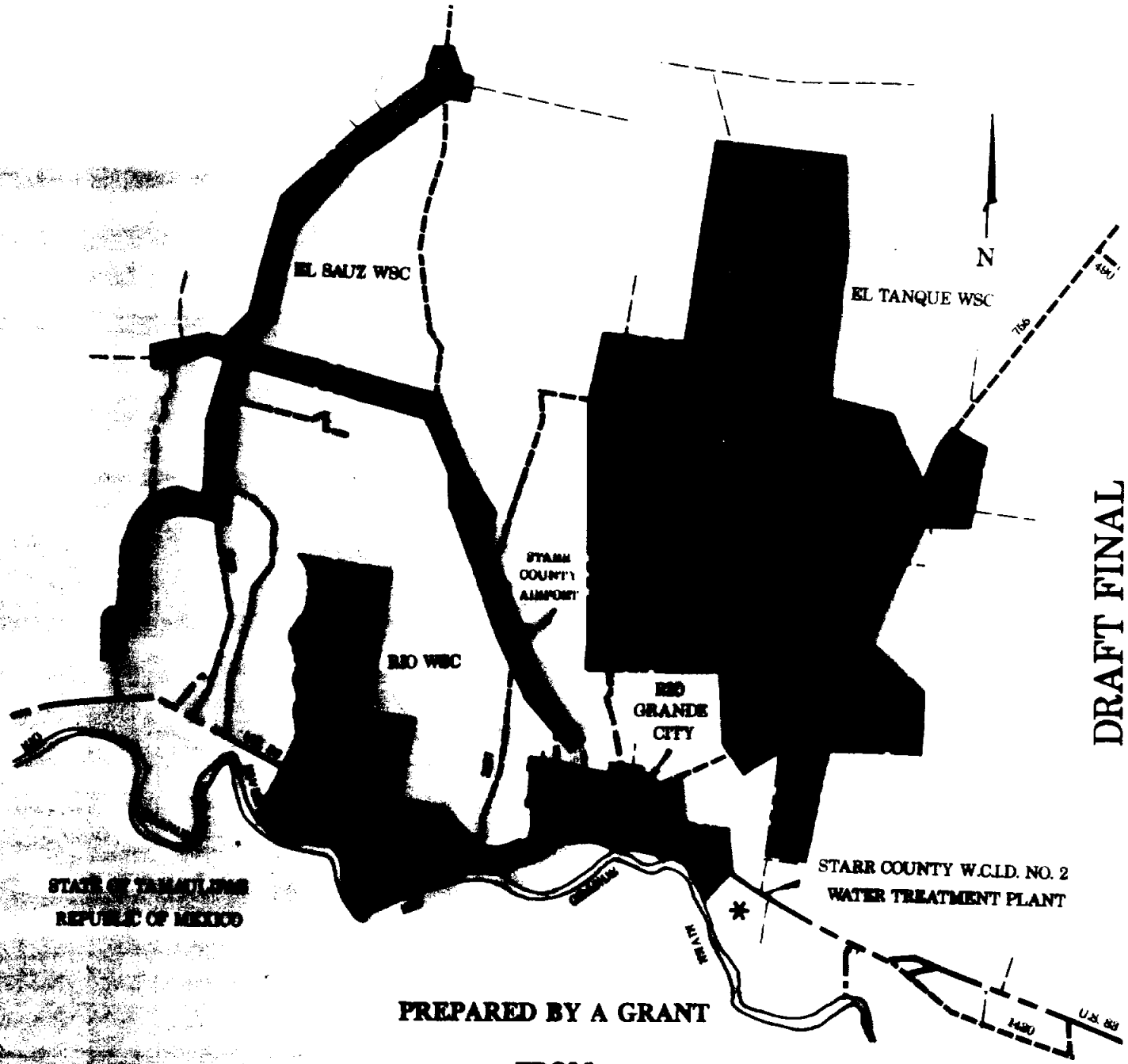
REGIONAL WATER SUPPLY STUDY
FOR
STARR COUNTY W.C.I.D. NO. 2



DRAFT FINAL

PREPARED BY A GRANT

FROM

TEXAS WATER DEVELOPMENT BOARD

JANUARY 1993

PREPARED BY

THE NELSON CORPORATION
5999 Summerside Drive, Suite 202
Dallas, Texas 75252
(214) 380-2685

STATE OF TEXAS
JOHN H. HERNDON
29424
REGISTERED
PROFESSIONAL ENGINEER

John H. Herndon
01/29/93

THE NELSON CORPORATION

PLANNING • ENGINEERING • SURVEYING
LANDSCAPE ARCHITECTURE • CONSTRUCTION MANAGEMENT

5999 SUMMERSIDE DRIVE • SUITE 202
DALLAS, TEXAS 75252
(214) 380-2605
FAX (214) 380-2609

LINDA SEWELL
SEC.-TREAS.

BRIAN MARCUS, P.E., R.P.L.S.
PRESIDENT

CRAIG T. CURRY
EXECUTIVE VICE PRESIDENT
DIRECTOR OF PLANNING

January 29, 1993

Mr. Gary Laneman, P.E., Contract Manager
Planning Division
TEXAS WATER DEVELOPMENT BOARD
P.O. Box 13231
Austin, Texas 78711-3231

Re: **STARR COUNTY WCID NO. 2** REGIONAL WATER SUPPLY PLANNING STUDY - Draft Final. Contract No. 92-483-312

Dear Mr. Laneman:

Enclosed are seven copies of the draft final of the **REGIONAL WATER SUPPLY PLANNING STUDY** done for **STARR COUNTY WCID NO. 2**. The copies are for your review and comment in accordance with the contract.

A final report will be prepared utilizing the input from this review. Please feel free to call if you have any questions or comments.

Sincerely,

THE NELSON CORPORATION

John H. Herndon

John H. Herndon, P.E.

EXECUTIVE SUMMARY

On December 12, 1991, the **TEXAS WATER DEVELOPMENT BOARD** approved the application for financial assistance by **STARR COUNTY WCID NO. 2** to develop a regional water supply plan.

The purpose of the plan is to evaluate existing and potential water supply facilities, treatment and distribution services, identify potential water supply sources, and formulate supply, treatment, and distribution alternatives for the years 1990, 2000, 2010, and 2020.

The planning area consists of the **STARR COUNTY WCID NO. 2** water service area, **EL SAUZ WSC** water service area, **RIO WSC** water service area, and **EL TANQUE WSC** water service area. This plan does directly consider unpopulated areas encompassed by the various CCN boundaries.

The planning area has experienced an average annual growth rate of 3.7% for the last 20 years and is expected to continue with a more moderate growth rate during the next 20 years. Population projections for the area and for each water supply corporation were made using the **TWDB HIGH** population projections.

The social and economic factors for the planning area population indicate that the area is eligible for many governmental assistance programs. The only central government in the area is **STARR COUNTY.** None of the planning area is within an incorporated area which would enable them to obtain additional funding. The per capita annual income for the planning area in 1987 was $3,464.

The only water rights owned by the entities in the planning area are those owned by **STARR COUNTY WCID NO. 2.** The additional water rights necessary for the design year (2010) to supply **EL TANQUE WSC, RIO WSC,** and **EL SAUZ WSC** must be obtained. It is recommended that water rights in the amount of 80% of these demand requirements be obtained and the additional 20% made up from free pumping or from purchased water.

The demands for treated municipal water are calculated using historical records for usage, peak/average demand ratios, and the population projections for each entity. The projected demand for the design year is calculated to be 6.58 million gallons per day (MGD).

An analysis of the individual units at the existing water treatment plant indicated that the plant, when renovated, will have a capacity of approximately 3.16 MGD. The proposed plant addition is of modular design with a capacity of 4.0 MGD giving a total treatment capacity of 7.16 MGD. The modular design of the plant will permit future plant additions in increments of one MGD.

The rate adjustments calculated to pay for the new facilities assuming assistance in the amount of a 75% grant are in the following tables.

STARR COUNTY WCID NO. 2

WATER USAGE	PRESENT RATE	PROPOSED RATE
0 - 2,000 GAL	$9.00	$10.95
OVER 2,000 GAL	$1.75/1,000 GAL	$1.81/1,000 GAL
AVERAGE BILL	$35.25	$38.10

EL TANQUE WSC

WATER USAGE	PRESENT RATE	PROPOSED RATE
0 - 2,000 GAL	$17.00	$18.95
OVER 2,000 GAL	$2.70/1,000 GAL	$3.25/1,000 GAL
AVERAGE BILL	$57.50	$67.70

EL SAUZ WSC

WATER USAGE	PRESENT RATE	PROPOSED RATE
0 - 2,000 GAL	$17.00	$16.95
0 - 2,000 GAL	$3.00/1,000 GAL	$3.63/1,000 GAL
AVERAGE BILL	$60.00	$71.40

RIO WSC

WATER USAGE	PRESENT RATE	PROPOSED RATE
0 - 3,000 GAL	$13.00	$14.95
3,000 - 6,000 GAL	$1.85/1,000 GAL	$2.19/1,000 GAL
6,000 - 15,000 GAL	$1.95/1,000 GAL	$2.29/1,000 GAL
OVER 15,000 GAL	$2.35/1,000 GAL	$2.69/1,000 GAL
AVERAGE BILL	$40.80	$46.82

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INTRODUCTION

I. INTRODUCTION

On December 12, 1991, the Texas Water Development Board approved the application for financial assistance by Starr County WCID #2 to develop a regional water supply plan.

The purpose of the plan is to evaluate existing and potential water supply, treatment and distribution services, identify potential water supply sources and formulate water supply, treatment and distribution alternatives for the years 1990, 2000, 2010, and 2020.

A. PLANNING AREA

The planning area consists of the **Starr County WCID #2** water service area, **Rio WSC** service area as defined by its CCN# 10245, **El Sauz WSC** service area as defined by its CCN# 11424 and **El Tanque WSC** service area as defined by its CCN# 11453. This plan will not directly consider unpopulated areas encompassed by the CCN boundaries. See **EXHIBIT 1 AND EXHIBIT 2** in the **APPENDIX.**

B. POPULATION

The planning area has experienced a high growth rate in the last 20 years and is expected to continue with a more moderate growth rate during the next 20 years.

Starr County's population increased 54% from 1970 to 1980 and 19% from 1980 to 1990.

The 1990 population of the planning area is estimated to be 15,582 - 38% of the total Starr County population.

The population is 97% Hispanic. The median age is 23.9 years.

C. SOCIAL AND ECONOMIC FACTORS

The Social and Economic Factors of the 1990 Planning Area Population are:

1. The population was 97% Hispanic.
2. There were 3,926 estimated households.
3. There were 3,493 estimated family households of which 559 had no husband present.
4. There were 433 estimated non-family households.
5. The average persons per household was 3.79.

