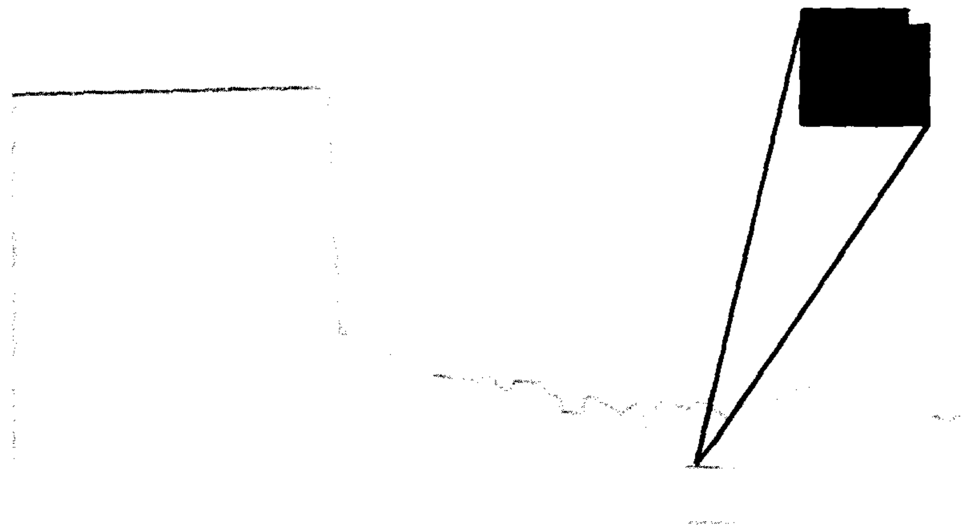

Collin County Regional Water and Wastewater Planning Study

March 1990

Brown&Root U.S.A., Inc.
Dallas • Houston

Collin County Regional Water and Wastewater Planning Study

This study was prepared for the water and wastewater agencies in Collin County. Funding was provided by:

Texas Water Development Board
Collin County
City of McKinney
North Texas Municipal Water District
City of Allen
City of Blue Ridge
City of Celina
City of Fairview
City of Frisco
City of Josephine
City of Melissa
City of Plano
City of Richardson
City of Sachse
City of Westminster
City of Wylie
Danville Water Supply Corporation
Frognot Water Supply Corporation
Gunter Water Supply Corporation
Lebanon Water Supply Corporation
North Collin Water Supply Corporation
South Grayson Water Supply Corporation
Weston Water Supply Corporation
Wylie Northeast Water Supply Corporation
Caddo Basin Special Utility District

STATE OF TEXAS
ALAN V. THOMPSON
PROFESSIONAL

Alan V. Thompson
July 16, 1990

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LIST OF ABBREVIATIONS

The following listing is presented to assist readers of this report in locating descriptions for abbreviations.

ABBREVIATIONS	DESCRIPTION
TWDB	Texas Water Development Board
NTMWD	North Texas Municipal Water District
WSC	Water Supply Corporation
MUD	Municipal Utility District
SUD	Special Utility District
NCTCOG	North Central Texas Council of Governments
NO.	Number
INC.	Incorporated
gpm	gallons per minute
ppm	parts per million
mgd	million gallons per day
U.S.	United States
gpcd	gallons per capita per day
BOD	Biochemical Oxygen Demand
TSS	Total Suspended Solids
mg/l	milligrams per liter
O&M	operation and maintenance

LIST OF ABBREVIATIONS, Continued

ABBREVIATIONS	DESCRIPTION
FM	Farm to Market
SH	State Highway
MSL	Mean Sea Level
WWTP	Wastewater Treatment Plant
TWC	Texas Water Commission
USGS	United States Geological Survey
COLLIN COUNTY	Referring to the area strictly within the boundaries of Collin County (Example: only a small portion of the City of Richardson is located in Collin County).
STUDY AREA	Encompasses Collin County and areas outside the county boundaries to include the entire city limits/service areas of entities only partially located in Collin County (Example: the entire City Limits of Richardson are included in the Study Area). The study area does not include that small portion of the City of Dallas that exists in Collin County.

SECTION I

INTRODUCTION

A. BACKGROUND

Collin County, located on the northeast side of the Dallas-Fort Worth metroplex, experienced significant population growth resulting from aggressive expansion by business and industry and progressive attitudes of governmental entities (See Figure I-1). Projections indicate that growth will continue in Collin County at rates which are higher than the national average.

As the impacts of growth and development increased, the Commissioners' Court of Collin County initiated a series of citizens' advisory committees to assess future resource needs of Collin County. One of these committees, the Water and Wastewater Committee, identified in November, 1987 the need for a county-wide water and wastewater planning study.

From the recommendations by the Water and Wastewater Committee, the Commissioners' Court, in cooperation with other governmental entities in Collin County, provided the leadership to apply to the Texas Water Development Board (TWDB) in November 1987 for a grant to partially fund a county-wide water and wastewater planning study.

In March 1988, the TWDB awarded a grant to partially fund the "Collin County Regional Water and Wastewater Planning Study." The City of McKinney was selected as the entity to contract with the TWDB and to manage the contract. In August, 1988, the City of McKinney awarded Brown & Root U.S.A., Inc. a contract to provide professional services for the Collin County Regional Water and Wastewater Planning Study.

Those local entities that participated in partial funding of the study were:

Collin County
North Texas Municipal Water District (NTMWD)
City of Allen
City of Blue Ridge
City of Celina
City of Fairview
City of Frisco
City of Josephine
City of McKinney
City of Melissa
City of Plano
City of Richardson
City of Sachse
City of Westminster
City of Wylie
Danville Water Supply Corporation
Frognot Water Supply Corporation
Gunter Water Supply Corporation
Lebanon Water Supply Corporation
North Collin Water Supply Corporation
South Grayson Water Supply Corporation
Weston Water Supply Corporation
Wylie Northeast Water Supply Corporation
Caddo Basin Special Utility District
(Formerly Hopewell Water Supply Corporation)

