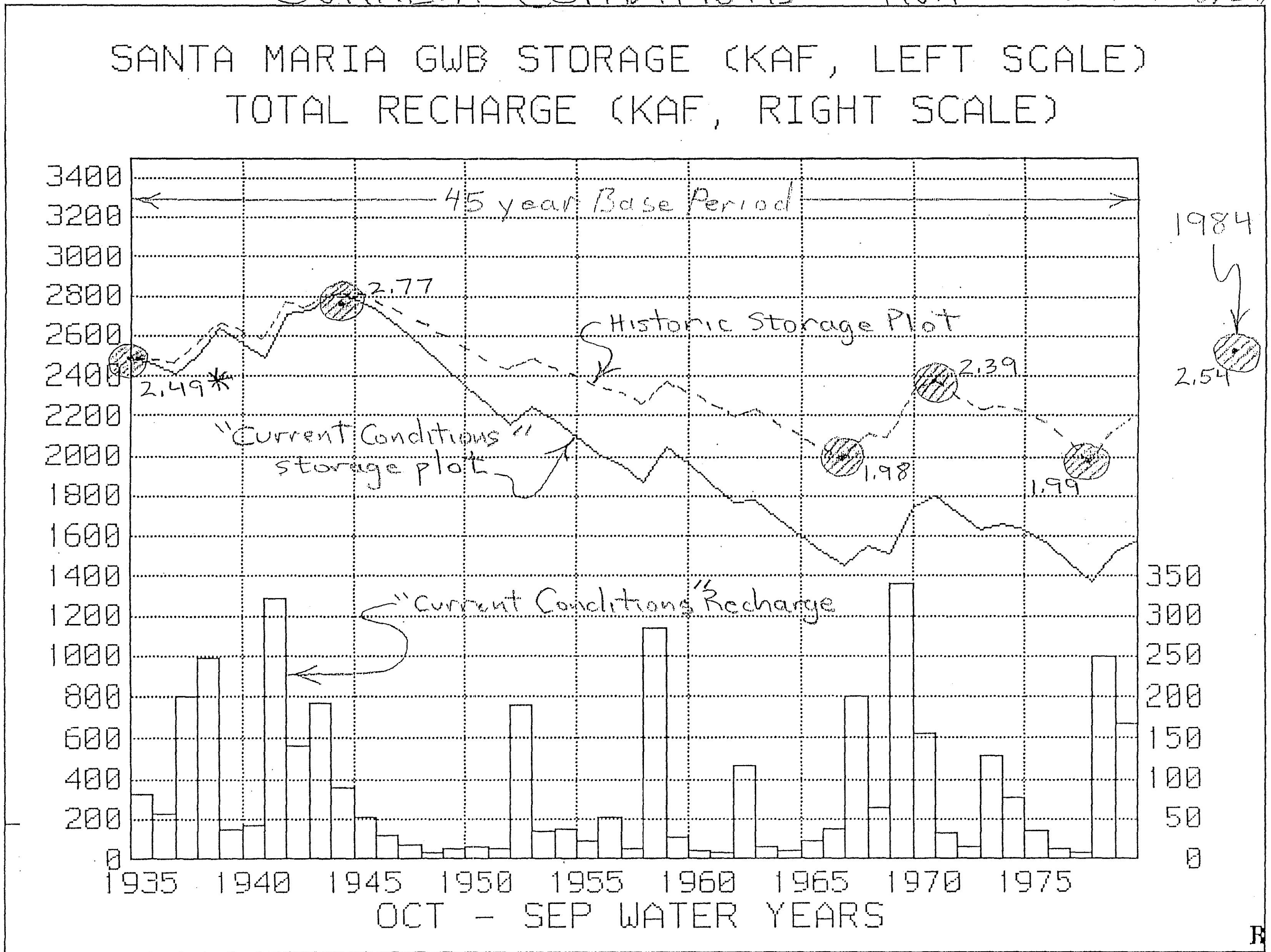
SANTA MARIA GW BASIN GROSS RECHA[illegible]TRACTION SCENARIO (HISTORIC)
(Beginning Ground Water storage = 249[illegible]F); Historic net pumpage displayed.
M&I returns vary 30% to 40%; Ag return[illegible]ry w water duty (over period 1935-79).

OCT-SEP WATR YR	SM-CITY RAINFAL	RAIN INFIL	UA RIVR PERCOLA	TWITCHL CONTRIB	U[illegible]R O-IN	TOTAL RECHARG	M&I C-USE	AGRI C-USE	SUBSU O-OUT	RELATIVE GWB VOLUM
1934-35	19.55	23347	39600	0	3550	66497	3640	42952	9765	2500139
1935-36	13.48	2513	36200	0	3499	42212	3768	47429	9861	2481293
1936-37	20.82	30638	102000	0	3594	136232	3895	46978	9683	2556969
19[illegible]38	22.18	38476	127000	0	3215	168691	4021	47745	10409	2663486
19[illegible]39	11.51	0	24600	0	2683	27283	4284	50946	11483	2624055
19[illegible]40	14.61	4912	27700	0	2880	35492	4407	54674	11078	2589388
19[illegible]-41	30.75	86473	150000	0	3053	239526	4530	49663	10729	2763992
194[illegible]42	16.95	10995	51500	0	2180	64675	4926	50922	12553	2760266
194[illegible]43	17.22	12484	106000	0	2199	120683	5455	53569	12512	2809413
1943-44	14.56	5199	70000	0	1953	77152	5572	55793	13055	2812145
1944-45	11.31	0	45100	0	1939	47039	5351	56711	13085	2784037
1945-46	11.08	0	25600	0	2080	27680	5130	55000	12773	2738813
1946-47	9.42	0	13900	0	2306	16206	5113	60000	12280	2677627
1947-48	8.20	0	4600	0	2612	7212	5096	56275	11630	2611837
1948-49	9.17	0	7800	0	2941	10741	5145	55000	10955	2551478
1949-50	10.47	0	11400	0	3243	14643	5461	56250	10355	2494055
1950-51	8.66	0	7100	0	3530	10630	5442	59452	9804	2429986
1951-52	18.57	20458	101200	0	3850	125508	5556	55397	9209	2485332
1952-53	10.87	0	27900	0	3573	31473	5800	59063	9721	2442221
1953-54	12.12	397	29800	0	3789	33985	5846	57318	9321	2403722
1954-55	13.17	2532	12000	0	3981	18513	5891	56037	8971	2351335
1955-56	14.56	5350	33900	0	4243	43494	6067	56554	8508	2323701
1956-57	9.01	0	6900	0	4381	11281	6046	57074	8269	2263593
1957-58	25.86	61112	138400	0	4682	204194	6154	69400	7764	2384469
1958-59	7.62	0	15100	0	4078	19178	6584	57112	8799	2331151
1959-60	11.33	0	4900	0	4344	9244	7076	57788	8333	2267198
1960-61	7.11	0	1300	0	4664	5964	7564	59127	7794	2198677
1961-62	16.45	9638	66700	30300	5007	111644	8112	60415	7239	2234556
1962-63	11.30	0	9200	0	4827	14027	8592	61653	7527	2170811
1963-64	7.81	0	5000	0	5146	10146	9069	62844	7021	2102024
1964-65	11.71	0	17200	400	5490	23090	9605	63992	6497	2045020
1965-66	9.11	0	29300	1800	5775	36875	10074	65258	6082	2000481
1966-67	15.35	7984	114600	70000	5998	198582	10540	66568	5768	2116187
1967-68	8.25	0	56000	1300	5419	62719	11064	68582	6603	2092657
1968-69	20.84	35865	224400	70000	5537	335802	11584	70493	6428	2339953
1969-70	9.59	0	79600	52300	4300	136200	12163	72291	8409	2383290
1970-71	9.82	0	23000	0	4084	27084	12180	73997	8789	2315407
1971-72	5.45	0	8000	0	4423	12423	12197	75631	8199	2231803
1972-73	19.59	30344	72400	17800	4841	125385	12213	77208	7504	2260263
1973-74	15.21	9308	58400	1800	4699	74206	12291	78730	7737	2235712
1974-75	12.45	1526	25900	400	4821	32647	12336	79914	7536	2168572
1975-76	11.97	140	5800	0	5157	11097	12563	79935	7003	2080167
1976-77	8.51	0	2700	0	5599	8299	12698	79953	6336	1989480
1977-78	24.46	59260	113800	70000	6000	249060	12831	78937	5692	2141080
1978-79	12.51	1665	126000	33200	5295	166160	13023	77921	6792	2209504
AVG.&DS	13.57	10236	50211	7762	4032	72242	7710	61746	9019	2389290

