EXECUTIVE SUMMARY

ES.1 Introduction

The State of Texas, recognizing a growing water need and the limited availability of fresh surface water and groundwater, funded analyses of three seawater desalination projects located along the Gulf Coast. They include the proposed Freeport Seawater Desalination Project, which would serve Brazoria County and the southeastern portion of Fort Bend County.

Extensive analyses, detailed in this report, conclude that the Freeport Seawater Desalination Project is an integral component to meeting future water demands in Brazoria and Fort Bend counties.

Following are major observations from the evaluation:

- Population in the area is projected to grow from 450,000 in 2000 to 1.2 million in 2060.
- Groundwater supplies in the service area are limited. Existing groundwater withdrawals in Brazoria County are approaching available yield. In addition, the Fort Bend Subsidence District has adopted rules requiring significant reductions in the use of groundwater.
- Existing surface water supplies will not meet all of the long-term water needs.
- As population continues to grow in the service area and groundwater use restrictions take effect, water deficits will occur. The total unmet municipal average day water demand in 2060 is more than 35 MGD. An additional 15 MGD is needed for seasonal peaking.
- Desalination technology is becoming more cost effective at the same time that the cost of treating surface water is becoming more complex and expensive due to more stringent drinking water rules. As these trends continue, desalination will become more cost competitive.
- There are significant public benefits to using desalinated water as a primary drinking water supply in the lower Brazos basin, including diversifying water resources in an area with limited traditional water supply alternatives, providing a high quality, drought-proof supply, mitigating growing subsidence problems due to groundwater withdrawals, and enhancing Brazos River flows in an area with increasing needs for surface water for manufacturing and irrigation uses.
- The public-private partnership between the Brazos River Authority (BRA) and Poseidon Resources provides added value to the State by leveraging private-sector capital for a public good, allowing flexibility to adapt to rapidly changing technology of the project, and shifting part of the performance risk to the private sector.
- Recognizing the public benefit of seawater desalination, both Florida and California have provided subsidies to enable seawater desalination projects to move forward. Also, the

federal government is considering bipartisan legislation that would provide subsidies for desalination facilities up to $0.62/1000 gallons to partially offset the cost of electrical energy required to operate such facilities.

The Freeport Seawater Desalination Project is the right project for Texas to pursue as a demonstration project. In addition to proactively meeting long-term needs, the project has several unique advantages:

- Experienced Partners – A public-private partnership between the BRA and Poseidon will leverage local and state resources with $76 million in private investments. Poseidon has substantial experience in large-scale desalination projects in Florida and California.

- Suitable Location – Co-locating the project at The Dow Freeport facilities brings numerous advantages. These include existing infrastructure, including on-site power and established site security; convenient access to seawater, river water supply, and concentrate discharge infrastructure; the possibility of amending existing permits, significantly reducing lead time; and reduced environmental issues related to brine disposal. Furthermore, because this project will use existing infrastructure, project implementation can occur rapidly.

- Basinwide Benefits – The project will provide a new, drought-proof source of water, resulting in a diversity of supply and enhanced reliability for the region. It also will provide efficiency and future benefits to the entire Brazos River basin by allowing limited surface water to be used in areas for which seawater is too distant to be a practical option. Finally, using high quality, reliable desalinated water for municipal supplies could make raw surface water available for irrigation and manufacturing needs. The Region H Water Plan predicts year 2050 water deficits of over 90,000 acre-feet/year for manufacturing and over 30,000 acre-feet/year for irrigation in Brazoria County. The plan also projects manufacturing and irrigation deficits as early as 2010.

ES.2 Desalination Options

In the public-private partnership proposed between the BRA and Poseidon, Poseidon will design, permit, build, operate, and finance the seawater desalination facility. The BRA will purchase water from Poseidon through a wholesale contract and will be responsible for conveying the water from the gate of the desalination facility to water utilities.

The proposed facility will be capable of running in either a full seawater or full river water mode to take advantage of the economics of the lower salinity source water in the Brazos River. This concept of "scalping" river water is a form of natural economic subsidy when river water is available to the Dow canal system, while still providing a drought-proof water supply. The proposed plant site location, being near the river's discharge to the Gulf, also makes scalping excess flow an attractive option.

A blending analysis indicates that the desalinated seawater is compatible with the existing groundwater and surface water supplies. The desalinated seawater will be conditioned as it leaves the desalination facility such that the treated desalinated water is comparable with other piping systems.

ES.3 Desalination Recommendation

The most economical seawater desalination option is more costly than the alternative to seawater desalination in terms of net present value. For a demonstration desalination project to succeed, the unit cost for potable desalinated water to potential customers should not be significantly more than the available alternatives. The Freeport project will require some form of financial assistance to achieve this end.

The primary reason for this is two-fold. First, desalination treatment technology is currently still more expensive than conventional surface water treatment costs. Second, new transmission infrastructure would be required to deliver desalinated water because the proposed desalination solution is regional as opposed to local. However, desalination technology is becoming more cost effective at the same time that the cost of treating surface water is becoming more complex and expensive due to more stringent drinking water rules. As these trends continue, desalination will become more cost competitive. In addition, there are significant benefits to using desalinated water that should be taken into account. These include a more diversified water source, a high quality, drought-proof supply, and increased river flows.

We recommend that the BRA and Poseidon proceed with implementation of what is being termed ”Option 5.” This option offers several advantages over the other desalinated water options. Under this scenario, a 10 MGD demonstration facility is constructed to provide water to the Brazosport area beginning in 2010. Utilities in northern Brazoria and Fort Bend counties will use their surface and groundwater until 2025, when a pipeline will be built to convey desalinated seawater to these utilities and the seawater desalination facility is expanded to 50 MGD to meet their growing demands.

The State can implement this demonstration project without having to provide capital for long-term needs. The infrastructure for long-term needs would be constructed as the needs develop. Furthermore, the Brazosport Water Authority's (BWA) existing surface water treatment plant could serve as a "back-up" in the event unforeseen problems were encountered during initial operations of the desalination plant, an ideal situation for a demonstration project.

In addition, we recommend that the BRA and Poseidon proceed as soon as possible with piloting studies. Notwithstanding activities associated with a full-scale demonstration plant, the State can learn much from piloting the proposed treatment process. Piloting will establish the viability of the project to the local area, which is an important aspect to moving the project forward to the full-scale 10 MGD demonstration phase.

ES.4 Financial Considerations

The BWA currently charges its customers $1.58/1000 gallons. This fee covers the liquidation of the capital cost of the surface water plant, water distribution piping and appurtenant storage and pumping facilities, and operating costs. It is estimated that the cost of treated water from the BWA will increase to $1.62/1000 gallons by 2010 due to improvements to the surface water plant that may be required by surface water regulations. The BWA's operations costs are estimated at approximately $0.41/1000 gallons. For the demonstration desalination project to have no financial impact on the BWA, a subsidy would be required to hold the cost of water from the desalination project to approximately $1.21/1000 gallons. Included in this cost would be the charge for desalinated water from the plant, liquidation of the capital cost of the pipeline from the desalination plant to Lake Jackson, pumping, storage, and the cost of compensating the BWA and its customer cities for stranded investment. The remaining $0.41/1000 gallons would be required by the BWA to liquidate the capital costs of the existing water distribution piping and appurtenant storage and pumping and for operation and maintenance costs.

At a unit cost of $1.21/1000 gallons and an estimated water delivery quantity of 9.2 MGD, the annual cost to the BWA cannot exceed $4,063,200. The annual charges for the seawater desalination project would be $12,025,300. In order to proceed, the demonstration project will need an annual operating subsidy of $7,962,100, or about $2.37/1000 gallons. The subsidy would be required as long as the cost of desalinated water is more than that for non-desalinated alternatives. The need for and the amount of a subsidy should be evaluated biennially. As desalination technology improves, the unit cost of desalinated water should decrease.

The benefits of seawater desalination have warranted operating subsidies in other states. For the 25 MGD facility at Tampa Bay, the State of Florida set aside an amount equal to 90 percent of capital costs, up to a maximum amount of $85 million. For the projected $2.08/1000 gallons cost of desalinated water, an initial subsidy of $0.50 to $0.60/1000 gallons was proposed to yield a net price of $1.50/1000 gallons for wholesale desalinated water. California has entered into agreements for annual subsidies of up to $250/acre-foot. The federal government is considering bipartisan legislation to provide subsidies up to $0.62/1000 gallons to partially offset power costs required to operate desalination facilities. These subsidies are being considered because of the benefits that the general public enjoys from the use of desalinated water.

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Section 1
Introduction

"It is not a matter of whether saltwater will one day be used as an abundant source of public use, but of when. As a people, we must have the courage to look into the future and invest today in a better tomorrow. There is no greater source of untapped water than the ocean water which Texas can easily access."

Governor Rick Perry put this vision into action in April 2002 by directing the Texas Water Development Board (TWDB) to develop a recommendation for a demonstration seawater desalination project. TWDB solicited Statements of Interest and then ranked proposals based on certain screening criteria. In order of importance, the criteria are:

- need/potential benefit;
- demonstration value of the proposed project;
- siting advantages/benefits;
- State/regional/local support for the project; and
- project cost.

After an intense process of reviewing proposals, TWDB awarded $500,000 planning grants to three projects, all located on the Gulf of Mexico, for in-depth study. They are:

- Freeport Seawater Desalination Project, presented jointly by the Brazos River Authority and Poseidon Resources, Inc.;
- Brownsville Demonstration Seawater Desalination Project, presented by the Brownsville Public Utilities Board and the Port of Brownsville; and
- Corpus Christi Demonstration Seawater Desalination Project, presented by the City of Corpus Christi.

In its December 2002 *Report of Recommendations* to Gov. Perry, TWDB noted that "of the three selected projects, the Freeport project appears to be the most feasible at this time on which to begin permitting and design activities. . . . Additionally, of the three projects, the Freeport project appears to be the more developmentally advanced project and, therefore, potentially closer to implementation."

1.1 About the Freeport Project

The Freeport Seawater Desalination Project is proposed as a public-private partnership between the Brazos River Authority (BRA) and Poseidon Resources.

The BRA, created by the Texas Legislature in 1929, was the first state agency in the United States established specifically for the purpose of developing and managing the water resources of an entire river basin. Today, the BRA's staff of more than 280 develop and distribute water supplies, provide water and wastewater treatment, monitor water quality, and pursue water conservation through public education programs. The BRA provides water supply and services to a 42,000 square mile region that stretches from the Texas-New Mexico border west of Lubbock to the Gulf of Mexico at Freeport.

Poseidon Resources is a private company that develops and invests in water projects throughout North America. Poseidon's innovative approach to project development, financing, asset management, and community outreach makes the company a leader in the field of water resources development. Poseidon Resources is a leading proponent of water and wastewater infrastructure projects using public-private partnerships, including the nation's largest seawater desalination project in Tampa Bay, Florida, as well as two large-scale desalination projects in Carlsbad and Huntington Beach, California. In the last 10 years alone, Poseidon's management team has structured, arranged, invested in, and completed more than $2.8 billion in financing for major public and private sector projects.

Poseidon Resources has partnered with the BRA to evaluate the feasibility of a regional desalination plant in the Freeport, Texas area. The proposed desalination project will be located within the existing Dow Chemical Company complex with convenient access to existing power supplies and other infrastructure. In this partnership, Poseidon Resources will be responsible for funding development of the plant and for permitting, designing, building, and operating the facility. The BRA will be responsible for purchasing potable water under a long-term supply contract and serve as a wholesale water provider.

The project will serve customers within an area encompassed by the Route 288 Corridor in Brazoria County, and northeast Fort Bend County, an area that is rapidly growing as the greater Houston area moves south. As growth continues, water resources will become scarce as groundwater use is being curtailed and there is limited availability of surface water rights.

1.2 Scope of Work

The BRA has contracted with CDM, a national engineering consulting firm with offices throughout Texas, to evaluate the feasibility of developing the Freeport desalination plant to provide the planning area with an alternative source of potable water.

The scope of work carried out in this project included:

- Projecting population growth and future water demands in the study area;
- Evaluating available water supplies, both groundwater and surface water, in the project area;
- Quantifying water deficits by water user group;
- Identifying potential customers for the project;

- Assessing infrastructure and conveyance requirements for transporting desalinated seawater to end users; and

- Developing and comparing costs and benefits of desalination to other water supply options.

Throughout the study, stakeholders played important roles in providing information and feedback. Communities, policy makers, and water suppliers throughout the project area have expressed support for the project as a crucial element to long-range water planning. Appendix A includes resolutions and letters of support for the project.

This report presents the results of the data analyses and evaluations. It also includes recommendations for turning project plans into an economically viable reality.

1.3 Public Participation & Outreach

Throughout the study, stakeholders played important roles in providing information and feedback that helped ensure accurate analyses and sound recommendations. In addition to one-on-one contacts and discussions with water suppliers and water users, the study team held a series of public meetings at regular intervals to keep communities informed on the progress of the project and results of the analyses. Senior officials and technical staff from the BRA, Poseidon, and CDM attended each meeting. Invitations to the meetings were mailed to names on an extensive database compiled by the BRA. In addition, press advisories were sent to all media in the study area in advance of the meetings.

Initial "kick-off" meetings were held November 18, 2003, in Lake Jackson and in Pearland. Those meetings presented general information about the project, reviewed on-going development activities including the reverse osmosis (RO) desalination technology, detailed methods being used to determine the service area for the proposed project, and summarized the project scope and schedule.

Progress meetings were held March 1, 2004, in Lake Jackson; July 7, 2004, in Angleton; and October 7, 2004, in Lake Jackson. The March meeting focused on population and water demand projections, current regional water production capacities, and water quality issues. The July meeting featured presentations on specific water needs by community, options for meeting needs, and the costs of providing water. The October meeting, held after the Draft Report was submitted to the TWDB on August 31, 2004, focused on the preliminary results and recommendations of the study.

All meetings provided opportunity for public questions and comments and for individual discussion with members of the study team. Summaries of points raised at each meeting are provided in Appendix B.

The BRA designed a special section on its website to post and update information about the project: www.brazos.org/Freeport_Desal/FreeportDesal.asp. The study team also developed a four-page brochure that concisely answered common questions about the project. This brochure was distributed at all meetings and made available on the website. A copy of the brochure is provided in Appendix B.

1.4 Organization of This Report

The remainder of this report is organized as follows:

Section 2: **Population and Water Demand Projections.** This section describes how the population for the service area was determined using TWDB data, Houston-Galveston Area Council data, and population data from individual cities. Section 2 also presents per capita water use and average day and maximum day water demands by utility.

Section 3: **Inventory of Existing Water Supplies.** Section 3 documents the available groundwater capacity and the impact of new Fort Bend Subsidence District rules on future capacity. Existing surface water capacity and surface water contracts are presented. Finally, the impact of existing and proposed drinking water quality rules on water availability is discussed.

Section 4: **Water Deficits.** Section 4 presents water deficits by water utility based upon projected water use and available water supply.

Section 5: **Basis of Water Pricing and Economic Analysis.** This section presents basic cost information that is used in subsequent net present value analysis and unit cost models.

Section 6: **Plan for Providing Desalinated Water.** Section 6 presents five desalinated seawater options for the service area. Included in this section is the amount of desalinated seawater that could be used under each option and the infrastructure required to deliver desalinated seawater to the end users.

Section 7: **Alternatives to Desalination.** Many of the utilities in the service area use groundwater. As new groundwater rules force these utilities to seek other water supply options, it is important to establish what these utilities will be paying for their new water supplies to allow a fair comparison with the desalinated water supply options.

Section 8: **Economic Comparison of Water Supply Alternatives.** Section 8 presents net present value information and unit costs for each desalinated water option and the non-desalinated water alternative.

Section 9: **Recommendations and Implementation Plan.** This section details the recommendations on implementing the most feasible water supply option, the steps required to fully implement the recommended option, and discussion of financial assistance that may be required to allow the desalination demonstration facility to proceed.

Section 2
Population and Water Demand Projections

To address the future water needs of the study area, the population growth and expected changes in water use rates must be determined. This section describes the methodology used in developing projected water demands for the users. As part of this evaluation, average day and maximum day demands were estimated to ensure communities were provided sufficient infrastructure to meet demands throughout the year.

2.1 Population Projections

A key task in this study was to determine and geographically distribute population and demand projections within the study area at 10-year increments throughout a 50-year planning horizon (from 2010 throughout year 2060). The study used projections approved by the Texas Water Development Board (TWDB) as a basis for the population projections. This section details the data processing steps used to spatially distribute those projections across the study area shown in Figure 2-1.

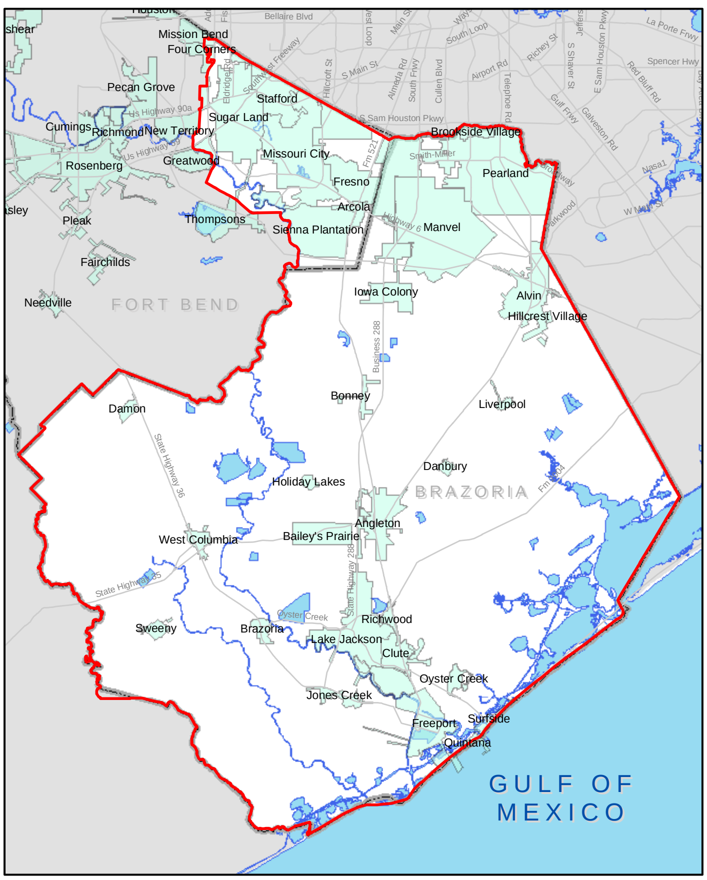


Figure 2-1
Area Used in Projecting Populations

This analysis used TWDB data as the primary source for population projections, but as TWDB groups rural areas into one designation for each county, additional steps were required to distribute these population projections into discreet areas and water user groups. To achieve this distribution, Houston-Galveston Area Council (HGAC) data were used to geographically distribute this rural population into Regional Analysis Zones (RAZ) throughout the county. Additionally, efforts were made to incorporate projections developed by individual cities where such data were available.

2.1.1 TWDB Population Projections

In 2003, the TWDB published approved population and water demand projections for the State of Texas. The projections are done on a county basis, with each county divided into urban and rural portions. The urban population is further subdivided into water user groups[1] (WUGs), and projections for each individual WUG determined. The remaining county population (the rural portion or what is called "County-Other") was calculated as the difference between the total county population and the total urban population. A few exceptions to the WUG designation published in the Region H Water Plan were taken into account in this study. These exceptions are summarized as follows:

- Palmer Plantation MUD 2 and First Colony MUD 9 were originally distinct WUGs. However, because these MUDs are located within the City of Missouri City, projections for these two MUDs have been included in the projections for Missouri City.

- Brazoria County MUD 6 narrowly missed the threshold for being defined as a WUG for 2000. However, MUD 6 met the criteria sometime in 2001. Therefore, with TWDB concurrence, MUD 6 was designated as a WUG for this study. The MUD 6 growth rate was taken as the average of Brazoria County MUDs 1 through 5 with a maximum population as indicated on its MUD application to the Texas Commission on Environmental Quality (TCEQ).

- Brazoria County MUDs 1 through 6 all are to be annexed by the City of Pearland by the year 2012. These annexations were accounted for at the appropriate planning stage.

- Sienna Plantation MUD 2 is to be annexed by the City of Missouri City, most likely within the next six years. This annexation was accounted for at the year 2010 planning stage.

Table 2-1 shows the WUGs within the study area by county and their 2000 population estimates.

[1] A city that serves 500 or more people per year or a district that produced an annual average of 250,000 gallons per day of water for municipal use in 2000 (approximately 280 acre-ft/year).

TABLE 2-1 TWDB WATER USER GROUPS IN THE STUDY AREA

BRAZORIA COUNTY	
WATER USER GROUP	2000 Pop.
Alvin	21,413
Angleton	18,130
Bailey's Prairie	694
Orbit Systems Inc	3,746
Brazoria	2,787
Brazoria Co MUD 1	4,110
Brazoria Co MUD 2	2,838
Brazoria Co MUD 3	2,727
Brazoria Co MUD 4	3,438
Brazoria Co MUD 5	4,743
Brazoria Co MUD 6	2,241
Brookside Village	1,960
Clute	10,424
Danbury	1,611
Freeport	12,708
Hillcrest Village	722
Holiday Lakes	1,095
Iowa Colony	804
Jones Creek	2,130
Lake Jackson	26,386
Manvel	3,046
Oyster Creek	1,192
Pearland	35,696
Richwood	3,012
Southwest Utilities	597
Surfside	763
Sweeny	3,624
Varner Creek Utility Dist	1,850
West Columbia	4,255
County-Other	65,266

FORT BEND COUNTY	
WATER USER GROUP	2000 Pop.
Arcola	1,048
Orbit Systems Inc	144
Fort Bend Co MUD 2	8,308
Fort Bend Co MUD 23	2,961
Houston	33,360
Kingsbridge MUD	4,547
Meadows Place	4,912
Missouri City	55,381
Sienna Plantation MUD 2	2,763
Stafford	15,371
Sugar Land	63,328
County-Other	44,339

2.1.2 Houston Galveston Area Council Projections

In this study, population projections were necessary to determine the location and quantity of future water demands for the purposes of locating and sizing water delivery pipelines. Therefore, the geographic distribution of the projections was just as important as the projections themselves. Spatial distribution for the WUGs was accomplished using the TWDB projection data alone; however, the County-Other portion of the projections is spread across the entire county. In Fort Bend[2] and Brazoria counties, County-Other currently makes up 13 percent and 27 percent of the population, respectively. In 2060, County-Other is projected to make up 33 percent and 20 percent of Fort Bend and Brazoria counties, respectively. In order to appropriately locate the water demands in the study area, geospatially distributed population projections published by the Houston-Galveston Area Council (HGAC) were used to more definitively target the locations associated with County-Other.

[2] Percent of Fort Bend County total. This study does not include all of Fort Bend County.

HGAC released its *2025 Regional Growth Forecast* in May 2003. This publication contains population projections at multiple planning stages through 2025. The projections encompass the eight-county Houston Consolidated Metropolitan Statistical Area, which includes Brazoria and Fort Bend counties. As part of its forecast, HGAC projected population in groups of census blocks, commonly termed Regional Analysis Zones (RAZs). Brazoria County contains 14 RAZs; Fort Bend County has 15. Figure 2-2 shows the RAZs in Brazoria and Fort Bendcounties. The HGAC population projections are provided in Appendix C.

Figure 2-2
Regional Analysis Zones in Brazoria and Fort Bend Counties

The HGAC developed projections under both moderate and aggressive growth scenarios. Table 2-2 compares HGAC and TWDB projections for Fort Bend and Brazoria counties. Aggressive growth scenarios were more consistent with TWDB projections and, consequently, were used in this study.

TABLE 2-2 HOUSTON-GALVESTON AREA COUNCIL POPULATION PROJECTIONS

		2000	2010	2020	2030
BRAZORIA COUNTY	TWDB	241,767	285,850	331,731	375,664
	HGAC-Moderate	241,769	277,254	303,548	338,000
	HGAC-Aggressive	241,769	279,049	316,209	358,000
FORT BEND COUNTY	TWDB	354,452	490,072	630,624	802,486
	HGAC-Moderate	354,459	507,259	629,380	763,000
	HGAC-Aggressive	354,459	507,259	661,414	824,000

Using HGAC projections required two data processing steps. First, the planning horizons were adjusted to match those of the TWDB. HGAC projections were provided at the following years: 2000 (Estimate), 2007, 2015, 2022, and 2025, while TWDB projections were provided at 10-year increments from 2010 to 2060. Second, HGAC projections were extrapolated to the year 2060 to match the TWDB planning horizon. Each of these steps is described in more detail below.

HGAC projections at 2010, 2020, and 2030 were determined by calculating the annual growth rate using projections before and after the target year. The calculated growth rate was then used to determine the population at the target year.

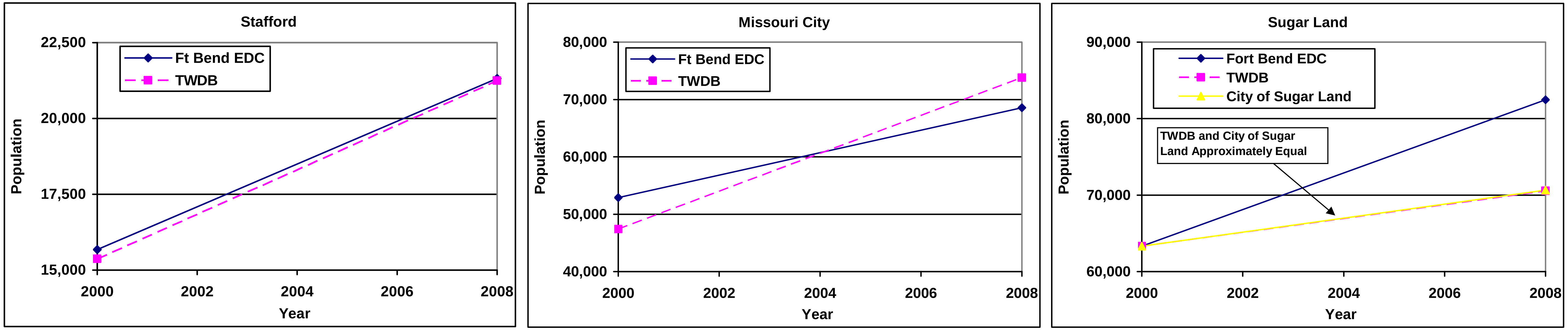
To extrapolate RAZ projections to 2060, TWDB annual growth rates for the years 2030-2060 were used to estimate a RAZ growth rate beyond 2030. This was done by determining the area-weighted average annual growth rate for each WUG within each RAZ. The resulting average annual growth rate was then used to calculate a total RAZ population for each planning horizon.

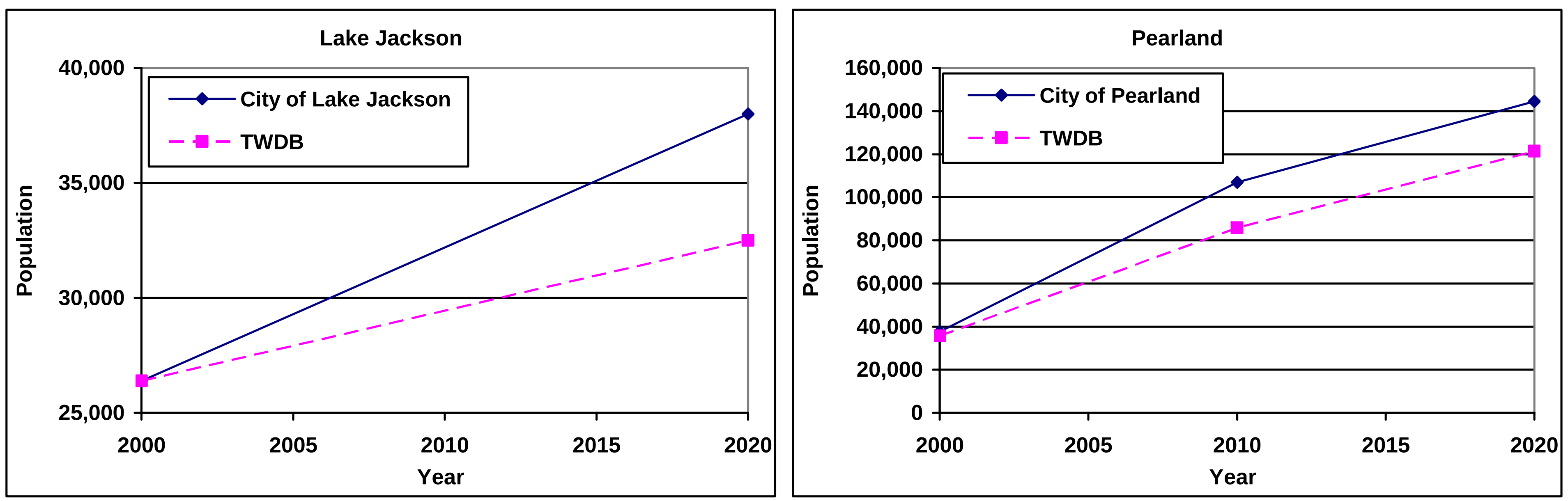
2.1.3 City Population Projections

The cities of Pearland, Lake Jackson, and Sugar Land have projected their respective populations through master planning studies. These populations are provided in Appendix C.

City of Pearland projections were performed through 2020 and include areas not presently within the city boundaries, such as planned annexations. The City of Lake Jackson has provided a single projected population for the year 2020, which includes potential expansions. The City of Sugar Land has provided a single projected population for the year 2008, which includes only the city limits. In addition, the Greater Fort Bend Economic Development Council (EDC) has provided population projections for the year 2008 for the cities of Missouri City, Stafford, and Sugar Land. These additional projections were compared to TWDB projections for their respective WUGs, as shown in Figure 2-3. As indicated in Figure 2-3, TWDB, individual city, and/or Greater Fort Bend EDC projections for Sugar Land, Missouri City, and Stafford are generally consistent. However, significant differences are observed between TWDB projections and those from the cities of Pearland and Lake Jackson.

Local knowledge of potential growth is key to developing accurate population projections. Accordingly, population from County-Other was re-allocated and added to TWDB projections for Pearland and Lake Jackson to match the projections provided by those cities. Details of this re-allocation are discussed in Section 2.2.2.





TWDB = Texas Water Development Board
EDC = Economic Development Council

Figure 2-3[3]
Comparison of TWDB and Alternative Projections

[3] Both City of Pearland projections include planned annexations of Brazoria County MUDs 1 through 6.

2.2 Geographically Locating Population

2.2.1 Water User Groups

This study uses the population projections to determine the location and quantity of future water demands for the purposes of locating and sizing water delivery pipelines. This also requires determining the boundaries associated with the projections for each planning horizon. The existing boundaries of most WUGs were defined by city limits, extraterritorial jurisdiction (ETJ) limits, and utility district boundaries. For future boundaries, the following cities were contacted to determine if any annexations and/or expansions were planned:

- Freeport
- Lake Jackson
- Angleton
- Oyster Creek
- Jones Creek
- Manvel
- Pearland
- Alvin
- Sugar Land
- Missouri City
- West Columbia

Where information was available, future annexations and/or expansions were included when defining the boundaries of each WUG. Table 2-3 summarizes the future annexations and/or expansions incorporated into the projections used in this study. The year 2000 and year 2060 WUG boundaries are shown in Figures 2-4 and 2-5, respectively.

TABLE 2-3 FUTURE ANNEXATIONS AND EXPANSIONS

City	Annexation or Expansion	Approximate Year	Source
Pearland	Brazoria County MUD 1 Brazoria County MUD 2 Brazoria County MUD 3 Brazoria County MUD 4 Brazoria County MUD 5 Brazoria County MUD 6	2006 2008 2009 2012 2005 2011	Pearland Planning Department
Missouri City	All Sienna Plantation MUDs Riverstone Area	2005 – 2013 Unknown	Missouri City Planning Department

2.2.2 County – Other

Once the RAZ population projections were adjusted to match the TWDB planning horizons, HGAC RAZs were used to better define the location of TWDB County-Other populations.

First, the boundaries associated with WUGs were intersected with the RAZ boundaries using ArcGIS software. This step split WUGs along RAZ boundaries. The WUG populations were then proportioned into each RAZ based upon area. This process is illustrated in Figure 2-6.

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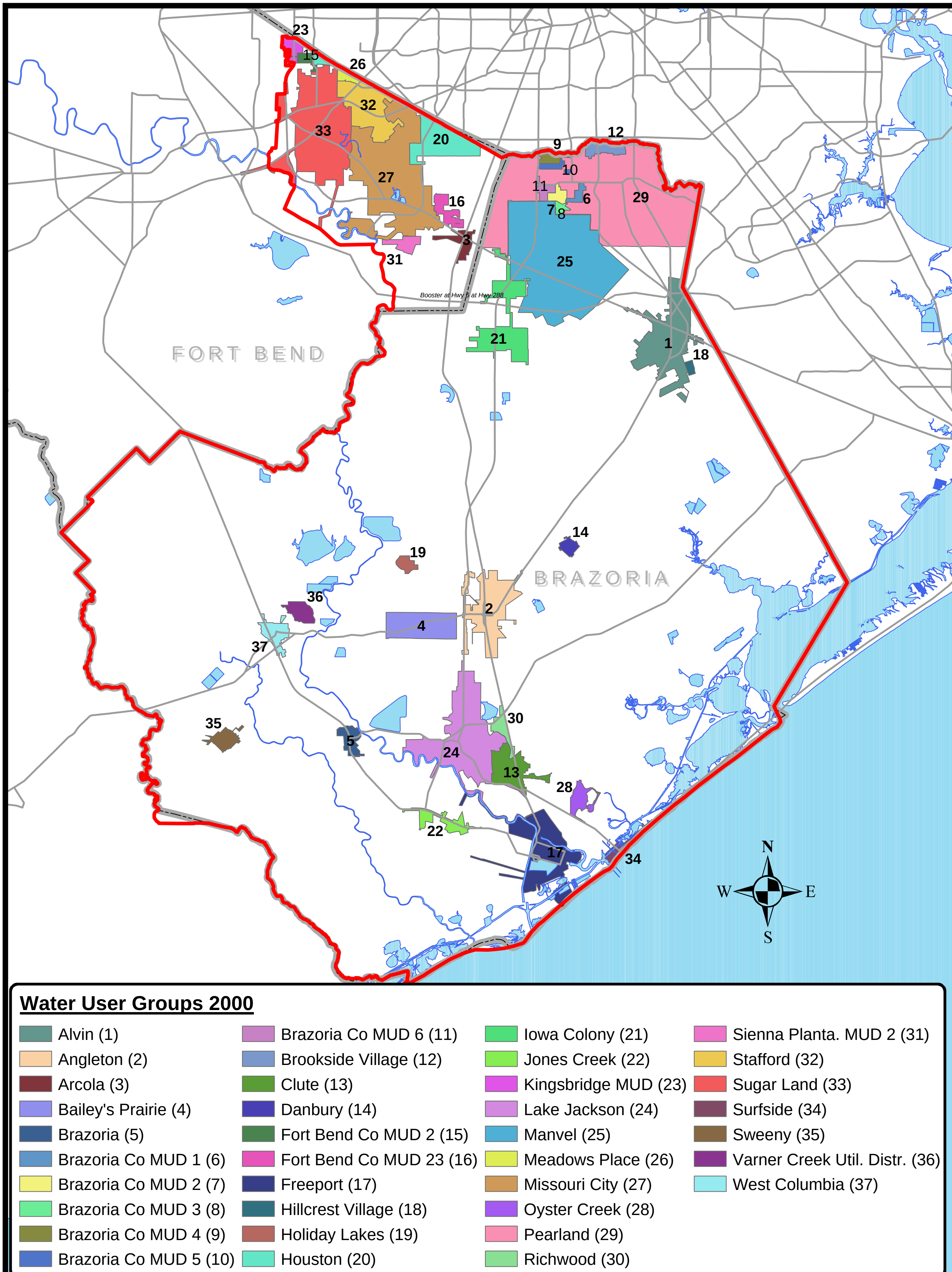

0 2.5 5 10 Miles

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

WATER USER GROUPS FOR THE YEAR 2000*

*Note: Does not include Southwest Utilities and Orbit Systems

FIGURE 2-4

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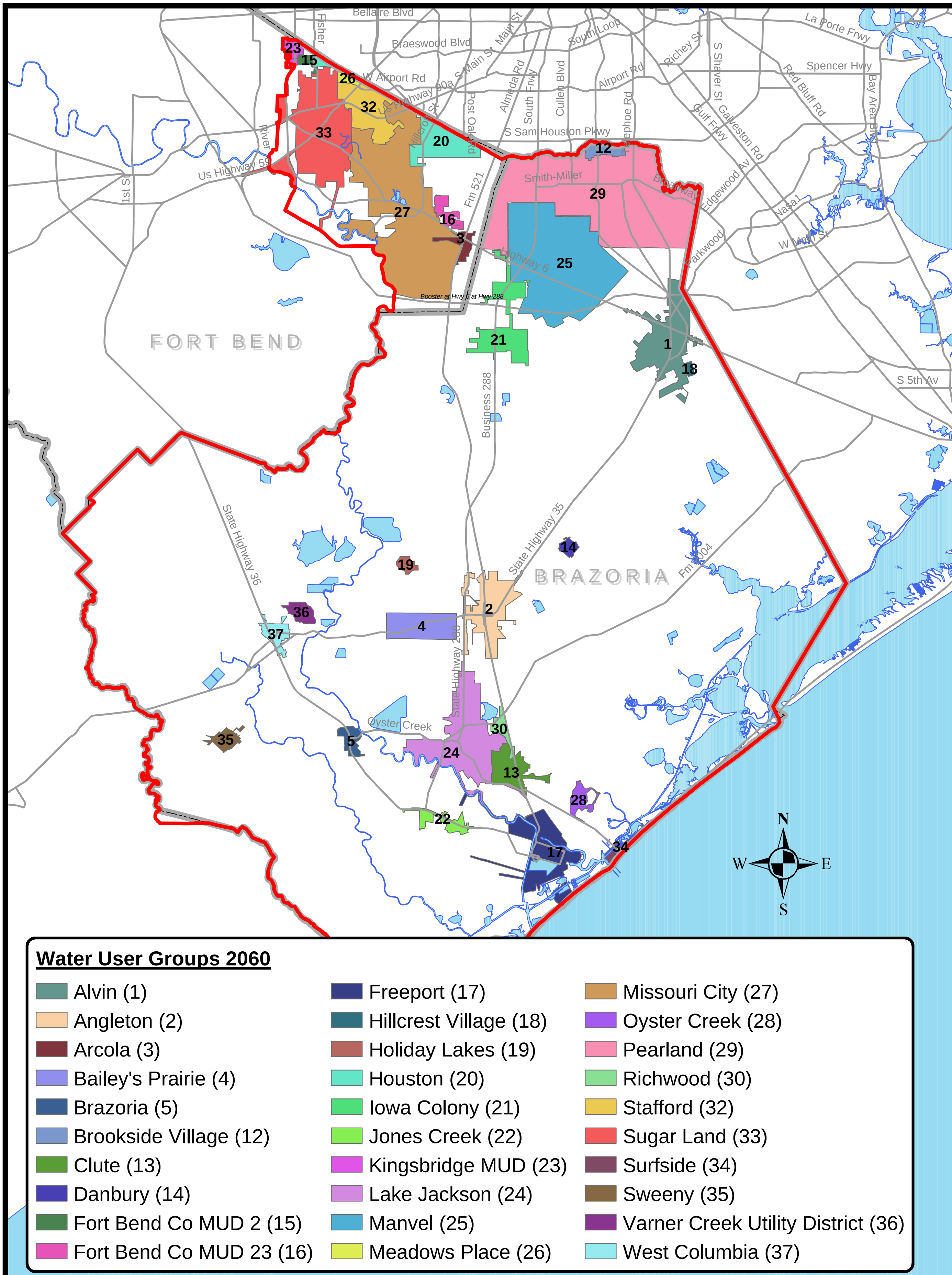


0 2.5 5 10 Miles

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

WATER USER GROUPS FOR THE YEAR 2060*

*Note: Does not include Southwest Utilities and Orbit Systems

FIGURE 2-5

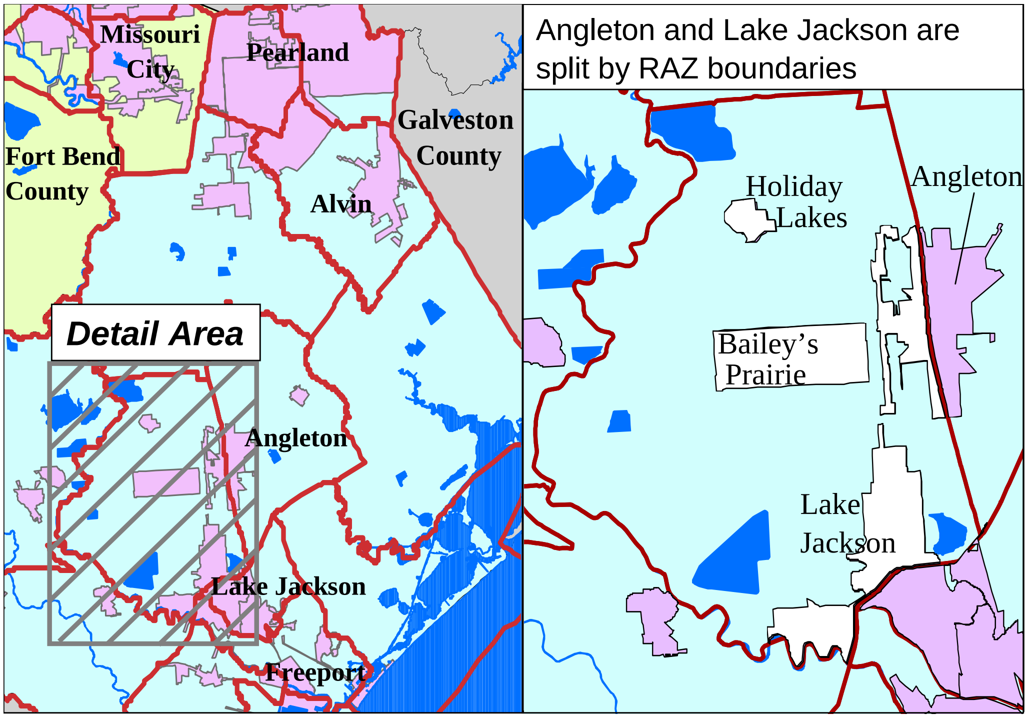


Figure 2-6
Splitting Water User Groups Within Regional Analysis Zones

For each RAZ, the total population within the WUGs was determined. The example shown above totals the population contributed by Lake Jackson, Angleton, Bailey's Prairie, and Holiday Lakes within the RAZ. This population represents the portion in the TWDB's WUGs. The remaining RAZ population is therefore the County-Other portion of the population within the RAZ. This process is illustrated in Figure 2-7.

In some cases, the total WUG population within a RAZ as indicated by the TWDB was greater than the total for that RAZ, resulting in a population deficit for the RAZ. For each planning horizon, this population deficit was proportioned across all RAZs based upon area.

Finally, population from County-Other was re-allocated and added to TWDB projections for Pearland and Lake Jackson to match the projections provided by those cities. The population was withdrawn from each County-Other RAZ, based upon the original proportion determined to be in the RAZ using the method described above. The advantages of this step are as follows:

- The Brazoria County totals will match those of the HGAC projections for each planning horizon. For Fort Bend County, totals for the RAZs within the study area will match HGAC projections at each planning horizon.

- The study will match the city projections provided by Pearland and Lake Jackson while simplifying overall data processing.

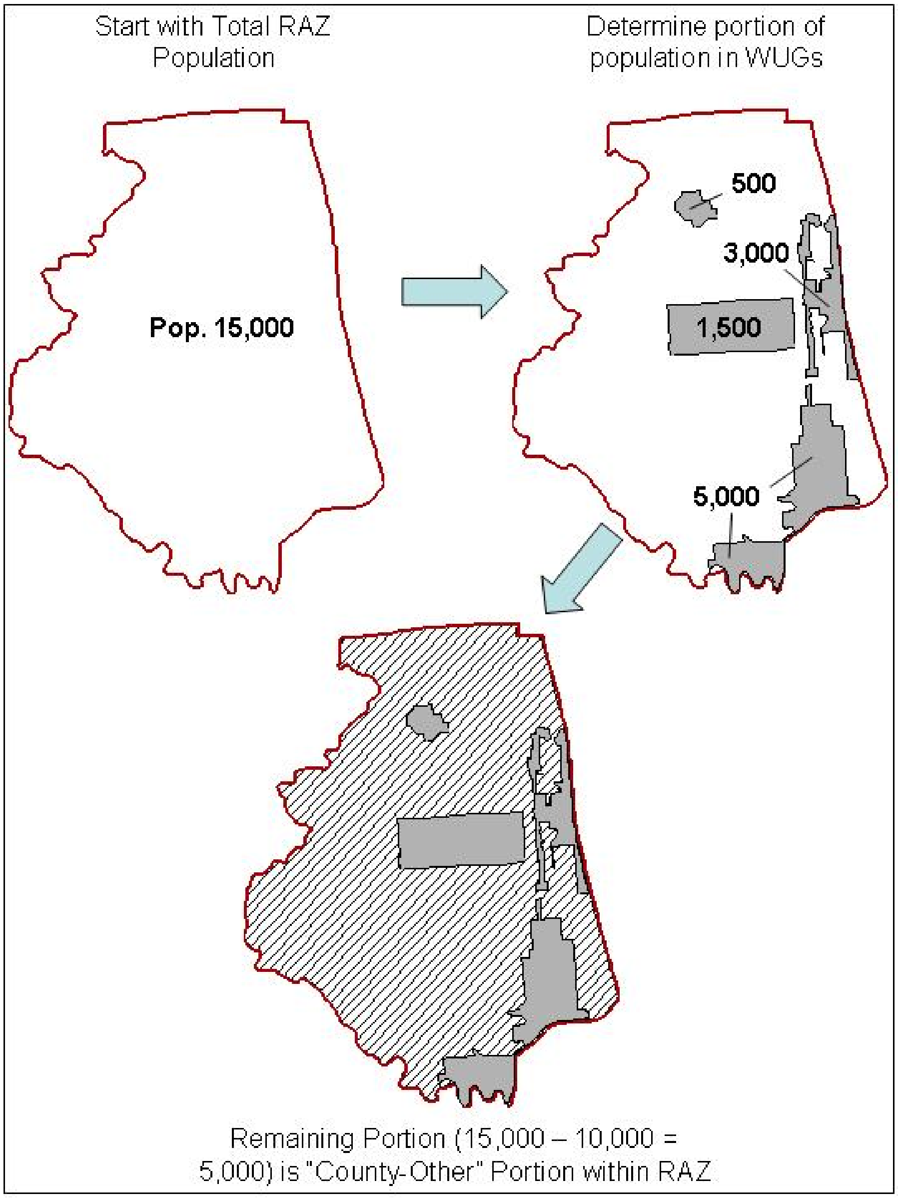
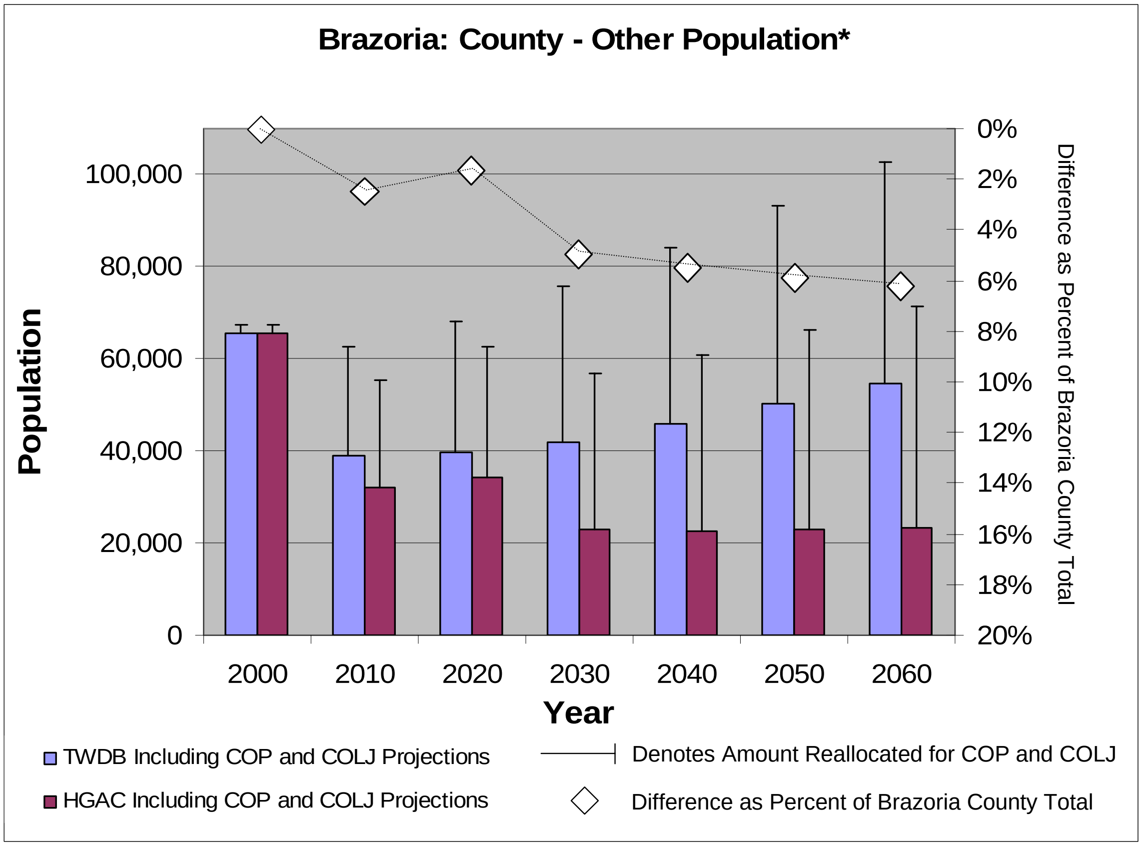


Figure 2-7
Determination of County – Other Within RAZ

- As the study area grows, many of the cities are likely to annex land, which will have the effect of increasing the portion of urban population. Shifting some rural population into urban areas in northern and southern Brazoria County (Lake Jackson and Pearland) approximates this process of urbanization in a regionally unbiased manner. Consequently, water delivery facilities, identified as part of this study, will be better suited for likely urbanization.

This methodology resulted in population projections for County-Other, City of Pearland, and City of Lake Jackson that differ from those published by the TWDB. Figure 2-8 compares the differing projections and shows the difference between the County-Other projections as a percentage of the total county population.



*Note: TWDB County-Other population also includes the WUGs Southwest Utilities and Orbit Systems.
COP = City of Pearland COLJ = City of Lake Jackson

Figure 2-8
Comparison of "County-Other" Populations

2.3 Population Projections and Maps

The population projections for WUGs in the study area are listed in Table 2-4. For comparison purposes, the projections determined by entities other than the TWDB are shown in bold and italics. These are the projections used in this study. Figures 2-9 and 2-10 show the spatial distribution of population for the years 2000 and 2060, respectively.

2.4 Water Demand Projections

TWDB approved in February 2004 a set of average day per capita municipal water demand projections to be used for the 2006 regional water plan. These projections do not include the planned annexations in Pearland and Missouri City (see Section 2.1.1). The water use projections were adjusted to accommodate for these planned annexations by determining the population-weighted average water use. The final per capita average day municipal water demand projections used in this study are listed in Table 2-5, which also notes water demands associated with a planned annexation. Average day water demands by WUGs and County-Other RAZs are itemized in Table 2-6 and are shown in Figures 2-11 and 2-12 for the years 2000 and 2060, respectively.

The water demands were used to plan water delivery systems in subsequent tasks of this study. Fluctuations in water use must be considered when planning such systems; therefore, maximum day demand factors were determined based upon usage patterns reported in the TCEQ annual Compliance Evaluation Investigation. The proposed maximum day demand peaking factors for each WUG are listed in Table 2-7. Maximum day peaking factors could not be determined in some cases. For example, County-Other WUGs, Orbit Systems, and Southwest Utilities are not centralized water suppliers. Other reasons include situations where a significant portion of the WUG is served by private water wells or no water demand data were reported on the TCEQ Compliance Evaluation Investigation. In these cases, the average of the known maximum day factors were used and is indicated in bold for each of these WUGs.

TABLE 2-4 POPULATION PROJECTIONS

WATER USER GROUP	2000	2010	2020	2030	2040	2050	2060
BRAZORIA COUNTY			**(COP = City of Pearland)**				
Alvin	21,413	23,231	25,123	26,935	28,605	30,375	32,223
Angleton	18,130	18,951	19,805	20,623	21,377	22,176	23,010
Bailey's Prairie	694	744	795	844	889	938	988
Orbit Systems Inc	3,746	4,717	5,728	6,696	7,589	8,535	9,523
Brazoria	2,787	2,845	2,906	2,964	3,017	3,074	3,133
Brazoria County MUD 1	4,110	COP	COP	COP	COP	COP	COP
Brazoria County MUD 2	2,838	COP	COP	COP	COP	COP	COP
Brazoria County MUD 3	2,727	COP	COP	COP	COP	COP	COP
Brazoria County MUD 4	3,438	3,438	COP	COP	COP	COP	COP
Brazoria County MUD 5	4,743	COP	COP	COP	COP	COP	COP
Brazoria County MUD 6	2,241	4,009	COP	COP	COP	COP	COP
Brookside Village	1,960	2,282	2,618	2,939	3,235	3,549	3,877
Clute	10,424	11,217	12,043	12,834	13,563	14,335	15,141
Danbury	1,611	1,747	1,888	2,023	2,148	2,280	2,418
Freeport	12,708	15,794	19,006	22,082	24,917	27,922	31,059
Hillcrest Village	722	744	767	789	810	832	855
Holiday Lakes	1,095	1,141	1,189	1,235	1,278	1,323	1,370
Iowa Colony	804	911	1,022	1,129	1,227	1,331	1,440
Jones Creek	2,130	2,130	2,130	2,130	2,130	2,130	2,130
Lake Jackson – TWDB	26,386	29,383	32,502	35,488	38,241	41,159	44,205
Lake Jackson/City of Lake Jackson	***26,386***	***31,665***	***38,000***	***41,491***	***44,710***	***48,121***	***51,683***
Manvel	3,046	3,046	3,046	3,046	3,046	3,046	3,046
Oyster Creek	1,192	1,424	1,666	1,897	2,110	2,336	2,572
Pearland - TWDB	35,696	85,789	121,404	146,461	167,815	190,423	214,011
Pearland – City of Pearland	***37,640***	***106,895***	***144,453***	***174,268***	***199,676***	***226,576***	***254,642***
Richwood	3,012	3,244	3,486	3,717	3,930	4,156	4,392
Southwest Utilities	597	632	668	703	735	769	804
Surfside	763	889	1,020	1,146	1,262	1,385	1,513
Sweeny	3,624	3,895	4,177	4,447	4,696	4,960	5,236
Varner Creek Utility Dist	1,850	2,341	2,852	3,341	3,792	4,270	4,769
West Columbia	4,255	4,158	4,057	3,960	3,871	3,777	3,678
County-Other TWDB (Incl Reallocation)	65,266	61,157	69,005	77,326	84,965	93,088	101,592
County-Other (HGAC)	***65,427***	***32,073***	***34,140***	***23,084***	***22,408***	***23,001***	***23,437***
FORT BEND COUNTY			**(COMC = City of Missouri City)**				
Arcola	1,048	2,500	2,750	3,025	3,328	3,661	4,026
Orbit Systems Inc	144	163	183	207	232	264	301
Fort Bend Co MUD 2	8,308	9,792	9,792	9,792	9,792	9,792	9,792
Fort Bend Co MUD 23	2,961	5,968	9,084	12,895	16,813	21,952	27,824
Houston	33,360	39,890	46,657	54,931	63,439	74,596	87,345
Kingsbridge MUD	4,547	6,371	8,262	10,574	12,952	16,070	19,633
Meadows Place	4,912	4,912	4,912	4,912	4,912	4,912	4,912
Missouri City	47,419	82,425	103,601	122,617	141,918	155,313	186,508
Sienna Plantation MUD 2	2,763	COMC	COMC	COMC	COMC	COMC	COMC
Stafford	15,371	23,026	30,959	40,659	50,633	63,714	78,661
Sugar Land	63,328	72,500	72,500	72,500	72,500	72,500	72,500
County-Other (TWDB) Entire County	44,339	72,626	128,876	204,565	282,622	396,970	511,758
County-Other (HGAC) Study Area	***17,338***	***29,777***	***80,642***	***104,848***	***138,074***	***183,044***	***219,302***

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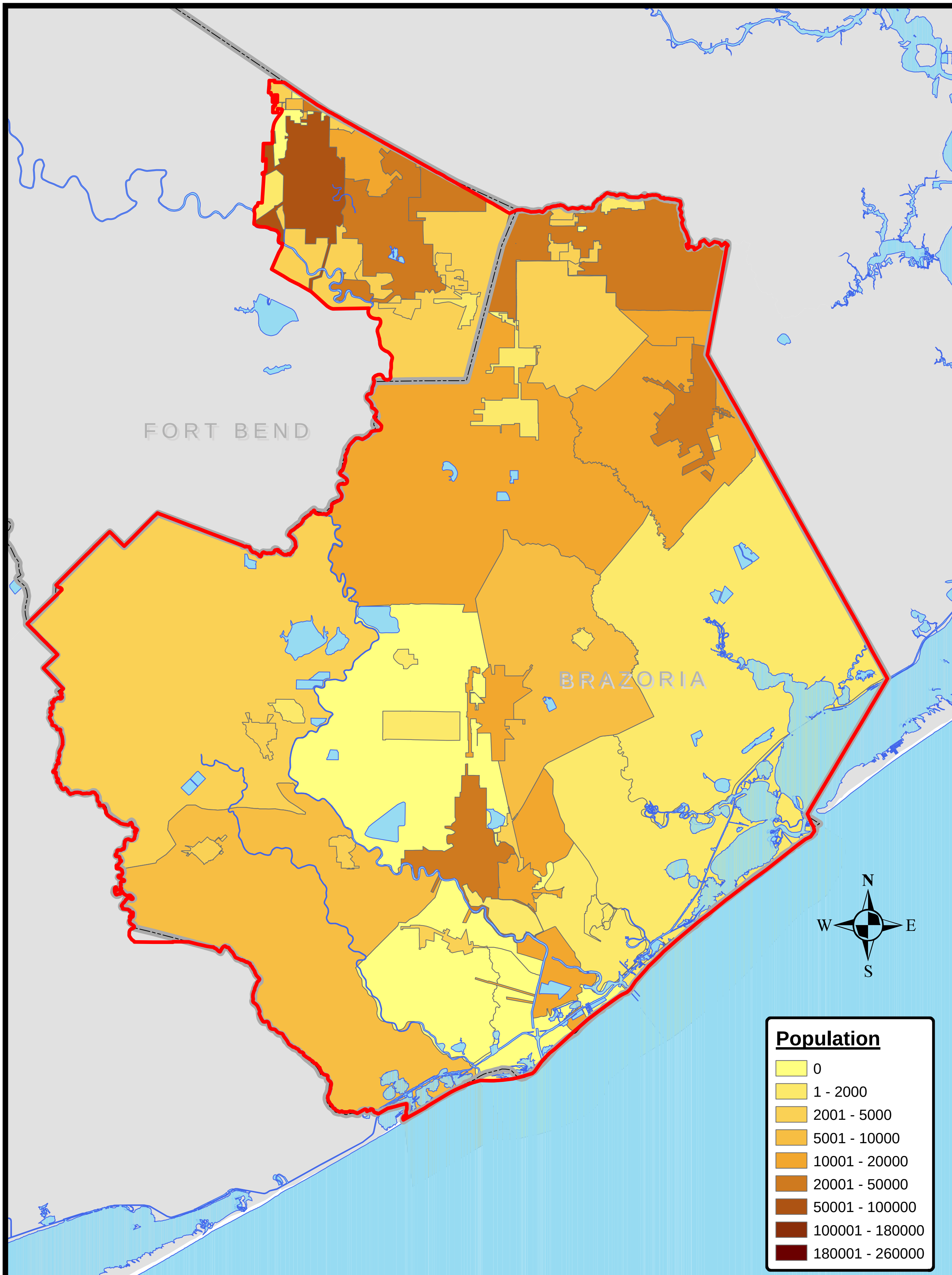

CDM

0 2.5 5 10
Miles

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

POPULATION ESTIMATES - YEAR 2000

FIGURE 2-9

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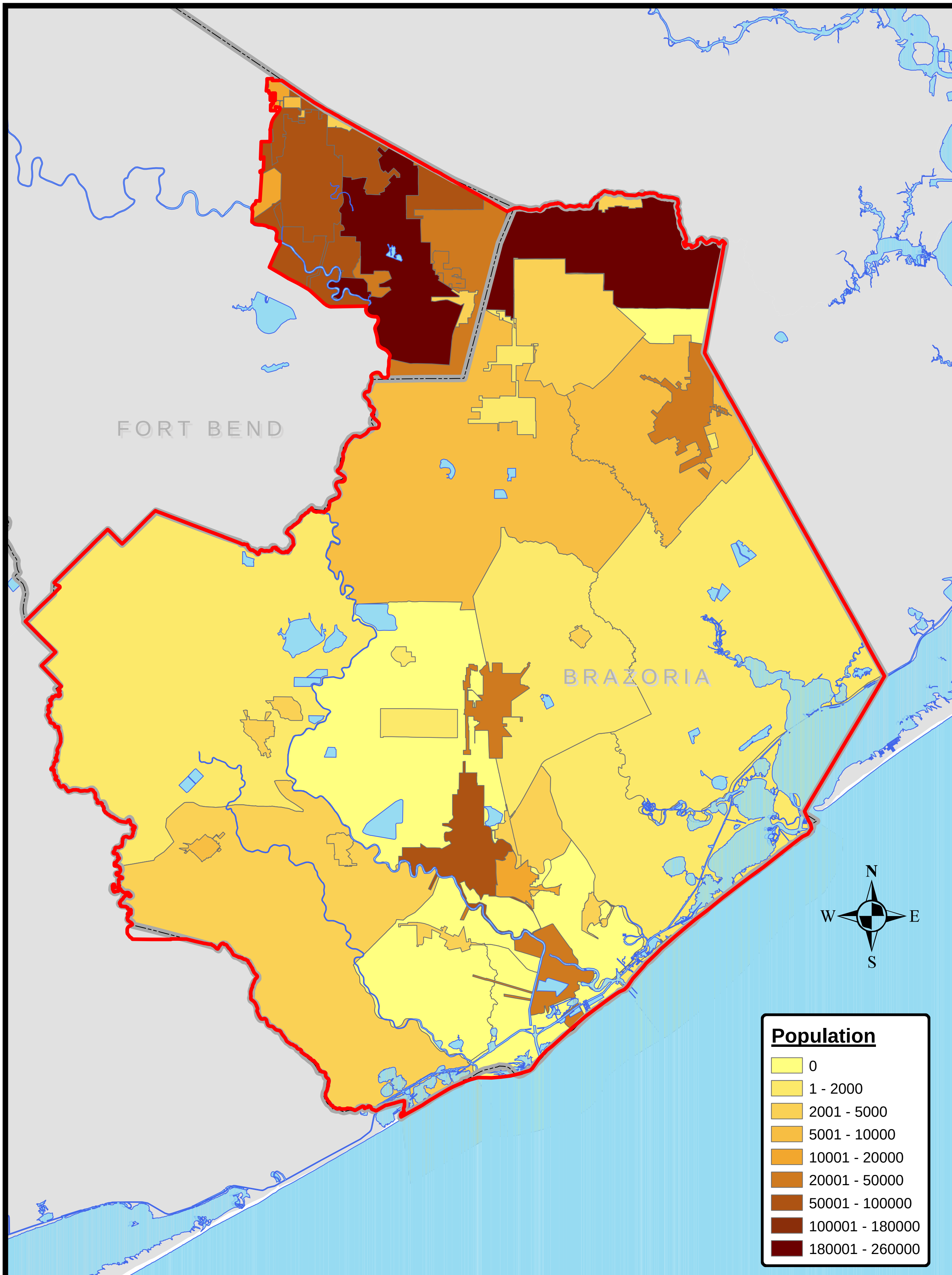

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THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

POPULATION PROJECTIONS - YEAR 2060

FIGURE 2-10

TABLE 2-5 AVERAGE DAY MUNICIPAL PER CAPITA WATER DEMAND PROJECTIONS (GALLONS PER CAPITA PER DAY)

Water User Group	2000	2010	2020	2030	2040	2050	2060
Alvin	124	120	117	114	111	110	110
Angleton	102	99	95	92	89	88	88
Bailey's Prairie	111	108	104	100	98	97	97
Brazoria	92	88	85	82	78	77	77
Brazoria County MUD 1	104	COP	COP	COP	COP	COP	COP
Brazoria County MUD 2	209	COP	COP	COP	COP	COP	COP
Brazoria County MUD 3	113	COP	COP	COP	COP	COP	COP
Brazoria County MUD 4	154	150	COP	COP	COP	COP	COP
Brazoria County MUD 5	133	COP	COP	COP	COP	COP	COP
Brazoria County MUD 6	143	138	COP	COP	COP	COP	COP
Brookside Village	109	104	101	98	96	95	95
Clute	97	94	90	88	85	84	84
County-Other (Brazoria)	224	220	217	215	212	211	211
Danbury	112	108	105	102	99	98	98
Freeport	112	107	103	101	99	98	98
Hillcrest Village	153	150	147	143	140	139	139
Holiday Lakes	76	72	68	65	62	61	61
Iowa Colony	111	106	103	100	98	97	97
Jones Creek	44	41	38	35	32	30	30
Lake Jackson	127	122	119	116	114	113	113
Manvel	107	104	101	98	95	93	93
Orbit Systems Inc	87	82	79	77	76	75	75
Oyster Creek	109	104	101	99	97	96	96
Pearland[4]	134	129	129	127	126	126	126
Richwood	90	86	83	80	77	76	76
Southwest Utilities	105	100	98	95	94	92	92
Surfside Beach	173	169	165	163	161	160	160
Sweeny	143	139	136	133	130	129	129
Varner Creek Utility District	142	137	134	132	131	130	130
West Columbia	120	116	113	110	107	105	105
Arcola	149	144	141	140	138	138	138
County-Other (Fort Bend)	151	146	147	146	143	142	142
First Colony MUD 9	COMC	COMC	COMC	COMC	COMC	COMC	COMC
Fort Bend County MUD 2	142	138	134	132	130	129	129
Fort Bend County MUD 23	102	101	100	100	100	100	100
Houston	159	155	152	149	147	146	146
Kingsbridge Mud	147	142	140	138	136	136	136
Meadows	270	266	262	259	256	255	255
Missouri City[5]	191.5	186.5	184.5	182.5	181.5	181.5	181.5
Orbit Systems Inc	87	82	78	78	77	74	74
Sienna Plantation MUD 2	171	167	165	165	164	164	164
Stafford	72	67	65	63	62	62	62
Sugar Land	221	216	214	212	211	211	211

COP = City of Pearland COMC = City of Missouri City

[4] Average of Pearland and annexed Brazoria County MUDs.
[5] Average of Missouri City and First Colony MUD 9.

TABLE 2-6 AVERAGE DAY MUNICIPAL WATER DEMAND PROJECTIONS (MGD)

WATER USER GROUP	2000	2010	2020	2030	2040	2050	2060
BRAZORIA COUNTY				**(COP = City of Pearland)**			
Alvin	2.66	2.79	2.94	3.07	3.18	3.34	3.54
Angleton	1.85	1.88	1.88	1.90	1.90	1.95	2.02
Bailey's Prairie	0.08	0.08	0.08	0.08	0.09	0.09	0.10
Orbit Systems Inc	0.33	0.39	0.45	0.52	0.58	0.64	0.71
Brazoria	0.26	0.25	0.25	0.24	0.24	0.24	0.24
Brazoria County MUD 1	0.43	COP	COP	COP	COP	COP	COP
Brazoria County MUD 2	0.59	COP	COP	COP	COP	COP	COP
Brazoria County MUD 3	0.31	COP	COP	COP	COP	COP	COP
Brazoria County MUD 4	0.53	0.52	COP	COP	COP	COP	COP
Brazoria County MUD 5	0.63	COP	COP	COP	COP	COP	COP
Brazoria County MUD 6	0.32	0.55	COP	COP	COP	COP	COP
Brookside Village	0.21	0.24	0.26	0.29	0.31	0.34	0.37
Clute	1.01	1.05	1.08	1.13	1.15	1.20	1.27
Danbury	0.18	0.19	0.20	0.21	0.21	0.22	0.24
Freeport	1.42	1.69	1.96	2.23	2.47	2.74	3.04
Hillcrest Village	0.11	0.11	0.11	0.11	0.11	0.12	0.12
Holiday Lakes	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Iowa Colony	0.09	0.10	0.11	0.11	0.12	0.13	0.14
Jones Creek	0.09	0.09	0.08	0.07	0.07	0.06	0.06
Lake Jackson – City of Lake Jackson	3.35	3.86	4.52	4.81	5.10	5.44	5.84
Manvel	0.33	0.32	0.31	0.30	0.29	0.28	0.28
Oyster Creek	0.13	0.15	0.17	0.19	0.20	0.22	0.25
Pearland – City of Pearland	5.04	13.79	18.63	22.13	25.16	28.55	32.08
Richwood	0.27	0.28	0.29	0.30	0.30	0.32	0.33
Southwest Utilities	0.06	0.06	0.07	0.07	0.07	0.07	0.07
Surfside	0.13	0.15	0.17	0.19	0.20	0.22	0.24
Sweeny	0.52	0.54	0.57	0.59	0.61	0.64	0.68
Varner Creek Utility Dist	0.26	0.32	0.38	0.44	0.50	0.56	0.62
West Columbia	0.51	0.48	0.46	0.44	0.41	0.40	0.39
County-Other (HGAC)	14.66	7.06	7.41	4.96	4.75	4.85	4.95
FORT BEND COUNTY				**(COMC = City of Missouri City)**			
Arcola	1,048	2,500	2,750	3,025	3,328	3,661	4,026
Orbit Systems Inc		0.39	0.45	0.52	0.58	0.64	0.71
Fort Bend Co MUD 2	1.18	1.35	1.31	1.29	1.27	1.26	1.26
Fort Bend Co MUD 23	0.30	0.60	0.91	1.29	1.68	2.20	2.78
Houston	5.30	6.18	7.09	8.18	9.33	10.89	12.75
Kingsbridge MUD	0.67	0.90	1.16	1.46	1.76	2.19	2.67
Meadows Place	1.33	1.31	1.29	1.27	1.26	1.25	1.25
Missouri City	9.08	15.37	19.11	22.38	25.76	28.19	33.85
Sienna Plantation MUD 2	0.47	COMC	COMC	COMC	COMC	COMC	COMC
Stafford	1.11	1.54	2.01	2.56	3.14	3.95	4.88
Sugar Land	14.00	15.66	15.52	15.37	15.30	15.30	15.30
County-Other (HGAC) Study	2.62	4.35	11.85	15.31	19.74	25.99	31.14

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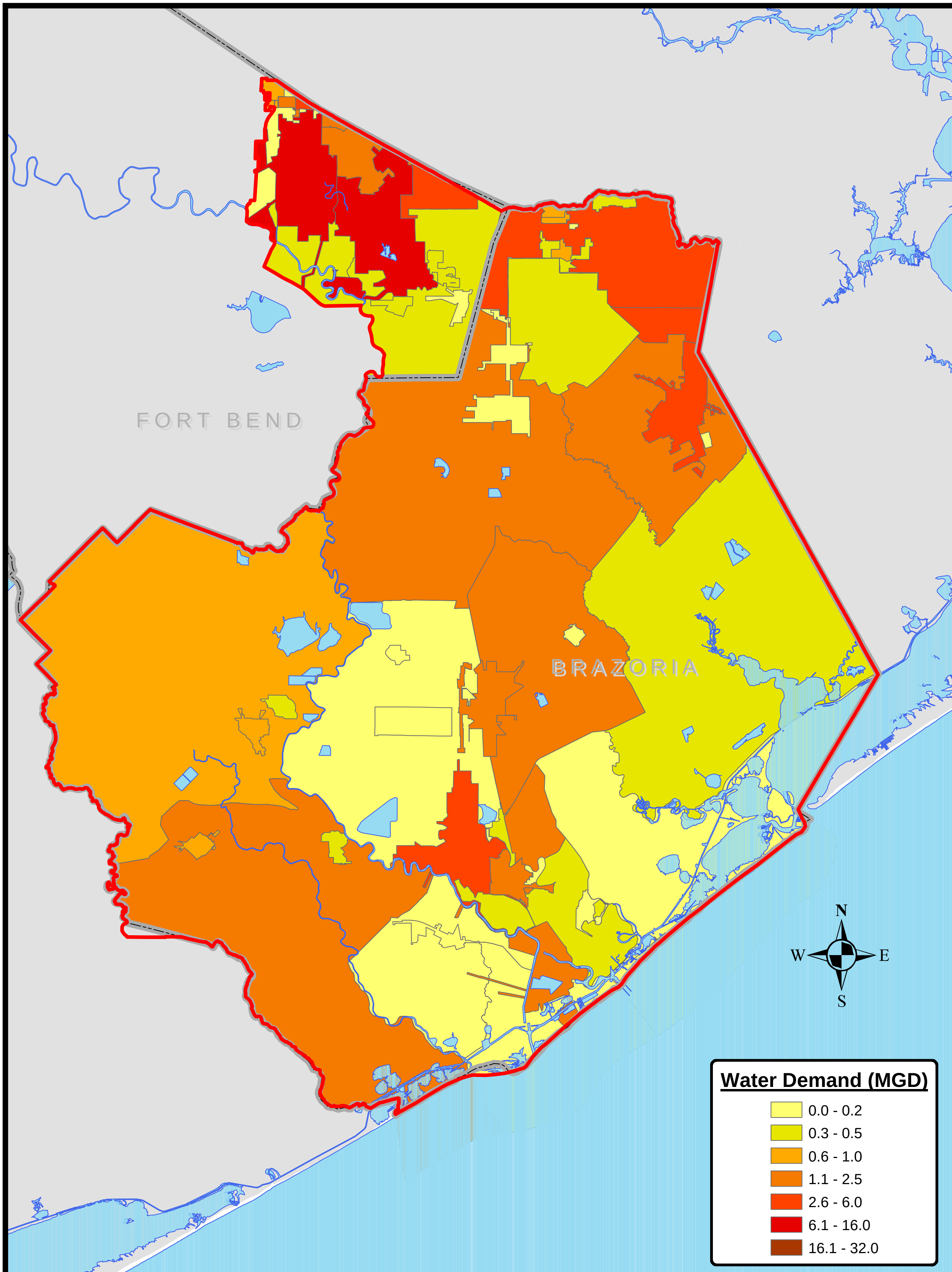

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AVERAGE DAY MUNICIPAL DEMAND ESTIMATES FOR THE YEAR 2000

FIGURE 2-11

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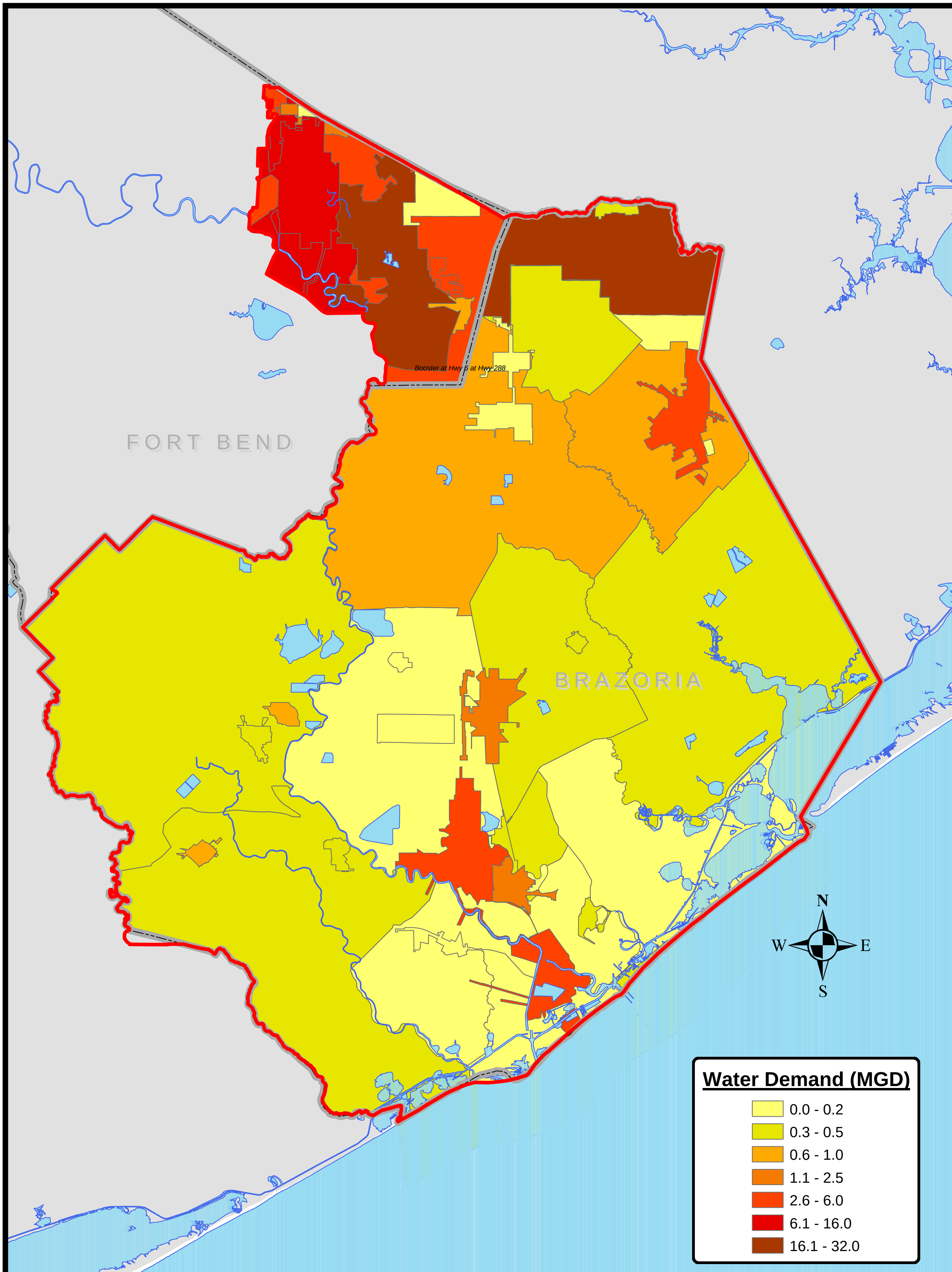

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THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

AVERAGE DAY MUNICIPAL DEMAND PROJECTIONS FOR THE YEAR 2060

FIGURE 2-12

TABLE 2-7 MAXIMUM DAY FACTORS FOR EACH WATER USER GROUP

Water User Group	Max Day Factor	Water User Group	Max Day Factor
Alvin	**2.23**	Holiday Lakes	2.03
Angleton	1.68	Iowa Colony	**2.23**
Arcola	**2.23**	Jones Creek	**2.23**
Bailey's Prairie	**2.23**	Kingsbridge MUD	2.55
Brazoria	1.71	Lake Jackson	2.00
Brazoria County MUD 1	**2.23**	Manvel	2.04
Brazoria County MUD 2	2.04	Meadows Place	**2.23**
Brazoria County MUD 3	**2.23**	Missouri City	2.79
Brazoria County MUD 4	1.45	Brazoria, Orbit Systems Inc	**2.23**
Brazoria County MUD 5	1.99	Fort Bend, Orbit Systems Inc	**2.23**
Brazoria County MUD 6	**2.23**	Oyster Creek	2.97
Brookside Village	**2.23**	Pearland	1.60
Clute	1.47	Richwood	2.08
Brazoria, County - Other	2.97	Sienna Plantation MUD 2	**2.23**
Fort Bend, County - Other	**2.23**	Southwest Utilities	**2.23**
Danbury	**2.23**	Stafford	1.66
First Colony MUD 9	2.00	Sugar Land	2.05
Fort Bend County MUD 2	2.31	Surfside Beach	2.07
Fort Bend County MUD 23	3.11	Sweeny	**2.23**
Freeport	1.58	Varner Creek Utility District	2.42
Hillcrest Village	3.21	West Columbia	1.90

2.5 Non-Municipal Water Demands

Although the focus of this study is on municipal water demands, it is important to consider non-municipal water demands when managing the total available water supply to a region. Table 2-8 shows the projected non-municipal water demands for Brazoria and Fort Bend County. In Brazoria County, 99 percent of the projected non-municipal water demand is for irrigation and manufacturing. While the irrigation demand in Brazoria County is projected to slightly decrease from 2010 through 2060, the manufacturing demand is projected to increase by almost 50 percent.

TABLE 2-8 **NON-MUNICIPAL WATER DEMANDS**

Brazoria County	2010	2020	2030	2040	2050	2060
Irrigation	135,033	123,115	118,544	115,788	115,788	115,788
Livestock	1,614	1,614	1,614	1,614	1,614	1,614
Manufacturing	260,239	286,554	309,841	333,348	354,093	379,241
Mining	4,104	4,502	4,737	4,969	5,201	5,419
Steam Electric	0	0	0	0	0	0
Total Brazoria Co. =	400,990	415,785	434,736	455,719	476,696	502,062
Fort Bend County	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Irrigation	53,455	53,455	53,455	53,455	53,455	53,455
Livestock	1,171	1,171	1,171	1,171	1,171	1,171
Manufacturing	6,863	7,199	7,468	7,685	7,829	7,410
Mining	3,010	3,070	3,105	3,138	3,169	3,196
Steam Electric	66,026	68,046	79,553	93,582	110,682	131,527
Total Fort Bend Co. =	130,525	132,941	144,752	159,031	176,306	196,759

Section 3
Inventory of Existing Water Supplies

This section details the total available water capacity for each water user group (WUG) in the study area based upon existing infrastructure, current contracts, future groundwater subsidence rules, and water quality limitations. The section specifically addresses:

- Data used to determine available water capacities;
- A summary of current and future water quality issues;
- Effect of Fort Bend Subsidence District rules on groundwater availability;
- Assumptions made during estimation of water capacities; and
- Total available water capacity by WUG.

The potable water capacity of the study area totals approximately 250 MGD, as determined by the current maximum capacity of well and surface water treatment facilities. Wells currently contribute approximately 95 percent of the potable water capacity in the study area.[1] The Brazosport Water Authority's (BWA) surface water treatment plant contributes the remaining five percent through wholesale treated water contracts. The Gulf Coast Water Authority (GCWA) and the City of Houston have contracts to provide an additional 56.5 MGD of wholesale surface water to entities in the study area. However, only 3 MGD of water under contract with the City of Houston currently is being used by these entities. The two sources of water – groundwater and surface water contracts – were evaluated for each water user group in the study area.[2]

3.1 Water Use Assumptions

The amount of a given water supply available to a community is dependent upon multiple factors, including:

- The environmentally sustainable yield of the supply;
- Contractual restrictions associated with a water supply;
- The quality of the water supply and effectiveness of treatment; and
- Demand fluctuations and associated water system operations.

Each of these issues is discussed in more detail in the following sections. In general, this study assumed contracted surface waters and desalinated water would be used at a constant rate (daily and annually), and groundwater would be used for peaking in the summer months. Communities would moderate diurnal fluctuations through local storage. This ideal annual pattern is depicted in Figure 3-1.

[1] Includes operating, demand (or peaking), and emergency groundwater wells.
[2] Water conservation can also be a water source. The per capita water demands used in this study (published by TWDB) include projected conservation efforts. See Table 2-5.

This assumption is generally consistent with the way existing surface water contracts are currently exercised or would be exercised in the future. However, there is some discrepancy in the way various communities interpret existing surface water contracts. Different interpretations may result in deviations from the availability of supplies reported in this study.

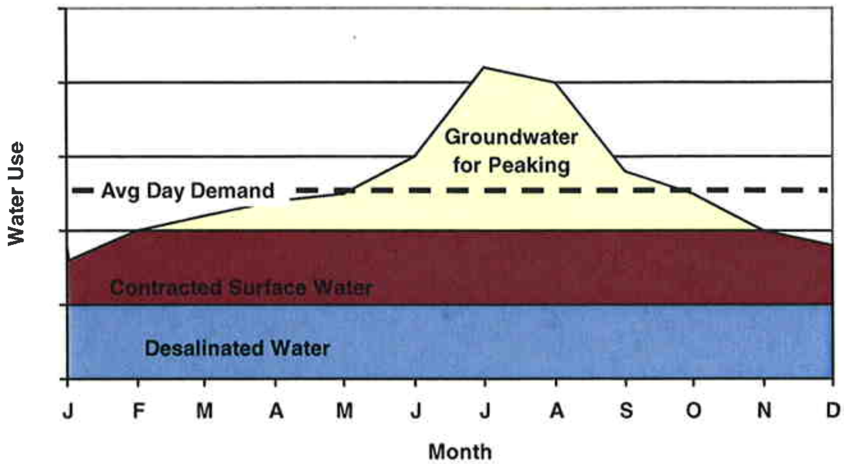

Figure 3-1
Annual Water Use Pattern

3.2 Groundwater Capacity

3.2.1 Well Capacity

Well capacities were determined with information from a database of all drinking water wells maintained by the Texas Commission on Environmental Quality (TCEQ). Data were received in both GIS and tabular format.

The total current well capacity within a WUG[3] was determined by summing the well capacities in the TCEQ database for operating, demand, and emergency wells. These data were summed by location using GIS software. The results then were compared to those capacities reported by each WUG in TCEQ Compliance Evaluation Investigations (CEI). The TCEQ Compliance Evaluation Investigations are contained in Appendix D. In some cases, the well capacities reported in the CEI were used as opposed to the sum of the individual well capacities. For WUGs with a significant number of private, non-regulated wells, year 2000 maximum day demand was used to represent maximum well capacity. (See Table 2-7 for maximum day peaking factors for each WUG.)

Table 3-1 summarizes the current well capacities by WUG. Because Angleton, Clute, Lake Jackson, Oyster Creek, and Richwood all currently use both wholesale purchased surface water and local groundwater to meet their water demands, the true well capacity for these WUGs is not known. This study assumes that their well capacities reflect their 2003 maximum day use.

[3] See Section 2 for definition of water user group (WUG).

TABLE 3-1 **WELL CAPACITIES**

WUG	Compliance Investigation (MGD)	Sum of Well Capacities (MGD)	Value Used (MGD)	Notes
Alvin	6.8	7.1	7.1	
Angleton	5.6	5.5	1.4	Assumed 2003 maximum day use
Arcola	0.2	0.3	0.3	Used capacity consistent with demand
Brazoria	0	0	0	
Brazoria County MUD 2	6.1	4.7	6.1	Used capacity consistent with demand
Brazoria County MUD 5	2.4	2.3	2.4	
Brazoria County MUD 1	0.0	0.0	0.0	
Brazoria County MUD 3	0.0	0.0	0.0	
Brazoria County MUD 4	0.0	0.0	0.0	
Brazoria County MUD 6	0.05	NA	0.05	
Brazoria County - Other	30.6	28.6	28.6	
Brookside Village	0.03	0.04	0.5	Mostly private wells; assumed capacity equal to maximum day demand
Clute	2.1	2.2	0.8	Assumed 2003 maximum day use
Danbury	0.9	0.9	0.9	
Ft Bend County - Other	2.5	3.2	3.2	
Ft Bend County MUD 2	3.7	3.5	3.5	
Ft Bend County MUD 23	2.5	3.5	2.5	Used capacity consistent with demand
Freeport	0.0	0.0	0.0	
Hillcrest Village	0.6	0.6	0.6	
Holiday Lakes	0.6	0.5	0.5	
Iowa Colony	0.1	0.1	0.2	Private wells; assumed capacity equal to maximum day demand.
Jones Creek	0.5	0.5	0.6	Private wells; assumed capacity equal to maximum day demand
Kingsbridge MUD	2.6	2.6	2.6	
Lake Jackson	5.5	6.7	4.4	Assumed 2003 max day use
Manvel	1.2	1.1	5.6	Private wells; assumed capacity equal to maximum day demand.
Meadows Place	5.6	5.4	5.4	
Missouri City	NA	39.3	39.3	
Oyster Creek	1.4	1.4	0.4	Assumed 2003 maximum day use
Pearland	NA	19.4	15.8	Based on conversation with Pearland
Richwood	0.5	0.5	0.4	Assumed 2003 maximum day use
Sienna Plantation MUD 2	0.0	0.0	0.0	
Stafford	15.9	16.2	16.2	
Sugar Land	NA	45.6	45.6	
Surfside	0.9	0.9	0.9	
Sweeny	1.9	1.9	1.9	
Varner Creek Util. Dist.	1.9	1.9	1.9	
West Columbia	2.1	2.1	2.1	
		Total =	201.8	(226,034 acre-ft/year)
		Total Brazoria County =	83.2	(93,159 acre-ft/year)
		Total Ft. Bend County =	118.6	(132,876 acre-ft/year)

3.2.2 Groundwater Contracts

Existing treated groundwater contracts are summarized in Table 3-2.

TABLE 3-2 SUMMARY OF EXISTING GROUNDWATER CONTRACTS

Buyer	Seller	Water Type	Amount	Year Ending
Brazoria County MUD 1	Brazoria County MUD 2	Treated	As Needed	2040
Brazoria County MUD 3	Brazoria County MUD 2	Treated	As Needed	2040
Brazoria County MUD 6	Brazoria County MUD 2	Treated	As Needed	2040
Sienna Plantation MUD 2	Sienna Plantation MUD 1	Treated	As Needed	None

In the process of using these contracted water supplies to accurately determine water deficits, specific water rates were assigned to "as needed" contract amounts based on the following assumptions:

- **Sienna Plantation MUDs 1 and 2:** All Sienna Plantation MUDs will be annexed by the City of Missouri City. Water exchanges that occur within a WUG have no impact on calculating deficits.

- **Brazoria County MUDs 1, 2, 3, and 6:** Brazoria County MUD 2 is a master services district, providing wholesale treated water to Brazoria County MUDs 1, 3, and 6. Unlike the Sienna Plantation MUDs, MUD 2 serves water to customers inside the district as well as providing wholesale water to neighboring MUDs. The maximum contracted purchase rate for the master services agreement for Brazoria County MUDs 1, 2, 3 and 6 was determined by distributing the total well capacity of MUD 2 across each MUD by population. Table 3-3 indicates the assumed maximum purchase rates for the master services agreement for Brazoria County MUDs 1, 2, 3, and 6.

TABLE 3-3 PURCHASE RATES FOR BRAZORIA CO MUDS 1, 2, 3, AND 6

	Production Capacity (MGD)	Population Served	Assumed Max. Purchase Rate (MGD)
Brazoria County MUD 1	0	4,122	2.09
Brazoria County MUD 2	6.1	3,402	1.73
Brazoria County MUD 3	0	2,241	1.14
Brazoria County MUD 6	0	2,241	1.14
Totals =	**6.1**	**12,006**	**6.10**

3.2.3 Groundwater Withdrawal Limitations

Fort Bend County

The Fort Bend Subsidence District (FBSD) was established in 1989 to manage groundwater withdrawal in order to prevent subsidence. In 2004, FBSD adopted a regulatory plan that will limit groundwater withdrawals in the future. The plan divides Fort Bend County into three areas – Area A, Subarea A, and Area B – and establishes future groundwater withdrawal restrictions and compliance deadlines for each. The portion of Fort Bend County included in this water planning study is Area A. Accordingly, this report references the rules associated with Area A.

FBSD Area A rules impact projected available groundwater capacities in Fort Bend County beyond 2010. FBSD currently plans on restricting groundwater withdrawals in Area A at two planning horizons. By 2013, communities will be required to limit groundwater withdrawals to "no more than 70 percent of total water demand." By 2025, groundwater withdrawals will be limited to 40 percent of total water demand. A copy of the adopted FBSD Area A rules is located in Appendix E.

As the Area A rules are currently written, groundwater withdrawal limitations are a function of demand; there are no rules that prohibit the installation of new groundwater wells. Consequently, long-term groundwater withdrawals may actually increase relative to existing withdrawals if demand becomes high enough. The projected demands for this study indicate that groundwater usage could be increased and still meet the FBSD Area A rules. One possible scenario for this additional groundwater need is indicated in Table 3-4.

Since the current rules do not indicate maximum withdrawal rates, this study assumed that the withdrawal limitations cited in the rules would be determined on an annual average basis. Consequently, it was assumed that communities would install new wells to meet short-term peaking needs as dictated by their projected maximum day water demands.

Table 3-4 summarizes by planning horizon and WUG the projected maximum groundwater capacity in Fort Bend County as dictated by FBSD Area A rules. The FBSD rules are based on a planning period that extends through the year 2030. Based on recent Region H planning discussions, additional curtailment of the use of groundwater may occur in years beyond 2025 if demands increase as projected; however, because further reductions in maximum groundwater pumping within the FBSD beyond the year 2025 are unknown, the study assumes a maximum allowable pumpage equal to 40 percent of annual average demand through the entire study period. The Region H Planning Group and the Fort Bend Subsidence district, recognizing that the District's current rules allow for increased groundwater withdrawals, have indicated that the rules may be changed to further restrict groundwater pumping in Fort Bend County as demands increase. This will have the effect of increasing the need for non-groundwater sources in Fort Bend County, such as desalinated water.

Brazoria County

The recently formed Brazoria County Groundwater Conservation District is subject to confirmation through a local election. However, pending confirmation, the District may implement rules regulating groundwater withdrawals. The most recently published State Water Plan concluded that there is a "complete utilization" of sustainable groundwater in Brazoria County and that groundwater therefore should not be used to meet future demands.[4] Preliminary results from the groundwater availability modeling (GAM) study to be completed in 2004 also indicate that current groundwater usage in Brazoria County is at maximum sustainable yield.[5] Consequently, this study assumed current groundwater withdrawal rates in Brazoria County represent the maximum available groundwater capacity.

[4] "Task 5 Report: Identification, Evaluation, and Selection of Water Management Strategies." Region H Water Planning Group. January 2001. Page 15.
[5] Conversation with TWDB staff.

TABLE 3-4 **FORT BEND SUBSIDENCE DISTRICT CAPACITY LIMITATIONS**[6]

Sugar Land (PF = 2.05)	2010	2020	2030	2040	2050	2060
Existing GW Capacity =	45.6	45.6	45.6	45.6	45.6	45.6
Average Day Demands =	15.7	15.5	15.4	15.3	15.3	15.3
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	4.7	9.2	9.2	9.2	9.2
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.0	0.0	0.0
Total GW Capacity =	45.6	27.2	22.3	22.2	22.2	22.2
Missouri City (PF = 2.79)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	39.3	42.5	42.5	42.5	42.5	42.5
Average Day Demands =	13.9	17.3	20.4	23.7	26.1	31.5
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	5.2	12.2	14.2	15.7	18.9
Additional GW Needed for Peaking =	0.0	0.6	2.1	9.4	14.7	26.5
Total GW Capacity =	39.3	43.1	44.6	51.9	57.1	69.0
Stafford/WCID No. 2 (PF = 1.66)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	16.2	16.2	16.2	16.2	16.2	16.2
Average Day Demands =	4.3	5.7	7.4	9.2	11.6	14.3
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	1.7	4.5	5.5	6.9	8.6
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.0	0.0	0.0
Total GW Capacity =	16.2	7.8	7.9	9.7	12.3	15.1
Arcola (PF = 2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	0.3	0.3	0.3	0.3	0.3	0.3
Average Day Demands =	0.4	0.4	0.4	0.5	0.5	0.6
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.1	0.3	0.3	0.3	0.3
Additional GW Needed for Peaking =	0.5	0.4	0.4	0.4	0.5	0.6
Total GW Capacity =	0.75	0.75	0.69	0.75	0.82	0.91
Fort Bend County MUD 2 (PF = 2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	3.7	3.7	3.7	3.7	3.7	3.7
Average Day Demands =	1.4	1.3	1.3	1.3	1.3	1.3
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.4	0.8	0.8	0.8	0.8
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.0	0.0	0.0
Total GW Capacity =	3.74	2.53	2.11	2.07	2.06	2.06

Fort Bend County MUD 23 (PF = 2.23)	2010	2020	2030	2040	2050	2060
Existing GW Capacity =	2.5	2.5	2.5	2.5	2.5	2.5
Average Day Demands =	0.6	0.9	1.3	1.7	2.2	2.8
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.3	0.8	1.0	1.3	1.7
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.3	1.1	2.0
Total GW Capacity =	2.49	1.75	2.10	2.74	3.58	4.54
Kingsbridge MUD (PF = 2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	2.6	2.6	2.6	2.6	2.6	2.6
Average Day Demands =	0.9	1.2	1.5	1.8	2.2	2.7
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.3	0.9	1.1	1.3	1.6
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.3	1.0	1.8
Total GW Capacity =	2.59	2.23	2.38	2.87	3.56	4.35
Meadows Place (PF = 2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	5.4	5.4	5.4	5.4	5.4	5.4
Average Day Demands =	1.3	1.3	1.3	1.3	1.3	1.3
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.4	0.8	0.8	0.8	0.8
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.0	0.0	0.0
Total GW Capacity =	5.43	2.48	2.07	2.05	2.04	2.04
Sienna Plantation MUD 2 (PF = 2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	0.0	0.0	0.0	0.0	0.0	0.0
Average Day Demands =	0.0	0.0	0.0	0.0	0.0	0.0
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	0.0	0.0	0.0	0.0	0.0
Additional GW Needed for Peaking =	0.0	0.0	0.0	0.0	0.0	0.0
Total GW Capacity =	0.0	0.0	0.0	0.0	0.0	0.0
Fort Bend County - Other (PF =2.23)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing GW Capacity =	3.1	0.1	0.1	0.1	2.3	3.8
Average Day Demands =	2.0	6.4	9.2	12.2	17.4	21.3
Subsidence Max.GW Used for Demand =	None	70%	40%	40%	40%	40%
Minimum Non-GW Source Required =	0.0	1.9	5.5	7.3	10.4	12.8
Additional GW Needed for Peaking =	4.3	12.4	15.0	19.8	26.0	30.9
Total GW Capacity =	7.40	12.44	15.08	19.84	28.33	34.74

PF = Peaking Factor for Maximum Day Demand GW = Groundwater

[6] Note that Missouri City is planning to eventually annex all of Sienna Plantation, which accounts for the increase in existing GW capacity.

3.3 Surface Water Capacity

All surface water in the study area, both used and unused, is delivered through wholesale contracts with the Brazosport Water Authority (BWA), the Gulf Coast Water Authority(GCWA), or the City of Houston. These contracts are summarized in Table 3-5.

TABLE 3-5 SUMMARY OF EXISTING SURFACE WATER CONTRACTS

Buyer	Seller	Water Type	Amount (MGD)	Year Ending
City of Angleton	BWA	Treated	1.8	2027
City of Brazoria	BWA	Treated	0.3	2027
City of Clute	BWA	Treated	1	2027
City of Freeport	BWA	Treated	2	2027
City of Lake Jackson	BWA	Treated	2	2027
City of Oyster Creek	BWA	Treated	0.095	2027
City of Richwood	BWA	Treated	0.235	2027
Fort Bend WCID No. 2*****	GCWA	Raw	10.5	Converts to take or pay in 2006
City of Missouri City*****	GCWA	Raw	15	Converts to take or pay in 2009
City of Pearland*****	GCWA	Raw	10	Converts to take or pay in 2010
City of Pearland	City of Houston	Treated	3	None
City of Sugar Land*****	GCWA	Raw	20	Converts to take or pay in 2012
TDCJ Clemens Unit	BWA	Treated	0.2	2027
TDCJ Wayne Scott Unit	BWA	Treated	0.2	2027

* Denotes contracts currently not exercised

3.3.1 Brazosport Water Authority (BWA)

Currently, there is one active surface water treatment plant (WTP) in the study area. The BWA owns and operates a conventional surface WTP with a maximum capacity of approximately 12.5 MGD. Raw water is withdrawn from the Dow Chemical freshwater canal system, which can be fed through either Jones Creek or the Buffalo Camp Bayou system. The plant currently provides wholesale water to nine customers at a total contracted capacity of 7.83 MGD.

The BWA contracts are summarized in Table 3-5. The BWA prefers that its customers do not use water at a rate higher than the specified contract amount. In reality, BWA customers often use up to 10 percent more than their contracted amount during maximum demand days. For the purposes of this study, it was assumed that the contracted amount specified could not be exceeded on any given day, and that, if needed, the BWA surface water could be supplied at the contracted amount year-round. This study also assumed these contracts would expire in the year 2027.

3.3.2 Gulf Coast Water Authority (GCWA)

Wholesale surface water contracts with the GCWA are of particular importance to water supply in the northern portion of the study area. The GCWA has contracts for 45.5 MGD of currently unused surface water with four major cities in this area: Missouri City, Sugar Land, Stafford (WCID No. 2), and Pearland. These contracts are currently option water contracts, but would convert to take-or-pay contracts when water is actually used.

Fort Bend County WCID No. 2 currently provides wholesale water to the cities of Stafford, Missouri City, Sugar Land, and to unincorporated areas in Fort Bend and Harris counties. If WCID No. 2 were to exercise its options under the GCWA contract, the water likely would be divided up among its customers. This study adopts the assumptions documented in the 2002 State Water Plan for allocating that contract water, as summarized in Table 3-6.

There is some discrepancy in the way various communities interpret the GCWA surface water contracts. For the purposes of this study, these surface water contracts were assumed to specify average day amounts that would be supplied at a constant rate, this rate being the specified contract amount.

TABLE 3-6 ASSUMED PURCHASE RATES FOR FT. BEND COUNTY WCID NO. 2

Ft. Bend Co. WCID 2 Customer	Assumed Portion of GCWA Contract
Missouri City	0.12 MGD
Sugar Land	0.04 MGD
Harris County - Other	0.0178 MGD
Fort Bend County - Other	0.098 MGD
Stafford	10.22 MGD
Total =	**10.5 MGD**

3.3.3 City of Houston

The City of Pearland currently has a contract with the City of Houston to purchase 3 MGD of wholesale treated surface water. Pearland is negotiating with the City of Houston to increase the total water available for purchase to 6 MGD. This study assumes that the 6 MGD contract amount is available for the City of Pearland. The City of Pearland is also currently negotiating with GCWA for 10 MGD in the City of Houston Southeast Water Purification Plant (SEWPP).[7]

3.4 Water Quality

Data on the quality of water supplied in the study area were collected and reviewed to determine the likelihood of current or future water service limitations as a result of poor water quality.

Water quality records for all public water suppliers in the study area were obtained from the TCEQ. These water quality records are summarized in Appendix F. Data on contaminants were divided into four categories: organics, inorganics, trihalomethanes (THMs), and haloacetic acids (HAAs). The years of coverage for each data set are as follows:

Data Set	Coverage
Organics	1993 - 2003, with a few isolated samples prior to 1993
Inorganics	1996 - 2003
THM	2002 - 2003
HAA	1991 - 2003

[7] The 10 MGD associated the City of Houston's SEWPP is distinct from the existing 10 MGD option contract between the City of Pearland and the GCWA.

The water quality data were evaluated for violations of current primary and secondary EPA drinking water standards and future regulations. (Upcoming regulations are discussed in Section 3.4.3.) The State of Texas can adopt primary drinking water standards at least as stringent as those specified by the EPA. For secondary standards, the State may choose to adopt less stringent standards. Correspondence between the TCEQ and most public water suppliers also was reviewed for notifications of water quality violations.

3.4.1 Primary Drinking Water Standards

EPA establishes maximum contaminant levels (MCLs) for primary drinking water contaminants. The primary drinking water standards "protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in water."[8] The primary standards are legally enforceable, subjecting violators to civil penalties.

Few primary drinking water standards violations were found for public water suppliers in the study area. Table 3-7 lists those that were identified.

TABLE 3-7 SUMMARY OF PRIMARY STANDARDS VIOLATIONS

Contaminant	No. of Violations	Value	MCL	Notes
Atrazine Fecal Coliform	1 1	9.01 mg/L	0.003 mg/L 5%/month	
Dichloromethane	1	11 mg/L	0.005 mg/L	
Dichloromethane Trichloroethylene 1,X-Dichloroethane	3 5 1	10 mg/L 5.3-17 mg/L 7.3 mg/L	0.005 mg/L 0.005 mg/L 0.005 mg/L	Plant abandoned
Uranium	1	32.6 µg/L	30 µg/L	
Radium 226 & 228 Gross Alpha	1 1	5.1 pCi/L 21.8 µg/L	5 pCi/L 15 pCi/L	

The atrazine violation was associated with the BWA and likely resulted from runoff containing pesticides that contaminated the Buffalo Camp Bayou source water for the BWA's treatment plant. The BWA was unaware of the pesticide application. Since then, the BWA has requested notification of pesticide applications that might affect its source waters so it can switch source water accordingly.

Positive tests for fecal coliforms have been observed in the BWA's system. However, the positive tests have not yet resulted in a primary standard violation.

The remaining primary standard violations appear to be sporadic. Therefore, it was concluded that there are no readily apparent water supply or treatment limitations dictated by primary drinking water standards.

[8] http://www.epa.gov/safewater/standard/setting.html

3.4.2 Secondary Drinking Water Standards

Secondary drinking water standard contaminants are those associated with cosmetic and aesthetic effects, such as tooth discoloration, taste, and odor. Secondary standards are established by the EPA for guidance only and are not enforceable.

Secondary standard violations are frequent and widespread throughout the study area. The majority of these violations are associated with groundwater supplies. The BWA had two secondary standard violations on record in the past seven years.

Figure 3-2 shows the number of secondary standard violations per 1,000 people by region within the study area. As indicated there, secondary drinking water standards violations are most problematic in the southeastern portion of the study area. Since secondary standards are non-enforceable, it is difficult to predict to what degree these violations will limit water supply availability in the future. Public acceptance and cost considerations will likely be balanced in addressing the effect that secondary standards may have on water availability and treatment. The estimated costs to treat water supplies within the study area to meet secondary standards are presented in Section 7.

3.4.3 Future Drinking Water Standards

Future drinking water quality standards may impact the extent to which a water supplier can continue to use its current water source and/or treatment scheme. Consequently, this study examined available water quality data to evaluate potential limitations associated with future water quality standards.

Table 3-8 summarizes the future drinking water quality standards used to evaluate water systems. In many cases, the data required to definitively determine the extent to which water suppliers will have difficulty meeting future standards are unavailable. These data will be collected as new rules become imminent.

Despite the lack of data, upcoming rules on arsenic and the Long Term 2 Enhanced Surface Water Treatment Rule may impact some public water suppliers.

Arsenic Rule

Levels of arsenic greater than 0.01 mg/L have been found in at least two samples each over the last five years for two entities, and five other smaller water suppliers (less than 500 customers) in the study area. Another entity also has experienced high levels of arsenic in its drinking water wells; however, this entity no longer uses its wells for drinking water. Appendix F contains TCEQ data on finished water quality with arsenic above the proposed regulatory limit of 0.01 mg/L.

For the purpose of ascertaining whether available water capacity would be limited because of upcoming water quality standards, wells with indications of arsenic levels greater than the proposed regulatory limit of 0.01 mg/L were considered either unusable or likely to require treatment.

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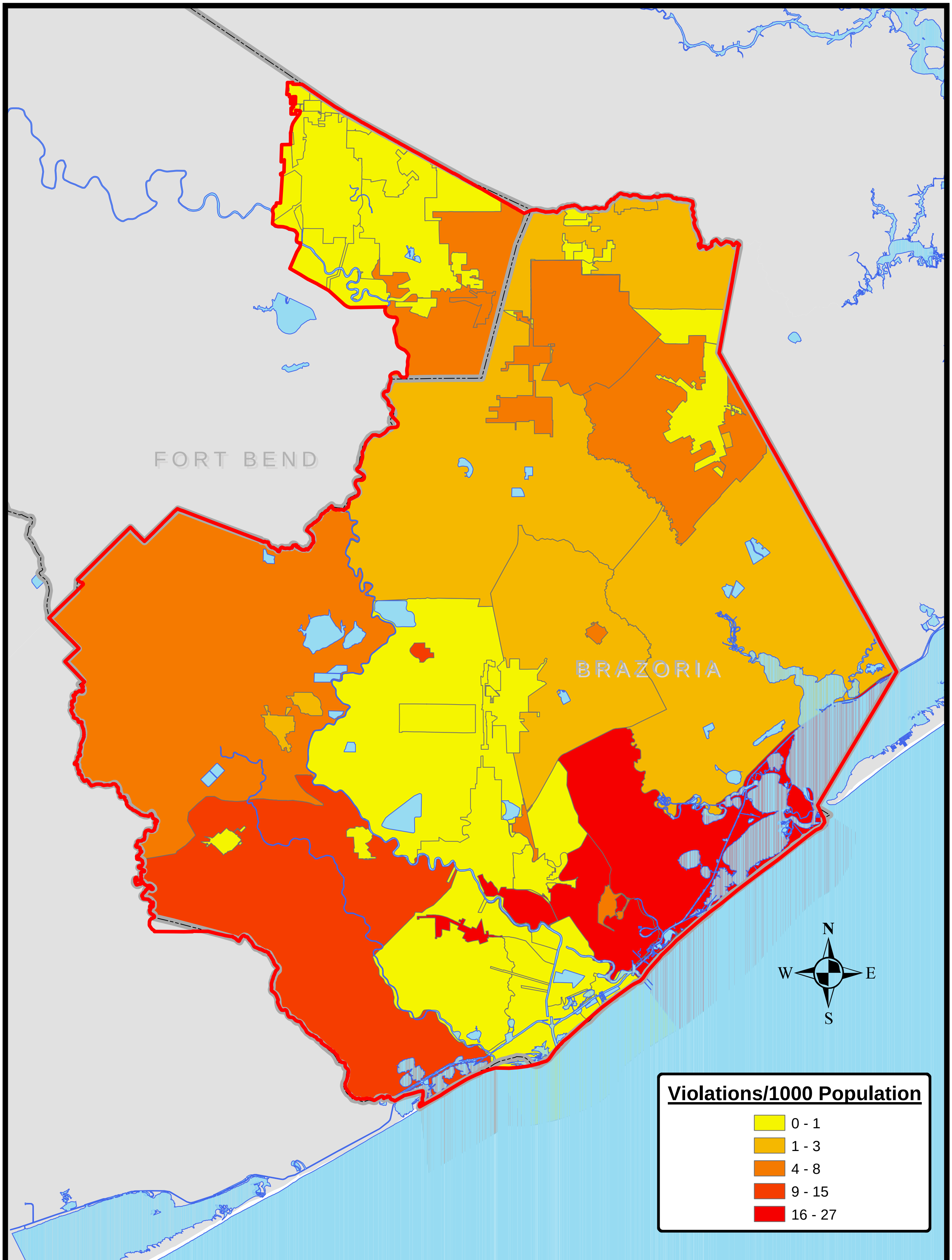

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

CDM

0 2.5 5 10 Miles

SECONDARY STANDARD VIOLATIONS PER POPULATION

FIGURE 3-2

TABLE 3-8 FUTURE WATER QUALITY STANDARDS

Rule Name	Short Description	Compliance Date
Arsenic Rule	MCL From 0.05 mg/L to 0.01 mg/L	January 2006
Radionuclides Rule	Changes in monitoring requirements for currently monitored parameters Changes in monitoring requirements No MCL changes for currently monitored parameters Establishes new MCL of 0.03 mg/L for Uranium	2003, Initial reporting to be completed in 2007
Radon Rule	Establishes new MCL or 300 pCi/L for Radon Initial monitoring required to determine required continued frequency of monitoring Rules differ based upon whether or not states develop multimedia monitoring programs Rules are less stringent for smaller water systems (< 10,000 people)	Likely 2004
Groundwater Rule	Applies to all groundwater systems Requires sanitary surveys every 3 years for community water systems and every 5 years for non-community water systems Hydrogeologic sensitivity assessment required for all groundwater systems that do not meet 4-log inactivation/removal of viruses Source water monitoring for sensitive or contaminated systems that do not have 4-log removal of viruses Daily compliance monitoring for systems serving < 3,300 people Continuous compliance monitoring for systems serving >= 3,300 people	Statutory Deadline 2003, Likely 2004
Stage 2 Disinfection Byproducts Rule (DBP)	Changes in sampling for TTHM and HAA5 ▪ From running annual avg. to local running annual average ▪ Highest DBP concentration locations will be used for compliance No MCL changes for TTHM and HAA5 New peak requirements: 0.1 mg/L for THM; 0.075 mg/L for HAA5 Establishes new MCL of 0.7 mg/L for Chloroform	EPA to finalize late 2004; Compliance 3-4 years after promulgation
Long Term 2 Enhanced Surface Water Treatment Rule	Additional monitoring required at various point in treatment process All unfiltered systems must provide at least 99 or 99.9 % inactivation of *cryptosporidium* depending on results of monitoring	Likely 2005 for large systems; smaller systems to follow
Contaminant Candidate List (CCL)	9 CCLs were reviewed in 2003. No new regulations were recommended	None
Total Coliform Rule	If routine samples are positive, repeat samples are required Compliance based on presence or absence of total coliform, determined each calendar month, based on routine and repeat samples	Likely 2008
Filter Backwash Rule	Requires public water systems to review their recycle practices and to work with the States to make any necessary changes to recycle practices	2004

Long Term 2 Enhanced Surface Water Treatment Rule
Depending on results of source water sampling, the BWA may need to modify or enhance the disinfection capabilities of its surface water treatment plant, such as adding ultraviolet (UV) disinfection, to meet the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). These probable modifications are discussed in more detail in Section 7 of this report.

Groundwater Rule
The upcoming Groundwater Rule may increase operational costs for groundwater-dependent systems in the study area by requiring increased monitoring. However, the TCEQ already conducts sanitary surveys every three years. The TCEQ also plans to conduct hydrogeologic sensitivity (HGS) assessments once the Groundwater Rule takes effect. Once that assessment is complete, an appropriate sampling schedule will be adopted. In general, the TCEQ indicated that it is too early in the planning stages to determine the impact of the Groundwater Rule on water suppliers in the study area.

3.5 Summary

The current available water capacities were evaluated for each WUG in the study area. Two water sources currently constitute the study area's water supply: groundwater and wholesale surface water provided through contracts with the BWA, the City of Houston, and the GCWA. The wholesale surface water contracted with the GCWA, an average day demand of 45.5 MGD, currently is not being used.

Three future restrictions to groundwater usage were identified: Subsidence District limitations in Fort Bend County; upcoming water quality regulations; and unquantified restrictions on increases in groundwater withdrawals in Brazoria County. The Fort Bend Subsidence District will limit groundwater pumping in Fort Bend County. A review of finished water quality data concluded that the upcoming Arsenic Rule may limit the ability of some water suppliers in Brazoria County to continue to deliver water using their current sources and infrastructure.

Table 3-9 summarizes the maximum available supplies by WUG based upon the current groundwater infrastructure, existing surface water contracts, Subsidence District limitations, and water quality limitations.

TABLE 3-9 **SUMMARY OF TOTAL MAXIMUM DAY AVAILABLE WATER SUPPLIES BY PLANNING HORIZON AND WATER USER GROUP**

Water User Group (WUG)	Current Well Capacity (MGD)	Surface Water Contract Amount (MGD)	Contract Ending Year	Well Capacity Loss Due to Arsenic Rule (MGD)	Subsidence Rules (Max Withdrawal as % of Demand) [10]	Total Available Capacity (MGD)					
						2010	2020	2030	2040	2050	2060
Alvin	7.10					7.10	7.10	7.10	7.10	7.10	7.10
Angleton	1.44	1.80	2027			3.24	3.24	1.44	1.44	1.44	1.44
Arcola	0.34				60% in 2013; 30% in 2025	0.80	0.75	0.69	0.75	0.82	0.91
Bailey's Prairie	0.17					0.17	0.17	0.17	0.17	0.17	0.17
Brazoria	0.00	0.30	2027			0.30	0.30	0.00	0.00	0.00	0.00
Brazoria County MUD 1	0.00	2.10	2040			COP	COP	COP	COP	COP	COP
Brazoria County MUD 2	6.13	(4.39)*	2040			COP	COP	COP	COP	COP	COP
Brazoria County MUD 3	0.00	1.14	2040			COP	COP	COP	COP	COP	COP
Brazoria County MUD 4	0.02					0.02	COP	COP	COP	COP	COP
Brazoria County MUD 5	2.36					COP	COP	COP	COP	COP	COP
Brazoria County MUD 6	0.05	1.14	2040			1.19	COP	COP	COP	COP	COP
Brazoria County - Other	28.61	0.40	2027	3.97		25.04	25.04	24.64	24.64	24.64	24.64
Brookside Village	0.48					0.48	0.48	0.48	0.48	0.48	0.48
Clute	0.75	1.00	2027			1.75	1.75	0.75	0.75	0.75	0.75
Danbury	0.88			0.88		0.00	0.00	0.00	0.00	0.00	0.00
Fort Bend County MUD 2	3.74				60% in 2013; 30% in 2025	3.74	2.53	2.11	2.07	2.06	2.06
Fort Bend County MUD 23	2.49				60% in 2013; 30% in 2025	2.49	1.75	2.10	2.74	3.58	4.54
Fort Bend County - Other	3.15	(0.90)*	Variable		60% in 2013; 30% in 2025	7.40	12.44	15.08	19.84	28.33	34.74
Freeport	0.00	2.00	2027			2.00	2.00	0.00	0.00	0.00	0.00
Hillcrest Village	0.55					0.55	0.55	0.55	0.55	0.55	0.55
Holiday Lakes	0.55					0.55	0.55	0.55	0.55	0.55	0.55
Iowa Colony	0.20					0.20	0.20	0.20	0.20	0.20	0.20
Jones Creek	0.62					0.62	0.62	0.62	0.62	0.62	0.62
Kingsbridge MUD	2.59				60% in 2013; 30% in 2025	2.59	2.23	2.38	2.87	3.56	4.35
Lake Jackson	4.40	2	2027			6.40	6.40	4.40	4.40	4.40	4.40
Manvel	5.60					5.60	5.60	5.60	5.60	5.60	5.60
Meadows Place	5.43				60% in 2013; 30% in 2025	5.43	2.48	2.07	2.05	2.04	2.04
Missouri City	39.28	15.12	None		60% in 2013; 30% in 2025	54.40	58.20	59.70	67.02	72.26	84.15
Oyster Creek	0.43	0.10	2027			0.52	0.52	0.43	0.43	0.43	0.43
Pearland	15.85	16.00	None			47.98	48.05	48.05	48.05	48.05	48.05
Richwood	0.37	0.24	2027			0.60	0.60	0.37	0.37	0.37	0.37
Sienna Plantation MUD 2	0.00	1.00	Prior to 2010		60% in 2013; 30% in 2025	COMC	COMC	COMC	COMC	COMC	COMC
Stafford	16.22	10.24	None		60% in 2013; 30% in 2025	26.08	17.63	17.73	19.60	22.12	24.99
Sugar Land	45.55	20.04	None		60% in 2013; 30% in 2025	65.59	47.19	42.33	42.22	42.22	42.22
Surfside	0.90			0.90		0.00	0.00	0.00	0.00	0.00	0.00
Sweeny	1.90					1.90	1.90	1.90	1.90	1.90	1.90
Varner Creek Utility District	1.87					1.87	1.87	1.87	1.87	1.87	1.87
West Columbia	2.07					2.07	2.07	2.07	2.07	2.07	2.07

** Contracted supplies in parenthesis indicate water sold, i.e., the net water balance for that WUG is negative.*

[10] In Fort Bend County, the available groundwater was determined by maximizing the amount of groundwater that could be used while still meeting the Fort Bend Subsidence District Rules. In some cases, this resulted in drilling new wells.

Section 5
Basis of Water Pricing and Economic Analysis

A number of unit costs and pricing assumptions are common to many of the cost estimates presented in the following sections of this report. Section 5 presents the unit costs used and pricing assumptions made for comparing proposed desalinated water supply versus conventional surface and groundwater supply and treatment. Prices are given in current year (2004) dollars unless otherwise indicated.

Where possible, capital and operating cost information was obtained from other local and regional projects. Otherwise, information was selected based on best professional judgment.

5.1 Plant Pricing

5.1.1 Desalinated Water

Poseidon Resources Corporation, a private developer and owner of water infrastructure that focuses on seawater desalination, has proposed designing, building financing, owning, and operating the seawater desalination water treatment plant within the confines of The Dow Chemical Company near Freeport, Texas. Although the unit cost information and assumptions internal to Poseidon are considered confidential, Poseidon has provided indicative finished desalinated water unit capacity and commodity charge estimates for various rated plant capacities. Table 5-1 shows the finished desalinated water cost estimates provided by Poseidon. The table also presents commodity charges for the proposed facility when operated using either raw Brazos River water or seawater from the Dow seawater intake system. Poseidon proposes to operate the plant using river water during times of excess flow to minimize delivered costs, especially in the short term. For the purposes of this study, an average of these two commodity charges was used, as shown in Table 5-1.

TABLE 5-1 DESALINATED WATER CAPACITY AND COMMODITY COSTS

Rated Capacity (MGD)	Capacity Charge for First 30 Years	Capacity Charge After 30 Years	Seawater Commodity Charge	River Water Commodity Charge	Average Commodity Charge
10	$1.78	$0.89	$1.10	$0.72	$0.91
15	$1.70	$0.85	$1.11	$0.72	$0.92
25	$1.42	$0.71	$1.07	$0.68	$0.88
50	$1.21	$0.61	$1.05	$0.66	$0.86
100	**$1.21**	**$0.61**	**$1.05**	**$0.66**	**$0.86**

The costs presented in Table 5-1 are all-inclusive. These costs incorporate expenditures associated with project development, permitting, financing, construction, start-up, administration, and long-term operation and maintenance. The costs for a 100 MGD plant (indicated above in bold face) are shown as the same unit costs as a 50 MGD plant. This is because there are no anticipated additional economies of scale realized above 50 MGD. The feasibility of a 100 MGD facility has not been confirmed. Site limitations could prohibit development of a plant this large.

The total unit cost of water is a sum of the capacity and commodity charges.

The capacity charge is intended to recover all fixed costs associated with the development, construction, and operation of the desalination plant of a certain rated capacity. This charge is a function of the rated plant capacity, rather than the actual desalinated water flow produced by the plant at any given time; due to economies of scale, the rate decreases significantly as the plant rated capacity increases. Under the financing Poseidon currently plans for the plant, the capacity charge associated with an initial capital expenditure would decrease by 50 percent 30 years after the initial capital expenditure. This was incorporated into the planning level costs presented in this study.

The commodity (variable) portion of the water cost accounts for expenses associated with water plant operations that are proportional to the desalinated water flow actually produced (e.g., energy, chemicals, etc.). Table 5-1 lists a commodity charge for the desalination facility when it is treating seawater and when it is treating river water. Although the unit commodity charge also decreases with the rated plant capacity, the economies of scale associated with this charge are significantly smaller because the unit price of commodities such as chemicals or power is significantly less dependent on or even independent of the actual amount of the commodity produced. For example, the unit cost of power ("power tariff") remains the same, regardless of the actual amount of power used.

The proposed facility will be capable of running in either a full seawater or full river water mode to take advantage of the economics of the lower salinity source water in the Brazos River. This concept of "scalping" river water is a form of natural economic subsidy when river water is available to the Dow canal system, while still providing a drought proof water supply. The proposed plant site location (near the river's discharge to the Gulf) also makes scalping excess flow an attractive option. The economic advantage of treating river water is apparent from reviewing the commodity charge for treating seawater and the commodity charge for treating surface water from the Brazos River. The study used the average of the seawater and river water commodity charges shown in Table 5-1.

The proposed desalination plant includes:

- Separate river water and seawater intakes, providing flexibility to use seawater, river water, or any mixture of the two influent sources to produce potable water;
- Enhanced sedimentation facilities for high turbidity influent;
- Two-stage granular media filtration or single-stage membrane filtration pretreatment system;
- A single-stage RO system; and
- Facilities for finished water conditioning, disinfection and storage, and solids and concentrate handling and disposal.

The finished water produced by the desalination plant will meet all primary and secondary Safe Drinking Water Act standards and have a concentration of total dissolved solids at 350 to 400 mg/L. The desalination infrastructure is sized for a combination of maximum and average day demands. The demand scenarios used to design the desalination infrastructure are presented in Section 4.

In general, the desalination infrastructure was sized based on average day demands, with desalinated water being delivered at or near a constant daily and seasonal rate. Such plant operations were assumed to minimize the costs associated with desalinated water transmission facilities and plant operations. Demands above the desalinated water plant capacity would be met by either surface water or groundwater wells. A more detailed review of the operational assumptions made as part of this study is found in Section 4.1.