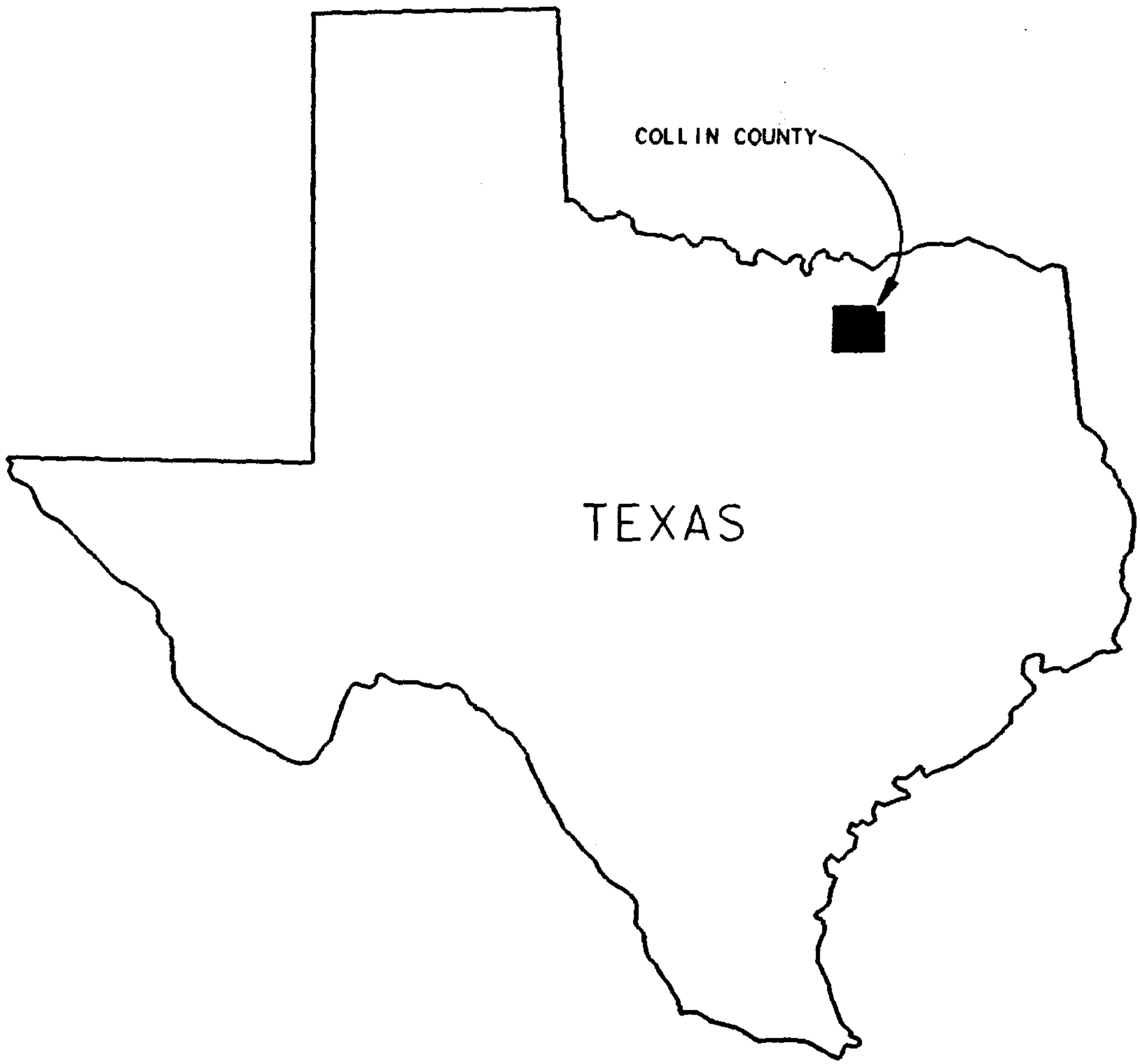


FIGURE I-1
COLLIN COUNTY LOCATION MAP

COLLIN.CHT

B. PURPOSE AND SCOPE

The Collin County Regional Water and Wastewater Planning Study is to serve as a master plan for orderly and timely development of adequate water and wastewater facilities for Collin County through the year 2020.

A regional approach is the most effective and efficient method to plan for future water and wastewater needs in Collin County. Smaller cities, towns and communities are in need of new facilities to accommodate projected growth in population. Individually, these entities may not have the financial ability to develop needed projects. Regionalization provides a method to collectively share costs of facilities and prevent duplication of services.

Development of new regional water and wastewater systems would lead to the elimination of individual systems that are inadequate and inefficient. Patchwork expansion or replacement of existing inadequate systems would be avoided. Economies of scale could be realized by sharing of cost.

The Collin County planning study includes projected populations, projected water supply needs, potential water supply sources, proposed water conveyance methods and estimated costs and implementation dates for these facilities. In addition, several options were prepared for implementation of regional wastewater collection and treatment systems.

The study also evaluated institutional organizations and financing methods for water and wastewater facilities.

C. PROJECT DESCRIPTION

The study area for the Collin County Regional Water and Wastewater Planning Study included all of the geographic area of Collin County and areas outside the county where entities with service areas extended across county boundaries. Specific work tasks were:

TASK	TITLE
I	Project Start-up, Research And Data Collection
II	Population Projections, Water Demands and Wastewater Treatment and Collection Needs
III	Water Supply Treatment And Distribution
IV	Wastewater Collection And Treatment
V	Institutional Organization And Financing
VI	Project Implementation Plan And Schedule
VII	Report

SECTION II

SUMMARY

Collin County, the jurisdictional boundaries of the Authority, experienced rapid growth during the past decade resulting largely from expansion of businesses and industries. Projections indicate continued growth with the population increasing from about 255,000 in 1988 to about 643,000 in the year 2020.

Rapid population growth will place an increased burden on limited water resources within Collin County. Accompanying the growth, average daily water use per person in the year 2020 is estimated to range from 145 to 300 gallons for various entities, with the county-wide average estimated to be about 200 gallons.

The average daily volume of water to meet the needs of water supply entities is projected to grow from about 57 million gallons per day in 1988 to approximately 146 million gallons per day in the year 2020 (excludes a portion of the City of Dallas which is in Collin County). A water conservation program should be adopted by each entity and implemented with a goal of reducing water consumption by 10 percent.

Groundwater supplies in Collin County are limited and use of surface water supplies is required to meet long term needs. The North Texas Municipal Water District provides wholesale treated surface water to several entities in Collin County. It is anticipated that the North Texas Municipal Water District will provide these services in the future.

Analyses of future water demands and available water supplies indicate a new surface water supply will be required in approximately the year 2006 to supplement existing water supplies from Lake Lavon, Lake Texoma and Lake Cooper (projected to be completed in 1995). The most favorable sources for future development are the New Bonham Reservoir on Bois d'Arc Creek in Fannin County, George Parkhouse Reservoir on the Sulphur River in Hopkins County and the Marvin C. Nichols Reservoir located on the Sulphur River immediately upstream of Lake Wright Patman.

