WATER RESOURCES
OF SAN DIEGO COUNTY

REPORT

OF THE

Water Committee

TO THE

Board of Directors of the San Diego Chamber of Commerce

MAY 15, 1916

SUBJECT:

Water Resources of San Diego County

PHYSICAL AND ECONOMIC CONDITION

The physical and economic condition of the different properties are as follows:

ON THE SAN LUIS REY RIVER

The present owners, the Volcan Land & Water Company, have purchased the reservoir lands for the Warner storage; have entered into an agreement with the Mutual Water Company of Escondido in reference to their water rights on the river; also have purchased the land and silenced the riparian and water rights with two or three exceptions, from Warner ranch to the Ocean. They have also done about $76,000.00 worth of work and construction at the Warner's dam-site. Also surveys and road construction. This has taken about nine years.

SANTA YSABEL OR BERNARDO RIVER

The Volcan Land & Water Company on this stream has acquired the water rights and lands formerly owned by the Linda Vista Irrigation District. They have also purchased other lands and made surveys and bearings on the dam-sites. Also have purchased the bonds and disorganized the Linda Vista Irrigation District, which included a portion of the Linda Vista Mesa, and thousands of acres in the Pueblo of San Diego. It has taken several years to accomplish the above described work.

SAN DIEGO RIVER

Commencing at the Old Town Bridge, the City of San Diego is the owner of several tracts of land, also riparian and other water rights, together with a pumping plant of some five-million gallons capacity per 24 hours. Other portions of Mission Valley is owned by private individuals

and corporations. From the Old Mission Dam to a point above Lakeside private parties have in the last few years made extensive improvements in developing the water and land lying along the river. The Capitan Grande Indian Reservation extends for several miles along the river. The El Capitan Reservoir site is partially within this reservation, although the dam-site is owned by the Cuyamaca Water Company. The San Diego Flume Company's system, built some 27 years ago, is now owned by the Cuyamaca Water Company, who furnish water for irrigation and domestic use to a portion of the inhabitants in El Cajon, Spring Valley, La Mesa, East San Diego and other sections; also part of the time a portion of the water supply of San Diego City. The City of San Diego, jointly with the La Mesa, Lemon Grove, and Spring Valley Irrigation District, brought before the State Railroad Commission condemnation proceedings against all the property of the Cuyamaca Water Company. The Railroad Commission placed a valuation of approximately $745,000.00 on the property. The City of San Diego had a hearing before the Land Office to acquire the right to flood that portion of the lands of the proposed El Capitan reservoir lying within the Indian Reservation. The La Mesa, Lemon Grove and Spring Valley Irrigation District have voted bonds and seek to acquire water for irrigation and domestic use. The District has water rights from the Cuyamaca Water Company for 138 miner's inches, or 1,788,480 gallons per 24 hours or 652,795,200 gallons per year or 2126 acre-feet.

SWEETWATER RIVER

The Sweetwater Water Company are the owners of the water system and control the flood waters of the stream. The Sweetwater reservoir furnishes the water for irriga-

tion and other uses. Additional development and extensions are contemplated by the Company.

OTAY CREEK

On this Creek and one of its branches is located the Upper and Lower Otay Reservoirs, which are more fully described in this report. The ownership is vested in the City of San Diego.

COTTONWOOD CREEK

On this stream is located the Moreno Reservoir and the proposed Barrett Reservoir. The ownership is vested in the City of San Diego. On the same stream below, near where it crosses the Boundary Line between Mexico and the United States, is the proposed Marron Valley Reservoir. A portion of the reservoir will be in the United States and a portion in Mexico. A detailed survey of this reservoir has been made by the City. The City of San Diego is the owner of several tracts of land in the portion in the United States.

TIJUANA RIVER OF THE SOUTH

This is entirely in Mexico and is more fully described in this report. Under the Mexican law a concession for the waters of a stream and the right to construct and operate a system of water works carries with it the obligation to furnish water for the irrigation of the lands under the system. Also water for the municipal use of any town under the aqueduct. A maximum price to be charged for the water so used is fixed in the concession.

Including the town of Tijuana, the total area in Mexico that will be irrigated will not exceed more than 3,000 acres. A considerable portion of this can be supplied with water pumped from the river below the dam-site.

OLD MISSION DAM (on San Diego River)

Located at head of gorge at lower end of the north El Cajon Valley, and is a low masonry structure from 8 to 10 feet in height. Built about 1776—140 years ago. Total area of watershed above dam-site, 376 square miles.

Elevation, Bottom Contour of dam, 275 feet above sea level.

Elevation, top proposed 50 feet dam, 325 feet above sea level.

Width of Canyon at base of dam, 275 feet.

Width of Canyon at top of dam, 600 feet.

Area flooded at 50 feet Contour, 740 Acres (Approx.).

Capacity of Reservoir 50 ft. Contour, 12,700 Acres-feet. (Approx.)

Capacity of Reservoir 50 ft. Contour, 4,139 Million Gal. (Approx.)

It is proposed to build a hollow reinforced dam 50 feet in height. Install a pumping plant under the down-stream face of the dam, direct connected to the outlet.

On the hill just above the dam, construct the distributing reservoir recommended in 1904. Elevation O-Contour 410 feet, Elevation of the water surface, 455 feet, Elevation top of dam, 460 feet A. S. L. Capacity of reservoir at Elevation 455 feet, 20 Million gallons. (Approx.) Normal capacity of Pumping Plant, 7.5 million gallons per 24 hours. Theoretical H. P. 230, Actual H. P. 355; Recommended H. P. 400.

The water would flow by gravity to University Heights Reservoir, a distance of 48,600 lineal feet, or 9.2 miles.

The following is the measured runoff of the San Diego River at the Old Mission Dam:

Year 1912	4,356,352,000	gallons	or	13,374	Acre-feet.
Year 1913	561,882,700	gallons	or	1,725	Acre-feet.
Year 1914	3,819,544,000	gallons	or	11,726	Acre-feet.
Year 1915	26,865,473,000	gallons	or	82,477	Acre-feet.
Total for 4 years	35,603,251,700	gallons	or	109,302	Acre-feet.
Average per year	8,900,812,925	gallons	or	27,325	Acre-feet.

SWEETWATER WATER COMPANY

The source of supply is from the Sweetwater River. The main branches of the Sweetwater Dam are Green Creek, which heads on the south and east slope of the Cuyamaca Mountains, and Gualay Creek, which heads to the south of the Cuyamaca Rancho. The Sweetwater River flows in a southwesterly direction into the Bay of San Diego near its head.

The reservoir and dam is located on the Sweetwater River, 7 miles from its mouth.

The distributing system covers a portion of the lands of Chula Vista, National City, and the surrounding country.

SWEETWATER RESERVOIR

Area of Watershed 186 Square Miles.

Contour.	Area Flooded.	Capacity.		Elevation.
	Acres.	Mil. Gals.	Acre-Ft.	Above S.L.
0	0			145
10	14.50	24.208	74	155
20	68.00	150.858	463	165
30	138.85	490.635	1506	175
40	249.40	1112.663	3415	185
50	364.85	2123.481	6517	195
60	510.95	3588.690	11013	205
70	695.15	5555.899	17050	215
80	945.00	8283.721	25422	225
90	1055.00	11542.294	35422	235

The runoff from 1905 to 1911-12 was 102,916 acre-feet, yearly average 14,702 acre-feet.