6. The average persons per family was 4.21.

7. In 1987, the median annual household income was $11,006, 55% below the Texas median income of $24,431. The per capita annual income was $3,464.

8. 93% of the housing units were served by public water.

9. 41% of the housing units were served by public sewer.

10. 7% of the housing units had no plumbing.

D. GOVERNMENT

There are no incorporated cities in the planning area. Rio Grande City, the County Seat and largest city in Starr County is serviced with water and sewage collection by the Starr County WCID #2. The three water supply corporations in the study area are each governed by a Board of Directors. The only local central government is Starr County.

The County is governed by a County Judge and four County Commissioners.

Honorable Jose Martinez, County Judge
Starr County Courthouse
Rio Grande City, Texas 78582.

The Starr County WCID #2 is governed by a Board of Directors. Their address is:

Starr County WCID #2
1730 West Main
Rio Grande City, Texas 78582

The Rio WCS is governed by a Board of Directors. Their address is:

Rio WSC
Route 3, Box 24
Rio Grande City, Texas 78582

The El Tanque WSC is governed by a Board of Directors. Their address is:

El Tanque
P. O. Box 41
Rio Grande City, Texas 78582

The El Sauz WSC is governed by a Board of Directors. Their address is:

El Sauz WSC
Route 1, Box 3312
Rio Grande City, Texas 78582

EXISTING WATER SUPPLY

II. EXISTING WATER SUPPLY

A. GENERAL

All of the water supplied to the planning area is produced by a surface water treatment plant owned and operated by Starr County WCID #2. Rio WSC, El Tanque WSC and El Sauz WSC all purchase 100% of their treated water from Starr County WCID #2 for resale.

Starr County receives its surface water from International Falcon Reservoir on the Rio Grande River. See **EXHIBIT 3** in the **APPENDIX.** The conservation storage of Falcon Reservoir is 2,267,600 acre feet, the United States share is 1,328,800 acre feet.

The present water rights in the Lower Rio Grande River are as follows:

TABLE II-1

USE	ACRE FEET
Irrigation Class A	1,548,562.563
Irrigation Class B	226,554.126
Municipal	158,195.513
Industrial	46,706.750
Domestic	25,483.419

The Water Commission has converted acres of irrigation rights to acre feet of irrigation rights so that all water rights are in the same units.

Irrigation rights may be converted to municipal use. This increases the priority but the amount of the right decreases as shown below.

TABLE II-2

IRRIGATION RIGHT		MUNICIPAL RIGHT
1 acre Class A	=	1.25 acre feet
1 acre Class B	=	1 acre foot
1 acre foot Class A	=	0.5 acre feet
1 acre foot Class B	=	0.4 acre feet

The priority of the right is used when there is not enough water to satisfy all users. The lowest priority users are restricted or prohibited from using their water right until there is sufficient water. Therefore, irrigation use, having a lower priority, would be restricted before municipal use.

B. STARR COUNTY WCID #2

1. Water Rights

Starr County WCID #2 presently owns approximately 2,676 acre feet of water rights for municipal use.

2. Treatment Facilities

The treatment facilities consist of the following units and their sizes.

a. Intake Pumps

Located at the intake structure on the Rio Grande River.

	1 @ 850	GPM	
	1 @ 950	GPM	
	1 @ 1250	GPM	
Total	3050	GPM	(4.4 MGD)

At the Texas Water Commission (TWC) required rate of 0.6 GPM per connection, the intake pumps will service 5,083 connections, or a total population of 19,265 persons.

b. Raw Water Storage Ponds

There are two ponds located at the treatment plant site. The total estimated capacity of the ponds is 12,000,000 gallons. At the projected demands, the ponds will provide 2.7 days storage for the current demand; 2.4 days for the projected 2000 demand; 1.8 days for the projected 2010 demand; and 1.4 days storage for the projected 2020 demand.

c. Raw Water Pumps

Located in the control building basement.

	1 @ 725	GPM	
	1 @ 725	GPM	
	1 @ 1450	GPM	
Total	2900	GPM	(4.2 MGD)

At the (TWC) required rate of 0.6 GPM per connection, the raw water pumps will service 4,833 connections, or a total population of 18,318 persons.

d. Flash Mixing

Located in the control building.

The flash mixing unit's volume is 4,907 gallons. At the recommended rate of 1 minute mixing time, the flash mixer is rated at **7.07 MGD.**

e. Flocculator

Two flocculation basins are located in the control building.

The flocculation units' volume is 32,919 gallons each for a total of 65,824 gallons. At the recommended rate of 30 minutes mixing time, the flocculators are rated for a total of **3.16 MGD.**

f. Clarifiers

Six units are located at the treatment plant site.

Two clarifiers were constructed around 1945 and are not physically connected to the remaining four. The remaining four clarifiers were constructed around 1967. The four clarifiers were renovated in 1986. The capacities are as follows:

219,014 gallons in the two older units
639,092 gallons in the four newer units
858,106 gallons total

At the required detention time of six hours, the clarifiers are rated for **3.43 MGD.**

g. Transfer Pump

Located in the control building basement.

	1 @	1000	GPM	
	1 @	1100	GPM	
	1 @	1100	GPM	
Total		3200	GPM	(4.6 MGD)

At the required rate of 0.6 GPM per connection, the transfer pumps will service 5,333 connections, or a population of 20,213 persons.

h. Filters

Six filters located in the control building.

Filters #1 and #2 were constructed around 1945, filters #5 and #6 were constructed around 1967 and filters #3 and #4 were constructed sometime between 1945 and 1967. Each pair of filters are not physically connected to any other pair. The capacities are as follows:

#1	-	90	square feet
#2	-	90	square feet
#3	-	150.3	square feet
#4		150.3	square feet
#5	-	362.5	square feet
#6	-	362.5	square feet
Total	-	1205.6	square feet

At the required area of 2 GPM per square foot, the filters are rated for **3.47 MGD.**

i. Backwash Pumps

Two pumps located in the control building basement.

2 @	2710	GPM
Total	5420	GPM

At the recommended rate of 15 GPM per square foot of filter area, the pumps will backwash 361.33 square feet of filter area.

j. Service Pumps

Six pumps are located in the central building basement.

1 @	1600	GPM	
1 @	1600	GPM	
1 @	750	GPM	
1 @	750	GPM	
1 @	750	GPM	
1 @	750	GPM	
Total	6200	GPM	(8.9 MGD)

At the required rate of 2 GPM per connection, the service pumps will service 3,100 connections or 11,749 persons.

3. Water Storage Facilities

A 1,500,000 gallon ground storage tank and a 2,000,000 gallon ground storage tank are located at the treatment plant. A 300,000 gallon elevated tank and a 150,000 gallon elevated tank are located within the distribution system. Total storage of 3,950,000 gallons provide a storage at the required rate of 200 gallons per connection, for 19,750 connections, or a population of 74,853 persons. The total elevated storage capacity of 450,000 gallons provide, at the required rate of 100 gallons per connection, for 4,500 connections or a population of 17,055 persons.

4. Observations

On-site inspections and interviews with operation personnel reveal the following:

a. The clarifiers, filters and mixing units are structurally sound and could be incorporated into a total treatment package. The valves were manufactured by a company that is no longer in existence, therefore, no parts are available for repairs. The valves should be replaced as a part of the total treatment plant improvement package.

b. The raw water, transfer, service and backwash pumps were installed in 1967, and although some have been repaired or replaced, all pumps should be replaced as a part of a total treatment package to increase capacity and to address reliability and the availability of replacement parts.

c. The intake structure is structurally sound and should be incorporated into the total treatment package. The intake pumps should be upgraded as a part of the total treatment package.

d. The ground storage and elevated storage tanks appear sound but need cleaning, repairing and recoating as a part of the total package.

C. EL TANQUE WATER SUPPLY CORPORATION

1. Water Rights

No Water Rights are owned.

2. Water Supply

El Tanque WSC purchases all of its treated water from Starr County WCID #2 and has a contract for 18,000,000 gallons per year. The treated water is furnished to the El Tanque pump station.

3. Water Storage Facilities

El Tanque WSC has a 65,000 gallon ground storage tank and a 88,000 gallon standpipe tank. Total storage of 153,000 gallons provide storage, at the rate of 200 gallons per connection, for 765 connections, or a population of 2,899 persons.

D. EL SAUZ WATER SUPPLY CORPORATION

1. Water Rights

No Water Rights are owned.

2. Water Supply

El Sauz WSC purchases treated water from Starr County WCID #2 and has a contract for 7,200,000 gallons per year. El Sauz WSC has installed an in-line pumping facility to pump water from Starr County WCID #2 lines to the El Sauz standpipe.

3. Water Storage Facilities

El Sauz WSC has a 69,000 gallon standpipe storage tank that will provide storage at the required rate of 200 gallons per connection, for 345 connections, or a population of 1,308 persons.

E. RIO WATER SUPPLY CORPORATION

1. Water Rights

No Water Rights are owned.

2. Water Supply

Rio WSC purchases treated water from Starr County WCID #2 and has a contract for 36,000,000 gallons per year. The treated water is furnished to the Rio WSC pump station by Starr County WCID #2.

3. Water Storage Facilities

Rio WSC has a 40,000 gallon ground storage tank that will provide storage, at the required rate of 200 gallons per connection, for 200 customers, or a population of 758 persons.

F. OTHER INFORMATION

El Sauz WSC, El Tanque WSC and Rio WSC all have submitted applications to FmHA for funds to add onto their facilities.

POPULATION PROJECTIONS

III. POPULATION PROJECTIONS

The Starr County Water and Wastewater Regional Study reviewed five population projections for the period from 1980 to 2020. Two versions were prepared by the Texas Water Development Board (TWDB) and three by the South Texas Development Council (STDC). The five projections are shown below.

FIGURE III-1

PROJECTION NAME	ACTUAL	YEAR				AVERAGE ANNUAL GROWTH
	1980	1990	2000	2010	2020	
TWDB - LOW	27,266	41,954	55,686	70,150	85,278	2.9%
TWDB - HIGH	27,266	43,445	58,300	73,631	90,702	3.1%
STDC - 0.0 MIGRATION	27,266	38,058	48,196	59,244	74,487	2.5%
STDC - 0.5	27,266	39,817	55,729	76,381	104,473	3.4%
STDC - 1.0	27,266	41,638	64,068	96,473	141,410	4.2%

The Regional Study used the TWDB HIGH for county-wide population projections.