Only one of these projects will be required to meet Collin County water needs through the year 2020. However, the water source or sources ultimately developed will be largely a function of how successful efforts are in bringing together in a joint working relationship the major water supply entities in north and northeast Texas. The Collin County Water Authority should actively encourage and participate in cooperative development efforts to reduce the cost of future water supplies and reduce risks associated with development of new water supply reservoirs.

New water treatment capacity will be needed by the year 1993. The North Texas Municipal Water District is considering new facilities and an estimated additional capacity of about 170 million gallons per day is required to serve the Collin County study area through the year 2020. Development of additional treated water transmission facilities within the county depends on the individual needs of each entity responsible for retail water sales. When needs do arise, every effort should be made to collectively plan for future multi-entity needs to promote regionalization, cost efficiency and system effectiveness.

The estimated cost of raw water from new sources is in the range of 60 cents per 1,000 gallons (1989 dollars) assuming sixty percent utilization of the firm yield of a reservoir. Additional costs will be incurred for new water treatment facilities and treated water transmission facilities. The estimated cost of the New Bonham Reservoir is $126 million, while the estimated cost for new water treatment facilities is $213 million. The cost of the reservoir and treatment plant will be shared by all of the member cities and customers of the North Texas Municipal Water District. The cost of the water transmission system within Collin County to deliver water from the treatment plant to the take points of consumers is estimated to be $48 million. The total capital investment is about $480 million for water supply including the Texoma Diversion through the year 2020.

Currently, there are 15 municipal wastewater treatment plants and two regional wastewater treatment plants in Collin County with a combined treatment capacity of about 45 million gallons per day. Plant sizes range from 70,000 to 2,000,000 gallons per day for the municipal plants while the regional plants have a combined capacity of 40 million gallons per day. At present, approximately 90 percent of the population of Collin County is served by wastewater collection and treatment systems.

The volume of wastewater flow in the study area is estimated to be about 80 million gallons per day by the year 2020. Regionalization of wastewater facilities should be encouraged and regulations governing installation of private sewage systems should be strengthened and strictly enforced.

Use of regionalization concepts indicates the county could be served in the year 2020 by six or seven wastewater treatment plants, depending on the regionalization option pursued. The capital cost of those facilities was estimated to be in the range of $90 to $110 million dollars (1989 dollars).

Financing for proposed projects could be accomplished by loans, selling of bonds or privatization of projects. Public works projects are usually financed by selling revenue bonds and/or general obligation bonds. Loan programs administered by the Texas Water Development Board could offer attractive financing.

Privatization of water and wastewater infrastructure is a feasible alternative. Each individual project should be examined to determine the benefits of using privatization.

The content of this Study deals specifically with addressing the needs of the study area through the year 2020. A significant increase in population is expected to occur beyond the scope of the planning period defined in this report. The planning process, beginning with this report, must include five-year updates (starting in 1995) to insure that the planning horizon always has a direction aimed toward the ultimate population of the county.

The successful implementation of this plan will require a cooperative effort on the part of all entities involved in providing water and wastewater services in Collin County. The various roles of the different entities should be fulfilled not in competition, but in unison to promote effective and efficient services for the citizens they serve.

The Collin County Water Authority was created in August 1989 by an Act of the Texas Legislature and signature of the Governor. The purpose of the Authority is to provide, on an orderly basis, for the water and wastewater needs of the unincorporated territory of Collin County without impairment of the powers of existing governmental entities. The Authority should rapidly act to establish its supportive role in assisting entities, where needed, to implement water and wastewater services for the citizens they serve.

SECTION III

SERVICE AREA DESCRIPTION

A. PHYSICAL CHARACTERISTICS

In 1846, the Texas Legislature created Collin County from Fannin County and named it after Collin McKinney, a pioneer settler of the area who signed the Texas Declaration of Independence. The County Seat was established at Buckner in 1847, but was moved to the City of McKinney in 1848.

Collin County, located in North Central Texas, has a total area of 886 square miles, or 567,040 acres, including 21,400 acres of water (See Figure III-1). The county is bounded by Dallas and Rockwall Counties to the south, Denton County to the west, Grayson and Fannin Counties to the north, and Hunt County to the east. The City of McKinney, centrally located in the county, is about 35 miles north of Dallas.

One of the principal highways in Collin County is U.S. Highway 75, extending north and south through the central part of the county, traversing through the Cities of Plano, Allen, McKinney, Melissa and Anna. Two other north/south thoroughfares includes U.S. Highway 289 (Preston Road) on the west side of the county and U.S. Highway 78 on the east side of the county. Highway 289 extends through Plano, Frisco, Prosper and Celina. Highway 78 extends through Wylie, Farmersville and Blue Ridge. The principal east/west highway in the county is U.S. Highway 380. This thoroughfare is located in the central part of the county and extends through Prosper, McKinney, Princeton and Farmersville. Another major highway in the county is U.S. Highway 121. This highway traverses the county diagonally from the southwest to the northeast.

Collin County is located in the Blackland Prairie of North Central Texas where soils are dark colored and significantly clayey. Soils in Collin County are categorized into six different soil associations: (1) Houston Black - Austin, (2) Houston Black - Houston, (3) Trinity - Frio, (4) Houston Black - Burleson, (5) Ferris-Houston, and (6) Wilson-Burleson. The Houston soils account for over 54 percent of the soils in the county. Within these six associations are 17 soil series that comprise the major associations. The Soil Conservation Service estimated the physical properties of each soil series including permeability. Permeability, the estimated rate at which water moves through undisturbed soil material, is important in determining whether septic tanks could operate efficiently. In an efficient septic system, soil material should be permeable to permit moderate to rapid percolation of wastewater effluent. Of the 17 soils series, 15 had moderately slow to very slow permeability which place severe limitations on the operation of septic tanks. These 15 series comprise 99.3% of the soils in the county. The remaining two series are defined as having slight to moderate limitations for septic tanks.