Note.—The storms of January, 1916, destroyed a portion of the dam at the north end, but is being repaired and is to be restored to its original height.

SAN DIEGO CITY WATER SYSTEM SOURCE OF SUPPLY

FIRST: The Moreno Reservoir on Cottonwood Creek which is a loose rock-fill dam with a reinforced concrete water face. Completed to the 155-foot Contour.

Area of watershed, 135 Square miles.

Elevation of Bottom Contour, 2,882.4 feet above sea level.

Floor of Spillway at the 146-foot contour at this elevation.

Capacity, 13,700,000,000 gallons or 42,059 acre-feet.

SECOND: Proposed Barrett Reservoir on Cottonwood Creek below junction of Pine Creek. Between Moreno and Barrett area of watershed also 135 square miles. Capacity at 125-foot contour about 5,000,000,000 gallons or 15,350 acre-feet.

THIRD: Lower Otay Reservoir on Otay Creek, which was an earth and rock-fill dam with a steel core.

Area of watershed about 86 square miles.

Elevation Bottom Contour, 347 feet above sea level. (Approx.)

Floor of spillway at 125-foot contour (Approx.) at this elevation.

Capacity, 11,915,000,000 gallons, or 36,559 acre-feet.

NOTE.—This dam was washed away in floods of January, 1916.

FOURTH: Upper Otay Reservoir on branch of Otay Creek is a curved Masonry dam with some steel reinforcement.

Area of watershed about 12 square miles.

Elevation Bottom Contour, 478 feet above sea level.

Floor of spillway at contour 73.6 or 549.6 feet above sea level at this elevation; area flooded 143 acres.

Capacity, 990,000,000 gallons or 3,039 acre-feet.

If the Barrett Dam is built with water surface at 125-foot contour and the Otay Dam reconstructed with water surface at the 125-foot contour, there would be a combined storage in the Moreno, Barrett, Upper Otay, and Lower Otay of 31,605,000,000 gallons or 97,107 acre-feet.

The Dulzura conduit from Barrett Dam-site to head waters of Otay Creek has a capacity of about 40 million gallons per 24 hours, or 14,600,000,000 gallons per year, with which to regulate the flood waters and draw from the combined storage of Moreno and Barrett Reservoirs. The estimated safe net yield from the above described system is 10 million gallons per 24 hours.

If the proposed Marron Valley Reservoir near Boundary Monument No. 249 is constructed with water surface at the 120-foot contour, the storage would be 14,820 million gallons or 45,530 acre-feet. Estimated safe yield is 5 million gallons per 24 hours, making a total of 15 million gallons per 24 hours.

The above development is based on the supposition that the City of San Diego joins in a Metropolitan Water District as outlined in this report. If the City does not join in the above arrangement then some other methods would have to be adopted.

MARRON VALLEY RESERVOIR

Capacity Table.

Contour.	Area Flooded. Acres.	Capacity. Acre-Ft.	Capacity. Mill. Gals.	Elevation. U.S.G.S. Proposed water level
0	0	0	0	506.5
10	13	65	21	516.5
20	26	261	85	526.5
30	65	718	234	536.5
40	127	1682	548	546.5
50	222	3431	1117	556.5
60	367	6378	2080	566.5
70	470	10560	3440	576.5
80	565	15740	5130	586.5
90	648	21800	7110	596.5
100	752	28800	9380	606.5
110	835	36740	11350	616.5
120	924	45530	14820	626.5
130	1013	55220	18000	636.5
140	1116	65860	21450	646.5
150	1218	77530	25200	656.5

Part of reservoir in Mexico and part in United States.

Area of Watershed below Barrett Dam.

In the United States.....190 Square miles
In Mexico ..... 45 Square miles

Total watershed.....235 Square miles

Measured stream flow at Dam-site.

From Jan. 1, 1915, to May 31, 1915—7,325,000,000 gallons. Probably one-third of the above was surplus from Barrett Dam.

TIJUANA RIVER OF THE SOUTH

The Tijuana River of the South is entirely in Mexico and heads near the summit of the divide some 70 miles easterly from the town of Tijuana. The general elevation of the divide is from 4,000 to 5,000 feet above sea level.

This summit is also the dividing line between the Colorado Desert and the Pacific Ocean. The main stream with its branches flows in a westerly direction through the valleys and canyons and unites with the Cottonwood or Tijuana River of the North in Mexico, about 4¾ miles southeasterly from the town of Tijuana. The western slope near the head waters has a considerable growth of pine and other varieties of timber. The greater portion of the watershed is rough and broken, which insures a larger runoff than if it were level plains. Table Mountain, located about 7 miles south of the Garcia dam-site, has an elevation of 2275 feet. Las Tuntas Mountains, some 25 miles easterly from the dam-site, have an elevation of from 3,000 to 4,000 feet above the sea level.

From the junction of the Tijuana River of the North and the South the river flows in a northwesterly direction and enters the United States some 2000 feet S. 84° 13′ W. of Monument No. 255 of the Boundary Line, a distance of about 4¾ miles; elevation, about 60 feet above sea level.

From this point the stream is in the United States and flows in a westerly direction about 6 miles, when it flows into the Pacific Ocean.

GARCIA RESERVOIR AND DAM-SITE ON TIJUANA RIVER IN BAJA CALIFORNIA

Location, about 11 miles below Boundary Line.

Area of watershed, about 1,000 square miles.

A survey of the above reservoir and dam-site was made by C. S. Alverson, C. E., in 1913-14, for private parties.

The dam-site is very favorably located. Immense ledges basalt and trap rock in the immediate vicinity will furnish plenty of material for the construction of any type of

masonry dam. The San Diego and Arizona Railway runs within about 1000 feet of the dam-site. Building material of all kinds can be imported into Baja California free of duty for the construction of the works.

In the bed of stream for 50 feet in width considerable excavation will have to be made to reach bedrock, on the remaining width the bedrock is on or near the surface. Up to the 75-foot contour on the side wall is practically solid rock.

The following is the capacity of the proposed Reservoir:

	Area Flooded.	Capacity.		Elevation.
Contour.	Acres.	Acres-Ft.	Mil. Gals.	A.S.L.
50				276 Elev. of Outlet
130	940	45,536	14,832	356
135	945	49,956	16,272	361
137	947	51,850	16,889	363
140	950	54,982	17,909	366

The water in the above reservoir can be delivered to the U. S. Boundary Line at an Elevation of 210 feet above sea level, and the length of conduit line would be about 64,200 lineal feet or 12.16 miles.