5.1.2 Surface Water

To benchmark the cost of providing finished desalinated water, surface water treatment and delivery alternatives were developed that meet the projected water needs for water deficits identified in Option 1.

The following general pricing values were used in the cost calculations:

- **Capital Costs**

  Expansion or construction of plants is estimated at $1.50/gallons per day (gpd). This price is a conservative average for construction of a conventional treatment plant with UV disinfection, a likely requirement for meeting the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). It was assumed that conventional treatment with UV will meet future water quality requirements. If membrane treatment is required to fully meet future drinking water standards, capital and O&M costs will be higher than the conventional treatment with UV, which was assumed adequate as part of this study.

- **Operations and Maintenance (O&M) Costs**

  O&M costs for future surface water provisions are estimated at $0.60/1000 gallons (1000 gallons = kGal). This cost is assumed to include O&M for plant pump stations and pipelines.

  O&M costs for treated surface water from the City of Houston are established at $0.58/kGal. Pumping O&M costs were determined based upon hydraulic modeling and unit electrical costs.

- **Administrative Fee**

  Consistent with most municipalities, a six percent administrative fee was added to the overall unit costs (including capital and O&M) calculated for providing treated surface water and groundwater to customers.

Water treatment system sizing for municipal water systems is typically based on maximum day demand (MDD). Based on previous water supply planning studies for this area, the surface water plants are assumed to be base loaded and sized to provide approximately an average day demand, depending on an individual entity and its other available water supplies. Demands in excess of the surface water plant capacities would be met by either desalinated water or groundwater wells.

5.2 Pipeline Pricing

Unit pipeline costs were taken from two reports:

- City of Houston/Water Production Optimization Strategy (CDM, Oct 2002); and
- City of Houston/Collaborative Strategic Plan for a Regional Water Distribution System (CH2M Hill, Sept 2001).

The costs per linear foot (LF) of installed pipe as referenced in the above studies are indicated in Table 5-2. Several prices were interpolated based upon engineering judgment; those are indicated in bold type. While these prices are based on data developed in 2001 and 2002, they are considered indicative of current day prices for this geographic area.

TABLE 5-2 UNIT PRICES FOR INSTALLED PIPE

Pipe Diameter (inches)	Cost ($/LF)
8	**60**
12	90
16	130
20	165
24	210
30	280
36	340
42	405
48	475
54	555
60	635
66	**715**
72	**795**
84	955
96	1125

These local unit costs are slightly high relative to other geographic areas. However, a number of difficult pipe crossings were not specifically included in the final cost estimate and some of the proposed piping would be rated at a high pressure. It should be noted that these unit costs are considered relatively conservative and lower unit pipe costs might be achieved in the study area.

5.3 Cost of Water

5.3.1 Contracted Treated Water

The City of Pearland currently purchases wholesale treated water from the City of Houston. The current wholesale rate to purchase treated water from the City of Houston is $1.38/kGal.

The Brazosport Water Authority sells water to its customers – the cities of Angleton, Brazoria, Clute, Freeport, Lake Jackson, Oyster Creek, Richwood, and the Texas Department of Criminal Justice – at a rate of $1.58/kGal.

5.3.2 Raw Water

Based on information provided by the City of Pearland, the cost to provide groundwater for all customers in the area was estimated at $0.49/kGal. This includes amortized capital expenditures, operations, and upgrades as necessary.

The Brazos River Authority (BRA) sells water to various entities in the study area through surface water contracts. The current rate is $45.75/acre-foot. The BRA is currently conducting a cost of service study and anticipates that there will be modest annual increases in the raw water price. Assumptions for these increases are included in the financial analysis contained in this study. These rate increases are a result of the cost of service for additional system infrastructure to meet anticipated needs of the basin, such as construction of the Allen's Creek Reservoir.

Finally, the GCWA has option contracts with several customers in the study area. Following are estimated rates of points when those contracts convert to take-or-pay contracts, the rates are estimated to be:

- 2004 - $22.80/acre-foot[1]
- 2011 - $29.33/acre-foot[2]
- 2023 - $35.84/acre-foot[2]

5.4 Cost of Storage

For certain take points (as detailed in Section 6 and 7), ground storage is considered as part of the water conveyance system. In general, the size of the ground storage tank is assumed to be equal to one-half of the average daily demand on the delivered water. This tank-sizing criterion is conservative and more than the TCEQ minimum for system ground storage.

The cost of storage was assumed to be $0.50/gallon of installed capacity.

5.5 Cost of Pump Stations

Pump stations were sized to deliver the design capacity of the desalination facility or surface water treatment facilities. Pump station capital costs were computed based on a unit cost of $0.15/gallon-per day. This value was taken from recent bids on high service pump stations of similar capacity. When additional pumping capacity is added to the pump stations, it is assumed that the additional capacity is added at a unit cost of $0.06/gallon-per day. Again, this value is taken from recent bids on pumps added to existing pump stations.

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[1] Sugar Land 2003 Surface Water Feasibility Study
[2] May 2004 draft Tri-Entity Surface Water Study, prepared by LAN for WCID No. 2, Sugar Land, and Missouri City.

5.6 Cost of Electricity

Electrical costs are computed separately for all pumping operations. The cost of electricity used in the study is $0.07/kwh.

5.7 Economic Analysis

Capital costs were amortized over 30 years. Based on typical plant schedule of values, it was assumed that rotating equipment (e.g., pumps and clarifiers) makes up approximately 30 percent of the total capital cost of treatment plants. It was further assumed that rotating equipment would require replacement every 20 years; thus rotating capital costs were amortized over 20 years.

Current competitive bond rates obtained from First Southwest Co. for fully insured, non-Qualified Tax Exempt Obligation (QTEO) retail utility revenue bonds are as follows:

- 30-year bond: 4.87%
- 20-year bond: 4.36%

The annualized present worth factors (A/P) for these 30-year and 20-year bonds are 0.06409 and 0.07595, respectively. In comparison, the A/P factor for a state tax exempt bond through the TWDB (22 years at 4.98 percent) is 0.07583.

In order to use the market interest rates quoted above to perform necessary financial analyses, the rates must be converted to real interest rates by removing the inflation rate. The inflation rate recommend by the U.S. Office of Management and Budget is two percent.[3] Removing the effect of inflation gives the final discount rates used in this study:

- 30-year bond: 2.87%
- 20-year bond: 2.36%

Finally, a 1.5 percent administrative fee was added to all costs for providing desalinated water to cover the BRA management and oversight costs.

[3] http://www.whitehouse.gov/omb/circulars/a094/a094.html

Section 6
Plan for Providing Desalinated Water

Section 4 presented four water deficit options; Section 6 analyzes how desalinated water produced at the proposed site location in Freeport could be used to meet the deficits for each option. Factors considered in these analyses include the proposed pipeline alignment and take points selected for delivery of finished desalinated water. For each water deficit option, a hydraulic analysis was conducted to determine the conveyance facilities necessary to deliver the finished desalinated water, including a finished water pumping station, pipelines, storage tanks, and booster station.

As a water supply, desalinated water has multiple advantages over existing supplies including, but not limited to, the following:

- Desalinated water is a drought-proof, reliable water supply;
- Desalinated water is of high quality, surpassing most drinking water quality standards;
- Desalinated water adds diversity to water supplies, which helps areas better manage subsidence; and
- Desalinated water supports industrial activities by:
  - ✓ reducing demand on existing surface water supplies;
  - ✓ providing a large source of high purity water for industries requiring high quality water; and
  - ✓ expanding local drinking water supplies, which enables healthy community growth.

The proposed Freeport Seawater Desalination Project has additional unique advantages over and above those mentioned above. The project is proposed as a public-private partnership between the Brazos River Authority (BRA) and Poseidon resources. Poseidon has a wealth of experience in designing, financing, building, and operating seawater desalination plants. The public-private relationship also leverages the private sector capital for a public good, allowing flexibility to adapt to rapidly changing technology of the project and shifting part of the performance risk to the private sector.

6.1 Proposed Desalination Treatment Plant

The 10 MGD Freeport Seawater Desalination Project will be a reverse osmosis (RO) membrane water treatment facility located within The Dow Chemical Company industrial complex in Freeport, Texas on a proposed 10-acre greenfield site known as Oyster Creek East. The desalination plant will withdraw Gulf Coast seawater from the existing seawater intake system known as A801 across from the Port of Freeport or raw Brazos River water from the Dow water canal system, produce high-quality potable drinking water for transmission to the BRA's proposed water conveyance system, and discharge the twice-concentrated seawater into the existing permitted Dow Freeport discharge canals and outfall No. 001 for dilution and discharge to the lower reach of the Brazos River and then

into the Gulf of Mexico. The initial 10 MGD phase will have the capability to expand to 50 MGD in subsequent phases.
The point of interconnection (delivery point) of the desalination project with the BRA is at the Dow Freeport plant boundary line near State Road 523 and 322 north of the greenfield site in Oyster Creek. The BRA will be responsible for the permitting, design, construction and installation of the product water pump stations and pipeline connecting the desalination plant to the respective distribution systems in Brazoria and/or Fort Bend counties.

The proposed site offers the unique advantages of accessibility to:

- Raw seawater and Brazos River water through the Dow canal system;
- Existing brine disposal infrastructure and permit [1]; and
- Electrical power at wholesale rates.

These unique features of the Freeport project result in significant cost savings and would allow for relatively rapid construction of a demonstration seawater desalination plant.

6.1.1 Water Sources

Source water for the desalination project will be lifted from the inland water way adjacent to the Port of Freeport and conveyed via a new lift station on an existing canal distribution system within the Dow Plant A complex. The desalination project will have two intakes: one for seawater and one for raw water from Dow's canal system off the Brazos River. Depending on the availability of surface water from the Brazos River and any potential minimum instream flow (MIF) restrictions, the plant will operate either on seawater or river water. Raw feed water will be pumped from the seawater and river water intake structures alongside the respective canal systems within Plant A and conveyed under the Dow Barge Canal through large diameter pipes to the proposed desalination plant site. The capacity of the desalination facility is incrementally increased from 10 MGD to 50 MGD depending on the option and the water demands in that option. The capacity of the desalination facility for each year and for each option is provided in Appendix G. For the 10 MGD scenario, the desalination plant will divert 22 MGD of seawater. Under a river water production mode, the facility will divert 19 MGD for production of potable water. To prevent growth of marine organisms in the seawater and freshwater intake systems, these systems will be equipped with provisions for disinfecting the raw water using chlorine.

6.1.2 Pretreatment System

Because the seawater and the river are high in suspended solids, the pretreatment system will include a combination of high-rate sedimentation followed by either two-stage gravity sand-media filters or membrane filtration systems. Chemical feed systems for addition of coagulant, such as ferric chloride or ferric sulfate, and for filter polymer feed are included to enhance the operation of both the high-rate sedimentation process and the filters as needed to provide the required quality and quantity of water to the RO process. There are a variety of filtration systems and technologies

[1] In February 2004, the Texas Commission on Environmental Quality (TCEQ) modified Dow's existing seawater withdrawal permits to include industrial and potable municipal uses.

available that can meet the feed water requirements the RO process. The preferred pretreatment filtration technology to be used will be determined during the design phase of the project.

The final phase of pretreatment will be cartridge filtration. The filter cartridges will be industry standard 5-micron polypropylene wound filters housed in pressure vessels. These pressure vessels will be located in the RO feed water piping between the pretreatment and RO processes.

Intake Water Chlorination/De-Chlorination

The source water-seawater or Brazos River water will be chlorinated intermittently to minimize microbiological growth on the filter media. Any chlorine remaining in the filter effluent water can damage the RO membranes due to membrane oxidation. To protect the RO system, the pretreatment filter effluent will be de-chlorinated using sodium bisulfite.

Intake Seawater pH Adjustment

The RO feed water would be treated with sulfuric acid as necessary to reduce the potential for scale formation in the RO process. The specific amount of acid will be determined based on the allowable concentration of sparingly soluble salts and Stiff & Davis Index (S&DI) of the RO concentrate. Addition of acid also creates carbon dioxide in the RO permeate (product water) which is needed to react with the lime to stabilize the product water in the permeate post-treatment process.

6.1.3 Reverse Osmosis (RO) Treatment Facilities

The RO treatment process will incorporate a single-pass design using industry standard 8-inch diameter, high-rejection seawater membrane elements. The RO treatment system will separate the pretreated and conditioned intake seawater in two streams: permeate, which is desalinated water of low salinity (350 to 400 mg/L of total dissolved solids), and concentrated seawater with salinity nearly two times higher than the intake seawater salinity (typically up to 66,000 mg/L TDS).

For the 10 MGD scenario, the RO system will consist of six, each with process trains, a design capacity of about 2.0 MGD. The facility will be designed to produce 10 MGD of potable water using five RO trains only. The sixth RO train will be provided as a standby to be used when any of the other trains undergoes maintenance/upkeep activities. This arrangement provides for approximately 20 percent standby capacity, which will ensure continuous water delivery with normal membrane wear and maintenance requirements.

Each RO train will be designed to operate independently from the other RO trains. A representative train feed pump will consist of a combination of low-pressure pretreatment filter transfer pump, followed by a high-pressure pump in series. The low-pressure transfer pumps will convey water from the pretreatment filter effluent wetwell to the suction pipe of the high-pressure RO pumps, which in turn will pump the filter effluent through the RO membranes. Each dedicated pump system will deliver water at feed pressures ranging from 600 to 950 psi. If a blend of fresh and seawater is used, the feed pressures and associated power use will be lower. The actual feed water pressure depends on several factors, including temperature and salinity of the intake water and the age of the membranes, but could be as low as approximately 250 psi. The low-pressure filter effluent transfer pumps will be equipped with variable frequency drives to improve energy efficiency and to provide pressure control over a wide range of feed water quality and membrane conditions. A large amount of residual pressure resides in the concentrated seawater leaving the RO process. To further improve energy efficiency, the high-pressure pumps will be equipped with energy recovery devices.

Ancillary RO support equipment will include a membrane clean in-place (CIP) system, which allows in-situ cleaning of each membrane array, and a system flush tank to remove high TDS feedwater from the feed/brine channel of the membrane elements during shutdown operations.

The facility will be equipped using state-of-the art control architecture for supervisory control and data acquisition (SCADA). Instrumentation and controls systems will utilize a combination of programmable logic controllers (PLCs) and integrated operator interface consoles (OICs) located in the plant operations control room.

A process schematic of the proposed RO facility at Freeport is shown as Figure 6-1.

6.1.4 Post-Treatment Facilities

Product water from the RO process (permeate) requires chemical conditioning for stabilization before it can be delivered to the distribution system. Stabilization will be accomplished by increasing the hardness level and reducing the permeate's corrosion potential. Lime and carbon dioxide will be used for this purpose. The product water also will be disinfected prior to delivery to the BRA distribution system. Chlorine, in the form of sodium hypochlorite, will be added as a disinfectant to meet all applicable product water quality standards and regulations for potable water disinfection. Ammonia also may be added if product water chloramination is required to match existing disinfection practices.

6.1.5 Product Water Storage Tank and Pump Station

The plant on-site product water storage and transfer facilities will include:

- One product water pump station;
- One 2.5 million gallon permeate storage reservoir; and
- One flow quantification meter and water quality sampling station at the point of delivery located at the Dow property fence line/delivery point.

The product water pump station will be equipped with three pumps (two duty and one standby) equipped with high-efficiency motors. All of the pumps will have average/maximum unit capacity of 5 MGD/6 MGD and their motors will be controlled by constant speed drives. The pumps are high volume/low pressure units designed to deliver product water at the desalination plant boundary line at 15 to 20 psig.

6.1.6 Discharge

The Dow Plant A complex discharges into the Brazos River discharge point 001 within the Plant B complex northwest of the proposed site under a TCEQ approved TPDES discharge permit. Consultation with the site host indicates that sufficient flow exists to accommodate the twice concentrated seawater discharge among the existing industrial process and seawater discharge into the Brazos River leading directly to the Gulf of Mexico. Upon signing of a water purchase agreement, Poseidon will release full permitting of the seawater desalination facility for seawater and river modes.

6.2 Proposed Pipeline Alignment

Finished desalinated water must be delivered to discrete locations. However, water deficits are regional, spread across municipal boundaries. For the purposes of delivering finished water, the regional water deficits were centralized into "take points." These are locations where finished desalinated water would be transferred from the BRA's regional conveyance system to the distribution systems of local water suppliers.

This study relied upon the following information to determine take point locations and pipeline alignments:

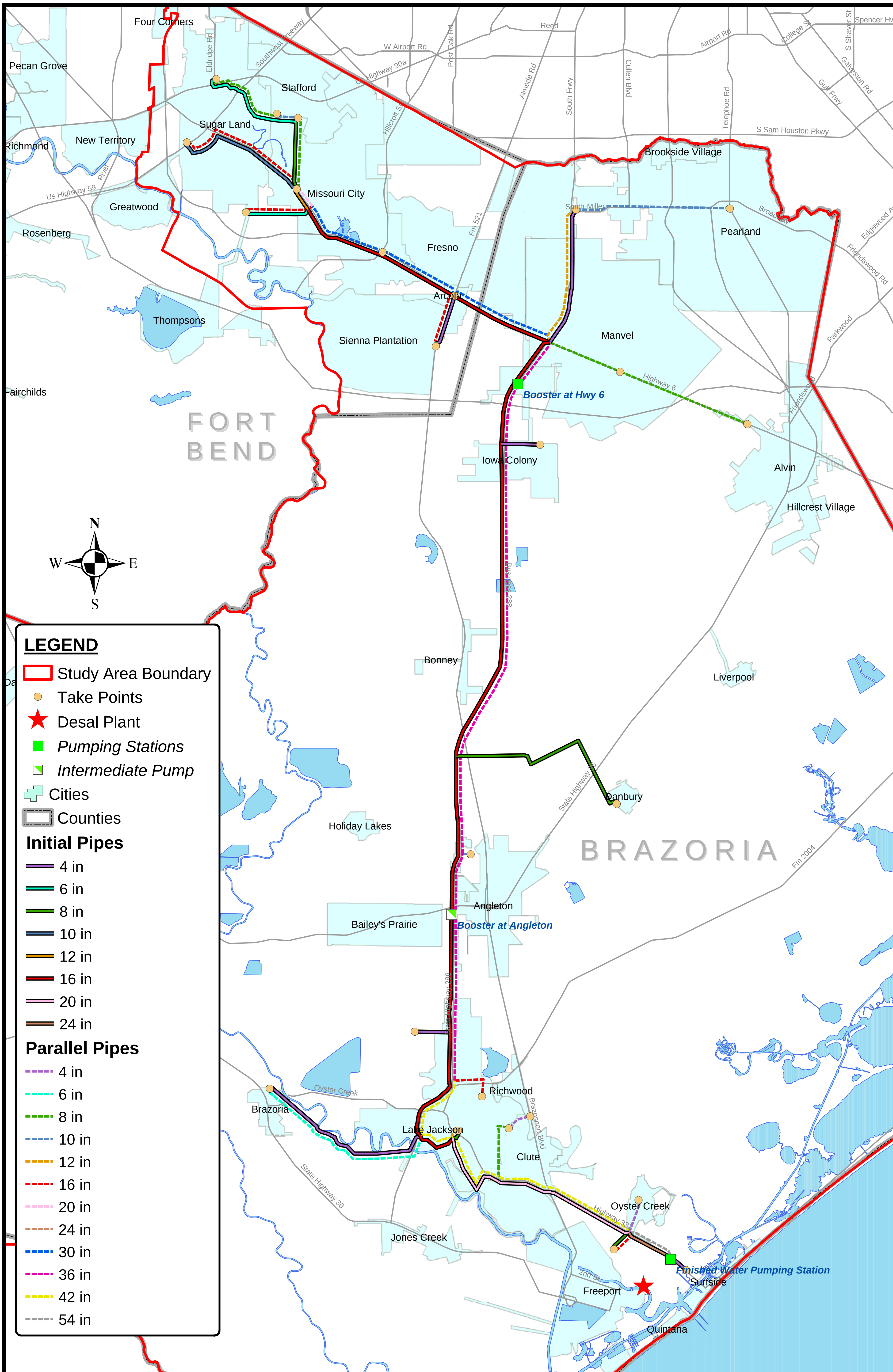
- *Regional Surface Water Plant Feasibility Study for Brazoria, Fort Bend, and West Harris Counties* (2000), published by the TWDB and the GCWA;
- *Regional Surface Water Plant Feasibility Study for Mid-Brazoria County Planning Group* (2000), published by the TWDB and the GCWA;
- Brazosport Water Authority water distribution system map; and
- Communication with individual public water suppliers.

Depending on each community's needs and the attributes of its distribution system, the study defined one or more take points for each major water user group (WUG). Delivering water to a location within the boundaries of every WUG demonstrating a deficit would be cost-prohibitive. Consequently, smaller WUGs are associated with the take points for adjacent larger groups. Figure 6-1 shows the locations of each take point and the proposed pipeline alignment.

Table 6-1 summarizes these associations and indicates the locations and names of the take points used in this study. In general, these associations were determined based upon proximity. The take point associations between Pearland and Brazoria County MUDs 1-6 are based upon planned annexations. The take point associations between Missouri City and Sienna Plantation are also based upon planned annexations.

Those WUGs that did not demonstrate a deficit through 2060 were not analyzed for water delivery options, and take points were not defined for them. In addition, although some WUGs were grouped into centralized take points, water capacities, demands, and deficits were calculated separately, not shared across WUG boundaries.

AUSSVR1\GIS\BRA\TWDB\FIGURES\Fig6-1.mxd 8/26/2004



THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

CDM

0 1 2 4 Miles

CONVEYANCE FACILITIES FOR OPTION 1

FIGURE 6-1

TABLE 6-1 **TAKE POINTS**

Take Point	Associated WUGs	Location
Alvin	Alvin	Highway 6 at Cardinal Drive
Angleton	Angleton	Henderson Road west of Highway 288
Arcola	Arcola	Highway 6 at FM 521
Brazoria	Brazoria	Red Oak Street near Laurie Lane
Clute	Clute	Oyster Creek Driver at Juniper Street
Danbury	Danbury	Avenue L at 5th Street
Freeport	Freeport	Baldwin Road south of Highway 288
Future MUD	Fort Bend County - Other	Cabrera Drive west of Oilfield Road
Iowa Colony	Iowa Colony	Airline Road No 3 at CR 65
Lake Jackson North	Lake Jackson	Beechwood Street near Dogwood St
Lake Jackson South	Lake Jackson	Oak Drive north of Highway 288
Missouri City Quail Valley	Missouri City	Highway 6 at FM 1092
	Fort Bend County MUD 23	
	Sienna Plantation MUD 2	
Missouri City Sienna Plantation	Missouri City	Knight Road at Highway 6
	Fort Bend County MUD 23	
	Sienna Plantation MUD 2	
Missouri City South & Future MUD	Missouri City	North of Scanlan Road on FM 521
	Fort Bend County MUD 23	
	Sienna Plantation MUD 2	
	Fort Bend County - Other	
Oyster Creek	Oyster Creek	Oyster Creek Bend Rd near Hays Dr
Pearland West	Brazoria County MUD 1-6	Broadway Street at Smith Ranch Road
	Brookside Village	
	Pearland	
Pearland East	Brazoria County MUD 1-6	Broadway Street at Main Street
	Brookside Village	
	Pearland	
Richwood	Richwood	Brazosport Blvd near College Blvd
Stafford/WCID No. 2 Site B	Stafford	Between Oakdale Drive and FM 1092
	Meadows Place	
Stafford/WCID No. 2 Ave E	Stafford	Avenue E at Brand Lane
	Meadows Place	
Sugar Land First Colony	Sugar Land	First Colony Blvd at Southwest Pkwy
	Fort Bend County MUD 23	
	Kingsbridge MUD	
	Fort Bend County - Other	
Sugar Land Lakeview	Sugar Land	Lakeview Drive at Eldridge Road
	Fort Bend County MUD 23	
	Kingsbridge MUD	
Surfside	Surfside	Highway 332 west of Casco Road
Future MUD	Fort Bend County - Other	Cabrera Drive west of Oilfield Road

It is cost prohibitive to deliver desalinated water to all areas that demonstrate a water deficit. A WUG can take advantage of piped-in desalinated water only if it has the ability to distribute the water to its customers. Consequently, areas that currently do not have centralized distribution systems or do not plan on developing such systems were not considered for delivery of desalinated water. The total deficit for which desalinated water was not considered for delivery is approximately 1 MGD.

Although the area immediately south of Sugar Land and southwest of Missouri City currently does not have a centralized distribution system, the high growth here is likely to result in development that includes centralized water distribution. Consequently, a take point was established to serve this area, termed "Future MUD" in this study.

6.3 Hydraulic Analysis

Hydraulic criteria and limitations were established in order to determine the necessary size and associated costs of the proposed finished desalinated water conveyance system. Table 6-2 summarizes the pressure and velocity criteria used to size the proposed water delivery system. Some exceptions to these criteria were allowed under special circumstances. These exceptions are discussed by option in Table 6-3.

The study assumes that finished desalinated water will be boosted from approximately 20 psi leaving the water treatment plant to 300 psi at a finished water booster station located within reasonable proximity to the plant. Booster pumping stations are required when the pressure in the transmission system drops below 20 psi.

TABLE 6-2 HYDRAULIC CRITERIA

Parameter	Minimum	Maximum	Optimal
Velocity (ft/s)	2	9	5.5
Pressure (psi)	20	300	NA

TABLE 6-3 EXCEPTIONS TO HYDRAULIC CRITERIA

Pipe Segment	Planning Horizon	Take Point Served	Options	Model Result (ft/s)	Reason for Exception
Airline Rd No. 3 from Hwy 288 to CR 65	2025	Iowa Colony	1-5	0.62	Min. pipe size recommended is 4"
Hwy 288 from Hwy 6 to Broadway Ave	2025	Pearland West	1, 2, & 5	0.87	Min. pipe size recommended is 4"
Brazos River Rd from FM 2004 to Brazoria	2060	Brazoria	1 & 3	1.88	Min. pipe size recommended is 4"
Brazos River Rd from FM 2004 to Brazoria	2020	Brazoria	2, 4, & 5	1.2	Used BWA pipe for 2025 planning horizon
FM 523/Oyster Creek Bend Rd from Hwy 332 to Oyster Creek	2020	Oyster Creek	2 & 4	0.33	Used BWA pipe for 2025 planning horizon
College Blvd from Juniper St to Brazosport Blvd	2020	Richwood	2 & 4	0.34	Used BWA pipe for 2025 planning horizon
Dixie Dr & Oyster Creek Dr in Clute	2020	Clute & Richwood	2 & 4	1.56	Used BWA pipe for 2025 planning horizon
Hwy 288 from Lake Jackson to Angleton	2020	Angleton	2 & 4	1.51	Used BWA pipe for 2025 planning horizon

6.4 Desalinated Seawater Delivery Options

Under each water deficit option, projected deficits increase significantly from 2010 to 2060. Installing a single set of pipes and pumps to meet the projected water deficits over all planning horizons is not feasible given the range in hydraulic conditions dictated by the deficits. At the same time, it is not practicable or cost effective to install new or parallel pipes each decade. Rather, this study assumes that two parallel transmission systems are implemented: one system to meet deficits through 2020 and a parallel system to meet deficits throughout 2060.

The 2020 planning horizon was chosen as the interim planning horizon for several reasons:

- BWA contracts expire in 2027;
- The second and more stringent phase of the Fort Bend Subsidence District rules take effect in 2025; and
- Preliminary hydraulic analysis indicates that a system designed for 2030 water deficits would be too large for the 2010 demands.

A hydraulic model was configured for each water deficit option presented in Section 4. The hydraulic criteria presented in Section 6.3 were used to size pumping facilities and pipelines along the proposed alignment indicated in Figure 6-2. The hydraulic analyses for each water deficit option are discussed below. For each option, the required infrastructure and any important hydraulic details are presented.

Options 2, 4, and 5 hypothetically assume that the BWA will buy wholesale desalinated water for distribution to its customer cities. (See Section 4.2 for a more detailed discussion of these options.) For Options 2, 4, and 5, existing BWA pipelines were used in lieu of new pipelines where hydraulically feasible. It was assumed that the BWA pipelines are 100 psi pressure class pipe. It was further assumed that the BWA pipes could not be used beyond 2025. A summary of the BWA pipelines used for Options 2, 4, and 5 is shown in Table 6-4. Using existing infrastructure decreases the cost to deliver water to the customer.

TABLE 6-4 BWA PIPES USED FOR OPTIONS 2, 4, AND 5

Pipe Description	Take Point	Length (ft)	Diameter (in)
Hwy 332 at FM 523 north into Oyster Creek	Oyster Creek	7,067	8
Brazos River Rd from FM 2004 to Brazoria	Brazoria	39,389	10
From Hwy 288 at FM 2004 going east into Lake Jackson	Lake Jackson	10,012	12
From Hwy 288 at Oak Dr going north into Lake Jackson	Lake Jackson	1,706	12
From Oyster Creek Dr at Dixie Dr to Brazosport Blvd at College Blvd	Richwood	5,216	14
From Hwy 288 at Dixie Dr to Oyster Creek Dr at Dixie Dr	Clute & Richwood	13,442	14
Hwy 332 at FM 523 south into Freeport	Freeport	4,627	16
Hwy 288 from Lake Jackson to Angleton	Angleton	63,096	16-18

6.4.1 Option 1

Figure 6-2 shows the location of the infrastructure for Option 1. Table 6-5 summarizes the necessary infrastructure for Option 1. Planning level cost estimates for Option 1 are contained in Appendix G.

TABLE 6-5 TRANSMISSION FACILITIES TO MEET OPTION 1 DEFICITS

Piping	Length (feet)	
Diameter (in)	**2020**	**2060**
4	98,316	12,283
6	35,756	54,244
8	61,148	76,722
10	28,781	38,859
12	6,723	29,020
16	240,455	69,691
20	67,361	5,154
24	0	425
30	0	58,435
36	0	154,788
42	0	89,808
48	0	906
TOTAL (Inch*Diameter*Miles) [2] =	**1,261**	**2,669**
Pumping	Peak Capacity (MGD)	
Location	**2020**	**2060**
Finished Water Booster	8.2	43.3
Booster at Angleton	4.1	-
Booster Hwy 6 at Hwy 288	4.0	25.9
Total Capacity (MGD) =	**16.3**	**69.2**
Storage	Capacity (MG)	
Take Point Name	**2020**	**2060**
Alvin	0.00	0.40
Danbury	0.22	0.04
Iowa Colony	0.02	0.04
Missouri City Sienna Plantation	0.05	0.86
Missouri City South & Future MUD	0.05	1.99
Oyster Creek	0.00	0.15
Pearland West	0.02	0.84
Pearland East	0.00	0.86
Stafford/WCID No. 2 Site B	0.10	0.09
Stafford/WCID No. 2 Ave E	0.10	0.09
Sugar Land First Colony & Future MUD	1.01	2.08
Surfside	0.17	0.08
Future MUD	0.40	2.36
Total Storage (MG) =	**2.14**	**9.89**

6.4.2 Option 2

Table 6-6 summarizes the necessary infrastructure for Option 2; Figure 6-3 shows the location of the infrastructure for this option. Planning level cost estimates for Option 2 are presented in Appendix G.

[2] An inch*diameter*miles ("IDM") is the diameter of the pipe multiplied by the length of pipe in miles. This unit is used to summarize the overall amount of pipe of different diameter.

TABLE 6-6 TRANSMISSION FACILITIES TO MEET OPTION 2 DEFICITS

Piping	Length (feet)	
Diameter (in)	**2020**	**2060**
4	52,026	19,789
6	35,849	40,315
8	57,203	94,387
10	28,781	33,767
12	23,025	29,223
16	213,589	71,155
20	8,183	5,726
24	46,696	0
30	20,199	35,492
36	0	252,418
42	0	15,273
48	0	812
TOTAL (Inch*Diameter*Miles) =	1,279	2,623
Pumping	Peak Capacity (MGD)	
Location	**2020**	**2060**
Finished Water Booster	15.4	43.3
Booster at Angleton	5.3	-
Booster Hwy 6 at Hwy 288	3.5	25.9
Total Capacity (MGD) =	**16.3**	**69.2**
Storage	Capacity (MG)	
Take Point Name	**2020**	**2060**
Alvin	0.00	0.40
Danbury	0.22	0.04
Iowa Colony	0.02	0.04
Missouri City Sienna Plantation	0.05	0.86
Missouri City South & Future MUD	0.05	1.99
Oyster Creek	0.00	0.15
Pearland West	0.02	0.84
Pearland East	0.00	0.86
Stafford/WCID No. 2 Site B	0.10	0.09
Stafford/WCID No. 2 Ave E	0.10	0.09
Sugar Land First Colony & Future MUD	1.01	2.08
Surfside	0.17	0.08
Future MUD	0.40	2.36
Total Storage (MG) =	**2.14**	**9.89**

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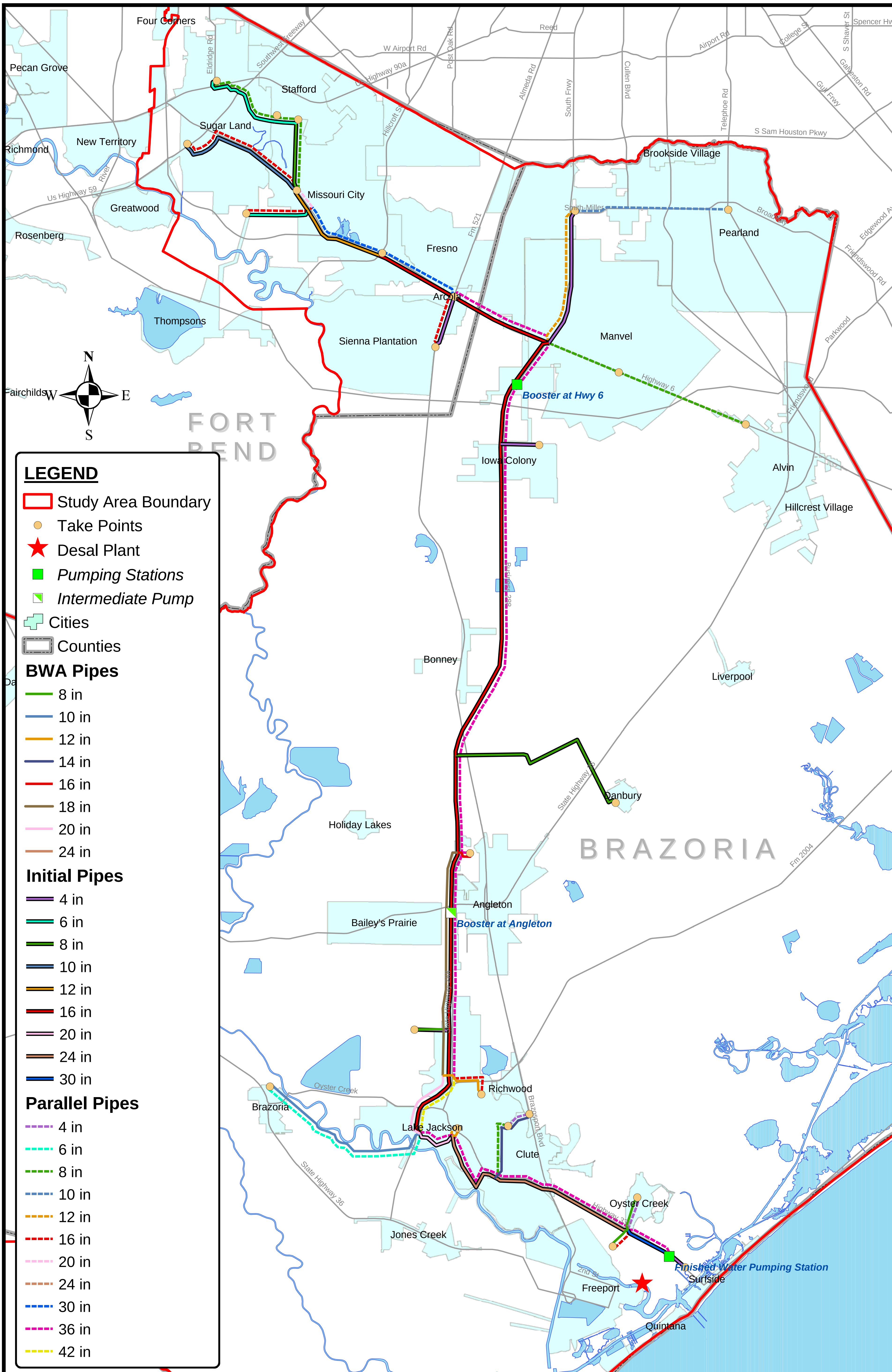

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CONVEYANCE FACILITIES FOR OPTION 2

FIGURE 6-2

6.4.3 Option 3

Table 6-7 summarizes the necessary infrastructure for Option 3; Figure 6-3 shows the location of the infrastructure for this option. Planning level cost estimates for Option 3 is shown in Appendix G.

TABLE 6-7 TRANSMISSION FACILITIES TO MEET OPTION 3 DEFICITS

Piping	Length (feet)	
Diameter (in)	**2020**	**2060**
4	57,139	12,283
6	0	38,674
8	61,979	58,840
10	39,580	2,091
12	19,313	0
16	47,799	29,979
20	143	63,029
24	39,941	32,029
30	250,213	14,495
36	21,725	34,978
42	0	35,491
48	0	22,944
54	0	8,682
60	0	236,820
TOTAL (Inch*Diameter*Miles) =	**2,153**	**4,213**
Pumping	Peak Capacity (MGD)	
Location	**2020**	**2060**
Finished Water Booster	22.8	103.6
Booster at Angleton	18.0	-
Booster Hwy 6 at Hwy 288	18.0	86.1
Total Capacity (MGD) =	**58.8**	**189.7**
Storage	Capacity (MG)	
Take Point Name	**2020**	**2060**
Alvin	0.00	0.40
Danbury	0.22	0.04
Iowa Colony	0.02	0.04
Missouri City Sienna Plantation	0.91	2.90
Missouri City South & Future MUD	0.91	4.03
Oyster Creek	0.00	0.15
Pearland West	0.91	4.95
Pearland East	0.00	5.86
Stafford/WCID No. 2 Site B	0.52	1.80
Stafford/WCID No. 2 Ave E	0.52	1.80
Sugar Land First Colony	2.19	4.44
Surfside	0.17	0.08
Future MUD	0.40	2.36
Total Storage (MG) =	6.79	28.86

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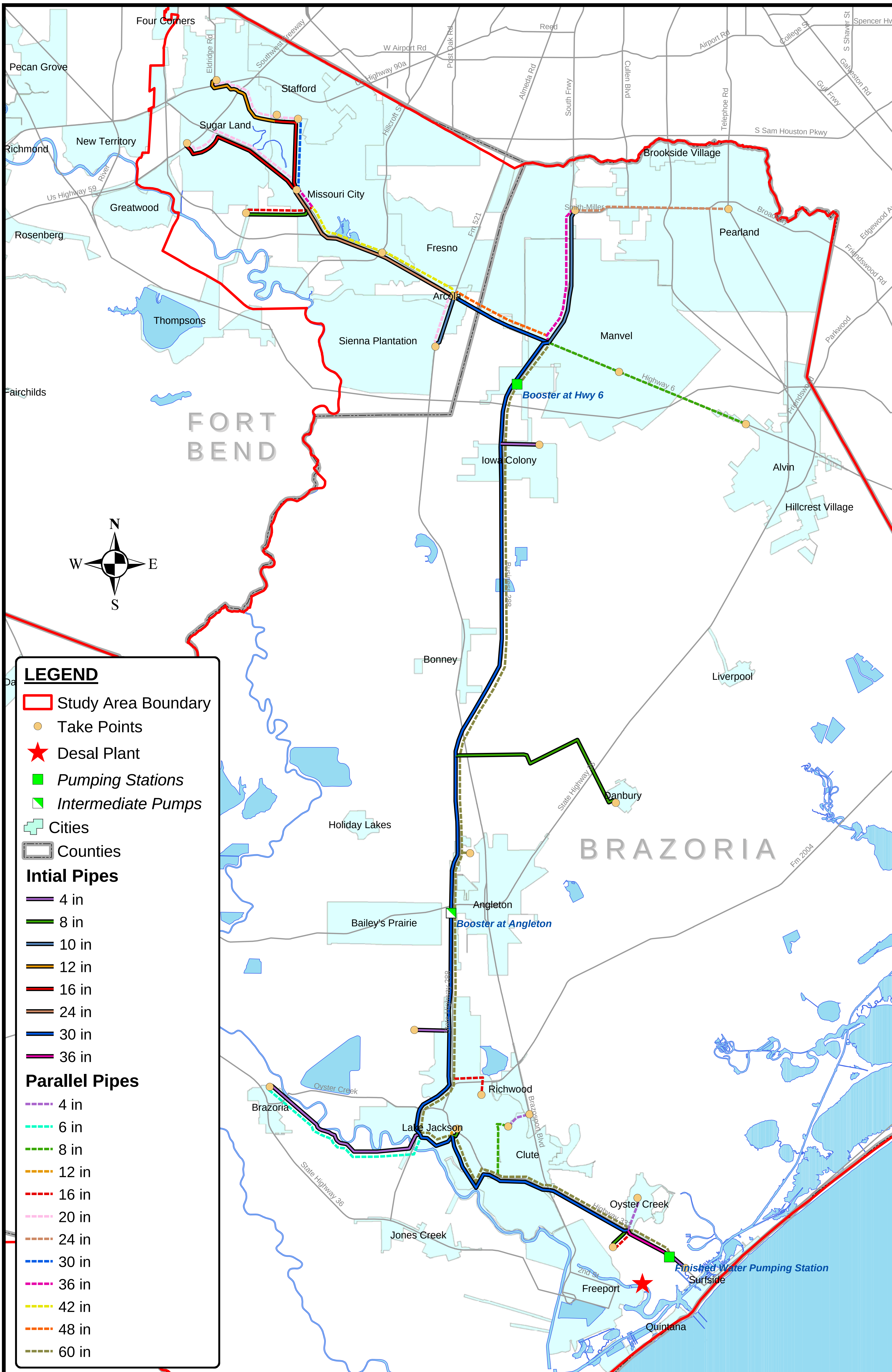

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CONVEYANCE FACILITIES FOR OPTION 3

FIGURE 6-3

0 1 2 4 Miles

CDM

6.4.4 Option 4

Table 6-8 summarizes the necessary infrastructure for Option 4; Figure 6-4 shows the location of the infrastructure for this option. The planning level cost estimates for Option 4 are shown in Appendix G.

TABLE 6-8 TRANSMISSION FACILITIES TO MEET OPTION 4 DEFICITS

Piping	Length (feet)	
Diameter (in)	**2020**	**2060**
4	11,119	19,789
6	0	39,142
8	58,127	56,944
10	39,310	2,147
12	17,647	2,087
16	47,896	47,038
20	1,010	46,356
24	39,943	31,620
30	194,863	14,495
36	53,761	29,580
42	20,199	22,969
48	0	40,735
54	0	7,004
60	0	237,783
TOTAL (Inch*Diameter*Miles) =	2,176	4,227
Pumping	Peak Capacity (MGD)	
Location	**2020**	**2060**
Finished Water Booster	28.9	103.6
Booster at Angleton	16.8	-
Booster Hwy 6 at Hwy 288	16.8	86.1
Total Capacity (MGD) =	**58.8**	**189.7**
Storage	Capacity (MG)	
Take Point Name	**2020**	**2060**
Alvin	0.00	0.40
Danbury	0.22	0.04
Iowa Colony	0.02	0.04
Missouri City Sienna Plantation	0.91	2.90
Missouri City South & Future MUD	0.91	4.03
Oyster Creek	0.04	0.12
Pearland West	0.91	4.95
Pearland East	0.00	5.86
Stafford/WCID No. 2 Site B	0.52	1.80
Stafford/WCID No. 2 Ave E	0.52	1.80
Sugar Land First Colony	2.19	4.44
Surfside	0.17	0.08
Future MUD	0.40	2.36
Total Storage (MG) =	6.83	28.82

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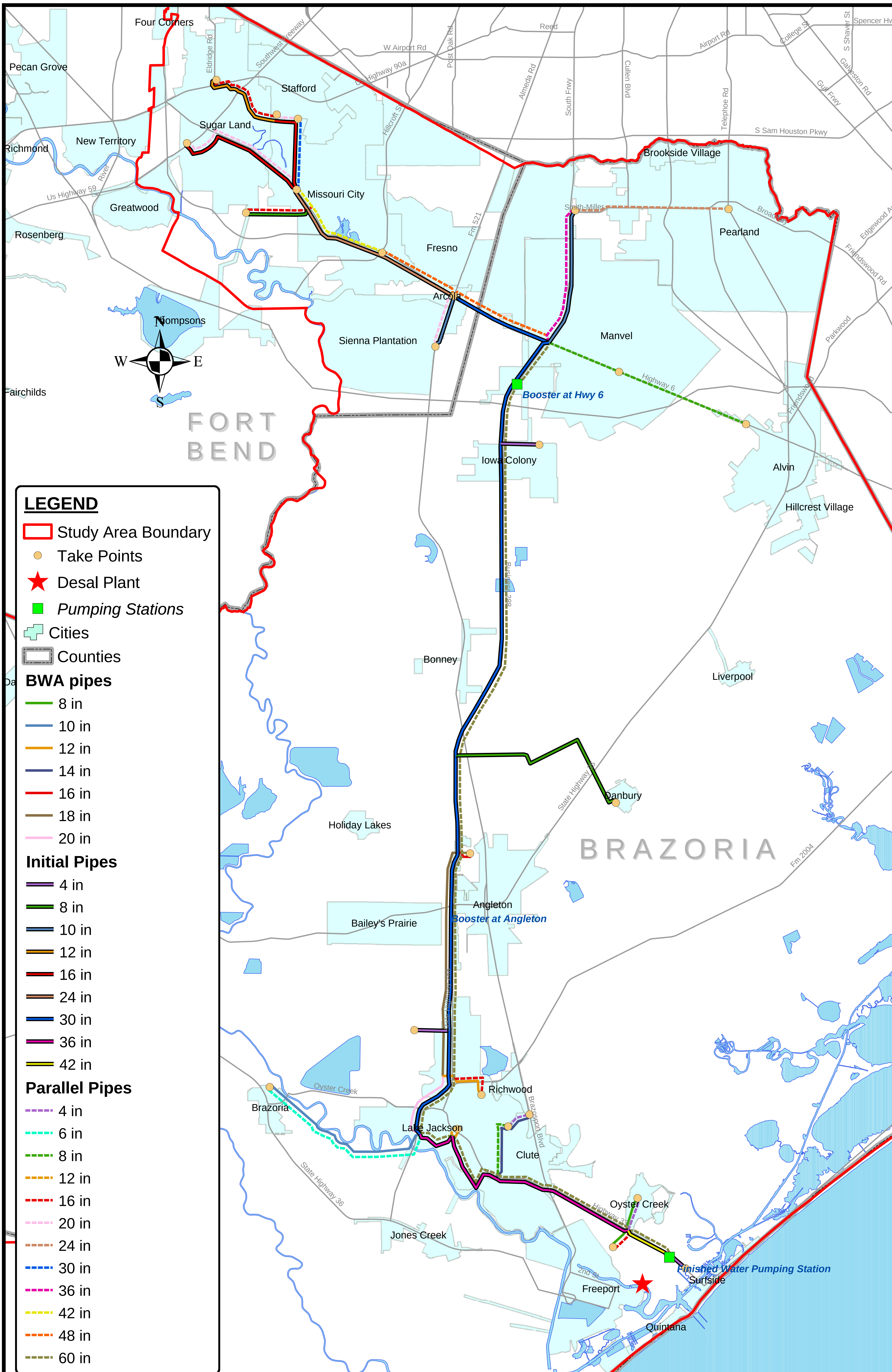

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CONVEYANCE FACILITIES FOR OPTION 4

FIGURE 6-4

CDM

0 1 2 4 Miles

6.4.5 Option 5

Table 6-9 summarizes the necessary infrastructure for Option 5; Figure 6-5 shows the location of the infrastructure for this option. The planning level cost estimates for Option 5 are shown in Appendix G.

TABLE 6-9 TRANSMISSION FACILITIES TO MEET OPTION 5 DEFICITS

Piping	Length (feet)	
Diameter (in)	**2020**	**2060**
4	4,025	55,433
6	0	40,739
8	237	117,264
10	0	52,785
12	143	203
16	7,270	56,180
20	47,138	61,719
24	20,307	42,258
30	0	4,918
36	0	104,443
42	0	197,602
48	0	812
54	0	0
60	0	0
TOTAL (Inch*Diameter*Miles) =	297	3,282
Pumping	Peak Capacity (MGD)	
Location	**2020**	**2060**
Finished Water Booster	11.4	43.3
Booster at Angleton	0	-
Booster Hwy 6 at Hwy 288	0	25.9
Total Capacity (MGD) =	**11.4**	**69.2**
Storage	Capacity (MG)	
Take Point Name	**2020**	**2060**
Alvin	0.00	0.40
Danbury	0.00	0.26
Iowa Colony	0.00	0.06
Missouri City Sienna Plantation	0.00	0.91
Missouri City South & Future MUD	0.00	2.04
Oyster Creek	0.04	0.12
Pearland West	0.00	0.86
Pearland East	0.00	0.86
Stafford/WCID No. 2 Site B	0.00	0.19
Stafford/WCID No. 2 Ave E	0.00	0.19
Sugar Land First Colony	0.00	3.09
Surfside	0.17	0.08
Future MUD	0.00	2.76
Total Storage (MG) =	0.21	11.82

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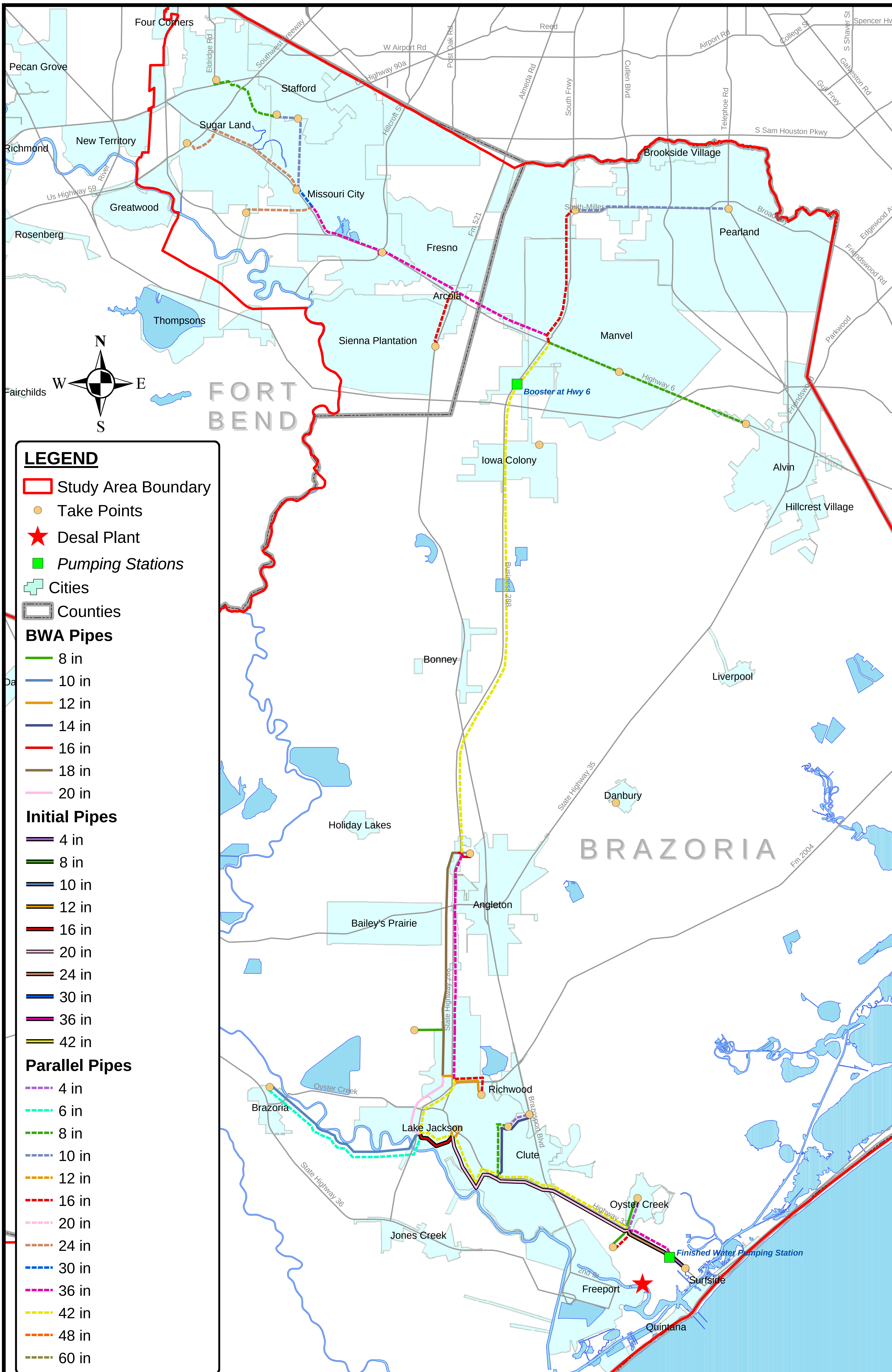

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CONVEYANCE FACILITIES FOR OPTION 5

FIGURE 6-5

6.5 Blending Considerations

A planning level blending analysis was performed for three locations within the study area: Missouri City, southern Brazoria County (the Brazosport area), and Pearland. These locations were chosen to cover the geographical extents of the study area and to analyze all the various blends of water supplies available to entities in the area. Representative planning horizons were chosen to analyze representative projected proportions of desalinated water, surface water, and groundwater lending analysis for blended compatibility.

The compatibility of blended waters was evaluated using the Rothberg, Tamburini and Winsor (RTW) water chemistry model published by the American Water Works Association. For this study, the RTW model was used to automate the calculation of the Langelier Index resulting from mixing two different source waters.

The Langelier Index parameter characterizes the stability of a water by considering the saturation level of the common precipitant Calcium Carbonate, $CaCO_{3\,(s)}$. The Langelier Index is a measure of the difference between the pH of a given water and the pH at which that water would begin precipitating $CaCO_{3\,(s)}$. Therefore, a positive Langelier index indicates supersaturation with respect to $CaCO_{3\,(s)}$, with increasing positive values corresponding to a greater tendency toward scaling. Alternatively, a negative Langelier Index indicates an unsaturated water, with increasingly negative numbers corresponding to greater corrosivity. Noteworthy is the fact that the RTW model and the Langelier Index both depend on equilibrium water chemistries, and thus do not predict *when* precipitation will occur, only the relative supersaturation of the solid. This explains why some waters may have negative Langelier Index values without the presence of scaling in the system. In this study, the Langelier Index of a particular blend of waters was compared to the Langelier Index of the constituent waters. Blended waters with Langelier Index values within 0.5 pH units of the existing water were regarded as similar and for the purposes of this study deemed compatible.

The results of the planning level blending analysis indicate all blending scenarios proposed in this study were found to be compatible. The greatest difference in indices was 0.51 for the Missouri City area using 60 percent GCWA surface water and 40 percent desalinated water in the year 2030. Additional more detailed evaluation of water compatibility will be required before desalinated seawater could be implemented. A tabular summary of all blending analysis data is provided in Appendix H.

Section 7
Alternatives to Desalination

As population in the study area increases and groundwater resources become limited, water suppliers in the study area will need to increase their available potable water supplies. Section 6 presented five desalinated water delivery options ("Options 1 - 5") that meet projected future potable water demands. However, the alternative considered prior to the possibility of using desalinated water focused on more traditional supplies to provide the next increment of potable water to the study area. This section of the report presents a feasible planning level alternative to meeting future water demands in the study area using traditional water supplies. This "Option 6" provides a non-desalinated water supply alternative that can be used to benchmark, both in economic and non-economic terms, the desalinated water supply options summarized in Section 6.

Two other water sources were evaluated for comparative purposes as alternatives to the use of desalinated seawater: groundwater and other surface water sources. This section presents limitations and costs associated with continued development and use of these two sources. Costs associated with use of groundwater reflect treatment of individual wells and are specific to a particular city or water user. The costs presented for surface water alternatives were not developed for each city or water user, but rather based on take point deficits, as discussed later in this section.

Early in this project, it became apparent that the study area can be divided in three subareas based on the direction communities are taking to address future water deficits: (1) the City of Pearland area, (2) the Fort Bend County area, and (3) the southern Brazoria County area. The water alternatives discussed here are presented in the context of these three geographic areas. Option 6 is the culmination of the non-desalinated water supply alternatives developed for these three areas.

7.1 Groundwater Sources

Most of the municipal water supplies in the study area currently are derived from groundwater. However, due to existing groundwater subsidence district rules and future uncertainty with regard to groundwater quantity and quality, many of the entities are planning to reduce their groundwater dependency and are evaluating alternative surface water options.

7.1.1 Groundwater Quantity

The Fort Bend Subsidence District (FBSD) has developed a Groundwater Management Plan that has been approved by the TWDB. FBSD also has adopted a District Regulatory Plan. In general, for the portion of this study area that is within Fort Bend County, the regulatory plan requires that by 2013, no more than 70 percent of the total water demand may be met by groundwater. Beginning in 2025, no more than 40 percent of the total water demand may be met by groundwater.

The newly formed Brazoria County Groundwater Conservation District still must be confirmed through a local election. If confirmed, the district will adopt a Groundwater Management Plan. This plan will be based in part on a Groundwater Availability Model that is being developed by the TWDB. This model is not yet complete; however, based upon discussions with the TWDB, it appears that current groundwater usage in Brazoria County is at or near sustainable levels. Therefore, it was assumed that groundwater will not be developed in excess of current usage levels in Brazoria County.

Finally, a number of relatively remote rural communities in the study area rely solely on groundwater from individual wells for their water supply. These areas do not have existing take points or existing centralized distribution systems. Their individual water needs are small enough that providing desalinated water would be economically infeasible. Because groundwater availability is not likely to increase in the future, some existing water utilities rely on groundwater will need to shift a portion of their demand to surface water to free up some additional groundwater for those that cannot readily utilize surface water sources.

7.1.2 Groundwater Quality

This study also evaluated how the quality of groundwater will affect availability. TCEQ records were queried to obtain water quality data in four categories for the various Public Water Systems (PWSs) in the study area:

- Organics;
- Inorganics;
- Trihalomethanes (THM); and
- Haloacetic Acids (HAA).

These records were evaluated against existing and proposed drinking water regulations.
The evaluation indicates that there have been a few violations of current primary drinking water standards associated with existing groundwater use.

Water quality violations should not increase as a result of future water quality standards. However, a few systems show arsenic levels that will require some action once the new Arsenic Rule comes into effect, probably in 2006. This is discussed in detail in Section 7.1.2 below.

There have been numerous violations of the secondary drinking water standards associated with groundwater in the study area. A number of systems have elevated levels of some inorganics (predominantly aluminum, iron, and manganese), which are typically associated with taste and odor problems rather than major health concerns. However, treatment for these parameters would result in water of higher quality that is more palatable and better accepted.

Costs for treating groundwater were analyzed for individual public water systems rather than for take points because treatment would be for individual wells as opposed to a centralized system.

Treatment for Arsenic

The most significant groundwater quality issue is the level of arsenic in supplies for the cities of Brazoria and Danbury and the Village of Surfside. These PWS have average arsenic concentrations of 19.2 ug/L, 11.2 ug/L, and 13.2 ug/L, respectively. When the new arsenic rules are implemented, each will have to make a choice: treat its groundwater to comply with the new MCL of 10 ug/L, mix the groundwater with another source to bring levels down through dilution, or replace groundwater altogether as a drinking water source.

CDM used the AWWA Research Foundation's Arsenic Decision eTree (http://www.awwarf.org/research/TopicsAndProjects/Resources/redirect/arsenic.aspx) to make a preliminary determination of appropriate treatment technology and associated costs. The eTree takes into consideration information on incoming water quality, required arsenic reduction, considerations for additional available land, additional handling that might be required, interest rate, payback period, and current Engineering News Record (ENR) indices when recommending the most cost effective treatment technology. The eTree decision matrix is based on each point of entry (POE) into the system. The City of Brazoria has one POE; the City of Danbury has two; and the Village of Surfside has five. The total demand was distributed among the POEs based on percent of total pumping capacity for the PWS.

The eTree requires input for a variety of parameters for each POE. The rated well capacity was used as the maximum design point for a given POE. The average flow rate used in the decision tree was assumed as half of the rated well capacity. The maximum design point effectively sets the calculated capital costs, while the average flow rate effectively sets the calculated O&M costs. The O&M cost calculations are proportional to the amount of water treated. For each planning period, O&M costs were adjusted by the ratio of projected demand to the average flow assumed in the eTree. The Village of Surfside has much more well capacity than its demands require. For this reason, it was assumed that the three larger wells could meet the requirements; the two smallest POEs (44 gpm and 60 gpm) were not considered in the cost analysis. While Brazoria and Danbury also have more well capacity than their demands require, Brazoria has only one POE and Danbury has only two. There was no option for leaving POEs out of the analysis. The flows used in the eTree are shown in Table 7-1.

Other POE-specific input data are shown in Table 7-2. These data came from TCEQ and TWDB databases.

TABLE 7-1 eTREE FLOWS FOR ARSENIC TREATMENT

PWS	Point of Entry	Maximum Design Flow (gpm)	Average Flow (gpm)
Brazoria	1	720	360
Danbury	1	210	105
	2	400	200
Surfside	1	250	125
	2	0	0
	3	145	72.5
	4	75	37.5
	5	0	0

TABLE 7-2 OTHER eTREE POE-SPECIFIC PARAMETERS

Parameter	Brazoria	Danbury	Surfside
Influent arsenic (ug/L)	19.2	11.9	13.2
Targeted finished arsenic (ug/L)	8	8	8
Influent sulfate (mg/L)	19	8.7	2.2
Influent silica (mg/L)	12.2	14.7	13.5
Influent nitrate as N (mg/L)	0.01	0.012	0.06
Influent iron (mg/L)	0.39	0.592	0.519
Influent manganese (mg/L)	0.036	0.0343	0.034
Influent phosphate (mg/L)	0.07	0.07	0.07
Influent pH	7.8	7.8	7.4
Influent TDS (mg/L)	710	657	1465
Influent alkalinity (mg/L)	234	384	489

The eTree takes into account such parameters as silica and phosphate, which could reduce the efficiency of some media-based treatment technologies. These two parameters typically are not constituents of concern for drinking water quality and thus are not typically sampled. Silica data were obtained for the cities of Brazoria and Danbury from the TWDB's Groundwater Monitoring Section. Because no silica data were available for groundwater in the Village of Surfside, the average values determined for the other two cities were used to estimate silica data for Surfside. Additionally, phosphate data were not available for any cities in Brazoria County. The eTree model was run using a range of phosphate values from 0 to 10 mg/L to test sensitivity to this parameter. The silica concentration was increased to 100mg/L to test sensitivity to this parameter. In both cases, the model results were not sensitive to either parameter. A sample of raw groundwater collected from the City of Brazoria indicated 0.07 mg/L phosphate in the groundwater.

Finally, a number of general decision tree data input values were consistent for all POEs. Table 7-3 outlines those default parameters used in the decision eTree.

Treatment with granular ferric hydroxide (GFH) was deemed the most cost effective for the City of Brazoria, while throwaway activated alumina (TAA) was deemed most cost effective for both the City of Danbury and the Village of Surfside. Following are capital costs for treatment for each of the systems:

City of Brazoria	$2,338,164
City of Danbury	$1,523,380
Village of Surfside	$ 921,293

TABLE 7-3 eTREE GENERAL DATA INPUT

General Data Input	Value
Would you be willing to adjust the pH?	Yes
Do you chlorinate the water?	Yes
If not, do you anticipate any As III presence?	No
Available Land at POE (acres):	5
Cost of additional land ($/acre):	5000
Acceptable water loss (%):	15
Would you be willing to treat liquid/solid waste generated by the treatment process?	Yes
Would you be willing to handle hazardous waste generated by the treatment process?	No
Maximum allowable TDS in sewer discharges (mg/L)?	1500
Maximum allowable arsenic in sewer discharges (mg/L)?	8
Would you be interested in doing a split stream treatment?	Yes
Current ENR building cost index:	3955
Current ENR skilled labor index:	6672.09
Current ENR construction cost index:	7064.14

ENR indices came from www.enr.com for 2004.

These costs were amortized over a 30-year period on the assumption that the systems have a 30-year useful life span and will require replacement on that schedule. Annual O&M costs are also estimated by the eTree. These annual costs were adjusted for each planning period using the ratio of projected average daily demand to assumed average flow, as follows:

$$AnnualO\,\&\,MCost = O\,\&\,MCost_{eTree} * \frac{AverageDayDemand_{projected}}{AverageFlow_{eTree}}$$

The annual O&M costs are shown in Table 7-4.

TABLE 7-4 ANNUAL ARSENIC TREATMENT O&M COSTS

PWS	2010	2020	2030	2040	2050	2060
Brazoria	$54,457	$53,728	$52,866	$51,187	$51,485	$52,473
Danbury	$38,343	$40,287	$41,934	$43,216	$45,408	$48,156
Surfside	$39,390	$44,125	$48,975	$53,270	$58,099	$63,469

Based on capital and O&M costs and projected demands, a cost in dollars per 1000 gallons (kGal) of water provided was calculated for each of the three entities. Total cost for a particular POE was calculated as follows:

$$Cost / kGal_{POE} = \frac{AnnualizedCapitalCost + AnnualO\,\&\,MCost}{Q_{gpm} * (60 * 24 * 365 / 1000)}$$

Overall total cost for a municipality with more than one POE was calculated using a weighted average:

$$Cost / kGal_{City} = \frac{\sum (Q_{POE} * Cost / kGal_{POE})}{\sum Q_{POE}}$$

Table 7-5 shows the cost of treating groundwater to meet the proposed EPA arsenic rules at each planning decade.

TABLE 7-5 OVERALL FUTURE GROUNDWATER COSTS WITH ARSENIC TREATMENT

	Total Cost/1000 Gallons					
PWS	2010	2020	2030	2040	2050	2060
Brazoria	$2.24	$2.26	$2.29	$2.34	$2.33	$2.30
Danbury	$1.97	$1.91	$1.85	$1.81	$1.75	$1.69
Surfside	$2.19	$2.05	$1.93	$1.85	$1.77	$1.69

Treatment to Meet Secondary Drinking Water Standards

A number of water users/suppliers have contaminant levels exceeding secondary drinking water standards. These standards deal with taste, odor, and aesthetic issues and do not affect human health. Exceedances of secondary standards have been an issue for some time; this situation is likely to continue in the future.

There is no regulatory driver for compliance with secondary standards. However, in order to compare other water sources to desalinated water (which will be a high quality water meeting all primary and secondary drinking water standards), options for treatment to meet secondary standards were evaluated and costed. Generally, secondary standards violations fell into two categories: metals (iron, manganese, or aluminum) or inorganics (total dissolved solids or chlorides). The City of Pearland has elevated levels of fluoride. In some cases, a particular entity fell into more than one category and would require more than one treatment type.

For the most part, the flows that would be treated are fairly low, although the well capacity for Missouri City does approach 40 MGD. While the arsenic eTree offers a user-friendly framework for selecting an appropriate treatment technology, there is no similar tool readily available for secondary standards constituents. A CDM water treatment expert reviewed contaminant levels and recommended appropriate treatment technologies.

Most cities in the study area could benefit from treatment for metals. Manganese Green Sand (MGS) would be appropriate treatment for these metals at the levels and flow rates for these cities. Capital costs for MGS are estimated at $0.50/gpd; O&M costs are estimated at $0.10/1000 gallons.
In addition to treatment for metals, one PWS would require treatment for fluoride levels. Activated alumina (AA) would be appropriate treatment for the levels and flow rates for the City of Pearland. Activated alumina capital costs are estimated at $0.80/gpd; O&M costs are estimated at $0.075/1000 gallons. Four cities would require treatment for total dissolved solids (TDS) or chlorides. Ultra-low-pressure reverse osmosis (ULPRO) would be appropriate treatment for these contaminants

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at the levels and flow rates for these cities. Capital costs for ULPRO are estimated at $1.50/gpd; O&M costs are estimated at $0.85/1000 gallons.

Table 7-6 presents amortized capital costs and annual O&M costs for treatment to meet secondary standards. Costs here were amortized over 20 years because this type of treatment system has a useful life span of 20 years. Because this equipment only has a 20 year useful life, the equipment will effectively be repurchased every 20 years; hence, just as the capital is being paid off, that same cost (not accounting for inflation) will recur. So, the amortized capital cost is carried out through all years of the planning period. Capital costs were determined based on well capacity. The City of Danbury and Village of Surfside appear in these tables, as well as in the arsenic treatment tables. However, the recommended treatment for secondary standards parameters in these two cities is different than that required for arsenic treatment, so they likely will have cost implications under both treatment schemes. Further investigation might reveal a treatment option that would be appropriate for both needs. Because compliance with secondary standards is not required, the costs presented for treatment to meet secondary standards were not carried forward in any of the financial analyses presented later in this report. In addition, if groundwater sources are mixed with other surface water sources or high quality desalinated water, these constituents would in all likelihood be diluted enough to meet the secondary standards.

Overall costs for treating groundwater to meet secondary drinking water standards were based on average day demands. These costs are presented in Table 7-7.

These cities have been using water of lower quality for years now, and it is unlikely that any will implement treatment for secondary standards. If these cities continue to rely only on ground-water, growth may take them to a point where public desire for water of a higher quality may warrant some level of treatment. Table 7-7 shows the order of magnitude of costs should such treatment be pursued.

7.2 Surface Water

There are several cities in the northern part of the study area with existing contracts for surface water. The following cities have option water contracts with the Gulf Coast Water Authority (GCWA): Pearland (10 MGD), Missouri City (15.12 MGD), Stafford/WCID No. 2 (10.1 MGD), and Sugar Land (20 MGD). These raw water contracts are not currently utilized, and water treatment plants will have to be constructed before they can be exercised. The City of Pearland currently exercises a contract with the City of Houston for 3 MGD of wholesale treated water. In addition to the 10 MGD from GCWA mentioned above, Pearland is in discussions with GCWA for another 10 MGD of treated water from the City of Houston Southeast Water Purification Plant (SEWPP).

Finally, Pearland is also in discussion with the City of Houston for an additional 3 MGD of wholesale treated water. The cities in the southern part of Brazoria County generally purchase surface water from the Brazosport Water Authority (BWA) to supplement their groundwater supplies. Freeport and Brazoria currently rely totally on the BWA for all of their water supply.

TABLE 7-6 AMORTIZED CAPITAL AND ANNUAL O&M COSTS TO MEET SECONDARY STANDARDS

PWS	Treatment	Capital Cost All years	O&M Cost 2010	2020	2030	2040	2050	2060
Angleton	MGS	$207,713	$61,320	$61,320	$61,320	$61,320	$61,320	$61,320
Arcola	MGS	$12,911	$5,475	$5,475	$5,475	$5,475	$5,475	$5,475
Danbury	MGS	$33,416	$6,887	$7,236	$7,532	$7,762	$8,156	$8,649
Freeport	ULPRO and MGS	$192,904	$547,865	$547,865	$547,865	$547,865	$547,865	$547,865
Iowa Colony	MGS	$7,595	$3,285	$3,285	$3,285	$3,285	$3,285	$3,285
Jones Creek	ULPRO	$71,200	$27,094	$25,112	$23,129	$21,147	$19,825	$19,825
Lake Jackson	MGS	$504,664	$141,004	$165,053	$175,673	$186,038	$198,475	$213,167
Manvel	MGS	$212,650	$11,563	$11,229	$10,896	$10,562	$10,340	$10,340
Missouri City	MGS	$1,491,587	$508,439	$513,920	$513,920	$513,920	$513,920	$513,920
Pearland	MGS and AA	$2,409,019	$880,801	$974,094	$974,094	$974,094	$974,094	$974,094
Richwood	MGS	$20,885	$9,490	$9,490	$9,490	$9,490	$9,490	$9,490
Surfside	ULPRO	$102,528	$46,612	$52,215	$57,954	$63,037	$68,751	$75,105

TABLE 7-7 OVERALL FUTURE UNIT COSTS TO MEET SECONDARY STANDARDS

PWS	Total Cost/1000 Gallons					
	2010	2020	2030	2040	2050	2060
Angleton	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Arcola	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Danbury	$0.59	$0.56	$0.54	$0.53	$0.51	$0.49
Freeport	$1.28	$1.28	$1.28	$1.28	$1.28	$1.28
Iowa Colony	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33
Jones Creek	$3.08	$3.26	$3.47	$3.71	$3.90	$3.90
Lake Jackson	$0.46	$0.41	$0.39	$0.37	$0.35	$0.34
Manvel	$1.94	$1.99	$2.05	$2.11	$2.16	$2.16
Missouri City	$0.39	$0.39	$0.39	$0.39	$0.39	$0.39
Pearland	$0.65	$0.61	$0.61	$0.61	$0.61	$0.61
Richwood	$0.32	$0.32	$0.32	$0.32	$0.32	$0.32
Surfside	$2.72	$2.52	$2.35	$2.23	$2.12	$2.01

It should be noted that there is some uncertainty about the amount of water available and how GCWA contracts would actually operate once they are converted to take-or-pay contracts. Consistent with recent regional water supply planning studies, this study assumes that the amount specified is the maximum amount that is available, even on the maximum use day. As discussed in Section 4, it also assumes that GCWA water is used to baseload any deficit that must be met. The same is true for the contract for SEWPP water. Any peaking would be met with groundwater.

The sections below focus on take points in the three main subareas described earlier in this section: Fort Bend County, City of Pearland, and southern Brazoria County. The water deficits used for these analyses are consistent with Option 1 presented in Section 4. Table 7-8 shows the entities that make up the take points in the three areas.

7.2.1 Fort Bend County Area

The three main municipalities in this area are Missouri City, Stafford/WCID No. 2, and Sugar Land. A number of user groups or MUDs also have been included in this regional area, as outlined in Table 7-8. As a group, these users have approximately 120 MGD of groundwater, with the largest portion of that total used by the three main cities.

Additional water beyond existing GCWA contracts will have to be secured to meet demands for Missouri City after 2050. In addition to the three main cities, certain populations not currently in any incorporated area have significant water needs in the outyears. These are the three RAZ areas. Two are included with existing take points; the third is projected to become a MUD in the future. This future MUD deficit has been considered along with the deficits for the other three cities. In addition, a number of users without existing option contracts in the area will need to secure additional surface water supplies before 2013.

TABLE 7-8 AREA GROUPING OF USERS

Area	Take Point	Entity
Fort Bend County	Missouri City	Missouri City
		Fort Bend County MUD 23
		Sienna Plantation MUD 2
		Regional Analysis Zone (RAZ) 155[1]
	Stafford/WCID No. 2	Stafford
		Meadows Place
	Sugar Land	Sugar Land
		Fort Bend County MUD 2
		Kingsbridge MUD
		RAZ 151[1]
	Arcola	Arcola
	Future MUD	RAZ 154[1]
Pearland Area	Pearland	Pearland
		Brazoria County MUD 1
		Brazoria County MUD 2
		Brazoria County MUD 3
		Brazoria County MUD 4
		Brazoria County MUD 5
		Brazoria County MUD 6
		Brookside Village
	Alvin	Alvin
		Hillcrest Village
So Brazoria County	BWA	Angleton
		Brazoria
		Clute
		Freeport
		Lake Jackson
		Oyster Creek
		Richwood
		Surfside

[1] See Section 2 for information on Regional Analysis Zones

Table 7-9 shows deficits for the users in the Fort Bend County area. These deficits represent demands in excess of groundwater supplies. Note that despite the fact that most users will baseload average day demands, Arcola needs to be able to have maximum day demands met because it lacks enough groundwater to meet its peaking needs. The deficits will be met through contracted water (for those users with GCWA contracts) or through other surface water supplies, most likely obtained through the BRA, as recommended in the 2001 Region H Water Plan.

TABLE 7-9 FORT BEND COUNTY AREA DEFICITS (MGD)

Take Point	WUG	2010	2013	2020	2030	2040	2050	2060
Arcola	***Arcola***	***0.00***	***0.11***	***0.12***	***0.25***	***0.28***	***0.30***	***0.33***
Future MUD	RAZ 154[2]	0.00	0.46	0.81	2.30	3.32	4.48	5.52
Missouri City	RAZ 155	0.00	0.00	0.00	0.00	0.00	1.38	2.26
Missouri City	Fort Bend Co MUD 2	0.00	0.21	0.27	0.77	1.01	1.32	1.67
Missouri City	Missouri City	0.00	4.48	5.19	12.21	14.22	15.66	18.91
Missouri City	Sienna Plantation MUD 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stafford/WCID No. 2	Meadows Place	0.00	0.39	0.39	0.76	0.75	0.75	0.75
Stafford/WCID No. 2	Stafford	0.00	1.42	1.71	4.45	5.51	6.94	8.57
Sugar Land	RAZ 151	0.00	0.52	1.13	3.25	3.98	4.57	5.00
Sugar Land	Fort Bend Co MUD 2	0.00	0.39	0.39	0.78	0.76	0.76	0.76
Sugar Land	Kingsbridge MUD	0.00	0.29	0.35	0.88	1.06	1.31	1.60
Sugar Land	Sugar Land	0.00	4.68	4.65	9.22	9.18	9.18	9.18
	Total	0.00	12.95	15.01	34.87	40.08	46.64	54.56

Much discussion over the last several years has related to a future water treatment plant in the vicinity of Missouri City or Stafford. The City of Houston does not have immediate water needs in the west, but under one scenario Houston could partner with Missouri City, Stafford/WCID No. 2, and Sugar Land to build this plant. Another, more likely option is for the three cities to work together to construct a regional water treatment plant to meet their needs. A primary source of water for this plant would be GCWA option contracts from the Brazos River, likely diverted from the canal system in this area, specifically the American Canal.

The possibility of the SEWPP supplying water to the area was considered but general consensus was the transport distance made this option much less feasible or desirable.

The anticipated course of action is that the contracts for option water that Missouri City, Stafford/WCID No. 2, and Sugar Land have with the GCWA convert to take or pay contracts as demands dictate. This water would be produced at and distributed from a plant in the vicinity of the three cities. For purposes of this report, the location is assumed to be a WCID No. 2 site in the vicinity of FM 1092 and 5th Street. This was deemed the most economical site in the November 2000 *Regional Surface Water Plant Feasibility Study* completed for the GCWA and TWDB. It should be noted that these three entites are currently re-evaluating this option in a separate study effort. Figure 7-1 shows the plant site, analyzed water take points, and proposed distribution system pipe alignment.

[2] See Section 2 for information on Regional Analysis Zones

The plant serving this contract water will need to be in place by 2013 to meet the first horizon of the FBSD Area A rules and should be rated for 35 MGD. This plant would serve deficits through the year 2030. Estimated capital costs are as follows:

- 35 MGD conventional plant with UV disinfection: $52.5 million.
- Raw water intake: $5.5 million.
- Transmission lines: $23.1 million (See Table 7-10 for pipe cost data)

TABLE 7-10 FORT BEND COUNTY AREA TRANSMISSION LINE COST DATA

	Linear Feet		Cost	
Pipe Size (in)	2013	2030	2013	2030
16	31,550	2,250	$4,101,500	$292,500
20	63,750	5,500	$10,518,750	$907,500
24	22,300	12,000	$4,683,000	$2,520,000
30	12,000	1,200	$3,360,000	$336,000
36	1,200	0	$408,000	$0
Totals	**130,800**	**20,950**	**$23,071,250**	**$4,056,000**

Deficits for year 2060, the end of the planning horizon, would be met by expanding the plant in 2030 from 35 MGD to 55 MGD.

Table 7-11 shows the various capital expenditures, amounts, and the planning years in which these costs would be incurred.

TABLE 7-11 FORT BEND COUNTY (FBC) AREA FUTURE CAPITAL COSTS

Year	Capital Improvement	Cost ($M)	2020	2030	2040	2050	2060
2013	35 MGD WTP	$52.5	X	X			
2013	Raw Water Intake - 35 MGD	$5.5	X	X			
2013	Initial Transmission Lines	$23.1	X	X			
2030	WTP Expansion (+20 MGD)	$30.0		X	X	X	
2030	Intake Expansion (+20 MGD)	$3.2		X	X	X	
2030	Parallel Transmission Lines	$4.1		X	X	X	
2033	Rotating Equipment (35 MGD) Replacement[1]	$17.4			X	X	
2050	Rotating Equipment (+20 MGD) Replacement[1]	$9.9				X	X
2053	Rotating Equipment (35 MGD) Replacement[1]	$17.4					X

[1] Rotating plant equipment is estimated at 30% of initial capital cost.

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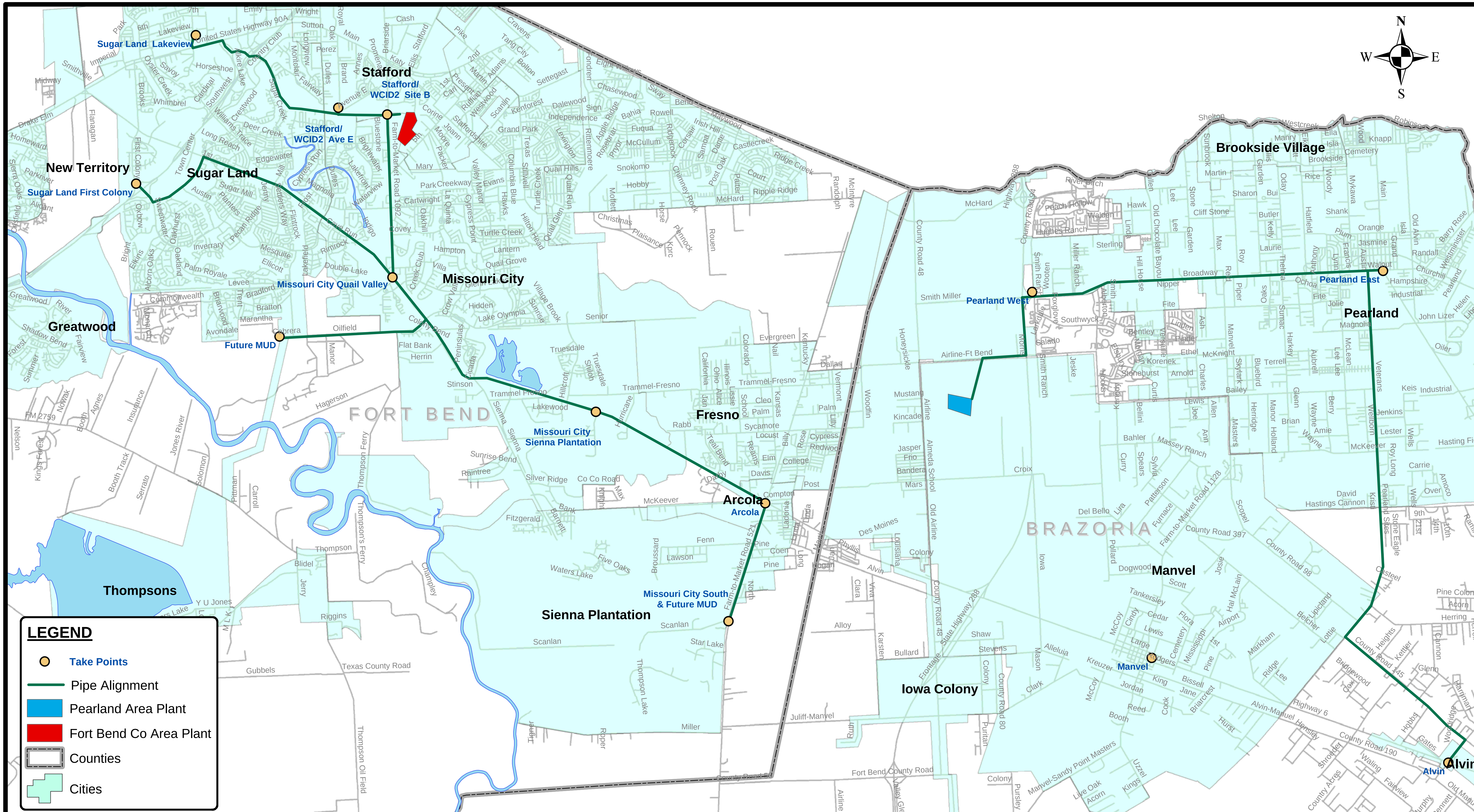

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2 1 0 2 Miles

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

FORT BEND COUNTY AREA AND PEARLAND AREA SURFACE WATER PLANT INFRASTRUCTURE

FIGURE 7-1

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Capital costs were amortized over a 30-year period. Annual O&M costs were calculated as follows:

$$Annual\ O\ \&\ M\ \ Cost = WaterCost * ADD * 365 + \frac{(OM_{GW} + OM_{Plant} + PC_{Pump}) * ADD * 365}{1000}$$

Where: WaterCost = Cost of purchasing raw water ($/gal)

ADD = Average Day Demand (gpd)

OM_{GW} = cost to provide groundwater

OM_{Plant} = cost of plant operation and maintenance (includes chemicals, power, labor, and routine maintenance) ($/kGal)

PC_{Pump} = cost of power for pumping ($/kGal)

Unit costs for groundwater O&M, plant O&M and power for pumping, as well as costs for raw water, were presented in Section 5.

An overall unit cost was calculated for the area at each planning decade as follows:

$$Cost / kGal = (\frac{AnnualizedCapitalCost + Annual\ O\ \&\ M\ \ Cost}{ADD * 365 / 1000}) * AdmnFee$$

Where: AnnualizedCapitalCost = Capital Cost amortized over 30 years

Annual O&M Cost = as calculated above

ADD = Average Day Demand (gpd)

AdmnFee = Administrative fee (%)

Table 7-12 presents amortized capital costs and annual O&M costs for the Fort Bend County area for several key planning years, along with the rate for customers. This rate is an amalgamation of costs for all sources of water provided and includes an administrative fee charged by the water service provider. Detailed breakout of costs can be found in Appendix G.

TABLE 7-12 FBC AREA ANNUALIZED CAPITAL AND O&M COSTS AND RATES

	Capital Cost	O&M Cost	Rate ($/kGal)
2010	$0	$7,651,641	$0.52
2013	$5,197,140	$11,587,535	$0.89
2020	$5,197,140	$12,063,989	$0.95
2030	$7,581,943	$20,579,084	$1.33
2040	$8,697,490	$24,138,283	$1.35
2050	$4,137,805	$29,159,584	$1.17
2060	$2,868,549	$36,161,605	$1.18

7.2.2 City of Pearland Area

The City of Pearland has approximately 16 MGD of groundwater from existing wells. Because the city will be annexing several MUDs over the course of a number of years, its available groundwater will increase to approximately 22 MGD. Pearland also has a contract with the City of Houston to purchase 3 MGD of wholesale treated water at a cost of $1.38/1000 gallons. In addition, Pearland has an option contract for 10 MGD raw water, and is in the process of pursuing an additional 3 MGD of wholesale treated water from the City of Houston. Finally, Pearland is pursuing a contract for 10 MGD of treated water from the SEWPP through a contract with GCWA.

Table 7-13 shows deficits for the Pearland area users. This table assumes that all six Brazoria County MUDs are annexed sometime during the planning period.

TABLE 7-13 PEARLAND AREA DEFICITS (MGD)

Take Point	WUG	2010	2020	2030	2040	2050	2060
Alvin	Alvin	0.00	0.00	0.00	0.00	0.16	0.36
Alvin	Hillcrest Village	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 1	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 2	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 3	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 4	0.50	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 5	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brazoria County MUD 6	0.00	0.00	0.00	0.00	0.00	0.00
Pearland	Brookside Village	0.02	0.05	0.07	0.10	0.12	0.15
Pearland	Pearland	0.00	1.77	7.36	12.21	17.63	23.29
	Total	0.52	1.82	7.44	12.30	17.91	23.80

Even with existing groundwater capacity and 6 MGD of wholesale water, the Pearland area shows an additional deficit in 2010 of less than 1 MGD. Although this study generally assumes that contracted water will not be shared, two exceptions are made. The largest portion of the initial deficit is from Brazoria County MUD 4, which will be annexed by Pearland by 2020. The assumption is that Pearland will make arrangements to cover that deficit and share contract water with Brookside Village. Although there are no annexation plans for the village, its deficit prior to 2040 is so small that an arrangement with Pearland could easily support this need.

It was assumed that Pearland would first receive additional water from the SEWPP. By 2035, this source of water becomes fully utilized. This study assumes that at this point Pearland will convert its option water to take-or-pay water and build a 15 MGD regional plant located southeast of the intersection of Airline-Ft Bend Rd and County Road 48. In addition, the City of Alvin has deficits that occur in the last two planning periods. For this reason, an additional transmission line to the Alvin take point will be built in 2045. Figure 7-1 shows the infrastructure for this regional plant. This scenario is consistent with the 2000 Montgomery Watson report. After 2035, any other water users with deficits will need to secure additional water rights, most likely from the BRA.

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Table 7-14 shows the various capital expenditures, amounts, and the planning years in which these costs would be incurred.

TABLE 7-14 PEARLAND AREA FUTURE CAPITAL COSTS

Year	Capital Improvement	Cost ($M)	2010	2020	2030	2040	2050	2060
2010	Buy into SEWPP (10 MGD)	$23.8	X	X	X			
2010	Buy into Major Transmission Lines (10MGD)	$3.1	X	X	X			
2010	Transmission line to Pearland Take Point	$4.9	X	X	X			
2010	Transmission line within Pearland (to other take point)	$6.6	X	X	X			
2030	Rotating Equipment (SEWPP) Replacement[1]	$7.14			X	X		
2035	Area WTP (15 MGD)	$22.5				X	X	X
2035	Raw Water Intake (15 MGD)	$2.4				X	X	X
2035	Transmission Line from Area WTP to Take Points	$9.23				X	X	X
2045	Transmission Line to Alvin	$2.3					X	X
2050	Rotating Equipment (SEWPP) Replacement[1]	$7.14					X	X
2055	Rotating Equipment (Area Plant) Replacement[1]	$7.47						X

[1] Rotating plant equipment is estimated at 30% of initial capital cost.

Capital costs were amortized over 30 years. Estimated costs to buy capacity in the SEWPP include payments to the Coastal Water Authority (CWA) and Trinity River Authority (TRA) and for associated infrastructure upgrades, such as Luce Bayou and Allen's Creek Reservoir. Costs for capacity in the SEWPP have been calculated by a consultant for the City of Houston and are consistent with cost-allocations for other potential customers.

Annual O&M costs were calculated based on average day demands using the same equations presented in Section 7.2.1. These include cost for raw water, groundwater O&M, plant O&M, and power for pumping. Wholesale water also was considered an O&M cost. Wholesale water purchased from Houston currently costs $1.38/1000 gallons, a rate that recently was increased from $1.13/1000 gallons. The overall unit cost was calculated based on the annualized capital cost, all annual O&M costs, and average day demands using similar equations presented in Section 7.2.1.

Table 7-15 presents amortized capital costs and annual O&M costs for the Pearland area, along with anticipated rates, for several key planning years. These rates represent an amalgamation of costs for all sources of water provided and include an administrative fee charged by the water service provider. Detailed breakout of costs can be found in Appendix G.

TABLE 7-15 PEARLAND AREA ANNUALIZED CAPITAL AND O&M COSTS AND RATES

Year	Capital Cost	O&M Cost	Rate ($/kGal)
2010	$2,461,657	$6,780,953	$1.06
2020	$2,461,657	$7,575,994	$0.98
2030	$2,919,264	$8,491,494	$0.99
2040	$2,645,110	$9,479,627	$0.96
2050	$4,915,135	$11,030,555	$1.14
2060	$12,385,135	$14,927,856	$1.78

7.2.3 Southern Brazoria County Area

The southern Brazoria County area consists largely of Brazosport Water Authority (BWA) customers. According to the Region H Water Plan, the BWA has rights to 45,000 acre-feet of water from the Brazos River; 13,217 acre-feet [3] is considered firm supply available through the drought of record. This information would indicate that the BWA has adequate raw water supply to meet the needs of its customers through the entire planning period, although the situation could be affected by future use and how BWA customers operate their groundwater systems.

The needs of this area were evaluated differently from those of the Fort Bend County and Pearland areas. In the Fort Bend County and Pearland areas, surface water is used to meet base load average demands. In the southern Brazoria County area, all BWA customers except Angleton currently use BWA water to meet peak demands. Thus, peaking factors were considered in sizing infrastructure; average O&M costs were still calculated based on average day demands.
Table 7-16 shows customer demands during the planning horizon.

TABLE 7-16 SOUTHERN BRAZORIA COUNTY AREA DEMANDS

	Average Day Demands (MGD)					
WUG	2010	2020	2030	2040	2050	2060
Angleton	1.80	1.80	1.75	1.76	1.84	1.96
Brazoria	0.30	0.30	0.42	0.40	0.40	0.41
Clute	1.00	1.00	0.91	0.94	1.02	1.12
Freeport	1.94	2.36	3.52	3.90	4.32	4.81
Lake Jackson	3.33	4.64	5.23	5.79	6.48	7.28
Oyster Creek	0.10	0.10	0.13	0.18	0.24	0.31
Richwood	0.24	0.24	0.25	0.26	0.29	0.33
Surfside	0.31	0.35	0.39	0.42	0.46	0.50
Total	9.01	10.78	12.60	13.66	15.05	16.72

The BWA plant currently can provide 12.5 MGD of treated water. The plant probably will have to add ultraviolet (UV) disinfection by 2010 to meet the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). In addition to disinfection improvements, a line must be constructed

[3] Brazos River Basin & San Jacinto-Brazos Coastal Basin Water Availability Model, Full Authorization Run dated 03/25/04, obtained from TCEQ on 3/26/04, using the February 2003 version of WRAP

to serve customers in Surfside, assuming that Surfside chooses to use BWA surface water in lieu of removing arsenic from its existing groundwater wells as required by the upcoming Arsenic Rule. Capital costs for disinfection improvements are estimated at $0.20/gpd for the 12.5 MGD plant for a total capital cost of $2.5 million. The transmission line is estimated at $120,000. The current BWA rate for providing water is $1.58/1000 gal; this value includes amortized existing capital costs and was used to estimate O&M costs for the BWA area through the year 2029.

In 2030, demands will exceed the current plant capacity. Since the plant will be almost 50 years old at that time, it most likely will be replaced with a new 20 MGD plant. With this capacity, the plant will be able to meet water demands through the 2060 planning horizon. Capital expenditures in 2030 will include $30 million for the plant and $3.2 million for a raw water intake. In 2030, O&M costs are estimated at $0.67/1000 gal, consistent with other area estimates used in this study.

Table 7-17 shows the various capital expenditures, amounts, and the planning years in which these costs would be incurred.

TABLE 7-17 SOUTHERN BRAZORIA COUNTY AREA FUTURE CAPITAL COSTS

Year	Capital Improvement	Cost ($M)	2010	2020	2030	2040	2050	2060
2010	UV Improvements	$2.5	X	X	X			
2010	Transmission Line to Surfside	$0.12	X	X	X			
2030	New 20 MGD WTP	$30.0			X	X	X	
2030	New Intake for Plant	$3.2			X	X	X	
2050	Rotating Equipment	$9.9			X	X	X	

Table 7-18 presents amortized capital costs and annual O&M costs for the southern Brazoria County area, along with anticipated rates, for several key planning years. These rates represent an amalgamation of costs for all sources of water provided and include an administrative fee charged by the water service provider. Detailed breakout of costs can be found in Appendix G.

TABLE 7-18 SOUTHERN BRAZORIA COUNTY AREA ANNUALIZED CAPITAL AND O&M COSTS AND RATES

Year	Capital Cost	O&M Cost	Rate ($/kGal)
2010	$130,822	$3,948,828	$1.50
2020	$130,822	$5,140,774	$1.53
2030	$1,235,950	$2,700,330	$0.98
2040	$1,105,128	$2,843,368	$0.94
2050	$1,436,667	$3,063,345	$1.00
2060	$1,436,667	$3,304,276	$0.98

7.2.4 City of Danbury

The City of Danbury is outside of the BWA service area. However, in this alternative, Danbury does not have access to BWA water. In order for Danbury to meet all of its needs, it must treat its groundwater to meet the EPA Arsenic Rule. The capital and O&M costs were presented earlier in Section 7.1.2, Treatment for Arsenic.

7.3 Blending and Treatability Issues

7.3.1 Blending Analysis

The compatibility of blended waters was evaluated using the Rothberg, Tamburini and Winsor (RTW) water chemistry model published by the American Water Works Association. For this study, the model was used to automate the calculation of the Langelier Index resulting from the mixing of two different source waters. The Langelier Index parameter characterizes the stability of water by considering the saturation level of the common precipitant Calcium Carbonate, $CaCO_{3(s)}$. The Langelier Index is a measure of the difference between the pH of a given water and the pH at which that water would begin precipitating Calcium Carbonate. Therefore, a positive Langelier index indicates supersaturation with respect to $CaCO_{3\,(s)}$, with increasing positive values corresponding to a greater tendency toward scaling. Alternatively, a negative Langelier Index indicates an unsaturated water, with increasingly negative numbers corresponding to greater corrosivity. Noteworthy is the fact that the RTW model and the Langelier Index both depend on equilibrium water chemistries, and thus do not predict *when* precipitation will occur, only the relative supersaturation of the solid. This explains why some waters may have negative Langelier Index values without the presence of scaling in the system. In this study, the Langelier Index of a particular blend of waters was compared to the Langelier Index of the constituent waters. Waters with Langelier Index values within 0.5 pH units were regarded as similar and, for the purposes of this study, deemed compatible.

For the City of Pearland area, consideration was given to mixing groundwater with water produced by the SEWPP. For the Fort Bend County area, consideration was given to mixing groundwater with treated GCWA water. All blending scenarios proposed for this option were found to be compatible. A tabular summary of all blending analysis data is provided in Appendix H.

7.3.2 Treatability Analysis

To better characterize the treatment requirements for the GWCA water, coagulant jar testing was conducted on a water sample collected from the American Canal in Missouri City, Texas. Jar testing is an experimental procedure common in water treatment that uses benchtop beakers and a six-paddle stir mechanism to simulate the coagulation, flocculation and settling processes common in conventional water treatment. By holding constant the mixing speeds, mixing times, settling times, temperature, etc., the impact of varying doses of coagulant can be determined. In this study, the coagulant used was Aluminum Sulfate ($Al_2(SO_4)_3 \bullet X\ H_2O$) better known as alum. The results of chemical analyses performed after the experiment are presented in Table 7-19. From the turbidity data, it is apparent that significant removal of solids occurs in alum doses greater than 20 mg/L. Furthermore, for the combination of TOC and alkalinity in the raw water, the EPA's Stage 1 Disinfection Byproducts Rule requires a minimum TOC removal of 35 percent to discourage disinfectant by-product formation. This level of treatment requires alum doses approaching 50 mg/L.

TABLE 7-19 TREATABILITY ANALYSIS RESULTS

Alum Dose [mg/L]	Tubidity [NTU]	Alkalinity [mg/L CaCO3]	pH [-]	TOC [mg/L]
RAW	46.2	77	7.75	6.21
5	40.1	88	7.88	6.41
10	36.9	85.8	7.89	6.28
20	35.9	84	7.66	6.57
50	0.9	73.6	7.5	3.66
100	1.9	46.8	7.18	2.82
150	3.1	26.4	6.87	2.48

The treatability analysis and TOC removal analysis were conducted to determine if the unit operating cost for surface water treatment used in this section was realistic. Although an alum dose of 50 mg/L is relatively high, the unit cost used for operation and maintenance of future surface water treatment plants in the analysis of alternatives to desalinated seawater is reasonable.

7.4 Summary of Alternatives to Desalination

This section has presented a plan to meet area needs using traditional supplies of groundwater and surface water. This plan or alternative is referred to as "Option 6." Each of the three geographic areas discussed has some unique needs, as well as unique limitations, in regards to incorporating conventionally treated surface water into the water supply portfolio. For this reason, costs have been presented specific to an area. However, collectively, these three "sub plans" outline actions that would likely have to be taken to meet water demands if desalinated water were not available as part of the water supply portfolio.

As water quality regulations continue to increase, the complexity of surface water treatment required to meet new standards also is likely increase. This could equate to higher costs for treatment than presented in this study. Another factor that could affect this alternative to using desalinated seawater is the potential impact of drought combined with future development of surface water for growing manufacturing, irrigation, and municipal demands. In addition, both the primary surface water source (the Brazos River) and groundwater are susceptible to salt water intrusion in some geographic areas. In 1996, a salt wedge that was moving up the Brazos River towards the Harris Reservoir elicited considerable concern. The Harris Reservoir is about 46 river miles from the Gulf. The salt wedge was within two miles of the reservoir intake. If it had continued to move up-river, the results could have been dramatic for the Brazosport area from both a manufacturing and municipal supply perspective.

While a water supply plan that focuses strictly on ground and traditional surface water sources is certainly feasible, having more sources of water available in a municipality's portfolio allows for greater flexibility, diversity, and reliability.

Section 8
Economic Comparison of Water Supply Alternatives

A total of six water supply alternatives were developed in Sections 6 and 7. Five of the alternatives – Option 1 through Option 5 – use various combinations of desalinated water, surface water, and groundwater to meet the projected water needs of the study area. Option 1 through Option 5 are discussed in detail in Section 6. The sixth alternative, Option 6, uses surface and groundwater to meet the projected water needs. Option 6 is discussed in detail in Section 7. Section 8 compares these alternatives on multiple economic bases.

This study assumed desalination conveyance infrastructure would be implemented in two phases. Initial infrastructure would be implemented by 2010 to meet short-term demands, followed by additional infrastructure in 2020 to meet long-term demands. Expansions in the capacity of the desalination facility are assumed to occur when required by demand and vary for each option. The spreadsheets in Appendix G list the capacity of the desalination facility by year for each option.

8.1 Net Present Value

In Sections 6 and 7, six water supply options were presented, each using different portions of surface water, groundwater, and desalinated water. The existing and future infrastructure listed below is common to all six of these options.

- Existing groundwater infrastructure;
- Future groundwater infrastructure in Fort Bend County consistent with the Fort Bend Subsidence District Rules; and
- Pearland's purchasing treated water from the City of Houston.

The costs associated with these commonalities were not included in the net present value analysis because it is assumed that they would be implemented under all the options evaluated. Consequently, they do not have the effect of stratifying the net present values so as to make an appropriate comparison among the options considered. The different costs used to determine the net present values are summarized in Table 8-1.

8.1.1 Economic Analysis Factors

The process of discounting is used to make dollar values comparable over time. Discounting does not account for inflation or for risk, but rather the "time preference" of money. For example, a million dollars today is worth more than a million dollars 10 years from now because of the potential interest earnings during those 10 years.

The process of discounting yields the "present value" of a future sum of money. The rate used to convert future dollars into present dollars (i.e., the discount rate) is typically the available interest rate.

TABLE 8-1 SUMMARY OF COST INCLUDED IN NET PRESENT VALUE ANALYSES

Description of Cost Item	Option						Administrative
	1	2	3	4	5	6	Fee
Seawater Desalination Treatment Plant							
Capacity Charge	x	x	x	x	x		x
Commodity Charge	x	x	x	x	x		x
Finished Desalinated Seawater Transmission							
Finished Water Pumping Station							
Capital	x	x	x	x	x		x
O&M	x	x	x	x	x		x
Booster at Angleton							
Capital	x	x	x				x
O&M	x	x	x				x
Booster at Hwy 6 & Hwy 288							
Capital	x	x	x	x	x		x
O&M	x	x	x	x	x		x
Pipeline Capital							
Original System	x	x	x	x	x		x
Parallel System	x	x	x	x			x
Storage Capital	x	x	x	x	x		x
Surface Water							
GCWA Raw Water Contracts							x
Raw Water Costs	x	x			x	x	x
Fort Bend County Plant							x
Capital (transmission and storage)	x	x			x	x	x
O&M							x
Pearland Area Plant							x
Capital (transmission and storage)	x	x			x	x	x
O&M	x	x			x	x	x
City of Houston Southeast WPP							x
Capital (transmission and storage)	x	x			x	x	x
O&M	x	x			x	x	x
City of Houston Treated Water (Pearland Only)							
Brazosport Water Authority							
UV Disinfecation Upgrade	x		x			x	
O & M	x		x			x	
Debt Payoff		x		x	x		
Plant Upgrade (2040)							
Capital (transmission and storage)						x	
O&M						x	
Groundwater Water							
Existing Wells (Operating)							
New Wells (Mixed Operating and Capital)							
Arsenic Removal (Danbury)					x	x	

Economic analyses are often most readily accomplished using real or constant-dollar values, i.e., by measuring benefits and costs in units of stable purchasing power. The difference between real and nominal values is due to inflation. Nominal and real values must not be combined in the same analysis. The nominal interest rate is the real interest rate plus inflation. The appropriate discount rate for any given analysis depends on whether the benefits and costs are measured in real or nominal terms: real dollars should be calculated using real interest rates and nominal dollars should be calculated using nominal interest rates.

All cost estimates presented in this study are in 2004 dollars, which are real dollars. However, market interest rates are nominal rates unless stated otherwise. Consequently, the market interest rate used in this study was converted to a real interest rate by assuming an inflation rate of two percent, which is the interest rate recommended by the U. S. Office of Management and Budget. [1]

This study uses a nominal rate of 4.87 percent, which is the rate for fully insured, non-Qualified Tax Exempt Obligation (QTEO) retail utility revenue bonds with 30-year maturity available to the BRA.[2] In comparison, the discount rate listed by the U. S. Office of Management and Budget for 30-year maturities is 5.5 percent. (OMB Circular A-94, Appendix C, revised February 2004). In order to use the nominal interest rate quoted above to perform necessary financial analyses, the rates must be converted to real interest rates by removing the inflation rate. Removing the effect of inflation (two percent) gives the final discount rates used in this study: 2.87 percent.

8.1.1 Net Present Value of Alternatives

Following the discounting guidelines for economic analyses presented above and using the information presented in Sections 6 and 7, the net present value (NPV) was calculated for each alternative.

Table 8-2 presents the NPV for each alternative and indicates the overall relative rank of each. Detailed breakdowns of costs for each option are presented in Appendix G.

TABLE 8-2 SUMMARY OF NET PRESENT VALUE ANALYSES

Option	Rank	Total Net Present Value	Desalinated Water Treatment	Desalinated Water Conveyance	Other Water Sources	Other Costs[3]	Desalinated Water Delivered from 2010-2060 (acre foot)
6	1	$597,002,800	NA	NA	$597,002,800	NA	NA
5	3	$789,464,130	$319,436,500	$134,474,261	$297,140,445	$38,412,924	1,051,614
1	2	$815,322,477	$330,852,366	$155,185,213	$298,595,074	$30,689,823	1,005,763
2	4	$838,042,830	$361,182,857	$159,714,599	$278,534,441	$38,610,934	1,099,079
3	5	$1,010,993,965	$663,856,639	$312,640,811	$20,060,633	$14,435,882	3,076,765
4	6	$1,049,222,088	$701,591,547	$325,097,129	$0	$22,533,412	3,167,928

Note: Dollars in Millions Unless Otherwise Noted.

[1] http://www.whitehouse.gov/omb/circulars/a094/a094.html
[2] The Texas Water Development Board can provide a 22-year maturity state tax-exempt bond at a nominal rate of 4.98 percent, as of July 2004. However, the bonds quoted to the BRA through private investors provide better financing. Consequently, these values were used in this study.
[3] Includes administrative fees and debt defeasance.

The NPV analysis demonstrates that economies of scale do exist for this project. For Options 3 and 4, increasing NPV by approximately 30 percent yields a threefold increase in the total amount of desalinated water delivered.

Options 5 and 6, the two lowest cost options, were selected for additional financial analyses. For these two options, Section 8.2 presents the time variable unit cost of water by water source while Section 8.3 presents the estimated consolidated unit rate costs that includes existing and future water supplies for several communities in the study area.

8.2 Comparison of Cost of Water Supplies

Options 5 and 6 use different portions of various water sources to meet the projected water deficits. It is useful to examine the time varying unit cost of desalinated water to the unit cost of other water supply alternatives to determine the potential long-term financial impact of supplying water from each source. Figure 8-1 compares the projected unit cost of desalinated water for Option 5 to the unit cost of the other water supply alternatives. Figure 8-1 indicates the varying unit cost of water in dollars per 1000 gallons.

8.3 Rate Analysis

A community considering incorporating desalinated water into its water supply must look at the total unit cost of water. The projected unit cost of desalinated water used as a sole source is expected to be high relative to the unit cost of conventional groundwater and surface water supplies. However, each community is projected to use desalinated water to meet only a portion of its demands. Consequently, by mixing the more expensive desalinated water with less expensive supplies, the overall unit cost of water could be moderated.

For Options 5 and 6, a preliminary rate analysis was conducted for the following take points:

- BWA customers (taken as a whole);
- Southeastern Fort Bend County area; and
- Pearland area.

Each community is projected to use different combinations of groundwater, surface water, and desalinated water throughout the planning horizon.

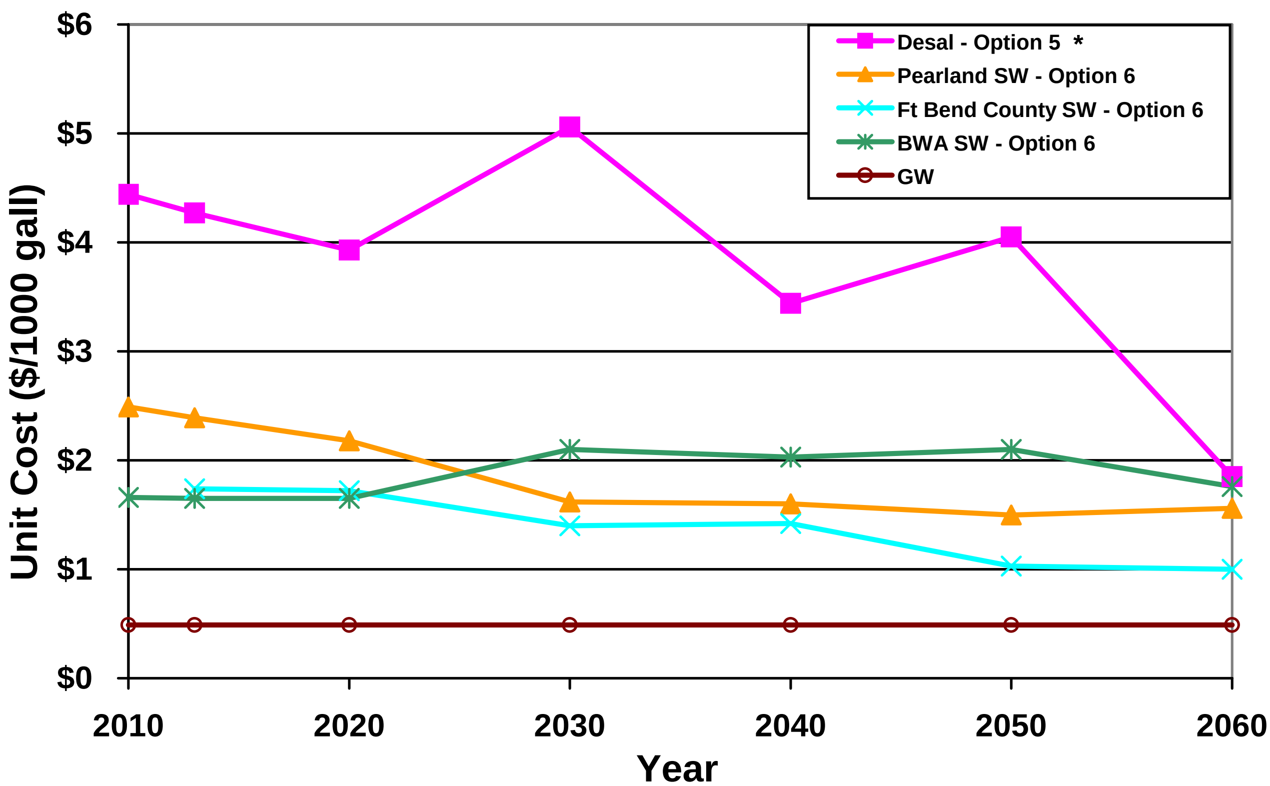

Figure 8-1
Time Varying Unit Cost of Water by Source
*** Values shown are for an initial delivery of 6.5 MGD of desalinated water**

Since these take points may serve more than one water user group, the costs are considered representative of the expected difference between the total costs of using desalinated water to meet water needs versus using surface water to meet water needs.

Figure 8-2 shows the rate analysis for Options 5 and 6 for the selected areas. The effect of incorporating desalinated water into the water supplies of the selected communities is apparent when the projected water rates for Option 5 are compared to the projected rates for Option 6, which meets all future demands through surface water or groundwater. The unit costs shown do not include any financial assistance in the form of an operating subsidy. Financial assistance is discussed in Section 9.

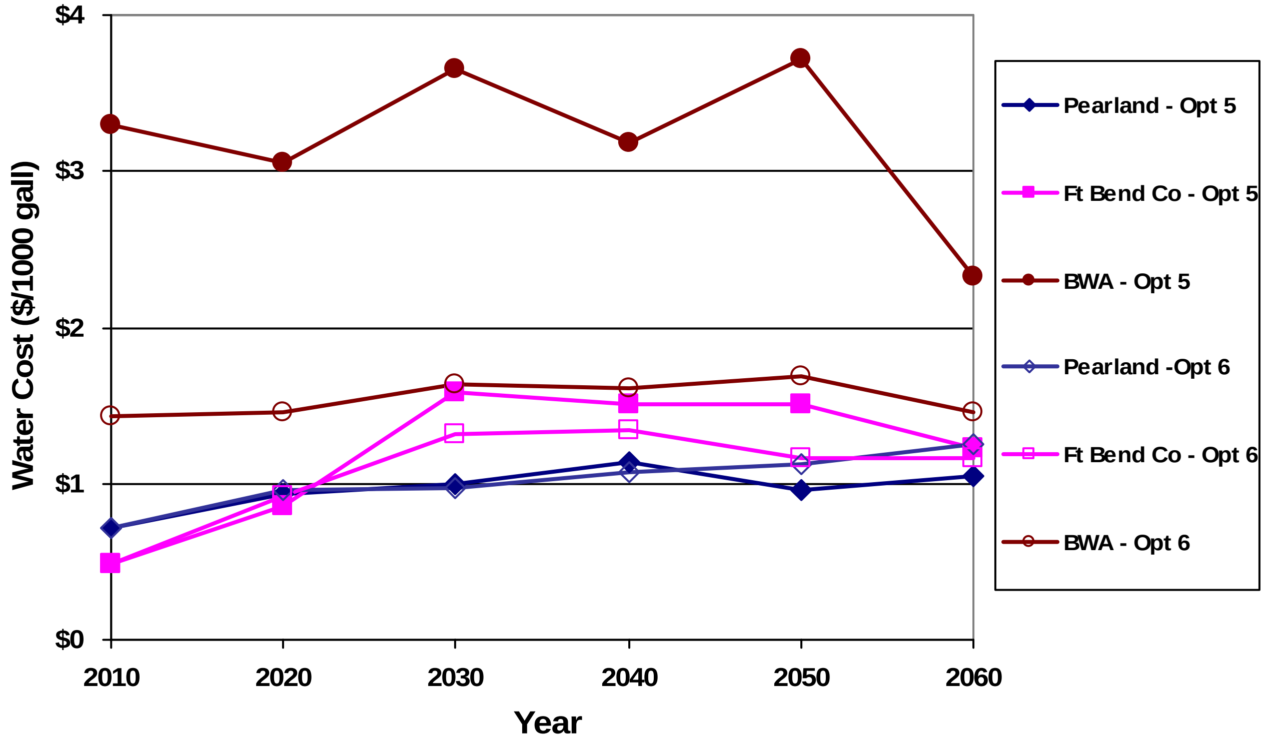

Figure 8-2
Rate Analysis for Selected Areas

8.4 Conclusions

For the five desalinated water supply options evaluated as part of this study, the net present value varies from $789 million to $1.05 billion. The net present value analysis indicates that economies of scale do exist for the desalinated water supply options: an approximate 30 percent increase in net present value results in delivering threefold the total amount of desalinated water.

The initial unit cost of desalinated water for Option 5 is $4.44 per 1000 gallons. Under Option 5, the cost of desalinated water increases in 2030, as major transmission facilities would be required to deliver desalinated water to the northern portion of the study area. After 2030, the unit cost of desalinated water for Option 5 starts to decline as debt from capital expenditures is retired and more desalinated water is used. By 2060, the projected desalinated water costs approach the projected cost of surface water.

The composite water rate, which includes blending desalinated water with other available water supplies, was projected for three areas within the study area: the Pearland area, southeastern Fort Bend County, and the BWA area. This rate analysis takes into account the groundwater and surface water supplies communities might use in the future. The rate analysis indicates that the increase associated with blending desalinated water with other available supplies is most pronounced in the BWA area. In the BWA area, the rate projected approximately doubles as a result of incorporating desalinated water into the total water supply. This increase occurs because the BWA uses a significant portion of desalinated water relative to other water supplies under the desalinated water options.

The rate analysis indicates that the BWA and its customers will require financial assistance to use desalinated water due to the significant increase that desalinated water is projected to have on the overall unit cost of water. For the Fort Bend County and Pearland areas, the effect of incorporating desalinated water into water supplies is not as significant. Consequently, financial assistance may not be needed.

Section 9 Recommendations and Implementation Plan

9.1 Introduction

The extensive analyses carried out as part of this study clearly demonstrate a municipal average day water deficit greater than 35 MGD in the proposed service area by 2060. With implementation of Option 5, a minimum average daily demand of approximately 6.5 MGD could be met by the demonstration project as soon as it becomes operational. An additional 2.7 MGD (for a total of 9.2 MGD) of manufacturing demand may also be met by the demonstration project, depending on industrial activities in the area.

9.2 Recommendations

The desalinated seawater option with the lowest net present value (NPV) is Option 5. Option 5 was developed to minimize upfront capital costs while maximizing initial demand. The economic specifics for Option 5 are shown below.

Option 5 Summary

NPV	$ 789,464,130
Initial Capital Cost	$ 28,161,324
Initial Average Day Demand	6.5 MGD
Average Unit Cost of Desalinated Seawater in First Five Years	$ 4.67/1000 gallons
Average Unit Cost of Desalinated Seawater over Study Period	$ 4.48/1000 gallons

The Brazosport Water Authority (BWA) and a large industrial client currently are discussing an additional 1 MGD of water demand; furthermore, the desalination facility will be located in a large industrial complex and there is a possibility that there will be additional demands for this high quality water. If these demands materialize after further development of the project, the unit cost of water and the required subsidy would decline. This prospect is examined further in Section 9.5.

The objective of the State of Texas is to help create a desalinated seawater demonstration project. To be feasible, the demonstration project must produce water in sufficient quantities and consistently so that important operating information about the facility can be ascertained. The demonstration project also must minimize any subsidies required and reduce large initial capital outlays. Option 5 meets all of these criteria.

Option 5 provides an initial desalinated seawater plant capacity of 10 MGD. Because Option 5 taps into an existing customer base, the initial average day demand for desalinated water would be a minimum of 6.5 MGD. Option 5 also uses portions of the BWA's existing infrastructure to deliver water to BWA customers, thus minimizing the initial capital investment. Furthermore, because these economic factors favor Option 5, the subsidy required to equalize the costs of desalinated seawater and existing water supplies would be minimized. The capacity of the desalinated seawater plant would be expanded under Option 5 as demand dictated. (The spreadsheets in

Appendix G show the increases in plant capacity.) Ultimately the desalinated seawater plant capacity under Option 5 reaches 50 MGD. The proposed demands and plant capacities are shown graphically in Figure 9-1.

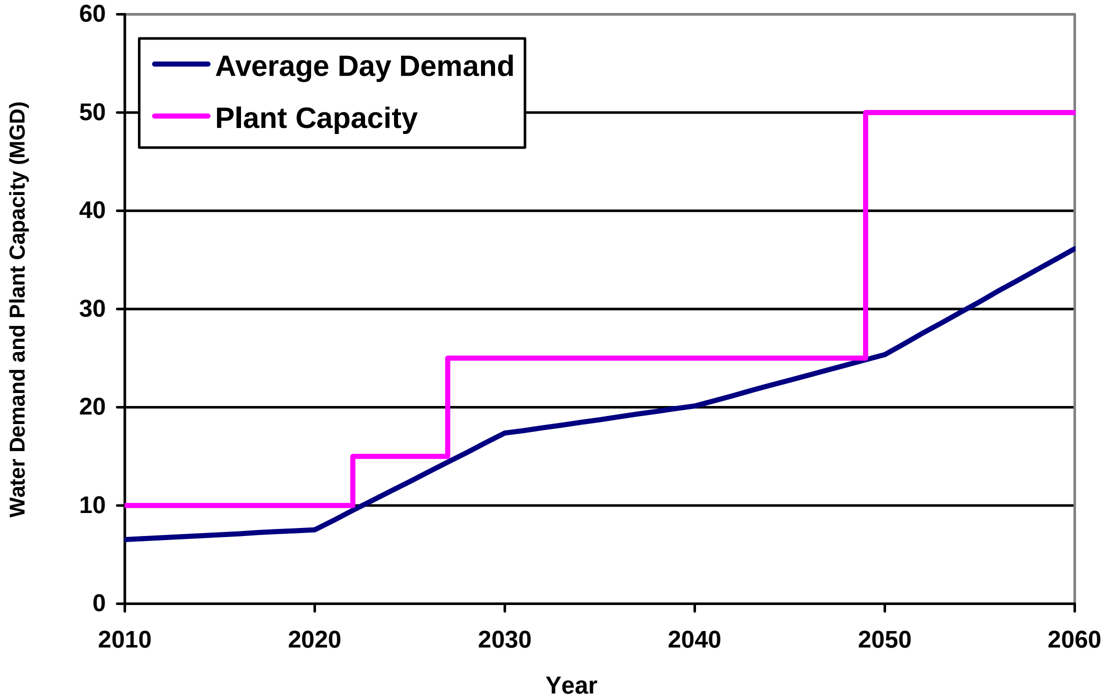

Figure 9-1
Projected Desalinated Water Demands and Plant Expansions for Option 5

Therefore, of the desalinated seawater options investigated, we recommend that the BRA and TWDB move forward with Option 5. The layout of Option 5 is shown in Figure 9-2.

Following submittal of the Draft Report, discussions with local stakeholders revealed an interest in a seawater desalination facility that would provide 3 MGD to 4 MGD. Because of the timing of this expression of interest, an option including this size facility was not included in the Final Report. However, the Brazos River Authority (BRA) will continue to pursue this option and will keep the TWDB informed regarding its progress.

9.3 Implementation Plan

Many steps must be taken to implement a desalinated seawater project at Freeport. The major steps are itemized below.

9.3.1 Piloting

Desalination using reverse osmosis is not an approved water treatment process in TCEQ 290 rules and therefore must be piloted prior to implementation. Data from a pilot test phase of at least 90 days must be submitted to TCEQ for review and approval prior to construction.

AUSSVR1\GIS\bra\TWDB\Figures\FigSR-7_9-2.mxd 8/25/2004

CDM

0 0.5 1 2 3 4 Miles

THE BRAZOS RIVER AUTHORITY
FREEPORT SEAWATER DESALINATION PROJECT

INITIAL CONVEYANCE FACILITIES - OPTION 5

FIGURE 9-2

The cost of desalinating seawater can vary significantly due to pretreatment requirements. We recommend piloting the pretreatment and reverse osmosis treatment for a minimum of six months to gather data on treatability under both warm and cold water conditions. The pilot program also should be designed to analyze the impact of using a mix of seawater and surface water as proposed by Poseidon Resources.

The pilot plant also would demonstrate the feasibility of the desalination project to stakeholders.

Poseidon will use the results of the pilot program to finalize its capacity and commodity charges for the facility. This study used indicative costs provided by Poseidon, but actual pilot data will allow those costs to be verified.

The TWDB has received a State and Tribal Lands Assistance Grant from EPA in the amount of $400,000 specifically designated for the Freeport project. The terms of the grant require matching funds. We recommend that this grant money and matching funds be used to pilot the desalinated seawater facility, including pretreatment, at Freeport for a minimum of six months.

9.3.2 Necessary Support, Agreements, and/or Contracts

Before the final unit cost of water from a seawater desalination project can be determined for its potential customers, the availability and amount of financial assistance from the State of Texas and the federal government must be finalized.

After the cost of water is determined, the BRA will need to pursue cooperative agreements with the BWA that would provide for the BRA/Poseidon Partnership treating and delivering desalinated seawater to BWA's facilities in Lake Jackson for distribution to BWA's customers.