The TWDB HIGH figures of 3.1% average annual increase is selected for this report. This rate reflects the growth rate that is anticipated during the planning period.

The current population figures were calculated by multiplying the total number of water connections reported by each water system by 3.79, the average number of persons per household as listed in the publication "CENSUS '90", U.S. Department of Commerce, Bureau of the Census.

The current population and population projections for each water supply corporation are as shown in **FIGURE III-2** below and graphically as **EXHIBIT 4** of the **APPENDIX**:

FIGURE III-2

	CURRENT POPULATION	YEAR 2000 POPULATION	YEAR 2010 POPULATION	YEAR 2020 POPULATION
Starr C. WCID #2	13,913	17,761	24,103	32,709
El Tanque WSC	891	1,137	1,544	2,095
El Sauz WSC	872	1,113	1,510	2,050
Rio WSC	2,085	2,662	3,612	4,902
TOTAL	17,761	22,673	30,769	41,756

These projections will be used to determine water requirements and for design flow calculations for proposed facilities.

WATER DEMAND

IV. WATER DEMAND

A. MUNICIPAL

The Starr County Water and Wastewater Regional Study developed per capita water production based on 3.79 persons per connection for all water suppliers in the county. The water production **in gallons per capita per day** for the water suppliers in the planning area is as follows:

FIGURE IV-1

WATER SUPPLIER	1984	1985	1986	1987	1988	1989
Starr Co. WCID #2	185	179	181	162	159	197
Rio WSC	85	105	112	115	115	118
El Tanque WSC					112	132
El Sauz WSC						107
Weighted Average	154	152	155	149	132	148

Using the average of 148 gallons per day per capita and the population projections developed in the previous section, the projected municipal water demand **in acre feet per year** is as follows.

FIGURE IV-2

WATER SUPPLIER	CURRENT YEAR	2000	2010	2020
Starr Co. WCID #2	2,131	3,104	4,212	5,716
Rio WSC	364	465	631	857
El Tanque WSC	156	199	270	366
El Sauz WSC	152	195	264	358
TOTAL	3,103	3,963	5,377	7,297

Starr County WCID #2 presently has the only water conservation plan in effect, but Rio Water Supply Corporation, El Tanque Water Supply Corporation and El Sauz Water Supply Corporation will enact them soon as part of individual improvement projects. The Texas Water Development Board has in place water conservation plans that would have the following effects on the overall municipal water demand **in acre feet.**

FIGURE IV-3

YEAR	% REDUCTION	WATER SAVED	PROJECTED DEMAND
1990	2.0	62	3,041
2000	4.0	159	3,804
2010	6.0	323	5,054
2020	8.0	584	6,713

The re-use of filter backwash water at the Starr County WCID No. 2 water treatment plant and the use of treated wastewater for the chlorination system at the Starr County WCID No. 2 wastewater treatment plant and a system wide water loss reduction program would further result in the following projected demands **in acre feet per year.** The demands used in this study are shown in **FIGURE IV-4.**

FIGURE IV-4

YEAR	% REDUCTION	WATER SAVED	PROJECTED DEMAND
1990	-0-	-0-	3,041
2000	10%	380	3,424
2010	10%	505	4,549
2020	10%	671	6,042

B. AGRICULTURAL

Agricultural uses for irrigation and livestock watering consist of 16.67% and 8% respectively of county-wide use. The projected demands, **in acre feet,** are shown in **FIGURE IV-5.**

FIGURE IV-5

USE	1990	2005	2020
Irrigation	6,589	6,452	6,040
Livestock	140	162	162
TOTAL	6,729	6,614	6,202

Very little, if any, of the water used for agricultural purposes will be processed by potable water treatment plants. The agricultural demands **will not** be considered in the water supply planning.

C. INDUSTRIAL

There are no industrial uses of water within the planning area and **no allowance for industrial use will be included** in the water supply planning.

TREATMENT PLANT CAPACITY REQUIRED

V. TREATMENT PLANT CAPACITY REQUIRED

The Starr County Water and Wastewater Regional Study analyzed the past history of the water suppliers in Starr County. The history of peak day usage to average day usage is as follows.

FIGURE V-1

WATER SUPPLIER	1984	1985	1986	1987	1988	1989
Starr Co. WCID #2	1.47	1.77	1.42	1.52	1.63	1.60
City of Roma	1.55	1.60	1.55	1.68	1.41	1.60
City of La Grulla					1.64	2.06
Unicon WSC		1.50	1.94	2.50	2.03	1.41
Falcon Rural WSC	1.79	1.66	1.58	1.79	1.62	1.65
La Joya WSC						
Rio WSC						
El Tanque WSC					1.80	1.55
El Sauz WSC						
Weighted Average	1.54	1.66	1.55	1.70	1.60	1.62

The Peak/Average ratio of 1.62 is used in this study to establish the needed plant capacity for the design year shown. The demands are graphically represented in **EXHIBIT 5** in the **APPENDIX.**

A. 1990 CAPACITY REQUIRED

Average demand	=	3,041	ac.ft./yr.
		X 1.62	(Peak Day)
		4,926.42	ac.ft./yr.
		÷ 365	days
		13.50	ac.ft./day
		X .325829	(million gallons/ac.ft.)
		4.40	MGD

The capacity required to meet 1990 requirements is **4.40 MGD.**

B. 2000 CAPACITY REQUIRED

Average demand	=	3,424	ac.ft./yr.
		X 1.62	(Peak Day)
		5,546.88	ac.ft./yr.
		÷ 365	days
		15.20	ac.ft./day
		X .325829	(million gallons/ac.ft.)
		4.95	MGD

The capacity required to meet 2000 requirements is **4.95 MGD.**

C. 2010 CAPACITY REQUIRED (DESIGN YEAR)

Average demand	=	4,549	ac.ft./yr.
		X 1.62	(Peak Day)
		7,369.38	ac.ft./yr.
		÷ 365	days
		20.19	ac.ft./day
		X .325829	(million gallons/ac.ft.)
		6.58	MGD

The capacity required to meet 2010 requirements is **6.58 MGD.**

D. 2020 CAPACITY REQUIRED

Average demand	=	6,042	ac.ft./yr.
		X 1.62	(Peak Day)
		9,788	ac.ft./yr.
		÷ 365	days
		26.82	ac.ft./day
		X .325829	(million gallons/ac.ft.)
		8.74	MGD

The capacity required to meet 2020 requirements is **8.74 MGD.**

PROPOSED IMPROVEMENTS

B. PRESENT IMPROVEMENTS (Year 2010 Requirements)

Capacity Required = **6.58 MGD**

1. Rehabilitation of Existing Facilities

   a. Replace all existing gate valves with new valves.

   b. Replace all pumps with new pumps, increasing the pump size where needed to meet demands.

   c. Replace all Venturi Tubes with new tubes, increasing size where needed to meet demands.

   d. Drain clarifier, remove all existing sludge handling equipment. Sand blast entire structure and repair defects. Install pyramid-type sludge removal valleys and piping for hydraulic differential sludge removal. Install timer operated automatic valves to remove settled sludge at set intervals. Coat all surfaces with epoxy-type coatings, clean and repair all effluent weirs, replacing any that are non-repairable.

   e. Drain filters, remove and discard all existing filter media. Sand blast entire structure and repair defects. Coat all surfaces with epoxy-type coatings. Clean and repair troughs, replacing any that are non-repairable. Clean and repair all underdrain equipment, replacing any that are non-repairable. Replace media with new graded media. Install surface air and water scour system.

   f. Drain rapid mix and flocculation basin. Sandblast entire surface and repair defects. Coat surfaces with epoxy-type coating. Remove, clean and repair both rapid mix and flocculator equipment, replacing any that are non-repairable.

   g. Clean and sandblast all existing piping that is to be used and paint according to recommended color scheme.

   h. Remove and salvage all piping, valves, etc. that are to be abandoned and return to Starr County WCID #2 for reuse or parts salvage.

   i. Fill all units that are to be abandoned with sand and pour concrete seal slab over top.

   j. Repair rusted out portions of control building.

   k. Install back-up chemical feed equipment.

VI. PROPOSED IMPROVEMENTS

Two methods of meeting the projected demands should be considered. Rehabilitation of usable existing facilities along with additional improvements to provide for the additional demand, or abandonment of all existing facilities and construction of all new facilities.

A. REHABILITATION OF EXISTING FACILITIES

A portion of the existing plant has been in service for 45-50 years and although in need of renovation, is still in use. The existing facilities will be considered for rehabilitation. The facilities to be used will be considered to have a remaining usable life of 15 years. The layout of the existing plant is shown in **EXHIBIT 6** of the **APPENDIX.**

1. Rehabilitation of existing facilities.

Replace Valves	$ 175,000.00
Replace Pumps	175,000.00
Replace Venturi Tubes	175,000.00
Rehab Clarifiers	325,000.00
Rehab Filters	200,000.00
Rehab Mixers	100,000.00
Repair Piping	20,000.00
Salvage Piping	10,000.00
Abandon Units	5,000.00
Repair Control Building	100,000.00
Back-up Chemical Feeders	100,000.00
	$1,380,000.00
+ 25% Other Cost	345,000.00
TOTAL	$1,725,000.00

The renovated existing facilities will provide **3.16 MGD** capacity.

$1,725,000.00 amortized @ 6% for 15 years is $177,611 per year.

To construct a new 3.16 MGD treatment plant.

3,160,000 @ $1.00/gallon = $3,160,000.

$3,160,000 amortized @ 6% for 40 years is $210,019 per year.

It appears that, using this comparison, the most cost effective improvements scheme is rehabilitation of existing facilities plus constructing new facilities to furnish the total required demand.

B. PRESENT IMPROVEMENTS (Year 2010 Requirements)

Capacity Required = **6.58 MGD**

1. Rehabilitation of Existing Facilities

   a. Replace all existing gate valves with new valves.

   b. Replace all pumps with new pumps, increasing the pump size where needed to meet demands.

   c. Replace all Venturi Tubes with new tubes, increasing size where needed to meet demands.

   d. Drain clarifier, remove all existing sludge handling equipment. Sand blast entire structure and repair defects. Install pyramid-type sludge removal valleys and piping for hydraulic differential sludge removal. Install timer operated automatic valves to remove settled sludge at set intervals. Coat all surfaces with epoxy-type coatings, clean and repair all effluent weirs, replacing any that are non-repairable.

   e. Drain filters, remove and discard all existing filter media. Sand blast entire structure and repair defects. Coat all surfaces with epoxy-type coatings. Clean and repair troughs, replacing any that are non-repairable. Clean and repair all underdrain equipment, replacing any that are non-repairable. Replace media with new graded media. Install surface air and water scour system.

   f. Drain rapid mix and flocculation basin. Sandblast entire surface and repair defects. Coat surfaces with epoxy-type coating. Remove, clean and repair both rapid mix and flocculator equipment, replacing any that are non-repairable.

   g. Clean and sandblast all existing piping that is to be used and paint according to recommended color scheme.

   h. Remove and salvage all piping, valves, etc. that are to be abandoned and return to Starr County WCID #2 for reuse or parts salvage.

   i. Fill all units that are to be abandoned with sand and pour concrete seal slab over top.

   j. Repair rusted out portions of control building.

   k. Install back-up chemical feed equipment.