PROPOSED STORAGE CAPACITY OF RESERVOIRS

Name.	Capacity. Acre-Ft.	Mil. Gals.	Proposed Contour.
Warner Reservoir	88,450	28,811	82.5
Pamo Reservoir	47,500	15,480	156.0
Carroll Reservoir	23,030	7,500	90.0
Santa Maria Reservoir	8,736	2,845	80.0
San Clemente Reservoir	8,574	2,790	90.0
Cuyamaca Reservoir	11,415	3,718	35.0
Diverting Dam Reservoir	3,100	1,010	84.0
El Capitan Reservoir	70,700	23,029	160.0
Old Mission Dam Reservoir	12,700	4,139	50.0
La Mesa Reservoir	5,920	1,928	100.0
Sweetwater Reservoir	35,422	11,542	90.0
Moreno Reservoir	42,059	13,700	146.0
Barrett Reservoir	15,350	5,000	125.0
Upper Otay Reservoir	3,039	990	73.6
Lower Otay Reservoir	36,559	11,915	125.0
Marron Valley Reservoir	45,530	14,820	120.0
Garcia (Tijuana) Reservoir	54,982	17,909	140.0
Sum Total	513,076	167,126	

To the above add the small distributing reservoirs, namely: Eucalyptus, Chollas Heights, University Heights, Old Town, Pacific Beach and La Jolla.

DUTY AND USE OF WATER

The following is the estimated duty of the water per acre per annum. It includes Domestic and City use. The table is comparative and forms a basis of estimates:

On 10,000 acres—87,120 cu. ft. or 651,700 gallons per acre.
On 10,000 acres—65,340 cu. ft or 488,775 gallons per acre.
On 60,000 acres—43,560 cu. ft. or 325,850 gallons per acre.
On 25,000 acres—32,670 cu. ft. or 244,387 gallons per acre.
On 25,000 acres—10,890 cu. ft. or 81,462 gallons per acre.
Total 130,000 acres.

The above area of land includes roads, boulevards, streets, stream beds, non-tillable tracts, also business and residence sections in the towns and cities. Vacant lots in the towns and cities, uncultivated tracts in the suburbs, and outlying sections, is the universal condition that exists in the well developed irrigated districts. The full amount of water proposed to be developed will not be required for actual use until the above described territory becomes densely settled and intense cultivation is practiced. If in the distant future more water is required, additional developments can be made on some of the branch streams, also increased pumping facilities installed to tide over periods of protracted drouth if they again recur.

Recent investigations furnish conclusive evidence that more than fifty per cent of the water used in the United States is a useless waste of this necessary element. This applies to the use of water in cities and town and for irrigation.

The character of the soil and climatic conditions materially affect the amount of water necessary to be used.

RECOMMENDATIONS

Of C. S. ALVERSON

Based on the assumption that a Metropolitan Water District will be formed on the plan heretofore outlined in this report, I recommend the following method of developing the water supply of San Diego County. Assuming that the District acquires by purchase or otherwise all the property and rights of the different owners of the heretofore described water systems.

A. Complete the Warner Dam to the 90-foot contour, the water surface to be the 82.5-foot contour.

B. Construct a conduit line from the Warner Reser-

voir (capacity 80 second-feet) and thence along the hillside above the left bank of the San Luis Rey River to tunnel No. 3 where it turns to the left and passes through the ridge that forms the dividing line between the watersheds of the San Luis Rey River and Pamo Creek. The lower approach of tunnel No. 3 ends at Station 332, or 6.29 miles. Elevation 2612 feet above sea level. From this point the water will flow down the channel of the stream to Pamo dam-site. Elevation, 850 feet above sea level.

C. At the Pamo Reservoir build a dam top 170-foot contour, water surface at the 156-foot contour.

D. Construct a conduit line from the Pamo Reservoir (capacity 54 second-feet) as shown on the map to end of tunnel, through the Poway divide above the proposed San Clemente Reservoir. Length of conduit line, 24.8 miles.

E. Build the San Clemente Dam top 95-foot contour, water surface at the 90-foot contour. From the San Clemente reservoir a conduit line can be constructed to make connections with desired points.

F. At the Santa Maria Reservoir site build a dam. Top of dam 87-feet contour, water surface at 80-foot contour. Connect this reservoir with the Pamo-San Clemente line by a conduit some 9580 feet in length.

G. At the Carroll reservoir site build an overflow dam. Top of dam at the 90-foot contour. At the dam install a pumping plant to raise the water to the proper height so that it will flow by gravity to San Diego. From the above point construct a conduit line to the Linda Vista Mesa and the Pueblo Lands north of San Diego River.

The above described development would give a daily supply of 27.5 million gallons for the territory north of San Diego and makes a complete unit. What portion of this unit is to be developed first to be determined later.

ON THE SAN DIEGO RIVER

H. Continue to utilize the Cuyamaca Reservoir as in the past, but construct a conduit similar to the Moreno-Barrett line a part of the way between Cuyamaca and the diverting dam to save loss in transmission.

Raise the Diverting dam to the 84-foot contour, giving a storage of some 3100 acre feet. Build the El Capitan dam to the 160-foot contour. Raise the La Mesa dam to the 100-foot contour. Raise the Old Mission dam to the 50-foot contour and install a pumping plant, and build a distributing reservoir and a pipe line to San Diego as described elesewhere in this report. Combine the pumping plants in Mission Valley.

The above would give a daily supply of 24.5 million gallons for the territory south of San Diego River and makes a second unit in the complete system.

ON THE SWEETWATER RIVER

I. The Sweetwater Water Company system, if it becomes a part of the proposed district, can be made interchangeable with the Moreno, Barrett, Otay system and forms a part of the third unit in the system.

OTAY, BARRETT, MORENO SYSTEM

J. This is an important factor in the distribution of the water for Otay, National Rancho, Encanto and East San Diego to be used in connection with the Sweetwater and San Diego River supply, and forms the fourth unit in the system.

TIJUANA RIVER PUMPING PLANT

Presumably located in Section 3, T. 19 S., R. 2 W. This would be a double system or a low and high service. The low service for the low land around South San Diego,

Oneonta, and Nestor. The high service to pump into the Coronado pipe line and the Highland Reservoir above the town of Nestor.

TIJUANA RIVER OF THE SOUTH

This is the Garcia Reservoir Site and is entirely in Baja California, and if it can be acquired on reasonable terms it will form a considerable factor in the system. It has been more fully described in another part of this report.

If a general plan of conservation is adopted, the above method of development would seem to be a practical solution of the problem, but if the City of San Diego elects to develop its own water supply and does not join with the other towns and suburban sections, then some of the above will have to be eliminated.

It may be that some of the data and information contained in the foregoing and following pages was not necessary in a report of this kind, but during the last thirty years the writer has been connected with the different water developments in San Diego County and desires that a portion at least of the knowledge acquired may be made of public record.

It is important that some definite action be taken looking toward the immediate development of these water supplies in a united and intelligent manner.

Respectfully submitted,

C. S. ALVERSON,
Hydraulic Engineer.

EVAPORATION AND OTHER LOSSES

In determining the loss of water stored in artificial reservoirs from evaporation and other causes a separate study and investigation must be made of each gathering and storage basin, in order to arrive at a reasonable degree of accuracy.

The following are the principal elements that influence evaporation:

(1) The amount of evaporation from bodies of water increases with the temperature of the water, with the wind; and diminishes with increased moisture.

(2) The lower temperature of water at high elevations and the lower dew points tend to decrease the evaporation.