Note: 45 year Base Period historic overdraft
=(2,490,000 AF-2,209,504 AF)/45 years
=6233 AFY

Fig. 7a

"CURRENT CONDITIONS" Run   SBCWA: 8/21/92



* Historic water well level based estimate of storage above sea level (million acre feet). M&I pumpage = 27,827 AFY

Ag pumpage = 121,500 AFY

Fig. 7b

SBCWA: 8/21/92

SANTA MARIA GW BASIN GROSS RECHARGE - EXTRACTION SCENARIO (CURRENT)
(Beginning Ground Water storage = 2490000 AF); 1990 Level of pumpage displayed.
M&I return flows fixed @ 40%; Ag returns are function of water duty (acft/acr).

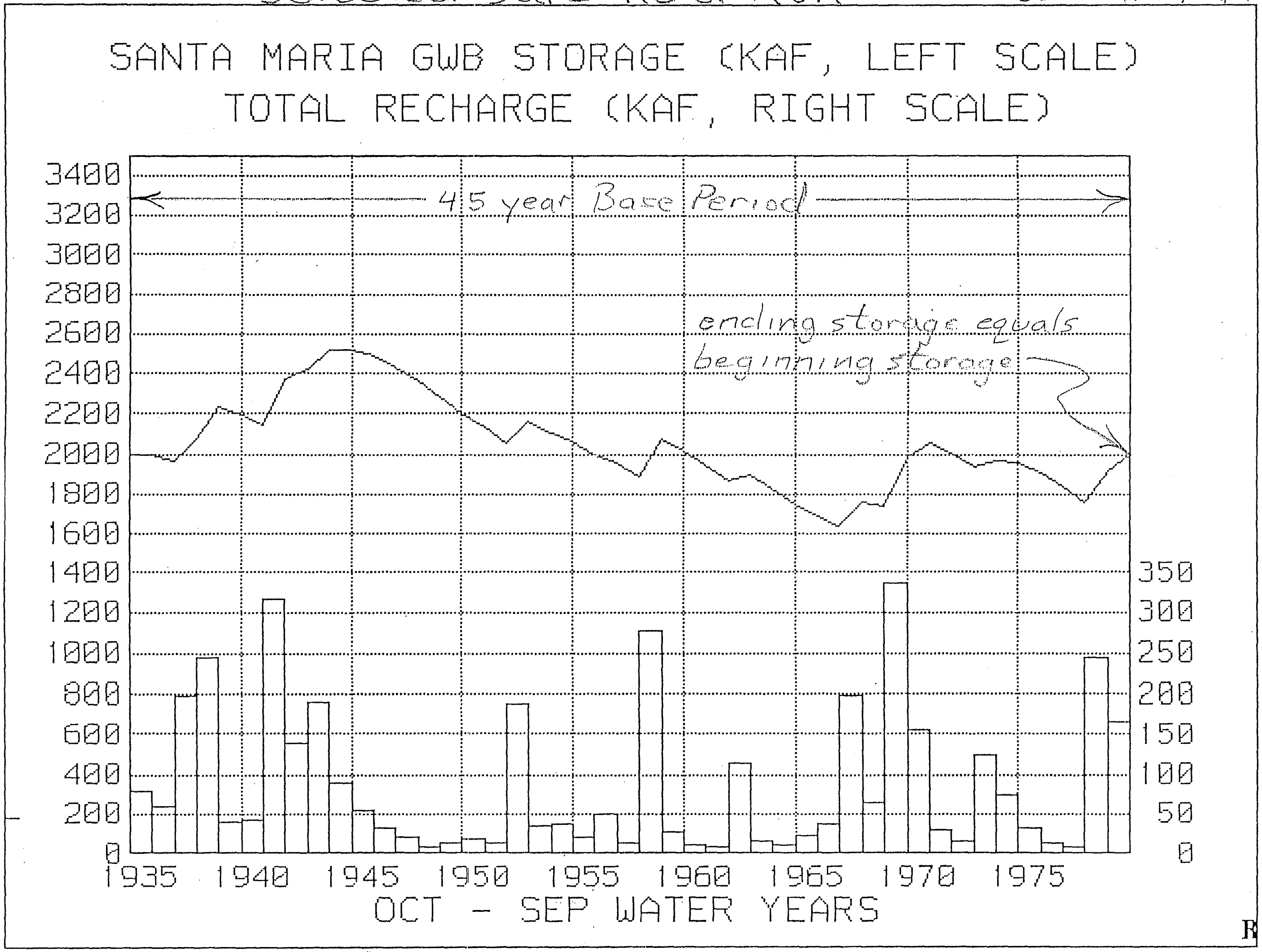
OCT-SEP WATR YR	SM-CITY RAINFAL	RAIN INFIL	UA RIVR PERCOLA	TWITCHL CONTRIB	UNDR O-IN	TOTAL RECHARG	M&I C-USE	AGRI C-USE	SUBSU O-OUT	RELATIVE GWB VOLUM
1934-35	19.55	31705	39600	5700	3550	80555	16696	83887	9765	2460206
1935-36	13.48	4746	36200	13000	3699	57645	16696	83887	9487	2407781
1936-37	20.82	39160	102000	54400	3961	199521	16696	83887	9008	2497710
1937-38	22.18	47143	127000	70000	3511	247654	16696	83887	9838	2634943
1938-39	11.51	0	24600	9900	2825	37325	16696	83887	11189	2560496
1939-40	14.61	8187	27700	3100	3198	42185	16696	83887	10444	2491653
1940-41	30.75	97449	150000	70000	3542	320990	16696	83887	9781	2702279
1941-42	16.95	16443	51500	70000	2489	140432	16696	83887	11889	2730238
1942-43	17.22	18028	106000	66000	2349	192377	16696	83887	12187	2809844
1943-44	14.56	8035	70000	10300	1951	90286	16696	83887	13060	2786486
1944-45	11.31	0	45100	5300	2068	52468	16696	83887	12800	2725570
1945-46	11.08	0	25600	2200	2372	30172	16696	83887	12137	2643021
1946-47	9.42	0	13900	1100	2785	17785	16696	83887	11272	2548951
1947-48	8.20	0	4600	0	3255	7855	16696	83887	10331	2445891
1948-49	9.17	0	7800	0	3771	11571	16696	83887	9354	2347524
1949-50	10.47	0	11400	600	4262	16262	16696	83887	8475	2254728
1950-51	8.66	0	7100	0	4726	11826	16696	83887	7691	2158279
1951-52	18.57	25952	101200	58400	5209	190761	16696	83887	6923	2241533
1952-53	10.87	0	27900	2600	4792	35292	16696	83887	7583	2168658
1953-54	12.12	604	29800	2400	5157	37961	16696	83887	7004	2099032
1954-55	13.17	3802	12000	0	5505	21307	16696	83887	6475	2013280
1955-56	14.56	8035	33900	4600	5934	52469	16696	83887	5857	1959308
1956-57	9.01	0	6900	0	6000	12900	16696	83887	5486	1866138
1957-58	25.86	68745	138400	70000	6000	283145	16696	83887	4880	2043819
1958-59	7.62	0	15100	5800	5781	26681	16696	83887	6073	1963843
1959-60	11.33	0	4900	0	6000	10900	16696	83887	5517	1868643
1960-61	7.11	0	1300	0	6000	7300	16696	83887	4895	1770464
1961-62	16.45	13791	66700	30300	6000	116791	16696	83887	4299	1782372
1962-63	11.30	0	9200	0	6000	15200	16696	83887	4369	1692619
1963-64	7.81	0	5000	0	6000	11000	16696	83887	3859	1599177
1964-65	11.71	0	17200	400	6000	23600	16696	83887	3366	1518827
1965-66	9.11	0	29300	1800	6000	37100	16696	83887	2973	1452370
1966-67	15.35	10441	114600	70000	6000	201041	16696	83887	2670	1550158
1967-68	8.25	0	56000	1300	6000	63300	16696	83887	3123	1509751
1968-69	20.84	39277	224400	70000	6000	339677	16696	83887	2931	1745914
1969-70	9.59	0	79600	70000	6000	155600	16696	83887	4157	1796773
1970-71	9.82	0	23000	2300	6000	31300	16696	83887	4455	1723035
1971-72	5.45	0	8000	0	6000	14000	16696	83887	4027	1632424
1972-73	19.59	31940	72400	17800	6000	128140	16696	83887	3537	1656443
1973-74	15.21	10015	58400	1800	6000	76215	16696	83887	3663	1628411
1974-75	12.45	1609	25900	400	6000	33909	16696	83887	3516	1558220
1975-76	11.97	147	5800	0	6000	11947	16696	83887	3162	1466422
1976-77	8.51	0	2700	0	6000	8700	16696	83887	2733	1371806
1977-78	24.46	60527	113800	70000	6000	250327	16696	83887	2327	1519221
1978-79	12.51	1792	126000	33200	6000	166992	16696	83887	2975	1582654
AVG.&DS	13.57	12168	50211	19882	4860	87121	16696	83887	6701	2053846

