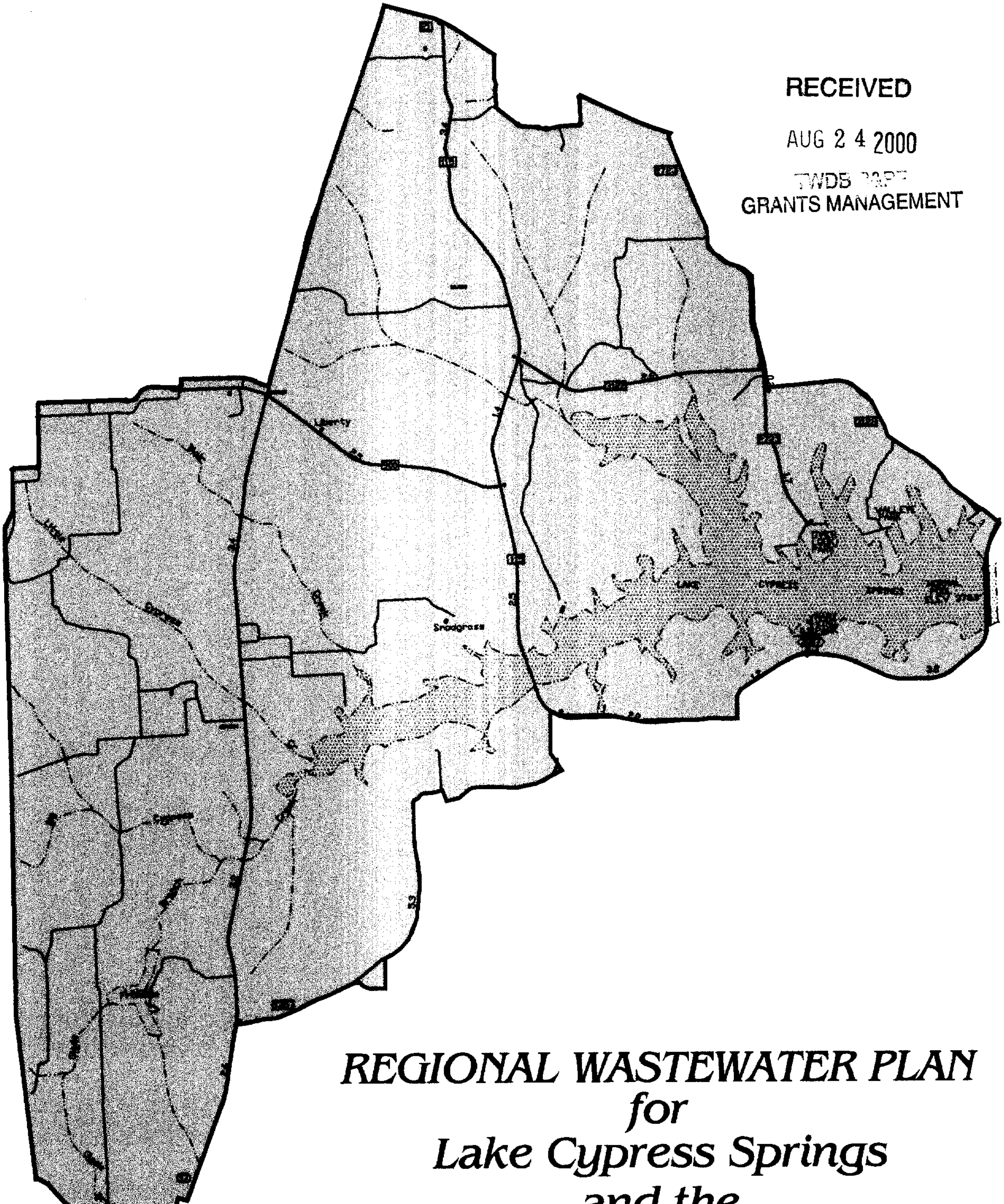

REGIONAL WASTEWATER PLAN for Lake Cypress Springs and the Franklin County Water District

REGIONAL WASTEWATER PLAN
for
LAKE CYPRESS SPRINGS
and the
FRANKLIN COUNTY WATER DISTRICT

Development of this Plan funded by the
FRANKLIN COUNTY WATER DISTRICT
and the
TEXAS WATER DEVELOPMENT BOARD
Prepared by:
Hayter Engineering, Inc.
March, 2000
(Revised 7/7/00)

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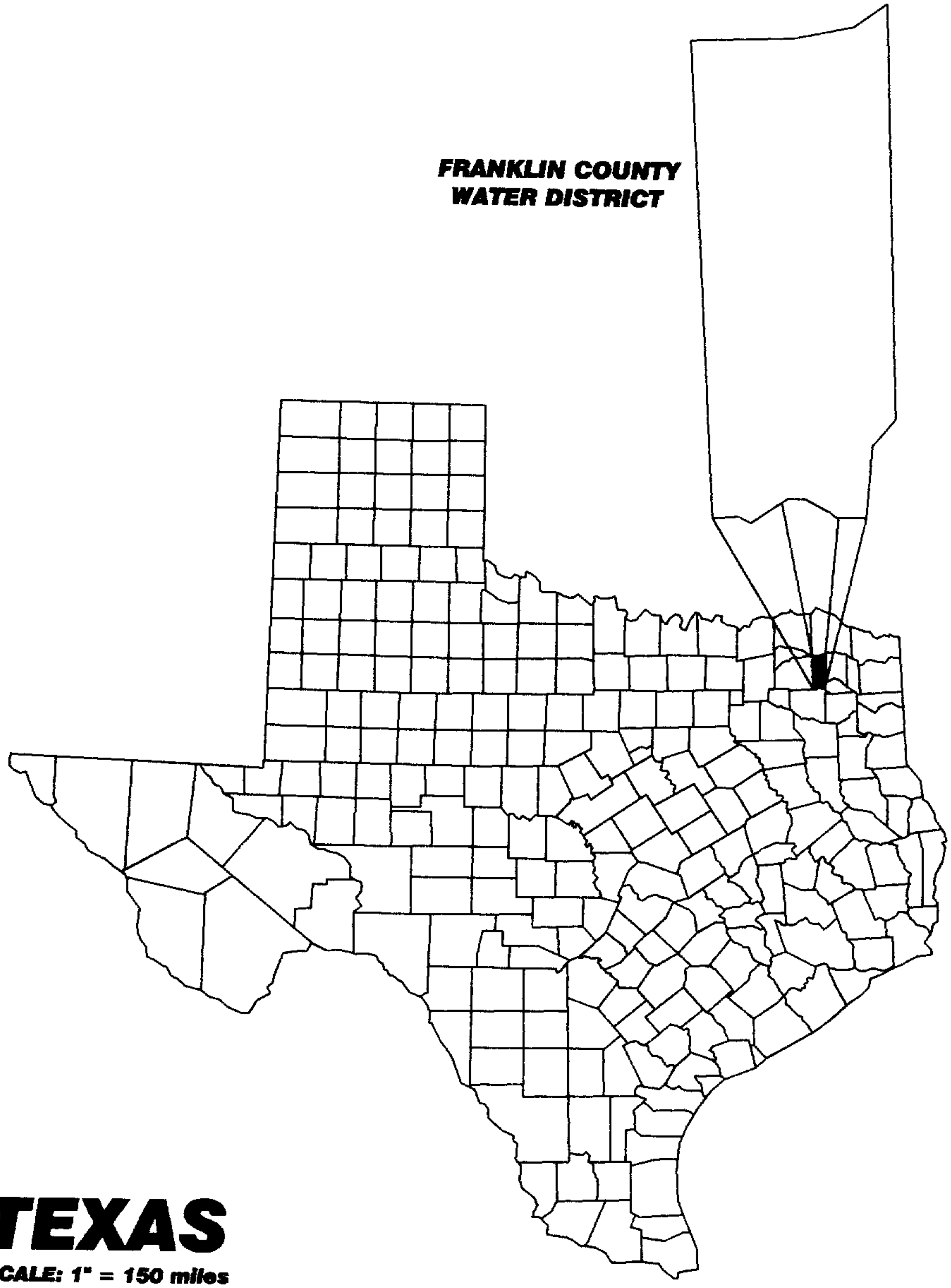


FIGURE 1
VICINITY MAP
FRANKLIN COUNTY
WATER DISTRICT

INTRODUCTION

Introduction

The Franklin County Water District is a Water and Conservation Reclamation District, created in 1965, to provide a water supply for the Franklin County area. The District's boundaries are coterminous with those of Franklin County. The District, together with the Texas Water Development Board, financed and constructed Lake Cypress Springs and the Franklin County Dam. These same entities are now cooperating in the development of this wastewater plan.

The lake is located in Franklin County in northeast Texas, south of Interstate 30. The nearest incorporated areas are the cities of Mt. Vernon and Winnsboro. Lake Cypress Springs is located on Big Cypress Creek, near the headwaters of the Cypress Basin.

Cypress Springs was authorized for construction in 1966, and impoundment began in 1970. The reservoir capacity at normal elevation is 72,800 acre-feet at 378.0 feet above MSL, with a surface area of 3400 acres. At the emergency spillway crest elevation of 385.0, the reservoir covers 4500 acres and impounds 100,400 acre-feet. The reservoir has a drainage area of 75 square miles. The dam is 5230 feet in length, with a maximum height of 74 feet.

Today, Cypress Springs is utilized heavily as a recreational resource, and serves as the raw water supply for the cities of Winnsboro and Mt. Vernon, the Cypress Springs Water Supply Corporation, and the M & W Recreational Facility (a golf course). Information on these wholesale customers is as follows:

	1998 Persons Served	1998 Contract Rights	Contract Expiration	1999 Actual Purchase (ac-ft)
City of Mt. Vernon	2417	3000 ac. ft.	2025	661.31
City of Winnsboro	3323	5000 ac. ft.	2025	918.12
Cypress Springs WSC	9072	3500 ac. ft.	2025	900.79
M & W Recreation	—	210 ac. ft.	2016	88.44
Unallocated		0 ac. ft.		

The District owns lands bordering the lake, generally, up to elevation 385. These are used for park purposes, and for leaseback to private development interests. To date there are 6 District operated parks around the lake – Dogwood, Mary King, Jack Guthrie, Overton, Walleye, and Twin Oaks. These include boat ramps, RV sites, public restrooms, swimming areas, baseball, tennis, picnic and camping areas. There are two privately operated marinas. Residential developments surround the lake, some of the larger being Tall Tree, Kings County, and Pine Valley.

The Franklin County Water District completed purchasing the Texas Water Development Board's share of the reservoir in 1997, and now administers the entire project. In addition to wholesale contracts and water rights issues, the District operates the public parks, maintains the dam, polices the lake, administers leaseback arrangements, regulates on-site waste disposal systems in the watershed and is responsible for overall water quality and operation of the reservoir.

In connection with these last mentioned duties, the District has authorized this report to determine if there is, or will be, within a 20 year planning period, a need for centralized wastewater collection and treatment facilities to replace on-site disposal systems in the area around the reservoir. The planning area is shown on Figure 2.

This regional wastewater plan consists of ten tasks, as described in the study application. The goal of these tasks is to determine what steps the Franklin County Water District (FCWD) should take to address present and future wastewater needs. Possible outcomes may be that no action is needed, that a district-wide wastewater collection system should be considered, or some action in-between these extremes.

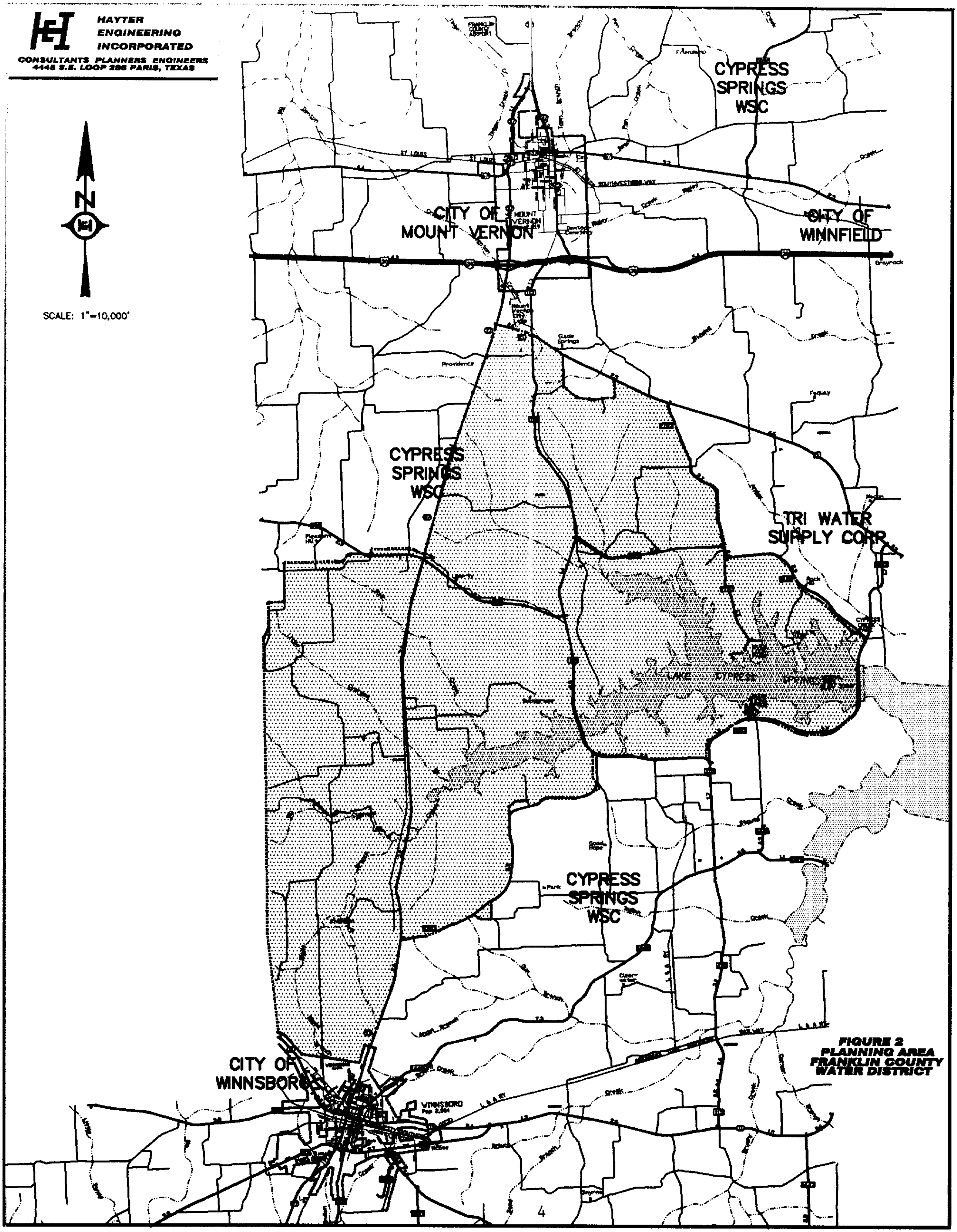
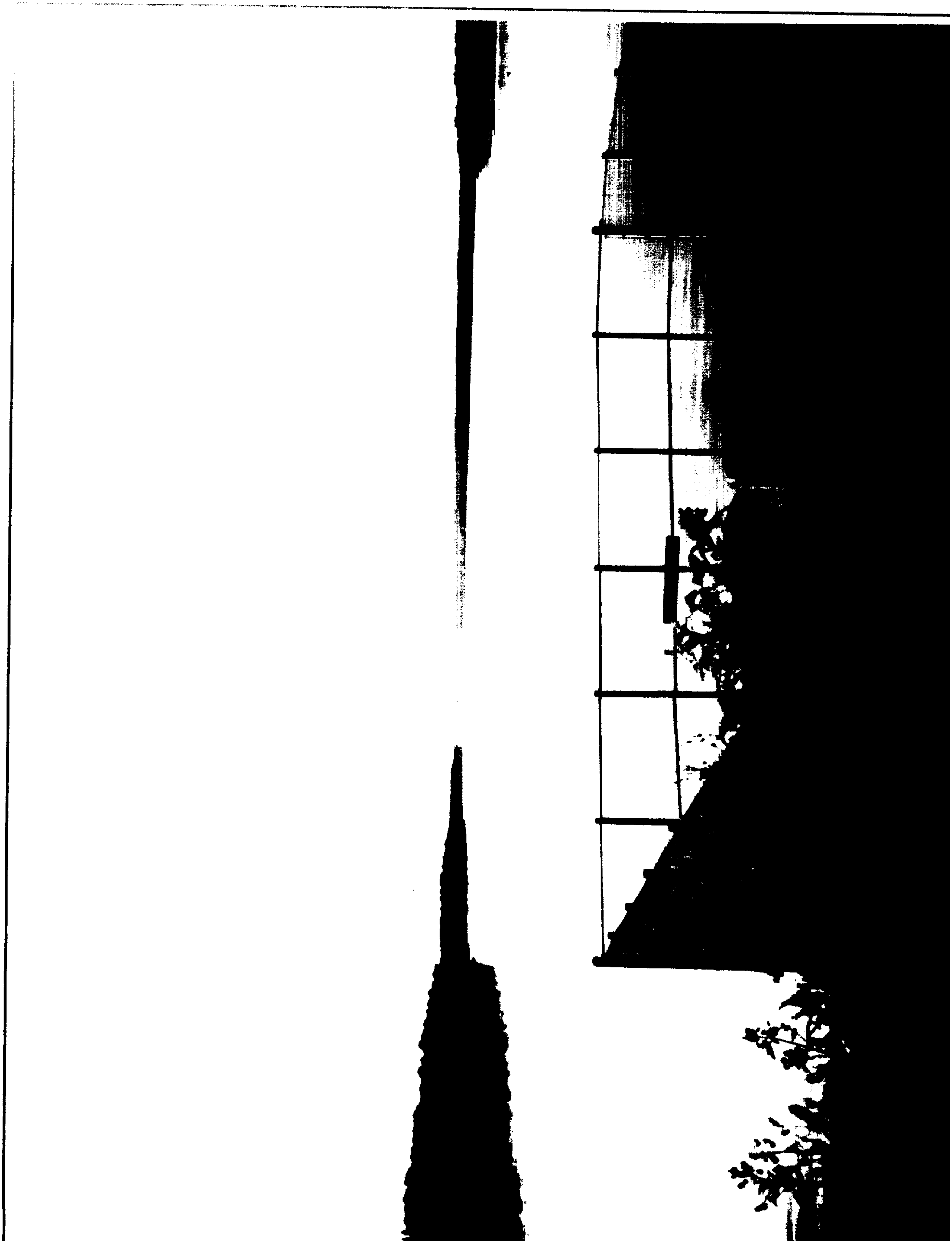


FIGURE 2
PLANNING AREA
FRANKLIN COUNTY
WATER DISTRICT

CHAPTER 1



Chapter 1 – Determination of Current Population

The goal of Task I is to develop accurate estimates of current population in the planning area, to zone the planning area according to population densities, and to determine the percentages of full-time and part-time residents. To achieve this goal, data was collected from the 1990 U.S. Census, Cypress Springs Water Supply Corporation, the Texas Water Development Board, Wood County Electric Co-op and Southwestern Electric Power Corporation (SWEPCO).

One accepted method for obtaining a current population count of a planning area is to determine the number of residential water meters in use. In August 1998, a count of residential water meters in the planning area was obtained from Cypress Springs WSC. This count included all residential meters in the area and accounted for one apartment complex, which has four units but only one meter. This count revealed 1,754 residences in the planning area.

All of the planning area is in the service area of CSWSC, but not all residences in the planning area use water supplied by CSWSC. According to the 1990 census, 15% of residences in the planning region use private wells rather than the public water supply system. To account for this, the water meter estimate was increased by 15%.

1754 x 1.15 = **2017 RESIDENCES IN THE PLANNING AREA**

In addition to water, all residences have electricity. Therefore, an analysis of electric meters was performed to check the accuracy of the water meter count. SWEPCO and Wood County Electric both serve the planning region. A count of residential electric meters in the planning area was obtained from both.

From analysis of these counts, it was determined that meters serving barns, workshops, personal offices, campers, etc. make up about 8% of the total count. These were excluded from the residential totals. SWEPCO was found to serve 1351 residential meters and Wood County Electric 745.

1351 + 745 = **2096 RESIDENCES IN THE PLANNING AREA**

The water and electric meter totals compare very closely, the difference between the two being only 2%. Therefore, the totals were averaged and the final number of residences in the planning area estimated at **2,057**.

This is an increase of 593 residences since 1990 when the census counted 1,464 homes.

To determine the number of residents in the planning area, it was necessary to estimate the number of residents per household. According to the 1990 census, there were 1464 total homes in the planning area in 1990. Of these homes, owners or renters occupied 657. The remaining 807 homes were considered "vacant." Vacancy status means that the residence is for rent, for sale, rented or sold but not occupied; used seasonally (summer homes, hunting cabins, etc.); or used by migrant workers. The total population in 1990 was 1,641 persons. If these full-time occupants are divided among occupied homes, the result is as follows:

1641 / 657 = **2.498 PERSONS PER HOUSEHOLD.**

This compares favorably with other studies of household size in northeast Texas. Assuming that this "persons per household" number is the same in 1998, we can multiply the current number of households by 2.498 to get the total population count (full-time and part-time).

2057 x 2.498 = **5138 TOTAL PERSONS IN THE PLANNING AREA**

The percentage of part-time and full-time residents can then be estimated by straight-line interpolation:

$$\frac{\text{TOTAL OCCUPIED (1990)}}{\text{TOTAL HOMES (1990)}} = \frac{\text{TOTAL OCCUPIED (1998)}}{\text{TOTAL HOMES (1998)}}$$

$$\frac{657}{1464} = \frac{X}{2057}$$

X = 923 OCCUPIED HOMES IN PLANNING AREA (1998)

This is an increase of 266 homes occupied by full-time residents since 1990.

923 x 2.498 = **2306 FULL TIME RESIDENTS IN PLANNING AREA**

The full-time population of the planning area has increased by 40% since 1990.The TWDB population estimate for year 2000 for Franklin County is 9242 persons of which 5835 are "County other" – not in Mt. Vernon or Winnsboro. Therefore, the planning area population represents 40% of the "County other" population. The County contains 294.7 square miles, and the planing area 9.3 square miles, or 3% of the geographic area. 40% of the population being in the planning area may seem disproportionate – the remainder of the County, however, is rural and sparsely populated. For example, as late as 1997 North Franklin WSC served 50% of the unincorporated areas (virtually the entire County north of I-30) with only 512 meters (1270 people). The "County other" population is heavily concentrated in the planning area around Lake Cypress Springs.

Total Residents – Full Time Residents = Part Time Residents

5138 – 2306 = **2832 PART TIME RESIDENTS IN PLANNING AREA**

2306 / 5138 = **45% FULL TIME RESIDENTS IN PLANNING AREA**

2832 / 5138 = **55% PART TIME RESIDENTS IN PLANNING AREA**

According to information from the Texas Department of Housing and Community Affairs, these percentages are appropriate for places such as college towns, cities with military bases and areas with part-time recreational users, such as this planning area.

In order to organize the planning region by density zones, the U.S. Census was consulted. The planning area was divided into 7 zones. The boundaries of these zones correlate with census block boundaries, as well as major roads and creeks. Seven zones were created so that the sizes would be small enough to be useful later in the planning process. For instance, if different drainage basins or different sides of roads become considerations for sewer system locations, these zones will be helpful in determining population densities.

Zone A includes the south shore of the reservoir, south to FM 3007, which is the southern border of the planning area. The area drains into the reservoir itself. The eastern end of Zone A is about 50% residentially developed – the western end of the zone remains primarily agricultural. For this reason, Zone A was further subdivided as A_1 (east of FM 115) and A_2 (west of FM 115). Mary King and Dogwood parks are in Zone A. Major residential developments include Deer Cove, Eldorado Bay, Whispering Pines, and Pine Tree.

Zone B includes that area west of State Highway 37, and south of Big Cypress Creek. The zone drains into Big Cypress, upstream of the reservoir. Land use in Zone B is primarily agricultural. Because it is not contiguous to the reservoir, there is little residential development underway.

Zone C includes that portion of the planning area west of State Highway 37, and north of Big Cypress Creek. Zone C also drains into Big Cypress upstream of the reservoir. The zone is primarily agricultural – little or no residential subdivision type development is underway.

Zone D includes the planning area east of State Highway 37 and south of FM 900. The area drains into the upper end of Lake Cypress Springs. The zone is approximately 40% timbered and largely undeveloped, but residential developments are beginning along the north shore of the reservoir, and along the west side of FM 115. This zone includes Northshore Development. Portions of Lake Cypress Springs adjoining Zone D are shallow – no more than18 feet in depth. There are 6 to 8 poultry houses located in Zone D.

Zone E encompasses the north shore of the reservoir, east of FM 115. The area drains directly into Lake Cypress Springs. Zone E encompasses the primary residential area of the lake, and is about 50% developed. Developments include Kings Country, Tall Tree, Holiday Retreat, and Eagle Point. Undeveloped portions of Zone E are in timber and/or pasture. Both marinas, and 3 of the District's parks are in Zone E. Zone E has the longest shoreline of any of the planning zones.

Zone F includes the area north of FM 3122 up to FM 21. This area drains via Frog Creek to the Panther Creek arm of the reservoir. Zone F is primarily agricultural, with substantial timber and only one residential subdivision, Tres Lagos. There are 15 to 20 poultry houses in Zone F.

Zone G lies between FM 115 and State Highway 37, and extends from FM 900 north to Mt. Vernon. The area is predominantly pasture, with perhaps 20% timber cover. Zone G drains predominantly into Panther Creek, and thence into the Panther Creek area of the lake.

Figure 3 segregates the planning area into zones, marked A-G, and labeled with appropriate ranking numbers according to population density. #1 is the most densely populated area and #7 is the least densely populated. The total number of full-time residents was calculated as described above, for each zone. The number of residents was then divided by total zone acreage to determine persons per acre, or population density. Table I shows these totals. Population densities were compared to a recent aerial photo of the planning area and appear to correlate well.

TABLE I
FULL TIME RESIDENTS PER ACRE

Zone	Number of Full-Time Residents	Total Acres in Zone	Persons per Acre	Population Density Ranking: (1-most dense to 7-least dense)
A	498	761.02	0.654	2
B	220	1003.6	0.219	5
C	226	1230.6	0.184	6
D	134	848.65	0.158	7
E	668	581.71	1.148	1
F	226	707.57	0.319	4
G	332	833.11	0.396	3
All	**2304**	**5966.31**	**0.368**	**NA**

Figure 3 and Table I show the density for full-time residents only. Figure 4 shows population density for both full-time and part-time residents (See also, Table II).

TABLE II
FULL-TIME AND PART TIME RESIDENTS PER ACRE

Zone	Number of Full Time and Part Time Residents	Total Acres in Zone	Persons per Acre	Population Density Ranking: (1-most dense to 7-lease dense)
A	1214	761.02	1.588	2
B	462	1003.6	0.460	5
C	430	1230.6	0.349	7
D	424	848.65	0.499	4
E	1988	581.71	3.418	1
F	587	707.57	0.830	3
G	351	833.11	0.421	6
All	**5456**	**5966.3**	**0.914**	**NA**

Both of these figures show the most densely populated areas to be around the south and northeast shore of the lake. (Areas A and E)

Based upon 2.48 persons per residence, Tables I and II also provide the population density in persons per acre.

Population

Population projections through the year 2020 are available from the Texas Water Development Board. These projections have recently been reviewed and confirmed by consultants working for the Northeast Texas Water Planning Group, charged with developing a 50-year water plan for 19 counties in northeast Texas.

As shown in Table III, the planning area is projected to increase in population from 2306 persons in 1998, to 3107 persons by year 2020. This projection is based on the TWDB projection for "Franklin County other", and anticipates that the planning area population will be 40% of the "County other".

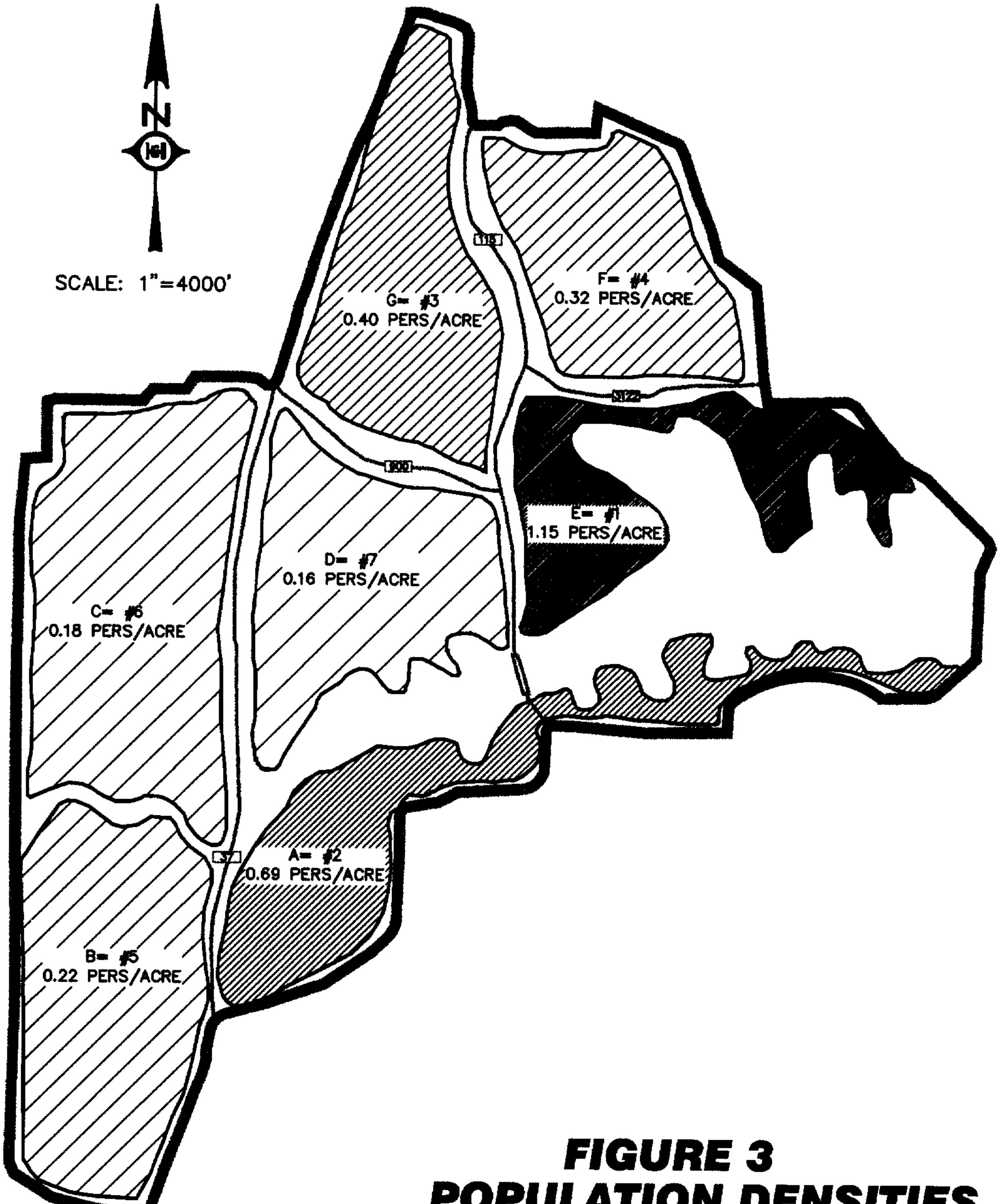


FIGURE 3
POPULATION DENSITIES FOR FULL TIME RESIDENTS FRANKLIN COUNTY WATER DISTRICT

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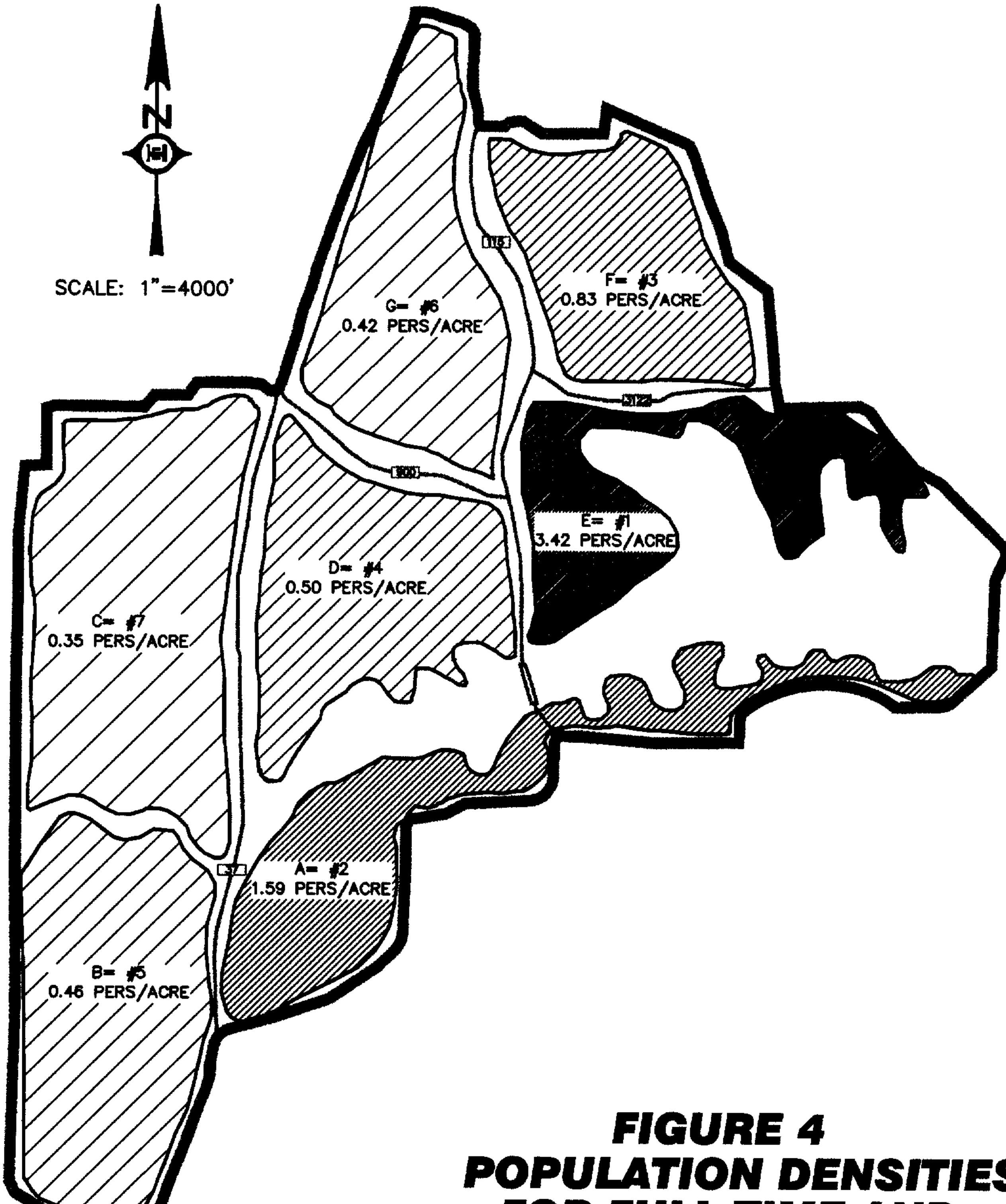

FIGURE 4
POPULATION DENSITIES FOR FULL TIME AND PART TIME RESIDENTS FRANKLIN COUNTY WATER DISTRICT

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TABLE III
Franklin County Water District
Past Population counts from U.S. Census
Population Projections from Texas Water Development Board

Entity	1940	1950	1960	1970	1980	1990	1998	2000	2010	2020
Franklin County	8378	6257	5101	5291	6893	7802		9242	10760	12263
Franklin County Other				3756		4912	5650	5835	6826	7805
Winnsboro	2092	2512	2675	3064	3458	2904		3259	3580	3831
Mt. Vernon	1443	1433	1338	1806	2025	2219		2631	3031	3428
Planning Area							2306	2349	2726	3107

Table IV and V show a distribution of the future population within the 7 planning zones. The current percent of the planning area population in each zone has been applied to the projected total planning area population to arrive at these projected zone populations.

TABLE IV

	Current			2000			2010			2020		
Zone	Full Time Residents	Acres	Persons/ Acre	Full Time Residents	Acres	Persons/ Acre	Full Time Residents	Acres	Persons/ Acre	Full Time Residents	Acres	Persons /Acre
A	498	761	0.69	508	761	0.67	589	761	0.77	671	761	0.88
B	220	1004	0.22	224	1004	0.22	261	1004	0.26	296	1004	0.29
C	227	1231	0.18	230	1231	0.19	268	1231	0.22	305	1231	0.25
D	134	849	0.16	137	849	0.16	158	849	0.19	180	849	0.21
E	669	582	1.15	680	582	1.17	790	582	1.36	902	582	1.55
F	226	708	0.32	231	708	0.33	267	708	0.38	305	708	0.43
G	332	833	0.40	339	833	0.41	393	833	0.47	448	833	0.54
Total	**2306**			**2349**			**2726**			**3107**		

Example Calculation $\frac{2349}{2306} = 1.02\%$ 1.02% x 498 = 508 people

TABLE V

	Current			2000			2010			2020		
Zone	Full/Part Time	Acres	Persons/ Acre	Full/Part Time	Acres	Persons/ Acre	Full/Part Time	Acres	Persons/ Acre	Full/Part Time	Acres	Persons/ Acre
A	1214	761	1.59	1238	761	1.63	1433	761	1.88	1639	761	2.15
B	462	1004	0.46	471	1004	0.47	545	1004	0.54	624	1004	0.62
C	430	1231	0.35	439	1231	0.36	507	1231	0.41	581	1231	0.47
D	424	849	0.50	433	849	0.51	500	849	0.59	572	849	0.67
E	1988	582	3.42	2028	582	3.49	2346	582	4.03	2684	582	4.61
F	587	708	0.83	599	708	0.85	693	708	0.98	792	708	1.19
G	351	833	0.42	358	833	0.43	414	833	0.50	474	833	0.57
Total	**5456**			**5566**			**6438**			**7366**		

Example calculation: Assume part time/full time ratio remains constant throughout planning period from Table IV $\frac{2349}{2306} = 1.02\%$ 1214 x 1.02% = 1238

CHAPTER 2

Chapter 2 – Per Capita Usage

The goal of Task II was to develop per capita water usage and wastewater contributions for the planning zones. To accomplish this task, Cypress Springs WSC was consulted, since their service area encompasses the planning area. Meter books were reviewed for the months of July 1998, a peak month, and December 1998, an off-peak month. The number of water meters in each individual zone was determined, as well as the total gallons of water sold. These totals were used to determine per capita water use in each zone.

The planning area contains a number of large poultry operations, and dairies. While these are substantial water users, they would not be significant contributors to wastewater flows. Thus, as shown in Tables VI and VII, zone total water sales were adjusted to account for non-domestic flows. Generally, this involved excluding any individual meters registering over 40,000 gallons/month.

The highest total water use in both the peak and off-peak month occurred around the south and northeast shores of the lake. Zone E had the highest total water use in both July and December 1998, which is expected since this zone also has the highest full-time and part-time population. Zone B had the highest per capita water use in both July and December, at 116 gpcpd and 61 gpcpd, respectively. Zone C had the lowest total water use in July, and Zone D had the lowest total use in December, as well as the lowest full-time population. The lowest per capita use in July occurred in Zones C and G at 43 gpcpd, and in December in Zone D at 23 gpcpd.

In general, the total water use rankings in July and December correspond with total zone population. Figure 5 is a map depicting per capita water use from high to low among the seven zones in July. Figure 6 shows December's per capita use.

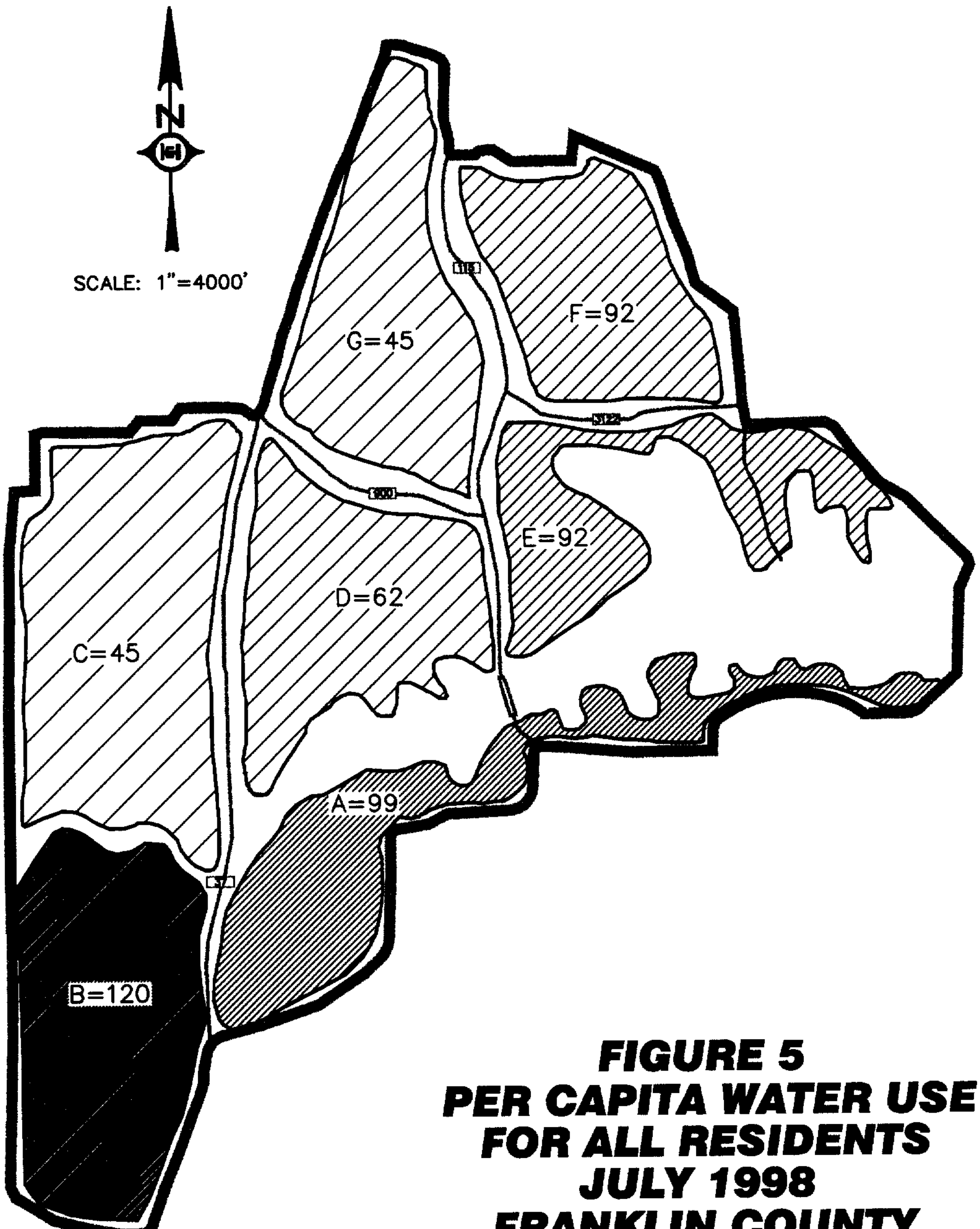

FIGURE 5
PER CAPITA WATER USE
FOR ALL RESIDENTS
JULY 1998
FRANKLIN COUNTY
WATER DISTRICT
GALLONS PER CAPITA PER DAY

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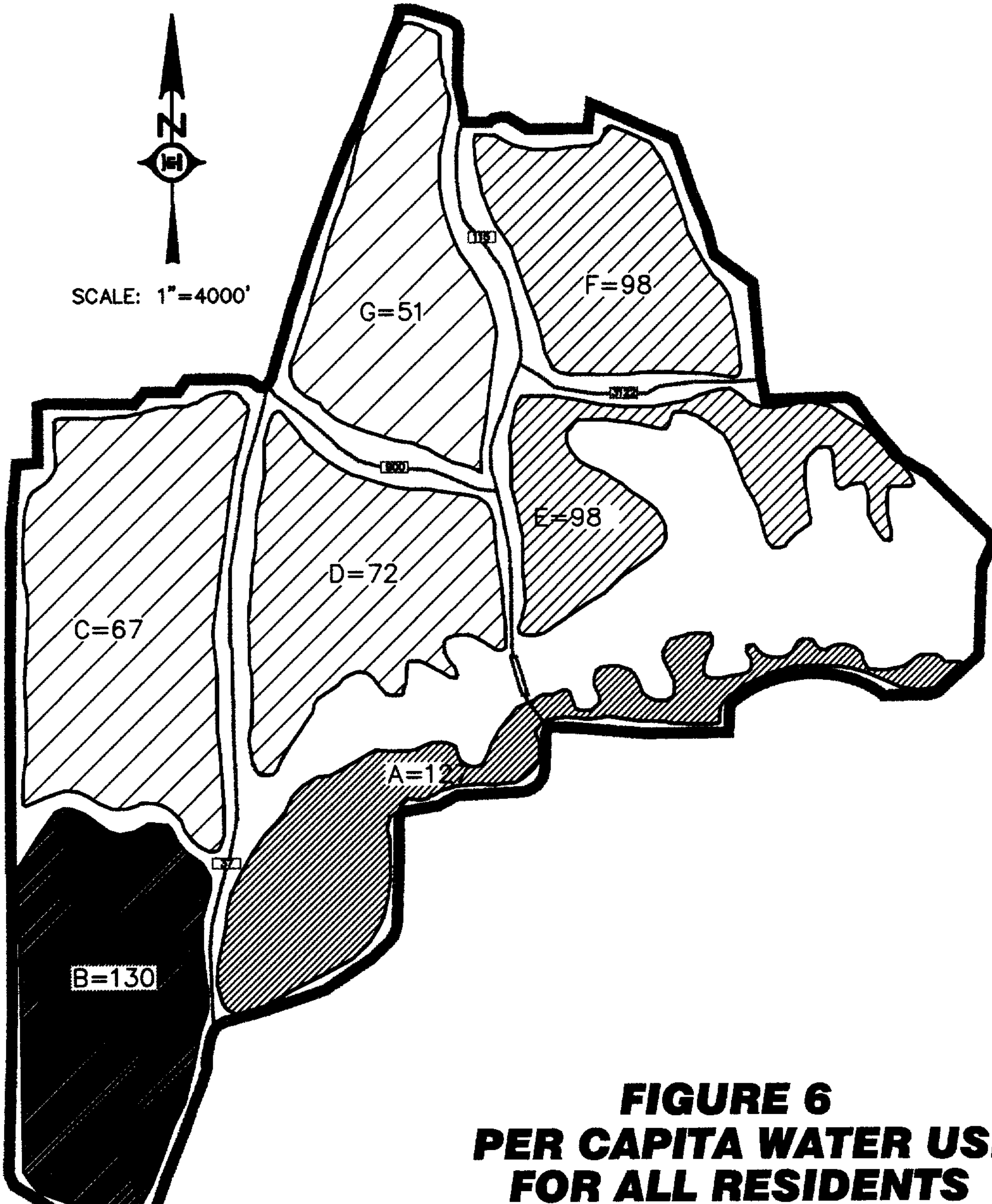

FIGURE 6
PER CAPITA WATER USE
FOR ALL RESIDENTS
DECEMBER 1998
FRANKLIN COUNTY
WATER DISTRICT
GALLONS PER CAPITA PER DAY

HAYTER
ENGINEERING
INCORPORATED
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4445 S.E. LOOP 286 PARIS, TEXAS

Tables VI and VII show water use in each zone for July and December. Also noted is the number of customers that used over 40,000 gallons in one month, while the per capita figures for December may initially appear unrealistically low, it should be noted that these were derived by dividing total water use by full and part-time population. Part-time usage would be very low during the winter months.

Depending upon the particular system, wastewater flows may typically range from 85% of water sales to in excess of 100% of water sales (considering infiltration, inflow, and similar). For purposes of this report, wastewater return flows have been assumed to equal 100% of water sales.

For planning purposes, the following current peak month usage is anticipated, based upon the total of both full and part-time residents:

TABLE VI
JULY WATER USE STATISTICS

Zone	July Use Total (Gal)	Zone Population (Full & Part Time)	July Per Capita Use Per Day	Customers Over 40K	July Use Corrected	July Per Capita/Day Use Corrected
A	5790900	1214	154	29	3530400	96
B	2205900	462	154	8	1630800	116
C	878600	430	66	5	567300	43
D	987774	424	75	3	777974	60
E	6482900	1988	105	21	5257700	89
F	2123400	587	117	10	1586100	89
G	711126	351	65	3	927200	43
All	**19180600**	**5456**	**113**	**79**	**14277474**	**86**

TABLE VII
DECEMBER WATER USE STATISTICS

Zone	December Use Total (Gal)	Zone Population (Full & Part Time)	December Per Capita Use	Customers Over 40K	December Use Corrected	December Per Capita Use Corrected
A	2726900	1214	75	6	1880200	52
B	966900	462	70	2	847200	61
C	524500	430	41	1	451600	35
D	288700	424	23	0	288700	23
E	2007300	1988	34	1	1957300	33
F	756100	587	43	2	657100	37
G	503000	351	48	0	503000	48
All	**7773400**	**5456**	**48**	**12**	**6585100**	**40**

TABLE VIII
GALLONS/CAPITA/DAY WASTEWATER FLOWS (3)

Zone	Peak Month (1)	Design Annual Average (2)	Minimum month
A	110	80	50
B	135	100	60
C	50	40	30
D	70	45	20
E	100	65	30
F	100	65	30
G	50	45	40

(1) July 1998, adjusted upward by 15% and rounded to nearest 5 gallons
(2) Average of July/December
(3) Full time plus part-time residents.

Wastewater contributions expressed in Table VIII appear low in some zones, primarily because of the relatively high percentages of part-time residents. On a full-time resident basis, these design flows would average 150 gpcpd. In recent studies, consultants for the Northeast Texas Regional Water Planning Group projected a year 2000 average municipal consumption of 148 gpcpd throughout the 19 counties of northeast Texas, and the Texas Water Development Board year 2000 projection for Franklin county "other" is 211 gpcpd.

Franklin County, Cypress Springs WSC, and Mt. Vernon all have existing water conservation plans. Winnsboro does not. The FCWD plan was prepared in 1997, and is included as an appendix hereto.

CHAPTER 3

Chapter 3 – District On-site System Standards

The objective of Task III is to compile current Texas Natural Resource Conservation Commission regulations concerning on-site waste disposal systems and to compare these with the District's existing permit system. In addition, recommendations are to be provided as to types of on-site systems to be permitted in the future. TNRCC regulations were consulted for this task.

The term "on-site sewerage facility" (OSSF) refers to wastewater treatment systems which treat and dispose of sewage produced on the same site at which it is produced, as opposed to collection and centralized treatment systems, which collect the wastewater and transport it to a remote location for treatment and disposal. Generally, an OSSF will consist of a primary treatment system – such as a septic tank or aerobic treatment unit – followed by a disposal system such as a drainfield, evaporation bed, mound system, spray irrigation system, or similar.

Current on-site system regulations were obtained from the TNRCC. These regulations have been included in this report as Appendix C. FCWD has adopted TNRCC regulations, in full, as current policy. FCWD is the authorized agent and therefore conducts on-site inspections, for all of Franklin County. In addition to TNRCC rules, the district requires a pre-inspection on district-owned property as well as all other inspection requirements. While the District allows all types on-site systems permitted by TNRCC regulations, as a practical matter the vast majority of systems installed in the last few years are of the aerobic "clearwater" type, with spray irrigation of the effluent.

A general summary of Chapter 285 regulations for on-site sewage facilities is as follows:

Subchapter A:

This subchapter outlines regulations of all on-site sewage facilities (OSSF). It includes general definitions and the following subsections.

General Requirements:

All aspects of the planning, installation, construction, alteration, extension, repair, operation and maintenance of OSSF's must be in accordance with this chapter or an ordinance of the authorized agent. Franklin County Water District has been authorized as an authorized agent by TNRCC, for all of Franklin County, and not just the planning area.

Boreholes, cesspools and seepage pits are not authorized for installation or use in Texas.

An appropriate permitting authority may consider variances from the provisions of this chapter.

Facility Planning:

Land developments and land subdivided for building, which will use OSSFs, must be evaluated for overall site suitability, and must be approved by the permitting authority prior to subdivision of the property. Residential lot sizing, and manufactured housing communities or multi-unit residential developments served by a central sewage collection system for on-site disposal will be considered. Planning materials must be submitted to the permitting authority including an overall site plan, floodplain maps, topographic maps, soil surveys, etc.

Submittal Requirements for Planning Materials:

Planning material are required to be submitted to the permitting authority for the above mentioned projects. In most cases, a registered professional engineer or registered sanitarian must submit the plans.

Cluster Systems:

Use of a cluster system shall be considered when lot sizes, lot location or soil conditions make a standard system unacceptable. They must be designed by a P.E. and submitted to the permitting authority. Each permitee on a cluster system must be a joint owner and is held responsible for maintenance of the system.

Surface Irrigation Systems:

Applications for OSSF permits using surface irrigation shall be considered, and require a site drawing, landscape plan, maintenance contracts, provisions for on-going maintenance, an affidavit of property ownership, testing and reporting schedules and provisions for effluent testing.

Maintenance Contract:

OSSF installers will give facility owners maintenance instructions at the time of installation.

Subchapter B:

Delineation of Texas Natural Resource Conservation Commission's delegation to local authorized agents is contained in this section. Discussion of how to become an authorized agent, how to amend existing ordinances, reporting requirements to TNRCC, and procedures for relinquishment of delegation is included.

Subchapter C:

This section discusses administration of the program in areas where no local administration exists. This section does not apply to Franklin County.

Subchapter D:

This subchapter outlines specific instructions to the authorized agent on site evaluation, setback requirements, criteria for sewage treatment and disposal systems, emergency repairs, dealing with abandoned treatment, holding and pump tanks, and maintenance and management practices.

Subchapter F:

This subchapter outlines requirements for registration, training and certification requirements for OSSF installers, apprentices, site evaluators and designated representatives. It includes discussion on applications for registration, qualifications required, examination information, fee schedules and certificate issuance procedures. It also discusses duties and responsibilities of an installer, training requirements and a description of the apprentice program.

Subchapter G:

Enforcement activities by TNRCC in regards to OSSF are profiled in this section.

Currently, traditional systems as well as non-standard wastewater systems are permitted by TNRCC. There is a trend across the state to increased use of non-standard systems, such as drip systems and spray irrigation, because of historically high failure rates of traditional systems. This failure is often due to the presence of soils that are unsuitable for septic tank use. According to the Tyler Office of TNRCC, all types of systems are still in use and will continue to be permitted into the foreseeable future.

In order to determine the most successful on-site system for the planning area, a soil analysis is necessary. The four general soil map units in the planning area, by NRCS classification, are Lilbert-Darco (planning zones A and B), Nahatche-Iuka, Woodtell-Freestone and Wolfpen-Pickton. These units make up approximately 90% of the area.

Table IX
General Soil Map Unit Comparison

Soil Unit	Septic Tanks	24" Permeability @ Deep	Depth to Ground Water
Lilbert-Darco	Severe* – poor filter, percolates slowly	6 - 20"/hr	>6.0 Ft.
Nahatche-Iuka	Severe – flooding, wetness	.6 – 2.0	0.5 – 3.0
Wolfpen-Pickton	Severe – poor filter, wetness	6 – 20	4 – 6
Woodtell-Freestone	Severe – wetness, percolates slowly	.06 - .2	1.5 – 6

**Severe rating indicates that "soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required". – NRCS*

Lilbert-Darco soils are loamy fine sands to the subsoil, where they become sandy clay loams high in acidity. They are moderate to slowly permeable and can be gently sloping to steep. They are well suited for most urban uses, however seepage and a sandy surface texture are limitations for sanitary facilities. Slope can also be limiting.

Nahatche-Iuka are nearly level soils which are subject to frequent flooding. They are moderate to poorly drained and are moderately permeable. The surface layer of the Nahatche soil is silty clay loam. The surface layer of the Iuka is fine sandy loam. Subsoils include silt loam, clay loam and sandy clay loam. These soils are not suited to urban uses because of flooding and wetness.

Wolfpen-Pickton are fine sands in the surface and subsurface layers and become sandy clay loams in the subsoil. Soils are slightly acid in the upper parts and become strongly acid in lower parts. Permeability is moderate to very slow. These soils are well suited for most urban uses, however wetness and seepage are problems for sanitary facilities.

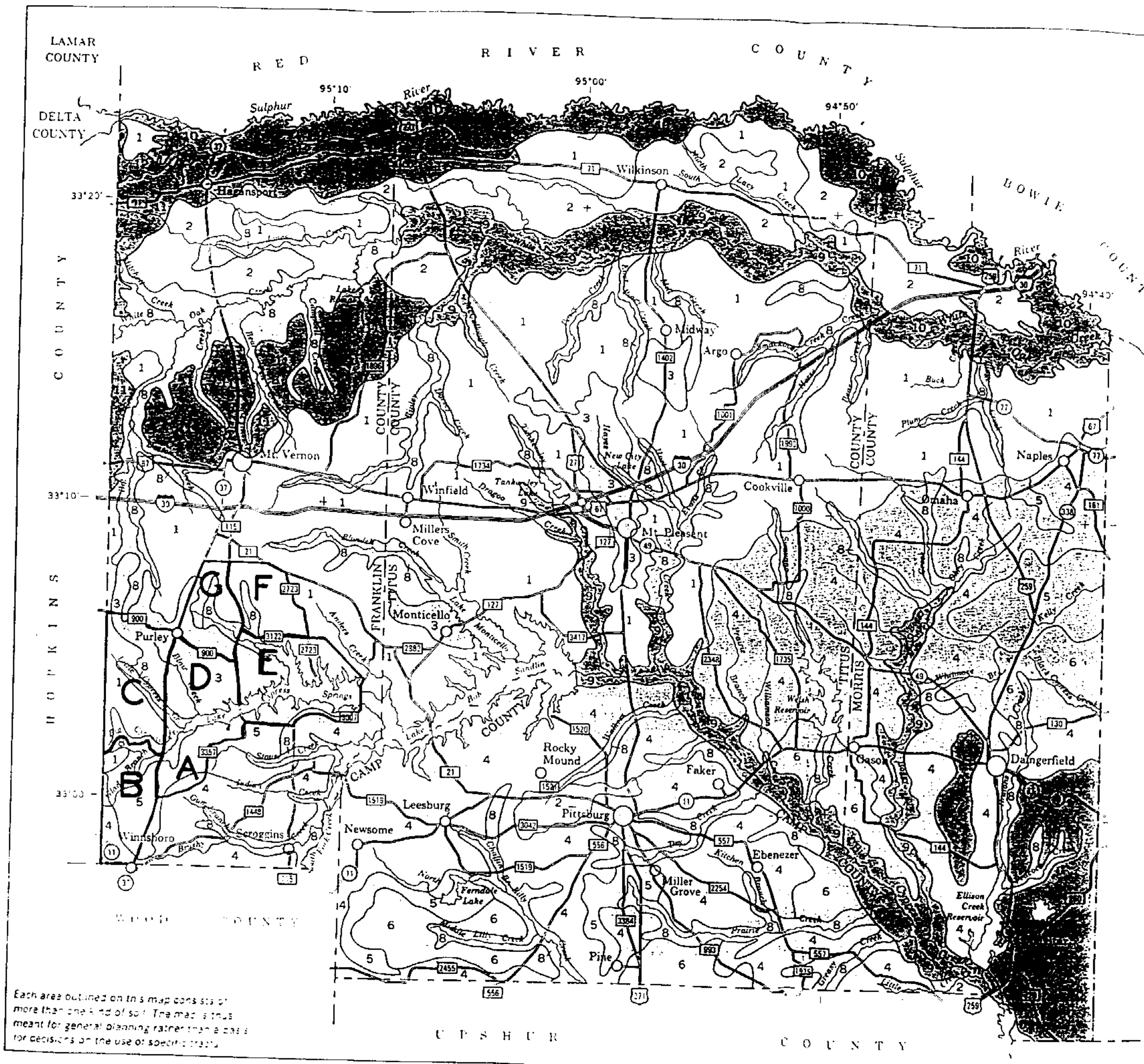
Woodtell-Freestone soils are slightly acidic fine sandy loams in the surface and subsurface layers. The subsoil is clay and brown loam and very acidic. Erosion hazard is severe with this soil type. These soils can be used in urban settings, however they have very slow permeability and have a tendency to shrink during dry weather and swell during wet weather. These are limitations for sanitary facilities, dwellings and streets.

For the various reasons mentioned, the Natural Resource Conservation Service does not recommend the majority of soils in the planning area for septic tank absorption fields, sewage lagoons or sanitary landfills. With respect to existing on-site units it can be noted that problems are most likely in soils of low permeability and higher groundwater. Generally, this would be the Woodtell-Freestone and the Nahatche-Iuka.

According to TNRCC requirements, individual lots utilizing OSSFs, must have surface areas of at least ½ acre or no less than two times the design area, and cannot be located within the 100-year floodplain. For lots smaller than ½ acre, or in areas where lot locations or soil conditions make a standard system unacceptable, a cluster system must be used. In the planning area, 97% of above ground systems and 97% of conventional systems are on lots larger than ½ acre. It is recommended that drain field systems not be allowed on lots less that one acre in the future in order to reduce filtration problems caused by poor soil.

There is not a FEMA floodplain map prepared for Lake Cypress Springs, and soils around the lake are sand and sandy loams, not prone to flooding. It is safe to assume, however, that the shores of the lake are inundated with water during wet periods of the year. Septic tanks are not recommended in areas with such poor permeability. It is recommended that septic tank drain fields not be built within 500 feet of the waters of Lake Cypress Springs in order to avoid problems associated with overflow in wet areas.

In choice of OSSFs, it is recommended that spray distribution and lined evapotranspiration beds be used. These types of systems are most suitable to the soil, climatic and geographic conditions in the planning area. The type of soil is the most limiting factor to using other types of on-site systems. These recommended systems fit soil, groundwater and surface slope requirements. Rock/reed filters may also provide suitable treatment of the septic tank effluent.



LEGEND

(NOT ALL SOIL UNITS OCCUR IN ALL COUNTIES)

SANDY AND LOAMY SOILS. ON SAVANNAHS

1 — Woodtell-Freestone. Gently sloping to moderately steep, moderately well drained, loamy soils

2 — Derly-Raino-Talco. Nearly level, poorly drained to moderately well drained, loamy soils

3 — Wolfpen-Pickton. Gently sloping to moderately steep, well drained, sandy soils

SANDY AND LOAMY SOILS. IN TIMBERLAND

4 — Bowie-Cuthbert-Kirvin. Gently sloping to steep, moderately well drained and well drained, loamy soils

5 — Lilbert-Darco. Gently sloping, well drained, sandy soils

6 — Kullit-Sacul. Gently sloping to moderately steep, moderately well drained, loamy soils

7 — Cuthbert-Redsprings. Strongly sloping to steep, well drained, loamy soils

LOAMY AND CLAYEY SOILS. ON FLOOD PLAINS

8 — Nahatche-Iuka. Nearly level, somewhat poorly drained and moderately well drained, loamy soils

9 — Estes. Nearly level, somewhat poorly drained, loamy soils

10 — Kaufman-Gladewater. Nearly level, somewhat poorly drained and poorly drained, clayey soils

LOAMY AND CLAYEY SOILS. ON PRAIRIES

11 — Crockett. Nearly level to gently sloping, moderately well drained, loamy soils

12 — Normangee-Crockett-Ellis. Gently sloping to strongly sloping, moderately well drained and well drained, loamy and clayey soils

COMPILED 19[illegible]

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD

GENERAL SOIL MAP

CAMP, FRANKLIN, MORRIS
AND TITUS COUNTIES
TEXAS

Scale 1:253,440

0 1 2 3 4 Miles

0 4 8 Km

FIGURE 7

Spray distribution systems consist of an aerobic treatment unit or a sand filter, a disinfecting device, and a pump tank and sprinkler system. Wastewater flows through the treatment unit where solids are removed. Next, it passes through the disinfecting device where bacteria and pathogens are eliminated. Finally, the treated wastewater is sprayed over the lawn by the sprinkler system. This is usually done at night to avoid human contact with the water. This system works well in all types of soils as long as the lot size is adequate and a grass cover is maintained which will reuse the wastewater. This system does require routine maintenance, including maintaining the treatment device and the disinfecting device and adding chlorine regularly.

Evapotranspiration (ET) beds consist of a septic tank, which removes solid materials, and an evapotranspiration bed, which allows the water to evaporate and transpire through plants. Lined beds are recommended for soils in the planning area and liners can be constructed of natural clays, synthetics or concrete. A grass cover is required over the evapotranspiration bed and a winter grass is required during winter months. ET beds require minimal maintenance such as mowing the grass cover regularly and diverting rainfall runoff around the system. This type of system would be better suited to permanent residents rather than part-time residents because vegetative cover over the ET bed must be maintained through hot and dry periods. Part-time residents may have difficulty keeping grass watered and mowed while they are away.

Rock/reed filter systems consist of a properly designed septic tank which removes solids and provides primary treatment, followed by a lined bed of gravel and reeds. The liner is impervious, so soil type is not critical. The rhizomes of the reeds spread throughout the gravel support media and provide a locale for aerobic and anaerobic bacteria to grow, which act to reduce BOD, TSS, ammonia and phosphorous, and to oxygenate the wastes. Maintenance includes periodic inspections to insure equalized flow across the bed, as well as control of undesirable weed species.

An option to OSSFs is the construction of a centralized wastewater collection system and wastewater treatment facility.

CHAPTER 4

INTRODUCTION

Eutrophication is the term used to describe the process of enrichment and aging of lakes with nutrients resulting in increased biological production and decreased lake volume. Natural eutrophication occurs at varying rates depending upon soil type, ratio of drainage area to surface area, mean depth, and flushing rate. Intense or increased activities on the land surrounding lakes such as erosion or sewage input can greatly increase the rate of eutrophication. The accelerated eutrophication has been termed "cultural" eutrophication. The symptoms of eutrophication including excessive macrophytes, blooms of algae, decreased oxygen, and fish kills can result in greatly decreased recreational, municipal, or industrial use.

Lake Cypress Springs, located in Franklin County, East Texas, has experienced excessive growth of aquatic plants, specifically the imported Hydrilla. The plant growth appeared to correlate with the extensive development occurring around the lake.

At the request of the Franklin County Water District, a study was conducted by Huther and Associates, Inc., subcontracted through Hayter Engineering, Inc. to determine the amounts and sources of nutrients entering the lake, determine the nutrient loading contribution from a large number of septic tanks draining into the lake, and evaluate whether or not a centralized wastewater treatment plant would reduce these loadings thereby slowing the eutrophication process.

STUDY DESIGN

Nutrient loadings, specifically nitrogen and phosphorous, are a major contributor of eutrophication. While treated wastewater from septic tanks frequently meet water quality standards for conventional pollutants such as TSS and BOD, septic treatment gives little or no nutrient reduction.[1]

Normally, drainage from septic tanks contain large quantities of nitrogen in the form of ammonia derived from feces and urine as well as particulate organic nitrogen. Bacterialreactions convert a portion of the particulate organic form to soluable ammonia. The ammonia present in septic tank discharge tends to be sorbed by the aquifer material in most groundwater systems. However, in the presence of oxygen in the groundwater the ammonia will be oxidized to nitrate. The nitrate is poorly sorbed by aquifer materials and is readily transported in groundwater. Nitrate is a primary nutrient responsible for algal and macrophyte growth.[2]

Numerous studies have shown that control of algal growth during the summer growing season can occur by limiting nitrogen and phosphorous. Typically, a limiting level of the inorganic forms of nitrogen (nitrate, nitrite) is 0.05 mg/L or less.