2. Construct New **4.00 MGD** Facility (total capacity = **7.16 MGD**). The general layout of the new plant is shown in **EXHIBIT 7** of the **APPENDIX** and the plan view of the modular unit is shown in **EXHIBIT 8** of the **APPENDIX.**

a. Replace existing cascade aerators with alternatives.

b. Construct Rapid Mixer

Steel cylinder tank at the center of clarifier group.

Requirement:	2 minutes detention time
Size:	5,600 gallons = 750 cu.ft.
Dimensions:	8' dia. X 15' deep

c. Construct Flocculators

Steel cone shaped tank concentric with each clarifier.

Requirement:	30 minutes detention time.
Size:	21,000 gallons each = 2,800 cu.ft.
Dimension:	8' dia. top - 20' dia. base - 15' deep

d. Construct Clarifiers

Four Cast-in-place interlocking octagon shaped concrete tanks.

Requirement:	2 hours settling time
Size:	83,400 gallons each = 11,150 cu.ft.
Dimensions:	30' dia. - 24' deep (20' water depth)
Mechanical:	Hydraulic differential sludge removal piping equipment with timer operated automatic valves to remove sludge at set intervals.

e. Construct Filters

Ten Cast-in-place concrete tanks sharing common walls with each other.

Requirement:	5 gallons per square foot of surface area with one out of service.
Size:	70 sq.ft. each
Dimension:	7' X 10' X 10' HIGH
Media:	Graded assorted sized rock with sand/anthracite top
Underdrain:	Perforated fiberglass underdrain plate

f. Construct 3 Backwash Ponds

Requirement:	Each pond to hold 1 backwash cycle for all filters
Size:	280,000 gallons each = 37,400 cu.ft.
Dimensions:	75' X 75' X 7' deep each
Operation:	3 ponds to operate in series with effluent from final pond to be recycled. Any pond can be by-passed for cleaning or repair.
Mechanical:	Recirculation pump in last pond, rated 500 GPM

g. Construct Filter Clearwell

Two Cast-in-place concrete tank below ground, adjacent to filters.

Requirement:	10% of plant capacity
Size:	200,000 gallons = 26,740 cu.ft. ea.
Dimensions:	63' X 30' X 15' deep
Mechanical:	3 - 800 GPM transfer pumps. Vertical turbine installed on roof of clearwell. 2 pumps for normal use, 1 as a standby.

h. Furnish and install 3 raw water pumps with suction from the raw water storage ponds.

Rating:	1450 GPM @ required head
Operation:	One pump for each side of the plant and one standby. All pumps will pump to the flash mixer headworks.

i. Furnish and install 2 backwash pumps with suction from the distribution system.

Rating:	2100 GPM each @ required head

j. Transmission line to transfer pump station

Line:	12,200 L.F. 18" dia.

k. Water storage reservoir at transfer station.

Size:	1,000,000 gallons

l. Transfer Pump Station

(1) El Tanque WSC

Size: 3 pumps @ 150 gpm ea.

(2) El Sauz WSC

Size: 3 pumps @ 125 gpm ea.

(3) Rio WSC

Size: 3 pumps @ 250 gpm ea.

m. Transmission Lines to WSC.

(1) El Tanque WSC

Line: 39,200 L.F. 12" dia.

(2) El Sauz WSC

Line: 56,000 L.F. 10" dia

(3) Rio WSC

Line: 29,000 L.F. 8" dia

WATER RIGHTS

VII. WATER RIGHTS

The study area is located in the **RIO GRANDE RIVER BASIN.** All of the water provided by the water suppliers in Starr County is surface water. The quality of the ground water in Starr County is Poor.

STARR COUNTY WCID NO. 2 receives its surface water from **INTERNATIONAL FALCON RESERVOIR** on the Rio Grand River. This reservoir was completed in 1953 and was the first reservoir built as a result of the 1945 treaty between Mexico and the United States.

The United States share is under the jurisdiction of the **TEXAS WATER COMMISSION** through the Rio Grande Watermaster located in Weslaco, Texas. The allocation of water complies with the decision of the Thirteenth Court of Civil Appeals in the case of State of Texas, et. al. vs Hidalgo Water Control and Improvement District No. 18, et. al., as approved by the Texas Supreme Court in 1969.

There are three ways to obtain water if you do not have enough water rights.

1. The first way is to purchase water rights. According to the Rio Grande Rivermaster, the going rate for Class A irrigation rights is approximately $300 per acre foot and Class B about $240 per acre foot. This amounts to approximately $600 per acre foot for municipal use.

2. The second way is to purchase the water, essentially, you *rent* the water right for a year. Contract water sells for approximately $15 per acre foot and is only good for the year you buy it.

3. The third way to get water is from free pumping. Free pumping can occur in tow ways. First, if the Falcon and Amisted reservoirs are above their conservation levels, then all pumping is free. Second, if the Rio Grande River is above its flood stage below Falcon Reservoir, then pumping is free. This privilege is only available to permitted users.

It is recommended that a minimum of 80% of total demand in Water Rights be purchased. The remaining 20% can be made up of contract water and/or free pumping.

PROJECTED COSTS

VIII. PROJECTED COSTS

The cost projections reflect the cost of constructing the improvements to satisfy the demand of the Design Year (2010). The cost shown in **FIGURE VIII-1** are those required to construct the plant improvements, to renovate the existing plant, and to transfer the treated water to the WSC's. The cost shown in **FIGURE VIII-2** through **FIGURE VIII-15** analyze the individual districts ability to retire the cost and debt service. The figures are based upon the project qualifying for a 75% grant, otherwise, the cost of water will exceed the ability of the customers to pay. The effect of the cost on the water rates is also shown.

FIGURE VIII-1

DESCRIPTION	COST
REHABILITATE EXISTING FACILITY	$1,725,000
NEW 4.00 MGD TREATMENT FACILITY	4,000,000
18" DIA. TRANSMISSION LINE - 12,200 L.F.	300,000
1,000,000 GALLON WATER STORAGE RESERVOIR	300,000
TRANSFER PUMP STATION	450,000
12" DIA. TRANSMISSION LINE - 39,200 L.F.	600,000
10" DIA. TRANSMISSION LINE - 56,000 L.F.	700,000
8" DIA. TRANSMISSION LINE - 29,000 L.F.	300,000
SUBTOTAL	$8,375,000
CONTINGENCY AND ENGINEERING - 15%	1,256,000
WATER RIGHTS PURCHASE 1873 ACRE FEET @ $600.00	400,000
TOTAL PROJECTED COST	$10,531,000

FIGURE VIII-2

TREATMENT PLANT IMPROVEMENTS (75% GRANT)

REHABILITATE EXISTING FACILITY	$431,300.00
NEW 4.0 MGD TREATMENT FACILITY	$1,000,000.00
SUBTOTAL	$1,431,300.00
CONTINGENCY & ENGINEERING - 15%	$214,700.00
TOTAL PROJECTED COST	$1,646,000.00

FIGURE VIII-3

DEBT SERVICE OF PLANT IMPROVEMENTS (75% GRANT)

$1,646,000 AMORTIZED @ 6% FOR 40 YEARS	$109,396.00
INITIAL COST (4,686[1] CONNECTIONS)	$1.95
2010 COST (8,118[2] CONNECTIONS)	$1.12

1. *The total number of connections in the service area. Calculated by dividing the population figure by 3.79.*
2. *The projected total number of connections in the study area. Calculated by dividing the projected population figure by 3.79.*

FIGURE VIII-4

DEBT SERVICE STARR CO. WCID N0. 2 (75% GRANT)

WATER RIGHTS[3] - 1,165 AC. FT @ $600	$699,000.00
$699,000 AMORTIZED @ 6% FOR 40 YEARS	$46,457.00
INITIAL COST (3,671[4] CONNECTIONS)	$1.05
PLANT IMPROVEMENTS	$1.95
TOTAL INITIAL MONTHLY COST[5]	$3.00
2010 COST (6,360[6] CONNECTIONS)	$0.61
PLANT IMPROVEMENTS	$1.12
TOTAL 2010 MONTHLY COST[7]	$1.73

3. *The required water rights for **STARR COUNTY WCID NO. 2** were calculated for the year 2010 using the demands in **FIGURE IV-2** and incorporating the reductions in **FIGURE IV-3 AND IV-4** and subtracting the amount of the existing water rights owned by the district (2,676 acre feet).*
4. *This number was calculated by dividing the present population of **STARR COUNTY WCID NO. 2** by 3.79.*
5. *This amount is that necessary to satisfy the debt service with the present number of connections.*
6. *This number was calculated by dividing the projected population of **STARR COUNTY WCID NO. 2** by 3.79.*
7. *This is the amount that is necessary to satisfy the debt service with the population projected for the design year (2010).*

FIGURE VIII-5

STARR CO. WCID NO. 2

EXISTING RATES (JANUARY 1993)

WATER USAGE	RATE
0 - 2,000 gal	$9.00
2,000 gal -	$1.75 (per 1,000 gallons)

Present monthly usage per connection based on 148 gallons per capita per day and 3.79 persons per connection is approximately 17,000 gallons.

The average water bill based on the above rates and the present monthly usage will be approximately $35.25.

The funds required to retire the costs of the improvements to the regional plant to be added to the base rate (contingent upon receiving a 75% grant) is $1.95. The cost of purchasing the water is included in the per gallon cost above the initial 2,000 gallons. This amount is $1.05 ($0.06 per 1,000 gallons). The new rate schedule will be:

FIGURE VIII-6

PROJECTED RATES

WATER USAGE	RATE
0 - 2,000 gal	$10.95
2,000 gal -	$1.81 (per 1,000 gallons)

The cost of the average water bill in **STARR CO. WCID NO. 2** will increase to approximately $38.10 per month.