(3) The diminished barometric pressure of high elevations tends to increase the evaporation, amounting to 14% at 8,000 feet and to 18% at 10,000 feet over the evaporation at 5,000 feet.

(4) Evaporation is lessened by any influence which diminishes the wind or decreases the temperature of the water.

(5) Evaporation proceeds when the water is frozen, but is less; averaging about 1 to 1½ inches per month.

(6) Every mile of wind movement in 24 hours increases the evaporation by from 1 to 2% over the evaporation if calm.

(7) Assuming the loss of 5 feet in depth per annum, an area of 100 acres would require ¾ cubic feet of water per second for the whole year to make good the loss of evaporation.

(8) The evaporation is not necessarily the same from adjacent bodies of water located at the same elevation.

TABLE I.

RAINFALL DATA SAN LUIS REY RIVER WATERSHED

Located in San Diego County, Calif.

FOR THE WARNER RESERVOIR WATERSHED

Season.	Warner Springs Elev. 3,165 Ft. Inches.	Mesa Grande Elev. 3,450 Ft. Inches.	Warner Dam Elev. 2,700 Ft. Inches.
1893-94	27.26*	21.03*	16.03*
94-95	20.92*	34.73*	29.73*
95-96	7.92*	14.81*	9.81*
96-97	14.78*	28.99*	23.99*
97-98	8.91*	16.23*	11.23*
98-99	7.10*	17.71*	12.71*
99-00	12.37*	25.97*	20.97*
1900-01	16.34*	27.89*	22.89*
01-02	16.14*	24.25*	19.25*
02-03	20.30*	26.98*	21.98*
03-04	10.07*	14.30*	19.30*
04-05	26.86*	40.30*	35.30*
05-06	30.03*	47.03	42.03*
06-07	23.23	33.66	28.66*
07-08	15.91	27.67	22.67*
08-09	17.68	36.67	31.67*
09-10	22.45	29.55	24.55*
1910-11	17.49	27.75	22.75*
11-12	14.06	27.60	22.60
12-13	13.81	25.65	20.65
13-14	18.55	30.99	25.99
Totals.....	362.18	579.76	484.76
Seasonal Av'age	17.25	27.61	23.08

Seasonal Rainfall quantities marked (*) are computed.

TABLE II.

REVISED RATING TABLE COMPILED FROM 21 YEAR PERIOD

Average Precipitation and Runoff San Luis Rey River.

Description.	Area Sq. Mi.	Mean Annual Precipitation Ins.	Mean Annual Precipitation Ac.-Ft.	Average Annual Runoff Total Ac.-Ft.	Average Annual Runoff Per Sq. Mi. Ac.-Ft.	Mean % of Run-off to Rainfl.
Drainage Basin Above the Warner Dam	205	21.50	233,536	20,509	100.0	8.8
Warner Dam to the Escondido Diversion ...	32	26.10	44,442	6,194	193.5	14.
Escondido Div's. to the U.S.G. Station above Pala	81	20.80	90,266	7,045	87.0	7.8
Total	318		368,244	33,748		

NOTE.—Examination of the above table in connection with other tables in this report shows that for the period from 1893-94 to 1913-14, or 21 years, that only 10 per cent of the total precipitation would have been available in surface runoff. The remaining 90 per cent being lost to view, but not to use, provided proper measures had been taken to develop and utilize the great underground storage reservoirs. When it is remembered that over 50 per cent of the water used in Southern California is obtained from underground sources it is imperative to consider this phase of the future water development for the City of San Diego.

TABLE III.

SURFACE RUNOFF FROM THE SAN LUIS REY RIVER

Located in San Diego County, California.
Values are given in Acre Feet.

Season.	Above the Warner Dam 205 Sq. Mi.	Warner Dam to Escondido Ditch Diversion 32 Sq. Mi.	Escondido Diversion to Pala Station 81 Sq. Mi.	Total For Pala 318 Sq. Mi.
1893-94	13,780	4,050	4,560	22,390
94-95	30,500	8,230	9,270	48,000
95-96	3,910	950	1,080	5,940
96-97	18,590	4,730	5,340	28,660
97-98	4,590	1,050	1,180	6,820
98-99	4,320	1,020	1,160	6,500
99-00	13,120	3,240	3,650	20,010
1900-01	17,600	4,560	5,150	27,310
01-02	12,030	3,040	3,420	18,490
02-03	25,700	6,660	7,500	39,860
03-04	4,590	1,230	1,396	7,216
04-05	28,200	7,810	8,815	44,825
05-06	66,957	19,310	21,777	108,044
06-07	38,800	23,070	26,020	87,890
07-08	17,160	4,890	5,505	27,555
08-09	24,050	12,950	14,608	51,608
09-10	38,800	5,160	5,812	49,772
10-11	27,050	6,470	8,570	42,090
11-12	12,030	4,990	5,620	22,640
12-13	6,042	2,240	2,525	10,807
1913-14	22,867	4,424	4,988	32,279
Totals	430,686	130,074	147,946	708,706
Seasonal Average	20,508	6,194	7,045	33,748

TABLE IV.

WARNER RESERVOIR

Area of Watershed 205 Square Miles

CAPACITY AREA AND EVAPORATION TABLE.

Elev.	Depth.	Acres Flooded.	Capacity Acre-Ft.	Capacity Mill. Gals.	Seasonal net Evaporation Acre-Ft.
2620	.0				
2630	10.	17	58	19	42*
	12.5	28	210		70
2635	15.	37	250	81	92
	17.5	45	300		112
2640	20.	58	433	141	145
	22.5	76	660		190
2645	25.	117	990	322	292
	27.5	175	1400		438
2650	30.	260	2026	660	650
	32.5	363	3010		907
2655	35.	500	4400	1433	1250
	37.5	660	6012		1650
2660	40.	875	7706	2510	2184
	42.5	1045	10800		2612
2665	45.	1180	12800	4169	2950
	47.5	1300	16010		3250
2670	50.	1400	19095	6220	3500
	52.5	1500	22750		3750
2675	55.	1612	26750	8713	4128
	57.5	1718	30800		4295
2680	60.	1822	35274	11490	4555
	62.5	1930	39985		4825
2685	65.	2060	44800	14592	5155
	67.5	2175	50000		5438
2690	70.	2300	55874	18200	5750
	72.5	2450	62000		6125
2695	75.	2600	68600	22345	6500
	77.5	2770	75025		6925
2700	80.	2960	82218	26780	7400†
	82.5	3185	88450		7962
2705	85.	3425	95000	30955	8562‡

*Outlet Tunnel. †Water Elevation. ‡Top of Dam.

TABLE V.

WARNER RESERVOIR ESTIMATED DUTY

Top of Dam 85-Foot Contour. Water Level 80-Foot Contour.

Based on the assumption that on July 1st, 1893, the water level stood at the 62.5-foot contour, or amount stored, 40,000 Acre Feet, and draft begins of 40 Acre Feet, or 13 million gallons per 24 hours.

Values are Given in Acre Feet.