Note; "Current Conditions" overdraft =
(2,490,000 − 1582654)/45 = 20,163 AFY
Round this to 20,000 AFY

M&I pumpage = 27,827 AFY; Ag pumpage = 121,500 AFY

Fig. 8a

"Selected Safe Yield Run" SBCWA: 8/21/92



Gross M&I Pumpage = 22,136 AFY

Gross Ag Pumpage = 96,653 AFY ⇒ 2.43 ft./yr. on 39,775 acres

Fig. 8b

SBCWA: 8/21/92

SANTA MARIA GW BASIN GROSS RECHARGE - EXTRACTION SCENARIO (CURRENT)
(Beginning Ground Water storage = 2000000 AF); 1990 Level of pumpage displayed.
M&I return flows fixed @ 40%; Ag returns are function of water duty (acft/acr).

OCT-SEP WATR YR	SM-CITY RAINFAL	RAIN INFIL	UA RIVR PERCOLA	TWITCHL CONTRIB	UNDR Q-IN	TOTAL RECHARG	M&I C-USE	AGRI C-USE	SUBSU Q-OUT	RELATIVE GWB VOLUM
1934-35	19.55	27635	39600	5700	6000	78935	13282	66732	5764	1993157
1935-36	13.48	3604	36200	13000	6000	58804	13282	66732	5717	1966229
1936-37	20.82	34803	102000	54400	6000	197203	13282	66732	5533	2077885
1937-38	22.18	42479	127000	70000	5611	245090	13282	66732	6319	2236641
1938-39	11.51	0	24600	9900	4817	39317	13282	66732	7544	2188400
1939-40	14.61	6218	27700	3100	5058	42076	13282	66732	7158	2143303
1940-41	30.75	90847	150000	70000	5283	316131	13282	66732	6808	2372611
1941-42	16.95	12961	51500	70000	4137	138598	13282	66732	8694	2422501
1942-43	17.22	14485	106000	66000	3887	190373	13282	66732	9141	2523719
1943-44	14.56	6102	70000	10300	3381	89783	13282	66732	10086	2523401
1944-45	11.31	0	45100	5300	3383	53783	13282	66732	10083	2487086
1945-46	11.08	0	25600	2200	3565	31365	13282	66732	9738	2428699
1946-47	9.42	0	13900	1100	3857	18857	13282	66732	9197	2358344
1947-48	8.20	0	4600	0	4208	8808	13282	66732	8569	2278569
1948-49	9.17	0	7800	0	4607	12407	13282	66732	7888	2203074
1949-50	10.47	0	11400	600	4985	16985	13282	66732	7274	2132770
1950-51	8.66	0	7100	0	5336	12436	13282	66732	6728	2058463
1951-52	18.57	22104	101200	58400	5708	187412	13282	66732	6178	2159683
1952-53	10.87	0	27900	2600	5202	35702	13282	66732	6934	2108436
1953-54	12.12	459	29800	2400	5458	38117	13282	66732	6545	2059993
1954-55	13.17	2887	12000	0	5700	20587	13282	66732	6189	1994377
1955-56	14.56	6102	33900	4600	6000	50602	13282	66732	5726	1959239