FIGURE VIII-7

DEBT SERVICE EL TANQUE WSC (23.15% COST[8]) (75% GRANT)

18" Ø TRANSMISSION LINE - 23.15%($75,000)	$17,400.00
TRANSFER PUMP STATION - 23.15%($112,500)	$26,000.00
1,000,000 GAL STORAGE RES. - 23.15%($75,000)	$17,400.00
12" Ø LINE - 39,000 L.F.	$150,000.00
SUBTOTAL	$210,800.00
CONTINGENCY & ENGINEERING - 15%	$31,600.00
WATER RIGHTS[9] - 181 AC. FT @ $600	$108,600.00
TOTAL PROJECTED COST	$351,000.00
$351,000 AMORTIZED @6% FOR 40 YEARS	$23,328.00
INITIAL COST (235[10] CONNECTIONS)	$8.27
PLANT IMPROVEMENTS	$1.95
TOTAL INITIAL MONTHLY COST[11]	$10.22
2010 COST (407[12] CONNECTIONS)	$4.78
PLANT IMPROVEMENTS	$1.12
TOTAL 2010 MONTHLY COST[13]	$5.90

8. *The cost represented at this point is the proportional cost of the transfer of treated water from the plant to the WSC's. This cost does not effect **STARR COUNTY WCID NO. 2** members.*
9. *The required water right for **EL TANQUE WSC** were calculated for the year 2010 using the demands in **FIGURE IV-2** and incorporating the reductions in **FIGURE IV-3**.*
10. *This number was calculated by dividing the present population of **EL TANQUE WSC** by 3.79.*
11. *This amount is that necessary to satisfy the debt service with the present number of connections.*
12. *This number was calculated by dividing the projected population of **EL TANQUE WSC** by 3.79.*
13. *This is the amount that is necessary to satisfy the debt service with the population projected for the design year (2010).*

FIGURE VIII-8

EL TANQUE WSC

EXISTING RATES (JANUARY 1993)

WATER USAGE	RATE
0 - 2,000 gal	$17.00
2,000 gal -	$2.70 (per 1,000 gallons)

Present monthly usage per connection based on 148 gallons per capita per day and 3.79 persons per connection is approximately 17,000 gallons.

The average water bill based on the existing rates and the present monthly usage will be approximately $57.50.

The funds required to retire the costs of the improvements to the regional plant to be added to the base rate (contingent upon receiving a 75% grant) is $1.95. The cost of purchasing water and the construction of the transmission facilities is included in the per gallon rate above the initial 2,000 gallons. This amount is $8.27 ($0.55 per 1,000 gallons). The new rate schedule will be:

FIGURE VIII-9

PROJECTED RATES

WATER USAGE	RATE
0 - 2,000 gal	$18.95
2,000 gal -	$3.25 (per 1,000 gallons)

The cost of the average water bill in **EL TANQUE WCS** will increase to approximately $67.70 per month.

FIGURE VIII-10

DEBT SERVICE EL SAUZ WSC (22.66% COST) (75% GRANT)

18" Ø TRANSMISSION LINE - 22.66%($75,000)	$17,000.00
TRANSFER PUMP STATION - 22.66%($112,500)	$25,500.00
1,000,000 GAL STORAGE RES - 22.66%($75,000)	$17,000.00
10" Ø LINE - 56,000 L.F.	$187,00.00
SUB TOTAL	$247,000.00
CONTINGENCY & ENGINEERING - 15%	$37,000.00
WATER RIGHTS[14] - 177 AC. FT, @ $600	$106,200.00
TOTAL PROJECTED COST	$390,200.00
$390,200 AMORTIZED @ 6% FOR 40 YEARS	$25,994.00
INITIAL COST (230[15] CONNECTIONS)	$9.42
PLANT IMPROVEMENTS	$1.95
TOTAL INITIAL MONTHLY COST[16]	$11.37
2010 COST (398[17] CONNECTIONS)	$5.44
PLANT IMPROVEMENTS	$1.12
TOTAL 2010 MONTHLY COST[18]	$6.56

14. *The required water rights for **EL SAUZ WSC** were calculated for the year 2010 using the demands in **FIGURE IV-2** and incorporating the reductions in **FIGURE IV-3**.*
15. *This number was calculated by dividing the present population of **EL SAUZ WSC** by 3.79.*
16. *This is the amount necessary to satisfy the debt service with the present number of connections.*
17. *This number was calculated by dividing the projected population of **EL SAUZ WSC** by 3.79.*
18. *This is the amount that is necessary to satisfy the debt service with the population projected for the design year (2010).*

FIGURE VIII-11

EL SAUZ WSC

EXISTING RATES (JANUARY 1993)

WATER USAGE	RATE
0 - 2,000 gal	$15.00
2,000 gal -	$3.00 (per 1,000 gallons)

Present monthly usage per connection based on 148 gallons per capita per day and 3.79 persons per connection is approximately 17,000 gallons.

The average water bill based on the existing rates and the present monthly usage will be approximately $60.00.

The funds required to retire the costs of the improvements to the regional plant to be added to the base rate (contingent upon receiving a 75% grant) is $1.95. The cost of purchasing the water and the construction of the transmission facilities will be included in the per gallon cost above the initial 2,000 gallons. This amount is $9.42 ($0.63 per 1,000 gallons). The new rate schedule will be:

FIGURE VIII-12

PROJECTED RATES

WATER USAGE	RATE
0 - 2,000 gal	$16.95
2,000 gal -	$3.63 (per 1,000 gallons)

The cost of the average water bill in **EL SAUZ WCS** will increase to approximately $71.40 per month.

FIGURE VIII-13

DEBT SERVICE RIO WSC (54.18% COST) (75% GRANT)

18" Ø TRANSMISSION LINE - 54.18%($75,000)	$40,600.00
TRANSFER PUMP STATION - 54.18%($112,500)	$61,000.00
1,000,000 GAL STORAGE RES. - 54.18%($75,000)	$40,600.00
8" Ø LINE - 29,000 L.F.	$75,000.00
SUB TOTAL	$217,200.00
CONTINGENCY & ENGINEERING - 15%	$32,600.00
WATER RIGHTS[19] - 424 AC. FT. @ $600	$254,400.00
TOTAL PROJECTED COST	$504,200.00
$504,200 AMORTIZED @ 6% FOR 40 YEARS	$33,510.00
INITIAL COST (550[20] CONNECTIONS)	$5.08
PLANT IMPROVEMENTS	$1.95
TOTAL INITIAL MONTHLY COST[21]	$7.03
2010 COST (953[22] CONNECTIONS)	$2.93
PLANT IMPROVEMENTS	$1.12
TOTAL 2010 MONTHLY COST[23]	$4.05

19. *The required water rights for **RIO WSC** were calculated for the year 2010 using the demands in **FIGURE IV-2** and incorporating the reductions if **FIGURE IV-3**.*
20. *This number was calculated by dividing the present population of **RIO WSC** by 3.79.*
21. *This is the amount necessary to satisfy the debt service with the present number of connections.*
22. *This number was calculated by dividing the projected population of **RIO WSC** by 3.79.*
23. *This is the amount that is necessary to satisfy the debt service with the population projected for the design year (2010)*

FIGURE VIII-14

RIO WSC

EXISTING RATES (JANUARY 1993)

WATER USAGE	RATE
0 - 3,000 gal	$13.00
3,000 - 6,000 gal	$1.85 (per 1,000 gallons)
6,000 - 15,000 gal	$1.95 (per 1,000 gallons)
15,000 gal -	$2.35 (per 1,000 gallons)

Present monthly usage per connection based on 148 gallons per capita per day and 3.79 persons per connection is approximately 17,000 gallons.

The average water bill based on the existing rates and the present monthly usage will be approximately $40.80.

The funds required to retire the costs of the improvements to the regional plant to be added to the base rate (contingent upon receiving a 75% grant) is $1.95. The cost of purchasing the water and the construction of the transmission facilities will be included in the per gallon cost above the initial 3,000 gallons. This amount is $5.08 ($0.34 per 1,000 gallons). The new rate schedule will be:

FIGURE VIII-15

PROJECTED RATES

WATER USAGE	RATE
0 - 3,000 gal	$14.95
3,000 - 6,000 gal	$2.19 (per 1,000 gallons)
6,000 - 15,000 gal	$2.29 (per 1,000 gallons)
15,000 gal -	$2.69(per 1,000 gallons)

The cost of the average water bill in **RIO WCS** will increase to approximately $46.82 per month.

CONCLUSIONS AND RECOMMENDATIONS

IX. CONCLUSIONS AND RECOMMENDATIONS

It is desirable to treat water at a single source for the planning area. The savings realized by using the economy of scale in the water treatment facility may seem to be lost with the cost of transferring the water to the corporations; however, the water must be transported to the corporations from the Rio Grande River area wherever the water is treated. The Rio Grande River is the only logical source of municipal water in the planning area.

The economy of recycling the existing plant and adding capacity with a modular system appears to be the most desirable alternative. The modular design will allow an increase in capacity at a later date to be done in a more economical manner. The modules can also be added as necessary to increase the capacity in one million gallons per day increments.

The financial complexion of the area is such that the needed improvements cannot be financed through local methods. The districts are dependent upon the **FARMERS HOME ADMINISTRATION** and the **TEXAS WATER COMMISSION** as sources of funding, both through grants and low interest loans. The analysis of the rate structure of the districts indicates that the improvements cannot be constructed without aid in the form of a grant. The rate analysis indicated the need for a 75% grant if the system is to be feasible.

An alternative to the system of WCID and WSC's that exists in the planning area would be the concept of a "Super District". This would be an entity that would obtain and consolidate the debt service of the entities into one debt and possibly obtain a grant to pay it off. All the customers in the various districts would be members of the "Super District" and the cost of water to the many individual customers would level off and the rates could be made uniform. The "Super District" would have the complexion of a WCID and have the advantages of additional governmental participation that is not available to WSC's.