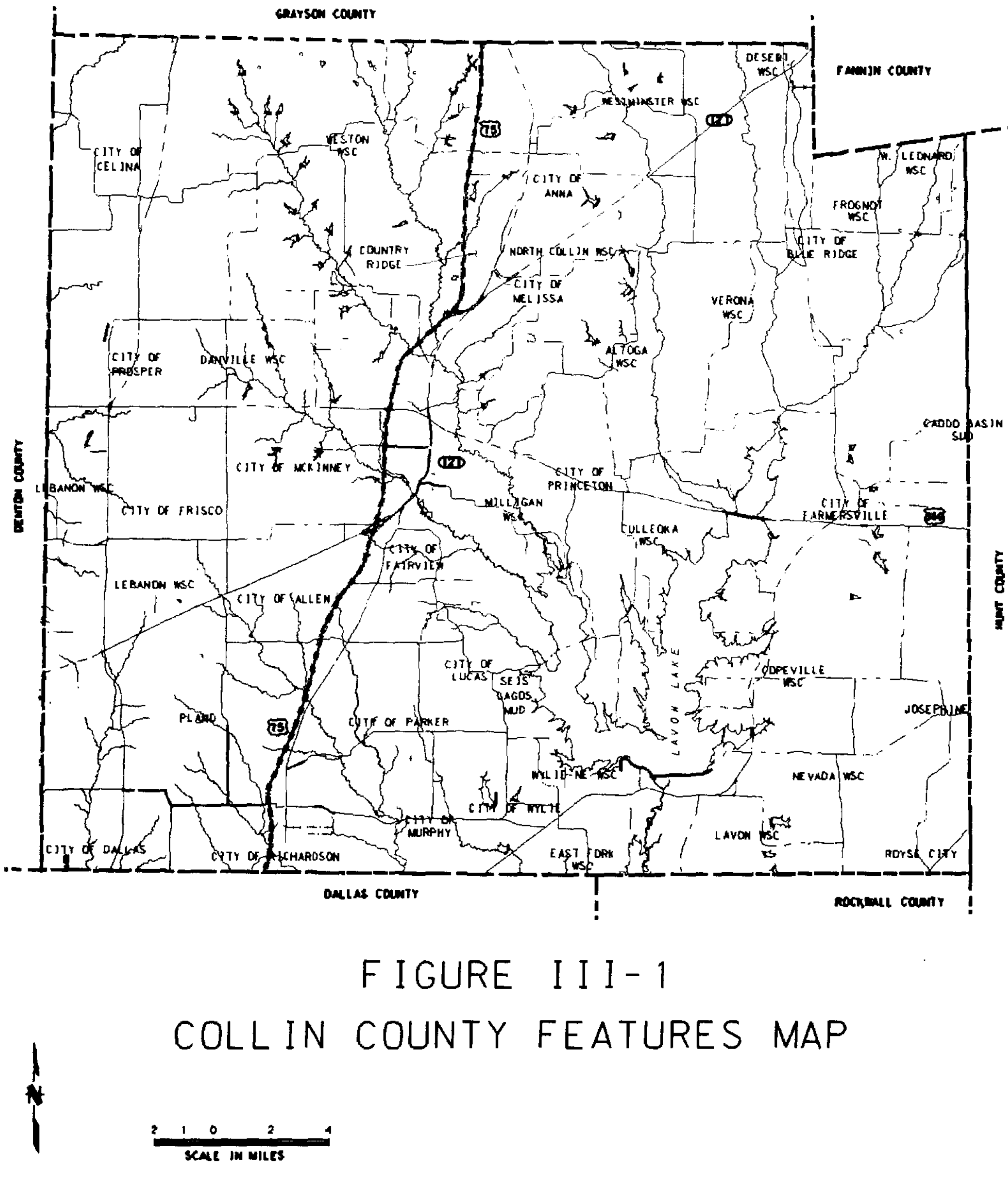


FIGURE III-1
COLLIN COUNTY FEATURES MAP

The topography of Collin County gently slopes from the north to the south. Elevations above mean sea level (MSL) in the northern part of the county vary from 650 to 800 MSL. The elevations in the southern part of the county range from 500 to 600 MSL. Four major drainage basins exist within the county. Approximately 10 percent of the county on the west side is in the Lake Lewisville watershed in Denton County. The primary water courses include Little Elm Creek, Doe Branch, Parvin Creek, Cottonwood Branch and Stewart Creek. In the southwest area, approximately 20 percent of the county drains into Lake Ray Hubbard in Dallas and Rockwall Counties. The primary water courses in this basin include Rowlett Creek, Muddy Creek, Cottonwood Creek and Spring Creek. Approximately 10 percent of the county on the extreme east side is tributary to Lake Tawakoni in Hunt County. The primary water courses in this area are Sabine Creek, Brushy Creek and Bois d'Arc Creek. The remaining 60 percent of the county is in the Lake Lavon Watershed. The major water courses in this drainage basin include Wilson Creek, East Fork Trinity River, Sister Grove Creek, Pilot Grove Creek and Indian Creek.

The climate of Collin County is warm, sub-tropical, and humid. Average annual rainfall is approximately 37 inches. Rainfall is fairly evenly distributed throughout the year, though usually, the maximum occurs in May and the minimum occurs in January. Table III-1 presents the 30-year average rainfall on a monthly basis.

TABLE III-1

AVERAGE MONTHLY RAINFALL

MONTH	RAINFALL, INCHES	MONTH	RAINFALL, INCHES
JANUARY	1.88	JULY	2.61
FEBRUARY	2.33	AUGUST	2.19
MARCH	3.03	SEPTEMBER	4.52
APRIL	4.46	OCTOBER	2.88
MAY	5.02	NOVEMBER	2.64
JUNE	3.20	DECEMBER	2.12

B. GOVERNMENTAL AGENCIES

Collin County is comprised of various types of political entities. Within the boundaries of the county, exist 28 incorporated cities, 20 water supply corporations, one water district, one municipal utility district, one special utility district and one private water company. The following list indicates the incorporated cities that are totally and partially within the boundaries of Collin County and provide water to residents.

TABLE III-2

CITIES WITH WATER SUPPLY SYSTEMS

CITY	COUNTY	CITY	COUNTY
Allen	100% Collin	Melissa	100% Collin
Anna	100% Collin	Murphy	100% Collin

TABLE III-2 (CONTINUED)

CITIES WITH WATER SUPPLY SYSTEMS

CITY	COUNTY	CITY	COUNTY
Blue Ridge	100% Collin	Parker	100% Collin
Celina	100% Collin	Plano	100% Collin
Dallas	2% Collin 98% Dallas	Princeton	100% Collin
Fairview	100% Collin	Prosper	100% Collin
Farmersville	100% Collin	Richardson	13% Collin 87% Dallas
Frisco	98% Collin 2% Denton	Royse City	7% Collin 93% Rockwall
Josephine	100% Collin	Sachse	3% Collin 97% Dallas
Lucas	100% Collin	Wylie	100% Collin
McKinney	100% Collin		

The Cities of Lavon, Lowry Crossing, New Hope, Nevada, Westminster, Weston and St. Paul are located within Collin County, but do not own or operate water or sewer systems. These seven cities are supplied with water by water supply corporations.