1956-57	9.01	0	6900	0	6000	12900	13282	66732	5486	1886639
1957-58	25.86	63249	138400	70000	6000	277649	13282	66732	5010	2079264
1958-59	7.62	0	15100	5800	5604	26504	13282	66732	6329	2019424
1959-60	11.33	0	4900	0	5903	10803	13282	66732	5900	1944312
1960-61	7.11	0	1300	0	6000	7300	13282	66732	5386	1866212
1961-62	16.45	10473	66700	30300	6000	113473	13282	66732	4880	1894791
1962-63	11.30	0	9200	0	6000	15200	13282	66732	5062	1824915
1963-64	7.81	0	5000	0	6000	11000	13282	66732	4624	1751276
1964-65	11.71	0	17200	400	6000	23600	13282	66732	4188	1690674
1965-66	9.11	0	29300	1800	6000	37100	13282	66732	3848	1643912
1966-67	15.35	7929	114600	70000	6000	198529	13282	66732	3597	1758829
1967-68	8.25	0	56000	1300	6000	63300	13282	66732	4232	1737883
1968-69	20.84	34916	224400	70000	6000	335316	13282	66732	4111	1989074
1969-70	9.59	0	79600	70000	6000	155600	13282	66732	5689	2058971
1970-71	9.82	0	23000	2300	5705	31005	13282	66732	6182	2003780
1971-72	5.45	0	8000	0	5981	13981	13282	66732	5791	1931956
1972-73	19.59	27861	72400	17800	6000	124061	13282	66732	5304	1970699
1973-74	15.21	7605	58400	1800	6000	73805	13282	66732	5563	1958926
1974-75	12.45	1222	25900	400	6000	33522	13282	66732	5484	1906950
1975-76	11.97	112	5800	0	6000	11912	13282	66732	5140	1833707
1976-77	8.51	0	2700	0	6000	8700	13282	66732	4678	1757715
1977-78	24.46	55347	113800	70000	6000	245147	13282	66732	4225	1918623
1978-79	12.51	1361	126000	33200	6000	166561	13282	66732	5216	1999953
AVG.&DS	13.57	10684	50211	19882	5453	86230	13282	66732	6216	2045762

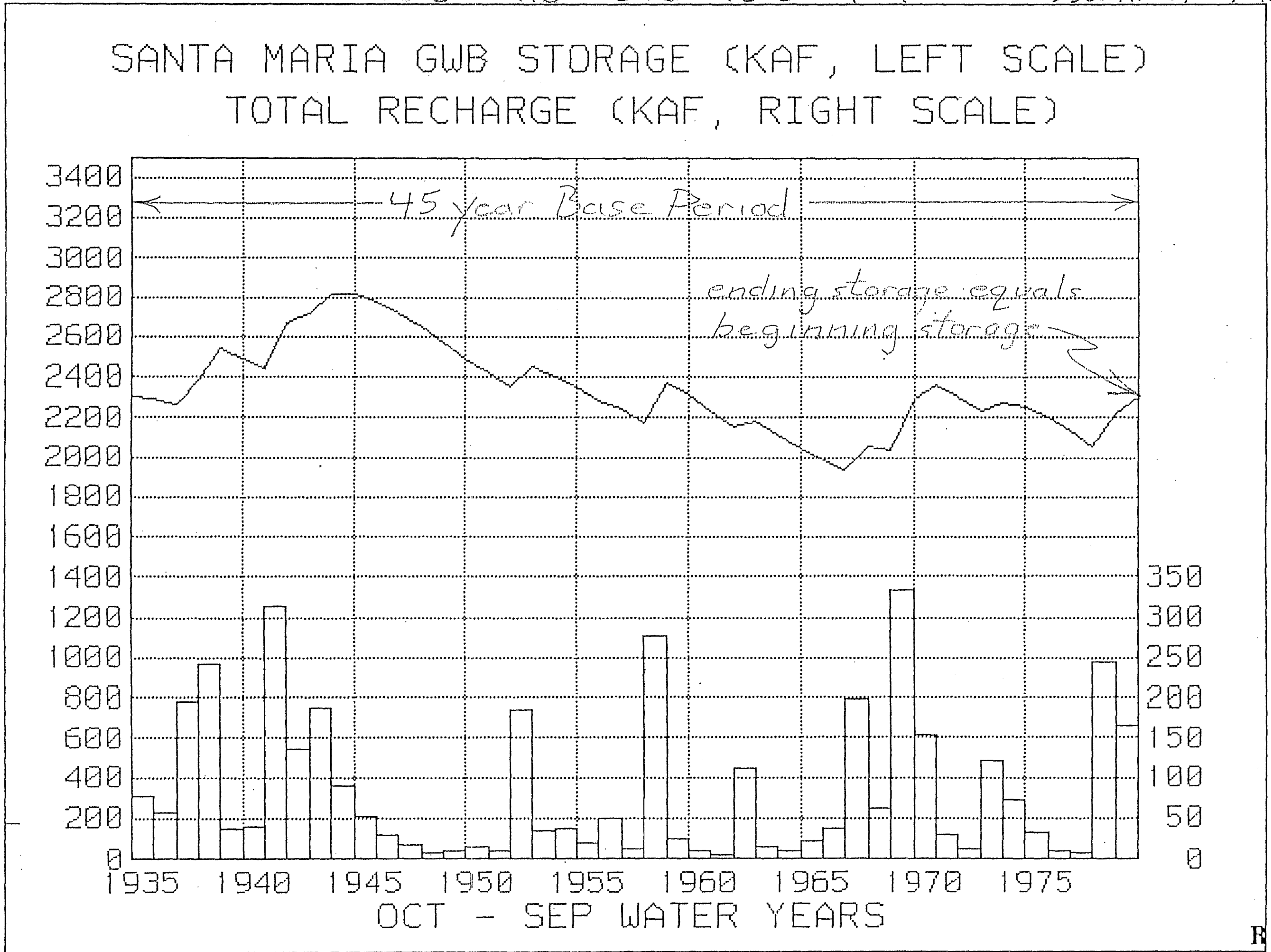
Gross M&I Pumpage = 22,136 AFY
Gross Ag Pumpage = 96,653 AFY
} 118,789 AFY

Rounded ⇒ 119,000 AFY selected "Safe Yield"

Fig. 9a

"Alternate Safe Yield Run"

SBCWA: 8/21/92



Gross M&I Pumpage = 21,098 AFY

Gross Ag. Pumpage = 92,192 AFY → 2.43 ft./yr. on 37,910 acres

Fig. 9b

SBCWA: 8/21/92

SANTA MARIA GW BASIN GROSS RECHARGE - EXTRACTION SCENARIO (CURRENT)
(Beginning Ground Water storage = 2300000 AF); 1990 Level of pumpage displayed.
M&I return flows fixed @ 40%; Ag returns are function of water duty (acft/acr).