APPENDIX

STATE OF TEXAS

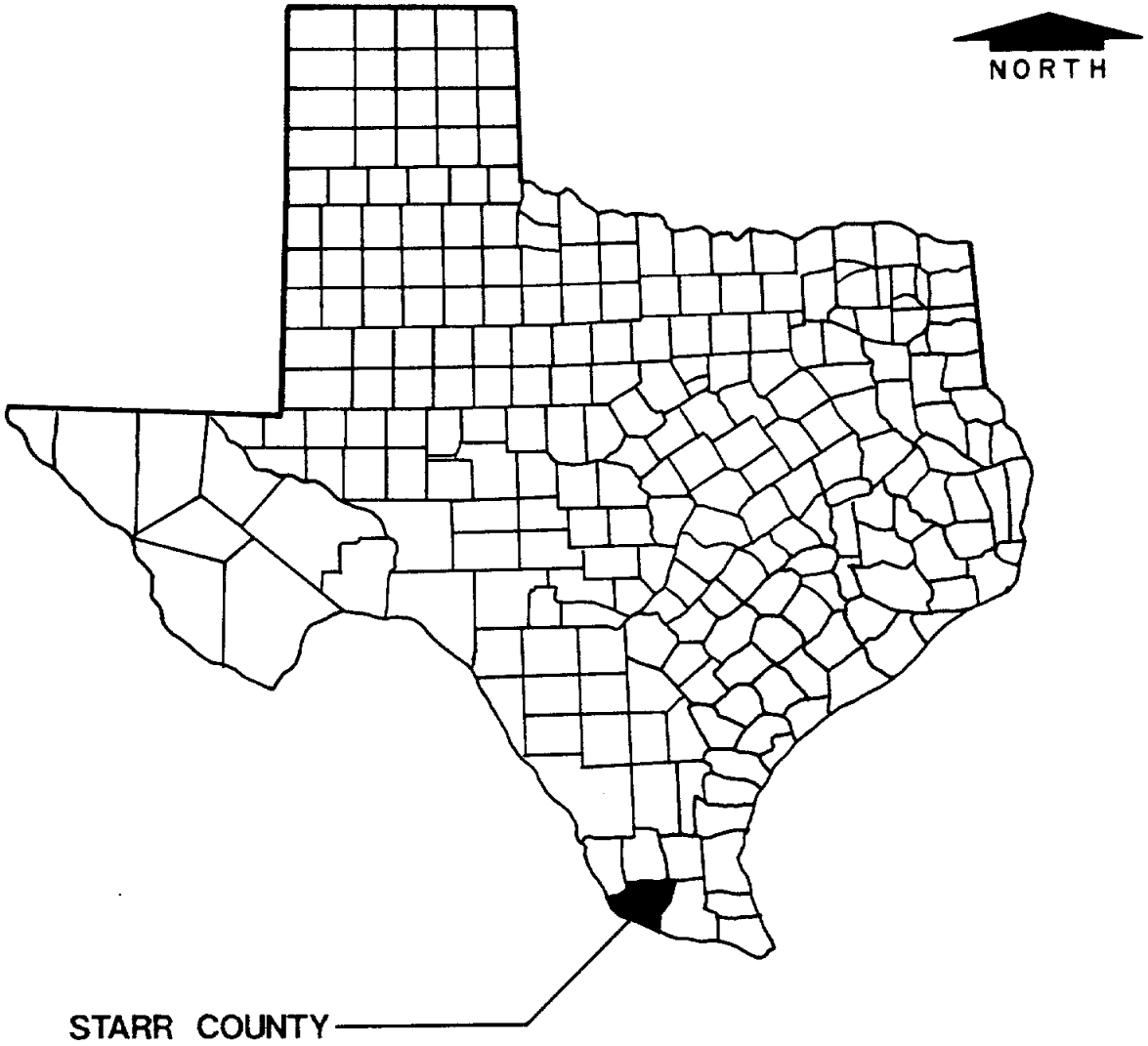
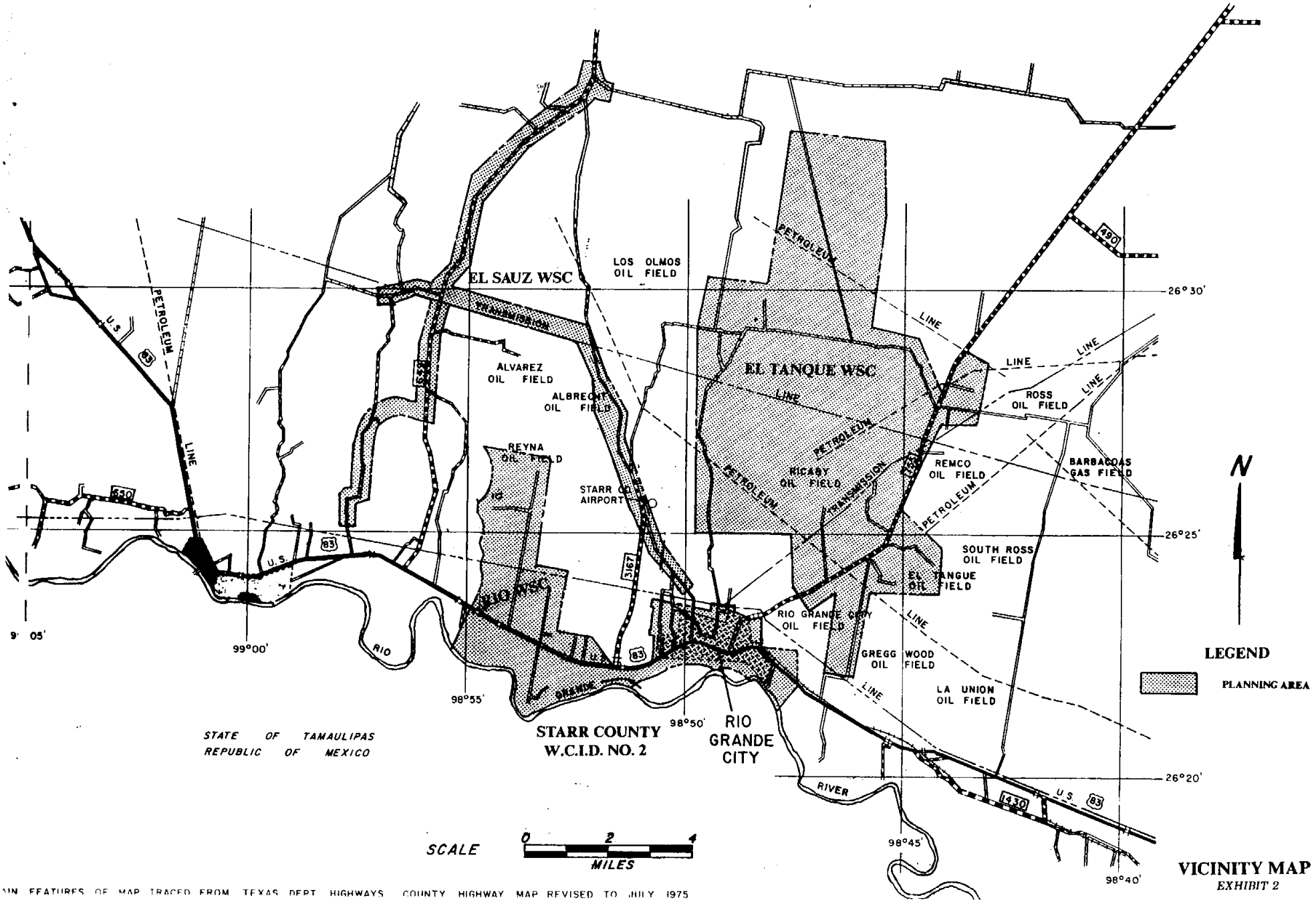
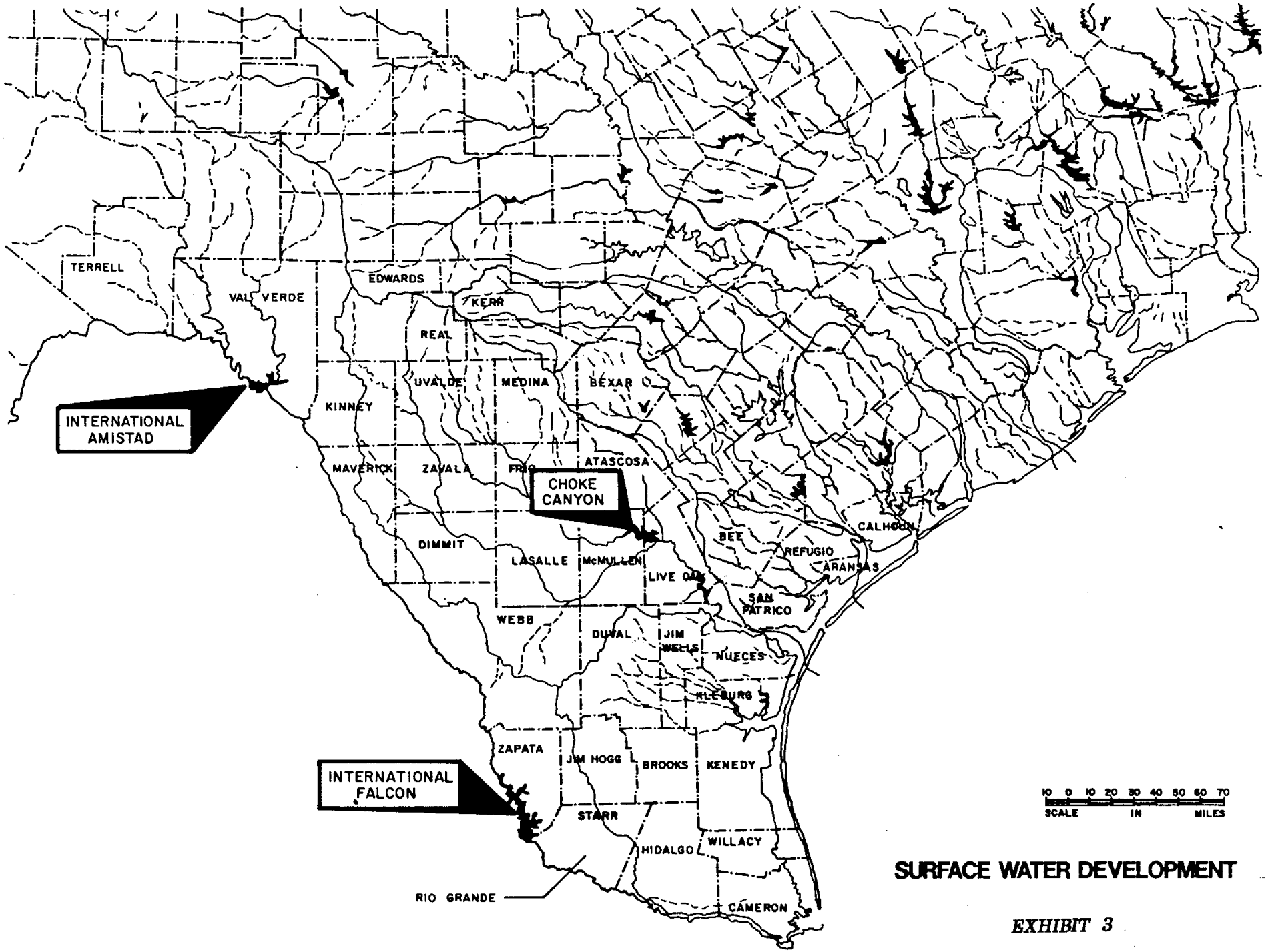