A significant proportion of the phosphorous found in sewage is derived from synthetic detergents. A large proportion of detergents is a phosphate building component, sodium tripoly phosphate (STP). Once in sewage, this builder is readily hydrolyzed to form orthophosphate. Orthophosphate is another primary nutrient responsible for algal and macrophyte growth. An algal growth limiting concentration of phosphorous in the ortho form is recognized as a value of less than 0.005 mg/L.[3]

Therefore, for the purpose of determining septic tank drainage contribution to eutrophication, several forms of nitrogen and phosphorous were measured: ammonia nitrogen, nitrate nitrogen, total phosphorous, and orthophosphate. In addition, sulfates, conductivity, dissolved oxygen, pH, TSS, turbidity, fecal coliform and fecal streptococcus were measured at each sample site.

There was a total of three water sampling events: September 30, 1998, April 21, 1999, and September 8, 1999; and one soil sampling event: November 18, 1999.

Six sites in the lake were selected for water sampling: two reference sites near parks with minimal septic systems and four sites near septic drainage fields. The sites were as follows:

Reference Site 1	Mary King Park
Reference Site 2	Dogwood Park
Site 1	Tall Tree Marina
Site 2	Crawfish Cove
Site 3	Alligator Cove
Site 4	El Dorado

Two perennial creeks flowing into the lake were also sampled: Panther Creek and Big Cypress Creek. Appendix A, Site Map, depicts the water sample sites.

Four sites were selected for soil sampling:

Reference Site 1	Guthrie
Site 1	North Shore
Site 2	Snug Harbor
Site 3	Kings Country

SAMPLING METHODS

Water samples were collected at a 24" depth using a Beta Plus Horizontal Sampler designed to collect a maximum of 2.2 liters of water. Sampling equipment and containers were acid washed (10% HCl) and deionized water rinsed prior to collections. Samples were submitted to Certes Laboratories for chemical analyses and to Star Analytical for fecal coliform and fecal streptococcus.

Sediment samples were collected from sites around the lake using a stainless steel 8" auger fitted with plastic liners. The overlying 4 - 6 inches of topsoil/leaf litter was removed prior to sampling. At all sites, dense clay was encountered at 10 - 12 inches depth. Sampling included several inches of clay. Samples were submitted to Certes Laboratory and Star Laboratory for chemical and bacteriological analyses.

RESULTS

Sampling Period Number One - September 30, 1998

Results of the lake samples showed a detectable level of ammonia nitrogen (0.12 mg/L) at Site 2, Crawfish Cove. Fecal coliform and fecal streptococcus were detected at Site 2, Crawfish Cove (>200.00 CFU/100 mL, >200.00 CFU/100 mL), Site 3, Alligator Cove (>200.00 CFU/100 mL, 44.0 CFU/100 mL), and Site 4, El Dorado (>200.00 CFU/100 mL, 35.0 CFU/100 mL).

Total phosphorous, orthophosphate, and sulfates were detected at Creek 1, Panther Creek (0.18 mg/L, 0.14 mg/L and 26.0 mg/L) and at Creek 2, Big Cypress Creek (0.37 mg/L 0.83 mg/L, and 28.0 mg/L). Fecal coliform and fecal streptococcus were greater than 400.0 CFU/100 mL at both creek sites. Results are presented in Appendix B.

Sampling Period Number Two - April 21, 1999

Results of the lake samples showed a detectable level of nitrate nitrogen (0.76 mg/L) at Site 3, Alligator Cove. Fecal coliform and fecal streptococcus was non-detectable at all sites.

Nitrate nitrogen, phosphorous, and sulfates were detected at Creek 1, Panther Creek (0.89 mg/L, 0.06 mg/L, and 33.0 mg/L) and at Creek 2, Big Cypress Creek (0.80 mg/L, 0.19 mg/L and 42.0 mg/L). Fecal coliform and fecal streptococcus were non-detectable at both sites. Results are presented in Appendix C.

Sampling Period Number Three - September 8, 1999

Results of the lake samples showed a detectable level of phosphorous at Site 1, Tall Tree (1.28 mg/L) and Site 4, El Dorado (2.42 mg/L). Fecal coliform and fecal streptococcus was detected at Site 2, Crawfish Cove (600.0 CFU/100 mL, 60.0 CFU/100 mL).

Phosphorous (0.71 mg/L) was detected at Creek 1, Panther Creek. Ammonia nitrogen (0.44 mg/L), phosphorous (0.75 mg/L), orthophosphate (0.087 mg/L), and sulfate (44.3 mg/L) were detected at Creek 2, Big Cypress Creek. Both creeks had extremely high numbers of fecal coliform (>20,000 CFU/100 mL, >20,000 CFU/100 mL) and fecal streptococcus (5,600 CFU/100 mL, 4,900 CFU/100 mL). Results are presented in Appendix D.

Sampling Period Number Four - Sediment - November 18, 1999

Compared to the reference site at Guthrie (minimal septic drainage) North Shore had an elevated level of ammonia nitrogen (39.0 mg/L) and Kings Country had an elevated level of orthophosphate (7.77 mg/L). Fecal coliform and fecal streptococcus were non-detectable at all sample sites. These results suggest that septic drainage into the lake via groundwater is occurring below the clay level. Results are presented in Appendix E.

Table 1. Summary of Lake Sites With Detectable Chemical/Biological Parameters [1]

Parameter	Site 1 Tall Tree			Site 2 Crawfish Cove			Site 3 Alligator Cove			Site 4 El Dorado		
	1	2	3	1	2	3	1	2	3	1	2	3
ammonia nitrogen (mg/L)	-	-	-	0.12	-	-	-	-	-	-	-	-
nitrate nitrogen (mg/L)	-	-	-	-	-	-	-	0.76	-	-	-	-
phosphorous (mg/L)	-	-	1.28	-	-	-	-	-	-	-	-	2.42
orthophosphate (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-
sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-
coliform (CFU/100 mL)	-	-	-	>200	-	600	>200	-	-	>200	-	-
streptococcus (CFU/100 mL)	-	-	-	>200	-	60	44	-	-	35	-	-

[1] As compared with reference sites.

Table 2. Summary of Creek Sites With Detectable Chemical/Biological Parameters [1]

Parameter	Creek 1 - Panther			Creek 2 - Big Cypress		
	1	2	3	1	2	3
ammonia nitrogen (mg/L)	-	-	-	-	-	0.44
nitrate nitrogen (mg/L)	-	0.89	-	-	0.80	-
total phosphorous (mg/L)	0.37	0.06	0.71	0.18	0.19	0.75
orthophosphate (mg/L)	0.83	-	-	0.14	-	0.09
sulfate (mg/L)	28.0	33.0	-	26.0	42.0	43.3
coliform (CFU/100 mL)	>400	N.D.	>20,000	>400	N.D.	>20,000
streptococcus (CFU/100 mL)	>400	N.D.	5,600	>400	N.D.	4,900

[1] As compared with reference sites.

Table 3. Summary of Sediment Sites With Detectable Chemical/Biological Parameters [1]

Parameter	North Shore	Kings Country	Snug Harbor
ammonia nitrogen (mg/L)	39.0	-	-
nitrate nitrogen (mg/L)	-	-	-
total phosphorous (mg/L)	-	7.77	-
orthophosphate (mg/L)	-	-	-
sulfate (mg/L)	-	-	-
coliform (CFU/100 mL)	-	-	-
streptococcus (CFU/100 mL)	-	-	-

[1] As compared with reference sites.

CONCLUSIONS

Nutrients were detected during various sampling periods at Tall Tree (1.28 mg/L phosphorous), Crawfish Cove (0.12 mg/L ammonia nitrogen), Alligator Cove (0.76 mg/L nitrate nitrogen) and El Dorado (2.42 mg/L phosphorous). No seasonal variation of nutrient loadings were detected at any of the lake sampling sites.

Fecal coliform and fecal streptococcus were detected at Crawfish Cove and Alligator Cove in higher number and more frequently than at other sites. These results coincide with the older age septic systems at these two sites.

The most consistent source of nutrients and fecal bacteria entering the lake were from the two perennial creeks, Panther Creek and Big Cypress Creek. Nutrients were detected during all three sampling periods. No seasonal variation of nutrient loadings were detected at any of the creek sampling sites. Of particular note was the elevated levels of fecal coliform and fecal streptococcus detected during the third sampling period. Fecal coliform exceeded 20,000 CFU/100 mL and fecal streptococcus exceeded 4,000 CFU/100 mL at both sites.

Sediment samples were high in ammonia-nitrogen (39.0 mg/L) at North Shore and high in phosphorous (7.77 mg/L) at Kings Country. Fecal bacteria were not detected at any of the sites. Results suggest that the source of these nutrients were from fertilizers rather than from septic tanks. Groundwater flow from septic tanks into the lake is probably below the clay soil level which was encountered at 6 - 8 inches from the surface. Auger soil sampling did not extend beyond 12 inches from the surface.

Extensive macrophyte growth was observed during all sampling periods in the eastern section of the lake, especially around the north shore coves. Alligator Cove and Big Cypress Creek are located in this section of the lake.

In instances where nutrient control is desirable, control of nitrogen and phosphorous is essential. When nitrogen alone becomes limiting, excess phosphorous can support growth of nitrogen-fixing blue-green algae. Therefore, a control program must limit both nutrients.

It is probable that failing and/or inefficient septic systems are contributing nutrients and fecal bacteria into the lake. Newer septic systems provide efficient bacteriological, ammonia-nitrogen, and nitrate nitrogen remover however they are ineffective in reducing or removing phosphates. A centralized wastewater treatment plant incorporating chemical dosing, sedimentation, activated sludge, and disinfection would result in a reduction of ammonia-nitrate, nitrogen nitrate, sulfates, phosphates, and fecal bacteria.

RECOMMENDATIONS

1. Continued monitoring of the lake and creek sites at a minimum of quarterly to determine any seasonal trends. Several years worth of data is suggested.

2. Conduct a more comprehensive soil testing study incorporating monitoring wells at various depths around the septic fields. By identifying the depth of groundwater flows around the septic fields and the quantities of nutrients and bacteria present, problem sites could be identified and prioritized.

3. The sources of nutrients and bacteria in the creeks should be investigated as soon as possible. A watershed management plan involving sampling, source identification, and source minimization is recommended. Sampling during a rain event following a period of dry weather would determine whether creek nutrients and bacteria were due to continuous inflows or episodic non-point source run-off.

4. Receiving water assessments which grade Texas creeks based on biological integrity would be valuable in determining the overall health of the perennial creeks. Periodic assessments would provide information on the perennial creek water quality entering Lake Cypress Springs. Methods should include habitat evaluations and fish electroshocking and seining following Texas Natural Resource and Conservation Commission procedures for Texas waters.

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CHAPTER 5

Chapter 5

Task V includes development of technical alternatives available to the District. These may include no action, enhancement of on-site systems, or a new collection system and wastewater treatment facility or transport to Mt. Vernon or Winnsboro for treatment.

In reality, there is no "no action" alternative. Changes in state law have significantly tightened on-site system regulations, and, enhanced the quality of OSSF effluent. As a practical matter, therefore, the "enhancement" option is the least action alternative available.

For a centralized wastewater system to be viable, the cost per user must be affordable. Generally speaking, the affordability will depend upon (1) the population density in the service area, (2) the overall population of the service area, and (3) the level of treatment required. Other miscellaneous factors may affect individual projects, such as per capita income of the service populations, land costs, environmental mitigation, and rock or other construction complications. One measure of affordability established by EPA during its construction grants program, was that the average annual user cost should not exceed a sliding scale from 1.5% to 2.5% of median household income. The scale percentage was selected at 1.5% for service populations with MH less than \$6,000, and 2.5 for service populations > \$10,000, based upon the 1980 census. The 1980 MHI for Franklin County was \$12,899, indicating that the 2.5% factor would be appropriate. The 1990 census indicates a median household income of \$23,103 for Franklin County. Thus \$23,103/12 x .025 implies that \$48 per month would be the upper limit for an affordable system. This is an average bill – not a minimum – and sewer charges would generally be in relation to potable water usage.

A typical average bill for a totally new system might be broken down as ⅓ for collection system debt, ⅓ for treatment system debt and ⅓ for operation and maintenance or purchased treatment. This allows \$16 per customer per month for collection system debt retirement, which would amortize a capital expense of around \$2,202 (6%, 20 years). Allowing \$30 per foot for conventional gravity sewer, and 15% for legal, engineering, and related expenses (\$35 total), the average customer spacing would need to be in the range of 63 feet. This equates to typical municipal subdivision densities of 3 homes per acre. None of the Franklin County Water District planning area approaches this population density – therefore, a conventional gravity collection system appears to be cost-prohibitive.

Alternatives to conventional gravity collection exist, such as vacuum systems, STEP (septic tank effluent pumping), or grinder pump pressure systems, and small diameter collection systems. Perhaps the most common of these would be a pressure sewer, employing a grinder pump station at each residence, discharging through small diameter force mains into a larger, common lift station for delivery to the treatment facility. These collection systems can be cost-effective at a density of 1 home per 2 acres, more or less. At 2.498 persons per household derived earlier herein, this equates to 1.25 persons per acre.

Referring to Table IV, only Zone E of the planning area is anticipated to reach this density during the planning period. However, the eastern end of Zone A should also reach this density –

Zone A is considerably more populated along the shore of the reservoir than in its western reaches.

To further the analysis, Zone A was been subdivided into A_1 (east of FM 115) and A_2 (west of FM 115). Zone A_1 has an area of 202.87 acres, a full/part time population of 878 and a density of 4.32/acre. Zone A_2 has an area of 583.85 acres.

In summary, only Zones E and A_1 appear to have projected populations which would be cost-effective for a pressure type system – during the planning period. These zones will be further discussed later herein.

For Zones B, C, D, F, G, and A_2, enhancement of existing on-site systems appears to be the only affordable alternative. Referring to Table XII, 37% of the conventional systems in these zones are over 10 years old. 82% of the conventional systems in these zones are on lots of 0.6 acres or more. Current on-site system design criteria were only adopted in 1997, so it is likely that most of the older systems were designed to lesser standards.

TABLE XII
ABOVE GROUND SYSTEMS – SYSTEMS PER LOT SIZE IN EACH ZONE

	Lot Size in Acres					
Zone	**0 – 0.5**	**0.6 - 1**	**1.1 – 1.5**	**1.6 - 2**	**2.1 +**	**Total**
A	3	9			2	14
B						
C		1			3	4
D	5	16			2	23
E	3	264		1	9	288
F		6	11		5	12
G			1		2	2
Total	**11**	**296**	**12**	**1**	**23**	**343**

TABLE XIV
CONVENTIONAL SYSTEMS – SYSTEMS PER LOT SIZE IN EACH ZONE

	Lot Size in Acres					
Zone	**0 – 0.5**	**0.6 - 1**	**1.1 – 1.5**	**1.6 - 2**	**2.1 +**	**Total**
A		10				10
B						
C		1			2	3
D	5	32	1	2		40
E	19	657	15	3	4	698
F		1			3	4
G					2	2
Total	**24**	**701**	**16**	**5**	**11**	**757**

TABLE XV
ABOVE GROUND– SYSTEMS PER AGE IN EACH ZONE

	Age in Years					
Zone	**0 - 5**	**6 – 10**	**11 - 15**	**16 – 20**	**21 - 25**	**Total**
A	14					14
B						
C	4					4
D	23					23
E	288					288
F	12					12
G	2					2
Total	**343**					**343**

TABLE XVI
CONVENTIONAL SYSTEMS– SYSTEMS PER AGE IN EACH ZONE

	Age in Years					
Zone	**0 - 5**	**6 – 10**	**11 - 15**	**16 – 20**	**21 - 25**	**Total**
A	2	2	1	4	1	10
B						
C	3					3
D	6	16	17	1		40
E	65	121	172	179	155	698
F	4					4
G		2				2
Total	**80**	**141**	**190**	**184**	**156**	**757**

Enhancement options for existing systems could include some or all of the following:

(1) <u>Stringent management of systems on lots of less then ½ acre</u>.

A small percentage of conventional system lots are less than ½ acre. Current regulations prohibit new systems or lots less than ½ acre. A larger proportion of malfunction can be anticipated on the smaller lots. A management strategy would be to identify the physical location of these systems, and provide frequent (for example, quarterly or semi-annual) inspections with enforcement where problems are found. When replacement is necessitated, conformance to current standards would be required.

(2) <u>Continued reliance on aerobic/spray systems.</u>

Table IX summarizes the soil types in the project area. Permeabilities are very low in the Nahatche-Luka and Woodtell-Freestone units, and each of these has a shallow depth to seasonal groundwater. These 2 soil associations account for 50% of Zones B, C, D, F, and G, and are unsuitable for subsurface discharge systems. Spray irrigation systems would be more appropriate in these areas, or systems employing an impermeable liner such as evapotranspiration beds or rock/reed filers.

(3) Implement conservation practices outlined in the District's Water Conservation Plan.

A primary failure mode for sub-surface on-site systems, is the inability of the drain field to accommodate peak flows. By encouraging conservation of potable water, the District can directly reduce flows to the septic systems, and thus minimize overflow from the drain fields, as well as run-off from the spray irrigation systems.

(4) Enhanced conservation measures.

The District may wish to adopt a more aggressive approach to water conservation. The District sells wholesale water only ~ not retail – and thus its conservation options are somewhat limited. Increased water pricing would have a minimal conservation effect, since the wholesale water cost represents a de minimus portion of the retail bill. In addition, the District is already committed to a long-term contractual pricing structure. A significant component, however, of most conservation efforts involve plumbing fixture changes to low-flow fixtures. Low-flow fixtures are a requirement of state law at present in all new construction. Subject to available legal capacity, the District could consider (1) financial incentives to individual property owners for retrofit of existing systems from traditional to low-flow fixtures or (2) requiring conversion to low-flow fixtures as a corrective mode for on-site systems experiencing runoff excursions.

Zones E and A_1 – Treatment

As outlined earlier, a pumped-type collection system appears worthy of further consideration for Zones E and Zone A_1.

The collected wastewater must be transported to a treatment facility for treatment. In this report, three alternative treatment points were considered:

(1) City of Mt. Vernon.
(2) City of Winnsboro.
(3) A new treatment facility for the planning area.

(1) The City of Mt. Vernon (1998 estimated population – 2417) operates a 0.425 mgd activated sludge treatment plant located northeast of the City, discharging into the Sulphur River Basin, segment 0303. The plant is of the oxidation ditch type, with final clarification and disinfection. Current permit limits are 20mg/l BOD_5, and 20mg/l TSS. The plant is reported to be overloaded, primarily due to infiltration and inflow, and the City is in the process of expanding the facility. Because of the relatively large flow from the planning area in comparison to the City's normal flows, it is anticipated that the delivery pipeline would extend all the way to the plant, rather than discharging into the fringes of the City system. From Area E, 8 miles of 8" force main would be required to reach the plant, assuming a master lift station somewhere in the vicinity of FM 3122 and FM 2723.

Mt. Vernon, after considering that the planning area population would exceed its own population, and in light of its own wastewater needs, declined to be considered as the treatment source for the lake population.

(2) The City of Winnsboro (1998 estimated population – 3323) operates a 1.12 mgd activated sludge treatment plant, located southeast of the City, which discharges into the Sabine River Basin, segment 0514. The plant is of the orbal oxidation ditch variety, with final clarification and disinfection. Current permit limits are 20mg/l BOD_5 and 20mg/l TSS. The plant has an unspecified amount of excess capacity at present. From Area A to the plant, the force main could parallel an existing power line easement, a distance of around 7 ¾ miles. An 8" force main would be required.

Winnsboro, after considering the magnitude of the flows and its own needs to accommodate expanding local and future industry, also declined to be considered as the treatment source for the lake population.

(3) The District would have the option of constructing its own wastewater treatment facility, subject to receipt of a permit from the Texas Natural Resource Conservation Commission. A review of the area topography shows a number of possible discharge points – all, however, discharge into either Lake Cypress Springs or Bob Sandlin. A "no discharge" facility employing spray irrigation of the effluent could also be considered.

Table XVII shows a design flow of 0.406 mgd required for the planning period. For a discharge into Cypress Springs, anticipated discharge permit limits would be 10 mg/l $CBOD_5$, 15 mg/l TS, 3 mg/l NH_3, and 5 mg/l D.O. Effluent of this quality would require an activated sludge facility, and testing filtration is assumed. Based upon similar projects in northeast Texas, estimated construction cost for the treatment facilities would be $4.00 per gallon, or $1.62 million dollars. Figure 8 shows a reconnaissance level layout for the grinder pump collection system. Table XVIII presents a cost projection for construction of these facilities. Table XX presents the overall project cost projection. Initial operation is assumed to serve 1250 residential/commercial connections. Staffing would require a chief operator, and two assistants. Typical O & M expenses for a system of this size are shown in Table XIX.

In addition to annual O & M, revenues received must be sufficient to amortize the $8,056,000 capital cost of the project. Chapter 7 of this plan presents a number of financing alternatives. The two most feasible for a project of this magnitude would be the TWDB: SRF Clean Water Fund, or the USDA Rural Development program. The approximate annual debt service through the SRF (5%, 20 years) would average $646,000/year. Coupled with $212,000 O & M, the annual cost would be $858,000, distributed over 1250 customers, yielding an average per customer cost of $57 per month.

TABLE XVII
DESIGN FLOW

Zone A_1 & Zone E	1999			2010			2020		
	Pop. Full/Part time	Per Capita Flow	TOTAL	Pop.	Per Capita Flow	TOTAL	Pop.	Per Capita Flow	TOTAL
Minimum Month	2866	40	114,640	3382	40	135,280	3869	40	154,760
Average Month	2866	75	214,950	3382	75	253,650	3869	75	290,175
Maximum Month (Design)	2866	105	300,930	3382	105	354,900	3869	105	406,245
Maximum Day	2866	125	358,250	3382	125	422,750	3869	125	483,625

TABLE XVIII
COST ESTIMATE – COLLECTION AND TRANSMISSION FACILITIES

Description	Quantity	Units	Unit Cost	Total Cost
2" PVC SDR26	21,813	LF	1.50	$32,719.50
3" PVC SDR26	212,035	LF	3.00	636,105.00
4" PVC SDR26	38,209	LF	3.75	143,283.75
6" PVC SDR26	75,452	LF	5.75	433,849.00
Lift Station	11	EA	40,000.00	440,000.00
Grinder Pump Assemblies	1250	EA	2,000.00	2,500,000.00
Bore, encasements, pavement repair, valves, etc. (20% of line cost)				250,000.00
			Total	**$4,435,957.25**

TABLE XIX
TYPICAL O & M EXPENSE

Description	Expense
Salaries/Payroll Taxes	$87,000.00
Office expense	20,000.00
Insurance	2,000.00
Vehicle expense, fuel & oil	12,000.00
Maintenance supplies & repai	40,000.00
Dues & education	2,000.00
Laboratory Testing	3,500.00
Chemicals	2,500.00
Utilities	24,000.00
Professional Services	15,000.00
TNRCC Inspection Fees	4,000.00
Annual Total	**$212,000.00**

TABLE XX
PROJECTION OF TOTAL COSTS

Category	Cost
Construction	
Treatment Facilities	$1,620,000.00
Collection/Transmission	4,436,000.00
Subtotal	**$6,056,000.00**
Contingency	
15% of construction	**$900,000.00**
Engineering	
Basic Engineering	$425,000.00
Other Engineering	250,000.00
Subtotal	**$675,000.00**
Administration	
Bond Attorneys, Financial Advisor, Issuance Costs	$150,000.00
Legal	25,000.00
Sites and R.O.W.	50,000.00
Interest during construction	200,000.00
Subtotal	**$425,000.00**
Total Project	**$8,056,000.00**

Under this Rural Development program, the debt service, assuming no grant and 5%, 40 year payback, would average $470,000/per year. Coupled with the $212,000 annual O & M the annual cost would be $682,000 and, distributed over 1250 customers would yield an average monthly per customer cost of $45 per month. Projects may also be eligible for grant assistance through Rural Development where the median household income is less than the state average MHI. Based on 1990 census data, the project area would appear to qualify for up to 55% grant assistance. Note, however, that 2000 census data will be available within the next 12 to 24 months, which could alter this eligibility. If the project were to receive 50% grant funding, the remaining debt service would become $235,000 per year, and the average monthly per customer cost would drop to $30 per month.

While the plant is designed for peak month flows, revenue received would be derived based on the average month usage, which was shown in Table XVII as 215,000 gpd. For 1250 customers, this equates to 5160 gallons/month. For comparative purposes, current rates for 5000 gallons usage in other area cities are:

Mt. Vernon	$19.37	Sulphur Springs	$9.67
Winnsboro	$13.25	Cooper	$13.35
Mt. Pleasant	$14.50	Pittsburg	$15.64

While the EPA affordability criteria show an "affordable" cost limit of $48/month, it is clear that any of the funding scenarios would result in a monthly bill significantly greater than for similar service in the surrounding area.

CHAPTER 6

Chapter 6 – Coordination with State and Federal Agencies

Chapter 6 provides for coordination with various state and federal agencies, to determine issues of concern for these agencies with respect to the planning effort.

In December, 1999, letters were sent to the following entities:

Ark-Tex Council of Governments	Texas Historical Commission
U.S. Fish & Wildlife	County Judge – Franklin County
U.S. Army Corp of Engineers	Water Quality Division, TNRCC
	Texas Parks and Wildlife

Responses were received from the Fish and Wildlife Service, Texas Parks and Wildlife, and the Texas Historical Commission. A sample of the letter sent, together with the responses received, is included in the appendix to this report.

In summary, the Fish and Wildlife Service noted that the bald eagle, a threatened species, has been documented to winter near Lake Cypress Springs – the project design will need to consider this habitat. Further, Fish and Wildlife noted that there are potential impacts to fish and wildlife resources from the sewer line construction, and suggested several ways in which the lines could be routed to minimize this potential for impacts. Texas Parks and Wildlife's response indicated minimal impact to fish and wildlife resources. The Texas Historical Commission commented that several archaeological sites are recorded in the general vicinity of the proposed treatment plant, and recommends that an archaeologist be retained to determine if any of the project area would merit further investigation. This type of study would be appropriate once the project proceeds to preliminary engineering and environmental phases.

Both Mt. Vernon and Winnsboro declined to be considered as the treatment entity for this wastewater. In either case, the wastewater would be diverted out of the Cypress Basin – Mt. Vernon discharges to the Sulphur and Winnsboro to the Sabine. The diversion of this potential return flow could be an issue for downstream water right holders in the Cypress Basin. However, construction impacts would be limited to pipeline construction and expansion of an existing plant site as opposed to creating a new discharge into a drinking water supply.

For a new treatment plant site, issues would be expected to revolve around perceived impact on water quality and on nuisance factors such as odor and noise from the treatment facility. Water quality should not be a viable issue – the discharge permit parameters for the facility would insure that the impact of the discharge is less than the impact of the existing on-site systems. Noise and odors should be minimal from a properly operated activated sludge plant. However, the treatment plant is proposed in the general vicinity of the south end of the dam – this is one of the least populated areas around the lake, and the southerly to southwesterly prevailing winds would carry odors away from most of the residential developments.

CHAPTER 7

Chapter 7 – Management and Financial Alternatives

The centralized wastewater treatment alternatives discussed in this plan require significantly large sums of money be expended for capital costs of construction, and for ongoing operation and maintenance. These sums are typically beyond the abilities of individual users, and consequently, the projects are constructed and operated on a centralized basis. Typically the owner/operator may be a member owned cooperative, such as a water supply city or a utility district; it may be a member owned cooperative, such as a water supply corporation; or it could be a for – profit utility operating company. In fact, the system can be constructed and owned by one entity, and operated by another (contract operation). Available financing alternatives vary from entity to entity.

For the Cypress Springs planning area, four management alternatives are apparent:

1. Construction and operation by the FCWD.
2. Construction of the facilities by the FCWD, with operation by another entity, most probably the Cypress springs WSC.
3. Construction and operation of the facilities by the Cypress Springs WSC.
4. Creation of an entirely new entity to construct and/or operate the facilities.

Option 1

FCWD is a conservation and reclamation district established under Article XVI, section 59 of the state constitution. The rights and privileges of the District are outlined in the enacting legislation, as well as the Texas Water Code. Section 4 of the enabling legislation empowers the District to "control, store, preserve and distribute its waters…" Preservation of water quality is a prime purpose in developing the wastewater system.

Advantages of construction and operation by the District would include:

a. The District may issue either revenue or general obligation bonds, or a combination thereof, which could allow support of the system by a combination of user fees and tax revenues;
b. The District is exempt from both ad valorem taxes and sales taxes. The sales tax exemption would save around $75,000 on each $100,000 spent to construct the project. The property tax exemption would reduce annual operating costs.
c. Section 4 of the District's creation act allows the District to accept grants or loans from federal and state sources – these could partially defray initial capital investment.
d. Interest earning on the District's bonds would be exempt from federal income tax, thus resulting in a lower interest rate to the District than typically charged taxable entities. Because of this feature, loans from the Texas Water Development Board to the District also carry a lower interest rate than similar loans to a taxable entity;

e. Section 4 of the District's creation act provides the District with the power of eminent domain, which would allow condemnation of property if necessary for plant sites or easements.
f. Since a key purpose of the project is preservation of the Cypress Springs water quality, and since FEWD is the entity responsible for that water quality, construction and operation by FCWD would provide FCWD with the most direct line of control.

Disadvantages of construction and/or operation by the FCWD include:

a. The tax levied for any general obligation bonds would affect all property owners in Franklin County, only a portion of whom will receive direct benefits. This may be problematic with respect to the use of tax-supported financing;
b. The District does not currently employ personnel familiar with, or licensed for, wastewater utility operations, nor does it have equipment suitable for utility maintenance;
c. Typically, wastewater bills are based upon a percentage of potable water used, and are most easily billed and collected by the entity controlling the water distribution system. The typical penalty for failure to pay the monthly bill for wastewater service would be to turn off the non-paying customers water service, which could be most readily accomplished by the Cypress Springs WSC.

Option 2

Option 2 would provide for construction of the facilities by the FCWD but, unlike Option 1, once constructed the facilities would be operated by a second entity. While this second entity could be of several types, the most logical selection would be the Cypress Springs WSC. Advantages of this approach would be as follows:

a. The financing advantages outlined in paragraphs a through d of Option 1 would be preserved;
b. Cypress Springs WSC employs staff familiar with utility operations. The staff may be in need of training or licensing specific to wastewater, as opposed to drinking water, but cross-training and dual licensing are fairly routine in the water utility industry.
c. Cypress Springs WSC has, in place, customer relationships, a billing system and method of metering the service rendered, the ability to deal with non-payment through termination of water service; and
d. Cypress Springs WSC also has a vested interest in preserving the water quality in the reservoir, since this is its water supply.
e. An economy of scale should be achievable in O & M expenses, since staff can be cross-trained, common management can be provided both water and wastewater systems, and common billing would be used.

Disadvantages would include:

a. Provision of any service through multiple entities is inherently more cumbersome than through a single entity;
b. A contract must be developed and maintained between FCWD and CSWSC which is acceptable to the participants, as well as to the regulatory and financing entities.
c. Annual operation and maintenance expenses will include sales tax on taxable purchases.
d. The bylaws or articles of incorporation of CSWSC may require amendments to allow for provision of wastewater service.

Option 3

Option 3 would provide for both construction and operation of the wastewater system by the Cypress Springs WSC.

Advantages of this option include:

a. The service would be provided by a single entity;
b. The operating efficiencies of a through e in Option 2 would be preserved.

Disadvantages of this option include:

a. The financing advantages of a, b, and d in Option 1 would be lost;
b. The eminent domain privileges enjoyed by FCWD would not apply;
c. Some grant/loan options may be less favorable – while Rural Development (USDA) will likely have similar grant/loan terms for both CSWSC and FCWD, other programs, such as TWDB, banks, or the public market will likely have higher interest rates for the taxable debt of the corporation. Water Supply Corporations are not eligible for funding under the Clean Water SRF funding program of the TWDB. TWDB funding is available to WSC's, but at interest rates about 3% higher than through the CWSRF.
d. CSWSC has a large number of customers who would not be direct beneficiaries of the wastewater system and may be reluctant to incur the debt and obligations associated with its construction.

Option 4

Option 4 involves the creation of a new entity to own and/or operate the wastewater utility. Entities might include another not-for-profit utility corporation, a for-profit corporation, a municipal utility district, municipal incorporation of the service area, conversion of CSWSC to a utility district, operation by the County (possibly requiring special legislation), or some form of economic development district, special purpose district, or river authority.

While each of these could be viable in certain situations, the creation of an additional entity if not required would only complicate management of the water resources. The current availability of both FCWD and CSWSC as viable candidates for development and operation of the wastewater system would seem to preclude the necessity of an additional entity. If, however, the existing entities are unwilling or unable to develop the project, further consideration should be given to Option 4.

Financing Alternatives

Typically, capital costs for construction of water and wastewater utility systems are provided through a combination of long-term debt, local contributions, and, where eligible, government grants-in-aid of construction. Funds for annual operating and maintenance costs, and amortization of the long-term debt are generally provided from user fees, supplemented in some cases by tax revenues.

Long-term debt will be in the form of municipal bonds for governmental entities, and as corporate bonds or mortgage notes for non-governmental sponsors. The bonds or notes may be sold to local banks, on the public market, or to various state or federal agencies maintaining programs for this purpose. Local contributions may include unencumbered funds accumulate by the sponsor from other activities, assessments on land developments, customer contributions, membership or connection fees. Various state and federal agencies may provide grant funds to projects which qualify and support the agencies established programs.

For operation and maintenance of wastewater systems, the utility establishes an annual expense budget and, generally based upon metered water sales, a monthly user charge which will produce sufficient revenues to meet expenses. In some cases, wholesale contract revenues, sales taxes, or other system revenues may also supplement user fees. When debt is issued by the utility, and supported only by revenues of the system, the bond or loan covenants may require that income exceed expenses by a "debt coverage ratio" typically 1.10 to 1.25 times. This coverage may be avoided where a pledge of tax revenue can supplement the user charges, or where the debt is fully supported by tax revenues in lieu of user fees. Where the debt is issued in the public market, the credit rating of the issuer and the presence or lack thereof of commercial insurance guaranteeing repayment can affect the interest rate at which the debt is sold.

For the FCWD project, Table XXI herein illustrates the alternatives available for financing the initial capital costs.

Table XXI
Franklin County Water District — Regional Wastewater Plan — Summary of Financial Assistance Alternatives

Financial Assistance	Level	Type	Use	Eligibility
Rural Development, USDA (formerly Farmers Home Administration)	Federal	Project Grants and Loans	Installation, repair, expansion of waste disposal facilities, including collection and treatment.	Municipalities, counties, and other political subdivisions of a State, such as districts and authorities; associations, cooperatives, and corporations operated on a non-profit basis. Facilities shall primarily serve rural residents. Median household income level determines extent of grant assistance available. Loans can be for up to 40 years.
Texas Water Development Board (State Revolving Fund)	State	Loan	Construction, repair, or expansion of publicly owned wastewater treatment works including collection and treatment.	Municipalities, counties, districts, WSC's, and authorities are eligible to apply for assistance loan. Applications are prioritized, and loans are generally for up to 20 years, with a rate that is about 1% less than the current market rate for similar securities.
Texas Department of Housing and Community Affairs (Texas Community Development Program)	State	Project Grants	Acquisition, rehabilitation or construction of public works facilities and improvements, clearance, housing rehabilitation, code enforcement, relocation payments and assistance, administrative expenses, economic development.	Eligible applicants are units of general local government (including counties). To be eligible each activity must directly impact on the applicant's need and must either: (1) benefit low and moderate income persons, or (2) aid in the prevention or elimination of slums or blight; or (3) meet other community development needs having a particular urgency. Maximum single grant is $250,000. Competitive selection process. Neither Districts nor WSC's are directly eligible, but the county can apply on behalf of either.
Texas Water Development Board: Water Assistance Fund	State	Loan	Construction, repair, or expansion of water and sewer facilities, including collection and treatment.	
Issuance of Bonds	Local	General Obligation and Revenue Bonds	For construction, expansion, rehabilitation of municipal-type utilities and facilities.	Municipalities, counties, water districts, River Authorities, WSC's and for profit corporations, subject to certain limitations on tax rates and total amount of indebtedness.
Local Sources	Local	Cash	For construction, expansion, operation, or rehabilitation of municipal-type utilities and facilities.	Varies by entity. Sources may include membership fees; cash on hand; developer contributions; sales, franchise, or other tax revenues.

CHAPTER 8

Chapter 8 – Public Involvement

Public involvement was provided through presentations at regular board meetings of the FCWD, and the local news media. Examples are included in Appendix B. The planning grant application envisioned appearances before the Winnsboro and Mt. Vernon City Council – these appearances were dropped after these entities declined to participate as the treatment entity.

In addition, a questionnaire was mailed to lake area residents, to elicit their feelings with respect to current treatment methods, and their opinions regarding a centralized collection system. A sample of the questionnaire, a summary of comments received with the questionnaire, and a tabulation of survey responses are included in Appendix B. A total of 1366 surveys were mailed using a mailing list compiled by the District of persons who lease lake property from the District. Some of these are currently developed, and some undeveloped. The majority will fall in planning sub-areas E and A_1, which are the areas considered potentially feasible for a centralized collection system. 683 survey responses were received.

89% of the responses received were from Areas E and A_1. 75% of the responses were from developed properties, with 25% being from property held for future development. Of the respondents, 57% report satisfaction with the current practice of on-site systems. 43% reported a preference for a centralized system, but only 31% would be willing to pay $30.00 per month or more for the service. Areas A_1 and E were tabulated separately, with similar percentages found for each area individually.

The written comments received generally express a desire to maintain the quality of water in the reservoir, but a concern over the cost of the centralized service. Several of the commentors noted that they would use the system only infrequently, thus making the monthly charge more burdensome. Others noted that they had recently spent large sums to upgrade their present systems. Several commentors suggested a need for more stringent enforcement of existing regulations.

CHAPTER 9

Chapter 9 – Conclusions

This study has analyzed the potential for a wastewater collection system and centralized treatment facility in a planning area which generally encompasses the watershed of Lake Cypress Springs in Franklin County, Texas. The study indicates at total of 5138 people in the planning area, of which 2306 are full-time residents.

The planning area was divided into 7 sub areas for analysis purposes. Data shows that a centralized system is not and will not likely be cost effective in 5 of those 7 areas during the planning period. For these areas it is recommended that the District consider methods to encourage water conservation; enhanced inspection and enforcement to eliminate substandard on-site systems; and continued inspection and regulation of newly installed systems.

Sub areas E and A_1 evidence potential for development of a pressure-type collection system and a centralized treatment facility. 1250 full or part-time residences could be served in these areas at present. However, the average monthly user cost would range from $30 to $57 per month, dependent upon financing and management arrangements. This is significantly higher than for surrounding systems. Results of a survey of lake area residents showed that only about one-third would be supportive of a centralized collection system at this time, with monthly rates in excess of $30.00. To be successful, the project must have a much higher acceptance level and, in fact, would probably require mandatory connection to the system. The project may be more favorably received at a future date within the planning period as increased densities drive down user costs and exacerbate environmental concerns.

Water quality studies indicate that, while there do appear to be nutrient and bacterial loadings to the lake from on-site wastewater facilities, the predominant nutrient and bacterial loadings are from upstream of the reservoir. Further studies are recommended to identify, and subsequently manage, these influents. Possible options include:

1) The Texas Water Development Board, through its Clean Water SRF program, funds the Source Water Assessment Program, or SWAP. SWAP provides guidance to water supply entities to identify pollutant sources in a reservoir watershed, and loans funds to rectify these identified problems.
2) The TNRCC, through the Clean Rivers Program, CRP, provides funding and assistance for developing water quality data on water bodies in Texas. FCWD has begun participation in this program by funding four water quality monitoring sites on Lake Cypress Springs for this year. Two of these sites will monitor influents from the major tributaries to the reservoir. Funding of these sites should be continued in subsequent years, to develop a meaningful database.
3) The Natural Resource Conservation Service provides a Section 319 program in conjunction with the Texas State Soil and Water Conservation Board. Under this program, once non-point agriculturally related water quality problems are identified by TNRCC or other parties, the program provides grant funds to partially defray the landowner's cost in rectifying the identified problems. Management plans are developed by the NRCS staff – the landowner matches the grant on a 60-40 basis.

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APPENDIX A

APPENDIX A
Federal and State Coordination Correspondence

Texas Parks and Wildlife Department

US Department of the Interior, Fish and Wildlife Service

Texas Historical Commission

HAYTER
ENGINEERING, INC.

CONSULTANTS PLANNERS ENGINEERS

4445 S.E. LOOP 286
PARIS, TEXAS 75460
(903) 785-0303
FAX (903) 785-0308

RECEIVED
FFR 0 3 2000

December 16, 1999

Review of the project activity as proposed indicated minimal impacts to fish and wildlife resources.
Reviewed: Roy C. Tellaro
1/31/2000

Mr. Roy G. Frye
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

Re: Franklin County Water District
Franklin County, Texas
Regional Wastewater Plan

Dear Mr. Frye:

Franklin County Water District owns and operates Lake Cypress Springs in Franklin County, Texas. With the assistance of the Texas Water Development Board, the District is developing a regional plan for wastewater services, generally covering the drainage area of the lake. The planning area is shown on Figure 1 attached. The plan is to assess the feasibility of such a project, and to investigate various alternatives available. This letter is to initiate coordination with your agency regarding any comments or concerns for a project of this nature.

The 3,400 acre surface area lake was impounded in 1971. Today, it serves as the water supply for the Cypress Springs Water Supply Corporation, and the Cities of Mt. Vernon and Winnsboro, The study has shown that there are 5138 full or part-time residents within the watershed, and that this will increase to 6675 by the year 2020.There are no industrial or substantial commercial contributors within the planning area. The lake is a prime recreational resource, with activities including camping, fishing, water skiing, swimming and other water based recreation.

The District enforces on-site waste disposal regulations established by the TNRCC. Soils in the watershed are, however, generally not conducive to on-site disposal, and the District forsees a need for collection and central treatment of the wastewater at some point in the future.

Four alternatives are being considered at this time:

Texas Parks & Wildlife Dept.
DEC 20 1999
Wildlife Habitat Assessment Program

1. Continuation of on-site systems
2. Collection and transport to the City of Winnsboro
3. Collection and transport to the City of Mt. Vernon
4. Collection and treatment at a site near the lake, to be determined

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79 1 3

Low population density appears to render collection and central treatment cost-prohibitive in all planning areas except E and A1, and it appears that continuation of on-site systems will be the selected alternative for low population density areas. Collection and centralized treatment may be cost-effective in areas E and A1, subject to further analysis.

If so, however, both Winnsboro and Mt. Vernon have currently declined to provide treatment because of the large lake population relative to their own. Preliminary discussions of alternate 4 have centered on a plant generally located at the south end of the Lake Cypress Springs dam covering 2 to 3 acres, as shown on the attached Figure 1. The plant would be of the activated sludge type, with a anticipated average daily flow of 0.400 mgd. Permit limits are anticipated to be 10 mg/l BOD_5, 15 mg/l TSS, 3 mg/l,. NH_3 and 5 mg/l D.O., with the discharge being into Lake Cypress Springs. Land application of the effluent will also be considered. The collection system would be of the grinder or septic tank effluent pump type with PVC mains. Lines would be routed adjacent to existing roads wherever feasible.

Analysis is currently underway on the cost-effectiveness of a collection system and treatment facility. Should you desire to comment at this stage, we would appreciate your response by January 20, 2000. Please feel free to contact me for any further information at 903-785-0303.

Sincerely,

HAYTER ENGINEERING, INC.

R. Reeves Hayter, P.E.
President

cc: Mr. David Weidman, FCWD
Mr. Ed Withers

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
WinSystems Center Building
711 Stadium Drive, Suite 252
Arlington, Texas 76011

2-12-00-I-175

January 12, 2000

JAN 18 REC'D

Mr. R. Reeves Hayter
Hayter Engineering, Inc.
4445 S.E. Loop 286
Paris, Texas 75460

Dear Mr. Hayter:

This responds to your December 16, 1999, letter requesting comments on Franklin County Water District's proposed regional plan for wastewater services in Franklin County, Texas. The proposed project consists of the construction of a treatment facility and collection system within the general drainage area of Lake Cypress Springs.

Threatened and Endangered Species

The only federally listed threatened or endangered species known to occur in Franklin County is the threatened bald eagle (*Haliaeetus leucocephalus*), which is considered a winter and possible spring resident and has been documented at Lake Cypress Springs in recent years. Bald eagles nest, roost, and perch in tall trees near water and feed primarily on fish and waterfowl. Winter habitat includes reservoirs, lakes, playas, rivers, and marshes. Most wintering bald eagles migrate north February through March; however, nesting eagles either stay throughout the entire year or migrate late in the summer.

For information regarding State listed species and Species of Concern, contact the Texas Parks and Wildlife Department, Texas Biological and Conservation Data System, 3000 South IH-35, Suite 100, Austin, Texas 78704, or call them at (512) 912-7011.

Wetlands and Wildlife Habitat

Because only a general project area for the proposed wastewater system has been submitted for our review, specific comments on the proposed treatment facility site and collection system routes cannot be addressed at this time. However, we would like to offer a few suggestions that should be considered during the planning phase to avoid and/or minimize the potential impacts to fish and wildlife resources and the environment, such as:

1) utilizing as much existing utility or road right-of-way as possible for sewer line.
2) avoiding impacts to wetland areas.
3) selecting sewer line routes that have the least number of creek, stream, river, or other waterbody crossings.
4) avoiding impacts to riparian and upland forested areas.
5) avoiding areas which may contain suitable habitat or have documented occurrences of federally listed species.

We would be glad to provide technical assistance at any stage of the planning and development process for the proposed project.

Thank you for the opportunity to comment on the proposed project. If you have any questions, please contact Clayton Napier or Omar Bocanegra at (817) 277-1100.

Sincerely,

Tom Cloud

Thomas J. Cloud, Jr.
Field Supervisor

TEXAS HISTORICAL COMMISSION

The State Agency for Historic Preservation

GEORGE W. BUSH, GOVERNOR

JOHN L. NAU, III, CHAIRMAN

F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

January 12, 2000

JAN 18 REC'D

R. Reeves Hayter, P.E.
Hayter Engineering, Inc.
4445 S. E. Loop 286
Paris, Texas 75460

Re: Franklin County Water District Regional Wastewater Plan
(TWDB)

Dear Mr. Hayter:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the area indicated from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission.

The review staff, led by Ed Baker, has completed its review. We prefer not to comment on the four specific alternatives listed in your letter, as they would have to be described in more detail. We can comment that several archeological sites are recorded in the area marked "general vicinity of proposed plant" on your project map. We recommend that you engage a qualified professional archeologist or, perhaps, enlist the aid of Texas Water Development Board archeologists and environmental staff to determine which, if any, of the possible project areas would merit further investigation or protection under state and federal laws. Please feel free to contact us again at any point in the planning process.

We look forward to further consultation with you and hope to maintain a partnership that will foster effective historic preservation. Thank you for your inquiry, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Ed Baker at 512/463-5866.**

Sincerely,

William A. Martin

for
F. Lawerence Oaks, State Historic Preservation Officer
FLO/elb

P.O. BOX 12276 · AUSTIN, TX 78711-2276 · 512/463-6100 · FAX 512/475-4872 · TDD 1-800/735-2989
www.thc.state.tx.us

APPENDIX B

APPENDIX B
Public Participation

Franklin County Water District, Notice of Board of Directors Meeting to be held on December 13, 1999 at 3:00 P.M.

Franklin County Water District, Notice of Board of Directors Meeting to be held on January 10, 2000 at 3:00 P.M.

Franklin County Water District, Notice of Board of Directors Meeting to be held on February 12, 2000 at 3:00 P.M.

Cypress Springs News, January 2000

Cypress Springs News, March 2000

Franklin County Water District, Lake Property Lessee survey results

FILED FOR RECORD
at 2:08 o'clock P M

DEC 08 1999

BARBARA KEITH CAMPBELL County Clerk
Franklin County, Texas
By B Emerson Deputy

FRANKLIN COUNTY WATER DISTRICT
MOUNT VERNON TEXAS
NOTICE OF BOARD OF DIRECTORS MEETING
TO BE HELD ON December 13, 1999 at 3:00 PM

NOTICE IS HEREBY GIVEN THAT A REGULAR MEETING of the above named Board of Directors will be held on the 13th day of DECEMBER, 1999, 3:00 P. M., in the District's office located on the East side of the square in Mount Vernon, Texas. The following subjects will be discussed and possible action taken thereon:

I. Invocation

CONSENT AGENDA

1. Consideration, Approval and Ratification of Minutes.

REGULAR AGENDA

1. Consideration, Approval of Payment of Bills.
2. Report from Hayter Engineering on Wastewater Study.
3. Consideration, Approval of Request by Kings Country POA to Construct Fishing Pier.
4. Consideration, Approval of Modification of Districts Request for Probation of Aquatic Aircraft on Lake Cypress Springs with TxDot.

EXECUTIVE SESSION

1. Personnel Matters...Employee Evaluations and Salaries. (Subchapter D, 551.074 (a) (1) Texas Open Meetings Act).
2. Consultation With Attorney...Pending Litigation. (Subchapter D, 551.071 (1) (A) Texas Open Meetings Act).
3. Open Session - Consideration, Approval of Items Discussed in Executive Session.

MANAGERS REPORT

1. Status of Spillway Property Closings and Easements.
2. Manager's Designated Representative Certification.
3. Report on Parks and Wildlife Vegetation Survey.

ATTORNEY'S REPORT

If further information concerning the meeting is desired, it can be obtained by contacting David I. Weidman at 537-4536

FRANKLIN COUNTY WATER DISTRICT
Dal Weid

I, undersigned County Clerk of Franklin County, Texas, do hereby certify that the above NOTICE OF MEETING of the above named Franklin County Water District is a true and correct copy of said NOTICE and I posted a true and correct copy of said NOTICE on the bulletin board at the courthouse door of Franklin County, Texas on the 8th day of December, 1999, and it remained so posted continuously for at least 72 hours immediately preceding the date of the meeting.

Barbara Keith Campbell
Barbara Keith Campbell, County Clerk
Brook Emerson - Deputy

FILED FOR RECORD
at 2:08 o'clock P M

DEC 08 1999

BARBARA KEITH CAMPBELL County Clerk
Franklin County, Texas
By B Emerson Deputy

FRANKLIN COUNTY WATER DISTRICT
MOUNT VERNON TEXAS
NOTICE OF BOARD OF DIRECTORS MEETING
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FRANKLIN COUNTY WATER DISTRICT
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Barbara Keith Campbell
Barbara Keith Campbell, County Clerk
Brook Emerson - Deputy

FRANKLIN COUNTY WATER DISTRICT

ATE 11/17/99 TIME 15:29:10 A/P CHECK DISTRIBUTION ** COMPANY NO. 1 PAGE 1

ECK #	VEND#	VENDOR NAME	INVOICE NO	CO#	ACCTS PAY	DISCOUNT	CASH	MISCELL	G/L #
14588	ALC01	ALCO DISCOUNT STORE	111099	01	187.17				
14588	ALC01	ALCO DISCOUNT STORE	111099	01			-187.17		
4589	ARK02	ARKLA	21419	01	12.00				
4589	ARK02	ARKLA	21419	01			-12.00		
4590	BIZ01	BIZ SUPPLIES	1003	01	623.83				
4590	BIZ01	BIZ SUPPLIES	1003	01			-623.83		
4591	CRO01	CROWSTON'S SERVICE CENTER	111099	01	78.14				
4591	CRO01	CROWSTON'S SERVICE CENTER	111099	01			-78.14		
4592	CRO02	BROOKSEY CROW	233140	01	222.00				
4592	CRO02	BROOKSEY CROW	233140	01			-222.00		
4593	CYP04	CYPRESS CREEK COUNTRY CLUB	6767	01	85.00				
4593	CYP04	CYPRESS CREEK COUNTRY CLUB	6767	01			-85.00		
4594	DIG02	DIGITEC INFORMATION SYSTEMS,IN	14084	01	137.50				
4594	DIG02	DIGITEC INFORMATION SYSTEMS,IN	14084	01			-137.50		
4595	FCW01	FCWD-MISCELLANEOUS FUND	2251	01	39.50				
4595	FCW01	FCWD-MISCELLANEOUS FUND	2252	01	96.21				
4595	FCW01	FCWD-MISCELLANEOUS FUND	2253	01	60.00				
4595	FCW01	FCWD-MISCELLANEOUS FUND	2254	01	60.00				
4595	FCW01	FCWD-MISCELLANEOUS FUND	2254	01			-255.71		
4596	FIR02	FIRST NATIONAL BANK	DEPOSIT	01	2265.58				
4596	FIR02	FIRST NATIONAL BANK	DEPOSIT	01			-2265.58		
4597	GTE01	GTE SOUTHWEST INCORPORATED	111599	01	213.63				
4597	GTE01	GTE SOUTHWEST INCORPORATED	111599	01			-213.63		
4598	HAY01	HAYTER ENGINEERING, INC.	5640	01	7545.89				
4598	HAY01	HAYTER ENGINEERING, INC.	5640	01			-7545.89		
4599	KUH02	JOE KUHL	11599	01	50.00				
4599	KUH02	JOE KUHL	11599	01			-50.00		
4600	LON03	LONE STAR TIRE	55679	01	32.00				
4600	LON03	LONE STAR TIRE	55679	01			-32.00		
4601	NEE01	NEELD SHARPENING SERVICE	29401	01	24.50				
4601	NEE01	NEELD SHARPENING SERVICE	29401	01			-24.50		
4602	PLE01	PLEASANT OAKS LANDFILL	000318	01	30.00				
4602	PLE01	PLEASANT OAKS LANDFILL	000318	01			-30.00		
4603	SOU01	SOUTHWESTERN ELECTRIC POWER CO	111699	01	185.69				
4603	SOU01	SOUTHWESTERN ELECTRIC POWER CO	111699	01			-185.69		
4604	SOU05	SOUTHWESTERN LIFE	1199	01	2120.06				
4604	SOU05	SOUTHWESTERN LIFE	1199	01			-2120.06		
4605	TWC01	TWCA RISK MANAGEMENT FUND	1199	01	560.00				
4605	TWC01	TWCA RISK MANAGEMENT FUND	1199	01			-560.00		
4606	TYL01	TYLER UNIFORM CO.	16697	01	231.36				
4606	TYL01	TYLER UNIFORM CO.	16697	01			-231.36		
4607	WAL02	WAL-MART	CM2	01	-86.04				
4607	WAL02	WAL-MART	CORRECTION	01	-28.62				
4607	WAL02	WAL-MART	00524	01	28.62				
4607	WAL02	WAL-MART	111099	01	86.04				
4607	WAL02	WAL-MART	2050	01	89.96				
4607	WAL02	WAL-MART	2359	01	179.92				
4607	WAL02	WAL-MART	2646	01	86.04				
4607	WAL02	WAL-MART	2646	01			-355.92		
4608	WEI01	CYNTHIA WEIDMAN #25,316	110599	01	199.50				
4608	WEI01	CYNTHIA WEIDMAN #25,316	110599	01			-199.50		

FRANKLIN COUNTY WATER DISTRICT

DATE 11/17/99 TIME 15:29:14 A/P CHECK DISTRIBUTION ** COMPANY NO. 1 PAGE 2

CHECK #	VEND#	VENDOR NAME	INVOICE NO	CO#	ACCTS PAY	DISCOUNT	CASH	MISCELL	G/L #
14609	WIN05	WINKLE OIL CO., INC.	25305	01	914.93				
14609	WIN05	WINKLE OIL CO., INC.	25305	01			-914.93		
			*** TOTALS		16330.41	0.00	-16330.41	0.00	

01	11120	CD	14576	J R ALPHIN	11/09/99	0.00	285.00
01	63540	CD	14576	J R ALPHIN	11/09/99	285.00	0.00
					11/09/99	285.00	285.00

FRANKLIN COUNTY WATER DISTRICT

: 11/17/99 TIME 13:52:43 A/P VOIDED & UNUSABLE CHECK EDIT LIST ** COMPANY NO. 1 PAGE 1

:ASH#	CHECK#	VEND#	VENDOR NAME	INVOICE #	DISC AMT	NET AMT	STATUS
				00524	0.00	28.62	
				2050	0.00	89.96	
				2359	0.00	179.92	
				2646	0.00	86.04	
:1120	14567	WAL02	WAL-MART		0.00	384.54	VOIDED
				*** TOTALS	0.00	384.54	

PAYROLL PERIOD ENDING 10/31/99

Check #	Payee	Amount
14576	Shirley Maples	$ 824.52
14577	Carole Dunn	527.33
14578	Trish Kuhl	160.91
14579	David Weidman	627.15
14580	Gary Marrs	829.66
14581	J. R Alphin	712.66
14582	Michael Jaggers	177.31
14583	Roy Medders	693.38
14584	Alice Kirkelie	575.62
14585	Shirley Dacus	63.73
14586	Chelitta Thomas	472.86
14587	Morlan Roach	669.79
14588	David Butler	414.37
Total		6,749.29

FILED FOR RECORD
at 2:23 o'clock P M
JAN 05 2000
[illegible]
B. Crane

FRANKLIN COUNTY WATER DISTRICT
MOUNT VERNON TEXAS
NOTICE OF BOARD OF DIRECTORS MEETING
TO BE HELD ON January 10, 2000 at 3:00 PM

NOTICE IS HEREBY GIVEN THAT A REGULAR MEETING of the above named Board of Directors will be held on the 10th day of JANUARY, 2000, 3:00 P. M., in the District's office located on the East side of the square in Mount Vernon, Texas. The following subjects will be discussed and possible action taken thereon:

1. Invocation

CONSENT AGENDA

1. Consideration, Approval and Ratification of Minutes.
2. Consideration, Approval and Ratification of Payment of Bills.

REGULAR AGENDA

1 Consideration, Approval of Letter of Understanding and Easement for City of Mount Pleasant Water Siphon Structure.
2. Consideration, Approval of District Water Quality and Sampling Program, and Participating with Cypress Basin in Clean Rivers Testing Program.
3 Consideration, Approval of Bids for Purchase of 2000 Truck for Inspector.
4. Consideration, Approval, Revised Work Barge Permits and Rules.
5. Amend 1999 Budget.

EXECUTIVE SESSION

MANAGERS REPORT

1. Attending TWCA Annual Convention and Public Funds Investment Training Session

ATTORNEY'S REPORT

If further information concerning the meeting is desired, it can be obtained by contacting David I. Weidman at 537-4536

FRANKLIN COUNTY WATER DISTRICT
D. I. Weidman

I, undersigned County Clerk of Franklin County, Texas, do hereby certify that the above NOTICE OF MEETING of the above named Franklin County Water District is a true and correct copy of said NOTICE and I posted a true and correct copy of said NOTICE on the bulletin board at the courthouse door of Franklin County, Texas on the 5th day of January, 2000, and it remained so posted continuously for at least 72 hours immediately preceding the date of the meeting.

Betty Crane Deputy
Barbara Keith Campbell, County Clerk

FILED FOR RECORD
at 3:08 o'clock P M

FEB 08 2000

BARBARA KEITH CAMPBELL County Clerk
Franklin County, Texas
[signature] Deputy

FRANKLIN COUNTY WATER DISTRICT
MOUNT VERNON TEXAS
NOTICE OF BOARD OF DIRECTORS MEETING
TO BE HELD ON February 14, 2000 at 3:00 PM

NOTICE IS HEREBY GIVEN THAT A REGULAR MEETING of the above named Board of Directors will be held on the 14th day of FEBRUARY, 2000, 3:00 P. M., in the District's office located on the East side of the square in Mount Vernon, Texas. The following subjects will be discussed and possible action taken thereon:

1. Invocation

CONSENT AGENDA

1. Consideration, Approval and Ratification of Minutes.
2. Consideration, Approval and Ratification of Payment of Bills.
3. Destruction of Three Legal Size Boxes of Records in Accordance with Records Control Schedule.
4. Budget Comparison January 2000.

REGULAR AGENDA

1. Report from Hayter Engineering on Wastewater Study.
2. Consideration, Approval Matters Concerning Withdrawal of the City of Mount Vernon from Participation in Aeration System on Lake Cypress Springs.
3. Consideration, Approval of Bids to Construct Retaining Wall in Walleye Park.
4. Consideration, Approval of Sale of General Fixed Assets.

EXECUTIVE SESSION

MANAGERS REPORT

1. Public Forum on Operation of Aquatic Aircraft on Lake Cypress Springs.
2. Report on CRP Water Quality Conference.

ATTORNEY'S REPORT

... contacting David I

FILED FOR RECORD
at 3:08 o'clock P M
FEB 08 2000
BARBARA KEITH CAMPBELL County Clerk
Franklin County, Texas
[illegible] Deputy

FRANKLIN COUNTY WATER DISTRICT
MOUNT VERNON TEXAS
NOTICE OF BOARD OF DIRECTORS MEETING
TO BE HELD ON February 14, 2000 at 3:00 PM

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EXECUTIVE SESSION

MANAGERS REPORT

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2. Report on CRP Water Quality Conference.

ATTORNEY'S REPORT

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FRANKLIN COUNTY WATER DISTRICT
David Weidman

I, undersigned County Clerk of Franklin County, Texas, do hereby certify that the above NOTICE OF MEETING of the above named Franklin County Water District is a true and correct copy of said NOTICE and I posted a true and correct copy of said NOTICE on the bulletin board at the courthouse door of Franklin County, Texas on the 9th day of February, 2000, and it remained so posted continuously for at least 72 hours immediately preceding the date of the meeting.

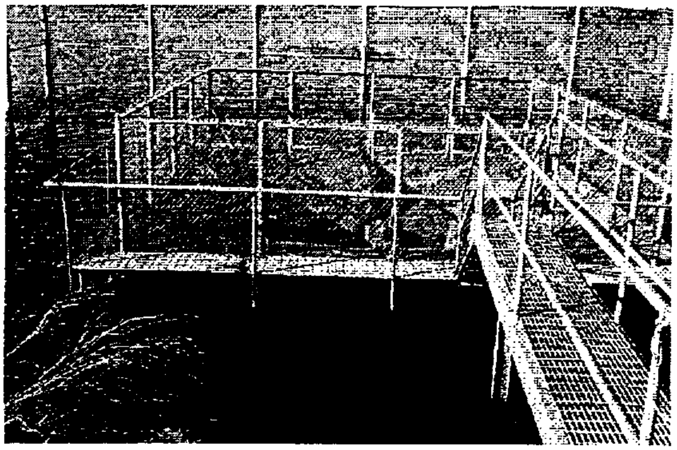
Barbara Keith Campbell
Barbara Keith Campbell, County Clerk
by: Betty Crane, Deputy

Cypress Springs News

Lake Cypress Springs: Franklin County's Economic Powerhouse

January 2000

Lake Still 2 Feet Below Normal



The "Glory Hole" at the dam is a silent reminder of how far the lake must rise before the level is normal.

Hydrilla Report

The Franklin County Water District (FCWD)has finally received the State report on Hydrilla. It reads (in part): "Based on this year's survey, the estimated coverage of Hydrilla was 125-150 ares, similar to that found in 1998. This represents a 50-60% reduction in coverage compared to that found in the early 1990's. All of the Hydrilla observed was in the lower end of the reservoir (below Hwy 115 bridge)."

CSN received a pointed letter from a resident of Pine Valley, inquiring whether the FCWD had been out on the lake recently. He and two friends in North Shore plus two in Tall Tree say that the Hydrilla is the worst in five years.

FCWD may do spot treatments.

Lake Conditions

As of 31 December, Lake Cypress Springs is 23 inches below normal. Water temperature is 53 °F in shallow water, and is very clear. The catfish are still in the Lake Property Management boathouse, albeit moving rather slowly. They still accept catfish food donations.

Pollution Entering Lake Cypress Springs From Creeks

FCWD commissioned a year-long toxicology study of pollution as a part of an ongoing program to insure Lake Cypress Springs water quality. During that period, only three samples were taken. Panther Creek (North end) and Big Cypress Creeks (West end) were found to have elevated levels of bacteria and household detergents. In one sample, pollution was 300 times that of reference sites. This seems to indicate that pollution is entering the lake mainly from the creeks. It is noteworthy that extensive cattle, dairy and chicken operations are upstream of the affected areas. Presently there are no state regulations on those agricultural industries.

Water was checked for pollutants at Big Cypress Creek, Panther Creek, Alligator Cove in North Shore, Crawfish Cove in Kings Country, El Dorado Bay, and Tall Tree. Panther and Big Cypress creeks had elevated levels of nitrate, phosphorous, orthophosphate, and sulfate as well as fecal coliform and fecal streptococus. The latter two are indicative of human and animal waste.

In the cases of Crawfish and Alligator Coves, some pollution seems to be coming from old, leaking, or outdated septic systems which are not using modern aerobic methods. However, pollution levels in feeder creeks is up to 20 times that of those coves. The source of the most of the pollution apparently comes from the runoff from chicken farms, dairy, and beef cattle upstream of the affected areas.

The report by Huther and Associates of Carrollton, TX recommends further sampling and an investigation of the sources of nutrients and fecal bacteria in the creeks. It further recommends continued monitoring, especially the creeks.

Given the fact that agricultural runoff is unregulated, FCWD seems to be aiming at a centralized wastewater treatment for lake homes.

Cypress Springs News

Cypress Springs: Franklin County's Economic Powerhouse

March, 2000

Central Wastewater Treatment?

Valentines Party at Cypress Creek Country Club

Good food, good friends, good prices, and live entertainment were the order of the day on February 18, when the Cypress Springs Country Club had it's first Sweetheart Supper. "The party exceeded our wildest expectations", said the General Manager, "We were expecting half as many as made reservations and really had to scramble at the last minute. We're really pleased with how our first event turned out, and have learned a lot about what people want from the Club."

Cypress Creek Country Club plans more monthly events, centered around major holidays; Memorial Day, Fourth of July, and Labor Day. The next event is St. Patrick's Day party scheduled for March 17-18. Make reservations by calling 903-860-2154.

Lake Conditions

As of 22 February, 2000, Lake Cypress Springs was 13 inches below normal. Water is cloudy due to the rain on Feb. 26, and water temperature is 59°F in shallow water. Catfish are not to be found in the Lake Property Management boathouse, gone to deep water to hide from fishermen.

Hayter Engineering presented the results of their study of a centralized wastewater treatment plant for Lake Cypress Springs at the Franklin County Water District Board meeting, February 14. The study is based on the assumption that at some later date 1250 homes around the lake might require a centralized septic system.

The treatment facility would likely be located at the south end of the dam because there is little development in that area, and the odors and noise would offend the fewest number of people. Prevailing winds would carry odors North and Northeast.

Untreated sewage would be pumped to the treatment plant by a 2" to 6" pipeline encircling the area delineated by the Hwy 115 bridge, the lake itself, and the dam. The 2 to 400,000 daily gallons of treated wastewater could be sent downstream, but that might create an issue for the water-rights holders of the Cypress Basin. Treated wastewater could also be discharged into the drinking water supply of Lake Cypress Springs.

The system would cost $8,056, 000.00 ($6,445/home vs. $4500 for an aerobic system) and have an operating budget of $212,000.00/year ($170 per year per home) excluding interest.

Winnsboro and Mt. Vernon have each declined to be considered as treatment entities, leaving three options; treatment by FCWD, a new entity, or Cypress Springs Water Supply.

Financing would be provided by grants, loans, and general obligation and revenue bonds. The latter would require a taxpayer referendum. If included in the monthly water utility bill, the average water bill would double or triple, and the homeowner would pay for the electricity to pump effluent into the central system.

As of 1 January FCWD and the State spent over $20,000.00 on studies, one of which demonstrated that pollution enters Lake Cypress Springs mainly from streams, not septic systems.

Franklin County Water District

LAKE CYPRESS SPRINGS
P. O. Box 559
MOUNT VERNON, TEXAS 75457

Dear Lake Property Lessee:

To protect and maintain water quality, the Franklin County Water District is conducting a study to determine if a centralized sewer collection and treatment system would be feasible for the property around Lake Cypress Springs. If such a system were determined feasible, it would be several years before it could be implemented. To assist us in this study, we would appreciate your answers to the following questions:

1. Is your property presently developed _______ or undeveloped _______?

2. Your present form of sewage disposal is:

   Clearwater/spray irrigation _______________ Other _______________

   Septic tank/drainfield _______________ None _______________

3. Considering your own present system and your neighbors' systems, do you think that these "on-site" systems are sufficient for the present time, or would you prefer to see a collection system and central treatment plant?