Table III-3 lists the 20 water supply corporations (WSC) located throughout the county:

TABLE III-3

WATER SUPPLY CORPORATIONS IN COLLIN COUNTY

WSC	COUNTY
Altoga	100% Collin County
Copeville	100% Collin County
Culleoka	100% Collin County
Danville	100% Collin County
Desert	22% Collin County 78% Fannin/Grayson Counties
East Fork	33% Collin County 65% Dallas County
Frognot	100% Collin County
Gunter	60% Collin County 40% Grayson County
Lavon	100% Collin County Serves City Of Lavon
Lebanon	100% Collin County
Milligan	100% Collin County Serves City Of Lowry Crossing
Nevada	100% Collin County Serves City Of Nevada
North Collin	100% Collin County Serves City Of New Hope
North Farmersville	100% Collin County

TABLE III-3 (CONTINUED)

WATER SUPPLY CORPORATIONS IN COLLIN COUNTY

WSC	COUNTY
South Grayson	50% Collin County 50% Grayson County
Verona	100% Collin County
West Leonard	29% Collin County 71% Fannin And Hunt Counties
Westminster	100% Collin County Serves City Of Westminster
Weston	100% Collin County Serves City Of Weston
Wylie Northeast	100% Collin County Serves Town Of St. Paul

Other entities that supply or distribute potable water within the county included: (1) the North Texas Municipal Water District, (2) Seis Lagos Municipal Utility District (MUD), (3) Caddo Basin Special Utility District (SUD), formerly known as Hopewell WSC, and (4) Country Ridge Estates, a private water company operating within the corporate limits of the City of Melissa.

The North Texas Municipal Water District is responsible for supplying treated water from Lake Lavon to all NTMWD member cities and contract customers in several counties including Collin County, Dallas County, Kaufman County, and Rockwall County. NTMWD member cities include Farmersville, Forney, Garland, McKinney, Mesquite, Plano, Princeton, Richardson, Rockwall, Royse City and Wylie. Several entities in Collin County are supplied with water from NTMWD through member cities and include: (1) North Farmersville WSC (Farmersville), (2) Caddo Basin SUD (Farmersville), (3) Copeville WSC (Farmersville), (4) North Collin WSC (McKinney), (5) Danville WSC (McKinney), (6) Culleoka WSC (Princeton), and (7) the City of Josephine (Royse City). Contract customers of the NTMWD in Collin County include:

City Of Allen	City Of Murphy
City Of Parker	City Of Frisco
City Of Lucas	Milligan WSC
East Fork WSC	City Of Sachse
Wylie NE WSC	Nevada WSC
Lavon WSC	City Of Fairview
Seis Lagos MUD	

For the purpose of this Planning Study, the portion of the City of Dallas that exists in Collin County was assumed to be adequately served by the City of Dallas and was not considered in this Study. A complete list of all entities in the county with the name, address, and telephone number of an entity representative is included in the Appendix A of this Report.

SECTION IV

DATA COLLECTION AND INFORMATION EXCHANGE

A. GENERAL

Information and data for this study was gathered using questionnaires, personal interviews, county-wide meetings and from existing reports and planning documents. Information collection focused on population data, water use data and wastewater flows. Data was also obtained on existing facilities and plans for future water and wastewater systems. This information was used in analyses and planning to develop the alternatives and recommendations presented in this report. Where the validity of data was questioned, appropriate measures were taken to confirm the accuracy of the data or the importance of the data was discounted. A list of the existing reports and other references is located in Appendix B.

B. LOCAL SOURCES

1. Questionnaire

The first phase of the Collin County Water and Wastewater Planning Study was to collect data using a questionnaire. The questionnaire was prepared in November 1988 and mailed to entities in the study area. This questionnaire was divided into three parts: (1) water, (2) wastewater, and (3) general information.

Information requested in Part I (Water) included service area population, number of taps, water rates, groundwater versus surface water usage, monthly water production and consumption usage, and type and size of existing facilities. The type of information requested in Part II (Wastewater) included sewered population, number of taps, sewer rates, discharge parameters, type and size of treatment plants, discharge flow rate and volumes, and effluent quality on a monthly basis. Part III (General) requested general information such as population projections, priorities for improvements, fire fighting capabilities, water conservation and existing planning documents. Questionnaires were sent to 50 entities (questionnaires were not sent to the City of Dallas and the NTMWD) and by the end of January 1989, 31 questionnaires had been returned either completed or partially completed. Several efforts were made to secure questionnaires from the remaining 19 entities. A copy of the Questionnaire is included in Appendix C.

2. Interviews

During the period of December 1988 through February 1989, either personal or telephone interviews were conducted with each entity in the study area. In December of 1988, visits were made to entities to answer questions about the purpose of the study or to clarify the information being requested by the questionnaire. Over 80 percent of the entities were visited in person, while the remaining 20 percent were contacted by telephone. In January and February of 1989, second in-person interviews were held with entities. The purpose of the second interview was two-fold: (1) to secure and clarify information on some of the questionnaires, and (2) to locate existing facilities (including water distribution mains and wastewater collection lines) on working drawings for future reference and identification.

Several discussions occurred with the NTMWD to fully understand the water supply network owned and operated by the NTMWD. Information was also obtained about the NTMWD operation and maintenance of wastewater treatment facilities throughout the county.

3. County-wide Meetings

On several occasions during the development of the planning study, county-wide meetings were conducted. Invitations were sent to all entities in the county regarding these meetings. The purposes of these meetings included: (1) to provide an update on the progress of the study, and (2) to incorporate local input and comments into the planning process.

In March of 1989, each entity was sent a letter listing preliminary future population estimates, water demands, and wastewater flow projections proposed for use in the study.

A county-wide meeting was scheduled and conducted after the receipt of these letters to specifically receive comments regarding these critical projections. A final public meeting was conducted in July 1989 for final input prior to the completion of the draft report. Additional comments were also received by letter and incorporated into the study report. In addition to the county-wide meetings, a periodic newsletter was published to communicate information on the progress of the study.

C. REGIONAL COORDINATION

Exchanging and sharing information with surrounding agencies was deemed necessary as a part of the success of this study. Several separate regional water and wastewater studies were being concurrently prepared in the north Texas area. In the latter part of 1988, the agencies conducting these regional studies began participating in regional coordination meetings.

These meetings were scheduled bimonthly to share concepts, give progress reports and to compare population estimates and other data. Most of these regional studies were funded by grants made available by the TWDB. Participants in these regional coordination meetings included: (1) Tarrant County Water Control And Improvement District No. 1, (2) City of Dallas, (3) Upper Trinity Regional Water District,

(4) Collin County, (5) North Texas Municipal Water District, (6) City of Fort Worth, (7) Trinity River Authority, and (8) the Corps of Engineers. The Texas Water Commission has also been indirectly involved in the regionalization issues.