The BRA and Poseidon will need to negotiate a pay-for-performance contract for Poseidon to deliver water to the BRA from the seawater desalination plant. The terms and conditions of this contract will be complex and beyond the scope of this study; at a minimum, they must include the amount of water to be purchased, the quality of the finished water, the term of the agreement, and commodity and capacity charges. The demonstration focus of this project, building ahead of actual demand, and the existence of groundwater and surface water facilities provide an ideal situation for a pay-for-performance public-private contract. The BRA and State of Texas can transfer a substantial portion of the project risk to the private sector since there will be alternative supplies still in place.

9.3.3 Permits

Permits and approvals for construction will be required before construction can begin on the seawater desalination facility and its storage and conveyance appurtenances. If the seawater desalination facility is constructed at the Dow facility, there should be few issues involving threatened/endangered species, wetlands, or archaeological artifacts. Depending on who owns the land where the facility will be constructed, environmental assessments of the property may be required.

Assessments also will be required of the impact to endangered/threatened species, wetlands, and archaeological issues from storage, pumping, and conveyance facilities. However, because the proposed pipeline from Freeport to Lake Jackson will be constructed parallel to the existing BWA pipeline, environmental and archaeological issues should be minimized.

The question of whether an individual 404 permit is required for the Freeport project will depend upon the total linear footage and number of acres disturbed in the waters of the United States. These issues can be revisited as pipeline routes and other construction sites are finalized.

Dow already has permits for withdrawing and discharging surface water and seawater. Poseidon plans on working with Dow to amend these permits as necessary for the seawater desalination project. In February 2004, the Texas Commission on Environmental Quality (TCEQ) modified Dow's existing seawater withdrawal permits to include industrial and potable municipal uses. [1]

For permitting purposes, The Dow Chemical Company discharges directly to the Brazos Coastal Segment as defined in Section 201 by the TCEQ and as referenced in the Dow discharge permit. The proposed desalination facility will discharge to an internal point within the Dow discharge canal system before being blended with other seawater and process water for discharge to the Brazos River at the existing discharge point 001. With the concurrence of the TCEQ, Poseidon expects to use the Dow discharge as a common outfall but under a separate TPDES discharge permit regulated by the state.

9.4 Schedule

The schedule for implementing the demonstration seawater desalination project at Freeport is as follows:

Task	Start Date	Finish Date
Pilot Agreements and Grant Application	January 2005	October 2005
Pilot Facility Construction and Implementation	November 2005	September 2006
TCEQ Review	October 2006	December 2006
Permits	October 2006	April 2007
Contract for Water Delivery between BRA & Poseidon	January 2007	June 2007
Wholesale Water Agreements	July 2007	December 2007
Design/Build Desalination Facilities	June 2008	May 2010
Design/Permit/Easements for Conveyance Facilities	June 2008	December 2008
Bid/Construct Conveyance Facilities	January 2009	May 2010

This is an aggressive schedule; however, we believe it is realistic because of the unique site at the Dow facility, the public-private partnership, the design/build delivery technique for constructing the desalination facility, and the relatively small amount of offsite improvements required to deliver water under Option 5.

[1] Amendment to Certification of Adjudication No. 11-5334 allows for industrial and now municipal uses for seawater. Date Granted Feb. 2, 2004, as Certificate No.11-5334A.

9.5 Financing

Five options to provide desalinated seawater to the service area were evaluated in detail. These five options were compared to a non-desalinated water option to determine any additional costs to implement desalinated seawater. Section 8 summarized the net present value and presented the projected unit cost of water for all of the options. The desalinated seawater options have higher net present values and higher unit costs than the alternative to desalinated seawater. However, the cost of desalinating seawater is decreasing as technology improves in this area. At the same time, the cost of treating surface water maintains an upward trend as drinking water rules continue to make treatment of surface water more complex and more expensive. As these trends continue into the future, the cost of desalinating seawater will become more competitive. Nevertheless, at this time, implementing a desalinated seawater option will require financial assistance, probably in the form of an operating subsidy.

9.5.1 Freeport Project Approach

The seawater desalination project at Freeport is unique among the projects being reviewed by TWDB. This project includes a public agency entering into a public-private partnership with Poseidon Resources. Virtually all the successful seawater desalination facilities have been completed as public-private partnerships. This project proposes that Poseidon design, permit, build, operate, and finance the seawater desalination facility in Freeport. (One financing vehicle being explored is the use of Private Activity Bonds.) Poseidon then will contract with the BRA to sell the water under a contract structure using a capacity charge and commodity charge.

BRA would be responsible for conveyance facilities from "the gate" to the individual water utility take points, including ground storage tanks, pump stations, and pipelines. This infrastructure probably would be financed over 30 years using tax-exempt financing. Revenue to repay the bonds would be derived from sales of desalinated seawater to water utilities.

The BRA may be able to proceed with the pilot facility using the EPA grant mentioned above. Full implementation depends on decisions made by the State of Texas as to whether the financial assistance will be provided to the seawater desalination project and in what amount.

The Freeport Seawater Desalination Project is the right project for Texas to pursue as a pilot demonstration project. In addition to proactively meeting long-term needs, the project has several unique advantages:

- Experienced Partners – A public-private partnership between the BRA and Poseidon Resources will leverage local and state resources with $76 million in private investments. Poseidon has substantial experience in large-scale desalination projects in Florida and California.

- Location – Co-locating the project at The Dow Freeport site brings numerous advantages:

  - ✓ existing infrastructure, including on-site power and established site security;
  - ✓ convenient access to seawater, river water supply, and discharge;
  - ✓ shorter project implementation schedule due to existing permits; and
  - ✓ no bay means reduced environmental issues related to brine disposal.

Furthermore, because this project will use existing infrastructure, project implementation can occur rapidly.

- Basinwide Benefits – The project will provide a new, drought-proof source of water resulting in a diversity of supply and enhanced reliability for the region. It also will provide efficiency and future benefits to the entire Brazos River basin by allowing limited surface water to be used in areas for which seawater is too distant to be a practical option. Finally, using high quality, reliable desalinated water for municipal supplies could make raw surface water available for irrigation and for manufacturing needs that do not require highly treated water.

9.5.2 Required Subsidy

The BWA currently sells water to its customers for $1.58/1000 gallons through take-or-pay contracts. The amount of water taken in excess of the contract amount also is billed to the customer cities at a unit cost of $1.58/1000 gallons. It is anticipated that improvements to the BWA surface water treatment plant may be required that would increase the unit cost of water to BWA customers to $1.62/1000 gallons by 2010. In order for the demonstration project to have no financial effect on BWA, a subsidy would be required to hold the cost of water from the desalination facility to approximately $1.21/1000 gallons, including storage, pumping, and pipeline. This cost ceiling is necessary because the BWA will have to retire debt on its pipeline facilities, provide for operation and maintenance of the pipeline facilities, and cover general and administrative costs. At a unit cost of $1.21/1000 gallons and the contracted quantities, the desalination project cannot exceed an annual cost to end users of $3,458,000.

BWA customers are shown below:

Customer	Contract Amount (MGD)	Take-or-Pay Amount
Angleton	1.800	$1,038,060
Brazoria	0.300	$ 173,010
Clute	1.000	$ 576,700
Freeport	2.000	$1,153,400
Lake Jackson	2.000	$1,153,400
Oyster Creek	0.095	$ 54,787
Richwood	0.235	$ 135,525
Correctional Units	0.400	$ 230,680
Total	**7.830**	**$4,515,562**

Annual charges for the demonstration seawater desalination facility as currently proposed include:

Capacity Charges (10 MGD)	$ 6,497,000
Commodity Charge (6.5 MGD)	$ 2,165,000
Debt Service for Conveyance Facilities	$ 1,747,900
Maintenance Cost for Conveyance Facilities	$ 724,600
Total	$11,134,600

In order to proceed, the demonstration seawater desalination project will need an annual subsidy of $7,676,600 in financial assistance. Based on 6.5 MGD of use, this is equal to $3.24/1000 gallons or about $1,056/acre-foot.

If additional industrial demand is added to the desalination project so that the total demand reaches 9.2 MGD by the year 2010, the required subsidy is $7,962,100 per year, but the unit cost of the subsidy becomes $2.37/1000 gallons or $772/acre-foot. The desalination project is located on a large industrial area and these possibilities are being actively explored.

The subsidy will be required as long as the cost of desalinated water is higher than non-desalination alternatives. The need for and amount of a subsidy should be evaluated biennially. As desalination technology improves, the unit cost of desalinated water should decrease. At what point in time improvements in technology would allow desalinated water unit costs to approach those of treated surface water is unknown.

9.5.3 Current Subsidies

In Florida and California, substantial subsidies have been established. The federal government also is considering operating subsidies for seawater desalination facilities. The current subsidies in place or being considered are described below.

Federal Government

The federal government is considering bipartisan legislation that would subsidize the energy costs of operating a seawater desalination facility. As currently proposed, HR 3834 would "direct the Secretary of Energy to make incentive payments to the owners or operators of qualified desalination facilities to partially offset the cost of electrical energy required to operate such facilities." The proposed payments would total $0.62/1000 gallons of desalinated water produced and sold. The legislation also provides that payments would be adjusted for inflation. The total funding available under HR 3834 is $200 million.

Southwest Florida Water Management District (SWFWMD)

Southwest Florida Water Management District (SWFWMD) is one of five water management districts within the State of Florida regulating the use of water resources in its territory. The SWFWMD serves 4 million people. As a public agency of the State of Florida created and operating pursuant to Chapter 373 of Florida Statutes, SWFWMD may use permit application fees and a method of ad valorem taxation to finance its activities. SWFWMD mandated that Tampa Bay Water (TBW) reduce reliance on groundwater resources and agreed to provide funding assistance in a maximum amount equal to 90 percent of capital costs for the 25 MGD Tampa Bay Desalination Project, up to a maximum amount of $85 million. The funding was to be used to pay:

- A portion of the cost of water purchased pursuant to the Water Purchase Agreement with Tampa Bay Desalination or an indirect payment of a portion of the capital cost of the project, including interest;

- A portion of the purchase price of the project in the event that TBW exercised an option to purchase the project; or

CDM

- The costs of another new water supply in accordance with a partnership agreement with SWFWMD.

For the projected $2.08/1000 gallons unit cost of desalinated water, an initial subsidy of $0.50 to $0.60 was proposed to yield a net price of approximately $1.50/1000 gallons of wholesale water.

Metropolitan Water District of Southern California

In order to stimulate the development of groundwater and wastewater reuse, as well as seawater desalination programs, the Metropolitan Water District of Southern California (MWD) has created a series of local resource programs over the last decade within its Integrated Resources Program. The MWD supplies imported water to 26 member agencies serving approximately 17 million people. The MWD has entered into a number of agreements for annual subsidies of local supply of up to $250/acre-foot of treated water in order to encourage the use of local supplies. For example, the Capistrano Valley Water District in Orange County recently financed and constructed a 5 MGD inland desalter called the San Juan Basin Desalter Project. MWD has agreed to make a financial contribution in the amount of $250/acre-foot to recover degraded groundwater.

9.6 Conclusion

The Freeport Seawater Desalination Project best meets the criteria put forth by the State of Texas for constructing a demonstration seawater desalination facility.

- Option 5 provides an immediate demand on the demonstration facility. The demonstration facility would be operated at 6.5 MGD when it opens. Population in the service area is projected to almost triple from 2000 to 2060 and water shortages have been identified in municipal, manufacturing, and irrigation areas.

- The facility is located close to the largest urban area in Texas and, of the three proposed seawater desalination projects, is the closest to two major engineering universities. The Freeport facility will add immensely to research on desalination and information on the project will reach a larger population.

- The site distinguishes the Freeport facility from the other proposed projects. Co-locating the Freeport facility within the existing Dow complex provides existing access to seawater, brine disposal discharge permits, and wholesale electrical power. Because the site is not a greenfield, development of the desalination facility will not cause environmental damage. The Texas coast at this location lacks a bay; as a consequence, the project will have minimal impact on the environment. Furthermore, construction cost will be reduced because no long brine discharge pipe will be needed.

- The project is supported by the major cities in the service area, the Brazoria County Economic Development Alliance, and the Greater Houston Partnership. The project is also supported in the Texas Legislature and the U.S. Congress.

- Because the project is being proposed as a public-private partnership, it limits risks to both the BRA and the State of Texas. Although financial assistance is needed, this support and the risk associated with the project are shared with a private entity.

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The Senate of
the State of Texas

Kyle Janek

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FAX: (713) 272-8956

P.O. BOX 888
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FAX: (979) 297-7996

August 26, 2004

COPY

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

I am writing in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, sustainable new water supply to Brazoria and Fort Bend counties.

There have been detailed analyses conducted over the past year which show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

For all these reasons, I believe the development of the Freeport Seawater Desalination Plant will be highly beneficial to SD 17 and all of Texas.

Please do not hesitate to contact me if I can answer any questions.

Sincerely,

Kyle Janek

Kyle Janek

TEXAS HOUSE OF REPRESENTATIVES

CAPITOL OFFICE:
P.O. Box 2910
Austin, Texas 78768-2910
(512) 463-0528
(512) 463-7820 Fax

DISTRICT OFFICE:
1550 Foxlake Dr., Ste 114
Houston, Texas, 77084
(281) 578-8484
Fax (281) 578-1674

BILL CALLEGARI
STATE REPRESENTATIVE

25 August 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

For all these reasons, I support development of the Freeport Seawater Desalination Plant and deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

I look forward to seeing the green light on this important and far-reaching project.

Sincerely,

W.A. Callegari

E-Mail: bill.callegari@house.state.tx.us

THE SENATE OF THE STATE OF TEXAS

CAPITOL OFFICE
P.O. BOX 12068
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MIKE.JACKSON@SENATE.STATE.TX.US
DIAL 711 FOR RELAY CALLS

COMMITTEES
SUBCOMMITTEE ON AGRICULTURE, *CHAIR*
NATURAL RESOURCES, *VICE-CHAIR*
BUSINESS AND COMMERCE
GOVERNMENT ORGANIZATION
NOMINATIONS
SUNSET ADVISORY COMMISSION

MIKE JACKSON

August 13, 2004

TWDB
RECEIVED
AUG 13 2004
ROUTE TO: ________
CC TO: KW, BM, JA, WR

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

For all these reasons, I support development of the Freeport Seawater Desalination Plant and deem water produced from the seawater desalination plant as a viable option for meeting long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

Sincerely,

Mike Jackson

Mike Jackson
State Senator
District 11

LEAGUE CITY DISTRICT OFFICE
201 ENTERPRISE, SUITE #600-A
LEAGUE CITY, TEXAS 77573
281/334-0011
FAX: 281/334-3043

THE SENATE OF TEXAS
SENATE DISTRICT 11

PASADENA DISTRICT OFFICE
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PASADENA, TEXAS 77504
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DENNIS BONNEN

CAPITOL OFFICE:
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(979) 848-1770
FAX (979) 849-3169

HOUSE OF REPRESENTATIVES
Committees: Chair, Environmental Regulation · Insurance

August 24, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

For all these reasons, I support development of the Freeport Seawater Desalination Plant and deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

We look forward to seeing the green light on this important and far-reaching project.

Sincerely,

Dennis Bonnen

Dennis Bonnen
State Representative
District 25

State of Texas
House of Representatives

Charlie Geren

CAPITOL OFFICE:
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512-463-0610
FAX 512-463-8310

DISTRICT OFFICE:
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RIVER OAKS, TEXAS 76114
817-738-8333
FAX 817-738-8362

August 25, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

Please allow me this opportunity to express my support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This worthwhile project will help provide a new and sustainable water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and reliability of water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation. Additionally, new technologies have made desalination more cost-competitive when compared with other new water supply development alternatives.

Desalinated seawater will be an important part of future water supply strategies for the State of Texas. I believe that encouraging reasonable rates in conjunction with public-private partnerships will ultimately be in our best interest. For these reasons, I support the development of the Freeport Seawater Desalination Plant.

As always, thank you for your thoughtful consideration. I truly understand and appreciate the outstanding work you do for future generations of Texans.

Sincerely,

Charlie Geren

RESOLUTION SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

WHEREAS, both sustainable growth and quality of life are dependent on reliable supplies of water; and

WHEREAS, communities in these counties face mounting restrictions on groundwater use necessary to control and prevent subsidence; and

WHEREAS, new demand for water from the Brazos River continues to increase; and

WHEREAS, advances in technology have made desalination of seawater cost-competitive with other new water supply development alternatives; and

WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

NOW, THEREFORE, BE IT RESOLVED that the Brazoria County Commissioners Court supports development of the Freeport Seawater Desalination Project; and

BE IT FURTHER RESOLVED that the Brazoria County Commissioners Court deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED AND APPROVED by the Brazoria County Commissioners Court on this 13th day of July, 2004.

County Judge John Willy

Commissioner Donald Payne, Pct. 1

Commissioner James Clawson, Pct. 2

Commissioner Jack Harris, Pct. 3

Commissioner L. L. Stanley, Pct. 4

Economic Development Alliance for Brazoria County
RESOLUTION SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

WHEREAS, both sustainable growth and quality of life are dependent on reliable supplies of water; and

WHEREAS, communities in these counties face mounting restrictions on groundwater use necessary to control and prevent subsidence; and

WHEREAS, new demand for water from the Brazos River continues to increase; and

WHEREAS, advances in technology have made desalination of seawater cost-competitive with other new water supply development alternatives; and

WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

NOW, THEREFORE, BE IT RESOLVED that the Economic Development Alliance for Brazoria County supports development of the Freeport Seawater Desalination Project; and

BE IT FURTHER RESOLVED that the Economic Development Alliance for Brazoria County deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED AND APPROVED by the Economic Development Alliance for Brazoria County on this 13th day of September, 2004.

David A. Stedman, President and CEO

GREATER HOUSTON PARTNERSHIP
Chamber of Commerce • Economic Development • World Trade

Robert Mosbacher, Jr.
Chairman of the Board

August 5, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Dear Mr. Ward:

Earlier this year, the Greater Houston Partnership's Water Supply Committee was briefed on the Freeport Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. After careful review and evaluation of the desalination project, the Partnership's Water Supply Committee **supports the development of the Freeport Seawater Desalination Plant.**

The City of Freeport is in the Region H water planning group along with Houston and surrounding counties. Region H has undergone extensive planning studies to predict water availability in 2050. All of the major water providers in the region, except for the Trinity River Authority, are projected to face supply shortages by 2050. Therefore, it is imperative to move forward with long-range planning efforts to address this issue now, before it becomes a crisis.

The Freeport Desalination Project promises to bring a high-quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties. This project will provide another alternative to surface water from the Brazos River and will provide an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability and salt water intrusion. Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

The Partnership's Water Supply Committee is in support of this project and would like to see it become a reality. Desalinated water is a viable option for meeting the region's long-term needs and having this water available, at reasonable rates, will play an important part in our future water supply strategy.

Best Regards,

Robert Mosbacher, Jr.

cc: The Honorable Bob Hebert, Fort Bend County Judge
The Honorable John Willy, Brazoria County Judge
Jim C. Kollaer, president and CEO, Greater Houston Partnership
Walt Mischer, Jr., chairman, Transportation/Infrastructure Advisory Committee
Glenn Johnson, chairman, Water Supply Committee
Phil Ford, general manager and CEO, Brazos River Authority

CITY OF LAKE JACKSON

25 OAK DRIVE • LAKE JACKSON, TEXAS 77566-5289 • 979-415-2400 • FAX 979-297-9804

July 21, 2004

TWDB
RECEIVED

AUG 04 2004

ROUTE TO: Jorge - 8/11/04

CC TO: KW, BM, JA, WR

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the desalination project, supplementing our surface and groundwater supplies could enhance the quality and certainty of our water supplies. Desalinated seawater at rates competitive to other sources could be an important part of our future water supply strategies.

As advances in technology make desalination of seawater cost-competitive when compared with other water supply development alternatives, desalination becomes an increasingly important alternative for our community.

For all these reasons, the City of Lake Jackson supports development of the Freeport Seawater Desalination Plant.

We look forward to seeing the green light on this important and far-reaching project.

Sincerely,

Shane W. Pirtle
Mayor, City of Lake Jackson

Young Lorfing, TRMC
City Secretary
(281) 652-1655
Telecopier (281) 652-1719
ylorfing@ci.pearland.tx.us

CITY OF PEARLAND
PEARLAND
TEXAS
EST. 1894

July 28, 2004

Brad Brunett
Brazos River Authority
P.O. Box 7555
Waco, TX 76714-7555

Dear Mr. Brunett:

Enclosed herewith is a copy of Resolution No. R2004-121. The resolution is authorizing and supporting a seawater desalination plant in Freeport. The resolution was adopted in a Regular Council Meeting of the City Council July 26, 2004.

Respectfully,

Young Lorfing, TRMC
City Secretary

YL/ls
Enclosure
cc: Alan Mueller, Deputy City Manager

CITY OF PEARLAND

PEARLAND

TEXAS

EST. 1894

CERTIFICATION

THE STATE OF TEXAS §

COUNTIES OF BRAZORIA, HARRIS &
FT. BEND. §

I, LaKeisha Cannon-Scott, Deputy City Secretary of the City of Pearland, Texas, hereby certify that the attached constitutes a true and correct copy of **Resolution No. R2004-121; duly passed and approved by the City Council on the 26th day of July 2004.**

Witness my hand and seal of the City of Pearland, Texas, this 28th day of July 2004, at Pearland, Texas.

LaKeisha Cannon-Scott
Deputy City Secretary

(SEAL)

3519 LIBERTY DRIVE • PEARLAND, TEXAS 77581-5416 • 281-652-1600 • www.ci.pearland.tx.us

RESOLUTION NO. R2004-121

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PEARLAND, TEXAS, AUTHORIZING THE CITY MANAGER OR HIS DESIGNEE TO SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT.

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

WHEREAS, both sustainable growth and quality of life are dependent on reliable supplies of water; and

WHEREAS, communities in these counties face mounting restrictions on groundwater use necessary to control and prevent subsidence; and

WHEREAS, new demand for water from the Brazos River continues to increase; and

WHEREAS, advances in technology have made desalination of seawater cost-competitive with other new water supply development alternatives; and

WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing as much as 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PEARLAND, TEXAS:

Section 1. That the City of Pearland supports development of the Freeport Seawater Desalination Project.

Section 2. That the City of Pearland deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED, APPROVED and ADOPTED this the 26th day of July, A.D., 2004.

Tom Reid

TOM REID
MAYOR

ATTEST:

Young Lorfing

YOUNG LORFING, TRMC
CITY SECRETARY

APPROVED AS TO FORM:

Darrin M. Coker

DARRIN M. COKER
CITY ATTORNEY

Questions and Answers from 1 March 2004 Public Meeting

Q: How does reverse osmosis (RO) water blend with groundwater? How will you ensure that doesn't cause problems?
A: This will be part of the study. RO is a very adjustable process, so should be easy to minimize potential blending problems. An RO plant can "dial in" water quality better than conventional water treatment plant.

Q: Where will the blending occur?
A: Probably at the receiving point.

Q: How will you prevent problems with odor that may result from blending or other delivery problems?
A: This will require close coordination with potential customers to address potential issues up front. The study will look at the history of each particular system, problems that have occurred in the past. From there, we will develop a "highest common denominator."

Q: One attendee expressed a big concern with the potential cost of desalination. He feels the only way to be economical is the use of blending. If the water can't be blended, it will be too expensive.
A: Blending is routinely done as part of RO processes. The implementation phase of the project will look into potential complications. Also, there will be a need to test to determine compatibilities of water; we will not spend $125 million without significant testing up front. This is "designer water," therefore it is easier to modify the process to meet the common denominator.

Q: How long till we know about cost?
A: This study is due at the end of the year. Concerns about cost are exactly why we are evaluating various options, not just desalination.

Q: One attendee expressed concern about using existing infrastructure. Typically you will pick up some metals and will need to treat with polyphosphates. What is the cost associated with having to treat with polyphosphates? Without treatment, the water will be rusty.
A: We will have to address that issue as part of the study.

Q: Will you use new or existing facilities?
A: Both will be considered.

Q: Will this project directly affect the capacity of wastewater collection and treatment facilities?
A: This will allow BRA to move water to where it's needed; will not cause overloading of wastewater systems.

Q: Will water quality of the Brazos downstream decline over planning horizon due to population growth upstream?
A: We do expect more water to be used, which will affect flows in the river. There may be an impact to water quality, but we are not aware of any specific threat at this point.

Q: What percentage of water in the Brazos is treated wastewater?
A: The amount of flow depend on the time of year. Treated wastewater flows in the summertime would constitute a greater percentage of the total flow than they would in the winter time. If you looked at it for an entire year, it would probably be fairly insignificant. Also, the drainage area of Brazos River is quite large.

Q: Is there a salt wedge moving up the Brazos River currently?
A: Yes, in times of low flows, the salt wedge moves well up the river channel. The Dow plant personnel would know how far up river it goes.

Q: There was a desalination facility on the Brazos River in the 60s. It was really expensive. A large storm wiped it out and it wasn't rebuilt because the water produced was too expensive. What's different now?
A: Thermal desalination was extremely expensive; in addition, the old plant was a demonstration plant. The technology has dramatically improved and costs have come way down with RO. We hope to minimize some initial capitol costs by collocating with existing facilities. There are 12,000 desalination plants worldwide. This technology is relatively common nowadays.

Q: Why can't we use the runoff that is detained in local detention facilities? What's the cost of this alternative?
A: That source of water is not a firm source. During drought periods you would not have any water at all. We have to ensure our customers of 100% reliability. You would also need to treat that runoff. At any rate, it is not a reliable source of water. *(One on one follow-up after formal Q&A - if a particular project utilizing detained water was determined to be technically feasible, treatment costs could vary dramatically, depending on the individual project and what's in the water.)* The Allen's Creek reservoir project now being planned also will function as a retention facility; however, it won't be built for 30 years.

Mark Lowry (TCB) added – The purpose of detention facilities is to delay the water moving downstream and control its release. If you kept the detention facilities full to have a 'more firm' source, you loose your flood control capability. These are not retention facilities.

Q: What is the vision of desalinated water as a long term supply of desalinated water for users within the interior of Texas?
A: If we meet demands downstream with desalination, there's more water available for upstream users.

Jorge Arroyo (TWDB) added – That is correct. The 3 studies currently going on are trying to determine if desalination is a viable option. We need to add seawater and brackish groundwater to our toolbox of options. There is a need to look at the

engineering and economics up front to determine viability. Long-term vision is a drought-proof source for water supply.

David Meesey (TWDB) added – We are also looking at brackish groundwater desalination possibilities in other inland areas (west part of TX). Brine disposal is an issue that will need to be addressed, maybe through deep well injection.

Q: Is this a competition among the 3 sites?
A: BRA does not look at this as a competition at all. However, we want to be sure to make our site work if it's a viable option that we have done everything right in order to have a project here.

Jorge Arroyo (TWDB) added – Not really. Three proposals were selected; on Dec. 1, we will send a formal recommendation to the Legislature. We don't know what the final recommendation will be – it might be one site, all sites, no sites, or a combination.

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The Senate of
the State of Texas

Kyle Janek

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7777 SOUTHWEST FRWY, STE. 102
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August 26, 2004

COPY

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

I am writing in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, sustainable new water supply to Brazoria and Fort Bend counties.

There have been detailed analyses conducted over the past year which show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

For all these reasons, I believe the development of the Freeport Seawater Desalination Plant will be highly beneficial to SD 17 and all of Texas.

Please do not hesitate to contact me if I can answer any questions.

Sincerely,

Kyle Janek

TEXAS HOUSE OF REPRESENTATIVES

CAPITOL OFFICE:
P.O. Box 2910
Austin, Texas 78768-2910
(512) 463-0528
(512) 463-7820 Fax

DISTRICT OFFICE:
1550 Foxlake Dr., Ste 114
Houston, Texas, 77084
(281) 578-8484
Fax (281) 578-1674

BILL CALLEGARI
STATE REPRESENTATIVE

25 August 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

For all these reasons, I support development of the Freeport Seawater Desalination Plant and deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

I look forward to seeing the green light on this important and far-reaching project.

Sincerely,

W.A. Callegari

E-Mail: bill.callegari@house.state.tx.us

THE SENATE OF THE STATE OF TEXAS

CAPITOL OFFICE
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MIKE.JACKSON@SENATE.STATE.TX.US
DIAL 711 FOR RELAY CALLS

COMMITTEES
SUBCOMMITTEE ON AGRICULTURE, *CHAIR*
NATURAL RESOURCES, *VICE-CHAIR*
BUSINESS AND COMMERCE
GOVERNMENT ORGANIZATION
NOMINATIONS
SUNSET ADVISORY COMMISSION

MIKE JACKSON

August 13, 2004

TWDB
RECEIVED
AUG 13 2004
ROUTE TO: ______
CC TO: KW, BM, JA, WR

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

For all these reasons, I support development of the Freeport Seawater Desalination Plant and deem water produced from the seawater desalination plant as a viable option for meeting long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

Sincerely,

Mike Jackson

Mike Jackson
State Senator
District 11

LEAGUE CITY DISTRICT OFFICE
201 ENTERPRISE, SUITE #600-A
LEAGUE CITY, TEXAS 77573
281/334-0011
FAX: 281/334-3043

SENATE DISTRICT 11

PASADENA DISTRICT OFFICE
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PASADENA, TEXAS 77504
713/948-0111
FAX: 713/948-0004

DENNIS BONNEN

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DISTRICT OFFICE:
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Fax (979) 849-3169

HOUSE OF REPRESENTATIVES
Committees: Chair, Environmental Regulation · Insurance

August 24, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and certainty of our water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability, and salt water intrusion.

Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

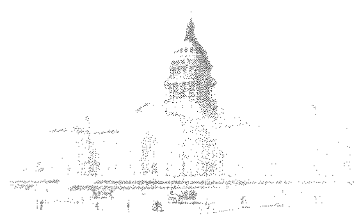
For all these reasons, I support development of the Freeport Seawater Desalination Plant and deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs. Desalinated seawater at reasonable rates will be an important part of our future water supply strategies.

We look forward to seeing the green light on this important and far-reaching project.

Sincerely,

Dennis Bonnen

Dennis Bonnen
State Representative
District 25



District 25 Brazoria (part)

State of Texas
House of Representatives

Charlie Geren

Capitol Office:
P.O. Box 2910
Austin, Texas 78768-2910
512-463-0610
Fax 512-463-8310

District Office:
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River Oaks, Texas 76114
817-738-8333
Fax 817-738-8362

August 25, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

Please allow me this opportunity to express my support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This worthwhile project will help provide a new and sustainable water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the project can dramatically enhance the quality and reliability of water supplies. This desalination project will provide another alternative to surface water from the Brazos River, which is given to drought susceptibility and issues of water quality in this portion of the basin. It also provides an alternative to groundwater, now subject to increasing regulation. Additionally, new technologies have made desalination more cost-competitive when compared with other new water supply development alternatives.

Desalinated seawater will be an important part of future water supply strategies for the State of Texas. I believe that encouraging reasonable rates in conjunction with public-private partnerships will ultimately be in our best interest. For these reasons, I support the development of the Freeport Seawater Desalination Plant.

As always, thank you for your thoughtful consideration. I truly understand and appreciate the outstanding work you do for future generations of Texans.

Sincerely,

Charlie Geren

RESOLUTION SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

WHEREAS, both sustainable growth and quality of life are dependent on reliable supplies of water; and

WHEREAS, communities in these counties face mounting restrictions on groundwater use necessary to control and prevent subsidence; and

WHEREAS, new demand for water from the Brazos River continues to increase; and

WHEREAS, advances in technology have made desalination of seawater cost-competitive with other new water supply development alternatives; and

WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

NOW, THEREFORE, BE IT RESOLVED that the Brazoria County Commissioners Court supports development of the Freeport Seawater Desalination Project; and

BE IT FURTHER RESOLVED that the Brazoria County Commissioners Court deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED AND APPROVED by the Brazoria County Commissioners Court on this 13th day of July, 2004.

County Judge John Willy

Commissioner Donald Payne, Pct. 1

Commissioner James Clawson, Pct. 2

Commissioner Jack Harris, Pct. 3

Commissioner L. L. Stanley, Pct. 4

Economic Development Alliance for Brazoria County
RESOLUTION SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

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WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

NOW, THEREFORE, BE IT RESOLVED that the Economic Development Alliance for Brazoria County supports development of the Freeport Seawater Desalination Project; and

BE IT FURTHER RESOLVED that the Economic Development Alliance for Brazoria County deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED AND APPROVED by the Economic Development Alliance for Brazoria County on this 13th day of September, 2004.

David A. Stedman, President and CEO

GREATER HOUSTON PARTNERSHIP
Chamber of Commerce • Economic Development • World Trade

Robert Mosbacher, Jr.
Chairman of the Board

August 5, 2004

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Dear Mr. Ward:

Earlier this year, the Greater Houston Partnership's Water Supply Committee was briefed on the Freeport Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. After careful review and evaluation of the desalination project, the Partnership's Water Supply Committee **supports the development of the Freeport Seawater Desalination Plant.**

The City of Freeport is in the Region H water planning group along with Houston and surrounding counties. Region H has undergone extensive planning studies to predict water availability in 2050. All of the major water providers in the region, except for the Trinity River Authority, are projected to face supply shortages by 2050. Therefore, it is imperative to move forward with long-range planning efforts to address this issue now, before it becomes a crisis.

The Freeport Desalination Project promises to bring a high-quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties. This project will provide another alternative to surface water from the Brazos River and will provide an alternative to groundwater, now subject to increasing regulation resulting from land subsidence, limited availability and salt water intrusion. Furthermore, advances in technology have made desalination of seawater more cost-competitive when compared with other new water supply development alternatives.

The Partnership's Water Supply Committee is in support of this project and would like to see it become a reality. Desalinated water is a viable option for meeting the region's long-term needs and having this water available, at reasonable rates, will play an important part in our future water supply strategy.

Best Regards,

Robert Mosbacher, Jr.

cc: The Honorable Bob Hebert, Fort Bend County Judge
The Honorable John Willy, Brazoria County Judge
Jim C. Kollaer, president and CEO, Greater Houston Partnership
Walt Mischer, Jr., chairman, Transportation/Infrastructure Advisory Committee
Glenn Johnson, chairman, Water Supply Committee
Phil Ford, general manager and CEO, Brazos River Authority

CITY OF LAKE JACKSON
25 OAK DRIVE • LAKE JACKSON, TEXAS 77566-5289 • 979-415-2400 • FAX 979-297-9804

July 21, 2004

TWDB
RECEIVED

AUG 04 2004

ROUTE TO: Jorge - 8/11/04
CC TO: KW, BM, JA, WR

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

This letter comes in support of the Freeport Seawater Desalination Project, the proposed public-private partnership between the Brazos River Authority and Poseidon Resources. This project promises to bring a high quality, drought-proof, sustainable new water supply to Brazoria and Fort Bend counties.

The detailed analyses that have been conducted over the past year show that the desalination project, supplementing our surface and groundwater supplies could enhance the quality and certainty of our water supplies. Desalinated seawater at rates competitive to other sources could be an important part of our future water supply strategies.

As advances in technology make desalination of seawater cost-competitive when compared with other water supply development alternatives, desalination becomes an increasingly important alternative for our community.

For all these reasons, the City of Lake Jackson supports development of the Freeport Seawater Desalination Plant.

We look forward to seeing the green light on this important and far-reaching project.

Sincerely,

Shane W. Pirtle
Mayor, City of Lake Jackson

Young Lorfing, TRMC
City Secretary
(281) 652-1655
Telecopier (281) 652-1719
ylorfing@ci.pearland.tx.us

July 28, 2004

Brad Brunett
Brazos River Authority
P.O. Box 7555
Waco, TX 76714-7555

Dear Mr. Brunett:

Enclosed herewith is a copy of Resolution No. R2004-121. The resolution is authorizing and supporting a seawater desalination plant in Freeport. The resolution was adopted in a Regular Council Meeting of the City Council July 26, 2004.

Respectfully,

Young Lorfing

Young Lorfing, TRMC
City Secretary

YL/ls
Enclosure
cc: Alan Mueller, Deputy City Manager

CERTIFICATION

THE STATE OF TEXAS §

COUNTIES OF BRAZORIA, HARRIS &
FT. BEND. §

I, LaKeisha Cannon-Scott, Deputy City Secretary of the City of Pearland, Texas, hereby certify that the attached constitutes a true and correct copy of **Resolution No. R2004-121; duly passed and approved by the City Council on the 26th day of July 2004.**

Witness my hand and seal of the City of Pearland, Texas, this 28th day of July 2004, at Pearland, Texas.

LaKeisha Cannon-Scott

LaKeisha Cannon-Scott
Deputy City Secretary

(SEAL)

RESOLUTION NO. R2004-121

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PEARLAND, TEXAS, AUTHORIZING THE CITY MANAGER OR HIS DESIGNEE TO SUPPORTING SEAWATER DESALINATION PLANT IN FREEPORT.

WHEREAS, Fort Bend and Brazoria counties are experiencing tremendous growth in population and economic activity; and

WHEREAS, both sustainable growth and quality of life are dependent on reliable supplies of water; and

WHEREAS, communities in these counties face mounting restrictions on groundwater use necessary to control and prevent subsidence; and

WHEREAS, new demand for water from the Brazos River continues to increase; and

WHEREAS, advances in technology have made desalination of seawater cost-competitive with other new water supply development alternatives; and

WHEREAS, the Gulf of Mexico is a drought-proof and convenient source of water; and

WHEREAS, the Brazos River Authority has undertaken a thorough analysis of water supplies and demand through 2060 and costs of providing water from all possible sources; and

WHEREAS, the Brazos River Authority has proposed a public-private partnership with Poseidon Resources to construct and operate a seawater desalination plant in Freeport; and

WHEREAS, this project will significantly benefit the entire region by bringing as much as 25 million to 50 million gallons per day of new drought-proof water supply to the area, has potential for a $125 million investment from the private sector, and will help meet the long-term sustainable development needs of the region;

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PEARLAND, TEXAS:

Section 1. That the City of Pearland supports development of the Freeport Seawater Desalination Project.

Section 2. That the City of Pearland deems water produced from the seawater desalination plant as a viable option for meeting its long-term needs and considers desalinated seawater at reasonable rates to be an important part of its future water supply strategies.

PASSED, APPROVED and ADOPTED this the 26th day of July, A.D., 2004.

Tom Reid

TOM REID
MAYOR

ATTEST:

Young Lorfing

YOUNG LORFING, TRMC
CITY SECRETARY

APPROVED AS TO FORM:

Darrin M. Coker

DARRIN M. COKER
CITY ATTORNEY

Freeport Desalination Project
18 November 2003 Public Meetings

Audience Questions/Comments

Lake Jackson Meeting

Q: Why does the graph show a decrease in water supply?
A: This is the impact of the groundwater subsidence district rules on groundwater availability.

Pearland Meeting

Q: Have you identified specific customers or is that the purpose of this meeting?
A: No, that will be part of this study.

Q: How does one get on the potential customer list?
A: See Susan Morgan or leave a business card with one of the team members.

Q/C: How is the concentrate diluted so that it doesn't impact aquatic life? How will the project ensure that the concentrate is diluted sufficiently? This will be an issue for the recreational and commercial fishing.
A: An explanation was give regarding dilution of discharge to the Brazos River. Dow has a large intake (100MGal of seawater, 100MGal of river water). The project can use 25MGal to blend with 25MGal of discharge brine. There will be a need for a permit from TCEQ.

Q: Will there be <u>any</u> negative environmental impact?
A: This site was "preselected" partly because Dow already discharges and has a permit. This project will need to stay within permit allowances.

C: There is likely to be an issue if people think current outflows are at maximum salinity; will have to believe/trust that concentrate is blended.
A: A suggestion was made regarding possibly developing a graphic on salinity impacts.

Q: What level of customer commitment is needed before construction is started? Commitment from the northern area?
A: That is part of this study.

C: Later presentations should reference the volume of water needed to make construction a go.

Q: Any projections on how discharge limits will affect the size of the facility that can be built?
A: That is something that Poseidon Resources will be evaluating. It was also pointed out that the Brazos River does go hypersaline at times because of tides.
C (from Rep. Callegari): "Very much in favor" of desal projects, particularly the Freeport project.

Questions and Answers from
1 March 2004 Public Meeting

Q: How does reverse osmosis (RO) water blend with groundwater? How will you ensure that doesn't cause problems?
A: This will be part of the study. RO is a very adjustable process, so should be easy to minimize potential blending problems. An RO plant can "dial in" water quality better than conventional water treatment plant.

Q: Where will the blending occur?
A: Probably at the receiving point.

Q: How will you prevent problems with odor that may result from blending or other delivery problems?
A: This will require close coordination with potential customers to address potential issues up front. The study will look at the history of each particular system, problems that have occurred in the past. From there, we will develop a "highest common denominator."

Q: One attendee expressed a big concern with the potential cost of desalination. He feels the only way to be economical is the use of blending. If the water can't be blended, it will be too expensive.
A: Blending is routinely done as part of RO processes. The implementation phase of the project will look into potential complications. Also, there will be a need to test to determine compatibilities of water; we will not spend $125 million without significant testing up front. This is "designer water," therefore it is easier to modify the process to meet the common denominator.

Q: How long till we know about cost?
A: This study is due at the end of the year. Concerns about cost are exactly why we are evaluating various options, not just desalination.

Q: One attendee expressed concern about using existing infrastructure. Typically you will pick up some metals and will need to treat with polyphosphates. What is the cost associated with having to treat with polyphosphates? Without treatment, the water will be rusty.
A: We will have to address that issue as part of the study.

Q: Will you use new or existing facilities?
A: Both will be considered.

Q: Will this project directly affect the capacity of wastewater collection and treatment facilities?
A: This will allow BRA to move water to where it's needed; will not cause overloading of wastewater systems.

Q: Will water quality of the Brazos downstream decline over planning horizon due to population growth upstream?
A: We do expect more water to be used, which will affect flows in the river. There may be an impact to water quality, but we are not aware of any specific threat at this point.

Q: What percentage of water in the Brazos is treated wastewater?
A: The amount of flow depend on the time of year. Treated wastewater flows in the summertime would constitute a greater percentage of the total flow than they would in the winter time. If you looked at it for an entire year, it would probably be fairly insignificant. Also, the drainage area of Brazos River is quite large.

Q: Is there a salt wedge moving up the Brazos River currently?
A: Yes, in times of low flows, the salt wedge moves well up the river channel. The Dow plant personnel would know how far up river it goes.

Q: There was a desalination facility on the Brazos River in the 60s. It was really expensive. A large storm wiped it out and it wasn't rebuilt because the water produced was too expensive. What's different now?
A: Thermal desalination was extremely expensive; in addition, the old plant was a demonstration plant. The technology has dramatically improved and costs have come way down with RO. We hope to minimize some initial capitol costs by collocating with existing facilities. There are 12,000 desalination plants worldwide. This technology is relatively common nowadays.

Q: Why can't we use the runoff that is detained in local detention facilities? What's the cost of this alternative?
A: That source of water is not a firm source. During drought periods you would not have any water at all. We have to ensure our customers of 100% reliability. You would also need to treat that runoff. At any rate, it is not a reliable source of water. *(One on one follow-up after formal Q&A - if a particular project utilizing detained water was determined to be technically feasible, treatment costs could vary dramatically, depending on the individual project and what's in the water.)* The Allen's Creek reservoir project now being planned also will function as a retention facility; however, it won't be built for 30 years.

Mark Lowry (TCB) added – The purpose of detention facilities is to delay the water moving downstream and control its release. If you kept the detention facilities full to have a 'more firm' source, you loose your flood control capability. These are not retention facilities.

Q: What is the vision of desalinated water as a long term supply of desalinated water for users within the interior of Texas?
A: If we meet demands downstream with desalination, there's more water available for upstream users.

Jorge Arroyo (TWDB) added – That is correct. The 3 studies currently going on are trying to determine if desalination is a viable option. We need to add seawater and brackish groundwater to our toolbox of options. There is a need to look at the

engineering and economics up front to determine viability. Long-term vision is a drought-proof source for water supply.

David Meesey (TWDB) added – We are also looking at brackish groundwater desalination possibilities in other inland areas (west part of TX). Brine disposal is an issue that will need to be addressed, maybe through deep well injection.

Q: Is this a competition among the 3 sites?
A: BRA does not look at this as a competition at all. However, we want to be sure to make our site work if it's a viable option that we have done everything right in order to have a project here.

Jorge Arroyo (TWDB) added – Not really. Three proposals were selected; on Dec. 1, we will send a formal recommendation to the Legislature. We don't know what the final recommendation will be – it might be one site, all sites, no sites, or a combination.

Questions and Answers from 1 March 2004 Public Meeting

Q: How does reverse osmosis (RO) water blend with groundwater? How will you ensure that doesn't cause problems?
A: This will be part of the study. RO is a very adjustable process, so should be easy to minimize potential blending problems. An RO plant can "dial in" water quality better than conventional water treatment plant.

Q: Where will the blending occur?
A: Probably at the receiving point.

Q: How will you prevent problems with odor that may result from blending or other delivery problems?
A: This will require close coordination with potential customers to address potential issues up front. The study will look at the history of each particular system, problems that have occurred in the past. From there, we will develop a "highest common denominator."

Q: One attendee expressed a big concern with the potential cost of desalination. He feels the only way to be economical is the use of blending. If the water can't be blended, it will be too expensive.
A: Blending is routinely done as part of RO processes. The implementation phase of the project will look into potential complications. Also, there will be a need to test to determine compatibilities of water; we will not spend $125 million without significant testing up front. This is "designer water," therefore it is easier to modify the process to meet the common denominator.

Q: How long till we know about cost?
A: This study is due at the end of the year. Concerns about cost are exactly why we are evaluating various options, not just desalination.

Q: One attendee expressed concern about using existing infrastructure. Typically you will pick up some metals and will need to treat with polyphosphates. What is the cost associated with having to treat with polyphosphates? Without treatment, the water will be rusty.
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Freeport Desalination Project
Public Meeting
July 7, 2004

Q&A

Q: Are the three desalination projects competing for funding from the Legislature?
Brad Brunett: We are not certain of how the projects will move forward, but the reality is that funding is limited.

Q: Are the projects on the same schedule?
Brad Brunett: There are different issues in the scopes of work for each.
Jorge Arroyo: There is an element of competition, but all the projects were selected via a public participation process and ranked according to a set of criteria. Each offers slightly different benefits to and meets different needs of the state:

- The Brownsville project is most closely linked to immediate need because of the Mexican water debt.
- The Corpus Christi system has plenty of supplies in place to meet needs through 2060; desal could allow the city to lease water to other communities.
- The Freeport project is innovative in the sense that it is a public-private partnership. This is an interesting way to help fund necessary projects.

Ultimately, the results will hinge on who is willing to buy the water and at what cost. Definitely, by 2060, Texas will be using desalinated seawater. The issue is what happens between now and then. Demonstration projects need to show they can enhance the reliability of water supplies.

Q: I am not against desal plants, especially in South Texas. However, we get lots of rain and don't reuse any of this water. Detention facilities should be considered as an option for storing and then using runoff.
Brad Brunett: At issue is where to store the water.

Q: Subsidence is a problem.
Brad Brunett: This is another benefit of desal.

Freeport Desalination Project
Public Meeting October 7, 2004

Q&A

Q: What is the time frame for construction of the proposed facility?
Susan Morgan: We think we can have piloting within a year to 18 months, depending on how quickly the Texas Water Development Board wants to move.
David Meesey: Obviously, this is early in the game. TWDB doesn't know how much money we're going to get. The next thing to look at is a pilot plant, which would serve as a small scale model. The Board has requested money for this in its current Legislative Appropriations Request, but we won't know until April about funding chances. So Susan's idea of having a stakeholder meeting in the spring is good. By then, we will know how the Legislature views the proposal, the status of the funding request, and the likelihood of proceeding.

Q: What would be the dollar value of the treatment process? *(LF: Not sure of this question.)*
David Meesey: Not sure; we would want enough to support a small-scale pilot plant in the range of 6 to 10 MGD.
Andy Shea: *(Turning to photo of Carlsbad, CA, pilot plant)* With a pilot plant like this, vendors can run different systems side-by-side to see which ones make sense and which technologies are appropriate. The pilot shown here can cost a half a million to a million dollars to run for 12 to 18 months. This gives assurance that the project will work.

Q: How much water does that plant produce?
Andy Shea: 35,000 gallons per day, which is about 1/1000th of what a large plant would produce.

Q: Would the plant in Freeport be similar?
Andy Shea: Identical. A smaller system is possible, but this size (an 8-inch pressure vessel) is the standard production block. It's also a good size for testing new technologies with potential for lowering unit costs. One of the values in piloting is ascertaining whether vendors can produce better technologies at lower costs.

Q: Is the California plant run 24/7?
Andy Shea: Yes; it has run for almost 18 months now and been very successful.

Q: Is this a batch process or does is the plant running continuously?
Andy Shea: Continuously, so that we can see how the system operates over time. Backwashing is a part of the cycle.
Susan Morgan: This proposed Freeport site offers the advantage of being able to do this. In addition, we are proposing to use the $400,000 EPA grant in this pilot stage.

Q: Will the pilot plant precede the demonstration plant?
Susan Morgan: Yes. We always do a piloting study for new technology such as this.

Allen Woelke: The Texas Commission on Environmental Quality considers this a “nonconventional” technology and thus requires piloting for at least 90 days. We will pilot for 12 to 18 months to work out kinks.
Andy Shea: TCEQ has to certify that the technology will not only produce clean water but also protect customer health.

Q: Is it appropriate to say that efforts to date, along with the resolutions of support, are keeping the door open? The opportunity is there and the pilot plant will give even better estimates. Communities are saying to the State that they support taking this project forward.
Susan Morgan: Yes.

Q: From how far offshore is the seawater pumped?
Andy Shea: This is one unique feature of the site. We’re proposing to lift water out of the Dow seawater canal system and return the discharge to Dow canals. There will be no pipeline offshore nor nay new construction offshore. We will minimize environmental impacts by using existing industrial infrastructure.

Q: How much seawater must be taken in to produce drinking water?
Andy Shea: There is about 50 percent recovery; we take in about 2 gallons to make 1 gallon.

Q: Does the regeneration phase consume much water?
Andy Shea: If we’re making 10 million gallons we’re actually taking in a little more than 20 milion gallons. About 10 to 20 percent of the water is used in process, for example, in backwashing. However, the system provides for a good bit of internal recovery of both water and energy.

Q: Don’t you backwash?
Andy Shea: Yes. There is a daily mode and a quarterly mode.

Q: Do the cost estimates figure in tankage? What happens if you’re out for a month?
Andy Shea: The proposals take into account the other water producers in the area. Are we 100 percent of the time or 90 percent of the time? We need to factor in how well we are integrated.

Q: What happens 30 years from now, when we’ve all become dependent on desalinated water and the system is out for a month? We need to have storage.
Andy Shea: The issue is how the area can become interconnected to ensure safety and security. We are fortunate to have a large river authority with vision.

Q: Would a demonstration plant cause the Brazosport Water Authority to shut down its plant and move its customers to desalinated water?
Susan Morgan: We’ve been talking a lot with BWA and its customer cities. A demonstration project could make surface water a back-up supply. We need to figure out how to shift the risk. This is an advantage of the public/private partnership: BRA would negotiate a pay-for-performance contract with Poseidon.

Q: If subsidies are required to keep water costs down, who will pay and for how long? Is there any guarantee that the subsidy would continue?

Susan Morgan: This needs to be worked out. We are proposing to build something before it's needed. These issues must be carefully sorted out before the BRA Board or potential customers will buy in to the project.

Q: The Tampa Bay project experienced delays and enormous cost overruns. We need to avoid these problems.
Susan Morgan: Absolutely. We learn from those lessons, which also make a good case for piloting.

Q: Will Texas have to pour desal water back into the ocean, as in Carlsbad?
Andy Shea: We hope not.

Q: What are the three locations being studied for desal plants?
Susan Morgan: The TWDB picked the Freeport area and Corpus Christi and Brownsville. We think the Board may opt to go forward with pilots on all.

Q: Are the sites in competition?
Susan Morgan: In the long-term, for that big subsidy. We feel that we have a good location and lots of other advantages.

Q: Are you negotiating specific square footage at the site?
Andy Shea: Absolutely. We've been working with Dow over the past four years. The real question is the size of the facility. Larger systems need to be integrated with intake and discharge structures. This site has intake, outfall, and power.

Q: The way the Dow site was originally built makes it a good spot.
Andy Shea: The previous desal plant took advantage of those same features.

Q: Who would be customers for a 10 MGD plant?
Susan Morgan: We would propose the BWA initially, since they are closet. However, there is still much discussion ahead. They already have developed a system and made investments that must be paid for. All these factors have been rolled into the subsidy calculations.

Q: If everything goes as planned, when would a pilot plant be implemented?
Susan Morgan: We could be working on it next summer or fall. But much remains to be done.
Brad Brunett: We already are working on necessary papers, etc.

Q: Is there anything that can be done now?
Andy Shea: We're already analyzing the seawater.

BRAZOS RIVER AUTHORITY
Regional Water Facility Plan for Freeport Seawater Desalination Project
July 7, 2004 – American Legion Post (Angleton)

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BRAZOS RIVER AUTHORITY
Regional Water Facility Plan for Freeport Seawater Desalination Project
March 1, 2004 – Lake Jackson Civic Center

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BRAZOS RIVER AUTHORITY
Regional Water Facility Plan for Freeport Seawater Desalination Project
November 18, 2003 - Pearland

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JIM SACCOMANNO	BASF	602 COPPER RD FREEPORT TEX 77541	979 415 6115		saccomj@BASF.com
Ron Bottoms	Freeport	200 W 2nd Freeport 77541	233-3526	233-8867	rbottoms@freeport.tx.us
MeL McKey	Velasco Drainage Dist.	P.O. Box 7 Clute, Tx.	(979) 265-4251	265-7602	VDD1@swbell.net
Cathy Laney	Brazoria Co Pct 2	21017 CR171 Angleton Tx 77515	979-864-1548	979-864-1080	Cathyl@brazoria-county.com
Michael Baker	The Facts	720 S. Main Clute, Tx 77531	979 265-0150	[illegible]	michael.baker@thefacts.com

Name	Representing	Address	Phone	Fax	E-Mail
Patrice Melancon	CDM	12357-A Riata Trace Pkwy # 210 Austin, TX 78727	512-346-1100	512-345-1483	melanconpa@cdm.com
Glenna Serf	BRA	16450 SW Freeway Sugar Land, TX 77479	281-980-2183	281-494-2410	gserf@brazos.org
Keith Swalles	Eco Resources Inc	12535 Reed Rd Sugar Land, TX 77478	281-340-1625	281-240-3221	KSwalles@EcoResources.com
Ivanna Cox	Senator Janek	979-297-5261			
Larry Buhler	E.D. Alliance	201 E. Myrtle Angleton 77515	979-848-0560	979-848-0403	LarryB@EDA-BC.com
Mary Kiesewetter	Cinco Mud 2	3314 Cinco Lakes Dr. Katy, TX 77450	281 395 5091		MARYK32458@earthlink.net
Robert D. Stahl	BWA	PO Box 816 Lake Jackson 77566	979-297-2715	979-297-8933	fredpitts@brazoria.net
Kelly Flanagan	BCM#5	1043 Margate Drive Pearland, TX 77584	281 927-2209		Kelly.Flanagan@Hp.Com

BRAZOS RIVER AUTHORITY
Regional Water Facility Plan for Freeport Seawater Desalination Project
November 18, 2003 – Lake Jackson

Name	Representing	Address	Phone	Fax	E-Mail
Cathy Dominguez-C	BRA	4600 Cobbs Waco			
Steve M. Boykin	BWA	~~FM 20~~ 102 West Mahan Richwood Tx 77531	(979) 265-1270	(979) 233-7861 x353	Sboykin@Computron.net
[illegible]	Bay [illegible] Cons. Dist.	P.O. Box 330 Damon, TX	979 742 3[illegible]		
James Weigel	Tom Stavinoha Comm FBG Pct I	Richmond Tex 301 Jackson 77469	281.344.94[illegible]	281.342.0587	
Carolyn Johnson	BRA Board	2301 Brazosport Freeport, TX 77541	(979) 238-5210	(979) 238-4903	chjohnson@dow.com
DALE CONGER	CINCO MUD 12 (PBS&J)	1880 S. DAIRY ASHFORD STE 300 HOU 77077	281 493 5100	281 493 4598	dconger@pbsj.com
Wyatt Ringgold	BWA	1251 FM 2004 Lake Jackson, TX	979-297-2715	979-297-8933	wRinggold@academicplan.com

Name	Representing	Address	Phone	Fax	E-Mail
Beth Layman	Palmer Plantation MUD#2	4302 Lakeshore Forest Drive Missouri City, Tx 77459	(713) 752-8436	(713) 756-1515	ELAYMAN@UH.EDU
Kelly Flanagan	BCM #5	1043 Margate Drive Pearland, TX 77584	281 927-2209		Kelly.Flanagan@Hp.Com
Will Benson	Pearland Eco-Dev Corp	3519 Liberty Dr. Pearland, Tx 77581	281 652-1627	281-652-1704	wbenson@ci.pearland.tx.us
Jim Coate	Southwood Estates, Inc	Box 757 Pearland, tx 77588	281-997-4000		
Robert Cox	FtBend #108	7327 Timberlake Dr Sugar Land Tx 77479	2813430357	2813439327	boblinda world@msn.com
Bill Eisen	City of Pearland	3519 Liberty Dr. Pearland, TX 77581	281-652-1663	281-652-1708	beisen@ci.pearland.tx.us
David Hersey	TWDB	PO Box 13231 Austin TX 78711	512)936-0857		
Doug Kneupper	Pearland	3519 Liberty Dr Pearland 77581	231-652-1631	281-652-1702	

Name	Representing	Address	Phone	Fax	E-Mail
Jim Adams	SJRA	PO Box 329 Conroe, TX 77305	936/588-1111	936/588-3043	jim@sjra.net
CRAIG SACKETT	ED ALLIANCE FOR BRAZORIA COUNTY	120 E. MYRTLE ST. ANGLETON, TX 77515	979-848-0560	979-848-0403	craigo@eda-bc.com
Kathy Ramsey	H-GAC	P.O Box 22777 Houston 77227	713-499-6653		Kathleen.ramsey@h-gac.com
Jason Fluharty	Reliant	12301 Kurland Houston Tx 77034	713-488-7182	713-488-7598	jfluharty@reliant.com
David S. Miller	Southwood Estates Inc.	P.O. Box 757 Pearland TX 77588	281-216-0119	281-485-1649	southwoodutility@aol.com
DNEAL KRISCH	Fort Bend County Judge	301 Jackson Richmond TX	281-341 8608	281 341 8609	krischdn@co.fort-bend.tx.us
Tom Reid	City of Pearland				
Justin Bower	City of Sugarland	111 Gillingham lane Sugar Land, Tx	281-275-2499	281-275-2465	JBower47@hotmail.c

Name	Representing	Address	Phone	Fax	E-Mail
Reed Eichelberger	San Jacinto River Authority	P.O. Box 329 Conroe, Tx	936-588-1111		reed@sjra.net
Benny Wleczyk	Fort Bend Subsidence	1813 Allen Rosenberg Ty 77471	281-342-6972		
Stephen Pallett	Herald-Coaster	Rosenberg	281-341-4474		
Gerald Roberts	Brazoria County	200 E. Locust, Rm 10 Angleton, Tx 77515	979-864-1265		
Scott Spidle	Severn Trent	16337 Park Row Hou TX 77084	281-578-4265		
[illegible] Stewart	AEDF	1600 E Aug 6 Alvin	281 388 1995		JStewart@subsidence[illegible]
Melissa Lavergne	SHAW	7330 Neuhaus Dr. Hou, TX 77061	281.699-4277		
Jam Scott	Shaw	7705 Hall Rd Houston TX 77075	713-644-6606		James.Scott@shawgrp.com

Name	Representing	Address	Phone	Fax	E-Mail
Joe Gorecky	City of Rosenberg	1820 Ave — Rosenberg 77471	281-342-5926	281-238-6041	joe.gorecky@gorecky.com
BILL CALLEGARI	STATE REPRESENTATIVE KATY				
R. KYLE McINTYRE	COBB FENDLEY & ASSO.	Hou, Tx 77040 5300 HOLLISTER STE 400	713.462.3242	713.462.0389	KMcINTYRE@cobfen.com
LARRY STANLEY	PCT 4 BRAZORIA COUNTY	1001 MARKET BRAZORIA	979 798 2158		
DUDE PAYNE	PCT 1 BRAZORIA COUNTY	P.O. BOX 998 CLUTE, TX 77531	979-265-3953	979-265-5489	dudep@brazoria-county.c
DONNA COLEMAN	SENATOR JACKSON	1109 FAIRMONT PASADENA	713 948 011	713948	DONNA.COLEMAN@SENATE.STATE.TX.US
JACK HARRIS	BRAZORIA COUNTY	P.O. BOX 548 ALVIN, TX	281-331-3197	281-331 6878	harrisjack@hotmail.
David Kocurek	BC DD & R #3	P.O. Box 789 Alvin, TX 77512	(281) 388-4315	(281) 388-4340	dkocurek@psf.cityof alvin.com

Name	Representing	Address	Phone	Fax	E-Mail
John Pare	Fort Bend MUD 25	18230 Old Richmond Rd. Sugar Land, Tx	281-850-0587		jhpare@waterdistrict25.com
Reem Hashem	TxDOT- Houston District	7721 Washington Ave Houston, 77007	713-802-5255		rhashem@dot.state.tx.us
Gary Knapp	1st Colony LID	1427 Sugar Crossing Sugar Land, Tx 77478	713-651-9455		gknapp@millerandlents.com

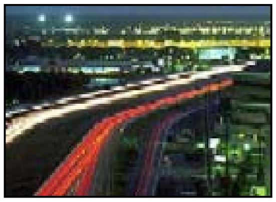
Name	Representing	Address	Phone	Fax	E-Mail
GREGG HAAN	LJA ENG.	2929 BRIARPARK DR	713-953-5061		
MARK GEHRINGER	TC&B	5757 Woodway Dr	713-267-3264		mark.gehringer@tcb.aecom.com

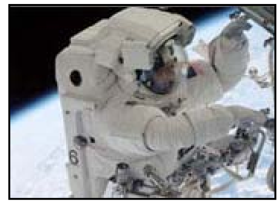
Name	Representing	Address	Phone	Fax	E-Mail
Kirstin Boyd	Congressman Tom DeLay	10701 Corporate Dr. Ste. 118 Stafford, TX 77477	281-240-3700	281-240-2959	kirstin.boyd@mail.house.gov

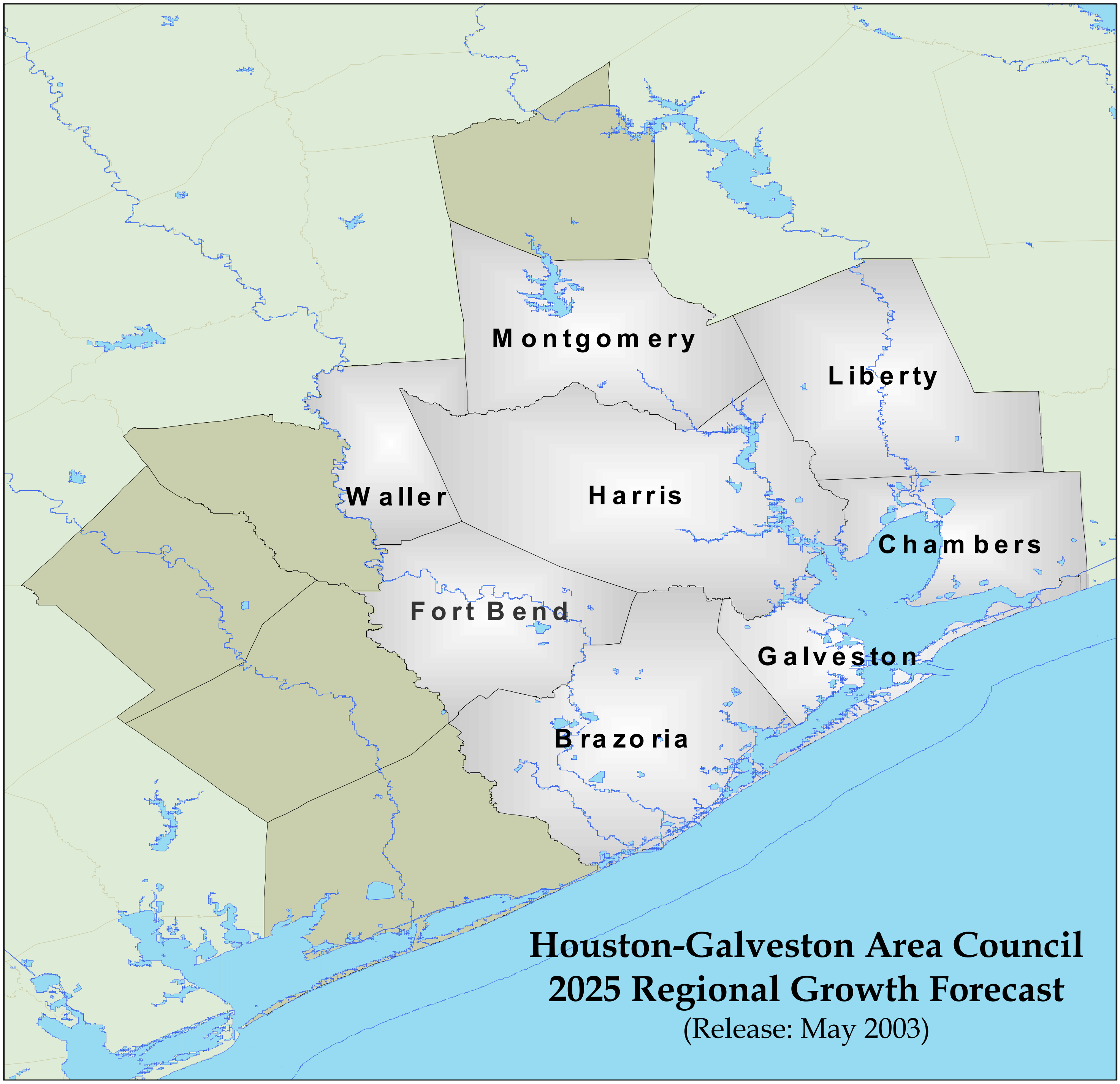
Individual City Population Data

City of Pearland	
2000	37,640
2010	106,895
2020	144,453

City of Lake Jackson	
2000	26,386
2020	38,000

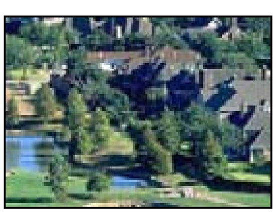


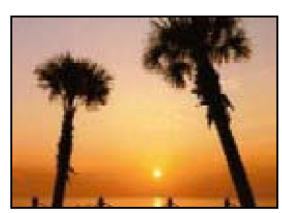



Houston-Galveston Area Council
2025 Regional Growth Forecast

(Release: May 2003)







H-GAC 2025 Regional Growth Forecast

(Release: May 2003)

Description of Enclosures

The Houston-Galveston Area Council (H-GAC) regularly prepares a forecast of employment, households, and population for the 8-county Houston Consolidated Metropolitan Statistical Area (CMSA). (Brazoria, Chambers, Galveston, Ft. Bend, Harris, Liberty, Montgomery, Waller.) These forecasts are intended primarily to support the agency's efforts in regional travel demand modeling. The current forecast is for horizon year 2025 and is prepared at a unit of geographic analysis called the Regional Analysis Zone (RAZ); RAZs consist of 199 zones that cover the Houston CMSA. H-GAC's forecasts are reviewed and adopted at this level, and the attached file represents the most recently updated forecast, prepared in May 2003.

This modeling effort takes place in two distinct steps:

1) H-GAC produced two baseline county level forecasts scenarios using the econometric model provided by Regional Economic Models Inc (REMI). The first forecast scenario, the "moderate baseline," assumes moderate growth trends that are roughly comparable to the employment growth rates that occurred in the region during the 1990's. The second forecast scenario, the "aggressive baseline," assumes increased activity in energy and corresponding professional service sectors.

"Packet A" contains the county level summaries of population, households, and jobs that result from this modeling exercise.

2) H-GAC has used a small area land-use model to allocate county-level REMI results for households, population, and jobs to 199 geographic units called "Regional Analysis Zones" (RAZs).

"Packet B" contains a RAZ-level summary of the small area allocation for households, population, and jobs based on the moderate forecast scenario.

"Packet C" contains maps showing the spatial distribution of households, population, and jobs for year 2000 and 2025. It also contains additional graphics that describe the forecast product

"Packet D" contains county level demographic profiles of the Houston CMSA for critical census variables.

This forecast has been evaluated and approved for local review by H-GAC Data Services Committee, which is comprised of representatives from the region's eight metropolitan counties who have expertise in analyzing demographic, economic, and development trends. In addition, staff has consulted with other planning, economic development, and public works officials who are not members of the Committee. After technical review and a public approval process, this forecast was accepted by the Houston-Galveston Area Council Board as a demographic baseline for use in small area regional planning studies.

Houston-Galveston Area Council 2025 Regional Growth Forecast
County Level Summary

Page	Scenario	Description
1	Moderate	Total Population, Population Change, Compound Annual Growth Rates (CAGR)
2	Moderate	Household (HH) Population, HH Count, HH Population Change, CAGR
3	Moderate	Total Employment, Wage & Salary Employment, Employment Change, CAGR
4	Aggressive	Total Population, Population Change, CAGR
5	Aggressive	Household (HH) Population, HH Count, HH Population Change, CAGR
6	Aggressive	Total Employment, Wage & Salary Employment, Employment Change, CAGR
7	Moderate/Aggressive	Comparing the H-GAC 2025 Regional Growth Forecast to other forecasts

Total Population: Moderate Scenario (MOD)

	MOD: Total Population (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	3,730	4,670	5,317	5,999	6,703	7,042	7,642
Brazoria	192	242	271	288	310	320	338
Chambers	20	26	26	28	30	31	33
Galveston	217	250	275	294	316	326	343
Ft. Bend	225	355	471	574	653	694	763
Harris	2,818	3,401	3,755	4,188	4,673	4,911	5,344
Liberty	53	70	77	89	101	106	113
Montgomery	182	294	402	489	564	595	644
Waller	23	33	40	49	56	59	64

Source: H-GAC Forecast Group

	MOD: Aggregate Total Population Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	598	917	877	944	1,151	1,515	2,972
Brazoria	22	49	35	27	35	71	96
Chambers	2	6	1	3	3	7	7
Galveston	21	32	31	29	34	53	93
Ft. Bend	95	126	150	122	137	221	409
Harris	395	567	498	628	817	962	1,943
Liberty	5	17	11	17	16	23	43
Montgomery	55	110	141	109	101	165	350
Waller	3	9	11	11	9	13	31

Source: H-GAC Forecast Group

	MOD: Total Population: Compound Annual Growth Rates						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.2%	1.7%	1.6%	1.6%	2.0%	1.7%
Brazoria	1.2%	2.3%	1.3%	0.9%	1.1%	1.8%	1.1%
Chambers	0.8%	2.6%	0.2%	0.9%	1.1%	1.7%	0.8%
Galveston	1.0%	1.4%	1.2%	1.0%	1.0%	1.2%	1.1%
Ft. Bend	5.5%	4.5%	3.6%	2.2%	2.0%	5.0%	2.6%
Harris	1.5%	1.8%	1.4%	1.5%	1.7%	1.7%	1.5%
Liberty	1.1%	2.9%	1.4%	1.9%	1.5%	2.0%	1.6%
Montgomery	3.6%	4.8%	4.0%	2.3%	1.7%	4.2%	2.6%
Waller	1.6%	3.4%	2.8%	2.3%	1.6%	2.5%	2.2%

Source: H-GAC Forecast Group

Note: Total Population is a mid year estimate of population, including survivors from the previous year, births, special population (inmates), and migrants (economic, international, and retired)

Households & Household Population: Moderate Scenario (MOD)

	MOD: Household Population (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	3,669	4,583	5,225	5,893	6,608	6,947	7,545
Brazoria	190	239	268	285	307	317	335
Chambers	20	26	26	28	30	31	32
Galveston	218	250	274	293	315	325	342
Ft. Bend	227	351	467	558	649	691	760
Harris	2,754	3,321	3,672	4,103	4,588	4,826	5,258
Liberty	53	70	76	89	100	105	113
Montgomery	187	296	404	491	566	596	646
Waller	20	30	37	46	53	56	60

Source: H-GAC Forecast Group

	MOD: Households (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	1,335	1,641	1,875	2,122	2,364	2,474	2,660
Brazoria	66	84	97	106	115	119	126
Chambers	7	10	10	11	12	13	13
Galveston	82	96	106	114	122	126	132
Ft. Bend	70	112	149	187	223	238	263
Harris	1,018	1,197	1,331	1,481	1,633	1,705	1,829
Liberty	19	25	28	31	35	36	38
Montgomery	65	106	142	176	206	219	240
Waller	7	10	12	15	17	18	20

Source: H-GAC Forecast Group

	MOD: Aggregate HH Population Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	586	905	870	943	1,149	1,491	2,962
Brazoria	21	51	34	27	34	72	95
Chambers	1	6	1	3	3	8	6
Galveston	21	36	31	28	33	57	92
Ft. Bend	93	128	150	122	137	221	408
Harris	387	545	493	627	816	932	1,936
Liberty	5	18	11	17	16	23	43
Montgomery	54	115	141	109	101	169	350
Waller	3	7	10	11	9	10	31

Source: H-GAC Forecast Group

	MOD: HH Population: Compound Annual Growth Rates						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.2%	1.8%	1.6%	1.7%	2.0%	1.7%
Brazoria	1.2%	2.4%	1.3%	0.9%	1.1%	1.8%	1.1%
Chambers	0.8%	2.8%	0.2%	0.9%	1.1%	1.8%	0.7%
Galveston	1.0%	1.6%	1.2%	1.0%	1.0%	1.3%	1.1%
Ft. Bend	5.5%	4.6%	3.6%	2.2%	2.0%	5.1%	2.6%
Harris	1.5%	1.8%	1.4%	1.5%	1.7%	1.7%	1.5%
Liberty	1.1%	3.0%	1.4%	1.9%	1.5%	2.0%	1.6%
Montgomery	3.6%	5.1%	4.0%	2.2%	1.7%	4.3%	2.6%
Waller	1.6%	2.6%	3.1%	2.5%	1.7%	2.1%	2.4%

Source: H-GAC Forecast Group

Note: Household Population differs from Total Population, and is a mid year estimate of population, including survivors from the previous year, births, migrants (economic, international, and retired), but NOT special population (inmates).

Employment: Moderate Scenario (MOD)

	MOD: Total Employment by Year (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	2,178	2,863	3,261	3,653	3,975	4,109	4,326
Brazoria	88	102	113	124	132	135	140
Chambers	8	9	10	11	11	11	12
Galveston	97	118	134	145	154	158	165
Ft. Bend	74	130	169	205	233	244	261
Harris	1,818	2,353	2,643	2,937	3,187	3,292	3,464
Liberty	20	23	28	32	35	36	38
Mont.	63	113	146	177	198	206	218
Waller	10	14	18	22	24	25	27

Source: H-GAC Forecast Group

	MOD: Total Wage & Salary Employment by Year (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	1,787	2,178	2,546	2,846	3,092	3,194	3,357
Brazoria	71	76	85	94	100	102	106
Chambers	9	8	8	8	9	9	9
Galveston	80	83	99	107	113	116	121
Ft. Bend	59	96	127	155	175	184	196
Harris	1,494	1,806	2,081	2,308	2,500	2,581	2,711
Liberty	15	15	21	24	27	28	29
Mont.	52	85	110	133	150	156	165
Waller	8	10	14	16	18	19	20

Source: 1990 Census (County Worker Flow), H-GAC Forecast Group

	MOD: Average Annual Wage & Salary Employment Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	277	501	472	378	328	778	1,178
Brazoria	8	8	13	10	7	16	30
Chambers	-1	2	0	0	0	1	1
Galveston	11	9	19	10	9	19	38
Ft. Bend	21	39	42	33	26	59	100
Harris	213	406	352	292	261	619	905
Liberty	2	0	7	4	3	2	14
Mont.	22	36	34	27	19	58	80
Waller	2	2	5	3	2	4	11

Source: H-GAC Forecast Group

	MOD: Wage & Salary Employment: Compound Annual Growth Rate						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.6%	2.0%	1.3%	1.0%	2.2%	1.5%
Brazoria	1.3%	1.1%	1.5%	1.1%	0.7%	1.2%	1.1%
Chambers	-1.4%	3.0%	0.3%	0.5%	0.4%	0.8%	0.4%
Galveston	1.5%	1.1%	2.1%	0.9%	0.8%	1.3%	1.2%
Ft. Bend	4.6%	5.3%	3.7%	2.1%	1.4%	5.0%	2.4%
Harris	1.7%	2.6%	1.8%	1.3%	1.0%	2.1%	1.4%
Liberty	1.2%	0.1%	3.7%	1.6%	1.2%	0.6%	2.2%
Mont.	6.1%	5.7%	3.5%	2.1%	1.2%	5.9%	2.2%
Waller	3.3%	2.0%	4.3%	2.0%	1.2%	2.6%	2.5%

Source: H-GAC Forecast Group

Employment Definitions

Total Employment: Bureau of Economic Analysis concept based on place of work; includes full-time, part-time, self-employed, and all private non-farm employees, individuals may have more than one job, and therefore be counted twice (Source: REMI Policy Insight)

Wage & Salary Employment: A regional level conversion factor is used to scale total employment to a measure of non-farm wage and salary employment.

Total Population: Aggressive Scenario (AGG)

	AGG: Total Population (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	3,730	4,670	5,317	6,124	7,224	7,662	8,374
Brazoria	192	242	271	293	326	339	358
Chambers	20	26	26	28	32	33	35
Galveston	217	250	275	299	333	345	364
Ft. Bend	225	355	471	574	700	749	824
Harris	2,818	3,401	3,755	4,290	5,069	5,385	5,912
Liberty	53	70	77	91	106	111	120
Montgomery	182	294	402	499	601	638	693
Waller	23	33	40	50	59	62	67

Source: H-GAC Forecast Group

	AGG: Aggregate Total Population Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	598	917	877	1,365	1,462	1,515	3,704
Brazoria	22	49	35	40	41	71	116
Chambers	2	6	1	4	4	7	9
Galveston	21	32	31	42	41	53	114
Ft. Bend	95	126	150	160	160	221	470
Harris	395	567	498	946	1,067	962	2,511
Liberty	5	17	11	21	18	23	50
Montgomery	55	110	141	138	120	165	399
Waller	3	9	11	13	11	13	35

Source: H-GAC Forecast Group

	AGG: Total Population: Compound Annual Growth Rates						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.2%	1.7%	2.2%	1.9%	2.0%	2.0%
Brazoria	1.2%	2.3%	1.3%	1.4%	1.2%	1.8%	1.3%
Chambers	0.8%	2.6%	0.2%	1.4%	1.3%	1.7%	1.0%
Galveston	1.0%	1.4%	1.2%	1.4%	1.2%	1.2%	1.3%
Ft. Bend	5.5%	4.5%	3.6%	2.8%	2.2%	5.0%	2.9%
Harris	1.5%	1.8%	1.4%	2.2%	2.0%	1.7%	1.9%
Liberty	1.1%	2.9%	1.4%	2.3%	1.6%	2.0%	1.8%
Montgomery	3.6%	4.8%	4.0%	2.8%	1.9%	4.2%	2.9%
Waller	1.6%	3.4%	2.8%	2.7%	1.8%	2.5%	2.4%

Source: H-GAC Forecast Group

Note: Total Population is a mid year estimate of population, including survivors from the previous year, births, special population (inmates), and migrants (economic, international, and retired)

Households & Household Population: Aggressive Scenario (AGG)

	AGG: Household Population (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	3,669	4,596	5,243	6,050	7,150	7,588	8,278
Brazoria	190	231	260	282	315	328	355
Chambers	20	26	26	28	31	33	35
Galveston	218	246	271	295	328	341	363
Ft. Bend	227	348	464	568	693	742	821
Harris	2,754	3,358	3,713	4,248	5,026	5,343	5,826
Liberty	53	65	72	86	101	106	119
Montgomery	187	292	401	497	599	636	695
Waller	20	29	37	47	56	59	64

Source: H-GAC Forecast Group

	AGG: Households (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	1,335	1,639	1,875	2,159	2,509	2,652	2,880
Brazoria	66	82	97	108	120	125	132
Chambers	7	9	10	11	13	13	14
Galveston	82	95	106	115	127	131	138
Ft. Bend	70	111	149	190	235	252	281
Harris	1,018	1,206	1,331	1,509	1,745	1,842	1,999
Liberty	19	23	28	32	36	37	40
Montgomery	65	103	142	179	217	232	255
Waller	7	10	12	16	18	19	21

Source: H-GAC Forecast Group

	AGG: Aggregate HH Population Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	586	917	858	1,363	1,461	1,503	3,683
Brazoria	21	42	43	40	41	64	124
Chambers	1	6	1	4	4	8	9
Galveston	21	32	35	42	41	53	117
Ft. Bend	93	124	153	160	160	217	473
Harris	387	581	457	945	1,066	968	2,468
Liberty	5	13	15	21	18	18	54
Montgomery	54	112	144	138	120	165	403
Waller	3	6	11	13	11	9	35

Source: H-GAC Forecast Group

	AGG: HH Population: Compound Annual Growth Rates						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.3%	1.7%	2.3%	2.0%	2.0%	2.0%
Brazoria	1.2%	2.0%	1.7%	1.4%	1.2%	1.6%	1.4%
Chambers	0.8%	2.8%	0.2%	1.4%	1.3%	1.8%	1.0%
Galveston	1.0%	1.4%	1.3%	1.4%	1.2%	1.2%	1.3%
Ft. Bend	5.5%	4.5%	3.7%	2.8%	2.2%	5.0%	2.9%
Harris	1.5%	1.9%	1.3%	2.2%	2.0%	1.7%	1.9%
Liberty	1.1%	2.3%	2.1%	2.3%	1.7%	1.7%	2.0%
Montgomery	3.6%	4.9%	4.1%	2.8%	1.9%	4.3%	2.9%
Waller	1.6%	2.4%	3.3%	2.9%	1.9%	2.0%	2.7%

Source: H-GAC Forecast Group

Note: Household Population differs from Total Population, and is a mid year estimate of population, including survivors from the previous year, births, migrants (economic, international, and retired), but NOT special population (inmates).

Employment: Aggressive Scenario (AGG)

	AGG: Total Employment by Year (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	2,178	2,863	3,261	3,846	4,344	4,472	4,720
Brazoria	88	102	113	129	140	143	148
Chambers	8	9	10	11	12	12	12
Galveston	97	118	134	149	162	166	174
Ft. Bend	74	130	169	214	252	263	281
Harris	1,818	2,353	2,643	3,104	3,504	3,603	3,802
Liberty	20	23	28	33	37	38	40
Mont.	63	113	146	184	213	220	234
Waller	10	14	18	22	26	27	28

Source: H-GAC Forecast Group

	AGG: Total Wage & Salary Employment by Year (thousands)						
	1990	2000	2007	2015	2022	2025	2030
CMSA	1,787	2,178	2,546	2,994	3,374	3,469	3,656
Brazoria	71	76	85	97	105	107	111
Chambers	9	8	8	9	9	9	9
Galveston	80	83	99	110	119	122	127
Ft. Bend	59	96	127	161	189	197	210
Harris	1,494	1,806	2,081	2,436	2,743	2,819	2,970
Liberty	15	15	21	25	28	29	31
Mont.	52	85	110	139	160	166	176
Waller	8	10	14	17	19	20	21

Source: 1990 Census (County Worker Flow), H-GAC Forecast Group

	AGG: Average Annual Wage & Salary Employment Change (thousands)						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	277	501	472	677	0	778	1,478
Brazoria	8	8	13	16	7	16	36
Chambers	-1	2	0	1	0	1	2
Galveston	11	9	19	15	10	19	44
Ft. Bend	21	39	42	47	26	59	115
Harris	213	406	352	550	261	619	1,164
Liberty	2	0	7	5	3	2	16
Mont.	22	36	34	38	19	58	91
Waller	2	2	5	4	2	4	12

Source: H-GAC Forecast Group

	AGG: Wage & Salary Employment: Compound Annual Growth Rate						
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	1980-2000	2000-2030
CMSA	1.8%	2.6%	2.0%	2.3%	0.9%	2.2%	1.7%
Brazoria	1.3%	1.1%	1.5%	1.7%	0.6%	1.2%	1.3%
Chambers	-1.4%	3.0%	0.3%	1.1%	0.4%	0.8%	0.6%
Galveston	1.5%	1.1%	2.1%	1.4%	0.8%	1.3%	1.4%
Ft. Bend	4.6%	5.3%	3.7%	3.0%	1.3%	5.0%	2.7%
Harris	1.7%	2.6%	1.8%	2.3%	0.9%	2.1%	1.7%
Liberty	1.2%	0.1%	3.7%	2.2%	1.1%	0.6%	2.3%
Mont.	6.1%	5.7%	3.5%	2.8%	1.2%	5.9%	2.5%
Waller	3.3%	2.0%	4.3%	2.5%	1.2%	2.6%	2.7%

Source: H-GAC Forecast Group

Employment Definitions

Total Employment: Bureau of Economic Analysis concept based on place of work; includes full-time, part-time, self-employed, and all private non-farm employees, individuals may have more than one job, and therefore be counted twice (Source: REMI Policy Insight)

Wage & Salary Employment: A regional level conversion factor is used to scale total employment to a measure of non-farm wage and salary employment.

H-GAC Forecast Comparisons

Population Forecasts (millions)	2000	2010	2020	2030
Total Population: Moderate	4.670	5.546	6.491	7.641
Total Population: Aggressive	4.670	5.546	6.912	8.374
Census (TOT POP)	4.670	N/A	N/A	N/A
Household Population: Moderate	4.583	5.453	6.396	7.545
Household Population: Aggressive	4.583	5.453	6.816	8.277
Texas State Data Center				
(Projections Post 2000 Census/ .5 Scenario: Dec 2001)	4.670	5.489	6.377	7.312
(Projections Post 2000 Census/ 1.0 Scenario: Dec 2001)	4.670	5.933	7.662	9.874
Institute for Regional Forecasting	4.670	5.542	6.661	N/A
(DATABook Houston: Trends and Projections: March 2003)				
Texas Water Development Board	4.670	5.568	6.475	7.431
(2006 Regional Water Plan: County Pop Proj March 2003)				
2000 Census (HH POP SF 1: P16)	4.595	N/A	N/A	N/A

Employment Forecasts (millions)	2000	2010	2020	2030
Wage & Salary Employment: Moderate	2.178	2.651	3.029	3.357
Wage & Salary Employment: Aggressive	2.178	2.651	3.327	3.656
Institute for Regional Forecasting	2.253	2.740	3.350	N/A
(DATABook Houston: Trends and Projections: March 2003)				
Texas Workforce Commission	2.235	2.812	N/A	N/A

Households Forecast (millions)	2000	2010	2020	2030
Households: Moderate	1.641	1.963	2.294	2.660
Households: Aggressive	1.641	1.963	2.408	2.880
2000 Census Households (SF 1: P15)	1.639	N/A	N/A	N/A

2000 Census	HH	HHPOP
CMSA	1,639,401	4,595,847
Brazoria	81,954	230,806
Chambers	9,139	25,797
Galveston	94,782	246,002
Ft. Bend	110,915	348,154
Harris	1,205,516	3,358,444
Liberty	23,242	65,113
Montgomery	103,296	292,077
Waller	10,557	29,454

Source: 2000 Census (SF 1: P15, P16)

RAZ LEVEL COMPARISON: HOUSEHOLD POPULATION AND TOTAL POPULATION
Aggressive Model Results

COUNTY LEVEL SUMMARY

County	AGGRESSIVE RAZ Level Model Results						AGGRESSIVE RAZ Level Model Results					
	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
BRAZORIA	230,808	260,146	282,119	315,228	327,712	96,904	241,769	271,107	293,080	326,189	338,673	96,904
CHAMBERS	25,795	26,073	28,014	31,465	32,733	6,938	26,029	26,307	28,248	31,699	32,967	6,938
FORT BEND	348,161	464,207	567,701	693,196	742,284	394,123	354,459	470,505	573,999	699,494	748,582	394,123
GALVESTON	246,014	271,083	295,173	328,472	340,711	94,697	250,170	275,239	299,329	332,628	344,867	94,697
HARRIS	3,358,479	3,712,785	4,248,070	5,026,369	5,342,928	1,984,449	3,400,613	3,754,919	4,290,204	5,068,503	5,385,062	1,984,449
LIBERTY	65,112	71,908	85,651	100,870	106,358	41,246	70,153	76,949	90,692	105,911	111,399	41,246
MONTGOMERY	292,084	400,585	497,130	599,035	635,969	343,885	293,775	402,276	498,821	600,726	637,660	343,885
WALLER	29,450	36,612	46,551	55,861	59,152	29,702	32,659	39,821	49,760	59,070	62,361	29,702
CMSA	4,595,903	5,243,399	6,050,409	7,150,496	7,587,847	2,991,944	4,669,627	5,317,123	6,124,133	7,224,220	7,661,571	2,991,944

RAZ LEVEL DETAIL

County	AGGRESSIVE RAZ Level Model Results							AGGRESSIVE RAZ Level Model Results						
	RAZ	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	RAZ	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
Harris	1	1,413	3,098	9,741	17,523	17,604	16,191	1	6,656	8,341	14,984	22,766	22,847	16,191
Harris	2	33,978	37,288	44,790	48,659	50,173	16,195	2	39,434	42,744	50,246	54,115	55,629	16,195
Harris	3	3,515	3,772	4,628	5,766	6,062	2,547	3	3,530	3,787	4,643	5,781	6,077	2,547
Harris	4	4,919	5,387	5,998	6,918	6,962	2,043	4	5,478	5,946	6,557	7,477	7,521	2,043
Harris	5	21,773	23,728	28,041	30,926	31,687	9,914	5	23,367	25,322	29,635	32,520	33,281	9,914
Harris	6	30,801	34,736	38,703	39,576	39,665	8,864	6	32,421	36,356	40,323	41,196	41,285	8,864
Harris	7	10,122	11,058	13,212	13,776	13,849	3,727	7	10,628	11,564	13,718	14,282	14,355	3,727
Harris	8	29,679	33,322	38,660	40,264	40,561	10,882	8	29,952	33,595	38,933	40,537	40,834	10,882
Harris	9	31,008	30,840	31,045	31,851	32,057	1,049	9	31,959	31,791	31,996	32,802	33,008	1,049
Harris	10	5,081	5,063	5,085	5,173	5,194	113	10	5,096	5,078	5,100	5,188	5,209	113
Harris	11	4,019	4,004	4,022	4,095	4,114	95	11	4,025	4,010	4,028	4,101	4,120	95
Harris	12	8,912	8,857	8,925	9,202	9,274	362	12	8,946	8,891	8,959	9,236	9,308	362
Harris	13	52,114	56,268	63,599	67,834	68,865	16,751	13	52,767	56,921	64,252	68,487	69,518	16,751
Harris	14	23,318	25,564	28,797	32,259	32,820	9,502	14	23,584	25,830	29,063	32,525	33,086	9,502
Harris	15	4,743	5,323	6,721	8,350	8,732	3,989	15	6,957	7,537	8,935	10,564	10,946	3,989
Harris	16	9,808	10,460	11,825	13,071	13,538	3,730	16	9,909	10,561	11,926	13,172	13,639	3,730
Harris	17	22,987	25,023	30,953	39,158	40,942	17,955	17	23,531	25,567	31,497	39,702	41,486	17,955
Harris	18	3,603	4,059	4,504	4,957	5,362	1,759	18	4,539	4,995	5,440	5,893	6,298	1,759
Harris	19	11,846	13,353	16,343	19,041	19,195	7,349	19	12,995	14,502	17,492	20,190	20,344	7,349
Harris	20	19,012	21,640	24,565	25,001	25,187	6,175	20	19,712	22,340	25,265	25,701	25,887	6,175
Harris	21	20,079	22,532	30,500	34,531	35,805	15,726	21	20,280	22,733	30,701	34,732	36,006	15,726
Harris	22	25,624	27,903	27,990	28,335	28,421	2,797	22	25,765	28,044	28,131	28,476	28,562	2,797
Harris	23	14,656	16,615	18,716	19,771	19,877	5,221	23	14,735	16,694	18,795	19,850	19,956	5,221
Harris	24	6,540	7,209	10,615	12,417	12,848	6,308	24	6,544	7,213	10,619	12,421	12,852	6,308
Harris	25	7,847	9,702	13,864	15,574	16,030	8,183	25	7,861	9,716	13,878	15,588	16,044	8,183

RAZ LEVEL COMPARISON: HOUSEHOLD POPULATION AND TOTAL POPULATION
Aggressive Model Results

County	AGGRESSIVE RAZ Level Model Results							AGGRESSIVE RAZ Level Model Results						
	RAZ	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	RAZ	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
Harris	26	4,551	5,240	6,509	6,644	6,662	2,111	26	4,675	5,364	6,633	6,768	6,786	2,111
Harris	27	16,380	17,838	23,280	26,273	26,929	10,549	27	16,619	18,077	23,519	26,512	27,168	10,549
Harris	28	34,418	37,646	45,753	63,287	71,981	37,563	28	34,855	38,083	46,190	63,724	72,418	37,563
Harris	29	18,239	19,318	20,687	23,964	25,744	7,505	29	18,756	19,835	21,204	24,481	26,261	7,505
Harris	30	22,775	24,701	27,554	34,100	37,229	14,454	30	22,917	24,843	27,696	34,242	37,371	14,454
Harris	31	42,684	45,714	50,290	58,563	62,225	19,541	31	42,792	45,822	50,398	58,671	62,333	19,541
Harris	32	49,853	53,690	60,688	73,157	77,653	27,800	32	50,309	54,146	61,144	73,613	78,109	27,800
Harris	33	39,894	42,965	50,006	63,407	67,863	27,969	33	40,069	43,140	50,181	63,582	68,038	27,969
Harris	34	15,527	16,719	19,039	24,120	26,715	11,188	34	15,647	16,839	19,159	24,240	26,835	11,188
Harris	35	33,501	36,956	47,248	61,997	66,252	32,751	35	33,670	37,125	47,417	62,166	66,421	32,751
Harris	36	12,556	12,531	12,560	12,677	12,707	151	36	12,620	12,595	12,624	12,741	12,771	151
Harris	37	8,584	8,559	8,589	8,702	8,729	145	37	8,584	8,559	8,589	8,702	8,729	145
Harris	38	44,579	47,558	53,305	55,279	55,578	10,999	38	44,810	47,789	53,536	55,510	55,809	10,999
Harris	39	10,640	12,107	16,030	18,424	20,381	9,741	39	11,057	12,524	16,447	18,841	20,798	9,741
Harris	40	33,934	37,825	41,635	42,580	42,832	8,898	40	33,976	37,867	41,677	42,622	42,874	8,898
Harris	41	9,574	10,683	16,480	19,901	20,575	11,001	41	9,886	10,995	16,792	20,213	20,887	11,001
Harris	42	4,964	5,351	7,103	8,367	8,960	3,996	42	5,010	5,397	7,149	8,413	9,006	3,996
Harris	43	31,479	34,425	43,335	49,524	50,794	19,315	43	31,523	34,469	43,379	49,568	50,838	19,315
Harris	44	31,691	34,664	46,242	55,532	58,021	26,330	44	32,181	35,154	46,732	56,022	58,511	26,330
Harris	45	20,579	22,512	25,757	28,853	29,372	8,793	45	20,620	22,553	25,798	28,894	29,413	8,793
Harris	46	10,466	11,432	13,164	17,201	18,280	7,814	46	10,525	11,491	13,223	17,260	18,339	7,814
Harris	47	9,195	9,975	10,988	13,497	14,944	5,749	47	9,196	9,976	10,989	13,498	14,945	5,749
Harris	48	15,981	17,234	19,237	23,932	26,054	10,073	48	16,065	17,318	19,321	24,016	26,138	10,073
Harris	49	21,114	22,788	25,030	29,822	32,067	10,953	49	21,201	22,875	25,117	29,909	32,154	10,953
Harris	50	83,812	90,104	96,881	110,797	116,791	32,979	50	83,891	90,183	96,960	110,876	116,870	32,979
Harris	51	8,942	8,889	8,953	9,205	9,270	328	51	8,966	8,913	8,977	9,229	9,294	328
Harris	52	63	63	63	65	65	2	52	63	63	63	65	65	2
Harris	53	60,266	63,872	67,644	74,384	77,261	16,995	53	60,570	64,176	67,948	74,688	77,565	16,995
Harris	54	60,759	64,905	70,160	79,859	83,956	23,197	54	61,145	65,291	70,546	80,245	84,342	23,197
Harris	55	18	40	55	78	109	91	55	18	40	55	78	109	91
Harris	56	23,319	25,055	26,805	31,292	33,263	9,944	56	23,323	25,059	26,809	31,296	33,267	9,944
Harris	57	21,746	23,313	25,925	31,639	34,646	12,900	57	21,761	23,328	25,940	31,654	34,661	12,900
Harris	58	14,791	16,206	19,176	25,898	29,511	14,720	58	14,995	16,410	19,380	26,102	29,715	14,720
Harris	59	14,662	15,949	18,638	24,459	27,030	12,368	59	14,692	15,979	18,668	24,489	27,060	12,368
Harris	60	80,327	85,233	95,502	110,708	115,913	35,586	60	80,463	85,369	95,638	110,844	116,049	35,586
Harris	61	36,762	39,738	47,644	55,000	56,403	19,641	61	37,678	40,654	48,560	55,916	57,319	19,641
Harris	62	69,408	74,788	87,894	98,179	99,507	30,099	62	69,913	75,293	88,399	98,684	100,012	30,099
Harris	63	42,880	46,995	57,795	63,731	65,452	22,572	63	43,123	47,238	58,038	63,974	65,695	22,572
Harris	64	23,185	24,315	24,397	24,723	24,804	1,619	64	23,201	24,331	24,413	24,739	24,820	1,619
Harris	65	82,791	88,794	109,575	131,968	136,798	54,007	65	83,719	89,722	110,503	132,896	137,726	54,007
Harris	66	8,136	8,551	9,540	11,115	11,574	3,438	66	8,142	8,557	9,546	11,121	11,580	3,438
Harris	67	27,476	29,128	34,494	41,032	42,797	15,321	67	27,476	29,128	34,494	41,032	42,797	15,321
Harris	68	68,767	74,329	88,605	118,766	131,384	62,617	68	68,874	74,436	88,712	118,873	131,491	62,617
Harris	69	10,847	12,043	17,510	24,242	26,288	15,441	69	10,994	12,190	17,657	24,389	26,435	15,441
Harris	70	25,332	27,427	31,397	36,577	38,089	12,757	70	25,410	27,505	31,475	36,655	38,167	12,757
Harris	71	14,795	15,992	18,548	24,381	27,049	12,254	71	14,812	16,009	18,565	24,398	27,066	12,254
Harris	72	11,835	13,007	15,380	19,867	21,649	9,814	72	12,006	13,178	15,551	20,038	21,820	9,814

RAZ LEVEL COMPARISON: HOUSEHOLD POPULATION AND TOTAL POPULATION
Aggressive Model Results

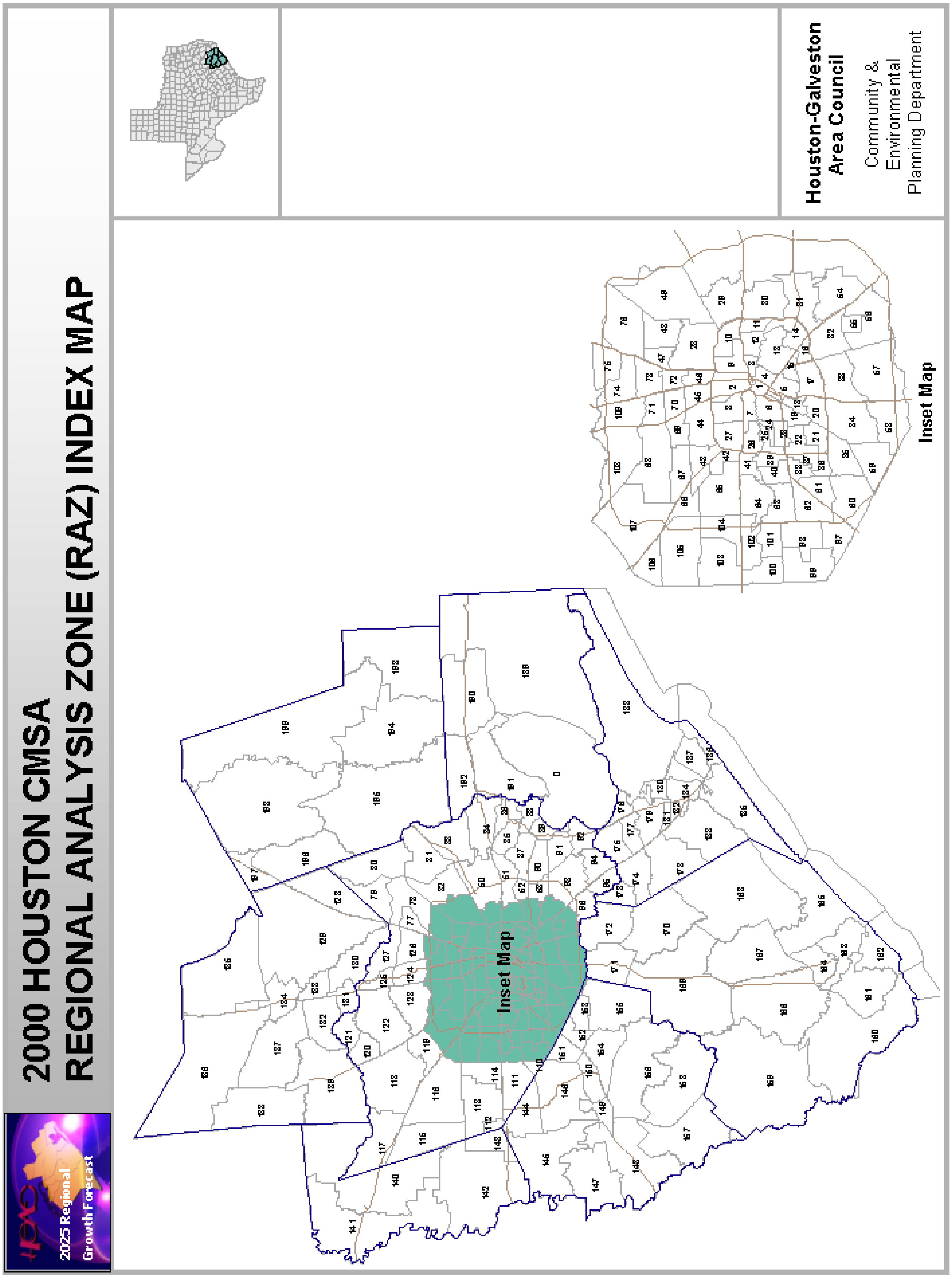
	AGGRESSIVE RAZ Level Model Results							AGGRESSIVE RAZ Level Model Results						
County	RAZ	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	RAZ	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
Harris	73	21,274	23,093	25,593	31,625	34,168	12,894	73	21,305	23,124	25,624	31,656	34,199	12,894
Harris	74	19,949	21,355	23,484	28,174	30,531	10,582	74	20,008	21,414	23,543	28,233	30,590	10,582
Harris	75	6,188	6,771	8,057	10,276	11,238	5,050	75	6,673	7,256	8,542	10,761	11,723	5,050
Harris	76	10,986	12,359	14,167	17,949	19,770	8,784	76	11,020	12,393	14,201	17,983	19,804	8,784
Harris	77	12,691	14,178	16,350	20,111	21,964	9,273	77	12,940	14,427	16,599	20,360	22,213	9,273
Harris	78	39,366	43,669	50,330	62,178	67,734	28,368	78	41,809	46,112	52,773	64,621	70,177	28,368
Harris	79	53,523	63,692	71,225	81,314	85,667	32,144	79	53,527	63,696	71,229	81,318	85,671	32,144
Harris	80	9,669	17,499	18,954	22,502	24,391	14,722	80	9,669	17,499	18,954	22,502	24,391	14,722
Harris	81	11,538	17,942	23,394	34,633	40,265	28,727	81	11,538	17,942	23,394	34,633	40,265	28,727
Harris	82	3,375	4,458	8,015	14,156	17,095	13,720	82	3,375	4,458	8,015	14,156	17,095	13,720
Harris	83	8,866	8,834	8,870	9,018	9,052	186	83	8,872	8,840	8,876	9,024	9,058	186
Harris	84	21,386	26,677	31,303	41,305	46,642	25,256	84	21,417	26,708	31,334	41,336	46,673	25,256
Harris	85	7,636	8,843	9,975	11,610	12,403	4,767	85	7,768	8,975	10,107	11,742	12,535	4,767
Harris	86	47,362	56,615	58,880	63,944	66,390	19,028	86	47,861	57,114	59,379	64,443	66,889	19,028
Harris	87	9	9	9	9	9	0	87	36	36	36	36	36	0
Harris	88	6,186	6,159	6,193	6,330	6,364	178	88	6,186	6,159	6,193	6,330	6,364	178
Harris	89	9,391	9,360	9,397	9,542	9,579	188	89	9,623	9,592	9,629	9,774	9,811	188
Harris	90	45,394	49,722	54,091	62,288	65,968	20,574	90	45,682	50,010	54,379	62,576	66,256	20,574
Harris	91	16,610	21,275	24,522	29,797	32,323	15,713	91	16,703	21,368	24,615	29,890	32,416	15,713
Harris	92	18,858	30,091	32,181	37,068	40,079	21,221	92	18,982	30,215	32,305	37,192	40,203	21,221
Harris	93	67,583	75,056	83,752	98,256	105,162	37,579	93	67,977	75,450	84,146	98,650	105,556	37,579
Harris	94	46,102	50,277	53,555	58,821	61,064	14,962	94	46,370	50,545	53,823	59,089	61,332	14,962
Harris	95	21,932	24,838	28,215	33,381	35,595	13,663	95	21,968	24,874	28,251	33,417	35,631	13,663
Harris	96	38,852	43,128	47,132	55,217	59,213	20,361	96	38,938	43,214	47,218	55,303	59,299	20,361
Harris	97	53,209	57,039	63,336	73,267	76,908	23,699	97	53,536	57,366	63,663	73,594	77,235	23,699
Harris	98	43,408	46,954	56,096	66,541	69,583	26,175	98	43,650	47,196	56,338	66,783	69,825	26,175
Harris	99	55,589	60,115	67,335	80,485	86,078	30,489	99	55,903	60,429	67,649	80,799	86,392	30,489
Harris	100	23,864	26,108	29,522	36,616	40,053	16,189	100	24,044	26,288	29,702	36,796	40,233	16,189
Harris	101	36,858	39,902	47,295	56,863	59,146	22,288	101	36,949	39,993	47,386	56,954	59,237	22,288
Harris	102	31,926	34,393	41,727	52,190	56,043	24,117	102	31,938	34,405	41,739	52,202	56,055	24,117
Harris	103	478	478	478	478	478	0	103	478	478	478	478	478	0
Harris	104	24,547	26,571	32,971	41,467	44,269	19,722	104	24,786	26,810	33,210	41,706	44,508	19,722
Harris	105	37,411	40,551	45,849	58,615	64,232	26,821	105	37,472	40,612	45,910	58,676	64,293	26,821
Harris	106	13,585	14,808	16,571	20,790	23,158	9,573	106	13,600	14,823	16,586	20,805	23,173	9,573
Harris	107	67,612	73,918	84,747	108,315	120,204	52,592	107	68,186	74,492	85,321	108,889	120,778	52,592
Harris	108	37,744	40,745	45,549	55,498	60,645	22,901	108	37,951	40,952	45,756	55,705	60,852	22,901
Harris	109	29,755	31,606	36,119	45,093	48,864	19,109	109	29,932	31,783	36,296	45,270	49,041	19,109
Harris	110	22,470	24,290	27,165	32,301	34,987	12,517	110	22,597	24,417	27,292	32,428	35,114	12,517
Harris	111	49,488	53,957	57,094	63,406	66,229	16,741	111	49,488	53,957	57,094	63,406	66,229	16,741
Harris	112	10,199	11,203	12,144	13,536	14,125	3,926	112	10,269	11,273	12,214	13,606	14,195	3,926
Harris	113	45,568	52,393	60,599	73,767	79,874	34,306	113	45,707	52,532	60,738	73,906	80,013	34,306
Harris	114	40,402	44,259	48,077	56,344	60,432	20,030	114	40,479	44,336	48,154	56,421	60,509	20,030
Harris	115	1,416	7,181	8,275	10,755	12,002	10,586	115	1,416	7,181	8,275	10,755	12,002	10,586
Harris	116	35,189	40,648	48,223	61,995	69,085	33,896	116	35,369	40,828	48,403	62,175	69,265	33,896
Harris	117	4,968	11,217	12,500	15,463	16,923	11,955	117	5,051	11,300	12,583	15,546	17,006	11,955
Harris	118	46,661	53,693	62,742	76,789	83,331	36,670	118	46,721	53,753	62,802	76,849	83,391	36,670
Harris	119	52,603	56,847	62,853	76,559	83,815	31,212	119	52,714	56,958	62,964	76,670	83,926	31,212

RAZ LEVEL COMPARISON: HOUSEHOLD POPULATION AND TOTAL POPULATION
Aggressive Model Results

	AGGRESSIVE RAZ Level Model Results							AGGRESSIVE RAZ Level Model Results						
County	RAZ	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	RAZ	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
Harris	120	9,974	11,566	13,141	15,565	16,590	6,616	120	10,403	11,995	13,570	15,994	17,019	6,616
Harris	121	5,908	7,610	9,591	11,842	12,781	6,873	121	5,908	7,610	9,591	11,842	12,781	6,873
Harris	122	93,399	105,634	120,559	144,564	155,922	62,523	122	93,564	105,799	120,724	144,729	156,087	62,523
Harris	123	121,950	131,808	142,670	165,833	177,368	55,418	123	122,657	132,515	143,377	166,540	178,075	55,418
Harris	124	18,814	21,001	24,282	32,400	36,625	17,811	124	18,814	21,001	24,282	32,400	36,625	17,811
Harris	125	16,166	17,942	20,257	24,048	25,874	9,708	125	16,169	17,945	20,260	24,051	25,877	9,708
Harris	126	3,607	5,463	8,371	14,043	17,387	13,780	126	3,617	5,473	8,381	14,053	17,397	13,780
Harris	127	37,511	43,014	49,356	59,641	64,271	26,760	127	37,529	43,032	49,374	59,659	64,289	26,760
Montgomery	128	22,516	25,633	31,809	38,831	41,540	19,024	128	22,541	25,658	31,834	38,856	41,565	19,024
Montgomery	129	39,241	46,209	69,413	94,303	104,150	64,909	129	39,432	46,400	69,604	94,494	104,341	64,909
Montgomery	130	7,182	8,372	19,437	34,006	39,587	32,405	130	7,190	8,380	19,445	34,014	39,595	32,405
Montgomery	131	31,222	48,453	61,200	70,129	73,763	42,541	131	31,222	48,453	61,200	70,129	73,763	42,541
Montgomery	132	51,960	76,616	95,049	112,680	118,833	66,873	132	52,329	76,985	95,418	113,049	119,202	66,873
Montgomery	133	4,691	8,319	10,907	15,103	16,503	11,812	133	4,693	8,321	10,909	15,105	16,505	11,812
Montgomery	134	27,679	37,541	42,632	47,619	48,298	20,619	134	27,826	37,688	42,779	47,766	48,445	20,619
Montgomery	135	24,868	29,737	31,118	32,118	32,433	7,565	135	25,588	30,457	31,838	32,838	33,153	7,565
Montgomery	136	33,344	40,579	43,299	45,754	46,522	13,178	136	33,506	40,741	43,461	45,916	46,684	13,178
Montgomery	137	12,746	15,812	17,341	19,255	19,969	7,223	137	12,783	15,849	17,378	19,292	20,006	7,223
Montgomery	138	5,137	6,330	7,218	8,089	8,388	3,251	138	5,152	6,345	7,233	8,104	8,403	3,251
Montgomery	139	31,498	56,984	67,707	81,148	85,983	54,485	139	31,513	56,999	67,722	81,163	85,998	54,485
Waller	140	13,511	16,877	21,279	25,495	27,013	13,502	140	16,275	19,641	24,043	28,259	29,777	13,502
Waller	141	7,301	8,977	11,640	14,038	14,892	7,591	141	7,452	9,128	11,791	14,189	15,043	7,591
Waller	142	7,347	9,177	11,769	14,194	15,007	7,660	142	7,641	9,471	12,063	14,488	15,301	7,660
Waller	143	1,291	1,581	1,863	2,134	2,240	949	143	1,291	1,581	1,863	2,134	2,240	949
Fort Bend	144	19,068	36,812	45,791	59,311	65,128	46,060	144	19,068	36,812	45,791	59,311	65,128	46,060
Fort Bend	145	4,587	7,134	6,920	6,835	6,812	2,225	145	4,646	7,193	6,979	6,894	6,871	2,225
Fort Bend	146	50,512	65,324	80,869	101,470	110,132	59,620	146	52,704	67,516	83,061	103,662	112,324	59,620
Fort Bend	147	1,768	2,880	2,781	2,743	2,733	965	147	1,768	2,880	2,781	2,743	2,733	965
Fort Bend	148	5,507	8,317	8,007	7,886	7,852	2,345	148	5,507	8,317	8,007	7,886	7,852	2,345
Fort Bend	149	32,298	36,700	38,642	41,698	42,999	10,701	149	33,196	37,598	39,540	42,596	43,897	10,701
Fort Bend	150	19,981	27,171	42,328	59,939	66,411	46,430	150	22,249	29,439	44,596	62,207	68,679	46,430
Fort Bend	151	39,858	48,491	63,605	77,733	82,771	42,913	151	40,252	48,885	63,999	78,127	83,165	42,913
Fort Bend	152	30,440	37,014	49,897	61,486	65,508	35,068	152	30,618	37,192	50,075	61,664	65,686	35,068
Fort Bend	153	44,419	51,241	56,611	64,148	67,261	22,842	153	44,565	51,387	56,757	64,294	67,407	22,842
Fort Bend	154	44,222	60,222	77,432	98,659	106,496	62,274	154	44,263	60,263	77,473	98,700	106,537	62,274
Fort Bend	155	41,989	61,641	74,359	91,141	98,118	56,129	155	42,049	61,701	74,419	91,201	98,178	56,129
Fort Bend	156	3,271	5,613	5,375	5,281	5,256	1,985	156	3,271	5,613	5,375	5,281	5,256	1,985
Fort Bend	157	5,706	8,781	8,471	8,349	8,317	2,611	157	5,768	8,843	8,533	8,411	8,379	2,611
Fort Bend	158	4,535	6,866	6,613	6,517	6,490	1,955	158	4,535	6,866	6,613	6,517	6,490	1,955
Brazoria	159	11,900	12,678	12,540	12,659	12,684	784	159	11,971	12,749	12,611	12,730	12,755	784
Brazoria	160	16,723	17,854	17,532	17,607	17,617	894	160	17,940	19,071	18,749	18,824	18,834	894
Brazoria	161	2,973	3,103	3,051	3,082	3,080	107	161	2,973	3,103	3,051	3,082	3,080	107
Brazoria	162	7,036	7,334	7,110	7,123	7,112	76	162	7,036	7,334	7,110	7,123	7,112	76
Brazoria	163	12,719	13,402	13,245	13,273	13,257	538	163	12,855	13,538	13,381	13,409	13,393	538
Brazoria	164	33,415	34,914	34,852	35,022	35,010	1,595	164	33,621	35,120	35,058	35,228	35,216	1,595
Brazoria	165	1,920	2,046	2,047	2,063	2,069	149	165	1,926	2,052	2,053	2,069	2,075	149
Brazoria	166	11,848	12,268	12,026	12,080	12,072	224	166	13,108	13,528	13,286	13,340	13,332	224

RAZ LEVEL COMPARISON: HOUSEHOLD POPULATION AND TOTAL POPULATION
Aggressive Model Results

County	AGGRESSIVE RAZ Level Model Results							AGGRESSIVE RAZ Level Model Results						
	RAZ	HH Pop 2000	HH Pop 2007	HH Pop 2015	HH Pop 2022	HH Pop 2025	HH Pop 2000 2025	RAZ	Tot Pop 2000	Tot Pop 2007	Tot Pop 2015	Tot Pop 2022	Tot Pop 2025	Tot Pop 2000-2025
Brazoria	167	19,591	20,529	20,123	20,278	20,274	683	167	20,663	21,601	21,195	21,350	21,346	683
Brazoria	168	2,282	3,276	4,254	5,522	6,124	3,842	168	2,296	3,290	4,268	5,536	6,138	3,842
Brazoria	169	8,284	10,616	12,618	15,642	16,913	8,629	169	14,938	17,270	19,272	22,296	23,567	8,629
Brazoria	170	37,884	46,027	52,329	52,394	52,332	14,448	170	38,074	46,217	52,519	52,584	52,522	14,448
Brazoria	171	21,417	27,494	37,048	58,068	66,117	44,700	171	21,423	27,500	37,054	58,074	66,123	44,700
Brazoria	172	42,816	48,605	53,344	60,415	63,051	20,235	172	42,945	48,734	53,473	60,544	63,180	20,235
Galveston	173	21,213	23,826	25,241	27,321	28,053	6,840	173	21,455	24,068	25,483	27,563	28,295	6,840
Galveston	174	17,928	21,495	25,475	31,426	33,911	15,983	174	17,948	21,515	25,495	31,446	33,931	15,983
Galveston	175	32,535	35,638	37,843	41,186	42,399	9,864	175	32,905	36,008	38,213	41,556	42,769	9,864
Galveston	176	12,007	13,069	13,567	14,484	14,853	2,846	176	12,027	13,089	13,587	14,504	14,873	2,846
Galveston	177	18,178	19,699	21,136	23,435	24,258	6,080	177	18,245	19,766	21,203	23,502	24,325	6,080
Galveston	178	19,534	21,218	23,500	27,164	28,536	9,002	178	19,539	21,223	23,505	27,169	28,541	9,002
Galveston	179	5,304	5,925	7,077	8,542	9,064	3,760	179	5,777	6,398	7,550	9,015	9,537	3,760
Galveston	180	25,507	27,645	29,661	32,292	33,108	7,601	180	25,790	27,928	29,944	32,575	33,391	7,601
Galveston	181	8,565	9,235	10,361	11,895	12,484	3,919	181	8,727	9,397	10,523	12,057	12,646	3,919
Galveston	182	11,212	12,296	14,004	16,364	17,141	5,929	182	11,266	12,350	14,058	16,418	17,195	5,929
Galveston	183	8,865	9,756	11,038	12,848	13,703	4,838	183	8,956	9,847	11,129	12,939	13,794	4,838
Galveston	184	5,219	5,638	6,199	6,993	7,290	2,071	184	5,223	5,642	6,203	6,997	7,294	2,071
Galveston	185	6,606	7,613	8,052	8,603	8,812	2,206	185	6,742	7,749	8,188	8,739	8,948	2,206
Galveston	186	48,220	51,628	54,979	57,790	58,566	10,346	186	49,834	53,242	56,593	59,404	60,180	10,346
Galveston	187	1,300	1,468	1,653	1,839	1,934	634	187	1,914	2,082	2,267	2,453	2,548	634
Galveston	188	3,821	4,934	5,387	6,290	6,599	2,778	188	3,822	4,935	5,388	6,291	6,600	2,778
Chambers	189	9,445	9,890	10,702	12,238	12,792	3,347	189	9,667	10,112	10,924	12,460	13,014	3,347
Chambers	190	3,124	3,138	3,290	3,589	3,723	599	190	3,124	3,138	3,290	3,589	3,723	599
Chambers	191	7,962	7,986	8,586	9,521	9,856	1,894	191	7,968	7,992	8,592	9,527	9,862	1,894
Chambers	192	5,264	5,059	5,436	6,117	6,362	1,098	192	5,270	5,065	5,442	6,123	6,368	1,098
Liberty	193	744	1,116	1,635	2,236	2,486	1,742	193	744	1,116	1,635	2,236	2,486	1,742
Liberty	194	11,929	13,176	15,540	18,227	19,174	7,245	194	12,383	13,630	15,994	18,681	19,628	7,245
Liberty	195	20,963	22,586	26,526	30,843	32,344	11,381	195	24,906	26,529	30,469	34,786	36,287	11,381
Liberty	196	8,183	8,905	10,713	12,653	13,342	5,159	196	8,203	8,925	10,733	12,673	13,362	5,159
Liberty	197	6,639	7,007	8,376	9,970	10,492	3,853	197	7,257	7,625	8,994	10,588	11,110	3,853
Liberty	198	7,836	8,970	10,709	12,639	13,404	5,568	198	7,836	8,970	10,709	12,639	13,404	5,568
Liberty	199	8,818	10,148	12,152	14,302	15,116	6,298	199	8,824	10,154	12,158	14,308	15,122	6,298


2000 HOUSTON CMSA
REGIONAL ANALYSIS ZONE (RAZ) INDEX MAP
2025 Regional Growth Forecast
Houston-Galveston Area Council
Community & Environmental Planning Department
Inset Map
Inset Map

0790309

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 9, 2001

The Honorable Grady Prestage, County Commissioner
5th Street Water System
2331 South Main Street
Stafford, Texas 77477-5519

Re: Compliance Evaluation Investigation at:
5th Street Water System, 5th Street, Stafford, Fort Bend County, Texas
TNRCC ID No. 0790309

Dear Commissioner Prestage:

On December 14, 2000, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols, Jr., P.E.
PWS Team Leader
Houston Region Office

RLE/hp

cc: Fort Bend Co. Health Dept.

PUBLIC . ATER SUPPLY REGULATORY PI GRAM

REGULATED ENTITY DATA KM 569Z

DISTRIBUTION ONLY SYSTEM

ID No. 0790309 **GW multi: #** - **SW multi : #** - **Community** x **NTNC** - **Non-Comm** -

CCN No. - Superior - Approved - Probation - **Region** 12

Name of System **5 th Street Water System** County Fort Bend

Physical location 5th Street - east of FM 1092

Responsible Official Grady Prestage Title County Commissioner Phone 281.499.1031

Mailing Address 2331 South Main Street Stafford Texas 77477-5519 **FAX** **281.499.4223**

Chief Cert Op Name Mark Woodward Grade & Type C- GW Phone 281.499.1031

2nd Op Req'd? no Name - Grade & Type - Total # Cert. Ops. 10

WS Manager/Superintendent Owen Matherne Other Officials -

Surveyed With M. Woodward Area Served 5th street area

Supplier and Source district - ground - system under pressure

Interconnection w/other PWS? yes Name PWS I/C Fort Bend WCID #2 Type I/C open

Retail Service Connection 252 Retail Meters 252 Retail 756

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge yes Dist. to and Name of Nearest **Mile to Fort Bend WCID # 2**

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 09.15.99

Map Attached no Previous Map OK? yes Well Operational Status no changes

Description of Supply, Source, Treatment, and Chemicals Used:

Ground water - receives treated water under direct pressure from Ft. Bend WCID # 2

Total Well Cap. 0 GPM 0 MGD RAW Cap. - GPM 0 MGD

Treatment Cap. - GPM 0 MGD Total Svc. Pump Cap. - GPM 0 MGD

Total Elevated Storage 0.0 MG Total Storage 0 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage 0 MG Date - Average Daily Usage 0 MG Time Period -

Wholesale Contract - Maximum Purchase Rate $6 - first 5000 gallons

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?		x
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 1/mo # Submitted 1/mo

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL * refer to PWS ID # 0790004 for chemical results

Acceptable Quality? yes Date, Last Analysis IOC - NO_2/N - RC - VOC - SOC -

List UNACCEPTABLE Values

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 12.14.2000 By Helen Pagola HPag

Date of Approval 01/09/01 By Ross L. Scholz X.