EXHIBIT 1



AIN FEATURES OF MAP TRACED FROM TEXAS DEPT. HIGHWAYS COUNTY HIGHWAY MAP REVISED TO JULY 1975

VICINITY MAP
EXHIBIT 2

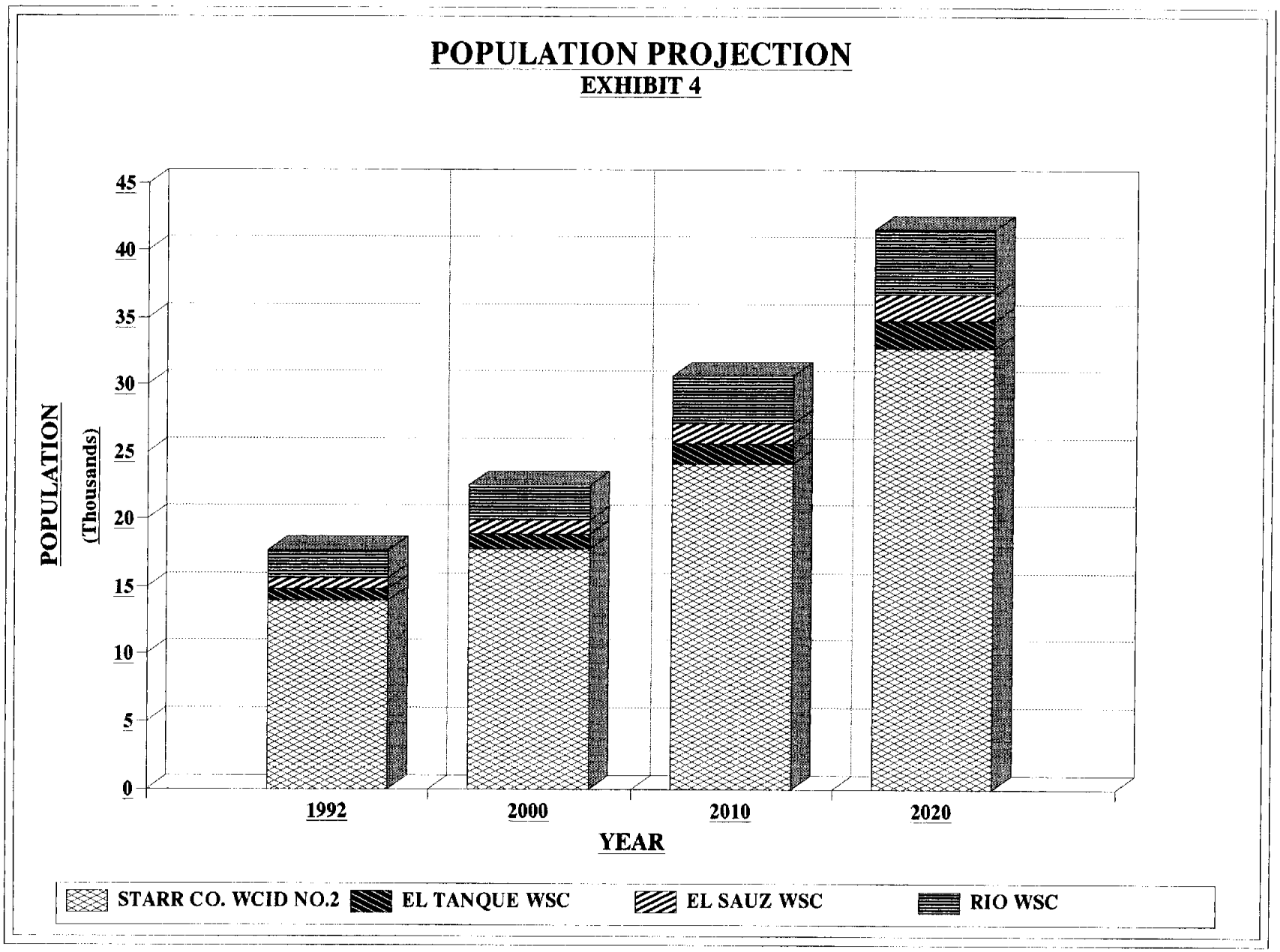


SURFACE WATER DEVELOPMENT

EXHIBIT 3

POPULATION PROJECTION

EXHIBIT 4



WATER DEMAND

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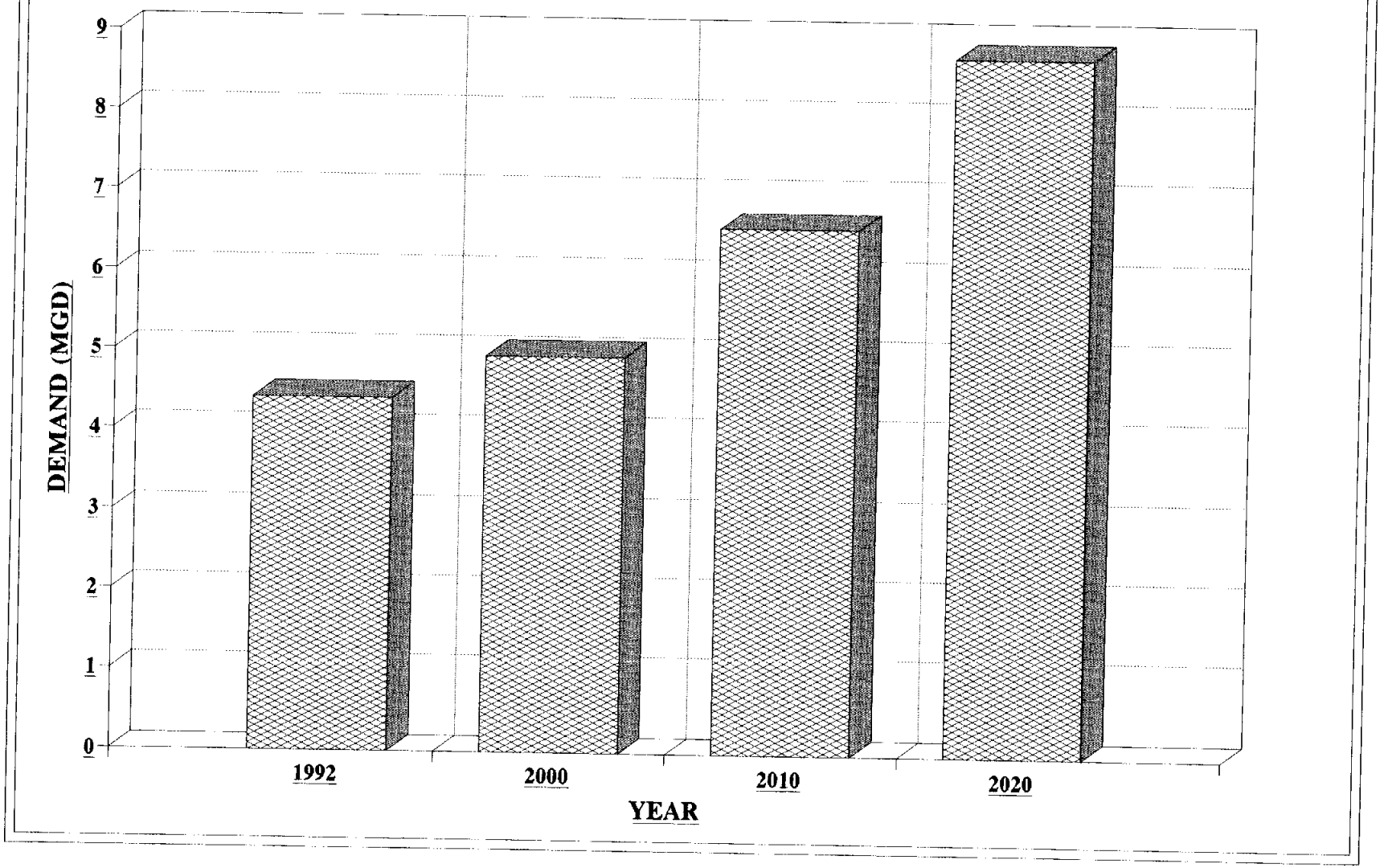