Another regional agency that was coordinating regionalization efforts was the North Central Texas Council of Governments (NCTCOG). NCTCOG had organized a regional water/wastewater estimates task force. This task force had two functions: (1) to correlate information in the north Texas area for input into the future revisions of the Texas Water Plan, and (2) to establish procedures for collecting water and wastewater data for the preparation of future planning documents and for updating existing plans. The June 1989 participants in the Task Force included:

City of Arlington
City of Fort Worth
North Texas Municipal Water District
City of Denton
City of Garland
Trinity River Authority
Dallas Water Utilities
Upper Trinity Regional Water District
Tarrant County Water Control And Improvement District No. 1
Camp Dresser & McKee, Inc.
Alan Plummer & Associates,Inc.
Brown & Root U.S.A., Inc.
Freese & Nichols, Inc.
Espey, Huston & Associates, Inc.
Turner, Collie & Braden, Inc.
Brown & Caldwell, Inc.

SECTION V

EXISTING WATER SUPPLY RESOURCES

A. GENERAL

Groundwater was initially the principal source of potable water in the study area until the North Texas Municipal Water District began treating surface water from Lake Lavon at its treatment plant in Wylie in 1956. Currently, about 95 percent of the water used in the study area is treated surface water provided by NTMWD. The remaining five percent is supplied generally from groundwater systems owned and operated by small cities and water supply corporations located in the northern half of the study area.

B. GROUNDWATER

1. Aquifer Formations

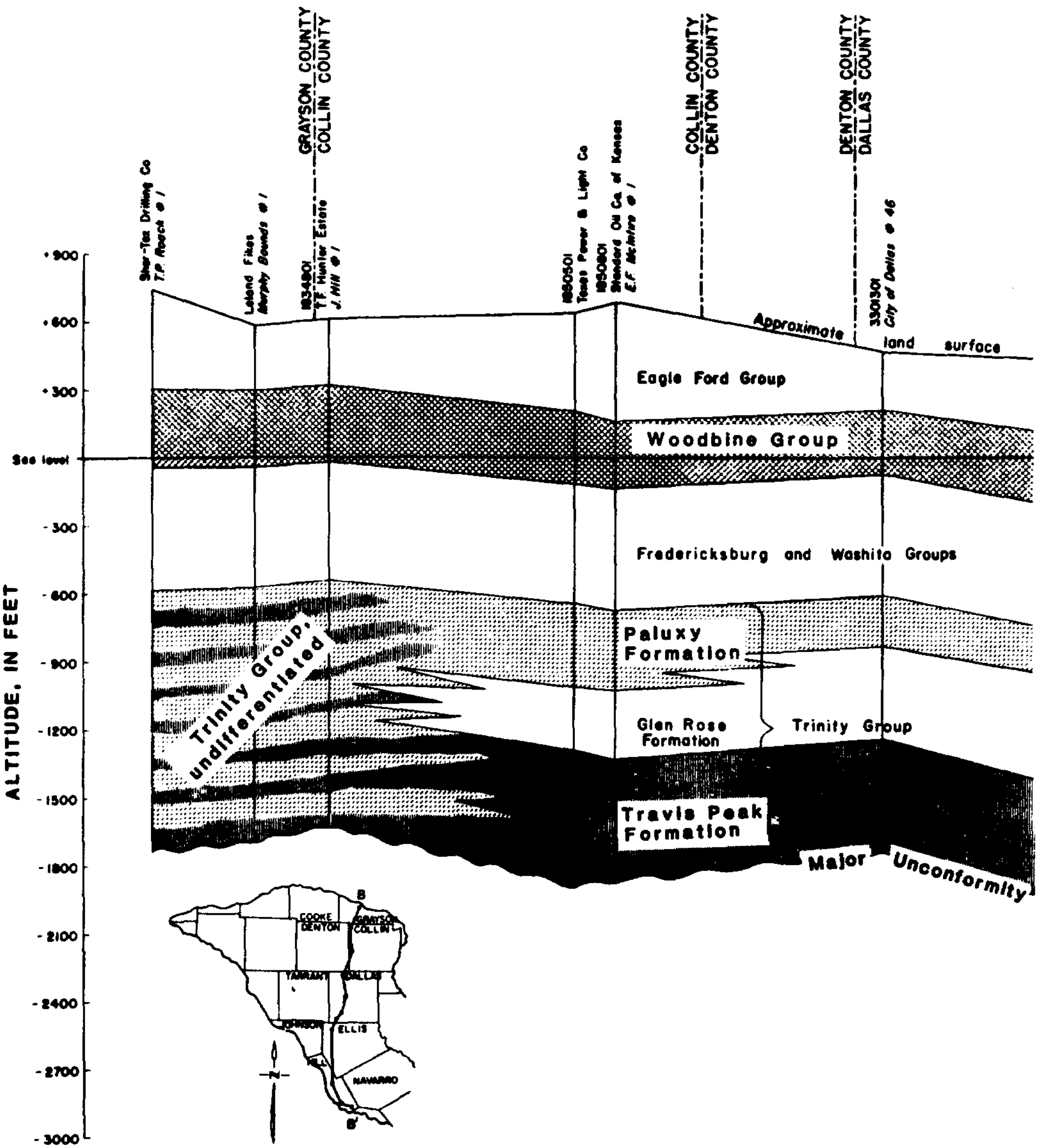
Groundwater in the study area is produced from the Trinity Group Aquifer, which includes the Paluxy and Travis Peak water bearing formations, and from the Woodbine Aquifer. Figure V-1 illustrates a profile of formations along the western edge of Collin County. The formations slope downward to the east at approximately 50 feet per mile. Depths from ground surface to the top of the Paluxy formation vary from 600 to 1,000 feet on the western edge to greater than 3,000 feet at the southeast corner of the county. The Travis Peak formation is 600 to 1,000 feet deeper than the Paluxy and is separated by the Glenrose limestone wedge throughout most of the county. The Woodbine Aquifer outcrops in Denton County about five miles west of the Collin County line. Depths to the top of this formation vary from less than 500 feet on the western edge of Collin County to greater than 1,500 feet along its eastern edge.