   On-site systems okay _______________ Prefer centralized system _______________

4. Our engineers feel that if a collection system and centralized treatment plant were built, the average monthly bill to the users would be $30 to $60 per month. Would you be interested at (check one):

   Less than $30 _______________ $40 - $50 _______________

   $30 - $40 _______________ $50 or more _______________

   Not interested _______________

Thank you for your assistance. Please return this survey by April 15, 2000 to:

Franklin County Water District
P.O. Box 559
Mt. Vernon, TX 75457

Sincerely,

David I. Weidman

David I. Weidman
General Manager

ELABORATED RESPONSES TO QUESTIONS

On-site systems okay (yes) with further commentation

1. Would prefer Centralized system at reasonable cost because of environment.
2. For now, but maybe will prefer centralized system later.
3. We are "week end" lake owners, asking $30 to $60 a month is a lot. Think this should be on a "usage" basis.
4. Would this involve fire hydrants?
5. Is there any problem with lake water due to seepage?
6. Would the money for residental sewage be better spent toward minimization of B.O.D. (manure) from dairies and chicken operation?
7. Who pays and maintains the pumps and tank from the house?
8. Just had expensive on-site system installed less than a year ago. Central system is good idea. We just wouldn't be interested now.
9. Four weekends, holiday, and occasional partial weeks, this doesn't seem cost effective.
10. However, we are very concerned about the quality of the lake water and believe we should take all necessary steps to preserve it.
11. We have no problems. We have too much invested in our system and it works great.
12. For now.
13. 9/17/98 I paid $5,000.00 for white water aerobic wastewater treatment unit. Planning to use it a good many years. It is doing fine.
14. Clearwater/spray systems should be required & inspection made to see they are properly maintained.
15. Need to increase inspections of leaks into the lake.
16. I am not a full time resident-one person, 3 days a week. Present system is adequate for me.
17. Not interested but......My septic tank is very adequate. I don't live here. It is only a summer vacation house and not used in winter. I only use it from April until October & then only on weekends except for maybe 1 full week of vacation. If you could accommodate users like me for a low winter rate & a vacation facility at reduced fees then I might be interested.
18. I also feel that if this system were forced on us, putting the treatment plant in Dogwood Park is unthinkable! With the nice homes in the area (Swannerland) which are very large homes, and pay a heafty tax load & to the county, it would be another slap in the face from the county at the Lake people.
19. Since we just added a clearwater system & paid for it, I would prefer to use it at this time.
20. I would like more information about the centralized system before committing to a preference. My family and I are weekend/holiday people on the lake.
21. My experience in the last community I lived in that installed a sewer system you can tripple your estimate and be closer to the monthly cost. You need to find out5 where the pollution is coming from before a commitment is made to a centralized system. If the polution is coming from ag runoff the biggest system in the world won't solve the problem.
22. I think that every person in Franklin County should bear the cost. Not only the ones on the lake.
23. Your proposed cost is outrageous! You must think everyone that lives on the lake are rich.
24. Please consider grandfathering clearwater/spray irrigation systems if you decide to go forward with a central system.
25. I only spend 1 week end every 2-3 months at my cabin & I don't need the added expnse!
26. I spent $7,000.00 on sewer system when I built my house 8 years ago. Why would I want to pay more?
27. In 15 years we have never had a problem.
28. I cannot afford another monthly bill on my fixed income. Sorry but that is the bottom line.
29. For next 5 years.
30. Willing to pay $30-$40...Would like more info before committing to a centralized system on this lot.
31. I am not under any circumstances interested in such a system. The capital cost would be an extreme burden & is not necessary.
32. You let Franklin County drink the farmers' runoff. What's the big deal about a little dishwater on the weekend.

33 Heavy development in some areas may require local collection systems. Our area is not dense enough in Pine Valley. Water quality studies should be done before you start and publicize the results.
34 Need more info
35 But I prefer centralized system for clean lake water.
36 It's nice after 10 years of owning property on this lake to be asked my opinion. Unfortunately I have nothing to base my opinion on. You are the water expert, tell us <u>why</u> we need this.

Prefer Centralized System (yes) with further commentation

1. Would the cost be to users of the system only or would every property owner be charged? I would be interested but am curious as to whether the charges would apply before I build/develop.
2. I have owned my lot since 1971 and I would really be in favor of this program. How long are we talking about?
3. My neighbors arobic system has been replaced twice and still doesn't work. Many small children are swimming in an area where raw sewer discharges into the lake.
4. Septic systems around the lake are getting old and the number of new building continues to increase. Our priority should be to preserve the quality of the lake water. Property values will suffer if the water suffers.
5. We are thinking of building within the next two years.
6. Willing to pay $30-$40. You didn't ask for comments but....
   In view of the costs of individual septic systems and the fact that some are used continuously and some just by weekenders or infrequently, it seems a central system would be beneficial. Don't know if this information is true, but I understand the Clearwater/spray system doesn't work well with infrequent use—once a month or every other month- so before I have to go to one, would like to see a central system. I am not a permanent resident.
7. We are concerned about safety of water from the lake.
8. Most definitely.
9. Our neighbor's clearwater system smells so bad!
10. The system should be mandatory, not voluntary, a universal system. I am satisfied with the clearwater system, I had my septic tank/drainfield system worked on 5 times.
11. We think this is an important issue given the possibility of rising levels of pollutants in the lake over time.
12. Expense should be shared equally by all who use water from this lake. For all of our health's sake.
13. This should be installed to protect the lake & the value of our property. I believe there should be a <u>large</u> initial installation fee. Then the maintenance & operating fee could be more reasonable.
14. Residents let their sewer run into the lake-the run off is dreadful—the spray irrigation is fine for us, however, others will not spend the money to do this—they don't care about the run off into the lake or they would do something.
15. Our present system works well, as this is a vacation home. A sewer system might be better if the costs are contained. But paying an added $50 or so <u>each</u> month for a system we only use maybe 5 weeks total a year would be a problem.
16. I would like to do whatever to make our lake water cleaner.
17. Still thankful you are asking for input. People must be made aware of the consequences to water quality if this is not adopted. Education is key. Please don't depend on the newspaper.
18. If water quality becomes threatened by increase residency at lake.

WILLING TO PAY

1. $30-$40 as long as this takes the place of Clearwater spray. That way we would have more room to build on.
2. Planning to build Fall 2000.
3. Less than $30. In Dallas sewer is based on the average rate of water useage. During Nov., Dec., Jan.—these are months where outside watering is minimal therefor water useage is in the house.

4. $30 to $40. At some point I think this will be necessary to insure lake water quality. This seems like a lot when water bill is already $30 - $40. I would want to keep it as low as possible.
5. $30 - $40 ...On site full time residents should pay more than weekend and 1 or 2 times yearly property owners.

NOT INTERESTED

1. We have just paid $4150.00 plus permits for an approved system. We feel other homeowners should do the same instead of requiring us to now pay a monthly fee for a centralized system.
2. On-site systems ok but should be inspected by Water District personnel on some scheduled basis. Many are presently dumping sewage out on ground.
3. At any price. This is a dumb idea!
4. This is our retirement home. This extra payment could make us have to move.
5. At this time. (2)
6. Unless it is less than $15 a month.
7.

UNDEVELOPED WITH NO AREAS ANSWERED... COMMENTS ONLY

1. Will deal with whatever cost when we build 5 – 10 years.
2. I would expect to have a new home built on my lot within the next 18 months. I would be interested in a centralized treatment if it was available. However, I am concerned that as will need to make reinvestment for a septi tank there seems to be an additional cost to me. Is this true? However, the most important aspect is to have a <u>clean</u> lake....
3. I think a centralized sewer collection & treatment system is an excellent idea..
4. Don't care.
5. Too expensive.

<u>totals</u>

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Und. E 107	1	1		103	33	31	21	18	5	6	55
NR				2		43					2
Und. A 42		2		15	16	17	10	12	4		13
NR				25		9					3
Und.Others 28	1			26	8	16	8	8	1		4
NR				1		4			2	1	8
Dev. E 320	116	201	1	1	214	106	63	56	22	14	165
NR				1							
Dev. A 141	49	89	3		87	52	27	33	11	5	61
NR					2						4
Dev.Others 45	16	29			31	14	7	6	4	2	26
Total 683	183	322	4	174	391	292	136	133	48	28	338

Undeveloped Area : A

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Barker Creek											
Club Lake Est											
Deer Cove		1		3	2	2		1	1		2
El Dorado's					2	3	1	4			3
Hickory Hill											
Miscellaneous				1		1			1		
Pine Valley					7	5	4	3	2		5
South Park		1		4	2	2	3	1			1
Southshore				1		1	1				
Spring Bluffs											
~~Swannerland~~				~~6~~	~~3~~	~~3~~	~~1~~	~~3~~			~~2~~
				25 nr		9 nr					3 nr
Total 42		2		40	16	26	10	12	4		16

Developed Area : A

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Barker Creek		5			1	4	2	1	1		1
Club Lake Est	1					1		1			
Deer Cove	9	5			10	4		4	1		8
El Dorado's	11	31			28	14	11	12	2	1	16
Hickory Hill	3	8			6	5	4	2	1		4
Miscellaneous	1	5			3	3	1	1		1	3
Pine Valley	12	15			16	11	3	5	2	2	15
South Park		3			2			1			2
Southshore	2	1	1		4		2				2
Spring Bluffs	1	4			2	3			3		2
Swannerland	9	12	2		15	7	4	6	1	1	8
Total 141	49	89	3		87	52	27	33	11	5	61

2 NR

4 NR

Undeveloped Area : E

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Cypress Cove											
Eagle Point				2	1	1			1		1
East Park	1			1	1	1				1	1
Holiday Ret				3	1	1	1		1		1
King's Country				38	12	13	6	6	1	1	23
Miscellaneous				1		1	1				
PCP & GE				4		4	1	2		1	
Pine Haven Est				1		1				1	
Pine Tree Shores				1		1	1				
Snug Harbor				2	1	2		2	1		
Tall Tree		1		47	16	5	9	7	1	2	28
WBay				3	1	1	2	1			
WCW											1
				2 nr		43 nr					2 nr
Total 107	1	1		105	33	74	21	18	5	6	57

Undeveloped Area : Others

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Blair Creek Est				2	1	1		1			1
Boiler Cove				3	2	1	1			1	1
Country C Est				1		1	1	1			
Fairway Shores				3		3		2	1		
Land's End											
Miscellaneous				2		1	2				
Northshore	1			11	5	6	3	2			6
Pelican Bay				1		1		1			
Sanct. Village											
The Oaks				2		2		1	1		
~~Unable to Identify~~				1			1				
				1 nr		4 nr					1 nr
Total 28	1			27	8	20	8	8	2	1	9

Developed Area : Others

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Blair Creek Est											
Boiler Cove											
Country C Est	1				1						1
Fairway Shores		3			2	1	1				2
Land's End											
Miscellaneous		5			1	4	1	1	2		1
Northshore	8	9			12	5	3	3	2	1	8
Pelican Bay	1	1			2						2
Sanct. Village											
The Oaks	2				2						2
Unable to Identify	4	11			11	4	2	2		1	10
Total 45	16	29			31	14	7	6	4	2	26

Developed Area : E

Development	Clear/Spray	Tank/Drain	Other	None	On-site OK	Prefer Central	Less $30	$30 - $40	$40 – 50	$50 +	Not Interested
Cypress Cove	1	1			1	1			1		1
Eagle Point	18	18			25	11	10	3	2	1	20
East Park	2	7			5	4	3	1	1	1	3
Holiday Ret	8	5			12	1	2	2			9
King's Country	33	59	1	Doesn't know)	60	34	17	21	6	4	44
Miscellaneous	1	5			4	2		1	1	1	3
PCP & GE	11	15			22	6	6	3	1		20
Pine Haven Est		3			2	1	2			1	
Pine Tree Shores		1				1	1				
Snug Harbor	9	17			19	6	4	6	2		13
Tall Tree	33	61			61	33	17	15	6	6	50
WBay		8			2	6	1	3	2		2
WCW		1			1			1			
				1 nr							
Total 320	116	201	1	2	214	106	63	56	22	14	165

APPENDIX C

APPENDIX C
T.A.E.S. On-site system summaries & TNRCC on-site system regulations

Texas Agricultural Extension Service, 1-99, On-site wastewater treatment systems – Conventional septic tank/drain field

Texas Agricultural Extension Service, 1-99, On-site wastewater treatment systems – Spray distribution

Texas Agricultural Extension Service, 1-99, On-site wastewater treatment systems – Evapotranspiration bed

Texas Agricultural Extension Service, 1-99, On-site wastewater treatment systems – Low-pressure dosing

Texas Agricultural Extension Service, 1-99, On-site wastewater treatment systems – Subsurface drip distribution

Texas Natural Resource Conservation Commission, Chapter 28 – On-site Sewage Facilities, SUBCHAPTER A : GENERAL PROVISIONS, §285.2, §285.8, Effective January 8, 1999.

Texas Agricultural Extension Service
The Texas A&M University System

L-5234
1-99

On-site wastewater treatment systems

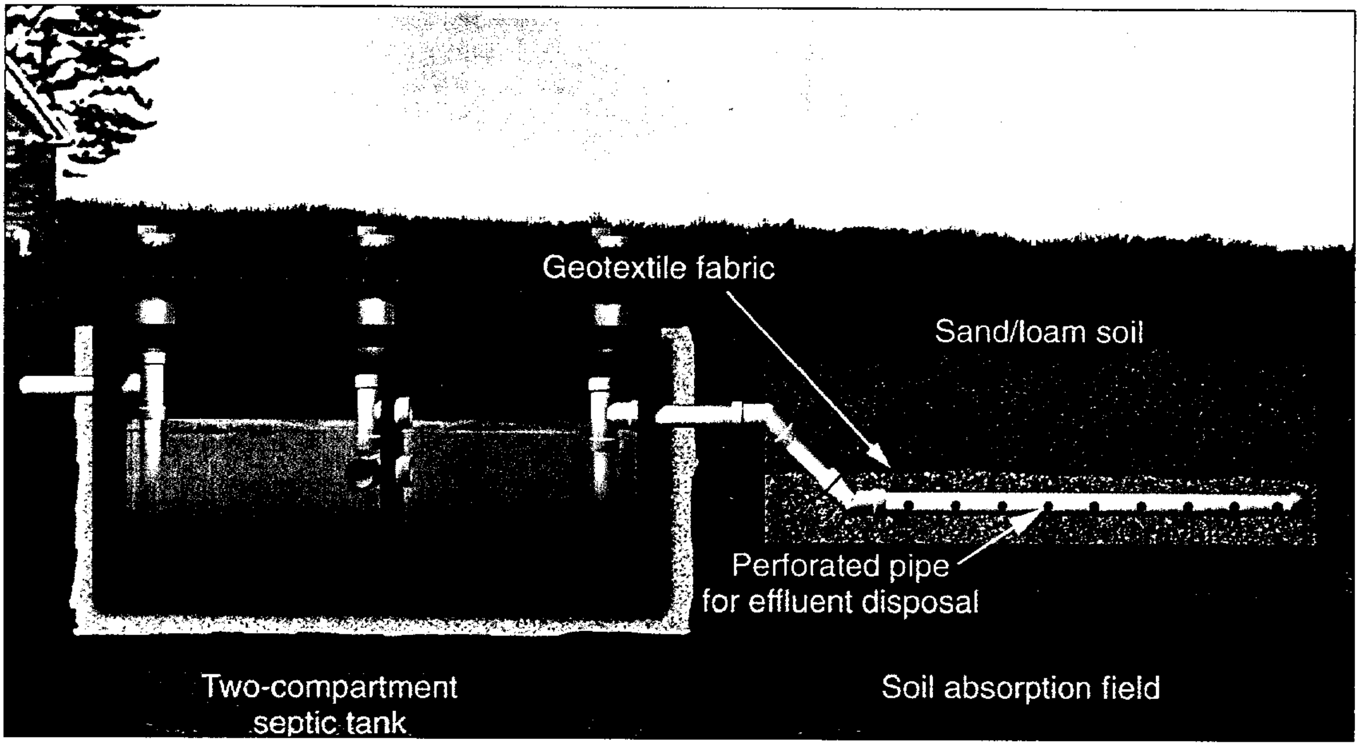


Figure 1: A septic tank and soil absorption field system.

Conventional septic tank/drain field

Bruce Lesikar
Extension Agricultural Engineering Specialist
The Texas A&M University System

Conventional septic systems have traditionally been the most commonly used technology for treating wastewater. These systems use gravity to treat and distribute wastewater in the soil. They have the lowest cost and require the least amount of maintenance, which is generally limited to periodic pumping of the septic tank.

A conventional gravity flow septic system consists of a series of tanks or a compartmented tank followed by a distribution system. The septic tanks are used to settle out solids and partially treat wastewater before it reaches the distribution system. The distribution system can be one of the standard subsurface drain field options. They consist of gravel-filled trenches, plastic chambers or plastic pipe installed underground to hold the wastewater leaving the tanks until it can seep into surrounding soil.

The soil provides most of the wastewater treatment. Soil particles filter solids and organic matter from the wastewater. Microbes living in the soil break down the solids and kill the bacteria and pathogens in the wastewater.

The size of the tanks and distribution system are based on the number of bedrooms in the house and the type of soil where the distribution system is installed.

Advantages

The conventional gravity flow septic system is usually the most inexpensive system to install and operate for on-site wastewater disposal.

Disadvantages

Conventional gravity flow septic systems cannot be installed in clay soils, shallow soils, rock, soils that become saturated during wet periods of the year, or soils with a high water table. A two-foot separation must be maintained between the bottom of the distribution system and saturated soils or restrictive soils such as heavy clay or rock.

How to keep it working

✓ The septic tank needs to be pumped a minimum of every 2 to 3 years. How often the tanks should be pumped depends on their size, the number of people living in the house and their waste management habits.

The distribution systems need limited maintenance:

✓ Generally, the distribution area should be protected from excessive rainwater runoff so it can accept wastewater from the house.

✓ Maintaining a grass cover over the soil distribution system will help remove water from the soil.

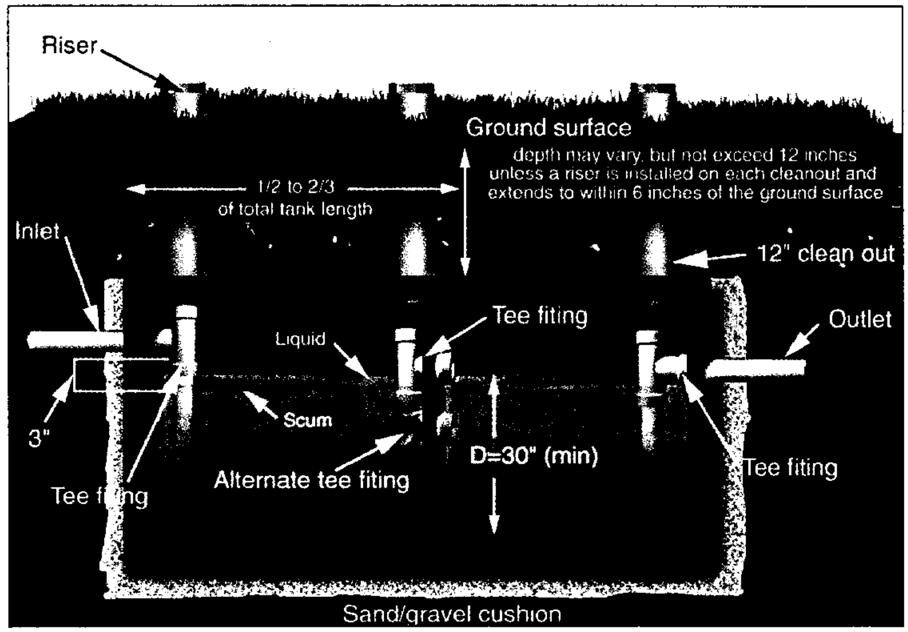


Figure 2: A two-compartment septic tank

✓ The system is designed to manage a specific volume of water. Leaking faucets and toilets need to be fixed. Low-flow devices will help reduce the wastewater volume.

Estimated costs

The installation cost ranges from $2,000 to $6,000, depending on the soil type, house size and other factors.

Septic tank maintenance costs are about $75 a year, based on a 3-year pump out. More frequent maintenance increases the cost.

The On-Site Wastewater Treatment Systems series of publications is a result of collaborative efforts of various agencies, organizations and funding sources. We would like to acknowledge the following collaborators:

Texas State Soil and Water Conservation Board	USEPA 319(h) Program
Texas On-Site Wastewater Treatment Research Council	Texas Agricultural Extension Service
Texas Natural Resource Conservation Commission	Texas Agricultural Experiment Station
USDA Water Quality Demonstration Projects	Texas On-Site Wastewater Association
Consortium of Institutes for Decentralized Wastewater Treatment	USDA Natural Resources Conservation Service

The fact sheet was developed in cooperation with the Houston-Galveston Area Council of Government's On-site Wastewater Project.

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All publications in the On-site Wastewater Treatment Systems series can be downloaded free from the World Wide Web at: http://agpublications.tamu.edu/pubs/ewaste

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On-site wastewater treatment systems

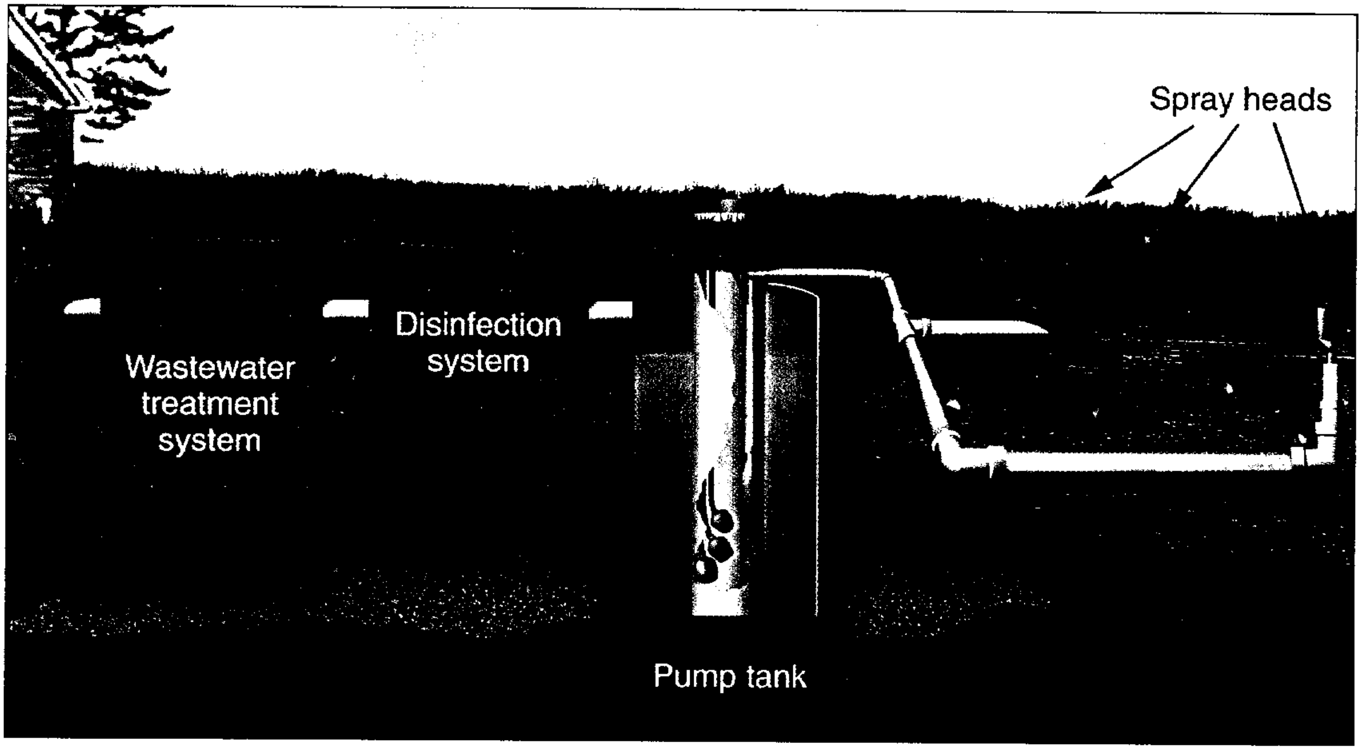

Figure 1: A spray distribution system with treatment and disinfection devices.

Spray distribution

Bruce Lesikar
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A spray distribution wastewater system is very similar to a lawn irrigation system. Spray heads are used to distribute treated wastewater to the surface of the yard. Because this system has the highest potential for human contact with treated wastewater, it requires the greatest amount of wastewater treatment and the most attention to maintenance.

A spray distribution system consists of a treatment device; a disinfecting device; and a pump tank and sprinkler equipment.

The treatment device is normally a package aerobic treatment unit (like a small city sewer plant), but it can be a sand filter. The treatment device removes organic matter and solids from the wastewater.

After wastewater is treated, it is disinfected, usually by a tablet chlorinator. The disinfection system kills the bacteria and pathogens (disease-causing organisms) in the wastewater.

The wastewater, now clear and free from most bacteria, remains in the pump tank until it is sprayed onto the yard. To minimize human contact, the pump can be controlled by a timer to discharge only at night.

Advantages

The spray distribution system works in all types of soils. The main soil requirement is the ability to support grass growth. The treated water is sprayed on the lawn, where it is reused.

Disadvantages

Lot size can be a factor. Lots under 1/2 acre may not have enough area to distribute the wastewater.

Electrical and mechanical components will need to be replaced. Spray systems require that a contract with a maintenance company be kept in force. This maintenance company must test the unit and report the results to the permitting authority at least every 4 months.

The required surface area for the spray system is based on wet weather conditions. Because the water sprayed on the lawn will not meet the grass's water needs in dry weather, supplemental irrigation will be required to keep the lawn adequately moist. The spray head type and location cannot be changed because the system permit requires a set surface area.

How to keep it working

✓ Treatment tanks should be pumped at least every 2 to 3 years.

✓ The treatment device must be maintained every 4 months by a certified company. Some areas require more site visits per year.

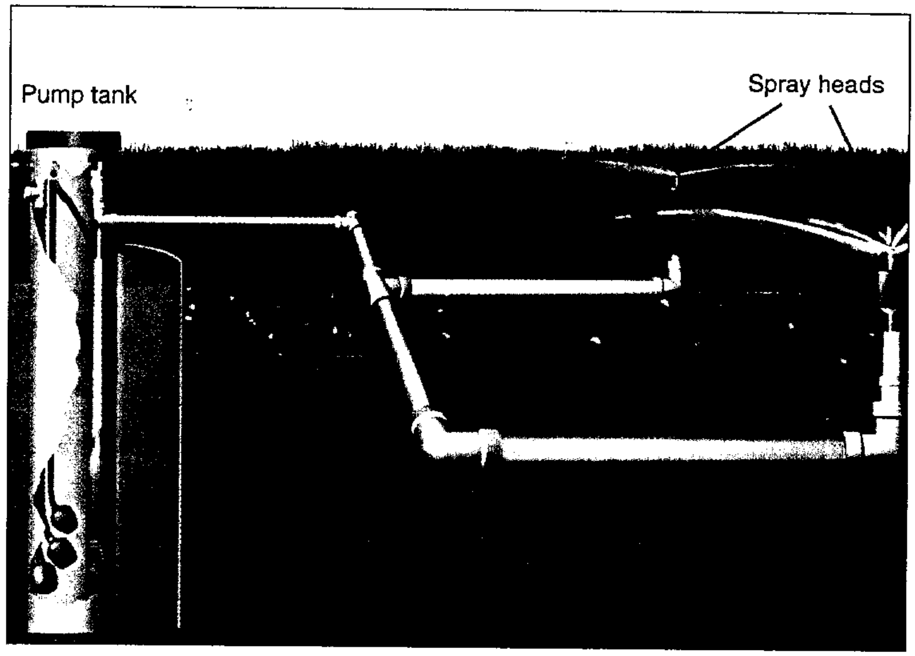

Figure 2: A spray distribution system.

✓ A chlorine system requires that you routinely add chlorine tablets, generally monthly.

✓ The disinfecting device must be maintained.

Estimated costs

The installation cost for a spray irrigation system using an aerobic unit ranges from $4,500 to $7,500, depending on the house size. Installing a spray irrigation system using a sand filter ranges from $6,500 to $15,000, depending on the house size and site condition.

Maintenance costs range from about $300 to $600 a year, which includes disinfectant, periodic pump out, electricity and required maintenance visits. The maintenance contract generally does not include replacement parts or labor for installing the parts.

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On-site wastewater treatment systems

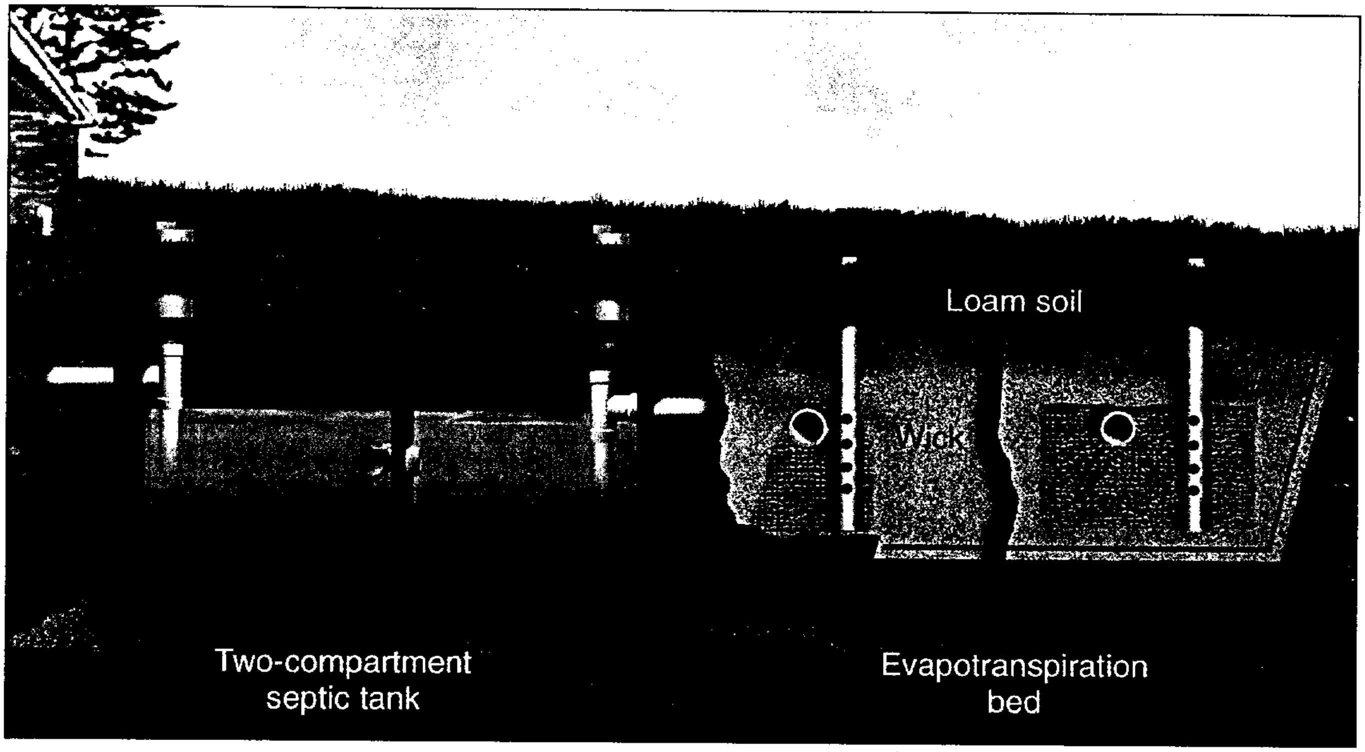

Figure 1: An evapotranspiration bed system.

Evapotranspiration bed

Bruce Lesikar
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The Texas A&M University System

An evapotranspiration (ET) bed treats wastewater by using evapotranspiration — the loss of water from the soil by evaporation and by transpiration from plants growing there.

ET beds are used where the soil cannot treat wastewater before it percolates to groundwater, such as in rocky soils, or where the soil prevents wastewater from percolating from the application field, such as in heavy clay soils.

ET systems are designed according to local evapotranspiration and rainfall rates, which vary across Texas. The local authorized agent, generally the local health department or regional office of the Texas Natural Resource Conservation Commission, can tell you what the rates are in your area. ET bed systems can be smaller in drier regions of the state compared to the same size household in wetter locations. These systems do not work in very wet areas where more rain falls than is evaporated or transpired.

There are two types of ET beds: lined and unlined. In lined systems, the ET bed is lined with a natural clay, synthetic or concrete liner. A liner is required if the surrounding soil is very permeable, such as in sandy gravel or karst limestone.

Unlined systems can be used in highly impermeable soils such as heavy clays. In unlined systems, wastewater is disposed of by a combination of evaporation, transpiration and absorption, which is often called an evapotranspiration/absorption (ETA) system.

Grass cover is important for transpiration of wastewater

Treatment

In ET bed systems, solid materials are removed from the wastewater by a septic tank. Then the wastewater is distributed throughout the ET bed system. There, final treatment and disposal occur when the water evaporates and plants use nutrients in the effluent and release moisture through transpiration.

As the water evaporates, salts, minerals and solids from the effluent accumulate in the bed. During very wet periods when evapotranspiration is low, ET beds store water until drier periods when it evaporates and transpires.

Design

An ET bed contains storage trenches, loam backfill around the trenches and sandy loam soil over the top of the loam backfill for grass growth. Generally, the required bed surface area is divided between two beds, which allows for switching between the beds to avoid overloading.

A liner and sand cushion are placed in the ground, and the storage system is set on the bed bottom. Generally, the storage system consists of a bed of rocks or gravel of a uniform size ranging from 3/4-inch to 2 inches in diameter, filling the bed to a depth of 12 inches or less, depending on the bed's overall depth. Distribution pipes are placed no more than 12 feet apart and no less than 3 feet from the bed walls. The top of the distribution pipe must be flush with the top of the rock media.

Other types of media such as tire chips, or storage systems such as leaching chambers, may be used for the storage trenches.

A water-permeable soil barrier (a geotextile filter fabric) is placed over the rock. A loam soil is added to fill the bed to within two inches of the top. Selecting the proper soil is extremely important in building an ET system. (State regulations classify the soil as a class II, loamy soil.) The soil draws the water toward the surface faster than coarse sand.

Wicks incorporated into the rock media draw water continuously from the rocks into the soil and toward the surface area, where it evaporates or is taken up by plants. A wick is a column of soil that extends through the rock media to the bottom of the bed. The total wick area should be 10 to 15 percent of the bed surface and should be uniformly spaced throughout the bed.

After the loamy soil is in place, the final two inches are filled with sandy loam and mounded in the center with a slope of 2 to 4 percent toward the outside of the bed. The last step is to plant vegetation specially selected to transpire the most water, such as bermudagrass or St. Augustine grass. Placing grass sod over the bed may be the best approach to establishing grass there. Using seed may let the mounded soil wash away during heavy rainfall before the grass is established. Larger plants with shallow root systems, such as evergreen bushes, may also be used to help take up water.

If you use grasses with dormant periods, be sure to provide adequate vegetation on the beds during these periods. A common solution is overseeding with winter grasses to provide year-round transpiration.

How to keep it working

A valve connecting the two beds allows you to alternate the wastewater inflow between each bed. When one bed becomes saturated, turn the valve to send effluent into the other underloaded bed. An inspection port added

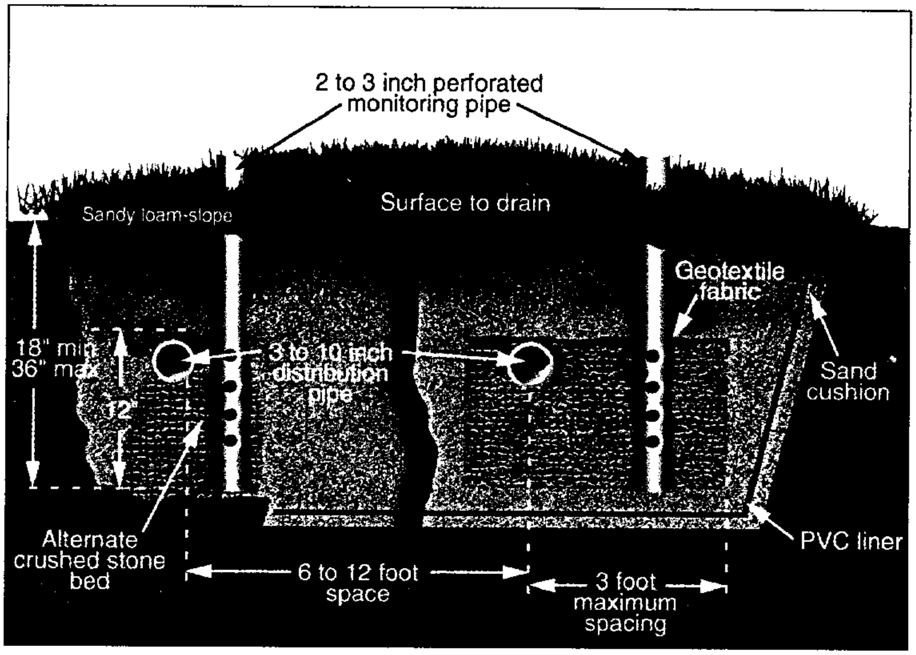

Figure 2: Evapotranspiration beds should be built as shallow as possible, from 18 inches to a maximum of 36 inches deep.

to each bed will help you determine each bed's water levels during use. Covering the port prevents insects, small animals and unauthorized people from getting to the bottom of the bed.

Here's how to maintain your ET bed properly:

✓ Mow the grass cover regularly. Grass cover is important for transpiration of wastewater. Overseed with a cool-season grass to provide transpiration in winter. If you do not maintain the grass cover, the system will probably fail.

✓ Divert rainfall runoff around the system. The system is designed to handle normal rainfall entering from the top of the system, but excessive rainfall will overload it. Rainfall runoff from buildings and paved areas can add too much water to the ET bed. This water must be diverted around the system. Maintain the sloped cover on the system to help rain run off the bed.

✓ Check the vegetation growing on the system as the system matures. You may need to use salt-tolerant grasses, such as bermuda-grass, because salt accumulates in the system. Water leaves salts in the soil when it evaporates. Harvesting the salt-tolerant grasses may reduce the salts in the system if the plants can accumulate the salt in their leaves. The potential for high salt concentrations depends on how much salt is in the water supply.

✓ Develop good water conservation habits at home. Excessive water use overloads the system and causes failure.

To keep the beds aerobic and prevent clogging, build them as shallow as possible, from 18 inches to a maximum of 36 inches deep.

Divert rainfall runoff around the system

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On-site wastewater treatment systems

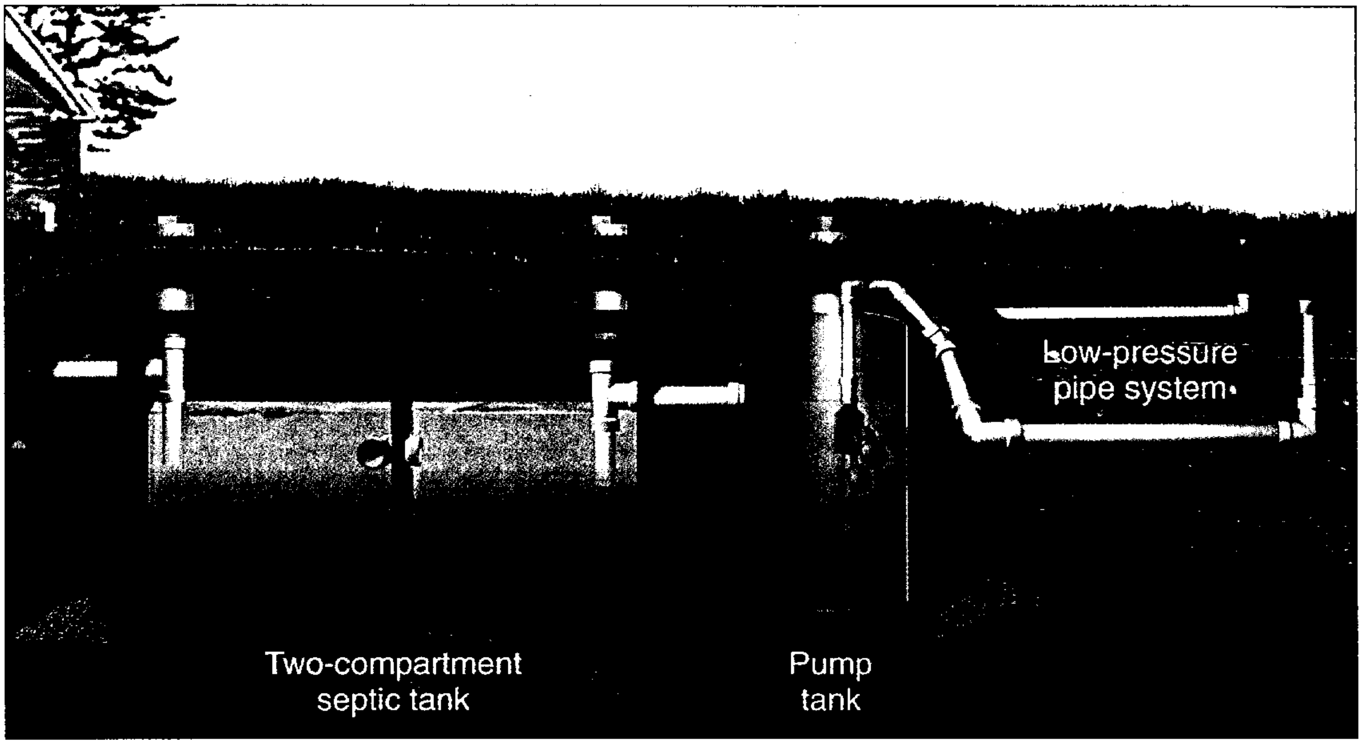

Figure 1: A low-pressure dosing system.

Low-pressure dosing

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Extension Agricultural Engineering Specialist
The Texas A&M University System

A low-pressure dosing system treats wastewater and then pumps it into the soil several times daily. Of the nonstandard drain fields, it is the least expensive to install and operate. The system generally has three components: a series of tanks or compartmented tanks used to settle out and partially treat the wastewater; a pump tank for dosing wastewater to the distribution system; and a system for distributing the wastewater to the soil.

The pump tank houses a pump that discharges wastewater to the distribution system three or four times a day. The distribution system consists of a small pipe with holes drilled in it, laid in narrow 6- to 12-inch-wide trenches.

The pump discharges wastewater to the trenches. Once in the trench, the wastewater seeps into the soil.

The soil provides most of the wastewater treatment. Soil particles filter solids and organic matter from the wastewater. Microbes in the soil break down the solids and kill the bacteria and pathogens in the wastewater.

The sizes of the septic tanks, pump tank and distribution system are based on the number of bedrooms in the house and the type of soil where the distribution system will be placed.

Advantages

For installation and operation, the low-pressure dosing system is the least expensive of the nonstandard distribution systems.

A low-pressure dosing system can be used in clay soils and relatively shallow soils. One foot of soil must be maintained between the bottom of the trench and the restrictive layer or fractured soil. The system can be designed and installed to work on sloping sites.

Disadvantages

Low-pressure dosing systems cannot be installed in soils that become saturated during wet periods of the year or in shallow soils.

Two feet of separation is required between the bottom of the trench and the saturated soil layer or groundwater.

Electrical and mechanical components require electricity for operation and replacement when the components break.

How to keep it working

✓ Pump the septic tanks a minimum of every 2 to 3 years.

✓ Inspect the pump and alarm system once a year.

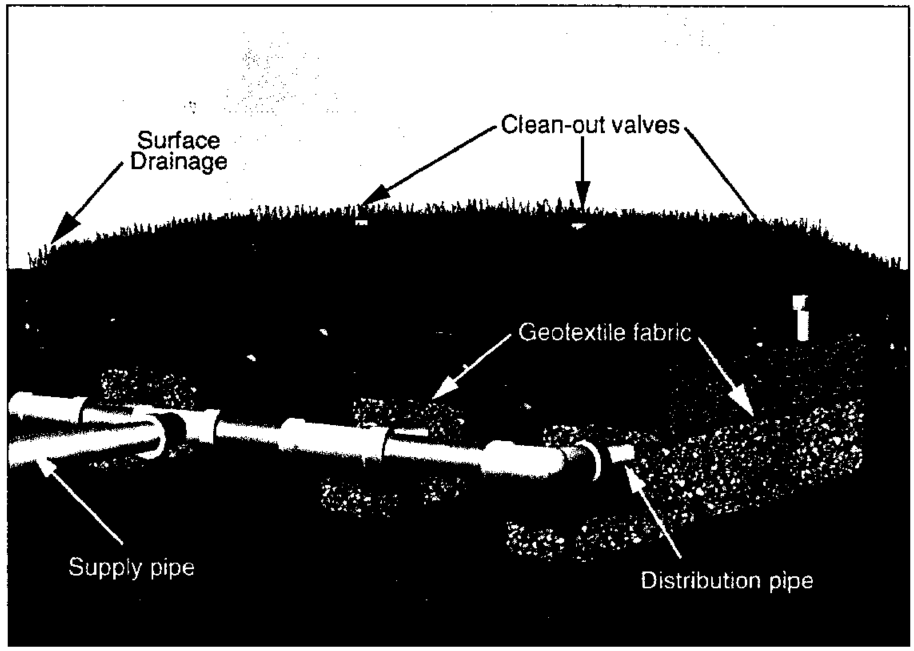

Figure 2: The low-pressure dosing system distributes wastewater into the soil several times a day.

✓ Flush the distribution lines every 5 years to remove sediment from the lines.

Estimated costs

Maintenance costs are about $125 per year based on a 3-year tank pump-out schedule, a 5-year pump replacement schedule, and small electrical usage.

Installation costs range between $3,000 to $10,000, depending on the soil type, house size and other factors.

The On-Site Wastewater Treatment Systems series of publications is a result of collaborative efforts of various agencies, organizations and funding sources. We would like to acknowledge the following collaborators:

Texas State Soil and Water Conservation Board
Texas On-Site Wastewater Treatment Research Council
Texas Natural Resource Conservation Commission
USDA Water Quality Demonstration Projects
Consortium of Institutes for Decentralized Wastewater Treatment
USEPA 319(h) Program
Texas Agricultural Extension Service
Texas Agricultural Experiment Station
Texas On-Site Wastewater Association
USDA Natural Resources Conservation Service

The fact sheet was developed in cooperation with the Houston-Galveston Area Council of Government's On-site Wastewater Project.

Produced by Agricultural Communications, The Texas A&M University System

All publications in the On-site Wastewater Treatment Systems series can be downloaded free from the World Wide Web at: http://agpublications.tamu.edu/pubs/ewaste

Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Chester P. Fehlis, Deputy Director, The Texas Agricultural Exension Service, The Texas A&M University System.
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The Texas A&M University System
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On-site wastewater treatment systems

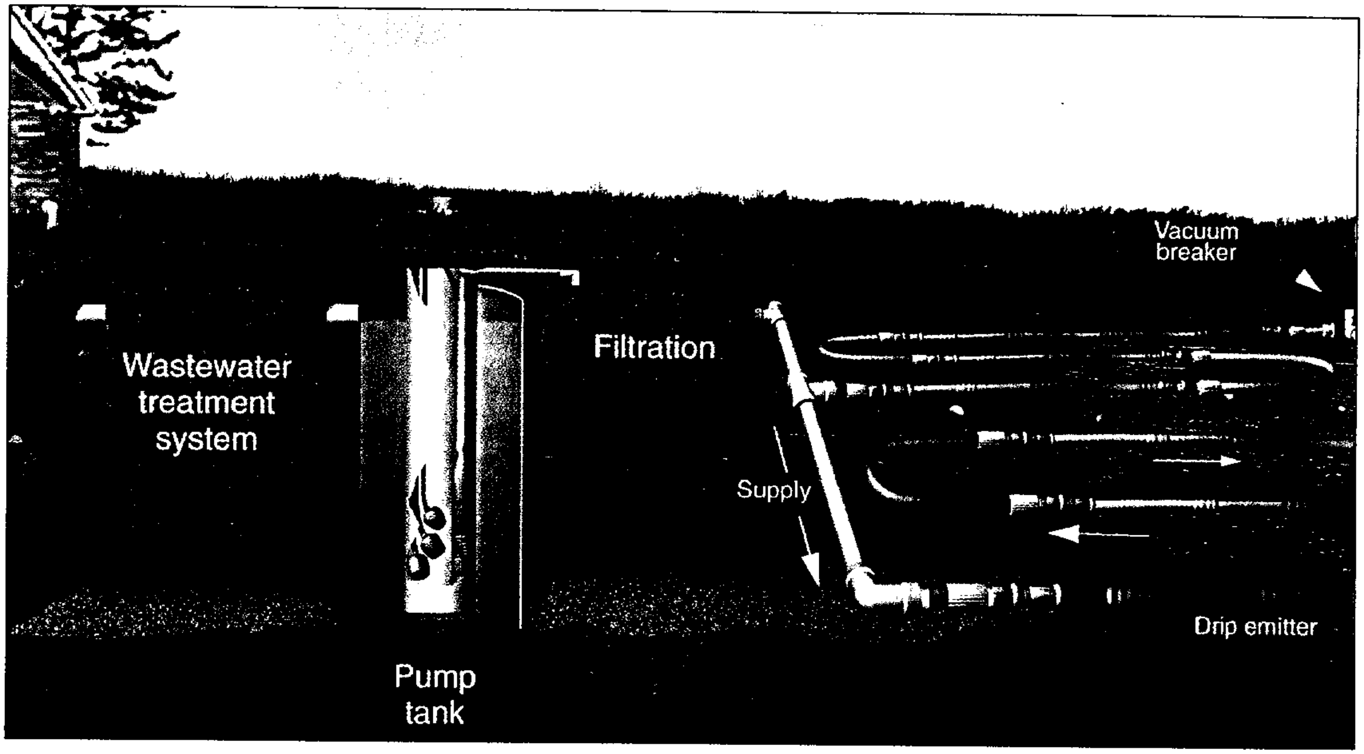

Figure 1: A subsurface drip system.

Subsurface drip distribution

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A subsurface drip system distributes wastewater to the lawn through a system of tubing installed below the ground surface. It generally consists of four main components: a treatment device, a pump tank, a filtering device and a drip distribution system.

Several treatment devices are available, including an aerobic unit, sand filter, trickling filter or constructed wetland. The choice of treatment device depends on the type of drip tubing being used and the manufacturer's recommendations.. The minimum treatment required is a septic tank to settle the solids. Most drip systems require additional treatment of the wastewater before it enters the filtering system.

The pump tank stores the water until the drip field is ready for a dose of water. A high head pump delivers the water from the pump tank through the filtering device to the drip distribution system.

The filtering device can be a sand, disk or screen filter. Its main purpose is to remove larger particles from the wastewater so they do not cause problems with the drip emitters. Depending on the wastewater quality, the filter may need to be an automatic cleaning system.

The drip distribution system is made of a drip tubing approved by the manufacturer for use with wastewater. The tubing is generally 1/2 inch in diameter with an emitter in the tubing wall. The pressure inside the tubing is generally operated at 15 to 20 pounds per square inch (psi), with the water exiting the emitter at 0 psi.

The collection manifold for the drip system needs to be connected back to the treatment device for flushing solids collecting inside the drip tubing back to the treatment device.

Advantages

The drip distribution system can be used in most sites. It can be placed in clay soils, shallow soils and sites with moderately saturated conditions. It requires 1 foot of unsaturated soil below the drip tubing, and less surface area than a spray distribution system.

The drip system distributes the water uniformly in the lawn for reuse by the plants in the landscape. Pressure-compensating emitters can be used on fairly steep slopes.

Disadvantages

The drip system requires at least 1 foot of unsaturated soil below the drip tubing, which is generally installed at 6 to 8 inches below the surface.

The drip system has very small emitters that can become clogged with organic matter and solids if the system is improperly maintained.

Drip distribution systems require an ongoing maintenance contract to operate and maintain the drip field.

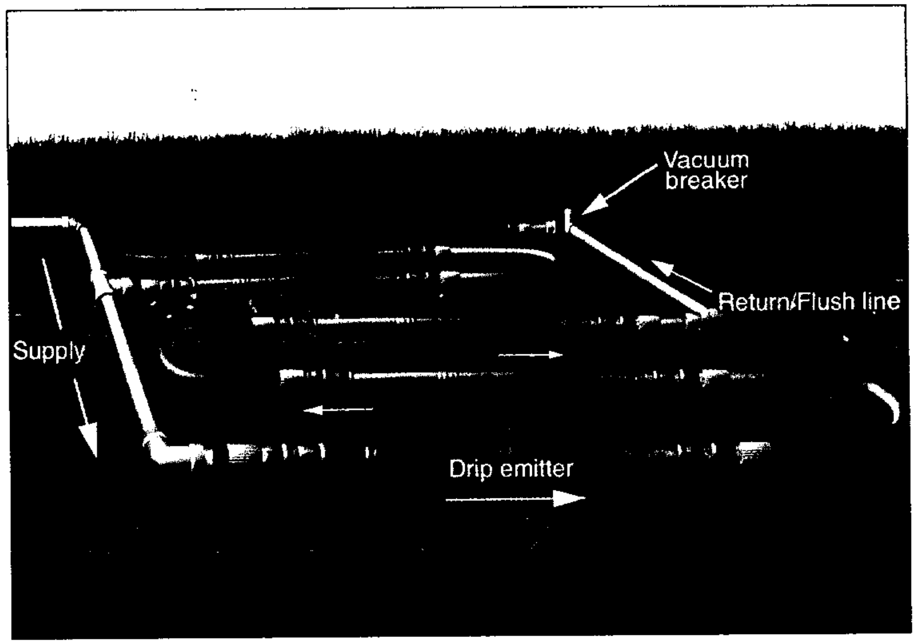

Figure 2: A subsurface drip system distributes water uniformly in the lawn.

How to keep it working

✓ Pump the treatment system at least every 2 to 3 years to prevent solids from being dosed into the drip tubing.

✓ Check the filtering system periodically.

Estimated costs

Installation generally costs between $4,000 to $10,000, depending on the type of pretreatment, filtering device and monitoring system. The pretreatment system is a large component of the installation costs. A drip distribution system generally costs $2,000 to $3,000.

Maintenance costs are about $300 to $600 per year, which includes periodic pump-out, electricity and required maintenance visits.

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SUBCHAPTER A : GENERAL PROVISIONS
§285.2, §285.8

Effective January 8, 1999

§285.1. Purpose.

It is the policy of the commission to assist the state's citizens in obtaining safe and adequate on-site sewage facilities (OSSFs); to minimize the exposure of Texas citizens to the disease transmission potential of human and domestic waste; to minimize the contamination of drinking water supplies and hazards to the state's recreational areas; and to reduce the potential for surface and groundwater pollution. It is further the policy of the commission to promote regulation of OSSFs by local governmental entities and to eliminate and prevent health hazards through the regulation and the proper planning of the location, design, construction, installation, alteration, extension, repair, operation, and maintenance of OSSFs.

Adopted January 20, 1997 Effective February 5, 1997

§285.2. Definitions.

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise:

(1) **Abandoned tank** - A tank that is not to be used or is not allowed to be used by a permitting authority.

(2) **Aerobic digestion** - The bacterial decomposition and stabilization of sewage in the presence of free oxygen.

(3) **Anaerobic digestion** - The bacterial decomposition and stabilization of sewage in the absence of free oxygen.

(4) **Apprentice** - An individual who has been properly registered with the agency, and is undertaking a training program under the supervision of an installer (holding a valid certificate under this chapter) who has agreed to accept responsibility for the individual.

(5) **Authorized agent** - A local governmental entity authorized by the commission, executive director or Chapter 284 of this title (relating to Private Sewage Facilities) to implement and enforce Chapter 366, Texas Health and Safety Code.

(6) **Bedrock** - A continuous horizontal layer of hardened mineral deposits that do not support growth of common plant life.

(7) **Blackwater** - All sewage other than greywater that contains sufficient human or animal wastes to require the water to be treated prior to disposal to the earth's surface or subsurface.

(8) **Borehole** - A drilled hole four feet or greater in depth and one to three feet in diameter.

(9) **Certificate or certification** - The actual certificate of registration held by an individual required to obtain such under this chapter or the process of obtaining a certificate of registration from the agency.

(10) **Cesspool** - A non-watertight, covered receptacle intended for the receipt and partial treatment of domestic sewage. This device is constructed such that its sidewalls and bottom are open-jointed to allow the gradual discharge of liquids while retaining the solids for anaerobic decomposition.

(11) **Chemical** - A substance that in sufficient quantity could have a biotoxic effect on OSSFs.

(12) **Cluster system** - An on-site sewage collection, treatment, and disposal system designed to serve two or more sewage-generating units on separate legal tracts where the total combined flow from all units does not exceed 5,000 gallons per day.

(13) **Composting toilet** - A self-contained treatment and disposal facility constructed to decompose non-waterborne human wastes through bacterial action facilitated by aeration.

(14) **Condensate drain** - Collection and disposal of water generated by air conditioners, refrigeration equipment, and other equipment.

(15) **Delegation** - To delegate or designate.

(16) **Designated representative** - An individual who holds a valid certificate with the agency and is designated by the authorized agent to make site evaluations, percolation tests, system evaluations, and inspections subject to the authorized agent's approval.

(17) **Direct supervision** - The responsibility of an installer to perform the oversight, direction and approval of all actions of an apprentice related to the installation of an OSSF.

(18) **Edwards Aquifer** - That portion of an arcuate belt of porous, water bearing limestones composed of the Comanche Peak, Edwards, and Georgetown formations trending from west to east to northeast through Kinney, Uvalde, Medina, Bexar, Comal, Hays, Travis, and Williamson Counties or as amended under Chapter 213 of this title (relating to Edwards Aquifer).

(19) **Edwards Aquifer Recharge zone** - Generally, that area where the stratigraphic units constituting the Edwards Aquifer crop out, and including the outcrops of other geologic formations in proximity to the Edwards Aquifer, where caves, sinkholes, faults, fractures, or other permeable features would create a potential for recharge of surface waters into the Edwards Aquifer. The recharge

zone is specifically that geological area delineated on official maps located in the Austin and San Antonio Regional Offices of the agency, or as amended by Chapter 213 of this title (relating to Edwards Aquifer).

(20) **Emergency repair** - A repair made to an OSSF to abate a serious and dangerous nuisance condition without altering the OSSF's planned function and notification is given to the permitting authority within 72 hours of when the repairs begin.

(21) **Evapotranspiration (ET) system** - A subsurface sewage disposal facility which relies on soil capillarity and plant uptake to dispose of treated effluent through surface evaporation and plant transpiration.

(22) **Floodplain (100-year)** - That area along a watercourse during the time the watercourse is subject to the statistical 100-year flood.

(23) **Floodway** - The channel of a watercourse and adjacent land areas (center portion of the 100-year floodplain) that must be reserved in order to discharge the 100-year flood without cumulatively increasing the water surface more than one foot above the 100-year flood elevation prior to encroachment into the 100-year floodplain.

(24) **Geotextile filter fabric** - A non-woven fabric suitable for wastewater applications.

(25) **Gravel-less drainfield pipe** - A generically labeled large diameter (usually eight or ten inches) geotextile fabric-wrapped piping product which is intended for use without gravel in a subsurface disposal facility.

(26) **Grease interceptor** - Floatation chambers where grease floats to the water surface and is retained while the clearer water underneath is discharged. There are no moving mechanical parts and its operational characteristics are similar to a septic tank.

(27) **Greywater** - Wastewater from clothes washing machines, showers, bathtubs, handwashing lavatories, and sinks not used for the disposal of hazardous or toxic ingredients or waste from food preparations.

(28) **Groundwater** - Subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated either year-round or on a seasonal or intermittent basis.

(29) **Hardness (water)** - Primarily the presence in water of calcium bicarbonate, magnesium bicarbonate, calcium sulfate (gypsum), magnesium sulfate (epsom salts), calcium chloride, and magnesium chloride in solution.

(30) **Holding tank** - A watertight container equipped with a high-level alarm used to receive and store sewage pending its delivery to, and treatment at, an approved treatment facility. This type of facility is generally intended for interim use, if and when approved by the permitting authority.

(31) **Individual** - A single living human being.

(32) **Installer** - An individual who holds a valid certificate with the agency and is compensated by another to perform services, construct, install, alter, or repair an OSSF.

(33) **Local governmental entity** - A municipality, county, river authority, or special district including an underground water district, soil and water conservation district, or public health district.

(34) **Maintenance** - The normal or routine upkeep, cleaning, or mechanical adjustments to an OSSF.

(35) **Maintenance company** - A person in the business of maintaining OSSFs. At least one individual in the company must hold an Installer II certificate or a Class D or higher wastewater operator certificate and be certified by the appropriate manufacturer's maintenance program for the proprietary unit being maintained.

(36) **Maintenance findings** - The results of a required performance check or component inspection on a specific OSSF by a valid maintenance company as outlined in the maintenance contract.

(37) **Manufactured housing community** - Any facility or area developed for lease or rental of space for the placement of two or more mobile homes.

(38) **Mound system** - A soil absorption disposal system which is installed above the natural grade and in or below an artificially created mound of earth.

(39) **Multi-unit residential development**- a building, structure or combination of structures which have been designed to contain units in which more than two families may reside.

(40) **NSF International** - National Sanitation Foundation International testing laboratories located in Ann Arbor, Michigan.

(41) **Natural soil** - Earthen materials deposited into place by natural processes and not disturbed by artificial processes.

(42) **Non-standard disposal** - All on-site disposal systems, components and materials not described in this chapter as standard and not marketed for sale in the state as a proprietary item.

(43) **Non-standard treatment** - All on-site sewage treatment processes not described in this chapter as "standard" or "proprietary" treatment processes.

(44) **Nuisance** -

(A) sewage, human excreta, or other organic waste discharged or exposed in a manner that makes it a potential instrument or medium in the transmission of disease to or between persons; or

(B) an overflowing septic tank or similar device, including surface discharge from or groundwater contamination by a component of an OSSF, or a blatant discharge from an OSSF.

(45) **On-site sewage disposal system** - One or more systems of treatment devices and disposal facilities that:

(A) produce not more than 5,000 gallons of waste each day; and

(B) are used only for disposal of sewage produced on a site on which any part of the system is located.

(46) **On-site sewage facility (OSSF)** - An on-site sewage disposal system.

(47) **On-site waste disposal order** - An order adopted by local governmental entity and approved by the executive director. Approval of this order by the executive director grants authorized agent status to the local governmental entity.

(48) **Owner** - A person who owns an OSSF.

(49) **Permit** - An authorization, issued by the permitting authority, to install, construct, alter, extend, repair, or operate an OSSF. The permit consists of the authorization to construct (including the approved planning materials) and the license to operate.

(50) **Permitting authority** - The executive director or an authorized agent.

(51) **Planning material** - Plans and other supporting materials submitted to the permitting authority for the purpose of obtaining a permit to construct and operate an OSSF.

(52) **Platted** - Subdivided property recorded with the county/city in an official plat record.

(53) **Pretreatment tank** - A tank placed ahead of a treatment unit that functions as an interceptor for material such as plastics, clothing, hair, and grease that are potentially harmful to treatment unit components.

(54) **Probation** - A formal procedure in which an individual or authorized agent is subject to an evaluation for a trial period to ascertain whether an individual should retain possession of a registration or certification as issued by the executive director or an authorized agent should retain delegation as an authorized agent.

(55) **Proprietary system** - An OSSF in which all or part of the treatment or disposal process is owned by a person and has a registered trademark or patent or utilizes a tradename or trademark.

(56) **Regional office** - A regional office of the Texas Natural Resource Conservation Commission.

(57) **Restrictive horizon** - A layer of the soil profile with a significant observable change in density, clay content, or particle size which restricts the vertical movement of water.

(58) **Revocation** - A formal procedure initiated by the executive director in which an authorized agent's delegation or an installer's, site evaluator's, or designated representative's registration or certification is rescinded by the commission.

(59) **Scum** - A mass of organic and/or inorganic matter which floats on the surface of sewage.

(60) **Secondary Treatment** - The reduction of pollutants to the levels specified in §309.1 of this title (relating to Domestic Wastewater Effluent Limitation and Plant Siting).

(61) **Seepage pit** - An unlined covered excavation in the ground which operates in essentially the same manner as a cesspool.

(62) **Septic tank** - A watertight covered receptacle constructed to receive, store, and provide treatment to domestic sewage. Its function is to separate solids from the liquid, digest organic matter under anaerobic conditions, store the digested solids through a period of detention, and allow the clarified liquid to be disposed of by an approved method in accordance with this chapter.

(63) **Sewage** - Waste that:

(A) is primarily organic and biodegradable or decomposable; and

(B) generally originates as human, animal, or plant waste from certain activities, including the use of toilet facilities, washing, bathing, and preparing food.

(64) **Sewage disposal plan** - A technical report prepared by either a registered professional engineer or a registered sanitarian having demonstrated expertise in on-site sewage disposal planning. The plan must include, but is not limited to, the location of structures, easements, wells, treatment units and disposal areas.

(65) **Single family dwelling** - A habitable structure constructed on, or brought to, its site and occupied by members of one family.

(66) **Site evaluator** - An individual who holds a valid certificate with the agency and visits a site and conducts a pre-construction site evaluation which includes performing soil analysis, a site survey, and other criteria necessary to determine the suitability of a site for a specific OSSF.

(67) **Sludge** - A semi-liquid mass of partially decomposed organic and inorganic matter which settles at or near the bottom of a receptacle containing sewage.

(68) **Soil** - The unconsolidated mineral material on the surface of the earth that serves as a natural medium for the growth of plants.

(69) **Soil absorption system** - A subsurface method for the disposal of partially treated sewage which relies on the soil's ability to absorb moisture and allow its dispersal by lateral and vertical movement through and between individual soil particles.

(70) **Subsurface sewage facility** - A system which treats sewage and distributes the pretreated sewage effluent into a below ground level disposal area.

(71) **Subdivision**- a division of a tract of property into two or more parts either by platting or field notes with metes and bounds, and transferred by deed or contract for deed.

(72) **Uniform gravel size** - Gravel to be used in standard absorption drainfields that has been processed through shaker screens to produce a size passing one size screen and retained on another. The smaller screen shall be at least 50% of the size of the larger screen.

(73) **Water softening** - the removal of minerals causing hardness from water.

Adopted December 16, 1998 Effective January 8, 1999

§285.3. General Requirements.

(a) Applicability.

(1) All aspects of the planning, installation, construction, alteration, extension, repair, operation, and maintenance of OSSFs must be in accordance with this chapter or in accordance with an order/ordinance or other published criteria of an authorized agent which has received the executive director's written approval.

(2) In the case of OSSFs proposed for installation, construction, alteration, extension, repair, operation, and maintenance in areas of the state void of an authorized agent, the executive director will be the permitting authority in accordance with this chapter.

(b) Unauthorized systems. Boreholes, cesspools, and seepage pits shall not be authorized for installation and use in Texas.

(c) Variances. Requests for variances from provisions of this chapter may be considered by the appropriate permitting authority on an individual basis. The variance request must demonstrate to the satisfaction of the permitting authority that the variance has been requested because conditions are such that the equivalent protection of the public health and the environment can be provided by alternate means. Any request for a variance under this subsection must contain planning materials prepared and sealed by either a registered sanitarian or a registered professional engineer.

(d) Exclusions. The following are exclusions from provisions of this chapter and must be permitted under Chapter 26, Texas Water Code, and Chapter 305 of this title (relating to Consolidated Permits):

(1) One or more systems of treatment devices and disposal facilities that cumulatively produce more than 5,000 gallons of sewage per day on one piece of property;

(2) Any system that produces waste that is either non-domestic municipal, recreational, agricultural, industrial, or other as defined in Chapter 26, Texas Water Code; and

(3) Any system that will have surface discharges into waters in the state or discharges adjacent to waters in the state.

Adopted January 20, 1997 Effective February 5, 1997

§285.4. Facility Planning.

(a) Land planning and site evaluation. Land developments and land subdivided for building construction which will utilize OSSFs for sewage disposal shall be evaluated for overall site suitability and this submittal shall be reviewed and approved by the permitting authority prior to approval being granted for subdivision of the property. The following items shall be evaluated:

(1) Residential lot sizing.