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

I.D. No.:	0790309	Survey Date:	12.14.2000

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	-		Proper Water Level Indicator Provided?	[43,c,4]	-	
Tanks Tight Against Leakage?	[43,c,6]	-		Drains Properly Connected?	[43,c,7]	-	
Vents Properly Installed?	[43,c,1]	-		Inlet and Outlet Properly Located?	[43,c,5]	-	
Openings Properly Screened	[43,c,1]	-		Disinfectant Residual in Water Storage Tanks	[46,d,2]	-	
Proper Roof Hatch Provided?	[43,c,2]	-		Intruder Resistant Fence?	[43,e]	-	
Roof Hatch Kept Locked?	[43,c,2]	-		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	-	
Proper Overflow Provided?	[43,c,3]	-		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	-	

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?**	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 56 psi Locations: 1123 Bowen

**Location: none

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	-		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: receives treated water				$CL2 = 1.17$ Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	-		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	-		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790309	Survey Date:	12.14.2000

VI. SYSTEM FACILITIES

Number of Connections 252

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
			DISTRIBUTION ONLY	° ' "/ ° ' "					
				° ' "/ ° ' "		'			
				° ' "/ ° ' "		'			
				° ' "/ ° ' "		'			
				° ' "/ ° ' "		'			
				° ' "/ ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? YES (Y/N) Describe: diesel generator at Plant System # 0790004 at plant 4 & plant 5

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production		GPM/Conn	X		Conn =		GPM		GPM	-	
Elevated/Pressure Storage		Gal/Conn	X		Conn =		MG		MG	-	
Ground/Total Storage		Gal/Conn	X		Conn =		MG		MG	-	
Service Pumping Cap.		GPM/Conn	X		Conn =		GPM		GPM	-	
Service Pump Peaking Factor		MDD/1,440	X	1.85	**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790309	Survey Date:	12.14.2000

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	-		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	-	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	-		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	-	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	-		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	-	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	-		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	-	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	-		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	-	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	-		Suitable sampling tap?	[41,c,3,M]	-	
Well cased 18" above ground level?	[41,c,3,B]	-		Well meter provided?	[41,c,3,N]	-	
Proper concrete sealing block?	[41,c,3,J]	-		Well blow-off properly installed?	[41,c,3,L]	-	
Well head sealed?	[41,c,3,K]	-		Well unit fenced or housed?	[41,c,3,O]	-	
Casing vent properly installed?	[41,c,3,K]	-		Well site properly drained?	[41,c,3,I]	-	
Air release devices properly installed?	[41,c,3,Q]	-		All weather road provided?	[41,c,3,P]	-	
Electrical Wiring installed in conduit?	[46,V]	-					

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

Number of A Violations: ☐ **Number of B Violations:** ☐ **Number of C Violations:** ☐

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Kathleen Hartnett White, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

PWS/ 020000/ /CO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 7, 2002

The Honorable Andy Reyes, Mayor
Alvin, City of
1100 West Hwy 6
Alvin, Texas 77511

Re: Compliance Evaluation Investigation at:
City of Alvin, 1100 West Hwy 6, Alvin, Brazoria Co. Texas
TCEQ ID No. 0200001

Dear Mayor Lewis:

On July 18, 2002 and September 4, 2002, Mr. David W. Livings Sr. R.S. of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. David W. Livings Sr. R.S. in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/dwl

cc: Brazoria Co. Health Dept.

Texas Co...mission on Environme..tal Quality

Investigation Report

CITY OF ALVIN

CITY OF ALVIN

RN101394872

Investigation # 8449

Incident # 4043

Investigator: DAVID LIVINGS

Site Classification

GW >1K-10K CONNECTION

Conducted: 07/18/2002 -- 07/18/2002

No Industry Code Assigned

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Location :

Additional ID(s) : 0200001

Address: 1100 W HIGHWAY 6;
ALVIN, TX 77511

Activity Type : PWS-COMPLAINT
PWS GW Multi Facilities CCI/CCM-Compliance Groundwater

Principal(s) :

Role	Name
RESPONDENT	CITY OF ALVIN

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	Operator	Eric Wilson	Work	(281) 388-4328

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE
QA REVIEWER	BOBBY HOLDER

Associated Check List

Checklist Name	Unit Name
PWS DISINFECTION	PWS DISINFECTION
PWS DISTRIBUTION	PWS DISTRIBUTION
PWS GENERAL INFORMATION	PWS GENERAL INFORMATION
PWS GROUND WATER SOURCE- SANITARY	PWS WATER SOURCE SANITA
PWS GROUND WATER SOURCE-CONSTRUCTION	PWS GROUND CONSTRUCTIO
PWS MICRO AND CHEMICAL INFORMATION	PWS MICRO CHEMICAL INFOR
PWS OPERATION AND MAINTENANCE	PWS OPERATION MAINTENAN
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 1@Durant
PWS STORAGE TANKS	ET and GST-ALL
PWS SYSTEM CAPACITIES	SYSTEM CAPACITIES
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	ET 0.25MG @ Snyder Pl
PWS SYSTEM FACILITIES-WELLS	WELL 4 Durant
PWS SYSTEM FACILITIES-WELLS	WELL 3 Snyder
PWS SYSTEM FACILITIES-WELLS	2 WELL 7 Brazos
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 2@Durant
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 3@Brazos
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 4@Brazos
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 2@Snyder
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 3@Durant
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 1@Brazos
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 2@Brazos
PWS SYSTEM FACILITIES-WELLS	Well 8 W. Willis

PWS SYSTEM FACILITIES-WELLS	1 WELL 6 Brazos
PWS INVESTIGATION TYPES	ACTIVITY
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	ET 0.50MG @ Dyche Ln.
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	1 GST 0.42MG@ Durant Pl
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	2 GST 0.21MG@ Durant Pl
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	1 GST 0.42MG@ Brazos Pl
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	2 GST 0.42MG@ Brazos Pl
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	3 GST 0.42MG@ Brazos Pl
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	ET 0.5MG Verhalen
PWS SYSTEM FACILITIES-STORAGE RESERVOIRS	GST 1.00MG@ Snyder Pl
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 1@Snyder
PWS STORAGE FACILITIES-SERVICE PUMPS	SVC PUMP 3@Snyder
QUALITY REVIEW - PWS	QAREVIEW
COMPLAINT INVESTIGATION - PWS	COMPLAINT INVESTIGATION

Investigation Comments :

An investigation of the City of Alvin Water System in response to a complaint, was conducted on July 18, 2002 and Sept 4, 2002. Present at the investigation were Mr. Eric Wilson Chief Operator(B Ground Water and Waste Water) and James Yeager Chief Operator (B Waste Water and B Water). This is a community system which consist of 5 Plants.

Plant 3... 1 Well, 3 service pumps 550 each. and a 1.2 MG Ground Storage Tank, and 0.25 MG Elevated Storage Tank.

Plant 4, 1 Well, 3 service pumps 450 each and 2 Ground Storage Tanks
0.42 MG and 0.21 MG

Plant 6, 4 service pumps 600 each and 2 Ground Storage Tanks
0.42 MG each.

Plant 7, 1 well.

Plant 8, 1 well

A 0.5 MG Elevated Storage Tank located at 650 Dyche Ln
A 0.5 Elevated Storage Tank located at Verhalen and Mustang Ln

The ground water source is treated using Hypochlorination and polyphosphate. During the investigation, there were no violations noted.
Complaint is closed is close as of July 18, 2002, but the inspection of the investigation is on going.

Signed ____________________ Date 10/7/2002
Environmental Investigator

Signed ____________________ Date 10-7-02
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)

✓ Letter to Facility (specify type) : Gen. Compliance

Investigation Report

___Sample Analysis Results

___Manifests

___NOR

___Maps, Plans, Sketches

___Photographs

___Correspondence from the facillity

✓ Other (specify) :

Water System Data Sheet

Core data form

8/27/02

TNRCC Core Data Form

SECTION I: General Information

1. Reason for Submission Example: new wastewater permit; IHW registration; change in customer information; etc.

2. Attachments
___Yes ___No

Describe Any Attachments: (ex: Title V Application, Waste Transporter Application, etc.)

3. Customer Reference Number-if issued
CN600549133

4. Regulated Entity Reference Number-if issued
RN101394872 ✓

SECTION II: Customer Information

5. Customer Role - As it relates to the Regulated Entity Listed on this Form
Operator

TNRCC Use Only ___Superfund ___PST ___Respondent

6. General Customer Information
___New Customer ___Change to Customer Info ___Change in Regulated Entity Ownership ___No Change*
*If "No Change" and Section 1 is complete, skip to Section III - Regulated Entity Information.

7. Type of Customer:
OG

8. Customer Name (if an individual, please print last name first)
City Of Alvin

9. Mailing Address:
~~Po Box 1407~~ 1100 WEST HWY 6
Alvin, TX ~~77512-1407~~
77511

10. Country Mailing Information (if outside USA)
USA

11. E-Mail Address (if applicable)

12. Telephone Number
~~(713) 585-6169~~
281-388-4200

13. Extension or Code

14. Fax Number

15. Fed Tax ID:

16. State Franchise Tax ID:

17. Duns Number:

18. No. of Employees:

19. Independently Owned/Operated:

SECTION III Regulated Entity Information

20. General Regulated Entity Information
___New Regulated Entity ___Change to Regulated Entity Information ___No Change*
*If "No Change" and Section I is complete, skip to Section IV - Preparer Information.

21. Regulated Entity Name (if an individual, please print last name first)
City Of Alvin

22. Street Address:
1100 WEST HWY 6, Alvin 77511-7648

23. Mailing Address:

24. E_Mail Address

25. Telephone Number:	26. Fax Number - if applicable

28. Primary SIC Code	29. Secondary SIC Code	30. Primary NAIC Code	31. Secondary NAIC Code

33. County:
Brazoria

34: Description of Physical Location
1100 WEST Hwy 6

35. Nearest City	State	Nearest Zip
MANvel	TX	

36. Latitude (N)	37. Longitude (W)
0.00	0.00

38. TNRCC Programs in Which This Regulated Entity Participates Not all prorams have been listed. Please add to this list as needed. If you don't know or are unsure, please mark "unknown."

PUBLIC WATER SYSTEM/SUPPLY

SECTION IV Preparer Information

39. Name	40. Title
Livings, DAVID W. R.S.	EI 4

41. Telephone Number	42. Extension or Code	43. Fax Number if applicable
713-767-3526		713-767-3691

44. E-Mail Address:

~~ET9~~ PWS/0200002CO VNU

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

July 13, 2001

The Honorable Gerald Roberts, Mayor
City of Angleton
121 South Velasco
Angleton, Texas 77515-6023

Re: Investigation Type - Compliance Evaluation Investigation at:
City of Angleton, 535 South Anderson, Angleton, Brazoria Co., Texas
TNRCC ID No. 0200002:

Dear Mayor Roberts:

On June 8, 2001 of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. David W. Livings in the Houston Region Office at (713)767-3650.

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
Team Leader
Houston Region Office

HDL/dwl

cc: Brazoria Co. Health Dept.

GPS quick-reference using **Starlink real-time** differential correction

Before you leave the office:

1. Pre-mission planning (see GPS Certification manual, p. 61)
2. Make sure that GPS receiver settings are correct (p. 65, and below.) The receiver will reset itself if backup battery failed, so check this every time.
3. **Make these changes to the settings:**

   Configuration-WPT Averaging- Averaging: On and *# of psns: 60*
   Configuration-RTCM- Mode Differential (GPD) and *Port A*
   Configuration-Communication-Port A- RTCM 9600 None 8 1

3. Make sure that large battery is charged and that you have all needed parts (cables, antenna, spare AA batteries, compass, tape measure, whatever...)
4. TAKE THE TOPO MAP WITH YOU to make sure that you get a location in case the GPS hardware fails. This is especially important for new water sources that have never been mapped. We perfer the accuracy of GPS, but any location is better than none.

When you get to the site:

1. Power on the receiver.
2. Check for a clear view of the sky.
3. Once you have acquired signal from 4 SV's and confirmed signal from beacon receiver (look for **3DX** in lower left of Position screen) move through the menu structure to *Navigation-Waypoint Setup-Add Here*

NOTE: your GeoExplorer will not acquire satellite signals if the StarLink cannot receive the beacon signal.

4. When you have collected 60 points at your position, record the Water source ID and latitude and longitude below. Close the file by saving the waypoint. File name can be edited to match Watersource ID.
5. Repeat 2-4 for each position to be measured.
6. If you do not have a clear view of the sky, or if you cannot place the receiver directly over the position to be measured, an offset measurement is required (see Offset Measurement Procedures.) If you cannot receive beacon correction signal, proceed with data collection using post-processing procedures (over.)
7. When you are finished collecting data, power off the receiver and unplug the Starlink. Be sure to leave the "battery eliminator" module or the AA battery pack installed in the GPS receiver to protect the memory and save your work.

Name__David W. Livings____ GPS Cert #__00032403_______________ Region____12__ Date__Feb 13, 2001____

WaterSource ID (example:G1010001A)	**Wpt**	**Latitude**	**Longitude**	**Altitude**	**Offset Distance**	**Offset Direction**
G020002F Angleton City of Well 6	001	N 29°10' 52.89"	W 95°25' 54.89"	6ft MSL	0	0
G020002GAngleton City of Well 7	001	N 29 10' 41.12"	W 95 25' 54.78"	13ft MSL	0	0
G020002H Angleton City of Well 8	001	N 29 11' 14.90"	W 95 25' 56.56"		0	0
G020002I Angleton City of Well 9	001	N 29 71' 23.44"	W 95 26' 14.79"	19ft MSL	0	0
G020002J Angleton City of Well 10	001	N 29 10' 42.39"	W 95 26' 13.99"	9ft MSL	0	0
G020002K Angleton City of Well 11	001	N 29 11' 38.79"	W 95 26' 20.38"	13ft MSL	0	0

When you return to the office:

1. Attach this form to the sanitary survey when you send it to the central office. Keep a copy for your files.
2. Delete waypoints from the GPS receiver to clear memory for next field collection.
3. Put battery on charge.

C:\files\gps\realtime.wpd 6/2/1998 EFBV

PUBLIC 'ATER SUPPLY REGULATORY I 'GRAM
REGULATED ENTITY DATA KM 828 S

ID No. 0200002 GW multi: # ____ SW multi : # ____ Community x NTNC ____ Non-Comm ____

CCN No. 11845 Superior n Approved n Probation n Region 12

Name of System CITY OF ANGLETON County BRAZORIA

Physical location 535 South Anderson----Water Barn

Responsible Official GERALD ROBERTS Title MAYOR Phone 979) 849 - 4364

Mailing Address 121 South Velasso Street Angleton Texas 77515-6023 FAX ____

Chief Cert Op Name DAVID KING Grade & Type C GW Phone 979) 849 - 0742

2nd Op Req'd? Yes Name David King Grade & Type C GW Total # Cert. Ops. 5

WS Manager/Superintendent David King Other Officials ____

Investig. With Jeff Sifford Area Served City Of Angleton

Supplier and Source Surface / Ground (BWA) SIX WELLS

Interconnection w/other PWS? Yes Name PWS I/C (BWA)- Type I/C -------

Retail Service Connection 6282 Retail Meters 6222 Retail Population 18,846

Wholesale Master Meters 0 Wholesale Service Connections 0 Wholesale Population 0

Charge yes Dist. to and Name of Nearest PWS I C (BWA) 2 Miles to

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 8 / 16 / 99

Map Attached NO Previous Map OK? YES Well Operational Status Changed? NONE

Description of Supply, Source, Treatment, and Chemicals Used:

CONSIST OF 6 WELLS, WELL 9 AND 10 DISCHARGES TO PLANT 2 AND 3. WELL 11 DISCHARGES TO PLANT 3. WATER @ PLANT 2 IS TREATED WITH CL2 AND DISCHARGED TO THE GROUND STORAGE TANK @ PLANT 3, WELL WATER IS AERATED TREATED WITH POLYPHOSPHATE, CL2 AND DISCHARGED TO TWO GROUND STORAGE TANKS SERVICE PUMPS TAKE SUCTION FROM THE GROUND STORAGE TANKS AT BOTH PLANTS AND DISCHARGE TO DISTRIBUTION. TWO ELEVATED STORAGE FLOATING ON THE SYSTEM, FULLY TREATED SURFACE WATER IS PURCHASED FROM (BWA) & GOES INTO PLANT 3 THEN TRANSFERED TO PLANT 2.

Total Well Cap. 3800 GPM 5.472 MGD RAW Cap. ____ GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 6000 GPM 8.64 MGD

Total Elevated Storage 0 Total Storage Cap. 2.065 MG Pressure Tank Cap. 0

Maximum Daily Usage 3.24 Date 9/5/00 Average Daily Usage 1.93 Time Period 0

Wholesale Contract 0 Maximum Purchase Rate 0

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?		
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 23 mo # Submitted 23 mo

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 1/12/99 NO_2/NO 1/12/99 RC 1/12/99 VOC 10/16/00 SOC -

List UNACCEPTABLE Values ____

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ____

Date of Investigation June 8, 2001 By DAVID W. LIVINGS R.S.

Date of Approval 7/12/01 By [signature]

Letter Date, if different from Approval Date ____ Reply Requested ____ Def Score 0

 # = Not Applicable **U=Unknown** **N= Not Observed** **R = Resolved** **$ = See Comments**

JUL 3 1 2001

I.D. No.:	020002	Survey Date:	June 8, 2001

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	x		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	x		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	-
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	x	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	x	
x				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]		
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	-
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	-
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	-

Tested 55 psi Locations: 900 KARDEA

**Location:

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Cholrination**				CL2 =**1.98** Mg/L/ **Total** Locations: same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-	-	DPD Chlorine Test Kit Provided? [110,d]		x	
Disinfection Prior to Storage?	[42,e,2,]	-	-	Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	-
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-	-	IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-	-	Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	-
Disinfection Room - Properly vented ?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	-

I.D. No.:	0200002	Survey Date:	June 8, 2001

VI. SYSTEM FACILITIES

Number of Connections 6282

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
002	F	6	1600 VELASCO	N 29 10 52.89 W 95 25 54.89	E	653'	VT		400
002	G	7	RICHMOND @ VELASCO	N 29 10 41.12 W 95 25 54.78	E	850'	VT		450
003	H	8	1800 BLACK OF VELASCO	N 29 11 14.90 W 95 25 56.56	E	850'	VT		550
002	I	9	TRACY LANE	N 29 71 23.44 W 95 26 14.79	D	956'	VT		750
003	J	10	WOODWAY	N 29 10 42.39 W 95 26 13.99	D	860'	VT		800
002	K	11	HENDERSON	N 29 11 38.79 W 95 26 20.38	0	850'	VT		850

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
Ground Storage	1.0 MG	Concrete	600 Cemetary Plant 2
Ground Storage	1.0 MG	Concrete	Henderson Plant 3
Ground Storage	0.065 MG	Bolted Steel	[illegible]
Elevated	0.5 MG	Welded Steel	Tinsely
Elevated	0.5 MG	Welded Steel	Park and Cemetary

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
2-1	750	Plant # 2	3-1	750	Plant # 3	3-4	750	Plant # 3
2-2	750	Plant # 2	3-2	750	Plant # 3	3-5	750	Plant # 3
2-3	750	Plant # 2	3-3	750	Plant # 3			

Emergency Power /Alternate Source? Yes (Y / N) Describe: Generator at Plant # 2 and 3

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	6282	Conn =		3762	GPM	3800	GPM	x	
Elevated/Pressure Storage	100	Gal/Conn X	6282	Conn =		0.6282	MG	1.0	MG	x	
Ground/Total Storage	200	Gal/Conn X	6282	Conn =		1.256	MG	2.065	MG	x	
Service Pumping Cap.	2	GPM/Conn X	6282	Conn =		12,564	GPM	6000	GPM	x	
Service Pump Peaking Factor	3	MDD/1,440 X	1.25	**		2812	GPM	6000	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0200002	Survey Date:	June 8, 2001

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

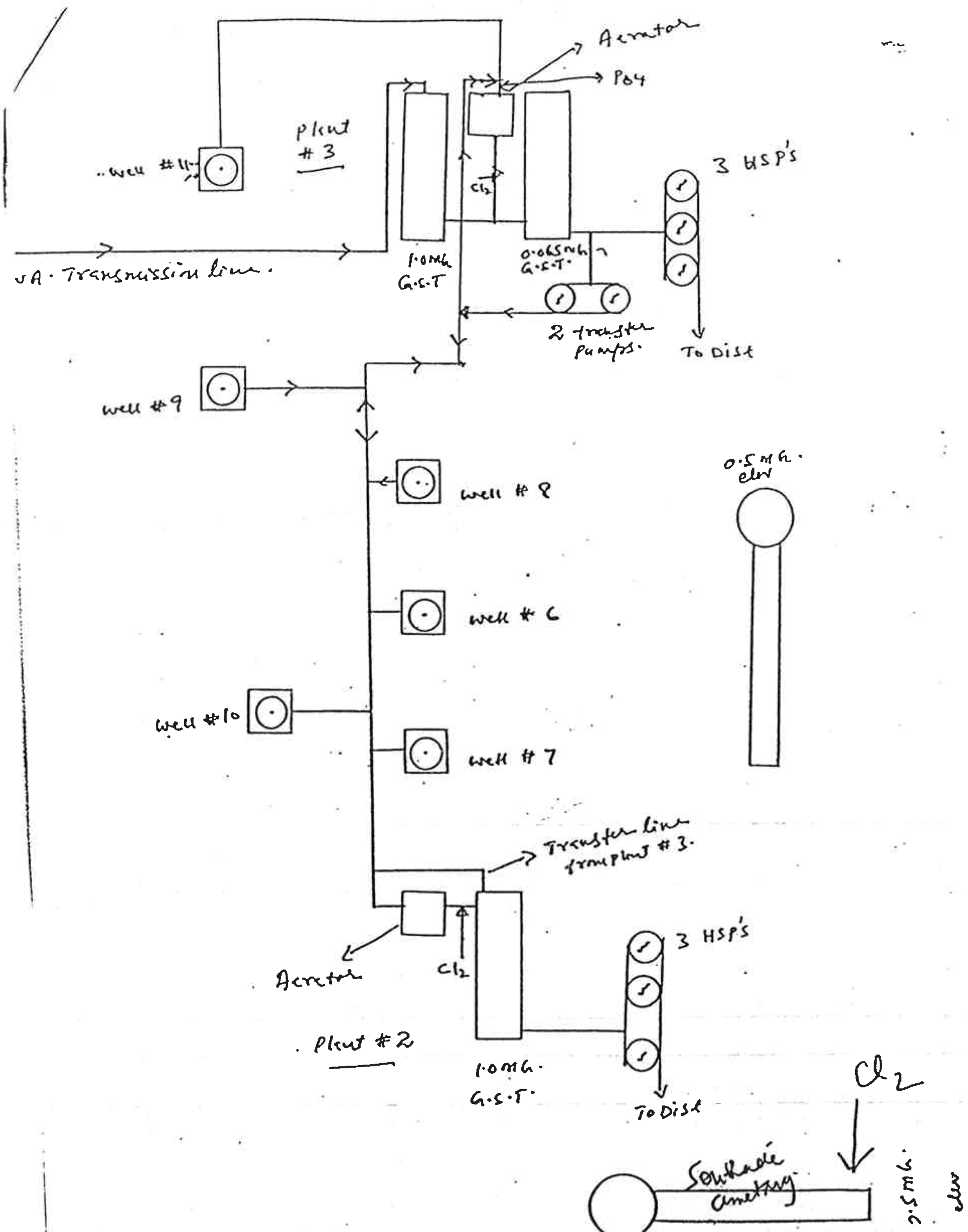
Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS - SYSTEM FLOW DIAGRAM

Name of System:	CITY OF ANGLETON	ID#:	0200002
Survey Date:	June 8, 2001	Surveyed By:	David W. Livngs R. S.

Description of Supply, Source, Treatment, and Chemicals Used



PWS/0 2004/51CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 5, 2003

CERTIFIED MAIL #7002 2030 0003 4748 6576
RETURN RECEIPT REQUESTED

Mr. Michael Merka, President
Walker Water Works
P.O. Box 907
El Campo, Texas 77543

Re: Compliance Evaluation at:
Ashley Oaks Mobile Home Community, 3504 Longwood, Brazoria County, Texas
TCEQ ID No. 0200415

Dear Mr. Merka:

On March 30, 2003, Mr. Bobby Holder of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office, conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. Enclosed is a summary which lists the investigation findings. During the investigation, a certain outstanding alleged violation was identified for which compliance documentation is required. Please submit to this office by September 30, 2003, a written description of corrective action taken and the required documentation demonstrating that compliance has been achieved for each of the outstanding alleged violations.

The Texas Commission on Environmental Quality appreciates your assistance in this matter. Please note that the Legislature has granted TCEQ enforcement powers which we may exercise to ensure compliance with environmental regulatory requirements. We anticipate that you will resolve the alleged violations as required in order to protect the State's environment. If you have additional information that we are unaware of, you have the opportunity to contest the violation(s) documented in this notice. Should you choose to do so, you must notify the Houston Region Office within 10 days from the date of this letter. At that time, Mr. Barry H. Price, Jr., PWS Team Leader, will schedule a violation review meeting to be conducted within 21 days from the date of this letter. However, please be advised that if you decide to participate in the violation review process, the TCEQ may still require you to adhere to the compliance schedule included in the attached Summary of Investigation Findings until an official decision is made regarding the status of any or all of the contested violations.

REPLY TO: REGION 12 • 5425 POLK AVE., STE. H • HOUSTON, TEXAS 77023-1486 • 713/767-3500 • FAX 713/767-3520

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tceq.state.tx.us

Mr. Michael Merka, Vice President
Page 2
May 5, 2003

If you or members of your staff have any questions, please feel free to contact Mr. Bobby Holder in the Houston Region Office at 713/767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/bjh

cc: Brazoria Co. Health Dept.

Summ / of Investigation Findings

ASHLEY OAKS MOBILE HOME COMMUNITY | Investigation # 33357
Date: 03/30/2003

, BRAZORIA COUNTY,

Additional ID(s): 0200415

OUTSTANDING ALLEGED VIOLATIONS

Track No: 26413 **Compliance Due Date: 9/30/03**

30 TAC Chapter 290.45(b)(2)(E)

Alleged Violation:

Investigation: 33357 Comment Date: 05/01/2003

Failure to meet 200 gallons per connection for Ground Storage Capacity by 6400 gallons. The system operates under 22,000 gallons and is required to have 28400 gallons

Recommended Corrective Action: Additional GST must be provided to adequatly ser subdivision

Resolution:

Texas Commission on Environmental Quality

Investigation Report

WALKER WATER WORKS INC

ASHLEY OAKS MOBILE HOME COMMUNITY

RN101268514

Investigation # 33357

Incident #

Investigator: BOBBY HOLDER

Site Classification
GW 51-250 CONNECTION

Conducted: 03/30/2003 -- 03/30/2003

SIC Code: 6515

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Location : 3504 Longwood
Key Map 731H

Additional ID(s) : 0200415

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	WALKER WATER WORKS INC

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	VICE PRESIDENT	MR MICHAEL MERKA	Work	(281) 388-2202
Participated in Investigation	OPERATOR	MR MIKE CHAMPION	Cell	(281) 808-9492

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

RECEIVED MAY 0 6 2003

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	Activity Types
PWS GENERIC VIOLATIONS	Ground Storage Capacity

Investigation Comments :

An investigation of Ashley Oaks Mobile Home Community System , RN101268514, was conducted on February 25, 2003. It operated by Walker Water Works, In Alvin, Texas. Mr. Michael Merka is the President, and responsible official. Present at the investigation was Mr Mike Champion, C-Water Operator, who can be contacted at 281.808.9492. The water system provides service to connections in the subdivision.

Ashley Oaks Mobile Home Community System is located at Key map 731H, on 3504 Longwood

Facility Location and Capacity list: 1 well (110 gpm), 1PT (0.0025 MG)
Treatments: hypochlorination, added prior to PT, polyphosphate to treat Mn exceedance of 0.064 mg/l
The System is interconnected with South Meadows, which provides additional 2500 PT, 0.22 MG Ground Storage, and 60 gpm well capactiy
During the investigation one violation was noted, for GST Capacity for both systems when combined.

OUTSTANDING ALLEGED VIOLATIONS

Track No: 26413 **Compliance Due Date: 9/30/03**
30 TAC Chapter 290.45(b)(2)(E)

Alleged Violation:
Investigation: 33357 Comment Date: 05/01/2003

Failure to meet 200 gallons per connection for Ground Storage Capacity by 6400 gallons. The system operates under 22,000 gallons and is required to have 28400 gallons

Recommended Corrective Action: Additional GST must be provided to adequatly serve the subdivision

Resolution:

Signed ____________ Date 05·01·03
Environmental Investigator

Signed ____________ Date 5/5/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : NOV
Investigation Report
✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility

___Sample Analysis Results

___Manifests

___NOR

✓ Other (specify) :

IWMD DATA SHEET

CAPACITIES DATA

MICRO-CHEM DATA

PWS - SYSTEM CAPACITY

Investigation #	33357	Additional ID(s)	0200415	Investigation Date	02.25.03

SYSTEM FACILITIES

Number of Connections 142

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	CR 864A		P	160			
001	B	2	“”		O	162	Sub	U	110

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
PT	0.0025	Welded Steel	well site #1

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? ________ Describe: ______________________________
(Y/N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	6	GPM/Conn X	142	Conn =	85.2	GPM	110	GPM	X	
Elevated/Pressure Storage	20	Gal/Conn X	142	Conn =	0.0028	MG	0.005 (0.0025 MG from South Meadows)	MG	X	
Ground/Total Storage	200	Gal/Conn X	142	Conn =	0.028	MG	0.022 (from South Meadows)	MG		X
Service Pumping Cap.	2	GPM/Conn X	142	Conn =	284	GPM	300 (from South Meadows)	GPM	X	
Service Pump Peaking Factor		MDD/1,440 X				GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring

Name of System:	Ashley Oaks Mobile Home Community	Additional ID(s)	0200415
Investigation #	33357	Investigation Date:	02.25.03

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on	X	

Number of Samples Required 1 # Submitted 1

Number of Raw Samples Required ____ # Submitted ____

Non-Comm Dates of Operation ________ Thru ________

CHEMICAL

Acceptable No Date, Last Analysis IOC 06.04.01 NO_2/NO_3 06.04.01 RC 06.04.01 VOC 06.04.01 SOC -

List UNACCEPTABLE Values mn = 0.064 mg/l . Sequestering, OK

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

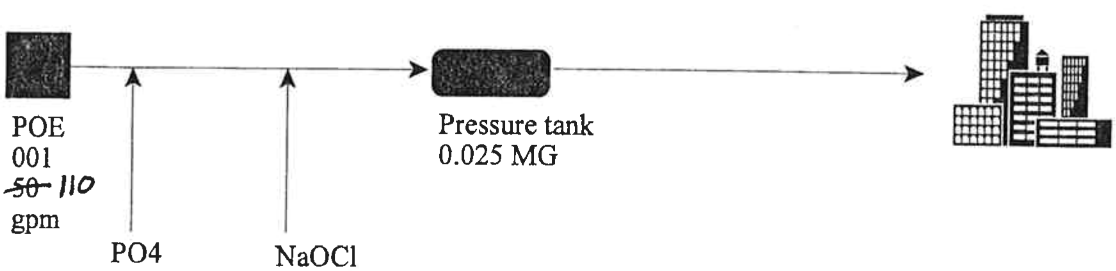
PWS - SYSTEM FLOW DIAGRAM

Name of System:	Ashley Oaks Mobile Home Community	Additional ID(s)	0200415
Investigation #	33357	Investigation Date:	03/30/2003
Description of Supply, Source, Treatment, and Chemicals Used			

Tested Distribution psi: ________40__ Location(s): _ Box 114 CR 864A

Tested Chlorine Residual: ____>0.75 mg/L Free Location(s): ___same as pressure test

Facility Name: Ashley Oaks Mobile Home Community
ID # 0200415
Investigation Date:03/30/2002
Investigator: Bobby Holder:



PWS/0790332/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 24, 2003

Ms. Dawn Guthrie, President
Big Oaks MUD
12535 Reed Road
Sugar Land, Texas 77478.3142

Re: Compliance Evaluation Investigation at:
Big Oaks MUD, 1464 Shelby Oaks Drive, Fort Bend County, Texas
TCEQ ID No. 0790332

Dear Ms. Guthrie:

On February 12, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

REPLY TO: REGION 12 • 5425 POLK AVE., STE. H • HOUSTON, TEXAS 77023-1486 • 713/767-3500 • FAX 713/767-3520

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tceq.state.tx.us

Texas Cor nission on Environme tal Quality
Investigation Report

SOUTHWEST WATER COMPANY

BIG OAKS MUD

RN102683851

Investigation # 21074

Investigator: HELEN PAGOLA

Incident #

Site Classification

GW >1K-10K CONNECTION

Conducted: 02/12/2003 -- 02/12/2003

No Industry Code Assigned

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Location : 1464 SHELBY OAKS DRIVE

KEY MAP 527E

Additional ID(s) : 0790332

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	SOUTHWEST WATER COMPANY

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	ENVIRONMENTAL SERVICES MANAGER	MR MICHAEL THORNHILL	Work	(281) 340-1607

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE
QA REVIEWER	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	investigation type
QUALITY REVIEW - PWS	qa review

Investigation Comments :

An investigation of Big Oaks MUD , Registration # PO952) was conducted on February 12, 2003. Present at the investigation were Mike Thornhill, Anita Smith and Hector Analis, who can be contacted at (281)240.1700. The water system, which consists of one entry point, provides service to 1035 connections in West Oak Village with a population of 3105 and is operated by ECO RESOURCES. The operation company has 2 or more operators that hold a A groundwater operations license.

The Community water system is comprised of 1 plant located at 1464 Shelby Oaks Drive. The water system consists of groundwater, two wells, one ground storage tank, three service pumps, two pressure tanks and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine. Emergency power is provided for well 1 with a right angle diesel drive and

auxillary power on booster pump 1. The facility maintains a closed interconnect with Fort Bend County MUD 30.

Facility Location and Information:
Entry Point 1- Located at 1464 Shelby Oaks Drive: consists of 1 submersible well (250 gpm) and one vertical turbine (1650 gpm), 1 ground storage tank (0.3 MG), 3 service pumps (3 @ 1200 gpm), 2 pressure tanks (1 @ 0.025 MG & 1 @ 0.01 MG), 2 diesel generators, and distribution. Treatment is gas chlorination; injection is prior to ground storage tank .

During the investigation no violations were noted. Please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

Signed ________________ Date 02.12.03
Environmental Investigator

Signed ________________ Date 2/24/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
- IWUD
- microbiological
- capacities

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	21074	Additional ID(s)	0790332	Investigation Date	02.12.2003

SYSTEM FACILITIES

Number of Connections 1035

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	1464 Shelby Oaks Drive	see GPS form	O	730'	vt	1550	1650 02.12.03
001	B	2	1464 Shelby Oaks Drive	see GPS form	O	480'	subm	170	250 02.12.03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	0.3	Welded steel	well site
pressure tank	0.025	Welded steel	well site
pressure tank	0.01	Welded steel	well site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1200	well site						
2	1200	well site						
3	1200	well site						

Emergency Power /Alternate Source? (Y / N) Yes Describe: Right angle drive @ well 1 & auxillary power @ BP 1

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	1035	Conn =	621	GPM	1900	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	1035	Conn =	0.021	MG	0.035	MG	x	
Ground/Total Storage	200	Gal/Conn X	1035	Conn =	0.207	MG	0.3	MG	x	
Service Pumping Cap.	2	GPM/Conn X	1035	Conn =	2070	GPM	3600	GPM	x	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	**Big Oaks MUD**	**Additional ID(s)**	**0790332**
Investigation #	**21074**	**Investigation Date:**	**02.12.2003**

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 3 # Submitted 3

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Y Date, Last Analysis IOC 05.02.02 NO_2/NO 10.17.95 RC 04.19.00 VOC 05.02.02 SOC 11.01.01

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons): 0673 MG

Date of maximum daily usage: 06.19.2002

Average daily usage: 0.306 MG

Time period for average daily usage: 01.2002 - 12.2002

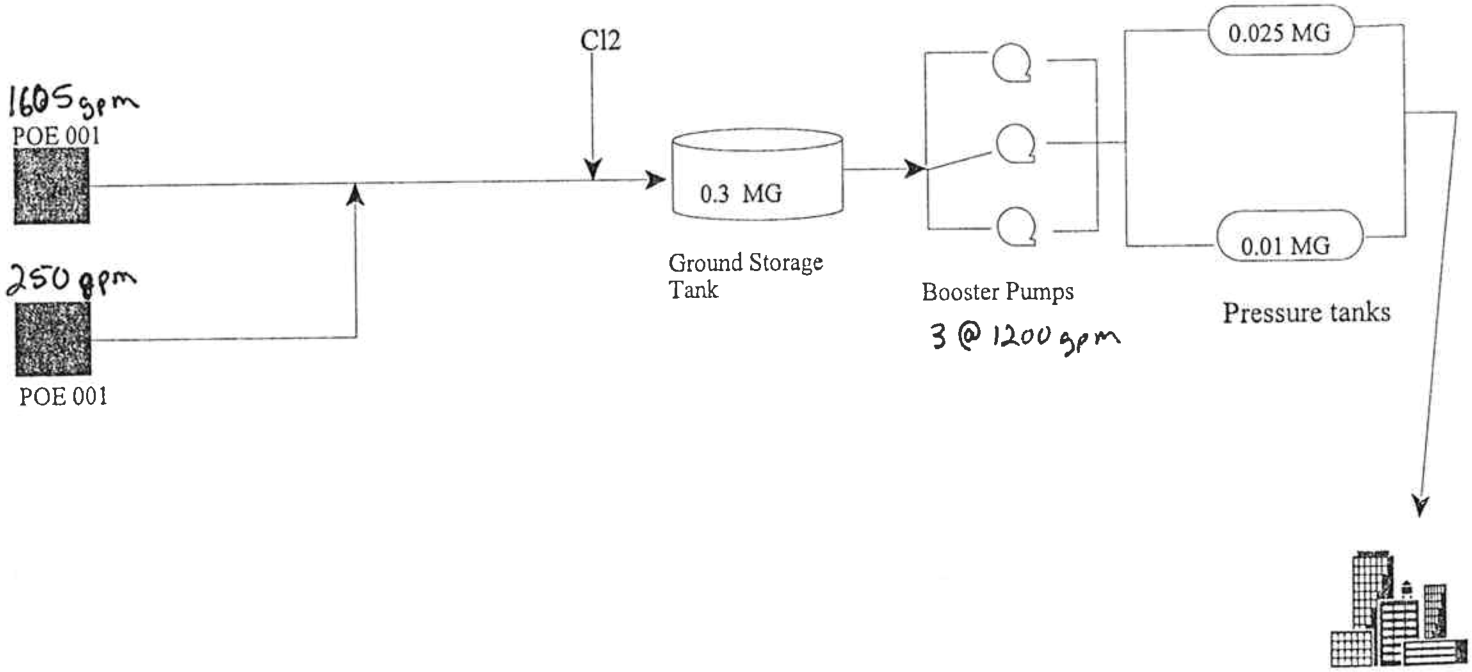
Tested Distribution psi: 64 Location(s): 6715 Oak Branch Manor

Tested Chlorine Residual: 1.03 mg/L Free Location(s): 6715 Oak Branch Manor

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Big Oaks MUD**	**Additional ID(s)**	0790332
Investigation #	21074	**Investigation Date:**	02.12.2003

Description of Supply, Source, Treatment, and Chemicals Used



VNV

0200411

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 22, 2001

Mr. William Cox, Jr, President
Brazoria County MUD #1
PO Box 487
Alief, Texas, 77411-0487

Re: Investigation Type - Compliance Evaluation Investigation at:
Brazoria County MUD #1, CR 89 and CR91, Brazoria County, Texas
TNRCC ID # 0200411

Dear Mr. Cox :

On hDecember 14, 2000, Mr. Bobby Holder of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Bobby Holder in the Houston Region Office at (713)767-3650.

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
Team Leader
Houston Region Office

HDL/bjh

cc: Brazoria County Health Dept.

PWS - SYSTEM FLOW DIAGRAM

Name of System:		ID#:
Survey Date:	Surveyed By:	
Description of Supply, Source, Treatment, and Chemicals Used		

PUBLIC ATER SUPPLY REGULATORY PI GRAM

REGULATED ENTITY DATA KM 613R

ID No. 0200411 GW multi: # n SW multi : # n **Community** X **NTNC** ______ **Non-Comm** ______

CCN No. ______ Superior N Approved N Probation N **Region** #12

Name of System Brazoria County MUD #1 County Brazoria County

Physical location CR 89 and CR 91 (south of FM 518)

Responsible Official William Cox, Jr. Title President Phone 281.579.5688

Mailing Address P.O. Box 487, Alief, Texas 77478 **FAX** *

Chief Cert Op Name Danny Davila Grade & Type B-GW Phone 832.646.1059 Cell

2nd Op Req'd? No Name Marcus Longoria Grade & Type C-GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources Other Officials -

Surveyed With Danny Davilla Area Served subdivision

Supplier and Source Receives treated water under direct pressure from Brazoria County #2,

Interconnection w/other PWS? Yes Name PWS I/C Brazoria MUD #2 Type I/C open

Retail Service Connection 1353 Retail Meters 1353 Retail 4059

Wholesale Master Meters 0 Wholesale Service Connections 0 Wholesale Population 0

Charge Yes Dist. to and Name of Nearest IC, 1 mile

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 01.26..99

Map Attached Y Previous Map OK? Y Well Operational Status -

Description of Supply, Source, Treatment, and Chemicals Used:

Ditribution Only system, receives water from BCO MUD #2

Total Well Cap. 0 GPM 0 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. ______ GPM 0 MGD Total Svc. Pump Cap. 0 GPM 0 MGD

Total Elevated Storage - Total Storage Cap. - Pressure Tank Cap. -

Maximum Daily Usage - Date - Average Daily Usage - Time Period -

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?		-
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 3/mo # Submitted 3/mo

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IO 10.24.91 NO_2/N - RC 02.18.97 VOC 01.11.91 SOC -

List UNACCEPTABLE Values None

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date -

Date of Investigation 12.09.00 By Bobby Holder BH

Date of Approval 1/22/01 By [signature]

Letter Date, if different from Approval Date ______ Reply Requested ______ Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

I.D. No.:	0200411	Survey Date:	12.09.00

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]		-	Distribution Map Up-to-Date?	[46,n,2]	X	
MOR's Properly Completed?	[46,f]		-	Ownership Sign Properly Display & Maintain?	[46,t]	X	
Dead End Mains Flushed?	[46,l]		-	Adequate Chemical Storage Provided?	[42,d,6]		-
New Lines and Repairs Disinfected?	[46,g]	X		ANSI/NSF Approved Chem/Media?	[42,i]		-
Supply of Disinfectant on Hand?	[46,h]	X		Facilities Properly Maintained?	[46,m]		-
85% Planning Report, if needed?	[291.93,3]	X		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]		-
				Drought Contingency Plan	[288]		-

II. STORAGE TANKS

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]		-	Proper Water Level Indicator Provided?	[43,c,4]		-
Tanks Tight Against Leakage?	[43,c,6]		-	Drains Properly Connected?	[43,c,7]		-
Vents Properly Installed?	[43,c,1]		-	Inlet and Outlet Properly Located?	[43,c,5]		-
Openings Properly Screened	[43,c,1]		-	Disinfectant Residual in Water Storage Tanks N	[46,d,2]		-
Proper Roof Hatch Provided?	[43,c,2]		-	Intruder Resistant Fence?	[43,e]		-
Roof Hatch Kept Locked?	[43,c,2]		-	Tanks Properly Maint., Inspected, Documented?	[46,m,1]		-
Proper Overflow Provided?	[43,c,3]		-	Below Ground Storage Properly Located?	[43,b]		-
				Inspection Ladder Provided?	[43,c]		-

III. PRESSURE TANKS"

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]		-	Tanks Tight Against Leakage?	[43,d,7]		-
Pressure Release Device Provided?	[43,d,2]		-	Routinely Maintained, Inspected, Documented?	[46,p,2]		-
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]		-	Fenced or Housed?	[43,e]		-
Air-Water Volume Indicator Provided?	[43,d,3]		-	Approval for > 3 pressure tanks at one location	[43,d,9]		-
				ASME, if Required?	[43,d,1]		-

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement?	[46,i]	X		Properly Installed Distribution Piping?	[44,a]	X	
Customer Service Inspection Program?	[46,j]	X		Adequate Flush/Gate Valves?	[44,d,6]	X	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	X		Air Release Valves Properly Installed?	[44,d,1]	X	
Sewer Lines Properly Located?	[44,e]	X		In-Line Booster Pumps in System? **	[44,d,2]		-
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	X		In-Line Booster Pumps in System Approved?	[44,d,2]		-
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	X		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]		-

Tested : 65 psi @ Glenwallen

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]		-	Adequate Residual Maintained / Recorded?	[46,f&110]	X	
Type Disinfection Used: Gas Chlorination				$CL2 = \underline{0.55}$ mg/l **FREE** Locations: same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]		-	DPD Chlorine Test Kit Provided?	[110,d]	X	
Disinfection Prior to Storage?	[42,e,2,]		-	Evacuation Plan Cl_2NH_3? If needed	[42,j,2]		-
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]		-	IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]		-	Properly Housed/Vented?	[42,e,8 & 42,d,7,H]		-
Disinfection Room Properly Vented?	[42,e,6,8]		-	Scales or Gauges Provided?	[42,e,3,D]		-

I.D. No.:	0200411	Survey Date:	12.09.00

VI. SYSTEM FACILITIES

Number of Connections 1353

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
-			Distribution Only	° ' "/ ° ' "					
				° ' "/ ° ' "					
				° ' "/ ° ' "					
				° ' "/ ° ' "					
				° ' "/ ° ' "					
				° ' "/ ° ' "					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
-			

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
-								

Emergency Power /Alternate Source? -____Describe: NA

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM		-
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG		-
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG		-
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM		-
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		-

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0200411	Survey Date:	12.09.00

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]		-	Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]		-
Livestock prohibited within 50 ft. of well?	[41,c,1,D]		-	Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]		-
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]		-	Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]		-
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]		-	UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]		-
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]		-	Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]		-

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]		-	Suitable sampling tap?	[41,c,3,M]		-
Well cased 18" above ground level?	[41,c,3,B]		-	Well meter provided?	[41,c,3,N]		-
Proper concrete sealing block?	[41,c,3,J]		-	Well blow-off properly installed?	[41,c,3,L]		-
Well head sealed?	[41,c,3,K]		-	Well unit fenced or housed?	[41,c,3,O]		-
Casing vent properly installed?	[41,c,3,K]		-	Well site properly drained?	[41,c,3,I]		-
Air release devices properly installed?	[41,c,3,Q]		-	All weather road provided?	[41,c,3,P]		-
Electrical Wiring installed in conduit?	[46,V]		-				

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

Number of A Violations: ___ Number of B Violations: ___ Number of C Violations: 0

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS 0200327 VNC

PUBLIC WATER SUPPLY REGULATORY PROGRAM

REGULATED ENTITY DATA

KM 613F

ID No. 0200327 GW multi: # n SW multi : # n Community X NTNC ____ Non-Comm ____

CCN No. ____ Superior N Approved N Probation N Region #12

Name of System Brazoria County MUD #4 County Brazoria County

Physical location Hwy 288 at FM 2224

Responsible Official Thomas Goss, Jr. Title President Phone 281.240.1700

Mailing Address P.O. Box 487 Aleif, Texas 77411-0487 FAX *

Chief Cert Op Name Danny Davila Grade & Type B-GW Phone 281.437.6642

2nd Op Req'd? Yes Name Ramon Castillo Grade & Type B-GW Total # Cert. Ops. 3

WS Manager/Superintendent ECO Resources Other Officials ____

Surveyed With Danny Davila and Ramon Castillo Area Served Country Pace Subdivision

Supplier and Source District, ground, 1 well

Interconnection w/other PWS? Yes Name PWS I/C Brazoria County MUD # 5 Type I/C closed

Retail Service Connection 1135 Retail Meters 1135 Retail 3405

Wholesale Master Meters 0 Wholesale Service Connections 0 Wholesale Population 0

Charge Yes Dist. to and Name of Nearest I/C, 0.5 miles

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 02.14.200

Map Attached Y Previous Map OK? Y Well Operational Status Yes, changed to Operational

Description of Supply, Source, Treatment, and Chemicals Used:

Consists of: 2 GW wells, 1 GST, 2PT, 4 SP, and distribution. Gas chlorination , Poly phosphate added prior to ~~distribution~~ storage

Total Well Cap. 1200 GPM 1.728 MGD RAW Cap. ____ GPM 0 MGD

Treatment Cap. ____ GPM 0 MGD Total Svc. Pump Cap. 2750 GPM 3.96 MGD

Total Elevated Storage * Total Storage Cap. 0.5 MG Pressure Tank Cap. 0.03 MG

Maximum Daily Usage 0.423 MG Date 09.10.00 Average Daily Usage 0.291 MG Time Period *

Wholesale Contract * Maximum Purchase Rate *

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?		*
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 3/mo # Submitted 3/mo

Number of Raw Samples Required * # Submitted *

Non-Comm Dates of Operation * Thru *

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IO 07.13.90 NO_2/N 04.19.94 RC 11.19.97 VOC 04.11.95 SOC 06.19.89

List UNACCEPTABLE Values None

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? * Date *

Date of Investigation 11.10.00 By Bobby Holder

Date of Approval 12/12/00 By [signature]

Letter Date, if different from Approval Date ____ Reply Requested ____ Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

RECEIVED ... P2:23

3 to 4 on 10/22/01

am

I.D. No.:	0200327	Survey Date:	11.10.00

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	X		Distribution Map Up-to-Date?	[46,n,2]	X	
MOR's Properly Completed?	[46,f]	X		Ownership Sign Properly Display & Maintain?	[46,t]	X	
Dead End Mains Flushed?	[46,l]	X		Adequate Chemical Storage Provided?	[42,d,6]	X	
New Lines and Repairs Disinfected?	[46,g]	X		ANSI/NSF Approved Chem/Media?	[42,i]	X	
Supply of Disinfectant on Hand?	[46,h]	X		Facilities Properly Maintained?	[46,m]	X	
85% Planning Report, if needed?	[291.93,3]	X		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]		-
				Drought Contingency Plan	[288]	X	

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	X		Proper Water Level Indicator Provided?	[43,c,4]	X	
Tanks Tight Against Leakage?	[43,c,6]	X		Drains Properly Connected?	[43,c,7]	X	
Vents Properly Installed?	[43,c,1]	X		Inlet and Outlet Properly Located?	[43,c,5]	X	
Openings Properly Screened	[43,c,1]	X		Disinfectant Residual in Water Storage Tanks	[46,d,2]	X	
Proper Roof Hatch Provided?	[43,c,2]	X		Intruder Resistant Fence?	[43,e]	X	
Roof Hatch Kept Locked?	[43,c,2]	X		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	X	
Proper Overflow Provided?	[43,c,3]	X		Below Ground Storage Properly Located?	[43,b]		-
				Inspection Ladder Provided?	[43,c]	X	

III. PRESSURE TANKS"

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	X		Tanks Tight Against Leakage?	[43,d,7]	X	
Pressure Release Device Provided?	[43,d,2]	X		Routinely Maintained, Inspected, Documented?	[46,p,2]	X	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	X		Fenced or Housed?	[43,e]	X	
Air-Water Volume Indicator Provided?	[43,d,3]	X		Approval for > 3 pressure tanks at one location	[43,d,9]		*
				ASME, if Required?	[43,d,1]	X	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	X		Properly Installed Distribution Piping?	[44,a]	X	
Customer Service Inspection Program?	[46,j]	X		Adequate Flush/Gate Valves?	[44,d,6]	X	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	X		Air Release Valves Properly Installed?	[44,d,1]	X	
Sewer Lines Properly Located?	[44,e]	X		In-Line Booster Pumps in System? **	[44,d,2]		*
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	X		In-Line Booster Pumps in System Approved?	[44,d,2]		*
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	X		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]		*

Tested : 62 psi @ 3110 N. Peach Hollow Circle

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	X		Adequate Residual Maintained / Recorded?	[46,f&110]	X	
Type Disinfection Used: Gas Chlorination				CL2 = 1.62mg/l **FREE** Locations: same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]			DPD Chlorine Test Kit Provided?	[110,d]	X	
Disinfection Prior to Storage?	[42,e,2,]	X		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]		*
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	X		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	X		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]		*
Disinfection Room Properly Vented?	[42,e,6,8]	X		Scales or Gauges Provided?	[42,e,3,D]		*

I.D. No.:	0200327	Survey Date:	11.10.00

VI. SYSTEM FACILITIES

Number of Connections 1135

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	Hwy 288 at FM 2224	° ‘ “/ ° ‘ “	O	1010	VT	unk	600
001	B	2	""	° ‘ “/ ° ‘ “	O	1010	VT	unk	600
				° ‘ “/ ° ‘ “					
				° ‘ “/ ° ‘ “					
				° ‘ “/ ° ‘ “					
				° ‘ “/ ° ‘ “					
				° ‘ “/ ° ‘ “					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
PT	0.015 MG	Welded Steel	Plant
""	0.015 MG	""	""
GST	0.5 MG	""	"""

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1000	plant						
2	1000	""						
3	600	""						
4	150	""						

Emergency Power /Alternate Source?Yes_____Describe: IC

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	1135	Conn =	681	GPM	1200	GPM	X	
Elevated/Pressure Storage	20	Gal/Conn X	1135	Conn =	0.022	MG	0.03	MG	X	
Ground/Total Storage	200	Gal/Conn X	1135	Conn =	0.227	MG	0.5	MG	X	
Service Pumping Cap.	2	GPM/Conn X	1135	Conn =	2270	GPM	2750	GPM	X	
Service Pump Peaking Factor	423000	MDD/1,440 X	1.85	**	543	GPM	1750	GPM *	X	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0200327	Survey Date:	11.10.00

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	X		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	X	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	X		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	X	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	X		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	X	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	X		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	X	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	X		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	X	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	X		Suitable sampling tap?	[41,c,3,M]	X	
Well cased 18" above ground level?	[41,c,3,B]	X		Well meter provided?	[41,c,3,N]	X	
Proper concrete sealing block?	[41,c,3,J]	X		Well blow-off properly installed?	[41,c,3,L]	X	
Well head sealed?	[41,c,3,K]	X		Well unit fenced or housed?	[41,c,3,O]	X	
Casing vent properly installed?	[41,c,3,K]	X		Well site properly drained?	[41,c,3,I]	X	
Air release devices properly installed?	[41,c,3,Q]	X		All weather road provided?	[41,c,3,P]	X	
Electrical Wiring installed in conduit?	[46,V]	X					

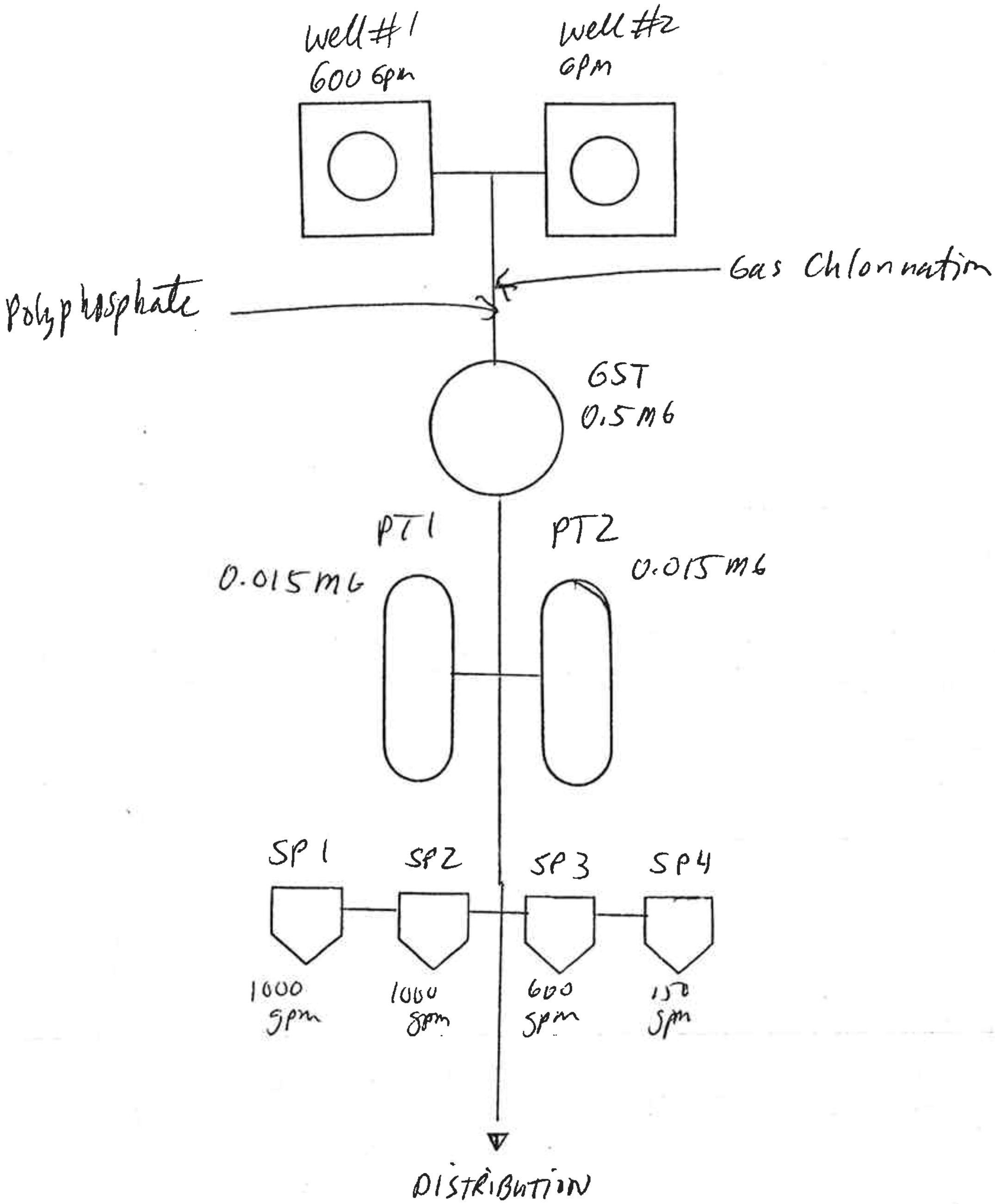
VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

Number of A Violations: ___ Number of B Violations: ___ Number of C Violations: 0

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Brazoria Cty MUD #4
0200327
11/10/00



PWS/0200578/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 3, 2003

Mr. Steven Gilmore, President
Brazoria County MUD 6
12535 Reed Rd
Sugar Land, Texas 77478-2837

Re: Compliance Evaluation Investigation at:
Brazoria County MUD 6, Brazoria County, Texas
TCEQ ID No. 0200578

Dear Mr. Gilmore:

On January 31, 2003, Mr. Bobby Holder of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Bobby Holder in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/bjh

cc: Brazoria Co. Health Dept.

Reply To: Region 12 • 5425 Polk Ave., Ste. H • Houston, Texas 77023-1486 • 713/767-3500 • Fax 713/767-3520

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tceq.state.tx.us

Texas Commission on Environmental Quality

Investigation Report

BRAZORIA COUNTY MUD 6

BRAZORIA COUNTY MUD 6

RN102684750

Investigation # 26559

Investigator: BOBBY HOLDER

Conducted: 01/31/2003 -- 01/31/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Additional ID(s) : 0200578

Incident #

Site Classification

P 251-1K CONNECTION

No Industry Code Assigned

Location : KEY MAP 660X
SILVERLAKE SUBDIVISION IN PEARLAND

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	BRAZORIA COUNTY MUD 6

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	PRESIDENT	MR STEVEN GILMORE	Work	(281) 240-1700
Participated in Investigation	AREA MANAGER	DANNY DAVILA	Work	(281) 240-1700

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	Activity type

Investigation Comments :

An investigation of Brazoria County MUD #6 , RN102684750, was conducted on January 31, 2003. It operated by ECO Resources Inc. Mr. Steven Gilmore is the board President. Present at the investigation was Danny Davila, B-Water Operator, who can be contacted at 281.240.1700 The water system is a distribution only system, receives treated water under direct pressure from Brazoria County MUD #2, provides service to 747 connections in the subdivision.

Brazoria County MUD #3 is located at Key map 600X, and serves the Silver Lake Subdivision in Pearland.

Facility Location and Capacity list:
Treated water under direct pressure from Brazoria County MUD #2

During the investigation no violations were noted

No Violations Associated to this Investigation

Signed ____________________ Date 2/28/03
Environmental Investigator

Signed ____________________ Date 2/28/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR
✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
IWUD DATASHEET
CAPACITIES DATA
MICRO-CHEM DATA

PWS - SYSTEM CAPACITY

Investigation #	26559	Additional ID(s)	0200578	Investigation Date	01.31.03

SYSTEM FACILITIES **Number of Connections** 747

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
			Dist. Only from BC MUD #2						

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? ________ Describe: ____________________
(Y / N)

SYSTEM CAPACITIES					**Required**		**Provided**		*Y*	*N*
Well Production	-	*GPM/Conn X*	-	*Conn =*	-	*GPM*	-	*GPM*		
Elevated/Pressure Storage	-	*Gal/Conn X*	-	*Conn =*	-	*MG*	-	*MG*		
Ground/Total Storage	-	*Gal/Conn X*	-	*Conn =*	-	*MG*	-	*MG*		
Service Pumping Cap.	-	*GPM/Conn X*	-	*Conn =*	-	*GPM*	-	*GPM*		
Service Pump Peaking Factor	-	*MDD/1,440 X*	-	**	-	*GPM*	-	*GPM **		

*** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.* ** CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))*

PWS -Microbiological and Chemical Monitoring

Name of System:	Brazoria County MUD 6	Additional ID(s)	0200578
Investigation #		Investigation Date:	01.31.03

MICROBIOLOGICAL	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on	X	

Number of Samples Required 2 # Submitted 2

Number of Raw Samples Required ____ # Submitted ____

Non-Comm Dates of Operation ________ Thru ________

CHEMICAL

Acceptable Yes Date, Last Analysis IOC - NO₂/N - RC - VOC - SOC ________

List UNACCEPTABLE Values See BC MUD #2

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Brazoria County MUD 6	Additional ID(s)	0200578
Investigation #	26556	Investigation Date:	01/31/2003
Description of Supply, Source, Treatment, and Chemicals Used			

Tested Distribution psi: _________70_______ Location(s): _2606 Salado Drive_

Tested Chlorine Residual: ____>2.20mg/L Free Location(s): ___same as pressure test

PWS | 0200497 | CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 28, 2003

Mr. Carl Morrison, President
Brazosport Water Authority
P.O. Box 816
Lake Jackson, Texas 77566-0816

Re: Compliance Evaluation Investigation at:
Brazosport Water Authority, 1251 FM 2004, Brazoria County, Texas
TNRCC ID # 0200497

Dear Mr. Morrison:

On August 11, 2003, Mr. Huyen D. Luu, P.E. and Ms. Lan Vu of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Huyen D. Luu in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hdl

cc: Brazoria Co. Health Dept.

Texas Commission on Environmental Quality

Investigation Report

BRAZOSPORT WATER AUTHORITY

BRAZOSPORT WATER AUTHORITY

RN101192524

Investigation # 152248

Investigator: LAN VU

Incident #

Site Classification

SURFACE WATER
SW >10K CONNECTION

Conducted: 08/11/2003 -- 08/11/2003

No Industry Code Assigned

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Location : KEY MAP 883N

Additional ID(s) : 0200497

Address: 1251 FM 2004; LAKE JACKSON, TX 77566

Activity Type : PWS CCI SW - Comprehensive compliance investigation of surface water treatment plant

Principal(s) :

Role	Name
RESPONDENT	BRAZOSPORT WATER AUTHORITY

Contact(s) :

Role	Title	Name	Phone	
Participated in Investigation	CHIEF OPERATOR	MR JAMES RINGGOLD	Work	(979) 297-2715
Regulated Entity Mail Contact	PRESIDENT	CARL MORRISON		

Other Staff Member(s) :

Role	Name
ASSOCIATE INVESTIGATOR	HUYEN LUU
SUPERVISOR	BARRY PRICE
QA REVIEWER	HUYEN LUU

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	CCI INVESTIGATION
PWS GENERIC VIOLATIONS	GENERIC VIOLATIONS

Investigation Comments :

System name: Brazosport Water Authority
ID#: 0200497 Type: Community, Surface Water Wholesale
Wholesale cons: 26,208 Wholesale population: 75,717
Customers: City of Angleton, Clute, Lake Jackson, Brazoria, Richwood, Freeport, Oyster Creek and 2 TCDJ Units: Clement & Wayne Scott.
Total # cert. Opers.: 13 Grade/Type: 2 A-Surface, 5 B-Surface, 5 C-Surface, 1 D-Water
Investigation date: 08/11/2003
Investigator: Huyen D. Luu & Lan Vu

Responsible official: Carl Morrison, President Phone number: 979-297-2715
Landon Roberts, General Manger

SEP 4 2003

Responsible official: Carl Morrison, President
Landon Roberts, General Manger
Phone number: 979-297-2715
System representatives: James W. Ringgold, Chief Operator
Exit interview: Conducted at the conclusion of the investigation with James Ringgold.
During the investigation no violation was noted.

Demands/Usage:

Max daily usage: 9.589 MG
Date: 10/2002
Avg. daily usage: 7.395 MG
Time period: 08/02 thru: 07/03
Wholesale contract: Contract for 7.805 MGD

Chlorine residual & pressure in distribution:

Chlorine: 3.1 mg/L Total
Location: Maintenance shop
Pressure: 73 psi
Location: Maintenance shop

Microbiological:

Number of samples required: 1/m
Number of samples submitted: 8/m
Acceptable sample monitoring plan on file: Yes

Chemical monitoring

Date of last chemical analysis:
IOC: 01/16/02, NO2/NO3: 1/21/03, RC: 1/21/03, VOC: 1/21/03, SOC: 1/21/03

Unacceptable values: pH=6.4 (1/21/03) , follow up by PDW, pH tested at time of investigation is 7.16.

Surface water plant operating criteria & information

Entry point number: 001
Plant location: 1251 FM 2004, Lake Jackson, Brazoria County

Chemical use:

- Coagulant: Alum
- Flocculation aid: Cationic polymer
- Filter aid: Anionic polymer
- Sequestration: Polyphosphate
- Fluoridation: Hydrofluorosilisic Acid
- pH Adjustment: Caustic

Sedimentation:

- Type of clarification: Solid contact
- Settled water turbidity (< 5 NTU ?): 0.39 NTU

Filtration:

- Type of filtration: Gravity
- Filter media: Sand & Anthracite Type: Dual Depth: 12" sand, 24" anthracite
- Proper back wash and design flow rate ?
  - Back wash flow rate: 22.4 pgpm/sqft
  - Back wash criteria: Turbidity > 0.2 NTU or 6-10 ft loss of head
  - Back wash spent water discharge to: waste basin

Back wash spent water discharge to: waste basin
Re-circulation of decant water to: splitter box before clarifiers
Percentage: 100%
Air scour use ? Yes, 3.5 cfm

Disinfection:

- Type of disinfection: Chlorine dioxide, amonia & gas chlorine

Operating control test:

Parameter	Filtered turbidity NTU	Chlorine mg/l	pH	Alkalinity mg/l	Fluoride mg/l
Daily log entries	0.08	3.3	7.13	118	0.73
Actual test results	0.074	3.2	7.16	119	0.707

Treatment plant evaluation:

Raw water pump capacity:
Number and size: 3 @ 3472 gpm /ea and 1 @ 2600 gpm
Total capacity: 13016 gpm or 18.743 MG
Capacity w/o lagest

NOV Date	Method
08/29/2003	WRITTEN

WITHDRAWN VIOLATIONS

Track No: 117692 **Compliance Due Date: 3/1/04**

30 TAC Chapter 290.42(d)(2)

Alleged Violation:
Investigation: 152248 Comment Date: 08/25/2003

Surface Water Treatment
Failure to prevent, in a filtration plant, the existence of a potential cross connection or interconnection between a conduit carrying filtered or post-chlorinated water and another conduit carrying raw water or water in any prior stage of treatment.

Description: There is no backflow or back siphonage prevention device present between the post-chlorinated water and the backwashed water. Post-chlorinated water, used to backwash the filters, is carried by a pipe that is lower in elevation than the elevation of the water in the filters when they are full. In case the filters are full, the higher elevated water in the filters could push contaminated water back through this lower pipe, through the pumps, and into the clearwells. Backflow prevent device is required.

Recommended Corrective Action: Submit photo or documentation to verify compliance.

Resolution:

Signed ____________________
Environmental Investigator

Date Aug 28, 2003

Signed ____________________
Supervisor

Date 8/28/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)

✓ Letter to Facility (specify type) : COM

Investigation Report

___Sample Analysis Results

___Manifests

___NOR

✓ Maps, Plans, Sketches

___Photographs

___Correspondence from the facility

✓ Other (specify) :

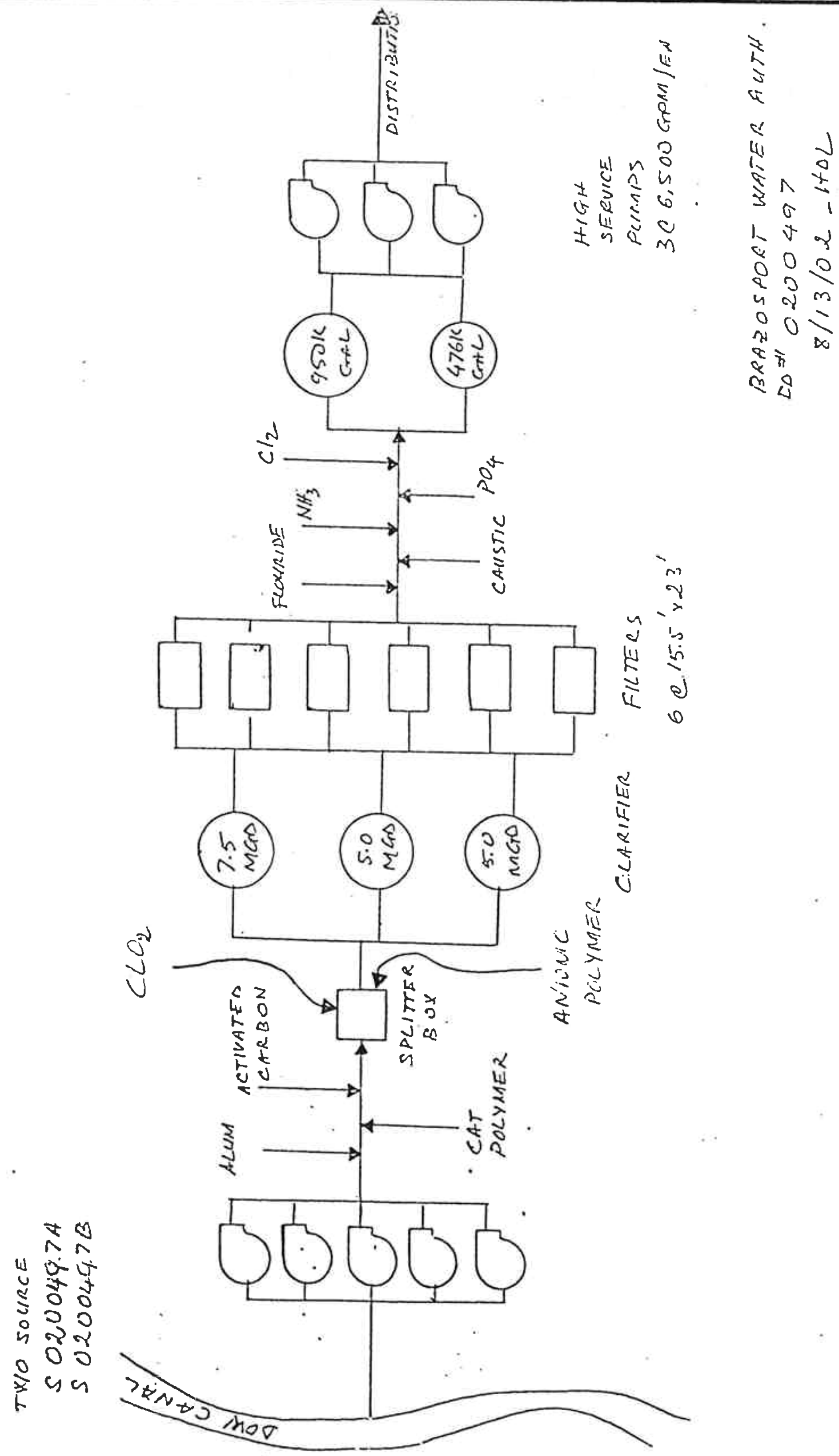
TCEQ CORE DATA SHEET

PWS. WATER SYSTEM DATA SHEET

/S- SYSTEM FLOW DIAGR/

Name of System:	Brazosport Water Authority	Additional ID(s)	0200497
Investigation #	152248	Investigation Date:	08/11/2003

Description of Supply, Source, Treatment, and Chemicals Used



√NU

PWS/0200004/ICO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

September 28, 2001

The Honorable Jerry Adkins, Mayor
City of Clute
P.O. Box 997
Clute, Texas 77531-0997

Re: Compliance Evaluation Investigation at:
City of Clute, 104 East Main Street, City of Clute, Brazoria County, Texas
TNRCC ID #0200004

Dear Mayor Adkins:

On September 13, 2001, Mr. Barry H. Price Jr. of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. During the investigation, the investigator verbally notified you of some apparent instances of noncompliance. You have provided us with information which appears to indicate that these problems have been corrected. No further response from you is necessary concerning this investigation. At this time, your public water supply continues to merit recognition as a "Superior" system.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Barry H. Price Jr. in the Houston Region Office at (713)767-3650

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
PWS Team Leader
Houston Region Office

HDL/bhp

cc: Brazoria Co. Health Dept.

SUMMARY OF INVESTIGATION FINDINGS

Regulated Entity Name: Clute, City of	TNRCC ID: 0200004	Investigation Date: 9/13/01

ALLEGED NONCOMPLIANCES NOTED AND RESOLVED

No.	Requirement Cited	Description of Alleged Noncompliance, Corrective Action Taken, and Compliance Documentation
1	30 TEX. ADMIN. CODE, §290.41(c)(3)(J)	Ground Water Sources and Development Failure to repair the cracked concrete sealing block surrounding well numbers #2 & #3 using a flexible, nontoxic, waterproof compound. Written documentation provided on 9/17/01 of the repairs having been completed.

PUBLIC [W]ATER SUPPLY REGULATORY P[RO]GRAM

REGULATED ENTITY DATA

KM 884Y

ID No. 0200004 GW multi: # Yes SW multi : # N Community X NTNC ____ Non-Comm ____

CCN No. - Superior X Approved ____ Probation ____ Region 12

Name of System Clute, City of County Brazoria

Physical location 104 E. Main St. - City Hall

Responsible Official Jerry Adkins Title Mayor Phone 979-265-2541

Mailing Address P.O. Box 997, Clute, Texas 77531-0997 **FAX** 979-265-3683

Chief Cert Op Name Robert R. Ray Grade & Type C-GW Phone 979-265-7939

2nd Op Req'd? Yes Name Jaime Deleon Grade & Type C Total # Cert. Ops. 4

WS Manager/Superintendent Barry A. Wright Other Officials None

Surveyed With Barry A. Wright Area Served City of Clute

Supplier and Source Surface water from BWA - ground water City - 4 wells

Interconnection w/other PWS? Yes Name PWS I/C BWA,City of Richwood, City of Lake Jackson Type I/C BWA-Open; Cities

Retail Service Connection 4518 Retail Meters 2501 Retail Population 10,000 by census

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge Yes Dist. to and Name of Nearest **2 Miles to Lake Jackson**

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 6/8/00

Map Attached No Previous Map OK? Yes Well Operational Status No Change

Description of Supply, Source, Treatment, and Chemicals Used:

System puchases 1 MG of treated surface water a day from BWA through a transmission line into the GST at Lazy Ln. The system consists of 4 wells, 3 service pumps, 1 GST, 1 EST, auxiliary power, and distribution. System typically uses 80% BWA water and 20% well water, but will switch to 100% well water when taste and odor become a problem. Treatment: Gas chlorination prior to storage.

Total Well Cap. 1445 GPM 2.0808 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 4000 GPM 5.76 MGD

Total Elevated Storage 0.75 MG Total Storage 1.75 MG Pressure Tank Cap. 0.0 MG

Maximum Daily Usage 1.75 MG Date 5/3/2001 Average Daily Usage 1.193 MGD Time 8/00 - 8/01

Wholesale Contract Purchase surface water from BWA Maximum Purchase Rate 1 MGD minimum @ $1.55 / 1000 gal.

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	-
Well(s) Surface Water Influenced?	-	-
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 10/Mo # Submitted 10/Mo.

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 3/1/99 NO_2/N - RC 3/1/99 VOC 3/1/99 SOC -

List UNACCEPTABLE Values None

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ____

Date of Investigation 9/13/01 By Barry H. Price Jr. [signature]

Date of Approval 9/28/01 By [signature]

Letter Date, if different from Approval Date ____ Reply Requested ____ Def Score 0

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

NOV 29 REC'D

I.D. No.:	0200004	Survey Date:	9/13/01

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	X		Distribution Map Up-to-Date?	[46,n,2]	X	
MOR's Properly Completed?	[46,f]	X		Ownership Sign Properly Display & Maintain?	[46,t]	X	
Dead End Mains Flushed?	[46,l]	X		Adequate Chemical Storage Provided?	[42,d,6]	X	
New Lines and Repairs Disinfected?	[46,g]	X		ANSI/NSF Approved Chem/Media?	[42,i]	X	
Supply of Disinfectant on Hand?	[46,h]	X		Facilities Properly Maintained?	[46,m]	X	
85% Planning Report, if needed?	[291.93,3]	X		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	X	
				Drought Contingency Plan	[288]	X	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	X		Proper Water Level Indicator Provided?	[43,c,4]	X	
Tanks Tight Against Leakage?	[43,c,6]	X		Drains Properly Connected?	[43,c,7]	X	
Vents Properly Installed?	[43,c,1]	X		Inlet and Outlet Properly Located?	[43,c,5]	X	
Openings Properly Screened	[43,c,1]	X		Disinfectant Residual in Water Storage Tanks	[46,d,2]	X	
Proper Roof Hatch Provided?	[43,c,2]	X		Intruder Resistant Fence?	[43,e]	X	
Roof Hatch Kept Locked?	[43,c,2]	X		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	X	
Proper Overflow Provided?	[43,c,3]	X		Below Ground Storage Properly Located?	[43,b]	-	-
				Inspection Ladder Provided?	[43,c]	X	

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	-	-	Tanks Tight Against Leakage?	[43,d,7]	-	-
Pressure Release Device Provided?	[43,d,2]	-	-	Routinely Maintained, Inspected, Documented?	[46,p,2]	-	-
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-	-	Fenced or Housed?	[43,e]	-	-
Air-Water Volume Indicator Provided?	[43,d,3]	-	-	Approval for > 3 pressure tanks at one location	[43,d,9]	-	-
				ASME, if Required?	[43,d,1]	-	-

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	X		Properly Installed Distribution Piping?	[44,a]	X	
Customer Service Inspection Program?	[46,j]	X		Adequate Flush/Gate Valves?	[44,d,6]	X	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	X		Air Release Valves Properly Installed?	[44,d,1]	-	-
Sewer Lines Properly Located?	[44,e]	X		In-Line Booster Pumps in System? **	[44,d,2]	-	-
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	X		In-Line Booster Pumps in System Approved?	[44,d,2]	-	-
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	X		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	-

Tested 43 psi Locations: 1409 Mockingbird

**Location:

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	X		Adequate Residual Maintained / Recorded?	[46,f&110]	X	
Type Disinfection Used: **Gas Chlorination**				CL2 = 0.98 Mg/L/T Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	X		DPD Chlorine Test Kit Provided?	[110,d]	X	
Disinfection Prior to Storage?	[42,e,2,]	X		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	-
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	X		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	X		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	-
Disinfection Room Properly Vented?	[42,e,6,8]	X		Scales or Gauges Provided?	[42,e,3,D]	-	-

I.D. No.:	0200004	Survey Date:	9/13/01

VI. SYSTEM FACILITIES

Number of Connections ____

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
002	B	2	Yaupon & Pecan		D	180'	subm.	-	330/9-13-01
003	C	3	Lazy Ln. & Brazoswood	Plant 1145	D	252'	subm.	-	450/9-13-01
003	D	4	Woodruff & Lakeview		D	242'	subm.	-	285/9-13-01
004	F	6	426 Commerce (Cobb Field)		D	242'	subm.	-	380/9-13-01
999	A	1	Parkwood / Barb		P	-	-	-	-

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	1.0 MG	Welded Steel	Lazy Ln. @ W. Marion
EST	0.75 MG	Welded Steel	426 Commerce

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1000	Lazy Ln.						
2	2000	Lazy Ln.						
3	1000	Lazy Ln.						

Emergency Power /Alternate Source? Yes Describe: # 3 Service pump diesel engine & a diesel generator at Lazy Ln. plant.
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	4518	Conn =	2710	GPM	1445*	GPM	X	
Elevated/Pressure Storage	100	Gal/Conn X	4518	Conn =	0.452	MG	0.750	MG	X	
Ground/Total Storage	200	Gal/Conn X	4518	Conn =	0.9	MG	1.0	MG	X	
Service Pumping Cap.	2	GPM/Conn X	4518	Conn =	9036	GPM	4000	GPM	X	
Service Pump Peaking Factor	1750000	MDD/1,440 X	1.25	**	1519	GPM	2000	GPM *	X	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0200004	Survey Date:	9/13/01

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	X		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	X	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	X		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	X	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	X		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	X	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	X		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	X	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	X		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	X	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	X		Suitable sampling tap?	[41,c,3,M]	X	
Well cased 18" above ground level?	[41,c,3,B]	X		Well meter provided?	[41,c,3,N]	X	
Proper concrete sealing block? **See Note #2**	[41,c,3,J]	R		Well blow-off properly installed?	[41,c,3,L]	-	-
Well head sealed?	[41,c,3,K]	X		Well unit fenced or housed?	[41,c,3,O]	X	
Casing vent properly installed?	[41,c,3,K]	X		Well site properly drained?	[41,c,3,I]	X	
Air release devices properly installed?	[41,c,3,Q]	X		All weather road provided?	[41,c,3,P]	X	
Electrical Wiring installed in conduit?	[46,V]	X					

VIII. ADDITIONAL COMMENTS:

Note #1: BWA contract call for the city to purchase a minimum of 1 MGD - the difference between the 2710 GPM capacity required by the system and 1445 GPM provided by the well capacity is made up by the BWA surface water contract.

Note #2: The slabs at the Lake Barbara & High School wells were cracked at the time of the inspection. The slabs have been repaired as of September 17, 2001 as per letter from City Public Works Department.

IX. RATING DEFICIENCY SCORE

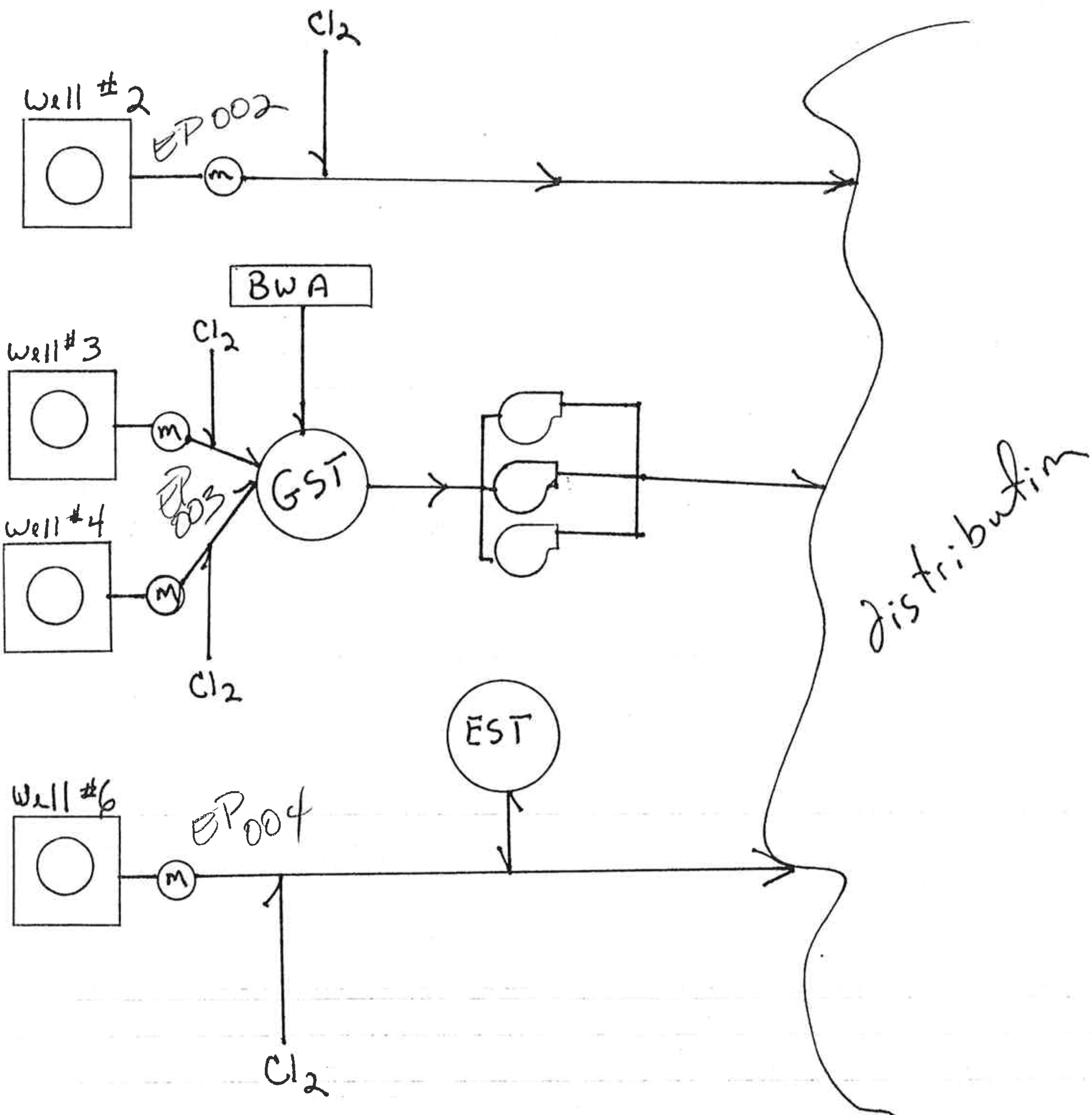
Number of A Violations: 0 **Number of B Violations:** 0 **Number of C Violations:** 0

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Clute, City of	ID#:	0200004
Survey Date:	9/13/01	Surveyed By:	Barry H. Price Jr.

Description of Supply, Source, Treatment, and Chemicals Used



PWS/0790230/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 17, 2003

CERTIFIED MAIL#7002 2030 0003 4748 5937
RETURN RECEIPT REQUESTED

Mr. Alan K. Sandersen, President
First Colony MUD #9
12535 Reed Road
Sugar Land, Texas 77478- 2837

Re: Compliance Evaluation Investigation at:
First Colony MUD #9, 2721 Lester St., Sugar Land, Fort Bend County, Texas
TCEQ ID No. 0790230

Dear Mr. Sandersen:

On February 14, 2003, Ms. Elaine Jackson of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office, conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. Enclosed is a summary which lists the investigation finding. During the investigation, some concerns were noted which were alleged noncompliances that have been resolved through verbal notification and subsequent corrective action. In addition, certain outstanding alleged violations were identified for which compliance documentation is required. Please submit to this office by September 12, 2003 a written description of corrective action taken and the required documentation demonstrating that compliance has been achieved for each of the outstanding alleged violation.

The Texas Commission on Environmental Quality appreciates your assistance in this matter. Please note that the Legislature has granted TCEQ enforcement powers which we may exercise to ensure compliance with environmental regulatory requirements. We anticipate that you will resolve the alleged violations as required in order to protect the State's environment. If you have additional information that we are unaware of, you have the opportunity to contest the violation documented in this notice. Should you choose to do so, you must notify the Houston Region Office within 10 days from the date of this letter. At that time, Mr. Barry H. Price, Jr., PWS Team Leader, will schedule a violation review meeting to be conducted within 21 days from the date of this letter. However, please be advised that if you decide to participate in the violation review process, the TCEQ may still require you to adhere to the compliance schedule included in the attached Summary of Investigation Findings until an official decision is made regarding the status of any or all of the contested violations.

REPLY TO: REGION 12 • 5425 POLK AVE., STE. H • HOUSTON, TEXAS 77023-1486 • 713/767-3500 • FAX 713/767-3520

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tceq.state.tx.us

Mr. Alan K. Sandersen, President
Page 2
March 17, 2003

If you or members of your staff have any questions, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at 713/767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Su...mary of Investigation Findi...

FIRST COLONY MUD 9
2721 LESTER
MISSOURI, FORT BEND COUNTY, TX 77459

Additional ID(s): 0790230

Investigation # 26436
Date: 02/14/2003

OUTSTANDING ALLEGED VIOLATIONS

Track No: 20155 **Compliance Due Date:** 9/12/03

30 TAC Chapter 290.45(b)(1)(D)(iv)

Alleged Violation:

Investigation: 26436 Comment Date: 03/11/2003

30 Tex. Admin. Code §290.45 Capacity Requirements

Failure to meet this Agency's "Minimum Water System Capacity Requirements." These requirements include:

a pressure tank capacity of 20 gallons per connection (with a maximum of 30,000 gallons. §290.45(b)(1)(D)(iv). This connection, your system has 40,000 gal of pressure tank capacity and needs 47,200 gal of capacity.

At the time of the inspection, your facility had 2360 connections x 20 gal/min/conn =47,200 gallons of pressure tank capacity. Your system is currently 7,200 gallons short of pressure tank capacity.

Your water system must be modified to meet this requirement to assure an adequate supply of water at all times.

Please be advised that public water systems shall notify the executive director prior to making any significant change or addition to the system's production, treatment, storage, or distribution facilities. Public water systems shall submit plans and specifications for the proposed changes upon request.

The water system may request an exception to these requirements by writing to TNRCC, Water Supply Division, Public Drinking Water Section, Surveillance and Technical Assistance, MC 155, P.O. Box 13087, Austin, TX 78711-3087; phone: (512) 239-6020.

Recommended Corrective Action: Submit a compliance plan, engineering report or certification OR a copy of a letter requesting an exception in addition to a compliance plan for final compliance, OR a copy of a letter granting an exception to verify compliance.

Resolution:

Texas Con ission on Environme al Quality

Investigation Report

FIRST COLONY MUD 9

FIRST COLONY MUD 9

RN102670908

Investigation # 26436

Investigator: ELAINE JACKSON

Incident #

Site Classification

GW >1K-10K CONNECTION

Conducted: 02/14/2003 -- 02/14/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

No Industry Code Assigned

Investigation Type : Compliance Investigation

Location : KEY MAP 609F

Additional ID(s) : 0790230

Address: 2721 LESTER;
MISSOURI, TX 77459

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	FIRST COLONY MUD 9

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	AREA MANAGER	DANNY DAVILA	Cell	(713) 907-6127

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	INVESTIGATION
PWS GENERIC VIOLATIONS	GENERIC

Investigation Comments :

An investigation of First Colony MUD #9 was conducted on February 14, 2003. Present at the investigation were Mr. Danny Davila, Operator, who can be contacted at (281) 240 1700. The water system, which consists of one entry point, provides service to 2360 connections in the Lake Colony, Lexington Colony and Plantation Creek Subdivisions with a population of 7080 and is operated by or managed by ECO RESOURCES, INC. The operation company 3 or more operators that hold an B AND C groundwater water operations license.

The Community water system is comprised of 2 plants located at (2727 Lester Street which the pressure tank and ground storage tank is located and the well is located 2721 Lester Street. The water system consists of groundwater, one well, two ground storage tanks, four service pumps, two pressure tanks and distribution. The ground water source is treated prior to the ground storage tank by using polyphosphate, gas chlorine, and fluoride. Emergency power is provided for the entire plant by a diesel generator. The facility has a closed interconnected with The City of Sugar Land. Capacity is 0.35 x 8494+ 2360= 3798 gpm, provided is 18,480.

Facility Location and Information:
Entry Point 1- Located at 2721 Lester Street and 2727 Lester Street: consists of 1 submersible well (2100 gpm), 2 ground storage tanks @ 0.450 MG, 1 service pumps @ 750 gpm and 3 @ 2000, 2 pressure tanks @ 0.02 MG, diesel generator, and distribution. Treatment is polyphosphate, gas chlorination and fluoride; injection is prior to ground storage tank.

NOV Date	Method
03/14/2003	WRITTEN

OUTSTANDING ALLEGED VIOLATIONS

Track No: 20155 **Compliance Due Date: 9/12/03**

30 TAC Chapter 290.45(b)(1)(D)(iv)

Alleged Violation:
Investigation: 26436 Comment Date: 03/11/2003

30 Tex. Admin. Code §290.45 Capacity Requirements

Failure to meet this Agency's "Minimum Water System Capacity Requirements." These requirements include:

a pressure tank capacity of 20 gallons per connection (with a maximum of 30,000 . gallons. §290.45(b)(1)(D)(iv). This connection, your system has 40,000 gal of pressure tank capacity and needs 47,200 gal of capacity.

At the time of the inspection, your facility had 2360 connections x 20 gal/min/conn =47,200 gallons of pressure tank capacity. Your system is currently 7,200 gallons short of pressure tank capacity.

Your water system must be modified to meet this requirement to assure an adequate supply of water at all times.

Please be advised that public water systems shall notify the executive director prior to making any significant change or addition to the system's production, treatment, storage, or distribution facilities. Public water systems shall submit plans and specifications for the proposed changes upon request.

The water system may request an exception to these requirements by writing to TNRCC, Water Supply Division, Public Drinking Water Section, Surveillance and Technical Assistance, MC 155, P.O. Box 13087, Austin, TX 78711-3087; phone:

Recommended Corrective Action: Submit a compliance plan, engineering report or certification OR a copy of a letter requesting an exception in addition to a compliance plan for final compliance, OR a copy of a letter granting an exception to verify compliance.

Resolution:

Signed Elaine Jackson **Date** 3/11/03
Environmental Investigator

Signed Barry Ari... **Date** 3/20/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : NOV
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) : PWS-system facilities & capacities, micro & chemical monitoring, data for

Investigation #	26436	Additional ID(s)	0790230	Investigation Date	2/14/2003

SYSTEM FACILITIES

Number of Connections 2360

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	2721 Lester Street	See Attached Copy	O	1205'	VT	2100	2100 2/14/03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
Ground Storage Tank	0.450 MG	Welded Steel	2727 Lester St.
Ground Storage Tank	0.450 MG	Welded Steel	2727 Lester St.
Pressure Tank	0.02 MG	Welded Steel	2727 Lester St.
Pressure Tank	0.02 MG	Welded Steel	2727 Lester St.

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	750	2727 Lester St.						
2	2000	2727 Lester St.						
3	2000	2727 Lester St.						
4	2000	2727 Lester St.						

Emergency Power /Alternate Source? Yes Describe: Diesel General @ Plant, right angle drive well
(Y) City of Sugar Land 0.35x 8494 + 2360= 3798gpm provide is 18,480 gpm

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	2360	Conn =	1416	GPM	2100	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	2360	Conn =	0.0472	MG	0.04	MG		x
Ground/Total Storage	200	Gal/Conn X	2360	Conn =	0.472	MG	0.90	MG	x	
Service Pumping Cap.	2	GPM/Conn X	2360	Conn =	4720	GPM	6750	GPM	x	
Service Pump Peaking Factor	-	MDD/1,440 X	-	**	-	GPM	-	GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	**Fort Bend MUD #9**	**Additional ID(s)**	**0790230**
Investigation #	**26436**	**Investigation Date:**	**2/14/2003**

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if	-	
Well(s) Surface Water	-	
Acceptable Sample Siting	x	

Number of Samples Required 6 # Submitted 9/mo.
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 11/13/02 NO_2/NO 6/12/95 RC 11/13/02 VOC 11/13/02 SOC -
List UNACCEPTABLE Values -
HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ______

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons):
1.762 mg

Date of maximum daily usage:
5/13/2002
Average daily usage:
0.883 mg
Time period for average daily usage:
1/2002- 12/2002
Tested Distribution psi: 60 psi Location: **4519 Forest Green**

Tested Chlorine Residual: 1.54 mg/l Free Location: **4519 Forest Green**

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Name of System First Colony Mud #9

Page_____ of ________________

FLUORIDATION

1. Type of fluoride compound used? Flurosili Acid - undiluted Acid 23%
(if fluosilicic acid is used, diluted or undiluted)

2. Type of feeder used? Positive displacement

3. Number of injection points? 1

4. Location of injection point(s) within the treatment process? [illegible] before Chlorination.

5. Are scales provided (except for saturator installation)?........... yes

6. Is adequate chemical storage provided? .... yes

7. Is an acceptable test kit provided? .... yes

8. Are daily residuals recorded on monthly report? .... yes

9. Are fluoridation facilities well maintained? .... yes

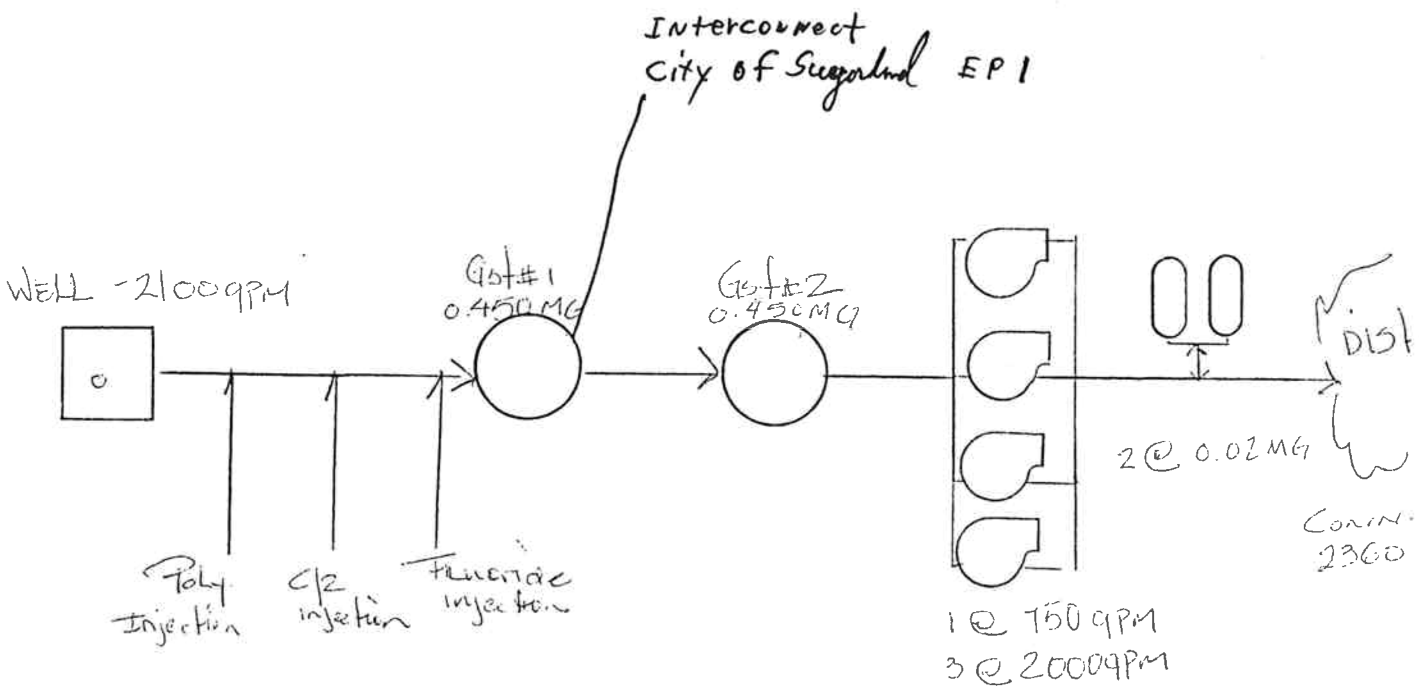
10. Is adequate protection against siphonage provided and operational?. yes

11. Is adequate safety equipment provided to minimize operator contact with chemicals? .... yes

Comments ________________________________

PWS - SYSTEM FLOW DIAGRAM

Name of System: Fort Bend MUD #9		Additional ID(s)	0790230
Investigation #26436	Investigation Date:	2/14/03	
Description of Supply, Source, Treatment, and Chemicals Used			



PWS/0790354/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 21, 2003

Mr. Mike Thornhill, Environmental Services Manager
Fort Bend County MUD 1
12535 Reed Road
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD 1, 6303 Sandy Ridge Drive, Fort Bend County, Texas
TCEQ ID No. 0790354

Dear Mr. Thornhill:

On January 10, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

Texas Cor nission on Environme tal Quality
Investigation Report
ECO RESOURCES INC

FORT BEND COUNTY MUD 1
RN102985249

Investigation # 21358
Investigator: HELEN PAGOLA

Conducted: 01/10/2003 -- 01/10/2003
Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Incident #

Site Classification
GW 251-1K CONNECTION

No Industry Code Assigned

Location : HIGHWAY 59 @ GRAND PARKWAY

KEY MAP 607e

Additional ID(s) : 0790354

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	ECO RESOURCES INC

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	ENVIRONMENTAL MANAGER	MIKE THORNHILL	Work	(281) 340-1607

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	investigation type

Investigation Comments :

An investigation of Fort Bend County MUD 1 was conducted on January 10, 2003). Present at the investigation were Chris Manthei, Mark Thornhill, and Mark Wahlstrom, who can be contacted at (281)340-1607. The water system, which consists of one entry point, provides service to 848 connections in the Riverpark Subdivision with a population of 2544 and is operated by ECO RESOURCES. The operation company has 2 operators that hold a B groundwater operations license.

The Community water system is comprised of 2 plants located at 6303 Sandy Ridge Lane and 6425 E. Riverpark . The water system consists of groundwater, two wells, one ground storage tank, three service pumps, one pressure tank and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine. Emergency power is provided for the entire plant by a diesel generator.

Facility Location and Information:
Plant 1- Located at 6303 Sandy Ridge Lane: consists of 1 vertical well , 1 ground storage tank, 3 service pumps, 1 pressure tank, diesel generator, and distribution. Treatment is gas chlorination, injection is prior to ground storage tank.

Plant 2- Located at 6425 E. Riverpark: consists of 1 vertical turbine well and distribution.

During the investigation no violations were noted, please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

Signed HMcCoy Date 01.17.03
Environmental Investigator

Signed Date 1/21/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
X Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
IWUD
PWS Sys Fact Cap
PWS Monitoring + chem.

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	21358	Additional ID(s)	0790354	Investigation Date	01.10.2003

Number of Connections 848

SYSTEM FACILITIES

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	6303 Sandy Ridge Dr.		O	500'	vt	1000	1129 01.10.03
001	B	2	6425 E. Riverpark		O	705'	vt	1200	648 01.10.03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	0.3	welded steel	well site 1
pressure tank	0.03	welded steel	well site 1

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	500	well site 1						
2	1300	well site 1						
3	1300	well site 1						

Emergency Power /Alternate Source? yes Describe: diesel generator
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	848	Conn =	508.8	GPM	1777	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	848	Conn =	0.0170	MG	0.03	MG	x	
Ground/Total Storage	200	Gal/Conn X	848	Conn =	0.170	MG	0.3	MG	x	
Service Pumping Cap.	2	GPM/Conn X	848	Conn =	1696	GPM	3100	GPM	x	
Service Pump Peaking Factor		MDD/1,440 X	1.85	**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE
(290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	Fort Bend County MUD 1	Additional ID(s)	0790354
Investigation #	21358	Investigation Date:	01.10.2003

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 2 # Submitted 2
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Y Date, Last Analysis IOC 4.19.00 NO_2/NO - RC 4.19.00 VOC 4.2.02 SOC 04.19.00

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons): 949,000 GALLONS

Date of maximum daily usage: 10.10.2002

Average daily usage: 277,000

Time period for average daily usage: 01.2002 - 12.2002

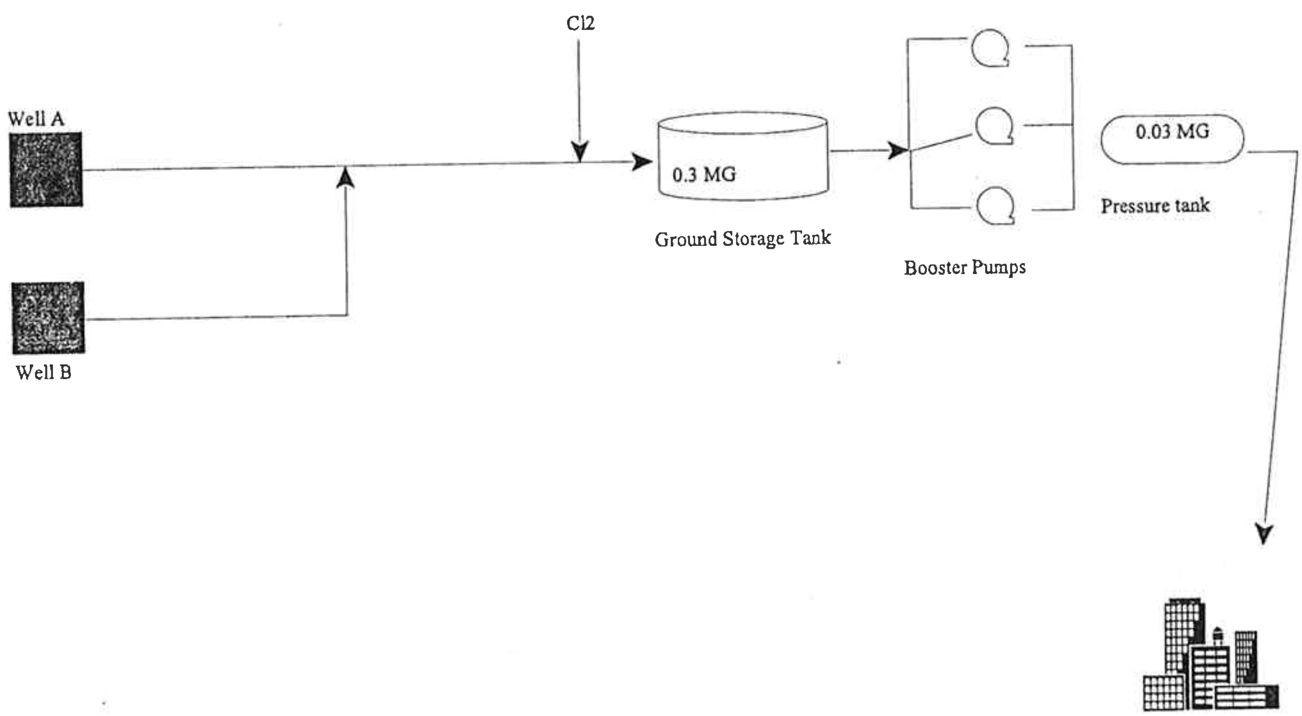
Tested Distribution psi: 58 Location(s): 2215 Arundel Crossing

Tested Chlorine Residual: 1.17 mg/L Free Location(s): 2215 Arundel Crossing

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Fort Bend County MUD 1	Additional ID(s)	079354
Investigation #	21358	Investigation Date:	01.10.2003

Description of Supply, Source, Treatment, and Chemicals Used



VNU

PWS/0790038/CO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 8, 2002

CERTIFIED MAIL# 7001 2510 0000 1793
RETURN RECEIPT REQUESTED

Mr. Tom Mangione, President
Fort Bend Co. MUD #2
11100 Brittmore Park Dr.
Houston, Texas 77041

Re: Compliance Evaluation Investigation at:
Fort Bend Co. MUD #2 , 10338 Westedge, Fort Bend County, Texas
TNRCC ID No. 0790038

Dear Mr. Mangione:

On December 5, 2001, Ms. Elaine Jackson of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. During the investigation, some concerns were noted which were alleged noncompliances that have been resolved through verbal notification and subsequent corrective action. In addition, certain outstanding alleged violation were identified for which compliance documentation is required. Enclosed is a summary which lists the investigation finding. Please submit to this office by February 8, 2002 a written description of corrective action taken and the required documentation demonstrating that compliance has been achieved for the outstanding alleged violation.

The Texas Natural Resource Conservation Commission appreciates your assistance in this matter. Please note that the Legislature has granted TNRCC enforcement powers which we may exercise to ensure compliance with environmental regulatory requirements. We anticipate that you will resolve the alleged violation as required in order to protect the State's environment. If you or members of your staff have any questions, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at 713/767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Enclosures: Summary of Investigation Findings

PUBLIC WATER SUPPLY REGULATORY PROGRAM

REGULATED ENTITY DATA

KM 528 W

ID No. 0790038 **GW multi: #** - **SW multi : #** - **Community** x **NTNC** ____ **Non-Comm** ____

CCN No. - Superior Yes Approved - Probation - **Region** 12

Name of System **Fort Bend Co. MUD #2** County Fort Bend

Physical location Plant #1- 10338 Westedge- Townwest Subdivision; Plant #2- 10442 Townview

Responsible Official Tom Mangione Title President Phone (713) 849- 9096

Mailing Address 11100 Brittmore Park Dr., Houston, Texas 77041 **FAX** **(713) 983- 3000**

Chief Cert Op Name Calvin Browne Grade & Type BGW Phone (713) 849- 9096

2nd Op Req'd? Yes Name Herbert Bolder Grade & Type CGW Total # Cert. Ops. 2

WS Manager/Superintendent AquaSources, Inc. Other Officials None

Surveyed With Herbert Bolder Area Served Townsend Subdivision

Supplier and Source District- 2 Groundwater wells

Interconnection w/other PWS? Yes Name PWS I/C Kingsbridge MUD, Ft Bend MUD #119, #120 Type I/C Closted

Retail Service Connection 2220 Retail Meters 2220 Retail Population 6660

Wholesale Master Meters 1 Wholesale Service Connections 1 Wholesale Population 1

Charge Yes Dist. to and Name of Nearest **2 Miles to** Kingsbridge MUD

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 12-6-00

Map Attached No Previous Map OK? Yes Well Operational Status None

Description of Supply, Source, Treatment, and Chemicals Used:

Consists of 2 Wells, 2 Ground Storage Tanks 2 Pressure Tanks, 3 Service Pumps, Auxillary and Distribution
Treatment: Fluoride, Gas Chlorination prior to storage

Total Well Cap. 2000 GPM 2.88 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 4700 GPM 6.768 MGD

Total Elevated Storage 0.0 MG Total Storage 1.029 MG Pressure Tank Cap. 0.03 MG

Maximum Daily Usage 1.423 MG Date 8-23-01 Average Daily Usage 0.615 MGD Time 11/00-10/01

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 7 # Submitted 8

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 7-6-99 NO_2/N 6-14-95 RC 5-21-98 VOC 7-23-99 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date -

Date of Investigation 12-5-01 By Elaine Jackson

Date of Approval 1/8/02 By Barry Price

Letter Date, if different from Approval Date ____ Reply Requested 2/8/02 Def Score 5

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

JAN 18 2002

I.D. No.:	079003	Survey Date:	12-5-01

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]		R
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	x	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

*** Leaking chlorine injection feed line going into the #2 GST. Corrected per fax 1-4-02.**

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	x	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	-	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested **62 psi** Locations: **10339 Gulf Stream Dr.**

**Location:

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Chlorination**				$CL2$ = **0.46 Mg/L/F** Locations: Same as pressure FL- 1.0 mg/l			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	079003	Survey Date:	12-5-01

VI. SYSTEM FACILITIES

Number of Connections 2222

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	10338 Westedge	29°39'59.65" / 95°38'06.95"82'	O	902'	VT	1000	900 12-5-01
001	B	2	10442 Townview	° ' " / ° ' "	-	900'	VT	1100	1100 est
			(Temp. out of service)	° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
Ground Storage Tank	0.429 MG	Bolted Steel	Well Site #1
Pressure Tank	0.015 MG	Welded Steel	Well Site #1
Pressure Tank	0.015 MG	Welded Steel	Well Site #1

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	700	Well Site #1	4	1200	Well Site #1			
2	800	Well Site #1	5	1200	Well Site #1			
3	800	Well Site #1						

Emergency Power /Alternate Source? Yes (Y) Describe: Right angle Drive at well #1; Diesel engine

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn	X	2220	Conn =	1332	GPM	2000	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn	X	2220	Conn =	0.0444/.03 max.	MG	0.03	MG	x	
Ground/Total Storage	200	Gal/Conn	X	2220	Conn =	0.444	MG	1.029	MG	x	
Service Pumping Cap.	2	GPM/Conn	X	2220	Conn =	4440	GPM	4700	GPM	x	
Service Pump Peaking Factor	1423	MDD/1,440	X	1.85	**	1828	GPM	3500	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790031	Survey Date:	12-5-01

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

1. Leaking chlorine injection feed line going into the #2 ground storage tank.. Corrected per fax dated 1-4-02.
2. Inadequate safely equipment for fluoride.(They stated that equipment is on order)

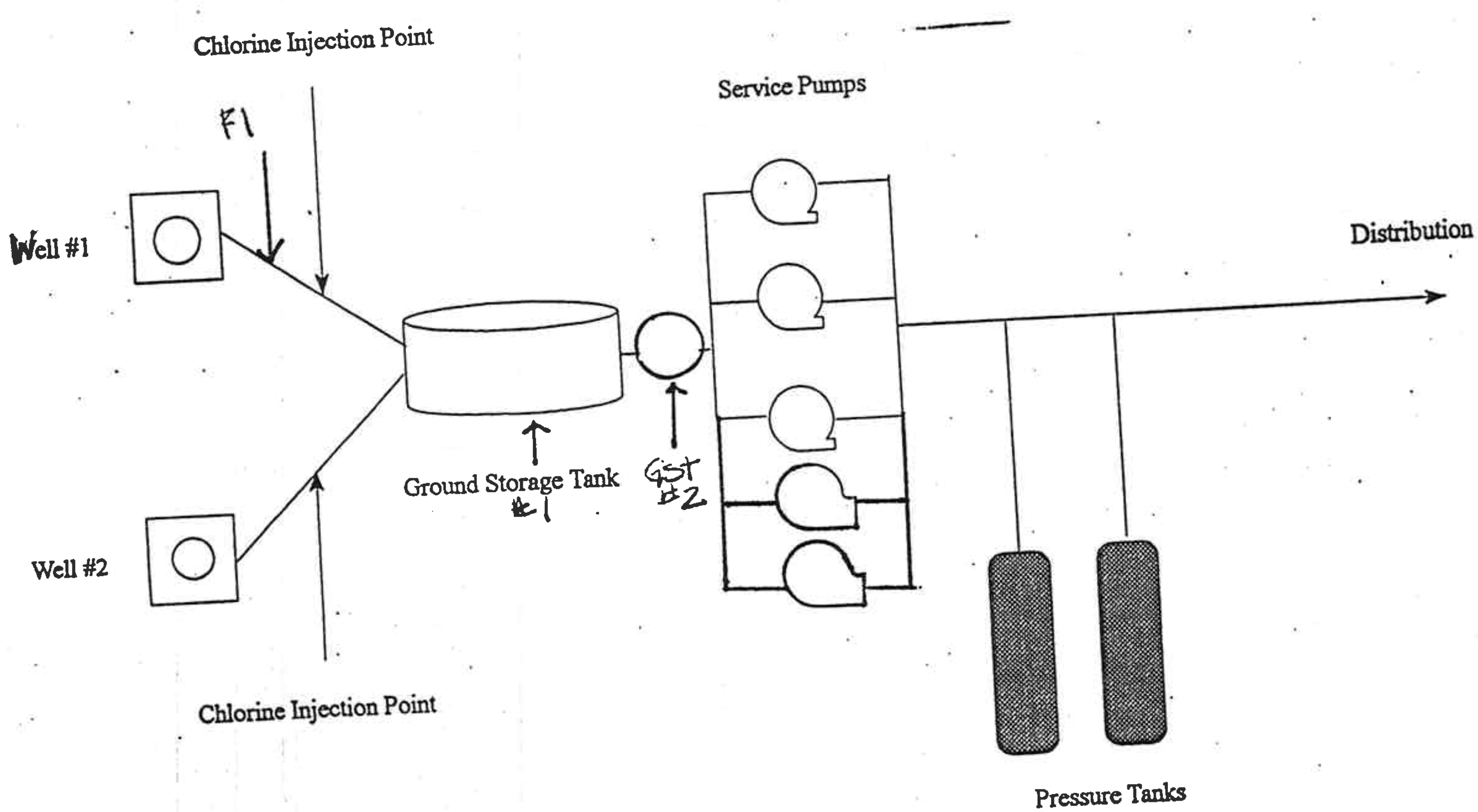
**** Well #2 it temporary out of service.**

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ]   Number of B Violations: 1   Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 5

Fort Bend County MUD #2
ID #0790038
Fort Bend County



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Name of System Ft Bend Co. Mud #2

Page 1 of ____

FLUORIDATION

1. Type of fluoride compound used? Hydrofluosilicic
(if fluosilicic acid is used, diluted or undiluted)

2. Type of feeder used? Positive displacement Pump

3. Number of injection points? 1

4. Location of injection point(s) within the treatment process? Prior to Storage

5. Are scales provided (except for saturator installation)?.......... yes

6. Is adequate chemical storage provided? .... yes

7. Is an acceptable test kit provided? .... yes

8. Are daily residuals recorded on monthly report? .... yes

9. Are fluoridation facilities well maintained? .... yes

10. Is adequate protection against siphonage provided and operational?. yes

11. Is adequate safety equipment provided to minimize operator contact with chemicals? .... no

Comments Operator stated that they ordered the safety equipment.

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

THE STATE OF TEXAS

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

May 17, 2001

Mr. Mark Massey, President
Fort Bend MUD #23
11100 Brittmoore Park Drive
Houston, Texas 77041

Re: Compliance Evaluation Investigation at:
Fort Bend MUD #23, 1575 Rabb Road, Fort Bend County, Texas
TNRCC ID No. 0790237

Dear Mr. Massey:

On April 26, 2001, Ms. Elaine Jackson of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. During the investigation, the investigator verbally notified you of some apparent instances of noncompliance. You have provided us with information which appears to indicate that these problems have been corrected. No further response from you is necessary concerning this investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
Team Leader
Houston Region Office

HDL/ej

cc: Fort Bend Co. Health Dept.

SUMMARY OF INVESTIGATION FINDINGS

Regulated Entity Name: Fort Bend MUD #23	TNRCC ID: 0790237	Investigation Date: 4-26-01

ALLEGED NONCOMPLIANCES NOTED AND RESOLVED		
No.	Requirement Cited	Description of Alleged Noncompliance, Corrective Action Taken, and Compliance Documentation
1	30 TEX. ADMIN. CODE , §290.46(m)	Operating Practices for Public Water Systems Failure to properly maintain the regulated entities by repainting the inside the hatch of the ground storage tank and repairing the broken meter at well #2. Corrected per fax on 5-16-01.

PUBL WATER SUPPLY REGULATORY ROGRAM

REGULATED ENTITY DATA KM 651 B

ID No. 0790237 GW multi: # No SW multi : # No Community x NTNC Non-Comm

CCN No. - Superior No Approved No Probation No Region 12

Name of System Fort Bend MUD #23 County Fort Bend

Physical location 1575 Rabb Rd.

Responsible Official Mark Massey Title President Phone (713) 849- 9096

Mailing Address 11100 Brittmoore, Houston, Texas 77041 **FAX** U

Chief Cert Op Name Calvin Browne Grade & Type BGW Phone 713) 849- 9096

2nd Op Req'd? No Name Herbert Bolden Grade & Type CGW Total # Cert. Ops. 3

WS Manager/Superintendent Aqua Source, Inc. Other Officials -

Surveyed With Calvin Browne and Herbert Bolden Area Served Teal Run Subdivision

Supplier and Source District- Ground- 2 Wells

Interconnection w/other PWS? No Name PWS I/C - Type I/C -

Retail Service Connection 965 Retail Meters 965 Retail Population 2895

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge Yes Dist. to and Name of Nearest 2 1/2 **Miles to** Fort Bend Co. MUD #45

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 6-16-00

Map Attached No Previous Map OK? Yes Well Operational Status None

Description of Supply, Source, Treatment, and Chemicals Used:

Consists of 2 Groundwater wells, 2 pressure tanks, 1 Ground Storage, 3 Service Pumps , Auxillary Power and Distribution
Treatment: Gas Chlorination, Chlorine injection point is prior to storage

Total Well Cap. 1700 GPM 2.448 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. GPM 0 MGD Total Svc. Pump Cap. 3100 GPM 4.464 MGD

Total Elevated Storage 0.0 MG Total Storage 0.5 MG Pressure Tank Cap. 0.02 MG

Maximum Daily Usage 0.932 MG Date 7-13-00 Average Daily Usage 0.300 MGD Time 4/00- 3/01

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 3 # Submitted 3

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 11-6-00 NO_2/N 6-21-95 RC 11-6-00 VOC 12-3-99 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 4-26-01 By Elaine Jackson

Date of Approval 5/17/01 By

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

JUN 14 2001

I.D. No.:	0790	Survey Date:	4-26-01

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]		x
85% Planning Report, if needed?	[291.93,3]	*		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

***Repaint inside of roof hatch on ground storage tank- Corrected per fax 5-16-01**
*** Well #2 meter broken- Corrected per fax 5-16-01**

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	x	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested _ **69 psi** Locations: _**1410 Bonnie Lea**

**Location:

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Chlorination**				CL2 = **1.46 Mg/L/F** Locations: **Same as pressure**			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790?	Survey Date:	4-26-01

VI. SYSTEM FACILITIES

Number of Connections 965

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	1575 Rabb Rd.	° ' " / ° ' "	O	1100'	VT	U	1700 4-26
001	B	2	" " "	° ' " / ° ' "	E	U	Subm.		U
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
Ground Storage Tank	0.5	Welded Steel	Well Site
Pressure Tank	0.02	Welded Steel	Well Site
Pressure Tank	0.02	Welded Steel	Well Site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1000	Well Site						
2	2000	Well Site						
3	100	Well Site						

Emergency Power /Alternate Source? Yes (Y) Describe: Diesel General @ Plant

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	965	Conn =	579	GPM	1700	GPM	x	
Pressure Storage	20	Gal/Conn X	965	Conn =	0.0193	MG	0.04	MG	x	
Ground/Total Storage	200	Gal/Conn X	965	Conn =	0.1930	MG	0.5	MG	x	
Service Pumping Cap.	2	GPM/Conn X	965	Conn =	1930	GPM	3100	GPM	x	
Service Pump Peaking Factor	-	MDD/1,440 X	-	**	-	GPM	-	GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790?	Survey Date:	4-26-01

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

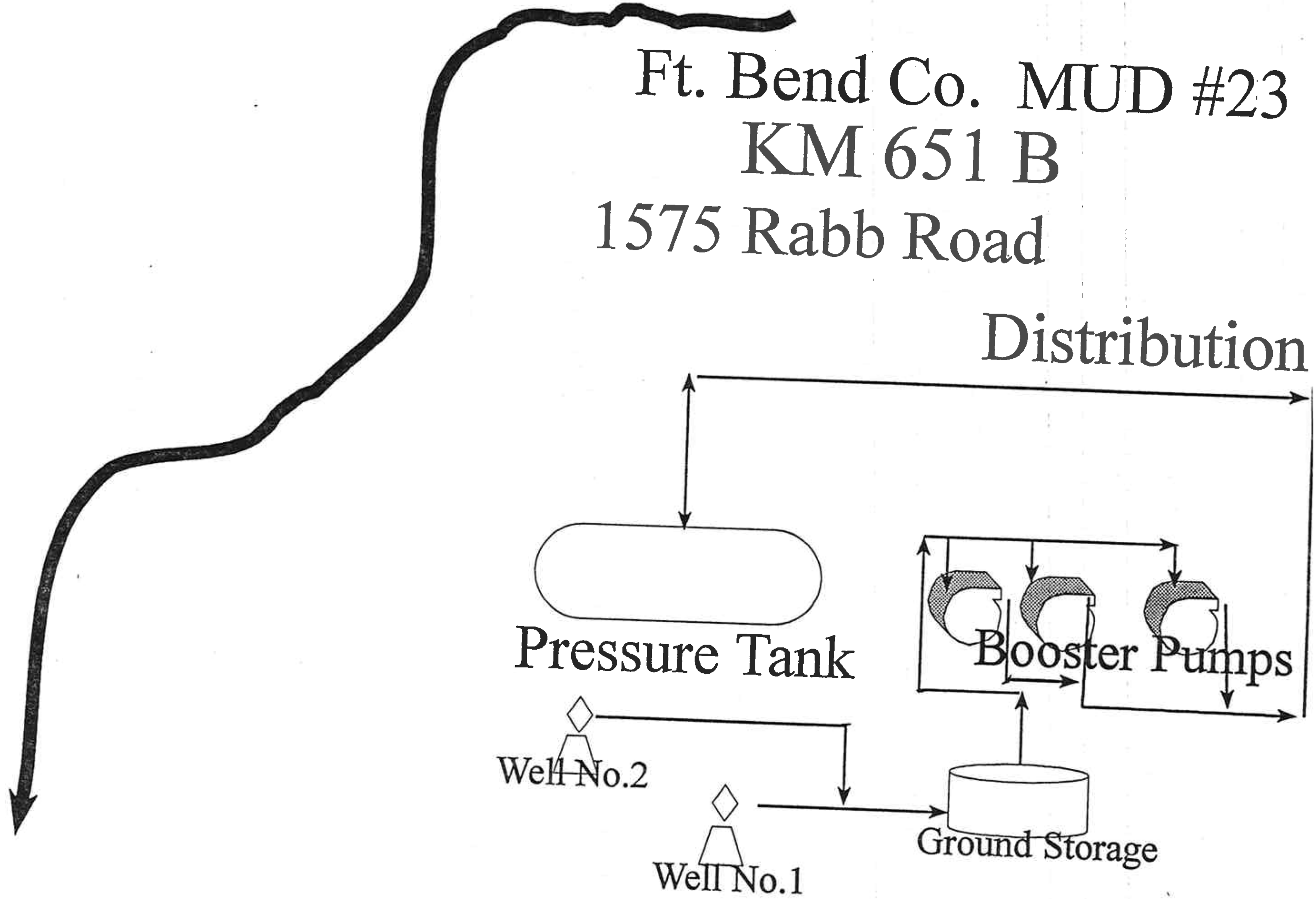
Number of A Violations: [ ] **Number of B Violations:** [ ] **Number of C Violations:** [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Ft. Bend Co. MUD #23

KM 651 B

1575 Rabb Road



VNU

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

August 1, 2000

Mr. James Cupp, President
Ft. Bend County MUD No 25
12550 Emily Court
Sugar Land, Texas 77478

Re: Public Water Supply:
Ft Bend County MUD No 25, 17111 Blue Mist, Sugar Land, Ft Bend Co., Texas
TNRCC ID #0790130

Dear Mr. Cupp:

On June 23, 2000, Mr. Barry H. Price, Jr. of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an inspection of the above-referenced facility to evaluate compliance with applicable public water supply requirements. No violations were documented during the inspection.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Barry H. Price, Jr. in our Houston Region Office at 713/767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols, Jr., P.E.
PWS Team Leader
Houston Region Office

RLE/bhp

cc: Ft Bend Co. Health Dept.