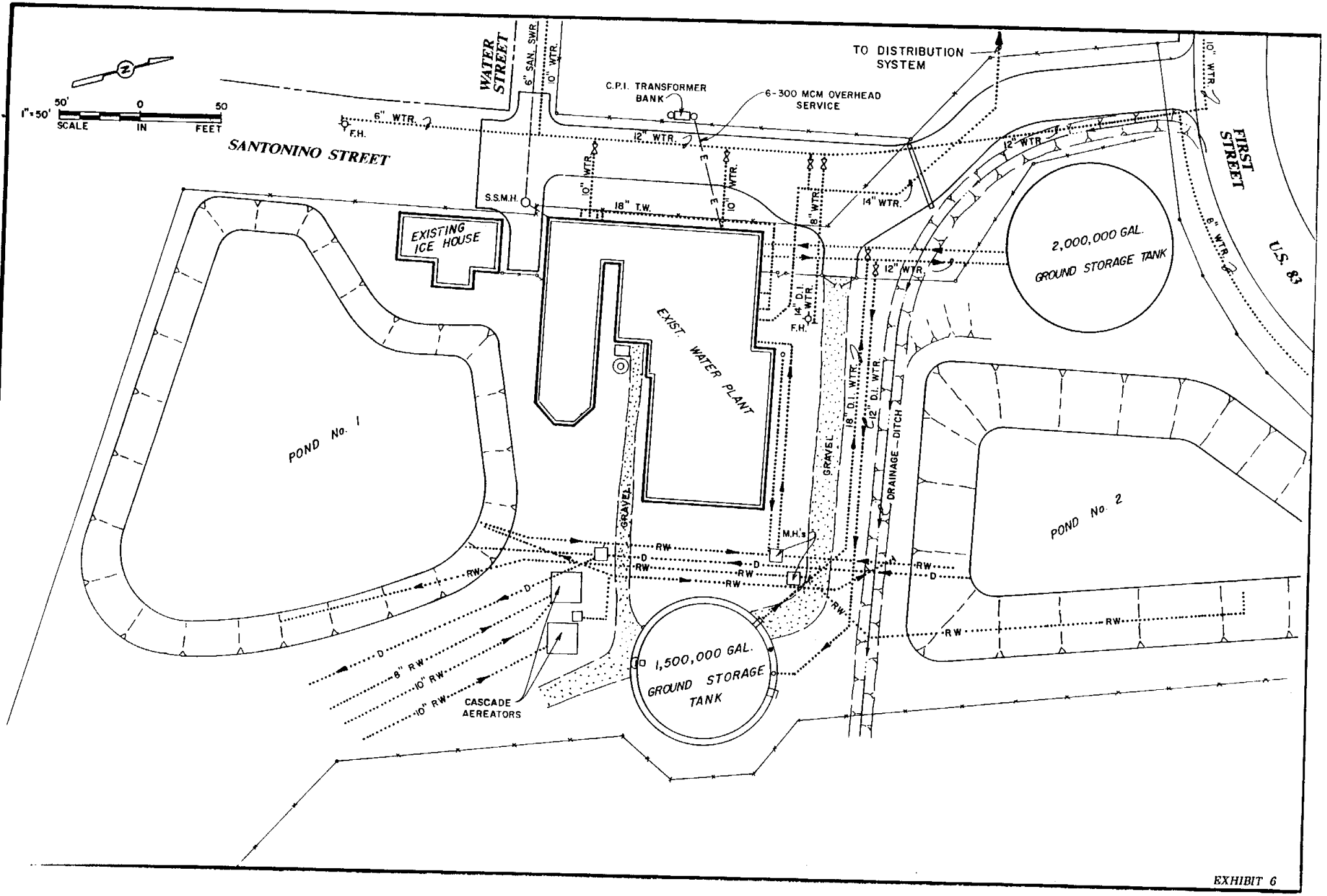
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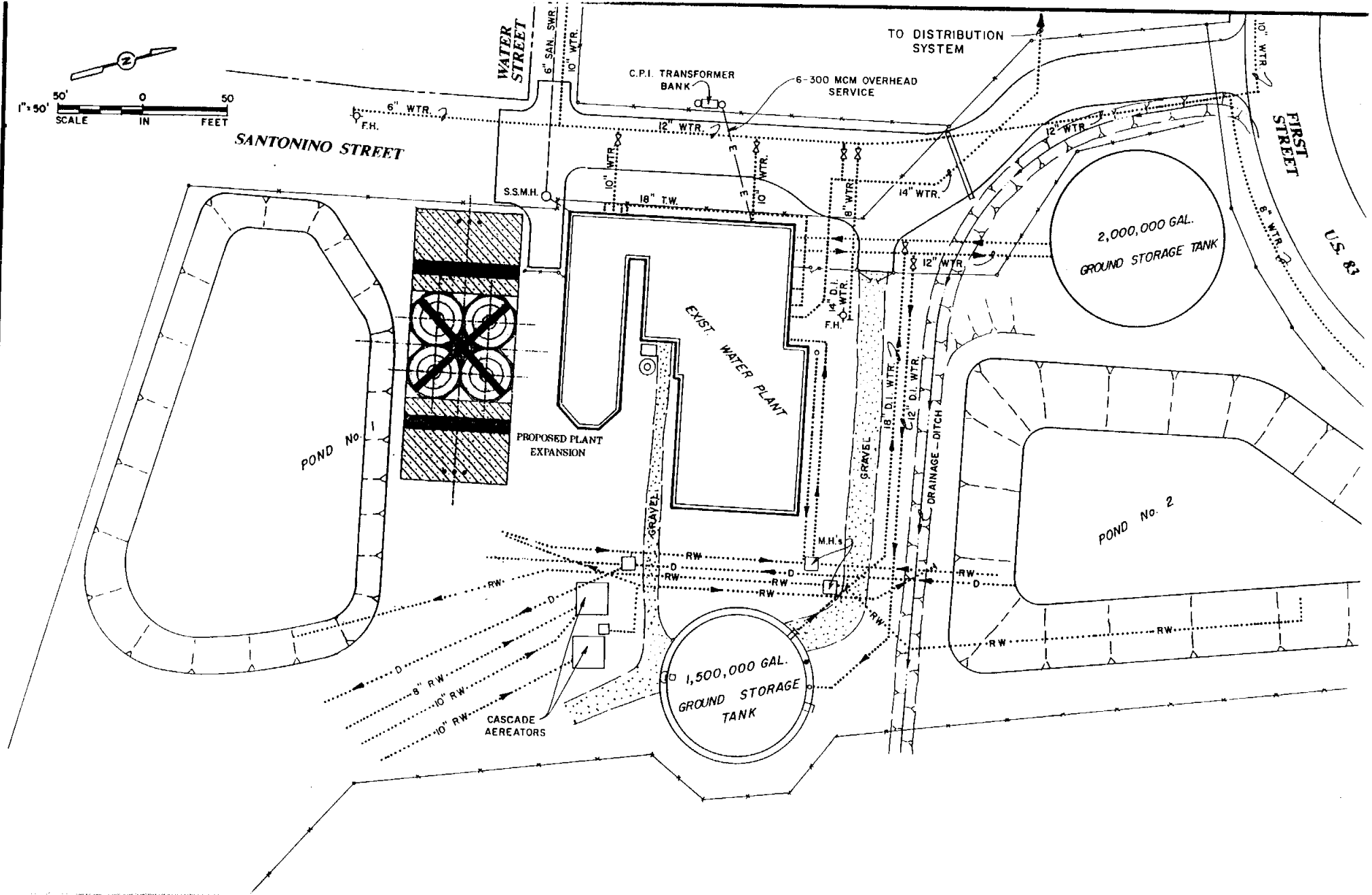
50' 0 50
SCALE IN FEET
WATER STREET
6" SAN. SWR.
10" WTR.
TO DISTRIBUTION SYSTEM
C.P.I. TRANSFORMER BANK
6-300 MCM OVERHEAD SERVICE
6" WTR.
F.H.
SANTONINO STREET
12" WTR.
FIRST STREET
U.S. 83
S.S.M.H.
18" T.W.
EXISTING ICE HOUSE
EXIST. WATER PLANT
2,000,000 GAL. GROUND STORAGE TANK
14" WTR.
8" WTR.
14" D.I. WTR.
POND No. 1
GRAVEL
8" D.I. WTR.
12" D.I. WTR.
DRAINAGE DITCH
POND No. 2
M.H.'s
RW
D
8" RW
10" RW
CASCADE AEREATORS
1,500,000 GAL. GROUND STORAGE TANK

EXHIBIT 6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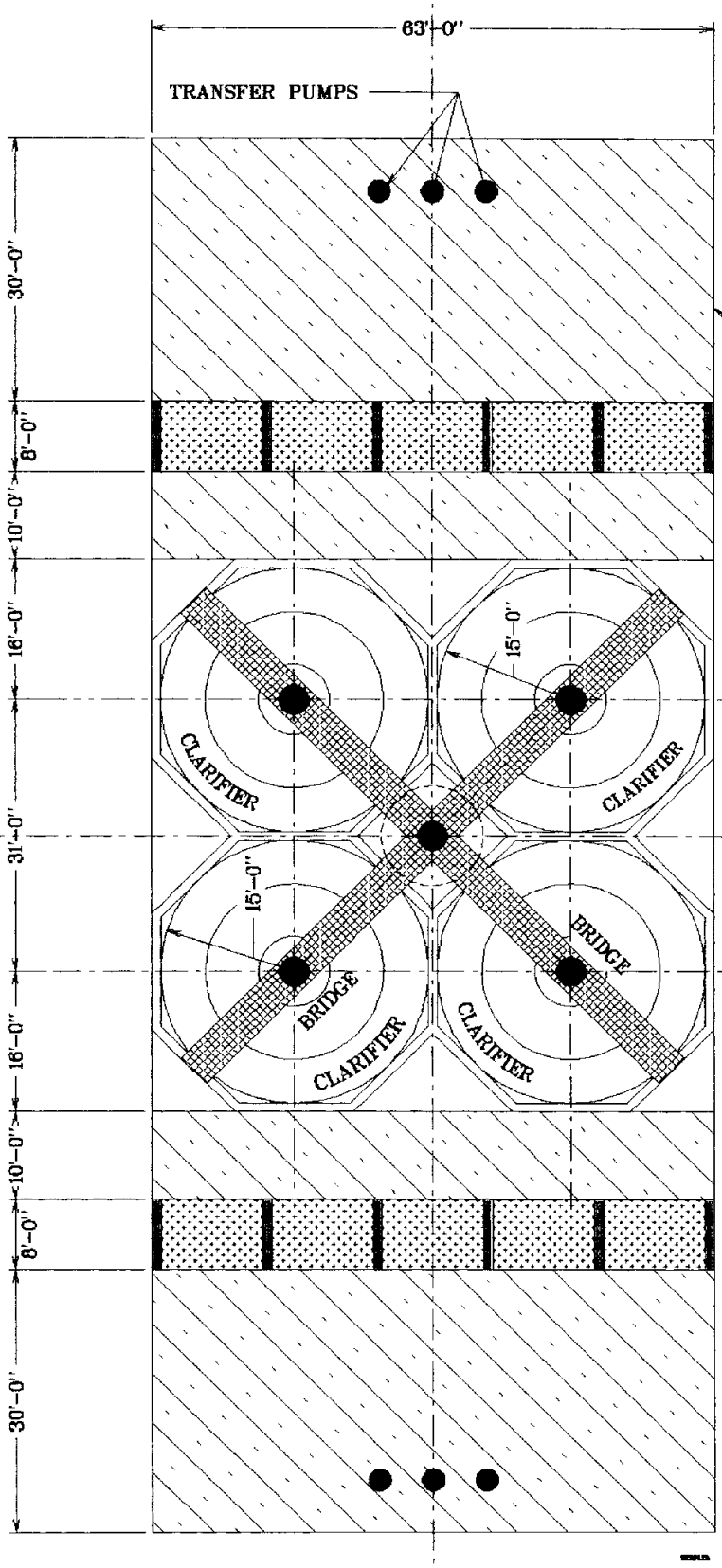
50' 0 50
SCALE IN FEET
SANTONINO STREET
WATER STREET
6" SAN. SWR.
10" WTR.
6" WTR.
F.H.
C.P.I. TRANSFORMER BANK
6-300 MCM OVERHEAD SERVICE
TO DISTRIBUTION SYSTEM
12" WTR.
S.S.M.H.
18" T.W.
10" WTR.
8" WTR.
14" WTR.
FIRST STREET
U.S. 83
2,000,000 GAL. GROUND STORAGE TANK
14" D.I. WTR.
EXIST. WATER PLANT
POND No. 1
PROPOSED PLANT EXPANSION
GRAVEL
18" D.I. WTR.
12" D.I. WTR.
DRAINAGE - DITCH
POND No. 2
M.H.'s
RW
D
8" RW
10" RW
CASCADE AEREATORS
1,500,000 GAL. GROUND STORAGE TANK

EXHIBIT 7



NOTE:

EACH MODULE HAS A CAPACITY OF 1.0 MGD

TOTAL CAPACITY = 4MGD

MODULAR WATER TREATMENT PLANT

EXHIBIT 8