(A) General considerations. The failure of an OSSF may be caused by a large number of circumstances, including inadequate soil percolation, improper construction, planning, installation, and misuse. The single most important factor concerning public health problems resulting from these failures is the residential dwelling density which is primarily a function of lot size. The failure of an OSSF in a highly populated area is the fundamental cause of public health hazards resulting from on-site sewage disposal. Failure of an OSSF provides a medium for the transmission of disease and the fact that many people are in the vicinity causes concern over the spreading of disease. OSSFs using soil absorption for effluent disposal are more likely to malfunction in high population density situations because the soil available to absorb or evaporate the effluent is limited. The failure of an absorption system on a small lot can be financially disastrous to the owner because the lot may not contain sufficient room to construct a new absorption field in a new location.

(B) Platted or unplatted subdivisions served by a public water supply. Subdivisions of single family dwellings platted or created after January 1, 1988, and served by a public water supply but utilizing individual OSSF methods for sewage disposal, shall provide for individual lots having surface areas of at least ½ acre, or shall have site-specific sewage disposal plan submitted by a registered professional engineer or registered sanitarian and approved by the permitting authority. The location of an OSSF under this paragraph shall be in accordance with §285.91(10) of this title (relating to Tables). In no instance shall the area available for such systems be less than two times the design area.

(C) Platted or unplatted subdivisions served by individual water systems. In subdivisions platted or created after January 1, 1988, for single family dwellings where each lot maintains an individual water supply well and an OSSF, the sewage disposal plan shall show the approved well location and a sanitary control easement around the well within a 100-foot radius in which no subsurface sewage system may be constructed. A watertight sewage unit or lined evapotranspiration bed with leak detection capability may be placed closer to the water well than 100 feet, provided the permitting authority has granted a variance. To minimize the possibility of the transmission of waterborne diseases due to the pollution of the water supplied for domestic use, each lot in a subdivision shall contain no less area than one acre, or shall have site-specific planning materials prepared by a registered professional engineer or a registered sanitarian and approved by the permitting authority. In no instance shall the area available for such systems be less than two times the design area.

(2) Manufactured housing communities or multi-unit residential developments served by a central sewage collection system for on-site disposal. Manufactured housing communities or multi-unit residential developments which are owned and controlled by a person which rents or leases space may utilize smaller lots than stated in paragraph (1)(A) and (1)(B) of this subsection provided a sewage disposal plan addressing replacement area is submitted to the permitting authority and approved. Developments of this type which connect living units to a sewage collection system for on-site disposal, must provide planning materials for the system prepared by a registered professional engineer or registered sanitarian. The total anticipated sewage production for such property shall not exceed 5,000 gallons per day from the connected homes and the OSSF must conform to the definition of OSSFs in §285.2 of this title (relating to Definitions).

(3) Site evaluation. The subdivided property must be evaluated for soil suitability in accordance with §285.30 of this title (relating to Site Evaluation).

(b) Approval of existing small lots or tracts. Existing small lots or tracts, subdivided prior to January 1, 1988, and not conforming to the minimum lot size requirements, may be approved for an OSSF provided the following conditions are met:

(1) Minimum separation distances in §285.31 of this title (relating to Separation/ Setback Requirements) are maintained; and

(2) The site has been evaluated by the site evaluator in accordance with §285.30 of this title (relating to Site Evaluation).

(c) Review of subdivision or development plans. Persons proposing residential subdivisions, manufactured housing communities, multi-unit residential developments, business parks, or other similar uses and utilizing OSSFs for sewage disposal must submit planning materials for these developments to the permitting authority. The planning materials must include an overall site plan, topographic map, 100-

year floodplain map, soil survey, location of water wells, and complete report detailing the types of OSSFs to be considered and their compatibility with area wide drainage and groundwater. A comprehensive drainage and 100-year floodplain impact plan must also be included in these planning materials. Planning materials shall also address potential replacement areas. A response to the submitted planning material from the permitting authority will be provided within 45 days of receipt.

Adopted January 20, 1997 Effective February 5, 1997

§285.5. Submittal Requirements for Planning Materials.

Planning materials required under this chapter shall be submitted to the permitting authority for review and approval in accordance with this section. All planning materials shall be in compliance with the provisions of this chapter and shall be submitted in accordance with of §285.91 (9) of this title (relating to Tables).

(1) Submittal of planning materials by an owner or installer. For OSSFs not requiring planning materials to be submitted in accordance with paragraphs (2) and (3) of this section, an owner or installer must submit the appropriate planning materials for the proposed OSSF.

(2) Submittal of planning materials by a registered professional engineer or registered sanitarian. OSSF planning materials shall be prepared and submitted by a registered professional engineer or registered sanitarian (with appropriate seal, date and signature) as follows:

(A) proposals for treatment and/or disposal that are not standard as described in Subchapter D of this chapter (relating to Planning, Construction, and Installation Standards for OSSF Systems);

(B) any OSSF proposed to serve manufactured housing communities, recreational vehicle parks, multi-unit residential developments which are owned or controlled by a person who rents or leases such space.

(C) any OSSF for a structure not exempted by §20 of the Texas Engineering Practice Act shall have planning materials submitted by a registered professional engineer.

(D) all standard or proprietary treatment systems that utilize surface irrigation disposal as detailed in Subchapter D of this chapter (relating to Planning, Construction, and Installation Standards for OSSF Systems).

(E) all non-standard treatment systems that utilize surface irrigation disposal as detailed in Subchapter D of this chapter and cluster systems shall have planning materials submitted by a registered professional engineer only.

(3) Review of non-standard planning materials. The executive director shall review initial plans for all non-standard planning material, as described in Subchapter D of this chapter (relating to Planning Construction and Installation Standards for OSSFs). Any subsequent similar non-standard

planning materials may be reviewed by the local authorized agent once the original concept and planning materials has received favorable review by the executive director.

Adopted January 20, 1997 Effective February 5, 1997

§285.6. Cluster Systems.

Use of a cluster system shall be considered when lot sizes, lot location, or soil conditions make a standard system unacceptable.

(1) Design. These systems shall be designed and constructed in accordance with the requirements of this chapter or Chapter 317 of this title (relating to Design Criteria for Sewerage Systems). These systems shall be designed and submitted to the permitting authority for review under seal of a registered professional engineer.

(2) Permits required. Each single family dwelling on a cluster system must be individually permitted by the permitting authority.

(3) Maintenance/Ownership agreement. Each permittee on a cluster system must be a party to a legally binding agreement regarding ownership, service, and maintenance of the cluster system. The minimum required elements of that agreement are as follows:

(A) The agreement must be legally binding to all parties;

(B) Each person who uses the system for treatment and/or disposal must be a party to the agreement;

(C) Each permittee must be a joint owner of the cluster system and the property on which the cluster system is located or the property on which the cluster system is located is owned in fee simple by one or more of the permittees to the cluster system and the owner/owners has granted a perpetual easement of access and use to all other permittees using the system.

(D) The agreement must provide a reliable management structure for performing service, maintenance, and inspection of the system;

(E) The agreement must include a reliable plan for handling apportionment and collection of cost among the parties; and

(F) The agreement must denote that all parties are individually and severally responsible for the proper maintenance and functioning of the system.

(4) Property ownership. The parties to the agreement must obtain all necessary rights of way, easements, or ownership of properties necessary for operation of the cluster system. The site for a cluster system shall be owned by all of the parties to the maintenance/ownership agreement or owned in fee simple by one or more of the permittees to the cluster system and having granted a perpetual easement of access and use to all other permittees using the system. The application for a cluster system

shall include a certified copy of an affidavit, which has been duly recorded with the county/city clerk's office and added to the real property deed where the cluster system is located and the real property deed of each permittee. The affidavit shall state that the property shall not be transferred to a new owner without the new owner being advised that the property is part of a cluster system and shall be party to the agreement.

Adopted January 20, 1997 Effective February 5, 1997

§285.7. Additional Application Requirements for Surface Irrigation Systems.

(a) Technical report. Each application for an OSSF permit utilizing surface irrigation as a disposal method shall be accompanied by a report outlining the planning and operation of the entire wastewater treatment and disposal system. A basis of planning, construction drawings, calculations, and system flow diagram shall be included in this report. Proprietary aerobic systems may reference the agency's approval number instead of furnishing construction drawings for the unit. All other information except construction drawings will be required for proprietary submittal.

(b) Site drawing. A scale drawing and legal description of all land which is to be a part of the surface irrigation system will be included in the submittal of an application for a permit. At a minimum, the drawing will show the location of all existing and proposed buildings, wastewater disposal area, buffer zones, water wells, and any other pertinent features or information.

(c) Landscape plan. The application for a permit shall be accompanied by a landscape plan, which will describe, in detail, the type of vegetation to be maintained on the irrigated area during any calendar year. Installations may irrigate existing vegetation provided all areas of bare ground are seeded or covered with sod, capable of growth, prior to system start up.

(d) Maintenance requirements. Final permit approval will be issued after planning materials approval, provided the applicant furnishes a valid maintenance contract with a maintenance company. The maintenance company will verify that the surface irrigation system is operating properly and that they will provide on-going maintenance of the installation. The initial maintenance contract must be valid for a minimum of two years.

(e) Maintenance contract. A maintenance contract will authorize the maintenance company to maintain and repair the system as needed. A copy of the signed maintenance contract between the property owner and the approved maintenance company shall be provided to the permitting authority prior to final permit approval.

(f) On-going maintenance. On-going maintenance shall be provided by a maintenance company.

(1) The owner of each surface application system shall continuously maintain a signed written contract with a valid maintenance company and shall submit a copy of the contract to the permitting authority at least 30 days prior to expiration of the previous contract.

(2) If the property owner or maintenance company desires to discontinue the provisions of the maintenance contract, the maintenance company shall notify, in writing, the permitting authority at least 30 days prior to the date service will cease.

(3) If a maintenance company discontinues business, the property owner shall within 30 days of the termination date, contract with another approved maintenance company and provide the permitting authority with a copy of the newly signed maintenance contract.

(g) Affidavit. Prior to issuance of a permit, a certified copy of an affidavit, which has been duly recorded at the county/city clerk's office and filed in reference to the real property deed on which the surface application system is to be installed, must be submitted. Such an affidavit, for example see §285.90(2) of this title (relating to Figures), shall state that the property shall not be transferred to a new owner without:

(1) the new owner being advised that the property contains a surface application system for wastewater disposal;

(2) the permit issued to the previous owner of the property being transferred to the new owner in accordance with §285.20(5) of this title (relating to Application Requirements General); and

(3) the new owner submitting a valid signed maintenance contract to the permitting authority.

(h) Testing and reporting. The maintenance company shall inspect each permitted surface irrigation system as directed by the testing and reporting schedule shown in §285.91(4) of this title (relating to Tables). The maintenance company shall report any responses to homeowner complaints and the results of its maintenance findings to the permitting authority within ten days of the specified reporting frequency. The number of site visits may be reduced to two per year for all systems having electronic monitoring and automatic telephone or radio access which will notify the maintenance company of system or component failure. This monitoring system shall also monitor effluent disinfection.

(i) Effluent disinfection. Treated effluent must be disinfected prior to surface application. Approved disinfection methods shall include but not be limited to chlorination, ozonation, or ultraviolet radiation. Tablets or other dry chlorinators shall use calcium hypochlorite of a type properly encapsulated and suitable for wastewater disinfection. The efficiency of the disinfection procedure will be established by monitoring the fecal coliform count or total chlorine residual from representative effluent grab samples as directed in the testing and reporting schedule. The frequency of testing and type of tests required are shown in §285.91(4) of this title.

Adopted January 20, 1997 Effective February 5, 1997

§285.8. Maintenance Contract.

(a) The installer of an on-site sewage disposal system shall provide the owner of the system with information regarding maintenance of the system at the time the system is installed.

(b) A permitting authority may not condition an on-site permit or the approval of an on-site permit for aerobic treatment systems serving single family residences located in a county with a population of less than 40, 000.

(c) The owner of an aerobic treatment system for single-family residence located in a county with a population of less than 40,000 shall either maintain the system directly or through a maintenance contract upon conclusion of any such maintenance provided under a warranty. If the owner elects to maintain the system directly, the owner must, prior to performing any maintenance, obtain training for the system from an installer who has been certified by the manufacturer.

(d) This section does not affect any testing and reporting requirement or schedule as provided by this chapter.

Adopted December 16, 1998

Effective January 8, 1999

SUBCHAPTER B : LOCAL ADMINISTRATION OF THE OSSF PROGRAM

§285.10. Delegation to Authorized Agents.

(a) Requirements/Procedures.

(1) Local governmental entities which desire to become authorized agents of the commission shall request such in writing to the executive director.

(2) Upon request, the executive director shall forward to the entity a description of the process of delegation and a copy of the model order/ordinance. Any changes to the model order/ ordinance by the local entity based on local conditions must be consistent with this chapter. The executive director shall be the sole and final authority in determining the acceptability of proposed changes from the model order/ordinance. A local government entity which wants to be designated an authorized agent for the OSSF program shall follow the following procedures:

(A) Upon request, the executive director shall provide model orders or ordinances to local entities.

(B) The executive director consults with local authorities as to specific procedures and requirements to obtain authorized agent status.

(C) The local government entity shall draft an order or resolution regulating OSSFs within its jurisdiction which meets the requirements of §366.032 of the Texas Health and Safety Code. In the event that the local government entity drafts a proposed order which is different from the model order/ordinance, the local government entity shall submit the proposed order/ordinance to the executive director for review and comment prior to notice being published. Within 30 days of receipt of the proposed order/ordinance, the executive director shall review the proposal and provide comment to the local government entity on whether the proposed order/ordinance meets the agency's minimum requirements.

(D) The local government entity shall cause notice to be published, in a newspaper regularly published and of general circulation in the area of jurisdiction, of a public hearing to be held to discuss the adoption of the proposed order or resolution;

(E) The local government entity shall hold a public meeting to discuss the proposed order or resolution;

(F) The local government entity shall adopt that order or resolution;

(G) The local government entity shall send a certified copy of the minutes of the meeting which adopted the order or resolution;

(H) The local government entity shall send a certified copy of the order or resolution;

(I) Upon receipt of the complete package requesting delegation, the executive director will review to see that it complies with the requirements of this chapter and Chapter 366 of the Health and Safety Code. If found to be compliant, the executive director will notify the local entity by mail of their authorized agent status and the date the authorized agent shall assume jurisdiction of the OSSF program. The authorized agent shall administer its OSSF program in accordance with its approved OSSF waste disposal order/ordinance. All authorized agents shall maintain their orders/ordinances in accordance with the minimum requirements of this chapter.

(b) Amendments to existing orders/ordinances. The amendment procedure may be initiated by the authorized agent in accordance with subsection (a) of this section. The executive director may require periodic revisions or renewals of OSSF orders/ordinances for compliance with new rules or regulations.

(c) Resolution of nuisance complaints by an authorized agent. A major activity of any authorized agent is the satisfactory resolution of nuisance complaints involving OSSFs. An authorized agent may require a property owner to repair a malfunctioning OSSFs on the owner's property not later than the 30th day after the date which the owner is notified by the authorized agent of the malfunctioning system.

(d) Authorized agent's reporting requirements. Each authorized agent shall provide to the executive director a detailed monthly report of OSSF activities as prescribed by the executive director. Categories in this report shall include, but not be limited to the following:

(1) subdivision reviews;

(2) complaint and enforcement activities;

(3) information on the numbers and types of OSSFs permitted; and

(4) administrative activities performed by the authorized agent.

(e) Relinquishment of authorized agent delegation. If an authorized agent decides to relinquish its delegation to regulate OSSFs under the regulatory authority granted by Chapter 366 of the Health and Safety Code and this chapter, the authorized agent shall adhere to the following procedures:

(1) The authorized agent shall inform the executive director by certified mail at least 30 days prior to publishing the notice that it wishes to relinquish its OSSF order.

(2) The authorized agent shall publish notice, indicating its intent to relinquish, in a newspaper regularly published or circulated in the area of jurisdiction prior to taking further action to relinquish.

(3) The authorized agent shall send the executive director copies of the following: the public notice, a publisher's affidavit of public notice, and a certified copy of the entity's minutes of the meeting in which it formally considered relinquishment of its delegation.

(4) The executive director shall process the request for relinquishment and may issue an order relinquishing the authority to regulate OSSFs within an authorized agent's jurisdiction or may refer the request to relinquish to the commission.

(5) Prior to issuance of a relinquishment order the local governmental entity and the executive director shall determine the exact date the authorized agent would surrender its authorized agent designation to the executive director.

(f) Revocation of authorized agent delegation.

(1) An authorized agent must consistently enforce this chapter and Chapter 366 of Health and Safety Code.

(2) An authorized agent's OSSF order may be revoked at any time by order of the commission for good cause after opportunity for public hearing is given in accordance with Subchapter C of the Texas Administrative Procedures Act.

(3) Failure by an authorized agent to consistently enforce this chapter, or Chapter 366 of the Health and Safety Code is good cause for revocation.

(4) When the executive director determines that revocation is warranted a petition seeking revocation may be filed by the executive director with the commission requesting that a public hearing be held.

(5) If the executive director files a petition for revocation with the commission, notice shall be given to the authorized agent of the time and place for the hearing not less than ten days prior to the hearing by certified mail, return receipt requested.

(6) If an authorized agent wants to consent to revocation, a written request or a written consent and wavier may be filed with the executive director not later than ten days after the receipt of notice of the petition to revoke. If the authorized agent requests or consents to revocation, the executive director may revoke without the necessity of a public hearing or commission action. The executive director shall notify the commission of each revocation of an authorized agent's authority.

(7) Upon completion of a public hearing the commission may do any of the following:

(A) Issue an order revoking the authorized agent's delegation;

(B) Issue an order placing the authorized agent on probation for a specified period of time; or

(C) Take no action on the request.

(8) Upon issuance of a revocation order by the commission, the executive director shall assume responsibility for the OSSF program in the former agent's jurisdiction.

Adopted January 20, 1997 Effective February 5, 1997

§285.11. Review of Locally Administered Programs.

The executive director shall review not more than once per year an authorized agent's locally administered program for adequate performance and compliance with requirements established by Chapter 366, Texas Health and Safety Code, this chapter, and the order/ordinance adopted by the authorized agent. If the executive director's review determines that an authorized agent does not enforce the commission's minimum requirements for OSSFs, the commission may hold a hearing to determine whether the entity shall lose its designation as an authorized agent in accordance with §285.10(f) of this title (relating to Delegation to Authorized Agents).

Adopted January 20, 1997 Effective February 5, 1997

SUBCHAPTER C : COMMISSION ADMINISTRATION OF THE OSSF PROGRAM IN AREAS WHERE NO LOCAL ADMINISTRATION EXISTS

§285.20. Application Requirements General.

Procedures for obtaining an agency permit include:

(1) Application for OSSF permits shall be made to the appropriate agency regional office. Application for a permit shall be made on a standard form provided by the executive director and must include the appropriate planning material in accordance with §285.5 of this title (relating to Submittal Requirements for Planning Materials). Any OSSF for a single residence located on a land tract that is ten acres or larger in which the sewage disposal line is not closer than one-hundred feet of the property line is not required to submit an application for authorization.

(2) Upon receipt of a complete application, the appropriate fee in accordance with this subchapter and a positive site evaluation performed by a certified site evaluator, the regional office shall issue an authorization to construct.

(3) An authorization to construct, if granted, will be valid for one calendar year from the date of application. Should a construction inspection not be requested during this one-year period, the application for authorization shall be rendered invalid. Fees for reapplication shall be the fee in effect on the date of reapplication.

(4) Upon approval of the OSSF planning materials and construction inspection, the regional office shall issue a license to operate the OSSF with a unique identification number.

(5) The permit will be issued in the name of the owner of the OSSF. Permits shall be transferred to the new owner automatically upon legal sale of the OSSF. The transfer of an OSSF permit under this section shall occur upon actual transfer of the property on which the OSSF is located unless the ownership of the OSSF has been severed from the property.

(6) A reinspection shall be required if the OSSF failed to pass the construction inspection. The installer shall pay the appropriate reinspection fee in accordance with §285.21 of this title (relating to Fees).

Adopted January 20, 1997 Effective February 5, 1997

§285.21. Fees.

(a) Application fees. The application fee for an OSSF permit is:

(1) $200 for a single family dwelling OSSF; or

(2) $400 for other types of OSSFs. The fee is payable upon application from the owner/agent to the Texas Natural Resource Conservation Commission for an OSSF permit. This fee shall be

submitted to the appropriate agency regional office. Money orders or personal checks only, payable to the Texas Natural Resource Conservation Commission, shall be accepted. All applications shall expire one year from the date of the original application. No refunds of any amount shall be granted.

(b) Reinspection fee. A reinspection fee shall be equal to one half of the permit application fee required at the time of application and shall be assessed to the installer of record each time a reinspection is required.

Adopted January 20, 1997 Effective February 5, 1997

SUBCHAPTER D : PLANNING, CONSTRUCTION AND INSTALLATION STANDARDS FOR OSSFS §285.32

Effective January 8, 1999

§285.30. Site Evaluation.

(a) Soil analysis procedures. At least two soil borings or two backhoe pits shall be taken in opposite ends of the area to be used for soil absorption systems. In the areas of high soil variability the permitting authority may require additional borings and backhoe pits. These borings or backhoe pits shall be excavated to the depth of two feet below the proposed excavation or to a restrictive horizon whichever is less. The type and size of an OSSF shall be determined on the basis of the most restrictive soil class located anywhere within two feet of the bottom of the proposed excavation. Evaluation of these borings and overall site evaluation shall be performed by individuals currently certified as a site evaluator. Characteristics including soil texture, soil structure, soil drainage, and soil depth shall be evaluated.

(b) Soil texture analysis. The soil classes shall be determined by a general texture analysis in accordance with §285.91(6) of this title (relating to Tables).

(1) Soil Class Ia. Sandy texture soils which contain more than 30% gravel. This class is considered unsuitable with respect to texture.

(2) Soil Class Ib. Sandy soils which contain less than or equal to 30% gravel. This class is be considered suitable with respect to texture.

(3) Soil Class II. This class is considered suitable with respect to texture.

(4) Soil Class III. This class is considered suitable with respect to texture.

(5) Soil Class IV. This class is considered unsuitable with respect to texture.

(c) Soil structure analysis. Soils determined to be in Class Ib or Class II soils are generally considered suitable as to structure. In Class IV soils structure analysis need not be performed. Three soil structures significant to the movement of sewage effluent through Class III soils are blocky, platy, and massive.

(1) Massive soil structure. A massive soil structure is considered unsuitable with respect to structure.

(2) Blocky soil structure. A blocky soil structure is considered suitable with respect to structure.

(3) Platy soil structure. A platy soil structure is considered unsuitable with respect to structure.

(d) Soil depth analysis. The depth of soils classified suitable as to texture and structure shall be at least 24 inches below the bottom of the proposed disposal area when standard ground absorption systems are to be utilized. Soils without at least 24 inches of suitable soil beneath the proposed drainfield shall be considered unsuitable.

(e) Restrictive horizons evaluation. Dense clay subsoils, rock and plugged laminar soils are considered to be restrictive horizons. They can be recognized by an abrupt change in texture from a sandy or loamy surface horizon to a clayey subsoil or rock like material which an auger will not penetrate. Soils in which restrictive horizons are less than 24 inches below the bottom of the proposed drainfield shall be considered unsuitable.

(f) Groundwater evaluation. The presence of groundwater shall be determined by a site evaluator. Any soil profile that is indicative of high water tables within 24 inches below the bottom of the proposed drainfield shall be considered unsuitable.

(g) Topography. Uniform slopes under 30% are considered suitable with respect to topography. When slopes are less than 2%, provisions shall be made to insure good surface drainage of rainfall or runoff from covering the soil absorption field. The drainfield excavation shall follow the contour of the ground. Soil absorption systems shall not be located in a depression or in areas of complex slope patterns where slopes are dissected by gullies and ravines.

(h) Flood hazard. No new OSSFs or substantial improvements to existing OSSFs shall be allowed in the regulated floodway, determined from either Federal Emergency Management Agency (FEMA) maps or a flood study prepared by a professional engineer registered in Texas. Any sites within the 100-year floodplain, determined from either FEMA maps or flood studies prepared by a professional engineer registered in Texas, shall be subject to special planning requirements to indicate that the location of the OSSF will not result in damage to the OSSF or result in contamination from the OSSF during flooding. Any planning materials submitted under this subsection shall indicate how possible tank flotation is eliminated.

(i) Determination of over-all site suitability. The following criteria shall determine if the site can be utilized for standard subsurface disposal methods without need of any significant modification of the site. §285.91(5) of this title (relating to Tables) summarizes soil and site criteria for construction of a standard treatment and disposal system.

(1) If all of the soil or site criteria categories are determined to be suitable, standard subsurface disposal methods may be utilized.

(2) If the site and soil evaluation proves to be suitable, the size of the subsurface absorption system may be calculated using data in §285.91(5) of this title (relating to Tables). Unsuitable sites must use appropriate proprietary or non-standard systems.

(3) If one or more of the soil or site criteria categories are evaluated as unsuitable, standard subsurface disposal methods cannot be utilized. However, the site may still be utilized for standard on-site wastewater treatment by using non-standard sub-surface disposal methods, except as noted in §285.33(a)(2) of this title (relating to Criteria for Sewage Disposal Systems).

Adopted January 20, 1997 Effective February 5, 1997

§285.31. Setback and Separation Requirements.

The construction of an OSSF (treatment and disposal systems) must be isolated from certain areas such as water wells, lakes, roads, and other objects subject to contamination from the OSSF or which may prevent the proper operation of the system. The minimum requirements for the state are described in §285.91(10) of this title (relating to Tables) for OSSFs subject to the following provisions:

(1) Surface irrigated areas shall be considered as drainfields for determining separation distances.

(2) Private and public water wells shall be completed in accordance with Chapters 290 and 338 of this title (relating to Water Hygiene and Water Well Drillers).

Adopted January 20, 1997 Effective February 5, 1997

§285.32. Criteria for Sewage Treatment Systems.

(a) Treatment processes - standard.

(1) Septic tanks (gravity flow). The septic tank is attached to wastewater fixtures through a watertight pipe identified as a building "stub out" or "house sewer". The septic tank is connected to the house sewer by an inlet device. Effluent from the septic tank, having undergone primary treatment, flows out of the tank through an outlet device into additional treatment processes or a disposal system. A septic tank, constructed in accordance with this chapter, shall meet the following material, component, construction, and approval requirements:

(A) Tank volumetric capacity. Measured from the bottom of the outlet, the liquid volume of a septic tank shall not be less than established in §285.91(2) of this title (relating to Tables). The liquid depth of the tank shall not be less than 30 inches.

(B) Inlet and outlet devices. The flowline of the inlet device shall be at least three inches higher than the flowline of the outlet device, see §285.90 (6) and (7) of this title (relating to Figures). The entry point of the outlet device shall be below the liquid level of the tank at a depth between 25% to 50% of the overall liquid depth of the tank. The inlet and outlet devices shall be "T" branch fittings, constructed baffles or other structures or fittings approved by the executive director. All outlet devices must use a "T" unless a executive director approved fitting is installed on the outlet. All inlet and outlet devices shall be installed water tight to the septic tank walls and be a minimum of three inches in diameter.

(C) Baffles and series tanks. All septic tanks shall be divided into two or three compartments by the use of baffles or by connecting two or more tanks in series. In a baffled tank, the baffle shall be located so that one half to two thirds of the total tank volume is located in the first of two compartments. Two or three tanks may be arranged in series to achieve the required liquid capacity. The first tank in a two tank system shall contain at least one half the required volume. The first tank in a three tank system shall contain at least one third of the total required volume, but no less than 500 gallons. Interconnecting inlet and outlet devices may be installed at the same elevation for multiple tank installations. Baffles shall be constructed the full width and height of the tank with a gap between the top of the baffle and the tank top. The baffle shall have an opening located below the liquid level of the tank at a depth between 25% and 50% of the liquid level. The opening may be a slot or hole and a "T" may be fitted. If a "T" is fitted, the inlet to the fitting shall be at the stated depth in this paragraph. Any metal structures, fittings, or fastenings shall be stainless steel.

(D) Inspection and cleanout ports. All septic tanks shall have an inspection and/or cleanout port located on the tank top, but not directly over, the inlet and outlet devices. These ports may be any configuration with the smallest dimension of the opening not less than 12 inches, but large enough to provide maintenance and equipment removal. Septic tanks buried more than 12 inches below the ground surface shall have risers over the port openings. These risers shall extend from within six inches of the ground surface up to the ground surface and be sealed to the tank and capped.

(E) Septic tank construction materials. The septic tank shall be of sturdy, water-tight construction. Materials used shall be steel-reinforced poured-in-place concrete, steel-reinforced pre-cast concrete, fiberglass, reinforced plastic polyethylene, or other materials approved by the executive director. Metal septic tanks are prohibited. The septic tank shall be structurally designed to resist buckling from internal hydraulic loading and exterior loading caused by earth fill and additional surface loads. Tanks exhibiting obvious deflections, leaks, or structural defects shall not be used. Where concrete tanks are installed, sweating at construction joints is acceptable.

(F) Precast concrete tanks. In addition to the general requirements aforementioned in subparagraph (E) of this paragraph, precast concrete tanks shall conform to requirements in the Materials and Manufacture Section and the Structural Design Requirements Section of American Society for Testing and Materials (ASTM) Designation: C 1227- 93, Standard Specification for Precast Concrete Septic Tanks (1993).

(G) Fiberglass and plastic polyethylene tank specifications.

(i) General. The tank shall be fabricated to perform its intended function when installed. The tank shall not be adversely affected by normal vibration, shock, climate conditions, nor typical household chemicals. The tank shall be free of rough or sharp edges that would interfere with installation or service of the tank.

(ii) Watertight integrity. The tank shall be designed and constructed so that all joints, seams, component parts, and fittings prevent the entrance of groundwater and prevent the exit of wastewater, except through designed inlet and outlet openings.

(iii) Structural characteristics. Full or empty tanks shall not collapse or rupture when subjected to earth and hydrostatic pressures.

(H) Special requirements for poured-in-place concrete tanks. Concrete tanks shall be structurally sound and water-tight. The concrete structure shall be designed by a registered professional engineer with relevant experience in the field.

(I) Tank manufacturer specifications. Beginning 180 days after the effective date of these rules, all pre-cast or prefabricated tanks shall be clearly and permanently marked, tagged, or stamped with the manufacturer's name, address, and tank capacity near the level of the outlet so as to be clearly visible. Direction of flow into and out of the tank shall be indicated by arrows or other identification clearly marked at the inlet and outlet.

(J) Installation of tanks. Septic tanks must be installed so as to provide at least 12 inches of drop in elevation from the bottom of the outlet pipe to the bottom of the disposal area. A minimum of four inches of sand, sandy loam, clay loam, or pea gravel free of rock shall be placed under and around all tanks, except poured-in-place concrete tanks. Tank excavations should be left open until such time that they have been inspected by the permitting authority. Tank excavations must be backfilled with sand, sandy loam, clay loam, or pea gravel free of rock. It is acceptable to mound soil over a septic tank, which would normally be exposed, to maintain slope to the drainfield.

(K) Pretreatment (Trash) tanks. The executive director may require the use of a pretreatment tank for use in conjunction with aerobic treatment units. Plastics and other non-digestible sewage can impair or prevent an aerobic unit from functioning properly. Those aerobic treatment units that do not prevent non-digestible sewage from interfering with aeration lines and diffusers may be required by the executive director to use pretreatment tanks for all units installed in the state. All pretreatment tanks shall meet all applicable structural requirements of this subchapter.

(2) Intermittent sand filters.

(A) Overview. An intermittent sand filter (a secondary treatment unit) applies wastewater received from a septic tank (the primary treatment unit) through a coarse porous media layer above a bed of sand by means of pressure distribution. The wastewater moves downward through the course sand media receiving further treatment on the surface of the sand particles. The treated wastewater is collected at the bottom of the sand filter and discharged, via gravity or pressure, to an appropriate disposal method discussed in this subchapter. A typical layout and cross-section of an intermittent sand filter is presented in §285.90(8) of this title (relating to Figures).

(B) Filter Bed.

(i) Sand media specifications. Sand filter media must meet ASTM C-33 specifications as outlined in §285.91(11) of this title (relating to Tables).

(ii) Loading rate. Shall not exceed 1.2 gallons/day/square foot.

(iii) Surface area. Minimum surface area shall be calculated using the formula: Q/1.2=Surface Area (Square Feet), where Q is the wastewater flow in gallons per day.

(iv) Depth (thickness) of sand media. There shall be a minimum of 24 inches of sand media.

(v) Filter bed containment. The filter bed shall be constructed of an impervious lined pit or tank. Acceptable liners specifications are detailed in §285.33(a)(2)(A) of this title (relating to Criteria for Sewage Disposal Systems).

(vi) Underdrains. For gravity discharge of effluent to a drainfield, place a three inch layer of pea gravel over a six inch layer of 0.75 inch gravel containing the underdrain collection pipe. When pumpwells are to be used to pump the effluent from the underdrain to the drainfield, they must be constructed of concrete or plastic sewer pipe. The pumpwell must contain a sufficient number of holes so that effluent can flow from the gravel void space as rapidly as the effluent is pumped out of the pumpwell, refer to §285.90(9) of this title (relating to Figures).

(b) Treatment processes - proprietary.

(1) System maintenance. On-going maintenance contracts in accordance with the maintenance provisions of §285.7 of this title (relating to Additional Application Requirements for Surface Irrigation Systems) shall be required for all proprietary systems.

(2) Electrical wiring. Electrical wiring for proprietary systems shall be in accordance with §285.34(b)(4) of this title (relating to Other Requirements).

(3) Approval of all proprietary systems. All proprietary treatment and disposal systems shall be approved by the executive director prior to their use in the State. Approval of proprietary systems shall be handled utilizing the procedures found in this section.

(4) Approval of proprietary aerobic treatment systems. All agency approved proprietary aerobic treatment systems will be identified and published in a list of approved systems which may be obtained from the executive director. Only treatment systems which have been tested by and are currently listed by NSF International as Class I systems under NSF Standard 40 (1996) or have been tested and certified as a Class I system in accordance with NSF Standard 40 (1996) by an American National Standard Institute (ANSI) or NSF International accredited testing institution shall be considered for approval by the executive director. All agency approved systems at the time of the effective date of this rule shall continue to be listed on the list of approved systems subject to retesting under the requirements of NSF Standard 40 (1996) and Certification Policies for Wastewater Treatment Devices (1997). The manufacturers of proprietary treatment systems and the accredited certification institution must comply with all the provisions of NSF Standard 40 (1996) and Certification Policies for Wastewater Treatment Devices (1997).

(5) For systems which NSF International, NSF International or ANSI accredited third party testing institutions will not accept for testing because of system size or type and are not approved

systems at the time of the effective date of these rules, the manufacturer shall seek approval in the following manner:

(A) These proprietary systems, components, or materials shall be tested by an independent third party in accordance with this subsection and with the supporting data submitted to the executive director for approval before being marketed for sale in the state.

(B) Testing may be accomplished by allowing a number of the items (usually 20 to 50) to be installed via a temporary authorization in areas typical of the site conditions for which the system would be installed. The temporary authorization may be issued by the executive director and, if issued, shall be specific and pertinent to the proposed proprietary process and shall contain provisions as to how the proprietary process is installed and maintained; the testing protocol for collecting and analyzing samples from the system; the monitoring of equipment, if applicable, and provisions for recording data and data retention necessary to evaluate the performance as well as the effect of the proprietary system on public health, groundwater, and surface waters.

(C) Authorized agents may issue installation permits upon receipt of the temporary authorization. The homeowner must be advised in writing that the system is temporarily approved for testing. System failures, regardless of the material or component, shall be replaced by the manufacturer at the manufacturer's expense. A system installed under §285.32(b)(5) of this title (relating to Criteria for Sewage Treatment Systems) is considered to be the responsibility of the manufacturer until the system has obtained final approval by the executive director in accordance with this section.

(D) Upon completion of the two-year test period, the executive director shall require the certification institution to submit a detailed report on the performance of the system tested. After evaluation of the detailed report, the executive director may issue conditional approval for installations only in areas similar to the area in which the system was tested and for a specified performance and evaluation (monitoring) period, not to exceed an additional five years. The system must be monitored by an entity approved by the executive director. Approval or disapproval of these systems, components or materials will be based on their performance during this five year monitoring period. Failure of one or more of the installed units may be cause for disapproval of the proprietary item. The monitoring method for the units shall be established by the executive director. System failures, regardless of the material or component, shall be replaced by the manufacturer at the manufacturer's expense. The homeowner must be advised in writing that the system is conditionally approved.

(E) Upon successful completion of the monitoring period without failure, systemic or otherwise, the monitoring requirements may be lifted by the executive director and the system deemed suitable for use in conditions similar to areas in which the system was tested and monitored.

(c) Treatment processes - non-standard. All OSSFs not described or defined in subsections (a) and (b) of this section will be considered to be non-standard treatment systems. These systems shall be submitted to the permitting authority for review by a registered professional engineer or registered sanitarian in accordance with §285.5(3) of this title (relating to Submittal Requirements for Planning Materials). Upon approval, a permit will be issued by the permitting authority.

(1) Types of systems considered non-standard include, but are not limited to, all forms of the activated sludge process, rotating biological contactors, recirculating sand filters, trickling type filters, submerged rock biological filters, sand filters not described in subsection (a)(2) of this section.

(2) Non-standard systems submitted for review will be analyzed on basic engineering principles and the criteria established in this chapter. These systems will be reviewed as one of a kind, site-specific installations.

(3) Electrical wiring. Electrical wiring for non-standard systems shall be in accordance with §285.34(b)(4) of this title (relating to Other Requirements).

Adopted December 16, 1998 Effective January 8, 1999

§285.33. Criteria for Sewage Disposal Systems.

(a) Disposal processes - standard. The effluent discharged from an approved treatment process requires further handling to render it safe from a public health standpoint. Acceptable standard disposal methods shall consist of a drainfield to disperse the effluent into adjacent soil (absorptive) or into the surrounding air through evapotranspiration (evaporation and transpiration).

(1) Absorptive drainfield. An absorptive drainfield is an excavation constructed in suitable soil. A porous media (crushed rock, stone, etc.) is then placed in the excavation and perforated pipe (drainline) placed in the media and connected to the outlet of the treatment system. The media is covered with a permeable geotextile fabric and the remainder of the excavation backfilled with previously removed soil. The top of the excavation area is seeded with plants or grasses, where vegetation is sustainable, to aid in water elimination. The following considerations must be met for approval of an absorptive drainfield:

(A) Excavation. The excavation must be constructed in suitable soils as described in §285.30 of this title (relating to Site Evaluation). The excavation shall not exceed a depth of three feet or six inches below the soil freeze depth, whichever is the larger. However, in areas of the state where annual precipitation is less than 26 inches of rainfall per year (as identified in the Climatic Atlas of Texas, (1983) published by the Texas Department of Water Resources and suitable soils (Class Ib, II, or III) lie below unsuitable soil caps, the maximum permissible excavation shall be five feet. Multiple excavations must be separated horizontally by at least three feet of undisturbed soil. After excavation the excavated surfaces (sidewalls and bottom) must be scarified as needed. The bottom of the excavation shall be not less than 18 inches in width and level to within one inch over each 25 feet of excavation. The size of the excavation shall be calculated using data from §285.91(8) of this title (relating to Tables). The formula A = Q/Ra shall be used to determine drainfield area where:

Figure 1: 30 TAC §285.33 (a)(1)(A)

A = absorptive area
Q = average daily sewage flow in gallons per day
Ra = soil application rate in gallons per square foot per day

(i) The usable surface area shall be calculated by adding the excavation bottom area to the total excavated perimeter (in feet) multiplied by one foot (bottom area + perimeter X 1.0).

Figure 2: 30 TAC §285.33 (a)(1)(A)(i)

Absorptive Area =(L x W) + 2 (L+W)
Where: L = Drainfield Length
W = Drainfield Width

(ii) The length of the excavation may be determined as follows when the area and width are known:

Figure 3: 30 TAC §285.33 (a)(1)(A)(ii)

$L = (A-2W)/(W+2)$

(iii) For excavations three feet wide or less use the following formula or §285.91(8) of this title (relating to Figures) to determine L:

Figure 4: 30 TAC §285.33 (a)(1)(A)(iii)

$L = A/(W+2)$

(B) Porous media. The porous media shall consist of clean, washed and graded gravel, broken concrete, rock, crushed stone, chipped tires, or similar aggregate that is generally one uniform size ranging from 0.75 - 2.0 inches as measured along its greatest dimension.

(i) The permitting authority may consider and approve on a case-by-case basis the use of chipped tire sizes greater than 0.75 - 2.0 inches along the greatest dimension.

(ii) When chipped tires are used in conjunction with geotextile fabric, a heavier duty geotextile fabric must be utilized to minimize fabric punctures and eliminate fabric tears due to protruding steel belt remnants.

(iii) Soft media such as oyster shell and soft limestone will not be approved.

(C) Drainline. The drainline shall be constructed of perforated distribution pipe and fittings in compliance with the following specifications:

(i) Three or four inch diameter polyvinyl chloride pipe with a standard dimension ratio- (SDR) of 35 or less.

(ii) Four inch diameter corrugated polyethylene, ASTM F405 in rigid ten foot joints only.

(iii) Three or four inch diameter polyethylene smoothwall, ASTM F810.

(iv) Any other pipe approved by the executive director.

(D) Installation Requirements. The drainline shall be placed in the porous media with at least six inches of media between the bottom of the excavation and the bottom of the drainline. The drainline shall be completely covered by the porous media and the drainline perforations shall be below the horizontal center line of the pipe. Single drainlines shall not exceed 150 feet, see §285.90(5) of this title (relating to Figures). The drainlines shall be placed parallel to each other and parallel to the longest horizontal dimension of the excavation. For excavations greater than three feet in width, the maximum separation distance between parallel drainlines shall be four feet (center to center). Multiple drainlines shall be manifolded together with solid or perforated pipe. The opposite ends of multiple drainlines shall be manifolded together with solid line or looped together using perforated line and bedding. If drainfield is not to be looped, end caps must be used.

(E) Permeable soil barrier. A permeable soil barrier shall be placed between the top of the porous media and the excavation backfill. Geotextile fabric shall be used for the permeable soil barrier. Geotextile fabric shall conform to the following specifications for unwoven, spun-bounded polypropylene, polyester or nylon filter wrap:

Figure 5: 30 TAC §285.33 (a)(1)(E)

Minimum values

Weight oz/sq yd (ASTM D3776)	0.70
Grab Strength lbs (ASTM D4632)	11
Air Permeability cfm/sq ft (ASTM D737)	500
Water Flow Rate gpm/sq ft @ 3" head (ASTM D4491)	33
Trapezoidal Tear Strength Lbs (ASTM D4553)	6

(F) Backfilling. Backfilling is the process of replacing the soil removed during excavating back into the drainfield and on top of the geotextile fabric. Only Class Ib or II soils as described in §285.30(b) and (c) of this title (relating to Site Evaluation) shall be used for backfill. Rock and high shrink swell clays are specifically prohibited for use as a backfill material. The backfill material shall be mounded over the excavated area so that the center of the excavation slopes down to the outer perimeter to allow for settling. The excavated area may be bermed or drainage swales may be used to divert surface runoff from the site.

(G) Drainfields on irregular terrain. Where topography or ground slope is greater than 15% but less than 30% slope for the construction of a level single drainfield, multiple long narrow drainfields may be constructed along descending contours. An overflow line shall be provided from the upper excavations to the lower excavations. This overflow line shall be constructed from solid pipe with an SDR of 35 or less and the excavation carrying the overflow pipe shall be backfilled with soil only.

(H) Drainfield plans. A number of approved sketches, specifications and details for drainfield construction are provided in §285.90(4) and (5) of this title (relating to Figures).

(2) Evapotranspirative drainfield (ET). An ET drainfield is a standard disposal process which may be used in soils which are classified as unsuitable in §285.30 of this title (relating to Site Evaluation) with respect to texture, structure, restrictive horizons and ground water. Water saving devices must be utilized in all structures for which ET beds are recommended. ET drainfields are generally constructed in accordance with the specifications for absorptive drainfields with the following exceptions:

(A) Liners. An impervious liner must be used between the excavated surface and the constructed drainfield in all Class Ia soils classified as unsuitable due to the possibility of ground water contamination. Liners are also required for Class IV soils with seasonal ground water tables which penetrate the excavation. Liners shall be constructed from impervious rubber or plastic material having a thickness of 20 mils or greater per layer. Reinforced concrete, gunite, and compacted and tested clay (one foot thick or more) may also be used for liner material. Liners shall be constructed in such a manner as to have a permeability of 10^{-7} cm/sec or less as tested by a certified soil laboratory. Rubber or plastic liners must be protected from rocks and stones (when exposed) by covering the excavated surface with a uniform sand cushion at least four inches thick.

(B) ET drainfield sizing. The following formula shall be used to calculate the top surface area of a constructed ET drainfield:

Figure 6: 30 TAC §285.33 (a)(2)(B)

$A = 1.6\ Q/Ret$

Where: $A =$ is the total top surface area of the excavation.
$Q =$ estimated daily water usage in gallons/day in §285.91(3) of this title (relating to Tables).
$Ret =$ net local evaporation rate in §285.91(7) of this title.

The proper selection of the estimated daily water usage, Q, is of vital importance for proper operation of an ET drainfield because the size of the drainfield is determined by this factor. The owner of the system shall be advised by the person putting together the planning materials of the limits placed on the system by the Q selected. The calculated flow rate, Q, shall be included as a condition to the permit and expressed in an affidavit properly filed and recorded in the deed records of the county in which the OSSF is located advising the owner, and future owners, of the system's wastewater disposal limits.

(C) Backfill material. Backfill material shall consist of soil Class II as described in §285.30 of this title (relating to Site Evaluation). Excavations containing two or more drainlines may eliminate the porous media between the drainlines to allow the backfill material to contact the bottom of the excavation. This construction procedure will enhance the wicking action of the soil and improve water transfer. The porous media shall extend at least one foot beyond the edge of the drainline horizontally.

(D) Vegetative cover for transpiration. The final grade shall be covered with vegetation fully capable to take maximum advantage of transpiration, depending on the season and the site's location. Evergreen bushes having shallow root systems may be planted in the drainfield to assist in water uptake. Grasses with dormant periods shall be overseeded to provide year-round transpiration.

(E) Multiple ET drainfields. ET drainfields shall be divided into two or more separate units connected by flow control valves. One of the units may be removed from service for an extended period of time to allow it to dry out and decompose biological material which might tend to plug the drainfield. If one of the units is removed from service, the daily water usage must be reduced to prevent overloading of the units still in operation. Normally, a unit must be removed from service for two to three dry months for biological breakdown to occur.

(F) Geographical location. ET drainfields shall only be used in those areas of the state where the annual average evaporation exceeds the annual rainfall. As the annual rainfall approaches the annual evaporation, the required ET drainfield size becomes very large and expensive to construct (see data in §285.91(7) of this title (relating to Tables)).

(G) ET drainfield plans. A number of approved sketches for ET drainfield construction are provided in §285.90(4) and (5) of this title (relating to Figures).

(3) Pumped effluent drainfield. Pumped effluent drainfields must utilize low pressure dosed drainfield specifications described in subsection (c)(1) of this section, with the following exceptions:

(A) Applicability. Pumped effluent drainfields may only be utilized by single family dwellings and not commercial or institutional structures.

(B) Length of drainfield. There shall be at least 1,000 linear feet of perforated drain pipe for a two bedroom single family dwelling. For each additional bedroom, there shall be an additional 400 linear feet of perforated drain pipe. No individual lateral may exceed 70 feet in length.

(C) Trench width and horizontal separation. Trenches shall be at least six inches wide. There shall be at least three feet of separation between trenches.

(D) Lateral depth and vertical separation. All drainfield laterals shall adhere to a depth range from 1.5 feet to 3 feet. There shall be at a minimum vertical separation distance of 2.0 foot from the bottom of the excavation to a restrictive horizon or to ground water.

(E) Porous media. Each dosing pipe shall be placed with the drain holes facing down and placed on at least 6 inches of porous media (pea gravel or larger) between the bottom of the excavation and pipe.

(F) Pipe and hole size. Lateral drain pipe shall use 1.25-1.5 inch diameter line. Manifolds or headers shall use 1.25-1.5 inch diameter line, where the manifold or header lines must have a diameter as large or larger than the lateral line diameter. Lateral drain pipe hole sizes shall be 3/16-1/4 inch diameter spaced 5 feet apart.

(G) Pump size. Pumped effluent drainfields shall utilize at least a 1/2 horsepower pump.

(H) Topography. When slopes are greater than 2.0%, pumped effluent drainfields shall not be used.

(b) Disposal processes - proprietary.

(1) Gravel-less drainfield piping. Gravel-less pipe may be used only on sites suitable for standard subsurface sewage disposal methods. Gravel-less pipe is available in eight-inch or ten-inch diameter corrugated perforated polyethylene pipe. The pipe is enclosed in a layer of unwoven spun-bonded polypropylene, polyester or nylon filter wrap. Gravel-less pipe shall meet American Society for Testing and Materials, ASTM F-667 Standard Specifications for large diameter corrugated high density polyethylene (ASTM D 1248) tubing. The filter cloth must meet the same material specifications as described under subsection (a)(1)(E) of this section.

(A) Planning parameters. Gravel-less drainfield pipe may be substituted for pipe in both absorptive or ET drainfields. When gravel-less pipe is substituted, the porous media around conventional pipe will not be required. ET drainfields shall be backfilled with Class II soils only. Gravel-less pipe shall not be used for absorptive drainfields in Class IV soils. All other planning parameters for absorptive or ET drainfields apply to gravel-less pipe.

(B) Installation. The proper installation of adequate construction materials is vitally important to the success of gravel-less drainfield systems. Materials include gravel-less pipe, backfill, end caps, offset connectors and filter cloth. All connections from the house to the septic tank shall be in accordance with §285.34(a) of this title (relating to Other Requirements). The connection from the septic tank to the gravel-less line shall be made by using an eight or ten-inch offset connector. It is important that the gravel-less line be laid level with the continuous stripe up, and joined with couplings. The filter cloth must be pulled over the joint to eliminate soil infiltration. The gravel-less pipe must be held in place during initial backfilling to prevent movement of the pipe in the excavation. The end of each gravel-less line shall have an end cap and inspection port installed. An inspection port is required because the amount of sludge or suspended solids in the line can be easily monitored and the distribution lines can be back-flushed.

(C) Drainfield Sizing. Eight inch diameter gravel-less pipe shall use W = 2.0 feet and 10 inch gravel-less pipe shall use W = 2.5 feet for absorptive drainfield sizing.

(2) Leaching chambers. Leaching chambers are bottomless chambers which are planned for installation in a drainfield excavation with the open bottom of the chamber in direct contact with the excavation. The chambers are linked together with sewer pipe (no perforations) in such a manner as to

completely cover the excavation with adjacent chambers in contact with each other. Other special conditions for leaching chambers are as follows:

(A) The excavation may be reduced by 40% from the value calculated using §285.91(1) of this title (relating to Tables). The following formula may be used for excavations utilizing leaching chambers:

Figure 7: 30 TAC §285.33 (b)(2)(A)

$$L = 0.6A/(W+2)$$

Where: A= minimum absorptive area; and
W= leaching chamber panel width

(B) These chambers shall not be used for absorptive drainfields in Class Ia or IV soils.

(C) Backfill covering leaching chambers should be Class Ib, or II soil.

(3) Drip Irrigation. A drip irrigation system consist of small diameter pressurized lines directly buried in the soil to a nominal depth of 6 inches. The lines contain pressure reducing emitters spaced at 30 inch maximum intervals. The purpose of the pressure reducing emitter is to restrict the flow of effluent from the pipe into the surrounding soil to a very low rate. This distribution method promotes uniform wetting of the soil in the root zone of surface vegetation. Since the near surface root zone of plants will absorb water, even in Class IV soils, this type of system may be used for on-site disposal in these soils. The system must be equipped with a filtering device capable of filtering to 100 microns and meet drip irrigation (pressure emitter) manufacturer requirements.

(A) Drainfield layout. The drainfield shall consist of a matrix of lines and emitters arranged in almost any configuration where the layout would ensure equal distribution throughout the drainfield. The system must be equipped with a mechanism to flush from the drainfield back to the treatment unit.

(B) Effluent quality. Treatment preceding this disposal process shall treat the wastewater to a degree to preclude plugging of the emitters. This quality shall be determined by the executive director.

(C) System maintenance. On-going maintenance contracts in accordance with the maintenance provisions of §285.7 of this title (relating to Additional Application Requirements for Surface Irrigation Systems) shall be required for all emitter systems. Systems must be equipped to flush the system back to the treatment unit.

(D) Loading Rates. Pressure emitters can be used in all classes of soils using loading rates as specified in §285.91(1) of this title (relating to Tables). Emitters are assumed to wet four square feet of absorptive area per emitter, however, overlapping areas shall only be counted once toward absorptive area requirements.

(E) There shall be a minimum of 1 foot of soil between the drip emitter and ground water or solid or fractured rock.

(F) No device associated with a drip irrigation system shall be installed which has not been labelled by the manufacturer as suitable for use with domestic sewage or is on an approved list of the executive director in accordance with §285.32(b)(5) of this title (relating to Treatment processes- proprietary).

(4) Testing and monitoring of proprietary disposal systems. All proprietary disposal systems other than those described in this section shall be approved by the executive director prior to their use in the state. Proprietary systems shall be approved by the executive director utilizing the procedures established in §285.32(b) of this title (relating to Criteria for Sewage Treatment Systems).

(c) Disposal processes - non-standard. Non-standard disposal processes are all systems, components and materials not described as standard and not marketed for sale in the state as a proprietary item. The permitting authority may at its option review and either approve or disapprove the planning materials on a case-by-case basis. Planning criteria will be derived from basic engineering analysis and scientific investigation of the proposed disposal process.

(1) Low pressure dosed drainfield. A low pressure dosing system consists of an approved treatment system as specified in §285.32 of this title (relating to Criteria for Sewage Treatment Systems). Effluent from this system is pumped, under low pressure, into a solid wall force main and then into a perforated distribution pipe which is installed within the drainfield area.

(A) The effluent pump in the pump tank must be capable of an operating range that will assure that effluent is delivered to the most distant point of the perforated piping network, yet not be excessive to the point that "blow-outs" occur.

(B) A start/stop switch or timer must be included in the system to control the dosing pump. A high water alarm, on an electric circuit separate from the pump, must be provided.

(C) Drainfield criteria. Pressure dosing systems may be installed in accordance with design criteria in the North Carolina State University Sea Grant College Publication UNC-S82-03 (1982) or other publications containing criteria or data on pressure dosed systems which are acceptable to the permitting authority. The following parameters are required for all low pressure subsurface drainfields:

(i) The low pressure dosed drainfield area shall be sized in accordance with §285.91(1) of this title (relating to Tables). Use 3 square feet of wetted area per linear foot of dosing pipe for all excavated areas less than one foot wide.

(ii) Each dosing pipe shall be placed with the drain holes facing down and placed on at least 6 inches of porous media (pea gravel or larger) between the bottom of the excavation and pipe.

(iii) Geotextile fabric shall be placed over the porous media and the excavation filled with Class Ib or II soil.

(iv) There shall be a minimum of one foot of soil between the bottom of the excavation and solid or fractured rock. There shall be a minimum of two feet of soil between the bottom of the excavation and ground water.

(2) Surface irrigation systems. Surface irrigation methods include, but are not limited to, spray irrigation, landscape irrigation or any other method of applying treated effluent onto the surface of the ground.

(A) Types of wastewater treatment. The treatment system shall consist of any standard, proprietary, approved aerobic units or non-standard treatment methods described in §285.32 of this title (relating to Criteria for Sewage Treatment Systems) and meeting the following effluent criteria:

Figure 8: 30 TAC §285.33 (c)(2)(A)

BOD & TSS:... 30 day average..... 20 mg/l
7 day average.......................... 30 mg/l
Daily Maximum....................... 45 mg/l
Single Grab............................ 65 mg/l
PH... 6.0 - 9.0

(B) Acceptable surface application areas. Acceptable land for surface application will include generally flat terrain (land less than or equal to 15 percent slope) covered with grasses, evergreen shrubs, bushes, trees or landscaped beds containing mixed vegetation. Sloped land may be acceptable if properly landscaped and terraced to minimize runoff.

(C) Unacceptable surface application areas. Land which cannot be used for surface irrigation includes land for growing food, gardens, orchards or crops which may be used for human consumption. Additionally, effluent shall not be applied to unseeded bare ground under any circumstances.

(D) Minimum required application area. The minimum surface application area required shall be determined by dividing the daily usage rate (Q) as established in §285.91(3) of this title (relating to Tables) by the allowable surface irrigation application rate (Ri) found in §285.90(1) of this title (relating to Figures) or as approved by the permitting authority.

Figure 9: 30 TAC §285.33 (c)(2)(D)

Reqd Surface area (sq. ft.) = Q /Ri
where: Ri = the effluent loading rate in gal/sq ft/day

(E) Uniform application of effluent. Distribution pipes, sprinklers, flow channels and other application methods/devices must provide uniform distribution of treated effluent. The application rate must be adjusted so as not to produce runoff.

(i) Sprinkler criteria. When sprinklers are used as the application method, the maximum inlet pressure shall be 40 pounds per square inch. Low angle nozzles (13 degrees or less in trajectory) shall be used in the sprinklers to keep the spray stream low and reduce aerosols. Sprinkler operation shall be controlled by commercial irrigation timers, when property line setbacks are less than 20 feet.

(ii) Sprinkler head requirements. Circular spray patterns may overlap to cover all irrigated area including rectangular shapes. However, the overlapped area will be only counted once toward the total application area. For large systems, multiple sprinkler heads are preferred to single gun delivery systems.

(iii) Effluent storage requirements. Storage requirements and pump tank construction and installation shall be in accordance with §285.34(b) of this title relating to Other Requirements). A sampling port shall be provided in the treated effluent line in the pump tank.

(3) Mound systems. A mound drainfield is an absorptive drainfield constructed above the native soil surface. A scarified interface (for absorptive mounds) between the native soil, a porous media around the distribution pipe, the distribution piping, and a topsoil cover are all components of the mound system. The depth of the material between the distribution pipe and the restrictive horizon or ground water shall be at least 2 feet. The preferred constructed shape is a long narrow rectangle, with the long dimension laid out along a contour. Effluent shall be pressure dosed into the distribution piping to ensure equal distribution and to control application rates. Planning criteria for mound construction may be as specified in the North Carolina State University Sea Grant College Publication UNC-SG-82-04 (1982), the United States Environmental Protection Agency's On-site Wastewater Treatment and Disposal Systems Design Manual (1980) or any technical publication containing mound system criteria and acceptable to the executive director. Shallow placement of the pressure distribution pipe is recommended to reduce mound height.

(4) Soil substitution drainfields. Soil substitution drainfields may be constructed in Class Ia soils, fractured rock, fissured rock, or other conditions of high permeability where septic tank effluent could rapidly reach ground water without undergoing adequate treatment through soil contact. A soil substitution drainfield is constructed similar to a standard absorptive drainfield with one exception. The exception consists of a 24-inch thick Class Ib, Class II or Class III soil buffer placed below and on all sides of the drainfield excavation to an elevation less than the top of the porous media. The Class Ib, Class II or Class III soil acts as a filter medium to remove contaminants from the wastewater prior to its contacting the highly permeable natural ground. Class IV soils may not be utilized for soil substitution. Disposal areas shall be sized based on the textural class of the substituted soil. It is recommended, but not mandatory, that low pressure dosing be used for effluent distribution.

(5) Drainfields Following Approved Aerobic Units, Secondary Treatment and Disinfection. Subsurface drainfields following secondary treatment and disinfection may be constructed in Class Ia soils, fractured rock, fissured rock, or other conditions where insufficient soil depth will allow septic tank effluent to reach fractured rock, fissured rock, or a restrictive horizon before undergoing adequate treatment through soil contact.

(A) Drainfield Sizing.

(i) If the unsuitable feature is Class Ia soils, the disposal area sizing should be based on the application rate for Class Ib soils. It is recommended, but not mandatory, that some form of pressure distribution be used for effluent disposal.

(ii) If the unsuitable feature is insufficient soil depth to fractured or fissured rock, the system sizing should be based on the application rate for Class III soils. It is recommended, but not mandatory, that some form of pressure distribution system be used for effluent disposal.

(B) Maintenance Requirements. The maintenance requirements of §285.7(c)-(g) of this title (relating to Additional Application Requirements for Surface Irrigation Systems) apply to these systems.

Adopted January 20, 1997 Effective February 5, 1997

§285.34. Other Requirements.

(a) House sewer. The sewer from the building's plumbing to the septic tank shall be constructed of cast iron, ductile iron, polyvinyl chloride (PVC) Schedule 40, SDR 26 or other material approved by the executive director. The slope of the sewer shall be no less than 1/8 inch fall per foot of pipe. The sewer stub out should be as shallow as possible to facilitate gravity flow. A two-way cleanout plug must be provided between building's plumbing and the septic tank. All fittings used on this section shall be sanitary type. An additional cleanout plug shall be provided every 50 feet (where applicable, near 90 degree bends) on long runs of pipe and may be of the single sanitary type. This sewer shall have a minimum inside diameter of three inches.

(b) Pump tanks. Pump tanks may be necessary when the septic tank outlet is at a lower elevation than the disposal field. All requirements in §285.32(a)(1)(D) - (H) of this title (relating to Criteria for Sewage Treatment Systems) are also applicable to pump tanks. The pump tank shall be constructed in accordance with the following specifications:

(1) Pump tank criteria. When effluent must be pumped to a disposal area, an appropriate pump shall be placed in a separate water-tight tank or chamber. A check valve may be required if the disposal area is above the pump tank. The pump tank shall be equipped to prevent siphoning. The tank shall be provided with an audio and visual high water alarm. If an electrical alarm is utilized the power circuit shall be separate from the pump. Batteries may be utilized for back-up power supply only. All electrical components shall be approved by Underwriters Laboratories (UL).

(2) Pump tank sizing. Pump tanks shall be sized for one-third day of flow above the alarm-on level. Reserve capacity (capacity above the alarm-on level) may be reduced to four hours average flow when pump tank is equipped with multiple pumps.

(3) Pump specifications. A single pump may be used for flows equal to or less than 1,000 gallons per day. Dual pumps are required for flows greater than 1,000 gallons per day. A dual pump system shall have the "alarm on" level below the "second pump on" level, and shall have a lock-on feature in the alarm circuit so that once it is activated it will not go off when the second pump draws the

liquid level below the "alarm on" level. All audio and visual alarms shall have a manual "silence" switch. Pump switch-gear shall be selected such that both pumps shall operate as the first pump on an alternating basis. All pumps shall be rated by the manufactures for pumping sewage or sewage effluent.

(4) Electrical wiring. All electrical wiring shall be in accordance with the most recent edition of the National Electric Code. Connections shall be in approved junction boxes and all external power wiring shall be in approved electrical conduit, buried and terminated at a main circuit breaker panel or sub-panel. All electrical components should have an electrical disconnect within direct vision. Electrical disconnects must be weatherproof (approved for outdoor use) and have maintenance lockout provisions.

(c) Grease interceptors. Grease interceptor shall be used on kitchen waste-lines from institutions, hotels, restaurants, schools with lunchrooms, and other places that may discharge large amounts of greases and oils to the OSSF. Grease interceptors shall be structurally equivalent to the requirements established for septic tanks under §285.32 (a)(1)(D)-(H) of this title (relating to Criteria for Sewage Treatment Systems). The interceptor shall be installed near the plumbing fixture that discharges greasy wastewater and shall be easily accessible for cleaning. Grease interceptors shall be cleaned out periodically to prevent the discharge of grease to the disposal system. Grease interceptors shall be properly sized and installed in accordance with the most recent requirements of the Uniform Plumbing Code or other prevailing code.

(d) Holding tanks. Tanks shall be constructed in accordance with subsection (b)(1) of this section and shall be structurally equivalent to the requirements established for septic tanks under §285.32 (a)(1)(D)-(H) of this title (relating to Criteria for Sewage Treatment Systems). Inlet (no outlet shall be provided) fittings are required. A baffle is also not required. Holding tanks shall be used only on lots where no other methods of sewage disposal are feasible (these holding tank provisions do not apply to portable toilets). All holding tanks shall be equipped with a visual and audible alarm to indicate when the tank has been filled to within 75% of its rated capacity. A port with its smallest dimension being 15 inches or greater shall be provided in the tank lid for inspection, cleaning, and maintenance. This port shall be accessible from the ground surface and must be easily removable and watertight.

(1) Minimum capacity. Holding tank minimum capacity shall be sufficient to store the estimated or calculated daily wastewater flow for a period of one week (wastewater usage rate in gallons/day X 7 days).

(2) Location. Holding tanks shall be installed in an area readily accessible to the pump truck under all weather conditions, and at a location that meets the minimum distance requirements in accordance with §285.91(10) of this title (relating to Tables).

(3) Maintenance. A scheduled pumping contract with a licensed waste transporter, holding a valid registration with the executive director, must be provided to the permitting authority before any holding tanks are installed. Records of such activities must be retained for 5 years.

(e) Composting toilets. Composting toilets will be approved by the executive director provided the system has been tested and certified under NSF International Standard 41 (1983).

(f) Condensation. If condensate lines are plumbed directly into a OSSF, the increased water volume must be accounted for (added to the usage rate) in the system planning materials.

Adopted January 20, 1997 Effective February 5, 1997

§285.35. Emergency Repairs.

An emergency repair may be made to an OSSF providing that such repair is made for the abatement of an immediate, serious and dangerous health hazard, that such repair does not constitute an alteration of that OSSF system's planning materials and function, and includes such items as replacing tank lids, inlet and outlet devices and repair of solid lines and that such repair meets minimum state criteria established in this chapter. The permitting authority must have written notification within 72 hours of the repair and given a detailed description of the methods and materials used in said repair. An inspection of the emergency repairs may be required at the discretion of the permitting authority.

Adopted January 20, 1997 Effective February 5, 1997

§285.36. Abandoned Treatment, Holding, and Pump Tanks.

It is the responsibility of the property owner to conduct the following actions, in the order listed, to properly abandon an OSSF:

(1) All tanks, boreholes, cesspools, seepage pits, holding tanks, and pump tanks shall have the wastewater/septage removed by a licensed waste transporter, holding a valid registration with the executive director; and

(2) All tanks, boreholes, cesspools, seepage pits, holding tanks, and pump tanks shall be filled with clean sand or other suitable fill material (less than three inches in diameter), free of organic debris, and completely covered with soil.

Adopted January 20, 1997 Effective February 5, 1997

§§285.37-285.38. Reserved for future expansion.

§285.39. OSSF Maintenance and Management Practices.

An installer shall provide the owner of an OSSF the following maintenance and management practices and water conservation measures related to the OSSF installed, repaired or maintained by the installer.

(1) Maintenance and management practices.

(A) An OSSF should not be treated as if it were a normal city sewer system.

(B) The excessive use of in-sink garbage grinders and grease discarding should be avoided. In-sink garbage grinders can cause a rapid buildup of sludge or scum resulting in a requirement for more frequent cleaning and possible system failure.

(C) Do not use the toilet to dispose of cleaning tissues, cigarette butts, or other trash. This disposal practice will waste water and also impose an undesired solids load on the treatment system.

(D) Septic tanks shall be cleaned before sludge accumulates to a point where it approaches the bottom of the outlet device. If sludge or scum accumulates to this point, solids will leave the tank with the liquid and possibly cause clogging of the perforations in the drainfield line resulting in sewage surfacing or backing up into the house through the plumbing fixtures.

(E) Since it is not practical for the average homeowner to inspect his tank and determine the need for cleaning, a regular schedule of cleaning the tank at two-to-three year intervals should be established. Commercial cleaners are equipped to readily perform the cleaning operation. Owners of septic tank systems shall engage only persons registered with the TNRCC to transport the septic tank cleanings.

(F) Do not build driveways, storage buildings, or other structures over the treatment works or its disposal field.