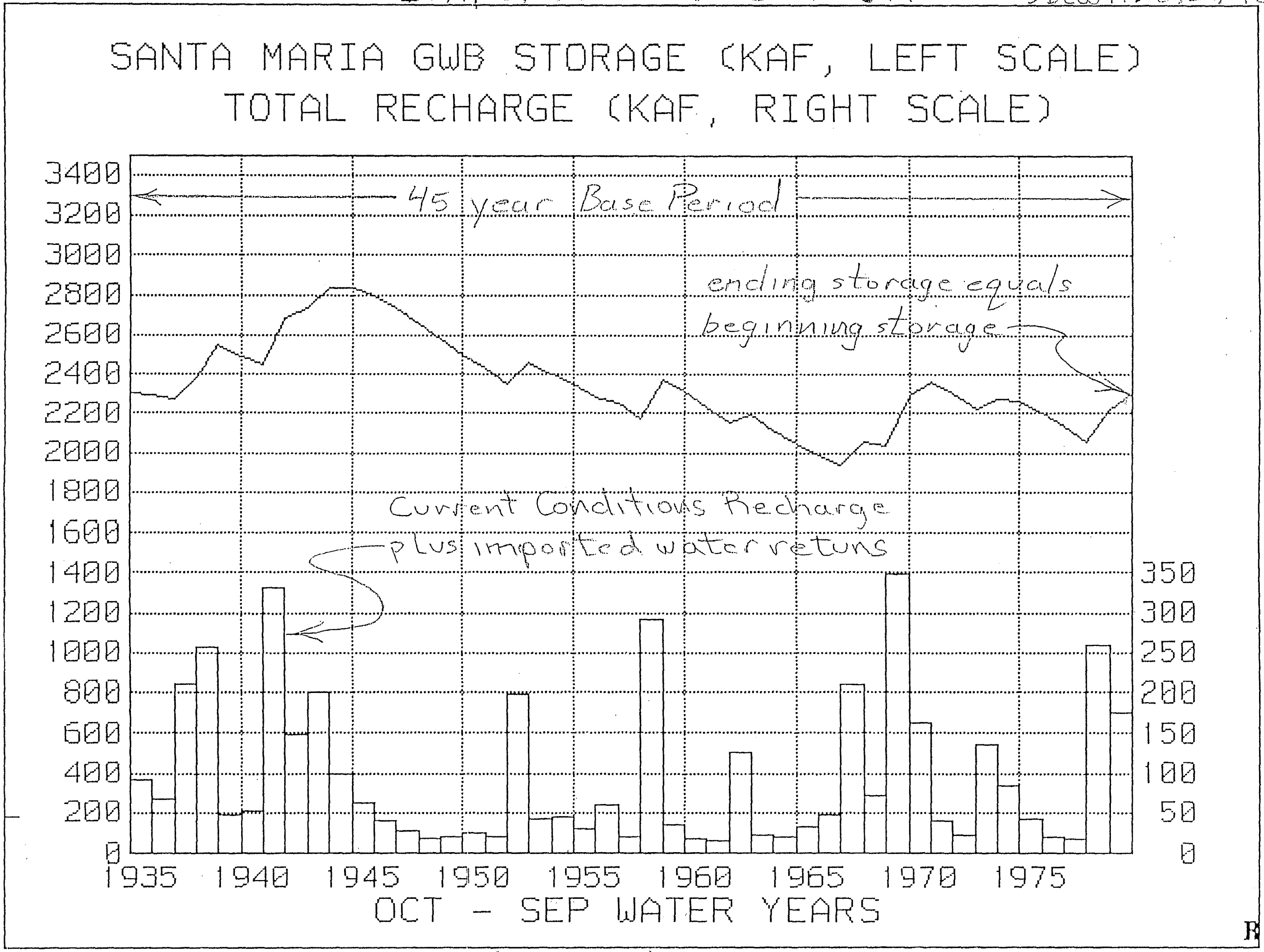
OCT-SEP WATR YR	SM-CITY RAINFAL	RAIN INFIL	UA RIVR PERCOLA	TWITCHL CONTRIB	UNDR Q-IN	TOTAL RECHARG	M&I C-USE	AGRI C-USE	SUBSU Q-OUT	RELATIVE GWB VOLUM
1934-35	19.55	26893	39600	5700	4500	76693	12659	63603	8068	2292363
1935-36	13.48	3396	36200	13000	4538	57134	12659	63603	8004	2265231
1936-37	20.82	34009	102000	54400	4674	195082	12659	63603	7778	2376273
1937-38	22.18	41628	127000	70000	4119	242747	12659	63603	8727	2534030
1938-39	11.51	0	24600	9900	3330	37830	12659	63603	10186	2485412
1939-40	14.61	5858	27700	3100	3573	40231	12659	63603	9722	2439659
1940-41	30.75	89643	150000	70000	3802	313445	12659	63603	9297	2667544
1941-42	16.95	12326	51500	70000	2662	136488	12659	63603	11525	2716245
1942-43	17.22	13839	106000	66000	2419	188258	12659	63603	12038	2816202
1943-44	14.56	5749	70000	10300	1919	87968	12659	63603	13131	2814777
1944-45	11.31	0	45100	5300	1926	52326	12659	63603	13115	2777726
1945-46	11.08	0	25600	2200	2111	29911	12659	63603	12704	2718671
1946-47	9.42	0	13900	1100	2407	17407	12659	63603	12064	2647752
1947-48	8.20	0	4600	0	2761	7361	12659	63603	11320	2567530
1948-49	9.17	0	7800	0	3162	10962	12659	63603	10513	2491717
1949-50	10.47	0	11400	600	3541	15541	12659	63603	9782	2421215
1950-51	8.66	0	7100	0	3894	10994	12659	63603	9129	2346817
1951-52	18.57	21403	101200	58400	4266	185268	12659	63603	8469	2447354
1952-53	10.87	0	27900	2600	3763	34263	12659	63603	9368	2395987
1953-54	12.12	432	29800	2400	4020	36652	12659	63603	8902	2347475
1954-55	13.17	2720	12000	0	4263	18983	12659	63603	8474	2281721
1955-56	14.56	5749	33900	4600	4591	48841	12659	63603	7915	2246385
1956-57	9.01	0	6900	0	4768	11668	12659	63603	7623	2174167
1957-58	25.86	62246	138400	70000	5129	275775	12659	63603	7047	2366633
1958-59	7.62	0	15100	5800	4167	25067	12659	63603	8642	2306796
1959-60	11.33	0	4900	0	4466	9366	12659	63603	8125	2231774
1960-61	7.11	0	1300	0	4841	6141	12659	63603	7504	2154148
1961-62	16.45	9868	66700	30300	5229	112097	12659	63603	6892	2183091
1962-63	11.30	0	9200	0	5085	14285	12659	63603	7116	2113997
1963-64	7.81	0	5000	0	5430	10430	12659	63603	6587	2041578
1964-65	11.71	0	17200	400	5792	23392	12659	63603	6057	1982650
1965-66	9.11	0	29300	1800	6000	37100	12659	63603	5645	1937843
1966-67	15.35	7471	114600	70000	6000	198071	12659	63603	5343	2054309
1967-68	8.25	0	56000	1300	5728	63028	12659	63603	6148	2034926
1968-69	20.84	34121	224400	70000	5825	334346	12659	63603	6010	2287000
1969-70	9.59	0	79600	70000	4565	154165	12659	63603	7959	2356944
1970-71	9.82	0	23000	2300	4215	29515	12659	63603	8557	2301640
1971-72	5.45	0	8000	0	4492	12492	12659	63603	8082	2229787
1972-73	19.59	27117	72400	17800	4851	122168	12659	63603	7488	2268205
1973-74	15.21	7166	58400	1800	4659	72025	12659	63603	7802	2256165
1974-75	12.45	1151	25900	400	4719	32171	12659	63603	7703	2204370
1975-76	11.97	105	5800	0	4978	10883	12659	63603	7284	2131706
1976-77	8.51	0	2700	0	5341	8041	12659	63603	6720	2056765
1977-78	24.46	54402	113800	70000	5716	243919	12659	63603	6166	2218255
1978-79	12.51	1282	126000	33200	4909	165391	12659	63603	7395	2299988
AVG.&DS	13.57	10413	50211	19882	4292	84798	12659	63603	8536	2338931