PUBLIC 'ATER SUPPLY REGULATORY P' 'GRAM

WATER SYSTEM DATA

KM 567F

Community X NTNC ______ Non-Comm ______

ID No. 0790130

Region 12

CCN No. P0147 Superior * Approved * Probation *

County Ft Bend

Name of System **Ft Bend County MUD No 25**

Physical location 17111 Blue Mist, FM 1464 and Old Richmond Road

Responsible Official James Cupp Title President Phone# (281) 240-1700

Mailing Address 12550 Emily Court, Sugar Land, Texas 77478

Chief Cert Op Name David L. Walker Grade & Type A Phone (281) 240-1700

2nd Op Req'd? Yes Name John Subia Grade & Type B Total # Cert. Ops. 2

WS Manager/Superintendent ECO RESOURCES INC Other Officials Contacted none

Surveyed With David L. Walker and John Subia Area Served Pheasant Creek Subdivision

Supplier and Source District - Ground - 2 wells

Interconnection w/other PWS? No Name PWS I/C None Type I/C None

Retail Service Connections 1809 Retail Meters 1809 Retail Population 5427

Wholesale Master Meters 0 Wholesale Service Connections 0 Wholesale Population 0

Charge ? Yes Dist. to and Name of Nearest PWS 0.5 miles - Ft Bend MUD No 41

Reason for this Survey (Routine, Follow Up, Initial, Enforcement, Complaint, Other) Routine Previous Survey Date 9/17/99

Map Attached No Previous Map OK? Yes Well Operational Status Changed? No

Description of Supply, Source, Treatment, and Chemicals Used:

System consists of two wells, two PT, two GST, five service pumps, two diesel generators, and distribution. Treatment: Hypochlorination prior to GST.

Total Well Cap. 1770 gpm 2.5488 mgd RAW Cap. 0 gpm 0 mgd

Treatment Cap. 0 gpm 0 mgd Total Svc. Pump Cap. 3250 gpm 4.68 mgd

Total Elevated Storage 0 Total Storage Cap. 0.52 MG Pressure Tank Cap. 0.035 MG

Maximum Daily Usage 1.345 MG Date 9/26/99 Average Daily Usage 0.763 MG Time Period June 99 - May 00

Wholesale Contract None Maximum Purchase Rate None

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	*	*
Well(s) Surface Water Influenced?	*	*
Acceptable Sample Siting Plan on File? .106	X	

Number of Samples Required 6 Mo. # Submitted 6 Mo.

Number of Raw Samples Required * # Submitted *

Non-Comm Dates of Operation * Thru *

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 6/02/99 NO_2/NO_3 10/12/95 RC 6/02/99 VOC 6/02/99 SOC *

List UNACCEPTABLE Values None

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ______ Date

Date of Survey 6/23/00 By Barry H. Price Jr. Barry H. Price

Date of Approval 08/01/00 By Ross L. Echols, Jr.

Letter Date, if different from Approval Date ______ Reply Requested ______ Def. Score of this Survey 0

*= Not Applicable
U=Unknown

SEP 21 2000

I.D. #0790130 SURVEY DATE: 6/23/00

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,d]	*	*
MOR's Properly Completed?	[46,d]	X	
Dead End Mains Flushed?	[46,l]	X	
New Lines and Repairs Disinfected?	[46,g]	X	
Supply of Disinfectant on Hand?	[46,h]	X	
Distribution Map Up-to-Date?	[46,n]	X	
Ownership Signs Properly Displayed and Maintained?	[46,w]	X	
Adequate Chemical Storage Provided?	[42,d,6]	X	
ANSI/NSF Approved Chem/Media?	[42]	X	
Facilities Properly Maintained?	[46,m&p]	X	
If Superior/Approved, Signs Properly Disp. & Maint.	[47,b]	X	

II. STORAGE TANKS

		Y	N
Storage Tanks Properly Covered?	[43,c]	X	
Tanks Tight Against Leakage?	[43,c,6]	X	
Vents Properly Installed?	[43,c,1]	X	
Proper Roof Hatch Provided?	[43,c,2]	X	
Roof Hatch Kept Locked?	[43,c,2]	X	
Proper Overflow Provided?	[43,c,3]	X	
Proper Water Level Indicator Provided?	[43,c,4]	X	
Drains Properly Connected?	[43,c,7]	X	
Inlet and Outlet Properly Located?	[43,c,5]	X	
Intruder Resistant Fence?	[43,e]	X	
Tanks Properly Inspected, Maintained, Docs.	[46,p,1]	X	
Below Ground Storage Properly Located?	[43,b]	*	*
Inspection Ladder Provided?	[43,c]	X	

III. PRESSURE TANKS

		Y	N
Accurate Pressure Gauges?	[43,d,2]	X	
Pressure Release Device Provided?	[43,d,2]	X	
Proper Facilities for Air/Water Ratio/Air filter?	[43,d,3]	X	
Air-Water Volume Indicator Provided?	[43,d,3]	X	
Tanks Tight Against Leakage?	[43,d,7]	X	
Routinely Inspected, Maintained, Documented?	[46,p,2]	X	
Fenced or Housed?	[43,e]	X	
ASME, if Required?	[43,d,1]	X	

IV. DISTRIBUTION

		Y	N
Plumbing Ordinance or Agreement?	[46,i]	X	
Customer Service Inspection Program?	[46,j]	X	
Backflow Assembly Report Recorded, if needed?	[44,h,4,D]	X	
Sewer Lines Properly Located?	[44,e]	X	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,u]	X	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,u]	X	
Properly Installed Distribution Piping?	[44,a]	X	
Adequate Flush/Gate Valves?	[44,d,6]	X	
Air Release Valves Properly Installed?	[44,d,1]	X	
In-Line Booster Pumps in System? **	[44,d,2]	*	
In-Line Booster Pumps in System Approved?	[44,d,2]	*	
If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	*	

Tested psi/Locations: **60 PSI @ 17023 Enchanted Cir. West**

**Location: *

V. DISINFECTION

		Y	N
Disinfection Equipment Adequate in Capacity?	[42,e]	X	
Type Disinfection Used: **Hypochlorination**			
Disinfection Equipment Properly Housed?	[42,e,6,8]	X	
Disinfection Room Properly Vented?	[42,e,7]	*	
Breathing Apparatus and Ammonia Bottle Provided?	[42,e,5]	*	
Scales Provided?	[42,e,4,D]	*	
Disinfection Prior to Storage?	[42,e,2,3]	X	
Adequate Residual Maintained/Recorded?	[46,f,1,2]	X	
Mg/L T/F Locations: **1.25 mg/L @ 17023 Enchanted Cir. West**			
Evacuation Plan Cl_2NH_3? If needed	[42,e,11]	*	
DPD Chlorine Test Kit Provided?	[46,f,2]	X	
IF AMMONIA FEED PROVIDED:			
Properly Housed/Vented?	[42,e,10]	*	
Scales or Gauges Provided?	[42,e,4,D]	*	

*= Not applicable
U= Unknown

VI. SYSTEM FACILITIES

Number of Connections 1809

WELLS (Y/N) OR RAW WATER PUMPS (Y/N)

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/Est GPM/Date
001	A	1	17111 Blue Mist Plant #1	N29°38'16.05"W95°39'53.52"	O	1050'	VT	*	850 - 6/23/00
002	B	2	FM 1464/Old Richmond Rd.	N29°38'03.63"W95°40'39.07"	O	924'	VT	*	920 - 6/23/00

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity	Material	Location
GST	0.42 MG	Welded Steel	Plant #1
PT	0.015 MG	Welded Steel	Plant #1
GST	0.100 MG	Welded Steel	Plant #2
PT	0.02 MG	Welded Steel	Plant #2

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1-1	750	Plant #1	2-1	500	Plant #2			
1-2	750	Plant #1	2-2	500	Plant #2			
1-3	750	Plant #1						

Emergency Power /Alternate Source? Yes (Y/N) Describe: Diesel Generators at plants 1 & 2. *0.030 Max by rules

SYSTEM CAPACITIES

					Required		Provided		Y	N
Well Production	0.6	Gal/Conn X	1809	Conn =	1085	GPM	1770	GPM	X	
Elevated/Pressure Storage	20	Gal/Conn X	1809	Conn =	0.030*	MG	0.035	MG	X	
Ground/Total Storage	200	Gal/Conn X	1809	Conn =	0.362	MG	0.52	MG	X	
Service Pumping Cap.	2	GPM/Conn X	1809	Conn =	3618	GPM	3250	GPM	*	*
Service Pump Peaking Factor	1.345	MDD/1,440 X	1.85	**	1728	GPM	3250	GPM	X	

** Factor = 1.25 or 1.85, MDD Listed as gallons.

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE GUI: Y N

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	X		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,C]	X	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	X		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	X	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	X		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	X	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	X		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	X	
Drainage ditch or lift station ≥300 ft.?	[41,c,1,B]	X		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	X	

B. CONSTRUCTION

Sanitary easement(s)recorded?	[41,c,1,F]	X		Suitable sampling tap?	[41,c,3,M]	X	
Well cased 18" above ground level?	[41,c,3,B]	X		Well meter provided?	[41,c,3,N]	X	
Proper pressure cement?	[41,c, 3, C]	X		Well blow-off properly installed?	[41,c,3,L]	X	
Proper concrete sealing block?	[41,c,3,J]	X		Well unit fenced or housed?	[41,c,3,O]	X	
Well head sealed?	[41,c,3,K]	X		Well site properly drained?	[41,c,3,I]	X	
Casing vent properly installed?	[41,c,3,K]	X		All weather road provided?	[41,c,3,P]	X	
Air release devices properly installed?	[41,c,3,Q]	X					

VIII. ADDITIONAL WATER SYSTEM DEFICIENCIES AND TAC REFERENCES :

IX. RATING DEFICIENCY SCORE

A. Certified Operator(s) If Required

1. None Surface	10 Pt.s ______
2. None Ground	4 Pt.s ______
3. Only one when two required	4 Pt.s ______
4. Improper certification	4 Pt.s ______

B. MCL Violations

1. Microbiological:	
Failure to sample	4/mo ______
MCL violation	10/vio ______
2. Primary standards	10/vio ______
3. Secondary standards	2/vio ______
4. Turbidity:	
Failure to report	4/mo ______
MCL violation	10/mo ______

C. Distribution

Pressure < 20 psi	10 Pt.s ______
Pressure < 35	4 Pt.s ______
Distribution problems	2 Pt.s ______
Treated water protection	3 Pt.s ______
Disinfection provided, but residual < 0.2 mg/l Free Chlorine or 0.5 mg/l Chloramine	4 Pt.s ______

D. Design

1. Ground Water	
No disinfection	10 Pt.s ______
Improper well location	4 Pt.s ______
No easement	4 Pt.s ______
Well construction deficiencies	3/item ______
2. Surface Water:	
No disinfection	20 Pt.s ______
No filtration	20 Pt.s ______
Excess filter rate	4 Pt.s ______
Inadequate chemical feed	4 Pt.s ______
Inadequate detention time	4 Pt.s ______
3. General:	
Production deficient	4 Pt.s ______
Storage deficient:	
Elevated or Pressure	4 Pt.s ______
Total storage Deficient	4 Pt.s ______

TOTAL, A + B + C + D = 0

PWS/0790229/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 27, 2003

Mr. Earl Tipton, Jr., President
Fort Bend County MUD 41
12535 Reed Road
Sugar Land, Texas 77478.3142

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD 41, 16418 Clover Lodge Court, Fort Bend County, Texas
TCEQ ID No. 0790229

Dear Mr. Tipton, Jr.:

On February 10, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation. At this time, your public water supply continues to merit recognition as a "Superior" system.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

Texas Commission on Environmental Quality

Investigation Report

2003 MAR 11 PM 12:47

FORT BEND COUNTY MUD 41

FORT BEND COUNTY MUD 41

RN102985280

Investigation # 25962
Investigator: HELEN PAGOLA

Conducted: 02/10/2003 -- 02/10/2003
Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Additional ID(s) : 0790229

Incident #

Site Classification
GW >1K-10K CONNECTION

No Industry Code Assigned

Location : 16418 CLOVER LODGE COURT

KEY MAP 567C

Address: 16418 CLOVER LODGE CT; SUGAR LAND, TX 77478

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	FORT BEND COUNTY MUD 41

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Mail Contact	ENVIRONMENTAL SERVICES MANAGER	MR MICHAEL THORNHILL	Work	(281) 340-1607

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE
QA REVIEWER	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	investigation type
QUALITY REVIEW - PWS	qa review

Investigation Comments :

An investigation of Fort Bend County MUD 41, Registration # PO152 was conducted on February 10, 2003. Present at the investigation were Mike Thornhill and Chris Manthei, who can be contacted at (281)340.1607. The water system, which consists of one entry point, provides service to 1167 connections in the Oak Lakes Subdivision with a population of 3501 and is operated by ECO RESOURCES. The operation company has 2 or more operators that hold a B groundwater operations license.

The Community water system is comprised of 1 plant located at 16418 Clover Lodge Court. The water system consists of groundwater, one well, one ground storage tank, four service pumps, two pressure tanks and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine. Emergency power is provided for the entire plant by a diesel generator and

there is a right angle drive on the well. The facility maintains an interconnect with Fort Bend County MUD 25.

Facility Location and Information:
Entry Point 1- Located at 16418 Clover Lodge Court: consists of 1 vertical turbine well (1100 gpm), 1 ground storage tank (0.334 MG), 4 service pumps (1 @ 250 gpm, 1@ 500gpm, 1 @ 750 gpm, 1 @ 1000 gpm), 2 pressure tank (2 @ 0.021 MG), diesel generator, and distribution. Treatment is gas chlorination; injection is prior to ground storage tank.

During the investigation no violations were noted. Please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

Signed HMcCoy
Environmental Investigator
Date 2.26.03

Signed [signature]
Supervisor
Date 2/27/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
IWUD
- microbiological
- capacity

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	25962	Additional ID(s)	0790229	Investigation Date	02.10.2003

SYSTEM FACILITIES

Number of Connections 1167

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	16418 Clover Lodge Court	-	O	1800'	vt	1200	1100 02.10.2003

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	0.334	welded steel	well site
pressure tank	0.021	welded steel	well site
pressure tank	0.021	welded steel	well site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	250	well site						
2	500	well site						
3	750	well site						
4	1000	well site						

Emergency Power /Alternate Source? Yes Describe: Right angle drive on well & diesel engine for the entire plant
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	1167	Conn =	700.2	GPM	1100	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	1167	Conn =	0.023	MG	0.042	MG	x	
Ground/Total Storage	200	Gal/Conn X	1167	Conn =	0.233	MG	0.334	MG	x	
Service Pumping Cap.	2	GPM/Conn X	1167	Conn =	2334	GPM	2500	GPM	x	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	Fort Bend County MUD 41	Additional ID(s)	0790229
Investigation #	25962	Investigation Date:	02.10.2003

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 4 # Submitted 4

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Y Date, Last Analysis IOC 4.19.00 NO_2/NO 6.12.95 RC 4.19.00 VOC 09.28.00 SOC 4.30.96

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ____

Usage and Field Tests:

Maximum Daily Usage (million gallons): 0859 MG

Date of maximum daily usage: 08.28.2003

Average daily usage: 0.341 MG

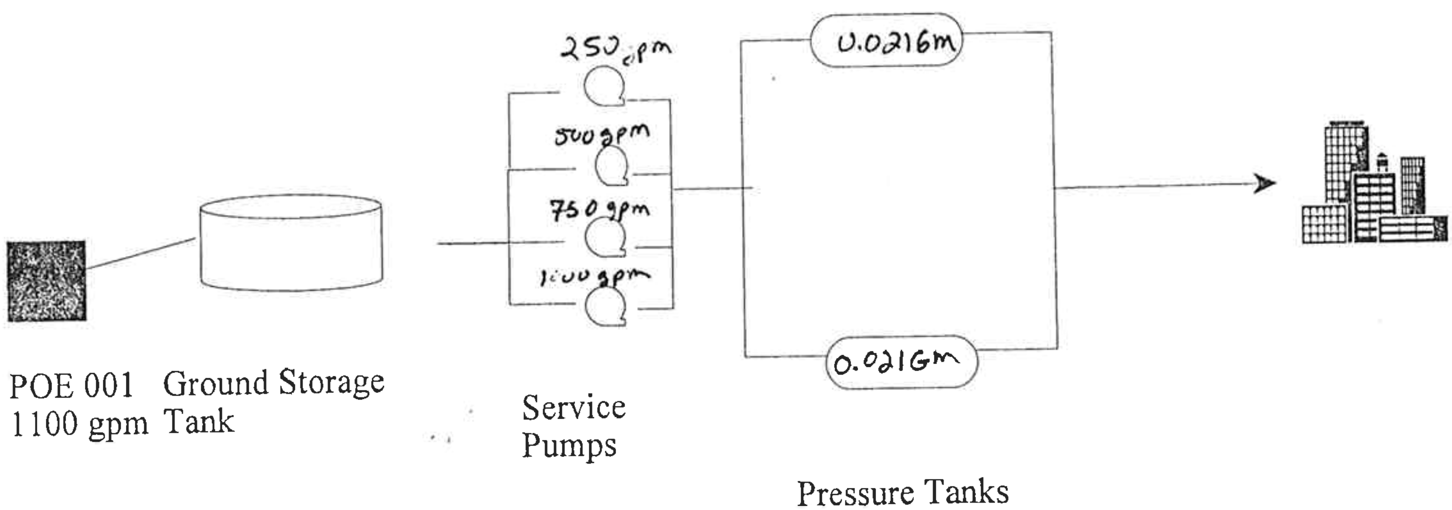
Time period for average daily usage: 01.2002 - 12.2002

Tested Distribution psi: 58 Location(s): 16434 Ember Hollow

Tested Chlorine Residual: 1.13 mg/L Free Location(s): 16434 Ember Hollow

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Fort Bend County MUD 41**	**Additional ID(s)**	**0790229**
Investigation #	**25962**	**Investigation Date:**	**02.10.2003**
Description of Supply, Source, Treatment, and Chemicals Used			



PWS/ 0790252CO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

May 7, 2002

Mr. Mike Albrecht, President
Fort Bend County MUD # 67
12550 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD # 67, Hwy. 99, Fort Bend County, Texas
TNRCC ID No. 0790252

Dear Mr. Albrecht:

On April 26, 2002, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend Co. Health Dept.

PUB ATER SUPPLY REGULATOR GRAM

REGULATED ENTITY DATA KM 567 W

ID No. 0790252 GW multi: # 0 SW multi : # 0 Community x NTNC Non-Comm

CCN No. - Superior - Approved - Probation - Region 12

Name of System Fort Bend County MUD # 67 County Fort Bend

Physical location New Territory Subdivision- Robinson Landing - Hwy 99 @ Hwy 90A

Responsible Official Mr. Mike Albrecht Title President Phone 281.240.1300

Mailing Address 12550 Emily Court Sugar Land Texas 77478 FAX 281.579.1029

Chief Cert Op Name Chris Manthei Grade & Type A - GW Phone 281.340.1640

2nd Op Req'd? yes Name John Subia Grade & Type B - GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Chris Manthei, John Subia Area Served New Territory - Robinson Landing

Supplier and Source distribution only - purchase water from Fort Bend Co. MUD 112

Interconnection w/other PWS? yes Name PWS I/C Ft. Bend County MUD # 112 Type I/C open

Retail Service Connection 1103 Retail Meters 1103 Retail Population 3309

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge yes Dist. to and Name of Nearest 1 Miles to Ft. Bend Co. MUD # 112

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 06.13.2001

Map Attached no Previous Map OK? yes Well Operational Status distribution only

Description of Supply, Source, Treatment, and Chemicals Used:

Distribution only - Receiving treated water under pressure from Ft. Bend Co. MUD # 112.

Total Well Cap. 0 GPM 0 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 0 GPM 0 MGD

Total Elevated Storage 0 Total Storage 0 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage MG Date Average Daily Usage MGD Time

Wholesale Contract - Maximum Purchase Rate 5000 gal - 5 $

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 5/m # Submitted 5/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? yes Date, Last Analysis IOC - NO_2/N - RC - VOC - SOC -

List UNACCEPTABLE Values distribution only

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 04.26.2002 By Helen Pagola

Date of Approval 5/7/02 By Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

2002 JUN 24 AM 10: 32

I.D. No.:	0790252	Survey Date:	04.26.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	-	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	-	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	-	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	-	

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	-		Proper Water Level Indicator Provided?	[43,c,4]	-	
Tanks Tight Against Leakage?	[43,c,6]	-		Drains Properly Connected?	[43,c,7]	-	
Vents Properly Installed?	[43,c,1]	-		Inlet and Outlet Properly Located?	[43,c,5]	-	
Openings Properly Screened	[43,c,1]	-		Disinfectant Residual in Water Storage Tanks	[46,d,2]	-	
Proper Roof Hatch Provided?	[43,c,2]	-		Intruder Resistant Fence?	[43,e]	-	
Roof Hatch Kept Locked?	[43,c,2]	-		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	-	
Proper Overflow Provided?	[43,c,3]	-		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	-	

III. PRESSURE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 60 psi Locations: 6503 Lussier

**Location: None

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	-		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used:				CL2 = 1.00 Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	-		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	-		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790.	Survey Date:	04.26.2002

VI. SYSTEM FACILITIES

Number of Connections 1103

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? N (Y / N) Describe: distribution only

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM	-	
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG	-	
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG	-	
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM	-	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790.	Survey Date:	04.26.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	-		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	-	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	-		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	-	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	-		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	-	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	-		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	-	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	-		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	-	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	-		Suitable sampling tap?	[41,c,3,M]	-	
Well cased 18" above ground level?	[41,c,3,B]	-		Well meter provided?	[41,c,3,N]	-	
Proper concrete sealing block?	[41,c,3,J]	-		Well blow-off properly installed?	[41,c,3,L]	-	
Well head sealed?	[41,c,3,K]	-		Well unit fenced or housed? *plank missing	[41,c,3,O]	-	
Casing vent properly installed?	[41,c,3,K]	-		Well site properly drained?	[41,c,3,I]	-	
Air release devices properly installed?	[41,c,3,Q]	-		All weather road provided?	[41,c,3,P]	-	
Electrical Wiring installed in conduit?	[46,V]	-					

VIII. ADDITIONAL COMMENTS:

*** Distribution only **

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS/0790297/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 21, 2003

Mr. Mike Thornhill, Environmental Services Manager
Fort Bend County MUD 108
12535 Reed Road
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD 108, Hwy 59 @ Crabb River Road, Fort Bend County, Texas
TCEQ ID No. 0790297

Dear Mr. Thornhill:

On January 10, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

Texas Commission on Environmental Quality

Investigation Report

FORT BEND COUNTY MUD 108

FORT BEND COUNTY MUD 108

RN102985215

Investigation # 21369

Investigator: HELEN PAGOLA

Conducted: 01/10/2003 -- 01/10/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Incident #

Site Classification

GW 251-1K CONNECTION

No Industry Code Assigned

Location : HIGHWAY 59 @ CRABB RIVER ROAD

KEY MAP 607N

Additional ID(s) : 0790297

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	FORT BEND COUNTY MUD 108

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Mail Contact	ENVIRONMENTAL MANAGER	MIKE THORNHILL	Work	(281) 340-1607

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	investigation type

Investigation Comments :

An investigation of Fort Bend County MUD # 108 was conducted on January 10, 2003. Present at the investigation were Mr. Mike Thornhill, Mr. Chris Manthei and Mr. Mark Wahlstrom who can be contacted at (281)340-1607. The water system is distribution only, provides service to 839 connections to the Greatwood Subdivision with a population of 2517 and is operated by managed by ECO RESOURCES. The operation company has 3 operators that hold a C groundwater operations license.

The Community water system is a distribution system only. The facility is interconnected with Fort Bend County MUD # 106 and has an open connection.

During the investigation no violations were noted, please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

Signed HMcCoy Date 01.15.03
Environmental Investigator

Signed Barry Hair Date 1/21/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR
✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) : IWUD

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	21369	Additional ID(s)	0790297	Investigation Date	01.10.2003

SYSTEM FACILITIES

Number of Connections 839

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
			distribution only						

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? ________Describe: ________________
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM		
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG		
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG		
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM		
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	**Fort Bend County MUD 108**	**Additional ID(s)**	**0790297**
Investigation #	**21369**	**Investigation Date:**	**01.10.2003**

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	X	

Number of Samples Required 2 # Submitted 2

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? YS Date, Last Analysis IOC - NO_2/NO - RC 01.28.97 VOC - SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons):

Date of maximum daily usage:

Average daily usage:

Time period for average daily usage:

Tested Distribution psi: 62 Location(s): 6819 Morningside Drive

Tested Chlorine Residual: 1.44 mg/L Free Location(s): 6819 Morningside Drive

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Fort Bend County MUD 108**	**Additional ID(s)**	**0790297**
Investigation #	**21369**	**Investigation Date:**	**01.10.2003**
Description of Supply, Source, Treatment, and Chemicals Used			

Distribution Only System

PWS/0790298/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 21, 2003

Mr. Mike Thornhill, Environmental Services Manager
Fort Bend County MUD 109
12535 Reed Road
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD #109, Highway 59, Sugar Land, Fort Bend County, Texas
TCEQ ID No. 0790298

Dear Mr. Thornhill:

On January 10, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

Texas Commission on Environmental Quality

Investigation Report

FORT BEND COUNTY MUD 109

FORT BEND COUNTY MUD 109

RN102985256

Investigation # 21393

Investigator: HELEN PAGOLA

Conducted: 01/10/2003 -- 01/10/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Additional ID(s) : 0790298

Address: ; ,

Incident #

Site Classification

GW >1K-10K CONNECTION

No Industry Code Assigned

Location : HIGHWAY 59 @ CRABB RIVER ROAD

KEY MAP 607N

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	FORT BEND COUNTY MUD 109

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Mail Contact	ENVIRONMENTAL SERVICES MANAGER	MR MICHAEL THORNHILL	Work	(281) 340-1607

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	invest.type
QUALITY REVIEW - PWS	qa

Investigation Comments :

An investigation of Fort Bend County MUD 109 was conducted on January 10, 2003. Present at the investigation were Mr. Mike Thornhill, Chris Manthei, and Mark Wahlstrom, who can be contacted at (281)340.1607. The water system, which is a distribution only system, provides service to 1050 connections in the Greatwood Subdivision with a population of 3150 and is operated by ECO RESOURCES. The operation company 3 or more operators that hold a B groundwater operations license.

The Community water system receives water from Fort Bend County MUD 106 (operated by ST Environmental Services).

During the investigation no violations were noted, please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

Signed HMcCoy
Environmental Investigator

Date 01.16.03

Signed Barry
Supervisor

Date 1/21/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : CCI
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
IWU A
PWS - System Fac & Cap.
PWS - micro & Chem Monitoring

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	21393	Additional ID(s)	0790298	Investigation Date	01.10.2003

SYSTEM FACILITIES

Number of Connections 1050

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
			distribution only						

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? ________ Describe: ____________________
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM		
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG		
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG		
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM		
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	Fort Bend County MUD 109	Additional ID(s)	0790298
Investigation #	21393	Investigation Date:	01.10.2003

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 4 # Submitted 4
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Y Date, Last Analysis IOC - NO_2/NO - RC 1.28.97 VOC - SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons): -

Date of maximum daily usage: -

Average daily usage: -

Time period for average daily usage: -

Tested Distribution psi: 65 Location(s): 7418 Greatwood Grove Drive

Tested Chlorine Residual: 1.66 mg/L Free Location(s): 7418 Greatwood Grove Drive

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Fort Bend County MUD 109	Additional ID(s)	0790298
Investigation #	21393	Investigation Date:	01.10.2003

Description of Supply, Source, Treatment, and Chemicals Used

Distribution Only System

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

May 7, 2002

Ms. Lisa Rickert, President
Fort Bend County MUD # 111
12550 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD #111, Hwy. 99, Fort Bend County, Texas
TNRCC ID No. 0790317

Dear Ms. Rickert:

On April 26, 2002, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend Co. Health Dept.

PUBLIC . ER SUPPLY REGULATORY P. AM

REGULATED ENTITY DATA KM 567T /U

ID No. 0790317 GW multi: # 0 SW multi : # 0 Community x NTNC ____ Non-Comm ____

CCN No. - Superior - Approved - Probation - Region 12

Name of System Fort Bend County MUD # 111 County Fort Bend

Physical location New Territory Subdivision- Point Royal , Hwy 99 @ Hwy 90A

Responsible Official Ms. Lisa Rickert Title President Phone 281.240.1300

Mailing Address 12550 Emily Court Sugar Land Texas 77478 FAX 281.579.1029

Chief Cert Op Name Chris Manthei Grade & Type A - GW Phone 281.340.1640

2nd Op Req'd? yes Name John Subia Grade & Type B - GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Chris Manthei, John Subia Area Served New Territory - Pointe Royal

Supplier and Source purchase water from Fort Bend Co. MUD 112

Interconnection w/other PWS? yes Name PWS I/C Ft. Bend County MUD # 112 Type I/C open

Retail Service Connection 1126 Retail Meters 1126 Retail Population 3378

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge yes Dist. to and Name of Nearest 1 Miles to Ft. Bend Co. MUD # 112

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 06.13.2002

Map Attached no Previous Map OK? yes Well Operational Status distribution only

Description of Supply, Source, Treatment, and Chemicals Used:

Distribution only - Receiving treated water under pressure from Ft. Bend Co. MUD # 112.

Total Well Cap. 0 GPM 0 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 0 GPM 0 MGD

Total Elevated Storage 0 Total Storage 0 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage MG Date ____ Average Daily Usage MGD Time ____

Wholesale Contract - Maximum Purchase Rate 5,000 gal - 5 $

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 5/m # Submitted 5/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? yes Date, Last Analysis IOC - NO_2/N - RC - VOC - SOC -

List UNACCEPTABLE Values distribution only

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date ____

Date of Investigation 04.26.2002 By Helen Paeola

Date of Approval 5/7/02 By Barry Price Barry Price

Letter Date, if different from Approval Date ____ Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

2002 JUN 24 AM 10: 58

I.D. No.:	079031	urvey Date:	04.26.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	-	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	-	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	-	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	x		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	-		Proper Water Level Indicator Provided?	[43,c,4]	-	
Tanks Tight Against Leakage?	[43,c,6]	-		Drains Properly Connected?	[43,c,7]	-	
Vents Properly Installed?	[43,c,1]	-		Inlet and Outlet Properly Located?	[43,c,5]	-	
Openings Properly Screened	[43,c,1]	-		Disinfectant Residual in Water Storage Tanks	[46,d,2]	-	
Proper Roof Hatch Provided?	[43,c,2]	-		Intruder Resistant Fence?	[43,e]	-	
Roof Hatch Kept Locked?	[43,c,2]	-		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	-	
Proper Overflow Provided?	[43,c,3]	-		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	-	

III. PRESSURE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 60 psi Locations: 6606 Alicant

**Location: None

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	-		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used:				CL2 = 0.87 Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	-		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	-		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790317	urvey Date:	04.26.2002

VI. SYSTEM FACILITIES

Number of Connections 1126

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? N (Y / N)   Describe: distribution only

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM	-	
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG	-	
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG	-	
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM	-	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.   * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790317	urvey Date:	04.26.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N
Well/pump room protected from flooding?	[41,c,3,H]	-	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	-	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	-	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	-	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	-	

		Y	N
Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	-	
Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	-	
Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	-	
UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	-	
Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	-	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	-	
Well cased 18" above ground level?	[41,c,3,B]	-	
Proper concrete sealing block?	[41,c,3,J]	-	
Well head sealed?	[41,c,3,K]	-	
Casing vent properly installed?	[41,c,3,K]	-	
Air release devices properly installed?	[41,c,3,Q]	-	
Electrical Wiring installed in conduit?	[46,V]	-	

Suitable sampling tap?	[41,c,3,M]	-	
Well meter provided?	[41,c,3,N]	-	
Well blow-off properly installed?	[41,c,3,L]	-	
Well unit fenced or housed? *plank missing	[41,c,3,O]	-	
Well site properly drained?	[41,c,3,I]	-	
All weather road provided?	[41,c,3,P]	-	

VIII. ADDITIONAL COMMENTS:

*** Distribution only **

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

VNU

PWS/0790253/CO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

June 7, 2002

Dr. Randall Glenn, President
Fort Bend County MUD # 112
12550 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD # 112, 4603 Thomas Chapel Road, Fort Bend County, Texas
TNRCC ID No. 0790253

Dear Dr. Glenn:

On April 26, 2002, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation. At this time, your public water supply continues to merit recognition as a "Superior" system.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend Co. Health Dept.

PUBLIC ATER SUPPLY REGULATORY P GRAM

REGULATED ENTITY DATA

KM 567 W X

ID No. 0790253 **GW multi: #** 2 **SW multi : #** 0 **Community** x **NTNC** **Non-Comm**

CCN No. - Superior X Approved - Probation - Region 12

Name of System Fort Bend County MUD # 112 County Fort Bend

Physical location Plant # 1 - 4603 Thomas Chapel Road; Plant # 2 - 5505 Homeward Way; Plant #3 - 4421 New Territory Blvd.

Responsible Official Dr. Randall Glenn Title President Phone 281.240.1300

Mailing Address 12550 Emily Court Sugar Land Texas 77478 **FAX** 281.579.1029

Chief Cert Op Name Chris Manthei Grade & Type A - GW Phone 281.340.1640

2nd Op Req'd? yes Name John Subia Grade & Type B - GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Chris Manthei Area Served New Territory Subd. , MUD 67, 68, 69, 111

Supplier and Source District - 3 ground water wells

Interconnection w/other PWS? yes Name PWS I/C Ft. Bend County MUD # 67, 68, 69, 111 Type I/C open

Retail Service Connection 734 Retail Meters 734 Retail Population 2202

Wholesale Master Meters 4 Wholesale Service Connections 4036 Wholesale Population 14,310

Charge yes Dist. to and Name of Nearest 6 **Miles to** City of Sugar Land

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 06.13.2001

Map Attached no Previous Map OK? yes Well Operational Status no changes

Description of Supply, Source, Treatment, and Chemicals Used:

Ground water - 3 wells, 6 pressure tanks, 6 ground storage tanks, 12 booster pumps, auxilllary power and distribution. Treatment: gas chlorination , and polyphosphate (MICO) ; injection points prior to storage.

Total Well Cap. 4700 GPM 6.768 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 13650 GPM 19.656 MGD

Total Elevated Storage 0 Total Storage 2.2 MG Pressure Tank Cap. 0.175 MG

Maximum Daily Usage 5.482 MG Date 7.12.01 Average Daily Usage 3.936 MGD Time 03.01 - 02.02

Wholesale Contract 10$ - 1st 10K gallons Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 3/m # Submitted 3/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? yes Date, Last Analysis IOC 10.7.98 NO_2/N 2.5.98 RC 2.5.98 VOC 10.7.98 SOC -

List UNACCEPTABLE Values none

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 04.26.2002 By Helen Pagola HP

Date of Approval 6/7/02 By Barry Price Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

2002 JUN 24 AM 10: 18

I.D. No.:	079025[illegible]	Survey Date:	04.26.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	x	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 62 psi Locations: 1310 Tahoe Valley Lane

**Location: None

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: gas chlorination				CL2 = 1.01 _Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790253	Survey Date:	04.26.2002

VI. SYSTEM FACILITIES

Number of Connections 4627

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	4603 Thomas Chapel Road	° ' " / ° ' "	O	1058'	VT	1500	1900 4.26.02
002	B	2	5505 Homeward Way	° ' " / ° ' "	O	892'	VT	1500	2800 4.26.02
003	C	3	4421 New Territory Blvd	° ' " / ° ' "	OOS	1600'	sub	2600	2680 6.13.01

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	0.35	welded steel	plant # 1
ground storage tank	0.3	welded steel	plant # 1
pressure tank	0.025	welded steel	plant # 1
pressure tank	0.03	welded steel	plant # 1
ground storage tank	0.25	welded steel	plant # 2
ground storage tank	0.3	welded steel	plant # 2
pressure tank	0.03	welded steel	plant # 2
pressure tank	0.03	welded steel	plant # 2
ground storage tank	0.5	welded steel	plant 3
ground storage tank	0.5	welded steel	plant 3
pressure tank	0.03	welded steel	plant 3
pressure tank	0.03	welded steel	plant 3

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1.1	1000	plant 1	2.1	1250	plant 2	3.1	1650	plant 3
1.2	750	plant 1	2.2	1250	plant 2	3.2	1650	plant 3
1.3	750	plant 1	2.3	2000	plant 2	3.3	2200	plant 3
1.4	1000	plant 1	2.4	2000	plant 2	3.4	2200	plant 3

Emergency Power /Alternate Source? Y (Y/N) Describe: diesel engine on both wells

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	4770	Conn =	2862	GPM	4700	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	4770	Conn =	0.0954	MG	0.175	MG	x	
Ground/Total Storage	200	Gal/Conn X	4770	Conn =	0.954	MG	2.2	MG	x	
Service Pumping Cap.	2	GPM/Conn X	4770	Conn =	9540	GPM	13,650	GPM	x	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790253	Survey Date:	04.26.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

		Y	N			Y	N
Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

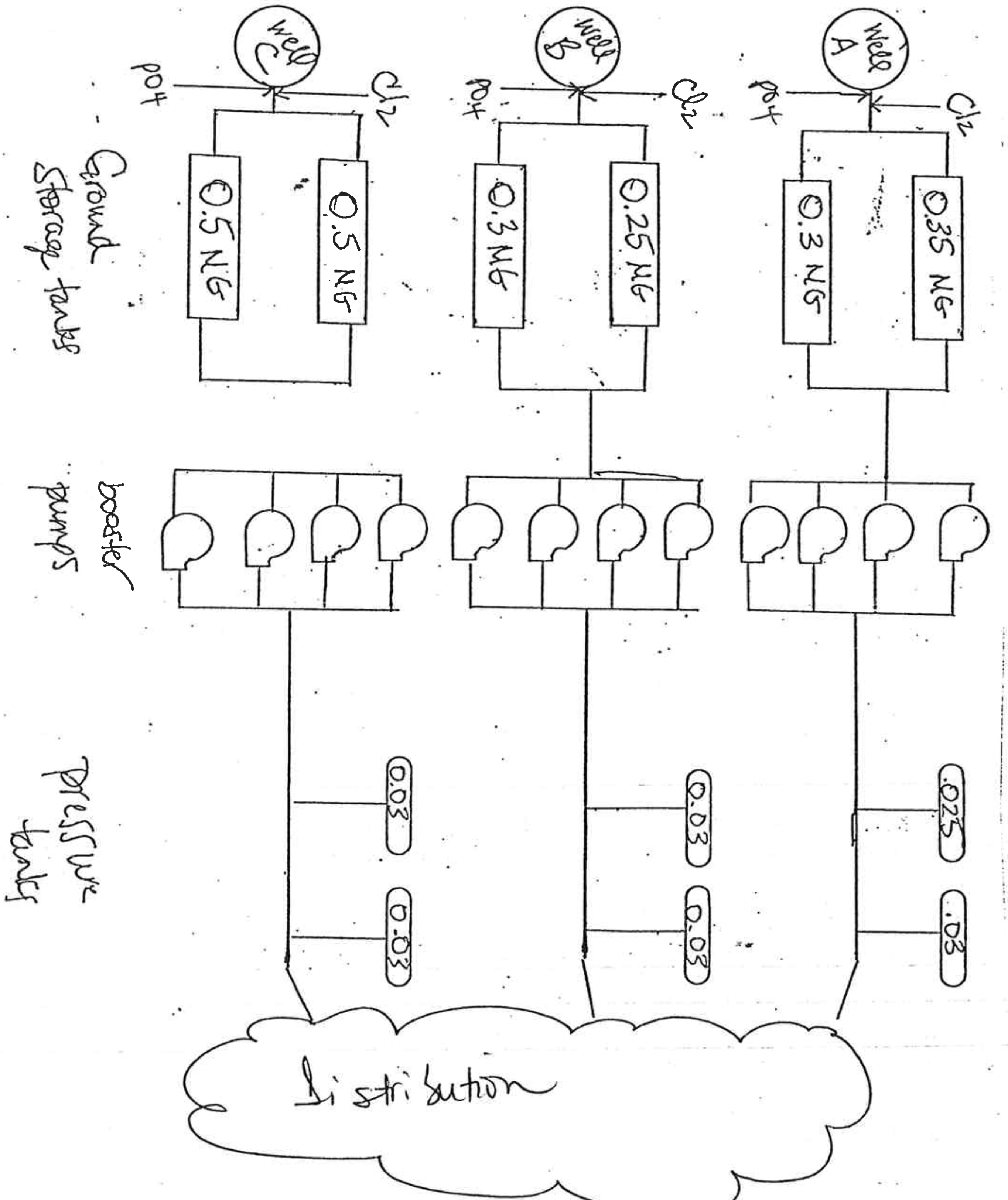
Number of A Violations: **Number of B Violations:**   **Number of C Violations:**

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Fort Bend County MUD # 112**	**ID#:**	**0790253**
Survey Date:	**04.26.2002**	**Surveyed By:**	**Helen Pagola**

Description of Supply, Source, Treatment, and Chemicals Used



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

June 15, 2000

Mr. Joseph Norrell, President
Ft. Bend MUD #117
16337 Park Row
Houston, Texas 77084

Re: Public Water Supply:
Ft. Bend MUD #117, Fairview I & II, Ft. Bend Co., Texas
TNRCC ID #0790375

Dear Mr. Norrell:

On June 7, 2000, Mr. Barry H. Price Jr. of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an inspection of the above-referenced facility to evaluate compliance with applicable public water supply requirements. No violations were documented during the inspection.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Barry H. Price Jr. in our Houston Region Office at 713/767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols, Jr., P.E.
PWS Team Leader
Houston Region Office

RLE/bhp

cc: Ft Bend Co. Health Dept.

PUBLIC WATER SUPPLY REGULATORY PROGRAM

WATER SYSTEM DATA

KM 567D

ID No. 0790375 **Community** X **NTNC** ____ **Non-Comm** ____

CCN No. * Superior * Approved * Probation * Region 12

Name of System FT Bend MUD No 117 County Ft Bend

Physical location Fairview I & II ; Brooksmill I & II

Responsible Official Joseph Norrell Title President Phone# (281) 578-4281

Mailing Address 16337 Park Row, Houston, Texas 77084

Chief Cert Op Name Al Alberson Grade & Type C - GW Phone (281) 578-4281

2nd Op Req'd? No Name Carl West Grade & Type C - GW Total # Cert. Ops. 4

WS Manager/Superintendent ST Environmental Services Other Officials Contacted None

Surveyed With Gary Benderim Area Served Subdivision

Supplier and Source Supplier - Wholesale - Ground

Interconnection w/other PWS? Yes Name PWS I/C Ft Bend Co. MUD #106 Type I/C open

Retail Service Connections 80 Retail Meters 80 Retail Population 240

Wholesale Master Meters 0 Wholesale Service Connections 0 Wholesale Population 0

Charge ? Yes Dist. to and Name of Nearest PWS 1/2 Mile Ft Bend Co. MUD #106

Reason for this Survey (Routine, Follow Up, Initial, Enforcement, Complaint, Other) Initial Previous Survey Date None

Map Attached No Previous Map OK? No Well Operational Status Changed? No well or storage system

Description of Supply, Source, Treatment, and Chemicals Used:

System is purchasing treated water from Ft. Bend.Co. MUD #106

Total Well Cap. 0 gpm 0 mgd RAW Cap. 0 gpm 0 mgd

Treatment Cap. 0 gpm 0 mgd Total Svc. Pump Cap. 0 gpm 0 mgd

Total Elevated Storage 0 Total Storage Cap. 0 Pressure Tank Cap. 0

Maximum Daily Usage * Date * Average Daily Usage 0.002 Time Period 5/99 - 4/00

Wholesale Contract None Maximum Purchase Rate None

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	*	
Well(s) Surface Water Influenced?		X
Acceptable Sample Siting Plan on File? .106	X	

Number of Samples Required 1 Mo. # Submitted 1 Mo.

Number of Raw Samples Required 0 # Submitted 0

Non-Comm Dates of Operation * Thru *

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC * NO_2/NO_3 * RC * VOC * SOC *

List UNACCEPTABLE Values See test results for Ft. Bend Co. MUD #106

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date

Date of Survey 6/7/00 By Barry H. Price Jr. Barry H. Price Jr.

Date of Approval 06/16/00 By Ross L. Scholz

Letter Date, if different from Approval Date ____ Reply Requested ____ Def. Score of this Survey 0

* = Not Applicable
U=Unknown

OPERATION AND MAINTENANCE

Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,d]	*		Distribution Map Up-to-Date?	[46,n]	X	
MOR's Properly Completed?	[46,d]	X		Ownership Signs Properly Displayed and Maintained?	[46,w]	*	
Dead End Mains Flushed?	[46,l]	X		Adequate Chemical Storage Provided?	[42,d,6]	*	
New Lines and Repairs Disinfected?	[46,g]	X		ANSI/NSF Approved Chem/Media?	[42]	*	
Supply of Disinfectant on Hand?	[46,h]	X		Facilities Properly Maintained?	[46,m&p]	*	
				If Superior/Approved, Signs Properly Disp. & Maint.	[47,b]	*	

II. STORAGE TANKS

Storage Tanks Properly Covered?	[43,c]	*		Proper Water Level Indicator Provided?	[43,c,4]	*	
Tanks Tight Against Leakage?	[43,c,6]	*		Drains Properly Connected?	[43,c,7]	*	
Vents Properly Installed?	[43,c,1]	*		Inlet and Outlet Properly Located?	[43,c,5]	*	
Proper Roof Hatch Provided?	[43,c,2]	*		Intruder Resistant Fence?	[43,e]	*	
Roof Hatch Kept Locked?	[43,c,2]	*		Tanks Properly Inspected, Maintained, Docs.	[46,p,1]	*	
Proper Overflow Provided?	[43,c,3]	*		Below Ground Storage Properly Located?	[43,b]	*	
				Inspection Ladder Provided?	[43,c]	*	

III. PRESSURE TANKS

ccurate Pressure Gauges?	[43,d,2]	*		Tanks Tight Against Leakage?	[43,d,7]	*	
ressure Release Device Provided?	[43,d,2]	*		Routinely Inspected, Maintained, Documented?	[46,p,2]	*	
roper Facilities for Air/Water Ratio/Air filter?	[43,d,3]	*		Fenced or Housed?	[43,e]	*	
ir-Water Volume Indicator Provided?	[43,d,3]	*		ASME, if Required?	[43,d,1]	*	

IV. DISTRIBUTION

Plumbing Ordinance or Agreement?	[46,i]	X		Properly Installed Distribution Piping?	[44,a]	X	
Customer Service Inspection Program?	[46,j]	X		Adequate Flush/Gate Valves?	[44,d,6]	X	
ackflow Assembly Report Recorded, if needed?	[44,h,4,D]	X		Air Release Valves Properly Installed?	[44,d,1]	X	
ewer Lines Properly Located?	[44,e]	X		In-Line Booster Pumps in System? **	[44,d,2]	*	
linimum Residual Pressure ≥ 20 PSI?	[44,d&46,u]	X		In-Line Booster Pumps in System Approved?	[44,d,2]	*	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,u]	X		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	*	

sted psi/Locations: **62 PSI @ 1623 Summer Rain Dr.**

**Location:*

. DISINFECTION

Disinfection Equipment Adequate in Capacity?	[42,e]	*		Adequate Residual Maintained/Recorded?	[46,f,1,2]	X	
Type Disinfection Used: *				Mg/L ,T(F)/Locations: **0.68 mg/L @ 1623 Summer Rain Dr.**			
Disinfection Equipment Properly Housed?	[42,e,6,8]	*		Evacuation Plan Cl_2NH_3? If needed	[42,e,11]	*	
isinfection Room Properly Vented?	[42,e,7]	*		DPD Chlorine Test Kit Provided?	[46,f,2]	X	
reathing Apparatus and Ammonia Bottle Provided?	[42,e,5]	*		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,4,D]	*		Properly Housed/Vented?	[42,e,10]	*	
Disinfection Prior to Storage?	[42,e,2,3]	*		Scales or Gauges Provided?	[42,e,4,D]	*	

= Not applicable
= Unknown

VI. SYSTEM FACILITIES

Number of Connections 80

WELLS (*Y/N*) OR RAW WATER PUMPS (*Y/N*) - NONE

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/Est GPM/Date

STORAGE RESERVOIRS AND PRESSURE TANKS - NONE

Type	Capacity	Material	Location

SERVICE PUMPS - NONE

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? NO (Y/N) Describe: Distribution only system

SYSTEM CAPACITIES	See Ft Bend Co MUD #106 meets Demand				Required		Provided		Y	N
Well Production	*	Gal/Conn X	*	Conn =	*	GPM	*	GPM	*	
Elevated/Pressure Storage	*	Gal/Conn X	*	Conn =	*	MG	*	MG	*	
Ground/Total Storage	*	Gal/Conn X	*	Conn =	*	MG	*	MG	*	
Service Pumping Cap.	*	GPM/Conn X	*	Conn =	*	GPM	*	GPM	*	
Service Pump Peaking Factor	*	MDD/1,440 X	*	**	*	GPM	*	GPM	*	

** Factor = 1.25 or 1.85, MDD Listed as gallons.

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE GUI: Y/N

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	*		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,C]	*	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	*		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	*	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	*		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	*	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	*		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	*	
Drainage ditch or lift station ≥300 ft.?	[41,c,1,B]	*		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	*	

B. CONSTRUCTION

Sanitary easement(s)recorded?	[41,c,1,F]	*		Suitable sampling tap?	[41,c,3,M]	*	
Well cased 18" above ground level?	[41,c,3,B]	*		Well meter provided?	[41,c,3,N]	*	
Proper pressure cement?	[41,c, 3, C]	*		Well blow-off properly installed?	[41,c,3,L]	*	
Proper concrete sealing block?	[41,c,3,J]	*		Well unit fenced or housed?	[41,c,3,O]	*	
Well head sealed?	[41,c,3,K]	*		Well site properly drained?	[41,c,3,I]	*	
Casing vent properly installed?	[41,c,3,K]	*		All weather road provided?	[41,c,3,P]	*	
Air release devices properly installed?	[41,c,3,Q]	*					

VIII. ADDITIONAL WATER SYSTEM DEFICIENCIES AND TAC REFERENCES :

A. RATING DEFICIENCY SCORE

A. Certified Operator(s) If Required

1. None Surface	10 Pt.s	________
2. None Ground	4 Pt.s	________
3. Only one when two required	4 Pt.s	________
4. Improper certification	4 Pt.s	________

B. MCL Violations

1. Microbiological:		
Failure to sample	4/mo	________
MCL violation	10/vio	________
2. Primary standards	10/vio	________
3. Secondary standards	2/vio	________
4. Turbidity:		
Failure to report	4/mo	________
MCL violation	10/mo	________

C. Distribution

Pressure < 20 psi	10 Pt.s	________
Pressure < 35	4 Pt.s	________
Distribution problems	2 Pt.s	________
Treated water protection	3 Pt.s	________
Disinfection provided, but residual < 0.2 mg/l Free Chlorine or 0.5 mg/l Chloramine	4 Pt.s	________

D. Design

1. Ground Water		
No disinfection	10 Pt.s	________
Improper well location	4 Pt.s	________
No easement	4 Pt.s	________
Well construction deficiencies	3/item	________
2. Surface Water:		
No disinfection	20 Pt.s	________
No filtration	20 Pt.s	________
Excess filter rate	4 Pt.s	________
Inadequate chemical feed	4 Pt.s	________
Inadequate detention time	4 Pt.s	________
3. General:		
Production deficient	4 Pt.s	________
Storage deficient:		
Elevated or Pressure	4 Pt.s	________
Total storage Deficient	4 Pt.s	________

TOTAL, A + B + C + D = 0

WATER PLANT INSPECTIO[illegible]
DATA SHEET

DISTRICT: Fort Bend County MUD 117 I.D./PERMIT NO. 0790375

PRESIDENT: Joseph Norrell

ADDRESS: C/O SEVERN TRENT ENVIRONMENTAL SERVICES
16337 PARK ROW
HOUSTON, TEXAS 77084 } mailing

1623
Summer Rain Dr.
62 PSI
.68 mg/L

TELEPHONE: (281) 578-4281

PLANT OPERATOR: LICENSE:

FIELD COORDINATOR: Al Alberson LICENSE: C/467-17-3940/9-10-00
2nd oper Carl West C

RESIDENTIAL METERS:	70	RESIDENTIAL METERS:	70
APARTMENT METERS:	0	APARTMENT UNITS:	0
COMMERCIAL METERS:	10	COMMERCIAL METERS:	10
TOTAL METERS:	80	TOTAL CONNECTIONS:	80

AVERAGE DAILY PUMPAGE/FLOW: 2,000 ~~19,000~~ (past 12 months) PERIOD: May, 99 (MN/YR) TO April, 00 (MN/YR)

MAXIMUM DAILY PUMPAGE/FLOW: 19,000 (past 12 months) DATE: April, 00

RESIDENTIAL WATER RATE: 0-1,000 1.05/1000 COMMERCIAL WATER RATE:

Residential		Commercial
1" Meter & under	$9.00	same as residential
1 1/2"	$18.00	
2"	$28.00	
3"	$60.00	
4"	$165.00	

g:\qc\gb\inspform.doc

6" $324.00
8" $405.00

PWS/0790382/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 5, 2003

Mr. Stephen Brown, President
Fort Bend County MUD 119
2300 First City Tower, 1001 Fannin Street, Ste. 2300
Houston, Texas 77002

Re: Compliance Evaluation Investigation at:
Fort Bend County MUD 119, 15050 McKaskle, Fort Bend County, Texas
TCEQ ID No. 0790382

Dear Mr. Brown:

On January 23, 2003, Ms. Helen Pagola McCoy of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola McCoy in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hpm

cc: Fort Bend Co. Health Dept.

Texas Co..mission on Environmental Quality

Investigation Report

FORT BEND COUNTY MUD 119

FORT BEND COUNTY MUD 119

RN102997608

Investigation # 23728

Investigator: HELEN PAGOLA

Incident #

Site Classification
GW 251-1K CONNECTION

Conducted: 01/23/2003 -- 01/23/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

No Industry Code Assigned

Investigation Type : Compliance Investigation

Location : 15050 MCKASKLE

KEY MAP 567D

Additional ID(s) : 0790382

Address: ; ,

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	FORT BEND COUNTY MUD 119

Contact(s) :

Role	Title	Name	Phone
Participated in Investigation	ASSISTANT MANAGER	MR LONNIE COX	Work (281) 578-4200 Cell (281) 850-8588
Regulated Entity Mail Contact	PRESIDENT OF THE BOARD	MR STEPHEN BROWN	Work (281) 578-4200

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	investigation type
QUALITY REVIEW - PWS	qa review

Investigation Comments :

An investigation of Fort Bend County MUD 119, Registration # P1224 was conducted on January 23, 2003. Present at the investigation were Lonnie Cox and James West, who can be contacted at (281)578.4200. The water system, which consists of one entry point, provides service to 923 connections in the Woodbridge Place Subdivision with a population of 2769 and is operated by ST Environmental Services. The operation company has 1 operator that holds an B groundwater operation license. + 1 "C" GW

The Community water system is comprised of 1 plant located at 15050 McKaskle. The water system consists of groundwater, one well, two ground storage tanks, five service pumps, two pressure tanks and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine. Emergency power is provided for the entire plant by a diesel generator. The facility

maintains a closed interconnect with Fort Bend County MUD 2.

Facility Location and Information:
Entry Point 1- Located at 15050 McKaskle: consists of 1 submersible well (1550 gpm), 2 ground storage tanks (0.2 MG), 5 service pumps (5 @ 1000 gpm), 2 pressure tanks (0.02 MG), diesel generator, and distribution. Treatment is gas chlorination; injection is prior to ground storage tank.

During the investigation no violations were noted. Please see attached summary of investigation findings.

Please see attached PWS system information sheets for details regarding this public water supply system.

No Violations Associated to this Investigation

2003 HM

Signed HM McCoy
Environmental Investigator

Date 02.03.~~02~~

Signed Barry H...
Supervisor

Date 2/5/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)

✓ Letter to Facility (specify type) : CC 1

Investigation Report

___Sample Analysis Results

___Manifests

___NOR

✓ Maps, Plans, Sketches

___Photographs

___Correspondence from the facility

✓ Other (specify) :
IWUD
capacity
microbiological

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	23728	Additional ID(s)	0790382	Investigation Date	01.23.2003

SYSTEM FACILITIES

Number of Connections 923

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	15050 McKaskle		O	1266'	VT	1500	1550 01.23.03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	0.2	Bolted steel	well site
ground storage tank	0.2	Bolted steel	well site
pressure tank	0.02	welded steel	well site
pressure tank	0.02	welded steel	well site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1000	well site	5	1000	well site			
2	1000	well site						
3	1000	well site						
4	1000	well site						

Emergency Power /Alternate Source? Yes Describe: Diesel generator - runs whole plant
(Y / N)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	923	Conn =	553.8	GPM	1550	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	923	Conn =	0.019	MG	0.04	MG	x	
Ground/Total Storage	200	Gal/Conn X	923	Conn =	0.19	MG	0.4	MG	x	
Service Pumping Cap.	2	GPM/Conn X	923	Conn =	1846	GPM	5000	GPM	x	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	**Fort Bend County MUD 119**	**Additional ID(s)**	**0790382**
Investigation #	**23728**	**Investigation Date:**	**01.23.2003**

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 3 # Submitted 3

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Y Date, Last Analysis IOC - NO_2/NO - RC 10.11.01 VOC 10.11.01 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ________

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons): 1.064 MG

Date of maximum daily usage: 06.05.2002

Average daily usage: 0.458 MG

Time period for average daily usage: 01/2002 - 12/2002

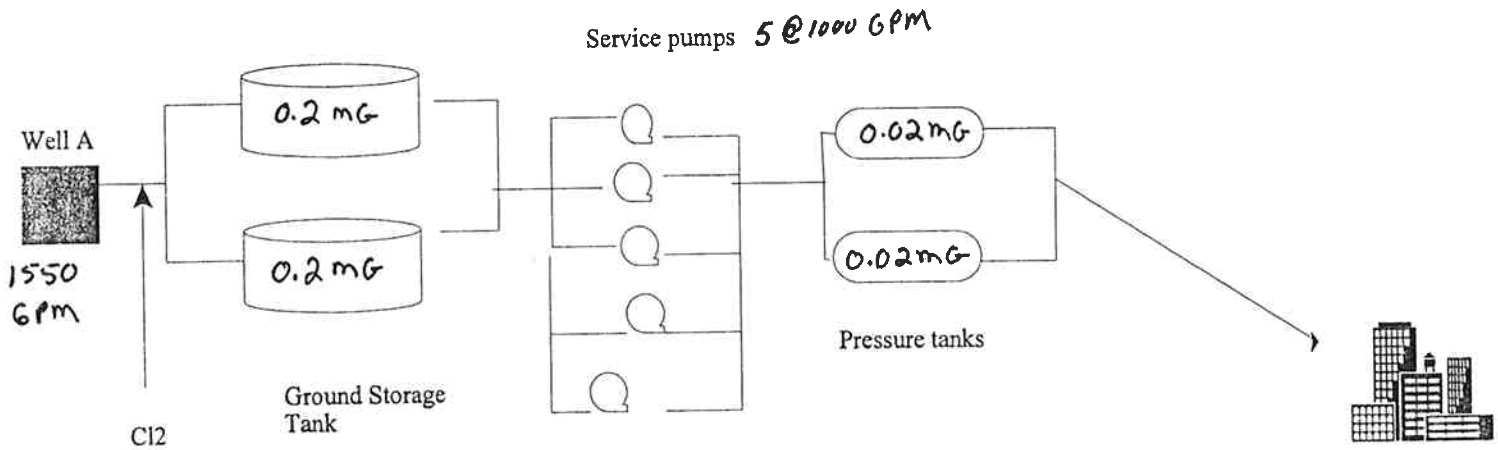
Tested Distribution psi: 62 Location(s): 14939 Bennets Mill

Tested Chlorine Residual: 1.33 mg/L Free Location(s): 14939 Bennets Mill

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Fort Bend County MUD 119	Additional ID(s)	0790382
Investigation #		Investigation Date:	01.23.2003

Description of Supply, Source, Treatment, and Chemicals Used



PWS/0790158/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

April 30, 2003

Mr. Robert C. Shindler, President
Kingsbridge MUD
12535 Reed Road
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Kingsbridge MUD, 14106 Old Richmond Road, Fort Bend County, Texas
TCEQ ID No. 0790158

Dear Mr. Shindler:

On April 4, 2003, Ms. Elaine Jackson of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Texas Con..nission on Environmen..al Quality

Investigation Report

KINGSBRIDGE MUD

KINGSBRIDGE MUD

RN102684727

Investigation # 34039

Investigator: ELAINE JACKSON

Conducted: 04/04/2003 -- 04/04/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Additional ID(s) : 0790158

Incident #

Site Classification

GW >1K-10K CONNECTION

No Industry Code Assigned

Location : KEY MAP 528S

Address: 14106 OLD RICHMOND ROAD; SUGAR LAND, TX 77478

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	KINGSBRIDGE MUD

Contact(s) :

Role	Title	Name	Phone	
Participated in Investigation	OPERATOR	MR DALE CLAYTON	Work	(281) 578-6800
Participated in Investigation	OPERATOR	RUSSELL FEATHERS	Work	(281) 578-6800
Regulated Entity Mail Contact	PRESIDENT	MR ROBERT SHINDLER	Other	(281) 578-6800

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	INVESTIGATION

Investigation Comments :

An investigation of Kingsbridge MUD was conducted on April 4, 2003. Present at the investigation were Mr. Dale Clayton and Russell Feathers, Operators, who can be contacted at (713) 983- 9096. Mr. Robert Shindler is the President of water system. The water system, which consists of one entry point, provides service to 2220 connections in the Kingsbridge, Dover, Teal Briar Waterford and Providence Subdivisions with a population of 6660 and is operated by and managed by Eco Resources, Inc. The operation company has 2 0perators that hold an C groundwater operations license at this facilities..

The Community water system is comprised of 1 plant located at 14106 Old Richmond Road. The water system consists of groundwater, one well, one ground storage tank, four service pumps, three pressure tanks and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorination. Emergency power is provided for the entire plant by a diesel generator. The facility is interconnected with Fort Bend MUD #2 (2174 conn.) and Renn Road MUD (1023 conn.) Kingsbridge (2220 conn.)= 5417x 0.35= 1895 gpm. Interconnect meets the 0.35 gpm/conn.

Facility Location and Information:
Entry Point 1- Located at : 14106 Old Richmond Road, consists of 1 vertical turbine well #1 @ 1800 gpm, 1 ground storage tank 0.500 MG, 4 service pumps, 1 @ 1300 gpm, 2 @ 600 gpm, 1 @ 1300 gpm, 2 pressure tanks @ 0.03 MG and 1 @ 0.010 MG, diesel generator and right angle drive on service pump #1, and distribution. Treatment is gas chlorination; injection is prior to ground storage tank.

No Violations Associated to this Investigation

Signed Elaine Jackson
Environmental Investigator

Date 4/25/03

Signed Barry Hun[illegible]
Supervisor

Date 4/29/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : compl.
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) : Capacities, Micro. & Chem., data form

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	34039	Additional ID(s)	0790158	Investigation Date	4/4/2003

Number of Connections 2220

SYSTEM FACILITIES

WELL

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	14106 Old Richmond Road	See previous survey	O	1505'	VT	1600	1800 4/4/03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.50	Welded Steel	Well Site
PT	0.030	Welded Steel	Well Site
PT	0.030	Welded Steel	Well Site
PT	0.010	Welded Steel	Well Site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1300	Well Site						
2	600	Well Site						
3	600	Well Site						
4	1300	Well Site						

Emergency Power /Alternate Source? Yes (Y) Describe: Right angle drive on service pump #1

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	2220	Conn =	1332	GPM	1800	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	2220	Conn =	0.0444	MG	0.070	MG	x	
Ground/Total Storage	200	Gal/Conn X	2220	Conn =	0.444	MG	0.5	MG	x	
Service Pumping Cap.	2	GPM/Conn X	2220	Conn =	4440	GPM	3800	GPM	x	
Service Pump Peaking Factor	2	MDD/1,440 X	1.85	**	2073	GPM	2500	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	Kingsbridge MUD	**Additional ID(s)**	0790158
Investigation #	34039	**Investigation Date:**	4/4/2003

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?	-	
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 7 # Submitted 7/mo.
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 9/39/2002 NO_2/NO 6/12/95 RC 6/2/99 VOC 9/30/02 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date -

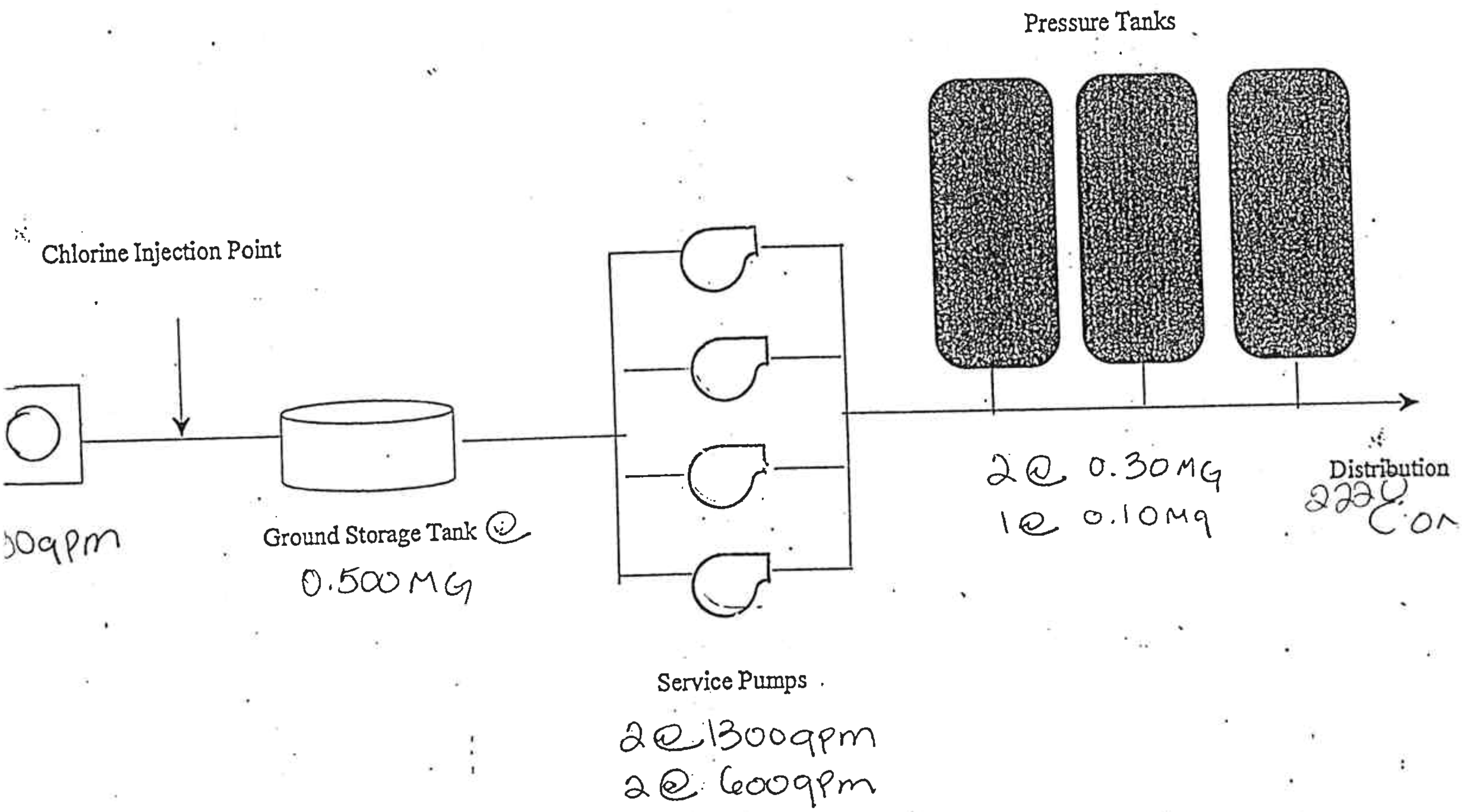
Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons):
1.614 MG
Date of maximum daily usage:
6/6/02
Average daily usage:
0.633 MG
Time period for average daily usage:
3/02- 3/03
Tested Distribution psi: 45 psi Location: 14810 Dale Bordon

Tested Chlorine Residual: 1.13 mg/L Free Location: Same

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Kingsbridge MUD**	**Additional ID(s)**	**0790158**
Investigation # 34039	**Investigation Date:**	4/4/2003	
Description of Supply, Source, Treatment, and Chemicals Used			



√NV

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

PWS/ ~~S~~/ 0790025 /CCO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

August 23, 2001

The Honorable James O. McDonald, Mayor
Meadows City of
P.O. Box 964
Meadows, Texas 77477

Re: Compliance Evaluation Investigation at:
Meadows City of, 11083 South Kirkwood, Ft Bend County, Texas
TNRCC ID No. 0790025

Mayor McDonald:

On August 8, 2001, Ms. Elaine Jackson of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
PWS Team Leader
Houston Region Office

HDL/ej

cc: Fort Bend Co. Health Dept.

PUBLIC W TER SUPPLY REGULATORY PR RAM

REGULATED ENTITY DATA

KM 569 B

ID No. 0790025 **GW multi: #** 3 **SW multi : #** - **Community** x **NTNC** **Non-Comm**

CCN No. - Superior - Approved - Probation - **Region** 12

Name of System Meadows, City of County Ft Bend

Physical location 11083 South Kirkwood

Responsible Official James O. McDonald Title Mayor Phone (281) 983- 2950

Mailing Address P.O. Box 964 Meadows Place, Texas 77477 **FAX** U

Chief Cert Op Name Daniel K. McGraw Grade & Type B-CW Phone (281) 983- 2950

2nd Op Req'd? Yes Name William Marshall Grade & Type DW Total # Cert. Ops. 2

WS Manager/Superintendent Daniel L. McGraw Other Officials None

Surveyed With Daniel L. McGraw and William Marshall Area Served City of Marshall

Supplier and Source City- Ground- 3 Wells

Interconnection w/other PWS? No Name PWS I/C - Type I/C -

Retail Service Connection 1686 Retail Meters 1686 Retail Population 5058

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge Yes Dist. to and Name of Nearest 1/4 **Miles to** Park Glen MUD

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 5-15-00

Map Attached No Previous Map OK? Yes Well Operational Status New motor - well #1

Description of Supply, Source, Treatment, and Chemicals Used:

System consists of 3 Wells, 3 Ground Storage Tanks, 4 Pressure Tanks, 8 Service Pumps and Distribution
Treatment: Gas Chlorination prior to storage

Total Well Cap. 3750 GPM 5.4 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 4750 GPM 6.84 MGD

Total Elevated Storage 0.0 MG Total Storage 0.980 MG Pressure Tank Cap. 0.055 MG

Maximum Daily Usage 0.999 MG Date Average Daily Usage 0.0127 MGD Time 6/01-7/00

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?		x
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 6 # Submitted 7/mo.

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 6-19-01 NO_2/N 4-13-99 RC 6-19-01 VOC 6-19-01 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 8-8-01 By Elaine Jackson

Date of Approval 8/23/01 By [signature]

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

SEP 24 REC'D

I.D. No.:	0790025	Survey Date:	8-8-01

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

Ground Storage Tank was inspected 5-15-01

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested **_62 psi** Locations: **_Office**

**Location:

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Chlorination**				CL2 = 0.71 Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790025	Survey Date:	8-8-01

VI. SYSTEM FACILITIES

Number of Connections 1686

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	11803 S. Kirkwood	° ' " / ° ' "	O	1100'	VT	U	1050 8-8-01
002	B	2	Dorrance & Dairy Ashford	° ' " / ° ' "	O	1100'	VT	U	1100 8-8-01
003	C	3	11975 W. Airport	° ' " / ° ' "	O	1066'	VT	U	1600 8-8-01
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.280 MG	Bolted Steel	Plant #1
PT	0.015 MG	Welded Steel	Plant #1
PT	0.010 MG	Welded Steel	Plant #1
GST	0.280 MG	Bolted Steel	Plant #2
PT	0.010 MG	Welded Steel	Plant #2
GST	0.420 MG	Bolted Steel	Plant #3
PT	0.020 MG	Welded Steel	Plant #3

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1-1	500	Plant #1	2-2	500	Plant #2			
1-2	500	Plant #1	3-1	750	Plant #3			
1-3	500	Plant #1	3-2	750	Plant #3			
2-1	500	Plant #2	3-3	750	Plant #3			

Emergency Power /Alternate Source? Yes (Y) Describe: Diesel Engine at each plant

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	1686	Conn =	1012	GPM	3750	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	1686	Conn =	0.034	MG	0.055	MG	x	
Ground/Total Storage	200	Gal/Conn X	1686	Conn =	0.337	MG	0.98	MG	x	
Service Pumping Cap.	2	GPM/Conn X	1686	Conn =	3372	GPM	4750	GPM	x	
Service Pump Peaking Factor	1	MDD/1,440 X	1.85	**	1283	GPM	4000	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790025	Survey Date:	8-8-01

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

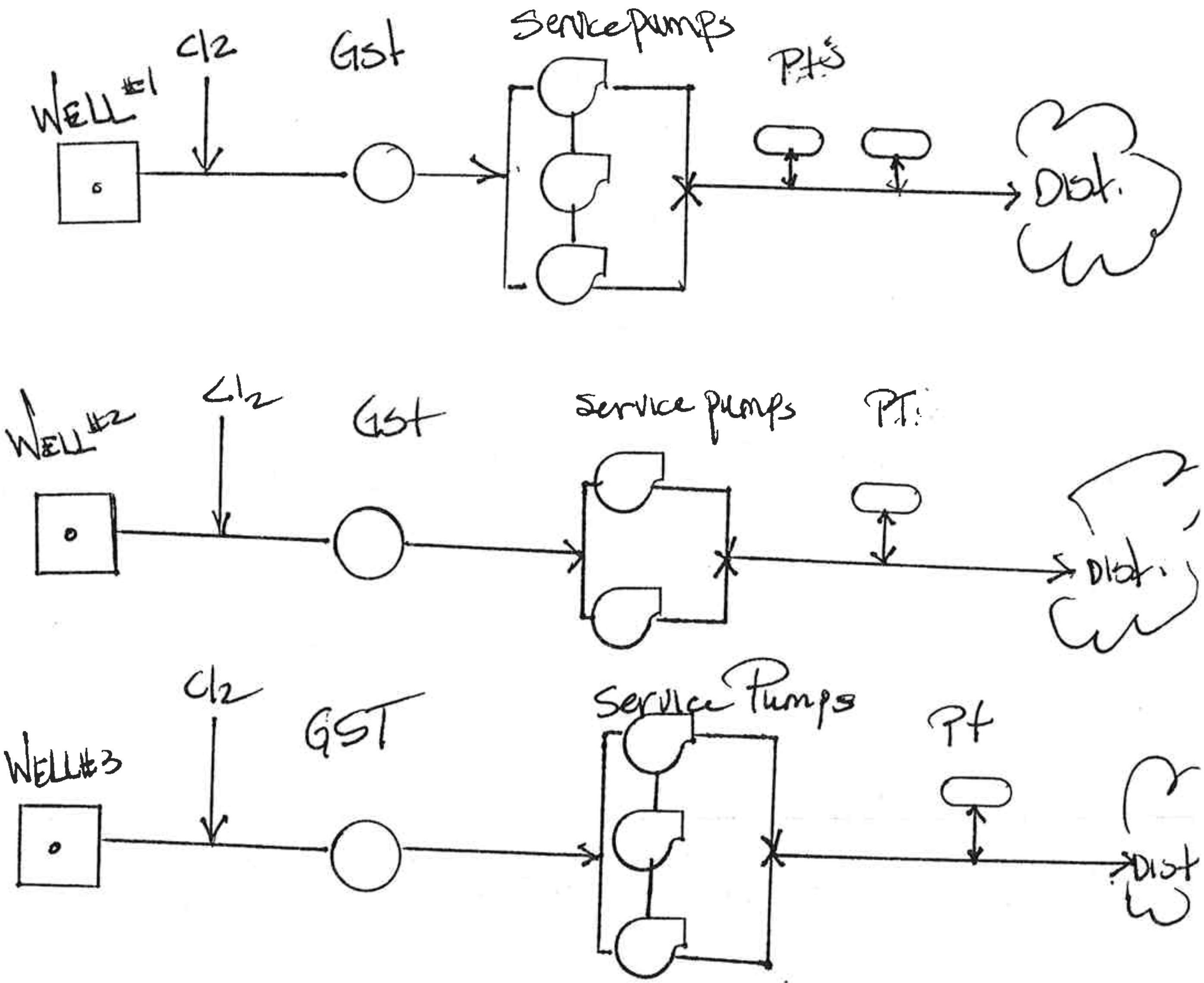
Number of A Violations: | Number of B Violations: | Number of C Violations:

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

P./S - SYSTEM FLOW DIAGRAM

Name of System:	Meadow City of	ID#:	0790025
Survey Date:	8-8-01	Surveyed By:	Elaine Jackson

Description of Supply, Source, Treatment, and Chemicals Used



VNU

PWS/ 0790174/ICO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 30, 2002

Mr. John Keith Parker, President
North Mission Glen MUD
12550 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
North Mission Glen MUD, 15922 Williwaw, Fort Bend County, Texas
TNRCC ID No. 0790174

Dear Mr. Parker:

On January 16, 2002, Ms. Elaine Jackson of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Ft. Bend Co. Health Dept.

PUBLI(ATER SUPPLY REGULATORY I)GRAM

REGULATED ENTITY DATA

KM 527 Q

ID No. 0790174 GW multi: # - SW multi : # - Community x NTNC ______ Non-Comm ______

CCN No. - Superior - Approved - Probation - Region 12

Name of System North Mission Glen MUD County Fort Bend

Physical location 15922 Williwaw of Addicks Clodine Road

Responsible Official John Keith Parker Title President Phone (281) 240-1700

Mailing Address 12550 Emily Count, Sugarland, Texas 77478 FAX U

Chief Cert Op Name Chris Manthei Grade & Type CGW Phone 1750

2nd Op Req'd? Yes Name Al Duberry Grade & Type CGW Total # Cert. Ops. 2

WS Manager/Superintendent Eco Resources, Inc. Other Officials None

Surveyed With Chris Manthei Area Served North Mission Glen Subd.

Supplier and Source District- 1 Ground Water Well

Interconnection w/other PWS? Yes Name PWS I/C Mission Bend MUD, #1&#2, Chelford One Type I/C Open

Retail Service Connection 1750 Retail Meters 1750 Retail Population 5250

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge Yes Dist. to and Name of Nearest 1000 Ft. to Ft Bend MUD #30

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 1-24-01

Map Attached No Previous Map OK? Yes Well Operational Status None

Description of Supply, Source, Treatment, and Chemicals Used:

Consists of 1 Well, 1Ground Storage Tank, 1 Pressure Tank, 2 Service Pumps and share Elevated Storage Tank with other water districts.
Treatment: Gas Chlorination prior to ground storage tank.

Total Well Cap. 1300 GPM 1.872 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 2850 GPM 4.104 MGD

Total Elevated Storage 0.0 MG Total Storage 0.250 MG Pressure Tank Cap. 0.03 MG

Maximum Daily Usage 1.019 MG Date 7-13-01 Average Daily Usage 0.130 MGD Time 1/01-12/01

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 4 # Submitted 4/Mo.

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yws Date, Last Analysis IOC 4-19-00 NO_2/N 6-21-00 RC 4-19-00 VOC 4-19-00 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date ______

Date of Investigation 1-16-02 By Elaine Jackson EJ

Date of Approval 1/30/02 By Barry Price

Letter Date, if different from Approval Date ______ Reply Requested ______ Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

I.D. No.:	0790174	Survey Date:	1-16-02

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested **56 psi** Locations: **15603 Schumann Lane**

**Location:

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Chlorination**				CL2 = **1.07 Mg/L/F** Locations: **Same as pressure**			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790174	Survey Date:	1-16-02

VI. SYSTEM FACILITIES

Number of Connections 1750

WELL

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	15922 Williwaw Dr.	° ' " / ° ' "	O	1200'	VT	750	1300 1-16-02
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
Ground Storage	0.250 MG	Welded Steel	Well Site
Pressure Tank	0.030 MG	" "	" "

Has agreement to share elevated storage with other water districts- see V111.

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	950	Well Site						
2	950	Well Site						
3	950	Well Site						

Emergency Power /Alternate Source? Yes (Y) Describe: Right Angle Drive, Diesel Generator for Plant

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn	X	1750	Conn =	1050	GPM	1300	GPM	x	
Elevated/Pressure Storage	20/100	Gal/Conn	X	1750	Conn =	.035/0.175	MG	0.03/.3	MG	x	
Ground/Total Storage	200	Gal/Conn	X	1750	Conn =	0.35	MG	0.25	MG	x	
Service Pumping Cap.	2	GPM/Conn	X	1750	Conn =	3500	GPM	2850	GPM	x	
Service Pump Peaking Factor	1019	MDD/1,440	X	1750	**	1309	GPM	1900	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790174	Survey Date:	1-16-02

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

*New Ground Storage Tank under construction- not on line.

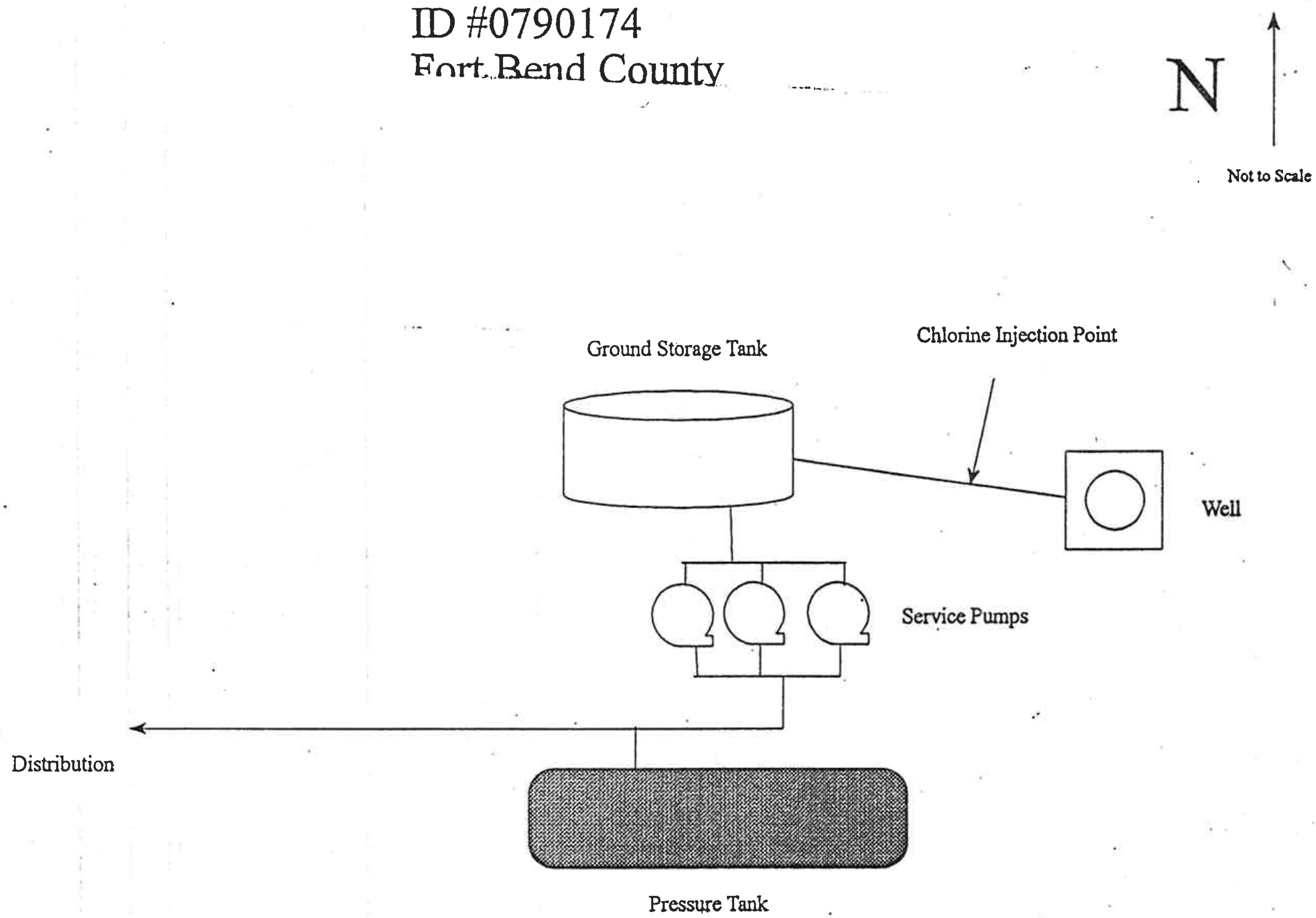
This water system has an agreement to share elevated storage with Mission Bend MUD #1and #2, Chelford One MUD and Chelford City MUD . See letter Attached.

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

North Mission Glen MUD
ID #0790174
Fort Bend County



PWS/0790323/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 5, 2003

Mr. James Wagner, President
Palmer Plantation MUD #2
3134 Cartwright Road
Missouri City, Texas 77459- 2599

Re: Compliance Evaluation Investigation at:
Palmer Plantation MUD #2, 1607 Lake Olympia, Missouri City, Ft. Bend County, Texas
TCEQ ID No. 0790323

Dear Mr. Wagner:

On April 11, 2003, Ms. Elaine Jackson of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Texas Com..ission on Environmen' l Quality

Investigation Report

PALMER PLANTATION MUD 2

PALMER PLANTATION MUD 2

RN103103404

Investigation # 35176

Investigator: ELAINE JACKSON

Conducted: 04/11/2003 -- 04/11/2003

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Additional ID(s) : 0790323

Incident #

Site Classification

GW 251-1K CONNECTION

No Industry Code Assigned

Location : KEY MAP 610K

Address: 1603 LAKE OLYMPIA PARKWAY; MISSOURI CITY, TX 77459

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	PALMER PLANTATION MUD 2

Contact(s) :

Role	Title	Name	Phone	
Participated in Investigation	OPERATOR	MR JOE TAYLOR	Work	(281) 499-5539
Regulated Entity Mail Contact	PRESIDENT	MR JAMES WAGNER	Other	(281) 499-5539

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	INVESTIGATION

Investigation Comments :

An investigation of Palmer Plantation MUD #2 was conducted on April 11, 2003. Present at the investigation were Mr. Joe Taylor, Operator. who can be contacted at (281) 499- 5539. The President is Mr. James Wagner. The water system, which consists of one entry point, provides service to 678 connections in the Lake Olympia Subdivision with a population of 2034 and is operated by and managed by Quail Valley Utility District. The operation company has 7 operators that hold an A, B and C groundwater operations license.

The Community water system is comprised of 1 plant located at 1603 Lake Olympia Parkway. The water system consists of groundwater, one well, one ground storage tank, three service pumps, one pressure tank and distribution. The ground water source is treated prior to the ground storage tank by using polyphosphate and gas chlorination. Emergency power is provided for the well by right angle drive . The interconnection with Fort Bend MUD #49 (conn. 340) + Palmer Plantation MUD #1 (546) + Palmer Plantation MUD #2 (678 conn) = 1564 x 0.35= 547.4 gpm. This system meet the 0.35 gpm/conn. type upon

Entry Point 1- Located at 1603 Lake Olympia Parkway: consists of 1 vertical turbine @ 1200 gpm, 1 ground storage tank @ 0.5 MG, 3 service pumps @ 1000 gpm, 1 pressure tank @ 0.015 MG, diesel generator, and distribution. Treatment is polyphosphate and gas chlorination; injection is prior to ground storage tank.

During the investigation no violations were noted.

No Violations Associated to this Investigation

Signed Elaine Jackson **Date** 4/29/03
Environmental Investigator

Signed Barry H[illegible] **Date** 4/5/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : Compl.
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

___Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
Capacities, micro. + chem., Data form

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	35176	Additional ID(s)	0790323	Investigation Date	4/11/2003

SYSTEM FACILITIES

Number of Connections 678

WELL

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	1603 Lake Olympia Pkwy.	See previous survey	O	1340'	VT	1200	1200 4/11/03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.5	Bolded Steel	Plant
PT	0.015	Welded Steel	Plant

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	1000	Plant						
2	1000	Plant						
3	1000	Plant						

Emergency Power /Alternate Source? Yes (Y) Describe: Diesel right angle drive on well

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	678	Conn =	406.8	GPM	1200	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	678	Conn =	0.01356	MG	0.015	MG	x	
Ground/Total Storage	200	Gal/Conn X	678	Conn =	0.1356	MG	0.5	MG	x	
Service Pumping Cap.	2	GPM/Conn X	678	Conn =	1356	GPM	3000	GPM	x	
Service Pump Peaking Factor	-	MDD/1,440 X	-	**	-	GPM	-	GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System: Palmer Plantation MUD #2		Additional ID(s) 0790323
Investigation # 35176	Investigation Date:	4/11/2003

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?	-	
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 2 # Submitted 3
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 2-1-00 NO_2/NO Unk RC 2-1-00 VOC 11-6-01 SOC -
List UNACCEPTABLE Values -
HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date -

Usage and Field Tests:

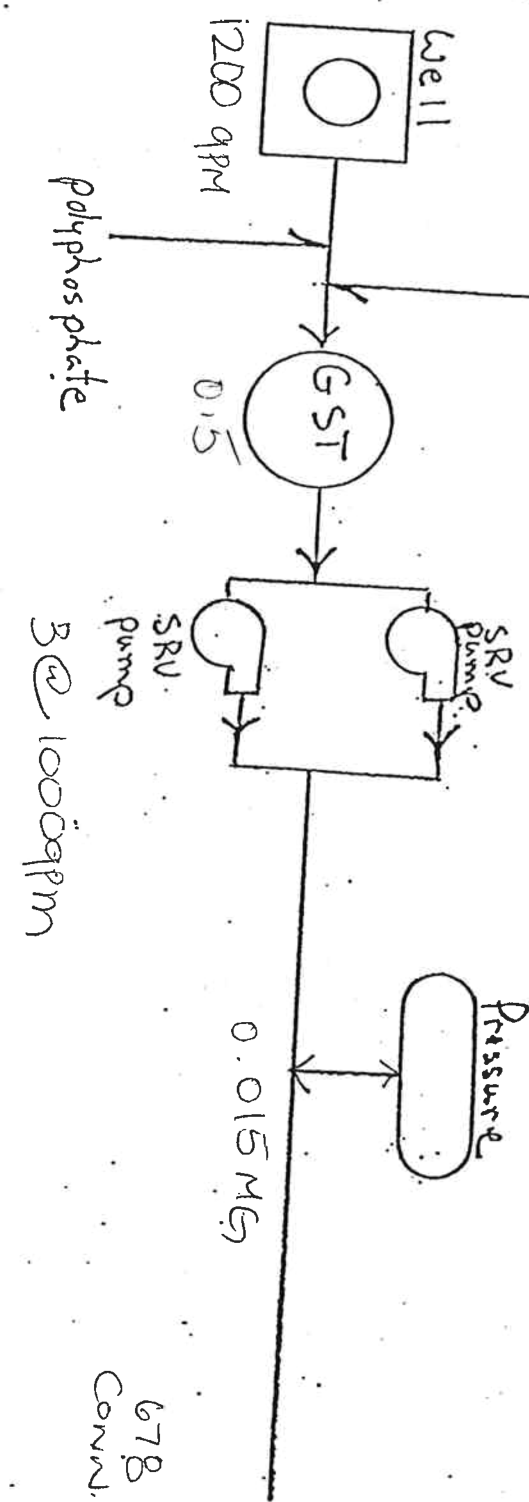
Maximum Daily Usage (gallons/million gallons):
2.033 MGD
Date of maximum daily usage:
6/12/02
Average daily usage:
0.672 MGD
Time period for average daily usage:
2/1/02- 1/31/03
Tested Distribution psi: 53 Location: 4619 Rainbow Valley Ct.

Tested Chlorine Residual: 1.49 mg/L Free Location: Same

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Palmer Plantation MUD #2**	**Additional ID(s)**	**0790323**
Investigation #	**35176**	**Investigation Date:**	**4/11/03**

Description of Supply, Source, Treatment, and Chemicals Used



VNU

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 23, 2001

Mr. Donald G. Morse , President
Quail Valley Utility District
3134 Cartwright Road
Missouri City, Texas 77459- 2599

Re: Compliance Evaluation Investigation at:
Quail valley Utility District, 3134 Cartwright, Missouri City, County, Texas
TNRCC ID No. 0790028

Dear Mr. Morse:

On March 30 2001, Ms. Elaine Jackson of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Huyen D. Luu

Huyen D. Luu, P.E.
PWS Team Leader
Houston Region Office

HDL/ej

cc: Fort Bend Co. Health Dept.

SL

PUBLIC WATER SUPPLY REGULATORY PROGRAM

REGULATED ENTITY DATA

KM 608A

ID No. 0790028 **GW multi: #** - **SW multi : #** - **Community** x **NTNC** **Non-Comm**

CCN No. -P0426 Superior x Approved Probation **Region** 12

Name of System **Quail Valley Utility District** County Fort Bend

Physical location 3134 Cartwright Road(Office)

Responsible Official Donald G. Morse Title President Phone (281) 499-5539

Mailing Address 3134 Cartwright Road, Missouri City, Texas 77459- 2599 **FAX** **(281) 261-4507**

Chief Cert Op Name Joe G. Taylor Grade & Type AW Phone (281)499- 5539

2nd Op Req'd? Yes Name Hector Acevedo Grade & Type BGW Total # Cert. Ops. 8

WS Manager/Superintendent Quail Valley U.D. Other Officials None

Surveyed With Joe G. Taylor Area Served Quail Valley Subdivision

Supplier and Source District- Ground- 4 Wells

Interconnection w/other PWS? Yes Name PWS I/C Meadowcreek, ThunderbirdUD&1,2,FtBd#42 Type I/C Open

Retail Service Connection 3781 Retail Meters 3157 Retail Population 11,343

Wholesale Master Meters N/A Wholesale Service Connections 805 Wholesale Population 2415

Charge Yes Dist. to and Name of Nearest **1 Miles to Meadowcreek MUD**

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 5-25-00

Map Attached - Previous Map OK? Yes Well Operational Status None

Description of Supply, Source, Treatment, and Chemicals Used:

Consists of Plant#1- 2 Wells, 3 GST, 4 Service Pumps, and Distribution; Plant #2- 1 Well, 1 GST, 3 Service Pumps, Emergency Power and Distribution; Plant #3- 1 Well, 1 GST, 1 Elevated Storage Tank, 4 Service Pumps, Emergency Power, and Distribution. Treatment: Gas Chlorination & Polyphosphate injection point prior to Ground Storage Tank.

Total Well Cap. 6515 GPM 9.3816 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 11000 GPM 15.84 MGD

Total Elevated Storage 0.5 MG Total Storage Cap. 3.22 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage 6.663 MG Dat 7/16&9/4/0 Average Daily Usage 2.128 MGD Time 2/1/00-1/31/00

Wholesale Contract - Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?		x
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 10 # Submitted 14

Number of Raw Samples Required 0 # Submitted 0

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 3-2-99 NO_2/NO_3 3-2-99 RC 3-2-99 VOC 3-2-99 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date

Date of Investigation 3-30-01 By Elaine Jackson

Date of Approval 4/23/01 By [signature]

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable **U=Unknown** **N= Not Observed** **R=Resolved** *** = See Comments**

RECEIVED

I.D. No.:	0790028	Survey Date:	3-30-01

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	x		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	x	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	x	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	-		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	-		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	-		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	-		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	-		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	-		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested **68psi** Locations: **4442 Covey Trail**

**Location:

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: **Gas Chlorination**				CL2 = **0.9mg/l/F** Locations: **Same as pressure**			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790028	Survey Date:	3-30-01

VI. SYSTEM FACILITIES

Number of Connections 3781

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	2935 Blue Lakes (Plant #1)	° ' " / ° ' "	O	1250'	VT	1500	2150 3/30
001	B	2	" " " "	° ' " / ° ' "	O	1200'	VT	500	390 "
002	C	3	2143 Cartwright (Plant #2)	° ' " / ° ' "	O	1000'	VT	1500	1600 "
003	D	4	5th Street/Rothwell(Plant #3)	° ' " / ° ' "	O	1300'	VT	1700	2375 "
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			
				° ' " / ° ' "		'			

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.225	Welded Steel	Plant #1
GST	0.225	"	" "
GST	0.500	"	" "
GST	0.750	"	Plant #2
GST	1.0	"	Plant #3
Elevated Storage Tank	0.500	"	" "

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1-1	1000	Plant #1	2-1	1000	Plant #2	3-2	1000	Plant #3
1-2	1000	" "	2-2	1000	" "	3-3	1000	" "
1-3	1000	" "	2-3	1000	" "	3-4	1000	" "
1-4	1000	" "	3-1	1000	" "			

Emergency Power /Alternate Source? Yes (Y / N) Describe: Natural Gas on Well 2; Diesel general at Plant #3

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn	X	3781	Conn =	2269	GPM	6515	GPM	x	
Elevated/Pressure Storage	100	Gal/Conn	X	3781	Conn =	0.3781	MG	0.50	MG	x	
Ground/Total Storage	200	Gal/Conn	X	3781	Conn =	0.756	MG	3.22	MG	x	
Service Pumping Cap.	2	GPM/Conn	X	3781	Conn =	7562	GPM	11000	GPM	x	
Service Pump Peaking Factor	7	MDD/1,440	X	1.25	**	5784	GPM	10000	GPM *	x	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790028	Survey Date:	3-30-01

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

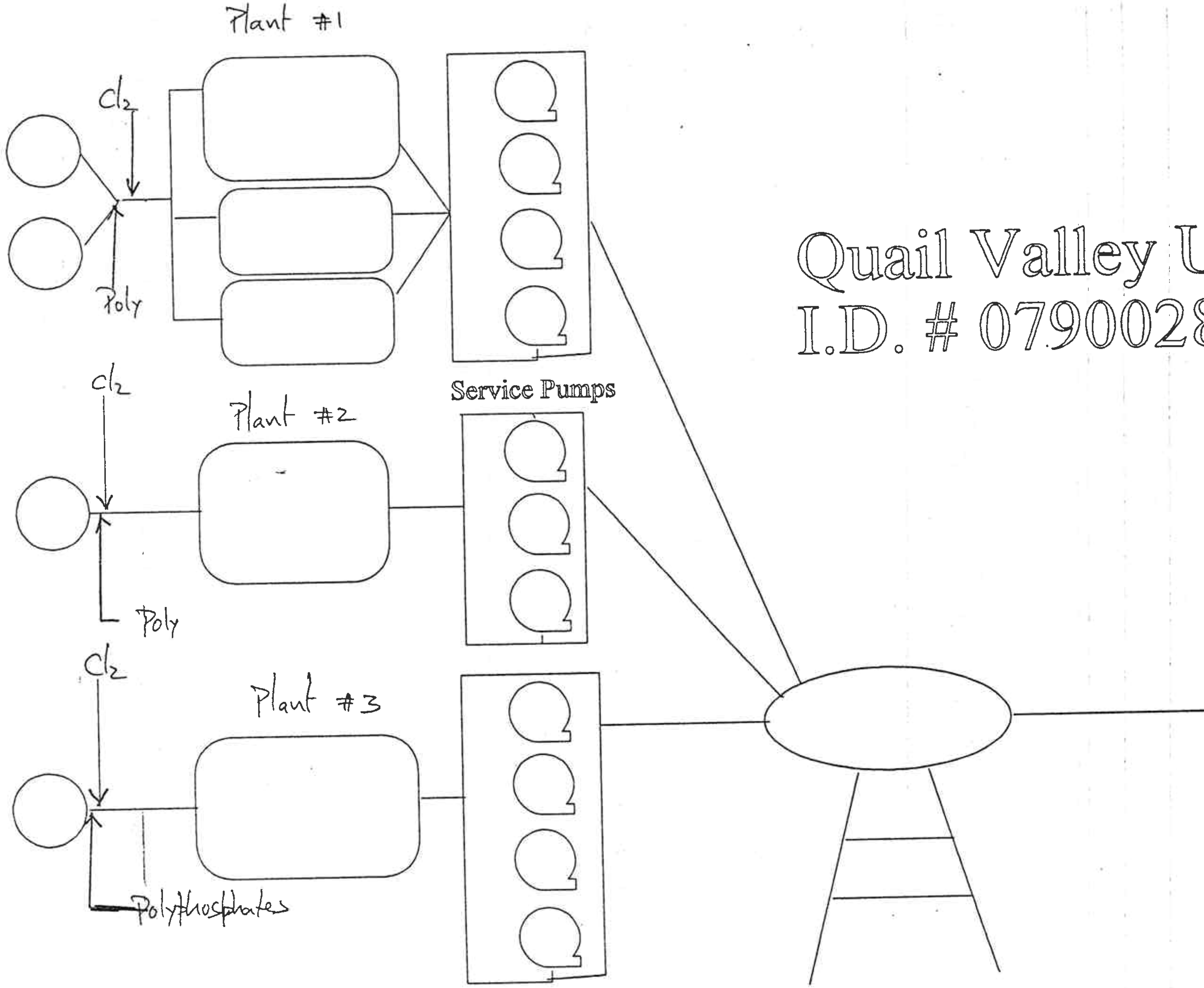
VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

Number of A Violations: ____ **Number of B Violations:** ____ **Number of C Violations:** ____

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Quail Valley U.D.
I.D. # 0790028



Natural Gas at well #2, Plant #2, and Diesel at Plant #3

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Kathleen Hartnett White, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

May 30, 2002

Glen Hefner, President
Sienna Plantation MUD #1
12550 Emily Court
Sugar Land, Texas 77478

Subject: Public Drinking Water Supply
Sienna Plantation MUD #1 - I.D. #0790373
Fort Bend County, Texas

Dear Mr. Hefner:

As a result of a recent sanitary survey and a review of our records, it has been determined that the public water system operated by and serving the Sienna Plantation MUD #1 meets the requirements for Texas Natural Resource Conservation Commission "Superior Rating." This recognition authorizes display of "Superior Public Water System" signs on highways entering the area served by this water system. Please note that before erecting the signs along the highway rights-of-way, the District Engineer of the Texas Department of Transportation should be contacted and his approval obtained as to the proposed erection sites.

We are enclosing two copies of an Agreement Form to be signed by the person indicated and returned to this office. My signature will be affixed to this document and one copy returned to you for your files.

In conclusion, we wish to thank you for your diligence and concern regarding the Sienna Plantation MUD #1 public water system. If we can be of any assistance, please do not hesitate to contact Mr. John McDaniel at (512) 239-6265.

Sincerely,

Buck Henderson

E. Buck Henderson, Manager
Public Drinking Water Section
Water Supply Division

EBH:JMM:sr

Enclosures

cc: TNRCC Region 12 - Houston

j:\pdw\common\sys-supr

PWS/0790373/CO

Transmittal Memo

From: Region 12 To: Monitoring and Enforcement

Subject: Survey of PWS requesting "Superior Status"

Re: (Sienna Plantation MUD # 1 - ID # 0790373)

The water system was surveyed on March 22, 2002, by Ms. Helen Pagola.. No deficiencies were noted. Attached is the survey packet. Region 12 supports the request for Superior Status, provided all conditions are met. Please draft correspondence.

PUBLI(TER SUPPLY REGULATORY F. RAM

REGULATED ENTITY DATA KM 650 L

ID No. 0790373 **GW multi: #** 1 **SW multi : #** 0 **Community** x **NTNC** **Non-Comm**

CCN No. - Superior - Approved - Probation - **Region** 12

Name of System Sienna Plantation MUD # 1 County Fort Bend

Physical location Plant # 1 - Murray Court; Plant # 2 - 3330 McMahon Way

Responsible Official Glen Hefner Title President Phone 281.240.1700

Mailing Address 12550 Emily Court Sugar Land Texas 77478 **FAX** **281.579.1029**

Chief Cert Op Name Danny Davila Grade & Type B - GW Phone 281.437.6642

2nd Op Req'd? yes Name Marcus Longoria Grade & Type B - GW Total # Cert. Ops. 3

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Danny Davila, Marcus Longoria, Mike Thornhill Area Served Sienna Plantation

Supplier and Source District - 3 ground water wells

Interconnection w/other PWS? yes Name PWS I/C Sienna Plantation MUD # 2 & 3 Type I/C open

Retail Service Connection 0 Retail Meters 0 Retail Population 0

Wholesale Master Meters 2 Wholesale Service Connections 1483 Wholesale Population 4449

Charge no Dist. to and Name of Nearest 4 **Miles to** Lake Olympia

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 07.14.2001

Map Attached no Previous Map OK? yes Well Operational Status no changes

Description of Supply, Source, Treatment, and Chemicals Used:

Ground water - 3 wells (1 irrigation only), 2 pressure tanks, 2 ground storage tanks, 4 booster pumps, auxilllary power and distribution. Treatment: gas chlorination and polyphosphate (NAPCO 201) at well # 1 , injection point prior to storage.

Total Well Cap. 2250 GPM 3.24 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 5000 GPM 7.2 MGD

Total Elevated Storage 0 Total Storage 0.6 MG Pressure Tank Cap. 0.03 MG

Maximum Daily Usage 2.123 MG Date 8.24.01 Average Daily Usage 0.8321 MGD Time 02.01 - 02.02

Wholesale Contract supplies water to SPM 1 & 3 Maximum Purchase Rate -

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 1/m # Submitted 1/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? yes Date, Last Analysis IOC 8.23.00 NO_2/N 8.23.00 RC - VOC 8.23.00 SOC -

List UNACCEPTABLE Values none

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 3/22/02 By Helen Pagola

Date of Approval 4/3/02 By Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

I.D. No.:	0790375	Survey Date:	03.22.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	x	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	
Tested _72_ psi Locations: 3231 Five Oaks Drive				**Location: None			

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: gas chlorination				CL_2 = 1.70 _Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790373	Survey Date:	03.22.2002

VI. SYSTEM FACILITIES

Number of Connections 2

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	Murray Court	° ' " / ° ' "	O	940'	VT	U	750 3.22.02
001	B	2	Murray Court	° ' " / ° ' "	N	U'	sub	U	
001	C	3	3330 McMahon Way	° ' " / ° ' "	O	1000'	sub	1500	1500 3.22.02

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank #1	0.1	bolted steel	plant # 1
ground storage tank #2	0.5	bolted steel	plant # 1
pressure tank	0.01	welded steel	plant # 1
pressure tank	0.02	welded steel	plant # 1

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1.1	1200	plant 1						
1.2	1200	plant 1						
1.3	200	plant 1						
1.4	2400	plant 1						

Emergency Power /Alternate Source? Y (Y / N) Describe: diesel generator for boosters & well # 1

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn	X	1483	Conn =	889.8	GPM	2250	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn	X	1483	Conn =	0.02966	MG	0.03	MG	x	
Ground/Total Storage	200	Gal/Conn	X	1483	Conn =	0.2966	MG	0.6	MG	x	
Service Pumping Cap.	2	GPM/Conn	X	1483	Conn =	2966	GPM	5000	GPM	x	
Service Pump Peaking Factor		MDD/1,440	X		**		GPM		GPM *		

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790373	Survey Date:	03.22.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x	

		Y	N
Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

		Y	N
Sanitary easement(s) recorded?	[41,c,1,F]	x	
Well cased 18" above ground level?	[41,c,3,B]	x	
Proper concrete sealing block?	[41,c,3,J]	x	
Well head sealed?	[41,c,3,K]	x	
Casing vent properly installed?	[41,c,3,K]	x	
Air release devices properly installed?	[41,c,3,Q]	x	
Electrical Wiring installed in conduit?	[46,V]	x	

		Y	N
Suitable sampling tap?	[41,c,3,M]	x	
Well meter provided?	[41,c,3,N]	x	
Well blow-off properly installed?	[41,c,3,L]	x	
Well unit fenced or housed?	[41,c,3,O]	x	
Well site properly drained?	[41,c,3,I]	x	
All weather road provided?	[41,c,3,P]	x	

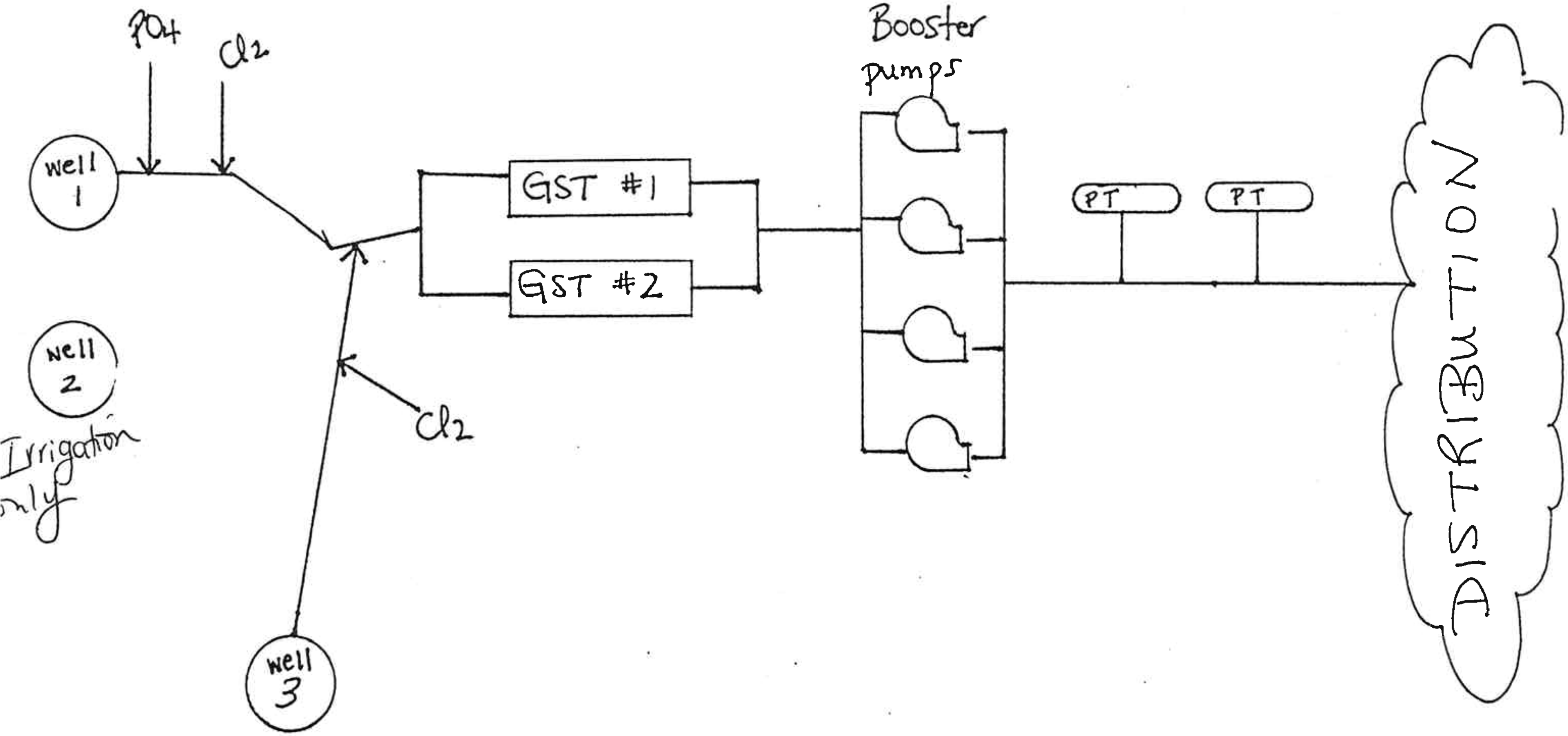
VIII. ADDITIONAL COMMENTS:

IX. RATING DEFICIENCY SCORE

Number of A Violations: ____ **Number of B Violations:** ____ **Number of C Violations:** ____

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Sienna Plantation MUD #1
ID# 0790373



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION 11/28/2001
WATER UTILITIES DIVISION
WATER SYSTEM DATA SHEET

0790373
I.D.

SIENNA PLANTATION MUD 1 — Name

@ECO RESOURCES INC — Mailing Name

12550 EMILY COURT — Mailing Address

SUGAR LAND — City | TX — St | 77478 — Zip

GLEN HEFNER — Responsible Official

PRESIDENT — Title | (281) 240-1700 — Phone

5 — Owner Type

R1 — Service Area

Owner Type	Service Area		
1-Federal	01-Interstate Carrier	S1-School	T1-Recreation
2-Private	02-Wholesaler	S2-Institution	T2-Service Station
3-State	09-Other Area	S3-Medical Facility	T3-Summer Camp
4-Local	R1-Residential	S4-Indust/Agr.	T4-Restaurant
5-Mixed Priv/Pub	R2-Mobile Home Park	S5-Day Care Center	T5-Highway Rest
6-Native American	R9-Other Residential	S9-Other Semi-resid	T6-Hotel/Motel
			T9-Other Transient

C — Plant Type

N — Interstate Carrier

C-Community
N-Non-community
P-Non-transient

Pop. Served	# of Connect	# of Meters	#I/C w/other PWS	Air Temp.
4449 ~~3477~~	1483 ~~1159~~	2 ✓	~~2~~ 2	0.0

Total Product (MGD)	Average Daily Consump.	Total Storage (MG)	Elev. Storage (MG)	Booster Pump Cap. (MGD)	Aux. Prod. Cap. (MGD)	Pressure Tank Cap. (MG)
3.24 ~~3.204~~	.8321 ~~0.531~~	.6 ~~0.600~~ ✓	0.000	7.2 ~~3.744~~	4.932	0.03000 ✓

/ / — Deactivation Date - Reason

A — Activity Indicator

System Classification | Y — Certified Operator - ~~2~~ 3 — Number - B — Highest Grade

RECEIVED
NOV 30 2001
REGION 12

Survey	Surveyor (Last Name)	Code	Region	County	Def. Score
3.22.02 ~~06/14/2001~~	Pagola	K42	12	FORT BEND	000

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
WATER UTILITIES DIVISION
WATER SYSTEM DATA SHEET
(ENTRY POINT)

Entry Point Codes: G - Ground Water W - Ground, Purchased
P - Surface, Purchased Y - GUI
S - Surface Z - GUI, Purchased

I.D.	Entry Point	Name	Plant Name	Code	Wells	Seller
0790373	001	GULF COAST	MURRAY COURT	G	2.0	

****

(TREATMENTS)

I.D.	Entry Point	Treatment	Obj.	Process	
0790373	001	01	D	403	Gaseous Chlorination, Pre
0790373	001	01	C	447	Inhibitor, Polyphosphate
0790373	001	01	D	423	Hypochlorination, Pre

****

(SOURCES)

Status Codes: (A) Abandoned (E) Emergency (O) Operational
(C) Capped (F) Former PWS Well (P) Plugged
(D) Demand (N) Non-drinking Water (T) Test

I.D.	Entry Point	Water Source	Owner Designation	Status	Depth	GPM
0790373	001	G0790373A	1-MURRAY COURT	O	940	~~600~~ 750

GPS Latitude	GPS Longitude	GPS Elevation	GPS Date	GPS Certificate No.
			/ /	

I.D.	Entry Point	Water Source	Owner Designation	Status	Depth	GPM
0790373	001	G0790373B	2-MURRAY COURT	N ~~E I~~	.000	~~100~~

GPS Latitude	GPS Longitude	GPS Elevation	GPS Date	GPS Certificate No.
			/ /	

0790373 001 G0790373C 3330 McMahon Way O 1000' Dpth. 1500 GPM

PWS/0790345/ICO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 4, 2002

Mr. James Brown, President
Sienna Plantation MUD #2
12550 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Sienna Plantation MUD #2, Ft. Bend County, Texas
TNRCC ID No. 0790345

Dear Mr. Brown:

On March 22, 2002, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend Co. Health Dept.

PUBLIC TER SUPPLY REGULATORY PF RAM

REGULATED ENTITY DATA KM 650K

ID No. 0790345 **GW multi: #** 0 **SW multi : #** 0 **Community** x **NTNC** **Non-Comm**

CCN No. - Superior - Approved - Probation - **Region** 12

Name of System **Sienna Plantation MUD # 2** County Fort Bend

Physical location Sienna Parkway & Steep Bank Trace

Responsible Official Mr. James Brown Title President Phone 281.240.1700

Mailing Address 12550 Emily Court Sugar Land Texas 77478 **FAX** **281.579.1029**

Chief Cert Op Name Danny Davila Grade & Type B - GW Phone 281.437.6642

2nd Op Req'd? yes Name Marcus Longoria Grade & Type C - GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Danny Davila, Marcus Longoria Area Served Sienna Plantation

Supplier and Source Wholesaler (District)

Interconnection w/other PWS? yes Name PWS I/C Sienna Plantation MUD # 1 Type I/C open

Retail Service Connection 1276 Retail Meters 1276 Retail Population 3828

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge yes Dist. to and Name of Nearest 4 **Miles to** Lake Olympia

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 06.14.2001

Map Attached no Previous Map OK? yes Well Operational Status distribution only

Description of Supply, Source, Treatment, and Chemicals Used:

Distribution only - Receiving treated water under pressure from Sienna Plantation MUD # 1.

Total Well Cap. 0 GPM 0 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 0 GPM 0 MGD

Total Elevated Storage 0 Total Storage 0 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage MG Date Average Daily Usage MGD Time

Wholesale Contract purchase water from SPM 1 Maximum Purchase Rate 10,000 gal - 15 $

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 2/m # Submitted 2/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? no Date, Last Analysis IOC - NO_2/N - RC - VOC - SOC -

List UNACCEPTABLE Values

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 03.22.2002 By Helen Pagola

Date of Approval 4/4/02 By Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

APR 3 0 2002

I.D. No.:	0790345	Survey Date:	03.22.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs:)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	-	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	-	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	-	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	-	

II. STORAGE TANKS

Storage Tanks Properly Covered?	[43,c]	-		Proper Water Level Indicator Provided?	[43,c,4]	-	
Tanks Tight Against Leakage?	[43,c,6]	-		Drains Properly Connected?	[43,c,7]	-	
Vents Properly Installed?	[43,c,1]	-		Inlet and Outlet Properly Located?	[43,c,5]	-	
Openings Properly Screened	[43,c,1]	-		Disinfectant Residual in Water Storage Tanks	[46,d,2]	-	
Proper Roof Hatch Provided?	[43,c,2]	-		Intruder Resistant Fence?	[43,e]	-	
Roof Hatch Kept Locked?	[43,c,2]	-		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	-	
Proper Overflow Provided?	[43,c,3]	-		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	-	

III. PRESSURE TANKS

Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 72 psi Locations: 3773 Sienna Parkway

**Location: None

V. DISINFECTION

Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	-		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used:				CL2 = 1.72 Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	-		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	-		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790355	Survey Date:	03.22.2002

VI. SYSTEM FACILITIES

Number of Connections 1276

Distribution only

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? N (Y/N)　　Describe: distribution only

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM	-	
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG	-	
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG	-	
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM	-	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790345	Survey Date:	03.22.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	-		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	-	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	-		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	-	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	-		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	-	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	-		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	-	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	-		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	-	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	-		Suitable sampling tap?	[41,c,3,M]	-	
Well cased 18" above ground level?	[41,c,3,B]	-		Well meter provided?	[41,c,3,N]	-	
Proper concrete sealing block?	[41,c,3,J]	-		Well blow-off properly installed?	[41,c,3,L]	-	
Well head sealed?	[41,c,3,K]	-		Well unit fenced or housed? *plank missing	[41,c,3,O]	-	
Casing vent properly installed?	[41,c,3,K]	-		Well site properly drained?	[41,c,3,I]	-	
Air release devices properly installed?	[41,c,3,Q]	-		All weather road provided?	[41,c,3,P]	-	
Electrical Wiring installed in conduit?	[46,V]	-					

VIII. ADDITIONAL COMMENTS:

*** Distribution only **

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] **Number of B Violations:** [ ] **Number of C Violations:** [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

PWS/0790376CO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 4, 2002

Ms. Terrie Gornet, President
Sienna Plantation MUD #3
12250 Emily Court
Sugar Land, Texas 77478

Re: Compliance Evaluation Investigation at:
Sienna Plantation MUD #3, Fort Bend County, Texas
TNRCC ID No. 0790376

Dear Ms. Gornet:

On March 22, 2002, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend 9Co. Health Dept.

PUBLIC ER SUPPLY REGULATORY P AM

REGULATED ENTITY DATA KM 650K

ID No. 0790376 GW multi: # 0 SW multi : # 0 Community x NTNC Non-Comm

CCN No. - Superior - Approved - Probation - Region 12

Name of System Sienna Plantation MUD # 3 County Fort Bend

Physical location Steep Bank Village Section 11 & 12

Responsible Official Ms. Terrie Gornet Title President Phone 281.437.1721

Mailing Address 12550 Emily Court Sugar Land Texas 77478 FAX 281.579.1029

Chief Cert Op Name Danny Davila Grade & Type B - GW Phone 281.437.6642

2nd Op Req'd? yes Name Marcus Longoria Grade & Type B - GW Total # Cert. Ops. 2

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Danny Davila, Marcus Longoria Area Served Sienna Plantation

Supplier and Source Wholesaler (District)

Interconnection w/other PWS? yes Name PWS I/C Sienna Plantation MUD # 1 Type I/C open

Retail Service Connection 207 Retail Meters 207 Retail Population 621

Wholesale Master Meters - Wholesale Service Connections - Wholesale Population -

Charge yes Dist. to and Name of Nearest 4 Miles to Lake Olympia

Type of Investigation (CCI, CCM, REC, Other) initial Previous Investig. Date 06.14.2001

Map Attached no Previous Map OK? yes Well Operational Status distribution only

Description of Supply, Source, Treatment, and Chemicals Used:

Distribution only - Receiving treated water under pressure from Sienna Plantation MUD # 1.