(G) Chemical additives or the so-called enzymes are not necessary for the operation of a septic tank. Some of these additives may even be harmful to the tank's operation.

(H) Soaps, detergents, bleaches, drain cleaners, and other household cleaning materials will very seldom affect the operation of the system. However, moderation should be exercised in the use of such materials.

(I) It is not advisable to allow water softener back flush to enter into any portion of the OSSF.

(J) The liquid from the OSSF is still heavily laden with bacteria. The surfacing of this liquid constitutes a hazard to the health of those that might come into contact with it.

(2) Water conservation measures/practices.

(A) Showers usually use less water than baths. Install a water saving shower head that uses less than two and 1/2 gallons per minute and saves both water and energy.

(B) If you take a tub bath, reduce the level of water in the tub from the level to which you customarily fill it.

(C) Leaky faucets and faulty toilet fill-up mechanisms should be repaired as quickly as possible.

(D) Check toilets for leaks that may not be apparent. Add a few drops of food coloring to the tank. Do not flush. If the color appears in the bowl within a few minutes, the toilet fill or ball-cock valve needs to be adjusted to prevent water from overflowing the stand pipe or the flapper at the bottom of the toilet tank needs to be replaced.

(E) Reduce the amount of water used for flushing the toilet by installing one of the following: a new toilet (1.6 gallon); a toilet tank dam; or filling and capping one-quart plastic bottles with water (usually one is all that will fit in smaller toilet tanks) and lowering them into the tank of the existing 3.5 gallon or larger toilet. Do not use bricks since they may crumble and cause damage to the fixture.

(F) Try to run the dishwasher with a full load, whenever possible.

(G) Avoid running the water continuously for brushing teeth, washing hands, rinsing kitchen utensils or for cleaning vegetables.

(H) Use faucet aerators that restrict flow to no more than 2.2 gallons per minute to reduce water consumption.

(I) Keep a container of drinking water in the refrigerator instead of running the faucet until the water turns cool.

(J) Insulate all hot water pipes to avoid long delays of wasted water while waiting for the heated water.

(K) Ask your city, county, or local government about their programs to conserve water and how they can help you save water.

SUBCHAPTER F : REGISTRATION, CERTIFICATION AND/OR TRAINING REQUIREMENTS FOR INSTALLERS, APPRENTICES, SITE EVALUATORS OR DESIGNATED REPRESENTATIVES

§285.50. General Requirements for Registration and Certification.

(a) The purpose of this section is to set forth a statewide uniform procedure for the training and registration of installers of OSSFs and training and certification of site evaluators and designated representatives and to assist individuals employed or seeking employment in the OSSF industry in meeting the educational and testing requirements for obtaining registration or certification.

(b) No individual shall install, construct, alter, extend, or repair an OSSF unless the individual holds a valid certification issued by the executive director or is expressly excempted from the installer's certification or registration requirements.

(c) No individual may represent himself or herself as an installer, site evaluator, or designated representative unless they possess a valid agency certificate for that profession.

(d) In addition to the requirements of this section, an installer shall comply with all requirements of this title and be responsible for the proper installation of all OSSFs installed under the installer's registration or certification.

(e) No individual shall work under an installer's certificate unless said individual is an apprentice of that installer or under direct supervision of that installer or the apprentice at the jobsite. Apprentices will be issued a registration card in accordance with §285.60 of this title (relating to Apprentice Program).

(f) The installer shall directly supervise all individuals working under the installer's certificate during the installation, construction, alteration, or repair of the OSSF and shall be present on the jobsite during each major phase, or may be represented by his or her apprentice.

(g) When required by the permitting authority, the installer or apprentice must be present at the job-site during the inspection or re-inspection of the OSSF.

(h) The executive director may allow reciprocity for an installer with a valid certificate from another state having certification requirements substantially equivalent to those of this state.

(i) Individuals who act in any capacity for a permitting authority which has jurisdiction over OSSFs shall not work as an installer or private site evaluator in that permitting authority's area of jurisdiction.

(j) Beginning 540 days after the effective date of this chapter, no individual shall be employed or compensated by an authorized agent as a designated representative without being registered with the executive director and possessing a valid designated representative's certificate.

(k) Beginning 540 days after the effective date of this chapter, no individual shall be compensated as a site evaluator conducting pre-construction site evaluation or soil analysis without being registered with the executive director and possessing a valid site evaluator's certificate.

Adopted January 20, 1997 Effective February 5, 1997

§285.51. Exceptions to Registration/Certification Requirements.

A single family residential property owner shall not be subject to the training and registration requirements when installing, constructing, altering, extending or repairing an OSSF on his or her property. However, the permitting authority must be contacted prior to construction of the OSSF regarding any permitting requirements to insure compliance with the commission's criteria or such criteria duly established by the authorized agent. The homeowner shall not compensate any person to perform any phase of the OSSF installation work where the individual performing the work is not a registered installer of the correct level. An exception shall be made for installation of electrical components by a licensed electrician where required.

Adopted January 20, 1997 Effective February 5, 1997

§285.52. Administration.

The executive director shall be responsible for the administration and management of the certification and registration of installers, apprentices, site evaluators, and designated representatives. This administration includes:

(1) accepting and reviewing applications to determine if qualifications are met and notifying applicants as to action taken;

(2) preparing and administering examinations;

(3) scoring examinations and promptly notifying applicants as to the results;

(4) issuing and renewing registrations and certifications;

(5) publishing of a roster with semi-annual updates of apprentices, installers, site evaluators, and designated representatives holding valid registration or certification;

(6) maintaining training records of installers, site evaluators, and designated representatives;

(7) approving training schools, courses, and instructors for registration and certification purposes; and

(8) collecting fees.

Adopted January 20, 1997 Effective February 5, 1997

§285.53. Applications.

(a) Applications for registration or certification shall be made on a standard form provided by the executive director or designee.

(b) Each applicant shall submit a non-refundable application fee in accordance with §285.57 of this title (relating to Fees).

(c) The applicant shall furnish evidence of any training credit or any other information pertaining to the license or renewal.

(d) Applicants shall meet the qualifications and training requirements established in this subchapter before taking the examination.

(e) An application is valid for 12 months from the initial date of the examination.

Adopted January 20, 1997
Effective February 5, 1997

§285.54. Qualifications.

(a) All applicants shall be required to successfully complete the educational training program provided by or for the executive director in accordance with §285.59 of this title (relating to Training).

(b) Only training that has been approved by the executive director is acceptable for registration or certification.

(c) All applicants for installer registration shall be required to pass an examination covering the field of OSSFs.

(d) Installer I qualifications:

(1) beginning 540 days after the effective date of this chapter, an applicant shall have at least one year of experience as a registered apprentice under the supervision of an Installer I or Installer II holding a valid certificate;

(2) successful completion of the Installer I training course; and

(3) must pass the Installer I examination.

(e) An Installer I is qualified to install, construct, alter, extend, or repair standard OSSFs as described in §285.91(9) of this title (relating to Tables). These systems consist of conventional trench drainfields, unlined ET beds, as well as the proprietary systems utilizing gravel-less pipe drainfields and leaching chambers.

(f) Installer II qualifications:

(1) must possess an Installer I certificate;

(2) have at least two years of verified experience in OSSF installation, construction, extension, alteration, and/or repair under said certification;

(3) must successfully complete the Installer II training course; and

(4) must pass the Installer II examination.

(g) An Installer II is qualified to install, construct, alter, extend, or repair all types of OSSFs.

(h) Beginning 540 days after the effective date of this chapter, an installer shall no longer operate as an Installer II without meeting all the requirements set forth in this subchapter.

(i) All applicants for certification as a site evaluator or designated representative shall be required to pass an examination covering the field of OSSF installation, construction, repair, operation, disposal, planning, maintenance, soil analysis, site evaluation, and program administration.

(j) Designated representative qualifications. Each individual appointed, employed, or compensated by a permitting authority having duties and responsibilities for the regulation and inspection of OSSFs shall be required to take and complete designated representative training and pass an examination for designated representatives. A designated representative is not required to hold a separate site evaluator certificate provided the individual only performs duties and responsibilities required by the permitting authority. If the individual leaves the employment of the permitting authority, or works as a site evaluator in another area of jurisdiction, a site evaluator certificate must be obtained in order for the individual to conduct preconstruction site evaluations.

(k) Site evaluator qualifications:

(1) must have two years of verifiable experience in the OSSF field and possess an Installer II certificate, designated representative certificate, registered sanitarian certificate, or professional engineer registration;

(2) must successfully complete the site evaluator training course; and

(3) must pass the Site Evaluator examination.

(4) A site evaluator is qualified to conduct preconstruction site evaluation which includes performing soil analysis, a site survey, and other criteria necessary to determine the suitability of a site for a specific OSSF.

Adopted January 20, 1997 Effective February 5, 1997

§285.55. Examinations.

(a) An applicant shall take an examination for an Installer (I or II), Designated Representative, or Site Evaluator certificate after presenting qualifications acceptable to the executive director. The passing score for an examination shall be 70%. The examinee shall be informed, in writing only, as to the results of the examination.

(b) Any applicant who fails an examination may repeat the examination after waiting 60 days and paying the reexamination fee in accordance with §285.57 of this title (relating to Fees). The examination may be repeated not more than three times in a given 12-month period.

(c) Following the failure of the examination, the initial application shall be held by the executive director for not more than 12 months from the initial date of the examination. If after the 12-month period, the applicant has not passed the examination, the application will be deemed invalid and he or she must submit a new application with the appropriate fee and repeat the appropriate training course before taking the examination again.

(d) Examinations shall be given at places and times approved by the executive director. Examinations shall be graded and the results shall be forwarded to the applicant no later than 45 days after the examination date.

Adopted January 20, 1997 Effective February 5, 1997

§285.56. Certificates/Renewal Applications.

(a) Issuance of certificate.

(1) Upon satisfactory fulfillment of the requirements provided in this subchapter, the appropriate installer, designated representative, or site evaluator certificate shall be issued by the executive director.

(2) The installer, designated representative, or site evaluator shall inform the executive director in writing of any change in address and phone number during the validity period of the certificate. All certificates expire on August 31 of each year.

(3) The authorized agent shall notify the executive director in writing of any change in job status of its designated representative.

(4) An installer, designated representative, or site evaluator certification will be issued to individuals only and will not be transferable.

(5) The issuance of a certificate shall not be construed by any individual that the commission or the executive director is responsible for the performance of the certificate holder.

(6) When an Installer I passes the Installer II examination, the lower level certificate becomes invalid and the individual is issued an Installer II certificate.

(b) Renewal application procedure.

(1) At least 30 days prior to the expiration date of the certificate, the executive director or designee shall mail to the installer, designated representative, or site evaluator a renewal application showing the expiration date and fee to be paid.

(2) The executive director or designee shall mail the renewal application to the installer, designated representative, or site evaluator at the most recent address provided to the executive director.

(3) It is the responsibility of the installer, designated representative, or site evaluator to make sure the renewal application and the renewal fee along with proof of the continuing educational course requirements are returned to the executive director or designee by the August 31 deadline.

(4) Upon the applicant's satisfactory fulfillment of the requirements for renewal provided in this section, an appropriate certificate renewal will be issued by the executive director.

(5) If an installer, designated representative, or site evaluator needs a duplicate certificate, the executive director shall upon request issue another certificate to the individual for a duplicate certificate fee in accordance with §285.57 of this title (relating to Fees).

(6) Applications for renewal shall be made according to this subchapter and on forms which may be obtained from the executive director.

(c) Denial of Certificate and Registration. The executive director or designee may deny a certificate or a registration for the following grounds:

(1) when an applicant fails to submit the required documentation as required by §285.50 of this title (relating to General Requirements for Registration and Certification);

(2) when an applicant fails to pay the appropriate fee as required under §285.57 of this title (relating to Fees);

(3) when an applicant submits an application with fraudulent or deceptive information; or

(4) for other cause(s) which in the opinion of the executive director constitute adequate ground(s) for denial.

Adopted January 20, 1997 Effective February 5, 1997

§285.57. Fees.

(a) The fees applicable to the registration and certification program administered by the executive director shall be as follows:

(1) Application fee - $75

(2) Installer Renewal Fee - $75

(3) Site Evaluator Renewal Fee - $75, a registered professional engineer or registered sanitarian in good standing in Texas is exempt from the application/examination and renewal fees.

(4) Designated Representative Renewal Fee - $50

(5) Combination Installer II and Site Evaluator Renewal Fee - $125

(6) Late Fee - Any individual failing to make payment of fees when due will be assessed late payment penalties and interest at the maximum rates established for delinquent taxes under Texas Tax Code, §111.060(a) and (b) and §111.061.

(7) Apprentice Registration/Renewal Fee - $25

(8) Duplicate Certificate Fee - $20

(9) Renewal/Late Fees

(A) If an installer's, designated representative's, or site evaluator's certification has not been renewed by August 31, the individual may renew the certification by submitting to the executive director the renewal fee in addition to a late fee and providing proof of the continuing educational course requirements. If an installer has not renewed his or her certificate in accordance with this section, the executive director shall terminate the registration of all apprentices registered under that installer's supervision.

(B) If an installer, designated representative or site evaluator renews after August 31, and their certification has been expired less than two years, the installer, designated representative, or site evaluator must pay all delinquent renewal and late fees and provide proof of the continuing educational course requirements to the executive director to obtain a current OSSF installer, designated representative, or site evaluator certification.

(C) If an installer's, designated representative's, or site-evaluator's certification has been expired for two years or more, the person may not renew the certification. The individual may obtain a new certification by taking the executive director-approved training course, submitting to reexamination, and complying with all other requirements and procedures for obtaining an original certification.

(b) An applicant shall pay all required fees before receiving a certificate. All fees shall be paid by personal check, cashier's check, or by money order. Cash cannot be accepted for payment of fees. If the applicant does not submit the appropriate payment with the new or renewal application, the certificate shall not be issued. The application fee for registration or certification shall not be prorated.

(c) All fees shall be made payable to the Texas Natural Resource Conservation Commission, and are not refundable.

Adopted January 20, 1997 Effective February 5, 1997

§285.58. Duties and Responsibilities.

(a) An installer shall:

(1) use reasonable care, judgement, or application of his or her knowledge in the performance of his or her duties;

(2) not practice theft, fraud, or deceit in the application of his or her duties;

(3) obtain the necessary permitting authority's authorization before beginning to install, construct, alter, extend, or repair an OSSF;

(4) not falsify information on any application or any other documentation;

(5) install the OSSF that is authorized by the permitting authority;

(6) install, construct, alter, extend, or repair the OSSF to meet the minimum criteria found in this chapter or more stringent design criteria of an authorized agent;

(7) use the proper materials in the installation, construction, alteration, extension, or repair of an OSSF;

(8) be present during all phases of installation, construction, alteration, extension, or repair of the OSSF at the jobsite or represented by the installer's apprentice;

(9) visit the jobsite at least once during each work day to verify the work performed by any apprentice under the installer's registration;

(10) not abandon, without just cause, an OSSF during the installation, construction, alteration, extension, or repair before or after the final inspection. The failure of an installer to perform work without just cause for 30 consecutive days shall constitute an abandoned project;

(11) call for the required inspection(s) from the permitting authority; and

(12) not alter the OSSF after the final inspection.

(b) A designated representative shall:

(1) use reasonable care, judgment, or application of knowledge in the performance of his or her duties;

(2) not practice theft, fraud, or deceit in the application of his or her duties;

(3) enforce the rules and regulations of the permitting authority's OSSF program;

(4) maintain accurate records of permitting, inspections, and nuisance complaints;

(5) investigate and resolve nuisance complaints;

(6) not knowingly accept falsified information on any permit application or other documentation;

(7) only receive compensation for OSSF-related services directly from the authorized agent or in accordance with a signed contract with the authorized agent;

(8) verify that an individual is an installer possessing a valid certification and the correct classification for installing, constructing, altering, extending, or repairing that particular OSSF before the initial inspection;

(9) perform a satisfactory and valid final inspection of an OSSF at the job site to verify that minimum criteria of this chapter or the more stringent criteria of the authorized agent has been met;

(10) verify the existence of an adequate maintenance contract between the property owner and the maintenance company, if required; and

(11) not operate as a registered installer while employed or compensated by the permitting authority within their area of jurisdiction.

(c) A site evaluator shall:

(1) use reasonable care, judgement, or application of his or her knowledge in the performance of his or her duties; and

(2) not practice theft, fraud, or deceit in the application of his or her duties;

Adopted January 20, 1997 Effective February 5, 1997

§285.59. Training.

All training credits and instructors shall be approved by the executive director.

(1) Training credit shall be based upon recorded attendance. The applicant is expected to attend at least 95 percent of the course hours. If the applicant attends less than the minimum 95 percent of the course hours, then he or she will not receive credit for having completed the course.

(2) The basic training required for the Installer I certificate shall cover specific knowledge regarding the basic treatment and disposal of wastewater. The training will offer instruction to applicants on rules, regulations, permitting, an introduction to using soils for wastewater treatment, wastewater characteristics and operation, installation, and construction of basic or conventional OSSFs utilizing standard subsurface treatment and disposal methods. The applicant shall also be familiar with distribution mechanisms and shall have the ability to make calculations, determine slope, and be familiar with the use of a leveling device.

(3) The advanced training required for the Installer II certificate shall cover specific knowledge regarding the subsurface treatment and disposal of wastewater. The training will offer instruction to applicants on installation, construction, and maintenance of alternative, standard, non-standard or proprietary OSSFs using non-standard treatment and disposal methods, ground-water protection practices,

basic soil analysis, and site evaluation. The applicant shall also be familiar with distribution mechanisms and shall have the ability to make calculations and measure water flow rates.

(4) The training required for the designated representative's or site evaluator's certificate shall cover specific knowledge regarding the subsurface treatment and disposal of wastewater, concepts and theory of OSSF systems, operations, installation, construction, and maintenance of all types of OSSFs, soil analysis and site evaluation, ground-water, regulatory operations, health laws, and the judicial system as it relates to OSSF enforcement. The applicant shall also be familiar with wastewater characteristics, distribution mechanisms, shall have the ability to make calculations, measure water flow rates, be able to operate different surveying equipment, and be acquainted with the proper inspection procedures, as well as having the ability to keep records.

(5) An individual holding an installer, designated representative, and/or site evaluator certificate must successfully complete a minimum of eight hours of continuing education training approved by the executive director prior to August 31 of each year in order to renew their certificate.

Adopted January 20, 1997 Effective February 5, 1997

§285.60. Apprentice Program.

(a) An individual who wishes to undertake a training program under the supervision of an installer holding a valid certificate under this chapter shall register with the executive director and provide proof that the supervising installer has agreed to accept the responsibility for the apprentice.

(b) A registration form and annual fee must be submitted by an installer for each individual desiring to register as an apprentice under his or her supervision. Registration shall be on forms which may be obtained from the executive director and shall include:

(1) the name, business address, and permanent mailing address of the apprentice;

(2) the name and business address of the installer who will supervise the apprentice;

(3) a detailed description of the apprentice program as set by the supervising installer;

(4) the effective commencement and termination dates of the apprentice training program (no apprentice program may be shorter in duration than one year);

(5) a statement by the supervising installer that he or she accepts financial responsibility for the activities of the apprentice undertaken on behalf of the installer; and

(6) the signatures of the apprentice and the supervising installer and a notarized statement from each that the information provided is true and correct.

(c) Commencement of the apprentice registration will take place upon receipt of the completed apprentice application and fee by the executive director. The executive director shall notify the apprentice and the supervising installer that the apprentice has been accepted as a registered apprentice and that the registration form shall remain in the agency's files for the stated duration of the apprentice period.

(d) The registration of an apprentice shall remain on file only for the stated duration of the period specified in the application. Upon completion of the apprentice training period, an apprentice may decide to apply to the executive director to obtain certification as an installer. Either the supervising installer or the apprentice may terminate the apprentice training program by written notice to the executive director. No reason for termination is required, and upon receipt of a letter stating that the apprentice training program has been terminated, the executive director shall terminate the apprentice's registration status.

(e) An apprentice shall:

(1) represent his supervising installer during operations at the site; and

(2) perform services associated with OSSF installation or repairs under direct supervision of an installer by directions on-site or by radio or other direct communication at all times.

(f) It is unlawful for an apprentice to act as or to offer to perform services as an installer on their own behalf. An apprentice may not perform any services associated with OSSF installation except under the supervision of an installer holding a valid certificate and/or according to the supervising installer's expressed directions. An apprentice's registration may be revoked if the apprentice is found to have engaged in prohibited activities.

Adopted January 20, 1997 Effective February 5, 1997

§285.61. Revocation, Suspension, or Reinstatement of Certificate and Registration.

(a) If the executive director determines good cause exists to suspend or revoke a certificate of a site evaluator or designated representative, or a registration of an installer or apprentice, the executive director shall request that the commission schedule a hearing before the State Office of Administrative Hearings or the commission. Such hearing shall be held only after proper notice has been provided to the certificate holder or registrant. The commission may suspend or revoke the certificate or the registration if the commission finds that the certificate holder or registrant was responsible for violating the provisions of this chapter, for falsifying any information or documents submitted to the executive director, or for other good cause.

(b) A certificate or registration may be suspended for a period of up to one year, depending upon the seriousness of the offense(s). A certificate or registration is revoked automatically upon a second suspension. At the request of the certificate holder or registrant, or for other good cause shown, the certificate or registration may be suspended indefinitely by the commission.

(c) A certificate or registration may be permanently revoked by the commission, or may be revoked for a term designated by the commission. If the certificate or registration is revoked for a term designated by the commission, then the certificate holder or registrant may apply for a new certificate or registration, in accordance with §285.53 of this title (relating to Applications), upon the expiration of the term of revocation.

Adopted January 20, 1997 Effective February 5, 1997

§285.62. Hearings.

(a) Notice for any hearing required by §285.61 of this title (relating to Revocation, Suspension or Reinstatement of Certificate and Registration) shall be issued not less than ten days prior to the hearing.

(b) Transmittal of the notice shall be by certified mail, return receipt requested.

(c) Persons to be notified include, but are not limited to, the following:

(1) the registrant or certificate holder;

(2) the complainant (if any); and

(3) any other person who may be affected by the outcome of the hearing, as determined by the executive director.

Adopted January 20, 1997 Effective February 5, 1997

§285.63. Type of Hearing.

Any hearing related to the suspension or revocation of a certificate or registration is subject to the Administrative Procedure Act (Texas Government Code, Ann. §2001.001 et. seq.).

Adopted January 20, 1997 Effective February 5, 1997

SUBCHAPTER G : OSSF ENFORCEMENT

§285.70. Agency Enforcement of OSSFs.

(a) The executive director may investigate matters concerning on-site systems, apprentices, installers of on-site systems, site evaluators, designated representatives, or authorized agents and may take appropriate enforcement action, as necessary, under Chapters 70 and 80 of this title (relating to Enforcement and Contested Case Hearings).

(b) If the executive director determines that an OSSF is creating a nuisance as defined in §285.2 of this title (relating to Definitions), the OSSF must be brought into compliance to abate the nuisance. The executive director may require a property owner to initiate repair of a malfunctioning OSSF on the owner's property not later than the 30th day after the date on which the owner is notified by the executive director of the malfunctioning system.

(c) If the executive director determines that enforcement action is warranted in response to the complaint, such action shall be taken under Chapters 70 and 80 of this title.

(d) The commission may assess an administrative penalty, or take any appropriate action described in Chapters 70 and 80 of this title, or Texas Water Code, Chapter 26 (relating to Water Quality); or Texas Health and Safety Code, Chapters 366 and 341 (relating to On-site Sewage Disposal Systems and Nuisance Conditions) for violations of the statutes or commission rules.

(e) The commission, before revoking or suspending a certification, or reprimanding a certificate holder, shall notify the certificate holder in writing of the alleged violation and provide the certificate holder with an opportunity for a hearing. The notice shall be given not later than the 10th day before the date set for the hearing. The notice shall be made by registered mail to the last known address of the certificate holder.

Adopted January 20, 1997 Effective February 5, 1997

SUBCHAPTER H : TREATMENT AND DISPOSAL OF GREYWATER

§285.80. Treatment and Disposal of Greywater.

New construction or modification to an existing greywater conveyance, treatment, storage or disposal system outside of a structure or building must be carried out in accordance with provisions of this chapter and any established requirements of the permitting authority. Any new construction or modification to an existing greywater reuse or reuse conveyance system associated with a structure or building must be carried out in accordance with requirements of the State Board of Plumbing Examiners.

Adopted January 20, 1997 Effective February 5, 1997

§285.91. Tables.

The following tables are necessary for the proper location, planning, construction, and installation of an OSSF.

(1) Table I. Effluent Loading Requirements Based on Soil Classification.

SOIL CLASS (Refer to Table VI)	LONG TERM APPLICATION (R_a) *GALLONS PER ABSORPTIVE AREA (SF) PER DAY
Ia	>0.50
Ib	0.38
II	0.25
III	0.20
IV	0.1

* The absorptive area consists of the bottom area of the excavation **PLUS** one foot of sidewall area around the full perimeter of the excavation.

The required absorptive area shall be calculated by the following formula:

ABSORPTIVE AREA = Q/R_a, Where Q is the wastewater usage rate in gallons per day (see Table III, Relating to Wastewater Usage Rate).

(2) Table II. Septic Tank Minimum Liquid Capacity.

SEPTIC TANK MINIMUM LIQUID CAPACITY

A. Determine the applicable wastewater usage rate (Q) in TABLE III of 30 TAC Chapter 285.

B. Calculate the minimum septic tank volume (V) as follows:

1. For Q equal to or less than 250 gal/day:
   $V = 750$ gallons

2. For Q greater than or equal to 251 gal/day but less than or equal to 350 gal/day:
   $V = 1000$ gallons

3. For Q greater than or equal to 351 gal/day but less than or equal to 500 gal/day:
   $V = 1250$ gallons

4. For Q greater than or equal to 501 gal/day but less than or equal to 1000 gal/day:
   $V = 2.5\,Q$

5. For Q greater than or equal to 1001 gal/day:
   $V= 1{,}750 + 0.75Q$

NOTES: The inside liquid depth of the tank shall not be less than 30 inches.

Tank sizing in B (1)(2)(3) correspond to two, three and four bedroom single family dwellings, respectively.

(3) Table III. Wastewater Usage Rate.

This table shall be used for estimating the hydraulic loading rates only [daily wastewater usage rate (Q) for sizing septic tank liquid capacity and drainfield area]. Sizing formulas are based on residential strength BOD$_5$. Commercial/institutional facilities must pretreat their wastewater to 140 BOD$_5$ or increase disposal area. **Actual water usage data or other methods of calculating wastewater usage rates may be used by the system designer if it is accurate and acceptable to the Texas Natural Resource Conservation Commission or its authorized agents.**

TYPE OF FACILITY	USAGE RATE GALLONS/DAY (Without Water Saving Devices)	USAGE RATE GALLONS /DAY (With Water Saving Devices)
Single family dwelling (one or two bedrooms) - less than 1,500 square feet.	225	180
Single family dwelling (three bedrooms) - less than 2,500 square feet.	300	240
Single family dwelling (four bedrooms) - less than 3,500 square feet.	375	300
Single family dwelling (five bedrooms) - less than 4,500 square feet.	450	360
Single family dwelling (six bedrooms) - less than 5,500 square feet.	525	420
Greater than 5,500 square feet, each additional 1,500 square feet or increment thereof.	75	60
Condominium or Townhouse (one or two bedrooms)	225	180
Condominium or Townhouse (each additional bedroom)	75	60
Mobile home (one or two bedrooms)	225	180
Mobile home (each additional bedroom)	75	60
Country Clubs (per member)	25	20
Apartment houses (per bedroom)	125	100
Boarding schools (per room capacity)	50	40
Day care centers (per child with kitchen)	25	20
Day care centers (per child without kitchen)	15	12
Factories (per person per shift)	15	12
Hospitals (per bed)	200	160
Hotels and motels (per bed)	75	60
Nursing homes (per bed)	100	80
Laundries (self service per machine)	250	200
Lounges (bar and tables per person)	10	8
Movie Theaters (per seat)	5	4
Office buildings (no food or showers per occupant)	5	4
Office buildings (with food service per occupant)	10	
Parks (with bathhouse per person)	15	12
Parks (without bathhouse per person)	10	
Restaurants (per seat)	35	28
Restaurants (fast food per seat)	15	
Schools (with food service & gym per student)	25	20
Schools (without food service)	15	
Service stations (per vehicle)	10	8
Stores (per washroom)	200	160
Swimming pool bathhouses (per person)	10	8
Travel trailer/RV parks (per space)	50	40
Vet clinics (per animal)	10	8
Construction sites (per worker)	50	40
Youth camps (per camper)	30	24

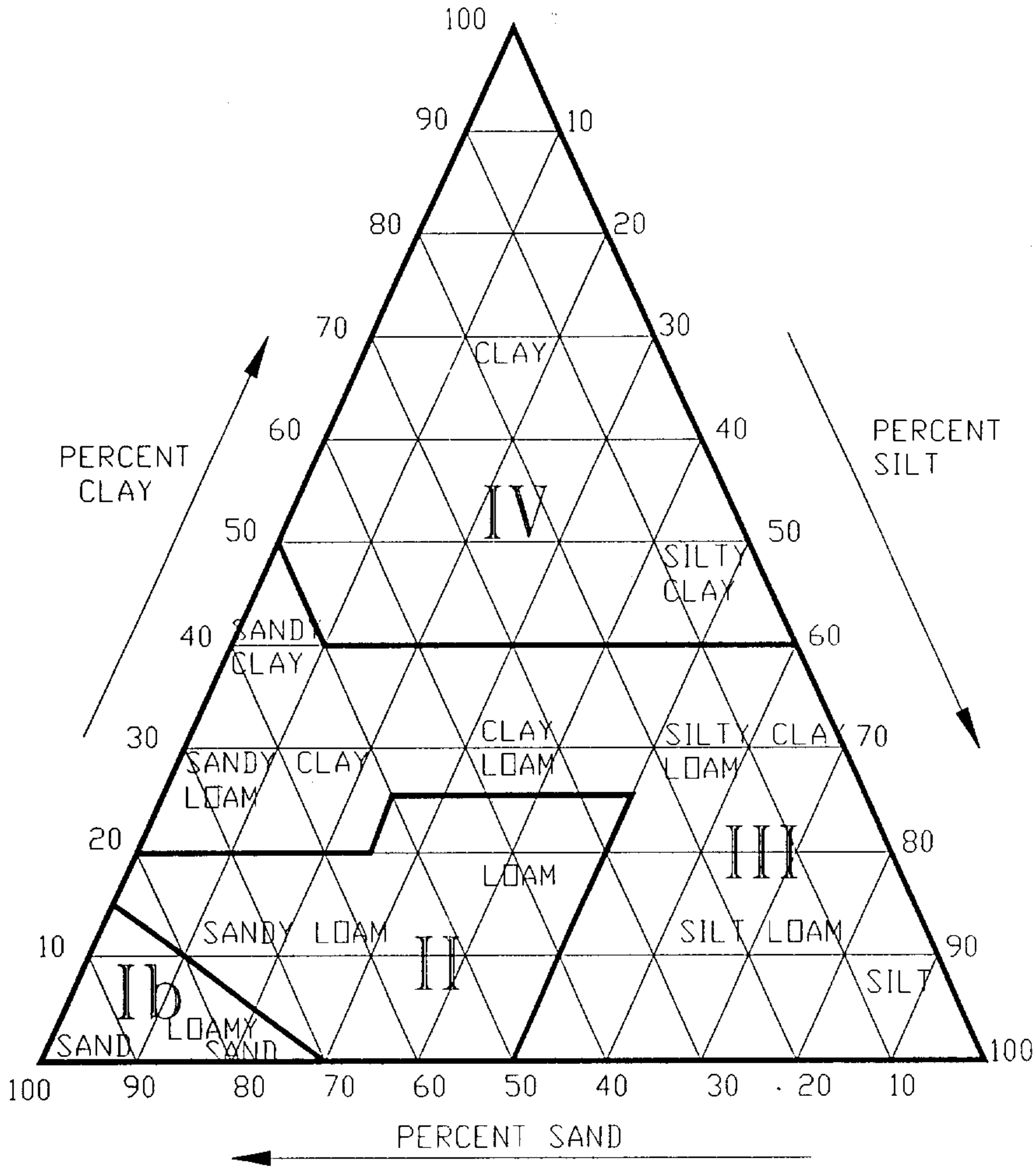
(4) Table IV. Required Testing and Reporting.

Type and Size of Treatment Unit	Frequency of Site Visits	Required Tests	Minimum Acceptable Test Results
Any Treatment Method in Conjunction with Surface Irrigation	3 Per Year	One BOD_5 and TSS Grab Sample Per Year (commercial and institutional facilities only) Chlorine Residual or Fecal Coliform at Each Site Visit	BOD_5 and TSS Grab Samples Not To Exceed 65 mg/l 1 mg/l Residual in Pump Tank or Fecal Coliform Not To Exceed 200 MPN/100 ml (CFU/100 ml)
Non Standard	Permit Specific	Permit Specific	Permit Specific

(5) Table V. Criteria for Standard Subsurface Disposal Methods.

FACTORS	SUITABLE (S)	UNSUITABLE (U)
Topography	Slopes 0-30%	Slopes greater than 30% Complex slopes.
Subsoil Texture	Soil Class Ib, II, or III Sandy Soils Loamy Soils	Soil Class Ia & IV Clayey soils (Except for pumped effluent systems in Class IV soils).
Subsoil Structure	Class Ib & II Structure not significant	Platy structure. Fractured rock. Massive clayey soil.
Soil Depth	Suitable soils greater than 24 inches below bottom of excavation.	Suitable or provisionally suitable soil less than 24 inches below excavation bottom.
Restrictive Horizon	No restrictive horizon within 24 inches of the bottom of the proposed excavation.	Restrictive horizon within 24 inches of the bottom of the proposed excavation.
Groundwater	No indication of groundwater within 24 inches of the bottom of the proposed excavation.	Drainage mottles within 24 inches of the bottom of the proposed excavation.
Flood Hazard	No flooding potential.	Areas located in the regulatory floodway. Depressional areas without adequate drainage.
Other		Fill material. Potential health hazards or groundwater contamination.

(6) Table VI. USDA Soil Textural Classifications.



SOIL PARTICLE SIZE:

Clay - Smaller than 0.002 mm in diameter.

Silt - 0.05 to 0.002 mm in diameter.

Sand - 2.0 to 0.05 mm in diameter.

Gravel - Greater than 2.0 mm in diameter.

mm = millimeter

Note 1: Sand shall be free of organic matter and shall be composed of silica, quartz, mica, or any other stable mineral.

Note 2: Class Ia soils contain more than 30% gravel, therefore, they are not portrayed on the soil triangle.

(7) Table VII. Yearly Average Net Evaporation (Evaporation - Rainfall).

REPORTING STATION	NET EVAPORATION*, RET INCHES/DAY
Amarillo	0.21
Austin	0.14
Beaumont	0.04
Big Spring	0.24
Brownsville	0.15
Chilicothe	0.20
Canyon Lake	0.15
College Station	0.12
Corpus Christi	0.15
Daingerfield	0.08
Dallas	0.14
El Paso	0.26
Fort Stockton	0.25
Houston	0.07
Laredo	0.23
Lubbock	0.21
Nacogdoches	0.06
San Antonio	0.15
San Angelo	0.23
Temple	0.15
Throckmorton	0.19
Tyler	0.08

* The calculations for all values listed include a 20% run-off consideration.

(8) Table VIII. OSSF Excavation Length (3 Feet in Width or Less).

	Excavation Length (Feet)								
	Soil Class Ib			Soil Class II			Soil Class III		
Daily Sewage Flow (Q)	For 1.5 Foot Excavation Width	For 2.0 Foot Excavation Width	For 3.0 Foot Excavation Width	For 1.5 Foot Excavation Width	For 2.0 Foot Excavation Width	For 3.0 Foot Excavation Width	For 1.5 Foot Excavation Width	For 2.0 Foot Excavation Width	For 3.0 Foot Excavation Width
100	75	66	53	114	100	80	143	125	100
125	94	82	66	143	125	100	179	156	125
150	113	99	79	171	150	120	214	188	150
175	132	115	92	200	175	140	250	219	175
200	150	132	105	229	200	160	286	250	200
225	169	148	118	257	225	180	321	281	225
250	188	165	132	286	250	200	357	313	250
275	207	181	145	314	275	220	393	344	275
300	226	197	158	343	300	240	429	375	300
325	244	214	171	371	325	260	464	406	325
350	263	230	184	400	350	280	500	438	350
375	282	247	197	429	375	300	536	469	375
400	301	263	211	457	400	320	571	500	400
425	320	280	224	486	425	340	607	531	425
450	338	296	237	514	450	360	643	563	450
475	357	313	250	543	475	380	679	594	475
500	376	329	263	571	500	400	714	625	500

1. To determine excavation lengths, greater than 3 feet in width or where the area and width are known, use the formula provided in §285.33(a)(1)(A)(ii).
2. To determine excavation lengths (3 feet or less in width, but greater than or equal to 1.5 feet in width) for daily sewage flows (Q) not provided in this table, use the formula provided in §285.33(a)(1)(iii).
3. Minimum excavation width is 1.5 feet for all excavation lengths.

(9) Table IX. OSSF System Designation.

SYSTEM DESCRIPTION	SYSTEM TYPE	PLANNING MATERIAL TO BE SUBMITTED BY REGISTERED SANITARIAN OR REGISTERED PROFESSIONAL ENGINEER	INSTALLER REQUIREMENTS
Septic Tank & Absorptive Drainfield	Standard	No	Class I or II
Septic Tank & ET Drainfield(Unlined) (Lined)	Standard Standard	No No	Class I or II Class II
Septic Tank & Pumped Drainfield	Standard	No	Class I or II
Septic Tank & Leaching Chamber	Proprietary	No	Class I or II
Septic Tank & Gravelless Pipe	Proprietary	No	Class I or II
Septic Tank, Filter & Drip Emitter	Proprietary	Yes	Class II
Septic Tank & Low Pressure Dosing	Non-standard	Yes	Class II
Septic Tank & Absorptive Mounds	Non-standard	Yes	Class II
Septic Tank, Secondary Treatment, Filter & Surface Irrigation	Non-standard	Yes	Class II
Aerobic Treatment & Absorptive Drainfields	Proprietary	Yes	Class II
Aerobic Treatment & ET Drainfield	Proprietary	Yes	Class II
Aerobic Treatment & Leaching Chamber	Proprietary	Yes	Class II
Aerobic Treatment & Gravelless Pipe	Proprietary	Yes	Class II
Aerobic Treatment, Filter & Drip Emitter	Proprietary	Yes	Class II
Aerobic Treatment & Low Pressure Dosing	Proprietary	Yes	Class II
Aerobic Treatment & Absorptive Mounds	Proprietary	Yes	Class II
Aerobic Treatment & Surface Irrigation	Proprietary	Yes	Class II
Any Other Treatment System	Non-standard	Yes	Class II
Any Other Subsurface Disposal System	Non-standard	Yes	Class II
Any Other Surface Disposal System	Non-standard	Yes	Class II
Non-Standard Treatment and Surface Irrigation	Non-Standard	Engineer Only	Class II
Holding Tank	---	No	Class I or II

(10) Table X. Minimum Required Separation Distances for On-Site Sewage Facilities.

FROM	TO: Sewage Treatment Tanks or Holding Tanks	TO: Soil Absorption Systems, & Unlined ET Beds	TO: Lined Evapotranspiration Beds	TO: Sewer Pipe With Watertight Joints	TO: Surface Irrigation (Spray Area)	TO: Drip Irrigation
Public Water Wells[2]	50	150	150	50	150	150
Public Water Supply Lines[2]	10	10	10	10	10	10
Private Water Well	50	100	50	20	100	100
Private Water Well (Pressure Cemented or Grouted to 100 ft. or Cemented or Grouted to Watertable if Watertable is Less Than 100 ft. deep)	50	50	50	20	50	50
Streams, Ponds, Lakes, Rivers (Measured From Normal Pool Elevation and Water Level), Salt Water Bodies (High Tide Only)	50	75, LPD (Secondary Treatment & Disinfection) - 50	50	20	50	25 when $R_a \le 0.1$ 75 when $R_a > 0.1$ (With Secondary Treatment & Disinfection - 50)
Foundations, Buildings, Surface Improvements, Property Lines, Easements, Swimming Pools, and Other Structures	5	5	5	5	No Separation Distances Except: Property lines - 10 Swimming Pools - 25	No Separation Distances Except: Property Lines - 5
Sharp slope Breaks	0 (special support may be required for zero separation distances)	25	5	10	25	10 when $R_a \le 0.1$ 25 when $R_a > 0.1$
Edwards Aquifer Recharge Features (See Rules & Regulations §313 of this Title Relating to Edwards Aquifer)[3]	50	150	50	50	150	100 when $R_a \le 0.1$ 150 when $R_a > 0.1$

1. All distances measured in feet, unless otherwise indicated.
2. For additional information or revisions to these separation distances, see Rules & Regulations in §290 of this Title relating to Water Hygiene.
3. No OSSF may be installed closer than 75 feet from the banks of the Nueces, Dry Frio, Frio, or Sabinal Rivers downstream from the northern Uvalde County line to the recharge zone.
4. Drip irrigation lines may not be placed under foundations.

(11) Table XI. Intermittent Sand Filter Media Specifications (ASTM C-33).

Particle Size Distribution		
Sieve	Particle Size	Percent Passing
3/8 inch	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	50 to 85
No. 30	0.60 mm	25 to 60
No. 50	0.30 mm	10 to 30
No. 100	0.15 mm	2 to 10
No. 200	0.075 mm	≤ 3

1. The sand shall have not more than 45% passing any one sieve and retained on the next consecutive sieve listed in TABLE XI.
2. The limit for material that can pass the No. 200 sieve shall not be more than 3%.
3. The fineness modulus shall not be less than 2.3 nor more than 3.1, and is defined as a numeric quantity to control the distribution of filter media particle sizes within the specified range for intermittent sand filters. The finess modulus is calculated by adding the cumulative percents of samples retained on the following screens, dividing the sum by 100.

U.S. Bureau of Standards	
Sieve	Particle Size
3/8 inch	9.50 mm
No. 4	4.75 mm
No. 8	2.36 mm
No. 16	1.18 mm
No. 30	0.60 mm
No. 50	0.30 mm
No. 100	0.15 mm

APPENDIX D

APPENDIX D
Huther and Associates Nutrient Loading Report
(Revised)

Final Report, Determination of Septic Tank Disposal Systems as sources of Nutrient Loading to Lake Cypress Springs.

FINAL REPORT
DETERMINATION OF SEPTIC TANK DISPOSAL SYSTEMS AS SOURCES OF NUTRIENT LOADING TO LAKE CYPRESS SPRINGS

Presented to:

Franklin County Water District
Post Office Box 559
Mount Vernon, Texas 75457

Presented by:

Huther and Associates, Inc.
1445 Mac Arthur Drive, Suite 216
Carrollton, Texas 75007

in conjunction with

Hayter Engineering, Inc.
4445 South East Loop 286
Paris, TX 75460

Revised

December 28, 1999

TABLE OF CONTENTS

INTRODUCTION

Eutrophication is the term used to describe the process of enrichment and aging of lakes with nutrients resulting in increased biological production and decreased lake volume. Natural eutrophication occurs at varying rates depending upon soil type, ratio of drainage area to surface area, mean depth, and flushing rate. Intense or increased activities on the land surrounding lakes such as erosion or sewage input can greatly increase the rate of eutrophication. The accelerated eutrophication has been termed "cultural" eutrophication. The symptoms of eutrophication including excessive macrophytes, blooms of algae, decreased oxygen, and fish kills can result in greatly decreased recreational, municipal, or industrial use.

Lake Cypress Springs, located in Franklin County, East Texas, has experienced excessive growth of aquatic plants, specifically the imported Hydrilla. The plant growth appeared to correlate with the extensive development occurring around the lake.

At the request of the Franklin County Water District, a study was conducted by Huther and Associates, Inc., subcontracted through Hayter Engineering, Inc. to determine the amounts and sources of nutrients entering the lake, determine the nutrient loading contribution from a large number of septic tanks draining into the lake, and evaluate whether or not a centralized wastewater treatment plant would reduce these loadings thereby slowing the eutrophication process.

STUDY DESIGN

Nutrient loadings, specifically nitrogen and phosphorous, are a major contributor of eutrophication. While treated wastewater from septic tanks frequently meet water quality standards for conventional pollutants such as TSS and BOD, septic treatment gives little or no nutrient reduction.[1]

Normally, drainage from septic tanks contain large quantities of nitrogen in the form of ammonia derived from feces and urine as well as particulate organic nitrogen. Bacterialreactions convert a portion of the particulate organic form to soluable ammonia. The ammonia present in septic tank discharge tends to be sorbed by the aquifer material in most groundwater systems. However, in the presence of oxygen in the groundwater the ammonia will be oxidized to nitrate. The nitrate is poorly sorbed by aquifer materials and is readily transported in groundwater. Nitrate is a primary nutrient responsible for algal and macrophyte growth.[2]

Numerous studies have shown that control of algal growth during the summer growing season can occur by limiting nitrogen and phosphorous. Typically, a limiting level of the inorganic forms of nitrogen (nitrate, nitrite) is 0.05 mg/L or less.

A significant proportion of the phosphorous found in sewage is derived from synthetic detergents. A large proportion of detergents is a phosphate building component, sodium tripoly phosphate (STP). Once in sewage, this builder is readily hydrolyzed to form orthophosphate. Orthophosphate is another primary nutrient responsible for algal and macrophyte growth. An algal growth limiting concentration of phosphorous in the ortho form is recognized as a value of less than 0.005 mg/L.[3]

Therefore, for the purpose of determining septic tank drainage contribution to eutrophication, several forms of nitrogen and phosphorous were measured: ammonia nitrogen, nitrate nitrogen, total phosphorous, and orthophosphate. In addition, sulfates, conductivity, dissolved oxygen, pH, TSS, turbidity, fecal coliform and fecal streptococcus were measured at each sample site.

There was a total of three water sampling events: September 30, 1998, April 21, 1999, and September 8, 1999; and one soil sampling event: November 18, 1999.

Six sites in the lake were selected for water sampling: two reference sites near parks with minimal septic systems and four sites near septic drainage fields. The sites were as follows:

Reference Site 1	Mary King Park
Reference Site 2	Dogwood Park
Site 1	Tall Tree Marina
Site 2	Crawfish Cove
Site 3	Alligator Cove
Site 4	El Dorado

Two perennial creeks flowing into the lake were also sampled: Panther Creek and Big Cypress Creek. Appendix A, Site Map, depicts the water sample sites.

Four sites were selected for soil sampling:

Reference Site 1	Guthrie
Site 1	North Shore
Site 2	Snug Harbor
Site 3	Kings Country

SAMPLING METHODS

Water samples were collected at a 24" depth using a Beta Plus Horizontal Sampler designed to collect a maximum of 2.2 liters of water. Sampling equipment and containers were acid washed (10% HCl) and deionized water rinsed prior to collections. Samples were submitted to Certes Laboratories for chemical analyses and to Star Analytical for fecal coliform and fecal streptococcus.

Sediment samples were collected from sites around the lake using a stainless steel 8" auger fitted with plastic liners. The overlying 4 - 6 inches of topsoil/leaf litter was removed prior to sampling. At all sites, dense clay was encountered at 10 - 12 inches depth. Sampling included several inches of clay. Samples were submitted to Certes Laboratory and Star Laboratory for chemical and bacteriological analyses.

RESULTS

Sampling Period Number One - September 30, 1998

Results of the lake samples showed a detectable level of ammonia nitrogen (0.12 mg/L) at Site 2, Crawfish Cove. Fecal coliform and fecal streptococcus were detected at Site 2, Crawfish Cove (>200.00 CFU/100 mL, >200.00 CFU/100 mL), Site 3, Alligator Cove (>200.00 CFU/100 mL, 44.0 CFU/100 mL), and Site 4, El Dorado (>200.00 CFU/100 mL, 35.0 CFU/100 mL).

Total phosphorous, orthophosphate, and sulfates were detected at Creek 1, Panther Creek (0.18 mg/L, 0.14 mg/L and 26.0 mg/L) and at Creek 2, Big Cypress Creek (0.37 mg/L 0.83 mg/L, and 28.0 mg/L). Fecal coliform and fecal streptococcus were greater than 400.0 CFU/100 mL at both creek sites. Results are presented in Appendix B.

Sampling Period Number Two - April 21, 1999

Results of the lake samples showed a detectable level of nitrate nitrogen (0.76 mg/L) at Site 3, Alligator Cove. Fecal coliform and fecal streptococcus was non-detectable at all sites.

Nitrate nitrogen, phosphorous, and sulfates were detected at Creek 1, Panther Creek (0.89 mg/L, 0.06 mg/L, and 33.0 mg/L) and at Creek 2, Big Cypress Creek (0.80 mg/L, 0.19 mg/L and 42.0 mg/L). Fecal coliform and fecal streptococcus were non-detectable at both sites. Results are presented in Appendix C.

Sampling Period Number Three - September 8, 1999

Results of the lake samples showed a detectable level of phosphorous at Site 1, Tall Tree (1.28 mg/L) and Site 4, El Dorado (2.42 mg/L). Fecal coliform and fecal streptococcus was detected at Site 2, Crawfish Cove (600.0 CFU/100 mL, 60.0 CFU/100 mL).

Phosphorous (0.71 mg/L) was detected at Creek 1, Panther Creek. Ammonia nitrogen (0.44 mg/L), phosphorous (0.75 mg/L), orthophosphate (0.087 mg/L), and sulfate (44.3 mg/L) were detected at Creek 2, Big Cypress Creek. Both creeks had extremely high numbers of fecal coliform (>20,000 CFU/100 mL, >20,000 CFU/100 mL) and fecal streptococcus (5,600 CFU/100 mL, 4,900 CFU/100 mL). Results are presented in Appendix D.

Sampling Period Number Four - Sediment - November 18, 1999

Compared to the reference site at Guthrie (minimal septic drainage) North Shore had an elevated level of ammonia nitrogen (39.0 mg/L) and Kings Country had an elevated level of orthophosphate (7.77 mg/L). Fecal coliform and fecal streptococcus were non-detectable at all sample sites. These results suggest that septic drainage into the lake via groundwater is occurring below the clay level. Results are presented in Appendix E.

Table 1. Summary of Lake Sites With Detectable Chemical/Biological Parameters [1]

Parameter	Site 1 Tall Tree			Site 2 Crawfish Cove			Site 3 Alligator Cove			Site 4 El Dorado		
	1	2	3	1	2	3	1	2	3	1	2	3
ammonia nitrogen (mg/L)	-	-	-	0.12	-	-	-	-	-	-	-	-
nitrate nitrogen (mg/L)	-	-	-	-	-	-	-	0.76	-	-	-	-
phosphorous (mg/L)	-	-	1.28	-	-	-	-	-	-	-	-	2.42
orthophosphate (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-
sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-
coliform (CFU/100 mL)	-	-	-	>200	-	600	>200	-	-	>200	-	-
streptococcus (CFU/100 mL)	-	-	-	>200	-	60	44	-	-	35	-	-

[1] As compared with reference sites.

Table 2. Summary of Creek Sites With Detectable Chemical/Biological Parameters [1]

Parameter	Creek 1 - Panther			Creek 2 - Big Cypress		
	1	2	3	1	2	3
ammonia nitrogen (mg/L)	-	-	-	-	-	0.44
nitrate nitrogen (mg/L)	-	0.89	-	-	0.80	-
total phosphorous (mg/L)	0.37	0.06	0.71	0.18	0.19	0.75
orthophosphate (mg/L)	0.83	-	-	0.14	-	0.09
sulfate (mg/L)	28.0	33.0	-	26.0	42.0	43.3
coliform (CFU/100 mL)	>400	N.D.	>20,000	>400	N.D.	>20,000
streptococcus (CFU/100 mL)	>400	N.D.	5,600	>400	N.D.	4,900

[1] As compared with reference sites.

Table 3. Summary of Sediment Sites With Detectable Chemical/Biological Parameters [1]

Parameter	North Shore	Kings Country	Snug Harbor
ammonia nitrogen (mg/L)	39.0	-	-
nitrate nitrogen (mg/L)	-	-	-
total phosphorous (mg/L)	-	7.77	-
orthophosphate (mg/L)	-	-	-
sulfate (mg/L)	-	-	-
coliform (CFU/100 mL)	-	-	-
streptococcus (CFU/100 mL)	-	-	-

[1] As compared with reference sites.

CONCLUSIONS

Nutrients were detected during various sampling periods at Tall Tree (1.28 mg/L phosphorous), Crawfish Cove (0.12 mg/L ammonia nitrogen), Alligator Cove (0.76 mg/L nitrate nitrogen) and El Dorado (2.42 mg/L phosphorous). No seasonal variation of nutrient loadings were detected at any of the lake sampling sites.

Fecal coliform and fecal streptococcus were detected at Crawfish Cove and Alligator Cove in higher number and more frequently than at other sites. These results coincide with the older age septic systems at these two sites.

The most consistent source of nutrients and fecal bacteria entering the lake were from the two perennial creeks, Panther Creek and Big Cypress Creek. Nutrients were detected during all three sampling periods. No seasonal variation of nutrient loadings were detected at any of the creek sampling sites. Of particular note was the elevated levels of fecal coliform and fecal streptococcus detected during the third sampling period. Fecal coliform exceeded 20,000 CFU/100 mL and fecal streptococcus exceeded 4,000 CFU/100 mL at both sites.

Sediment samples were high in ammonia-nitrogen (39.0 mg/L) at North Shore and high in phosphorous (7.77 mg/L) at Kings Country. Fecal bacteria were not detected at any of the sites. Results suggest that the source of these nutrients were from fertilizers rather than from septic tanks. Groundwater flow from septic tanks into the lake is probably below the clay soil level which was encountered at 6 - 8 inches from the surface. Auger soil sampling did not extend beyond 12 inches from the surface.

Extensive macrophyte growth was observed during all sampling periods in the eastern section of the lake, especially around the north shore coves. Alligator Cove and Big Cypress Creek are located in this section of the lake.

In instances where nutrient control is desirable, control of nitrogen and phosphorous is essential. When nitrogen alone becomes limiting, excess phosphorous can support growth of nitrogen-fixing blue-green algae. Therefore, a control program must limit both nutrients.

It is probable that failing and/or inefficient septic systems are contributing nutrients and fecal bacteria into the lake. Newer septic systems provide efficient bacteriological, ammonia-nitrogen, and nitrate nitrogen remover however they are ineffective in reducing or removing phosphates. A centralized wastewater treatment plant incorporating chemical dosing, sedimentation, activated sludge, and disinfection would result in a reduction of ammonia-nitrate, nitrogen nitrate, sulfates, phosphates, and fecal bacteria.

RECOMMENDATIONS

1. Continued monitoring of the lake and creek sites at a minimum of quarterly to determine any seasonal trends. Several years worth of data is suggested.

2. Conduct a more comprehensive soil testing study incorporating monitoring wells at various depths around the septic fields. By identifying the depth of groundwater flows around the septic fields and the quantities of nutrients and bacteria present, problem sites could be identified and prioritized.

3. The sources of nutrients and bacteria in the creeks should be investigated as soon as possible. A watershed management plan involving sampling, source identification, and source minimization is recommended. Sampling during a rain event following a period of dry weather would determine whether creek nutrients and bacteria were due to continuous inflows or episodic non-point source run-off.

4. Receiving water assessments which grade Texas creeks based on biological integrity would be valuable in determining the overall health of the perennial creeks. Periodic assessments would provide information on the perennial creek water quality entering Lake Cypress Springs. Methods should include habitat evaluations and fish electroshocking and seining following Texas Natural Resource and Conservation Commission procedures for Texas waters.

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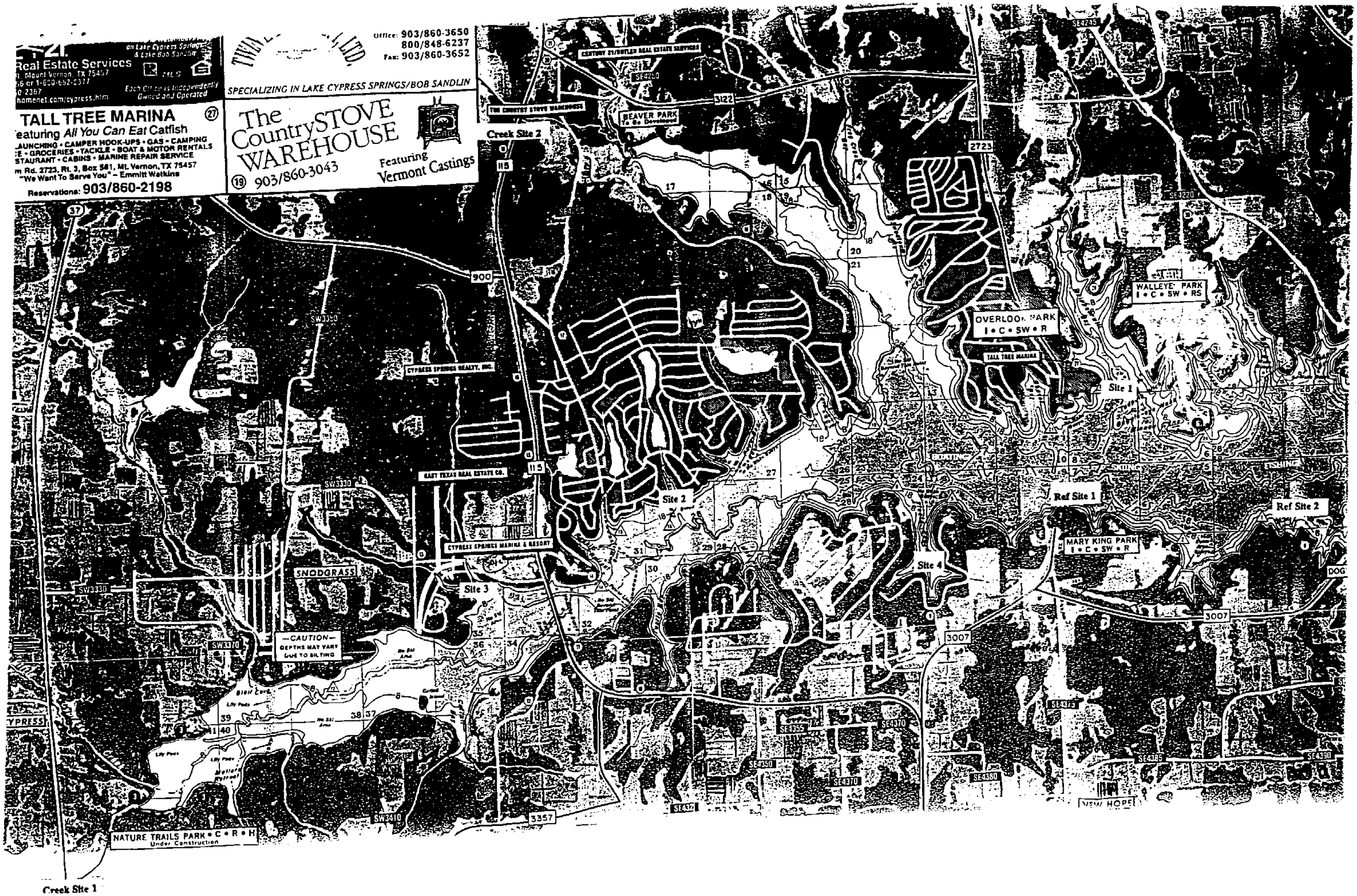
APPENDIX A



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Site 3
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EAST TEXAS REAL ESTATE CO.
CYPRESS SPRINGS MARINA & RESORT
CENTURY 21/BUTLER REAL ESTATE SERVICES
THE COUNTRY STOVE WAREHOUSE
NEW HOPE
37
115
900
2723
3122
3007
3357
SW3330
SW3370
SW3410
SE4260
SE4220
SE4370
SE4350
SE4380
SE4385
SE4390
Lily Pads
Blair Cove

APPENDIX B

Results of Samples Taken at Lake Cypress Springs - Sampling Period 1, September 1998

Parameter	Ref 1 Mary King	Ref 2 Dogwood	Site 1 Tall Tree	Site 2 Crawfish	Site 3 Alligator	Site 4 El Dorado	Creek 1 Panther	Creek 2 Big Cypress
Ammonia Nitrogen (mg/L)	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	<0.10
Nitrate Nitrogen (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total phosphorous (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.37	0.18
Orthophosphate (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.83	0.14
TSS (mg/L)	6.0	6.0	7.0	8.0	7.0	6.0	17.0	64.0
Sulfate (mg/L)	14.0	15.0	14.0	15.0	11.0	15.0	28.0	26.0
Turbidity (NTU)	2.0	2.0	2.0	3.0	3.0	2.0	21.0	45.0
Fecal Coliform (CFU/100 mL)	>200.0	>200.0	>200.0	>200.0	>200.0	>200.0	>400.0	>400.0
Fecal Streptococcus (CFU/100 mL)	7.0	6.0	1.0	>200.0	44.0	35.0	>400.0	>400.0
pH (units)	8.1	8.2	8.3	8.1	8.3	8.2	7.6	7.8
D.O. (mg/L)	7.87	7.73	7.76	7.81	7.74	7.79	7.21	7.29
Conductivity (*u*mhos/cm^2)	122	118	119	135	100	125	256	143
Hardness (mg/L as $CaCO_3$)	28	36	40	40	36	36	72	44.0
Alkalinity (mg/L as $CaCO_3$)	60	38	24	36	24	28	40	32.0

Certes
Environmental Laboratories

2209 Wisconsin Street, Suite 200
Dallas, Texas 75229
972-620-7966
800-394-2872
972-620-7963 FAX • Email: certes@aol.com

CERTES ENVIRONMENTAL LABORATORIES
ANALYTICAL REPORT

Certes File Number: **98-3157**

Client Project I.D.:
CYPRESS SPRINGS #1

Prepared for:
HUTHER & ASSOCIATES, INC.
1445 MacArthur Drive, Suite 216
Carrollton, TX 75007

Attention:
Bruce Huther

Report Date:
10/20/98

Included are the results of chemical analyses for the samples submitted to Certes Environmental Laboratories, L.L.C., on 09/30/98. All analytical results met Quality Control requirements as set by the industry accepted criteria. Please refer to the Laboratory Quality Control Results section of this report.

Sincerely,

Certes Environmental Laboratories, L.L.C.

Bharat Vandra
Laboratory Manager

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
Client Sample ID: REFERENCE 1						Sample Number: 98-3157-001		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 9:00						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	6	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	14	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	2	NTU	1		10/01/98	DD	1
Client Sample ID: REFERENCE 2						Sample Number: 98-3157-002		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 8:45						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	6	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	15	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	2	NTU	1		10/01/98	DD	1
Client Sample ID: SITE 1						Sample Number: 98-3157-003		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 8:00						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	7	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	14	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	2	NTU	1		10/01/98	DD	1

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		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
Client Sample ID: SITE 2						Sample Number: 98-3157-004		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 9:50						Sampled By: BH		
SM4500NH3.D	Ammonia	0.12	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	8	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	15	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	3	NTU	1		10/01/98	DD	1
Client Sample ID: SITE 3						Sample Number: 98-3157-005		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 9:35						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	7	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	11	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	3	NTU	1		10/01/98	DD	1
Client Sample ID: SITE 4						Sample Number: 98-3157-006		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 9:15						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	<0.05	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	6	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	15	mg/L	5		10/05/98	AKJ	1
EPA 180.1	Turbidity	2	NTU	1		10/01/98	DD	1

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		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
Client Sample ID: BIG CYPRESS CREEK						Sample Number: 98-3157-007		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 11:15						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	0.37	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	0.83	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	17	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	28	mg/L	10		10/05/98	AKJ	2
EPA 180.1	Turbidity	21	NTU	1		10/01/98	DD	1

Client Sample ID: N.CREEK						Sample Number: 98-3157-008		
Date Sampled: 09/30/98						Sample Matrix: Liquid		
Time Sampled: 11:00						Sampled By: BH		
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10		10/06/98	AKJ	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10		10/15/98	DD	1
EPA 365.2	Phosphorus	0.18	mg/L	0.05		10/16/98	AKJ	1
	Orthophosphate	0.137	mg/L	0.05		10/01/98	AKJ	1
EPA 160.2	Total Suspended Solids	64	mg/L	1		10/05/98	SW	1
EPA 375.4	Sulfate	26	mg/L	10		10/05/98	AKJ	2
EPA 180.1	Turbidity	45	NTU	1		10/01/98	DD	1

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Results of Analyses - Laboratory Quality Control **File No.: 98-3157**

	Nitrate	Sulfate	Sulfate
Matrix Spike			
Batch Number	NO_3-101598	SO_4-100598A	SO_4-100598B
Date Prepared	N/A	N/A	N/A
Date Analyzed	10/15/98	10/05/98	10/05/98
Spiked Sample ID	3182-9	3068-1	3178-2
Sample Measured Result	0.13	N/A	N/A
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.50	4000	2000
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.63	3970	2210
% Recovery	99	99	110
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.66	3900	2180
% Recovery Duplicate	106	97	109
Relative Percent Difference (RPD)	7	2	1
Control Limits (%low-%high)	75-125	80-120	80-120
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<0.10	<5.00	<5.00
Laboratory Control Sample			
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.50	20.0	20.0
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.45	18.7	19.6
% Recovery	90	94	98
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A
% Recovery Duplicate	N/A	N/A	N/A
Relative Percent Difference (RPD)	N/A	N/A	N/A
Control Limits (%low-%high)	90-110	80-120	80-120

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

Results of Analyses - Laboratory Quality Control

File No.: 98-3157

	Phosphorus	Ortho-phosphate	Ammonia
Matrix Spike			
Batch Number	PO_4-101698	OPO_4-100198	NH_3-100698
Date Prepared	N/A	N/A	N/A
Date Analyzed	10/16/98	10/01/98	10/06/98
Spiked Sample ID	3157-2	3157-2	3157-8
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.20	0.50	5.00
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.23	0.511	0.058
% Recovery	114	102	1*
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.22	0.505	0.052
% Recovery Duplicate	108	101	1*
Relative Percent Difference (RPD)	5	1	18
Control Limits (%low-%high)	80-120	0-20	80-120
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<0.050	<0.050	<0.10
Laboratory Control Sample			
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.20	0.20	5.00
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.21	0.23	5.03
% Recovery	103	114	101
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A
% Recovery Duplicate	N/A	N/A	N/A
Relative Percent Difference (RPD)	N/A	N/A	N/A
Control Limits (%low-%high)	80-120	80-120	80-120

***Matrix Interference**

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

-3157

@aol.com

Microbiology

1445 MacArthur Suite 216 (Billing Address)	972 242-8741
Carrollton (City) Tx (State) 75007 (Zip)	
Purchase Order No.	To ensure proper billing, please reference quotation number.
Project Manager: B. Huther	Site Location: Cypress Springs #1

Certes No.	Sample ID	Date	Time	Matrix[1]	V	G	J	O	P[3]	Ammonia Nitrog.	Nitrate Nitrog.	Total Phosphorou.	Orthophosphate	TSS	Sulfate	Turbidity				
1	Reference 1	9/30	0900	Water						X	X	X	X	X	X	X				
2	Reference 2		0845																	
3	Site 1		0800																	
4	Site 2		0950																	
5	Site 3		0935																	
6	Site 4		0915																	
7	Big Cypress Creek		1115																	
8	N. Creek		1100																	

(No. & Type of Container[2]: V, G, J, O, P[3])

Sampled By: R. Rutherford B. Huther

1 Matrix: A - Air Bag; C - Charcoal Tube; L - Liquid; OL - Oil; S - Soil; SD - Solid; SL - Sludge; WP - Wipe; W - Water/Wastewater
2 Container Type: V - 40ml VOA Vial; G - Amber or Glass 1 Liter; J - 250ml Wide-mouth Glass Jar; O - Other:
3 Preservative: HCl - Hydrochloric Acid; HNO_2 - Nitric Acid; H_2SO_4 - Sulfuric Acid; O - Other:

TAT	Client Project ID	Special Instructions (including specific detection limits)	Certes Job Number
Standard: Date Required ____ / RUSH: Date Required ____	Cypress Springs #1		98-3157

	Date	Time	
Relinquished by Sampler: [signature]	9/30/98	1430	Received By
Relinquished by	Date	Time	Received By
Relinquished by	9/30/98	1430	Received By Laboratory: Rick Rose

NOTE: By submitting these samples, you agree to the terms and conditions contained in Certes' Schedule of Fees. Certes cannot accept verbal changes. Please FAX written changes to (972) 620-7963.