2. Water-Bearing Characteristics

Both the Trinity Group and the Woodbine Aquifers are characterized by fine sands of low permeability which limit yield. Pumping rates of wells producing from the Trinity Group, undifferentiated, in the northern part of the county range from 160 to 300 (gpm). Wells producing from the Paluxy formation range from 100 to 200 gpm. Woodbine wells varied from 60 to 230 gpm and on the average have lower pumping rates than wells producing from the Trinity (undifferentiated) or the Paluxy formations.

3. Water Quality

Water produced from the Trinity Group and Woodbine Aquifers is a generally soft bicarbonate type. In the



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

AQUIFER PROFILES

FIGURE V-1

Trinity wells, the water is generally low in chloride and sulphate content and total dissolved solids generally vary from 400 to 800 parts per million (ppm). Salinity increases with depth. Water produced from the Woodbine Aquifer is also a bicarbonate type but the water is higher in sulfates and fluorides and total dissolved solids generally range from 600 to greater than 1,000 ppm.

4. Supply

In 1988, approximately 38 water supply system wells operated in the study area. Seven wells produced from the Paluxy formation, ten from the Trinity (undifferentiated formation) and twenty-one from the Woodbine formation. The total pumping capacity of these wells was approximately 5,800 gpm, which is equivalent to 8.4 million gallons per day (mgd). The current average daily use rate is approximately 2.4 mgd.

C. SURFACE WATER

1. General

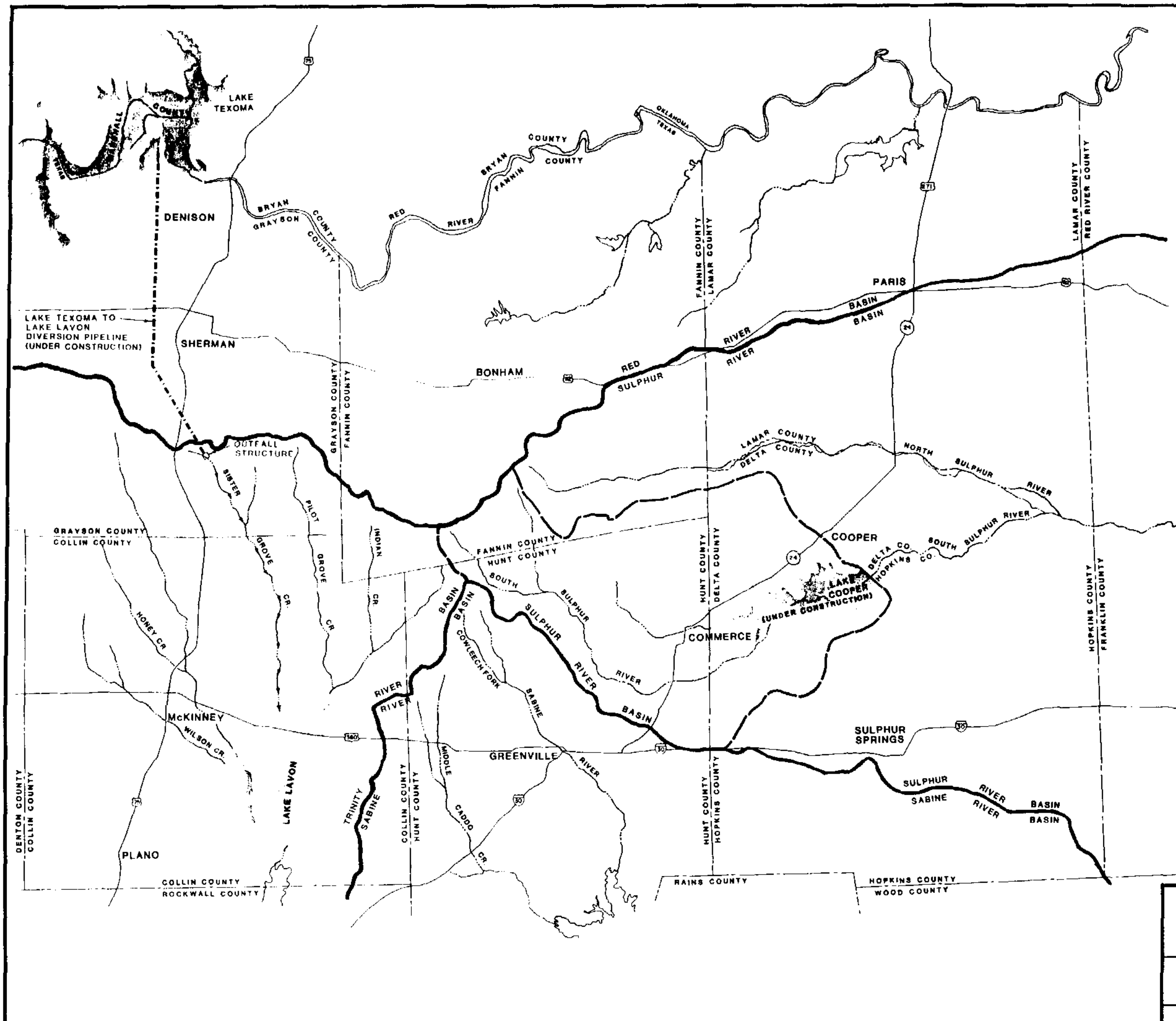
Three reservoir projects considered as existing resources were Lake Lavon, Lake Texoma and the Cooper Lake Project. Lake Lavon was the only source in use.

The Texoma Diversion and Cooper Lake Projects were under construction and nearing completion. The projects are shown on Figure V-2.

2. Water Supply Facilities

a. Lake Lavon

The dam for Lake Lavon is located on the East Fork Trinity River in Collin County. The project is owned by the U. S. Government and operated by the Corps of Engineers, Fort Worth District. Construction began in 1953 and impoundment of water began in 1958. The project had since been enlarged to increase conservation storage and supply capability. The lake provides 276,000 acre-feet of flood control storage at elevation 503.5 and 380,000 acre-feet of conservation storage at elevation 492.0. The surface area of the lake at top of conservation storage is 21,400 acres. NTMWD originally acquired the conservation storage capacity from the federal government and obtained water right permits from the state to store, divert and make beneficial use of 104,000 acre-feet per year (93 mgd) for municipal purposes. The water is diverted from the lake at a pumping station near the west end of the dam and pumped by pipeline to water treatment plants at Wylie. In water year 1987-1988, the NTMWD



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

SURFACE WATER SOURCES

FIGURE V-2

delivered 128.0 mgd from this source to its member cities and customers. Approximately 50 percent of the water supplied was provided to member cities and customers within the study area.

b. Lake Texoma

The lake is located on the Red River in Texas and Oklahoma. The dam is five miles north of Denison, Texas. On the Texas side, the lake is in Grayson and Cooke Counties. The project is owned by the U. S. Government and is operated by the Corps of Engineers, Tulsa District. The project is used for flood control, power generation, water conservation, and recreation. Construction was completed and deliberate impoundment of water began in 1943. The normal pool elevation and top of conservation storage is at elevation 617.0. Surface area of the lake at this level is 91,000 acres. Conservation storage allocated for municipal, industrial and power generation purposes is 1,730,300 acre-feet.