M&I gross pumpage = 21098 AFY }
Ag gross pumpage = 92121 AFY } 113,219 AFY

This "Safe Yield" is 5570 AFY Less than the "Selected" safe yield of Fig. 8a&b...

Fig. 10a

"Imported Water Run" SBCWA: 8/21/92



M&I gross use = 5177 AFY (pumpage) + 22650 AFY Imports = 27,827 AFY
Ag gross use = 121,500 AFY (pumpage) same as "Current Conditions Run". Fig. 7 a and b...

Fig. 10b

SBCWA: 8/21/92

SANTA MARIA GW BASIN GROSS RECHARGE - EXTRACTION SCENARIO (CURRENT)
(Beginning Ground Water storage = 2300000 AF); 1990 Level of pumpage displayed.
M&I return flows fixed @ 40%; Ag returns are function of water duty (acft/acr).

OCT-SEP WATR YR	SM-CITY RAINFAL	RAIN INFIL	UA RIVR PERCOLA	TWITCHL CONTRIB	UNDR Q-IN	TOTAL RECHARG	M&I C-USE	AGRI C-USE	SUBSU Q-OUT	RELATIVE GWB VOLUM
1934-35	19.55	31705	39600	5700	4500	90565	3106	83887	8068	2295503
1935-36	13.48	4746	36200	13000	4522	67528	3106	83887	8030	2268008
1936-37	20.82	39160	102000	54400	4660	209280	3106	83887	7801	2382494
1937-38	22.18	47143	127000	70000	4088	257291	3106	83887	8782	2544009
1938-39	11.51	0	24600	9900	3280	46840	3106	83887	10283	2493572
1939-40	14.61	8187	27700	3100	3532	51580	3106	83887	9799	2448359
1940-41	30.75	97449	150000	70000	3758	330267	3106	83887	9377	2682255
1941-42	16.95	16443	51500	70000	2589	149592	3106	83887	11678	2733175
1942-43	17.22	18028	106000	66000	2334	201422	3106	83887	12219	2835385
1943-44	14.56	8035	70000	10300	1823	99218	3106	83887	13347	2834262
1944-45	11.31	0	45100	5300	1829	61289	3106	83887	13334	2795223
1945-46	11.08	0	25600	2200	2024	38884	3106	83887	12897	2734216
1946-47	9.42	0	13900	1100	2329	26389	3106	83887	12230	2661381
1947-48	8.20	0	4600	0	2693	16353	3106	83887	11461	2579280
1948-49	9.17	0	7800	0	3104	19964	3106	83887	10629	2501621
1949-50	10.47	0	11400	600	3492	24552	3106	83887	9875	2429304
1950-51	8.66	0	7100	0	3853	20013	3106	83887	9202	2353121
1951-52	18.57	25952	101200	58400	4234	198847	3106	83887	8524	2456451
1952-53	10.87	0	27900	2600	3718	43278	3106	83887	9452	2403283
1953-54	12.12	604	29800	2400	3984	45848	3106	83887	8967	2353170
1954-55	13.17	3802	12000	0	4234	29096	3106	83887	8524	2286748
1955-56	14.56	8035	33900	4600	4566	60161	3106	83887	7957	2251959
1956-57	9.01	0	6900	0	4740	20700	3106	83887	7669	2177997
1957-58	25.86	68745	138400	70000	5110	291315	3106	83887	7077	2375242
1958-59	7.62	0	15100	5800	4124	34084	3106	83887	8718	2313614
1959-60	11.33	0	4900	0	4432	18392	3106	83887	8183	2236829
1960-61	7.11	0	1300	0	4816	15176	3106	83887	7545	2157466
1961-62	16.45	13791	66700	30300	5213	125064	3106	83887	6917	2188619
1962-63	11.30	0	9200	0	5057	23317	3106	83887	7160	2117782
1963-64	7.81	0	5000	0	5411	19471	3106	83887	6615	2043645
1964-65	11.71	0	17200	400	5782	32442	3106	83887	6072	1983021
1965-66	9.11	0	29300	1800	6000	46160	3106	83887	5647	1936540
1966-67	15.35	10441	114600	70000	6000	210101	3106	83887	5334	2054313
1967-68	8.25	0	56000	1300	5728	72088	3106	83887	6148	2033260
1968-69	20.84	39277	224400	70000	5834	348571	3106	83887	5998	2288839
1969-70	9.59	0	79600	70000	4556	163216	3106	83887	7974	2357088
1970-71	9.82	0	23000	2300	4215	38575	3106	83887	8558	2300110
1971-72	5.45	0	8000	0	4499	21559	3106	83887	8069	2226607
1972-73	19.59	31940	72400	17800	4867	136067	3106	83887	7463	2268218
1973-74	15.21	10015	58400	1800	4659	83934	3106	83887	7802	2257355
1974-75	12.45	1609	25900	400	4713	41682	3106	83887	7713	2204331
1975-76	11.97	147	5800	0	4978	19986	3106	83887	7284	2130039
1976-77	8.51	0	2700	0	5350	17110	3106	83887	6708	2053447
1977-78	24.46	60527	113800	70000	5733	259119	3106	83887	6142	2219431
1978-79	12.51	1792	126000	33200	4903	174955	3106	83887	7405	2299987
AVG.&DS	13.57	12168	50211	19882	4264	95585	3106	83887	8592	2344490

M&I gross pumpage = 5177 AFY; M&I Imports = 22,650 AFY.
Total M&I = 27,827 AFY (as in Fig. 7).
Ag gross pumage = 121,500 AFY (as in Fig. 7).