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED CCREDITED

r, Ste. 216
5007

Project: Cypress Springs #1
Project Number: 4526
Project Manager: Bruce Huther

Sampled: 9/30/98
Received: 9/30/98
Reported: 10/15/98 09:32

09:32

ANALYTICAL REPORT FOR SAMPLES:

tion	Laboratory Sample Number	Sample Matrix	Date Sampled
	8090324-01	Water	9/30/98
	8090324-02	Water	9/30/98
	8090324-03	Water	9/30/98
	8090324-04	Water	9/30/98
	8090324-05	Water	9/30/98
	8090324-06	Water	9/30/98
	8090324-07	Water	9/30/98
	8090324-08	Water	9/30/98

	Notes*
al	1
al	1
al	1
al	1
l	1
l	1
l	1
	1

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

l definitions.

cal, Inc.

roject Manager

STAR ANALYTICAL
14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc. 1445 MacArthur, Ste. 216 Carrolton, TX 75007	Project: Cypress Springs #1 Project Number: 4526 Project Manager: Bruce Huther	Sampled: 9/30/98 Received: 9/30/98 Reported: 10/15/98 09:32

Notes and Definitions

#	Note
1	Test not checked/counted after 24 hr period. Checked 48 hr after set-up.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

Star Analytical, Inc.

L Hall

Lari Hall, Project Manager

STAR ANALYTICAL SAMPLE RECEIPT LOG

CLIENT NAME: Huther + Associates

WORK ORDER: 8090324

REC. BY (PRINT): Greg Hurton

DATE OF LOG-IN: 9-30-98

CIRCLE THE APPROPRIATE RESPONSE

1 Custody Seal(s) present? Yes / No

2. Custody Seal #: NA

3. Chain of Custody present? Yes / No

4 Chain of Custody filled out properly? Yes / No

5. Ice and packing material? Yes / No

6. Correct containers used? Yes / No

7 Containers intact? Yes / No

8 Does information on custody reports, traffic reports and sample tags agree? Yes / No

9 Headspace in VOA's? NA ~~Yes~~ / No

10 Preserved properly? Yes / No

11 Date Rec. at Lab: 9-30-98

12 Time Rec. at Lab: 1425

13 Temp Rec. at Lab: 4C

LAB SAMPLE #	DASH #	CLIENT IDENTIFICATION	CONTAINER DESCRIPTION	SAMPLE MATRIX	DATE SAMP	REMARKS: CONDITION (ETC.)
01	A-B	Reference 1	26oz	water	9-30-98	
02		Reference 2				
03		Site 1				
04		Site 2				
05		Site 3				
06		Site 4				
07		Big Cypress				
08		N. Creek				

Shipping Method (circle one): STAR CLIENT AIRBORNE FED EX UPS OTHER: ____

Page 1 of 1

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: HUTHER & ASSOCIATES	Project Name: CYPRESS SPRINGS #1 PROJECT 4526
Address: 1445 MAC ARTHUR SUITE 216	Billing Address (if different):
City: CARROLLTON State: TX Zip Code: 75007	
Telephone: 972 242-6844 FAX#: 972 242-8741	P.O.#:
Report To: B. HUTHER Sampler: B. HUTHER	

Turnaround Time: STANDARD

❑ 10 Working Days ❑ 4 Working Days ❑ 24 Hours
❑ 7 Working Days ❑ 3 Working Days ❑ 2 - 8 Hours
❑ 5 Working Days ❑ 2 Working Days

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	Fecal Coliform		Fecal STREPTOCOCCUS							Comments
1. REFERENCE 1	0900 9/30		1	BAC	8090324-01	X		X							
2. REFERENCE 2	0845 "		1	"	-02	X		X							
3. SITE 1	0800 "		1	"	-03	X		X							
4. SITE 2	0950 "		1	"	-04	X		X							
5. SITE 3	0930 "		1	"	-05	X		X							
6. SITE 4	0915 "		1	"	-06	X		X							
7. BIG CYPRESS	1115 "		1	"	-07	X		X							
8. N. Creek	1100 "		1	"	-08	X		X							
9.															
10.															

Relinquished By: [illegible signature]	Date 9/30/98	Time: 1425	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By: [illegible signature]	Date: 9-30-98	Time: 1425

Samples Received in Good Condition? ☒ Yes ❑ No Samples Cold? ☒ Yes ❑ No Method of Shipment PICK-UP Page 1 of 1

Custody Seal Intact? ❑ Yes ❑ No ☒ N/A

Pink - Client Yellow - Star White - Star

APPENDIX C

Results of Samples Taken at Lake Cypress Springs - Sampling Period 2, April 21, 1999

Parameter	Ref 1 Mary King	Ref 2 Dogwood	Site 1 Tall Tree	Site 2 Crawfish	Site 3 Alligator	Site 4 El Dorado	Creek 1 Panther	Creek 2 Big Cypress
Ammonia Nitrogen (mg/L)	<0.10	0.12	0.11	<0.10	0.11	0.11	<0.10	<0.10
Nitrate Nitrogen (mg/L)	<0.10	<0.10	<0.10	<0.10	0.76	<0.10	0.89	0.80
Total phosphorous (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.19
Orthophosphate (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07
TSS (mg/L)	<4.0	5.0	<4.0	8.0	21.0	4.0	16.0	22.0
Sulfate (mg/L)	21.0	21.0	22.0	21.0	18.0	21.0	33.0	42.0
Turbidity (NTU)	6.0	5.0	6.0	10.0	19.0	7.0	19.0	26.0
Fecal Coliform (CFU/100 mL)	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU
Fecal Streptococcus (CFU/100 mL)	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU	<1 CFU
pH (units)	6.47	6.52	6.56	6.58	6.58	6.35	6.50	6.72
D.O. (mg/L)	7.61	7.81	6.94	7.91	7.52	7.49	7.14	6.24
Conductivity (μmhos/cm^2)	137	122	113	123	111	155	244	185
Hardness (mg/L as $CaCO_3$)	36	32	36	36	32	32	76	64
Alkalinity (mg/L as $CaCO_3$)	20	24	30	28	26	26	46	36

Certes

Environmental Laboratories, L.L.C.

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Dallas, Texas 75229
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CERTES ENVIRONMENTAL LABORATORIES
ANALYTICAL REPORT

Certes File Number: **99-1247**

Client Project I.D.:

CYPRESS SPRINGS #2

Prepared for:

HUTHER & ASSOCIATES, INC.
1445 MacArthur Drive, Suite 216
Carrollton, TX 75007

Attention:
Bruce Huther

Report Date:

05/06/99

Included are the results of chemical analyses for the samples submitted to Certes Environmental Laboratories, L.L.C., on 04/23/99. All analytical results met Quality Control requirements as set by the industry accepted criteria. Please refer to the Laboratory Quality Control Results section of this report.

This report must be reproduced in its entirety.

Sincerely,

Certes Environmental Laboratories, L.L.C.

Amy R. LaSalle

Amy LaSalle
President

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution

Client Sample ID: **CRAWFISH COVE SITE 2**
Date Sampled: **04/22/99**
Time Sampled: **9:45**
Sample Number: **99-1247-004**
Sample Matrix: **Liquid**
Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10	05/04/99	05/04/99	DWT	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10	05/04/99	05/04/99	BWB	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
	Orthophosphate	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
EPA 160.2	Total Suspended Solids	**8**	mg/L	4	04/29/99	04/29/99	DWT	4
EPA 375.4	Sulfate	**21**	mg/L	10	05/03/99	05/03/99	DWT	2
EPA 180.1	Turbidity	**10**	NTU	1	04/26/99	04/26/99	DWT	1

Client Sample ID: **ALLIGATOR COVE SITE 3**
Date Sampled: **04/22/99**
Time Sampled: **10:00**
Sample Number: **99-1247-005**
Sample Matrix: **Liquid**
Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
SM4500NH3.D	Ammonia	**0.11**	mg/L	0.10	05/04/99	05/04/99	DWT	1
EPA 353.3	Nitrate	**0.76**	mg/L	0.10	05/04/99	05/04/99	BWB	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
	Orthophosphate	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
EPA 160.2	Total Suspended Solids	**21**	mg/L	4	04/29/99	04/29/99	DWT	4
EPA 375.4	Sulfate	**18**	mg/L	10	05/03/99	05/03/99	DWT	2
EPA 180.1	Turbidity	**19**	NTU	1	04/26/99	04/26/99	DWT	1

Client Sample ID: **EL DORADO SITE 4**
Date Sampled: **04/22/99**
Time Sampled: **10:15**
Sample Number: **99-1247-006**
Sample Matrix: **Liquid**
Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
SM4500NH3.D	Ammonia	**0.11**	mg/L	0.10	05/04/99	05/04/99	DWT	1
EPA 353.3	Nitrate	<0.10	mg/L	0.10	05/04/99	05/04/99	BWB	1
EPA 365.2	Phosphorus	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
	Orthophosphate	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
EPA 160.2	Total Suspended Solids	**4**	mg/L	4	04/29/99	04/29/99	DWT	4
EPA 375.4	Sulfate	**21**	mg/L	10	05/03/99	05/03/99	DWT	2
EPA 180.1	Turbidity	**7**	NTU	1	04/26/99	04/26/99	DWT	1

Certes Environmental Laboratories
2209 Wisconsin Street, Suite 200 Dallas, Texas, 75229 • 972-620-7966 • 800-394-2872 • FAX 972-620-7963 • Email: certes@aol.com

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Analyzed By	Dilution
Client Sample ID: NORTH CREEK						Sample Number:	99-1247-007	
Date Sampled: 04/22/99						Sample Matrix:	Liquid	
Time Sampled: 10:30						Sampled By:	BH	
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10	05/04/99	05/04/99	DWT	1
EPA 353.3	Nitrate	0.89	mg/L	0.10	05/04/99	05/04/99	BWB	1
EPA 365.2	Phosphorus	0.06	mg/L	0.05	04/28/99	04/28/99	BWB	1
	Orthophosphate	<0.05	mg/L	0.05	04/28/99	04/28/99	BWB	1
EPA 160.2	Total Suspended Solids	16	mg/L	4	04/29/99	04/29/99	DWT	4
EPA 375.4	Sulfate	33	mg/L	10	05/03/99	05/03/99	DWT	2
EPA 180.1	Turbidity	19	NTU	1	04/26/99	04/26/99	DWT	1

Client Sample ID: BIG CYPRESS CREEK						Sample Number:	99-1247-008	
Date Sampled: 04/22/99						Sample Matrix:	Liquid	
Time Sampled: 10:45						Sampled By:	BH	
SM4500NH3.D	Ammonia	<0.10	mg/L	0.10	05/04/99	05/04/99	DWT	1
~~EPA 354.1~~	~~Nitrite~~	~~0.03~~	~~mg/L~~	~~0.01~~	~~04/23/99~~	~~04/23/99~~	~~DWT~~	~~1~~
EPA 353.3	Nitrate	0.80	mg/L	0.10	05/04/99	05/04/99	BWB	1
EPA 365.2	Phosphorus	0.19	mg/L	0.05	04/28/99	04/28/99	BWB	1
	Orthophosphate	0.07	mg/L	0.05	04/28/99	04/28/99	BWB	1
EPA 160.2	Total Suspended Solids	22	mg/L	4	04/29/99	04/29/99	DWT	4
EPA 375.4	Sulfate	42	mg/L	10	05/03/99	05/03/99	DWT	2
EPA 180.1	Turbidity	26	NTU	1	04/26/99	04/26/99	DWT	1

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Results of Analyses - Laboratory Quality Control **File No.: 99-1247**

	Nitrite	**Nitrate**	**Ammonia**	**Sulfate**
Matrix Spike				
Batch Number	$NO_2$042399	$NO_3$050499A	$NH_3$050499B	$SO_4$050399
Date Prepared	04/23/99	05/04/99	05/04/99	05/03/99
Date Analyzed	04/23/99	05/04/99	05/04/99	05/03/99
Spiked Sample ID	1247-01	1247-01	1247-01	1245-01
Sample Measured Result	<0.010	<0.10	<0.10	39.9
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.10	0.50	10.0	20.0
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.11	0.52	9.40	62.8
% Recovery	110	104	94	114
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.11	0.52	9.50	63.7
% Recovery Duplicate	110	104	95	119
Relative Percent Difference (RPD)	0	0	1	4
Control Limits (%low-%high)	75-125	75-125	75-125	75-125
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<0.010	<0.10	<0.10	<5.00
Laboratory Control Sample				
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.10	0.50	1.00	20.0
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.11	0.54	0.98	21.7
% Recovery	110	108	98	108
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A	N/A
% Recovery Duplicate	N/A	N/A	N/A	N/A
Relative Percent Difference (RPD)	N/A	N/A	N/A	N/A
Control Limits (%low-%high)	90-110	90-110	90-110	90-110

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

	Total Suspended Solids	Turbidity	Phosphorus	Ortho-phosphorus
Matrix Spike				
Batch Number	TSS-042999	Turb-042699	P-042899	oPO_4-042899
Date Prepared	04/29/99	04/26/99	04/28/99	04/28/99
Date Analyzed	04/29/99	04/26/99	04/28/99	04/28/99
Spiked Sample ID	1247-01	1247-01	1247-01	1247-01
Sample Measured Result	<4.00	5.80	<0.050	<0.050
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	500	10.0	0.50	0.50
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	496	18.5	0.49	0.53
% Recovery	99	127	98	106
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	472	180	0.52	0.52
% Recovery Duplicate	94	122	104	104
Relative Percent Difference (RPD)	5	4	6	2
Control Limits (%low-%high)	75-125	75-125	75-125	75-125
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<4.00	<1.00	<0.050	<0.050
Laboratory Control Sample				
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	500	50.5	0.50	0.50
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	494	50.0	0.45	0.53
% Recovery	99	101	90	106
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	0.43	N/A
% Recovery Duplicate	N/A	N/A	85	N/A
Relative Percent Difference (RPD)	N/A	N/A	5	N/A
Control Limits (%low-%high)	90-110	90-110	75-125	90-110

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

Certes

Environmental Laboratories, L.L.C.
2209 Wisconsin Street, Suite 200
Dallas, Texas 75229
972-620-7966 972-620-7963 Fax

Analysis(es) Requested

Client Name: HUTHER
Phone No.: 972 242-6844
Client Address: 1445 MacArthur Suite 216
Fax No.: 972 242-8741
Billing Address / City / State / Zip: CARROLLTON TX 75007
Purchase Order No.:
To ensure proper billing, please reference quotation number.
Project Manager: B. HUTHER
Site Location: CYPRESS SPRINGS #2

Certes No.	Sample ID	Date	Time	Matrix[1]	V	G	J	O	P[3]	Ammonia Nitrogen	Nitrate Nitrogen	Total Phosphorous	Orthophosphate	TSS	Sulfate	Turbidity				
1	Mary King Ref 1	4/22	0830	Water						X	X	X	X	X	X	X				
2	Dogwood Ref 2	4/22	0900																	
3	Tall Tree Site 1	"	09:30																	
4	Crawfish Cove Site 2	"	0945																	
5	Alligator Cove Site 3	"	1000																	
6	El Dorado Site 4	"	1015																	
7	North Creek	"	1030																	
8	Big Cypress Creek	"	1045																	

(V, G, J, O, P[3]: No. & Type of Container[2])

Sampled By: B. HUTHER / R. TOLDER

1 Matrix: A - Air Bag; C - Charcoal Tube; L - Liquid; OL - Oil; S - Soil; SD - Solid; SL - Sludge; WP - Wipe; W - Water/Wastewater
2 Container Type: V - 40ml VOA Vial; G - Amber or Glass 1 Liter; J - 250ml Wide-mouth Glass Jar; O - Other: ______
3 Preservative: HCl - Hydrochloric Acid; HNO_2 - Nitric Acid; H_2SO_4 - Sulfuric Acid; O - Other: ______

TAT
Standard: Date Required ______
RUSH: Date Required ______

Client Project ID: Cypress Springs #2

Special Instructions (including specific detection limits)

Certes Job Number: 99-1247

Relinquished by Sampler: Fred [signature]	Date 4.23.99	Time 1320	Received By	
Relinquished by: Adam McMullen	Date	Time	Received By	
Relinquished by	Date 4/23/99	Time 1320	Received By Laboratory	Rick Rosales

STAR ANALYTICAL

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(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc. 1445 MacArthur, Ste. 216 Carrollton, TX 75007	Project: Cypress Springs #2 Project Number: none Project Manager: Bruce Huther	Sampled: 4/21/99 Received: 4/21/99 Reported: 4/29/99 15:18

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
Dogwood Park Ref 2	9040231-01	Liquid	4/21/99
Mary King Ref 1	9040231-02	Liquid	4/21/99
Tall Tree Site 1	9040231-03	Liquid	4/21/99
Crawfish Cove Site 2	9040231-04	Liquid	4/21/99
Alligator Bay Site 3	9040231-05	Liquid	4/21/99
El Dorado Site 4	9040231-06	Liquid	4/21/99
North Creek	9040231-07	Liquid	4/21/99
Big Cypress Creek	9040231-08	Liquid	4/21/99

Star Analytical, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
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J Ballinger

Janice Ballinger, Project Manager

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ACCREDITED

Huther & Assoc.	Project: Cypress Springs #2	Sampled:	4/21/99
1445 MacArthur, Ste. 216	Project Number: none	Received:	4/21/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported:	4/29/99 15:18

Conventional Chemistry Parameters
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
Dogwood Park Ref 2			**9040231-01**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D	< 1CFU/50ml	ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
Mary King Ref 1			**9040231-02**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
Tall Tree Site 1			**9040231-03**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
Crawfish Cove Site 2			**9040231-04**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
Alligator Bay Site 3			**9040231-05**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
El Dorado Site 4			**9040231-06**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
North Creek			**9040231-07**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	
Big Cypress Creek			**9040231-08**				**Liquid**	
Fecal Coliforms	04V9560	4/23/99	4/23/99	STM 9222D		ND	CFU/50 ml	1
Fecal Streptoccocus	"	"	"	SM9230C		ND	"	

CG - CFU/50

Star Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

J Ballinger

Janice Ballinger, Project Manager

STAR ANALYTICAL

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ACCREDITED

Huther & Assoc.	Project:	Cypress Springs #2		Sampled:	4/21/99
1445 MacArthur, Ste. 216	Project Number:	none		Received:	4/21/99
Carrollton, TX 75007	Project Manager:	Bruce Huther		Reported:	4/29/99 15:18

Notes and Definitions

#	Note
1	Please note the Analyses were subcontracted to an outside laboratory.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

Star Analytical, Inc.

J Ballinger

Janice Ballinger, Project Manager

Star Analytical Sample Receipt Log

Huther & Assoc
1) Client Name

2) Custody Seal(s)/Packaging intact?
☐ Yes ☐ No ☑ N/A

3) Method of Shipping/Receipt:
☑ Star ☐ Client ☐ UPS
☐ Fed Ex ☐ Airborne ☐ ______

4/21/99 14:36
4) Date & Time Received at/by Lab

N Schnell
5) Received for Lab by

6) Ice/Packing material used?
☑ Yes ☐ No Temp. 4 °C

7) Chain of Custody filled out properly?
☑ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?
☑ Yes ☐ No

9) Containers supplied by Lab?
☑ Yes ☐ No

10) Correct/Appropriate containers used?
☑ Yes ☐ No

11) Containers intact?
☑ Yes ☐ No

12) Containers properly preserved?
☐ Yes ☐ No ☑ N/A

13) Headspace in VOAs?
☐ Yes ☐ No ☑ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
Bacti Cup	01	A-B	Dogwood Park Ref 2	L	4/21/99	
↓	02	↓	Mary King Ref 1	↓	↓	
↓	03	↓	Tall Tree Site 1	↓	↓	
↓	04	↓	Crawfish Cove Site 2	↓	↓	
↓	05	↓	Alligator Bay Site 3	↓	↓	
↓	06	↓	El Dorado Site 4	↓	↓	
↓	07	↓	North Creek	↓	↓	
↓	08	↓	Big Cypress Creek	↓	↓	

Additional Comments and/or Problems, Resolutions:

4/21/99
Date of Log-In

9040231
Work Order Number

Page 1 of 1

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: HUTHER & ASSOC	Project Name: CYPRESS SPRINGS #2
Address: 1445 MacARTHUR SUITE 212	Billing Address (if different):
City: CARROLLTON State: TX Zip Code: 75007	
Telephone: (972)242-6844 FAX#: (972)242-8741	P.O.#:
Report To: BRUCE HUTHER Sampler:	

Turnaround Time: ☐ 10 Working Days ☐ 7 Working Days ☒ 5 Working Days ☐ 4 Working Days ☐ 3 Working Days ☐ 2 Working Days ☐ 24 Hours ☐ 2 - 8 Hours

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	Fecal Coliform	Fecal Streptococcus							Comments
1. DOGWOOD PARK REF 2	4/21 0900		2		9040231-01	X	X							Please
2. MARY KING ~~REF~~ REF 1	4/21 0900		2		02	X	X							report Value
3. TALL TREE SITE 1	〃		2		03	X	X							NOT GREATER
4. CRAWFISH COVE SITE 2	〃		2		04	X	X							THAN OR
5. ALLIGATOR BAY SITE 3	〃		2		05	X	X							TNTC
6. EL DORADO SITE 4	〃		2		06	X	X							(To Numerous to Count)
7. NORTH CREEK	〃		2		07	X	X							
8. BIG CYPRESS CREEK	〃		2		08	X	X							
9.														
10.														

Relinquished By: [signature]	Date: 4/21/99	Time: 1435	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	~~Received By:~~	Date:	Time:
Relinquished By:	Date:	~~Time:~~	Received By: [signature]	Date: 4/21/99	Time: 14:35

Samples Received in Good Condition? ☐ Yes ☐ No Samples Cold? ☒ Yes ☐ No Method of Shipment STAR

Pink - Client Yellow - Star White - Star

APPENDIX D

Results of Samples Taken at Lake Cypress Springs - Sampling Period 3, September 1999

Parameter	Ref 1 Mary King	Ref 2 Dogwood	Site 1 Tall Tree	Site 2 Crawfish	Site 3 Alligator	Site 4 El Dorado	Creek 1 Panther	Creek 2 Big Cypress
Ammonia Nitrogen (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.44	<0.10
Nitrate Nitrogen (mg/L)	8.66	0.47	<0.10	<0.10	<0.10	<0.10	0.14	0.67
Total phosphorous (mg/L)	0.05	0.22	1.28	0.12	0.07	2.42	0.75	0.71
Orthophosphate (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.087	<0.05
TSS (mg/L)	5.0	5.0	4.0	6.0	13.0	6.0	31.0	48.0
Sulfate (mg/L)	18.0	17.0	17.7	18.3	16.4	18.3	44.3	11.5
Turbidity (NTU)	3.0	3.0	5.0	4.0	8.0	4.0	15.0	39.0
Fecal Coliform (CFU/100 mL)	30.0	100.0	100.0	600.0	<100.0	<100.0	>20,000	>20,000
Fecal Streptococcus (CFU/100 mL)	<10.0	<10.0	<10.0	60.0	<10.0	<10.0	4,900	5,600
pH (units)	7.35	7.38	7.42	7.40	7.50	7.40	7.21	7.22
D.O. (mg/L)	7.62	7.58	7.65	7.81	7.82	7.53	7.04	6.42
Conductivity (μmhos/cm^2)	144	122	123	145	144	140	285	295
Hardness (mg/L as $CaCO_3$)	34	36	40	42	40	36	75	62
Alkalinity (mg/L as $CaCO_3$)	50	55	50	58	52	53	51	46

Bacteria was non-detectable in the seawood samples.

Certes

Environmental Laboratories, L.L.C.

2209 Wisconsin Street, Suite 200
Dallas, Texas 75229
972-620-7966
800-394-2872
972-620-7963 FAX • Email: certes@aol.com

CERTES ENVIRONMENTAL LABORATORIES
ANALYTICAL REPORT

Certes File Number: **99-2749**

Client Project I.D.:

CYP #3

Prepared for:

HUTHER & ASSOCIATES, INC.
1445 MacArthur Drive, Suite 216
Carrollton, TX 75007

Attention:
Bruce Huther

Report Date:

09/23/99

Included are the results of chemical analyses for the samples submitted to Certes Environmental Laboratories, L.L.C., on 09/09/99. All analytical results met Quality Control requirements as set by the industry accepted criteria. Please refer to the Laboratory Quality Control Results section of this report.

This report must be reproduced in its entirety.

Sincerely,
Certes Environmental Laboratories, L.L.C.

Amy R. LaSalle

Amy LaSalle
President

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio

Client Sample ID: **REF. SITE 1 MARY KING** Sample Number: **99-2749-001**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **11:00** Sampled By:

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	**8.66**	mg/L	5.00	09/14/99	09/14/99		BWB	50
EPA 365.2	Total Phosphorus	**0.05**	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	**5**	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	**18.0**	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	**3**	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	**0**	µg/L		09/09/99	09/09/99		SAB	1
	Methyltert-butylether	< 5	µg/L	5	09/09/99	09/09/99	B	SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1
	Difluorobenzene (SS)	**101%**	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	**83%**	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **REF. SITE 2 DOGWOOD** Sample Number: **99-2749-002**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **11:15** Sampled By:

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	**0.47**	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	**0.22**	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	**5**	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	**17.0**	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	**3**	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	**0**	µg/L		09/09/99	09/09/99		SAB	1
	Methyltert-butylether	**5**	µg/L	5	09/09/99	09/09/99	B	SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1

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Sample: False continued...		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 8021B	Difluorobenzene (SS)	107%	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	85%	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **SITE 1 TALL TREE** Sample Number: **99-2749-003**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **11:30** Sampled By:

EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	< 0.10	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	1.28	mg/L	0.50	09/17/99	09/17/99		bwb	10
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	4	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	17.7	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	5	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	0	µg/L		09/09/99	09/09/99		SAB	1
	Methyltert-butylether	5	µg/L	5	09/09/99	09/09/99	B	SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1
	Difluorobenzene (SS)	103%	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	86%	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **SITE 2 CRAWFISH COVE** Sample Number: **99-2749-004**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **11:45** Sampled By:

EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	< 0.10	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	0.12	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	6	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	18.3	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	4	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	0	µg/L		09/09/99	09/09/99		SAB	1

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Sample: False continued...		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 8021B	Methyltert-butylether	5	µg/L	5	09/09/99	09/09/99	B	SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1
	Difluorobenzene (SS)	99%	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	82%	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **SITE 3 ALLIGATOR COVE**
Date Sampled: **09/08/99**
Time Sampled: **12:00**
Sample Number: **99-2749-005**
Sample Matrix: **Liquid**
Sampled By:

EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	< 0.10	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	0.07	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	13	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	16.4	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	8	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	0	µg/L		09/09/99	09/09/99		SAB	1
	Methyltert-butylether	< 5	µg/L	5	09/09/99	09/09/99		SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1
	Difluorobenzene (SS)	103%	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	88%	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **SITE 4 EL DORADO**
Date Sampled: **09/08/99**
Time Sampled: **12:15**
Sample Number: **99-2749-006**
Sample Matrix: **Liquid**
Sampled By:

EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	< 0.01	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	< 0.10	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	2.42	mg/L	0.50	09/17/99	09/17/99		bwb	10
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	6	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	18.3	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	4	NTU	1	09/10/99	09/10/99		DWT	1
EPA 8021B	Benzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Toluene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1
	Ethylbenzene	< 1	µg/L	1	09/09/99	09/09/99		SAB	1

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Sample: False continued...		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 8021B	Xylenes (Total)	< 3	µg/L	3	09/09/99	09/09/99		SAB	1
	Total BTEX (Calculated)	0	µg/L		09/09/99	09/09/99		SAB	1
	Methyltert-butylether	< 5	µg/L	5	09/09/99	09/09/99		SAB	1
	**Quality Control Surrogate				09/09/99	09/09/99		SAB	1
	Difluorobenzene (SS)	99%	74-116%		09/09/99	09/09/99		SAB	1
	4-Bromofluorobenzene (SS)	81%	80-151%		09/09/99	09/09/99		SAB	1

Client Sample ID: **BIG CYPRESS CREEK** Sample Number: **99-2749-007**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **13:00** Sampled By:

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3	Ammonia	0.44	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	0.02	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	0.14	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	0.75	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	0.087	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	31	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	44.3	mg/L	10.0	09/13/99	09/13/99		DWT	2
EPA 180.1	Turbidity	15	NTU	1	09/10/99	09/10/99		DWT	1

Client Sample ID: **N. CREEK** Sample Number: **99-2749-008**
Date Sampled: **09/08/99** Sample Matrix: **Liquid**
Time Sampled: **13:30** Sampled By:

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3	Ammonia	< 0.10	mg/L	0.10	09/16/99	09/16/99		OX	1
EPA 354.1	Nitrite	0.03	mg/L	0.01	09/09/99	09/09/99		BWB	1
EPA 353.3	Nitrate	0.67	mg/L	0.10	09/14/99	09/14/99		BWB	1
EPA 365.2	Total Phosphorus	0.71	mg/L	0.05	09/17/99	09/17/99		bwb	1
	Orthophosphate	< 0.05	mg/L	0.05	09/09/99	09/09/99		BWB	1
EPA 160.2	Total Suspended Solids	48	mg/L	1	09/09/99	09/09/99		DWT	1
EPA 375.4	Sulfate	11.5	mg/L	5.0	09/13/99	09/13/99		DWT	1
EPA 180.1	Turbidity	39	NTU	1	09/10/99	09/10/99		DWT	1

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Analytical Chemistry Environmental Sciences Research Microbiology

Index of Narrative Footnotes

D - Surrogate diluted out of range
M - Recoveries out of range due to matrix interferences inherent in sample
L - Re-extraction was not possible due to limited sample amount
X - Laboratory contamination suspected
T - Sample prepared or analyzed out of hold time
N - Sample has presumptive compounds other than fuel products
H - Sample contains significant levels of heavy petroleum products > C28
I - Sample was reported at a dilution with few or no reportable values as a result of matrix interference
Z - Dilution was required due to the dark color and thickness of the extract
P - Result is unconfirmed. The quantitative result from the primary column and secondary column did not agree within 40%. The higher result was reported.
J - Value is a J-value and to be considered an estimate only.
E - Result is above the linear range of the instrument and is to be considered an estimate.
V - Insufficient sample was available for analysis as prescribed by the method. The lesser amount used for analysis raised reporting limits accordingly.
Y - Benzo(B) and Benzo(K) Fluoranthene did not resolve. Value was reported as Benzo(B)fluoranthene
B - Analyte detected in the associated method blank.

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Results of Analyses - Laboratory Quality Control **File No.: 99-2749**

	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE
Matrix Spike					
Batch Number	090999L2	090999L2	090999L2	090999L2	090999L2
Date Prepared	09/09/99	09/09/99	09/09/99	09/09/99	09/09/99
Date Analyzed	09/09/99	09/09/99	09/09/99	09/09/99	09/09/99
Spiked Sample ID	2748-1	2748-1	2748-1	2748-1	2748-1
Sample Measured Result	<1	<1	<1	<3	12
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1000	1000	1000	3000	1000
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1040	1000	945	2890	1000
% Recovery	104	100	95	96	99
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1030	988	940	2880	984
% Recovery Duplicate	103	99	94	96	97
Relative Percent Difference (RPD)	1	1	1	0	2
Control Limits (%low-%high)	70-130	70-130	70-130	70-130	70-130
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<1	<1	<1	<3	<5
Laboratory Control Sample					
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	100	100	100	300	100
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	93.4	88.8	84.5	258	106
% Recovery	93	89	85	86	106
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	103	98.5	93.7	286	106
% Recovery Duplicate	103	99	94	95	106
Relative Percent Difference (RPD)	10	10	10	10	0
Control Limits (%low-%high)	70-130	70-130	70-130	70-130	70-130

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

	Sulfate	Turbidity	Total Suspended Solids
Matrix Spike			
Batch Number	SO_4-091399	Turb-091099	TSS-090999
Date Prepared	09/13/99	09/10/99	09/09/99
Date Analyzed	09/13/99	09/10/99	09/09/99
Spiked Sample ID	2751-02	2749-01	2730-02
Sample Measured Result	<5.00	3.00	6.00
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	20.0	10.0	1000
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	20.0	14.0	968
% Recovery	100	110	96
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	20.3	13.0	940
% Recovery Duplicate	102	100	93
Relative Percent Difference (RPD)	2	10	3
Control Limits (%low-%high)	75-125	75-125	75-125
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<5.00	<1.00	<4.00
Laboratory Control Sample			
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	20.0	100	1000
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	20.9	96.0	946
% Recovery	104	96	95
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A
% Recovery Duplicate	N/A	N/A	N/A
Relative Percent Difference (RPD)	N/A	N/A	N/A
Control Limits (%low-%high)	90-110	90-110	85-115

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

Results of Analyses - Laboratory Quality Control **File No.: 99-2749**

	Nitrite	Nitrate	Total Phosphorus	Ortho-phosphate
Matrix Spike				
Batch Number	NO_2-9999	NO_3-91499	P-91799	OP-9999
Date Prepared	09/09/99	09/14/99	09/16/99	09/09/99
Date Analyzed	09/09/99	09/14/99	09/17/99	09/09/99
Spiked Sample ID	2749-1	2738-16	2749-5	2738-16
Sample Measured Result	<0.010	0.18	0.073	<0.050
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.050	0.50	0.50	0.50
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.048	0.60	0.66	0.45
% Recovery	96	84	117	90
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.046	0.62	0.67	0.44
% Recovery Duplicate	93	88	119	88
Relative Percent Difference (RPD)	3	5	2	2
Control Limits (%low-%high)	75-125	75-125	75-125	75-125
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<0.010	<0.10	<0.050	<0.050
Laboratory Control Sample				
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.050	0.50	0.50	0.50
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	0.050	0.51	0.52	0.46
% Recovery	100	102	103	93
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A	N/A
% Recovery Duplicate	N/A	N/A	N/A	N/A
Relative Percent Difference (RPD)	N/A	N/A	N/A	N/A
Control Limits (%low-%high)	90-110	90-110	90-110	90-110

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

	Ammonia
Laboratory Control Sample	
Batch Number	091699
Date Prepared	09/16/99
Date Analyzed	09/16/99
Spiked Sample ID	5401
% Recovery	104
% Recovery Duplicate	110
Relative Percent Difference (RPD)	6
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<0.10

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

HUTHER & ASSOCIATES, INC.

1445 Mac Arthur Drive, Suite 216
Carrollton, Texas 75007
Phone: (972) 242-6844 Fax: (972) 242-8741

ANALYTICAL CHAIN-OF-CUSTODY

Company Name: HUTHER
Address: SAME AS ABOVE
Contact:
Phone #:

Project #: Cyp #3
P.O.#:
Project Name: ~~CYPR~~ CYPRESS SPRINGS #3

Sample Description	Date	Time	Matrix	Ammonia	Nitrate	Phosphorous	Orthophosphate	TSS	Sulfate	Turbidity	BTEX/MTBE				# Containers
Ref Site 1 Mary King	9/8/99	1100	water	X	X	X	X	X	X	X	X				3
Ref Site 2 Dogwood	"	1115	"	X	X	X	X	X	X	X	X				3
Site 1 Tall Tree	"	1130	"	X	X	X	X	X	X	X	X				3
SITE 2 CRAWFISH COVE	"	1145	"	X	X	X	X	X	X	X	X				3
SITE 3 Alligator COVE	"	1200	"	X	X	X	X	X	X	X	X				3
SITE 4 El DORADO	"	1215	"	X	X	X	X	X	X	X	X				3
BIG CYPRESS CREEK	"	1300	"	X	X	X	X	X	X	X					2
N. CREEK	"	1330	"	X	X	X	X	X	X	X					2

RELINQUISHED BY: (Signature) Date Time

RECEIVED BY: (Signature) Date Time:

METHOD OF SHIPMENT:

ADDITIONAL COMMENTS: STANDARD TAT

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc.	Project: Cypress Springs	Sampled:	9/8/99
1445 MacArthur, Ste. 216	Project Number: none	Received:	9/8/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported:	9/24/99 10:02

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
Ref 1 Mary King	9090260-01	Liquid	9/8/99
Ref 2 Dogwood	9090260-02	Liquid	9/8/99
Site 1 Tall Tree	9090260-03	Liquid	9/8/99
Site 2 Crawfish Cove	9090260-04	Liquid	9/8/99
Site 3 Alligator Cove	9090260-05	Liquid	9/8/99
Site 4 El Dorado	9090260-06	Liquid	9/8/99
Big Cypress	9090260-07	Liquid	9/8/99
N Creek	9090260-08	Liquid	9/8/99
Alligator Cove (Seaweed 2)	9090260-09	Soil	9/8/99

***** Please note samples were subcontracted to Talem, Inc. Samples were delivered directly to Talem by Huther & Associates.**

Star Analytical, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

J Ballinger

Janice Ballinger, Project Manager

STAR ANALYTICAL

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(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc.	Project: Cypress Springs	Sampled:	9/8/99
1445 MacArthur, Ste. 216	Project Number: none	Received:	9/8/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported:	9/24/99 10:02

Conventional Chemistry Parameters
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
Ref 1 Mary King			**9090260-01**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	**30**	cfu/100mL	1
Fecal Streptococcus	"	"	"	SM9230C	10.0	<10.0	"	
Ref 2 Dogwood			**9090260-02**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	**100**	cfu/100mL	1
Fecal Streptococcus	"	"	"	SM9230C	10.0	<10.0	"	
Site 1 Tall Tree			**9090260-03**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	**100**	cfu/100mL	1
Fecal Streptococcus	"	"	"	SM9230C	10.0	<10.0	"	
Site 2 Crawfish Cove			**9090260-04**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	**600**	cfu/100mL	1
Fecal Streptococcus	"	"	"	SM9230C	10.0	**60.0**	"	
Site 3 Alligator Cove			**9090260-05**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	100	<100	cfu/100mL	1,2
Fecal Streptococcus	"	"	"	SM9230C	10.0	<10.0	"	
Site 4 El Dorado			**9090260-06**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	100	<100	cfu/100mL	1,2
Fecal Streptococcus	"	"	"	SM9230C	10.0	<10.0	"	
Big Cypress			**9090260-07**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	NR	cfu/100mL	1,3
Fecal Streptococcus	"	"	"	SM9230C	100	**4900**	"	
N Creek			**9090260-08**				**Liquid**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9222D	1.0	>20000	cfu/100mL	1,2
Fecal Streptococcus	"	"	"	SM9230C	100	**5600**	"	
Alligator Cove (Seaweed 2)			**9090260-09**				**Soil**	
Fecal Coliforms	09V9405	9/8/99	9/8/99	SM9221B	200	<200	MPN/g	1
Fecal Streptococcus	"	"	"	SM9230B	1.0	<1.0	"	

Star Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Janice Ballinger, Project Manager

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Huther & Assoc.	Project: Cypress Springs	Sampled:	9/8/99
1445 MacArthur, Ste. 216	Project Number: none	Received:	9/8/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported:	9/24/99 10:02

Notes and Definitions

#	Note
1	Analysis subcontracted to a non Sequoia network laboratory.
2	Confluent growth occurred during incubation, therefore Fecal colonies could not be distinguished.
3	Value could not be reported due to confluent growth occurred during incubation in both trays, therefore Fecal colonies could not be distinguished.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

Star Analytical, Inc.

Janice Ballinger, Project Manager

SRF # 37048
9/8/99

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: HUTHER & ASSOCIATES
Address: 1445 MacARTHUR SUITE 216
City: CARROLLTON State: TX Zip Code: 75007
Telephone: (972) 242-6EYV FAX#: 972-242-8741
Report To: ~~HUTHER~~ / STAR Sampler:

Project Name: CYPRESS SPRINGS
Billing Address (if different): STAR ANALYTICAL (SEE ABOVE)
P.O.#:

Turnaround Time: STANDARD
☐ 10 Working Days ☐ 4 Working Days ☐ 24 Hours
☐ 7 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours
☐ 5 Working Days ☐ 2 Working Days

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	Fecal Coliform	Fecal Streptococcus								Comments
1. REF 1 MARY KING	9/8/99 1100	WATER	2		9090200-1	X	X								Values must be reported NOT > "X"
2. REF 2 DOGWOOD	" 1115	WATER	2		-2	X	X								
3. SITE 1 TALL TREE	" 1130	"	2		-3	X	X								
4. SITE 2 CRAWFISH COVE	" 1145	"	2		-4	X	X								
5. SITE 3 Alligator Cove	" 1200	"	2		-5	X	X								
6. SITE 4 EL DORADO	" 1215	"	2		-6	X	X								
7. BIG CYRESS	" 1300	"	2		-7	X	X								
8. N. CREEK	" 1330	"	2		-8	X	X								
9. Alligator Cove (Seaweed 2)		Solid	(seaweed) 2		-9	X	X								
10. B 9/28/99		~~Solid~~													

Relinquished By: [signature]	Date: ~~[illegible]~~	Time: 16:15	Received By: Gloria Clark	Date: 9/8/99	Time: 16:15
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Samples Received in Good Condition? ☐ Yes ☐ No Samples Cold? ☐ Yes ☐ No Method of Shipment ______ Page of

Pink - Client
Yellow - Star
White - Star

SEP-22-99 09:52 FROM- T-518 P.02/02 F-607

APPENDIX E

Results of Samples Taken at Lake Cypress Springs - Sampling Period 4 - Soil, November 18, 1999

Parameter	Guthrie [1]	N. Shore	Kings	Snug
Ammonia Nitrogen (mg/L)	22.8	39.0	24.3	21.3
Nitrate Nitrogen (mg/L)	<0.1	2.1	<0.5	2.4
Total phosphouous (mg/L)	165	43.9	63.1	14.8
Orthophosphate (mg/L)	2.67	0.75	7.77	3.34
Fecal Coliform (CFU/100 mL)	<20.0	<20.0	<20.0	<20.0
Fecal Streptococcus (CFU/100 mL)	<1.0	<1.0	<1.0	<1.0

[1] Reference Site

Certes
Environmental Laboratories, L.L.C.

2209 Wisconsin Street, Suite 200
Dallas, Texas 75229
972-620-7966
800-394-2872
972-620-7963 FAX • Email: certes@aol.com

CERTES ENVIRONMENTAL LABORATORIES
ANALYTICAL REPORT

Certes File Number: **99-3384**

Client Project I.D.:

Prepared for:

HUTHER & ASSOCIATES, INC.
1445 MacArthur Drive, Suite 216
Carrollton, TX 75007

Attention:
Bruce Huther

Report Date:
12/02/99

Included are the results of chemical analyses for the samples submitted to Certes Environmental Laboratories, L.L.C., on 11/22/99. All analytical results met Quality Control requirements as set by the industry accepted criteria. Please refer to the Laboratory Quality Control Results section of this report.

This report must be reproduced in its entirety.

Sincerely,
Certes Environmental Laboratories, L.L.C.

Amy R. LaSalle

Soil

Amy LaSalle
President

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio

Client Sample ID: **GUTHRIE** Sample Number: **99-3384-001**
Date Sampled: **11/22/99** Sample Matrix: **Solid**
Time Sampled: **10:00** Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3M	Ammonia	**22.8**	mg/Kg	5.0	12/01/99	12/01/99		DWT	1
EPA 354.1M	Nitrite	< 0.1	mg/Kg	0.1	11/29/99	11/29/99		BWB	1
EPA 353.3	Nitrate	< 0.5	mg/Kg	0.5	11/29/99	11/30/99		BWB	1
EPA 365.2M	Total Phosphorus	**165**	mg/Kg	25.0	11/23/99	11/23/99		BWB	50
EPA 365.2	Orthophosphates	**2.67**	mg/Kg	0.500	11/29/99	11/29/99		BWB	1

Client Sample ID: **NORTH SHORE** Sample Number: **99-3384-002**
Date Sampled: **11/22/99** Sample Matrix: **Solid**
Time Sampled: **10:00** Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3M	Ammonia	**39.0**	mg/Kg	5.0	12/01/99	12/01/99		DWT	1
EPA 354.1M	Nitrite	< 0.1	mg/Kg	0.1	11/29/99	11/29/99		BWB	1
EPA 353.3	Nitrate	**2.1**	mg/Kg	0.5	11/29/99	11/30/99		BWB	1
EPA 365.2M	Total Phosphorus	**43.9**	mg/Kg	5.0	11/23/99	11/23/99		BWB	10
EPA 365.2	Orthophosphates	**0.754**	mg/Kg	0.500	11/29/99	11/29/99		BWB	1

Client Sample ID: **KINGS COUNTRY** Sample Number: **99-3384-003**
Date Sampled: **11/22/99** Sample Matrix: **Solid**
Time Sampled: **10:00** Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3M	Ammonia	**24.3**	mg/Kg	5.0	12/01/99	12/01/99		DWT	1
EPA 354.1M	Nitrite	< 0.1	mg/Kg	0.1	11/29/99	11/29/99		BWB	1
EPA 353.3	Nitrate	< 0.5	mg/Kg	0.5	11/29/99	11/30/99		BWB	1
EPA 365.2M	Total Phosphorus	**63.1**	mg/Kg	5.0	11/23/99	11/23/99		BWB	10
EPA 365.2	Orthophosphates	**7.77**	mg/Kg	0.500	11/29/99	11/29/99		BWB	1

Client Sample ID: **SNUG** Sample Number: **99-3384-004**
Date Sampled: **11/22/99** Sample Matrix: **Solid**
Time Sampled: **10:00** Sampled By: **BH**

		Result	Units	Reporting Limit	Date Prepared	Date Analyzed	Flag	Analyzed By	Dilutio
EPA 350.3M	Ammonia	**21.3**	mg/Kg	5.0	12/01/99	12/01/99		DWT	1
EPA 354.1M	Nitrite	< 0.1	mg/Kg	0.1	11/29/99	11/29/99		BWB	1
EPA 353.3	Nitrate	**2.4**	mg/Kg	0.5	11/29/99	11/30/99		BWB	1
EPA 365.2M	Total Phosphorus	**14.8**	mg/Kg	5.0	11/23/99	11/23/99		BWB	10
EPA 365.2	Orthophosphates	**3.34**	mg/Kg	0.500	11/29/99	11/29/99		BWB	1

Certes Environmental Laboratories
2209 Wisconsin Street, Suite 200 Dallas, Texas, 75229 • 972-620-7966 • 800-394-2872 • FAX 972-620-7963 • Email: certes@aol.com

Index of Narrative Footnotes

D - Surrogate diluted out of range
M - Recoveries out of range due to matrix interferences inherent in sample
L - Re-extraction was not possible due to limited sample amount
X - Laboratory contamination suspected
T - Sample prepared or analyzed out of hold time
N - Sample has presumptive compounds other than fuel products
H - Sample contains significant levels of heavy petroleum products > C28
I - Sample was reported at a dilution with few or no reportable values as a result of matrix interference
Z - Dilution was required due to the dark color and thickness of the extract
P - Result is unconfirmed. The quantitative result from the primary column and secondary column did not agree within 40%. The higher result was reported.
J - Value is a J-value and to be considered an estimate only.
E - Result is above the linear range of the instrument and is to be considered an estimate.
V - Insufficient sample was available for analysis as prescribed by the method. The lesser amount used for analysis raised reporting limits accordingly.
Y - Benzo(B) and Benzo(K) Fluoranthene did not resolve. Value was reported as Benzo(B)fluoranthene
B - Analyte detected in the associated method blank.
RR - Sample being re-extracted due to failing surrogate or internal standard

Certes Environmental Laboratories
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Results of Analyses - Laboratory Quality Control

File No.: 99-3384

	Ammonia	Nitrite	Nitrate	Ortho-phosphate	Total Phosphorus
Matrix Spike					
Batch Number	NH_3-120199	NO_2-112999	NO_3-113099	OP-112999	P-112399
Date Prepared	12/01/99	11/29/99	11/29/99	11/29/99	11/23/99
Date Analyzed	12/01/99	11/29/99	11/30/99	11/29/99	11/23/99
Spiked Sample ID	3393-01	3384-3,4	3393-3,4	3393-3,4	3291-1
Sample Measured Result	133	<1.00	8.38	250	20.2
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1000	10.0	50.0	250	5.00
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1080	9.30	52.4	536	N/A
% Recovery	95	93	88	114	N/A
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	1160	9.40	50.9	511	N/A
% Recovery Duplicate	103	94	85	102	N/A
Relative Percent Difference (RPD)	8	1	3	11	N/A
Control Limits (%low-%high)	75-125	75-125	75-125	75-125	75-125
Method Blank (mg/L) (µg/L) (mg/Kg) (µg/Kg)	<5.00	<1.00	<0.050	<0.500	<0.500
Laboratory Control Sample					
Spike Level (mg/L) (µg/L) (mg/Kg) (µg/Kg)	50.0	1.00	5.00	5.00	5.00
Spike Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	52.6	1.02	4.56	5.30	5.60
% Recovery	105	102	91	105	113
Spike Duplicate Result (mg/L) (µg/L) (mg/Kg) (µg/Kg)	N/A	N/A	N/A	N/A	5.20
% Recovery Duplicate	N/A	N/A	N/A	N/A	105
Relative Percent Difference (RPD)	N/A	N/A	N/A	N/A	7
Control Limits (%low-%high)	85-115	90-110	90-110	90-110	75-125

µg/l = micrograms per liter (ppb)
µg/kg = micrograms per kilogram (ppb)
< = less than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Sample
BS = Blank Spike
µmhos/cm = micromhos/centimeter

mg/l = milligrams per liter (ppm)
mg/kg = milligrams per kilogram (ppm)
% = percent
RPD = Relative Percentage Difference
RW - Reagent Water
LCSD = Laboratory Control Sample Duplicate
BSD = Blank Spike Duplicate

HUTHER & ASSOCIATES, INC.

1445 Mac Arthur Drive, Suite 216
Carrollton, Texas 75007
Phone: (972) 242-6844 Fax: (972) 242-8741

99-3384

ANALYTICAL CHAIN-OF-CUSTODY

Company Name: Huther & Assoc
Address: Same As Above
Contact: Bruce Huther
Phone #: 972 242-6844 (

Project #:	P.O.#:	Project Name:
N/A		Cypress Springs Soil

PARAMETERS FOR ANALYSIS

Sample Description		Date	Time	Matrix	Ammonia	Nitrite	Nitrate	Total Phosphous	Orthophosphate							# Containers
Guthrie	1	11/22/99	1000	Soil	✓	✓	✓	✓	✓							2
North Shore	2	"	"	"	✓	✓	✓	✓	✓							2
Kings Country	3	"	"	"	✓	✓	✓	✓	✓							2
Snug	4	"	"	"	✓	✓	✓	✓	✓							2

RELINQUISHED BY: (Signature) Bruce Huther Date 11/22/99 Time 0900

RECEIVED BY: (Signature) Rick Rosales Date 11/22/99 Time: 0900

METHOD OF SHIPMENT: Deliver

ADDITIONAL COMMENTS: There is a duplicate sample labeled "duplicate" for each collection site in case extra sample is needed for the requested analyses.

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc.	Project: Cypress Springs	Sampled: 11/18/99
1445 MacArthur, Ste. 216	Project Number: none	Received: 11/18/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported: 12/3/99 14:22

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
Northshore	9110219-01	Solid	11/18/99
Snug	9110219-02	Solid	11/18/99
Kings Country	9110219-03	Solid	11/18/99
Guthrie	9110219-04	Solid	11/18/99

Star Analytical, Inc.

J Ballinger

Janice Ballinger, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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ACCREDITED

Huther & Assoc. 1445 MacArthur, Ste. 216 Carrollton, TX 75007	Project: Cypress Springs Project Number: none Project Manager: Bruce Huther	Sampled: 11/18/99 Received: 11/18/99 Reported: 12/3/99 14:22

Conventional Chemistry Parameters
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
Northshore			9110219-01				Solid	
Fecal Coliforms	12V9051	11/22/99	11/22/99	SM9221E	20.0	<20.0	MPN/100gm	1
Fecal Streptoccocus	"	"	"	SM9230C	1.00	<1.00	CFU/50gm	
Snug			9110219-02				Solid	
Fecal Coliforms	12V9051	11/22/99	11/22/99	SM9221E	20.0	<20.0	MPN/100gm	1
Fecal Streptoccocus	"	"	"	SM9230C	1.00	<1.00	CFU/50gm	
Kings Country			9110219-03				Solid	
Fecal Coliforms	12V9051	11/22/99	11/22/99	SM9221E	20.0	<20.0	MPN/100gm	1
Fecal Streptoccocus	"	"	"	SM9230C	1.00	<1.00	CFU/50gm	
Guthrie			9110219-04				Solid	
Fecal Coliforms	12V9051	11/22/99	11/22/99	SM9221E	20.0	<20.0	MPN/100gm	1
Fecal Streptoccocus	"	"	"	SM9230C	1.00	<1.00	CFU/50gm	

Star Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

J Ballinger

Janice Ballinger, Project Manager

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

ACCREDITED

Huther & Assoc.	Project: Cypress Springs	Sampled:	11/18/99
1445 MacArthur, Ste. 216	Project Number: none	Received:	11/18/99
Carrollton, TX 75007	Project Manager: Bruce Huther	Reported:	12/3/99 14:22

Notes and Definitions

#	Note
I	Analysis subcontracted to a non Sequoia network laboratory.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

Star Analytical, Inc.

J Ballinger

Janice Ballinger, Project Manager

Star Analytical Sample Receipt Log

Huther & Assoc

1) Client Name

2) Custody Seal(s)/Packaging intact?

☐ Yes ☐ No ☒ N/A

3) Method of Shipping/Receipt:

☒ Star ☐ Client ☐ UPS

☐ Fed Ex ☐ Airborne ☐ ______

11/18/99 1624

4) Date & Time Received at/by Lab

E Mowland

5) Received (into ELM) By

6) Ice/Packing material used?

☒ Yes ☐ No Temp. 6 *C

7) Chain of Custody filled out properly?

☒ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?

☒ Yes ☐ No

9) Containers supplied by Lab?

☐ Yes ☒ No

10) Correct/Appropriate containers used?

☒ Yes ☐ No

11) Containers intact?

☒ Yes ☐ No

12) Containers properly preserved?

☐ Yes ☐ No ☒ N/A

13) Headspace in VOAs?

☐ Yes ☐ No ☒ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
2 2oz jar	01	A-B	Northshore	S	11/18/99	
↓	02	↓	Snug	↓	↓	
↓	03	↓	Kings Country	↓	↓	
↓	04	↓	Guthrie	↓	↓	

Additional Comments and/or Problems, Resolutions:

11/18/99

Date of Log-In

9110219

Work Order Number

Page 1 of 1

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: HUTHER & ASSOC	Project Name: CYPRESS SPRINGS
Address: 1445 MAC ARTHUR SUITE 216	Billing Address (if different):
City: CARROLLTON State: TX Zip Code: 75007	
Telephone: 972 242-6844 FAX#:	P.O.#:
Report To: BRUCE HUTHER Sampler:	

Turnaround Time: NORMAL

- ❑ 10 Working Days
- ❑ 7 Working Days
- ❑ 5 Working Days
- ❑ 4 Working Days
- ❑ 3 Working Days
- ❑ 2 Working Days
- ❑ 24 Hours
- ❑ 2 - 8 Hours

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	FECAL Coliform	FECAL STREPTOCOCCUS								Comments
1. NORTHSHORE	11/18/99 1100	Solid	1	Glass	9110219-01	X	X								
2. SNUG	" 1150				02	X	X								
3. KINGS COUNTRY	" 1130				03	X	X								
4. GUTHRIE	" 1115				04	X	X								
5.															
6.															
7.															
8.															
9.															
10.															

MUST HAVE A VALUE NOT: (TOO NUMEROUS TO COUNT) OR GREATER THAN

Relinquished By: [signature]	Date: 11/10/99	Time: 1300	Received By: [signature]	Date: 11/10/99	Time: 1500
Relinquished By:	~~Date:~~	~~Time:~~	~~Received By:~~	Date:	Time:
Relinquished By: [signature]	Date: 11/10/99	Time: 1624	Received By: [signature]	Date: 11/18/99	Time: 1624

Samples Received in Good Condition? ☑ Yes ❑ No Samples Cold? ☑ Yes ❑ No Method of Shipment STAR Page 1 of 1

Pink - Client Yellow - Star White - Star

APPENDIX E

APPENDIX E
Creation Act, FCWD

Creative Act, Franklin County Water District, Chapter 719, H.B. No. 1161

CREATIVE ACT

FRANKLIN COUNTY WATER DISTRICT

CHAPTER 719

H. B. NO. 1161

An Act creating and establishing a conservation and reclamation district under Article XVI, Section 59, of the Constitution of Texas, comprising all the territory contained within the boundaries of Franklin County, Texas, to be known as "Franklin County Water District"; constituting the same a governmental agency and body politic and corporate and a political subdivision of the State; defining the boundaries thereof and finding that all land and property therein will be benefited and no exclusion hearing shall be held, and that no election shall be necessary to confirm the organization of the District nor shall hearings be held on a plan of taxation but the ad valorem plan shall be used; prescribing the rights, powers, privileges and duties of said District and Incorporating the General Law pertaining to water control and improvement districts not in conflict or inconsistent with the provisions of this Act; providing for a Board of Directors, their terms, the filling of vacancies, the election of successors, and prescribing the duties and qualifications for such Directors and related matters; providing for the awarding of certain contracts; prescribing the purpose for which bonds may be issued ; the methods of securing the payment and the procedure for the issuance of such bonds ; requiring all bonds payable in whole or in part from taxes, except refunding bonds, to be approved by the resident qualified property taxpaying voters whose property has been duly rendered for taxation and providing terms and conditions for the issuance of bonds and the sale thereof ; providing for approval by the Texas Water Commission of plans and specifications of projects to be financed by the sale of bonds ; prescribing the manner in which such elections shall be called, held and notice thereof given; exempting the District's bonds from taxation; providing that the District shall have the power to fix rates and charges for services furnished; providing for a District depository and its selection; making applicable to the District Title 52, Revised Civil Statutes of Texas, as amended, relating to eminent domain and providing that the cost of relocation, raising, re-routing, or changing the grade or altering the construction of any highway, railroad, electric transmission line or telegraph properties and facilities or pipelines shall be borne by District ; enacting provisions relating to contracts with a City and providing that the District may acquire water rights under certain terms and conditions ; providing that bonds of the District shall be authorized investments in certain instances and shall be eligible to secure the deposit of certain funds ; declaring the District essential; making certain findings relating to the publication of notice of intention to apply for the passage of this act ; enacting provisions incident and relating to the subject ; providing a savings clause ; and declaring an emergency.

Be it enacted by the Legislature of the State of Texas:

District created

Section 1. Pursuant to, as expressly authorized by Section 59, Article XVI of the Constitution of the State of Texas, and in addition to all other districts into which the State has been divided heretofore, there is hereby created a conservation and reclamation district to be known as "Franklin County Water District" (hereinafter referred to as the "District"), which shall be recognized to be a governmental agency, a body politic and corporate, and a political subdivision of this State. The area of the District shall consist of all of the County of Franklin, State of Texas, and the boundaries of said District shall be identical with the boundaries of said County.

No confirmation election, hearing on exclusion of land or plan of taxation necessary.

Sec. 2. It is being hereby found and determined that all of the land included within the boundaries of the District will be benefited and that the District is created to serve a public use and benefit, it shall not be necessary for the Board of Directors to call a confirmation election or to hold a hearing on the exclusion of lands or a hearing on the adoption of a plan of taxation, but the ad valorem plan of taxation shall be used by the District.

Governing body of the district

Sec. 3. (a) All powers of the District shall be exercised by a Board of five (5) Directors. Each Director shall serve a term of office as herein provided, and thereafter until his successor shall be elected or appointed and qualified. No person shall be a Director unless he is at least twenty-one years of age, resides in and owns land in the territorial limits of the District. Said Directors shall subscribe to the Constitutional Oath of office and each shall give bond in the amount of Five Thousand Dollars ($5,000.00) for the faithful performance of his duties, the cost of which shall be paid by the District.

(b) Immediately after this Act becomes effective, the following named persons (all at least twenty-one years of age and residing and being owners of land within said District) shall be the Directors of said District, and shall constitute the Board of Directors of said District :

W. C. Newsome
Horris Morris
A. J. Laws
D. O. Aldridge
Landon Ramsay

If any of the aforementioned persons shall become incapacitated or otherwise not be qualified to assume his duties under this Act, the remaining Directors shall appoint his successor. Succeeding Directors shall be elected or appointed as hereinafter provided.

(c) The first two (2) named Directors in Section 3 (b) , above, shall serve until the first Tuesday in April, 1966, and thereafter until their successors have been declared elected and qualified, and the following three (3) named Directors shall serve until the first Tuesday in April, 1967, and thereafter until their successors have been declared elected and qualified. Regular elections for Directors shall be held on the first Tuesday in April of each year beginning in 1966. Two (2) Directors shall be elected in each even-numbered year and three (3) in each odd- numbered year. Notice of the election shall be published in accordance with the General Law applicable to water control and improvement districts. The election order shall state the time, the place or places and purpose of the election, and the Board of Directors shall appoint a presiding judge who shall appoint one (1) assistant judge and at least two (2) clerks to assist in holding such election. Only qualified electors residing in the District shall be entitled to vote at said election. The candidates receiving the highest number of votes shall be declared elected. Returns of the election shall be made to and canvassed by the Board of Directors of said District, which shall enter its order declaring the results of the election.

(d) Any candidate for Director desiring to have his name printed on the ballot may do so by a petition so requesting signed by not less than ten (10) residents of the District who are qualified to vote at the election. Such petition shall be presented to the Secretary of the Board of Directors not less than ten (10) full days prior to the date of the election.

(e) Any vacancies occurring in the Board of Directors shall be filled for the unexpired term by majority vote of the remaining Directors.

(f) The Directors shall receive such fees for attending Board meetings as may be established by unanimous vote of the Board, but not to exceed Ten Dollars ($10) for each meeting and not more than Twenty Dollars ($20) for all meetings held in any one calendar month. Said Directors shall also be entitled to receive reimbursement for actual expenses incurred in attending to District business, provided that such expenses are approved by the Board.

(g) The Board of Directors of the District shall elect from its number a President and a Vice President, and such other officers as in the judgment of the Board are necessary. The President shall be the chief executive officer, and the presiding officer of the Board, and shall have the same right to vote as any other Director. The Vice President shall perform all duties and exercise all power conferred by this Act upon the President when the President is absent or fails to or declines to act. The Board shall also appoint a Secretary, who may or may not be a member of the Board. Three (3) members of the Board shall constitute a quorum for the transaction of all business and a favorable vote of a majority of a quorum present shall be sufficient for the enactment of all measures. The Directors shall hold regular meetings at least once a month at such time and place as is fixed by resolution or bylaws of the Board. The President or any two (2) members may call such special meetings as may be necessary in the administration of the District's business provided that at least five (5) days prior to the meeting date the Secretary shall have mailed notice to each members, and notice of special meetings may be waived in writing by any Director.

(h) The Directors shall carefully keep and preserve a true and full account of all their meetings and proceedings, and preserve their minutes, contracts, records, notices, accounts, receipts and records of all kinds. The same shall be the property of the District and subject to public inspection. A regular office shall be established and maintained within the District for the conduct of its business. All records and accounts shall conform to approved methods of bookkeeping. The Board shall cause to be made and completed annually, as soon as practicable after the expiration of each calendar year, an audit of the books of account and financial records of the District for such calendar year, such audit to be made by an individual public accountant or firm of public accountants. The report on said audit shall be submitted at the first regular meeting of the Board of Directors thereafter. One copy of said report shall be filed with the office of the District, one with the depository of the District, and one in the office of the auditor, all of which shall be open to public inspection. Additional copies of said report shall be filed with any State or governmental agencies as may be required by law.

District powers

Sec. 4. The District herein created shall have and possess and is hereby vested with all rights, powers and privileges conferred by the General Laws of this State now in force and effect or hereafter enacted applicable to water control and improvement districts created under the authority of Article XVI, Section 59, of the Texas Constitution, but to the extent that said General Laws may be inconsistent or in conflict herewith, the provisions of this Act shall prevail. It is further the intention of the Legislature that the District herein created shall have all the power and authority necessary to fully qualify and gain the benefits of any and all laws which are in any wise helpful in carrying out the purposes for which the District is created and the provisions of all such laws of which the District may lawfully avail itself are hereby adopted by this reference and made applicable to the District.

Without limiting the generality of the foregoing, the District shall and is hereby empowered to exercise the following powers, privileges and functions:

(1) To control, store, preserve and distribute its waters and flood waters, the waters of its rivers and streams, for all useful purposes and to accomplish these ends by all practicable means including the construction, maintenance, and operation of all appropriate improvements, plants, works and facilities, the acquisition of water rights and all other properties, lands, tenements, easements and all other rights necessary to the purpose of the organization of the District.

(2) To process and store such waters and distribute same for municipal, domestic, irrigation and industrial purposes, subject to the requirements of Chapter 1, Title 128, Revised Civil Statutes of Texas, 1925, as amended.

(3) To dispose of property or rights therein when the same are no longer needed for the purposes for which the District is created or to lease same for purposes which will not interfere with the use of the property of the District.

(4) To cooperate with and contract with the State of Texas, the United States of America, or with any of their departments or agencies now existing, or which may hereafter be created, to carry out any of the powers or to further any of the purposes of the District and, for such purposes, to receive grants, loans or advancements therefrom.

(5) To make or cause to be made surveys and engineering investigations for the information of the District to facilitate the accomplishment of its purposes and to employ a general manager, attorneys, accountants, engineers, financial experts, or other technical or non-technical employees or assistants; further to fix the amount and manner of their compensation and to provide for the payment of all expenditures deemed essential to the proper operation and maintenance of the District and its affairs.

(6) To exercise all functions to permit the accomplishment of its purposes including the acquisition within or without said District of land, easements, and rights-of way and any other character of property incident to, or necessary in carrying out the purposes and work of the District by way of gift, device, purchase, leasehold or condemnation. The right of eminent domain is hereby expressly conferred on said District and the procedure with reference to condemnation, the assessment of and estimating of damages, payment, appeal, the entering upon the property pending appeal and other procedures prescribed in Title 52 of the Revised Civil Statutes of Texas, 1925, as heretofore or hereafter amended, shall apply to said District. In the event the District, in the exercise of the power of eminent domain or power of relocation, or any other power granted hereunder makes necessary the taking of any property or the relocation, raising, re-routing or changing the grade, or altering the construction of any highway, railroad, electric transmission line, telephone or telegraph properties and facilities, or pipeline, all such necessary taking, relocation, raising, re-routing, changing of grade or alteration of construction shall be accomplished at the expense of the District. It is provided, however, that the expense of the District shall be strictly confined to that amount which is equal to the actual cost of the property taken or work required without enhancement thereof and after deducting the net salvage value which may be derived from any property taken.

(7) To do any and all other acts or things necessary or proper to carry into effect the purpose for which the District is created and organized.

Awarding construction or purchase contracts

Sec. 5. Any construction contract or contracts for the purchase of materials, equipment or supplies requiring an expenditure of more than Two Thousand Dollars ($2,000) shall be made to the lowest and best bidder after publication of a notice to bidders once a week for two (2) weeks before awarding the contract. Such notice shall be sufficient if it states the time and place when and where the bids will be opened, the general nature of the work to be done, or the material, equipment or supplies to be purchased, and shall state where and the terms upon which copies of the plans and specifications may be obtained. The publication shall be in a newspaper published in Franklin County and designated by the Board of Directors.