Total Well Cap. 0 GPM 0 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 0 GPM 0 MGD

Total Elevated Storage 0 Total Storage 0 MG Pressure Tank Cap. 0 MG

Maximum Daily Usage MG Date Average Daily Usage MGD Time

Wholesale Contract - Maximum Purchase Rate 10,000 gal - 15 $

MICROBIOLOGICAL	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 1/m # Submitted 1/m

Number of Raw Samples Required - # Submitted -

Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? no Date, Last Analysis IOC - NO_2/N - RC - VOC - SOC -

List UNACCEPTABLE Values

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 03.22.2002 By Helen Pagola

Date of Approval 4/4/02 By Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

APR 3 0 2002

I.D. No.:	0790376	Survey Date:	03.22.2002

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref.	Y	N	Item	Ref.	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	-	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	-	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	-	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained?	[46,m]	x	
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	-	
				Drought Contingency Plan	[288]	-	

II. STORAGE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Storage Tanks Properly Covered?	[43,c]	-		Proper Water Level Indicator Provided?	[43,c,4]	-	
Tanks Tight Against Leakage?	[43,c,6]	-		Drains Properly Connected?	[43,c,7]	-	
Vents Properly Installed?	[43,c,1]	-		Inlet and Outlet Properly Located?	[43,c,5]	-	
Openings Properly Screened	[43,c,1]	-		Disinfectant Residual in Water Storage Tanks	[46,d,2]	-	
Proper Roof Hatch Provided?	[43,c,2]	-		Intruder Resistant Fence?	[43,e]	-	
Roof Hatch Kept Locked?	[43,c,2]	-		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	-	
Proper Overflow Provided?	[43,c,3]	-		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	-	

III. PRESSURE TANKS

Item	Ref.	Y	N	Item	Ref.	Y	N
Accurate Pressure Gauges?	[43,d,2]	-		Tanks Tight Against Leakage?	[43,d,7]	-	
Pressure Release Device Provided?	[43,d,2]	-		Routinely Maintained, Inspected, Documented?	[46,p,2]	-	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	-		Fenced or Housed?	[43,e]	-	
Air-Water Volume Indicator Provided?	[43,d,3]	-		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	-	

IV. DISTRIBUTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Plumbing Ordinance or Agreement?	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 72 psi Locations: 3773 Sienna Parkway

**Location: None

V. DISINFECTION

Item	Ref.	Y	N	Item	Ref.	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	-		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used:				$CL2$ = 1.72 Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	-		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	-		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	-		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	-		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	-		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790376	urvey Date:	3.22.2002

VI. SYSTEM FACILITIES

Distribution only

Number of Connections 207

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					
				° ' " / ° ' "					

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location

Emergency Power /Alternate Source? N (Y / N) Describe: distribution only

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production		GPM/Conn X		Conn =		GPM		GPM	-	
Elevated/Pressure Storage		Gal/Conn X		Conn =		MG		MG	-	
Ground/Total Storage		Gal/Conn X		Conn =		MG		MG	-	
Service Pumping Cap.		GPM/Conn X		Conn =		GPM		GPM	-	
Service Pump Peaking Factor		MDD/1,440 X		**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790376	urvey Date:	03.22.2002

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	-		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	-	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	-		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	-	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	-		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	-	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	-		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	-	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	-		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	-	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	-		Suitable sampling tap?	[41,c,3,M]	-	
Well cased 18" above ground level?	[41,c,3,B]	-		Well meter provided?	[41,c,3,N]	-	
Proper concrete sealing block?	[41,c,3,J]	-		Well blow-off properly installed?	[41,c,3,L]	-	
Well head sealed?	[41,c,3,K]	-		Well unit fenced or housed? *plank missing	[41,c,3,O]	-	
Casing vent properly installed?	[41,c,3,K]	-		Well site properly drained?	[41,c,3,I]	-	
Air release devices properly installed?	[41,c,3,Q]	-		All weather road provided?	[41,c,3,P]	-	
Electrical Wiring installed in conduit?	[46,V]	-					

VIII. ADDITIONAL COMMENTS:

*** Distribution only **

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

August 19, 1999

Mr. Marty Smith, Director of Environmental Affairs
Texas Department of Criminal Justice
P.O. Box 99
Huntsville, Texas 77342-0099

Re: Public Water Supply:
TDCJ - Darrington Unit, CR 54, Brazoria County, Texas
TNRCC ID # 0200204

Dear Mr. Smith:

On August 4, 1999, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an inspection of the above-referenced facility to evaluate compliance with applicable public water supply requirements. No violations were documented during the inspection.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in our Houston Region Office at 713/767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols,Jr., P.E.
PWS Team Leader
Houston Region Office

RLE/hp

cc: Brazoria Co. Health Dept.

Texas Natural Resource Conservation Commission
Division of Water Utilities
30 TAC §Chapter 290.44(i)

Checklist for surveying boats, tank trucks, and trailers utilized for hauling drinking water

Name of System TDCJ - Darrington **System ID #** 0200204

1. Water obtained from an approved source? . . . . Yes
2. Tank used solely for transporting drinking water? . . . . Yes
3. Tank properly labeled? . . . . Yes
4. Tank water-tight and of an approved material? . . . . Yes
5. Manhole and manhole cover properly designed and locked? . . . . . . Yes
6. Air vent properly installed? . . . . Yes
7. All connections provided with caps and keeper chains? . . . . Yes
8. Tank drain provided? . . . . Yes
9. Transfer pump permanently mounted to tank, if used? . . . . Yes
10. Hoses properly labeled, stored and capped? . . . . Yes
11. Tank disinfected monthly? . . . . Yes
12. Bacteriological samples submitted monthly, as required? . . . . . . Yes
13. Minimum chlorine residual of 0.5 mg/L maintained? . . . . Yes
14. Operational records maintained? . . . . Yes

Tanks # 27020
21143

PUBLIC WATER SUPPLY REGULATORY PROGRAM

WATER SYSTEM DATA

ID No. 0200204 Community ✓ NTNC ___ Non-Comm ___

CCN No. — Superior Y(N) Approved Y(N) Probation Y(N) Region 12

Name of System TDCJ-Darrington Unit County Brazoria

Physical location FM 521 & CR 54

Responsible Official Marty Smith Title Dir. of Env. Affairs Phone 409.294.6811

Mailing Address TDCJ- P.O. Box 99 Huntsville, Tx 77342-0099

Chief Cert Op Name Manuel Reynolds Grade & Type C. Gr Phone 4.849.9306

2nd Op Req'd? Yes Other Cert Op Name Fred Washington Grade & Type C. Gr Total # Cert Ops 2

WS Manager/Superintendent Susan Safty Other Officials Contacted —

Surveyed With M. Reynolds, F. Washington, Susan Safty Area Served prison compound

Supplier and Source State - ground - 3 wells

Interconnection with another PWS? NO Name PWS I/C — Type I/C —

Retail Service Connections 199 Retail Meters — Retail Population 2500

Wholesale Master Meters — Wholesale Service Connections — Wholesale Population —

Charge Y(N) — Dist. to and Name of Nearest PWS 3 miles - Rosharon

Reason for this Survey (Routine, Follow Up, Initial, Enforcement, Complaint, Other) Previous Survey Date 12.29.97

Map Attached NO Previous Map OK? Yes Well Operational Status Changed? No

Description of Supply, Source, Treatment, and Chemicals Used

Ground - 3 wells, 1 GST, 1 ET, 3SP, and distribution

Treatment - gas chlorination & polyphosphate; chlorine injection

pt. prior to GST

AUG 24 1999

Total Well Cap. 1310 gpm 1.886 mgd RW Cap — gpm — mgd

Treatment Cap. — gpm — mgd Total Svc. Pump Cap. 1050 gpm 1.512 mgd

Total Elevated Storage 0.1 MG Total Storage Cap. 0.15 MG Pressure Tank Capacity —

Maximum Daily Usage 1.01 MG Date 07.31.98 Average Daily Usage 0.51 MG Time Period 07.98-07.99

Wholesale Contract — Maximum Purchase Rate —

MICROBIOLOGICAL Y N

Samples Submitted in Accordance with DWS? ☑ ☐ Number of Samples Required 4-distribution/month 2-raw/month 6/mos # Submitted 6/mos

Raw Samples Submitted, if Required? ~~☐ ☐ Number of Raw Samples~~ —

Well(s) Surface Water Influenced? ☐ ☑ Non-Comm. Dates of Operation — Thru —

Acceptable Sample Siting Plan on File? ☑ ☐

CHEMICAL

Acceptable Quality? Yes Date, Last Chemical Analysis IOC 1.27.97 NO_2/NO_3 4.12.95 RC 1.27.97 VOC 10.14.98 SOC —

List UNACCEPTABLE Values —

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ___ Date ___

Date of Survey 08.04.99 **By** Helen Pagola

Date of Approval 8/19/99 **By** Ross L. Echols, Jr.

Letter Date, if different from Approval Date ___ Reply Requested ___ Def. Score of this Survey 0

ID# 0200204 SURVEY DATE 8/4/99

I. SYSTEM FACILITIES

Number of Connections 199

ELLS (Y/N) OR RAW WATER PUMPS (Y/N)

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Tested/Est GPM/Date
001	A	1	Employee Rest Center		O	537'	SUB	360 8/99
001	B	2	Near front entrance		O	598'	SUB	350 8/99
001	C	3	next to E.T.		O	575'	SUB	600 8/99

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (gal)	Material	Location
Ground	150,000	concrete	Well site #3
E.T.	100,000	welded steel	"

SERVICE PUMPS

No.	Output (GPM)	Location	No.	Output (GPM)	Location	No.	Output (GPM)	Location
1	250	Wellsite #3						
2	500	"						
3	300	"						

Emergency Power/Alternate Source (Y/N) Yes Describe Generator at wellsite #3 for plant

Required Well Production Capacity 0.6 GPM/Conn. X 199 Conn. = 119.4 GPM

	Y	N
Total Well Production Capacity Provided = 1310 GPM Adequate?	✓	
Required Elevated/Pressure Storage: 100 Gal/Conn. X 199 Conn. = 0.02 MG		
Elevated/Pressure Storage Provided = 0.1 MG Adequate?	✓	
Required Total Storage: 200 Gal/Conn. X 199 Conn. = 0.04 MG		
Total Storage Provided = 0.150 MG Adequate?	✓	
Required Service Pumping Capacity: 2.0 GPM/Conn. X 199 Conn. = 398 GPM		
Service Pump Peaking Factor: ____ ____ MDD/1,440 X ____ ____ = ____ GPM Peak Demand		
Total Service Pump Capacity = 1050 GPM Adequate?	✓	

).# 0200204 Survey Date 08.04.99

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

I. GROUND WATER SOURCE

GUI? Y/N

SANITARY

		Y	N			Y	N
ll or pump room protected from flooding?	[.41(c)(3)(H)]	✓	_	Sewage treatment plant ≥ 500 ft.?	[.41(c)(1)(C)]	✓	_
estock Prohibited within 50 ft. of well?	[.41(c)(1)(D)]	✓	_	Animal pens or landfill ≥ 500 ft.?	[.41(c)(1)(C)]	✓	_
itary sewer, septic tank, cemetery ≥ 50 ft.?	[.41(c)(1)(A)]	✓	_	Sewage irrigated land ≥ 500 ft.?	[.41(c)(1)(C)]	✓	_
tic Tank drainfields ≥ 150 ft.?	[.41(c)(1)(A)]	✓	_	UST or liquid transmission pipeline ≥ 150'?	[.41(c)(1)(A)]	✓	_
inage ditch or liftstation ≥ 300 ft.?	[.41(c)(1)(B)]	✓	_	Abandoned wells ≤ 1/4 mi. plugged?	[.41(c)(1)(E)]	✓	_

CONSTRUCTION

		Y	N			Y	N
itary easement(s) recorded?	[.41(c)(1)(F)]	✓	_	Suitable sampling tap?	[.41(c)(3)(M)]	✓	_
ll cased 18" above ground level?	[.41(c)(3)(B)]	✓	_	Well meter provided?	[.41(c)(3)(N)]	✓	_
oper pressure cement?	[.41(c)(3)(C)]	✓	_	Well blow-off properly installed?	[.41(c)(3)(L)]	✓	_
oper concrete sealing block?	[.41(c)(3)(J)]	✓	_	Well unit fenced or housed?	[.41(c)(3)(O)]	✓	_
ll head sealed?	[.41(c)(3)(K)]	✓	_	Well site properly drained?	[.41(c)(3)(I)]	✓	_
sing vent properly installed?	[.41(c)(3)(K)]	✓	_	All weather road provided?	[.41(c)(3)(P)]	✓	_
r release devices properly installed?	[.41(c)(3)(Q)]	✓	_				

III. ADDITIONAL WATER SYSTEM DEFICIENCIES AND TAC REFERENCE NUMBERS:

____

____

____

____

. RATING DEFICIENCY SCORE

A. Certified Operator(s) (If Required)

1. None Surface	10 Pt.s	____
2. None Ground	4 Pt.s	____
3. Only One When Two Required	4 Pt.s	____
4. Improper Certificate	4 Pt.s	____

B. MCL Violations

1. Microbiological: –		
Failure to Sample	4/Mon.	____
MCL Violation	10/Mon.	____
2. Primary standards	10/Vio.	____
3. Secondary Standards	2/Vio.	____
4. Turbidity:		
Failure to Report	4/Mon.	____
MCL Violation	10/Mon.	____

C. Distribution

Pressure < 20 psi	10 Pt.s	____
Pressure < 35 psi	4 Pt.s	____
Distribution Problems	2 Pt.s	____
Treated Water Protection	3 Pt.s	____
Disinfection Provided But Residual < 0.2 mg/l Free Chlorine or 0.5 mg/l Chloramine	4 Pt.s	____

D. Design Deficiencies

1. Ground Water:		
No Disinfection	10 Pt.s	____
Improper Well Location	4 Pt.s	____
No Easement	4 Pt.s	____
Well Construction Deficiencies	3/item	____
2. Surface Water:		
No Disinfection	20 Pt.s	____
No Filtration	20 Pt.s	____
Excess Filter Rate	4 Pt.s	____
Inadequate Chemical Feed	4 Pt.s	____
Inadequate Detention Time	4 Pt.s	____
3. General:		
Production Deficient	4 Pt.s	____
Storage Deficient:		
Elevated or Pressure	4 Pt.s	____
Total Storage Deficient	4 Pt.s	____

TOTAL (A + B + C + D) = 0

). #: 0200204 Survey Date 08-04-99

ᴜPERATION AND MAINTENANCE

ɜase note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

)PERATIONAL

		Y	N
nthly Reports Submitted to TNRCC (if Required)?	[.46(d)]	✓	—
)R's Properly Completed?	[.46(d)]	✓	—
ad End Mains Flushed?	[.46(l)]	✓	—
v Lines and Repairs Disinfected?	[.46(g)]	✓	—
ɔply of Disinfectant on Hand?	[.46(h)]	✓	—
Distribution Map Up-to-Date?	[.46(n)]	✓	—
Ownership Signs Properly Displayed and Maintained?	[.46(w)]	✓	—
Adequate Chemical Storage Provided?	[.42(d)(6)]	✓	—
ANSI/NSF Approved Chem/Media?	[.42]	✓	—
Facilities Properly Maintained?	[.46(m) & (p)]	✓	—
If Superior/Approved, Signs Properly Disp. & Maint.?	[.47(b)]	—	—

STORAGE TANKS

		Y	N
ɪrage Tanks Properly Covered?	[.43(c)]	✓	—
nks Tight Against Leakage?	[.43(c)(6)]	✓	—
:nts Properly Installed?	[.43(c)(1)]	✓	—
ɔper Roof Hatch Provided?	[.43(c)(2)]	✓	—
ıof Hatch Kept Locked?	[.43(c)(2)]	✓	—
ɔper Overflow Provided?	[.43(c)(3)]	✓	—
Proper Water Level Indicator Provided?	[.43(c)(4)]	✓	—
Drains Properly Connected?	[.43(c)(7)]	✓	—
Inlet and Outlet Properly Located?	[.43(c)(5)]	✓	—
Intruder Resistant Fence?	[.43(e)]	✓	—
Tanks Properly Inspected, Maintained, Documented?	[.46(p)(1)]	✓	—
Below Ground Storage Properly Located?	[.43(b)]	—	—
Inspection Ladder Provided?	[.43(c)]	✓	—

I. PRESSURE TANKS

		Y	N
:curate Pressure Gauges?	[.43(d)(2)]		
ɛssure Release Device Provided?	[.43(d)(2)]		
ɔper Facilities for Air/Water Ratio/ Airfilter?	[.43(d)(3)]		—
ir-Water Volume Indicator Provided?	[.43(d)(3)]		—
Tanks Tight Against Leakage?	[.43(d)(7)]		
Routinely Inspected, Maintained, Documented?	[.46(p)(2)]		
Fenced or Housed?	[.43(e)]		—
ASME, if Required?	[.43(d)(1)]		—

/. DISTRIBUTION

		Y	N
lumbing Ordinance or Agreement?	[.46(i)]	NA	
ustomer Service Inspection Program?	[.46(j)]	—	—
ackflow Assembly Program, if needed?	[.44(h)(4)(D)]	—	—
ewer Lines Properly Located?	[.44(e)]	✓	—
linimum Residual Pressure ≥ 20 PSI?	[.44(d) & .46(u)]	✓	—
ormal Working Pressure ≥ 35 PSI?	[.44(d) & .46(u)]	✓	—
Properly Installed Distribution Piping?	[.44(a)]	✓	—
Adequate Flush/Gate Valves?	[.44(d)(6)]	✓	—
Air Release Valves Properly Installed?	[.44(d)(1)]	NA	
In-Line Booster Pumps in System? Location None		—	—
In-Line Booster Pumps in System Approved?		—	—
If Yes, Pressure Cut-off ≥ 20 psi Provided?	[.44(d)(2)&(3)]	—	—

ested psi/Locations 62 psi - pool house

/. DISINFECTION

		Y	N
Disinfection Equipment Adequate in Capacity?	[.42(e)]	✓	—
Disinfection Equipment Properly Housed?	[42(e)(6)(8)]	✓	—
Disinfection Room Properly Vented?	[.42(e)(7)]	✓	—
Breathing Apparatus and Ammonia Bottle Provided?	[.42(e)(5)]	✓	—
Scales Provided?	[.42(e)(4)(D)]	✓	—
Disinfection Prior to Storage?	[.42(e)(2)(3)]	✓	—
Adequate Residual Maintained/Recorded?	[.46(f)(1)(2)]	✓	—
Evacuation Plan Cl_2/NH3? If needed	[.42(e)(11)]	NA	
DPD Chlorine Test Kit Provided?	[.46(f)(2)]	✓	—
IF AMMONIA FEED PROVIDED:			
Properly Housed/Vented?	[.42(e)(10)]	—	—
Scales or Gauges Provided?	[.42(e)(4)(D)]	—	—

Type Disinfection Used: Gas chlorination

Mg/L (T/F)/Locations 1.92 mg/L - pool house

0790030
PWS/0790030/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 4, 2003

Ms. Doris S. Puig, Environmental Service & Compliance
Texas Instruments Inc.
P.O. Box 1443
Houston Texas, Texas 77251- 1443

Re: Compliance Evaluation Investigation at:
Texas Instruments Inc., 12201 SouthWest Freeway. Fort Bend County, Texas
TCEQ ID No. 0790030

Dear Ms. Puig:

On January 13, 2003, Ms. Elaine Jackson of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Texas Cor nission on Environmε tal Quality

Investigation Report

TEXAS INSTRUMENTS INCORPORATED

TEXAS INSTRUMENTS STAFFORD

RN101717999

Investigation # 22693
Investigator: ELAINE JACKSON

Incident #
Site Classification
GW <=50 CONNECTION

Conducted: 01/13/2003 -- 01/13/2003
Program(s): PUBLIC WATER SYSTEM/SUPPLY

SIC Code: 3674

Investigation Type : Compliance Investigation

Location : 12201 SOUTHWEST FREEWAY

Additional ID(s) : 0790030

Address: 12201 SOUTHWEST FWY; STAFFORD, TX 77477

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	TEXAS INSTRUMENTS INCORPORATED

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	ENVIRONMENTAL SERVICES AND COMPLIANCE TEAM LEADER	MS DORIS PUIG	Work	(281) 274-2073

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	INVESTIGATION

Investigation Comments :

An investigation of Texas Instruments, Inc. was conducted on January 13, 2003. Present at the investigation was Ms. Doris Puig, Environmental Services & Compliance Team Leader and Javier Mendiola, Operator, has CGW operations license, can be contacted at (281) 274- 2073. The water system, which consists of one entry point, provides service to 1500 people.
5 connection

The NTNC water system is comprised of three wells located at 12201 Southwest Freeway. The water system consists of groundwater, three wells, two ground storage tanks, five service pumps, distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine. Emergency power is provided for the entire plant by a gas power generator. The facility has closed interconnected with Fort Bend Co. WCID #2 . System was waived for pressure tank capacity on 7/25/91. Letter attached.

Entry Point 1- Located at 12201 Southwest Freeway: consists of 3 verticle turible wells (Well #1-700 gpm, Well #2- 810 gam, Well #3- 850}, 2 ground storage tank (0.25 MG), and {0.25 mg}, 5 service pumps 3 @ 420 gpm and 1 @ 450 gpm and 1 @ 890 gpm), power generator for entire plant, and distribution. Treatment is gas chlorination; injection is prior to ground storage tank.

No Violations Associated to this Investigation

Signed Elaine Jackson
Environmental Investigator

Date 1/30/03

Signed Barry H[illegible]
Supervisor

Date 2/4/03

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : Compl.
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) :
System facilities Capacities, Micro & chem.

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	22693	Additional ID(s)	0790030	Investigation Date	1/13/03

SYSTEM FACILITIES

Number of Connections 5

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	South of Admin Bldg.	Previous Survey	O	1030'	VT	700	700 1/13/03
001	B	2	North of Bldg.#2	Previous Survey	O	1020'	VT	760	810 "
001	C	3	West of Water Plant	Previous Survey	O	934'	VT	800	850 "

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.25 MG	Welded Steel	Well Site
GST	0.25 MG	Welded Steel	Well Site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1-1	420	Well Site	1-4	450	Well Site			
1-2	420	Well Site	1-5	890	Well Site			
1-3	420	Well Site						

Emergency Power /Alternate Source? Yes Describe: Gas Diesel engine for plant

(N)

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	24x1500/1440	GPM/Conn	X		Conn =	25	GPM	2360	GPM	x	
Elevated/**Pressure** Storage	-	Gal/Conn	X		Conn =	-	MG	-	MG	-	
Ground/Total Storage	50% max D.D.	Gal/Conn	X	0.036	Conn =	0.018	MG	0.5	MG	x	
Service Pumping Cap.	0.036/1440	GPM/Conn	X	3	Conn =	75	GPM	2570	GPM	x	
Service Pump Peaking Factor		MDD/1,440	X		**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System:	Texas Instruments Inc.	Additional ID(s)	0790030
Investigation #	22693	Investigation Date:	1/13/03

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	-	
Well(s) Surface Water Influenced?	-	
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 1 # Submitted 1
Number of Raw Samples Required - # Submitted -
Non-Comm Dates of Operation - Thru -

CHEMICAL

Acceptable Quality? ___ Date, Last Analysis IOC 1/31/00 NO_2/NO 6/8/94 RC ______ VOC 10/16/00 SOC ______

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date ______

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons):
N/A
Date of maximum daily usage:
N/A
Average daily usage:
N/A
Time period for average daily usage:

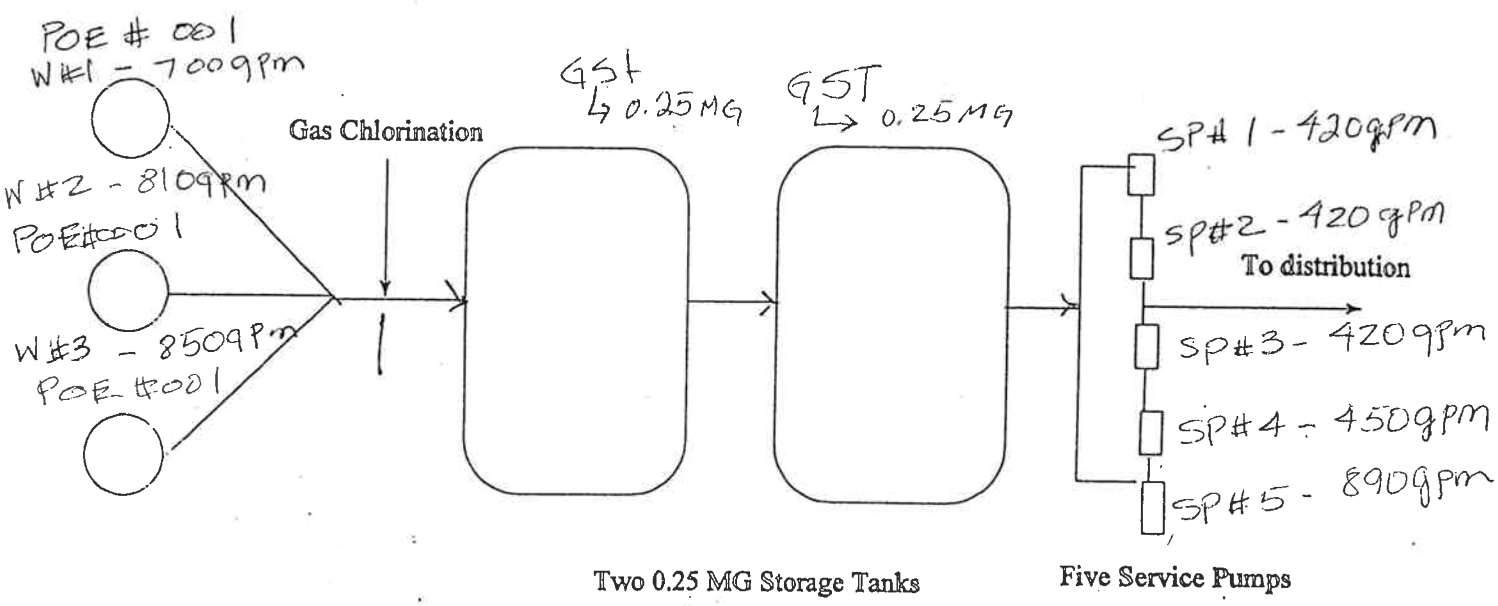
Tested Distribution psi: 70 psi Location(s): DI Water Plant

Tested Chlorine Residual: 1.35 mg/L Free Location: Same

PWS - SYSTEM FLOW DIAGRAM

Name of System:	Texas Instruments Inc.	Additional ID(s)	0790030
Investigation #	22693	Investigation Date:	1/13/03

Description of Supply, Source, Treatment, and Chemicals Used



PWS1079005 01CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 6, 2003

Mr. Jerry Storseth, President
Thunderbird UD #2
3134 Cartwright
Missouri City, Texas 77459- 2599

Re: Compliance Evaluation Investigation at:
Thunderbird UD #2, 1455 Turtle Creek Dr., Missouri City, Ft Bend County, Texas
TCEQ ID No. 0790050

Dear Mr. Storseth:

On January 15, 2003, Ms. Elaine Jackson of the Texas Commission on Environmental Quality (TCEQ), (formerly Texas Natural Resource Conservation Commission (TNRCC)) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TCEQ appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Elaine Jackson in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/ej

cc: Fort Bend Co. Health Dept.

Texas Co nission on Environm tal Quality
Investigation Report

QUAIL VALLEY UTILITY DISTRICT

THUNDERBIRD UTILITY DISTRICT 2

RN102687258

Investigation # 23549 | **Incident #**

Investigator: ELAINE JACKSON

Site Classification
GW 251-1K CONNECTION

Conducted: 01/15/2003 -- 01/15/2003

No Industry Code Assigned

Program(s): PUBLIC WATER SYSTEM/SUPPLY

Investigation Type : Compliance Investigation

Location : KEY MAP 610F

Additional ID(s) : 0790050

Address: 1455 TURTLE CREEK; MISSOURI, TX 77459

Activity Type : PWS CCI GW/PW - Discretionary comprehensive compliance investigation for standard groundwater, purchased water or re-pressurization facilities

Principal(s) :

Role	Name
RESPONDENT	QUAIL VALLEY UTILITY DISTRICT

Contact(s) :

Role	Title	Name	Phone	
Regulated Entity Contact	OPERATOR	MR JOE TAYLOR	Work	(281) 499-5539

Other Staff Member(s) :

Role	Name
SUPERVISOR	BARRY PRICE

Associated Check List

Checklist Name	Unit Name
PWS INVESTIGATION TYPES	INVESTIGATION

Investigation Comments :

An investigation of Thunderbird U.D. #2 was conducted on January 15, 2003. Present at the investigation was Mr. Joe G. Taylor, Operator, who can be contacted at (281) 499- 5539. The water system, which consists of one entry point, provides service to 581 connections in the Quail Valley North Subdivision with a population of 1743 and is operated by and managed by Quail Valley Utility District. The operation company has 8 operators that hold an A, B, C groundwater water operations license.

The Community water system is comprised of 1 plant located at 1455 Turtle Creek. The water system consists of groundwater, one well, one ground storage tank, three service pumps, one pressure tank and distribution. The ground water source is treated prior to the ground storage tank by using gas chlorine and polyphosphate. Emergency power is provided for the entire plant by a diesel generator. The facility is interconnected with Quail Valley U.D. which has 6560 gpm of well capacity.

Entry Point 1- Located at : 1455 Turtle Creek consists of 1 vertical turbine well (730 gpm), 1 ground storage tank (0.5 MG), (3 service pumps @ 650 gpm), 1 pressure tank (0.02 MG), diesel generator, and distribution. Treatment is gas chlorination and polyphosphate; injection is prior to ground storage tank.

During the investigation no violations were noted.

No Violations Associated to this Investigation

Signed Elaine Jackson Date 2/5/03
Environmental Investigator

Signed Barry R Date 2/6/03
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
✓ Letter to Facility (specify type) : Compl.
Investigation Report
___Sample Analysis Results
___Manifests
___NOR

✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
✓ Other (specify) : System fac & capacities, micro. + chem. monitoring, flow diagram

PWS - SYSTEM FACILITIES AND CAPACITIES

Investigation #	23549	Additional ID(s)	0790050	Investigation Date	1/15/03

SYSTEM FACILITIES

Number of Connections 581

WELL

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth FT	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	1455 Turtle Creek	See Attached copy	O	1314'	VT	730	730 1/14/03

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
GST	0.5 MG	Welded Steel	Plant Site
PT	0.02 MG	Welded Steel	Plant Site

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1-1	650							
1-2	650							
1-3	650							

Emergency Power /Alternate Source? Yes Describe: Diesel Generator

(Y)

SYSTEM CAPACITIES					Required		Provided		Y	N
Well Production	0.6	GPM/Conn X	581	Conn =	348.6	GPM	730	GPM	x	
Elevated/Pressure Storage	20	Gal/Conn X	581	Conn =	0.01162	MG	0.02	MG	x	
Ground/Total Storage	200	Gal/Conn X	581	Conn =	0.1162	MG	0.5	MG	x	
Service Pumping Cap.	2	GPM/Conn X	581	Conn =	1162	GPM	1950	GPM	x	
Service Pump Peaking Factor	-	MDD/1,440 X	-	**	-	GPM	-	GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons. * CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

PWS -Microbiological and Chemical Monitoring
Usage and Field Tests

Name of System: Thunderbird Utility District #2	Additional ID(s) 0790050
Investigation # 23549	Investigation Date: 1/15/03

MICROBIOLOGICAL	Y	N				
Samples Submitted per DWS?	X		Number of Samples Required	1	# Submitted	1
Raw Samples Submitted, if Required?	-		Number of Raw Samples Required	-	# Submitted	-
Well(s) Surface Water Influenced?	-		Non-Comm Dates of Operation	-	Thru	-
Acceptable Sample Siting Plan on File?	x					

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 2/01/01 NO_2/NO 1/2/00 RC 10/6/98 VOC 2/1/00 SOC -

List UNACCEPTABLE Values -

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? - Date -

Usage and Field Tests:

Maximum Daily Usage (gallons/million gallons):
0.348 MG
Date of maximum daily usage:
8/9/02
Average daily usage:
0.158 MG
Time period for average daily usage:
1/1/02- 1/31/02
Tested Distribution psi: 59 psi Location(s): 1906 Quail Valley East

Tested Chlorine Residual: 1.29 mg/L Free Location(s): Same

GPS DATA REPORTING FORM

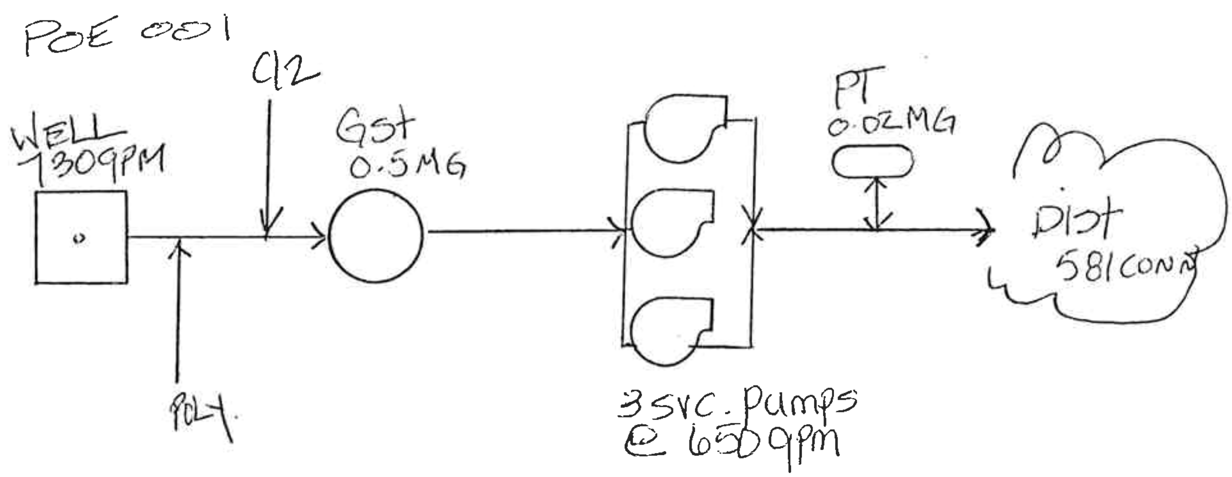
GPS Cert # 98040804 Region 12 Date 12-14-01

WaterSource	Collector Name	Latitude	Longitude	Max PDOP	Collection Method	Receiver Type	Correction Status	Total positions	Datum	Time
G1010001A	Lamb, T.	29° 30' 15.35" (Decimal Degrees not available with GeoExplorer)	95.9991	4.5	Superim-posed	GeoExplr (old Trimble)	Diff. Correc.	60	NAD83	1010 A
G1010001B	Lamb, T.	29.25211	95.9991	4.5	Centroid	GeoExplr 3	Post Processing	60	NAD83	12:15P
G1010001C	Lamb, T.	29.11111	95.9991	6	Off Set	Magellan	Diff. Correc.	60	NAD83	1:45P
First three Shaded	Rows Above	Are EXAMPLES	ONLY.	SKIP	THIS	LINE.				
G0790049A	Jackson, E	29.586861191	-95.550935474	6	Superimposted		Diff. correc.	60	NAD83	9:50
G0790254A	Jackson, E	29.595562387	-95.56743705	6	Superimposted		Diff. correc	60	NAD83	10:04
G0790028A	Jackson, E	29.590192416	-95.560810851	6	Superimposted		Diff. correc	60	NAD83	10:47
G0790137A	Jackson, E	29.602120576	-95.532688709	6	Superimposted		Diff. correc	60	NAD83	10:30
G0790137B	Jackson, E	29.601882854	-95.5322935	6	Superimposted		Diff. correc	60	NAD83	10:40
G0790028C	Jackson, E	29.582989558	-95.536627869	6	Superimposted		Diff. correc	60	NAD83	10:50
G0790050A	Jackson, E	29.576135015	95.520878336	6	Superimposted		Diff. correc	60	NAD83	11:07
G0790033A	Jackson, E	29.560700868	-95.559612836	6	Superimposted		Diff. correc	60	NAD83	11:20
G0790033B	Jackson, E	29.561664	-95.551073953	6	Superimposted		Diff. correc	60	NAD83	11:30
G0790028A	Jackson, E	29.573727854	-95.55048068	6	Superimposted		Diff. correc	60	NAD83	10:17
G0790028B	Jackson, E	29.573489567	-95.552050636	6	Superimposted		Diff. correc	60	NAD83	10:55

PWS - SYSTEM FLOW DIAGRAM

Name of System:	**Thunderbird Utility District #2**	**Additional ID(s)**	**0790050**
Investigation # 23549		**Investigation Date:**	**1/15/03**

Description of Supply, Source, Treatment, and Chemicals Used



VNU

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Kathleen Hartnett White, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

PWS/0790314/ICO

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

November 19, 2001

The Honorable Dean Hrbacek, Mayor
City of Sugar Land
P.O. Box 110
Sugar Land, Texas 77487.0110

Re: Compliance Evaluation Investigation at:
City of Sugar Land - Annex, 1420 Austin Parkway, Sugar Land, Fort Bend County, Texas
TNRCC ID No. 0790314

Dear Mayor Hrbacek:

On October 29, 2001, Ms. Helen Pagola of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. During the investigation, the investigator verbally notified you of an apparent instance of noncompliance. You have provided us with information which appears to indicate that this problem has been corrected. No further response from you is necessary concerning this investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Helen Pagola in the Houston Region Office at (713)767-3650.

Sincerely,

Barry H. Price, Jr.
PWS Team Leader
Houston Region Office

BHP/hp

cc: Fort Bend Co. Health Dept.

PUBLI(VATER SUPPLY REGULATORY I' ƆGRAM

REGULATED ENTITY DATA

KM 568 Y

ID No. 0790314 **GW multi: #** 2 **SW multi : #** 0 **Community** x **NTNC** **Non-Comm**

CCN No. - Superior - Approved - Probation - **Region** 12

Name of System City of Sugar Land - Annex County Fort Bend

Physical location 1420 Austin Parkway, 2628 Grants Lake, 2120 First Colony, & 4226 Willow Bank, Soldier's Court

Responsible Official Dean Hrbacek Title Mayor Phone 281.275.2450 / 281.275.2493

Mailing Address P.O. Box 110 Sugar Land Texas 77487 - 0110 **FAX** **281.579.2465**

Chief Cert Op Name Mike Thelen Grade & Type B - GW Phone 281.275.2456

2nd Op Req'd? yes Name Russell Feather Grade & Type B - GW Total # Cert. Ops. 5

WS Manager/Superintendent ECO Resources, Inc. Other Officials none

Surveyed With Leo Reyes, P. Kagarice, Bruce Lawton, S. Barr Area Served Annexed areas & Ft. Bend Co. 113

Supplier and Source City - ground - 6 wells

Interconnection w/other PWS? yes Name PWS I/C First Colony MUD # 9 Type I/C open

Retail Service Connection 12325 Retail Meters 12325 Retail Population 30, 600

Wholesale Master Meters 1 Wholesale Service Connections 860 Wholesale Population 2580

Charge yes Dist. to and Name of Nearest **50 feet to** City of Sugar Land

Type of Investigation (CCI, CCM, REC, Other) CCI Previous Investig. Date 09.25.00

Map Attached no Previous Map OK? yes Well Operational Status new well (well # 6)

Description of Supply, Source, Treatment, and Chemicals Used:

Ground water -6 wells, 5 ground storage tanks, 1 elevated towers, 3 pressure tanks, 9 booster pumps, 2 diesel generators, 2 RT angle drive and distribution. Treatment: gas chlorination, polyphosphate and fluoride; injection points prior to storage.

Total Well Cap. 14450 GPM 20.808 MGD RAW Cap. 0 GPM 0 MGD

Treatment Cap. 0 GPM 0 MGD Total Svc. Pump Cap. 16500 GPM 23.76 MGD

Total Elevated Storage 2.0 MG Total Storage 7.62 MG Pressure Tank Cap. 0.06 MG

Maximum Daily Usage 13.841 MG Date 08.12.01 Average Daily Usage 7.27 MGD Time 10.00 - 09.01

Wholesale Contract - Maximum Purchase Rate 1.13$ - first 1000 gallons

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	x	
Raw Samples Submitted, if Required?	x	
Well(s) Surface Water Influenced?		x
Acceptable Sample Siting Plan on File?	x	

Number of Samples Required 40/ # Submitted 44/m

Number of Raw Samples Required 1 # Submitted 1

Non-Comm Dates of Operation - Thru -

* raw water sample submitted due to Well # 4 @ 1500' from BRA discharge into stream

CHEMICAL

Acceptable Quality? yes Date, Last Analysis IOC 3.17.99 NO_2/N 3.17.99 RC 6.01.99 VOC 2.15.01 SOC 02.15.01

List UNACCEPTABLE Values none

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? Date

Date of Investigation 10.29.2001 By Helen Pagola

Date of Approval 11/19/01 By Barry Price

Letter Date, if different from Approval Date Reply Requested Def Score 0

- = Not Applicable U=Unknown N= Not Observed R=Resolved * = See Comments

JAN 15 2002

I.D. No.:	07903	Survey Date:	10.29.2001

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

		Y	N			Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,f]	-		Distribution Map Up-to-Date?	[46,n,2]	x	
MOR's Properly Completed?	[46,f]	x		Ownership Sign Properly Display & Maintain?	[46,t]	x	
Dead End Mains Flushed?	[46,l]	x		Adequate Chemical Storage Provided?	[42,d,6]	x	
New Lines and Repairs Disinfected?	[46,g]	x		ANSI/NSF Approved Chem/Media?	[42,i]	x	
Supply of Disinfectant on Hand?	[46,h]	x		Facilities Properly Maintained? see comments	1[46,m]		R
85% Planning Report, if needed?	[291.93,3]	-		Super./Apprv'd Signs Properly Disp. & Maint.?	[47,a]	x	
				Drought Contingency Plan	[288]	x	

II. STORAGE TANKS

		Y	N			Y	N
Storage Tanks Properly Covered?	[43,c]	x		Proper Water Level Indicator Provided?	[43,c,4]	x	
Tanks Tight Against Leakage?	[43,c,6]	x		Drains Properly Connected?	[43,c,7]	x	
Vents Properly Installed?	[43,c,1]	x		Inlet and Outlet Properly Located?	[43,c,5]	x	
Openings Properly Screened	[43,c,1]	x		Disinfectant Residual in Water Storage Tanks	[46,d,2]	x	
Proper Roof Hatch Provided?	[43,c,2]	x		Intruder Resistant Fence?	[43,e]	x	
Roof Hatch Kept Locked?	[43,c,2]	x		Tanks Properly Maint., Inspected, Documented?	[46,m,1]	x	
Proper Overflow Provided?	[43,c,3]	x		Below Ground Storage Properly Located?	[43,b]	-	
				Inspection Ladder Provided?	[43,c]	x	

III. PRESSURE TANKS

*** GST & PT inspected on 05.03.2001**

		Y	N			Y	N
Accurate Pressure Gauges?	[43,d,2]	x		Tanks Tight Against Leakage?	[43,d,7]	x	
Pressure Release Device Provided?	[43,d,2]	x		Routinely Maintained, Inspected, Documented?	[46,p,2]	x	
Proper Facilities for Air/Water Ratio & Air filter?	[43,d,3]	x		Fenced or Housed?	[43,e]	x	
Air-Water Volume Indicator Provided?	[43,d,3]	x		Approval for > 3 pressure tanks at one location	[43,d,9]	-	
				ASME, if Required?	[43,d,1]	x	

IV. DISTRIBUTION

		Y	N			Y	N
Plumbing Ordinance or Agreement? *city ordinance	[46,i]	x		Properly Installed Distribution Piping?	[44,a]	x	
Customer Service Inspection Program?	[46,j]	x		Adequate Flush/Gate Valves?	[44,d,6]	x	
Backflow Assembly Report Recorded, if needed?	[44,h,4,C]	x		Air Release Valves Properly Installed?	[44,d,1]	x	
Sewer Lines Properly Located?	[44,e]	x		In-Line Booster Pumps in System? **	[44,d,2]	-	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,r]	x		In-Line Booster Pumps in System Approved?	[44,d,2]	-	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,r]	x		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	-	

Tested 53 psi Locations: 2216 Oilfield Road (ET on Settler's Way)

**Location: None

V. DISINFECTION

		Y	N			Y	N
Disinfection Equipment Adequate in Capacity?	[42,e,3,A]	x		Adequate Residual Maintained / Recorded?	[46,f&110]	x	
Type Disinfection Used: gas chlorination				CL2 = 1.24 _Mg/L/F Locations: Same as pressure			
Disinfection Equipment Properly Housed?	[42,e,5,8]	x		DPD Chlorine Test Kit Provided?	[110,d]	x	
Disinfection Prior to Storage?	[42,e,2,]	x		Evacuation Plan Cl_2NH_3? If needed	[42,j,2]	-	
Breathing Apparatus & Ammonia Bottle Provided?	[42,e,4]	x		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,3,D]	x		Properly Housed/Vented?	[42,e,8 & 42,d,7,H]	-	
Disinfection Room Properly Vented?	[42,e,6,8]	x		Scales or Gauges Provided?	[42,e,3,D]	-	

I.D. No.:	0790314	Survey Date:	10.29.2001

VI. SYSTEM FACILITIES

Number of Connections 12325

WELLS

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/ Est GPM/ Date
001	A	1	1420 Austin Parkway	° ' "/° ' "	O	1700'	VT	2000	2000 10.29.01
001	B	2	2628 Grants Lake	29°35 '3587" /95°36'5036"	O	1200'	vt	2000	2000 10.29.01
001	D	4	4226 Willow Bank Court	29°34'5020" /95°37'3559"	O	944'	sub	2100	2400 10.29.01
002	E	3	2120 First Colony	° ' "/° ' "	O	1500'	vt	2100	2200 10.29.01
002	F	5	Soldier's Court	29°36'1274" /95°38'1995"	O	900'	sub	2750	2750 10.29.01
002	G	6	1526 Great Oak Lane	29°35'4723" /95°37'4999"	O	2335'	sub	2900	3100 10.29.01

4114 - Plant

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity (MG)	Material	Location
ground storage tank	1.58	welded steel	site 1
ground storage tank	0.48	bolted steel	site 1
ground storage tank	0.48	bolted steel	site 1
ground storage tank	1.58	welded steel	site3
ground storage tank	1.5	welded steel	site 3
elevated tower	2.0	welded steel	Settler's Way
pressure tank	0.02	welded steel	site 1
pressure tank	0.02	welded steel	site 1
pressure tank	0.02	welded steel	site 2

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1.1	1750	site 1	1.5	1000	site 1	3.4	500	site 3
1.2	2500	site 1	3.1	3000	site 3	1.4	1750	site 1
1.3	2500	site 1	3.2	2500	site 3	3.3	1000	site 3

Emergency Power /Alternate Source? Y (Y / N) Describe: 2 diesel generators & 1 RT angle drive (well # 1 & 3)

SYSTEM CAPACITIES						Required		Provided		Y	N
Well Production	0.6	GPM/Conn	X	13185	Conn =	7911	GPM	14450	GPM	x	
Elevated/Pressure Storage	100	Gal/Conn	X	13185	Conn =	1.32	MG	2	MG	x	
Ground/Total Storage	200	Gal/Conn	X	13185	Conn =	2.64	MG	7.62	MG	x	
Service Pumping Cap.	0.6	GPM/Conn	X	13185	Conn =	7911	GPM	16500	GPM	x	
Service Pump Peaking Factor		MDD/1,440	X	1.25	**		GPM		GPM *	-	

** Factor = 1.25 (ES) or 1.85 (PT), MDD listed as gallons.

* CALCULATE WITH LARGEST PUMP OUT OF SERVICE (290.45(B)(1)(D)(iii))

I.D. No.:	0790314	Survey Date:	10.29.2001

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE

A. SANITARY

		Y	N			Y	N
Well/pump room protected from flooding?	[41,c,3,H]	x		Sewage Treatment plant ≥ 500 ft.?	[41,c,1,B]	x	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	x		Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	x	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	x		Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	x	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	x		UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	x	
Drainage ditch or liftstation ≥ 300 ft.?	[41,c,1,B]	x		Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	x	

B. CONSTRUCTION

Sanitary easement(s) recorded?	[41,c,1,F]	x		Suitable sampling tap?	[41,c,3,M]	x	
Well cased 18" above ground level?	[41,c,3,B]	x		Well meter provided?	[41,c,3,N]	x	
Proper concrete sealing block?	[41,c,3,J]	x		Well blow-off properly installed?	[41,c,3,L]	x	
Well head sealed?	[41,c,3,K]	x		Well unit fenced or housed?	[41,c,3,O]	x	
Casing vent properly installed?	[41,c,3,K]	x		Well site properly drained?	[41,c,3,I]	x	
Air release devices properly installed?	[41,c,3,Q]	x		All weather road provided?	[41,c,3,P]	x	
Electrical Wiring installed in conduit?	[46,V]	x					

VIII. ADDITIONAL COMMENTS:

1) Roof hatch on GST located at wellsite # 1 is heavily corroded on the interior side. In addition, there are several rust holes about 1.5 inches from the roof hatch on the tank roof.

Resolved via email on 11.08.2001.

IX. RATING DEFICIENCY SCORE

Number of A Violations: [ ] Number of B Violations: [ ] Number of C Violations: [ ]

Deficiency Score (A= 20 pts, B=5 pts, C= 2 pts) = 0

Magellan Check List and Data Reporting Form

Session Planning: Collect Fresh Almanac (AUX 9): Use RTCM (can use base station--or use 2nd Magellan unit for control point.), or Post Processing. Use Trimble.com internet site for Coverage Predictions.

1. Check Equipment and Make appropriate connections
2. Turn Equipment On and Off as check -- go through **set up, ensure defaults (1 -20)**
3. Check and power up (connections and batteries–Make sure you have PLENTY of Batteries)

To Collect Data:

4. **Turn On**
5. Get a Fix; if no fix, go to set up #7
6. Go to **SET UP 7– Configure = Port 1, Baud Rate = 9600**
7. Press **POS,** (Confirm antenna working); hit ↓ verify status WGS84,date, time, etc.; hit ↓ verify satellites, pdop
8. Hit **DIF** 4–turn on **Diff. RTCM**, use right arrow (→); Display should say **Receiving RTCM**.
9. Hit **POS**–wait a couple of minutes–confirm **D** icon on display, then ready to collect data
10. Go to Wellhead (point to be collected)–Hold ANTENNA over Wellhead (know antenna height)
11. Hit **DIF 1**, Confirm Auto Stop
12. Hit **ENTER**; Select **Avg. # of Positions to average** (Set to **60, DESCRIPTOR,** hit **ENTER**); Assure sec=1,raw=1, hit **ENTER**
13. hit **ENTER** again and DON"T MOVE for 60 epochs. NOTE: Watch your *s= 's* (Standard Deviation)–if it jumps higher than 5, REDO SESSION (a S.D. of 5 will put you within 3 meters 90% of the time).

After averaging 60 positions (about 60 seconds) you need to...

14. Name the waypoint by pressing **ENTER** , →(right arrow) on alphanumeric keys OR AUTO NAME by pressing **ENTER** without keying in any characters, and annotate name on notes/chart.
15. Make sure you see 2 arrows to confirm storage... ↓ & ➛
16. Verify waypoint storage by going to WAYPOINT (**ENTER**), using right arrow (➛) to find Waypoint and confirm it is stored.
17. If there is to be a delay before doing more data collection, power OFF receiver and backpack unit.
18. As a safety precaution, you may store your car position when in the "boonies" as a waypoint (naming it "car"). If lost, navigate one leg route from HERE to CAR (from position collected hit **NAV, ENTER**, pick up SV's and go).

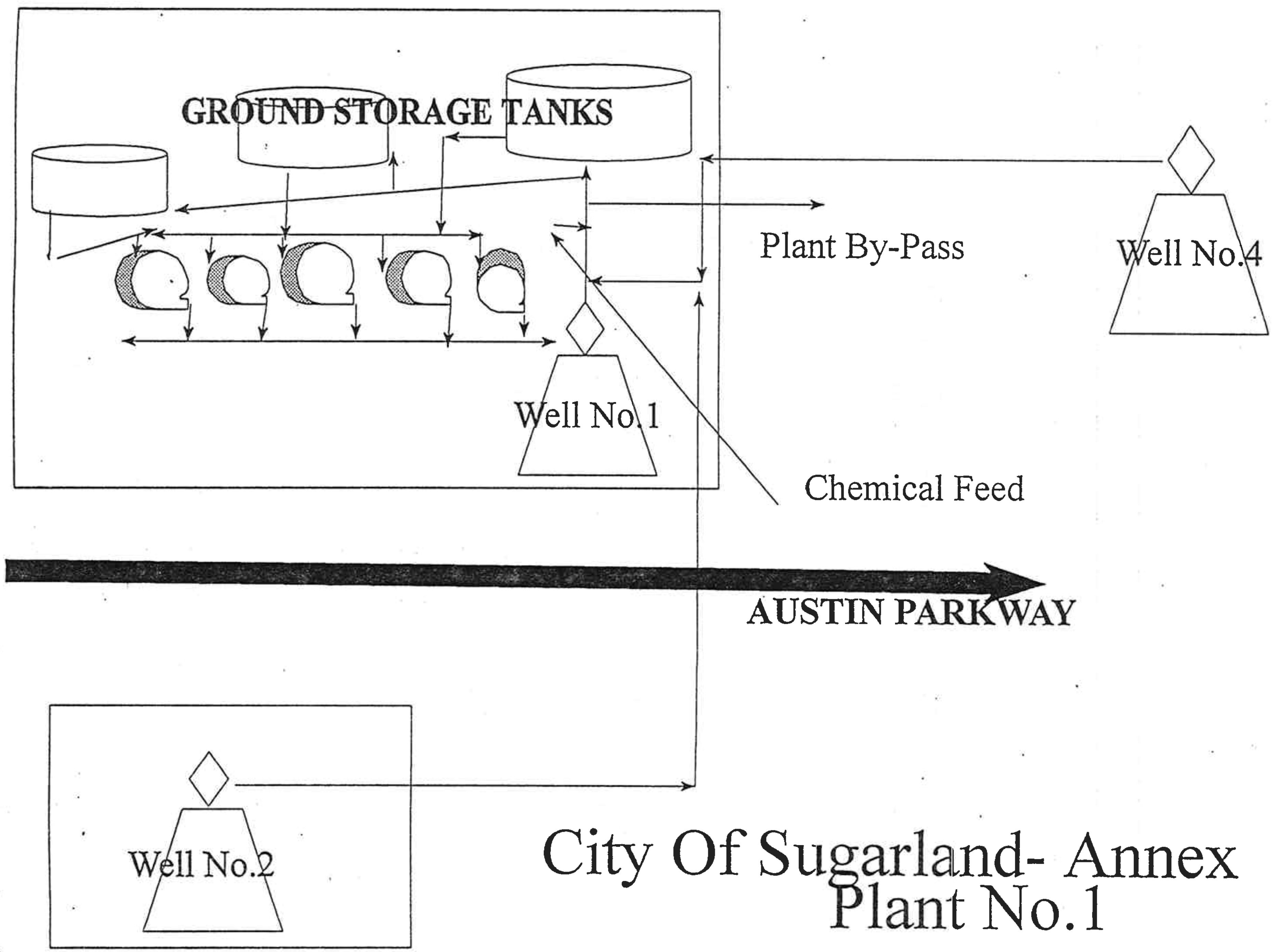
Name___Helen Pagola____ GPS Cert #______97101008_____ Region__12____ Date_10.29.2001____

WaterSource ID (example:G1010001A)	**Wpt**	**Latitude**	**Longitude**	**Altitude**	**Offset Distance**	**Offset Direction**
0790314 B	1	N 29 35 35.87	W 95 36 50.36	55		
0790314 D	2	N 29 34 50.20	W 95 37 35.59	59		
0790314 F	3	N 29 36 12.74	W 95 38 19.95	62		
0790314 G	4	N 29 35 47.23	W 95 37 49.99	59		

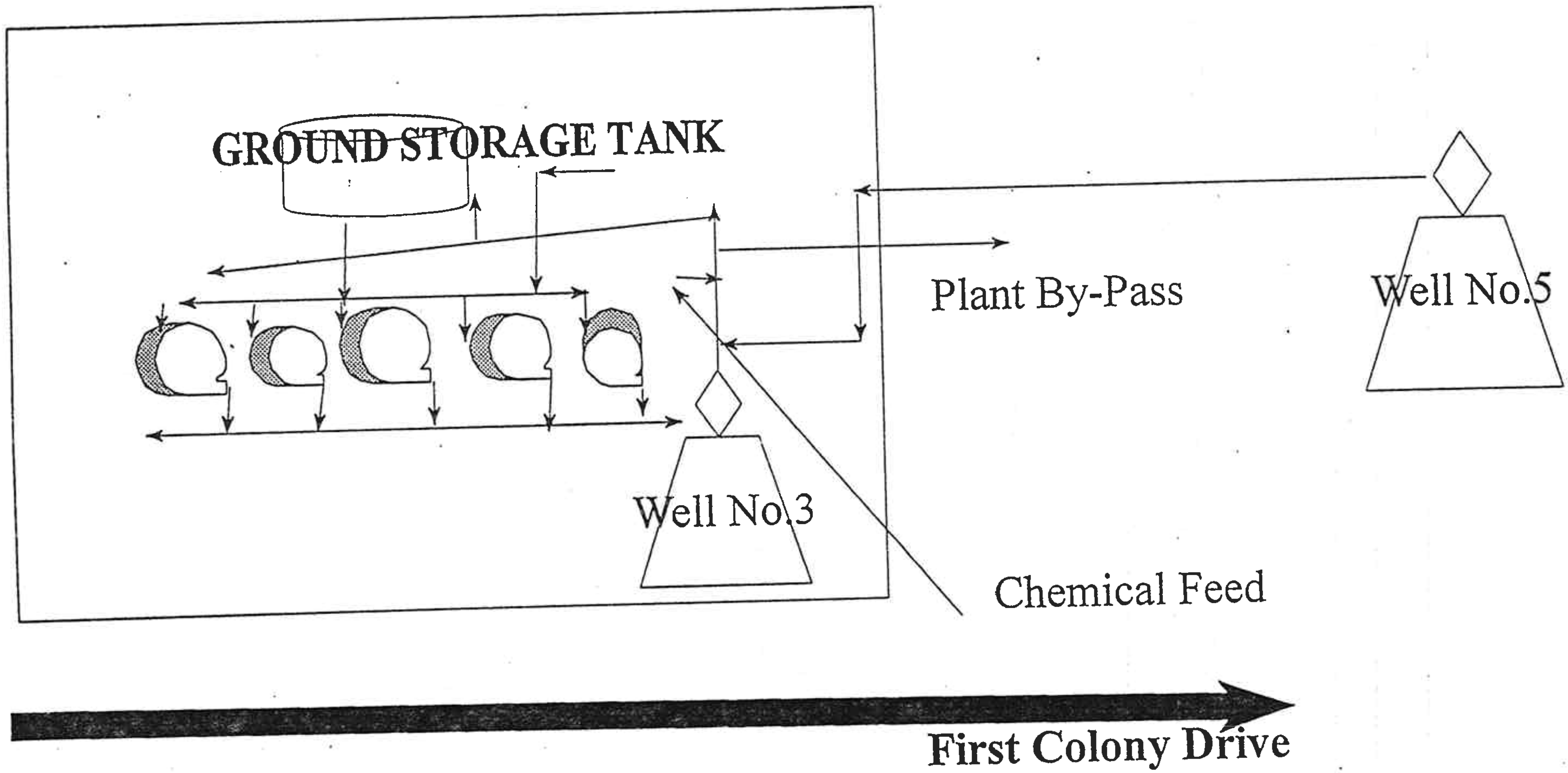
When you return to the office:

1. Attach this form to the sanitary survey when you send it to the central office. Keep a copy for your files.
2. Delete waypoints from the GPS receiver to clear memory for next field collection.
3. Put battery on charge if there is a battery charge adapter available.

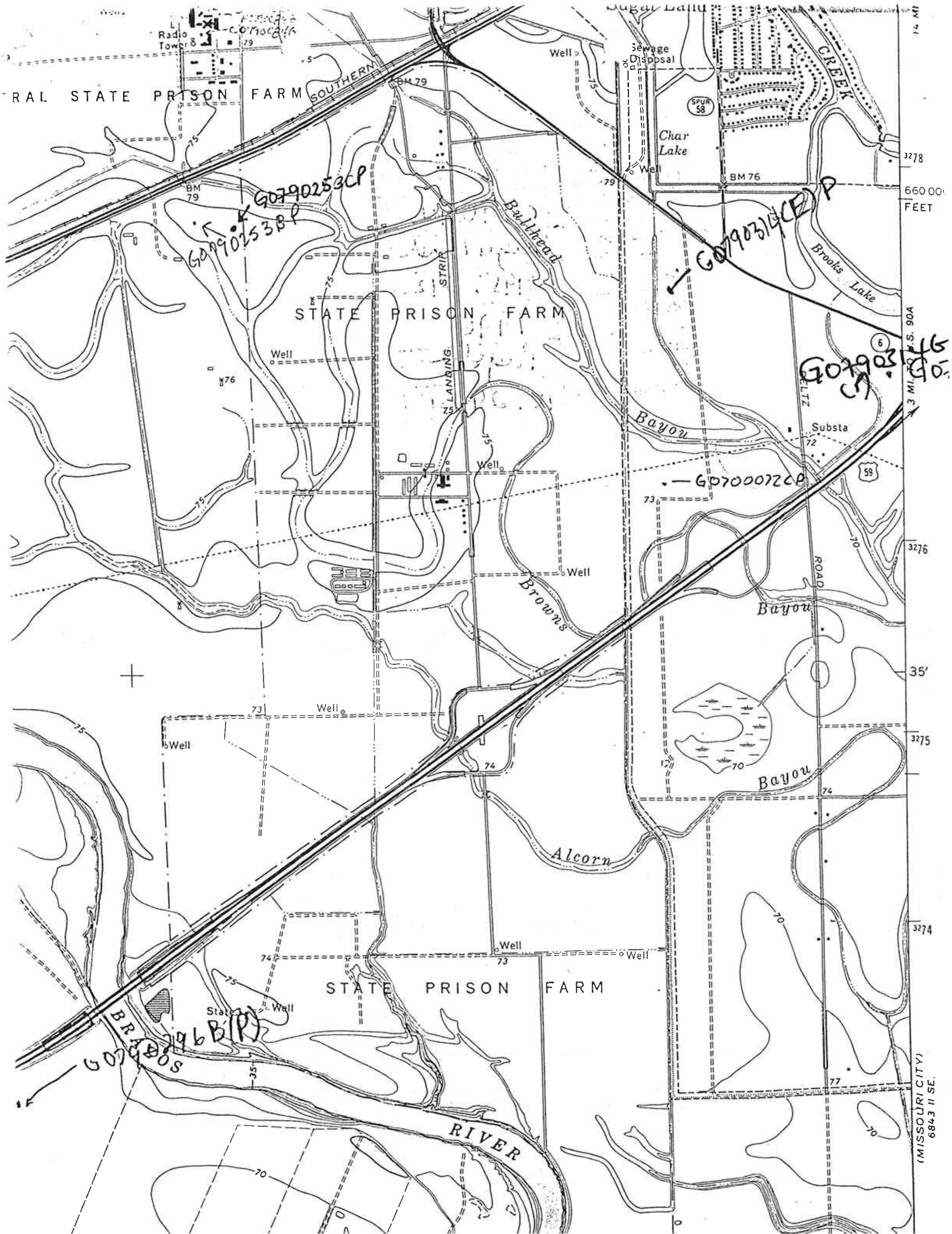
C:\files\magelGPS.wpd Revised 04.05.2000 CR



City Of Sugarland- Annex
Plant No.1



City Of Sugarland- Annex
Plant No.2



Radio Tower 8
RAL STATE PRISON FARM
SOUTHERN
BM 79
Sugar Land
Sewage Disposal
Well
SPUR 58
Char Lake
BM 76
CREEK
14 MI
3278
660 000 FEET
G0790253CP
G0790253BP
G0790314(E)P
Bullhead
Brooks Lake
STATE PRISON FARM
LANDING STRIP
U.S. 90A
6
G0790314G
Bayou
Substa
72
3 MI TO
59
G0700072CP
73
75
76
3276
Browns
Well
Bayou
35′
3275
Bayou
74
70
Alcorn
3274
STATE PRISON FARM
State
BRAZOS
RIVER
G0790296B(P)
77
(MISSOURI CITY)
6843 II SE

SUMMARY OF INVESTIGATION FINDINGS

Regulated Entity Name: City of Sugar Land - Annex	TNRCC ID: 0790314	Investigation Date: 10.29.2001

ALLEGED NONCOMPLIANCES NOTED AND RESOLVED

No.	Requirement Cited	Description of Alleged Noncompliance, Corrective Action Taken, and Compliance Documentation
1	30 TEX. ADMIN. CODE , §290.46(m)	<u>Operating Practices for Public Water Systems</u> Failure to properly maintain the regulated entities by not repairing or replacing the corrosion on the interior side of the roof hatch on the ground storage tank located at well site # 1, and associated rust holes. Violation was resolved via email 11.08.2001.

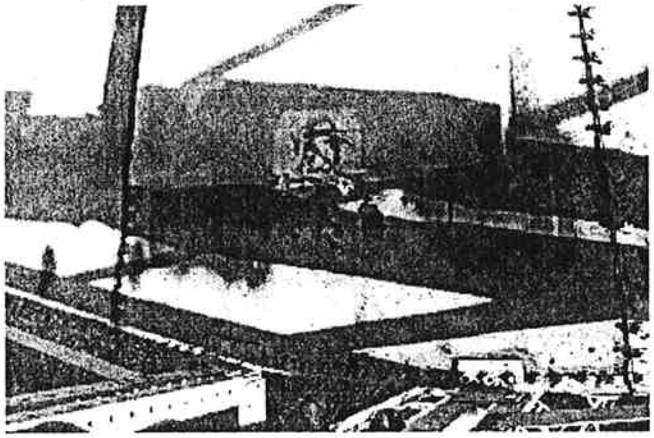
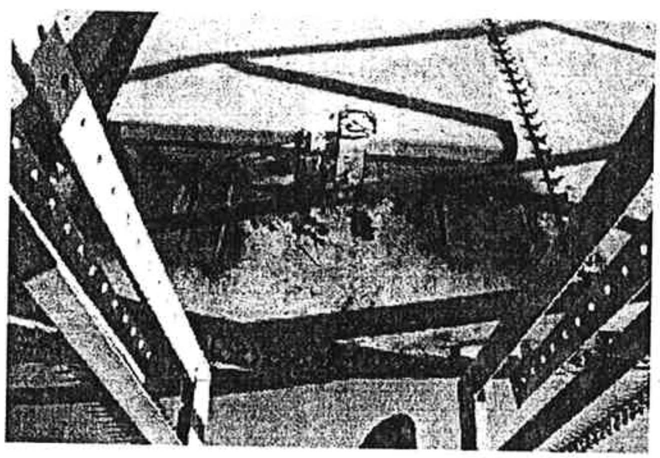


Image 320x213 pixels



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Name of System City of Sugar Land. Annex

Page_____ of _____

FLUORIDATION

1. Type of fluoride compound used? Hydrofluorosilic Acid
   (if fluosilicic acid is used, diluted or undiluted)
2. Type of feeder used? centrifugal pump
3. Number of injection points? 6
4. Location of injection point(s) within the treatment process? prior to chlorination injection pt.
5. Are scales provided (except for saturator installation)?........... y
6. Is adequate chemical storage provided? .... y
7. Is an acceptable test kit provided? .... y
8. Are daily residuals recorded on monthly report? .... y
9. Are fluoridation facilities well maintained? .... y
10. Is adequate protection against siphonage provided and operational?. y
11. Is adequate safety equipment provided to minimize operator contact with chemicals? .... y

Comments _____

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

July 18, 2000

Ms. Ramona Darden, President
Treasure Island MUD
12931 Gulf Beach Drive
Freeport, Texas 77541-9291

Re: Public Water Supply:
Treasure Island MUD, C.R. 257 West of San Luis Pass, Brazoria County, Texas
TNRCC ID #0200038

Dear Ms. Darden:

On June 9 , 2000, Ms. Leticia DeLeon of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an inspection of the above-referenced facility to evaluate compliance with applicable public water supply requirements. No violations were documented during the inspection.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Ms. Leticia DeLeon in our Houston Region Office at 713/767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols, Jr. P.E.
PWS Team Leader
Houston Region Office

RLE/ld

cc: Brazoria County Health Dept.

3641W

PUBLIC ATER SUPPLY REGULATORY P GRAM

WATER SYSTEM DATA

ID No. 0200038 Community ✓ NTNC ___ Non-Comm ___

CCN No. — Superior * Approved * Probation * Region 12

Name of System Treasure Island MUD County Brazoria

Physical location C.R. 257 - West of San Luis Pass - on Jolly Roger

Responsible Official Ramona Darden Title President Phone# 979.233.3024

Mailing Address 12931 Gulf Beach Dr. Freeport, Texas 77541-9291 979.299.9099

Chief Cert Op Name Jackie Jackson Grade & Type B-water Phone 979.233.3024

2nd Op Req'd? No Name — Grade & Type — Total # Cert. Ops. 1

WS Manager/Superintendent Jim Coursey Other Officals Contacted —

Surveyed With Jim Coursey 409.285.5613 cell phone Area Served Treasure Island Subdivision

Supplier and Source City of Galveston - Surface Water

Interconnection w/other PWS? Yes Name PWS I/C City of Galveston Type I/C open

Retail Service Connections 173 Retail Meters 173 Retail Population ~500

Wholesale Master Meters — Wholesale Service Connections — Wholesale Population —

Charge ? 21.60/mo. Dist. to and Name of Nearest PWS ~1/2 mile City of Galveston

Reason for this Survey (Routine, Follow Up, Initial, Enforcement, Complaint, Other) — Previous Survey Date 2/24/99

Map Attached Yes Previous Map OK? Yes Well Operational Status Changed? No

Description of Supply, Source, Treatment, and Chemicals Used:
Purchase surface water from City of Galveston
3GSTs, 2 PTs, 3 svc. pumps + distribution. Apply gas Cl_2 when needed prior to storage

Total Well Cap. — gpm 0 — mgd RAW Cap. — gpm 0 — mgd

Treatment Cap. — gpm 0 — mgd Total Svc. Pump Cap. 560 gpm 0.806 mgd

Total Elevated Storage — Total Storage Cap. 0.128 Pressure Tank Cap. 0.009

Maximum Daily Usage 0.0803 Date 7/99 Average Daily Usage 0.0340 Time Period 6/99 - 5/00

Wholesale Contract City of Galveston Maximum Purchase Rate $3.00 / 1000 gal. - 20 yr. contract with City of Galveston

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	✓	
Raw Samples Submitted, if Required?	*	*
Well(s) Surface Water Influenced?		✓
Acceptable Sample Siting Plan on File [.106]	✓	

Number of Samples Required 1/mo. # Submitted 1/mo.

Number of Raw Samples Required — # Submitted —

Non-Comm Dates of Operation — Thru —

CHEMICAL

Acceptable Quality? Yes Date, Last Analysis IOC 3/30/92 NO_2/NO_3 — RC 3/30/92 VOC 2/6/91 SOC —

List UNACCEPTABLE Values None

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? — Date —

Date of Survey 6/9/00 By Leticia DeLeon

Date of Approval 07/18/00 By Ross L. Echols

Letter Date, if different from Approval Date ___ Reply Requested ___ Def. Score of this Survey 0

*= Not Applicable
U=Unknown

0200038 6/9/02
I.D. #0 SURVEY DATE: (

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,d]	✓		Distribution Map Up-to-Date?	[46,n]	✓	
MOR's Properly Completed?	[46,d]	✓		Ownership Signs Properly Displayed and Maintained?	[46,w]	✓	
Dead End Mains Flushed?	[46,l]	✓		Adequate Chemical Storage Provided?	[42,d,6]	✓	
New Lines and Repairs Disinfected?	[46,g]	✓		ANSI/NSF Approved Chem/Media?	[42]	✓	
Supply of Disinfectant on Hand?	[46,h]	✓		Facilities Properly Maintained?	[46,m&p]	✓	
				If Superior/Approved, Signs Properly Disp. & Maint.	[47,b]	*	*

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	✓		Proper Water Level Indicator Provided?	[43,c,4]	✓	
Tanks Tight Against Leakage?	[43,c,6]	✓		Drains Properly Connected?	[43,c,7]	✓	
Vents Properly Installed?	[43,c,1]	✓		Inlet and Outlet Properly Located?	[43,c,5]	✓	
Proper Roof Hatch Provided?	[43,c,2]	✓		Intruder Resistant Fence?	[43,e]	✓	
Roof Hatch Kept Locked?	[43,c,2]	✓		Tanks Properly Inspected, Maintained, Docs.	[46,p,1]	✓	
Proper Overflow Provided?	[43,c,3]	✓		Below Ground Storage Properly Located?	[43,b]	✓	
				Inspection Ladder Provided?	[43,c]	✓	

III. PRESSURE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	✓		Tanks Tight Against Leakage?	[43,d,7]	✓	
Pressure Release Device Provided?	[43,d,2]	✓		Routinely Inspected, Maintained, Documented?	[46,p,2]	✓	
Proper Facilities for Air/Water Ratio/Air filter?	[43,d,3]	✓		Fenced or Housed?	[43,e]	✓	
Air-Water Volume Indicator Provided?	[43,d,3]	✓		ASME, if Required?	[43,d,1]	✓	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	✓		Properly Installed Distribution Piping?	[44,a]	✓	
Customer Service Inspection Program?	[46,j]	✓		Adequate Flush/Gate Valves?	[44,d,6]	✓	
Backflow Assembly Report Recorded, if needed?	[44,h,4,D]	*	*	Air Release Valves Properly Installed?	[44,d,1]	*	*
Sewer Lines Properly Located?	[44,e]	✓		In-Line Booster Pumps in System? **	[44,d,2]		
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,u]	✓		In-Line Booster Pumps in System Approved?	[44,d,2]		
Normal Working Pressure ≥ 35 PSI?	[44,d&46,u]	✓		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	X	X

Tested psi/Locations 50psi – 313 Schooner

**Location:

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e]	✓		Adequate Residual Maintained/Recorded?	[46,f,1,2]	✓	
Type Disinfection Used:				Mg/L ,T(F)Locations 0.22mg/L – 313 Schooner			
Disinfection Equipment Properly Housed?	[42,e,6,8]	✓		Evacuation Plan Cl_2NH_3? If needed	[42,e,11]	*	*
Disinfection Room Properly Vented?	[42,e,7]	✓		DPD Chlorine Test Kit Provided?	[46,f,2]	✓	
Breathing Apparatus and Ammonia Bottle Provided?	[42,e,5]	✓		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,4,D]	✓		Properly Housed/Vented?	[42,e,10]	*	*
Disinfection Prior to Storage?	[42,e,2,3]	✓		Scales or Gauges Provided?	[42,e,4,D]	*	✓

*= Not applicable
U= Unknown

0200038 6/9/00
I.D. # 0 SURVEY DATE 0

VI. SYSTEM FACILITIES

Purchase treated Water from City of Galveston

Number of Connections 173

WELLS ,(Y/N) OR RAW WATER PUMPS ,(Y/N)

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/Est GPM/Date
999	C	3	Jolly Roger		P				
999	D	4	C.R. 257		P				
999	E	5	W. San Luis Pass		P				

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity	Material	Location
GST	0.042	W. steel	plant site
GST	0.042	W. steel	"
GST	0.044	W. steel	" (New)
PT	0.003	W. "	"
PT	0.004	" "	"
PT	0.002	" "	" (To be removed)

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	280	plant site						
2	280	" "						
3	200	back-up						

Emergency Power /Alternate Source? No (Y/N) Describe: —

SYSTEM CAPACITIES

					Required		Provided (City of Galveston)		Y	N
Well Production	0.6	Gal/Conn X	173	Conn =	103.8	GPM	unlimited	GPM	✓	
Elevated/Pressure Storage	20	Gal/Conn X	173	Conn =	0.00346	MG	0.009	MG	✓	
Ground/Total Storage	200	Gal/Conn X	173	Conn =	0.0346	MG	0.128	MG	✓	
Service Pumping Cap.	2.0	GPM/Conn X	173	Conn =	346	GPM	560	GPM	✓	
Service Pump Peaking Factor	80,300	MDD/1,440 X	1.85	**	103	GPM	560	GPM	✓	

** Factor = 1.25 or 1.85, MDD Listed as gallons.

0200038 6/9/00

I.D. #0 SURVEY DATE 0

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE GUI Y/N

A. SANITARY

		Y	N
Well/pump room protected from flooding?	[41,c,3,H]	X	X
Livestock prohibited within 50 ft. of well?	[41,c,1,D]		
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]		
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]		
Drainage ditch or lift station ≥300 ft.?	[41,c,1,B]	X	X

		Y	N
Sewage Treatment plant ≥ 500 ft.?	[41,c,1,C]	X	X
Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]		
Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]		
UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]		
Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	X	X

B. CONSTRUCTION

		Y	N
Sanitary easement(s)recorded?	[41,c,1,F]	X	X
Well cased 18" above ground level?	[41,c,3,B]		
Proper pressure cement?	[41,c, 3, C]		
Proper concrete sealing block?	[41,c,3,J]		
Well head sealed?	[41,c,3,K]		
Casing vent properly installed?	[41,c,3,K]		
Air release devices properly installed?	[41,c,3,Q]	X	X

		Y	N
Suitable sampling tap?	[41,c,3,M]	X	X
Well meter provided?	[41,c,3,N]		
Well blow-off properly installed?	[41,c,3,L]		
Well unit fenced or housed?	[41,c,3,O]		
Well site properly drained?	[41,c,3,I]		
All weather road provided?	[41,c,3,P]	X	X

VIII. ADDITIONAL WATER SYSTEM DEFICIENCIES AND TAC REFERENCES :

—

X. RATING DEFICIENCY SCORE

A. Certified Operator(s) If Required

1. None Surface	10 Pt.s ____
2. None Ground	4 Pt.s ____
3. Only one when two required	4 Pt.s ____
4. Improper certification	4 Pt.s ____

B. MCL Violations

1. Microbiological:	
Failure to sample	4/mo ____
MCL violation	10/vio ____
2. Primary standards	10/vio ____
3. Secondary standards	2/vio ____
4. Turbidity:	
Failure to report	4/mo ____
MCL violation	10/mo ____

C. Distribution

Pressure < 20 psi	10 Pt.s ____
Pressure < 35	4 Pt.s ____
Distribution problems	2 Pt.s ____
Treated water protection	3 Pt.s ____
Disinfection provided, but residual < 0.2 mg/l Free Chlorine or 0.5 mg/l Chloramine	4 Pt.s ____

D. Design

1. Ground Water	
No disinfection	10 Pt.s ____
Improper well location	4 Pt.s ____
No easement	4 Pt.s ____
Well construction deficiencies	3/item ____
2. Surface Water:	
No disinfection	20 Pt.s ____
No filtration	20 Pt.s ____
Excess filter rate	4 Pt.s ____
Inadequate chemical feed	4 Pt.s ____
Inadequate detention time	4 Pt.s ____
3. General:	
Production deficient	4 Pt.s ____
Storage deficient:	
Elevated or Pressure	4 Pt.s ____
Total storage Deficient	4 Pt.s ____

TOTAL, A + B + C + D = 0 ✓

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

November 6, 2000

Ms. Paula Jones, General Manager
Varner Creek Utility District
188 Freeman Blvd.
West Columbia, Texas 77486-9616

Re: Public Water Supply:
Varner Creek Utility District, 188 Freeman Blvd., Brazoria Co., Texas
TNRCC ID #0200070

Dear Ms. Jones:

On October 12, 2000, Mr. Barry H. Price Jr. of the Texas Natural Resource Conservation Commission (TNRCC) Houston Region Office conducted an investigation of the above-referenced facility to evaluate compliance with applicable requirements for public water supply systems. No violations were documented during the investigation.

The TNRCC appreciates your assistance in this matter and your compliance efforts to ensure protection of the State's environment. If you or members of your staff have any questions regarding these matters, please feel free to contact Mr. Barry H. Price Jr. in the Houston Region Office at (713)767-3650.

Sincerely,

Ross L. Echols, Jr.

Ross L. Echols, Jr., P.E.
PWS Team Leader
Houston Region Office

RLE/bhp

cc: Brazoria Health Dept.

PUBLIC ATER SUPPLY REGULATORY P' GRAM

WATER SYSTEM DATA

KM 824J

ID No. 0200070 — Community X — NTNC ____ — Non-Comm ____

CCN No. P0477 — Superior * — Approved * — Probation * — Region 12

Name of System: Varner Creek Utility District — County: Brazoria

Physical location: Wellshire Ave. Plant #1

Responsible Official: Paula Jones — Title: General Manager — Phone# (979) 345-2511

Mailing Address: 188 Freeman Blvd., West Columbia, Texas 77486-9616

Chief Cert Op Name: Allen Gragert — Grade & Type: C-GW — Phone: (979) 345-5151 ex. 154

2nd Op Req'd? NO — Name: none — Grade & Type: none — Total # Cert. Ops. 1

WS Manager/Superintendent: Allen Gragert — Other Officials Contacted: None

Surveyed With: Allen Gragert — Area Served: Columbia Lakes Subdivision

Supplier and Source: District - groundwater - two wells

Interconnection w/other PWS? No — Name PWS I/C: None — Type I/C: none

Retail Service Connections: 577 — Retail Meters: 577 — Retail Population: 1731

Wholesale Master Meters: 0 — Wholesale Service Connections: 0 — Wholesale Population: 0

Charge ? Yes — Dist. to and Name of Nearest PWS: 2 miles - Brazos River Lake Club

Reason for this Survey (Routine, Follow Up, Initial, Enforcement, Complaint, Other): Routine — Previous Survey Date: 11/29/99

Map Attached: No — Previous Map OK? Yes — Well Operational Status Changed? No

Description of Supply, Source, Treatment, and Chemicals Used:

System consists of two wells, two GSTs, two PTs, three service pumps, two auxiliary power generators, and distribution. Treatment: Polyphosphate and gas chlorination injected prior to storage.

Total Well Cap. 1300 gpm — 1.872 mgd — RAW Cap. 0 gpm — 0 mgd

Treatment Cap. 0 gpm — 0 mgd — Total Svc. Pump Cap. 1250 gpm — 1.8 mgd

Total Elevated Storage: 0 — Total Storage Cap. 0.42 MG — Pressure Tank Cap. 0.02 MG

Maximum Daily Usage: 0.674 MG — Date: 9/1/2000 — Average Daily Usage: 0.279 MG — Time Period: 1/2000 - 9/2000

Wholesale Contract: None — Maximum Purchase Rate: None

MICROBIOLOGICAL

	Y	N
Samples Submitted per DWS?	X	
Raw Samples Submitted, if Required?	*	*
Well(s) Surface Water Influenced?	*	*
Acceptable Sample Siting Plan on File? .106	X	

Number of Samples Required: 2 Mo. — # Submitted: 4 Mo.

Number of Raw Samples Required: * — # Submitted: *

Non-Comm Dates of Operation: * — Thru: *

CHEMICAL

Acceptable Quality? No — Date, Last Analysis — IOC 2/14/00 — NO_2/NO_3 * — RC 2/14/00 — VOC 2/14/00 — SOC ____

List UNACCEPTABLE Values: Iron = 0.369 MCL = 0.3 mg/L Sequestering with polyphosphate

HAS PROPER PUBLIC NOTIFICATION BEEN GIVEN? ____ Date

Date of Survey: 10/12/2000 — By: Barry H. Price Jr. Barry H. Price

Date of Approval: 11/06/00 — By: Ross L. Echols

Letter Date, if different from Approval Date ____ — Reply Requested ____ — Def. Score of this Survey: 2

*= Not Applicable
U=Unknown

OPERATION AND MAINTENANCE

(Please note: all violations listed below include paragraph numbers from §290 of the Rules and Regulations for PWSs.)

I. OPERATIONAL

Item	Ref	Y	N	Item	Ref	Y	N
Monthly Reports Submitted to TNRCC (if Required)?	[46,d]	X		Distribution Map Up-to-Date?	[46,n]	X	
MOR's Properly Completed?	[46,d]	X		Ownership Signs Properly Displayed and Maintained?	[46,w]	X	
Dead End Mains Flushed?	[46,l]	X		Adequate Chemical Storage Provided?	[42,d,6]	X	
New Lines and Repairs Disinfected?	[46,g]	X		ANSI/NSF Approved Chem/Media?	[42]	X	
Supply of Disinfectant on Hand?	[46,h]	X		Facilities Properly Maintained?	[46,m&p]	X	
				If Superior/Approved, Signs Properly Disp. & Maint.	[47,b]	*	

II. STORAGE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Storage Tanks Properly Covered?	[43,c]	X		Proper Water Level Indicator Provided?	[43,c,4]	X	
Tanks Tight Against Leakage?	[43,c,6]	X		Drains Properly Connected?	[43,c,7]	X	
Vents Properly Installed?	[43,c,1]	X		Inlet and Outlet Properly Located?	[43,c,5]	X	
Proper Roof Hatch Provided?	[43,c,2]	X		Intruder Resistant Fence?	[43,e]	X	
Roof Hatch Kept Locked?	[43,c,2]	X		Tanks Properly Inspected, Maintained, Docs.	[46,p,1]	X	
Proper Overflow Provided?	[43,c,3]	X		Below Ground Storage Properly Located?	[43,b]	*	
				Inspection Ladder Provided?	[43,c]	X	

III. PRESSURE TANKS

Item	Ref	Y	N	Item	Ref	Y	N
Accurate Pressure Gauges?	[43,d,2]	X		Tanks Tight Against Leakage?	[43,d,7]	X	
Pressure Release Device Provided?	[43,d,2]	X		Routinely Inspected, Maintained, Documented?	[46,p,2]	X	
Proper Facilities for Air/Water Ratio/Air filter?	[43,d,3]	X		Fenced or Housed?	[43,e]	X	
Air-Water Volume Indicator Provided?	[43,d,3]	X		ASME, if Required?	[43,d,1]	X	

IV. DISTRIBUTION

Item	Ref	Y	N	Item	Ref	Y	N
Plumbing Ordinance or Agreement?	[46,i]	X		Properly Installed Distribution Piping?	[44,a]	X	
Customer Service Inspection Program?	[46,j]	X		Adequate Flush/Gate Valves?	[44,d,6]	X	
Backflow Assembly Report Recorded, if needed?	[44,h,4,D]	X		Air Release Valves Properly Installed?	[44,d,1]	X	
Sewer Lines Properly Located?	[44,e]	X		In-Line Booster Pumps in System? **	[44,d,2]	*	
Minimum Residual Pressure ≥ 20 PSI?	[44,d&46,u]	X		In-Line Booster Pumps in System Approved?	[44,d,2]	*	
Normal Working Pressure ≥ 35 PSI?	[44,d&46,u]	X		If Yes, Pressure Cut-off ≥ 20 psi Provided?	[44,d,2&3]	*	
Tested psi/Locations: **72 PSI - 2526 Lake Side**				**Location:*			

V. DISINFECTION

Item	Ref	Y	N	Item	Ref	Y	N
Disinfection Equipment Adequate in Capacity?	[42,e]	X		Adequate Residual Maintained/Recorded?	[46,f,1,2]	X	
Type Disinfection Used: **Gas Chlorination**				Mg/L ,T/H/Locations: **0.24 mg/L - 2526 Lake Side**			
Disinfection Equipment Properly Housed?	[42,e,6,8]	X		Evacuation Plan Cl_2NH_3? If needed	[42,e,11]	*	
Disinfection Room Properly Vented?	[42,e,7]	X		DPD Chlorine Test Kit Provided?	[46,f,2]	X	
Breathing Apparatus and Ammonia Bottle Provided?	[42,e,5]	X		IF AMMONIA FEED PROVIDED:			
Scales Provided?	[42,e,4,D]	X		Properly Housed/Vented?	[42,e,10]	*	
Disinfection Prior to Storage?	[42,e,2,3]	X		Scales or Gauges Provided?	[42,e,4,D]	*	

*= Not applicable
U= Unknown

VI. SYSTEM FACILITIES

Number of Connections ________

WELLS (Y/N) OR RAW WATER PUMPS (Y/N)

Entry Pt. #	Water Source Code	Owner's Desig.	Location	GPS Lat/Long	Oper. Status	Well Depth	Pump Type	Rated GPM	Tested/Est GPM/Date
001	A	1	Wellshire Ave.	N29°10'13.60"W95°37'52.33"	O	640'	VT	*	500 - 10/12/00
001	B	2	Lake Side Dr.	N29°10'07.37"W95°37'48.17"	O	635'	VT	*	800 - 10/12/00

STORAGE RESERVOIRS AND PRESSURE TANKS

Type	Capacity	Material	Location
GST	0.21 MG	Bolted Steel	well site #1
GST	0.21 MG	Bolted Steel	well site #1
PT	0.01 MG	Welded Steel	well site #1
PT	0.01 MG	Welded Steel	well site #1

SERVICE PUMPS

No.	Output GPM	Location	No.	Output GPM	Location	No.	Output, GPM	Location
1	250	Well site #1						
2	500	Well site #1						
3	500	Well site #1						

Emergency Power /Alternate Source? Yes (Y / N) Describe: Natural gas drive engine at well #1 and SVC pump #3

SYSTEM CAPACITIES

					Required		Provided		Y	N
Well Production	0.6	Gal/Conn X	577	Conn =	346.2	GPM	1300	GPM	X	
Elevated/Pressure Storage	20	Gal/Conn X	577	Conn =	0.0115	MG	0.02	MG	X	
Ground/Total Storage	200	Gal/Conn X	577	Conn =	0.1154	MG	0.42	MG	X	
Service Pumping Cap.	2	GPM/Conn X	577	Conn =	1154	GPM	1250	GPM	X	
Service Pump Peaking Factor	674,000	MDD/1,440 X	1.85	**	866	GPM	1250	GPM	X	

** Factor = 1.25 or 1.85, MDD Listed as gallons.

I.D. #0200070 SURVEY DATE: 10/12/00

GROUND WATER SOURCE AND WATER SYSTEM DEFICIENCIES

VII. GROUND WATER SOURCE GUI: Y/N

A. SANITARY

		Y	N
Well/pump room protected from flooding?	[41,c,3,H]	X	
Livestock prohibited within 50 ft. of well?	[41,c,1,D]	X	
Sanitary sewer, septic tank, cemetery ≥ 50 ft.?	[41,c,1,A]	X	
Septic tank drainfields ≥ 150 ft.?	[41,c,1,A]	X	
Drainage ditch or lift station ≥300 ft.?	[41,c,1,B]	X	

		Y	N
Sewage Treatment plant ≥ 500 ft.?	[41,c,1,C]	X	
Animal pens or landfill ≥ 500 ft.?	[41,c,1,C]	X	
Sewage irrigated land ≥ 500 ft.?	[41,c,1,C]	X	
UST or liquid transmission pipeline ≥ 150 ft.?	[41,c,1,A]	X	
Abandoned wells ≤ 1/4 mi. plugged?	[41,c,1,E]	X	

B. CONSTRUCTION

Sanitary easement(s)recorded?	[41,c,1,F]	X	
Well cased 18" above ground level?	[41,c,3,B]	X	
Proper pressure cement?	[41,c, 3, C]	X	
Proper concrete sealing block?	[41,c,3,J]	X	
Well head sealed?	[41,c,3,K]	X	
Casing vent properly installed?	[41,c,3,K]	X	
Air release devices properly installed?	[41,c,3,Q]	X	

Suitable sampling tap?	[41,c,3,M]	X	
Well meter provided?	[41,c,3,N]	X	
Well blow-off properly installed?	[41,c,3,L]	X	
Well unit fenced or housed?	[41,c,3,O]	X	
Well site properly drained?	[41,c,3,I]	X	
All weather road provided?	[41,c,3,P]	X	

VIII. ADDITIONAL WATER SYSTEM DEFICIENCIES AND TAC REFERENCES :

IX. RATING DEFICIENCY SCORE

A. Certified Operator(s) If Required

1. None Surface	10 Pt.s	
2. None Ground	4 Pt.s	
3. Only one when two required	4 Pt.s	
4. Improper certification	4 Pt.s	

B. MCL Violations

1. Microbiological:		
Failure to sample	4/mo	
MCL violation	10/vio	
2. Primary standards	10/vio	
3. Secondary standards	2/vio	2
4. Turbidity:		
Failure to report	4/mo	
MCL violation	10/mo	

C. Distribution

Pressure < 20 psi	10 Pt.s	
Pressure < 35	4 Pt.s	
Distribution problems	2 Pt.s	
Treated water protection	3 Pt.s	
Disinfection provided, but residual < 0.2 mg/l Free Chlorine or 0.5 mg/l Chloramine	4 Pt.s	

D. Design

1. Ground Water		
No disinfection	10 Pt.s	
Improper well location	4 Pt.s	
No easement	4 Pt.s	
Well construction deficiencies	3/item	
2. Surface Water:		
No disinfection	20 Pt.s	
No filtration	20 Pt.s	
Excess filter rate	4 Pt.s	
Inadequate chemical feed	4 Pt.s	
Inadequate detention time	4 Pt.s	
3. General:		
Production deficient	4 Pt.s	
Storage deficient:		
Elevated or Pressure	4 Pt.s	
Total storage Deficient	4 Pt.s	

TOTAL, A + B + C + D = 2

Fort Bend Subsidence District
2003 Regulatory Plan

Adopted September 24, 2003
FBSD Board Resolution No. 03-187

Fort Bend Subsidence District
PO Box 427
Richmond, TX 77469-0427
(281) 342-3273

www.fbsubsidence.org

CONTENTS

PURPOSE AND INTENT

It is the purpose and intent of the District Regulatory Plan (DRP) to establish policy in the areas of groundwater regulation, permits, and enforcement and to establish District regulatory areas and regulatory requirements for each area. The District's Regulatory Plan has been developed for the period through the year 2030. This Regulatory Plan will be reviewed periodically and may be amended or revised prior to the year 2030. This Regulatory Plan replaces in whole the Regulatory Plan adopted by the Board of Directors in 1990.

BACKGROUND

The Fort Bend Subsidence District (District) was created in 1989 by the State Legislature (Act of May 26, 1989, 71st Leg., R.S., ch. 1045 Tex. Gen. Laws 4251) as a conservation and reclamation district. The District was created "… to provide for the regulation of the withdrawal of groundwater within the district created by this Act to prevent subsidence that contributes to or precipitates flooding, inundation, or overflow of areas within the District, including rising waters resulting from storms or hurricanes."

The District adopted its first Regulatory Plan in September 1990. The initial plan focused on the need for better data and called for additional groundwater monitoring and subsidence measurements within Fort Bend County.

Since the 1990 Regulatory Plan, the District has performed the following items:

- Collected water-level measurements in both the Chicot and Evangeline Aquifers in Fort Bend County
- Collected and analyzed water quality samples from wells in the two aquifers
- Collected land-surface elevations throughout the county, consisting of re-levelings in 1995 and 2000 and the development of five GPS elevation sites operated on a monthly schedule
- Established updated population and water demand projections through the year 2030
- Prepared and had certified by the Texas Water Development Board, the District's Groundwater Management Plan (as required Senate Bill 1 in 1997)
- Developed and recalibrated the Mod-flow groundwater model
- Developed and recalibrated four subsidence models (PRESS Sites)
- Developed baseline and various regulatory scenarios to determine the effects of groundwater regulation on the aquifers
- Assisted or participated in numerous other studies related to water issues in and around Fort Bend County, including the Region H Water Planning Group.

The District will continue to collect data and evaluate groundwater conditions in Fort Bend County and take necessary actions to meet the purpose for which it was created. When population estimates for 2005 are available from the U.S. Census Bureau, the District will evaluate the status of this Regulatory Plan and the estimates of population growth within Fort Bend County and make any necessary changes to this Regulatory Plan.

This 2003 Regulatory Plan divides the District into two regulatory areas and one sub-area. The requirements contained within this Regulatory Plan are based on the most current data and studies on water demand, aquifer levels, and projected subsidence. The Plan provides permittees organizational flexibility in meeting these regulations.

GROUNDWATER MANAGEMENT PLAN

The District prepared a Groundwater Management Plan (GMP) in conformance with Senate Bill 1 (1997 Texas State Legislature) that was certified by the Texas Water Development Board in August 1998. The GMP sets forth the following five goals:

- Provide for the efficient use of groundwater
- Control and prevent waste of groundwater
- Control and prevent subsidence
- Address conjunctive surface water management
- Address groundwater natural resource issues

The GMP identifies objectives and action steps, in support of these goals that include:

- Assessment and revision of the 1990 District Regulatory Plan to establish acceptable levels of groundwater withdrawals.

- Analysis of permit fee structure to determine a fee schedule necessary to reduce groundwater dependence.

- Review, update and implement a District Regulatory Plan that balances regional land subsidence with groundwater availability.

In preparation for development of the 2003 District Regulatory Plan, the District updated population and water demand forecasts and analyzed their effect on water-levels in the Chicot and Evangeline Aquifers and the resultant impacts on land surface subsidence. The results of these analyses support the need for significant reductions in groundwater withdrawal.

REGULATORY OBJECTIVES

Low-lying areas along the coast are the most vulnerable to floods resulting from hurricane storm surge events. While Fort Bend County is not generally affected by storm surges, subsidence in areas that are not vulnerable to storm surges still contributes to flooding. The objective in these areas is to halt subsidence as soon as realistically feasible.

In establishing these objectives, the District has taken into account the time and cost of introducing alternative water supplies into the District and considered other water resource management strategies that may be available.

GROUNDWATER REGULATION

This portion of the District's Regulatory Plan establishes policy for the District regarding groundwater regulation. These policies are designed to support the regulation of groundwater withdrawals to control subsidence on a regional basis. Because subsidence is a region-wide problem requiring solutions achieved through concerted efforts, the District will work with other political subdivisions in the region to implement this Regulatory Plan.

Permitting

The District may deny permits or limit groundwater withdrawals following the guidelines stated in the Act, the Rules of the District, and this Regulatory Plan. In determining whether to issue a permit or limit groundwater withdrawal, the District will weigh the public benefit against individual hardship after considering all appropriate documentation and relevant factors including:

1. the purposes of the Act,

2. the objectives and requirements of this Regulatory Plan,

3. the quality, quantity, and availability of alternative water supplies,

4. the feasibility of implementing alternative water supply strategies, and

5. the economic impact on the applicant from granting or denial of the permit, or terms prescribed by the permit, in relation to the effect on subsidence that would result.

Permit Fees

The District's permit fees are intended to operate as an economic disincentive in order to regulate groundwater withdrawal. This 2003 Regulatory Plan establishes a permit fee structure that includes a base fee and a disincentive fee.

The District's permit fees are established for the purpose of achieving certain regulatory objectives and the reduction of groundwater withdrawals. All funds collected from permit fees will be used for regulatory purposes.

Base Fees: This fee is applied to all of a permittee's permitted groundwater withdrawals.

Funds obtained from collection of base fees are used to cover the costs of issuing permits and performing other regulatory functions of the District.

Disincentive Fees: In addition to the base fee, a disincentive fee will be applied to permitted groundwater withdrawals that exceed 40% of a Regulatory Area A permittee's total water demand.

The purpose of the disincentive fee is to create a financial incentive to encourage permittees to take steps to ultimately reduce groundwater use to no more than 40% of total water demand in Area A according to the schedule set forth in this Regulatory Plan. The disincentive fee can be avoided by reducing groundwater withdrawals to no more than 40% of total water demand or through actions in compliance with milestones contained in a certified Groundwater Reduction Plan (GRP). The disincentive fee is applied in each permit year that groundwater reduction requirements are not met.

A disincentive fee rate will be determined after this Regulatory Plan is adopted and prior to June 2004.

Funds obtained from the collection of disincentive permit fees will be placed in a special account for the purpose of expediting reductions in groundwater withdrawal, the development of water conservation measures, and other alternative water supply strategies. The District's enabling legislation and Chapter 36 of the Water Code authorize the use of these funds to provide grants and/or loans for purposes such as financing the design and construction of alternative source water treatment and transmission facilities. The District will also consider various alternative means, including coordination with other agencies, for the distribution of any such funds.

Regulatory Area Descriptions

The District is divided into two regulatory areas (Area A, which includes the Richmond/Rosenberg Sub-Area, and Area B), described in detail below and pictured on the following map.

Regulatory Area A

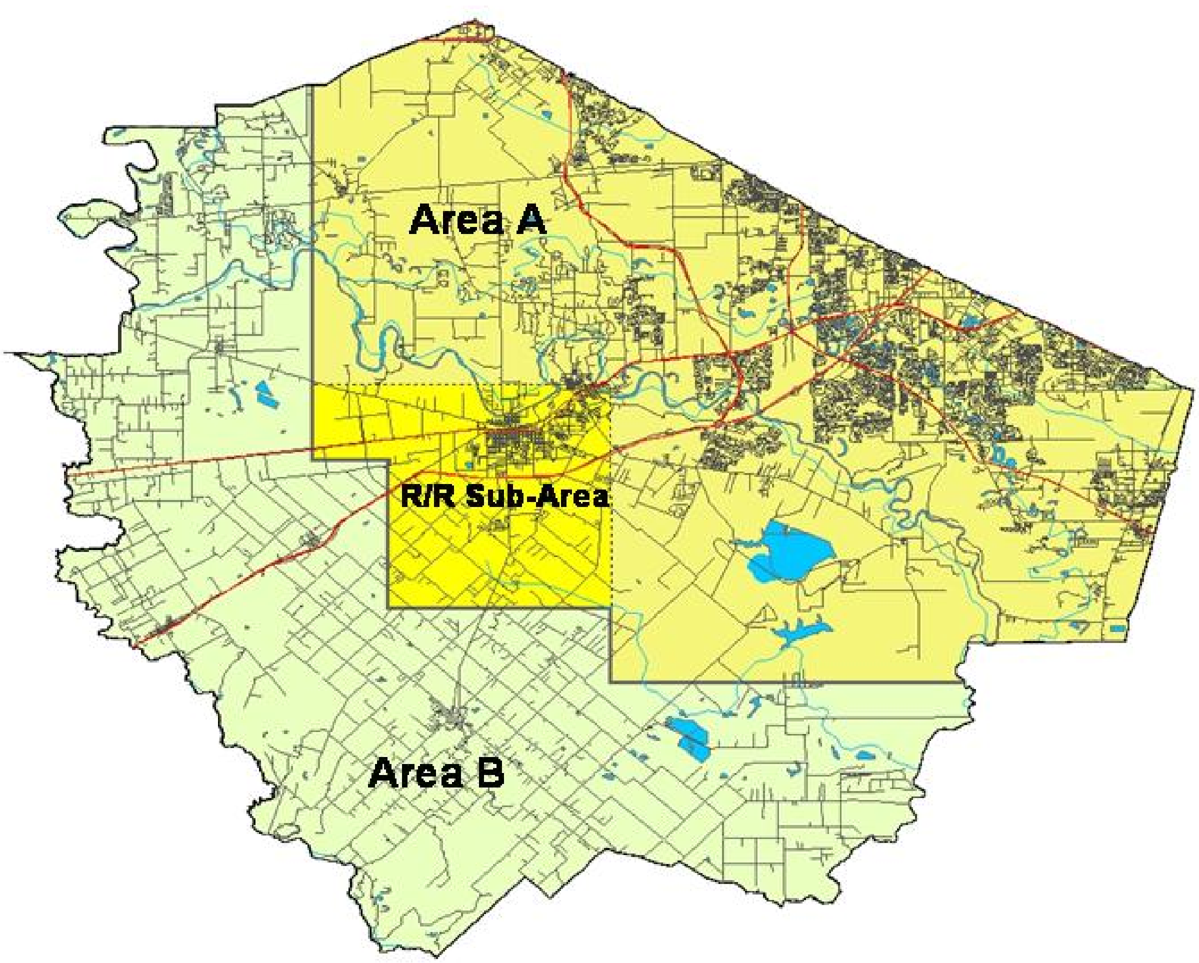
- Beginning at the intersection of longitude 95^{o} 55' 00" west and the Fort Bend/Waller County line follow this line of longitude south to the point at 29^{o} 32' 30" north latitude.
- Thence, east along this line of latitude to the point at 95^{o} 52' 30" west longitude.
- Thence, south along this line of longitude to the point at 29^{o} 27' 30" north latitude.
- Thence, east along this line of latitude to the point at 95^{o} 45' 00" west longitude.
- Thence, south along this line of longitude to the point at 29^{o} 25' 00" north latitude.
- Thence, east along this line of latitude to the intersection of longitude 95^{o} 07' 30" west and the Fort Bend/Brazoria County line.
- Thence, generally north and east, following the Fort Bend/Brazoria County line to the intersection of the Fort Bend, Brazoria, and Harris County boundaries.
- Thence, generally northwest, following the Fort Bend/Harris County line to the intersection of the Fort Bend, Harris, and Waller County boundaries.
- Thence, generally southwest, following the Fort Bend/Waller County line back to the intersection with longitude 95^{o} 55' 00" west.

Richmond/Rosenberg Sub-Area

- Beginning on the Area A/B boundary, at the intersection of longitude 95^{o} 55'00" west and latitude 29^{o} 35'00" north, follow this line of latitude east to the point at longitude 95^{o} 45' 00" west.
- Thence, south along this line of longitude to the Area A/B boundary at the intersection of longitude 95^{o} 45' 00" west and 29 27'30" north.
- Thence, generally northwest, following the Area A/B boundary back to the intersection with latitude 29^{o} 35'00" north and longitude 95^{o} 55'00" west.

Regulatory Area B

- The remaining portion of Fort Bend County that lies outside of Regulatory Area A.



Regulatory Area Requirements

Regulatory Area A

1. Following adoption of the District's Regulatory Plan, the District will require that unconverted permittees begin a planning process to define acceptable methods necessary to meet the groundwater compliance requirements established within this Regulatory Plan.

2. Two or more permittees may enter into contractual agreements to share costs or cooperate in ways that achieve orderly reductions in total groundwater use and conversions to alternative water supplies. Permittees may join with or form new regional entities for the purpose of reducing groundwater withdrawal. Individual permittees will be waived from separate compliance with groundwater reduction requirements when they form a group that achieves collective compliance with the regulatory area requirements.

3. Beginning in January, 2008, a permittee (or a group of permittees operating under a single permit) will be required to submit a Groundwater Reduction Plan (GRP) to the District for certification. (Minimum requirements for an acceptable GRP are presented in more detail further in this Regulatory Plan).

4. Beginning in January, 2013, a permittee (or a group of permittees operating under a single permit) shall be required to reduce and maintain their groundwater withdrawals to comprise no more than 70% of the permittee's total water demand, except that permittees whose wells are located within the Richmond/Rosenberg Sub-Area shall be required to meet the reduction requirements beginning in January 2015. A permittee with an aggregate system that is split between Regulatory Area A and the Richmond/Rosenberg Sub-Area will be required to meet the reduction requirements applicable to the Richmond/Rosenberg Sub-Area.

5. Beginning in January, 2025 and continuing thereafter, a permittee (or a group of permittees operating under a single permit) shall be required to reduce and maintain their groundwater withdrawals to comprise no more than 40% of the permittee's total water demand.

6. A disincentive fee shall be applied to any groundwater withdrawals that constitute greater than 40% of a permittee's (or a group of permittee's operating under a single permit, within the same regulatory area) total water demand if a permittee has not developed and received certification of a GRP by the permit beginning date in 2008 (Item 3 of this section) or if a permittee is not in compliance with the reduction schedule found in Items 4 and 5 of this section or with the elements identified in their certified GRP.

Regulatory Area A - Exemptions:

1. Permits for irrigating agricultural crops, as defined in the District Rules, are exempted from groundwater reduction requirements and disincentive fees set forth in the District Regulatory Plan. However, all permittees are encouraged to use best management practices to reduce groundwater withdrawals.

2. Permittees with a total water demand of 10.0 million gallons per year (MGY) or less are exempted from groundwater reduction requirements and disincentive fees until such time that an alternative water supply is available. When an alternative water supply is available to a site, permittees under the 10.0 MGY exemption, will be required to reduce their groundwater withdrawal to no more than 40% of their total water demand, unless the permittee is in compliance with a certified Groundwater Reduction Plan.

3. Permittees demonstrating that they meet the definition of economic hardship may be granted an exemption from groundwater reduction requirements and disincentive fees. All exemptions based on economic hardship will be reconsidered during the regular, annual permitting process. Economic hardship exemptions are granted at the discretion of the Board and are not considered a long-term solution.

Regulatory Area B

1. Increases in groundwater withdrawal, regardless of use type, may be permitted by the District, through regular permitting procedures, as adopted by the District.

2. Groundwater withdrawn in this area for uses other than agricultural irrigation shall not be supplied to any areas inside the boundary of Area A, unless the permittee can demonstrate that the groundwater was withdrawn for use in a single, aggregate system prior to the adoption of this District Regulatory Plan.

3. Permittees within Area B are not subject to groundwater reduction requirements and disincentive fees at this time. The District will continue to evaluate water-level and subsidence conditions within the boundaries of Area B and may adopt groundwater reduction requirements in the future as necessary, to meet the goals of the District.

REGULATORY PLAN ADMINISTRATION

This section provides guidance for fulfilling milestone requirements in this Regulatory Plan. The District has developed a regulatory approach that provides a hierarchy of options to consider when evaluating how to reduce reliance on groundwater. Implementation of these options could significantly reduce a permittee's groundwater need while not requiring this reduction to come totally from surface water.

The evaluation of strategies for meeting water demands involves an analytical process, which requires an integrated examination of the following options:

1. Efficient Management Practices -- the applicant should pursue all feasible measures to assure efficient management of the applicant's water supplies in order to minimize groundwater usage;

2. Water Conservation -- the applicant should consider the implementation of aggressive water conservation measures;

3. Surface Water Conversion -- the applicant should initiate implementation of surface water conversion.

4. Other Alternative Water Supply Strategies – the applicant is encouraged to investigate other alternative water supply strategies, including but not limited to reuse projects, to meet reduction requirements.

Water Conservation and Efficient Management Practices

Measurable reductions in groundwater withdrawals can be achieved through the use of water conservation measures and efficient management practices. Conservation measures and efficient management practices result in the overall reduction of total water demand, which reduces both the need for groundwater and alternative water supplies. The District encourages the use of any conservation measures and efficient management practices that reduce total water demand. The District may require permittees to submit water conservation and drought management plans with implementation measures, to preserve and protect groundwater resources within the District's boundaries. Measures that can be implemented include, but are not limited to:

1. Audits of facilities to determine what measures can be used to reduce water consumption such as irrigation schedules and installation of low-flow toilets or other water conservation devices.

2. Leak detection, water audits, and other efficient management practices that improve overall system accountability.

3. Installation of water efficient appliances such as washers, dishwashers, etc.

4. For municipal users, rebate programs for installation of low-flow toilets, low water use appliances, and/or retrofit kits which include items such as low-flow shower heads, faucet aerators, shut-off valves, flow restrictors, and toilet leak detection dye tablets.

5. Adoption of educational programs such as "Learning to be Water Wise™"

6. Education of the public through water conservation pamphlets.

7. Pricing policies that discourage excessive and wasteful water use practices.

Surface Water Conversion and Other Alternative Water Supply Strategies

Reductions in groundwater withdrawals will be achieved through surface water conversion or other alternative water supply strategies, including but not limited to reuse, use of treated effluent, and desalinated water. Conversion to alternative water supplies meets the District's requirements for reducing groundwater withdrawals to a certain percent of total water demand. All alternative water supplies must be metered in order to satisfy the District's groundwater reduction requirements.

Groundwater Reduction Plans

Permittees eligible to submit Groundwater Reduction Plans in Regulatory Area A are required to submit GRPs for groundwater reductions in compliance with the deadlines in this Regulatory Plan. All GRPs must, at a minimum, include details of the strategies and steps necessary to achieve the groundwater reduction requirements for Area A, as stated previously.

In order for permittees in Area A who are not otherwise exempt to avoid disincentive fees, the permittees must have received certification of their GRP by the beginning date of their permit term in 2008. The District may adopt a schedule, by rule or resolution, for GRPs to be submitted for review. GRPs must be submitted to the District for certification prior to filing an application for renewal or for a new well, beginning, in January, 2008.

Minimum requirements for an acceptable GRP include:

1. Identification of current and projected total water demand

    - The data must be from a source agreed upon by the District and the permittee
    - Projections must be for a time period consistent with Plan's requirements through the year 2030.
    - Reasons detailing significant projected increases or decreases in groundwater total water demand

2. Plans for groundwater reduction

    - Definition of infrastructure requirements to meet permittee's projected total water demand
    - Timetable showing what infrastructure will be constructed by specific dates to meet projected requirements
    - Explanation of how infrastructure costs will be financed
    - Identification of source and amount of alternative water supply and water provider
    - Evidence (executed contractual agreement and/or financial commitment) that the water supplier has sufficient water supplies and/or rights and is committed to meet the permittee's present and projected demands
    - Preliminary engineering report of the proposed facilities to be constructed through year 2013 including a description of the proposed project and area maps.
    - Conceptual schematic plans of the proposed facilities to be constructed for the year 2025 requirements.

3. Specific details of any conservation measures and/or efficient management practices to be implemented.

4. Description of how over-conversion credits and/or water conservation credits would be used by the permittee (or group of permittees).

5. Other information reasonably necessary for an adequate understanding of the project.

Contractual Agreement and/or Financial Commitment

A contractual agreement and/or financial commitment is any legally binding written instrument that is evidence of the agreement between, in this case, a water supplier and a permittee requiring an alternative water supply. The contractual agreement shall include the term of the agreement, the amount of water to be supplied, and the method of payment. The financial commitment shall include the manner in which financial resources will be acquired, as well as the manner in which funding will be dispensed.

Construction Start Date

The construction start date for infrastructure projects will be deemed to be the point in time when a construction contract has been signed, a notice to proceed has been issued, and the actual physical construction begins in accordance with the schedule. A schedule for construction with milestones tied to specific calendar dates must be in place before a project's construction start date will be acknowledged by the District. Estimates of construction time will be reviewed on a case by case basis, with an appropriate start date and construction milestone(s) being elements of a certified GRP.

Over-Conversion Credits

District staff has evaluated the concept of using over-conversion credits to facilitate the accomplishment of early and over-conversion in Regulatory Area A and has recommended that the Board of Directors adopt, by resolution, a Regulatory Area A Over-Conversion Credit Policy, which would establish a uniform policy and procedure governing the issuance and redemption of over-conversion credits. District staff and consultants evaluated and modeled a proposed over-conversion scenario by using the District's groundwater model and subsidence PRESS models and have determined that the modeled over-conversion scenario, which included a gallon-for-gallon over-conversion credit, resulted in a net benefit in terms of subsidence prevention.

The recommended over-conversion credit policy would allow entities in Regulatory Area A to reduce groundwater withdrawals and convert to alternative water supplies (including metered reuse) prior to the 2013 conversion date and/or in excess of the conversion requirements after 2013 in exchange for a credit that could be used to offset future under-conversions.

Water Conservation Program Credits

In October of 1999, the District began sponsoring fifth grade students in a water conservation program entitled "Learning to be WaterWise." The award-winning program is a combination education and plumbing retrofit program implemented in local school districts utilizing a specialized water conservation resource action program that includes teacher curriculum and resource materials and a student kit containing plumbing retrofit devices.

As a means of encouraging water conservation and generating support for the WaterWise program, District staff has evaluated the concept of establishing a water conservation credit program in which entities who sponsor students in the WaterWise program would receive a water conservation credit certificate worth a certain amount of groundwater based on the number of students sponsored (84,000 gallons per student sponsored). District staff has recommended that the Board of Directors adopt, by resolution, the “Learning to be WaterWise” Water Conservation Program, which would establish a uniform policy and procedure governing the issuance and redemption of water conservation credits.

APPENDIX A: DEFINITIONS

“Act” means District’s enabling legislation (Act of May 26, 1989, 71st Leg., R.S., ch. 1045 Tex. Gen. Laws 4251).

“Alternative Water Supply” means water from any source other than groundwater withdrawn from within Fort Bend County, including but not limited to surface water, reuse water, treated effluent, and desalinated water.

“Area” means a geographical area designated by the Board in which regulatory policy will be applied.

“Available Alternative Water Supplies” or “Availability of Alternative Water Supplies” means alternative water supplies that can be utilized with the exercise of reasonable diligence within a reasonable time.

“Board” means the Board of Directors of the Fort Bend Subsidence District.

“Conservation” means water saved through efficient practices and technology.

“Contractual Agreement” means the entire agreement made between the parties where, in this case, one party agrees to provide a specified amount of surface or alternative source water to another for a specified period of time.

“Construction Start Date” means the date fixed for the start of work that is adequate to meet infrastructure requirements as described in a GRP certified by the District.

“District” means the Fort Bend Subsidence District.

“DRP” means District Regulatory Plan

“Economic Hardship” means, for the purpose of this Regulatory Plan, a permittee serving an area that does not have an alternative water source available and where average per capita income is more than 35% below the county average. If data for a permittee’s specific service area or geographic limits is not available, a permittee may use data corresponding to the appropriate census tracts or zip codes.

“GMP” means Groundwater Management Plan

“GRP” means Groundwater Reduction Plan

“Groundwater” means water located beneath the earth’s surface but does not include water produced with oil in the production of oil and gas.

“Over-Conversion Credit” means a credit issued by the District to a permittee (or group of permittees) who reduces groundwater pumpage beyond District requirements, redeemable pursuant to District policies.

“Permittee” includes any person (see below) to whom the District issues a water well permit allowing the withdrawal of a specified amount of groundwater for a designated period of time. Permittee may also include a group of individual entities, within the same regulatory area who have contracted together to operate under a single permit in order to meet groundwater reduction requirements.

“Person” includes corporation, individual, organization, government or governmental subdivision or agency, business trust, estate, trust, partnership, association, or any other legal entity.

“Preliminary Engineering” means the amount of engineering necessary to define the infrastructure needs of the project, to determine the feasibility and projected construction timetable of the project, and to establish reliable cost estimates. The requirement of preliminary engineering is not intended to include preliminary construction plans for the entire submittal, however, that level of detail could be required for specific components. The District will make the final determination of whether a proposed GRP meets the definition of preliminary engineering.

“Subsidence” means the lowering in elevation of the surface of land by the withdrawal of groundwater.

“Surface Water” means metered water from rivers, lakes, and reservoirs.

“Total Water Demand” means the amount of groundwater, surface water, and other alternative water supplies being utilized by a permittee to meet current or projected water needs. This may also include water from alternative water strategies and conservation measures.

“Water Conservation Program Credit” means a credit issued by the District for sponsorship of students in the District’s water conservation program, redeemable pursuant to District policies.

“Well” means any excavation, facility, device or method that could be used to withdraw groundwater.

“Withdraw” means the act of extracting groundwater by any method.