Fig. 11 "Subsurface Outflow Function"

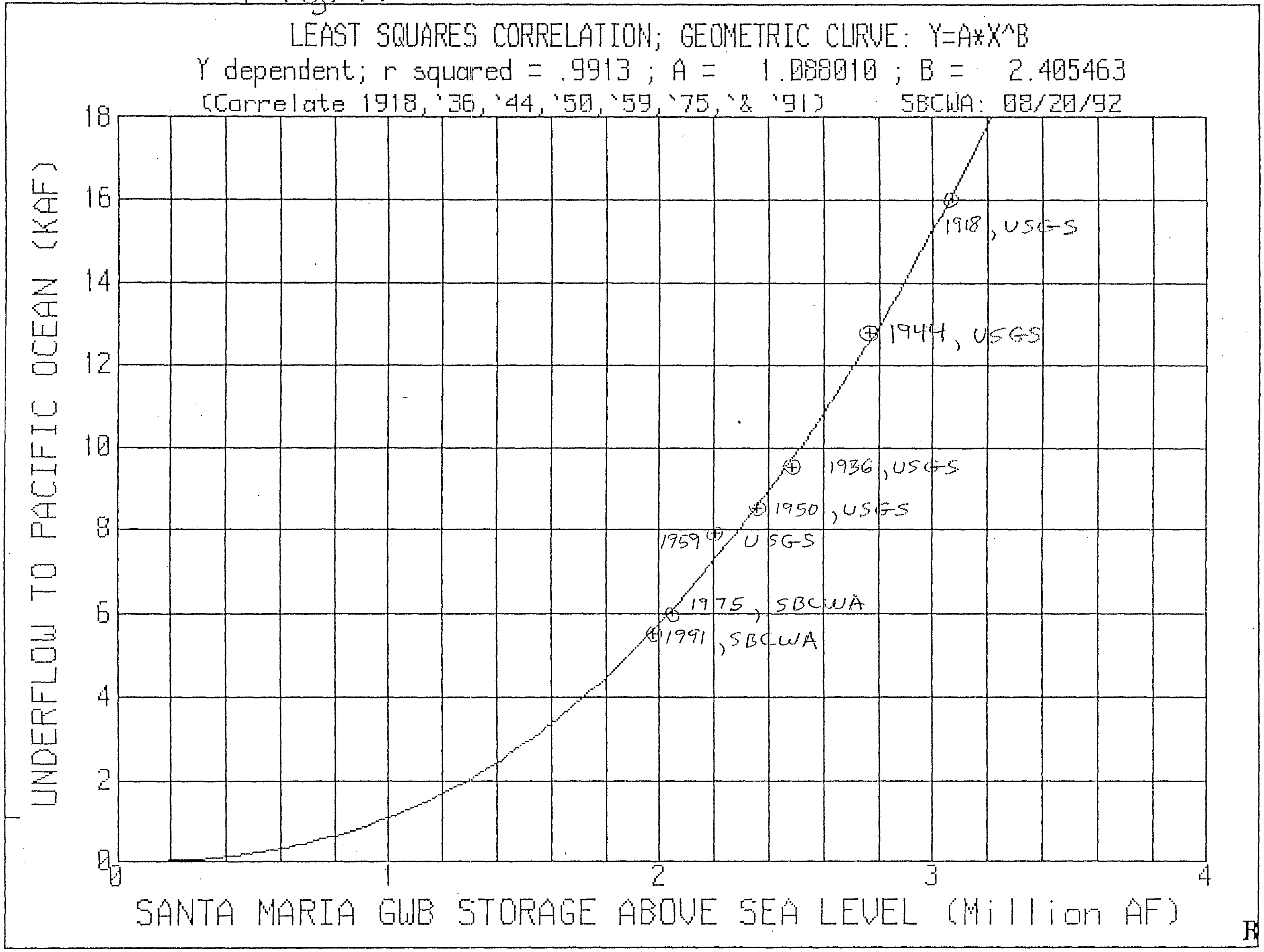


Fig. 12

SBCWA: 8/15/92

SANTA MARIA GWB MEASURED AND ESTIMATED STREAM SEEPAGE

(All values, not estimated, are from published USGS water resources reports)