May issue bonds

Sec. 6. (a) For the purpose of providing funds for purchasing or otherwise providing works, plants, facilities or appliances necessary to the accomplishment of the purposes authorized by this Act, and for the purpose of carrying out any other power or authority conferred by this Act, the District is hereby empowered to borrow money and issue its negotiable bonds to be payable from ad valorem taxes or revenues or both taxes and revenues of the District, as are pledged by resolution of the Board of Directors. Pending the issuance of definitive bonds, the Board may authorize the delivery of negotiable interim bonds or notes eligible for exchange or substitution by use of definitive bonds. Such bonds shall be issued in the name of the District, signed by the President, attested by the Secretary, and shall bear the seal of the District. It is provided, however, that the signatures of the President or Secretary, or of both, may be printed or lithographed on the bonds authorized by the Board of Directors and that the seal of the District may be impressed on the bonds or may be printed or lithographed thereon, if so authorized. The bonds shall mature serially or otherwise, in not to exceed forty (40) years and may be sold at a price and under terms as determined by the Board of Directors to be the most advantageous reasonably obtainable, provided that the interest cost to the District, calculated by the use of standard bond interest tables, currently in use by insurance companies and investment houses, does not exceed six per cent (6%) per annum, and within the discretion of the Board may be made callable prior to maturity at such times and prices as may be prescribed in the resolution authorizing the bonds, and may be made registrable as to principal or as to both principal and interest.

(b) Bonds may be issued in one or more than one series, and from time to time, as required for carrying out the purposes of this Act

(c) The bonds may be secured by a pledge of all or part of the net revenues of the District, or by the net revenues of any one or more contracts theretofore or thereafter made or other revenues and income specified by the resolution of the Board of Directors or in the trust indenture. Any such pledge may reserve the right, under conditions therein specified, to issue additional bonds which would be on a parity with or subordinate to the bonds then being issued. The term "net revenues" as used in this Section shall mean the gross revenues of the District after deduction of the amount necessary to pay the reasonable cost of maintaining and operating the District and its properties.

(d) Where bonds are issued, payable wholly or partially from ad valorem taxes, it shall be the duty of the Board of Directors to levy, assess and cause to be collected a tax sufficient to pay the bonds and the interest thereon as such bonds and interest become due, and in levying such tax shall take into consideration reasonable delinquencies and costs of collection. In the case of bonds payable partially from ad valorem taxes, the rate of the tax for any year may be fixed after giving consideration to the money reasonably to be received from the pledged revenues available for payment of principal and interest and to the extent and in the manner permitted by the resolution authorizing the issuance of the bonds.

(e) Where bonds payable wholly from revenues are issued, it shall be the duty of the Board of Directors to fix, establish and from time to time as necessary revise the rates of compensation for the sale of water and other services furnished, supplied and rendered by the District and collect same in amounts sufficient to pay the expenses of operating and maintaining the facilities of the District and to pay the bonds as they mature and the interest as it accrues, and to maintain the reserve and other funds as provided in the resolution authorizing the bonds. Where bonds payable partially from revenues are issued, it shall be the duty of the Board to fix, establish and from time to time as necessary revise the rates of compensation for the sale of water and other services furnished, supplied and rendered by the District and to collect same in amounts sufficient to assure compliance with the resolution authorizing the bonds.

(f) From the proceeds of the sale of bonds, the District may set aside an amount for the payment of interest expected to accrue during construction and a reserve interest and sinking fund, and such provision may be made in the resolution authorizing the bonds. Proceeds from the sale of bonds may also be used for the payment of all expenses necessarily incurred in accomplishing the purpose for which the District is created, including expenses of its organization, engineering investigations and of the issuance and sale of the bonds. The proceeds from the sale of the bonds may be placed on time deposit with the District's depository bank or may be temporarily invested in direct obligations of the United States Government maturing in not more than one (1) year form the date of investment.

(g) In the event of a default or a threatened default in the payment of principal of or interest on bonds payable wholly or partially from revenues, any court of competent jurisdiction may, upon petition of the holders of the outstanding bonds, appoint a receiver with authority to collect and receive all income of the District except taxes, employ and discharge agents and employees of the District, take charge of funds on hand (except funds received from taxes unless commingled) and manage the proprietary affairs of the District without consent or hindrance by the Directors. Such receiver may also be authorized to sell or make contracts for the sale of water or other services furnished by the District or renew such contracts with the approval of the court appointing him. The court may vest the receiver with such other powers and duties as the court may find necessary for the protection of the holders of the bonds. The resolution authorizing the issuance of the bonds or the trust indenture securing them may limit or qualify the rights of less than all of the outstanding bonds payable from the same source to institute or prosecute any litigation affecting the District's property or income.

(h) The provisions of Section 139, Chapter 25, General Laws, Acts of the 39th Legislature, Regular Session, 1925, as amended, relating to Texas Water Commission approval of plans and specifications for projects to be financed by the sale of bonds, apply to the sale of bonds under this Act.

<u>Refunding bonds authorized</u>

Sec. 7. The District is authorized to issue refunding bonds for the purpose of refunding any of the outstanding bonds authorized by this Act and the interest thereon. Such refunding bonds may be issued to refund more than one (1) series of outstanding bonds and combine the pledges for the outstanding bonds for the security of the refunding bonds, and may be secured by other or additional revenues and mortgage liens. The provisions of this law with reference to the issuance by the District of other bonds, their security, and their approval by the Attorney General and the remedies of the holders shall be applicable to refunding bonds. Refunding bonds shall be registered by the Comptroller of Public Accounts of the State of Texas upon surrender and cancellation of the bonds to be refunded, but in lieu thereof, the resolution authorizing their issuance may provide that they shall be sold and the proceeds thereof deposited in the bank where the original bonds were payable, in which case the refunding bonds may be issued in an amount sufficient to pay the principal of and interest on the original bonds to their effective option date or maturity date: and the Comptroller shall register them without concurrent surrender and cancellation of the original bonds.

Provisions for trust indenture as to bonds secured partially by revenues

Sec. 8. Any bonds (including revenue bonds) authorized by this Act, not payable wholly from ad valorem taxes, may be additionally secured by a trust indenture under which the trustee may be a bank having trust powers, situated either within or without the State of Texas. Such bonds, within the discretion of the Board of Directors, may be additionally secured by a deed of trust or mortgage lien upon physical properties of the District and all franchises, easements, water rights and appropriation permits, leases and contracts and all rights appurtenant to such properties, vesting in the trustee power to sell the properties for payment of the indebtedness, power to operate the properties and all other powers and authority for the further security of the bonds. Such trust indenture, regardless of the existence of the deed of trust or mortgage lien on the properties, may contain any provisions prescribed by the Board of Directors for the security of the bonds and the preservation of the trust estate, and may make provision for amendment or modification thereof and the issuance of bonds to replace lost or mutilated bonds, and may condition the right to expend District money or sell District property upon approval of a registered professional engineer selected as provided therein, and may make provision for the investment of funds of the District. Any purchaser under a sale under the deed of trust lien, where one is given, shall be the absolute owner of the properties, facilities and rights so purchased and shall have the right to maintain and operate the same.

Bond elections

Sec. 9. (a) No bonds payable wholly or partially from ad valorem taxes (except refunding bonds) shall be issued unless authorized at an election at which only the qualified voters, who reside in the District and own taxable property therein and have duly rendered the same for taxation, are permitted to vote, unless a majority of such votes cast is in favor of the issuance of the bonds. Bonds not payable wholly or partially from ad valorem taxes may be issued without an election.

(b) Such bond elections may be called by the Board of Directors without a petition. The resolution calling the election shall specify the time and place or places of holding the same, the purpose for which the bonds are to be issued, the maximum amount thereof, the maximum interest rate, the maximum maturity thereof, the form of the ballot, and the presiding judge for each voting place. The presiding judge serving at each voting place shall appoint one (1) assistant judge and at least two (2) clerks to assist in holding such election. Notice of election for the issuance of bonds shall be given by publication of a substantial copy of the resolution calling the election in a newspaper of general circulation in the District once each week for at least four (4) consecutive weeks, the first publication to appear not less than twenty-eight (28) days prior to the date assigned for the election. The returns of the election shall be made to and canvassed by the Board of Directors of the District. Except as herein otherwise provided, the General Laws relating to elections shall be applicable. In the event a bond issue election fails, another bond election shall not be called for a period of six (6) months.

Bonds to be approved by the Attorney General of Texas

Sec. 10. After any bonds (including refunding bonds) are authorized by the District, such bonds and the record relating to their issuance shall be submitted to the Attorney General for his examination as to the validity thereof. Where such bonds recite that they are secured by a pledge of the proceeds of a contract theretofore made between the District and any city or other governmental agency, authority or district, a copy of such contract and the proceedings of the city or other governmental agency, authority or district authorizing such contract shall also be submitted to the Attorney General . If such bonds have been authorized and if such contracts have been made in accordance with the Constitution and laws of the State of Texas, he shall approve the bonds and such contracts and the bonds shall then be registered by the Comptroller of Public Accounts. Thereafter the bonds, and the contracts, if any, shall be valid and binding and shall be incontestable for any cause.

Taxes and tax elections authorized

Sec. 11. The Board of Directors may, upon a favorable majority vote of the qualified property taxpaying voters of the District, voting at an election held for the purpose within the boundaries of such District, levy, assess and collect annual taxes to provide funds necessary to construct or acquire, maintain and operate works, plants and facilities deemed essential or beneficial to the District and its purposes, and also when so authorized may levy, assess and collect annual taxes to provide funds adequate to defray the cost of the maintenance, operation and administration of the District. Elections for the levy of such taxes shall be ordered by the Board of Directors and notice thereof shall be given and same shall be held and conducted and the results thereof determined in the manner provided herein with relation to elections for the authorization of bonds. All taxes levied by the District for any purpose shall constitute a lien on the property against which levied and limitation shall not bar the enforcement or collection thereof. In calling an election for taxes under this Section 11, the Board of Directors shall specify the maximum rate of tax which is sought to be levied and no tax in excess of that amount may be levied without submitting the question of the increased rate of taxation at an election as provided.

Bonds eligible for investment and to secure deposits

Sec. 12. All bonds of the District shall be and are hereby declared to be legal and authorized investments for banks, savings banks, trust companies, building and loan associations, savings and loan associations, insurance companies, fiduciaries, trustees, and sinking funds of cities, towns and villages, counties, school districts, or other political subdivisions of the State of Texas, and for all public funds of the State of Texas or its agencies, including the State Permanent School Fund. Such bonds shall be eligible to secure deposit of any and all public funds of the State of Texas, and any and all public funds of cities, towns, villages, counties, school districts, or other political subdivisions or corporations of the State of Texas; and such bonds shall be lawful and sufficient security for said deposits to the extent of their value, when accompanied by all unmatured coupons appurtenant thereto.

District depository

Sec. 13. The Board of Directors shall designate one or more banks within the District to serve as depository for the funds of the District. All funds of the District shall be deposited in such depository bank or banks except that sufficient funds shall be remitted to the bank or banks of payment of principal of and interest on the outstanding bonds of the District and in time that such may be received by the said bank or banks of payment on or prior to the date of the maturity of such principal and interest so to be paid. To the extent that funds in the depository bank or banks are not insured by the Federal Deposit Insurance Corporation, they shall be secured in the manner provided by law for the security of county funds. Membership on the Board of Directors of an officer or director of a bank shall not disqualify such bank from being designated as depository.

District and bonds exempt from taxation

Sec. 14. The accomplishment of the purposes stated in this Act being for the benefit of the people of this State and for the improvement of their properties and the industries, the District in carrying out the purposes of this Act will be performing an essential public function under the Constitution and shall not be required to pay any tax or assessment on the project or any part hereof, and the bonds issued hereunder and their transfer and the income therefrom, including the profits made on the sale thereof, shall at all times be free from taxation within this State.

District authorized to enter into water supply contracts

Sec. 15. The District is authorized to enter into contracts with cities and others for supplying water services to them. The District may also contract with any city for the rental or leasing, or for the operation of such city's water production, water supply, water filtration, or purification and water supply facilities. Any such contract may be upon such terms, for such consideration and for such time as the parties may agree and it may provide that it shall continue in effect until bonds specified therein and any refunding bonds issued in lieu of such bonds are paid.

District empowered to acquire storage capacity in reservoirs

Sec. 16. The District is hereby empowered to lease or acquire rights in and to storage and storage capacity in any reservoir constructed or to be constructed by any persons, firm, corporation or public agency, or from the United States Government or any of its agencies. The District is also empowered to purchase or make contracts for the purchase of water or a water supply from any person or firm, corporation, or public agency, of from the United States Government or from any of its agencies.

District declared essential

Sec. 17. The Legislature hereby declares that the enactment hereof is in fulfillment of a duty conferred upon it by Section 59 of Article XVI of the Constitution of the State of Texas wherein it is required to pass such laws as may be appropriate in the preservation and conservation of the natural resources of the State; that the District herein created is essential to the accomplishment of such purposes and that this Act therefore operates on a subject in which the State and the public at large are interested. All the terms and provisions of this Act are to be liberally construed to effectuate the purposes herein set forth.

Savings clause

Sec. 18. Nothing in this Act shall be construed to violate any provisions of the Federal or State Constitutions and all acts done hereunder shall be done in such manner as may conform thereto whether herein expressly provided or not. Where any procedure hereunder may be held by any court to be violative of either of such Constitutions, the District shall have the power by resolution to provide an alternative procedure conformable to such Constitutions. If any provision of the Act shall be invalid, such fact shall not affect the creation of the District or the validity of any other provision of this Act, and the Legislature hereby declares that it would have created the District and enacted the valid provisions of this Act notwithstanding the invalidity of any other provision or provisions hereof.

Proper notice published and given

Sec. 19. It is hereby found and determined that in conformity with Article XVI, Section 59, of the Constitution of Texas (as amended in 1964) notice of the intention to introduce this bill setting forth the general substance of this contemplated bill and law has been published at least thirty (30) days and not more than ninety (90) days prior to the introduction of this bill in the Legislature in a newspaper or newspapers having general circulation in Franklin County and by delivering a copy of such notice and such bill to the Governor, who has submitted such notice and bill to the Texas Water Commission, which has filed its recommendations as to such bill with the Governor, Lieutenant Governor and Speaker of the House of Representatives within thirty (30) days from date notice was received by the Texas Water Commission. The evidence of the foregoing was exhibited in the Legislature before the passage of this Act. The time, form and manner of giving said notices and the performance of said acts as required by the Constitution are hereby found to be sufficient to comply with the Constitution and such notices and all acts in relation thereto are hereby approved and ratified.

Emergency measure

Sec. 20. The public importance of the purposes herein contemplated; the fact that material benefits and improvements will result to the territory embraced within the District by the enactment hereof; and the public importance to the State in expediting the development of conservation projects and facilities within said District create an emergency and an imperative public necessity that the Constitutional Rule requiring that bills be read on three separate days in each House be suspended, and said Rule is hereby suspended, and this Act shall take effect from and after its passage, and it is so enacted.

Passed by the House on May 20, 1965; Yeas 145, Nays 2;
Passed by the Senate on May 26, 1965; Yeas 31, Nays 0.
Approved June 19, 1965.
Effective June 19, 1965.

APPENDIX F

APPENDIX F
Water Conservation Plan, FCWD

Franklin County Water District, Water Conservation and Drought Contingency Plan, December 1996.

Regional Wastewater Plan, Franklin County Water District, Franklin County, Texas, 24 x 36 map

Franklin County Water District
WATER CONSERVATION
AND
DROUGHT CONTINGENCY PLAN
December 1996

By
Hayter Engineering, Inc.

TABLE OF CONTENTS

Franklin County Water District
WATER CONSERVATION
AND
DROUGHT CONTINGENCY PLAN

I. GENERAL INFORMATION

A. Purpose

A water conservation and drought contingency plan is required of the Franklin County Water District (the District) by the Texas Natural Resource Conservation Commission (TNRCC). This plan is necessary in order to revise the allocation of the District's water rights in Lake Cypress Springs. This document provides a specific conservation and drought contingency plan that meets the TNRCC's requirements for wholesale water suppliers.

B. Background Information

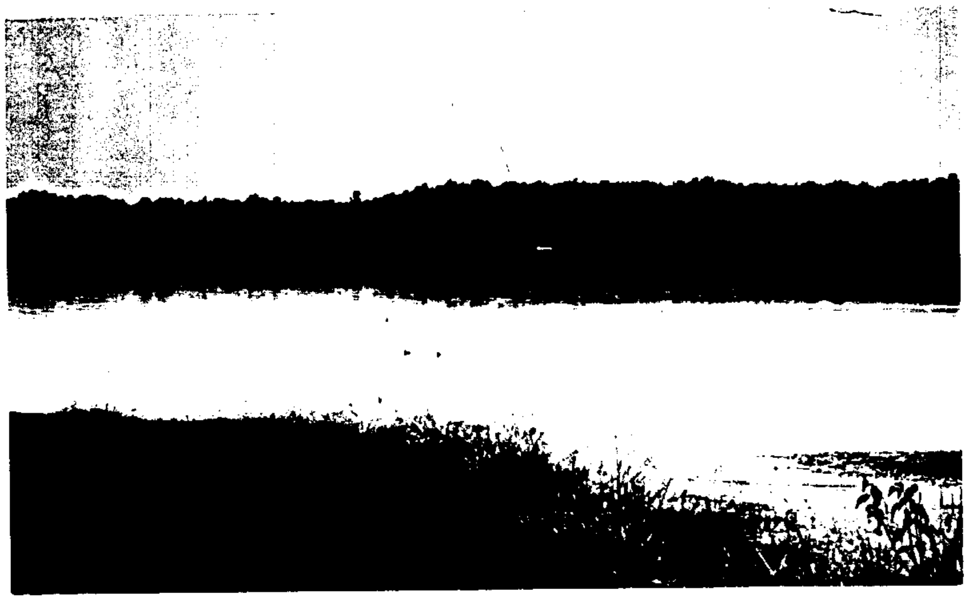
The District is a conservation and reclamation district and a political subdivision of the State of Texas. It encompasses all of Franklin County (a vicinity map showing the District's location is included as Figure 1 in the Appendix). It was created to develop Lake Cypress Springs and to administer the water stored therein, recreational uses of the reservoir, and certain lands adjacent to the reservoir. Today, it acts as a wholesale water supplier, which owns and operates the Lake and its adjacent land.

Lake Cypress Springs is a spring fed reservoir located on Cypress Creek. The reservoir and dam were completed in February of 1971. The Reservoir has a service capacity of 72,800 acre-feet over an area of 3,400 acres at an elevation of 378 feet above mean sea level (M.S.L.). It has an emergency capacity of 100,400 acre-feet over an area of 4,500 acres at an elevation of 385 feet above M.S.L.

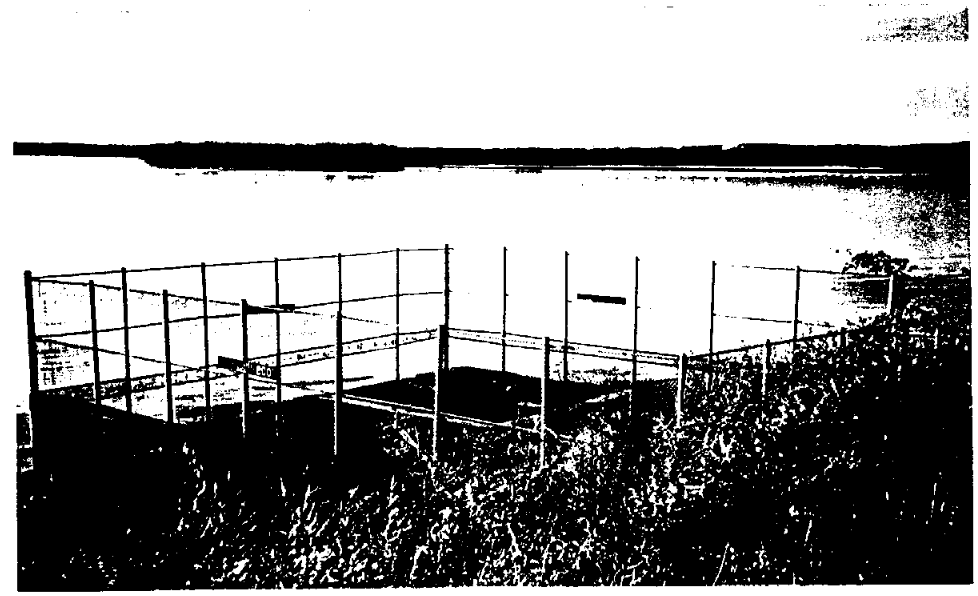
At present, the District is authorized to divert and use a maximum of 15,300 acre-feet per year as a raw water supply. This volume of water is currently designated for the following purposes:

Municipal	*9,300 acre-feet*
Industrial	*5,940 acre-feet*
Irrigation	*60 acre-feet*
TOTAL	*15,300 acre-feet*

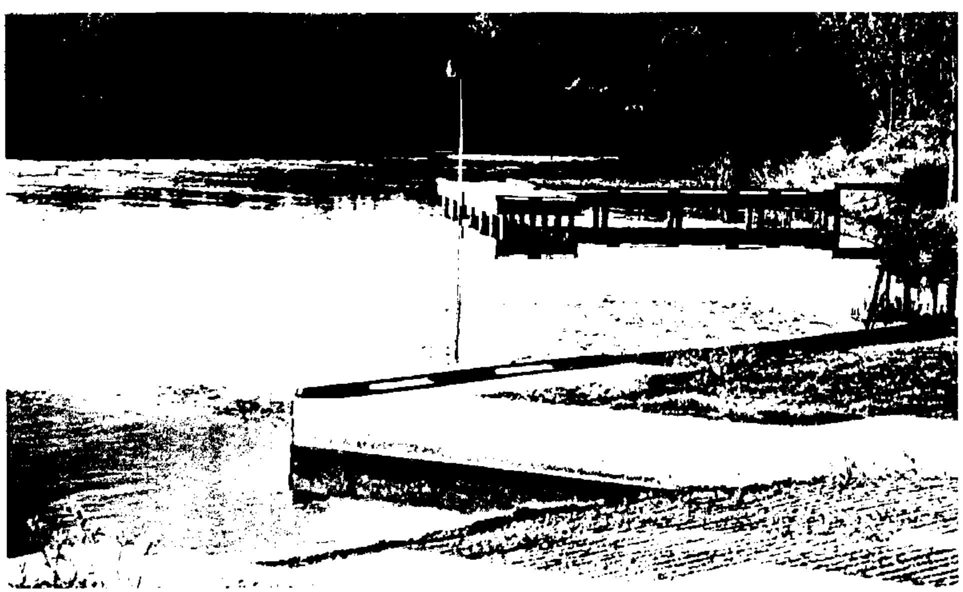
LAKE CYPRESS SPRINGS
Franklin County, Texas



View of Lake from Shoreline



23'x23' "Morning Glory" Intake Strucure



Boat Ramp and Dock

F.M.115 Bridge

Water is withdrawn from the lake for these purposes through five raw water intake structures located on the lake. These structures are owned and maintained by the District's individual customers, and pictures of these structures are included as Exhibit I in the Appendix.

The District has the following four customers: City of Mount Vernon, City of Winnsboro, Cypress Springs W.S.C. (formerly South Franklin W.S.C.), and M&W Recreational Facility. Each customer has executed a Water Purchase Contract with the District. Included in the Appendix as Exhibit II A-D are copies of each contract.

C. Service Area and Customer Data

The District is a raw water supplier only, it does not supply treated water. However, it does own and operate lands adjacent to the Lake. The residents have long term (99-year) leases and pay the District annually. Though the District does not supply these residents water, it does inspect and issue permits for any construction on these properties as well as operate and maintain the amenities (parks, campgrounds, boat ramps, etc.) surrounding the lake. The District has direct contact with these residents and visitors to the lake (through billing, permitting, rentals, etc.) which can allow them to influence water conservation.

In addition, the District can encourage water conservation within the service area of each wholesale customer. Included as Figure 2 in the Appendix is a map distinguishing the service areas of the District's four customers. The following is information on the service area for each customer including area and population data, water use data, water supply system data, and wastewater data (if applicable).

City of Mount Vernon

The service area includes the city limits of Mount Vernon and selective parts of the city's extra territorial jurisdiction, and covers an area of approximately 3.5 square miles. Mount Vernon also provides wholesale treated water to the North Franklin Water Supply Corporation (NFWSC) and Cypress Springs Water Supply Corporation (CSWSC).

The current population of the Mount Vernon service area is 2,219 while the current population served water by Mount Vernon (including NFWSC and a portion of CSWSC) is 3,138. The source cited for current population data is the 1990 Census.

The active connections by user type are as follows: 870 residential, 145 commercial, eight public, and eight listed as others. The city has averaged approximately 185,100,000 gallons of water per year diverted and/or pumped over the last five years (1991-1995) with a total of 190,200,000 gallons for 1995. This historical water use data was calculated by observing the city's master meter which is located at a point of diversion at the city's raw water intake. The city's raw water intake is located on the north side of the lake on the east side of F.M. 115.

The City is supplied entirely from surface water out of Lake Cypress Springs. Mount Vernon's current contract with the District makes available 3,000 acre-feet of water for municipal purposes. The length of this contract is through the year 2024. The city currently operates water treatment facilities with a capacity of 1.44 million gallons per day (MGD). The city has the following water storage facilities:

500,000 gallons	*Ground Storage Tank*
300,000 gallons	*Elevated Storage Tank*

Mount Vernon also operates wastewater treatment facilities with a capacity of 245,000 gallons per day (GPD). The plant is operated by the city under TNRCC Permit #11122-022. The wastewater treatment facilities consist of an activated sludge plant, which discharges its effluent into Town Branch Creek, in the Sulphur River Basin.

City of Winnsboro

The service area includes the city limits of Winnsboro and covers approximately four square miles.

The current population of the service area and the population served water by the city is 2,904. The source of the population information is a 1991 Community Development and Master Plan developed by Tim F. Glendening & Associates and Brannon Corporation, Consulting Engineers and Planners.

The active connections by user type are as follows: 1,314 residential, 272 commercial, one industrial, and two listed as other. The city has averaged approximately 191,900,000 gallons of water per year diverted and/or pumped over the last five years (1991-1995) with a total of 199,300,000 gallons in 1995. The historical water use data was calculated by observing the city's master meter which is located at a point of diversion at the city's raw water intake. Winnsboro's intake structure is located on the south side of the lake, to the west of F.M. 115.

Winnsboro is also supplied entirely by surface water from the lake and currently is under contract with the District for a maximum of 5,000 acre-feet of water. The City's current contract with the District is valid until the year 2039. Winnsboro operates a 1.5 MGD water treatment plant. They also have a one million gallon ground storage tank, a 350,000 gallon elevated storage tank and a 500,000 gallon ground storage tank that will be restored and placed back into service later this year.

Winnsboro has wastewater treatment facilities with a capacity of 1.12 MGD. This plant is operated by the City of Winnsboro under TNRCC Permit #10319-002. It is an activated sludge plant with the treated effluent discharging into Indian Creek, thence to Big Sandy Creek in Segment #0514 of the Sabine River Basin.

Cypress Springs W.S.C.

The service area includes the portion of Franklin County south of Mount Vernon and north of Winnsboro (including Lake Cypress Springs) and incorporates a portion of Hopkins County along FM 3019 and FM 900, near the Greenwood Community. The Corporation serves an approximate 150 square mile area.

The current population is estimated at approximately 5,940 people based upon 2,713 active connections (meters). There are approximately 2,700 residential meters, 10 commercial meters, one industrial meter and two meters listed as others.

The Corporation obtains its water supply primarily from surface water from Lake Cypress Springs and supplements that with groundwater from a number of low-yielding wells in the Carrizo-Wilcox aquifer. The corporation's current contract with the District allows for a maximum of 3,500 acre-ft of surface water from the lake. This contract is valid through the year 2034.

The corporation currently has two raw water intakes in the lake and they are located on opposite sides of the lake (north and south). The intake on the north side of the lake is located east of F.M. 115 and supplies the corporation's users in the northern part of its service area. The intake on the south side of the lake is located west of F.M. 115 and supplies the corporation's users in the southern part of its service area.

The corporation has averaged 236,338,000 gallons of water per year diverted and/or pumped from Lake Cypress Springs and 14,355,600 gallons of water per year from their groundwater wells over the last five years (1991-1995) with a total of 248,099,100 and 11,122,900 gallons per year for surface water and ground water respectively.

The capacity of the water system is 1.985 MGD including 525,000 GPD from existing wells and 1.46 MGD from the corporation's water treatment plants. The corporation has two water treatment plants. The treatment plant for the northern part of the corporation's service area has a capacity of 860,000 GPD. and the plant serving the southern area has a capacity of 600,000 GPD. The corporation has the following water storage capacities:

720,000 Gallons	*Ground Storage Tanks*
225,000 Gallons	*Stand Pipes*

The corporation does not provide wastewater service.

M&W Recreational Facility

M&W Recreational Facility operates a country club and a golf course on the southern shore of Lake Cypress Springs, on property it leases long-term from the District. The water M&W purchases is primarily for irrigation of the golf course.

The facility has averaged approximately 15,700,000 gallons of water per year diverted and/or pumped over the last five years (1991-1995) with a total of 17,900,000 gallons in 1995. The historical water use data was calculated by observing the facility's meter which is located at a point of diversion at the facility's raw water intake structure. The intake structure is located on the south side of the lake, west of F.M. 115.

D. Goals

The District's conservation goals are to encourage and/or require all users of its water supply to practice water conservation; to preserve the quality of its water supply; and to maximize the yield of the lake by proper maintenance and administration.

II. WATER CONSERVATION PLAN

The objective of this water conservation plan is to reduce the quantity required for each specific water use, where practical, through implementation of efficient water use practices. Though the District does not have direct control over its customers' retail users, many conservation techniques can be encouraged, or in some cases, required. The District will recommend that existing, and require that new customers, adopt water conservation and drought contingency plans that follow state guidelines. Two of the District's customers, the City of Winnsboro and the Cypress Springs W.S.C., have already adopted plans. The following is the District's plan:

A. Information / Education

The District will promote water conservation by providing educational information about the many different ways to conserve water. As mentioned before, the District owns and leases the property adjacent to the lake. These properties are served water by CSWSC. However, lease payments, septic tank permits, building permits, and other various permits are administered by the District. Therefore, the District can include water conservation information in its correspondence with residents surrounding the lake.

Specifically, the District will:

1. Distribute a fact sheet explaining this newly adopted *Water Conservation and Drought Contingency Plan* to each wholesale customer.

2. Each spring, the District will encourage its wholesale customers to distribute educational materials to their retail customers Distribution of educational material should be made annually, timed to correspond with the peak summer demand period. Educational material is available from the American Water Works Association (AWWA), Texas Water Development Board (TWDB), and other similar associations. A list of current materials available is included in the Appendix as Exhibit III. These materials can be attained from:

   Texas Water Development Board
   P.O. Box 13231, Capitol Station
   Austin, Texas 78711-3231

3. An article promoting water conservation will be published in the local newspaper annually.

4. Educational materials concerning water conservation will be made

available in the District's office for people applying for leases, permits and similar business.

B. Plumbing Codes

The District will recommend that individuals applying for building and septic tank permits to install water conserving plumbing fixtures for new construction or when replacing existing fixtures. The District has adopted the TNRCC's on-site system construction standards, and inspects and permits all leased properties surrounding the lake.

In addition, the District will encourage its wholesale water customers to recommend or require their users to install water conserving plumbing fixtures.

The District will make available in its office, information for plumbers, customers, and others regarding water conserving retrofit equipment.

C. Water Rate Structure

The District charges a constant rate (per acre-foot) for water sales to its customers. The District will recommend that its wholesale customers implement a water rate structure which encourages water conservation through either a constant rate or a increasing block rate structure, and will discourage declining block rates.

D. Metering

The District requires that all wholesale water be metered. The District periodically reads the water meters maintained by its four customers and bills them on a monthly basis. Within each of the water purchase contracts between the District and its customers, are requirements for maintenance and accuracy (2%) of the meters. The meters will be calibrated at least every three years.

In addition, the District will recommend to its wholesale customers that they meter 100% of their water sales, track water loss rates, and implement or continue an aggressive maintenance schedule for all of their metering equipment and distribution piping. Each wholesale customer will be encouraged to test and repair its retail meters on a regular basis.

E. Erosion Control and Water Conservation Landscaping

The District recommends the use of erosion control, such as rip-rap, when construction takes place along the lake front. The District can require this during the permit process. By protecting the shores of the lake, the District can maintain the lake's aesthetic quality, while maximizing its water yield.

The District will also recommend that each of its wholesale customers encourage water saving practices in the installation of landscaping by their retail customers. The following examples are methods that can be used and/or included in customer conservation plans:

1. Choose low water using plants and grasses.

2. Install efficient irrigation systems.

3. Utilize drip irrigation, where practical.

F. Pollution Protection and Leak Detection

The District uses the following methods to protect the lake against pollution:

1. The District samples water periodically for water quality testing (testing done by TNRCC).
2. The District employs licenced peace officers to patrol lake looking for sources of pollution (such as oil leaks, septic failures, and litter).
3. The District inspects and permits all on-site wastewater disposal systems.

The District will also recommend that each wholesale customer create or continue a leak detection and repair program. The following are suggested components of a successful and efficient leak detection and repair program.

1. Utilize appropriate leak detection techniques.
    a. Constantly monitor facilities to identify any major water main break.
    b. Constantly watch out for abnormal conditions when visually inspecting water meters.

2. Keep a monthly account of water delivery efficiencies ("loss" rate).

3. Pay close attention to monthly water-use accounting to identify any abnormal excessive water quantities.

4. Employ an adequate maintenance staff which is available to repair leaks quickly and efficiently.

G. Contracts with Wholesale Customers and Other Political Entities

The District will require, through contractual agreement, that other entities contracting to purchase raw water from the District will either 1) adopt appropriate provisions for water conservation and drought management from this plan, or 2) have a plan in place that has been approved by the Texas Water Development Board. This requirement will be effective for new water purchase contracts, and for existing contracts at the time they are renewed. Furthermore, the contract will require that each successive customer in the resale of the water will implement water conservation measures in accordance with this plan or other approved plans. This is a TNRCC requirement for wholesale water suppliers.

III. DROUGHT CONTINGENCY PLAN

A. Introduction

Drought and other uncontrollable circumstances can disrupt the normal availability of a raw water supply. Regardless of the adequacy of any water supply, the supply could become contaminated or a natural disaster could destroy the supply. During drought periods, consumer demand is typically higher than under normal conditions. Therefore, it is important to be prepared for a drought situation or supply disruption emergency.

A drought contingency plan is distinctly different from a water conservation plan. While water conservation involves implementing permanent efficient water use and reuse practices, drought contingency plans establish temporary methods or techniques designed to be used only as long as the emergency exists.

A drought contingency plan for a treated water supplier differs from a plan for a raw water supplier. The following plan is for the District (a raw water supplier) but also includes information which may be used by a wholesale customer (treated water suppliers) to create their own drought contingency plan.

B. Information / Education

As a component of the Information / Education section in the Water Conservation Plan, the purpose and effect of the Drought Contingency Plan should be communicated to each of the District's customers.

Examples of methods for a treated water supplier to convey drought contingency information to its users are as follows:
1. a fact sheet
2. a newspaper article
3. supplying new customers with educational information

C. Trigger Conditions

Trigger conditions are those conditions that identify a period of drought. For a surface water supplier like the District, the level of the lake is what distinguishes the severity of the drought.

The District has historical lake elevation data. Included as Exhibit IV in the Appendix is a tabulation of the lake level readings (at least once a week) for the last five years.

The District's water supply can also be affected by levels in down-stream reservoirs. The District is required by the Cypress Basin Operating Agreement to release enough water to avoid adverse effects on the down stream water rights of prior users (specifically Lake of the Pines). A copy of this agreement is included in the Appendix as Exhibit V. While a release for this purpose has never occurred, it must be recognized that the possibility exists and that it would very likely have a significant impact on the level in Cypress Springs.

The District will initiate drought contingency measures upon occurrences of the following conditions:

Mild Conditions:

When the lake elevation is 2 feet below the 23 by 23 foot rectangular drop inlet (morning glory - elev. 378 feet above M.S.L.) located near the dam. A picture of this intake structure is included on the top right of the cover sheet of this document. The storage capacity at this water level is approximately 66,000 acre-feet which is just over 90% of the normal capacity at 378 feet above M.S.L.

Moderate Conditions:

When the lake elevation is 5 feet below the 23 by 23 foot rectangular drop inlet (morning glory - elev. 378 feet above M.S.L.) located near the dam. At this depth, the pumps at CSWSC's intake structure on the south side of the lake will begin to be exposed. The storage capacity at this water level is approximately 56,000 acre-feet which is just over 75% of normal capacity.

Severe Conditions:

When the lake elevation is 8 feet below the 23 foot by 23 foot rectangular drop inlet (morning glory - elev. 378 feet above M.S.L.) located near the dam. This water level is the design minimum lake level. The storage capacity at this level is approximately 48,000 acre-feet which is just over 65% of normal capacity.

Trigger conditions for a treated water supplier may be different. They will depend on the amount of water a supplier can treat and deliver. A treated water supplier's treatment capacity is generally a much smaller quantity of water than their contracted water supply volume. Therefore, a treated water supplier's trigger conditions will depend on their treatment, and storage and delivery capacities.

D. Notification Procedures

When trigger conditions appear to be approaching, the District will notify the public with articles in local newspapers (Mount Vernon and Winnsboro). Each wholesale customer will be notified in writing, by mail.

When trigger conditions are reached, the District will notify each wholesale customer that drought contingency measures are necessary, and specify the measures to be taken.

E. Emergency Management Program

The District will direct its customers to take necessary actions when trigger conditions are reached. The following are specific actions that will be taken if trigger conditions are met. They are divided into recommended actions for mild, moderate and severe drought conditions.

Mild Conditions

The District will direct that its wholesale customers do the following:

1. Inform the public through news media that users should look for ways to voluntarily reduce water use. Specific steps should be outlined for users to take.

2. Notify major commercial and industrial water users and request voluntary water reductions.

Moderate Conditions

The District will direct that its wholesale customers do the following:

1. Require that all nonessential water use be prohibited.

2. Implement mandatory lawn watering schedule. For example, only allow watering during 6:00 a.m. to 10:00 a.m. and 8:00 p.m. to 10:00 p.m.

3. Prohibit car washing, except with a bucket.

4. Prohibit the following public water uses, not essential for public health or safety:

    a. Street washing
    b. Water hydrant flushing
    c. Athletic field watering

Severe Conditions

The District will ration water supplies. The Water Purchase Contracts between the District and its customers all stipulate that if there is insufficient availability of water to meet the Districts contractual agreement, the water available will be rationed on a pro rata basis to the District's customers. Water will be available for the following uses in order of priority:

1. Municipal
2. Commercial
3. Industrial

APPENDIX

The District will require that its wholesale customers implement the following:

1. Ban all outdoor water use.
2. Set limits on both commercial and residential users.
3. Establish monetary fines for exceeding water use limits or violation of drought contingency plan. Notify all customers of penalties.
4. Establish water service termination procedures for violators of the drought plan.

F. Termination of Drought Contingency Measures

When a particular drought condition no longer exists, the implementation and enforcement of the measures advocated by the Emergency Management Program for that particular drought condition shall cease and the public shall be notified in the same manner in which was used to implement the measures. The emergency will be deemed to end at such time as the lake rises to within two feet of the service spillway crest.

IV. IMPLEMENTATION AND ENFORCEMENT

As mentioned in previous sections of this plan, the District has direct control only of inspecting and permitting the property it leases around the lake. The legal basis by which the District can enforce water conservation by its customers and their users is to contractually obligate each successive user to use water conservation techniques or adopt water conservation plans. By requiring the wholesale customer to adopt a water conservation plan, the District can indirectly conserve their water supply.

The administrator of this plan will be the District's General Manager.

Included in the Appendix as Exhibit VI is a checklist of needed information to help District customers prepare their own water conservation and drought contingency plans.

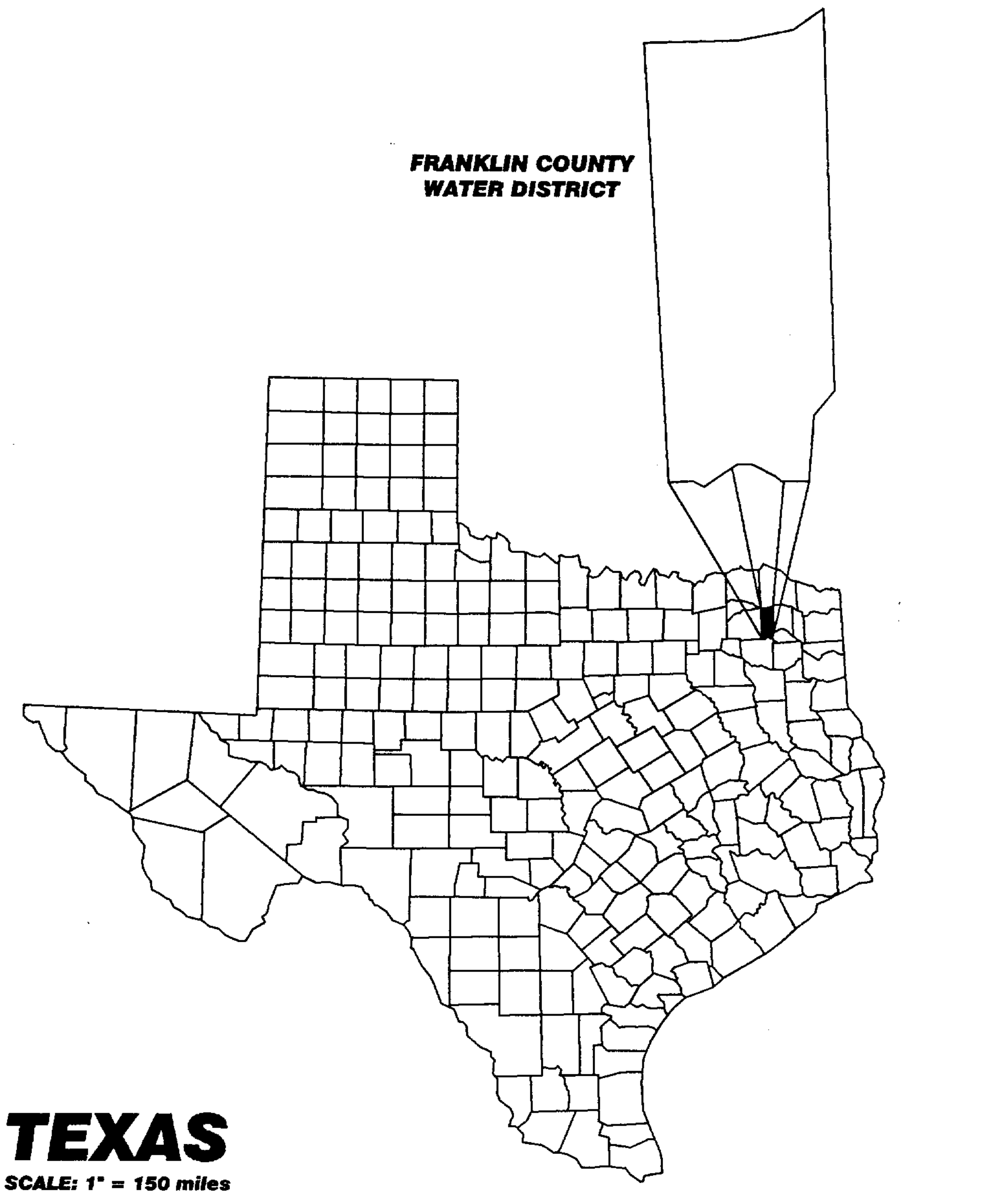


FIGURE 1
VICINITY MAP
FRANKLIN COUNTY
WATER DISTRICT

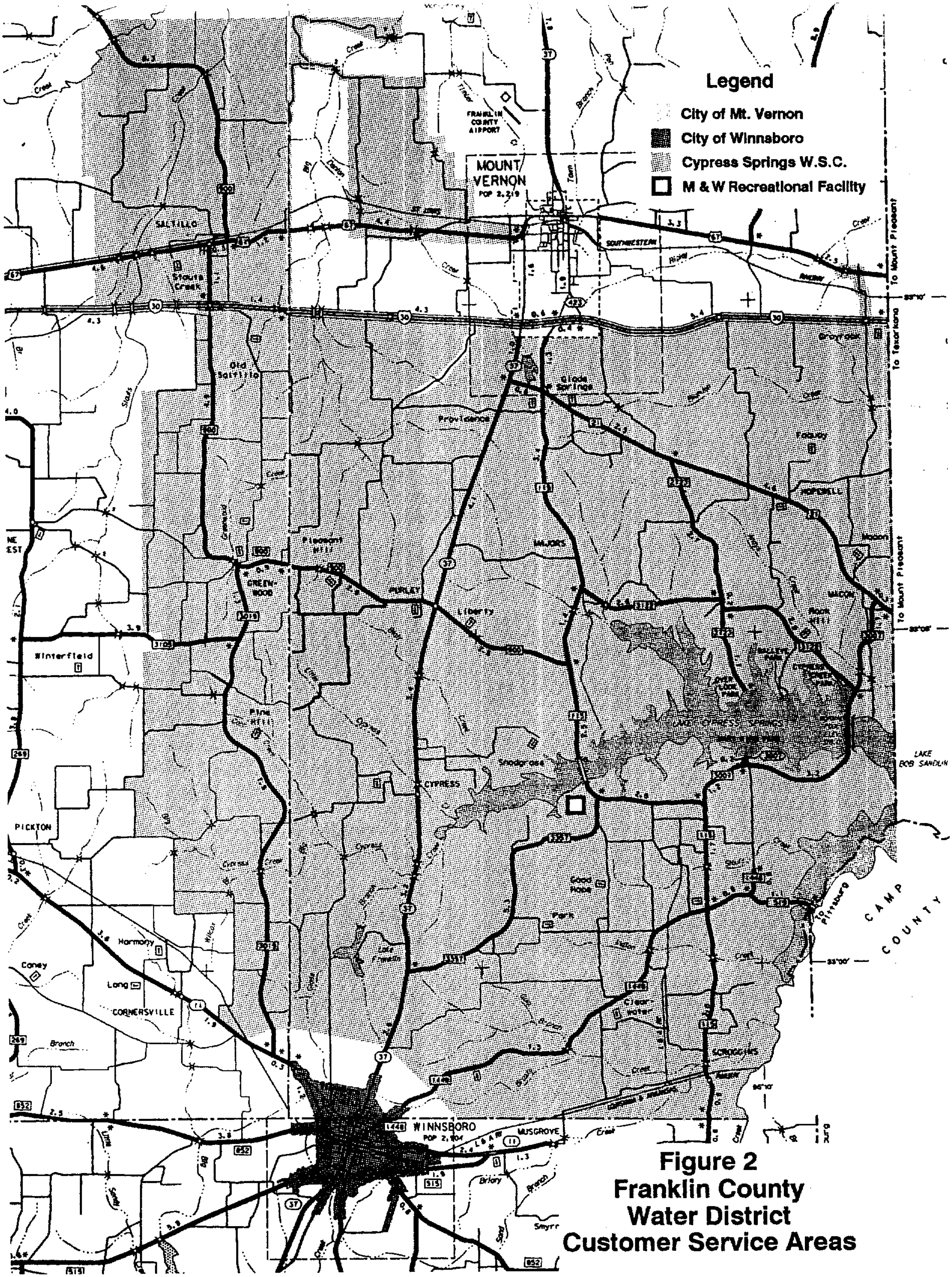
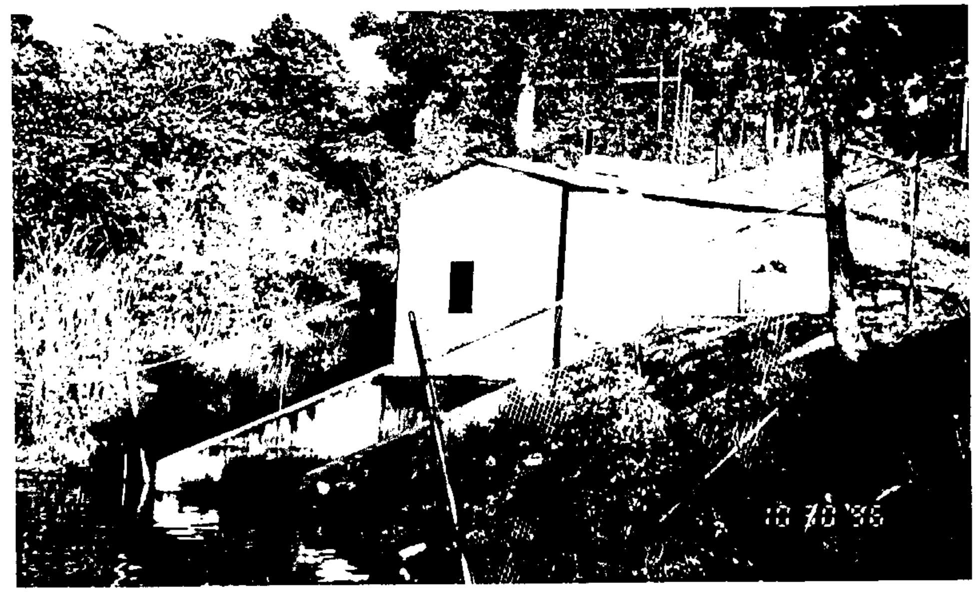


Figure 2
Franklin County
Water District
Customer Service Areas

EXHIBIT I - RAW WATER INTAKE STRUCTURES

Mount Vernon and Cypress Springs WSC (North)



Winnsboro

Cypress Springs WSC (South)

M&W Rec. Facility

EXHIBIT II-A

WATER PURCHASE CONTRACT

STATE OF TEXAS
COUNTY OF FRANKLIN

This Water Purchase Contract is entered into as of the 15th day of APRIL, 1996, by and between Franklin County Water District, a conservation and reclamation district and a political subdivision of the State of Texas (the "District"), and the City of Mount Vernon, Texas, a municipal corporation of said State (the "City").

WHEREAS, the District and the Texas Water Development Board hold appropriative permit number 2231 and City holds contractual permit number CP-182A;

WHEREAS, City has identified a need to obtain additional amount of water in order to provide sufficient amounts of water for its existing and future demands; and

IT IS HEREBY MUTUALLY AGREED AND UNDERSTOOD AS FOLLOWS:

NOW, THEREFORE, in consideration of the premises and the mutual covenants and conditions hereinafter set forth, the City and the District agree as follows:

1. (Sale of Water) From and after the date of execution hereof, the City shall have the right to withdraw the hereinafter described quantities of raw water from the Lake Cypress Springs, Franklin County, Texas (the "Lake") at the "point of delivery" as defined herein and is to furnish and bear all expenses and all liability for pumping facilities and metering equipment. The City has taken such action as it has deemed appropriate with regard to the quality of the water proposed to be purchased and is satisfied with same. The District makes no representation as to the present or future quality of the water and the same shall be purchased in its then existing condition; but District agrees that it will enforce its regulations and will notify the City of any change in its "Land Use and Recreation Plan" which might adversely affect the quality of the water. During each of the years set forth below, the City agrees to take and pay for (or pay for, whether taken or not), the quantities of water per calendar year which are set forth below in Column "A". "Optional Water", as set forth in Column

"B", shall be defined as that water in excess of the take or pay amount for the then effective Level which would determine a plateau to be exceeded for a period of three years before obligating the City to advance to the next Level.

Level	Year	COLUMN "A" (Acre Feet of Water For Which Payment Must Be Made)	COLUMN "B" ("Optional Water" In Acre Feet)
ONE	1984-1985	450	200
TWO	1986-1990	450	375
THREE	1991-1995	500	425
FOUR	1996-2000	550	2450
FIVE	2001-2005	600	2400
SIX	2006-2010	700	2300
SEVEN	2011-2015	800	2200
EIGHT	2016-2020	900	2100
NINE	2221-2025	1000	2000

Notwithstanding the amounts set forth above, the City may at any time during the term hereof (provided that the City has not waived its rights to purchase additional quantities of water by failing to meet the minimum take or pay purchase requirement) purchase up to 3,000 acre feet of water during any single calendar year.

In the event that the City shall elect to purchase, during each of any three calendar years, a quantity of water in excess of the aggregate of the minimum "take or pay quantity" set forth in Column "A" above and the "Optional Water" set forth in Column "B" above for the "Level" at which the City is at that time purchasing water, the City shall be deemed to have elected to have progressed to the corresponding "Level" set forth on the above chart; and in such event the City shall during each of the remaining years of the Contract be obligated to take or pay for the quantity of water set forth in Column "A" for the appropriate "Level" for which such election has been made. (For example, if in the years 1986, 1987, and 1988, the City purchases at least

550 acre feet of water per year but less than 600 acre feet of water per year, the City shall be deemed to have elected to thereafter purchase Level "FOUR" for each of the calendar years then remaining during the term of this Contract. The City then shall, in such event, be obligated to purchase at least 550 acre feet of water during each of the remaining calendar years under this Contract. Continuing such example, if the City shall elect during each of any three calendar years to purchase more than 1,100 acre feet of water, it shall be deemed to have elected to thereafter purchase water at Level "FIVE" and it shall thereafter be obligated to take or pay for at least 600 but no more than 700 acre feet of water during each of the remaining calendar years throughout the term of this Contract.) The City of Mount Vernon shall pay three dollars per acre foot per year for each acre foot of 3,000 acre feet not taken. The City of Mount Vernon shall have the right to take as much as 3,000 acre feet per year. The City of Mount Vernon shall pay annually an amount equal to three dollars multiplied by the difference between 3,000 acre feet and the amount actually taken.

In addition to the above requirement, the City must also in order to progress from a lower Level to a higher Level for the purchase of water, provided to the District written notice of such election at least 12 but not more than 15 months prior to the effective calendar year thereof.

2. (Billing Procedure) The City shall furnish to the District at its office (at its current address of P. O. Box 559, Mount Vernon, Texas 75457 or at such other address as the District shall in writing specify) not later than the 10th day of each month after the effective date of this Contract an itemized statement of the amounts of water taken by the City each month. On the same day the City shall pay the District 1/12th of the annual take or pay amount then in effect for the calendar year in question and at the end of the Corporation's fiscal year, the City shall pay the District the remaining sum owing District for water used over the take-or-pay amounts.

3. (Price) The price of water to be sold hereunder, through September 30, 1996, shall be $25.00 per acre foot for the

amounts of water set in Level "Two" Column "A" and Column "B" above; however, the price of water to be sold hereunder on October 1, 1996, shall be $35.00 per acre foot. The District also reserves the right to elect to modify the price of the water at any time when the price of water has been in effect for five years or longer. The price of water may be adjusted several times during the duration of this contract. The price of water shall be determined in a nondiscriminatory manner by the Board of Directors of the District, subject to the rate making and review powers of the Texas Department of Water Resources.

4. (Point of Delivery) City shall have the right to withdraw raw water from the Lake at a point bearing North 27 deg. 25 min. West, 1,394 feet from the southeast corner of the J. C. Miller Survey, Abst. No. 311, Franklin County, Texas, approximately 9.1 miles south of Mount Vernon, Texas.

5. (Pump and Measurement of Water) The City at its expense shall install and maintain (a) an appropriate intake structure and (b) such ancillary equipment as is needed, including but not limited to such meters and recording devices as are approved by the District, such meters to permit accurate determination of quantities of raw water to be withdrawn hereunder in units of 1,000 gallons. The City will maintain all meters in accurate operating condition and shall recalibrate, at its expense, all metering equipment at 3-year intervals or when required by District. A meter registering not more than two percent (2%) above or below the test result shall be deemed to be accurate. The previous readings of any meter disclosed by test to be incorrect shall be corrected for the six months previous to such test in accordance with the percentage of inaccuracy found by such test.

If a meter fails to register for any period, the amount of water deemed to have been taken by the City shall be not less than the greater of the amount delivered in the corresponding period (a) immediately prior to the failure or (b) in the preceding year, unless the District and City shall agree upon a different amount. Should a malfunction be found in metering equipment at any time, the City shall have said metering equipment repaired with due diligence.

6. (Term) The terms of this Contract shall be from the date of execution through December 31, 2024, and thereafter may be renewed or extended upon such terms and conditions as may be agreed upon by the parties, unless same is terminated sooner by District as otherwise provided in this Contract.

7. (Termination) In the event that the City shall fail to make any payment required by this Contract or shall otherwise be in material breach hereunder for a period of 90 days following written notice by the District of such breach, the District may terminate this Contract and all rights of the City hereunder or avail itself of such other remedies to which it may be entitled by law.

8. (Regulatory Agencies) This Contract is subject to such rules, regulations, or laws as may be applicable to similar agreements in the State of Texas. The parties agree to collaborate in the filing of a copy of this water purchase contract along with any appropriate application with the Texas Natural Conservation Commission immediately. Purchaser understands and agrees that no amounts of water not previously permitted shall be withdrawn under this Contract if any applicable governmental entity shall refuse or fail to provide any necessary consent or approval. This Contract is also contingent upon the approval of the Texas Water Development Board.

9. (Availability of Water) The District hereby represents to the City that it has been advised that it should have sufficient water in the Lake to permit it to comply with the terms of this Contract and the City has made such investigation of such facts as it has deemed necessary to assure itself of the District's ability to comply herewith. In the event that sufficient water may not be available for the District to comply with the terms of this Contract, (i) the minimum take or pay quantities under the terms hereof shall be suspended or reduced during the times at which the District cannot comply and the District shall have no additional liability therefor; (ii) to the extent that the District has not heretofore obligated itself to

do otherwise, the District will allocate the available water among its customers on a pro rata basis. District makes no guaranty that water will be available at any particular time or place or that said Lake will be retained at any specific level at any particular time.

10. (Indemnity) The City hereby agrees to indemnify and hold harmless the District from any and all claims or demands whatsoever by reason of any injury to person or property or otherwise resulting from or in any way connected with (a) any and all actions and activities (or failure to act) of the City hereunder, (b) any purchases or uses of the water by the City or its customers, (c) any failure of the City to adequately treat or inspect the water and (d) the construction, installation, maintenance, or operation of the Corporation's intake, pumping, and other facilities.

11. (Severability, Successors, etc.) In the event any provision of this Agreement shall be held to be invalid or unenforceable, the remaining provisions shall be valid. A waiver by either party of any provision, term, condition or covenant hereof shall not be construed as a waiver of a subsequent breach of the enforcement thereof by the other party. The successors and assigns of each party shall be bound to the terms of this Agreement. This Agreement may not be assigned in whole or in part for any purpose by either party without the written consent of the other party.

12. (Interest of Texas Water Development Board) It is hereby acknowledged by and between the parties hereto that the Permit, which authorizes the impoundment of Lake Cypress Springs and the diversion and use of a specified quantity of water therefrom, is owned jointly by the District and the Texas Water Development Board (the "Board"). The relationship between the District and the Board is controlled by a Master Agreement relating to the respective interests in the project which includes certain provisions relating to the purchase of the undivided interest of the Board in the Permit by the District. As of the date hereof, the District owns approximately a sixty and fifty-eight one-hundredths (60.58%) percent undivided

interest in and to the Permit. It is acknowledged that, if the City exercises its options to acquire additional quantities of water under this Contract, such quantities of water could exceed the District's existing undivided interest in the Permit. It is anticipated that the escalating levels of the quantities of water to be taken by the City under this Contract will not cause the total amount of water to exceed the District's then undivided ownership in the Permit. However, in consideration of the foregoing, it is further agreed that, in the event the City shall desire to exercise any option to purchase additional quantities of water as provided in this Contract and the exercise of such option would cause the District to be contractually liable to furnish to the City and the other present customers (set forth below) of the District a total amount of water per year which exceeds the District's then existing undivided ownership interest in and to the total quantity of water appropriated under the Permit, then before such option may be exercised by the City, the District shall contract with the Board to buy at least a portion of the Board's remaining undivided ownership interest in the Permit sufficient to satisfy the District's total contractual obligations to the City and the other present customers of the District after the exercise of such option. The other present customers of the District as of the date hereof are the City of Winnsboro, Texas, the South Franklin Water Supply Corporation, and M & W Recreational Facility, Inc.

IN WITNESS WHEREOF, the parties hereto, acting under authority of their respective governing bodies, have caused this Water Purchase Contract to be duly executed in four (4) counterparts, each of which shall constitute an original on this 15th day of APRIL, 1996.

FRANKLIN COUNTY WATER DISTRICT

By: KENNETH JAGGERS, President

ATTEST:

BILLY M. JORDAN, Secretary

CITY OF MOUNT VERNON, TEXAS

By: MICHAEL L. EDWARDS, Mayor

ATTEST:

CHERRY ONLEY, City Secretary

(Acknowledgments)

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 15th day of APRIL, 1996, by Kenneth Jaggers, President of the Board of Directors of the Franklin County Water District.

SHIRLEY MAPLES
NOTARY PUBLIC
STATE OF TEXAS
Comm. Expires 4-18-97

NOTARY PUBLIC, State of Texas
Notary's name (printed):

My commission expires:

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 23rd day of February, 1996, by Michael L. Edwards, Mayor of the City of Mount Vernon, Texas.

CHARLOTTE K. ROGERS
NOTARY PUBLIC
State of Texas
Comm. Exp 02-16-2000

NOTARY PUBLIC, State of Texas
Notary's name (printed):
Charlotte K. Rogers
Notary's commission expires: 02-16-2000

EXHIBIT II-B

WATER PURCHASE CONTRACT

THE STATE OF TEXAS

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF FRANKLIN

This Contract for the sale and purchase of water is entered into as of the 12th day of March, 1996, between the Franklin County Water District a conservation and reclamation district and a political subdivision of the State of Texas (the "District") and the City of Winnsboro, a municipal corporation of said State (the "City").

WITNESSETH:

WHEREAS the City desires to obtain an additional supply of raw water for municipal purposes from the District; and

WHEREAS the District holds Texas Water Rights Commission Permit 2231A, as amended, under which it is authorized to divert and appropriate water from Big Cypress Creek in Franklin County, Texas and has applied or will as soon as reasonably practicable apply for an amended permit (the "Permit") to allow the sale of raw water for municipal purposes to the city; and

WHEREAS by Resolution properly enacted, by the Board of Directors of Franklin County Water District, the sale of water to the City in accordance with the provisions of the said Resolution was approved, and the execution of this contract carrying out the said Resolution by the President of the board of Directors of the District and attested by its Secretary, was duly authorized; and

WHEREAS by Resolution properly enacted, by the City Council of the City of Winnsboro, the purchase of water from the Franklin County Water district by the City in accordance with the provisions of the said Resolution was approved, and the execution of this Contract carrying out said Resolution by the Mayor of the City of Winnsboro and attested by its Secretary was duly authorized;

NOW, THEREFORE, in consideration of the premises and the mutual covenants and conditions hereinafter set forth, the City and the District agree as follows:

1. (Sale of Water) From and after July 1, 1983, or at such time as the City may commence taking water from Lake Cypress Springs, Franklin County, Texas (the "Lake"), the city shall have

the right to withdraw the hereinafter described quantities of raw water from the Lake at the "point of delivery" as defined herein and is to furnish and bear all expenses and all liability for pumping facilities and metering equipment. The City has hired engineering experts and has taken such other action as it has deemed appropriate with regard to the quality of the water proposed to be purchased and is satisfied with same. The District makes no representation as to the present or future quality of the water and the same shall be purchased in its then existing condition; but District agrees that it will enforce its regulations and will notify the City of any change in its "Land Use and Recreation Plan" which might adversely affect the quality of the water. During each of the years set forth below, the City agrees to take and pay for (or pay for, whether taken or not), the quantities of water per calendar year which are set forth below in Column "A".

Level	Year	Column "A" (Acre Feet of Water for Which Payment Must be made)
ONE	1983 through 1999	800
TWO	2000 through 2009	1,200
THREE	2010 through 2014	1,700
FOUR	2015 through 2019	2,500
FIVE	2020 and thereafter	4,000

Notwithstanding the amounts set forth above, the City may at any time during the term hereof (provided that the City has not waived its rights to purchase additional quantities of water by failing to meet the minimum take or pay purchase requirements) purchase up to 5,000 acre feet of water during any single calendar year. The City shall pay three dollars per acre foot each year for each acre foot of 5,000 acre feet not taken. The City shall have the right to take as much as 5,000 acre feet per year. The City shall pay annually an amount equal to three dollars multiplied by the difference between 5,000 acre feet and the amount actually taken.

In the event that the City shall elect to purchase, during each of any three calendar years, a quantity of water in excess of the aggregate of the minimum "take or pay quantity" set forth in Column "A" above at which the City is at that time purchasing water, the City shall be deemed to have elected have progressed to the corresponding "Level" set forth on the above chart; and in such event the City shall during each of the remaining years of the Contract be obligated to take or pay for the quantity of water set forth in Column "A" for the appropriate "Level" for which such election has been made. (For example, if in the years 1987, 1988, and 1989, the City purchase at least 2,500 acre feet of water per year but less than 4,000 acre feet of water per year, the City shall be deemed to have elected to thereafter purchase at Level "FOUR" for each of the calendar years then remaining during the term of this Contract. The City then shall, in such event, be obligated to purchase at least 2,500 acre feet of water during each of the remaining calendar years under this Contract. Continuing such example, if the City shall elect during each of any three calendar years to purchase more then 4,000 acre feet of water, it shall be deemed to have elected to thereafter purchase water at Level "FIVE" and it shall thereafter be obligated to take or pay for at least 4,000 but no more than 5,000 acre feet of water during each of the remaining calendar years throughout the term of this Contract.)

In addition to the above requirements, the City must also in order to progress from a lower Level to a higher Level for the purchase of water, provide to the District written notice of such election at least 12 but not more than 15 months prior to the effective calendar year thereof.

2. (Billing Procedure) The City shall furnish to the District at its office (at its current address of P.O. Box 559, Mount Vernon, Texas 75457 or at such other address as the District shall in writing specify) not later than the 10th day of each month after the effective date of this Contract an itemized statement of the amount of water taken by the City each month.

On the same day the City shall be the District 1/12th of the annual take or pay amount then in effect for the calendar year in question and at the end of the calendar year, on or before the 10th day of January, City shall pay the District the remaining sum owing District for water used over the take-or-pay amounts.

3. (Price) The price of water to be sold hereunder through September 30, 1996, shall be $25.00 per acre foot. The price of the water to be sold hereunder shall be $35.00 per acre foot effective October 1, 1996. Such price shall apply to the minimum amount of water used or deemed to be used under the take or pay provision on column "A" above, and to the additional water taken by the City in excess of such quantity. The District hereby reserves the right to elect to require a renegotiation of the price of the water at any time when any rate has been in-effect for five years. The price of water may be adjusted several times during the duration of this contract. The price of the water for each such period shall be based upon the projected expenditures prepared by the District for such period for (A) the types of expenditures currently included by it in its maintenance and operating and capital outlay accounts and (B) other expenditures projected by it to be incurred during such period, which such other expenditures would be directly or indirectly a benefit to the City. In making such projections, the District shall give consideration to the expenditures made by it during the preceding period but it shall not be required to base or compute the projected changes in such expenditures at the same rates of increase or decrease as were incurred during such preceding 5-year period. The price of water shall be determined in a nondiscriminatory manner by the Board of Directors of the District, subject to the rate making and review powers of any applicable governmental agency of the State of Texas.

4. (Point of Delivery) Deliveries shall be made by the District to an intake structure to be constructed by the City at its expense at the location to be described in Exhibit "A" hereto on the southern side of the Lake. The City shall erect and maintain required markers and make other provisions as are necessary to prevent motorboat traffic and other public use

within 200 feet of the intake structure or as then may be required by applicable laws, regulations or appropriate safety precautions.

5. (Pump and Measurement of Water) The City at its expense shall install and maintain (a) an appropriate intake structure and (b) such ancillary equipment as is needed, including but not limited to such meters and recording devices as are approved by the District, such meters to permit accurate determination of quantities of raw water to be withdrawn hereunder in units of 1,000 gallons. The City will maintain all meters in accurate operating condition and shall recalibrate, at its expense, all metering equipment at 3-year intervals. A meter registering not more than two percent (2%) above or below the test result shall be deemed to be accurate. The previous readings of any meter disclosed by test to be incorrect, shall be corrected for the six months previous to such test in accordance with the percentage of inaccuracy found by such test.

If a meter fails to register for any period, the amount of water deemed to have been taken by the City shall be not less than the greater of the amount delivered in the corresponding period (a) immediately prior to the failure or (b) in the preceding year, unless the District and City shall agree upon a different amount. Should a malfunction be found in metering equipment repaired with due diligence.