Year	Water Deficit (MGD)	Seawater Desalination Treatment Plant: Rated Capacity (MGD)	Seawater Desalination Treatment Plant: Capacity Charge	Seawater Desalination Treatment Plant: Commodity Charge	Desalinated Water Storage	Pumping Stations: Capital Costs: Finished Water	Pumping Stations: Capital Costs: Booster at Angleton	Pumping Stations: Capital Costs: Booster at Hwy 6/288	Pumping Stations: O&M Costs: Finished Water	Pumping Stations: O&M Costs: Booster at Angleton	Pumping Stations: O&M Costs: Booster at Hwy 6/288	Pipeline: Capital Costs	Storage: Capital Costs	Pearland Surface Water: SE WTP: Capital Cost	Pearland Surface Water: SE WTP: O & M	Pearland Surface Water: GCWA - New Plant: Capital Cost	Pearland Surface Water: GCWA - New Plant: O & M	Admin Fee at 6.00%	Fort Bend Co Surface Water: GCWA - New Plant: Capital Cost	Fort Bend Co Surface Water: GCWA - New Plant: O & M	Admin Fee at 6.00%	BWA Plant: UV Disinfection	BWA Plant: O & M	Admin Fee at 1.50%
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0
2010	**2.03**	10	$6,497,000	$674,265	$2,908,203	$1,744,922	$608,635	$603,424	**$200,584**	**$15,104**	**$17,332**	$53,735,160	$1,067,635	0	0	0	0	$0	0	0	$0	$2,500,000	**$1,487,076**	$977,461
2011	2.42	10	$6,497,000	$802,966	0	0	0	0	$221,320	$39,406	$28,954	0	0	0	0	0	0	$0	0	0	$0	0	$1,487,076	$113,845
2012	2.80	10	$6,497,000	$931,667	0	0	0	0	$242,056	$63,707	$40,576	0	0	0	0	0	0	$0	0	0	$0	0	$1,487,076	$116,625
2013	3.19	10	$6,497,000	$1,060,369	0	0	0	0	$262,792	$88,009	$52,198	0	0	0	0	0	0	$0	$52,655,846	**$4,074,300**	$3,403,809	0	$1,487,076	$119,406
2014	3.58	10	$6,497,000	$1,189,070	0	0	0	0	$283,528	$112,311	$63,819	0	0	0	0	0	0	$0	0	$4,108,312	$246,499	0	$1,487,076	$122,186
2015	3.97	10	$6,497,000	$1,317,771	0	0	0	0	$304,265	$136,613	$75,441	0	0	0	0	0	0	$0	0	$4,142,323	$248,539	0	$1,487,076	$124,966
2016	4.35	10	$6,497,000	$1,446,473	0	0	0	0	$325,001	$160,915	$87,063	0	0	0	0	0	0	$0	0	$4,176,334	$250,580	0	$1,487,076	$127,747
2017	4.74	10	$6,497,000	$1,575,174	0	0	0	0	$345,737	$185,217	$98,685	0	0	0	0	0	0	$0	0	$4,210,346	$252,621	0	$1,487,076	$130,527
2018	5.13	10	$6,497,000	$1,703,875	0	0	0	0	$366,473	$209,519	$110,307	0	0	0	0	0	0	$0	0	$4,244,357	$254,661	0	$1,487,076	$133,308
2019	5.52	10	$6,497,000	$1,832,577	0	0	0	0	$387,209	$233,820	$121,928	0	0	0	0	0	0	$0	0	$4,278,369	$256,702	0	$1,487,076	$136,088
2020	**5.90**	10	$6,497,000	$1,961,278	0	0	0	0	**$407,945**	**$258,122**	**$133,550**	0	0	$38,409,000	**$374,298**	0	0	$2,326,998	0	**$4,312,380**	$258,743	0	**$1,487,076**	$138,868
2021	7.05	10	$6,497,000	$2,341,790	0	0	0	0	$449,357	$301,422	$150,289	0	0	0	$492,769	0	0	$29,566	0	$4,728,734	$283,724	0	$1,487,076	$146,098
2022	8.20	10	$6,497,000	$2,722,302	0	0	0	0	$490,769	$344,722	$167,027	0	0	0	$611,239	0	0	$36,674	0	$5,145,087	$308,705	0	$1,487,076	$153,327
2023	9.34	10	$6,497,000	$3,102,814	0	0	0	0	$532,181	$388,022	$183,766	0	0	0	$729,710	0	0	$43,783	0	$5,561,441	$333,686	0	$1,487,076	$160,557
2024	10.49	15	$9,307,500	$3,502,465	0	0	0	0	$573,592	$431,321	$200,504	0	0	0	$848,181	0	0	$50,891	0	$5,977,795	$358,668	0	$1,487,076	$210,231
2025	11.63	15	$9,307,500	$3,885,068	$9,038,345	$1,365,131	0	0	$615,004	**$474,621**	**$217,243**	$128,901,685	$4,946,780	0	$966,651	0	0	$57,999	$24,865,385	**$6,394,148**	$1,875,572	0	$1,487,076	$2,245,695
2026	12.78	15	$9,307,500	$4,267,671	0	0	0	0	$656,416	0	0	0	0	0	$1,085,122	0	0	$65,107	0	$6,744,548	$404,673	0	$1,487,076	$213,474
2027	13.92	15	$9,307,500	$4,650,274	0	0	0	0	$697,828	0	0	0	0	0	$1,203,593	0	0	$72,216	0	$7,094,947	$425,697	0	**$1,487,076**	$219,834
2028	15.07	25	$12,957,500	$4,812,860	0	0	0	0	$739,240	0	0	0	0	0	$1,322,064	0	0	$79,324	0	$7,445,346	$446,721	0	0	$277,644
2029	16.22	25	$12,957,500	$5,178,737	0	0	0	0	$780,651	0	0	0	0	0	$1,440,534	0	0	$86,432	0	$7,795,745	$467,745	0	0	$283,753
2030	**17.36**	25	$12,957,500	$5,544,614	0	0	0	0	**$822,063**	0	0	0	0	0	**$1,559,005**	0	0	$93,540	0	**$8,146,144**	$488,769	0	0	$289,863
2031	17.64	25	$12,957,500	$5,633,325	0	0	0	0	$851,298	0	0	0	0	0	$1,614,804	0	0	$96,888	0	$8,220,140	$493,208	0	0	$291,632
2032	17.92	25	$12,957,500	$5,722,035	0	0	0	0	$880,533	0	0	0	0	0	$1,670,604	0	0	$100,236	0	$8,294,136	$497,648	0	0	$293,401
2033	18.19	25	$12,957,500	$5,810,746	0	0	0	0	$909,769	0	0	0	0	0	$1,726,403	0	0	$103,584	$9,946,154	$8,368,132	$1,098,857	0	0	$295,170
2034	18.47	25	$12,957,500	$5,899,457	0	0	0	0	$939,004	0	0	0	0	0	$1,782,203	0	0	$106,932	0	$8,442,128	$506,528	0	0	$296,939
2035	18.75	25	$12,957,500	$5,988,168	0	0	0	0	$968,239	0	0	0	0	0	$1,838,002	0	0	$110,280	0	$8,516,124	$510,967	0	0	$298,709
2036	19.03	25	$12,957,500	$6,076,878	0	0	0	0	$997,474	0	0	0	0	0	$1,893,802	0	0	$113,628	0	$8,590,120	$515,407	0	0	$300,478
2037	19.31	25	$12,957,500	$6,165,589	0	0	0	0	$1,026,709	0	0	0	0	0	$1,949,601	0	0	$116,976	0	$8,664,116	$519,847	0	0	$302,247
2038	19.58	25	$12,957,500	$6,254,300	0	0	0	0	$1,055,944	0	0	0	0	0	$2,005,401	0	0	$120,324	0	$8,738,112	$524,287	0	0	$304,016
2039	19.86	25	$12,957,500	$6,343,010	0	0	0	0	$1,085,179	0	0	0	0	0	$2,061,200	0	0	$123,672	0	$8,812,108	$528,727	0	0	$305,785
2040	**20.14**	25	$9,709,000	$6,431,721	0	0	0	0	**$1,114,415**	0	0	0	0	$7,140,000	**$2,117,000**	$24,858,050	**$941,366**	$2,103,385	0	**$8,886,104**	$533,166	0	0	$258,827
2041	20.66	25	$9,709,000	$6,598,672	0	0	0	0	$1,159,867	0	0	0	0	0	$2,117,000	0	$1,073,986	$191,459	0	$8,942,946	$536,577	0	0	$262,013
2042	21.18	25	$9,709,000	$6,765,624	0	0	0	0	$1,205,318	0	0	0	0	0	$2,117,000	0	$1,206,607	$199,416	0	$8,999,788	$539,987	0	0	$265,199
2043	21.71	25	$9,709,000	$6,932,575	0	0	0	0	$1,250,770	0	0	0	0	0	$2,117,000	0	$1,339,227	$207,374	0	$9,056,629	$543,398	0	0	$268,385
2044	22.23	25	$9,709,000	$7,099,526	0	0	0	0	$1,296,222	0	0	0	0	0	$2,117,000	0	$1,471,847	$215,331	0	$9,113,471	$546,808	0	0	$271,571
2045	22.75	25	$9,709,000	$7,266,477	0	$2,169,203	0	0	$1,341,674	0	0	0	0	0	$2,117,000	0	$1,604,468	$223,288	$7,459,615	$9,170,313	$997,796	0	0	$307,295
2046	23.27	25	$9,709,000	$7,433,429	0	0	0	0	$1,387,126	0	0	0	0	0	$2,117,000	0	$1,737,088	$231,245	0	$9,227,154	$553,629	0	0	$277,943
2047	23.80	25	$9,709,000	$7,600,380	0	0	0	0	$1,432,578	0	0	0	0	0	$2,117,000	0	$1,869,709	$239,203	0	$9,283,996	$557,040	0	0	$281,129
2048	24.32	25	$9,709,000	$7,767,331	0	0	0	0	$1,478,030	0	0	0	0	0	$2,117,000	0	$2,002,329	$247,160	0	$9,340,838	$560,450	0	0	$284,315
2049	24.84	25	$9,709,000	$7,934,282	0	0	0	0	$1,523,482	0	0	0	0	0	$2,117,000	0	$2,134,950	$255,117	0	$9,397,679	$563,861	0	0	$287,501
2050	**25.37**	50	$18,834,000	$7,916,063	0	0	0	0	**$1,568,934**	0	0	0	0	0	**$2,117,000**	0	**$2,267,570**	$263,074	0	**$9,454,521**	$567,271	0	0	$424,785
2051	26.44	50	$18,834,000	$8,252,713	0	0	0	0	$1,637,729	0	0	0	0	0	$2,117,000	0	$2,325,512	$266,551	0	$9,312,775	$558,766	0	0	$430,867
2052	27.52	50	$18,834,000	$8,589,363	0	0	0	0	$1,706,524	0	0	0	0	0	$2,117,000	0	$2,383,453	$270,027	0	$9,171,029	$550,262	0	0	$436,948
2053	28.60	50	$18,834,000	$8,926,014	0	0	0	0	$1,775,320	0	0	0	0	0	$2,117,000	0	$2,441,395	$273,504	$9,946,154	$9,029,282	$1,138,526	0	0	$443,030
2054	29.68	50	$17,428,750	$9,262,664	0	0	0	0	$1,844,115	0	0	0	0	0	$2,117,000	0	$2,499,337	$276,980	0	$8,887,536	$533,252	0	0	$428,033
2055	30.76	50	$17,428,750	$9,599,315	0	0	0	$1,556,525	$1,912,910	0	**$990,982**	0	0	0	$2,117,000	0	$2,557,279	$280,457	0	$8,745,790	$524,747	0	0	$472,327
2056	31.84	50	$17,428,750	$9,935,965	0	0	0	0	$1,981,705	0	$1,038,675	0	0	0	$2,117,000	0	$2,615,220	$283,933	0	$8,604,043	$516,243	0	0	$455,776
2057	32.92	50	$17,428,750	$10,272,615	0	0	0	0	$2,050,500	0	$1,086,368	0	0	0	$2,117,000	0	$2,673,162	$287,410	0	$8,462,297	$507,738	0	0	$462,574
2058	34.00	50	$15,603,750	$10,609,266	0	0	0	0	$2,119,296	0	$1,134,061	0	0	0	$2,117,000	0	$2,731,104	$290,886	0	$8,320,551	$499,233	0	0	$441,996
2059	35.07	50	$15,603,750	$10,945,916	0	0	0	0	$2,188,091	0	$1,181,754	0	0	0	$2,117,000	0	$2,789,045	$294,363	0	$8,178,804	$490,728	0	0	$448,793
2060	**36.15**	50	$15,603,750	$11,282,567	0	0	0	0	**$2,256,886**	0	**$1,229,447**	0	0	0	**$2,117,000**	0	**$2,846,987**	$297,839	0	**$8,037,058**	$482,223	0	0	$455,590
		Present Worth:	$229,096,638	$101,755,728	$7,443,237	$2,905,934	$513,600	$876,848	$18,558,816	$2,176,706	$2,580,581	$116,497,957	$3,631,534	$27,001,919	$24,823,455	$8,975,785	$11,435,696	$11,133,053	$63,745,528	$142,552,059	$12,377,855	$2,109,636	$17,950,997	$7,178,915

Net Present Value Analysis
Option 1

		Seawater Desalination Treatment Plant			Desalinated	Pumping Stations						Pipeline	Storage	Pearland Surface Water				Admin	Fort Bend Co Surface Water		Admin	BWA	Admin
	Water	Rated	Capacity	Commodity	Water	Capital Costs			O&M Costs					SE WTP		GCWA - New Plant		Fee at	GCWA - New Plant		Fee at	Consolidate	Fee at
Year	Deficit (MGD)	Capacity (MGD)	Charge	Charge	Storage	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs	Capital Costs	Capital Cost	O & M	Capital Cost	O & M	6.00%	Capital Cost	O & M	6.00%	Debt	1.50%
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0.00%
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0.00%
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0.00%
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0.00%
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0.00%
2010	**7.24**	10	$6,497,000	$2,403,340	$3,591,442	$2,154,865	$788,096	$524,753	**$616,804**	**$9,331**	**$8,960**	$55,571,675	$955,203	0	0	0	0	$0	0	0	$0	$8,777,415	$1,042,950
2011	7.65	10	$6,497,000	$2,540,684	0	0	0	0	$623,807	$29,048	$14,068	0	0	0	0	0	0	$0	0	0	$0	0	$145,569
2012	8.06	10	$6,497,000	$2,678,028	0	0	0	0	$630,809	$48,765	$19,177	0	0	0	0	0	0	$0	0	0	$0	0	$148,107
2013	8.48	10	$6,497,000	$2,815,373	0	0	0	0	$637,812	$68,481	$24,285	0	0	0	0	0	0	$0	$52,655,846	**$4,074,300**	$3,403,809	0	$150,644
2014	8.89	10	$6,497,000	$2,952,717	0	0	0	0	$644,814	$88,198	$29,393	0	0	0	0	0	0	$0	0	$4,108,312	$246,499	0	$153,182
2015	9.30	10	$6,497,000	$3,090,061	0	0	0	0	$651,817	$107,915	$34,501	0	0	0	0	0	0	$0	0	$4,142,323	$248,539	0	$155,719
2016	9.72	10	$6,497,000	$3,227,405	0	0	0	0	$658,819	$127,631	$39,609	0	0	0	0	0	0	$0	0	$4,176,334	$250,580	0	$158,257
2017	10.13	15	$9,307,500	$3,383,237	0	0	0	0	$665,822	$147,348	$44,717	0	0	0	0	0	0	$0	0	$4,210,346	$252,621	0	$203,229
2018	10.54	15	$9,307,500	$3,521,336	0	0	0	0	$672,824	$167,065	$49,825	0	0	0	0	0	0	$0	0	$4,244,357	$254,661	0	$205,778
2019	10.96	15	$9,307,500	$3,659,435	0	0	0	0	$679,827	$186,781	$54,933	0	0	0	0	0	0	$0	0	$4,278,369	$256,702	0	$208,327
2020	**11.37**	15	$9,307,500	$3,797,534	0	0	0	0	**$686,830**	**$206,498**	**$60,041**	0	0	$38,409,000	**$374,298**	0	0	$2,326,998	0	**$4,312,380**	$258,743	0	$210,876
2021	11.97	15	$9,307,500	$3,997,589	0	0	0	0	$708,433	$228,547	$69,595	0	0	0	$492,769	0	0	$29,566	0	$4,728,734	$283,724	0	$214,675
2022	12.57	15	$9,307,500	$4,197,644	0	0	0	0	$730,037	$250,597	$79,149	0	0	0	$611,239	0	0	$36,674	0	$5,145,087	$308,705	0	$218,474
2023	13.17	15	$9,307,500	$4,397,698	0	0	0	0	$751,641	$272,647	$88,702	0	0	0	$729,710	0	0	$43,783	0	$5,561,441	$333,686	0	$222,273
2024	13.77	15	$9,307,500	$4,597,753	0	0	0	0	$773,244	$294,696	$98,256	0	0	0	$848,181	0	0	$50,891	0	$5,977,795	$358,668	0	$226,072
2025	14.37	15	$9,307,500	$4,797,808	$9,038,345	$1,365,131	0	0	$794,848	**$316,746**	**$107,810**	$125,934,490	$5,059,211	0	$966,651	0	0	$57,999	$24,865,385	**$6,394,148**	$1,875,572	0	$2,215,253
2026	14.96	15	$9,307,500	$4,997,863	0	0	0	0	$816,452	0	0	0	0	0	$1,085,122	0	0	$65,107	0	$6,744,548	$404,673	0	$226,827
2027	15.56	25	$12,957,500	$4,970,686	0	0	0	0	$838,055	0	0	0	0	0	$1,203,593	0	0	$72,216	0	$7,094,947	$425,697	0	$281,494
2028	16.16	25	$12,957,500	$5,161,995	0	0	0	0	$859,659	0	0	0	0	0	$1,322,064	0	0	$79,324	0	$7,445,346	$446,721	0	$284,687
2029	16.76	25	$12,957,500	$5,353,305	0	0	0	0	$881,263	0	0	0	0	0	$1,440,534	0	0	$86,432	0	$7,795,745	$467,745	0	$287,881
2030	**17.36**	25	$12,957,500	$5,544,614	0	0	0	0	**$902,867**	0	0	0	0	0	**$1,559,005**	0	0	$93,540	0	**$8,146,144**	$488,769	0	$291,075
2031	17.64	25	$12,957,500	$5,633,325	0	0	0	0	$934,964	0	0	0	0	0	$1,614,804	0	0	$96,888	0	$8,220,140	$493,208	0	$292,887
2032	17.92	25	$12,957,500	$5,722,035	0	0	0	0	$967,060	0	0	0	0	0	$1,670,604	0	0	$100,236	0	$8,294,136	$497,648	0	$294,699
2033	18.19	25	$12,957,500	$5,810,746	0	0	0	0	$999,157	0	0	0	0	0	$1,726,403	0	0	$103,584	$9,946,154	$8,368,132	$1,098,857	0	$296,511
2034	18.47	25	$12,957,500	$5,899,457	0	0	0	0	$1,031,254	0	0	0	0	0	$1,782,203	0	0	$106,932	0	$8,442,128	$506,528	0	$298,323
2035	18.75	25	$12,957,500	$5,988,168	0	0	0	0	$1,063,351	0	0	0	0	0	$1,838,002	0	0	$110,280	0	$8,516,124	$510,967	0	$300,135
2036	19.03	25	$12,957,500	$6,076,878	0	0	0	0	$1,095,448	0	0	0	0	0	$1,893,802	0	0	$113,628	0	$8,590,120	$515,407	0	$301,947
2037	19.31	25	$12,957,500	$6,165,589	0	0	0	0	$1,127,545	0	0	0	0	0	$1,949,601	0	0	$116,976	0	$8,664,116	$519,847	0	$303,760
2038	19.58	25	$12,957,500	$6,254,300	0	0	0	0	$1,159,642	0	0	0	0	0	$2,005,401	0	0	$120,324	0	$8,738,112	$524,287	0	$305,572
2039	19.86	25	$12,957,500	$6,343,010	0	0	0	0	$1,191,739	0	0	0	0	0	$2,061,200	0	0	$123,672	0	$8,812,108	$528,727	0	$307,384
2040	**20.14**	25	$9,709,000	$6,431,721	0	0	0	0	**$1,223,836**	0	0	0	0	$7,140,000	**$2,117,000**	$24,858,050	**$941,366**	$2,103,385	0	**$8,886,104**	$533,166	0	$260,468
2041	20.66	25	$9,709,000	$6,598,672	0	0	0	0	$1,260,927	0	0	0	0	0	$2,117,000	0	$1,073,986	$191,459	0	$8,942,946	$536,577	0	$263,529
2042	21.18	25	$9,709,000	$6,765,624	0	0	0	0	$1,298,018	0	0	0	0	0	$2,117,000	0	$1,206,607	$199,416	0	$8,999,788	$539,987	0	$266,590
2043	21.71	25	$9,709,000	$6,932,575	0	0	0	0	$1,335,109	0	0	0	0	0	$2,117,000	0	$1,339,227	$207,374	0	$9,056,629	$543,398	0	$269,650
2044	22.23	25	$9,709,000	$7,099,526	0	0	0	0	$1,372,200	0	0	0	0	0	$2,117,000	0	$1,471,847	$215,331	0	$9,113,471	$546,808	0	$272,711
2045	22.75	25	$9,709,000	$7,266,477	0	$2,169,203	0	$1,556,525	$1,409,291	0	**$198,024**	0	0	0	$2,117,000	0	$1,604,468	$223,288	$7,459,615	$9,170,313	$997,796	0	$334,628
2046	23.27	25	$9,709,000	$7,433,429	0	0	0	0	$1,446,382	0	$204,769	0	0	0	$2,117,000	0	$1,737,088	$231,245	0	$9,227,154	$553,629	0	$281,904
2047	23.80	25	$8,303,750	$7,600,380	0	0	0	0	$1,483,473	0	$211,514	0	0	0	$2,117,000	0	$1,869,709	$239,203	0	$9,283,996	$557,040	0	$263,987
2048	24.32	25	$8,303,750	$7,767,331	0	0	0	0	$1,520,564	0	$218,259	0	0	0	$2,117,000	0	$2,002,329	$247,160	0	$9,340,838	$560,450	0	$267,149
2049	24.84	25	$8,303,750	$7,934,282	0	0	0	0	$1,557,655	0	$225,004	0	0	0	$2,117,000	0	$2,134,950	$255,117	0	$9,397,679	$563,861	0	$270,310
2050	**25.37**	50	$17,428,750	$7,916,063	0	0	0	0	**$1,594,746**	0	**$231,749**	0	0	0	**$2,117,000**	0	**$2,267,570**	$263,074	0	**$9,454,521**	$567,271	0	$407,570
2051	26.44	50	$17,428,750	$8,252,713	0	0	0	0	$1,665,842	0	$231,749	0	0	0	$2,117,000	0	$2,325,512	$266,551	0	$9,312,775	$558,766	0	$413,686
2052	27.52	50	$17,428,750	$8,589,363	0	0	0	0	$1,736,938	0	$231,749	0	0	0	$2,117,000	0	$2,383,453	$270,027	0	$9,171,029	$550,262	0	$419,802
2053	28.60	50	$17,428,750	$8,926,014	0	0	0	0	$1,808,034	0	$231,749	0	0	0	$2,117,000	0	$2,441,395	$273,504	$9,946,154	$9,029,282	$1,138,526	0	$425,918
2054	29.68	50	$17,428,750	$9,262,664	0	0	0	0	$1,879,130	0	$231,749	0	0	0	$2,117,000	0	$2,499,337	$276,980	0	$8,887,536	$533,252	0	$432,034
2055	30.76	50	$17,428,750	$9,599,315	0	0	0	0	$1,950,225	0	**$231,749**	0	0	0	$2,117,000	0	$2,557,279	$280,457	0	$8,745,790	$524,747	0	$438,151
2056	31.84	50	$17,428,750	$9,935,965	0	0	0	0	$2,021,321	0	$461,365	0	0	0	$2,117,000	0	$2,615,220	$283,933	0	$8,604,043	$516,243	0	$447,711
2057	32.92	50	$15,603,750	$10,272,615	0	0	0	0	$2,092,417	0	$690,982	0	0	0	$2,117,000	0	$2,673,162	$287,410	0	$8,462,297	$507,738	0	$429,896
2058	34.00	50	$15,603,750	$10,609,266	0	0	0	0	$2,163,513	0	$920,598	0	0	0	$2,117,000	0	$2,731,104	$290,886	0	$8,320,551	$499,233	0	$439,457
2059	35.07	50	$15,603,750	$10,945,916	0	0	0	0	$2,234,609	0	$1,150,215	0	0	0	$2,117,000	0	$2,789,045	$294,363	0	$8,178,804	$490,728	0	$449,017
2060	**36.15**	50	$15,603,750	$11,282,567	0	0	0	0	**$2,305,705**	0	**$1,379,832**	0	0	0	**$2,117,000**	0	**$2,846,987**	$297,839	0	**$8,037,058**	$482,223	0	$458,578
		Present Worth:	$240,442,598	$120,740,258	$8,019,791	$3,251,867	$665,038	$930,700	$23,040,950	$1,621,284	$2,176,421	$116,409,827	$3,598,721	$27,001,919	$24,823,455	$8,975,785	$11,435,696	$11,133,053	$63,745,528	$142,552,059	$12,377,855	$7,406,861	$7,693,165

Net Present Value Analysis
Option 2

	Water	Seawater Desalination Treatment Plant			Desalinated	Pumping Stations						Pipeline	Storage	BWA Plant		Admin
	Deficit	Rated	Capacity	Commodity	Water	Capital Costs			O&M Costs					UV	O & M	Fee at
						Finished	Booster at	Booster at Hwy		Booster at	Booster at Hwy					
Year	(MGD)	Capacity (MGD)	Charge	Charge	Storage	Water	Angleton	6/288	Finished Water	Angleton	6/288	Capital Costs	Capital Costs	Disinfection		1.50%
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	**2.03**	10	$6,497,000	$674,359	$9,327,003	$5,596,202	$4,901,198	$4,763,648	**$143,931**	**$7,496**	**$11,843**	$102,308,075	$3,394,629	$2,500,000	**$1,487,076**	$1,924,476
2011	3.88	10	$6,497,000	$1,289,693	0	0	0	0	$250,070	$63,533	$50,219	0	0	0	$1,487,076	$122,258
2012	5.74	10	$6,497,000	$1,905,027	0	0	0	0	$356,209	$119,571	$88,595	0	0	0	$1,487,076	$134,496
2013	7.59	10	$6,497,000	$2,520,360	0	0	0	0	$462,347	$175,608	$126,970	0	0	0	$1,487,076	$146,734
2014	9.44	10	$6,497,000	$3,135,694	0	0	0	0	$568,486	$231,645	$165,346	0	0	0	$1,487,076	$158,973
2015	11.29	15	$9,307,500	$3,771,638	0	0	0	0	$674,625	$287,682	$203,722	0	0	0	$1,487,076	$358,650
2016	13.15	15	$9,307,500	$4,390,352	0	0	0	0	$780,764	$343,720	$242,098	0	0	0	$1,487,076	$225,966
2017	15.00	15	$9,307,500	$5,009,067	0	0	0	0	$886,902	$399,757	$280,473	0	0	0	$1,487,076	$238,255
2018	16.85	25	$12,957,500	$5,381,758	0	0	0	0	$993,041	$455,794	$318,849	0	0	0	$1,487,076	$301,604
2019	18.70	25	$12,957,500	$5,973,425	0	0	0	0	$1,099,180	$511,832	$357,225	0	0	0	$1,487,076	$313,487
2020	**20.56**	25	$12,957,500	$6,565,092	0	0	0	0	**$1,205,318**	**$567,869**	**$395,600**	0	0	0	**$1,487,076**	$325,371
2021	23.91	25	$12,957,500	$7,635,123	0	0	0	0	$1,263,115	$660,619	$456,450	0	0	0	$1,487,076	$344,592
2022	27.26	50	$22,082,500	$8,506,179	0	0	0	0	$1,320,912	$753,369	$517,300	0	0	0	$1,487,076	$497,704
2023	30.61	50	$22,082,500	$9,551,752	0	0	0	0	$1,378,709	$846,119	$578,150	0	0	0	$1,487,076	$516,558
2024	33.96	50	$22,082,500	$10,597,325	0	0	0	0	$1,436,506	$938,869	$639,000	0	0	0	$1,487,076	$535,413
2025	37.31	50	$22,082,500	$11,642,898	$24,120,573	$4,374,693	0	0	$1,494,303	**$1,031,618**	**$699,850**	$223,556,920	$14,430,791	0	$1,487,076	$4,189,704
2026	40.66	50	$22,082,500	$12,688,471	0	0	0	0	$1,552,100	0	0	0	0	0	$1,487,076	$544,846
2027	44.01	50	$22,082,500	$13,734,044	0	0	0	0	$1,609,897	0	0	0	0	0	**$1,487,076**	$561,397
2028	47.36	50	$22,082,500	$14,779,617	0	0	0	0	$1,667,694	0	0	0	0	0	0	$577,947
2029	50.71	50	$22,082,500	$15,825,190	0	0	0	0	$1,725,491	0	0	0	0	0	0	$594,498
2030	**54.06**	50	$22,082,500	$16,870,763	0	0	0	0	**$1,783,288**	0	0	0	0	0	0	$611,048
2031	55.20	50	$22,082,500	$17,225,830	0	0	0	0	$1,866,729	0	0	0	0	0	0	$617,626
2032	56.34	50	$22,082,500	$17,580,898	0	0	0	0	$1,950,169	0	0	0	0	0	0	$624,204
2033	57.47	50	$22,082,500	$17,935,965	0	0	0	0	$2,033,610	0	0	0	0	0	0	$630,781
2034	58.61	50	$22,082,500	$18,291,033	0	0	0	0	$2,117,051	0	0	0	0	0	0	$637,359
2035	59.75	50	$22,082,500	$18,646,101	0	0	0	0	$2,200,492	0	0	0	0	0	0	$643,936
2036	60.89	50	$22,082,500	$19,001,168	0	0	0	0	$2,283,933	0	0	0	0	0	0	$650,514
2037	62.02	50	$22,082,500	$19,356,236	0	0	0	0	$2,367,373	0	0	0	0	0	0	$657,092
2038	63.16	50	$22,082,500	$19,711,303	0	0	0	0	$2,450,814	0	0	0	0	0	0	$663,669
2039	64.30	50	$22,082,500	$20,066,371	0	0	0	0	$2,534,255	0	0	0	0	0	0	$670,247
2040	**65.44**	50	$18,834,000	$20,421,438	0	0	0	0	**$2,617,696**	0	0	0	0	0	0	$628,097
2041	66.93	50	$18,834,000	$20,887,925	0	0	0	0	$2,753,771	0	0	0	0	0	0	$637,135
2042	68.43	50	$18,834,000	$21,354,412	0	0	0	0	$2,889,846	0	0	0	0	0	0	$646,174
2043	69.92	50	$18,834,000	$21,820,899	0	0	0	0	$3,025,922	0	0	0	0	0	0	$655,212
2044	71.42	50	$18,834,000	$22,287,386	0	0	0	0	$3,161,997	0	0	0	0	0	0	$664,251
2045	72.91	50	$17,428,750	$22,753,873	0	$5,788,937	0	0	$3,298,072	0	0	0	0	0	0	$739,044
2046	74.41	50	$17,428,750	$23,220,360	0	0	0	0	$3,434,148	0	0	0	0	0	0	$661,249
2047	75.90	50	$17,428,750	$23,686,847	0	0	0	0	$3,570,223	0	0	0	0	0	0	$670,287
2048	77.40	50	$15,603,750	$24,153,334	0	0	0	0	$3,706,298	0	0	0	0	0	0	$651,951
2049	78.89	50	$15,603,750	$24,619,821	0	0	0	0	$3,842,374	0	0	0	0	0	0	$660,989
2050	**80.39**	50	$15,603,750	$25,086,308	0	0	0	0	**$3,978,449**	0	0	0	0	0	0	$670,028
2051	82.00	50	$15,603,750	$25,588,648	0	0	0	0	$4,152,794	0	0	0	0	0	0	$680,178
2052	83.60	50	$11,041,250	$26,090,989	0	0	0	0	$4,327,138	0	0	0	0	0	0	$621,891
2053	85.21	50	$11,041,250	$26,593,329	0	0	0	0	$4,501,483	0	0	0	0	0	0	$632,041
2054	86.82	50	$11,041,250	$27,095,669	0	0	0	0	$4,675,828	0	0	0	0	0	0	$642,191
2055	88.43	50	$11,041,250	$27,598,010	0	0	0	$5,164,250	$4,850,172	0	**$204,908**	0	0	0	0	$732,879
2056	90.04	50	$11,041,250	$28,100,350	0	0	0	0	$5,024,517	0	$207,807	0	0	0	0	$665,609
2057	91.65	50	$11,041,250	$28,602,690	0	0	0	0	$5,198,862	0	$210,706	0	0	0	0	$675,803
2058	93.26	50	$11,041,250	$29,105,031	0	0	0	0	$5,373,207	0	$213,606	0	0	0	0	$685,996
2059	94.87	50	$11,041,250	$29,607,371	0	0	0	0	$5,547,551	0	$216,505	0	0	0	0	$696,190
2060	**96.48**	50	$11,041,250	$30,109,711	0	0	0	0	**$5,721,896**	0	**$219,404**	0	0	0	0	$706,384
		Present Worth:	$357,281,161	$306,575,478	$21,185,109	$8,951,711	$4,135,898	$5,239,606	$44,384,723	$4,657,192	$3,520,446	$209,735,805	$10,830,322	$2,109,636	$17,950,997	$14,435,882

Net Present Value Analysis
Option 3

Year	Water Deficit (MGD)	Seawater Desalination Treatment Plant Rated Capacity (MGD)	Seawater Desalination Treatment Plant Capacity Charge	Seawater Desalination Treatment Plant Commodity Charge	Desalinated Water Storage	Pumping Stations Capital Costs Finished Water	Pumping Stations Capital Costs Booster at Hwy 6/288	Pumping Stations O&M Costs Finished Water	Pumping Stations O&M Costs Booster at Hwy 6/288	Pipeline Capital Costs	Storage Capital Costs	BWA Consolidate Debt	Admin Fee at 1.50%
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	**7.24**	15	$9,307,500	$2,416,545	$9,986,246	$5,991,747	$4,763,648	**$616,804**	**$23,565**	$104,253,090	$3,413,317	$8,777,415	$1,961,793
2011	9.10	10	$6,497,000	$3,020,949	0	0	0	$707,191	$707,191	0	0	0	$163,985
2012	10.95	15	$9,307,500	$3,658,551	0	0	0	$797,579	$797,579	0	0	0	$218,418
2013	12.81	15	$9,307,500	$4,279,554	0	0	0	$887,966	$887,966	0	0	0	$230,445
2014	14.67	15	$9,307,500	$4,900,557	0	0	0	$978,353	$978,353	0	0	0	$242,471
2015	16.53	25	$12,957,500	$5,280,180	0	0	0	$1,068,740	$1,068,740	0	0	0	$377,082
2016	18.39	25	$12,957,500	$5,874,036	0	0	0	$1,159,127	$1,159,127	0	0	0	$317,247
2017	20.25	25	$12,957,500	$6,467,891	0	0	0	$1,249,515	$1,249,515	0	0	0	$328,866
2018	22.11	25	$12,957,500	$7,061,746	0	0	0	$1,339,902	$1,339,902	0	0	0	$340,486
2019	23.97	25	$12,957,500	$7,655,602	0	0	0	$1,430,289	$1,430,289	0	0	0	$352,105
2020	**25.83**	50	$22,082,500	$8,060,898	0	0	0	**$1,520,676**	**$810,279**	0	0	0	$487,115
2021	28.65	50	$22,082,500	$8,941,884	0	0	0	$1,580,325	$934,914	0	0	0	$503,094
2022	31.48	50	$22,082,500	$9,822,871	0	0	0	$1,639,974	$1,059,548	0	0	0	$519,073
2023	34.30	50	$22,082,500	$10,703,857	0	0	0	$1,699,623	$1,184,182	0	0	0	$535,052
2024	37.12	50	$22,082,500	$11,584,844	0	0	0	$1,759,271	$1,308,817	0	0	0	$551,031
2025	39.94	50	$22,082,500	$12,465,830	$24,120,573	$4,374,693	0	$1,818,920	**$1,433,451**	$224,413,445	$14,412,104	0	$4,215,014
2026	42.77	50	$22,082,500	$13,346,817	0	0	0	$1,878,569	0	0	0	0	$559,618
2027	45.59	50	$22,082,500	$14,227,803	0	0	0	$1,938,217	0	0	0	0	$573,728
2028	48.41	50	$22,082,500	$15,108,790	0	0	0	$1,997,866	0	0	0	0	$587,837
2029	51.24	50	$22,082,500	$15,989,776	0	0	0	$2,057,515	0	0	0	0	$601,947
2030	**54.06**	50	$22,082,500	$16,870,763	0	0	0	**$2,117,163**	0	0	0	0	$616,056
2031	55.20	50	$22,082,500	$17,225,830	0	0	0	$2,208,909	0	0	0	0	$622,759
2032	56.34	50	$22,082,500	$17,580,898	0	0	0	$2,300,654	0	0	0	0	$629,461
2033	57.47	50	$22,082,500	$17,935,965	0	0	0	$2,392,400	0	0	0	0	$636,163
2034	58.61	50	$22,082,500	$18,291,033	0	0	0	$2,484,146	0	0	0	0	$642,865
2035	59.75	50	$22,082,500	$18,646,101	0	0	0	$2,575,891	0	0	0	0	$649,567
2036	60.89	50	$22,082,500	$19,001,168	0	0	0	$2,667,637	0	0	0	0	$656,270
2037	62.02	50	$22,082,500	$19,356,236	0	0	0	$2,759,383	0	0	0	0	$662,972
2038	63.16	50	$22,082,500	$19,711,303	0	0	0	$2,851,128	0	0	0	0	$669,674
2039	64.30	50	$22,082,500	$20,066,371	0	0	0	$2,942,874	0	0	0	0	$676,376
2040	**65.44**	50	$22,082,500	$20,421,438	0	0	0	**$3,034,619**	0	0	0	0	$683,078
2041	66.93	50	$22,082,500	$20,887,925	0	0	0	$3,216,371	0	0	0	0	$692,802
2042	68.43	50	$22,082,500	$21,354,412	0	0	0	$3,398,123	0	0	0	0	$702,526
2043	69.92	50	$22,082,500	$21,820,899	0	0	0	$3,579,874	0	0	0	0	$712,249
2044	71.42	50	$22,082,500	$22,287,386	0	0	0	$3,761,626	0	0	0	0	$721,973
2045	72.91	50	$22,082,500	$22,753,873	0	$5,788,937	$5,164,250	$3,943,378	**$31,985**	0	0	0	$896,474
2046	74.41	50	$22,082,500	$23,220,360	0	0	0	$4,125,130	$38,382	0	0	0	$741,996
2047	75.90	50	$22,082,500	$23,686,847	0	0	0	$4,306,881	$44,779	0	0	0	$751,815
2048	77.40	50	$22,082,500	$24,153,334	0	0	0	$4,488,633	$51,176	0	0	0	$761,635
2049	78.89	50	$22,082,500	$24,619,821	0	0	0	$4,670,385	$57,572	0	0	0	$771,454
2050	**80.39**	50	$22,082,500	$25,086,308	0	0	0	**$4,852,136**	**$63,969**	0	0	0	$781,274
2051	82.00	50	$22,082,500	$25,588,648	0	0	0	$4,941,132	$114,135	0	0	0	$790,896
2052	83.60	50	$22,082,500	$26,090,989	0	0	0	$5,030,128	$164,300	0	0	0	$800,519
2053	85.21	50	$22,082,500	$26,593,329	0	0	0	$5,119,124	$214,466	0	0	0	$810,141
2054	86.82	50	$22,082,500	$27,095,669	0	0	0	$5,208,121	$264,631	0	0	0	$819,764
2055	88.43	50	$22,082,500	$27,598,010	0	0	0	$5,297,117	$314,797	0	0	0	$829,386
2056	90.04	50	$22,082,500	$28,100,350	0	0	0	$5,386,113	$364,962	0	0	0	$839,009
2057	91.65	50	$22,082,500	$28,602,690	0	0	0	$5,475,109	$415,128	0	0	0	$848,631
2058	93.26	50	$22,082,500	$29,105,031	0	0	0	$5,564,105	$465,293	0	0	0	$858,254
2059	94.87	50	$22,082,500	$29,607,371	0	0	0	$5,653,101	$515,459	0	0	0	$867,876
2060	**96.48**	50	$22,082,500	$30,109,711	0	0	0	**$5,742,097**	**$565,624**	0	0	0	$877,499
		Present Worth:	$425,267,400	$324,056,957	$21,741,414	$9,285,494	$5,638,535	$53,967,883	$11,778,114	$211,849,913	$10,835,776	$7,406,861	$15,842,544

Net Present Value Analysis
Option 4

	Water	Seawater Desalination Treatment Plant			Desalinated	Pumping Stations				Pipeline	Storage	Pearland Surface Water				Admin	Fort Bend Co Surface Water		Admin	Danbury		BWA	Admin
	Deficit	Rated	Capacity	Commodity	Water	Capital Costs		O&M Costs				SE WTP		GCWA - New Plant		Fee at	GCWA - New Plant		Fee at	Arsenic Treatment of Well Water		Consolidate	Fee at
Year	(MGD)	Capacity (MGD)	Charge	Charge	Storage	Finished Water	Booster at Hwy 6/288	Finished Water	Booster at Hwy 6/288	Capital Costs	Capital Costs	Capital Cost	O & M	Capital Cost	O & M	6.00%	Capital Cost	O & M	6.00%	Capital	O & M	Debt	1.50%
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	$1,523,380	$70,626	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	$70,992	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	$71,357	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	0	0	$0	0	$71,722	0	0
2010	**6.52**	10	$6,497,000	$2,165,132	$3,111,171	$1,866,703	0	**$560,171**	0	$13,371,585	$105,783	0	0	0	0	$0	0	0	$0	0	**$72,088**	$8,777,415	$368,496
2011	6.62	10	$6,497,000	$2,198,679	0	0	0	$562,456	0	0	0	0	0	0	0	$0	0	0	$0	0	$72,453	0	$138,872
2012	6.72	10	$6,497,000	$2,232,226	0	0	0	$564,741	0	0	0	0	0	0	0	$0	0	0	$0	0	$72,819	0	$139,410
2013	6.82	10	$6,497,000	$2,265,774	0	0	0	$567,026	0	0	0	0	0	0	0	$0	$62,924,308	**$4,640,143**	$4,053,867	0	$73,184	0	$139,947
2014	6.92	10	$6,497,000	$2,299,321	0	0	0	$569,311	0	0	0	0	0	0	0	$0	0	$4,711,635	$282,698	0	$73,549	0	$140,484
2015	7.02	10	$6,497,000	$2,332,869	0	0	0	$571,595	0	0	0	0	0	0	0	$0	0	$4,783,128	$286,988	0	$73,915	0	$141,022
2016	7.12	10	$6,497,000	$2,366,416	0	0	0	$573,880	0	0	0	0	0	0	0	$0	0	$4,854,620	$291,277	0	$74,280	0	$141,559
2017	7.23	10	$6,497,000	$2,399,964	0	0	0	$576,165	0	0	0	0	0	0	0	$0	0	$4,926,112	$295,567	0	$74,646	0	$142,097
2018	7.33	10	$6,497,000	$2,433,511	0	0	0	$578,450	0	0	0	0	0	0	0	$0	0	$4,997,604	$299,856	0	$75,011	0	$142,634
2019	7.43	10	$6,497,000	$2,467,059	0	0	0	$580,735	0	0	0	0	0	0	0	$0	0	$5,069,097	$304,146	0	$75,376	0	$143,172
2020	**7.53**	10	$6,497,000	$2,500,606	0	0	0	**$583,020**	0	0	0	$38,409,000	**$374,298**	0	0	$2,326,998	0	**$5,140,589**	$308,435	0	**$75,742**	0	$143,709
2021	8.51	10	$6,497,000	$2,827,185	0	0	0	$590,146	0	0	0	0	$492,769	0	0	$29,566	0	$5,690,551	$341,433	0	$76,052	0	$148,715
2022	9.50	10	$6,497,000	$3,153,765	0	0	0	$597,272	0	0	0	0	$611,239	0	0	$36,674	0	$6,240,512	$374,431	0	$76,361	0	$153,721
2023	10.48	15	$9,307,500	$3,499,467	0	0	0	$604,399	0	0	0	0	$729,710	0	0	$43,783	0	$6,790,474	$407,428	0	$76,671	0	$201,170
2024	11.46	15	$9,307,500	$3,827,840	0	0	0	$611,525	0	0	0	0	$848,181	0	0	$50,891	0	$7,340,435	$440,426	0	$76,981	0	$206,203
2025	12.44	15	$9,307,500	$4,156,214	$9,038,345	$1,365,131	0	$618,652	0	$158,482,225	$5,908,632	0	$966,651	0	0	$57,999	$16,576,923	**$7,890,397**	$1,468,039	0	$77,290	0	$2,697,575
2026	13.43	15	$9,307,500	$4,484,587	0	0	0	$625,778	0	0	0	0	$1,085,122	0	0	$65,107	0	$7,941,546	$476,493	0	$77,600	0	$216,268
2027	14.41	15	$9,307,500	$4,812,961	0	0	0	$632,904	0	0	0	0	$1,203,593	0	0	$72,216	0	$7,992,696	$479,562	0	$77,910	0	$221,300
2028	15.39	25	$12,957,500	$4,916,577	0	0	0	$640,031	0	0	0	0	$1,322,064	0	0	$79,324	0	$8,043,845	$482,631	0	$78,220	0	$277,712
2029	16.38	25	$12,957,500	$5,230,595	0	0	0	$647,157	0	0	0	0	$1,440,534	0	0	$86,432	0	$8,094,995	$485,700	0	$78,529	0	$282,529
2030	**17.36**	25	$12,957,500	$5,544,614	0	0	0	**$654,284**	0	0	0	0	**$1,559,005**	0	0	$93,540	0	**$8,146,144**	$488,769	0	**$78,839**	0	$287,346
2031	17.64	25	$12,957,500	$5,633,325	0	0	0	$678,581	0	0	0	0	$1,614,804	0	0	$96,888	0	$8,220,140	$493,208	0	$79,080	0	$289,041
2032	17.92	25	$12,957,500	$5,722,035	0	0	0	$702,878	0	0	0	0	$1,670,604	0	0	$100,236	0	$8,294,136	$497,648	0	$79,321	0	$290,736
2033	18.19	25	$12,957,500	$5,810,746	0	0	0	$727,175	0	0	0	0	$1,726,403	0	0	$103,584	$12,432,692	$8,368,132	$1,248,049	0	$79,562	0	$292,431
2034	18.47	25	$12,957,500	$5,899,457	0	0	0	$751,472	0	0	0	0	$1,782,203	0	0	$106,932	0	$8,442,128	$506,528	0	$79,803	0	$294,126
2035	18.75	25	$12,957,500	$5,988,168	0	0	0	$775,769	0	0	0	0	$1,838,002	0	0	$110,280	0	$8,516,124	$510,967	0	$80,044	0	$295,822
2036	19.03	25	$12,957,500	$6,076,878	0	0	0	$800,067	0	0	0	0	$1,893,802	0	0	$113,628	0	$8,590,120	$515,407	$1,523,380	$80,285	0	$297,517
2037	19.31	25	$12,957,500	$6,165,589	0	0	0	$824,364	0	0	0	0	$1,949,601	0	0	$116,976	0	$8,664,116	$519,847	0	$80,526	0	$299,212
2038	19.58	25	$12,957,500	$6,254,300	0	0	0	$848,661	0	0	0	0	$2,005,401	0	0	$120,324	0	$8,738,112	$524,287	0	$80,766	0	$300,907
2039	19.86	25	$12,957,500	$6,343,010	0	0	0	$872,958	0	0	0	0	$2,061,200	0	0	$123,672	0	$8,812,108	$528,727	0	$81,007	0	$302,602
2040	**20.14**	25	$6,460,500	$6,431,721	0	0	0	**$897,255**	0	0	0	$7,140,000	**$2,117,000**	$24,858,050	**$941,366**	$2,103,385	0	**$8,886,104**	$533,166	0	**$81,248**	0	$206,842
2041	20.66	25	$6,460,500	$6,598,672	0	0	0	$975,870	0	0	0	0	$2,117,000	0	$1,073,986	$191,459	0	$8,942,946	$536,577	0	$81,661	0	$210,526
2042	21.18	25	$6,460,500	$6,765,624	0	0	0	$1,054,485	0	0	0	0	$2,117,000	0	$1,206,607	$199,416	0	$8,999,788	$539,987	0	$82,073	0	$214,209
2043	21.71	25	$6,460,500	$6,932,575	0	0	0	$1,133,100	0	0	0	0	$2,117,000	0	$1,339,227	$207,374	0	$9,056,629	$543,398	0	$82,485	0	$217,893
2044	22.23	25	$6,460,500	$7,099,526	0	0	0	$1,211,715	0	0	0	0	$2,117,000	0	$1,471,847	$215,331	0	$9,113,471	$546,808	0	$82,897	0	$221,576
2045	22.75	25	$6,460,500	$7,266,477	0	$2,169,203	$3,891,313	$1,290,330	**$48,907**	0	0	0	$2,117,000	0	$1,604,468	$223,288	$4,973,077	$9,170,313	$848,603	0	$83,309	0	$316,901
2046	23.27	25	$6,460,500	$7,433,429	0	0	0	$1,368,946	$50,572	0	0	0	$2,117,000	0	$1,737,088	$231,245	0	$9,227,154	$553,629	0	$83,721	0	$229,702
2047	23.80	25	$6,460,500	$7,600,380	0	0	0	$1,447,561	$52,238	0	0	0	$2,117,000	0	$1,869,709	$239,203	0	$9,283,996	$557,040	0	$84,134	0	$233,410
2048	24.32	25	$6,460,500	$7,767,331	0	0	0	$1,526,176	$53,904	0	0	0	$2,117,000	0	$2,002,329	$247,160	0	$9,340,838	$560,450	0	$84,546	0	$237,119
2049	24.84	25	$6,460,500	$7,934,282	0	0	0	$1,604,791	$55,570	0	0	0	$2,117,000	0	$2,134,950	$255,117	0	$9,397,679	$563,861	0	$84,958	0	$240,827
2050	**25.37**	50	$15,585,500	$7,916,063	0	0	0	**$1,683,406**	**$57,236**	0	0	0	**$2,117,000**	0	**$2,267,570**	$263,074	0	**$9,454,521**	$567,271	0	**$85,370**	0	$378,633
2051	26.44	50	$15,585,500	$8,252,713	0	0	0	$1,755,007	$134,785	0	0	0	$2,117,000	0	$2,325,512	$266,551	0	$9,312,775	$558,766	0	$85,887	0	$385,920
2052	27.52	50	$15,585,500	$8,589,363	0	0	0	$1,826,607	$212,334	0	0	0	$2,117,000	0	$2,383,453	$270,027	0	$9,171,029	$550,262	0	$86,404	0	$393,207
2053	28.60	50	$12,775,000	$8,926,014	0	0	0	$1,898,208	$289,882	0	0	0	$2,117,000	0	$2,441,395	$273,504	$12,432,692	$9,029,282	$1,287,718	0	$86,920	0	$358,337
2054	29.68	50	$12,775,000	$9,262,664	0	0	0	$1,969,809	$367,431	0	0	0	$2,117,000	0	$2,499,337	$276,980	0	$8,887,536	$533,252	0	$87,437	0	$365,624
2055	30.76	50	$12,775,000	$9,599,315	0	0	0	$2,041,410	**$444,980**	0	0	0	$2,117,000	0	$2,557,279	$280,457	0	$8,745,790	$524,747	0	$87,954	0	$372,911
2056	31.84	50	$12,775,000	$9,935,965	0	0	0	$2,113,011	$522,529	0	0	0	$2,117,000	0	$2,615,220	$283,933	0	$8,604,043	$516,243	$1,523,380	$88,470	0	$380,198
2057	32.92	50	$12,775,000	$10,272,615	0	0	0	$2,184,612	$600,078	0	0	0	$2,117,000	0	$2,673,162	$287,410	0	$8,462,297	$507,738	0	$88,987	0	$387,485
2058	34.00	50	$9,125,000	$10,609,266	0	0	0	$2,256,213	$677,627	0	0	0	$2,117,000	0	$2,731,104	$290,886	0	$8,320,551	$499,233	0	$89,504	0	$340,022
2059	35.07	50	$9,125,000	$10,945,916	0	0	0	$2,327,813	$755,176	0	0	0	$2,117,000	0	$2,789,045	$294,363	0	$8,178,804	$490,728	0	$90,021	0	$347,309
2060	**36.15**	50	$9,125,000	$11,282,567	0	0	0	**$2,399,414**	**$832,725**	0	0	0	**$2,117,000**	0	**$2,846,987**	$297,839	0	**$8,037,058**	$482,223	0	**$90,537**	0	$354,596
		Present Worth:	$207,846,211	$111,590,289	$7,614,513	$3,008,699	$1,219,714	$20,106,526	$1,180,906	$98,765,334	$3,350,810	$27,001,919	$24,823,455	$8,975,785	$11,435,696	$11,133,053	$68,066,838	$151,575,939	$13,178,567	$2,405,325	$2,071,665	$7,406,861	$6,706,027

Net Present Value Analysis
Option 5

	Pearland Surface Water					Fort Bend Co Surface Water			Danbury		BWA		Admin
	SE WTP			GCWA - New Plant		GCWA - New Plant		BRA No Contract	Arsenic Treatment of Well Water		UV & New Plant	O&M	Fee at
Year	Capacity (MGD)	Capital Cost	O & M (excl GW)	Capital Cost	O & M	Capital Cost	O & M	O&M	Capital	O&M			6.00%
2005		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2006		$0	$0	$0	$0	$0	$0	$0	$1,523,380	$70,626	$0	$0	$0
2007		$0	$0	$0	$0	$0	$0	$0	$0	$70,992	$0	$0	$0
2008		$0	$0	$0	$0	$0	$0	$0	$0	$71,357	$0	$0	$0
2009		$0	$0	$0	$0	$0	$0	$0	$0	$71,722	$0	$0	$0
2010	10	$38,409,000	$110,719	$0	$0	$0	$0	$0	$0	$72,088	$2,616,430	$3,462,507	$1,187,202
2011		$0	$138,113	$0	$0	$0	$0	$0	$0	$72,453	$0	$3,573,810	$1,192,784
2012		$0	$165,507	$0	$0	$0	$0	$0	$0	$72,819	$0	$3,685,113	$1,198,367
2013		$0	$192,901	$0	$0	$81,090,481	$2,934,892	$767,267	$0	$73,184	$0	$3,796,416	$1,737,907
2014		$0	$220,295	$0	$0	$0	$2,973,669	$818,275	$0	$73,549	$0	$3,907,719	$1,748,877
2015		$0	$247,689	$0	$0	$0	$3,012,445	$869,284	$0	$73,915	$0	$4,019,022	$1,759,847
2016		$0	$275,083	$0	$0	$0	$3,051,222	$920,293	$0	$74,280	$0	$4,130,325	$1,770,816
2017		$0	$302,477	$0	$0	$0	$3,089,998	$971,302	$0	$74,646	$0	$4,241,629	$1,781,786
2018		$0	$329,871	$0	$0	$0	$3,128,775	$1,022,310	$0	$75,011	$0	$4,352,932	$1,792,756
2019		$0	$357,265	$0	$0	$0	$3,167,551	$1,073,319	$0	$75,376	$0	$4,464,235	$1,803,725
2020		$0	$384,659	$0	$0	$0	$3,206,328	$1,606,183	$0	$75,742	$0	$4,575,538	$1,843,606
2021		$0	$503,634	$0	$0	$0	$3,603,795	$1,865,592	$0	$76,052	$0	$4,568,156	$1,876,869
2022		$0	$622,610	$0	$0	$0	$4,001,262	$2,125,001	$0	$76,361	$0	$4,560,774	$1,910,132
2023		$0	$741,585	$0	$0	$0	$4,514,485	$2,384,410	$0	$76,671	$0	$4,553,393	$1,950,341
2024		$0	$860,561	$0	$0	$0	$4,922,412	$2,643,819	$0	$76,981	$0	$4,546,011	$1,984,231
2025		$0	$979,536	$0	$0	$0	$5,330,338	$2,903,228	$0	$77,290	$0	$4,538,629	$2,018,122
2026		$0	$1,098,511	$0	$0	$0	$5,738,265	$3,162,637	$0	$77,600	$0	$4,531,247	$2,052,013
2027		$0	$1,217,487	$0	$0	$0	$6,146,192	$3,422,047	$0	$77,910	$0	$4,523,865	$2,085,903
2028		$0	$1,336,462	$0	$0	$0	$6,554,119	$3,681,456	$0	$78,220	$0	$4,516,484	$2,119,794
2029		$0	$1,455,438	$0	$0	$0	$6,962,045	$3,940,865	$0	$78,529	$0	$4,509,102	$2,153,685
2030		$7,140,000	$1,574,413	$0	$0	$37,209,846	$7,369,972	$7,431,254	$0	$78,839	$33,153,846	$4,501,720	$2,618,286
2031		$0	$1,628,672	$0	$0	$0	$7,456,116	$7,612,418	$0	$79,080	$0	$4,535,457	$2,641,493
2032		$0	$1,682,930	$0	$0	$0	$7,542,261	$7,793,582	$0	$79,321	$0	$4,569,194	$2,664,700
2033		$0	$1,737,189	$0	$0	$17,405,769	$7,628,406	$7,974,746	$0	$79,562	$0	$4,602,931	$2,754,840
2034		$0	$1,791,448	$0	$0	$0	$7,714,550	$8,155,910	$0	$79,803	$0	$4,636,668	$2,778,047
2035		$0	$1,845,706	$0	$0	$0	$7,800,695	$8,337,075	$0	$80,044	$0	$4,670,405	$2,801,254
2036		$0	$2,117,000	$34,131,400	$85,695	$0	$7,886,839	$8,518,239	$1,523,380	$80,285	$0	$4,704,142	$2,978,307
2037		$0	$2,117,000	$0	$221,497	$0	$7,972,984	$8,699,403	$0	$80,526	$0	$4,737,879	$3,006,558
2038		$0	$2,117,000	$0	$357,014	$0	$8,059,128	$8,880,567	$0	$80,766	$0	$4,771,616	$3,034,791
2039		$0	$2,117,000	$0	$492,816	$0	$8,145,273	$9,061,731	$0	$81,007	$0	$4,805,353	$3,063,042
2040		$0	$2,117,000	$0	$627,194	$0	$8,231,417	$9,242,895	$0	$81,248	$0	$4,839,090	$2,935,658
2041		$0	$2,117,000	$0	$781,729	$0	$8,297,593	$9,597,668	$0	$81,661	$0	$4,884,995	$2,976,356
2042		$0	$2,117,000	$0	$936,264	$0	$8,363,769	$9,952,440	$0	$82,073	$0	$4,930,900	$3,017,054
2043		$0	$2,117,000	$0	$1,090,800	$0	$8,429,944	$10,307,213	$0	$82,485	$0	$4,976,806	$2,745,924
2044		$0	$2,117,000	$0	$1,245,335	$0	$8,496,120	$10,661,986	$0	$82,897	$0	$5,022,711	$2,786,621
2045		$0	$2,117,000	$2,270,025	$1,399,870	$0	$8,562,296	$11,016,759	$0	$83,309	$0	$5,068,616	$3,001,768
2046		$0	$2,117,000	$0	$1,554,405	$0	$8,628,471	$11,371,531	$0	$83,721	$0	$5,114,522	$3,042,466
2047		$0	$2,117,000	$0	$1,708,940	$0	$8,694,647	$11,726,304	$0	$84,134	$0	$5,160,427	$3,083,164
2048		$0	$2,117,000	$0	$1,863,475	$0	$8,760,823	$12,081,077	$0	$84,546	$0	$5,206,332	$3,123,861
2049		$0	$2,117,000	$0	$2,018,011	$0	$8,826,998	$12,435,849	$0	$84,958	$0	$5,252,238	$3,164,559
2050		$7,140,000	$2,117,000	$0	$2,172,546	$9,946,154	$8,893,174	$12,790,622	$0	$85,370	$9,946,154	$5,298,143	$3,225,149
2051		$0	$2,117,000	$0	$2,239,991	$0	$8,939,523	$13,317,324	$0	$85,887	$0	$5,353,852	$3,288,027
2052		$0	$2,117,000	$0	$2,307,437	$0	$8,985,872	$13,844,027	$0	$86,404	$0	$5,409,561	$3,350,904
2053		$0	$2,117,000	$0	$2,374,882	$17,405,769	$9,032,221	$14,370,729	$0	$86,920	$0	$5,465,271	$3,480,714
2054		$0	$2,117,000	$0	$2,442,327	$0	$9,078,571	$14,897,431	$0	$87,437	$0	$5,520,980	$3,543,591
2055		$0	$2,117,000	$7,470,000	$2,509,773	$0	$9,124,920	$15,424,134	$0	$87,954	$0	$5,576,689	$4,054,669
2056		$0	$2,117,000	$0	$2,577,218	$0	$9,171,269	$15,950,836	$1,523,380	$88,470	$0	$5,632,398	$4,117,546
2057		$0	$2,117,000	$0	$2,644,664	$0	$9,217,618	$16,477,538	$0	$88,987	$0	$5,688,107	$4,180,423
2058		$0	$2,117,000	$0	$2,712,109	$0	$9,263,967	$17,004,240	$0	$89,504	$0	$5,743,817	$4,243,300
2059		$0	$2,117,000	$0	$2,779,555	$0	$9,310,316	$17,530,943	$0	$90,021	$0	$5,799,526	$4,306,178
2060		$0	$2,117,000	$0	$2,847,000	$0	$9,356,666	$18,057,645	$0	$90,537	$0	$5,855,235	$4,225,967
Present Worth =		$37,775,652	$26,841,122	$16,277,043	$11,042,120	$95,407,959	$126,973,523	$128,688,970	$2,405,325	$2,071,665	$20,800,612	$105,104,804	$54,279,645

Net Present Value Analysis
Option 6

	Water	Seawater Desalination Treatment Plant					Desalinated Water Storage	Pumping Stations						Desalination Pipeline & Local Storage		Allocated Desal Capital Costs			Pearland Surface Water									Surface Water Admin Fee	BRA Admin Fee at	Rate Analysis		
		Purchased	Average Day	Rated	Capacity	Commodity		Capital Costs Annualized			O&M Costs			Pipeline	Storage			Average Day	SE WTP					GCWA - New Plant						Total	Total	Annual Rate
Year	Deficit (MGD)	Demand Desal	Demand Desal	Capacity (MGD)	Charge	Charge	Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs Annualized	Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Demand GW (MGD)	Capacity (MGD)	Capital Cost Amortized	O&M Average Day Demand SW - CofH	Average Day Demand SW (MGD)	O & M (Including GW)	Capacity (MGD)	Average Day Demand SW (MGD)	Capital Cost Amortized	O & M	6.00%	1.50%	Pearland Avg Day Demand	Pearland Service Area Cost	Cost/ 1,000 gal
																					6.00											
2010	2.02	0.06	0.52	10	$6,497,000	$671,939	$186,372	$111,823	0	0	$200,746	15108.5661	17339.0787	$3,443,921	$68,425	$1,702,513	$234,001	17.47		0	$3,022,200		$3,124,867			0	0	$368,824	$29,048	24.00	$8,481,453	$0.97
2011	2.41	0.06	0.48	10	$6,497,000	$800,382	$186,372	$111,823	0	0	$221,452	39395.9018	28946.1609	$3,443,921	$68,425	$1,305,169	$215,167	17.74		0	$3,022,200	0.00	$3,172,477			0	0	$371,681	$22,805	24.21	$8,109,499	$0.92
2012	2.80	0.06	0.43	10	$6,497,000	$928,824	$186,372	$111,823	0	0	$242,158	63683.2375	40553.2432	$3,443,921	$68,425	$1,017,719	$195,268	18.00		0	$3,022,200	0.00	$3,220,087			0	0	$374,537	$18,195	24.43	$7,848,007	$0.88
2013	3.18	0.06	0.38	10	$6,497,000	$1,057,267	$186,372	$111,823	0	0	$262,864	87970.5732	52160.3255	$3,443,921	$68,425	$800,111	$174,694	18.27		0	$3,022,200	0.00	$3,267,697			0	0	$377,394	$14,622	24.65	$7,656,717	$0.85
2014	3.57	0.06	0.33	10	$6,497,000	$1,185,709	$186,372	$111,823	0	0	$283,570	112257.909	63767.4078	$3,443,921	$68,425	$629,648	$153,662	18.54		0	$3,022,200	0.00	$3,315,307			0	0	$380,250	$11,750	24.87	$7,512,817	$0.83
2015	3.96	0.06	0.29	10	$6,497,000	$1,314,151	$186,372	$111,823	$39,008	$38,674	$304,276	$136,545	$75,374	$3,443,921	$68,425	$499,541	$134,159	18.80		0	$3,022,200	0.00	$3,362,917			0	0	$383,107	$9,505	25.09	$7,411,429	$0.81
2016	4.34	0.06	0.24	10	$6,497,000	$1,442,594	$186,372	$111,823	$39,008	$38,674	$324,981	$160,833	$86,982	$3,443,921	$68,425	$386,235	$112,574	19.07		0	$3,022,200	0.00	$3,410,526			0	0	$385,964	$7,482	25.31	$7,324,982	$0.79
2017	4.73	0.06	0.20	10	$9,307,500	$1,571,036	$186,372	$111,823	$39,008	$38,674	$345,687	$185,120	$98,589	$3,443,921	$68,425	$407,444	$90,810	19.34		0	$3,022,200	0.00	$3,458,136			0	0	$388,820	$7,474	25.53	$7,374,885	$0.79
2018	5.12	0.06	0.15	10	$9,307,500	$1,699,479	$186,372	$111,823	$39,008	$38,674	$366,393	$209,407	$110,196	$3,443,921	$68,425	$292,189	$68,908	19.60		0	$3,022,200	0.00	$3,505,746			0	0	$391,677	$5,416	25.75	$7,286,136	$0.78
2019	5.50	0.06	0.10	10	$9,307,500	$1,827,921	$186,372	$111,823	$39,008	$38,674	$387,099	$233,695	$121,803	$3,443,921	$68,425	$193,132	$46,895	19.87		0	$3,022,200	0.00	$3,553,356			0	0	$394,533	$3,600	25.97	$7,213,717	$0.76
2020	5.89	0.06	0.05	10	$9,307,500	$1,956,364	$186,372	$111,823	$39,008	$38,674	$407,805	$257,982	$133,410	$3,443,921	$68,425	$100,760	$22,924	20.13	10	$2,461,657	$3,022,200	1.77	$3,975,252			0	0	$567,547	$1,855	27.95	$10,152,195	$1.00
2021	7.03	0.06	0.05	10	$9,307,500	$2,336,582	$186,372	$111,823	$39,008	$38,674	$462,438	$212,860	$172,548	$3,443,921	$68,425	$91,336	$23,267	19.94		$2,461,657	$3,022,200	2.33	$4,058,521			0	0	$572,543	$1,719	28.32	$10,231,243	$0.99
2022	8.18	0.06	0.05	10	$9,307,500	$2,746,656	$186,372	$111,823	$39,008	$38,674	$520,073	$247,199	$198,237	$3,443,921	$68,425	$84,549	$24,417	19.74		$2,461,657	$3,022,200	2.89	$4,141,791			0	0	$577,539	$1,634	28.68	$10,313,787	$0.99
2023	9.32	0.06	0.06	10	$9,307,500	$3,131,053	$186,372	$111,823	$39,008	$38,674	$572,778	$281,454	$223,258	$3,443,921	$68,425	$79,429	$25,366	19.54		$2,461,657	$3,022,200	3.45	$4,225,060			0	0	$582,535	$1,572	29.05	$10,397,820	$0.98
2024	10.47	1.50	0.06	15	$9,307,500	$3,515,450	$186,372	$111,823	$39,008	$38,674	$620,553	$315,626	$247,610	$3,443,921	$68,425	$440,921	$26,304	19.35		$2,461,657	$3,022,200	4.01	$4,308,330			0	0	$587,531	$7,008	29.41	$10,853,953	$1.01
2025	11.61	1.50	0.06	15	$9,307,500	$3,730,288	$765,646	$199,316	$39,008	$38,674	$663,398	$474,720	$217,159	$11,705,311	$385,468	$1,362,229	$26,712	19.15		$2,461,657	$3,022,200	4.57	$4,391,600			0	0	$592,527	$20,834	29.78	$11,877,760	$1.09
2026	12.76	1.50	0.06	15	$9,307,500	$4,097,972	$765,646	$199,316	$39,008	$38,674	$701,312	0	0	$11,705,311	$385,468	$1,359,594	$23,849	18.95		$2,461,657	$3,022,200	5.13	$4,474,869			0	0	$597,524	$20,752	30.14	$11,960,445	$1.09
2027	13.90	1.50	0.07	15	$12,957,500	$4,465,656	$765,646	$199,316	$39,008	$38,674	$734,296	0	0	$11,705,311	$385,468	$1,374,667	$24,610	18.76		$2,461,657	$3,022,200	5.69	$4,558,139			0	0	$602,520	$20,989	30.51	$12,064,782	$1.08
2028	15.05	2.50	0.07	25	$12,957,500	$4,833,341	$765,646	$199,316	$39,008	$38,674	$762,350	0	0	$11,705,311	$385,468	$1,372,069	$25,361	18.56		$2,461,657	$3,022,200	6.24	$4,641,409			0	0	$607,516	$20,961	30.87	$12,151,173	$1.08
2029	16.19	2.50	0.07	25	$12,957,500	$5,201,025	$765,646	$199,316	$39,008	$38,674	$785,473	0	0	$11,705,311	$385,468	$1,369,838	$26,101	18.36		$2,461,657	$3,022,200	6.80	$4,724,678			0	0	$612,512	$20,939	31.24	$12,237,926	$1.07
2030	17.34	2.50	0.07	25	$12,957,500	$5,568,709	$765,646	$199,316	$39,008	$38,674	$821,923	0	0	$11,705,311	$385,468	$1,367,901	$26,908	18.17		$2,461,657	$3,022,200	7.36	$4,807,948			0	0	$617,508	$20,922	31.60	$12,325,045	$1.07
2031	17.61	2.50	0.08	25	$12,957,500	$5,657,691	$765,646	$199,316	$39,008	$38,674	$830,652	0	0	$11,705,311	$385,468	$1,368,661	$27,701	17.99		$2,461,657	$3,022,200	7.63	$4,833,151			0	0	$619,020	$20,945	31.70	$12,353,336	$1.07
2032	17.89	2.50	0.08	25	$12,957,500	$5,746,673	$765,646	$199,316	$39,008	$38,674	$858,083	0	0	$11,705,311	$385,468	$1,369,398	$28,573	17.82		$2,461,657	$3,022,200	7.89	$4,858,354			0	0	$620,533	$20,970	31.79	$12,381,684	$1.07
2033	18.17	2.50	0.08	25	$12,957,500	$5,835,655	$765,646	$199,316	$39,008	$38,674	$885,958	0	0	$11,705,311	$385,468	$1,370,112	$29,449	17.65		$2,461,657	$3,022,200	8.15	$4,883,557			0	0	$622,045	$20,993	31.89	$12,410,013	$1.07
2034	18.45	2.50	0.08	25	$12,957,500	$5,924,637	$765,646	$199,316	$39,008	$38,674	$914,279	0	0	$11,705,311	$385,468	$1,370,805	$30,329	17.48		$2,461,657	$3,022,200	8.42	$4,908,759			0	0	$623,557	$21,017	31.98	$12,438,325	$1.07
2035	18.72	2.50	0.08	25	$12,957,500	$6,013,619	$765,646	$199,316	$39,008	$38,674	$943,045	0	0	$11,705,311	$385,468	$1,371,478	$31,212	17.31		$2,461,657	$3,022,200	8.68	$4,933,962			$1,593,168	0	$720,659	$21,040	32.08	$14,155,377	$1.21
2036	19.00	2.50	0.09	25	$12,957,500	$6,102,601	$765,646	$199,316	$39,008	$38,674	$972,255	0	0	$11,705,311	$385,468	$1,372,130	$32,099	17.14		$2,461,657	$3,022,200	10.00	$5,182,382	10	0.27	$1,593,168	$76,869	$740,177	$21,063	33.50	$14,501,745	$1.19
2037	19.28	2.50	0.09	25	$12,957,500	$6,191,583	$765,646	$199,316	$39,008	$38,674	$1,001,911	0	0	$11,705,311	$385,468	$1,372,764	$32,989	16.97		$2,461,657	$3,022,200	10.00	$5,151,780		0.76	$1,593,168	$214,949	$746,625	$21,086	33.81	$14,617,219	$1.18
2038	19.55	2.50	0.09	25	$12,957,500	$6,280,565	$765,646	$199,316	$39,008	$38,674	$1,032,011	0	0	$11,705,311	$385,468	$1,373,380	$33,882	16.80		$2,461,657	$3,022,200	10.00	$5,121,179		1.24	$1,593,168	$352,743	$753,057	$21,109	34.13	$14,732,376	$1.18
2039	19.83	2.50	0.09	25	$12,957,500	$6,224,785	$765,646	$199,316	$39,008	$38,674	$1,062,556	0	0	$11,705,311	$385,468	$1,373,979	$34,102	16.63		$2,461,657	$3,022,200	10.00	$5,090,578		1.72	$1,593,168	$490,823	$759,506	$21,121	34.44	$14,847,134	$1.18
2040	20.11	2.50	0.10	25	$9,709,000	$6,311,744	$579,273	$87,492	$39,008	$38,674	$1,114,415	0	0	$8,261,391	$317,042	$978,159	$35,086	16.46		$2,919,264	$3,022,200	10.00	$5,059,977		2.21	$1,593,168	$628,618	$793,394	$15,199	34.76	$15,045,064	$1.19
2041	20.63	2.50	0.11	25	$9,709,000	$6,475,556	$579,273	$87,492	$39,008	$38,674	$1,130,963	0	0	$8,261,391	$317,042	$985,706	$41,850	16.25		$2,919,264	$3,022,200	10.00	$5,023,795		2.75	$1,593,168	$783,010	$800,486	$15,413	35.12	$15,184,894	$1.18
2042	21.15	2.50	0.13	25	$9,709,000	$6,639,368	$579,273	$87,492	$39,008	$38,674	$1,168,838	0	0	$8,261,391	$317,042	$992,880	$48,729	16.05		$2,919,264	$3,022,200	10.00	$4,987,614		3.29	$1,593,168	$937,403	$807,579	$15,624	35.48	$15,324,462	$1.18
2043	21.67	2.50	0.15	25	$9,709,000	$6,803,180	$579,273	$87,492	$39,008	$38,674	$1,207,169	0	0	$8,261,391	$317,042	$999,708	$55,625	15.85		$2,919,264	$3,022,200	10.00	$4,951,433		3.83	$1,593,168	$1,091,796	$814,672	$15,830	35.83	$15,463,696	$1.18
2044	22.19	2.50	0.17	25	$9,709,000	$6,966,992	$579,273	$87,492	$39,008	$38,674	$1,245,957	0	0	$8,261,391	$317,042	$1,006,216	$62,536	15.65		$2,919,264	$3,022,200	10.00	$4,915,251		4.38	$1,593,168	$1,246,189	$821,764	$16,031	36.19	$15,602,620	$1.18
2045	22.72	2.50	0.19	25	$9,709,000	$7,130,804	$579,273	$254,016	0	$0	$1,285,203	0	$0	$8,261,391	$317,042	$1,021,308	$69,464	15.44		$2,919,264	$3,022,200	10.00	$4,879,070		4.92	$1,593,168	$1,400,582	$828,857	$16,362	36.55	$15,750,275	$1.18
2046	23.24	2.50	0.21	25	$9,709,000	$7,294,615	$579,273	$254,016	0	$0	$1,324,906	0	$0	$8,261,391	$317,042	$1,027,238	$76,408	15.24		$2,919,264	$3,022,200	10.00	$4,842,889		5.46	$1,593,168	$1,554,974	$835,950	$16,555	36.91	$15,888,646	$1.18
2047	23.76	2.50	0.22	25	$8,303,750	$7,458,427	$579,273	$254,016	0	$0	$1,365,066	0	$0	$8,261,391	$317,042	$1,019,630	$83,368	15.04		$2,919,264	$3,022,200	10.00	$4,806,707		6.00	$1,593,168	$1,709,367	$843,042	$16,545	37.27	$16,013,292	$1.18
2048	24.28	2.50	0.24	25	$8,303,750	$7,622,239	$579,273	$254,016	0	$0	$1,405,683	0	$0	$8,261,391	$317,042	$1,024,270	$90,345	14.84		$2,919,264	$3,022,200	10.00	$4,770,526		6.55	$1,593,168	$1,863,760	$850,135	$16,719	37.63	$16,150,388	$1.18
2049	24.80	2.50	0.26	25	$8,303,750	$7,786,051	$579,273	$254,016	0	$0	$1,446,757	0	$0	$8,261,391	$317,042	$1,028,715	$97,337	14.63		$2,919,264	$3,022,200	10.00	$4,734,345		7.09	$1,593,168	$2,018,153	$857,228	$16,891	37.98	$16,287,301	$1.17
2050	25.33	5.00	0.28	50	$17,428,750	$7,949,863	$579,273	$254,016	0	$0	$1,568,934	0	$0	$8,261,391	$317,042	$1,133,861	$105,238	14.43		$457,607	$3,022,200	10.00	$4,698,163		7.63	$1,593,168	$2,172,546	$716,621	$18,586	38.34	$13,917,990	$0.99
2051	26.40	5.00	0.63	50	$17,428,750	$8,288,150	$579,273	$254,016	0	$0	$1,551,619	0	$0	$8,261,391	$317,042	$1,358,610	$235,673	14.22		$457,607	$3,022,200	10.00	$4,660,265		7.87	$1,593,168	$2,239,991	$718,394	$23,914	38.72	$14,309,823	$1.01
2052	27.48	5.00	0.98	50	$17,428,750	$8,626,437	$579,273	$254,016	0	$0	$1,614,949	0	$0	$8,261,391	$317,042	$1,565,732	$367,000	14.01		$457,607	$3,022,200	10.00	$4,622,367		8.10	$1,593,168	$2,307,437	$720,167	$28,991	39.10	$14,684,669	$1.03
2053	28.56	5.00	1.34	50	$17,428,750	$8,964,723	$579,273	$254,016	0	$0	$1,678,280	0	$0	$8,261,391	$317,042	$1,757,223	$498,328	13.80		$457,607	$3,022,200	10.00	$4,584,468		8.34	$1,593,168	$2,374,882	$721,940	$33,833	39.48	$15,043,649	$1.04
2054	29.64	5.00	1.69	50	$17,428,750	$9,303,010	$579,273	$254,016	0	$0	$1,741,610	0	$0	$8,261,391	$317,042	$1,934,787	$629,655	13.58		$457,607	$3,022,200	10.00	$4,546,570		8.58	$1,593,168	$2,442,327	$723,712	$38,467	39.85	$15,388,493	$1.06
2055	30.71	5.00	2.04	50	$17,428,750	$9,641,297		$166,524	0	$99,759	$1,804,941	0	$991,105	0	0	$1,185,346	$826,874	13.37		$457,607	$3,022,200	10.00	$4,508,672		8.82	$1,593,168	$2,509,773	$725,485	$30,183	40.23	$14,859,308	$1.01
2056	31.79	5.00	2.39	50	$17,428,750	$9,979,584		$166,524	0	$99,759	$1,868,271	0	$896,190	0	0	$1,339,257	$959,805	13.16		$457,607	$3,022,200	10.00	$4,470,773		9.05	$1,593,168	$2,577,218	$727,258	$34,486	40.61	$15,181,772	$1.02
2057	32.87	5.00	2.75	50	$15,603,750	$10,317,871		$166,524	0	$99,759	$1,931,601	0	$932,928	0	0	$1,330,567	$1,101,597	12.95		$457,607	$3,022,200	10.00	$4,432,875		9.29	$1,593,168	$2,644,664	$729,031	$36,482	40.98	$15,348,191	$1.03
2058	33.95	5.00	3.10	50	$15,603,750	$10,656,158		$166,524	0	$99,759	$1,994,932	0	$970,082	0	0	$1,451,151	$1,243,526	12.74		$457,607	$3,022,200	10.00	$4,394,977		9.53	$1,593,168	$2,712,109	$730,804	$40,420	41.36	$15,645,961	$1.04
2059	35.03	5.00	3.45	50	$15,603,750	$10,994,445		$166,524	0	$99,759	$2,058,262	0	$1,007,654	0	0	$1,564,313	$1,385,591	12.52		$457,607	$3,022,200	10.00	$4,357,078		9.76	$1,593,168	$2,779,555	$732,576	$44,249	41.74	$15,936,337	$1.05
2060	36.10	5.00	3.80	50	$15,603,750	$11,332,732		$166,524	0	$99,759	$2,257,026	0	$1,229,307	0	0	$1,670,721	$1,561,414	12.31		$457,607	$3,022,200	10.00	$4,319,180		10.00	$1,593,168	$2,847,000	$734,349	$48,482	42.12	$16,254,121	$1.06

Rate Analysis Costs for Pearland Area
Option 1

		Seawater Desalination Treatment Plant						Pumping Stations						Desalination Pipeline & Local		Allocated Desal Capital Costs			Surface Water				Surface	BRA	Rate Analysis		
	Water	Purchased	Average Day	Rated	Capacity	Commodity	Desalinated Water Storage	Capital Costs Annualized			O&M Costs			Pipeline	Storage				GCWA - New Plant				Water Admin Fee	Admin Fee at	Total Ft Bend	Total Ft Bend County	Annual Rate
Year	Deficit (MGD)	Demand Desal	Demand Desal	Capacity (MGD)	Charge	Charge	Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs Annualized	Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Average Day Demand GW (MGD)	Capacity (MGD)	Average Day Demand SW (MGD)	Capital Cost	O & M (Including GW)	6.00%	1.50%	Average Day Demand (MGD)	County Service Area Costs	Cost/ 1,000 gal
2010	2.02	4.48	0.00	10	$6,497,000	$671,939	$186,372	$111,823	0	0	$200,746	$15,109	$17,339	$3,443,921	$68,425	$1,707,123	0	40.36				$7,218,529	$433,112	$25,607	40.36	$9,384,370	$0.64
2011	2.41	4.48	1.38	10	$6,497,000	$800,382	$186,372	$111,823	0	0	$221,452	$39,396	$28,946	$3,443,921	$68,425	$5,440,967	$626,527	39.83			0	$7,124,120	$427,447	$91,012	41.22	$13,710,074	$0.91
2012	2.80	4.48	1.61	10	$6,497,000	$928,824	$186,372	$111,823	0	0	$242,158	$63,683	$40,553	$3,443,921	$68,425	$5,440,967	$732,872	39.31			0	$7,029,710	$421,783	$92,608	40.91	$13,717,939	$0.92
2013	3.18	4.48	1.83	10	$6,497,000	$1,057,267	$186,372	$111,823	0	0	$262,864	$87,971	$52,160	$3,443,921	$68,425	$5,440,967	$839,216	38.78	20	10.58	$3,374,747	$9,870,192	$794,696	$94,203	51.19	$20,414,022	$1.09
2014	3.57	4.48	2.05	10	$6,497,000	$1,185,709	$186,372	$111,823	0	0	$283,570	$112,258	$63,767	$3,443,921	$68,425	$5,440,967	$945,561	38.25		10.72	$3,374,747	$9,814,559	$791,358	$95,798	51.02	$20,462,991	$1.10
2015	3.96	4.48	2.27	10	$6,497,000	$1,314,151	$186,372	$111,823	$39,008	$38,674	$304,276	$136,545	$75,374	$3,443,921	$68,425	$5,475,769	$1,051,906	37.72		10.86	$3,374,747	$9,758,926	$788,020	$97,915	50.85	$20,547,283	$1.11
2016	4.34	4.48	2.50	10	$6,497,000	$1,442,594	$186,372	$111,823	$39,008	$38,674	$324,981	$160,833	$86,982	$3,443,921	$68,425	$5,475,769	$1,158,250	37.19		11.00	$3,374,747	$9,703,293	$784,682	$99,510	50.69	$20,596,252	$1.11
2017	4.73	4.48	2.72	10	$6,497,000	$1,571,036	$186,372	$111,823	$39,008	$38,674	$345,687	$185,120	$98,589	$3,443,921	$68,425	$5,475,769	$1,264,595	36.67		11.14	$3,374,747	$9,647,660	$781,344	$101,105	50.52	$20,645,220	$1.12
2018	5.12	4.48	2.94	10	$6,497,000	$1,699,479	$186,372	$111,823	$39,008	$38,674	$366,393	$209,407	$110,196	$3,443,921	$68,425	$5,475,769	$1,370,939	36.14		11.28	$3,374,747	$9,592,027	$778,006	$102,701	50.36	$20,694,189	$1.13
2019	5.50	4.48	3.16	10	$6,497,000	$1,827,921	$186,372	$111,823	$39,008	$38,674	$387,099	$233,695	$121,803	$3,443,921	$68,425	$5,475,769	$1,477,284	35.61		11.42	$3,374,747	$9,536,394	$774,668	$104,296	50.19	$20,743,158	$1.13
2020	5.89	4.48	3.39	10	$6,497,000	$1,956,364	$186,372	$111,823	$39,008	$38,674	$407,805	$257,982	$133,410	$3,443,921	$68,425	$5,475,769	$1,583,628	35.08		11.56	$3,374,747	$9,480,761	$771,330	$105,891	50.03	$20,792,127	$1.14
2021	7.03	4.48	3.93	10	$6,497,000	$2,336,582	$186,372	$111,823	$39,008	$38,674	$462,438	$212,860	$172,548	$3,443,921	$68,425	$5,373,093	$1,779,774	33.91		12.99	$3,374,747	$9,669,169	$782,635	$107,293	50.84	$21,086,711	$1.14
2022	8.18	4.48	4.48	10	$6,497,000	$2,746,656	$186,372	$111,823	$39,008	$38,674	$520,073	$247,199	$198,237	$3,443,921	$68,425	$5,299,156	$2,032,482	32.74		14.42	$3,374,747	$9,857,576	$793,939	$109,975	51.65	$21,467,874	$1.14
2023	9.32	4.48	5.03	10	$6,497,000	$3,131,053	$186,372	$111,823	$39,008	$38,674	$572,778	$281,454	$223,258	$3,443,921	$68,425	$5,243,373	$2,268,124	31.58		15.86	$3,374,747	$10,161,740	$812,189	$112,672	52.46	$21,972,846	$1.15
2024	10.47	7.75	5.57	15	$9,307,500	$3,515,450	$186,372	$111,823	$39,008	$38,674	$620,553	$315,626	$247,610	$3,443,921	$68,425	$6,962,600	$2,501,053	30.41		17.29	$3,374,747	$10,360,607	$824,121	$141,955	53.27	$24,165,082	$1.24
2025	11.61	7.75	6.12	15	$9,307,500	$3,730,288	$765,646	$199,316	$39,008	$38,674	$663,398	$474,720	$217,159	$11,705,311	$453,893	$11,724,510	$2,679,276	29.24	15	18.72	$4,968,385	$10,559,474	$931,672	$216,057	54.08	$31,079,374	$1.57
2026	12.76	7.75	6.67	15	$9,307,500	$4,097,972	$765,646	$199,316	$39,008	$38,674	$701,312	$0	$0	$11,705,311	$453,893	$11,683,377	$2,507,242	28.07		20.16	$4,968,385	$10,758,341	$943,604	$212,859	54.89	$31,073,808	$1.55
2027	13.90	7.75	7.21	15	$9,307,500	$4,465,656	$765,646	$199,316	$39,008	$38,674	$734,296	0	0	$11,705,311	$453,893	$11,649,018	$2,697,362	26.90		21.59	$4,968,385	$10,957,209	$955,536	$215,196	55.70	$31,442,705	$1.55
2028	15.05	12.90	7.76	25	$12,957,500	$4,833,341	$765,646	$199,316	$39,008	$38,674	$762,350	0	0	$11,705,311	$453,893	$13,493,019	$2,885,129	25.73		23.02	$4,968,385	$11,156,076	$967,468	$245,672	56.51	$33,715,748	$1.63
2029	16.19	12.90	8.31	25	$12,957,500	$5,201,025	$765,646	$199,316	$39,008	$38,674	$785,473	0	0	$11,705,311	$453,893	$13,458,197	$3,070,540	24.56		24.45	$4,968,385	$11,354,943	$979,400	$247,931	57.32	$34,079,395	$1.63
2030	17.34	12.90	8.85	25	$12,957,500	$5,568,709	$765,646	$199,316	$39,008	$38,674	$821,923	0	0	$11,705,311	$453,893	$13,427,973	$3,262,918	23.39		25.89	$4,968,385	$11,553,810	$991,332	$250,363	58.13	$34,454,781	$1.62
2031	17.61	12.90	9.07	25	$12,957,500	$5,657,691	$765,646	$199,316	$39,008	$38,674	$830,652	0	0	$11,705,311	$453,893	$13,482,670	$3,340,197	23.74		26.19	$4,968,385	$11,702,105	$1,000,229	$252,343	59.00	$34,745,929	$1.61
2032	17.89	12.90	9.28	25	$12,957,500	$5,746,673	$765,646	$199,316	$39,008	$38,674	$858,083	0	0	$11,705,311	$453,893	$13,535,673	$3,427,143	24.09		26.49	$4,968,385	$11,850,400	$1,009,127	$254,442	59.86	$35,045,170	$1.60
2033	18.17	12.90	9.50	25	$12,957,500	$5,835,655	$765,646	$199,316	$39,008	$38,674	$885,958	0	0	$11,705,311	$453,893	$13,587,060	$3,514,436	24.44		26.79	$5,605,840	$11,998,695	$1,056,272	$256,522	60.73	$36,018,826	$1.62
2034	18.45	12.90	9.72	25	$12,957,500	$5,924,637	$765,646	$199,316	$39,008	$38,674	$914,279	0	0	$11,705,311	$453,893	$13,636,904	$3,602,076	24.78		27.10	$5,605,840	$12,146,990	$1,065,170	$258,585	61.60	$36,315,563	$1.62
2035	18.72	12.90	9.93	25	$12,957,500	$6,013,619	$765,646	$199,316	$39,008	$38,674	$943,045	0	0	$11,705,311	$453,893	$13,685,272	$3,690,062	25.13		27.40	$5,605,840	$12,295,285	$1,074,067	$260,630	62.46	$36,611,156	$1.61
2036	19.00	12.90	10.15	25	$12,957,500	$6,102,601	$765,646	$199,316	$39,008	$38,674	$972,255	0	0	$11,705,311	$453,893	$13,732,230	$3,778,394	25.48		27.70	$5,605,840	$12,443,579	$1,082,965	$262,659	63.33	$36,905,668	$1.60
2037	19.28	12.90	10.36	25	$12,957,500	$6,191,583	$765,646	$199,316	$39,008	$38,674	$1,001,911	0	0	$11,705,311	$453,893	$13,777,838	$3,867,074	25.83		28.00	$5,605,840	$12,591,874	$1,091,863	$264,674	64.19	$37,199,162	$1.59
2038	19.55	12.90	10.58	25	$12,957,500	$6,280,565	$765,646	$199,316	$39,008	$38,674	$1,032,011	0	0	$11,705,311	$453,893	$13,822,153	$3,956,099	26.17		28.31	$5,605,840	$12,740,169	$1,100,761	$266,674	65.06	$37,491,697	$1.58
2039	19.83	12.90	10.79	25	$12,957,500	$6,224,785	$765,646	$199,316	$39,008	$38,674	$1,062,556	0	0	$11,705,311	$453,893	$13,865,231	$3,966,674	26.52		28.61	$5,605,840	$12,888,464	$1,109,658	$267,479	65.92	$37,703,346	$1.57
2040	20.11	12.90	11.01	25	$12,957,500	$6,311,744	$579,273	$87,492	$39,008	$38,674	$1,114,415	0	0	$8,261,391	$385,468	$11,940,882	$4,066,244	26.87		28.91	$5,605,840	$13,036,759	$1,118,556	$240,107	66.79	$36,008,388	$1.48
2041	20.63	12.90	11.43	25	$12,957,500	$6,475,556	$579,273	$87,492	$39,008	$38,674	$1,130,963	0	0	$8,261,391	$385,468	$12,026,840	$4,215,463	27.31		29.15	$5,605,840	$13,181,503	$1,127,241	$243,635	67.88	$36,400,521	$1.47
2042	21.15	12.90	11.86	25	$12,957,500	$6,639,368	$579,273	$87,492	$39,008	$38,674	$1,168,838	0	0	$8,261,391	$385,468	$12,108,556	$4,376,477	27.75		29.38	$5,605,840	$13,326,248	$1,135,925	$247,276	68.98	$36,800,323	$1.46
2043	21.67	12.90	12.28	25	$12,957,500	$6,803,180	$579,273	$87,492	$39,008	$38,674	$1,207,169	0	0	$8,261,391	$385,468	$12,186,337	$4,537,863	28.19		29.61	$2,231,094	$13,470,992	$942,125	$250,863	70.07	$33,619,274	$1.31
2044	22.19	12.90	12.70	25	$12,957,500	$6,966,992	$579,273	$87,492	$39,008	$38,674	$1,245,957	0	0	$8,261,391	$385,468	$12,260,461	$4,699,618	28.63		29.84	$2,231,094	$13,615,737	$950,810	$254,401	71.17	$34,012,120	$1.31
2045	22.72	12.90	13.12	25	$12,957,500	$7,130,804	$579,273	$254,016	$0	$0	$1,285,203	0	0	$8,261,391	$385,468	$12,377,021	$4,861,743	29.06		30.07	$2,709,185	$13,760,481	$988,180	$258,581	72.26	$34,955,193	$1.33
2046	23.24	12.90	13.55	25	$12,957,500	$7,294,615	$579,273	$254,016	0	$0	$1,324,906	0	$0	$8,261,391	$385,468	$12,444,563	$5,024,239	29.50		30.31	$2,709,185	$13,905,226	$996,865	$262,032	73.36	$35,342,110	$1.32
2047	23.76	12.90	13.97	25	$12,957,500	$7,458,427	$579,273	$254,016	0	$0	$1,365,066	0	$0	$8,261,391	$385,468	$12,509,138	$5,187,105	29.94		30.54	$2,709,185	$14,049,970	$1,005,549	$265,444	74.45	$35,726,391	$1.31
2048	24.28	12.90	14.39	25	$12,957,500	$7,622,239	$579,273	$254,016	0	$0	$1,405,683	0	$0	$8,261,391	$385,468	$12,570,937	$5,350,341	30.38		30.77	$2,709,185	$14,194,715	$1,014,234	$268,819	75.55	$36,108,231	$1.31
2049	24.80	12.90	14.81	25	$12,957,500	$7,786,051	$579,273	$254,016	0	$0	$1,446,757	0	$0	$8,261,391	$385,468	$12,630,136	$5,513,947	30.82		31.00	$2,709,185	$14,339,459	$1,022,919	$272,161	76.64	$36,487,808	$1.30
2050	25.33	25.80	15.24	50	$22,082,500	$7,949,863	$579,273	$254,016	0	$0	$1,568,934	0	$0	$8,261,391	$385,468	$18,176,430	$5,726,440	31.26		31.24	$2,709,185	$14,484,204	$1,031,603	$358,543	77.73	$42,486,405	$1.50
2051	26.40	25.80	15.86	50	$22,082,500	$8,288,150	$579,273	$254,016	0	$0	$1,551,619	0	$0	$8,261,391	$385,468	$18,158,925	$5,911,734	31.79		31.40	$2,709,185	$14,625,254	$1,040,066	$361,060	79.05	$42,806,224	$1.48
2052	27.48	25.80	16.49	50	$22,082,500	$8,626,437	$579,273	$254,016	0	$0	$1,614,949	0	$0	$8,261,391	$385,468	$18,142,792	$6,145,544	32.32		31.56	$2,709,185	$14,766,304	$1,048,529	$364,325	80.37	$43,176,680	$1.47
2053	28.56	25.80	17.12	50	$22,082,500	$8,964,723	$579,273	$254,016	0	$0	$1,678,280	0	$0	$8,261,391	$385,468	$18,127,878	$6,379,354	32.85		31.73	$3,346,640	$14,907,354	$1,095,240	$367,608	81.69	$44,224,075	$1.48
2054	29.64	25.80	17.75	50	$22,082,500	$9,303,010	$579,273	$254,016	0	$0	$1,741,610	0	$0	$8,261,391	$385,468	$18,114,048	$6,613,164	33.38		31.89	$3,346,640	$15,048,405	$1,103,703	$370,908	83.01	$44,596,868	$1.47
2055	30.71	25.80	18.37	50	$22,082,500	$9,641,297		$166,524	0	$99,759	$1,804,941	0	$991,105	$0	$0	$13,346,834	$7,439,839	33.91		32.05	$1,753,002	$15,189,455	$1,016,547	$311,800	84.33	$39,057,477	$1.27
2056	31.79	25.80	19.00	50	$22,082,500	$9,979,584		$166,524	0	$99,759	$1,868,271	0	$896,190	0	0	$13,334,846	$7,616,385	34.44		32.21	$1,753,002	$15,330,505	$1,025,010	$314,268	85.65	$39,374,018	$1.26
2057	32.87	25.80	19.63	50	$22,082,500	$10,317,871		$166,524	0	$99,759	$1,931,601	0	$932,928	0	0	$13,323,645	$7,871,678	34.97		32.38	$1,753,002	$15,471,555	$1,033,473	$317,930	86.97	$39,771,284	$1.25
2058	33.95	25.80	20.26	50	$22,082,500	$10,656,158		$166,524	0	$99,759	$1,994,932	0	$970,082	0	0	$13,313,155	$8,127,214	35.50		32.54	$1,753,002	$15,612,606	$1,041,936	$321,606	88.29	$40,169,518	$1.25
2059	35.03	25.80	20.88	50	$22,082,500	$10,994,445		$166,524	0	$99,759	$2,058,262	0	$1,007,654	0	0	$13,303,310	$8,382,992	36.03		32.70	$1,753,002	$15,753,656	$1,050,399	$325,295	89.61	$40,568,654	$1.24
2060	36.10	25.80	21.51	50	$22,082,500	$11,332,732		$166,524	0	$99,759	$2,257,026	0	$1,229,307	0	0	$13,294,053	$8,829,130	36.56		32.87	$1,753,002	$15,894,706	$1,058,862	$331,848	90.93	$41,161,601	$1.24

Rate Analysis Costs for Fort Bend County Area
Option 1

		Seawater Desalination Treatment Plant						Pumping Stations						Desalination Pipeline & Local		Allocated Desal Capital Costs				BWA Treatment Plant		Admin Fee	Rate Analysis		
								Capital Costs Annualized			O&M Costs			Pipeline	Storage										
Year	Water Deficit (MGD)	Purchased Demand Desal	Average Day Demand Desal	Rated Capacity (MGD)	Capacity Charge	Commodity Charge	Desalinated Water Storage Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs Annualized	Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Average Day Demand GW (MGD)	Average Day Demand SW (MGD)	Capital Cost of UV Upgrade	O & M (Including GW)	at 1.50%	Total BWA Area Avg Day Demand (MGD)	Total BWA Area Service Area Costs	Annual Rate Cost/ 1,000 gal
2010	2.02	5.46	1.31	10	$6,497,000	$671,939	$186,372	$111,823	0	0	$200,746	$15,109	$17,339	$3,443,921	$68,425	$6,287,709	$586,122	1.43	6.57	$160,227	$1,742,415	$103,107	9.309	$8,879,580	$2.61
2011	2.41	5.46	1.40	10	$6,497,000	$800,382	$186,372	$111,823	0	0	$221,452	$39,396	$28,946	$3,443,921	$68,425	$5,866,001	$635,186	1.43	6.57	$160,227	$1,743,560	$97,518	9.409	$8,502,491	$2.48
2012	2.80	5.46	1.50	10	$6,497,000	$928,824	$186,372	$111,823	0	0	$242,158	$63,683	$40,553	$3,443,921	$68,425	$5,560,926	$683,120	1.44	6.57	$160,227	$1,744,704	$93,661	9.510	$8,242,637	$2.37
2013	3.18	5.46	1.59	10	$6,497,000	$1,057,267	$186,372	$111,823	0	0	$262,864	$87,971	$52,160	$3,443,921	$68,425	$5,329,974	$730,337	1.45	6.57	$160,227	$1,745,849	$90,905	9.610	$8,057,292	$2.30
2014	3.57	5.46	1.69	10	$6,497,000	$1,185,709	$186,372	$111,823	0	0	$283,570	$112,258	$63,767	$3,443,921	$68,425	$5,149,059	$777,069	1.45	6.57	$160,227	$1,746,994	$88,892	9.711	$7,922,240	$2.24
2015	3.96	5.46	1.78	10	$6,497,000	$1,314,151	$186,372	$111,823	$39,008	$38,674	$304,276	$136,545	$75,374	$3,443,921	$68,425	$5,045,922	$823,459	1.46	6.57	$160,227	$1,748,138	$88,041	9.811	$7,865,787	$2.20
2016	4.34	5.46	1.87	10	$6,497,000	$1,442,594	$186,372	$111,823	$39,008	$38,674	$324,981	$160,833	$86,982	$3,443,921	$68,425	$4,926,290	$869,598	1.47	6.57	$160,227	$1,749,283	$86,938	9.911	$7,792,336	$2.15
2017	4.73	5.46	1.97	10	$6,497,000	$1,571,036	$186,372	$111,823	$39,008	$38,674	$345,687	$185,120	$98,589	$3,443,921	$68,425	$4,826,219	$915,548	1.47	6.57	$160,227	$1,750,428	$86,126	10.012	$7,738,547	$2.12
2018	5.12	5.46	2.06	10	$6,497,000	$1,699,479	$186,372	$111,823	$39,008	$38,674	$366,393	$209,407	$110,196	$3,443,921	$68,425	$4,741,274	$961,351	1.48	6.57	$160,227	$1,751,572	$85,539	10.112	$7,699,963	$2.09
2019	5.50	5.46	2.16	10	$6,497,000	$1,827,921	$186,372	$111,823	$39,008	$38,674	$387,099	$233,695	$121,803	$3,443,921	$68,425	$4,668,267	$1,007,039	1.49	6.57	$160,227	$1,752,717	$85,130	10.213	$7,673,378	$2.06
2020	5.89	5.46	2.25	10	$6,497,000	$1,956,364	$186,372	$111,823	$39,008	$38,674	$407,805	$257,982	$133,410	$3,443,921	$68,425	$4,604,846	$1,052,633	1.49	6.57	$160,227	$1,753,862	$84,862	10.313	$7,656,430	$2.03
2021	7.03	5.46	2.85	10	$6,497,000	$2,336,582	$186,372	$111,823	$39,008	$38,674	$462,438	$212,860	$172,548	$3,443,921	$68,425	$4,751,427	$1,288,307	1.66	6.57	$160,227	$1,784,033	$90,596	11.078	$8,074,591	$2.00
2022	8.18	5.46	3.44	10	$6,497,000	$2,746,656	$186,372	$111,823	$39,008	$38,674	$520,073	$247,199	$198,237	$3,443,921	$68,425	$4,856,980	$1,562,121	1.83	6.57	$160,227	$1,814,205	$96,287	11.842	$8,489,820	$1.96
2023	9.32	5.46	4.04	10	$6,497,000	$3,131,053	$186,372	$111,823	$39,008	$38,674	$572,778	$281,454	$223,258	$3,443,921	$68,425	$4,936,616	$1,822,588	2.00	6.57	$160,227	$1,844,377	$101,388	12.607	$8,865,196	$1.93
2024	10.47	5.75	4.63	15	$9,307,500	$3,515,450	$186,372	$111,823	$39,008	$38,674	$620,553	$315,626	$247,610	$3,443,921	$68,425	$5,610,406	$2,080,096	2.17	6.57	$160,227	$1,874,549	$115,358	13.372	$9,840,636	$2.02
2025	11.61	5.75	5.23	15	$9,307,500	$3,730,288	$765,646	$199,316	$39,008	$38,674	$663,398	$474,720	$217,159	$11,705,311	$385,468	$9,225,963	$2,290,204	2.34	6.57	$160,227	$1,904,721	$172,742	14.137	$13,753,857	$2.67
2026	12.76	5.75	5.83	15	$9,307,500	$4,097,972	$765,646	$199,316	$39,008	$38,674	$701,312	$0	$0	$11,705,311	$385,468	$9,284,685	$2,191,561	2.50	6.57	$160,227	$1,934,893	$172,144	14.901	$13,743,509	$2.53
2027	14.30	5.75	6.82	15	$9,307,500	$4,594,136	$765,646	$199,316	$39,008	$38,674	$755,422	0	0	$11,705,311	$385,468	$9,473,798	$2,551,534	2.67	6.57	$160,227	$1,965,065	$180,380	16.066	$14,331,004	$2.44
2028	15.85	9.60	7.82	25	$12,957,500	$5,090,301	$765,646	$199,316	$39,008	$38,674	$802,879	0	0	$11,705,311	$385,468	$11,435,414	$2,907,217	2.84	0.00	$160,227	$508,220	$215,139	10.660	$15,226,217	$3.91
2029	17.39	9.60	8.81	25	$12,957,500	$5,586,465	$765,646	$199,316	$39,008	$38,674	$843,683	0	0	$11,705,311	$385,468	$11,609,716	$3,258,611	3.01	0.00	$160,227	$538,392	$223,025	11.824	$15,789,970	$3.66
2030	17.34	9.60	8.21	25	$12,957,500	$5,568,709	$765,646	$199,316	$39,008	$38,674	$821,923	0	0	$11,705,311	$385,468	$11,179,235	$3,026,272	3.18	0.00	$160,227	$568,564	$213,083	11.389	$15,147,380	$3.64
2031	17.61	9.60	8.27	25	$12,957,500	$5,657,691	$765,646	$199,316	$39,008	$38,674	$830,652	0	0	$11,705,311	$385,468	$11,125,397	$3,045,584	3.18	0.00	$160,227	$568,493	$212,565	11.447	$15,112,264	$3.62
2032	17.89	9.60	8.33	25	$12,957,500	$5,746,673	$765,646	$199,316	$39,008	$38,674	$858,083	0	0	$11,705,311	$385,468	$11,073,225	$3,073,634	3.18	0.00	$160,227	$568,421	$212,203	11.504	$15,087,710	$3.59
2033	18.17	9.60	8.38	25	$12,957,500	$5,835,655	$765,646	$199,316	$39,008	$38,674	$885,958	0	0	$11,705,311	$385,468	$11,022,645	$3,101,778	3.18	0.00	$160,227	$568,350	$211,866	11.562	$15,064,866	$3.57
2034	18.45	9.60	8.44	25	$12,957,500	$5,924,637	$765,646	$199,316	$39,008	$38,674	$914,279	0	0	$11,705,311	$385,468	$10,973,585	$3,130,015	3.18	0.00	$160,227	$568,278	$211,554	11.619	$15,043,658	$3.55
2035	18.72	9.60	8.50	25	$12,957,500	$6,013,619	$765,646	$199,316	$39,008	$38,674	$943,045	0	0	$11,705,311	$385,468	$10,925,976	$3,158,345	3.18	0.00	$160,227	$568,206	$211,265	11.677	$15,024,019	$3.53
2036	19.00	9.60	8.56	25	$12,957,500	$6,102,601	$765,646	$199,316	$39,008	$38,674	$972,255	0	0	$11,705,311	$385,468	$10,879,755	$3,186,768	3.18	0.00	$160,227	$568,135	$210,998	11.735	$15,005,883	$3.50
2037	19.28	9.60	8.62	25	$12,957,500	$6,191,583	$765,646	$199,316	$39,008	$38,674	$1,001,911	0	0	$11,705,311	$385,468	$10,834,863	$3,215,284	3.18	0.00	$160,227	$568,063	$210,752	11.792	$14,989,190	$3.48
2038	19.55	9.60	8.67	25	$12,957,500	$6,280,565	$765,646	$199,316	$39,008	$38,674	$1,032,011	0	0	$11,705,311	$385,468	$10,791,243	$3,243,894	3.18	0.00	$160,227	$567,992	$210,527	11.850	$14,973,883	$3.46
2039	19.83	9.60	8.73	25	$12,957,500	$6,224,785	$765,646	$199,316	$39,008	$38,674	$1,062,556	0	0	$11,705,311	$385,468	$10,748,842	$3,208,853	3.18	0.00	$160,227	$567,920	$209,365	11.907	$14,895,207	$3.43
2040	20.11	9.60	8.79	25	$12,957,500	$6,311,744	$579,273	$87,492	$39,008	$38,674	$1,114,415	0	0	$8,261,391	$317,042	$9,244,361	$3,246,348	3.18	0.00	$0	$567,849	$187,361	11.965	$13,245,918	$3.03
2041	20.63	9.60	8.87	25	$12,957,500	$6,475,556	$579,273	$87,492	$39,008	$38,674	$1,130,963	0	0	$8,261,391	$317,042	$9,151,319	$3,270,573	3.17	0.00	$0	$567,259	$186,328	12.042	$13,175,478	$3.00
2042	21.15	9.60	8.95	25	$12,957,500	$6,639,368	$579,273	$87,492	$39,008	$38,674	$1,168,838	0	0	$8,261,391	$317,042	$9,062,867	$3,303,991	3.17	0.00	$0	$566,668	$185,503	12.118	$13,119,029	$2.97
2043	21.67	9.60	9.03	25	$12,957,500	$6,803,180	$579,273	$87,492	$39,008	$38,674	$1,207,169	0	0	$8,261,391	$317,042	$8,978,675	$3,337,479	3.17	0.00	$0	$566,078	$184,742	12.195	$13,066,975	$2.94
2044	22.19	9.60	9.11	25	$12,957,500	$6,966,992	$579,273	$87,492	$39,008	$38,674	$1,245,957	0	0	$8,261,391	$317,042	$8,898,443	$3,371,037	3.16	0.00	$0	$565,488	$184,042	12.272	$13,019,010	$2.91
2045	22.72	9.60	9.19	25	$12,957,500	$7,130,804	$579,273	$254,016	$0	$0	$1,285,203	0	0	$8,261,391	$317,042	$8,856,011	$3,404,665	3.16	0.00	$0	$564,898	$183,910	12.349	$13,009,485	$2.89
2046	23.24	9.60	9.27	25	$12,957,500	$7,294,615	$579,273	$254,016	0	$0	$1,324,906	0	$0	$8,261,391	$317,042	$8,782,903	$3,438,364	3.16	0.00	$0	$564,308	$183,319	12.425	$12,968,893	$2.86
2047	23.76	9.60	9.35	25	$12,957,500	$7,458,427	$579,273	$254,016	0	$0	$1,365,066	0	$0	$8,261,391	$317,042	$8,713,006	$3,472,132	3.15	0.00	$0	$563,717	$182,777	12.502	$12,931,632	$2.83
2048	24.28	9.60	9.43	25	$12,957,500	$7,622,239	$579,273	$254,016	0	$0	$1,405,683	0	$0	$8,261,391	$317,042	$8,646,113	$3,505,970	3.15	0.00	$0	$563,127	$182,281	12.579	$12,897,492	$2.81
2049	24.80	9.60	9.51	25	$12,957,500	$7,786,051	$579,273	$254,016	0	$0	$1,446,757	0	$0	$8,261,391	$317,042	$8,582,035	$3,539,879	3.15	0.00	$0	$562,537	$181,829	12.655	$12,866,280	$2.79
2050	25.33	19.20	9.59	50	$22,082,500	$7,949,863	$579,273	$254,016	0	$0	$1,568,934	0	$0	$8,261,391	$317,042	$11,975,877	$3,604,395	3.14	0.00	$0	$561,947	$233,704	12.732	$16,375,923	$3.52
2051	26.40	19.20	9.69	50	$22,082,500	$8,288,150	$579,273	$254,016	0	$0	$1,551,619	0	$0	$8,261,391	$317,042	$11,714,874	$3,609,633	3.14	0.00	$0	$561,052	$229,868	12.823	$16,115,427	$3.44
2052	27.48	19.20	9.78	50	$22,082,500	$8,626,437	$579,273	$254,016	0	$0	$1,614,949	0	$0	$8,261,391	$317,042	$11,474,341	$3,645,409	3.13	0.00	$0	$560,158	$226,796	12.914	$15,906,704	$3.37
2053	28.56	19.20	9.88	50	$22,082,500	$8,964,723	$579,273	$254,016	0	$0	$1,678,280	0	$0	$8,261,391	$317,042	$11,251,961	$3,681,185	3.13	0.00	$0	$559,264	$223,997	13.005	$15,716,407	$3.31
2054	29.64	19.20	9.97	50	$22,082,500	$9,303,010	$579,273	$254,016	0	$0	$1,741,610	0	$0	$8,261,391	$317,042	$11,045,754	$3,716,961	3.12	0.00	$0	$558,370	$221,441	13.096	$15,542,525	$3.25
2055	30.71	19.20	10.07	50	$22,082,500	$9,641,297		$166,524	0	$99,759	$1,804,941	0	$991,105	$0	$0	$7,342,169	$4,077,678	3.12	0.00	$0	$557,475	$171,298	13.187	$12,148,620	$2.52
2056	31.79	19.20	10.17	50	$22,082,500	$9,979,584		$166,524	0	$99,759	$1,868,271	0	$896,190	0	0	$7,163,431	$4,075,081	3.11	0.00	$0	$556,581	$168,578	13.278	$11,963,671	$2.47
2057	32.87	19.20	10.26	50	$22,082,500	$10,317,871		$166,524	0	$99,759	$1,931,601	0	$932,928	0	0	$6,996,414	$4,115,548	3.11	0.00	$0	$555,687	$166,679	13.369	$11,834,329	$2.43
2058	33.95	19.20	10.36	50	$22,082,500	$10,656,158		$166,524	0	$99,759	$1,994,932	0	$970,082	0	0	$6,840,001	$4,156,053	3.10	0.00	$0	$554,793	$164,941	13.460	$11,715,787	$2.38
2059	35.03	19.20	10.45	50	$22,082,500	$10,994,445		$166,524	0	$99,759	$2,058,262	0	$1,007,654	0	0	$6,693,213	$4,196,594	3.10	0.00	$0	$553,898	$163,347	13.551	$11,607,053	$2.35
2060	36.10	19.20	10.55	50	$22,082,500	$11,332,732		$166,524	0	$99,759	$2,257,026	0	$1,229,307	0	0	$6,555,189	$4,330,419	3.09	0.00	$0	$553,004	$163,284	13.642	$11,601,897	$2.33

Rate Analysis Costs for BWA Area
Option 1

Year	Water	Seawater Desalination Treatment Plant						Pumping Stations						Desalination Pipeline & Local Storage		Allocated Desal Capital Costs			Pearland Surface Water									Surface Water Admin Fee	Admin Fee	Rate Analysis		
								Capital Costs Annualized			O&M Costs			Pipeline	Storage				SE WTP					GCWA - New Plant					at	Total	Total	Annual Rate
Year	Deficit (MGD)	Purchased Demand Desal	Average Day Demand Desal	Rated Capacity (MGD)	Capacity Charge	Commodity Charge	Desalinated Water Storage Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs Annualized	Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Average Day Demand GW (MGD)	Capacity (MGD)	Capital Cost Amortized	O&M Average Day Demand SW - CofH	Average Day Demand SW (MGD)	O & M (Including GW)	Capacity (MGD)	Average Day Demand SW (MGD)	Capital Cost Amortized	O & M	6.00%	1.50%	Pearland Avg Day Demand	Pearland Service Area Cost	Cost/ 1,000 gal
																					6.00											
2010	6.52			10	$6,497,000	$2,165,053	$201,000	$120,600	0	0	$560,153	0	0	$856,993	$6,780	$0	$0	17.47		0	$3,022,200	0.52	$3,235,586			0	0	$375,467	$0	24.00	$6,633,253	$0.76
2011	6.62			10	$6,497,000	$2,198,607	$201,000	$120,600	0	0	$550,389	0	0	$856,993	$6,780	$0	$0	17.74		0	$3,022,200	0.65	$3,310,590			0	0	$379,967	$0	24.39	$6,712,758	$0.75
2012	6.72			10	$6,497,000	$2,232,161	$201,000	$120,600	0	0	$540,626	0	0	$856,993	$6,780	$0	$0	18.00		0	$3,022,200	0.78	$3,385,594			0	0	$384,468	$0	24.79	$6,792,262	$0.75
2013	6.82			10	$6,497,000	$2,265,715	$201,000	$120,600	0	0	$530,862	0	0	$856,993	$6,780	$0	$0	18.27		0	$3,022,200	0.91	$3,460,598			0	0	$388,968	$0	25.18	$6,871,766	$0.75
2014	6.92			10	$6,497,000	$2,299,269	$201,000	$120,600	0	0	$521,098	0	0	$856,993	$6,780	$0	$0	18.54		0	$3,022,200	1.04	$3,535,602			0	0	$393,468	$0	25.58	$6,951,270	$0.74
2015	7.02			10	$6,497,000	$2,332,822	$201,000	$120,600	$0	$0	$511,334	$0	$0	$856,993	$6,780	$0	$0	18.80		0	$3,022,200	1.17	$3,610,606			0	0	$397,968	$0	25.97	$7,030,774	$0.74
2016	7.12			10	$6,497,000	$2,366,376	$201,000	$120,600	$0	$0	$501,571	$0	$0	$856,993	$6,780	$0	$0	19.07		0	$3,022,200	1.30	$3,685,609			0	0	$402,469	$0	26.37	$7,110,278	$0.74
2017	7.23			10	$6,497,000	$2,399,930	$201,000	$120,600	$0	$0	$491,807	$0	$0	$856,993	$6,780	$0	$0	19.34		0	$3,022,200	1.43	$3,760,613			0	0	$406,969	$0	26.76	$7,189,782	$0.74
2018	7.33			10	$6,497,000	$2,433,484	$201,000	$120,600	$0	$0	$482,043	$0	$0	$856,993	$6,780	$0	$0	19.60		0	$3,022,200	1.56	$3,835,617			0	0	$411,469	$0	27.16	$7,269,286	$0.73
2019	7.43			10	$6,497,000	$2,467,037	$201,000	$120,600	$0	$0	$472,279	$0	$0	$856,993	$6,780	$0	$0	19.87		0	$3,022,200	1.69	$3,910,621			0	0	$415,969	$0	27.56	$7,348,790	$0.73
2020	7.53			10	$6,497,000	$2,500,591	$201,000	$120,600	$0	$0	$462,516	$0	$0	$856,993	$6,780	$0	$0	20.13	10	$2,461,657	$3,022,200	1.82	$3,985,625			0	0	$568,169	$0	27.95	$10,037,651	$0.98
2021	8.51			10	$6,497,000	$2,826,387	$201,000	$120,600	$0	$0	$481,707	$0	$0	$856,993	$6,780	$0	$0	19.94		$2,461,657	$3,022,200	2.38	$4,069,403			0	0	$573,196	$0	28.32	$10,126,455	$0.98
2022	9.49			10	$6,497,000	$3,186,823	$201,000	$120,600	$0	$0	$500,897	$0	$0	$856,993	$6,780	$0	$0	19.74		$2,461,657	$3,022,200	2.94	$4,153,180			0	0	$578,222	$0	28.68	$10,215,260	$0.98
2023	10.47			10	$9,307,500	$3,516,199	$201,000	$120,600	$0	$0	$520,088	$0	$0	$856,993	$6,780	$0	$0	19.54		$2,461,657	$3,022,200	3.50	$4,236,958			0	0	$583,249	$0	29.05	$10,304,064	$0.97
2024	11.45	1.50		15	$9,307,500	$3,845,575	$201,000	$120,600	$0	$0	$539,279	$0	$0	$856,993	$6,780	$118,537	$0	19.35		$2,461,657	$3,022,200	4.07	$4,320,736			0	0	$588,276	$1,778	29.41	$10,513,184	$0.98
2025	12.43	1.50		15	$9,307,500	$3,993,431	$780,274	$208,092	$0	$0	$558,470	$0	$0	$11,014,220	$385,468	$1,238,805	$0	19.15		$2,461,657	$3,022,200	4.63	$4,404,513			0	0	$593,302	$18,582	29.78	$11,739,060	$1.08
2026	13.41	1.50		15	$9,307,500	$4,308,487	$780,274	$208,092	$0	$0	$577,661	0	0	$11,014,220	$385,468	$1,238,805	$0	18.95		$2,461,657	$3,022,200	5.19	$4,488,291			0	0	$598,329	$18,582	30.14	$11,827,865	$1.08
2027	14.39	1.50		15	$9,307,500	$4,623,542	$780,274	$208,092	$0	$0	$596,851	0	0	$11,014,220	$385,468	$1,238,805	$0	18.76		$2,461,657	$3,022,200	5.75	$4,572,069			0	0	$603,356	$18,582	30.51	$11,916,669	$1.07
2028	15.38	2.50		25	$12,957,500	$4,938,598	$780,274	$208,092	$0	$0	$616,042	0	0	$11,014,220	$385,468	$1,238,805	$0	18.56		$2,461,657	$3,022,200	6.31	$4,655,847			0	0	$608,382	$18,582	30.87	$12,005,473	$1.07
2029	16.36	2.50		25	$12,957,500	$5,253,653	$780,274	$208,092	$0	$0	$635,233	0	0	$11,014,220	$385,468	$1,238,805	$0	18.36		$2,461,657	$3,022,200	6.88	$4,739,624			0	0	$613,409	$18,582	31.24	$12,094,278	$1.06
2030	17.34	2.50		25	$12,957,500	$5,568,709	$780,274	$208,092	$0	$0	$654,424	0	0	$11,014,220	$385,468	$1,238,805	$0	18.17		$2,461,657	$3,022,200	7.44	$4,823,402			0	0	$618,436	$18,582	31.60	$12,183,082	$1.06
2031	17.61	2.50		25	$12,957,500	$5,657,691	$780,274	$208,092	$0	$0	$678,707	0	0	$11,014,220	$385,468	$1,238,805	$0	17.99		$2,461,657	$3,022,200	7.69	$4,847,059			0	0	$619,855	$18,582	31.69	$12,208,159	$1.06
2032	17.89	2.50		25	$12,957,500	$5,746,673	$780,274	$208,092	$0	$0	$702,990	0	0	$11,014,220	$385,468	$1,238,805	$0	17.82		$2,461,657	$3,022,200	7.95	$4,870,717			0	0	$621,274	$18,582	31.77	$12,233,236	$1.05
2033	18.17	2.50		25	$12,957,500	$5,835,655	$780,274	$208,092	$0	$0	$727,273	0	0	$11,014,220	$385,468	$1,238,805	$0	17.65		$2,461,657	$3,022,200	8.21	$4,894,374			0	0	$622,694	$18,582	31.86	$12,258,313	$1.05
2034	18.45	2.50		25	$12,957,500	$5,924,637	$780,274	$208,092	$0	$0	$751,556	0	0	$11,014,220	$385,468	$1,238,805	$0	17.48		$2,461,657	$3,022,200	8.46	$4,918,032			0	0	$624,113	$18,582	31.94	$12,283,390	$1.05
2035	18.72	2.50		25	$12,957,500	$6,013,619	$780,274	$208,092	$0	$0	$775,840	0	0	$11,014,220	$385,468	$1,238,805	$0	17.31		$2,461,657	$3,022,200	8.72	$4,941,689			$1,593,168	0	$721,123	$18,582	32.03	$13,997,225	$1.20
2036	19.00	2.50		25	$12,957,500	$6,102,601	$780,274	$208,092	$0	$0	$800,123	0	0	$11,014,220	$385,468	$1,238,805	$0	17.14		$2,461,657	$3,022,200	10.00	$5,182,382	10	0.27	$1,593,168	$76,869	$740,177	$18,582	33.41	$14,333,840	$1.18
2037	19.28	2.50		25	$12,957,500	$6,191,583	$780,274	$208,092	$0	$0	$824,406	0	0	$11,014,220	$385,468	$1,238,805	$0	16.97		$2,461,657	$3,022,200	10.00	$5,151,780		0.76	$1,593,168	$214,949	$746,625	$18,582	33.72	$14,447,767	$1.17
2038	19.55	2.50		25	$12,957,500	$6,280,565	$780,274	$208,092	$0	$0	$848,689	0	0	$11,014,220	$385,468	$1,238,805	$0	16.80		$2,461,657	$3,022,200	10.00	$5,121,179		1.24	$1,593,168	$352,743	$753,057	$18,582	34.04	$14,561,392	$1.17
2039	19.83	2.50		25	$12,957,500	$6,224,785	$780,274	$208,092	$0	$0	$872,972	0	0	$11,014,220	$385,468	$1,238,805	$0	16.63		$2,461,657	$3,022,200	10.00	$5,090,578		1.72	$1,593,168	$490,823	$759,506	$18,582	34.35	$14,675,319	$1.17
2040	20.11	2.50	0.10	25	$6,460,500	$6,311,744	$579,273	$87,492	$0	$0	$897,255	0	0	$10,157,226	$378,688	$1,150,791	$34,060	16.46		$2,919,264	$3,022,200	10.00	$5,059,977		2.21	$1,593,168	$628,618	$793,394	$17,773	34.76	$15,219,244	$1.20
2041	20.63	2.50	0.11	25	$6,460,500	$6,475,556	$579,273	$87,492	$0	$0	$975,870	0	0	$10,157,226	$378,688	$1,155,813	$40,997	16.25		$2,919,264	$3,022,200	10.00	$5,023,795		2.75	$1,593,168	$783,010	$800,486	$17,952	35.12	$15,356,686	$1.20
2042	21.15	2.50	0.13	25	$6,460,500	$6,639,368	$579,273	$87,492	$0	$0	$1,054,485	0	0	$10,157,226	$378,688	$1,160,586	$48,016	16.05		$2,919,264	$3,022,200	10.00	$4,987,614		3.29	$1,593,168	$937,403	$807,579	$18,129	35.48	$15,493,960	$1.20
2043	21.67	2.50	0.15	25	$6,460,500	$6,803,180	$579,273	$87,492	$0	$0	$1,133,100	0	0	$10,157,226	$378,688	$1,165,130	$55,110	15.85		$2,919,264	$3,022,200	10.00	$4,951,433		3.83	$1,593,168	$1,091,796	$814,672	$18,304	35.83	$15,631,077	$1.20
2044	22.19	2.50	0.17	25	$6,460,500	$6,966,992	$579,273	$87,492	$0	$0	$1,211,715	0	0	$10,157,226	$378,688	$1,169,460	$62,276	15.65		$2,919,264	$3,022,200	10.00	$4,915,251		4.38	$1,593,168	$1,246,189	$821,764	$18,476	36.19	$15,768,049	$1.19
2045	22.72	2.50	0.19	25	$6,460,500	$7,130,804	$579,273	$226,518	0	$249,397	$1,290,330	0	$48,819	$10,157,226	$378,688	$1,212,434	$69,909	15.44		$2,919,264	$3,022,200	10.00	$4,879,070		4.92	$1,593,168	$1,400,582	$828,857	$19,235	36.55	$15,944,720	$1.20
2046	23.24	2.50	0.21	25	$6,460,500	$7,294,615	$579,273	$226,518	0	$249,397	$1,368,946	0	$50,502	$10,157,226	$378,688	$1,216,380	$77,246	15.24		$2,919,264	$3,022,200	10.00	$4,842,889		5.46	$1,593,168	$1,554,974	$835,950	$19,404	36.91	$16,081,475	$1.19
2047	23.76	2.50	0.22	25	$6,460,500	$7,458,427	$579,273	$226,518	0	$249,397	$1,447,561	0	$52,186	$10,157,226	$378,688	$1,220,152	$84,641	15.04		$2,919,264	$3,022,200	10.00	$4,806,707		6.00	$1,593,168	$1,709,367	$843,042	$19,572	37.27	$16,218,114	$1.19
2048	24.28	2.50	0.24	25	$6,460,500	$7,622,239	$579,273	$226,518	0	$249,397	$1,526,176	0	$53,869	$10,157,226	$378,688	$1,223,762	$92,090	14.84		$2,919,264	$3,022,200	10.00	$4,770,526		6.55	$1,593,168	$1,863,760	$850,135	$19,738	37.63	$16,354,643	$1.19
2049	24.80	2.50	0.26	25	$6,460,500	$7,786,051	$579,273	$226,518	0	$249,397	$1,604,791	0	$55,552	$10,157,226	$378,688	$1,227,220	$99,589	14.63		$2,919,264	$3,022,200	10.00	$4,734,345		7.09	$1,593,168	$2,018,153	$857,228	$19,902	37.98	$16,491,069	$1.19
2050	25.33	5.00	0.28	50	$15,585,500	$7,949,863	$579,273	$226,518	0	$249,397	$1,683,406	0	$57,236	$10,157,226	$378,688	$1,331,420	$107,136	14.43		$457,607	$3,022,200	10.00	$4,698,163		7.63	$1,593,168	$2,172,546	$716,621	$21,578	38.34	$14,120,440	$1.01
2051	26.40	5.00	0.63	50	$15,585,500	$8,288,150	$579,273	$226,518	0	$249,397	$1,754,993	0	$134,757	$10,157,226	$378,688	$1,532,400	$243,772	14.22		$457,607	$3,022,200	10.00	$4,660,265		7.87	$1,593,168	$2,239,991	$718,394	$26,643	38.72	$14,494,440	$1.03
2052	27.48	5.00	0.98	50	$15,585,500	$8,626,437	$579,273	$226,518	0	$249,397	$1,826,579	0	$212,277	$10,157,226	$378,688	$1,717,617	$382,191	14.01		$457,607	$3,022,200	10.00	$4,622,367		8.10	$1,593,168	$2,307,437	$720,167	$31,497	39.10	$14,854,251	$1.04
2053	28.56	5.00	1.34	50	$12,775,000	$8,964,723	$579,273	$226,518	0	$249,397	$1,898,166	0	$289,798	$10,157,226	$378,688	$1,757,262	$522,192	13.80		$457,607	$3,022,200	10.00	$4,584,468		8.34	$1,593,168	$2,374,882	$721,940	$34,192	39.48	$15,067,911	$1.05
2054	29.64	5.00	1.69	50	$12,775,000	$9,303,010	$579,273	$226,518	0	$249,397	$1,969,753	0	$367,319	$10,157,226	$378,688	$1,887,414	$663,602	13.58		$457,607	$3,022,200	10.00	$4,546,570		8.58	$1,593,168	$2,442,327	$723,712	$38,265	39.85	$15,374,866	$1.06
2055	30.71	5.00	2.04	50	$12,775,000	$9,641,297	$0	$139,026	0	$249,397	$2,041,340	0	$444,840	0	0	$888,164	$806,273	13.37		$457,607	$3,022,200	10.00	$4,508,672		8.82	$1,593,168	$2,509,773	$725,485	$25,417	40.23	$14,536,759	$0.99
2056	31.79	5.00	2.39	50	$12,775,000	$9,979,584	$0	$139,026	0	$249,397	$2,112,927	0	$522,445	0	0	$1,000,978	$950,082	13.16		$457,607	$3,022,200	10.00	$4,470,773		9.05	$1,593,168	$2,577,218	$727,258	$29,266	40.61	$14,828,552	$1.00
2057	32.87	5.00	2.75	50	$12,775,000	$10,317,871	$0	$139,026	0	$249,397	$2,184,513	0	$600,050	0	0	$1,106,395	$1,094,915	12.95		$457,607	$3,022,200	10.00	$4,432,875		9.29	$1,593,168	$2,644,664	$729,031	$33,020	40.98	$15,113,874	$1.01
2058	33.95	5.00	3.10	50	$9,125,000	$10,656,158	$0	$139,026	0	$249,397	$2,256,100	0	$677,655	0	0	$871,896	$1,240,672	12.74		$457,607	$3,022,200	10.00	$4,394,977		9.53	$1,593,168	$2,712,109	$730,804	$31,689	41.36	$15,055,121	$1.00
2059	35.03	5.00	3.45	50	$9,125,000	$10,994,445	$0	$139,026	0	$249,397	$2,327,687	0	$755,260	0	0	$938,073	$1,387,269	12.52		$457,607	$3,022,200	10.00	$4,357,078		9.76	$1,593,168	$2,779,555	$732,576	$34,880	41.74	$15,302,407	$1.00
2060	36.10	5.00	3.80	50	$9,125,000	$11,332,732		$139,026	0	$249,397	$2,399,274	0	$832,865	0	0	$1,000,300	$1,534,631	12.31		$457,607	$3,022,200	10.00	$4,319,180		10.00	$1,593,168	$2,847,000	$734,349	$38,024	42.12	$15,546,459	$1.01