Season.	Seasonal Runoff.	Seasonal Draft.	Seasonal Loss and Evap'tion.	Total Depletion.	Stored in Reservoir. July 1. 1894
Stored	40,000				
1893-94	13,780	14,600	4,530	19,130	34,650
94-95	30,500	14,600	5,010	19,610	45,540
95-96	3,910	14,600	4,580	19,180	30,270
96-97	18,590	14,600	3,990	18,590	30,270
97-98	4,590	*12,180	3,460	15,640	19,200
98-99	4,320	*12,180	2,740	14,920	8,600
99-00	13,120	*12,180	2,030	14,210	7,520
1900-01	17,600	*12,180	1,885	14,065	11,055
01-02	12,030	*12,180	2,125	14,305	8,780
02-03	25,700	*12,180	3,100	15,280	19,200
03-04	4,590	14,600	2,780	17,380	6,410
04-05	28,200	14,600	1,710	16,310	18,300
05-06	66,957	14,600	4,647	19,247	70,000
06-07	†38,800	14,600	6,670	21,270	75,500
07-08	17,160	14,600	6,690	21,290	71,370
08-09	24,050	14,600	6,650	21,250	74,270
09-10	†38,800	14,600	6,910	21,510	74,300
10-11	†27,050	14,600	6,805	21,405	75,000
11-12	12,030	14,600	6,620	21,220	66,310
12-13	6,042	14,600	6,122	20,722	51,630
13-14	22,867	14,600	5,497	20,097	52,400
Totals	470,686	292,080	94,551	386,631	

Balance stored Reservoir on July 1, 1914—52,400 Acre Feet.
†Excess Runoff over spillway to July 1, '14 30,000 Acre Feet.
*Deficiency in storage from July, 1897, to July, 1903 .....14,520 Acre Feet.

TABLE VI.

SAN LUIS REY RIVER

DIVERSION AT HEAD OF ESCONDIDO DITCH

Located in SW¼ of NW ¼ Sec. 33, T. 10 S., R. 1 E.

Values Given in Acre Feet.

Date.	*Yearly Diversion.	Season.	Runoff from Warner Dam to Escondido Diversion Seasonal.	Aggregate.
1905	2345	1904-05	7810	7810
1906	3087	05-06	19310	27120
1907	2350	06-07	23070	50190
1908	2644	07-08	4890	55080
1909	3145	08-09	12950	68030
1910	2634	09-10	5160	73190
1911	3230	10-11	6470	79660
1912	2711	11-12	4990	84650
1913	4260	11-13	2240	86890
1914	5594	13-14	4424	91314
Total	32000	Total	91314	
Yearly Average	3220	Seasonal Average	9131	

*Authority, United States Geological Survey.
(See Water Supply Paper 331, Page 51.)

NOTE—On June 21, 1912, an agreement was entered into between the Escondido Mutual Water Co. and the Volcan Land and Water Company. A synopsis of this contract shows that during the critical period determining the safe net yield of the Warner Reservoir it would have been necessary to furnish or release from the Warner Reservoir the average amount of 742 Acre Feet per annum in order to meet the contract agreement of 4143 Acre Feet per annum, the assumed acquired rights of the Escondido Mutual Water Company.

TABLE VII.

COMPARATIVE AREA FLOODED AND STORAGE.

Contour.	Warner Reservoir		El Capitan Reservoir	
	Acres Flooded.	Storage Acre-Ft.	Acres Flooded.	Storage Acre-Ft.
20	58	433	46	614
25	117	990	62	880
30	260	2026	76	1228
35	500	4400	88	1540
40	875	7706	107	1995
45	1180	12800	127	2600
50	1400	19095	153	3378
55	1612	26750	173	4210
60	1822	35274	200	5220
65	2060	44800	227	6280
70	2300	55874	260	7360
75	2600	68600	303	8650
80	2960	82218	353	10430
85	....	.....	414	12260
90	....	.....	475	14400
95	....	.....	546	16900
100	....	.....	615	20000
105	....	.....	667	23125
110	....	.....	720	26700
115	....	.....	761	30300
120	....	.....	800	34400
125	....	.....	838	38500
130	....	.....	880	42500
135	....	.....	925	47500
140	....	.....	970	51500
145	....	.....	1010	56000
150	....	.....	1050	60500
155	....	.....	1100	65875
160	....	.....	1165	70700

ESTIMATED COST OF CONSTRUCTED PORTION OF WARNER DAM AND RESERVOIR

Sub-masonry cut-off wall, borings, etc.	$25,000
1,020 lineal feet of outlet tunnel, (concrete lined) at $18	18,360
Outlet basin, weir, etc.,	3,500
Buildings and water supply to same	7,000
Improvements, fencing, etc.,	2,000
Equipment and tools	4,000
Surveys of Reservoir Site and Dam-site	3,000
Add 8% for 1 year (½ period) for interest	5,030
Total	$67,890
Add 12% for Overhead charges	8,150
Sum Total	$76,040

PROPOSED CARROLL RESERVOIR

Located in the N. E. ¼ Sec. 18, T. 13 S., R. 2 W.
Area of Water Shed Below Pamo, 196 Square Miles.

	Area Flooded	Capacity		Elevation
	Acres.	Acre-Ft.	Mill. Gals.	A.S.L.
10	4	20	6.5	226
20	20	140	45.7	236
30	65	307	100	246
40	133	1,475	480	256
50	220	3,287	1,070	266
60	336	6,990	1,950	276
70	490	10,200	3,320	286
80	720	16,190	5,270	296
90	980	23,030	7,500	306

This is a pumping proposition, if the water is to be delivered to the Linda Vista Mesa and San Diego Pueblo Lands north of the San Diego River.

It is proposed to pump the water to an elevation of 526 feet as a lift of about 300 feet. Thence in a gravity conduit and pipe line to point of delivery for territory north of the San Diego River, which includes some 30,000 acres, or more than three-fifths of the Pueblo Lands of San Diego.

PROPOSED SANTA MARIA RESERVOIR

Located in N. W. ¼ Sec. 11, T. 13 S., R. 1 W.
Area of Water-shed, 60 Square Miles.

	Area Flooded	Capacity		Elevation
Contour.	Acres.	Acre-Ft.	Mill. Gals.	A.S.L.
10	1	1	0	1,270
20	8	45	14.663250	1,280
30	23	100	32.585000	1,290
40	41	522	170.000000	1,300
50	80	1,108	360.912000	1,310
60	154	2,305	744.300000	1,320
70	286	4,500	1,466.325000	1,330
80	561	8,736	2,845.603000	1,340
From 80-foot Contour it is estimated				
90	1,100	15,000	4,886.000000	1,350
100	1,775	24,500	7,980.560000	1,360
110	2,575	35,000	11,404.750000	1,370
120	3,350	46,000	14,989.100000	1,380

SAN CLEMENTE RESERVOIR

Drainage Area Very Small

CAPACITY AND ELEVATION TABLE

Contour.	Area Flooded Acres.	Capacity Acre-Ft.	Capacity Mill. Gals.	Elevation U.S.G.S.
10	8	2		600
20	25	15	5	610
30	60	430	140	620
40	79	1,075	350	630
50	93	1,935	630	640
60	129	3,070	1,000	650
70	166	4,515	1,470	660
80	201	6,390	2,080	670
90	238	8,574	2,790	680
100	277	11,150	3,630	
110	317	14,130	4,600	

Estimated yield of the San Diego River from the 191 square miles of watershed above the proposed El Capitan Reservoir, segregated as follows:

1. Cuyamaca Lake, area of watershed, 12 square miles. Capacity at the 35-foot contour, 11,416 acre feet.
2. Proposed Diverting Dam Reservoir area of watershed, 92 square miles.
   Capacity at the 84-foot contour, 3,100 acre feet.
3. Proposed El Capitan Reservoir area of watershed, 87 square miles.
   Capacity at the 160-foot contour, 70,700 acre feet.
4. New La Mesa Reservoir area of watershed, 8 square miles.