6. (Term) This Contract shall be for a term of fifty (50) years from the date of the initial delivery of any water by the District to the City and may be renewed or extended upon terms and conditions as may be agreed upon by the Parties. The Parties agree that the City received its initial delivery of water from the District for purposes of commencing the term on a date certain in 1989.

7. (Termination) In the event that the City shall fail to make any payment required by this Contract or shall otherwise be in material breach hereunder for a period of 90 days following written notice by the District of such breach, the District may terminate this Contract and all rights of the City hereunder or avail itself of such other remedies to which it may be entitled

by law.

8. (Cooperation in Obtaining Permit) The District and the City will cooperate with each other and act with dispatch in obtaining any necessary permits or certificates and agree that this Contract and the effective date hereof shall be contingent upon the approval of the Texas Water Rights Commission.

9. (Rights of Way) The District shall, upon written request by the City and at such time as the City advises the District that it is ready to proceed to commence construction of the necessary improvements, provide the City with an easement of the District's property described in Exhibit "B" hereto for the purposes of constructing, maintaining, operating and repairing the City's necessary facilities for so long as this Contract shall remain in effect. The City shall keep and maintain at its expense its facilities, pipelines and all access thereto.

10. (Availability of Water) The District hereby represents to the City that it has been advised that it should have sufficient water in the Lake to permit it to comply with the terms of this Contract and the City has made such investigation of such facts as it has deemed necessary to assure itself of the District's ability to comply herewith. In the event that sufficient water may not be available for the District to comply with the terms of this Contact, (i) the minimum take or pay quantities under the terms hereof shall be suspended or reduced during the times at which the District cannot comply and the District shall have no additional liability therefore; (ii) to the extent that the District has not heretofore obligated itself to do otherwise, the District will allocate the available water among its customers on a pro rata basis.

11. (Indemnity) The City hereby agrees to indemnify and hold harmless the District from any and all claims or demands whatsoever by reason of any injury to person or property or otherwise resulting from or in any way connected with (a) any and all actions and activities (or failure to act) of the City hereunder, (b) any purchases or uses of the water by the City or its customers, (c) any failure of the City to adequately treat or inspect the water and (d) the construction, installation,

maintenance or operation of the City's intake, pumping and other facilities; whether or not any of the foregoing be caused, in part, by the negligence of the District.

12. (Severability, Successors) In the event any provision of this Agreement shall be held to be invalid or unenforceable, the remaining provisions shall be valid. A waiver by either party of any provision, term, condition or covenant hereof shall not be construed as a waiver of a subsequent breach or the enforcement thereof by the other party. The successors and assigns of each party shall be bound to the terms of this Agreement. This Agreement may not be assigned in whole or in part for any purpose by either party without the written consent of the other party; provided, however, that the City may, prior to the time at which it begins to take water under this Contract, assign this Contract to another governmental entity in Wood County, Texas.

Irrespective of any other language contained in this Agreement to the contrary, this Agreement may be assigned by the City to the Farmers Home Administration or to other agents of the State or Federal government for the purpose of securing any loan or loans to the City of Winnsboro.

IN WITNESS WHEREOF, the parties hereto, acting under authority of their respective governing bodies, have caused this Contract to be duly executed in three (3) counterparts, each of which shall constitute an original.

FRANKLIN COUNTY WATER DISTRICT

By: ______________________
KENNETH JAGGERS, President
Board of Directors

ATTEST:

____
BILLY M. JORDAN, Secretary

CITY OF WINNSBORO, TEXAS

By: ______________________
JERRY HOPPER, Mayor

ATTEST:

Pamela Mangum

PAMELA MANGUM, City Secretary

(Acknowledgments)

THE STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 15th day of APRIL, 1996, by KENNETH JAGGERS, President of the Board of Directors of the Franklin County Water District.

SHIRLEY MAPLES
NOTARY PUBLIC
STATE OF TEXAS
Commission Expires 4-18-97

Shirley Maples

NOTARY PUBLIC, State of Texas
Notary's name (printed):

My commission expires:

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 13th day of March, 1996, by Jerry Hopper, Mayor of the City of Winnsboro, Texas.

MARY C. McLEMORE
NOTARY PUBLIC
STATE OF TEXAS
My Commission Expires 2-4-99

Mary C. McLemore

NOTARY PUBLIC, State of Texas
Notary's name (printed):

Notary's commission expires: 2-4-99

EXHIBIT II-C

WATER PURCHASE CONTRACT

STATE OF TEXAS
COUNTY OF FRANKLIN

This Water Purchase Contract is entered into as of the 15th day of APRIL, 1996, by and between Franklin County Water District, a conservation and reclamation district and a political subdivision of the State of Texas (the "District"), and the South Franklin Water Supply Corporation, a corporation organized and established under the provisions of Article 143a, V. A. T. S. for the purpose of constructing and operating a water supply distribution system serving water users within the areas described in plans now on file in the office of the corporation, of the State of Texas (the "Corporation").

WHEREAS, the District and the Texas Water Development Board hold appropriative permit number 2231 and Corporation holds contractual permit number CP-161A;

WHEREAS, Corporation has identified a need to obtain additional amount of water in order to provide sufficient amounts of water for its existing and future demands; and

IT IS HEREBY MUTUALLY AGREED AND UNDERSTOOD AS FOLLOWS:

NOW, THEREFORE, in consideration of the premises and the mutual covenants and conditions hereinafter set forth, the Corporation and the District agree as follows:

1. (Sale of Water) From and after the date of execution hereof, the Corporation shall have the right to withdraw the hereinafter described quantities of raw water from the Lake Cypress Springs, Franklin County, Texas (the "Lake") at the "point of delivery" as defined herein and is to furnish and bear all expenses and all liability for pumping facilities and metering equipment. During each of the years set forth below, the Corporation agrees to take and pay for (or pay for, whether taken or not), the quantities of water per calendar year which are set forth below in Column "A". "Guaranteed Available", as set forth in Column "B", shall be defined as that total amount of water which District promises to make available in any one year beginning in 1996.

		COLUMN "A" Min. Take-or-Pay Ac. Ft./Year	COLUMN "B" Guaranteed Available Ac.Ft./Year
LEVEL	YEAR		
ONE	1980	400	-
TWO	1985	500	2500
TWO-A	1990	650	2500
THREE	1995	775	2725
FOUR	2005	1075	2425
FIVE	2015	1375	2125
SIX	2025	1700	1800

In the event that the Corporation shall elect to purchase, during each of any three calendar years, a quantity of water in excess of the minimum "take or pay quantity" set forth in Column "A" above for the "Level" at which the Corporation is at that time purchasing water, the Corporation shall be deemed to have elected to have progressed to the corresponding "Level" set forth on the above chart; and in such event the Corporation shall during each of the remaining years of the Contract be obligated to take or pay for the quantity of water set forth in Column "A" for the appropriate "Level" for which such election has been made. (For example, if in the years 1985, 1986, and 1987, the Corporation purchases at least 775 acre feet of water per years but less than 1075 acre feet of water per year, the Corporation shall be deemed to have elected to thereafter purchase Level THREE for each of the Calendar years then remaining during the term of this contract. The Corporation then shall, in such event, be obligated to purchase at least 775 acre feet of water during each of the remaining calendar years until the year 2005.) The Corporation shall have the right to take as much as 3,500 acre feet per year. The Corporation shall pay three dollars per acre foot each year for each acre foot of 3,500 acre feet not taken. The Corporation shall pay annually an amount equal to three dollars multiplied by the difference between 3,500 acre foot and the amount actually taken.

2. (Billing Procedure) The Corporation shall furnish to the District at its office (at its current address of P. O. Box

559, Mount Vernon, Texas 75457 or at such other address as the District shall in writing specify) not later than the 10th day of each month after the effective date of this Contract an itemized statement of the amounts of water taken by the Corporation each month. On the same day the Corporation shall pay the District 1/12th of the annual take or pay amount then in effect for the calendar year in question and at the end of the Corporation's fiscal year, the Corporation shall pay the District the remaining sum owing District for water used over the take-or-pay amounts.

3. (Price) The price of water to be cols shall be $25.00 per acre foot through September 30, 1996. The price of water to be sold hereunder shall, be $35.00 per acre foot, effective October 1, 1996, and shall be adjusted whenever a price per acre foot has been in effect five (5) years or longer. The District also reserves the right to elect to modify the price of all water used or deemed to be used under the take or pay provision in Column "A" above and of water used under Column "B" "Guaranteed Available" at the end of the initial five year period and at any other time when the rate has been in effect for at least five (5) years. The price of water may be adjusted several times during the duration of this contract. The price of water shall be determined in a nondiscriminatory manner by the Board of Directors of the District, subject to the rate making and review powers of any applicable governmental agency of the State of Texas.

4. (Point of Delivery) Corporation shall have the right to withdraw raw water from the Lake at a point on the north shore of Lake Cypress Springs, approximately 9-1/2 miles south of Mount Vernon, Texas, near State Hwy. 115 on the east side of a bridge crossing said lake and to withdraw raw water from the Lake at a point on the south shore of Lake Cypress Springs, near Hwy 115 on the west side of the bridge crossing said Lake and contiguous and adjacent to the property held by the City of Winnsboro for the purpose of withdrawing water from the Lake.

5. (Pump and Measurement of Water) The Corporation at its expense shall install and maintain (a) an appropriate intake structure and (b) such ancillary equipment as is needed,

including but not limited to such meters and recording devices as are approved by the District, such meters to permit accurate determination of quantities of raw water to be withdrawn hereunder in units of 1,000 gallons. The Corporation will maintain all meters in accurate operating condition and shall recalibrate, at its expense, all metering equipment at 3-year intervals or when required by District. A meter registering not more than two percent (2%) above or below the test result shall be deemed to be accurate. The previous readings of any meter disclosed by test to be incorrect shall be corrected for the six months previous to such test in accordance with the percentage of inaccuracy found by such test.

If a meter fails to register for any period, the amount of water deemed to have been taken by the Corporation shall be not less than the greater of the amount delivered in the corresponding period (a) immediately prior to the failure or (b) in the preceding year, unless the District and Corporation shall agree upon a different amount. Should a malfunction be found in metering equipment at any time, the Corporation shall have said metering equipment repaired with due diligence.

6. (Term) The terms of this Contract as amended hereby shall be from the date of execution hereof through December 31, 2034, and thereafter may be renewed or extended upon such terms and conditions as may be agreed upon by the parties, unless same is terminated sooner by District as otherwise provided in this Contract.

7. (Termination) In the event that the Corporation shall fail to make any payment required by this Contract or shall otherwise be in material breach hereunder for a period of 90 days following written notice by the District of such breach, the District may terminate this Contract and all rights of the Corporation hereunder or avail itself of such other remedies to which it may be entitled by law. Corporation may terminate this Contract upon District's failure or inability to furnish raw water as required by this Contract, also after ninety days' written notice to District by Corporation of such failure.

8. (Regulatory Agencies) This Contract is subject to such

rules, regulations, or laws as may be applicable to similar agreements in the State of Texas. The parties agree to collaborate in the filing of a copy of this water purchase contract along with any appropriate application with any necessary governmental agency of the State of Texas. Purchaser understands and agrees that no amounts of water not previously permitted shall be withdrawn under this Contract until the issuance by an appropriate governmental agency of a permit to the Corporation for use of such water for the purposes set out herein for the duration of this Contract. In the event that such a permit is not obtained by the Corporation within one year of the execution of this Contract, this Contract shall be null and void at the option of Franklin County Water District. This Contract is also contingent upon the approval of the Texas Water Development Board.

9. (Availability of Water) The District hereby represents to the Corporation that it has been advised that it should have sufficient water in the Lake to permit it to comply with the terms of this Contract and the Corporation has made such investigation of such facts as it has deemed necessary to assure itself of the District's ability to comply herewith. In the event that sufficient water may not be available for the District to comply with the terms of this Contract, (i) the minimum take or pay quantities under the terms hereof shall be suspended or reduced during the times at which the District cannot comply and the District shall have no additional liability therefor; (ii) to the extent that the District has not heretofore obligated itself to do otherwise, the District will allocate the available water among its customers on a pro rata basis. District makes no guaranty that water will be available at any particular time or place or that said Lake will be retained at any specific level at any particular time.

10. (Indemnity) The Corporation hereby agrees to indemnify and hold harmless the District from any and all claims or demands whatsoever by reason of any injury to person or property or otherwise resulting from or in any way connected with (a) any and all actions and activities (or failure to act) of the Corporation

hereunder, (b) any purchases or uses of the water by the Corporation or its customers, (c) any failure of the Corporation to adequately treat or inspect the water and (d) the construction, installation, maintenance, or operation of the Corporation's intake, pumping, and other facilities.

11. (Severability, Successors, etc.) In the event any provision of this Agreement shall be held to be invalid or unenforceable, the remaining provisions shall be valid. A waiver by either party of any provision, term, condition or covenant hereof shall not be construed as a waiver of a subsequent breach or the enforcement thereof by the other party. The successors and assigns of each party shall be bound to the terms of this Agreement. This Agreement may not be assigned in whole or in part for any purpose by either party without the written consent of the other party, except, however, Corporation may assign this Contract to the United States of America as security for a loan or loans made to the Corporation by the United States of America through the Farmers Home Administration.

12. (Interest of Texas Water Development Board) It is hereby acknowledged by and between the parties hereto that the Permit, which authorizes the impoundment of Lake Cypress Springs, and the diversion and use of a specified quantity of water therefrom, is owned jointly by the District and the Texas Water Development Board (the "Board"). The relationship between the District and the Board is controlled by a Master Agreement relating to the respective interests in the project which includes certain provisions relating to the purchase of the undivided interest of the Board in the Permit by the District. As of February 12, 1990, the District owned approximately a sixty and fifty-eight one-hundredths (60.58%) percent interest in and to the Permit. It is acknowledged that, if the Corporation exercises its options to acquire additional quantities of water under this Contract, such quantities of water could exceed the District's existing undivided interest in the Permit. It is anticipated that the escalating levels of the quantities of water to be taken by the Corporation under this Contract will not cause the total amount of water to exceed the District's then undivided

ownership in the Permit. However, in consideration of the foregoing, it is further agreed that, in the event the Corporation shall desire to exercise any option to purchase additional quantities of water as provided in this Contract and the exercise of such option would cause the District to be contractually liable to furnish to the Corporation and the other present customers (set forth below) of the District a total amount of water per year which exceeds the District's then existing undivided ownership interest in and to the total quantity of water appropriated under the Permit, then before such option may be exercised by the Corporation, the District shall contract with the Board to buy at least a portion of the Board's remaining undivided ownership interest in the Permit sufficient to satisfy the District's total contractual obligations to the Corporation and the other present customers of the District after the exercise of such option. The other present customers of the District as of the date hereof are the City of Winnsboro, Texas, the City of Mount Vernon, Texas, and M & W Recreational Facility, Inc.

IN WITNESS WHEREOF, the parties hereto, acting under authority of their respective governing bodies, have caused this Water Purchase Contract to be duly executed in four (4) counterparts, each of which shall constitute an original on this 15th day of APRIL, 1996.

FRANKLIN COUNTY WATER DISTRICT

By: Kenneth Jaggers

KENNETH JAGGERS, President

ATTEST:

Billy Jordan

BILLY JORDAN, Secretary

SOUTH FRANKLIN WATER SUPPLY CORPORATION

By: Kern Anderson

KERN ANDERSON, President

ATTEST:

Glenn W. Emerson

GLENN W. EMERSON, Secretary

(Acknowledgments)

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 15th day of APRIL, 1996, by Kenneth Jaggers, President of the Board of Directors of the Franklin County Water District.

SHIRLEY MAPLES
NOTARY PUBLIC
STATE OF TEXAS
Commission Expires 4-18-97

Shirley Maples

NOTARY PUBLIC, State of Texas
Notary's name (printed):

My commission expires:

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 13th day of February, 1996, by Kern Anderson, President of the Board of Directors of the South Franklin Water Supply Corporation.

Gail Kerr

NOTARY PUBLIC, State of Texas
Notary's name (printed): GAIL KERR

Notary's commission expires: 6-22-98

GAIL KERR
NOTARY PUBLIC
STATE OF TEXAS
My Commission Expires 6-22-98

WATER PURCHASE CONTRACT

STATE OF TEXAS
COUNTY OF FRANKLIN

This Water Purchase Contract is entered into as of the 10th day of June, 1996, by and between Franklin County Water District, a conservation and reclamation district and a political subdivision of the State of Texas (the "District"), and the M & W Recreational Facility, Inc. d/b/a Cypress Creek Country Club, a Texas corporation duly organized and established within the State of Texas (the "Corporation").

WHEREAS, the District and the Texas Water Development Board hold appropriate permits;

WHEREAS, Corporation has identified a need to obtain additional amount of water in order to provide sufficient amounts of water for its existing and future demands; and

IT IS HEREBY MUTUALLY AGREED AND UNDERSTOOD AS FOLLOWS:

NOW, THEREFORE, in consideration of the premises and the mutual covenants and conditions hereinafter set forth, the Corporation and the District agree as follows:

1. (Sale of Water) From and after the date of execution hereof, the Corporation shall have the right to withdraw the hereinafter described quantities of raw water from the Lake Cypress Springs, Franklin County, Texas (the "Lake") at the "point of delivery" as defined herein and is to furnish and bear all expenses and all liability for pumping facilities and metering equipment. During each of the years set forth below, the Corporation agrees to take and pay for (or pay for, whether taken or not), the quantities of water per calendar year which are set forth below in Column "A". "Guaranteed Available", as set forth in Column "B", shall be defined as that total amount of water which District promises to make available in any one year beginning in 1997.

LEVEL	YEAR	COLUMN "A" Min. Take-or-Pay Ac. Ft./Year	COLUMN "B" Guaranteed Available Ac.Ft./Year
ONE	1997	50	160

The Corporation is obligated to purchase at least 50 acre feet of water during each of the calendar years of this contract. The Corporation shall have the right to take as much as 210 acre feet per year. The Corporation shall pay three dollars per acre foot each year for each acre foot of 210 acre feet not taken. The Corporation shall pay annually an amount equal to three dollars multiplied by the difference between 210 acre foot and the amount actually taken. The first annual payment for water not taken shall be due on October 1, 1997, and on each first day of October of each year thereafter.

2. (Billing Procedure) The Corporation shall furnish to the District at its office (at its current address of P. O. Box 559, Mount Vernon, Texas 75457 or at such other address as the District shall in writing specify) not later than the 10th day of each month after the effective date of this Contract an itemized statement of the amounts of water taken by the Corporation each month. On the same day the Corporation shall pay the District 1/12th of the annual take or pay amount then in effect for the calendar year in question and at the end of the Corporation's fiscal year, the Corporation shall pay the District the remaining sum owing District for water used over the take-or-pay amounts.

3. (Price) The price of water to be sold shall be $25.00 per acre foot through September 30, 1997. The price of water to be sold hereunder shall, be $35.00 per acre foot, effective October 1, 1997, and shall be adjusted whenever a price per acre foot has been in effect five (5) years or longer. The District also reserves the right to elect to modify the price of all water used or deemed to be used under the take or pay provision in Column "A" above and of water used under Column "B" "Guaranteed Available" at the end of the initial five year period and at any other time when the rate has been in effect for at least five (5) years. The price of water may be adjusted several times during

the duration of this contract. The price of water shall be determined in a nondiscriminatory manner by the Board of Directors of the District, subject to the rate making and review powers of any applicable governmental agency of the State of Texas.

4. (Point of Delivery) Corporation shall have the right to withdraw raw water from the Lake at a point on the south shore of Lake Cypress Springs, approximately 9-1/2 miles south of Mount Vernon, Texas, near State Hwy. 115 on the west side of a bridge crossing said lake contiguous and adjacent to the property held by the Cypress Springs Water Supply Corporation for the purpose of withdrawing water from the Lake.

5. (Pump and Measurement of Water) Corporation at its expense shall install and maintain an appropirate pump and such ancillary equipment as is needed, together with a measuring device and operate and maintain the metering equipment herinafter provided to be installed by the Corporation and to calibrate such metering equipment at such intervals as District may deem proper. A meter registering not more than two (2%) above or below the test result shall be demed accurate. The previous readings of any meter disclosed by test to be corrected for the six months previous to such test in accordance with the percentage of inaccuracy found by such test. If any meter fails to register for any period the amount of water delivered in the corresponding period immediately prior to the failure, unless District and Corporation shall agree upon a difference amount. The metering equipment shall be read on the 20th day of each month during the term of this contract. Corporation shall, in lieu of a measuring device and with prior permission of the District, apply a standard electrical formula to the Corporations's electric power bill for operating a pump to determine the amount of water used in any given month. The formula to be applied to each monthly power bill is as follows:

KWH x 1.34111 = H.P. Hours

H.P. Hours/30 H.P. = Hours Oper.

Hours Oper. x 60 min. x 320 GPM = Gallons pumped @ 100% efficiency.

Gallons pumped x .75 efficiency = Gallons used.

6. (Term) The terms of this Contract as amended hereby shall be from the date of execution hereof through December 31, 2016, and thereafter may be renewed or extended upon such terms and conditions as may be agreed upon by the parties, unless same is terminated sooner by District as otherwise provided in this Contract.

7. (Termination) In the event that the Corporation shall fail to make any payment required by this Contract or shall otherwise be in material breach hereunder for a period of 90 days following written notice by the District of such breach, the District may terminate this Contract and all rights of the Corporation hereunder or avail itself of such other remedies to which it may be entitled by law. Corporation may terminate this Contract upon District's failure or inability to furnish raw water as required by this Contract, also after ninety days' written notice to District by Corporation of such failure.

8. (Regulatory Agencies) This Contract is subject to such rules, regulations, or laws as may be applicable to similar agreements in the State of Texas. The parties agree to collaborate in the filing of a copy of this water purchase contract along with any appropriate application with any necessary governmental agency of the State of Texas. Purchaser understands and agrees that no amounts of water not previously permitted shall be withdrawn under this Contract until the issuance by an appropriate governmental agency of a permit to the Corporation for use of such water for the purposes set out herein for the duration of this Contract. In the event that such a permit is not obtained by the Corporation within one year of the execution of this Contract, this Contract shall be null and void at the option of Franklin County Water District. This Contract is also contingent upon the approval of the Texas Water Development Board.

9. (Availability of Water) The District hereby represents to the Corporation that it has been advised that it should have sufficient water in the Lake to permit it to comply with the

terms of this Contract and the Corporation has made such investigation of such facts as it has deemed necessary to assure itself of the District's ability to comply herewith. In the event that sufficient water may not be available for the District to comply with the terms of this Contract, (i) the minimum take or pay quantities under the terms hereof shall be suspended or reduced during the times at which the District cannot comply and the District shall have no additional liability therefore; (ii) to the extent that the District has not heretofore obligated itself to do otherwise, the District will allocate the available water among its customers on a pro rata basis. District makes no guaranty that water will be available at any particular time or place or that said Lake will be retained at any specific level at any particular time.

10. (Indemnity) The Corporation hereby agrees to indemnify and hold harmless the District from any and all claims or demands whatsoever by reason of any injury to person or property or otherwise resulting from or in any way connected with (a) any and all actions and activities (or failure to act) of the Corporation hereunder, (b) any purchases or uses of the water by the Corporation or its customers, (c) any failure of the Corporation to adequately treat or inspect the water and (d) the construction, installation, maintenance, or operation of the Corporation's intake, pumping, and other facilities.

11. (Severability, Successors, etc.) In the event any provision of this Agreement shall be held to be invalid or unenforceable, the remaining provisions shall be valid. A waiver by either party of any provision, term, condition or covenant hereof shall not be construed as a waiver of a subsequent breach or the enforcement thereof by the other party. The successors and assigns of each party shall be bound to the terms of this Agreement. This Agreement may not be assigned in whole or in part for any purpose by either party without the written consent of the other party, except, however, Corporation may assign this Contract to the United States of America as security for a loan or loans made to the Corporation by the United States of America through the Farmers Home Administration.

12. (Interest of Texas Water Development Board) It is hereby acknowledged by and between the parties hereto that the Permit, which authorizes the impoundment of Lake Cypress Springs, and the diversion and use of a specified quantity of water therefrom, is owned jointly by the District and the Texas Water Development Board (the "Board"). The relationship between the District and the Board is controlled by a Master Agreement relating to the respective interests in the project which includes certain provisions relating to the purchase of the undivided interest of the Board in the Permit by the District. As of February 12, 1990, the District owned approximately a sixty and fifty-eight one-hundredths (60.58%) percent interest in and to the Permit. It is acknowledged that, if the Corporation exercises its options to acquire additional quantities of water under this Contract, such quantities of water could exceed the District's existing undivided interest in the Permit. It is anticipated that the escalating levels of the quantities of water to be taken by the Corporation under this Contract will not cause the total amount of water to exceed the District's then undivided ownership in the Permit. However, in consideration of the foregoing, it is further agreed that, in the event the Corporation shall desire to exercise any option to purchase additional quantities of water as provided in this Contract and the exercise of such option would cause the District to be contractually liable to furnish to the Corporation and the other present customers (set forth below) of the District a total amount of water per year which exceeds the District's then existing undivided ownership interest in and to the total quantity of water appropriated under the Permit, then before such option may be exercised by the Corporation, the District shall contract with the Board to buy at least a portion of the Board's remaining undivided ownership interest in the Permit sufficient to satisfy the District's total contractual obligations to the Corporation and the other present customers of the District after the exercise of such option. The other present customers of the District as of the date hereof are the City of Winnsboro, Texas,

the City of Mount Vernon, Texas, and Cypress Springs Water Supply Corporation.

IN WITNESS WHEREOF, the parties hereto, acting under authority of their respective governing bodies, have caused this Water Purchase Contract to be duly executed in four (4) counterparts, each of which shall constitute an original on this 10th day of June, 1996.

FRANKLIN COUNTY WATER DISTRICT

By: Kenneth Jaggers
KENNETH JAGGERS, President

ATTEST:

Billy M. Jordan
BILLY JORDAN, Secretary

M & W RECREATIONAL FACILITY, INC. d/b/a
Cypress Creek Country Club

By: George O. Coker
GEORGE O. COKER, President

ATTEST:

Bob Keel
BOB KEEL, Secretary

(Acknowledgments)

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 10th day of June, 1996, by Kenneth Jaggers, President of the Board of Directors of the Franklin County Water District.

Shirley Maples
NOTARY PUBLIC, State of Texas
Notary's name (printed):

My commission expires:

SHIRLEY MAPLES
NOTARY PUBLIC
STATE OF TEXAS
Commission Expires 4-18-97

STATE OF TEXAS
COUNTY OF FRANKLIN

This instrument was acknowledged before me on the 10th day of June, 1996, by George O. Coker, President of the Board of Directors of the M & W Recreational Facility, Inc. d/b/a Cypress Creek Country Club.

SHIRLEY MAPLES
NOTARY PUBLIC
STATE OF TEXAS
Commission Expires 4-18-97

Shirley Maples
NOTARY PUBLIC, State of Texas
Notary's name (printed):

Notary's commission expires:

TEXAS WATER DEVELOPMENT BOARD
WATER CONSERVATION LITERATURE
(As of January 1, 1988)

Single copies of all of the following publications and materials can be obtained at no charge. The * indicates those publications that are available free in small quantities (usually 500 or less). The # indicates those publications that are available for sale when large quantities (usually 500 or more) are desired. Municipalities or organizations that want to reprint TWDB publications locally may request the print negatives. To make a request, write: CONSERVATION, Texas Water Development Board, P.O. Box 13231, Capitol Station, Austin, Texas 78711-3231

Agricultural Conservation Literature

Title	Originally Published By	Description	Length
Agricultural Water Conservation in Texas*	TWDB	Pamphlet with Tear-out	8 pages
Have Your Irrigation System Evaluated Free*	TWDB	Pamphlet	4 pages
LEPA Irrigation*	TWDB	Pamphlet	6 pages
Drip Irrigation*	TWDB	Pamphlet	6 pages
Conserving Water In Irrigated Agriculture*	TWDB	Booklet	12 pages
Furrow Dikes*	HPUWCD #1	Pamphlet	4 pages
Soil Moisture Monitoring*	HPUWCD #1	Pamphlet	4 pages
Center Pivot Irrigation Systems L-2219*	TAEX	Pamphlet	4 pages
Surge Flow Irrigation L-2220*	TAEX	Pamphlet	4 pages
Surge Irrigation*	SCS	Pamphlet	6 pages

Abbreviations:

AWWA	American Water Works Association
EPA	Environmental Protection Agency
HPUWCD #1	High Plains Underground Water Conservation District No. 1
NXC	National Xeriscape Council, Inc.
SCS	USDA - Soil Conservation Service
TAEX	Texas Agricultural Extension Service
TDA	Texas Department of Agriculture
TWDB	Texas Water Development Board

Municipal Conservation Brochures and Materials Available for Use in Education and Information Programs

Title	Originally Published By	Description	Length
Water...Half-A-Hundred Ways To Save It*#	TWDB	Pamphlet	8 pages
Water Saving Ideas For Business and Industry*#	TWDB	Pamphlet	8 pages
How To Save Water Outside The Home*#	TWDB	Pamphlet	8 pages
How To Save Water Inside The Home*#	TWDB	Pamphlet	8 pages
A Homeowner's Guide To Water Use and Water Conservation*#	TWDB	Booklet	22 pages
Drip Irrigation*	TWDB	Pamphlet	6 pages
Lawn Watering Guide*	TWDB	3 1/2" x 5" Plastic Card	2 sides
A Directory of Water Saving Plants and Trees for Texas*	TWDB	Booklet	36 pages
Toilet Tank Leak Detector Tablets*	-	2 Tablets per packet	-
Municipal and Commercial Water Conservation Services	TWDB	Pamphlet with Tear-out	8 pages
Efficient Use of Water in the Garden and Landscape (B-1496)	TAEX	Booklet	20 pages
How to Xeriscape	NXC	Pamphlet	10 pages
Texas Sesquicentennial Native Plant Landscape (located in Austin)	TDA/TWDB	Pamphlet	8 pages

Municipal Conservation Brochures and Materials (Continued)

Title	Originally Published By	Description	Length
Plastic Ruler*	TWDB	6" x 1 1/4"	-
Coloring Poster for Children*#	TWDB	Poster	1 page
Water Conservation Coloring Book No. 1*#	TWDB	Booklet	4 pages
Water Conservation Coloring Book No. 2*#	TWDB	Booklet	4 pages

CONSERVATION PLANNING LITERATURE AND GUIDES FOR WATER UTILITIES

The Authority of Cities, Water Utilities, and Water Districts to Regulate and Enforce Water Conservation Measures	TWDB	Paper	5 pages
Guide for Locating and Reducing Unaccounted for Water Through the Use of the Water Audit and Leak Detection	In Preparation	Guidebook	-
Guide for Designing Conservation Water Rate Structures	In Preparation	Guidebook	-
Guidelines for Municipal Water Conservation and Drought Contingency Planning and Program Development	TWDB	Loose-leaf	36 pages
Guidelines for Water Reuse EPA-600/8-80-036	EPA	Book	105 pages
Model Water Ordinances	In Preparation	Guidebook	-
Sources of Leak Detection Equipment and Services	TWDB	List	2 pages
Sources of Water Saving Devices	TWDB	List	21 pages
Texas Water Resources and Conservation	TWDB	Paper	38 pages
Water Conservation and Drought Contingency Plan Development Procedures	TWDB	Loose-leaf	58 pages

Texas Water Resources and Planning Literature

Title	Originally Published By	Description	Length
TWDB Report 294 - Surveys of Irrigation in Texas	TWDB	Book	243 pages
Summary of Water for Texas (C-20)	TWDB	Pamphlet	8 pages
Water Planning in Texas	TWDB	Booklet	27 pages
Texas Water Development Board (Funding Programs)	TWDB	Pamphlet	4 pages
Water For Texas (GP-4-1)	TWDB	Books	
Volume 1 (Comprehensive Plan)	[Available for purchase only from the Texas Water Commission, P.O. Box 13087 Austin, Texas 78711]		72 pages
Volume 2 (Technical Appendix)			530 pages
Texas Water Facts	TWDB	Booklet (Out-of-Print)	12 pages
Regional Planning Grants for Water Supply and Wastewater Treatment	TWDB	Pamphlet	4 pages

PUBLICATIONS AND AUDIOVISUAL MATERIALS AVAILABLE FOR LOAN FROM TEXAS WATER DEVELOPMENT BOARD (TWDB) (a)

The following water conservation publications and audiovisual materials are available for a loan of up to two weeks from TWDB. To borrow any of these write to: CONSERVATION, Texas Water Development Board, Capitol Station, Austin, Texas 78711-3231.

Publications

Title	Originally Published By	Description	Length
Water Audit and Leak Detection Guidebook	California Dept. of Water Res.	Book	142 pages
Example Brochures and Promotional Material	Compiled by TWDB	Ringbinder	32 pages
Municipal Water Conservation Workshop Notebook	TWDB	Ringbinder	6 sections

Audiovisual Materials

Title	Originally Published By	Description	Length
The Alternative is Conservation	Water Films	16mm Film or VCR/VHS Format	28 minutes
Water Follies	American Water Works Assoc. (AWWA)	16mm Film or VCR/VHS Format	7.5 minutes
Orangutans (Public Service Announcement)	AWWA VCR/VHS Format	16mm Film or VCR/VHS Format	30 seconds
Gooney Birds (Public Service Announcement)	AWWA VCR/VHS Format	16mm Film or VCR/VHS Format	30 seconds
Tanks (Public Service Announcement)	AWWA VCR/VHS Format	16mm Film or VCR/VHS Format	30 seconds
Spot Announcements	Lower Colorado River Authority	Audio Cassette	30 seconds

(a) The films, video cassettes, and publications are provided for review purposes only. Permission to use any of this material for print or broadcast must be obtained from the producer or publisher of the material.

EXHIBIT IV
LAKE CYPRESS SPRINGS WATER LEVEL ELEVATIONS

Date	Elevation (feet above msl)	Comments
1996		
10/29	378.04	
10/22	378.08	
10/16	377.80	
10/8	377.96	
10/1	378.00	
9/24	378.00	
9/20	377.94	
9/17	377.88	
9/10	377.96	
9/3	377.86	
8/29	377.88	
8/28	377.70	
8/27	377.64	
8/20	377.64	
8/13	377.80	
8/7	377.60	
8/1	377.64	Measurement @ 7 am
7/31	377.60	Measurement @ 12 noon
7/31	377.50	Measurement @ 2 pm
7/31	377.40	Measurement @ 10 am
7/31	377.35	
7/29	377.20	
7/23	377.04	
7/16	377.16	
7/15	377.18	
7/9	377.16	
7/2	377.26	
6/25	377.34	
6/19	377.45	
6/4	377.56	
5/21	377.60	
5/14	377.68	
5/7	377.58	
4/30	377.60	
4/23	377.60	
4/16	377.58	
4/9	377.55	
4/8	377.55	
4/2	377.45	
3/28	377.45	
3/26	377.36	
3/19	377.38	
3/12	377.20	
3/5	377.30	
2/20	377.20	
2/13	377.20	
2/6	377.20	

Date	Elevation (feet above msl)	Comments
1996		
1/30	377.20	
1/23	377.18	
1/16	377.10	
1/9	377.10	
1/2	377.10	
1995		
12/26	377.00	
12/19	377.04	
12/12	376.90	
12/4	376.90	
11/28	376.94	
11/21	377.02	
11/14	377.00	
11/7	377.02	
11/1	377.02	
10/31	376.90	
10/24	377.00	
10/17	377.10	
10/10	377.20	
10/3	377.30	
10/2	377.30	
9/26	377.26	
9/19	377.30	
9/12	377.20	
9/5	377.30	
8/29	377.46	
8/15	377.70	
8/8	377.80	
8/1	377.86	
7/25	377.90	
7/18	378.00	
7/5	378.20	
6/23	378.10	
6/13	378.30	
6/6	378.20	
5/30	378.30	
5/9	380.01	
5/8	379.30	
5/2	378.66	
4/25	379.20	
4/18	378.70	
4/11	379.20	
4/4	378.50	
3/21	378.56	
3/14	378.70	
3/7	378.48	
2/21	378.34	

EXHIBIT IV
LAKE CYPRESS SPRINGS WATER LEVEL ELEVATIONS

Date	Elevation (feet above msl)	Comments
1995		
2/14	378.40	
2/7	378.50	
2/3	378.98	
1/27	379.40	
1/24	378.80	
1/17	378.70	
1/10	378.50	
1/3	378.60	
1994		
12/27	378.60	
12/20	379.30	
12/19	379.50	
12/13	378.64	
12/7	378.20	
11/29	378.26	
11/15	378.76	
11/9	379.23	
11/7	379.70	
11/5	380.00	
11/1	378.00	
10/25	377.40	
10/21	377.80	
10/18	377.74	
10/11	377.62	
10/4	377.30	
9/27	377.40	
9/20	377.50	
9/13	377.60	
9/6	377.70	
8/30	377.79	
8/23	377.80	
8/16	377.94	
8/9	378.00	
8/2	378.08	
7/25	378.26	
7/19	378.30	
7/12	377.90	
7/5	378.00	
6/28	378.06	
6/21	378.20	
6/13	378.10	
6/7	378.20	
6/1	378.40	
5/24	378.30	
5/17	378.66	
5/10	378.18	
5/3	378.22	

Date	Elevation (feet above msl)	Comments
1994		
4/26	378.20	
4/19	378.20	
4/12	378.30	
4/5	378.26	
3/29	378.40	
3/22	378.40	
3/15	378.62	
3/8	378.68	
3/1	378.92	
2/22	378.86	
2/18	378.36	
1/11	378.30	
1993		
12/30	378.20	
12/17	378.42	
12/12	378.42	
12/3	378.40	
11/15	378.28	
11/9	378.35	
10/21	380.04	
10/20	380.00	
10/19	377.88	
10/18	377.44	
10/4	377.04	
9/22	377.00	
9/20	376.98	
9/13	376.86	
9/9	376.86	
8/30	377.00	
8/27	377.12	
8/24	377.17	
8/17	377.30	
8/16	377.34	
8/9	377.42	
7/29	377.50	
6/15	378.10	
5/31	378.26	
4/19	378.64	
3/26	378.66	
3/19	378.70	
2/26	379.60	
2/10	378.48	
2/1	378.56	
1/7	379.42	
1/5	379.94	
1/4	379.16	

EXHIBIT IV
LAKE CYPRESS SPRINGS WATER LEVEL ELEVATIONS

Date	Elevation (feet above msl)	Comments
1992		
12/23	378.62	
12/16	380.00	
12/15	379.40	
11/30	378.42	
11/13	377.88	
11/3	378.02	
10/16	377.91	
9/29	378.02	
9/22	378.20	
9/8	378.09	
8/31	378.01	
8/26	378.10	
7/28	378.55	
7/20	379.06	
7/9	378.68	
6/30	380.80	
6/29	379.42	
6/25	378.16	
5/23	378.35	
5/13	378.25	
5/4	378.26	
5/1	378.28	
4/24	378.36	
3/25	378.82	
3/24	378.71	
3/17	378.93	
3/12	379.88	
3/10	380.65	
3/9	378.84	
2/25	378.69	
2/24	378.70	
2/18	378.73	
2/3	378.54	
1/30	378.71	
1/28	378.80	
1/24	378.71	
1/16	378.45	
1991		
12/27	379.01	
12/26	379.17	
12/23	379.70	
12/16	378.66	
12/13	378.79	
12/10	378.86	
12/2	378.88	
11/20	378.52	

Date	Elevation (feet above msl)	Comments
1991		
11/19	378.32	
11/14	378.32	
11/1	379.20	
10/31	379.00	
10/30	379.09	
10/29	378.06	
10/28	377.64	
10/23	377.34	
10/9	377.50	
10/2	377.62	
9/25	377.70	
9/24	377.68	
9/19	377.80	
8/21	377.80	
7/29	378.90	
6/19	378.20	
6/11	378.30	
6/6	378.20	
6/4	378.26	
5/8	379.12	
5/6	379.54	
4/22	378.68	
4/15	379.40	
4/1	378.36	
3/18	378.40	
3/5	378.70	
2/22	378.74	
2/19	378.44	
2/11	378.58	
1/18	378.96	
1/14	379.39	
1/12	379.78	
1/10	379.30	
1/2	378.68	

EXHIBIT V
CYPRESS BASIN OPERATING
AGREEMENT

This agreement entered into this day of ,
1972, by and between the Franklin County Water District, the Titus County Fresh Water Supply District No. 1, the Northeast Texas Municipal Water District, the Texas Water Development Board and Loan Star Steel Company.

Whereas, the full development of the water resources of Cypress Creek Basin in Texas is our primary interest to the local area and to the State of Texas, and

Whereas, to accomplish this, it is necessary to resolve the problems associated with water rights in the basin upstream from Lake O' the Pines. This agreement consists of governing rules for division of water resources of the basin through an exchange of storage between Franklin County Reservoir, Titus County Reservoir, Lake O' the Pines and Ellison Creek Reservoir without impairment of existing water rights and will provide a solution for this initial problem.

Whereas, this agreement will:

a. Allow Franklin and Titus Reservoirs to impound portions of their natural inflows which may in fact be covered by prior downstream rights.

b. Provide rules which insure that waters covered by prior downstream rights, if impounded in the upper reservoirs, will be released when necessary to avoid adverse effects on the downstream rights.

c. Equitably divide the waters of Franklin and Titus Reservoirs between the owners of storage space therein.

d. Provide a workable system whereby the Texas Water Rights Commission can monitor hydrologic conditions and administer water rights in the Cypress Creek watershed above Ferrells Bridge Dam (Lake O' the Pines) under conditions of full development and use.

The following abbreviations and definitions are used in this agreement:

1. "FCWD" shall mean Franklin County Water District.

2. "TCFWSD" shall mean Titus County Fresh Water Supply District No. 1.

3. "NETMWD" shall mean Northeast Texas Municipal Water District.

4. "TWDB" shall mean Texas Water Development Board.

5. "TWRC" shall mean Texas Water Rights Commission.

6. "LSS" shall mean Lone Star Steel Company.

7. "Titus Reservoir" shall mean the reservoir proposed for construction on Cypress Creek by TCFWSD and TWDB.

8. "Lake O' the Pines" shall mean Lake O' the Pines Reservoir on Cypress Creek.

9. "Ellison Reservoir" shall mean Ellison Reservoir on Ellison Creek.

10. "Franklin Reservoir" shall mean Lake Cypress Springs on Cypress Creek.

11. "Normal pool level" shall mean the elevation in a reservoir designated as the top of the storage space allocated for water conservation.

12. "Storage account" shall mean a volume of water held in storage in either Franklin or Titus Reservoir and belonging to a specific water rights holder.

13. "Accounting period" shall mean the interval of time at which storage accounts in Franklin and Titus Reservoirs are up-dated. The accounting period shall normally be by calendar months. Any shorter period may be set by mutual agreement between FCWD, TCFWSD, NETMWD, LSS and TWDB. If Lake O' the Pines is drawn down to elevation 221.5 or lower, NETMWD shall have the right to have the accounting period shortened to one week.

14. "Daily inflows" shall mean the computed daily inflows of Franklin and Titus Reservoirs, which shall be determined for purposes of establishing the quantity of water which could possibly be obligated to LSS and NETMWD. Daily inflows to each of the two reservoirs from uncontrolled runoff shall be determined in the following manner:

(a) The over-land runoff entering each reservoir during the accounting period shall be calculated as the algebraic sum of:

(1) The change in reservoir content during the accounting period;

(2) Plus all diversions and releases made from the reservoir during the accounting period;

(3) Plus all spills from the reservoir during the accounting period;

(4) Plus the computed gross evaporation loss from the lake surface during the accounting period;

(5) Minus the computed total rainfall volume falling on the lake surface during the accounting period;

(6) Minus, in the case of Titus Reservoir, any releases or spills coming in from Franklin Reservoir during the accounting period.

(b) The average lake surface area during the accounting period shall be subtracted from the net drainage area contributing to the lake (75 square miles in the case of Franklin Reservoir and 128 square miles in the case of Titus Reservoir) to determine the watershed area from which the over-land runoff originated.

(c) The total runoff for the accounting period shall then be computed as the over-land runoff multiplied by the ratio of the net drainage area (75 square miles for Franklin and 128 for Titus) to the over-land runoff watershed area derived in step (b) above.

(d) If the total runoff for the accounting period is negative, daily inflows shall be taken as zero throughout the accounting period. If the total runoff is positive, the daily inflows shall be computed from the total runoff by assuming a daily pattern of flows comparable to the daily flow pattern observed at the stream gaging station specified in Section E-2-c below.

15. "Net inflow" to Franklin and Titus Reservoirs shall be computed for each accounting period as described below and shall provide the basis for division of the impounded waters between the respective owners of storage space:

a. The change in reservoir content during the accounting period;

b. Plus all releases and diversions chargeable to FCWD, TCFWSD, and TWDB;

c. Minus the changes in the storage accounts of NETMWD and LSS during the accounting period as defined in Section A below;

d. Plus or minus appropriate adjustments for delayed releases by Franklin Reservoir through Titus Reservoir.

It is therefore agreed between the parties that the following are the rules to be used for the exchange of storage:

A. Water Accounting

The water in storage at the end of each accounting period creditable to each owner of a storage account in Franklin and Titus Reservoirs shall be determined as follows:

1. LSS's Storage Accounts

a. LSS's storage accounts in both Franklin and Titus Reservoirs at the end of an accounting period shall be computed as the water in storage to LSS's credit at the beginning of the accounting period:

(1) Plus the daily inflows accumulated during the accounting period creditable to LSS as described in Section B below;

(2) Minus releases made from LSS's storage accounts;

(3) Minus reservoir spills chargeable to the LSS storage accounts (spills are chargeable first to NETMWD's storage accounts until depletion of those accounts and then to LSS's storage accounts);

(4) Minus the computed difference in net evaporation loss at Ellison Reservoir due to the LSS storage account water being withheld upstream, based on computation procedures to be developed by engineers of the respective agencies;

(5) Plus, in the case of Titus Reservoir, incoming spills from Franklin Reservoir which are charged against the LSS storage account in Franklin Reservoir.

b. If LSS's storage account total in Franklin and Titus Reservoirs is greater than the empty conservation storage space in Ellison Reservoir, the excess shall transfer to the NETMWD storage accounts, with adjustments being made first in Franklin Reservoir because FCWD holds prior rights over TCFWSD.

2. NETMWD's Storage Accounts

a. NETMWD's storage accounts in both Franklin and Titus Reservoirs at the end of an accounting period shall be computed as the water in storage to NETMWD's credit at the beginning of the accounting period:

(1) Plus the daily inflows accumulated during the accounting period creditable to NETMWD (daily inflows are creditable to NETMWD's storage account <u>only</u> to the extent that the daily inflow is surplus, on a day-to-day basis, to that to which LSS is entitled according to rules set forth herein);

(2) Minus releases made from NETMWD's storage accounts;

(3) Minus reservoir spills chargeable to the NETMWD storage accounts (spills are chargeable first to NETMWD's storage accounts until depletion of those accounts and then to LSS's storage accounts);

(4) Minus the computed difference in net evaporation loss at Lake O' the Pines due to the NETMWD storage account water being withheld upstream, based on computation procedures to be developed by engineers of the respective agencies;

(5) Plus, in the case of Titus Reservoir, incoming spills from Franklin Reservoir which are charged against the NETMWD storage account in Franklin Reservoir;

(6) Minus releases or diversions made to satisfy municipal requirements for Pittsburg (a debit balance may accumulate in NETMWD's storage account from this source).

b. If NETMWD's storage account total in Franklin and Titus Reservoirs at the end of an accounting period is greater than the empty space in Lake O' the Pines, the excess shall transfer to the accounts of FCWD, TCFWSD, and TWDB, divided in the manner set forth for net inflow in Sections A-3 and A-4 below, with adjustment being made first in Franklin Reservoir because FCWD holds prior rights over TCFWSD.

3. <u>FCWD's Storage Account</u> - FCWD's storage account in Franklin Reservoir at the end of an accounting period shall be equal to the water in storage to FCWD's credit at the beginning of the accounting period, plus a percentage of the net inflow to Franklin Reservoir during the period, minus the releases and diversions chargeable to FCWD during the period. The percentage applied to the net inflow shall be based on percentage ownership of conservation storage space whenever the net inflow is positive, and on the percentage ownership of actual water in storage whenever the net inflow is negative.

4. <u>TCFWSD's Storage Account</u> - TCFWSD's storage account in Titus Reservoir at the end of an accounting period shall be equal to the water in storage to TCFWSD's credit at the beginning of the accounting period, plus a percentage of the net

inflow to Titus Reservoir during the period, minus the releases and diversions chargeable to TCFWSD during the period. The percentage applied to the net inflow shall be based on percentage ownership of conservation storage space whenever the net inflow is positive, and on the percentage ownership of actual water in storage whenever the net inflow is negative.

5. TWDB's Storage Account - TWDB's storage accounts in Franklin and Titus Reservoirs at the end of an accounting period shall be, respectively, the total content of the conservation space in Franklin and Titus Reservoirs less the amounts credited in each to FCWD, TCFWSD, NETMWD and LSS.

6. Transfer of Credits

a. At no time will water in conservation storage credited to either FCWD, TCFWSD, or TWDB exceed the respective volumes of conservation storage owned by those agencies, and any water in excess of the owned conservation storage capacity shall be transferred to the other storage accounts.

b. Transfer of storage credits between parties to this agreement may be made at any time by mutual agreement between the parties concerned, subject to approval to TWRC.

7. <u>Withdrawal of Credits</u>

a. FCWD, TCFWSD and TWDB may utilize water from their respective storage accounts at any time subject to the following:

(1) Releases and diversions made during any calendar year shall not exceed the appropriative rights granted by the TWRC.

(2) Releases and diversions shall be limited to the extent that water is available to their respective storage accounts.

b. <u>NETMWD</u> shall have the right to obtain releases from its storage accounts in the two upper reservoirs to the extent that the total volume of water in those accounts exceeds the following values as they relate to drawdown in Lake O' the Pines (below normal Pool Level, El. 228.5):

Drawdown in Lake O' the Pines (in feet)	NETMWD's Combined Storage Accounts in the Upper Reservoirs (in Acre-Feet)
2'	30,000 Ac-Ft
3'	24,000 Ac-Ft
4'	18,000 Ac-Ft
5'	12,000 Ac-Ft
6'	6,000 Ac-Ft
7'	0 Ac-Ft

c. If at any time the quantity of water credited to NETMWD's storage account in either of the upper reservoirs exceeds twenty percent (20%) of the total storage therein, the excess shall be released if requested by NETMWD.

d. In addition to the above, NETMWD shall have the unconditional right to furnish municipal water for the City of Pittsburg from its storage accounts. NETMWD shall have the right to construct an intake structure and diversion pump station at Titus Reservoir for this purpose.

e. LSS shall have the right to utilize water from its storage accounts to the extent of its availability whenever Ellison Reservoir level is three (3') feet or more below normal.

f. When the LSS storage accounts have been exhausted, and so long as the flow in Cypress Creek at the LSS diversion point remains less than the capacity of existing diversion facilities, the upper lakes shall be operated so as to pass current inflows through these lakes on a day-to-day basis, to the extent that such inflows are creditable to the LSS accounts, if such action is requested by LSS.

g. If releases are made under the terms of Section A-7-b or Section A-7-e above, they shall be made first from Titus Reservoir insofar as possible and then from Franklin Reservoir.

h. Any release from the NETMWD and LSS storage accounts in Franklin Reservoir shall be allowed to pass through Titus Reservoir without hindrance.

B. Operation of Ellison Reservoir

1. When storage accounts are up-dated at the end of an accounting period, the LSS storage accounts shall have priority over NETMWD storage accounts, and water shall be credited to the LSS storage accounts if the following two conditions are met:

a. LSS shall be entitled to storage account credit for a given day only if the flow in Cypress Creek at the LSS diversion point on that day is less than the amount that LSS is able to divert from Cypress Creek with existing facilities under terms of Permit 1405, as amended, and also

b. LSS shall be entitled to storage account credit for a given day only if the amount actually diverted from Cypress Creek by LSS on that day is equal to or greater than ninety (90%) percent of the amount of water available to LSS in Cypress Creek.

2. On any day when these conditions are satisfied, the amount of water credited to the LSS storage accounts shall be the difference between the said LSS diversion capacity and the amount flowing in Cypress Creek at the point of diversion, the amounts credited, however, to be limited to not exceed the inflows to the upper reservoirs on the same day.

C. Until Modifications are made to the outlet works at the Franklin Reservoir, it may be impossible to release waters credited to NETMWD or LSS as rapidly as desired. Insofar as as it is practicable to do so, releases will be made from Titus Reservoir storage to make up for the restricted discharge capability at Franklin Dam, and compensating releases will be made from Franklin Reservoir as rapidly as possible. Metering of the water released from Franklin into Titus Reservoir shall be accomplished by FCWD at its expense.

D. LSS and NETMWD shall have the option at any time of calling for the water credited to their storage accounts, when eligible to do so, or leaving the water in storage in the upper reservoirs. Each shall retain title to such waters until conditions prevail as described in Section A-1-b for LSS's account and A-2-b for NETMWD's account when adjustments in ownerships shall be made as set forth therein. Waters released will be at the rate and time requested by LSS or NETMWD, measured at Franklin Dam for releases required from Franklin Reservoir and at Titus Dam for releases required from Titus Reservoir.

E. Streamflow Gages

Parties to this agreement will cooperate with the U. S. Geological Survey in the cost of operation and maintenance of recording streamflow gages as described herein and others that may be required by the TWRC.

1. FCWD's Gages

a. Franklin Reservoir lake-stage recording gage,

b. Cypress Creek upstream from head of Franklin Reservoir.

2. <u>TCFWSD's Gages</u>

a. Cypress Creek downstream from its dam for measurement of spillway and outlet works discharges,

b. Titus Reservoir lake-stage recording gage,

c. Tributary stream upstream from head of Titus Reservoir for use in computation of daily inflows.

3. <u>NETMWD's Gages</u>

a. Lake O' the Pines lake-stage recording gage.

4. <u>LSS's Gages</u>

a. Ellison Reservoir lake-stage recording gage.

5. <u>Gages Financed Jointly by Owners of the Four Reservoirs</u>

a. Cypress Creek upstream from mouth of Ellison Creek.

6. In addition to the stream flow gages, all diversions made from Franklin Reservoir, Titus Reservoir, Ellison Reservoir, and Lake O' the Pines will be metered with modern equipment indicating quantities to an accuracy within five (5%) percent, and all records collected will be available for examination by other parties to the Agreement.

F. This agreement shall become effective January 1, 1973.

EXHIBIT VI

SAMPLE REVIEW CHECKLIST

for Water Conservation and Drought Contingency Plan Development

The following checklist provides a convenient method to insure that the most important items that are needed for the development of a conservation and a drought contingency program are considered.

1. Utility Evaluation Data

   A. Population of Service Area ______________ (Number)

   B. Area of Service Area ______________ (Sq. mi.)

   C. Number and Type of Equivalent 5/8" Meter Connections in Service Area ______(Res.) ______(Comm.) ______(Ind.)

   D. Net Rate of New Connection Additions per year (New Connections less disconnects) ______(Res.) ______(Comm.) ______(Ind.)

   E. Water Use Information

      (1) Water Production for the Last Year ______________ (gal./yr.)

      (2) Average Water Production for Last 2 Years ______________ (gal./yr.)

      (3) Average Monthly Water Production for Last 2 Years ______________ (gal./mo.)

      (4) Estimated Monthly Water Sales by User Category (1000 gal.) (Use latest typical year)

	Residential	Commercial-Institutional	Industrial	Total
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
Total				

      (5) Average Daily Water Use ______________ (gpd)

      (6) Peak Daily Use ______________ (gpd)

      (7) Peak to Average Use Ratio (average daily summer use divided by annual average daily use) ______

      (8) Unaccounted for Water (% of Water Production)

F. Wastewater Information

(1) Percent of your potable water customers sewered by your wastewater treatment system _____.

(2) Percent of potable water customers who have septic tanks or other privately operated sewage disposal systems __________%.

(3) Percent of potable water customers sewered by another wastewater treatment utility _________%.

(4) Percent of total potable water sales to the three categories described in F(1), F(2), and F(3).

(a) Percent of total sales to customers you serve ________%.

(b) Percent of total sales to customers who are on septic tanks or private disposal systems _________%.

(c) Percent of total sales to customers who are on other wastewater treatment systems __________%.

(5) Average daily volume of wastewater treated ____________ (gal)

(6) Peak daily wastewater volumes ______________________ (gal).

(7) Estimated percent of wastewater flows to your treatment plant that originate from the following categories:

Residential	________%
Industrial and Manufacturing	________%
Commerical/Institutional	________%
Stormwater	________%
Other - Explain	________%

G. Safe Annual Yield of Water Supply __________________ (gal.)

H. Peak Daily Design Capacity of Water System _______________ (gpd)

I. Major High-Volume Customers (List) ______________________________

____

____

J. Population and Water Use or Wastewater Volume Projections (List) ______________________________

____

K. Percent of Water Supply Connections in System Metered _____(Res). _____(Comm.) _____(Ind.).

L. Water or Wastewater Rate Structure (Uniform, Increasing Block, etc.) ______________________________

____

____

APPENDIX G

APPENDIX G

Texas Water Development Board – Comments and Responses

TWDB letter from Tommy Knowles to David Weidman, May 21, 2000

Attachment 1, TWDB, Review Comments

Hayter Engineering, Inc., Response to Review Comments

Huther and Associates, Inc., Response to Review Comments

APPENDIX G

Texas Water Development Board – Comments and Responses

TWDB letter from Tommy Knowles to David Weidman, May 21, 2000

Attachment 1, TWDB, Review Comments

Hayter Engineering, Inc., Response to Review Comments

Huther and Associates, Inc., Response to Review Comments

TEXAS WATER DEVELOPMENT BOARD

May 12, 2000

Mr. David I. Weidman
General Manager
Franklin County Water District
P.O. Box 559
Mt. Vernon, Texas 75457

Re: Regional Wastewater Planning Contract Between Franklin County Water District (District) and the Texas Water Development Board (Board), Contract No. 98-483-247, Review of Draft Final Report "Regional Wastewater Plan for Lake Cypress Springs and the Franklin County Water District"

Dear Mr. Weidman:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 98-483-247. As stated in the above referenced contract, the District will consider incorporating comments from the EXECUTIVE ADMINISTRATOR shown in Attachment 1 and other commentors on the draft final report into a final report. The District must include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report.

The Board looks forward to receiving one (1) unbound camera-ready original and nine (9) bound double-sided copies of the Final Report on this planning project. Please contact Mr. Ralph Boeker, Contract Manager for this project, at (512) 936-0851, if you have any questions about the Board's comments.

Sincerely,

Tommy Knowles

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

Cc: Ralph Boeker

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ATTACHMENT 1
TEXAS WATER DEVELOPMENT BOARD
REVIEW COMMENTS: Contract No. 98-483-247

"Regional Wastewater Plan for Lake Cypress Springs and the Franklin County Water District"

1. The report should describe any seasonal variation of nutrient loading, in accordance with Task 4 of the contract.

2. In Chapter 3, page 23, spray irrigation and lined evapotranspiration systems are recommended as the preferred on-site systems. It is not clear if rock/reed systems are covered in the lined evapotranspiration system description. If not, they should also be evaluated for appropriateness. Also, innovative systems such as composting toilets, ultra-sonic toilets, etc. should be mentioned as alternative technologies in need of further analysis.

3. In Chapter 4, page 24, it is stated that treated wastewater from septic tanks frequently meet water quality standards for conventional pollutants, such as TSS and BOD. Please provide a literature citation. Water quality standards should probably be termed effluent limitations. The nitrogen mentioned being present in septic tank effluent could be in the form of organic nitrogen, as well as ammonia nitrogen, as stated. A literature citation here would be helpful. The statement about poor sorption of nitrates should be referenced, as it would be specific to the aquifer being studied.

4. On page 25, second paragraph, clarify if sewage is the proper term, rather than septage or septic system runoff.

5. On page 29, second paragraph, "suggesting sewage input from septic systems". Fecal coliform are available from a number of sources, including confined-animal feeding operations and waterfowl. Since the report indicates some CAFOs are in the area, clarify the basis for reaching this conclusion. Confirm that use of the term sewage is correct; see comment 4 above.

6. Page 29, last paragraph, "It is certain that old, failing, or inefficient septic systems are contributing nutrients and fecal bacteria into the lake." Elevated levels of nutrients and fecal coliform bacteria were present in the lake when it was sampled. It is not certain that "old" septic systems are a source of it, particularly if they've been well designed and maintained. Failing and inadequate systems are more likely contributors, but several factors come into play for each individual system, such as depth to ground water, overburden, damage to tanks or laterals, soils, etc. The use of the word "certain" may not be warranted. Probable contributors may be a better description.

7. Chapter 5, page 33, last paragraph. Soil suitability would not necessarily apply to some subsurface on-site systems, since soil may be imported for use in a lined-system. Lined ET systems would also appear to be an option here, with less of a health risk due to aerosol inhalation.

8. In Chapter Five of the report, data on age, type, and number of on-site systems are shown for 1100 on-site systems. Chapter One of the report indicates about 923 occupied residences in the planning area. Please clarify the reasons for differences in these numbers.

9. The report proposes a pressure-type sewer collection system and centralized treatment facility for a portion of the planning area. The proposed improvements would be eligible for Texas Water Development Board financing through the Clean Water State Revolving Fund (political subdivisions only) and through the Texas Water Development Fund (political subdivisions and non-profit water supply corporations). The proposed improvements appear to be feasible and cost estimates look reasonable.

10. Discussions of possible project financing included in the report list the Board's Clean Water State Revolving Fund (CWSRF) as a potential funding source for water supply corporations (WSC) as well as political subdivisions. WSC's are not eligible entities for CWSRF financing. WSC's would have to be funded through the Texas Water Development Fund at interest rates about 3% higher than those offered through the CWSRF.

11. The report includes initial coordination with the US Fish and Wildlife Service, Texas Parks and Wildlife Department and the Texas Historical Commission. Funding through the Texas Water Development Board would require preparation of an environmental assessment and further coordination with those agencies as well as the US Army Corps of Engineers.

12. Appendix C references, but does not include Texas Natural Resource Conservation Commission on-site system regulations. These should be included in the report.

HAYTER
ENGINEERING, INC.

CONSULTANTS PLANNERS ENGINEERS

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PARIS, TEXAS 75460
(903) 785-0303
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RESPONSE TO REVIEW COMMENTS
CONTRACT NUMBER 98-483-247
"REGIONAL WASTEWATER PLAN FOR LAKE CYPRESS SPRINGS AND THE FRANKLIN COUNTY WATER DISTRICT"

Item 2. Page 23 at the end of the 3rd paragraph a sentence has been added: "Rock/reed filters may also provide suitable treatment of the septic tank effluent."

New wording has been added after the 5th existing paragraph, as follows:

> Rock/reed filter systems consist of a properly designed septic tank, which removes solids and provides primary treatment, followed by a lined bed of gravel and reeds. The liner is impervious, so soil type is not critical. The rhizomes of the reeds spread throughout the gravel support media and provide a locale for aerobic and anaerobic bacteria to grow, which act to reduce BOD, TSS, ammonia and phosphorous, and to oxygenate the wastes. Maintenance includes periodic inspections to insure equalized flow across the bed, as well as control of undesirable weed species.
>
> Innovative technologies such as composting toilets, ultra-sonic toilets, and others are alternatives which should be monitored as they develop and may warrant future consideration.

Item 7. In the last paragraph on page 33, wording has been added to include "systems employing an impermeable liner such as evapotranspiration beds or rock/reed filters."

Item 8. In Chapter 1, the reference to 923 occupied residences means residences occupied full-time. There are an estimated 2057 total residences in the planning area, the difference being weekend or second homes occupied on a part-time basis. Data is only available in Chapter 5 for 1100 of these, since until very recently, the District did not inspect on-site systems unless they were located on District property. In recent years, the District has become the approval authority for on-site systems throughout Franklin County.

Item 9. This comment does not appear to require a response.

Item 10. Under item (C) of "Option 3", a sentence has been added as follows: "Water Supply Corporations are not eligible for funding under the Clean Water SRF funding program of the TWDB. TWDB funding is available to WSC's, but at interest rates about 3% higher than through the CWSRF."

Item 11. A letter describing the project was sent to the U.S. Army Corps of Engineers - no response was received. The project would be subject to further coordination and a environmental assessment as more details become available.

Item 12. TNRCC on-site system regulations have been included as a part of Appendix C.

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RESPONSE TO REVIEW COMMENTS
CONTRACT NUMBER 98-483-247
"REGIONAL WASTEWATER PLAN FOR LAKE CYPRESS SPRINGS AND THE FRANKLIN COUNTY WATER DISTRICT"

Item 1. The study was limited to three sampling periods, late September 1998, April 1999, and early September 1999. In the final report recommendation #1 stated "Continued monitoring of the lake and creek sites at a minimum of quarterly to determine any trends. Several years worth of data is recommended."

The last sentence of paragraph 1, conclusions, has been changed from, "Nutrients were not consistently detected in any of the sample sites." to "No seasonal variation of nutrient loadings were detected at any of the lake sampling sites."

The following sentence was added to paragraph 3, conclusions: "No seasonal variation of nutrient loadings were detected at either of the creek sampling sites."

Item 3. A reference has been added to the report regarding septic tanks and conventional pollutants:

Ryding, S. and Rast, W. (ed.) (1989) *The Control of Eutrophication of Lakes and Reservoirs*, Volume I, Man and the Biosphere Series, Parthenon Publishing Group.

Typically water quality standards are applied to a body of water as a result of point source and non-point source discharges whereas effluent limitations are applied to a direct, point source discharge, such as an outfall. Because a septic system does not directly discharge into a body of water, the use of the term water quality standards seems more appropriate.

Under "Study Design" of the Huther report (Chapter 4, Page 24) the statement in question reads "Normally, effluents from septic tanks contain large quantities of nitrogen in the form of ammonia derived from feces and urine." While this statement is factual, nitrogen is also present in the form of organic nitrogen. The sentence has been changed to: "Effluents from septic tanks contain large quantities of nitrogen in the form of ammonia derived from feces and urine as well as particulate organic nitrogen. Bacterial reactions convert part of the particulate organic form to soluble ammonia. The ammonia present in septic tank effluent tends to be sorbed by the aquifer material in most ground water systems. However, in the presence of oxygen in the groundwater the ammonia will be oxidized to nitrate."

The following reference source has been added:

Jones, R.A. and Lee, G.F. "Septic Tank Disposal Systems as Phosphorous Sources for Surface Waters," Grant No. R-804549, Robert S. Kerr Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Ada, Oklahoma. EPA-600/3-77-129, November 1977.

Item 4. Various papers use various terms for wastes leaving septic tanks. The term sewage can encompass treated waste, partially treated waste, or untreated waste and therefore may be misleading to the reader. The term "sewage" has been changed to septic tank drainage.

Item 5. Fecal coliform and fecal streptococcus were detected in two coves, Crawfish Cove and Alligator Cove in two of three sampling events. Samples were collected following a period of dry weather. Neither cove had flowing tributaries entering the lake. The last sentence of that paragraph (page 29, second paragraph) reads: "Overall, fecal bacteria was (were) detected at all sites suggesting sewage input from septic systems." The sentence has been changed to: "The detection of fecal bacteria at these two sites in two of three sampling events suggest septic tank drainage input. Sampling was conducted following periods of dry weather. Neither cove had flowing tributaries entering the lake. Additional sampling for confirmation purpose is recommended."

Item 6. The author agrees with reviewers that the use of the word "old" does not allow for the possibility that "new" septic systems could also contribute nutrients and fecal bacteria to the lake and that not all old septic systems "are contributing nutrients and fecal bacteria into the lake." Therefore all reference to age has been deleted.

The use of the word "certain" does not allow for the possibility that a failing or inefficient septic system around the lake may be draining into water bodies other than Lake Cypress Springs. Therefore the word "certain" has been changed to "probable."

Regional Wastewater Plan Franklin County Water District
Detail Planning Areas - A & E Lake Cyspress Springs
Contract #98-483-247

The following map is not attached to this report. Due to the size, it could not be copied. It is located in the official file and may be copied upon request.

Detail of Planning Areas A & E Lake Cypress Springs

Please contact Research and Planning Fund Grants Management Division at (512) 463-7926 for copies.