Oct–Sep water year	Sisquoc R. Near Sisquoc	LaBrea Crk. Near Sisquoc	Foxen Crk. Near Sisquoc	Tepusquet Cr. Near Sisquoc	Sisquoc R. Near Garey	Bradley plus Blosser Ditch**	Cuyama River Below Twitchell	TOTAL GWB INPUT	Santa Maria R. at Guadalupe	GWB STREAM SEEPAGE	TWITCHELL CONTRIB.***	Rounded Unaugmented StreamSeep.
1944	40500	6860	370 *	1520	37800	2200 *	32150 *	83600	13560	70040	0	70000
1945	24080	2960	240 *	867	16980	1650 *	20300 *	50097	4990	45107	0	45100
1946	17400	141	100 *	352	8520	1050 *	11400 *	30443	4880	25563	0	25600
1947	7640	0	60 *	219	2230	800 *	7700 *	16419	2530	13889	0	13900
1948	774	0	40 *	148	0	700 *	2900 *	4562	0	4562	0	4600
1949	3680	0	60 *	222	89	800 *	3000 *	7762	0	7762	0	7800
1950	6880	107	70 *	243	1200	850 *	5700 *	13850	2460	11390	0	11400
1951	1190	0	80 *	268	0	900 *	4700 *	7138	0	7138	0	7100
1952	76660	20670	610 *	2680	73720	3000 *	110400 *	214020	112800	101220	0	101200
1953	11640	1170	200 *	780	5160	1600 *	12900 *	28290	362	27928	0	27900
1954	13720	2110	260 *	917	9920	1700 *	12400 *	31107	1270	29837	0	29800
1955	5260	572	140 *	539	609	1300 *	4200 *	12011	0	12011	0	12000
1956	14060	2070	290 *	1160	8360	1900 *	18600 *	38080	4200	33880	0	33900
1957	3420	0	60 *	197	95	800 *	2400 *	6877	0	6877	0	6900
1958	110600	19200	970 *	4560	99210	3800 *	132800 *	271930	133500	138430	0	138400
1959	9840	13	50 *	157	2410	700 *	4300	15060	0	15060	0	15100
1960	2910	0	50 *	154	52	700 *	1060	4874	0	4874	0	4900
1961	826	0	20 *	45	0	400 *	22	1313	0	1313	0	1300
1962	48750	8120	560 *	2460	46570	2800 *	58560	121250	24280	96970	30300	66700
1963	5580	0	70 *	247	275	850 *	2430	9177	0	9177	0	9200
1964	2510	0	40 *	132	0	650 *	1670	5002	0	5002	0	5000
1965	12720	653	70 *	260	3190	900 *	3010	17613	0	17613	400	17200
1966	24250	1080	45	293	9870	950 *	5350	31968	908	31060	1800	29300
1967	108400	26550	132	3260	95450	3200 *	75100	216642	32040	184602	70000	114600
1968	11530	475	69	246	3280	850 *	44190	57360	104	57256	1300	56000
1969	261400	48620	1610	8070	287800	5200 *	149200	474100	179700	294400	70000	224400
1970	17010	895	347	839	5180	1600 *	111300	131991	131	131860	52300	79600
1971	15630	581	117	311	3930	680	5730	23049	0	23049	0	23000
1972	7260	0	76	109	1020	560	0	8005	0	8005	0	8000
1973	46370	5160	340	3030	36520	3050	42190	100140	9990	90150	17800	72400
1974	19950	4100 *	350 *	1480	5610	1230	33330	60440	209	60231	1800	58400
1975	18310	670 *	120 *	456	8180	1200	5820	26576	307	26269	400	25900
1976	4270	50 *	50 *	181	391	1270	0	5821	0	5821	0	5800
1977	1770	10 *	40 *	122	63	780	0	2722	7	2715	0	2700
1978	135100	8100 *	560 *	2430	108200	4800	82640	233630	49870	183760	70000	113800
1979	34890	1500 *	200 *	752	28360	1500 *	122600	161442	2230	159212	33200	126000
1980	75610	13000 *	730 *	3260	85950	2700	110000	205300	21180	184120		
1981	15010	1000 *	150 *	573	6540	2200	10280	29213	549	28664		
1982	22000	2300 *	250 *	980	14900	2200	26580	54310	322	53988		
1983	139800	45000 *	1600 *	7980	231800	5000	91630	291010	151400	139610		

* Denotes estimated value (see correlation graphs). The 1944 thru 1958 estimates for Cuyama River Below Twitchell equal Twitchell Inflow (Karen Johnson model, 1979) plus 1/3rd Tepusquet Creek.

** Based upon 4 years of correlation, Blosser Ditch is set equal to Bradley Ditch for all years...

*** Rounded values from SBCWA 18 year daily model of Twitchell Reservoir.

Note that Sisquoc River Near Garey is NOT a GWB input; it is the output flow of the Sisquoc watershed just above Fugler Point (& the confluence with the Cuyama River).

"used working function"

Fig. 13

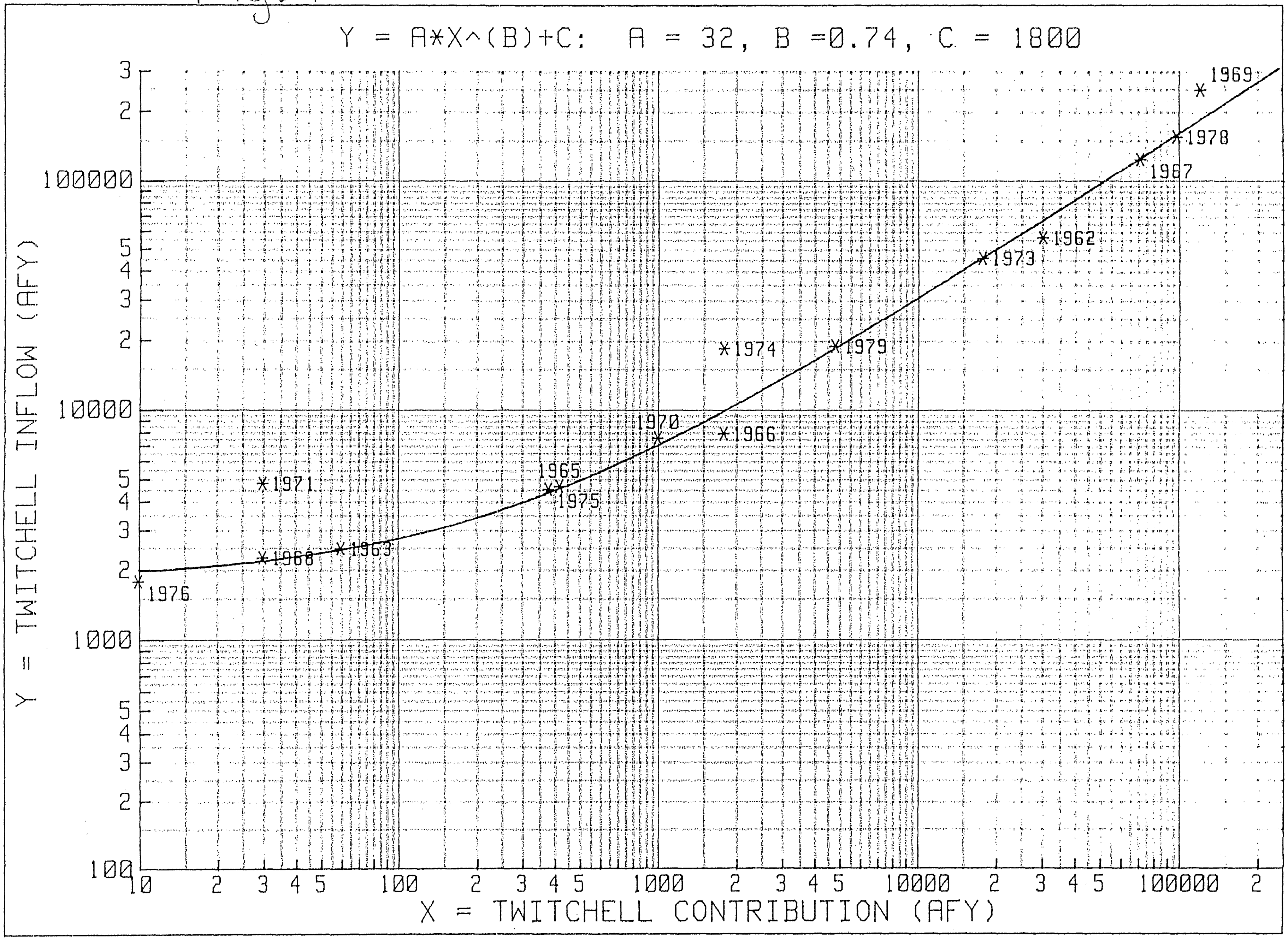


Fig. 14

"Agricultural Pumpage Returnflow Function"