   Capacity at the 100-foot contour, 5,929 acre feet.

This will be the old dam raised to the 100-foot contour, so as to impound an additional supply from the floodwaters of the San Diego River during the flood season.

5. A portion of the flood waters of the San Diego River to be conveyed by conduit during the flood season direct to the City of San Diego and also into the Lower Otay pipe-line.

The records for the last 21 years show that the surface runoff from the 92 square miles between Cuyamaca Dam and the Diverting Dam is sufficient without drawing from Cuyamaca Lake, excepting during the period of unusual drought, before the first day of April of each year. (See Table No. 10.)

The records also show that the mean draft from Cuyamaca Lake, together with the Boulder Creek supply from April 1st to June 30th of each year, can be taken to be 2,250 acre feet. Allowing 20 per cent. loss in transmission, gives 1,800 acre feet net at the Diverting Dam—or 20 acre feet, or 6,517,000 gallons per 24 hours for the 90-day period.

It is assumed that the safe draft from the Diverting Dam Reservoir alone for the 184 days from July 1st to December 31st will be 2,760 acre feet, or 15 acre feet, or 4,887,750 gallons per 24 hours.

In order to convey a portion of the flood waters to the La Mesa Reservoir, to the Otay pipe-line and to the City of San Diego it will be necessary to construct a conduit of 62 second-feet capacity (or 40 million gallons per 24 hours) from the Diverting Dam to the Lankersheim tunnel, east side of El Cajon Valley. From Lankersheim tunnel a single or two conduits to the end of the present flume at Eucalyptus Reservoir.

The date draft begins and the quantity per day can be changed to suit the surface flow in the streams and the amount stored in the Reservoirs.

The following tables have been compiled from the rec-

ords, from reports and other reliable data extending over a period of twenty-one years.

REVISED RATING TABLE

Compiled from 21 year period. Average Precipitation and Runoff.

Period from 1893-94 to 1913-14, Incl.

San Diego River Drainage Area.	Area Sq. Mi.	Mean Annual Precipitation Ins.	Mean Annual Precipitation Ac.-Ft.	Mean Annual Runoff Total Ac.-Ft.	Mean Annual Runoff Per Sq. Mi. Ac.-Ft.
Drain Basin above the Cuyamaca Dam	12	36.2	23,168	4,110	342.5
Cuyamaca Dam to Diverting Dam	92	25.0	122,417	12,144	132.0
Diverting Dam to El Capitan Dam Site	87	19.5	90,480	6,824	78.4
	191				
El Capitan Dam Site to U. S. Gauging Station	17	18.0	16,320	1,292	76.0
U. S. Gauging Sta. to Old Mission Dam	168	12.5	112,000	6,216	37.0
	376		364,385	30,586	
South Fork Branch from Head to San Diego Main Flume	37	20.0	39,466	3,412	92.2

NOTE.—It is estimated that an annual mean of 2,000 acre feet of the flood waters of the South Fork Branch can be diverted into the main conduit in a 100-day period.

The South Fork is also included in the 87 square mile area above from Diverting Dam to El Capitan Dam-site.

TABLE VIII.

SEASONAL RAINFALL AND RUNOFF

Values are given in acre feet.

Season.	Cuyamaca Reservoir Area 12.5 Sq. Mi.		Diverting Dam Reservoir Area 92 Sq. Mi.	
	Rainfall.	Runoff.	Rainfall.	Runoff.
1893-94	14,445	2,563	119,575	11,640
94-95	35,123	11,279	91,754	28,820
95-96	14,963	2,152	34,739	3,850
96-97	24,934	4,216	64,866	14,650
97-98	17,786	834	39,106	3,840
98-99	16,800	472	31,107	1,033
99-1900	18,426	260	51,470	655
1900-01	27,398	3,031	81,254	4,360
01-02	23,040	2,351	52,158	4,555
02-03	23,418	2,516	78,065	8,375
03-04	14,957	492	35,720	986
04-05	37,050	6,831	120,016	22,065
05-06	36,014	12,780	125,561	33,390
06-07	28,742	9,259	119,624	29,945
07-08	19,424	3,201	73,845	12,632
08-09	29,856	7,172	80,371	20,760
09-10	21,402	5,134	82,677	13,630
10-11	20,576	2,765	77,476	10,324
11-12	20,416	3,520	85,768	13,336
12-13	19,853	2,982	49,850	5,478
13-14	21,990	2,505	86,455	10,700
Total.....	486,613	86,315	1,581,457	255,024
Seasonal Mean	23,172	4,110	75,307	12,144
		17.74%		16.13%

NOTE.—1 inch rainfall equals 640 Acre Feet. 1 inch rainfall equals 4,906.64 Acre Feet.

CUYAMACA RESERVOIR

Contour.	Area Flooded Acres.	Capacity Acre-Ft.	Capacity Mill. Gals.	Elevation A.S.L.
10	6	12	4.0	4,605
12	44	56	18.3	4,607
14	106	204	66.3	4,609
16	178	489	159.3	4,611
18	255	920	299.5	4,613
20	346	1,520	494.6	4,615
22	428	2,291	746.3	4,617
24	519	3,236	1,054.3	4,619
26	605	4,366	1,422.1	4,621
28	684	5,655	1,842.0	4,623
30	768	7,116	2,314.7	4,625
32	842	8,716	2,839.0	4,627
35	956	11,416	3,718.6	4,630

Data from Records kept at Cuyamaca Dam.

Mean Rainfall from 1888 to 1896, inclusive, 44.23 inches.
Mean Runoff in Acre-feet.....5,397 acre-feet
Mean Per cent. of runoff to precipitation, 19.83 per cent.
Mean evaporation per annum in depth.....4.73 feet
Average draft from reservoir, per annum, 4,331 acre-feet

PROPOSED DIVERTING DAM RESERVOIR

Elevation Bottom Contour, 792.5 feet above mean sea level.
Elevation Top, 876.5 feet above mean sea level.
Capacity, Area and Evaporation Table.