Rate Analysis Costs for Pearland Area
Option 5

		Seawater Desalination Treatment Plant						Pumping Stations						Desalination Pipeline & Local		Allocated Desal Capital Costs			Surface Water						Surface	BRA	Rate Analysis		
								Capital Costs Annualized			O&M Costs			Pipeline	Storage				GCWA - New Plant				BRA - No Contract		Water Admin Fee	Admin Fee at	Total Ft Bend	Total Ft Bend County	Annual Rate
Year	Water Deficit (MGD)	Purchased Demand Desal	Average Day Demand Desal	Rated Capacity (MGD)	Capacity Charge	Commodity Charge	Desalinated Water Storage Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Capital Costs Annualized	Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Average Day Demand GW (MGD)	Capacity (MGD)	Average Day Demand SW (MGD)	Capital Cost	O & M (Including GW)	Average Day Demand SW (MGD)	O & M	6.00%	1.50%	County Average Day Demand (MGD)	County Service Area Costs	Cost/ 1,000 gal
2010	6.52	0	0.00	10	$6,497,000	$2,165,053	$201,000	$120,600	0	0	$560,153	0	0	$856,993	$6,780	0	0	40.36				$7,218,529			$433,112	$0	40.36	$7,651,641	$0.52
2011	6.62	0.00	0.00	10	$6,497,000	$2,198,607	$201,000	$120,600	0	0	$550,389	0	0	$856,993	$6,780	$0	$0	39.83			0	$7,124,120			$427,447	$0	39.83	$7,551,567	$0.52
2012	6.72	0.00	0.00	10	$6,497,000	$2,232,161	$201,000	$120,600	0	0	$540,626	0	0	$856,993	$6,780	$0	$0	39.31			0	$7,029,710			$421,783	$0	39.31	$7,451,493	$0.52
2013	6.82	0.00	0.00	10	$6,497,000	$2,265,715	$201,000	$120,600	0	0	$530,862	0	0	$856,993	$6,780	$0	$0	38.78	25	10.58	$4,032,859	$9,870,192	2.37	$787,196	$881,415	$0	51.73	$15,571,662	$0.82
2014	6.92	0.00	0.00	10	$6,497,000	$2,299,269	$201,000	$120,600	0	0	$521,098	0	0	$856,993	$6,780	$0	$0	38.25		10.72	$4,032,859	$9,814,540	2.52	$838,442	$881,150	$0	51.49	$15,566,990	$0.83
2015	7.02	0.00	0.00	10	$6,497,000	$2,332,822	$201,000	$120,600	0	0	$511,334	0	0	$856,993	$6,780	$0	$0	37.72		10.86	$4,032,859	$9,758,887	2.68	$889,688	$880,886	$0	51.26	$15,562,319	$0.83
2016	7.12	0.00	0.00	10	$6,497,000	$2,366,376	$201,000	$120,600	$0	$0	$501,571	$0	$0	$856,993	$6,780	$0	$0	37.19		11.00	$4,032,859	$9,703,234	2.83	$940,934	$880,622	$0	51.03	$15,557,648	$0.84
2017	7.23	0.00	0.00	10	$6,497,000	$2,399,930	$201,000	$120,600	$0	$0	$491,807	$0	$0	$856,993	$6,780	$0	$0	36.67		11.14	$4,032,859	$9,647,581	2.99	$992,180	$880,357	$0	50.79	$15,552,977	$0.84
2018	7.33	0.00	0.00	10	$6,497,000	$2,433,484	$201,000	$120,600	$0	$0	$482,043	$0	$0	$856,993	$6,780	$0	$0	36.14		11.28	$4,032,859	$9,591,928	3.14	$1,043,426	$880,093	$0	50.56	$15,548,306	$0.84
2019	7.43	0.00	0.00	10	$6,497,000	$2,467,037	$201,000	$120,600	$0	$0	$472,279	$0	$0	$856,993	$6,780	$0	$0	35.61		11.42	$4,032,859	$9,536,276	3.30	$1,094,672	$879,828	$0	50.32	$15,543,634	$0.85
2020	7.53	0.00	0.00	10	$6,497,000	$2,500,591	$201,000	$120,600	$0	$0	$462,516	$0	$0	$856,993	$6,780	$0	$0	35.08		11.56	$4,032,859	$9,480,623	3.45	$1,637,025	$909,030	$0	50.09	$16,059,537	$0.88
2021	8.51	0.00	0.00	10	$6,497,000	$2,826,387	$201,000	$120,600	$0	$0	$481,707	$0	$0	$856,993	$6,780	$0	$0	33.91		12.99	$4,032,859	$9,669,044	4.00	$1,899,898	$936,108	$0	50.91	$16,537,909	$0.89
2022	9.49	0.00	0.00	10	$6,497,000	$3,186,823	$201,000	$120,600	$0	$0	$500,897	$0	$0	$856,993	$6,780	$0	$0	32.74		14.42	$4,032,859	$9,857,466	4.56	$2,162,771	$963,186	$0	51.73	$17,016,281	$0.90
2023	10.47	0.00	0.00	10	$9,307,500	$3,516,199	$201,000	$120,600	$0	$0	$520,088	$0	$0	$856,993	$6,780	$0	$0	31.58		15.86	$4,032,859	$10,161,640	5.11	$2,425,644	$997,209	$0	52.54	$17,617,352	$0.92
2024	11.45	7.75	0.00	15	$9,307,500	$3,845,575	$201,000	$120,600	$0	$0	$539,279	$0	$0	$856,993	$6,780	$612,443	$0	30.41		17.29	$4,032,859	$10,360,522	5.67	$2,688,517	$1,024,914	$9,187	53.36	$18,728,441	$0.96
2025	12.43	7.75	0.89	15	$9,307,500	$3,993,431	$780,274	$208,092	$0	$0	$558,470	$0	$0	$11,014,220	$385,468	$7,063,174	$324,088	29.24	20	18.72	$5,095,284	$10,559,403	6.22	$2,951,390	$1,116,365	$110,809	55.07	$27,220,514	$1.35
2026	13.41	7.75	1.77	15	$9,307,500	$4,308,487	$780,274	$208,092	$0	$0	$577,661	$0	$0	$11,014,220	$385,468	$7,628,938	$644,895	28.07		20.16	$5,095,284	$10,758,284			$951,214	$124,107	49.99	$25,202,723	$1.38
2027	14.39	7.75	2.66	15	$9,307,500	$4,623,542	$780,274	$208,092	$0	$0	$596,851	0	0	$11,014,220	$385,468	$8,117,598	$963,089	26.90		21.59	$5,095,284	$10,957,166			$963,147	$136,210	51.14	$26,232,495	$1.41
2028	15.38	12.90	3.54	25	$12,957,500	$4,938,598	$780,274	$208,092	$0	$0	$616,042	0	0	$11,014,220	$385,468	$9,376,206	$1,279,173	25.73		23.02	$5,095,284	$11,156,047			$975,080	$159,831	52.29	$28,041,621	$1.47
2029	16.36	12.90	4.43	25	$12,957,500	$5,253,653	$780,274	$208,092	$0	$0	$635,233	0	0	$11,014,220	$385,468	$9,898,517	$1,593,524	24.56		24.45	$5,095,284	$11,354,929			$987,013	$172,381	53.44	$29,101,648	$1.49
2030	17.34	12.90	8.85	25	$12,957,500	$5,568,709	$780,274	$208,092	$0	$0	$654,424	0	0	$11,014,220	$385,468	$13,008,055	$3,177,397	23.39		25.89	$5,095,284	$11,553,810			$998,946	$242,782	58.13	$34,076,274	$1.61
2031	17.61	12.90	9.07	25	$12,957,500	$5,657,691	$780,274	$208,092	$0	$0	$678,707	0	0	$11,014,220	$385,468	$13,062,753	$3,261,976	23.74		26.19	$5,095,284	$11,702,105			$1,007,843	$244,871	59.00	$34,374,832	$1.60
2032	17.89	12.90	9.28	25	$12,957,500	$5,746,673	$780,274	$208,092	$0	$0	$702,990	0	0	$11,014,220	$385,468	$13,115,756	$3,346,667	24.09		26.49	$5,095,284	$11,850,400			$1,016,741	$246,936	59.86	$34,671,784	$1.59
2033	18.17	12.90	9.50	25	$12,957,500	$5,835,655	$780,274	$208,092	$0	$0	$727,273	0	0	$11,014,220	$385,468	$13,167,143	$3,431,467	24.44		26.79	$5,892,103	$11,998,695			$1,073,448	$248,979	60.73	$35,811,834	$1.62
2034	18.45	12.90	9.72	25	$12,957,500	$5,924,637	$780,274	$208,092	$0	$0	$751,556	0	0	$11,014,220	$385,468	$13,216,986	$3,516,369	24.78		27.10	$5,892,103	$12,146,990			$1,082,346	$251,000	61.60	$36,105,794	$1.61
2035	18.72	12.90	9.93	25	$12,957,500	$6,013,619	$780,274	$208,092	$0	$0	$775,840	0	0	$11,014,220	$385,468	$13,265,354	$3,601,370	25.13		27.40	$5,892,103	$12,295,285			$1,091,243	$253,001	62.46	$36,398,357	$1.60
2036	19.00	12.90	10.15	25	$12,957,500	$6,102,601	$780,274	$208,092	$0	$0	$800,123	0	0	$11,014,220	$385,468	$13,312,312	$3,686,465	25.48		27.70	$5,892,103	$12,443,579			$1,100,141	$254,982	63.33	$36,689,583	$1.59
2037	19.28	12.90	10.36	25	$12,957,500	$6,191,583	$780,274	$208,092	$0	$0	$824,406	0	0	$11,014,220	$385,468	$13,357,920	$3,771,651	25.83		28.00	$5,892,103	$12,591,874			$1,109,039	$256,944	64.19	$36,979,531	$1.58
2038	19.55	12.90	10.58	25	$12,957,500	$6,280,565	$780,274	$208,092	$0	$0	$848,689	0	0	$11,014,220	$385,468	$13,402,236	$3,856,922	26.17		28.31	$5,892,103	$12,740,169			$1,117,936	$258,887	65.06	$37,268,255	$1.57
2039	19.83	12.90	10.79	25	$12,957,500	$6,224,785	$780,274	$208,092	$0	$0	$872,972	0	0	$11,014,220	$385,468	$13,445,313	$3,863,479	26.52		28.61	$5,892,103	$12,888,464			$1,126,834	$259,632	65.92	$37,475,826	$1.56
2040	20.11	12.90	11.01	25	$6,460,500	$6,311,744	$579,273	$87,492	$0	$0	$897,255	0	0	$10,157,226	$378,688	$9,318,074	$3,947,337	26.87		28.91	$5,892,103	$13,036,759			$1,135,732	$198,981	66.79	$33,528,986	$1.38
2041	20.63	12.90	11.43	25	$6,460,500	$6,475,556	$579,273	$87,492	$0	$0	$975,870	0	0	$10,157,226	$378,688	$9,360,932	$4,129,511	27.31		29.15	$5,892,103	$13,181,503			$1,144,416	$202,357	67.88	$33,910,823	$1.37
2042	21.15	12.90	11.86	25	$6,460,500	$6,639,368	$579,273	$87,492	$0	$0	$1,054,485	0	0	$10,157,226	$378,688	$9,401,675	$4,312,383	27.75		29.38	$5,892,103	$13,326,248			$1,153,101	$205,711	68.98	$34,291,222	$1.36
2043	21.67	12.90	12.28	25	$6,460,500	$6,803,180	$579,273	$87,492	$0	$0	$1,133,100	0	0	$10,157,226	$378,688	$9,440,456	$4,495,903	28.19		29.61	$1,859,245	$13,470,992			$919,814	$209,045	70.07	$30,395,455	$1.19
2044	22.19	12.90	12.70	25	$6,460,500	$6,966,992	$579,273	$87,492	$0	$0	$1,211,715	0	0	$10,157,226	$378,688	$9,477,413	$4,680,024	28.63		29.84	$1,859,245	$13,615,737			$928,499	$212,362	71.17	$30,773,279	$1.18
2045	22.72	12.90	13.12	25	$6,460,500	$7,130,804	$579,273	$226,518	$0	$249,397	$1,290,330	0	48818.7652	$10,157,226	$378,688	$9,713,098	$4,892,907	29.06		30.07	$2,177,972	$13,760,481			$956,307	$219,090	72.26	$31,719,856	$1.20
2046	23.24	12.90	13.55	25	$6,460,500	$7,294,615	$579,273	$226,518	0	$249,397	$1,368,946	0	$50,502	$10,157,226	$378,688	$9,746,774	$5,079,347	29.50		30.31	$2,177,972	$13,905,226			$964,992	$222,392	73.36	$32,096,703	$1.20
2047	23.76	12.90	13.97	25	$6,460,500	$7,458,427	$579,273	$226,518	0	$249,397	$1,447,561	0	$52,186	$10,157,226	$378,688	$9,778,971	$5,266,280	29.94		30.54	$2,177,972	$14,049,970			$973,677	$225,679	74.45	$32,472,549	$1.19
2048	24.28	12.90	14.39	25	$6,460,500	$7,622,239	$579,273	$226,518	0	$249,397	$1,526,176	0	$53,869	$10,157,226	$378,688	$9,809,783	$5,453,676	30.38		30.77	$2,177,972	$14,194,715			$982,361	$228,952	75.55	$32,847,459	$1.19
2049	24.80	12.90	14.81	25	$6,460,500	$7,786,051	$579,273	$226,518	0	$249,397	$1,604,791	0	$55,552	$10,157,226	$378,688	$9,839,299	$5,641,504	30.82		31.00	$2,177,972	$14,339,459			$991,046	$232,212	76.64	$33,221,492	$1.19
2050	25.33	25.80	15.24	50	$15,585,500	$7,949,863	$579,273	$226,518	0	$249,397	$1,683,406	0	$57,236	$10,157,226	$378,688	$15,357,133	$5,829,738	31.26		31.24	$2,177,972	$14,484,204			$999,731	$317,803	77.73	$39,166,581	$1.38
2051	26.40	25.80	15.86	50	$15,585,500	$8,288,150	$579,273	$226,518	0	$249,397	$1,754,993	0	$134,757	$10,157,226	$378,688	$15,344,779	$6,114,883	31.79		31.40	$2,177,972	$14,625,254			$1,008,194	$321,895	79.05	$39,592,976	$1.37
2052	27.48	25.80	16.49	50	$15,585,500	$8,626,437	$579,273	$226,518	0	$249,397	$1,826,579	0	$212,277	$10,157,226	$378,688	$15,333,393	$6,399,918	32.32		31.56	$2,177,972	$14,766,304			$1,016,657	$326,000	80.37	$40,020,244	$1.36
2053	28.56	25.80	17.12	50	$12,775,000	$8,964,723	$579,273	$226,518	0	$249,397	$1,898,166	0	$289,798	$10,157,226	$378,688	$13,638,269	$6,684,856	32.85		31.73	$2,974,791	$14,907,354			$1,072,929	$304,847	81.69	$39,583,047	$1.33
2054	29.64	25.80	17.75	50	$12,775,000	$9,303,010	$579,273	$226,518	0	$249,397	$1,969,753	0	$367,319	$10,157,226	$378,688	$13,630,268	$6,969,708	33.38		31.89	$2,974,791	$15,048,405			$1,081,392	$309,000	83.01	$40,013,563	$1.32
2055	30.71	25.80	18.37	50	$12,775,000	$9,641,297		$139,026	0	$249,397	$2,041,340	0	$444,840	$0	$0	$7,842,246	$7,254,482	33.91		32.05	$1,912,366	$15,189,455			$1,026,109	$226,451	84.33	$33,451,109	$1.09
2056	31.79	25.80	19.00	50	$12,775,000	$9,979,584		$139,026	0	$249,397	$2,112,927	0	$522,445	0	0	$7,835,311	$7,539,236	34.44		32.21	$1,912,366	$15,330,505			$1,034,572	$230,618	85.65	$33,882,609	$1.08
2057	32.87	25.80	19.63	50	$12,775,000	$10,317,871		$139,026	0	$249,397	$2,184,513	0	$600,050	0	0	$7,828,831	$7,823,928	34.97		32.38	$1,912,366	$15,471,555			$1,043,035	$234,791	86.97	$34,314,507	$1.08
2058	33.95	25.80	20.26	50	$9,125,000	$10,656,158		$139,026	0	$249,397	$2,256,100	0	$677,655	0	0	$5,644,952	$8,108,563	35.50		32.54	$1,912,366	$15,612,606			$1,051,498	$206,303	88.29	$32,536,287	$1.01
2059	35.03	25.80	20.88	50	$9,125,000	$10,994,445		$139,026	0	$249,397	$2,327,687	0	$755,260	0	0	$5,640,884	$8,393,146	36.03		32.70	$1,912,366	$15,753,656			$1,059,961	$210,510	89.61	$32,970,523	$1.01
2060	36.10	25.80	21.51	50	$9,125,000	$11,332,732		$139,026	0	$249,397	$2,399,274	0	$832,865	0	0	$5,637,058	$8,677,682	36.56		32.87	$1,912,366	$15,894,706			$1,068,424	$214,721	90.93	$33,404,958	$1.01

Rate Analysis Costs for Fort Bend County Area
Option 5

		Seawater Desalination Treatment Plant						Pumping Stations					
								Capital Costs Annualized			O&M Costs		
Year	Water Deficit (MGD)	Purchased Demand Desal	Average Day Demand Desal	Rated Capacity (MGD)	Capacity Charge	Commodity Charge	Desalinated Water Storage Amortized Costs	Finished Water	Booster at Angleton	Booster at Hwy 6/288	Finished Water	Booster at Angleton	Booster at Hwy 6/288
2010	6.52	6.5183	6.52	10	6497000	2165053.345	201000.472	120600.31	0	0	560153.245	0	0
2011	6.62	6.62	6.62	10	$6,497,000	$2,198,607	$201,000	$120,600	0	0	$550,389	0	0
2012	6.72	6.72	6.72	10	$6,497,000	$2,232,161	$201,000	$120,600	0	0	$540,626	0	0
2013	6.82	6.82	6.82	10	$6,497,000	$2,265,715	$201,000	$120,600	0	0	$530,862	0	0
2014	6.92	6.92	6.92	10	$6,497,000	$2,299,269	$201,000	$120,600	0	0	$521,098	0	0
2015	7.02	7.02	7.02	10	$6,497,000	$2,332,822	$201,000	$120,600	0	0	$511,334	0	0
2016	7.12	7.12	7.12	10	$6,497,000	$2,366,376	$201,000	$120,600	$0	$0	$501,571	$0	$0
2017	7.23	7.23	7.23	10	$6,497,000	$2,399,930	$201,000	$120,600	$0	$0	$491,807	$0	$0
2018	7.33	7.33	7.33	10	$6,497,000	$2,433,484	$201,000	$120,600	$0	$0	$482,043	$0	$0
2019	7.43	7.43	7.43	10	$6,497,000	$2,467,037	$201,000	$120,600	$0	$0	$472,279	$0	$0
2020	7.53	7.53	7.53	10	$6,497,000	$2,500,591	$201,000	$120,600	$0	$0	$462,516	$0	$0
2021	7.60	7.60	7.60	10	$6,497,000	$2,523,136	$201,000	$120,600	$0	$0	$481,707	$0	$0
2022	7.66	7.66	7.66	10	$6,497,000	$2,573,655	$201,000	$120,600	$0	$0	$500,897	$0	$0
2023	7.73	7.73	7.73	10	$6,497,000	$2,596,448	$201,000	$120,600	$0	$0	$520,088	$0	$0
2024	7.80	7.80	7.80	15	$9,307,500	$2,619,240	$201,000	$120,600	$0	$0	$539,279	$0	$0
2025	12.43	7.87	7.87	15	$9,307,500	$3,992,516	$780,274	$208,092	$0	$0	$558,470	$0	$0
2026	13.41	9.60	7.94	15	$9,307,500	$4,307,755	$780,274	$208,092	$0	$0	$577,661	$0	$0
2027	14.39	9.60	8.01	15	$9,307,500	$4,622,993	$780,274	$208,092	$0	$0	$596,851	0	0
2028	15.37	9.60	8.07	25	$12,957,500	$4,938,232	$780,274	$208,092	$0	$0	$616,042	0	0
2029	16.36	9.60	8.14	25	$12,957,500	$5,253,470	$780,274	$208,092	$0	$0	$635,233	0	0
2030	17.34	9.60	8.21	25	$12,957,500	$5,568,709	$780,274	$208,092	$0	$0	$654,424	0	0
2031	17.61	9.60	8.27	25	$12,957,500	$5,657,691	$780,274	$208,092	$0	$0	$678,707	0	0
2032	17.89	9.60	8.33	25	$12,957,500	$5,746,673	$780,274	$208,092	$0	$0	$702,990	0	0
2033	18.17	9.60	8.38	25	$12,957,500	$5,835,655	$780,274	$208,092	$0	$0	$727,273	0	0
2034	18.45	9.60	8.44	25	$12,957,500	$5,924,637	$780,274	$208,092	$0	$0	$751,556	0	0
2035	18.72	9.60	8.50	25	$12,957,500	$6,013,619	$780,274	$208,092	$0	$0	$775,840	0	0
2036	19.00	9.60	8.56	25	$12,957,500	$6,102,601	$780,274	$208,092	$0	$0	$800,123	0	0
2037	19.28	9.60	8.62	25	$12,957,500	$6,191,583	$780,274	$208,092	$0	$0	$824,406	0	0
2038	19.55	9.60	8.67	25	$12,957,500	$6,280,565	$780,274	$208,092	$0	$0	$848,689	0	0
2039	19.83	9.60	8.73	25	$12,957,500	$6,224,785	$780,274	$208,092	$0	$0	$872,972	0	0
2040	20.11	9.60	8.79	25	$12,957,500	$6,311,744	$579,273	$87,492	$0	$0	$897,255	0	0
2041	20.63	9.60	8.87	25	$12,957,500	$6,475,556	$579,273	$87,492	$0	$0	$975,870	0	0
2042	21.15	9.60	8.95	25	$12,957,500	$6,639,368	$579,273	$87,492	$0	$0	$1,054,485	0	0
2043	21.67	9.60	9.03	25	$12,957,500	$6,803,180	$579,273	$87,492	$0	$0	$1,133,100	0	0
2044	22.19	9.60	9.11	25	$12,957,500	$6,966,992	$579,273	$87,492	$0	$0	$1,211,715	0	0
2045	22.72	9.60	9.19	25	$12,957,500	$7,130,804	$579,273	$226,518	$0	$249,397	$1,290,330	0	48818.7652
2046	23.24	9.60	9.27	25	$12,957,500	$7,294,615	$579,273	$226,518	0	$249,397	$1,368,946	0	$50,502
2047	23.76	9.60	9.35	25	$12,957,500	$7,458,427	$579,273	$226,518	0	$249,397	$1,447,561	0	$52,186
2048	24.28	9.60	9.43	25	$12,957,500	$7,622,239	$579,273	$226,518	0	$249,397	$1,526,176	0	$53,869
2049	24.80	9.60	9.51	25	$12,957,500	$7,786,051	$579,273	$226,518	0	$249,397	$1,604,791	0	$55,552
2050	25.33	19.20	9.59	50	$22,082,500	$7,949,863	$579,273	$226,518	0	$249,397	$1,683,406	0	$57,236
2051	26.40	19.20	9.69	50	$22,082,500	$8,288,150	$579,273	$226,518	0	$249,397	$1,754,993	0	$134,757
2052	27.48	19.20	9.78	50	$22,082,500	$8,626,437	$579,273	$226,518	0	$249,397	$1,826,579	0	$212,277
2053	28.56	19.20	9.88	50	$22,082,500	$8,964,723	$579,273	$226,518	0	$249,397	$1,898,166	0	$289,798
2054	29.64	19.20	9.97	50	$22,082,500	$9,303,010	$579,273	$226,518	0	$249,397	$1,969,753	0	$367,319
2055	30.71	19.20	10.07	50	$22,082,500	$9,641,297		$139,026	0	$249,397	$2,041,340	0	$444,840
2056	31.79	19.20	10.17	50	$22,082,500	$9,979,584		$139,026	0	$249,397	$2,112,927	0	$522,445
2057	32.87	19.20	10.26	50	$22,082,500	$10,317,871		$139,026	0	$249,397	$2,184,513	0	$600,050
2058	33.95	19.20	10.36	50	$22,082,500	$10,656,158		$139,026	0	$249,397	$2,256,100	0	$677,655
2059	35.03	19.20	10.45	50	$22,082,500	$10,994,445		$139,026	0	$249,397	$2,327,687	0	$755,260
2060	36.10	19.20	10.55	50	$22,082,500	$11,332,732		$139,026	0	$249,397	$2,399,274	0	$832,865

	Desalination Pipeline & Local Storage		Allocated Desal Capital Costs				BWA		Admin Fee	Rate Analysis			Costs of Desal Only		
Year	Pipeline Capital Costs Annualized	Storage Capital Costs Annualized	Pearland Take Points	Pearland Take Points	Average Day Demand GW (MGD)	Average Day Demand SW (MGD)	Consolidate Debt	O & M (GW)	at 1.50%	Total BWA Area Avg Day Demand (MGD)	Total BWA Area Service Area Costs	Annual Rate Cost/ 1,000 gal	Total Cost	Avg Day Desal Need (MGD)	Desal Unit Cost Cost/ 1,000 gal
2010	856993.3709	6779.699621	7682373.851	2725206.59	3.19	0	$562,550	$571,068	$156,114	9.711	$11,697,312	$3.30	$11,126,244	6.52	$4.79
2011	$856,993	$6,780	$7,682,374	$2,748,997	3.19	0	$562,550	$571,014	$156,471	9.812	$11,721,406	$3.27	$11,150,391	6.62	$4.73
2012	$856,993	$6,780	$7,682,374	$2,772,787	3.19	0	$562,550	$570,961	$156,827	9.913	$11,745,499	$3.25	$11,174,538	6.72	$4.67
2013	$856,993	$6,780	$7,682,374	$2,796,577	3.19	0	$562,550	$570,907	$157,184	10.013	$11,769,592	$3.22	$11,198,685	6.82	$4.61
2014	$856,993	$6,780	$7,682,374	$2,820,367	3.19	0	$562,550	$570,853	$157,541	10.114	$11,793,685	$3.19	$11,222,832	6.92	$4.55
2015	$856,993	$6,780	$7,682,374	$2,844,157	3.19	0	$562,550	$570,800	$157,898	10.215	$11,817,778	$3.17	$11,246,979	7.02	$4.50
2016	$856,993	$6,780	$7,682,374	$2,867,947	3.19	0	$562,550	$570,746	$158,255	10.316	$11,841,872	$3.15	$11,271,126	7.12	$4.44
2017	$856,993	$6,780	$7,682,374	$2,891,737	3.19	0	$562,550	$570,692	$158,612	10.416	$11,865,965	$3.12	$11,295,272	7.23	$4.39
2018	$856,993	$6,780	$7,682,374	$2,915,527	3.19	0	$562,550	$570,639	$158,969	10.517	$11,890,058	$3.10	$11,319,419	7.33	$4.34
2019	$856,993	$6,780	$7,682,374	$2,939,317	3.19	0	$562,550	$570,585	$159,325	10.618	$11,914,151	$3.07	$11,343,566	7.43	$4.29
2020	$856,993	$6,780	$7,682,374	$2,963,107	3.19	0	$562,550	$570,532	$159,682	10.719	$11,938,245	$3.05	$11,367,713	7.53	$4.24
2021	$856,993	$6,780	$7,682,609	$3,004,951	3.19	0	$562,550	$570,335	$160,313	10.786	$11,980,759	$3.04	$11,410,075	7.60	$4.22
2022	$856,993	$6,780	$7,682,840	$3,074,773	3.19	0	$562,550	$570,138	$161,364	10.853	$12,051,666	$3.04	$11,480,830	7.66	$4.21
2023	$856,993	$6,780	$7,683,067	$3,116,868	3.19	0	$562,550	$569,941	$161,999	10.920	$12,094,426	$3.03	$11,523,443	7.73	$4.19
2024	$856,993	$6,780	$10,494,186	$3,158,964	3.19	0	$562,550	$569,745	$204,797	10.987	$14,990,243	$3.74	$14,418,714	7.80	$5.19
2025	$11,014,220	$385,468	$18,280,495	$2,881,162	3.18	0	$562,550	$569,548	$317,425	11.054	$22,611,180	$5.60	$27,202,788	12.43	$6.15
2026	$11,014,220	$385,468	$13,436,887	$2,891,374	3.18	0	$562,550	$569,351	$244,924	11.121	$17,705,086	$4.36	$27,542,233	13.41	$5.77
2027	$11,014,220	$385,468	$13,105,335	$2,903,361	3.18	0	$562,550	$569,154	$240,130	11.188	$17,380,531	$4.26	$27,881,679	14.39	$5.44
2028	$11,014,220	$385,468	$11,561,539	$2,916,782	3.18	0.00	$562,550	$568,958	$217,175	11.255	$15,827,004	$3.85	$31,925,875	15.37	$5.83
2029	$11,014,220	$385,468	$11,207,219	$2,931,379	3.18	0.00	$562,550	$568,761	$212,079	11.322	$15,481,988	$3.75	$32,265,321	16.36	$5.54
2030	$11,014,220	$385,468	$10,893,013	$2,946,953	3.18	0	$562,550	$568,564	$207,600	11.389	$15,178,681	$3.65	$32,604,767	17.34	$5.28
2031	$11,014,220	$385,468	$10,839,175	$2,974,262	3.18	0.00	$562,550	$568,493	$207,202	11.447	$15,151,682	$3.63	$32,719,731	17.61	$5.22
2032	$11,014,220	$385,468	$10,787,004	$3,001,460	3.18	0.00	$562,550	$568,421	$206,827	11.504	$15,126,262	$3.60	$32,834,695	17.89	$5.16
2033	$11,014,220	$385,468	$10,736,424	$3,028,551	3.18	0.00	$562,550	$568,350	$206,475	11.562	$15,102,349	$3.58	$32,949,659	18.17	$5.09
2034	$11,014,220	$385,468	$10,687,363	$3,055,541	3.18	0.00	$562,550	$568,278	$206,144	11.619	$15,079,875	$3.56	$33,064,623	18.45	$5.04
2035	$11,014,220	$385,468	$10,639,754	$3,082,433	3.18	0.00	$562,550	$568,206	$205,833	11.677	$15,058,777	$3.53	$33,179,587	18.72	$4.98
2036	$11,014,220	$385,468	$10,593,534	$3,109,233	3.18	0.00	$562,550	$568,135	$205,542	11.735	$15,038,994	$3.51	$33,294,551	19.00	$4.92
2037	$11,014,220	$385,468	$10,548,642	$3,135,945	3.18	0.00	$562,550	$568,063	$205,269	11.792	$15,020,469	$3.49	$33,409,516	19.28	$4.87
2038	$11,014,220	$385,468	$10,505,022	$3,162,571	3.18	0.00	$562,550	$567,992	$205,014	11.850	$15,003,149	$3.47	$33,524,480	19.55	$4.82
2039	$11,014,220	$385,468	$10,462,621	$3,125,373	3.18	0.00	$562,550	$567,920	$203,820	11.907	$14,922,284	$3.43	$33,492,510	19.83	$4.74
2040	$10,157,226	$378,688	$9,966,204	$3,151,416	3.18	0.00	$0	$567,849	$196,764	11.965	$13,882,234	$3.18	$31,839,717	20.11	$4.45
2041	$10,157,226	$378,688	$9,873,162	$3,203,888	3.17	0.00	$0	$567,259	$196,156	12.042	$13,840,464	$3.15	$32,085,780	20.63	$4.37
2042	$10,157,226	$378,688	$9,784,710	$3,255,604	3.17	0.00	$0	$566,668	$195,605	12.118	$13,802,587	$3.12	$32,331,844	21.15	$4.29
2043	$10,157,226	$378,688	$9,700,518	$3,306,619	3.17	0.00	$0	$566,078	$195,107	12.195	$13,768,322	$3.09	$32,577,907	21.67	$4.22
2044	$10,157,226	$378,688	$9,620,286	$3,356,982	3.16	0.00	$0	$565,488	$194,659	12.272	$13,737,415	$3.07	$32,823,970	22.19	$4.15
2045	$10,157,226	$378,688	$9,692,893	$3,426,489	3.16	0.00	$0	$564,898	$196,791	12.349	$13,881,071	$3.08	$33,211,144	22.72	$4.11
2046	$10,157,226	$378,688	$9,619,785	$3,476,077	3.16	0.00	$0	$564,308	$196,438	12.425	$13,856,607	$3.06	$33,457,208	23.24	$4.04
2047	$10,157,226	$378,688	$9,549,888	$3,525,130	3.15	0.00	$0	$563,717	$196,125	12.502	$13,834,860	$3.03	$33,703,271	23.76	$3.98
2048	$10,157,226	$378,688	$9,482,995	$3,573,683	3.15	0.00	$0	$563,127	$195,850	12.579	$13,815,656	$3.01	$33,949,334	24.28	$3.93
2049	$10,157,226	$378,688	$9,418,917	$3,621,768	3.15	0.00	$0	$562,537	$195,610	12.655	$13,798,832	$2.99	$34,195,398	24.80	$3.87
2050	$10,157,226	$378,688	$12,812,759	$3,669,414	3.14	0	$0	$561,947	$247,233	12.732	$17,291,352	$3.72	$43,703,336	25.33	$4.85
2051	$10,157,226	$378,688	$12,551,756	$3,733,673	3.14	0.00	$0	$561,052	$244,281	12.823	$17,090,763	$3.65	$44,119,358	26.40	$4.69
2052	$10,157,226	$378,688	$12,311,223	$3,796,298	3.13	0.00	$0	$560,158	$241,613	12.914	$16,909,292	$3.59	$44,535,380	27.48	$4.55
2053	$10,157,226	$378,688	$12,088,843	$3,857,474	3.13	0.00	$0	$559,264	$239,195	13.005	$16,744,775	$3.53	$44,951,401	28.56	$4.42
2054	$10,157,226	$378,688	$11,882,636	$3,917,358	3.12	0.00	$0	$558,370	$237,000	13.096	$16,595,363	$3.47	$45,367,423	29.64	$4.30
2055	$0	$0	$7,389,071	$3,976,086	3.12	0.00	$0	$557,475	$170,477	13.187	$12,093,109	$2.51	$34,412,725	30.71	$3.15
2056	0	0	$7,210,333	$4,033,803	3.11	0.00	$0	$556,581	$168,662	13.278	$11,969,380	$2.47	$34,828,747	31.79	$3.08
2057	0	0	$7,043,316	$4,090,583	3.11	0.00	$0	$555,687	$167,008	13.369	$11,856,595	$2.43	$35,244,769	32.87	$3.01
2058	0	0	$6,886,903	$4,146,515	3.10	0.00	$0	$554,793	$165,501	13.460	$11,753,712	$2.39	$35,660,791	33.95	$2.95
2059	0	0	$6,740,115	$4,201,677	3.10	0.00	$0	$553,898	$164,127	13.551	$11,659,818	$2.36	$36,076,812	35.03	$2.89
2060	0	0	$6,602,091	$4,256,139	3.09	0.00	$0	$553,004	$162,873	13.642	$11,574,108	$2.32	$36,492,834	36.10	$2.84

Rate Analysis Costs BWA Area
Option 5

Year	Average Day Demand GW (MGD)	Pearland Surface Water: SE WTP: Plant Capacity Bought (MGD)	SEWPP Capital Cost	O&M Average Day Demand SW - CofH (MGD) 6.00	Avg Day Demand SW - SEWPP (MGD)	Total O & M (incl GW)	GCWA - New Plant: Capacity (MGD)	Average Day Demand SW (MGD)	Capital Cost	O & M	BRA - No Raw Water Contract: Average Day Demand SW (MGD)	O & M	Rate Analysis: Total Pearland Area Avg Day Demand (MGD)	Total Pearland Service Area Cost (excl admin fee)	BRA Admin Fee (6%)	Annual Rate Cost/ 1,000 gal
2010	17.47	10	$2,461,657	$3,022,200	0.52	$3,235,586			0	0	0.00	$0	24.00	$8,719,443	$523,167	$1.06
2011	17.74		$2,461,657	$3,022,200	0.65	$3,310,590			0	0	0.00	$0	24.39	$8,794,447	$527,667	$1.05
2012	18.00		$2,461,657	$3,022,200	0.78	$3,385,594			0	0	0.00	$0	24.79	$8,869,451	$532,167	$1.04
2013	18.27		$2,461,657	$3,022,200	0.91	$3,460,598			0	0	0.00	$0	25.18	$8,944,455	$536,667	$1.03
2014	18.54		$2,461,657	$3,022,200	1.04	$3,535,602			0	0	0.00	$0	25.58	$9,019,459	$541,168	$1.02
2015	18.80		$2,461,657	$3,022,200	1.17	$3,610,606			0	0	0.00	$0	25.97	$9,094,463	$545,668	$1.02
2016	19.07		$2,461,657	$3,022,200	1.30	$3,685,609			0	0	0.00	$0	26.37	$9,169,467	$550,168	$1.01
2017	19.34		$2,461,657	$3,022,200	1.43	$3,760,613			0	0	0.00	$0	26.76	$9,244,470	$554,668	$1.00
2018	19.60		$2,461,657	$3,022,200	1.56	$3,835,617			0	0	0.00	$0	27.16	$9,319,474	$559,168	$1.00
2019	19.87		$2,461,657	$3,022,200	1.69	$3,910,621			0	0	0.00	$0	27.56	$9,394,478	$563,669	$0.99
2020	20.13		$2,461,657	$3,022,200	1.82	$3,985,625			0	0	0.00	$0	27.95	$9,469,482	$568,169	$0.98
2021	19.94		$2,461,657	$3,022,200	2.38	$4,069,403			0	0	0.01	$0	28.32	$9,553,260	$573,196	$0.98
2022	19.74		$2,461,657	$3,022,200	2.94	$4,153,180			0	0	0.01	$0	28.70	$9,637,037	$578,222	$0.98
2023	19.54		$2,461,657	$3,022,200	3.50	$4,236,958			0	0	0.02	$0	29.07	$9,720,815	$583,249	$0.97
2024	19.35		$2,461,657	$3,022,200	4.07	$4,320,736			0	0	0.03	$0	29.44	$9,804,593	$588,276	$0.97
2025	19.15		$2,461,657	$3,022,200	4.63	$4,404,513			0	0	0.04	$0	29.81	$9,888,371	$593,302	$0.96
2026	18.95		$2,461,657	$3,022,200	5.19	$4,488,291			0	0	0.04	$0	30.18	$9,972,148	$598,329	$0.96
2027	18.76		$2,461,657	$3,022,200	5.75	$4,572,069			0	0	0.05	$0	30.56	$10,055,926	$603,356	$0.96
2028	18.56		$2,461,657	$3,022,200	6.31	$4,655,847			0	0	0.06	$0	30.93	$10,139,704	$608,382	$0.95
2029	18.36		$2,461,657	$3,022,200	6.88	$4,739,624			0	0	0.06	$0	31.30	$10,223,481	$613,409	$0.95
2030	18.17		$2,919,264	$3,022,200	7.44	$4,823,402			0	0	0.07	$0	31.67	$10,764,866	$645,892	$0.99
2031	17.99		$2,919,264	$3,022,200	7.69	$4,847,059			0	0	0.073	$0	31.76	$10,788,524	$647,311	$0.99
2032	17.82		$2,919,264	$3,022,200	7.95	$4,870,717			0	0	0.076	$0	31.85	$10,812,181	$648,731	$0.99
2033	17.65		$2,919,264	$3,022,200	8.21	$4,894,374			0	0	0.079	$0	31.94	$10,835,839	$650,150	$0.99
2034	17.48		$2,919,264	$3,022,200	8.46	$4,918,032			0	0	0.082	$0	32.03	$10,859,496	$651,570	$0.98
2035	17.31		$2,919,264	$3,022,200	8.72	$4,941,689			$0	0	0.085	$0	32.11	$10,883,154	$652,989	$0.98
2036	17.14		$2,919,264	$3,022,200	10.00	$5,182,382	15	0.30	$2,187,503	$85,695	0.088	$73,876	33.53	$13,470,920	$808,255	$1.17
2037	16.97		$2,919,264	$3,022,200	10.00	$5,151,780		0.78	$2,187,503	$221,497	0.091	$76,395	33.84	$13,578,639	$814,718	$1.17
2038	16.80		$2,919,264	$3,022,200	10.00	$5,121,179		1.25	$2,187,503	$357,014	0.094	$78,913	34.15	$13,686,073	$821,164	$1.16
2039	16.63		$2,919,264	$3,022,200	10.00	$5,090,578		1.73	$2,187,503	$492,816	0.097	$81,432	34.45	$13,793,793	$827,628	$1.16
2040	16.46		$457,607	$3,022,200	10.00	$5,059,977		2.20	$2,187,503	$627,194	0.100	$83,950	34.76	$11,438,431	$686,306	$0.96
2041	16.25		$457,607	$3,022,200	10.00	$5,023,795		2.75	$2,187,503	$781,729	0.118	$99,061	35.12	$11,571,896	$694,314	$0.96
2042	16.05		$457,607	$3,022,200	10.00	$4,987,614		3.29	$2,187,503	$936,264	0.136	$114,172	35.48	$11,705,361	$702,322	$0.96
2043	15.85		$457,607	$3,022,200	10.00	$4,951,433		3.83	$2,187,503	$1,090,800	0.154	$129,283	35.83	$11,838,825	$710,330	$0.96
2044	15.65		$457,607	$3,022,200	10.00	$4,915,251		4.37	$2,187,503	$1,245,335	0.17	$144,394	36.19	$11,972,290	$718,337	$0.96
2045	15.44		$457,607	$3,022,200	10.00	$4,879,070		4.92	$4,457,528	$1,399,870	0.19	$159,505	36.55	$14,375,780	$862,547	$1.14
2046	15.24		$457,607	$3,022,200	10.00	$4,842,889		5.46	$4,457,528	$1,554,405	0.21	$174,616	36.91	$14,509,245	$870,555	$1.14
2047	15.04		$457,607	$3,022,200	10.00	$4,806,707		6.00	$4,457,528	$1,708,940	0.23	$189,727	37.27	$14,642,710	$878,563	$1.14
2048	14.84		$457,607	$3,022,200	10.00	$4,770,526		6.55	$4,457,528	$1,863,475	0.24	$204,838	37.63	$14,776,175	$886,570	$1.14
2049	14.63		$457,607	$3,022,200	10.00	$4,734,345		7.09	$4,457,528	$2,018,011	0.26	$219,949	37.98	$14,909,639	$894,578	$1.14
2050	14.43		$457,607	$3,022,200	10.00	$4,698,163		7.63	$4,457,528	$2,172,546	0.28	$235,060	38.34	$15,043,104	$902,586	$1.14
2051	14.22		$457,607	$3,022,200	10.00	$4,660,265		7.87	$4,457,528	$2,239,991	0.63	$530,900	38.72	$15,368,491	$922,109	$1.15
2052	14.01		$457,607	$3,022,200	10.00	$4,622,367		8.10	$4,457,528	$2,307,437	0.98	$826,740	39.10	$15,693,878	$941,633	$1.17
2053	13.80		$457,607	$3,022,200	10.00	$4,584,468		8.34	$4,457,528	$2,374,882	1.34	$1,122,579	39.48	$16,019,265	$961,156	$1.18
2054	13.58		$457,607	$3,022,200	10.00	$4,546,570		8.58	$4,457,528	$2,442,327	1.69	$1,418,419	39.85	$16,344,652	$980,679	$1.19
2055	13.37		$457,607	$3,022,200	10.00	$4,508,672		8.82	$11,927,528	$2,509,773	2.04	$1,714,259	40.23	$24,140,039	$1,448,402	$1.74
2056	13.16		$457,607	$3,022,200	10.00	$4,470,773		9.05	$11,927,528	$2,577,218	2.39	$2,010,099	40.61	$24,465,426	$1,467,926	$1.75
2057	12.95		$457,607	$3,022,200	10.00	$4,432,875		9.29	$11,927,528	$2,644,664	2.75	$2,305,939	40.98	$24,790,813	$1,487,449	$1.76
2058	12.74		$457,607	$3,022,200	10.00	$4,394,977		9.53	$11,927,528	$2,712,109	3.10	$2,601,778	41.36	$25,116,199	$1,506,972	$1.76
2059	12.52		$457,607	$3,022,200	10.00	$4,357,078		9.76	$11,927,528	$2,779,555	3.45	$2,897,618	41.74	$25,441,586	$1,526,495	$1.77
2060	12.31		$457,607	$3,022,200	10.00	$4,319,180		10.00	$11,927,528	$2,847,000	3.80	$3,193,458	42.12	$25,766,973	$1,546,018	$1.78

Rate Analysis Costs Pearland Area Option 6

	Fort Bend County Area Surface Water							Rate Analysis			
	GCWA - New Plant					BRA - No Raw Water Contract		Total Ft Bend	Total Ft Bend County		Annual Rate
Year	Plant Capacity (MGD)	Average Day Demand GW (MGD)	Average Day Demand SW (MGD)	Capital Cost	O & M	Average Day Demand SW (MGD)	O & M	County Average Day Demand (MGD)	County Service Area Costs (excl admin fee)	BRA Admin Fee (6%)	Cost/ 1,000 gal
2010		40.36		0	$7,218,529			40.36	$7,218,529	$433,112	$0.52
2011		39.83		0	$7,124,120			39.83	$7,124,120	$427,447	$0.52
2012		39.31		0	$7,029,710			39.31	$7,029,710	$421,783	$0.52
2013	35	38.78	10.58	$5,197,140	$9,870,192	2.31	$767,267	51.67	$15,834,599	$950,076	$0.89
2014		38.25	10.72	$5,197,140	$9,814,559	2.46	$818,275	51.43	$15,829,975	$949,799	$0.89
2015		37.72	10.86	$5,197,140	$9,758,926	2.62	$869,284	51.20	$15,825,351	$949,521	$0.90
2016		37.19	11.00	$5,197,140	$9,703,293	2.77	$920,293	50.96	$15,820,727	$949,244	$0.90
2017		36.67	11.14	$5,197,140	$9,647,660	2.92	$971,302	50.73	$15,816,102	$948,966	$0.91
2018		36.14	11.28	$5,197,140	$9,592,027	3.08	$1,022,310	50.49	$15,811,478	$948,689	$0.91
2019		35.61	11.42	$5,197,140	$9,536,394	3.23	$1,073,319	50.26	$15,806,854	$948,411	$0.91
2020		35.08	11.56	$5,197,140	$9,480,761	3.39	$1,606,183	50.03	$16,284,084	$977,045	$0.95
2021		33.91	12.99	$5,197,140	$9,669,169	3.93	$1,865,592	50.84	$16,731,901	$1,003,914	$0.96
2022		32.74	14.42	$5,197,140	$9,857,576	4.48	$2,125,001	51.65	$17,179,718	$1,030,783	$0.97
2023		31.58	15.86	$5,197,140	$10,161,740	5.03	$2,384,410	52.46	$17,743,290	$1,064,597	$0.98
2024		30.41	17.29	$5,197,140	$10,360,607	5.57	$2,643,819	53.27	$18,201,567	$1,092,094	$0.99
2025		29.24	18.72	$5,197,140	$10,559,474	6.12	$2,903,228	54.08	$18,659,843	$1,119,591	$1.00
2026		28.07	20.16	$5,197,140	$10,758,341	6.67	$3,162,637	54.89	$19,118,119	$1,147,087	$1.01
2027		26.90	21.59	$5,197,140	$10,957,209	7.21	$3,422,047	55.70	$19,576,396	$1,174,584	$1.02
2028		25.73	23.02	$5,197,140	$11,156,076	7.76	$3,681,456	56.51	$20,034,672	$1,202,080	$1.03
2029		24.56	24.45	$5,197,140	$11,354,943	8.31	$3,940,865	57.32	$20,492,948	$1,229,577	$1.04
2030	55	23.39	25.89	$7,581,943	$11,553,810	8.85	$7,431,254	58.13	$26,567,007	$1,594,020	$1.33
2031		23.74	26.19	$7,581,943	$11,702,105	9.07	$7,612,418	59.00	$26,896,466	$1,613,788	$1.32
2032		24.09	26.49	$7,581,943	$11,850,400	9.28	$7,793,582	59.86	$27,225,925	$1,633,556	$1.32
2033		24.44	26.79	$8,697,490	$11,998,695	9.50	$7,974,746	60.73	$28,670,931	$1,720,256	$1.37
2034		24.78	27.10	$8,697,490	$12,146,990	9.72	$8,155,910	61.60	$29,000,390	$1,740,023	$1.37
2035		25.13	27.40	$8,697,490	$12,295,285	9.93	$8,337,075	62.46	$29,329,849	$1,759,791	$1.36
2036		25.48	27.70	$8,697,490	$12,443,579	10.15	$8,518,239	63.33	$29,659,308	$1,779,558	$1.36
2037		25.83	28.00	$8,697,490	$12,591,874	10.36	$8,699,403	64.19	$29,988,767	$1,799,326	$1.36
2038		26.17	28.31	$8,697,490	$12,740,169	10.58	$8,880,567	65.06	$30,318,226	$1,819,094	$1.35
2039		26.52	28.61	$8,697,490	$12,888,464	10.79	$9,061,731	65.92	$30,647,685	$1,838,861	$1.35
2040		26.87	28.91	$8,697,490	$13,036,759	11.01	$9,242,895	66.79	$30,977,144	$1,858,629	$1.35
2041		27.31	29.15	$8,697,490	$13,181,503	11.43	$9,597,668	67.88	$31,476,661	$1,888,600	$1.35
2042		27.75	29.38	$8,697,490	$13,326,248	11.86	$9,952,440	68.98	$31,976,178	$1,918,571	$1.35
2043		28.19	29.61	$3,500,349	$13,470,992	12.28	$10,307,213	70.07	$27,278,555	$1,636,713	$1.13
2044		28.63	29.84	$3,500,349	$13,615,737	12.70	$10,661,986	71.17	$27,778,072	$1,666,684	$1.13
2045		29.06	30.07	$4,137,805	$13,760,481	13.12	$11,016,759	72.26	$28,915,045	$1,734,903	$1.16
2046		29.50	30.31	$4,137,805	$13,905,226	13.55	$11,371,531	73.36	$29,414,562	$1,764,874	$1.16
2047		29.94	30.54	$4,137,805	$14,049,970	13.97	$11,726,304	74.45	$29,914,079	$1,794,845	$1.17
2048		30.38	30.77	$4,137,805	$14,194,715	14.39	$12,081,077	75.55	$30,413,596	$1,824,816	$1.17
2049		30.82	31.00	$4,137,805	$14,339,459	14.81	$12,435,849	76.64	$30,913,113	$1,854,787	$1.17
2050		31.26	31.24	$4,137,805	$14,484,204	15.24	$12,790,622	77.73	$31,412,631	$1,884,758	$1.17
2051		31.79	31.40	$4,137,805	$14,625,254	15.86	$13,317,324	79.05	$32,080,383	$1,924,823	$1.18
2052		32.32	31.56	$4,137,805	$14,766,304	16.49	$13,844,027	80.37	$32,748,136	$1,964,888	$1.18
2053		32.85	31.73	$5,253,352	$14,907,354	17.12	$14,370,729	81.69	$34,531,435	$2,071,886	$1.23
2054		33.38	31.89	$5,253,352	$15,048,405	17.75	$14,897,431	83.01	$35,199,187	$2,111,951	$1.23
2055		33.91	32.05	$5,253,352	$15,189,455	18.37	$15,424,134	84.33	$35,866,940	$2,152,016	$1.24
2056		34.44	32.21	$5,253,352	$15,330,505	19.00	$15,950,836	85.65	$36,534,693	$2,192,082	$1.24
2057		34.97	32.38	$5,253,352	$15,471,555	19.63	$16,477,538	86.97	$37,202,445	$2,232,147	$1.24
2058		35.50	32.54	$5,253,352	$15,612,606	20.26	$17,004,240	88.29	$37,870,198	$2,272,212	$1.25
2059		36.03	32.70	$5,253,352	$15,753,656	20.88	$17,530,943	89.61	$38,537,950	$2,312,277	$1.25
2060		36.56	32.87	$2,868,549	$15,894,706	21.51	$18,057,645	90.93	$36,820,900	$2,209,254	$1.18

Rate Analysis Costs Fort Bend County Area
Option 6

Year	Avg Day Demand GW (MGD)	BWA Surface Water WTP Capacity (MGD)	Avg Day Demand SW (MGD)	Capital Cost (UV and Expansions)	O & M	Rate Analysis Total BWA Area Avg Day Demand (MGD)	Total BWA Area Service Area Costs (excl admin fee)	BRA Admin Fee (6%)	Annual Rate Cost/ 1,000 gal
2010	1.43	12.5	6.00	$130,822	$3,717,905	7.43	$3,848,726	$230,924	$1.50
2011	1.43		6.20	$130,822	$3,830,352	7.63	$3,961,174	$237,670	$1.51
2012	1.44		6.39	$130,822	$3,942,800	7.83	$4,073,622	$244,417	$1.51
2013	1.45		6.58	$130,822	$4,055,248	8.03	$4,186,069	$251,164	$1.51
2014	1.45		6.78	$130,822	$4,167,696	8.23	$4,298,517	$257,911	$1.52
2015	1.46		6.97	$130,822	$4,280,143	8.43	$4,410,965	$264,658	$1.52
2016	1.47		7.16	$130,822	$4,392,591	8.63	$4,523,413	$271,405	$1.52
2017	1.47		7.36	$130,822	$4,505,039	8.83	$4,635,860	$278,152	$1.53
2018	1.48		7.55	$130,822	$4,617,487	9.03	$4,748,308	$284,898	$1.53
2019	1.49		7.74	$130,822	$4,729,934	9.23	$4,860,756	$291,645	$1.53
2020	1.49		7.93	$130,822	$4,842,382	9.43	$4,973,204	$298,392	$1.53
2021	1.66		7.92	$130,822	$4,865,172	9.58	$4,995,994	$299,760	$1.51
2022	1.83		7.91	$130,822	$4,887,962	9.74	$5,018,784	$301,127	$1.50
2023	2.00		7.90	$130,822	$4,910,753	9.89	$5,041,574	$302,494	$1.48
2024	2.17		7.88	$130,822	$4,933,543	10.05	$5,064,364	$303,862	$1.46
2025	2.34		7.87	$130,822	$4,956,333	10.21	$5,087,155	$305,229	$1.45
2026	2.50		7.86	$130,822	$4,979,123	10.36	$5,109,945	$306,597	$1.43
2027	2.67		7.84	$130,822	$5,001,914	10.52	$5,132,735	$307,964	$1.42
2028	2.84		7.83	$130,822	$5,024,704	10.67	$5,155,525	$309,332	$1.40
2029	3.01		7.82	$130,822	$5,047,494	10.83	$5,178,316	$310,699	$1.39
2030	3.18	20	7.81	$1,235,950	$5,070,284	10.99	$6,306,234	$378,374	$1.67
2031	3.18		7.86	$1,235,950	$5,103,950	11.04	$6,339,899	$380,394	$1.67
2032	3.18		7.92	$1,235,950	$5,137,615	11.10	$6,373,565	$382,414	$1.67
2033	3.18		7.98	$1,235,950	$5,171,281	11.16	$6,407,230	$384,434	$1.67
2034	3.18		8.04	$1,235,950	$5,204,946	11.22	$6,440,896	$386,454	$1.67
2035	3.18		8.10	$1,235,950	$5,238,611	11.28	$6,474,561	$388,474	$1.67
2036	3.18		8.16	$1,235,950	$5,272,277	11.33	$6,508,227	$390,494	$1.67
2037	3.18		8.22	$1,235,950	$5,305,942	11.39	$6,541,892	$392,514	$1.67
2038	3.18		8.27	$1,235,950	$5,339,608	11.45	$6,575,557	$394,533	$1.67
2039	3.18		8.33	$1,235,950	$5,373,273	11.51	$6,609,223	$396,553	$1.67
2040	3.18		8.39	$1,105,128	$5,406,938	11.57	$6,512,067	$390,724	$1.64
2041	3.17		8.47	$1,105,128	$5,452,254	11.64	$6,557,382	$393,443	$1.64
2042	3.17		8.55	$1,105,128	$5,497,569	11.72	$6,602,697	$396,162	$1.64
2043	3.17		8.63	$1,105,128	$5,542,884	11.79	$6,648,012	$398,881	$1.64
2044	3.16		8.71	$1,105,128	$5,588,199	11.87	$6,693,327	$401,600	$1.64
2045	3.16		8.79	$1,105,128	$5,633,514	11.95	$6,738,642	$404,319	$1.64
2046	3.16		8.87	$1,105,128	$5,678,829	12.02	$6,783,957	$407,037	$1.64
2047	3.15		8.95	$1,105,128	$5,724,144	12.10	$6,829,272	$409,756	$1.64
2048	3.15		9.03	$1,105,128	$5,769,459	12.18	$6,874,588	$412,475	$1.64
2049	3.15		9.11	$1,105,128	$5,814,774	12.25	$6,919,903	$415,194	$1.64
2050	3.14		9.19	$1,436,667	$5,860,090	12.33	$7,296,756	$437,805	$1.72
2051	3.14		9.28	$1,436,667	$5,914,905	12.42	$7,351,571	$441,094	$1.72
2052	3.13		9.38	$1,436,667	$5,969,720	12.51	$7,406,386	$444,383	$1.72
2053	3.13		9.48	$1,436,667	$6,024,535	12.60	$7,461,201	$447,672	$1.72
2054	3.12		9.57	$1,436,667	$6,079,349	12.70	$7,516,016	$450,961	$1.72
2055	3.12		9.67	$1,436,667	$6,134,164	12.79	$7,570,831	$454,250	$1.72
2056	3.11		9.77	$1,436,667	$6,188,979	12.88	$7,625,646	$457,539	$1.72
2057	3.11		9.86	$1,436,667	$6,243,794	12.97	$7,680,461	$460,828	$1.72
2058	3.10		9.96	$1,436,667	$6,298,609	13.06	$7,735,276	$464,117	$1.72
2059	3.10		10.06	$1,436,667	$6,353,424	13.15	$7,790,091	$467,405	$1.72
2060	3.09		10.15	$1,436,667	$6,408,239	13.25	$7,844,906	$470,694	$1.72

Rate Analysis Costs BWA Area Option 6

Year	Water Deficit (MGD)	Seawater Desalination Treatment Plant: Rated Capacity (MGD)	Seawater Desalination Treatment Plant: Capacity Charge	Seawater Desalination Treatment Plant: Commodity Charge	Desalinated Water Storage: Capital Expenditures	Desalinated Water Storage: Amortized Costs	Pumping Stations: Capital Expenditures: Finished Water	Pumping Stations: Capital Expenditures: Booster at Hwy 6/288	Pumping Stations: Amortized Costs	Pumping Stations: O&M Costs: Finished Water	Pumping Stations: O&M Costs: Booster at Hwy 6/288	Desalination Pipeline & Local Storage: Pipeline Capital Expenditures	Desalination Pipeline & Local Storage: Storage Capital Expenditures	Desalination Pipeline & Local Storage: Amortized Costs	BWA Consolidate Debt: Capital Expenditures	BWA Consolidate Debt: Amortized Costs	Admin Fee at 1.50%	Total Desalinated Water Annual Cost	Desalinated Water Unit Rate
2010	**7.24**	15	$9,307,500	$2,416,545	$9,986,246	$0	$5,991,747	$4,763,648	$689,320	**$616,804**	**$23,565**	$104,253,090	$3,413,317	$6,900,408	$8,777,415	$562,550	$299,312	$20,816,005	$7.88
2011	9.10	10	$6,497,000	$3,020,949	0	$640,025	0	0	$689,320	$707,191	$707,191	0	0	$6,900,408	0	$562,550	$287,431	$20,012,067	$6.03
2012	10.95	15	$9,307,500	$3,658,551	0	$640,025	0	0	$689,320	$797,579	$797,579	0	0	$6,900,408	0	$562,550	$341,864	$23,695,376	$5.93
2013	12.81	15	$9,307,500	$4,279,554	0	$640,025	0	0	$689,320	$887,966	$887,966	0	0	$6,900,408	0	$562,550	$353,891	$24,509,180	$5.24
2014	14.67	15	$9,307,500	$4,900,557	0	$640,025	0	0	$689,320	$978,353	$978,353	0	0	$6,900,408	0	$562,550	$365,918	$25,322,984	$4.73
2015	16.53	25	$12,957,500	$5,280,180	0	$640,025	0	0	$689,320	$1,068,740	$1,068,740	0	0	$6,900,408	0	$562,550	$429,074	$29,596,538	$4.90
2016	18.39	25	$12,957,500	$5,874,036	0	$640,025	0	0	$689,320	$1,159,127	$1,159,127	0	0	$6,900,408	0	$562,550	$440,693	$30,382,787	$4.53
2017	20.25	25	$12,957,500	$6,467,891	0	$640,025	0	0	$689,320	$1,249,515	$1,249,515	0	0	$6,900,408	0	$562,550	$452,313	$31,169,036	$4.22
2018	22.11	25	$12,957,500	$7,061,746	0	$640,025	0	0	$689,320	$1,339,902	$1,339,902	0	0	$6,900,408	0	$562,550	$463,932	$31,955,286	$3.96
2019	23.97	25	$12,957,500	$7,655,602	0	$640,025	0	0	$689,320	$1,430,289	$1,430,289	0	0	$6,900,408	0	$562,550	$475,551	$32,741,535	$3.74
2020	**25.83**	50	$22,082,500	$8,060,898	0	$640,025	0	0	$689,320	**$1,520,676**	**$810,279**	0	0	$6,900,408	0	$562,550	$610,562	$41,877,219	$4.44
2021	28.65	50	$22,082,500	$8,941,884	0	$640,025	0	0	$689,320	$1,580,325	$934,914	0	0	$6,900,408	0	$562,550	$626,541	$42,958,467	$4.11
2022	31.48	50	$22,082,500	$9,822,871	0	$640,025	0	0	$689,320	$1,639,974	$1,059,548	0	0	$6,900,408	0	$562,550	$642,520	$44,039,716	$3.83
2023	34.30	50	$22,082,500	$10,703,857	0	$640,025	0	0	$689,320	$1,699,623	$1,184,182	0	0	$6,900,408	0	$562,550	$658,499	$45,120,964	$3.60
2024	37.12	50	$22,082,500	$11,584,844	0	$640,025	0	0	$689,320	$1,759,271	$1,308,817	0	0	$6,900,408	0	$562,550	$674,478	$46,202,213	$3.41
2025	39.94	50	$22,082,500	$12,465,830	$24,120,573	$2,185,928	$4,374,693	0	$969,697	$1,818,920	**$1,433,451**	$224,413,445	$14,412,104	$22,206,889	0	$562,550	$947,448	$64,673,214	$4.44
2026	42.77	50	$22,082,500	$13,346,817	0	$2,185,928	0	0	$969,697	$1,878,569	0	0	0	$22,206,889	0	$562,550	$940,056	$64,173,005	$4.11
2027	45.59	50	$22,082,500	$14,227,803	0	$2,185,928	0	0	$969,697	$1,938,217	0	0	0	$22,206,889	0	$562,550	$954,166	$65,127,750	$3.91
2028	48.41	50	$22,082,500	$15,108,790	0	$2,185,928	0	0	$969,697	$1,997,866	0	0	0	$22,206,889	0	$562,550	$968,275	$66,082,495	$3.74
2029	51.24	50	$22,082,500	$15,989,776	0	$2,185,928	0	0	$969,697	$2,057,515	0	0	0	$22,206,889	0	$562,550	$982,385	$67,037,239	$3.58
2030	**54.06**	50	$22,082,500	$16,870,763	0	$2,185,928	0	0	$969,697	**$2,117,163**	0	0	0	$22,206,889	0	$562,550	$996,494	$67,991,984	$3.45
2031	55.20	50	$22,082,500	$17,225,830	0	$2,185,928	0	0	$969,697	$2,208,909	0	0	0	$22,206,889	0	$562,550	$1,003,196	$68,445,500	$3.40
2032	56.34	50	$22,082,500	$17,580,898	0	$2,185,928	0	0	$969,697	$2,300,654	0	0	0	$22,206,889	0	$562,550	$1,009,898	$68,899,015	$3.35
2033	57.47	50	$22,082,500	$17,935,965	0	$2,185,928	0	0	$969,697	$2,392,400	0	0	0	$22,206,889	0	$562,550	$1,016,601	$69,352,530	$3.31
2034	58.61	50	$22,082,500	$18,291,033	0	$2,185,928	0	0	$969,697	$2,484,146	0	0	0	$22,206,889	0	$562,550	$1,023,303	$69,806,046	$3.26
2035	59.75	50	$22,082,500	$18,646,101	0	$2,185,928	0	0	$969,697	$2,575,891	0	0	0	$22,206,889	0	$562,550	$1,030,005	$70,259,561	$3.22
2036	60.89	50	$22,082,500	$19,001,168	0	$2,185,928	0	0	$969,697	$2,667,637	0	0	0	$22,206,889	0	$562,550	$1,036,707	$70,713,076	$3.18
2037	62.02	50	$22,082,500	$19,356,236	0	$2,185,928	0	0	$969,697	$2,759,383	0	0	0	$22,206,889	0	$562,550	$1,043,409	$71,166,592	$3.14
2038	63.16	50	$22,082,500	$19,711,303	0	$2,185,928	0	0	$969,697	$2,851,128	0	0	0	$22,206,889	0	$562,550	$1,050,112	$71,620,107	$3.11
2039	64.30	50	$22,082,500	$20,066,371	0	$2,185,928	0	0	$969,697	$2,942,874	0	0	0	$22,206,889	0	$562,550	$1,056,814	$72,073,623	$3.07
2040	**65.44**	50	$22,082,500	$20,421,438	0	$1,545,903	0	0	$280,377	**$3,034,619**	0	0	0	$15,306,481	0	0	$940,070	$63,611,388	$2.66
2041	66.93	50	$22,082,500	$20,887,925	0	$1,545,903	0	0	$280,377	$3,216,371	0	0	0	$15,306,481	0	0	$949,793	$64,269,351	$2.63
2042	68.43	50	$22,082,500	$21,354,412	0	$1,545,903	0	0	$280,377	$3,398,123	0	0	0	$15,306,481	0	0	$959,517	$64,927,313	$2.60
2043	69.92	50	$22,082,500	$21,820,899	0	$1,545,903	0	0	$280,377	$3,579,874	0	0	0	$15,306,481	0	0	$969,241	$65,585,275	$2.57
2044	71.42	50	$22,082,500	$22,287,386	0	$1,545,903	0	0	$280,377	$3,761,626	0	0	0	$15,306,481	0	0	$978,964	$66,243,237	$2.54
2045	72.91	50	$22,082,500	$22,753,873	0	$1,545,903	$5,788,937	$5,164,250	$982,374	$3,943,378	**$31,985**	0	0	$15,306,481	0	0	$999,697	$67,646,191	$2.54
2046	74.41	50	$22,082,500	$23,220,360	0	$1,545,903	0	0	$982,374	$4,125,130	$38,382	0	0	$15,306,481	0	0	$1,009,517	$68,310,646	$2.52
2047	75.90	50	$22,082,500	$23,686,847	0	$1,545,903	0	0	$982,374	$4,306,881	$44,779	0	0	$15,306,481	0	0	$1,019,336	$68,975,101	$2.49
2048	77.40	50	$22,082,500	$24,153,334	0	$1,545,903	0	0	$982,374	$4,488,633	$51,176	0	0	$15,306,481	0	0	$1,029,156	$69,639,556	$2.47
2049	78.89	50	$22,082,500	$24,619,821	0	$1,545,903	0	0	$982,374	$4,670,385	$57,572	0	0	$15,306,481	0	0	$1,038,976	$70,304,011	$2.44
2050	**80.39**	50	$22,082,500	$25,086,308	0	$1,545,903	0	0	$982,374	**$4,852,136**	**$63,969**	0	0	$15,306,481	0	0	$1,048,795	$70,968,466	$2.42
2051	82.00	50	$22,082,500	$25,588,648	0	$1,545,903	0	0	$982,374	$4,941,132	$114,135	0	0	$15,306,481	0	0	$1,058,418	$71,619,591	$2.39
2052	83.60	50	$22,082,500	$26,090,989	0	$1,545,903	0	0	$982,374	$5,030,128	$164,300	0	0	$15,306,481	0	0	$1,068,040	$72,270,715	$2.37
2053	85.21	50	$22,082,500	$26,593,329	0	$1,545,903	0	0	$982,374	$5,119,124	$214,466	0	0	$15,306,481	0	0	$1,077,663	$72,921,840	$2.34
2054	86.82	50	$22,082,500	$27,095,669	0	$1,545,903	0	0	$982,374	$5,208,121	$264,631	0	0	$15,306,481	0	0	$1,087,285	$73,572,964	$2.32
2055	88.43	50	$22,082,500	$27,598,010	0	0	0	0	$701,997	$5,297,117	$314,797	0	0	0	0	0	$839,916	$56,834,336	$1.76
2056	90.04	50	$22,082,500	$28,100,350	0	0	0	0	$701,997	$5,386,113	$364,962	0	0	0	0	0	$849,539	$57,485,461	$1.75
2057	91.65	50	$22,082,500	$28,602,690	0	0	0	0	$701,997	$5,475,109	$415,128	0	0	0	0	0	$859,161	$58,136,585	$1.74
2058	93.26	50	$22,082,500	$29,105,031	0	0	0	0	$701,997	$5,564,105	$465,293	0	0	0	0	0	$868,784	$58,787,709	$1.73
2059	94.87	50	$22,082,500	$29,607,371	0	0	0	0	$701,997	$5,653,101	$515,459	0	0	0	0	0	$878,406	$59,438,834	$1.72
2060	**96.48**	50	$22,082,500	$30,109,711	0	0	0	0	$701,997	**$5,742,097**	**$565,624**	0	0	0	0	0	$888,029	$60,089,958	$1.71

Desalinated Unit Cost Analysis
Option 5

Missouri City

	Blending Scenarios: Water 1 + 2 + 3	Langlier Index	Δ Langlier Index
2004	Groundwater (100%)	0.37	-
2030	GCWA (60%)+ Desal (40%)	-0.14	**0.51**
2060	GCWA (48%)+ Groundwater (40%) + Desal (12%)	-0.06	0.43

Pearland

	Blending Scenarios: Water 1 + 2 + 3	Langlier Index	Δ Langlier Index
2004	Groundwater (100%)	0.37	-
2030	SEWPP (33%)+ Groundwater (67%)	0.1	0.27
2060	SEWPP (62%)+ Groundwater (27%) + Desal (11%)	0.14	0.21

South County

	Blending Scenarios: Water 1 + 2 + 3	Langlier Index	Δ Langlier Index
Brazoria - 2020	BWA (71%) + Desal (29%)	-0.51	0.06
Freeport - 2020	BWA (67%) + Desal (33%)	-0.52	0.07
Lake Jackson - 2020	BWA (31%) + Desal (69%)	-0.55	0.1

SOURCE WATER CHARACTERISTICS

PARAMETER	GCWA	North County GW	SEWPP	BWA	Desal
Langlier Index	0.37	0.37	0.32	-0.45	-0.08
Total Dissolved Solids	187	438	254	355	350
Temperature	23	21	23	20	22.8
pH	8	8	8	7	8.15
Alkalinity	77	282	99	128	65
Calcium	76	58	113	136	50
Sulfate	22	80	32	81	-
Chloride	16	7	36	61	12.5
Metal Ions	1.62	0.88	0.05	0.02	-

APPENDIX I

Responses to Texas Water Development Board Comments On Draft Regional Water Facility Planning Report Contract No. 2004-483-514

Attachment A
Comments Provided Electronically on September 23, 2004 (Responses Submitted Electronically on September 30, 2004)

1. **For comparative consistency between the three proposed projects, please provide the total cost difference between implementing the currently approved water management strategies and seawater desalination.**

   Answer: A non-desalinated water option (also referred to as Option 6 in the preliminary draft report) was developed as part of the Freeport Project study effort for the purpose of comparing with options for implementing desalinated seawater. For the most part, the non-desalinated water option consists of developing additional surface water supplies at several locations within the study area (see section 7 of preliminary draft report). This is consistent with management strategies recommended in the 2001 Region H Water Plan. However, it is important to keep in mind that we evaluated implementing a demonstration desalination facility. Option 5 in the preliminary draft report recommends near-term implementation of a 10 MGD facility before there is an actual need for the water. It is also important to keep in mind that the final unit cost for desalinated water provided according to Option 5 was developed based on actual demand projections as opposed to providing a unit cost that assumes optimal utilization of the full plant capacity, as is commonly done. We felt that projecting unit costs based on actual demand projections was more conservative and reflects realistic future costs.

   a. **Provide the net present value of this cost differential over the life of the first phase of the project.**

      Answer: The net present value of the recommended seawater desalination option (Option 5) over the first phase of the project (through 2024) is $127,950,541. The net present value of the non-desalinated water option (Option 6) over the first phase of the project (through 2024) is $53,432,496. The net present value of the recommended seawater desalination option (Option 5) through 2060 is

$812,539,994. The net present value of the non-desalinated water option (Option 6) through 2060 is $515,130,355.

b. **Identify and consider any offsetting income resulting from sales related to surplus water rights and/or surplus water resources generated by the desalination project.**

Answer: Implementation of the project will result in surplus water resources; however, it is premature to speculate on potential income or other benefits derived from these resources at this time.

c. **Identify and consider any other costs that would have to be addressed if the seawater desalination project is implemented; such as debt on existing facilities that may become redundant as a result of the desalination project.**

Answer: The financial calculations for Option 5 in the preliminary draft report include defeasance of $8,777,415 of debt on existing facilities in 2010 (See discussion in section ES-9 and Net Present Value Analysis for Option 5 in Appendix G).

d. **Calculate and report the corresponding cost differential as dollars per acre-foot.**

Description	2010 $/AF	2030 $/AF	2060 $/AF
Desal – Option 5	1,561	1,720	925
Brazosport Area Surface Water	541	685	573
Pearland Area Surface Water	812	529	509
Fort Bend Co. Area Surface Water	NA	456	324

2. **Please provide a breakdown of the water production and transmission cost (net present value) on dollars per acre-ft, as follows:**

   a. **Treatment**
      i. **Debt service**
      ii. **Operations and maintenance costs**
         - **Chemical**
         - **Membrane replacement**
         - **Power costs**
         - **Miscellaneous**

- **Labor**

Answer: See attached file "Plant Economics Discussion" for a narrative description. See the Net Present Value Analysis for Option 5 contained in Appendix G of the preliminary draft report for the capacity and commodity charges proposed by Poseidon for treatment. See the attached file titled "Treatment Cost Details" for a detailed breakdown of costs for the 10 MGD treatment facility operated in seawater mode.

b. Transmission

i. **Debt service**
ii. **Operations and maintenance costs**

Answer: See the Net Present Value Analysis for Option 5 contained in Appendix G of the preliminary draft report.

3. **Regarding the subsidy requirements described in the draft report; please confirm the amount of subsidy, length over which it would be applied, and what would be the equivalent amount in dollars per acre-foot when considered over the life of the initial phase of the project.**

Answer: Since submitting the draft report on August 31, we have identified some necessary changes to our calculations that will likely result in a slightly lower subsidy requirement. This will be reflected in the final report. The estimated initial annual operating subsidy required to implement Option 5 as laid out in the preliminary draft report is $8,276,600, or $3.49/1000 gallons ($1,137/AF). This subsidy was estimated by determining the financial assistance needed to provide desalinated water to the Brazosport Water Authority's (BWA) customer cities at the rate these cities currently pay for treated surface water. In other words, the subsidy would cover any costs associated with desalinated water over and above the current cost of surface water in the BWA's service area. Please note that the estimated subsidy includes the projected costs of treatment, transmission, debt defeasance, and administrative fees associated with an initial delivery of an average annual quantity of 6.5 MGD (7,281 AF/year). We believe this is a conservative estimate that incorporates all costs required to implement the 10 MGD seawater desalination facility in 2010. However, this strict financial comparison does not capture some of the benefits of the desalinated water supply over the conventional surface water supply, such as its sustainable, drought-proof nature and production of higher quality water. The ultimate configuration of the plant and its end users will shape the subsidy requirement over time. We are not currently able to provide a definitive answer of what the subsidy requirement will be over time; however, the *attached file "Cost vs Time" contains a graph that depicts the estimated cost of water from Option 5 through 2060 versus costs for continued development of surface water supplies within the study area.*

4. **Task 6 of the contract scope of work (Exhibit A, p. 44) describes a review that would include "technical and financial aspects of Poseidon's proposed plan to supply desalinated seawater to (the) Authority." The report does not clearly include this review and does not include any analysis of it. This appears to be an omission in the report of information required by the scope of work. Please provide details on the intake(s), intake locations, pretreatment, desalination, and post-treatment systems, the costs for these various components, and how the price of water was calculated.**

   Answer: Due to the expedited nature of the study effort and reporting deadlines, the Brazos River Authority (BRA) has not formally begun work on Task 6, and we do not expect to spend the $25,000 budgeted for this task. However, we have been in preliminary internal discussions with Poseidon regarding its technical and business approach, and we are comfortable that they are valid at a conceptual level. The intended purpose of Task 6 was to secure outside assistance to the BRA in negotiating a detailed wholesale water supply agreement with Poseidon. The BRA believes it is premature to spend the State's money on this task until more is known regarding future funding availability for implementation of the project. However, the BRA has two separate outside consultants under contract to begin this task at the appropriate time.

   Please see the attached file "Project Description" for a narrative description of details regarding the proposed plant. The attached files "Site Distant" and "Site Details" are maps depicting the site location and key components. Cost details are presented in the response to item 2 above.

5. **The brief description of the treatment facilities contained in Section 5 of the draft report refers to a single-pass reverse-osmosis system. Please explain the rationale to arrive at this selection.**

   Answer: The selection of single-pass RO system is based on the analysis of the intake and product water quality. A single-stage RO system using standard seawater RO membranes can produce permeate of TDS concentration of 250 to 300 mg/L for design intake TDS concentration of up to 33,500 mg/L. This conclusion is based on both projections from several membrane manufacturers and on long-term pilot testing experience at Poseidon's seawater desalination demonstration facility in Carlsbad, CA. This *facility has been producing permeate of 250 to 300 mg/L using a single-stage RO system since August 2003.*

Taking into consideration that the RO system permeate has to be conditioned and disinfected prior to conveyance to the distribution system and that the conditioning chemicals (lime, chlorine and ammonia) will contribute additional 50 to 100 mg/l of TDS to the permeate salinity, the potable water is projected to have TDS concentration of 350 to 400 mg/L. See the attached file "Project Description" for additional details.

6. **Please describe the ownership arrangements over the treatment facilities; who will be the owner of the desalination plant when it is completed; would there be a transferability agreement as part of the public-private partnership?**

   Answer: As detailed in the November 2002 Statement of Interest and as further confirmed in the BRA's submittal of August 31, 2004, the Freeport Seawater Desalination Project is intended to be a public-private partnership between the BRA and Poseidon Resources Corporation. As such, Poseidon will be responsible for the development, permitting, engineering, procurement, construction, financing, ownership and operation of the desalination facility; correspondingly, the BRA will be responsible for the same activities associated with the conveyance pipeline(s) and integration with the retail water systems.

   Amongst numerous commercial considerations surrounding the preliminary pricing for the various desalination scenarios and consistent with the nature of the public-private partnership, Poseidon has proposed an initial term of 30 years with a transfer provision within the draft water sales agreement for the proposed Build/Own/Operate/Transfer project.

7. **Section 5 states that seawater, river water or any mixture of the two may be used for the desalination plant. It is inferred that the ability to blend the source of water will lower the cost of the produced water; however, this gain may impact the demonstration value of this project as large-scale seawater desalination project. Please describe in full the blending aspects of the proposed project. Please explain whether there will be separate treatment facilities for river water and for seawater. Please comment on the extent, frequency and conditions under which it is anticipated that blending will occur.**

   Answer: The facility will be capable of running in either a ***full*** *seawater or* ***full*** *river water mode to take advantage of the economics of the lower* *salinity source water in the Brazos River. This concept of "scalping" river water is a form of natural economic subsidy when river water is available to the Dow canal system, while still providing a drought proof water supply. The proposed plant site location, being near the river's discharge to the Gulf, also makes scalping excess flow an attractive option. Table 5-1 in the preliminary draft report displays savings achieved through the use of excess river flow. The average commodity charge displayed in Table 5-1 was used for the financial analyses presented in the preliminary draft report.*

This application of conjunctive use makes wise and beneficial use of both surface water and seawater while still providing all the benefits of a large-scale seawater desalination project. This is one aspect of value that the Brazos River Authority brings to the project as a provider of fresh surface water.

Near-term interruptible river water availability, recognizing minimum instream flow requirements and the potential creep of the salt wedge up the Brazos River, is expected to be 70- 80 %. Longer-term interruptible river water supply availability is contemplated to be 50 %. The river water supply would be diverted on an interruptible basis in accordance with the State's water right permitting system through existing or new water right permits. Conceptually speaking, the plant would treat river water during wet months and switch to 100 percent seawater during dry months. This capability results in a drought-proof water supply.

Based on source water data collection and analysis to date, high rate sedimentation (pre-pretreatment) will be sized to accommodate highly turbid seawater and the less turbid river water. We are currently continuing evaluation of the source water, and this dual source water aspect of the project will be further tested and validated during the piloting process. See the attached files "Project Description" and "Process Schematic" for additional details.

Attachment B
Texas Water Development Board (TWDB) staff review comments

1. **The initial scope of work for seawater desalination feasibility studies called for "a plant capacity of 25 mgd, potentially expandable to 100 mgd". However, the executive summary in the report recommends a 10 mgd plant, while the final pages of the report (section 9.6) indicate that the facility would be operated at only 6.5 mgd capacity. Since the intent of the Governor's Seawater Desalination Initiative is to demonstrate seawater desalination at a large-scale, please comment on the timing and likelihood that this project will be incrementally expanded to a larger capacity.**

   Response: The projected necessary plant expansions were identified in detail in Appendix G. Under each desalinated water delivery option, the desalination plant capacity is projected to incrementally expand as demands for desalinated water increase. Plant size increments used were 10 MGD, 15 MGD, 25 MGD, and 50 MGD. Under Option 5, the projected desalination plant capacity expansions are as follows:

   - *From 10 MGD to 15 MGD in 2023*
   - *From 15 MGD to 25 MGD in 2028*
   - *From 25 MGD to 50 MGD in 2050*

   The intent to expand the plant as necessary has been made more evident in additional sections of the final report.

2. **The schedule for implementing the Freeport project (Section 9.4) shows that the initial 6.5 mgd project is likely to be completed in 2010. Given the reduced scale of the project, as compared to the originally proposed 25 mgd, it would appear that a faster timeline would be possible. Please comment on the proposed timeline versus a more aggressive one.**

   Response: The reduction from 25 to 10 mgd for initial sizing of the facility has minimal impacts on reducing the implementation schedule. While the facility size and capital costs are reduced, the project must still go through all phases of development that would be required of the larger 25 mgd facility including piloting, permitting, contracting, design and construction. The reduced size of the facility does not materially impact the time to complete these steps. It is possible that under ideal circumstances, the 10 mgd plant could be implemented prior to 2010. We previously reported that the project could be operational as early as 2007; however, based on the results of our *study effort over the last year and the fact that there is not an immediate shortage of water, we believe the schedule laid out in Section 9.4 of the draft report represents a more reasonable, prudent, and deliberate approach for implementing a demonstration facility.*

3. **Section 5 states that "unit cost information and assumptions internal to Poseidon are considered confidential". Since this is a public water supply project involving public funds, all assumptions, designs, analyses and unit costs need to be provided for complete evaluation and assessment. It appears from the conclusions reached in section 8, that even in the very distant future (2030-2050), the unit cost of desalinated water in the Freeport area would stay at a relatively high cost of $4.00-$5.00 per 1,000 gallons. Figure 8-1 indicates that desalinated water would be more expensive than surface water even in 2060. Complete details on the technical design of the pre-treatment system, reverse osmosis desalination system, as well as post-treatment systems and their cost information need to be provided for evaluation. Please provide additional information on the various alternatives studied as well as the justification for the selected options in sufficient detail for a thorough evaluation.**

   Response: The proposed desalination facility will be a public-private partnership between the Brazos River Authority (BRA) and Poseidon. No federal, state, or local funds are intended to be directly used by Poseidon as the proposed owner of the desalination facility. Any public funding, similar to Tampa Bay Water's involvement with Southwest Water Management District's $85 million subsidy of the Tampa Bay Desal 25 mgd facility, is intended to go to the public entity and not to the private entity in the lowering of the gross whole cost of desalination. The BRA fully intends to closely scrutinize Poseidon's activities and negotiate a wholesale water purchase agreement with Poseidon at the appropriate time. See the response to item four of TWDB's Attachment A comments for additional information.

   A detailed description of the plant components along with an alternatives analysis is not part of the regional planning study scope of work. However, at TWDB's request, a description of the proposed facilities was submitted in the September 30, 2004, response from the BRA to the TWDB's Attachment A comments. A description was also incorporated into the final report text. Since no public funding is going directly to the full-scale desalination facility and no construction activity is proposed in the waters of the state, the alternatives analysis requirements of the National Environmental Policies Act will be limited.

4. **In Section 5, it is stated that the desalination plant could use "seawater, river water, or any mixture of the two sources". No technical information on the source water location or intakes is provided. This is not adequate detail for evaluation, because, according to the above statement, only (brackish) river water could potentially be used for the desalination plant, and if that occurs, the project would not address the goal of serving as a seawater desalination demonstration project. Full details are needed on the quantity of seawater that would be drawn daily as the source water for the desalination plant, the recovery ratio, the intake location, pipeline capacities, and associated engineering design of the intake(s) and the raw water pipeline.**

   Response: See the response to item seven of TWDB's Attachment A comments previously supplied on September 30.

   All water intake and discharge facilities are uptake structures from existing river water and seawater canal systems or discharge canal systems within the Dow Chemical complex. As such, the proposed new structures are not regulated as being in the waters of the state, and no Corps of Engineers 401/404 permitting activity and technology description or alternatives analyses related to these activities are to be provided. Please see the response to item four of TWDB's Attachment A comments for additional information and a site map. The desalination plant will be constructed with two separate intakes - one for river water and another for seawater. The plant pretreatment facilities will be designed to be able to process both river and seawater or a combination of the two. The reverse osmosis (RO) system will be equipped with high-rejection seawater membranes that can be used for desalination of both seawater and brackish water. When used for desalination of brackish river water, the RO plant will produce the same water quality and quantity at lower power and chemical costs, which is reflected in the overall cost of water. The build-in flexibility of using the desalination plant for processing both seawater and brackish water takes advantage of the lower source water salinity of the river water during periods of the year when river water is abundant.

5. **There is no mention of energy recovery in the report. In a desalination plant such as this one needing enormous amounts of energy, it would be necessary to provide energy recovery devices. This is especially important in this application because unit power costs are shown to be higher than at other proposed locations. An explanation is needed on why energy recovery devices have not been included in the report.**

Response: Please see the Project Description and associated Process Schematic included in our response to item seven of TWDB's Attachment A comments. As identified on the conceptual schematic, energy recovery devices such as the Pelton Wheel or the Positive Pressure Displacement system will be proposed, depending upon the technology current at the time of construction and the vendor warrantees available. The current standard for efficacy rating of a desalination plant using Gulf of Mexico water without surface water influence is 13 to 14 kwh/kgal and approximately 5 to 6 kwh/kgal on highly turbid surface water.

6. **The costs for a pilot plant are not included in this report. If the project proceeds to construction, please comment to what extent external firms would be interviewed and selected for operating the pilot plant, and to what extent Poseidon Resources (as owners of the desalination plant) would pay for the costs incurred in excess of the federal subsidy provided for the pilot project.**

   Response: Piloting was identified and recommended in the implementation plan laid out in the draft report. However, we have not yet fully evaluated the costs and logistics for piloting. We expect to begin this effort in November upon completion of the ongoing TWDB regional facility planning study effort.

7. **The report does not include a discussion of brine concentrate disposal, except to say that there are no concerns about brine disposal since there is no bay or estuary present (ES-2). While it is true that a bay is not present in this area, an estuary is present at the mouth of the Brazos River and there should be some discussion of potential environmental effects of brine disposal from the desalination plant. A discussion of the costs of brine disposal should also be included in the report.**

   Response: For permitting purposes, The Dow Chemical Company discharges directly to the Brazos Coastal Segment as defined in Section 201 by the TCEQ and as referenced in the Dow discharge permit. This clarification does not seek to change the permitting status nor comment on the formal determination of the estuarine status of the mouth and lower reach of the Brazos River other than acknowledge that the salt wedge travels well upstream depending upon the flow in the Brazos River. As described in the supplemental Project Description supplied in our response to the Attachment A comments, the proposed desalination facility will discharge to an internal point within the Dow discharge canal system before being blended with other seawater and process water for discharge to the Brazos River at the existing *discharge point 001. With the concurrence of the TCEQ, Poseidon expects to have a separate TPDES discharge permit regulated by the state and use the Dow discharge as a common outfall. The cost of brine disposal is the cost of installing the nominal pipe run between the facility location and the discharge canal along with the cost of permitting this activity. Please see the response to item two of the TWDB Attachment A comments for additional information on general project economics. Also see the Texas Parks and Wildlife comments for further information on the environmental impacts associated with this proposed activity.*

8. Please explain to what extent potential industrial customers for desalinated water have been evaluated as a means of increasing the initial size of the facility and lowering the unit cost of water.

Response: Potential Industrial customers including the site host, The Dow Chemical Company, have been considered during the planning effort. In addition to the four public meetings held specifically for the project, we have conducted other outreach and meetings in the study area. We have received some interest from the industrial community, but it seems that most potential industrial customers desire to see further development of the project before indicating specific interest. Therefore, rather than speculate on quantification of potential industrial demand in our report, we focused our efforts on more definitive municipal demand. However, we believe that there will be some industrial users that will materialize as the project proceeds toward implementation. We also feel that this project will indirectly benefit local industry in that it will relieve future pressure for additional water supply development from the river, which is heavily relied upon by industry.

9. In the Executive Summary is a statement that co-locating the seawater desalination facility at the Dow site and locating new pipeline facilities near existing pipeline corridors will reduce environmental impacts. However, the report does not specify where pipelines will be located, or information regarding source water intakes or alternative brine disposal sites. Therefore, there is inadequate information in this report to determine the proposed facility feasibility on the basis of environmental issues unless additional information is provided.

Response: The proposed desalination facility is a commercial proposal for a public-private partnership between the BRA and Poseidon Resources Corporation. No attempt has been made to provide substantive technical and commercial details of the site due to the proprietary nature of The Dow Chemical Company and its restricted access location under the Homeland Security Act. Final routing and description of construction techniques for the *proposed desalination plant within the Dow complex are not available to the public at this time. Any wetlands disturbance will be handled under the Corps of Engineers 401/404 nationwide permitting process. Any canal crossings will be handled by directional drilling techniques to avoid any disturbance to waterways.*

Routing for the BRA conveyance facilities will be within the public right of ways and will be handled within the nationwide permitting process of the 401/401 Corps of Engineers permitting process. The proposed pipeline alignments for each option considered are shown in Section 6 of the report.

Attachment C
Comments from Texas Parks and Wildlife Department

General comments regarding seawater desalination plants

Cooling Water Intake Structure rules, adopted under the Clean Water Act Section 316(b), already exist for power plants, and are anticipated for all other large facilities in the future. These rules will require certain facilities to use technology to minimize impingement and entrainment of larval and juvenile fish. These rules will be implemented in the TPDES permitting process.

Each of the facilities would have a pretreatment waste stream of relatively low volume, compared to a 25 MGD brine discharge. Having a low volume, this waste stream could go to a local wastewater treatment plant, or it could be commingled with the brine.

Facilities operating water pipelines typically periodically use some sort of antifouling chemicals to clean their lines. As part of the TPDES application process for brine disposal, the facilities would have to specify what they plan to use, to ensure that TCEQ can properly regulate to prevent environmental harm.

Freeport Proposal

There is very limited discussion of potential environmental impacts in this proposal. The proposal seems to have minimal impacts from pipelines based upon the use of existing routes. It is not clear whether there will be impacts that may require mitigation. The plan to collocate with DOW should help minimize environmental impacts. Even though the project sponsor intends to use DOW's intake and discharge permits both for freshwater and saltwater, they do acknowledge that they will need additional permits. Based on earlier discussion with the consultant and information presented in the proposal, the plan to discharge 25 MGD (ultimately 100 MGD) of brine in the Dow Canal should not cause significant environmental impacts. However, more information is needed to make a definitive statement.

Response: Both Poseidon and the Dow Chemical Company are familiar with the current and proposed 316(b) regulations as they pertain to power plants, large industrial facilities, and desalination facilities. As correctly noted above, the requirements for non-power plant applications are being promulgated along with a time line for their implementation. The Dow intakes are believed to be Level 3, while the uptake facilities for the proposed desalination facility have no pending *requirements. As a general rule, however, any environmentally sound method of prescreening raw river or seawater of biological material makes good business sense.*

As described in the response to item seven of the Attachment B comments, consultations with Dow and state representatives have indicated that the desalination facility will require a separate TPDES permit for disposal of twice-concentrated seawater (6 percent salt concentration) before commingling within the Dow canal system with industrial process water and seawater (3 percent salt concentration) and ultimate discharge to the lower Brazos River at Discharge Point 001 and adjacent to Discharge Points 002 and 003. A specific determination of the environmental acceptability of the proposed facility is not warranted at this time as final sizing of the facility (10 to 25 mgd) has not been established; however, expansion to the much larger 100 mgd system will be solely related to then current water demand, Dow activity and other industrial internal discharges to the Dow canal system at that time , and the acceptability of the proposed system to representatives of the state (TCEQ and Texas Parks & Wildlife) in a stakeholder- based permitting process delegated by the US EPA to the State of Texas.

Attachment D
Comments from the Water Treatment Engineering and Research Group of the United States Bureau of Reclamation

As noted in transmittal, there is very little technical information about the structure or operation of the desalination facility in this report

Response: Development of detailed technical information regarding the desalination plant was not part of the scope of work for the regional water facility planning study. However, additional technical information regarding the proposed plant has been provided in response to TWDB Attachment A and B comments.

Typically the entity that builds and owns a BOOT (Build Own Operate and Transfer) plant, which this plant appears to be, is selected by a competitive process. The selection criteria are dominated by the transfer price of the water. In the case of this plant, it appears that Poseidon has been preselected, or has preselected itself, which gives them an unusual degree for freedom in setting the cost of the water. One would have to wonder how the transfer price of the water was established, particularly since the cost information and assumptions are considered confidential (p.5-1).

Response: The proposed site location at the Dow facility in Freeport appears to the most feasible site for a seawater desalination facility within the Brazos River Basin, and Poseidon is currently working through a Memorandum of Understanding with The Dow Chemical Company for development of a seawater desalination facility at that site. The Authority does not intend to contract with Poseidon to construct the desalination plant. Rather, the Authority will consider entering a wholesale water contract to purchase water produced at the plant from Poseidon. This contract, including the price paid for water produced at the plant, will be intensely negotiated at the appropriate time. The pricing contained in the August 31, 2004, Preliminary Draft Report, Freeport Seawater Desalination Project, was proposed by Poseidon as indicative pricing for the purpose of the planning study effort. Ultimately, the wholesale water contract provisions and the price for water will have to withstand close scrutiny and must be acceptable to the Brazos River Authority and its customers. "The Authority and Poseidon are currently working through a Memorandum of Understanding to develop the project; however, there are no contractual arrangements in place at this time."

The stability of the finished water is critical to its effect on the existing and future distribution systems. However, not until the discussion of blending waters does a standard, such as the Langelier Index, appear.

In the discussion on blending waters (p.6-15), I would suggest that a difference of 0.5 in the Langelier Index (p. 6-15) is not trivial. However, not to worry about a difference of 0.5 and to worry about a difference of 0.51 is unusual.

Response: The decision to use a Langelier Index difference of 0.5 as the benchmark for judging water compatibility was based on the experiences and direction of a water quality expert at CDM. This number does not indicate an absolute trigger as much as a guidepost for interpreting the relevance of the modeling results. The value of 0.51 was provided simply as an indication of the maximum discrepancy found in our analysis and is not indicative of incompatibility.

The plant location has been selected as the site of the Dow Chemical Company plant, which extracts magnesium from seawater. The reject from the desalination plant, being about twice as concentrated in magnesium as the seawater feed, should therefore be attractive. The prospect of having an entity make use of the reject stream from a desalination plant is exciting. However, I did not find any reference to this in the report.

Response: The original Dow Chemical Company Plant A was sited along side the Gulf of Mexico in the late 1930's for extracting magnesium in the early 1940's. As such, massive seawater intake and outfall structures were developed and permitted to handle over a billion gallons per day of seawater for Plant A and Plant B operations. With the relatively inexpensive magnesium production from overseas sources, the Dow Chemical Company has ceased operations of magnesium oxide extraction facilities within the last decade. The prospect of reusing the twice concentrated seawater (6 percent salt) as a feedwater to the brine extraction process at Stratton Ridge is indeed exciting; however, the presence of bromide salts sharply reduces the attractiveness of this reject wastewater from the desalination facility for source water to the Chlor-alkalai operations at Dow.

It is not clear who would own the plant at the end of the contract period.

Response: As currently envisioned, provisions for plant ownership and continued operation at the end of the initial contract period will be a negotiated component of the wholesale water supply agreement between the BRA and Poseidon.

PLANT ECONOMICS DISCUSSION

Treatment Plant
Discussion of Financial/Economic Analysis Variables

A. Term of financing
- As identified in the Project's 2002 Statement of Interest, Poseidon contemplates the use of a project finance structure. The capital for the project will be a combination of long-term institutional fixed-rate debt and private equity. The financing will be non-recourse to the BRA, will be secured by the assets of the project, and is anticipated to be investment-grade rated. As the Private Activity Bond cap has been raised for water projects in sub ceiling 2, the project will use private activity tax-exempt bond allocation to the maximum extent available. The proposed term on permanent financing is 30 years.

B. Interest rates for cost analysis
- For a financing event two years from the date of this proposal, we are assuming a tax-exempt rate of 5 percent. Actual rate will be passed through at time of negotiation of the water services agreement.

C. Staffing costs
- These fixed and potential variable labor costs are included in the proposed capacity and commodity charges. We have assumed staffing of 12 personnel for the 10 MGD scenario.

D. O&M costs
- Fixed and variable operations and maintenance charges are built into the respective capacity and commodity charges. Additionally, all major maintenance and membrane replacements are assumed in the fixed price approach.

E. Transmission/delivery costs
- Transmission and delivery costs along the 1.3 to 2.5 mile pipeline to the Dow fence line are assumed in the all-in costs. Similarly, onsite storage of 2.5 million gallons for the 10 MGD scenario is based upon the operational needs of the desalination plant and is contained in the facility pricing. Conveyance by the BRA to BWA or other customers is the responsibility of the BRA.

F. Concentrate disposal costs
- All concentrate disposal costs, including pumping and transmission to the Dow discharge canal and outfall structure 001, are included in Poseidon's pricing.

G. Electrical power costs
- Power to the proposed project will be via the Dow Power system. As those negotiations are highly proprietary, we are not able to disclose the proposal rate information to the public.

H. Treatment of depreciation/replacement costs
- Facility- Because of the tax-exempt financing structure, the facility depreciation is extended to 30 years.
- Membranes – Depending upon river water or seawater usage scenarios, the expected life should be 5 years

I. Plant utilization for average unit cost
- For the nominal 10 MGD scenario, an availability in the range of 90-95 percent can be achieved using a 6 membrane train system and operating on 5 trains.

J. Treatment of inflation
- All costs are stated in $2004 dollars. Inflation is assumed to be 2.7%.

TREATMENT COST DETAILS

Freeport Seawater Desalination Project - Cost Breakdown for 100 % Intake Seawater

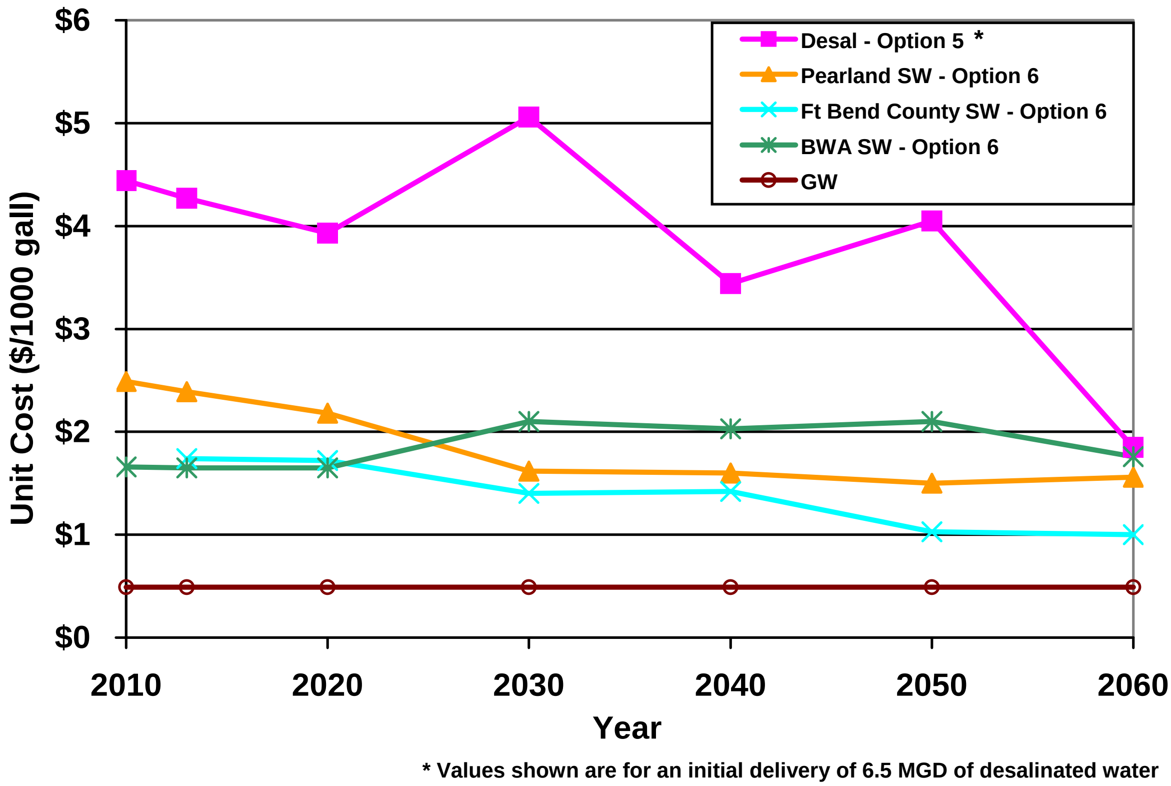
Plant Capacity = 10 MGD

Opeations and Maintenance Costs	**$/yr**	**$/1,000 gal**	**$/AF**	**Commodity $/1000 gal**	**Capacity $/1000 gal**
Chemicals =	$ 727,000	$ 0.20	$ 65	**$ 0.20**	
Membrane Replacement Costs =	$ 241,000	$ 0.07	$ 22		**$ 0.07**
Power Costs =	$ 2,602,000	$ 0.71	$ 232	**$ 0.71**	
Labor Costs =	$ 1,192,000	$ 0.33	$ 106		**$ 0.33**
Maintenance =	$ 777,000	$ 0.21	$ 69	**$ 0.11**	**$ 0.11**
Sludge Disposal =	$ 861,900	$ 0.24	$ 77		**$ 0.24**
Miscellaneous =	$ 403,000	$ 0.11	$ 36	**$ 0.08**	**$ 0.03**
Total O&M Costs =	**$ 6,803,900**	$ 1.86	$ 608		
Debt Service =	**$ 3,708,100**	$ 1.02	$ 331		**$ 1.02**
Total Seawater Desalination Cost =	**$ 10,512,000**	**$ 2.88**	**$ 939**	**$ 1.10**	**$ 1.78**

Cost Breakdown By Commodity and Capacity Charge

Capacity Charge =	$ 6,497,000	$ 1.78	580
Seawater Comodity Charge =	$ 4,015,000	$ 1.10	359
Total Seawater Desalination Cost =	**$ 10,512,000**	**$ 2.88**	**$ 939**

COSTS VERSUS TIME



PROJECT DESCRIPTION

The 10 MGD Freeport Seawater Desalination Project will be a reverse osmosis (RO) membrane water treatment facility located within the Dow Chemical Company industrial complex in Freeport, Texas on a proposed 10 acre greenfield site known as Oyster Creek East. The desalination plant will withdraw Gulf Coast seawater from the existing seawater intake system known as A801 across from the Port of Freeport or raw Brazos River water from the Dow water canal system, produce high-quality potable drinking water for transmission to the Brazos River Authority's (BRA's) proposed water conveyance system, and discharge the twice-concentrated seawater into the existing permitted Dow Freeport discharge canals and outfall No. 001 for dilution and discharge to the lower reach of the Brazos River and then into the Gulf of Mexico. The initial 10 MGD phase will have the capability to expand to 50 MGD in subsequent phases.

The design, construction and startup of the desalination plant facilities will be completed in accordance with prudent engineering and water industry practices using design and construction methods and criteria which are in compliance with all applicable federal, state, and local codes and regulatory requirements. The type and quality of materials used for facility construction and for critical process equipment and pipe systems will be selected to preserve structural and mechanical integrity, and performance over the entire term of the proposed 30 year Water Purchase Agreement with the BRA.

The point of interconnection (Delivery Point) of the desalination project with the BRA is at the Dow Freeport plant boundary line near State road 523 and 322 north of the Greenfield site in Oyster Creek. The BRA will be responsible for the permitting, design, construction and installation of the product water pump station/s and pipeline connecting the desalination plant to the respective distribution systems in Brazoria and/or Fort Bend counties.

INTAKE WATER

Water Sources

Source water for the desalination project will be lifted from the inland water way adjacent to the Port of Freeport and conveyed via a new lift station on an existing canal distribution system within the Dow Plant A complex. The desalination project will have two intakes – one for seawater and one for raw water from Dow's canal system off of the Brazos River. Depending on the availability of surface water from the Brazos River and any potential Minimum Instream Flow (MIF) restrictions, the plant will operate either on seawater or river water. Raw feed water will be pumped from the seawater and river water intake structures alongside the respective canal systems within Plant A and conveyed under the Dow Barge Canal through large diameter pipes to the proposed desalination plant site. For the 10 mgd scenario, the desalination plant will divert 22 MGD of seawater. Under a river water production mode, the facility with divert 19 mgd for production of potable water. To prevent growth of marine organisms in the seawater and freshwater intake systems, these systems will be equipped with provisions for disinfection of the raw water using chlorine.

Section B shows the location of the intake canals, the plant site, and the outfall areas.

Intake Water Quality

The primary source of feed water to the desalination plant is seawater. The desalination plant will be designed to process seawater of water quality specified in Table 1 and river water quality in Table 2.

TABLE 1
Key Design Intake Seawater Characteristics

Parameter	Design Minimum Value	Design Average Value	Design Maximum Value
Intake Seawater Flow, mgd	18	22	29
Salinity (TDS), mg/l	23,000	26,000	33,000
Chloride, mg/l	13,000	18,000	20,000
TOC, mg/l	3.5	5	8.5
pH	7.6	7.8	8.3
Oil & Grease, mg/l	Non-detectible	0.1	4
Temperature, ^{o}F	65	80	85
Turbidity, NTU	8	85	650
Total Suspended Solids, mg/l	2	72	200
Fecal Coliforms, #/100 ml	2	57	820

Note: All design characteristics are daily average values.

TABLE 2
Typical Intake River Characteristics

Parameter	Typical Minimum Value	Typical Average Value	Typical Maximum Value
Intake Flow, mgd (typ. 55% recovery)	16	20	24
Salinity (TDS), mg/l	325	495	875
Chloride, mg/l	75	85	220
TOC, mg/l	4	6	5
pH	7.0	7.6	8.2
Oil & Grease, mg/l	Non-detectible	<5	<7
Temperature, oF	65	80	85
Turbidity, NTU	3	40	150
Total Suspended Solids, mg/l	35	95	250
Fecal Coliforms, #/100 ml	2	88	220

Note: All design characteristics are daily average values.

PRODUCT WATER QUALITY

The desalination plant will supply product water at the Point of Delivery of water quality which will be in compliance with the regulatory requirements of the Safe Drinking Water Act and all state standards applicable to this project at the time of execution of the Water Purchase Agreement.

The product water quality will meet and exceed the water quality limits defined in the Total Coliform Rule (TCR), the Surface Water Treatment Rule (SWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), the Total Trihalomethane Rule (TTR), the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage

1 DBPR), and the Stage 2 Disinfectants/Disinfection Byproducts Rule (Stage 2 DBPR). Table 3 below presents key product water quality parameters.

TABLE 3
Key Facility Product Water Characteristics

Parameter	Water Quality
Product Water Flow, MGD	8 to 12 (avg. of 10 MGD/11.200 AF/yr)
Total Dissolved Solids (TDS), mg/l	350-400
Hardness, mg/L as $CaCO_3$	40 to 100
THMs (ug/L)	10 to 40 (less than 80 at all times)
HAAs (ug/L)	1 to 30 (less than 60 at all times)
Turbidity, NTU	0.1 to 0.3 (less than 1 at all times)
TOC, mg/l	0.5 to 1.5 (less than 3 at all times)

Note: Product Water quality will be maintained pursuant to Monitoring, Sampling and Reporting Requirements to be defined in a Water Purchase Agreement.

All water quality analyses will be completed according to the testing procedures described in the Standard Methods for Examination of Water and Wastewater, latest EPA approved edition.

PRETREATMENT SYSTEM

Due to the high suspended solids content of the seawater and river water, the pretreatment system will include a combination of high-rate sedimentation followed by either two-stage gravity sand-media filters or membrane filtration systems. Chemical feed systems for addition of coagulant, such as ferric chloride or ferric sulfate, and for filter polymer feed are included to enhance the operation of both the high-rate sedimentation process and the filters as needed, to provide the required quality and quantity of water to the RO process. There are a variety of filtration systems and technologies available that can meet the feed water requirements to the RO process. The preferred pretreatment filtration technology to be used will be determined during the design phase of the project.

The final phase of pretreatment will be cartridge filtration. The filter cartridges will be industry standard 5-micron polypropylene wound filters housed in pressure vessels. These pressure vessels will be located in the RO feed water piping between the pretreatment and RO processes.

Intake Water Chlorination/De-Chlorination

The seawater and the Brazos River intake water (when fresh water is used) will be chlorinated intermittently to minimize microbiological growth on the filter media. Any chlorine remaining in the filter effluent water can damage the RO membranes due to membrane oxidation. To protect the RO system, the pretreatment filter effluent will be de-chlorinated using sodium bisulfite.

Intake Seawater pH Adjustment

The RO feed water would be treated with sulfuric acid as necessary to reduce the potential for scale formation in the RO process. The specific amount of acid will be determined based on the allowable concentration of sparingly soluble salts and Stiff & Davis Index (S&DI) of the RO concentrate. Addition of acid also creates carbon dioxide in the RO permeate (product water) which is needed to react with the lime for product water stabilization in the permeate post-treatment process.

RO TREATMENT FACILITIES

The RO treatment process will incorporate a single-pass design using industry standard 8-inch diameter, high-rejection seawater membrane elements. The RO treatment system will separate the pretreated and conditioned intake seawater in two streams: permeate, which is desalinated water of low salinity (350 to 400 mg/L of total dissolved solids); and concentrated seawater with salinity nearly two times higher than the intake seawater salinity (typically up to 66,000 mg/L TDS).

For the 10 mgd scenario, the RO system will consist of six (five duty and one standby) process trains, and each train will have a design capacity of about 2.0 million gallons per day (mgd). The facility will be designed to produce 10 MGD of potable water using five RO trains only. The sixth RO train will be provided as a standby to be used when any of the other trains undergoes maintenance/upkeep activities. This arrangement provides for approximately 20 percent standby capacity, which will to ensure continuous water delivery with normal membrane wear and maintenance requirements.

Each RO train will be designed to operate independently from the other RO trains. A representative train feed pump will consist of a combination of low-pressure pretreatment filter filtrate transfer pump, followed by a high-pressure pump in series. The low-pressure transfer pumps will convey water from the pretreatment filter effluent wetwell to the suction pipe of the high-pressure RO pumps, which in turn will pump the filter effluent through the RO membranes. Each dedicated pump system will deliver water at feed pressures ranging from 600 to 950 psi. If a blend of fresh and seawater is used, the feed pressures and associated power use will be lower. The actual feed water pressure depends on several factors including temperature and salinity of the intake water, and the age of the membranes, but could be as low as approximately 250-psi. The low-pressure filter effluent transfer pumps will be equipped with variable frequency drives to improve energy efficiency and to provide pressure control over a wide range of feed water quality and membrane conditions. A large amount of residual pressure resides in the concentrated seawater leaving the RO process. To further improve energy efficiency, the high-pressure pumps capture this pressure since they will be equipped with energy recovery devices.

Ancillary RO support equipment will include a membrane clean in-place (CIP) system which allows in-situ cleaning of each membrane array, and a system flush tank to remove high TDS feedwater from the feed/brine channel of the membrane elements during shutdown operations.

The facility will be equipped using state-of-the art control architecture for supervisory control and data acquisition (SCADA). Instrumentation and controls systems will utilize a combination of programmable logic controllers (PLCs) and integrated operator interface consoles (OICs) located in the plant operations control room.

POST-TREATMENT FACILITIES

Product water from the RO process (permeate) requires chemical conditioning for stabilization prior to delivery to the distribution system. Stabilization will be accomplished by increasing the hardness level and reducing the permeate's corrosion potential. Lime and carbon dioxide are planned to be utilized for this post-treatment stabilization of the product water. The product water will also be disinfected prior to delivery to the BRA distribution system. Chlorine, in the form of sodium hypochlorite, will be added as a disinfectant to meet all applicable product water quality standards and regulations for potable water disinfection. Ammonia may also be added if product water chloramination is required to match existing disinfection practices.

CHEMICAL USAGE AND STORAGE

The plant water treatment chemicals will be delivered by trucks. On average, one truck per day will be delivering chemicals to the site. Process chemicals will be of high quality ("food" grade) and approved by the National Safety Foundation (NSF) for potable water production application.

All storage and containment equipment will be designed and constructed using the appropriate engineering standards and will meet all Occupational Health and Safety Administration (OSHA) and United States Environmental Protection Agency (US EPA) regulations. The layout of the chemical facilities will be such that the risk of chemical interaction is greatly minimized.

PRODUCT WATER STORAGE TANK AND PUMP STATION

The plant on-site product water storage and transfer facilities will include:

- One product water pump station;
- One 2.5 -million gallon permeate storage reservoir;
- One flow quantification meter and water quality sampling station at the point of delivery located at the Dow property fence line/delivery point.

The product water pump station will be equipped with three pumps (two duty and one standby) equipped with high-efficiency motors. All of the pumps will have average/maximum unit capacity of 5 MGD/6 MGD and their motors will be controlled by constant speed drives. The pumps are high volume/low pressure units designed to deliver product water at the desalination plant boundary line at 15 to 20 psig.

DISCHARGE

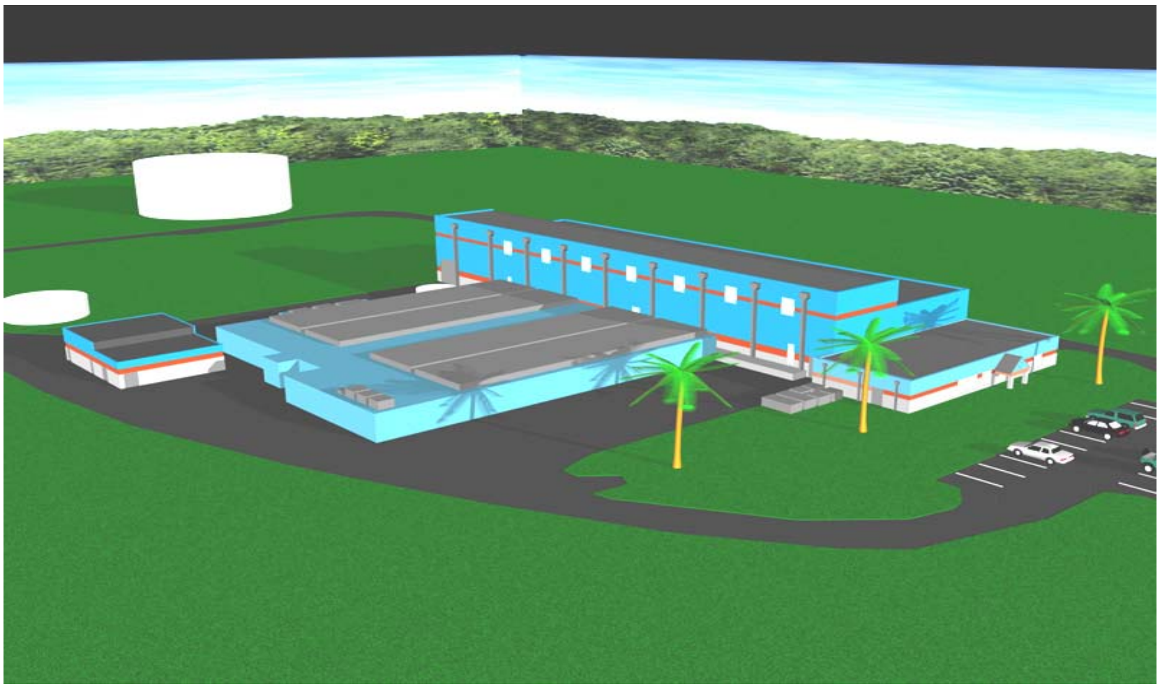
The Dow Plant A complex discharge into the Brazos River discharge point 001 within the Plant B complex northwest of the proposed site under a TCEQ approved TPDES discharge permit. Consultation with the site host indicated that sufficient flow exists to accommodate the twice concentrated sweater discharge amongst the existing industrial process and seawater discharge into the Brazos river leading directed to the Gulf of Mexico. Upon signing of a water purchase agreement, Poseidon will release full permitting of the seawater desalination facility for seawater and river modes.

STAFFING

Approximately 12 full-time personnel will staff the plant. The staff will include management, operators, maintenance, and administration/support personnel. In addition to the full-time employees, some outside contracting of part-time time staff is expected for specialized services for electrical, instrumentation and mechanical maintenance or other specialized support. The plant will be staffed 24 hours per day, 365 days per year. Operations personnel will be qualified and licensed as required by the State of Texas for a potable water treatment facility. The estimated number of staff on duty during regular working hours Monday through Friday will be five to six. A minimum of two people will be on duty during the swing and graveyard shifts and weekends.

DESALINATION FACILITY STRUCTURE

The desalination equipment will be housed in an aesthetically pleasing, industrial grade tilt up concrete or Butler building type structure with administration complex. Options for a Center for Membrane Research are being considered as an adjoining building. A conceptual drawing of the facility is presented below.

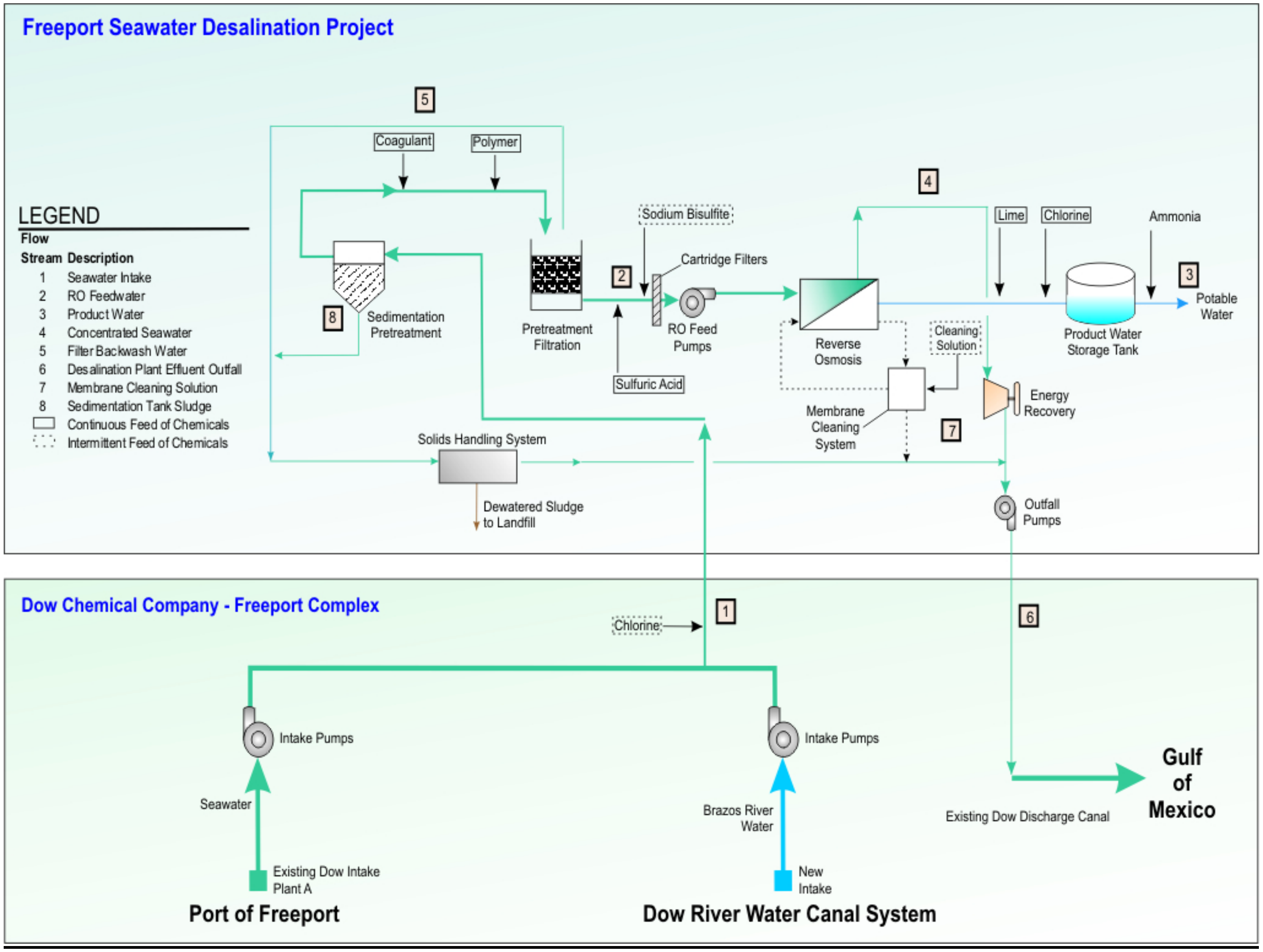


Concept Drawing of 10 MGD Seawater Desalination Facility in Freeport, Texas

SITE DISTANCE

SITE DETAILS

PROCESS SCHEMATIC



Brazoria County
Conservation and Reclamation District No. Three

P. O. BOX 789
ALVIN, TEXAS 77512-0789

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1318 ROSHARON ROAD

TWDB
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AUG 20 2004

ROUTE TO: ________

CCTO: KW, BM, JA, WR

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Ward:

The Brazoria County Conservation & Reclamation District No. Three supports Velasco Drainage Districts proposal or request that other alternatives to the Freeport Seawater Desalination plant/project be considered. We agree that the proposed public-private partnership between the Brazos River Authority (BRA) and Poseidon Resources, if analyses are true, will create more social infrastructure problems than the single issue of increased demand for drinking water.

Therefore, assuming the population growth does occur as predicted, this Board agrees with what we feel would be a more practical (and more fiscally responsible) solution of drink water source: to capture and re-use water for drinking.

Sincerely,

Ricky Kubeczka, Commissioner

Charles E. Knight, Commissioner

David Kocurek, Commissioner