Depth.	Capacity Acre-Ft.	Area Flooded Acres.	Seasonal Loss by Evaporation Acre-Ft.
20	2	2.0	9.5
22	12	3.3	16.0
24	25	4.8	23.0
26	38	6.2	30.0
28	52	8.0	38.5
30	69	10.0	48.5
32	86	12.1	58.5
34	108	14.7	71.0
36	131	17.5	84.5
38	162	20.4	98.5
40	200	24.0	116.0
42	260	27.0	130.5
44	348	30.3	146.5
46	444	33.5	162.0
48	540	37.0	178.5
50	640	40.0	193.0
52	740	43.6	210.5
54	840	47.0	227.0
56	940	50.8	245.5
58	1,040	54.2	262.0
60	1,140	58.0	280.0
62	1,240	61.0	294.5
64	1,350	64.4	311.0
66	1,458	67.7	327.0
68	1,578	71.0	343.0
70	1,715	74.0	357.5
72	1,848	78.0	376.5
74	2,005	81.4	393.0
76	2,190	85.0	410.5
78	2,385	88.8	429.0
80	2,600	93.0	449.0
82	2,810	97.8	472.5
84	3,100	102.8	496.5
86	3,470	108.5	524.0
88	3,920	115.0	555.5
90	4,480	123.0	594.0

Evaporation per Month at Proposed Diverting Dam Reservoir

Month.	Depth Ins.	Depth %	Loss on Acre-Ft.
January	1.16	2	9.67
February	1.74	3	14.50
March	3.48	6	28.90
April	5.22	9	43.50
May	6.96	12	58.00
June	8.70	15	72.50
July	8.12	14	67.66
August	6.96	12	58.00
September	6.38	11	53.16
October	4.64	8	38.67
November	2.90	5	24.16
December	1.74	3	14.50
Year	58.0	100	483.

Net loss due to evaporation, 58.0 in., 4.833 feet depth.

PROPOSED EL CAPITAN DAM AND RESERVOIR

Elevation Bottom Contour, 605 feet above mean sea level.
Elevation Top Contour, 765 feet above mean sea level.
Capacity, Area and Evaporation Table.

Depth.	Capacity Acre-Ft.	Area Flooded Acres.	Seasonal Loss by Evaporation Acre-Ft.
20	614	46	222
25	880	62	300
30	1,228	76	367
35	1,540	88	425
40	1,995	107	517
45	2,600	127	614
50	3,378	153	739
55	4,210	173	865
60	5,220	200	966
65	6,280	227	1,097
70	7,360	260	1,256
75	8,650	303	1,464
80	10,430	353	1,706
85	12,260	414	2,000
90	14,400	475	2,296
95	16,900	546	2,639
100	20,000	615	2,972
105	23,125	667	3,164
110	26,700	720	3,482
115	30,300	761	3,678
120	34,400	800	3,866
125	38,500	838	4,050
130	42,500	880	4,253
135	47,500	925	4,470
140	51,500	970	4,688
145	56,000	1,010	4,871
150	60,500	1,050	5,075
155	65,875	1,100	5,316
160	70,700	1,165	5,631

Evaporation per Month at Proposed El Capitan Dam and Reservoir

Month.	Depth Ins.	Depth %	Loss on 100 acres Acre-Ft.
January	1.16	2	9.67
February	1.74	3	14.50
March	3.48	6	28.90
April	5.22	9	43.50
May	6.96	12	58.00
June	8.70	15	72.50
July	8.12	14	67.66
August	6.96	12	58.00
September	6.38	11	53.16
October	4.64	8	38.67
November	2.90	5	24.16
December	1.74	3	14.50
Year	58.0	100	483.

Net loss due to evaporation equals 58.0 inches, equals 4.833 feet.

ESTIMATED DUTY OF EL CAPITAN RESERVOIR

Based on the assumption that the deficiency of the 10,000 acre feet seasonal draft from the 92 square miles above the Diverting Dam and of the 2,000 acre-feet from the 37 square miles of the South Fork, will be taken from the El Capitan Reservoir in addition to the regular draft of 2,120 acre-feet. Also, that the El Capitan Reservoir, April 10th, 1894, contains 70,700 acre-feet.

Values Are Given in Acre-Feet.

Season.	Deficiency.	Draft.	*Evap'tion.	Total Depletion,	Balance in Reservoir 12-31-'14
1893-94	.....	2,120	4,630	6,750	63,950
94-95	.....	2,120	4,630	6,750	63,950
95-96	7,072	2,120	4,100	13,292	51,636
96-97	.....	2,120	4,285	6,405	56,085
97-98	7,085	2,120	3,770	12,975	44,185
98-99	10,678	2,120	3,160	15,958	28,516
99-00	11,162	2,120	2,100	15,382	13,308
1900-01	6,419	2,120	898	9,437	5,192
01-02	° 6,170	2,120	840	2,960	3,508
02-03	° 1,625	2,120	510	2,630	3,298
03-04	°10,738	2,120	454	2,574	1,000
04-05	.....	2,120	2,621	4,741	18,680
05-06	.....	2,120	4,120	6,240	52,528
06-07	.....	2,120	4,630	6,750	63,950
07-08	.....	2,120	4,630	6,750	63,950
08-09	.....	2,120	4,630	6,750	63,950
09-10	.....	2,120	4,630	6,750	63,950
10-11	.....	2,120	4,450	6,570	61,486
11-12	.....	2,120	4,600	6,720	63,570
12-13	4,989	2,120	4,160	11,269	53,834
13-14	.....	2,120	4,146	6,266	52,760
Totals..	65,244	44,520	71,994	163,917	

* The evaporation loss for 265 days, April 10 to Dec. 31, equals 100 acre-feet per 100 acres area.

° There is a deficiency of 6,170 in 1902, 1,625 in 1903, and 10,738 in 1904, a total of 18,533 acre-feet. This is more than made up in the year that follows.

SURFACE RUNOFF OF THE SAN DIEGO RIVER FOR THE 191 SQUARE MILES ABOVE EL CAPITAN DAM

Values Are in Acre Feet.

Season.	Above the Cuyamaca Dam Area 12 Sq. Mi.	Cuyamaca to Diverting Dam Area 92 Sq. Mi.	Diverting to El Capitan Dam Area 87 Sq. Mi.	Seasonal Sum Total 191 Sq. Mi.
1893-94	2,563	11,640	6,518	20,721
94-95	11,269	28,820	16,139	56,238
95-96	2,152	3,850	2,156	8,158
96-97	4,216	14,650	8,204	27,070
97-98	834	3,840	2,150	6,824
98-99	472	1,033	578	2,083
99-00	260	655	367	1,282
1900-01	3,031	4,360	2,442	9,833
01-02	2,351	4,555	2,551	9,457
02-03	2,516	8,375	4,690	15,581
03-04	492	986	552	2,030
04-05	6,531	22,065	12,356	41,252
05-06	12,780	33,390	18,698	64,868
06-07	9,259	29,945	16,769	55,973
07-08	3,201	12,632	7,074	22,907
08-09	7,171	20,760	11,625	39,556
09-10	5,134	13,630	7,633	26,397
10-11	2,765	10,324	5,782	18,871
11-12	3,520	13,336	7,468	24,324
12-13	2,982	5,476	3,066	11,524
13-14	2,505	10,700	6,492	19,697
Sum Total	86,315	255,024	143,310	484,649
Average per Season	4,110	12,144	6,824	23,078.5
Mean per Square Mile	342.5	132.0	78.4	120.8

CAPACITY, AREA AND EVAPORATION TABLE OF PROPOSED NEW LA MESA RESERVOIR

Depth.	Capacity Acre-Ft.	Acres Flooded Acres.	Seasonal by Evap. Acre-Ft.
20	30	5	24
25	60	8	38
30	110	12	58
35	185	165	80
40	270	24	116
45	425	31.5	151
50	610	41	198
55	830	51	246
60	1,130	62	300
65	1,460	72	348
70	1,850	83	400
75	2,310	97	468
80	2,820	113	546
85	3,400	131	633
90	4,130	152	734
95	5,015	175	845
100	5,920	205	990

Evaporation per Month

Month.	Depth Ins.	%	Loss on 100 acres Acre-Ft.
January	1.16	2	9.67
February	1.74	3	14.50
March	3.48	6	28.90
April	5.22	9	43.50
May	6.96	12	58.00
June	8.70	15	72.50
July	8.12	14	67.68
August	6.96	12	58.00
September	6.38	11	53.16
October	4.68	8	38.67
November	2.90	5	24.16
December	1.74	3	14.50
Year	58.0	100	483.

From Proposed Diverting Dam Reservoir from July 1st to December 31st, a period of 184 days, a draft of 2,760 acre-feet, allowing 10% loss in conduit transmission, gives 2,484 acre-feet, 13.5 acre-feet, or 4,398,975 gallons per 24 hours.

From Proposed New La Mesa Reservoir from April 1st to December 31st, a period of 275 days, a draft of 4,860 acre-feet, 17.7 acre-feet or 5,767,545 gallons per 24 hours.

FINAL SUMMARY

The net supply per annum from the 191 square miles above the proposed El Capitan Reservoir would be as follows (from flood waters, January 1st to April 10th):

To San Diego City direct	1,710 acre-feet or	557 mil.-gal.
From Lower Otay Pipe-Line	1,520 acre-feet or	495 mil.-gal.
From La Mesa Reservoir	4,860 acre-feet or	1,583 mil.-gal.
From Cuyamaca Lake	1,620 acre-feet or	528 mil.-gal.
From Diverting Dam Reservoir	2,484 acre-feet or	810 mil.-gal.
El Capitan Reservoir	1,908 acre-feet or	621 mil.-gal.
Sum Total	14,102 acre-feet or	4,594 mil.-gal.

This is the equivalent of 38.7 acre-feet or 12.6 million-gallons per 24 hours for 365 days.

NOTE.—The duty of the El Capitan Reservoir for 365 days would be 10.4 acre-feet or 3.4 million-gallons per 24 hours. If the El Capitan Dam is eliminated, gives a balance of 34 acre-feet or 10.9 million-gallons per 24 hours.

ESTIMATED AVAILABLE NET SUPPLY FROM THE SAN DIEGO RIVER

For the 191 Square Miles Watershed Above the Proposed El Capitan Dam

SUMMARY

From surface runoff of the 92 square miles from the Cuyamaca Dam to the Diverting Dam from January 1st to April 10th, 100 days, 70 acre-feet per 24 hours or total of 7,000 acre-feet.

From surface runoff of the 37 square miles of the South Fork above main conduit line from January 1st to April 10th, 100 days, 20 acre-feet per 24 hours, or a total of 2,000 acre-feet.

Allowing 5 per cent. loss in conduit transmission,

Location.	Total for 100 days Acre-Ft.	Mil. Gals.
Into La Mesa Reservoir	5,320	1,733
Into San Diego City	1,710	557
Into Lower Otay Pipe Line	1,520	2,785
Total Flood Waters	8,550	5,075

From Cuyamaca Lake from April 1st to June 30th, a period of 90 days, a draft of 2,250 acre-feet allowing 20% loss from Cuyamaca Lake to Diverting Dam in transmission, gives 1,800 acre-feet net supply at Diverting Dam, and allowing an additional 10% loss in transmission from Diverting Dam to meter gives a net of 1,620 acre-feet or 18 acre-feet—5,865,300 gallons per 24 hours.

From the proposed El Capitan Reservoir from April 10th to December 31st, a period of 265 days, a draft of 2,120 acre-feet or 7.2 acre-feet—2,346,120 gallons per 24 hours for the period.

ESTIMATED SAFE NET YIELD OF THE PRINCIPAL WATER SUPPLY STREAMS IN SAN DIEGO COUNTY

Also Underground Sources of Supply

	Quantity per Day.		Quantity per Year.	
	Mil. Gals.	Acre-Ft.	Mil. Gals.	Acre-Ft.
Warner Reservoir, San Luis Rey River	11.5	35.30	4,197,500,000	12,880
"B" Dam Reservoir (Pamo) Santa Ysabel River	8.0	24.55	2,920,000,000	8,960
Carroll Reservoir (pumping) Santa Ysabel River	5.5	16.88	2,007,500,000	6,160
Santa Maria Reservoir (Branch) Santa Ysabel River	2.5	7.67	912,500,000	2,800
Cuyamaca & El Capitan Reservoirs San Diego River	10.0	30.70	3,650,000,000	11,200
Mission Dam Reservoir (pumping) San Diego River	7.0	21.50	2,555,000,000	7,840
Mission Valley City Pumping Plant San Diego River	4.0	12.28	1,460,000,000	4,480
Mission Valley Private Pumping Plants San Diego River	3.5	10.75	1,277,500,000	3,920
Sweetwater Reservoir present yield Sweetwater River	6.5	19.95	2,372,500,000	7,280
Proposed future development Sweetwater River	3.5	10.75	1,277,500,000	3,920
Valley pumping plants on Sweetwater River	2.5	7.67	912,500,000	2,800
San Diego City System Cottonwood & Otay River	10.0	30.70	3,650,000,000	11,200
Pumping plants in Otay Valley, Otay River	2.0	6.13	730,000,000	2,240
Pumping plant on Lower Section Tia Juana River	8.0	24.55	2,920,000,000	8,960
Sub. Total	84.5	259.38	30,842,500,000	94,640

Additional development on the Tia Juana River that involve international questions with Mexico would be as follows:

	Quantity per Day.		Quantity per Year.	
	Mil. Gals.	Acre-Ft.	Mil. Gals.	Acre-Ft.
Proposed Marron Reservoir near Boundary Monument No. 249	5.0	15.35	1,825,000,000	5,600
Proposed Garcia Reservoir, 11 miles below Boundary Line	18.0	55.25	6,570,000,000	20,160
Sub-total	23.0	70.60	8,395,000,000	25,760
Previous Total	84.5	259.38	30,842,500,000	94,640
Grand Total	107.5	329.98	39,237,500,000	120,400

Safe net yield refers to the available supply after deducting loss from seepage, evaporation, conduit transmission, vested and riparian rights.

If a Metropolitan Water District should be formed, it could include approximately the following territory: A portion of the Linda Vista and Ex-Mission Lands, the Pueblo Lands of San Diego, East San Diego City, Encanto, South of Encanto, La Mesa, Lemon Grove and Spring Valley Irrigation District, part of La Nacion Grant that includes National City and Chula Vista, part of Otay Rancho; also Otay City, Nestor, South San Diego, and the Oneonta section—in all approximately 130,000 acres.

By leaving out some tracts where the people object to their land being included in a water district, the above described lands include the best territory directly tributary to the City of San Diego.

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