The Red River Compact governs use of waters from the Red River Basin and provides for the division of Lake Texoma water between the States of Oklahoma and

Texas. NTMWD acquired rights for the diversion of water from Lake Texoma to Lake Lavon. The diversion facilities consist of a pumping station on Lake Texoma, a 72-inch diameter pipeline from the lake and an outflow structure on Sister Grove Creek near the City of Howe in the Trinity River Basin. The water would flow in this watercourse to Lake Lavon. The Texoma to Lavon raw water diversion project is expected to be completed in 1990 and provide up to 75 mgd of additional raw water supply.

c. Cooper Lake

Cooper Lake is a U. S. Government project under construction by the Corps of Engineers. The lake will be used for flood control, water supply, and recreation. The dam is located on the South Sulphur River near Cooper, Texas. The lake will provide 131,400 acre-feet of flood control storage and 273,000 acre-feet of water supply storage. At the top of conservation storage, elevation 440.0, the lake surface area will be 19,300 acres. The lake will provide a firm supply of 134,400 acre per feet per year. The NTMWD and City of Irving each hold permits for 49,286 acre feet per year (44.0 mgd) and the Sulphur River Municipal Water District holds a permit for use of 35,845 acre-feet per year (32.0 mgd). Under the present contract schedule, deliberate impoundment of water in the lake is expected to begin in late 1991. NTMWD and the City of Irving had begun design of the intake structure, pump station and raw water pipeline to bring the water to the Trinity River Basin. The NTMWD's 44.0 mgd share of the raw water will be discharged to Lake Lavon. First delivery of water to Lake Lavon is dependent on (1) funding by Congress to complete construction of Cooper Lake, (2) weather conditions for filling the lake after construction is completed and, (3) the design and construction schedule of the Cooper to Lavon conveyance system. The system is expected to be completed by the year 1995.

3. Water Quality

The water in Lake Lavon is of a good quality, calcium bicarbonate type, suitable for almost all uses. Natural runoff above the lake generally contains 100 to 250 ppm of dissolved solids. The concentration of dissolved solids in the lake is usually less than 250 parts per million. In the Red River Basin above Lake Texoma, many tributary streams are highly saline. Under low-flow conditions, the lower reaches of Prairie Dog Town Fork

Red River, Pease River, and Wichita River have total dissolved solids exceeding 25,000 ppm, sulfates above 3,000 ppm and chlorides above 10,000 ppm. These high salt loads are derived principally from salt springs and seeps. The quality of the main stem of the Red River improves downstream. Lake Texoma receives good quality inflows from the Washita River in Oklahoma. The resulting dilution reduces the average concentration of total dissolved solids in water discharged from the lake to about 1,000 ppm. Runoff from the South Sulphur River above Cooper Lake is of good quality, calcium carbonate type, suitable for almost all uses and generally contains about 150 ppm of total dissolved solids. The NTMWD will always maintain water treatment requirements that are within the standards of the Texas Department of Health and the Safe Drinking Water Act.

SECTION VI

EXISTING FACILITIES INVENTORY

A. WATER SYSTEMS

1. General

Water supply in Collin County is provided by 45 entities. These entities include 22 municipal systems (including one private water company), 20 water supply corporations, one municipal utility district, one special utility district; with all treated surface water supplied by the North Texas Municipal Water District. The study area does not include that portion of the City of Dallas located in Collin County.

2. Cities

a. Allen

The City of Allen is located in the southwest quadrant of the county. The population of 17,000 is served by 5,917 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. Total water purchased by the city in 1987 was 1,036 million gallons and total water consumption was 850 million gallons. Average daily water purchased by the city was 2.8 mgd or 170 gallons per capita per day (gpcd).

The average daily water consumption was 2.3 mgd or 133 gpcd. The maximum daily water purchase by the city was 5.5 mgd for a 324 gpcd maximum purchase rate.

Storage facilities include two ground storage tanks and two elevated tanks. The ground storage tanks have capacities of two and three million gallons. The elevated storage tanks have capacities of 0.5 and 2.0 million gallons.

There are two high service pump stations. The first has three pumps of 2,000, 2,000, and 4,000 gpm capacity. The second pump station has four pumps of 1,950, 3,950, 3,950, and 3,950 gpm capacity.

b. Anna

The City of Anna is located in the north central portion of the county. Approximately 530 customer taps serve a population of 1,340 (1988). Groundwater is supplied from two wells in the Woodbine formation.

Storage facilities include three ground storage tanks and one elevated storage tank. The ground storage tanks have capacities of 42,000; 100,000; and 300,000 gallons. The elevated tank has a capacity of 55,000 gallons.

c. Blue Ridge

The City of Blue Ridge (population 600) is located in the northeast quadrant of the county and is served by 278 customer taps. Two wells supply groundwater from the Woodbine formation. The pumping capacities are 100 and 150 gpm.

The total water production for 1987 was 20.8 million gallons and total consumption was 18.1 million gallons. The average daily water production was 0.057 mgd for a 95 gpcd production rate. The average daily consumption was 0.052 mgd for a 86 gpcd use rate. The city has one elevated storage tank with a capacity of 50,000 gallons.

d. Celina

The City of Celina, located in the northwest quadrant of the county, had a 1988 population of 1,870.

Groundwater is supplied by four wells. Two of the wells are in the Trinity formation, one is in the Woodbine formation, and one is in the Paluxy formation. Capacities are 60, 60, 175, and 300 gpm.

Storage facilities include two ground storage tanks, one standpipe and one elevated tank. Capacities are 75,000; 150,000; 150,000; and 75,000 gallons, respectively.

e. Country Ridge Development

Country Ridge Development is located in the City of Melissa. The population of 120 is served by 50 customer taps.

One well with a capacity of 160 gpm supplies groundwater from the Woodbine formation.

Total water production and consumption for 1987 was 11.3 million gallons and 11.2 million gallons, respectively. The average daily production was 31,000 gallons per day for a 260 gpcd production rate. The average daily consumption was 31,000 gallons per day for a 260 gpcd use rate. The maximum daily production was 100,000 gallons.

The one ground storage tank and hydropneumatic tank have capacities of 250,000 gallons and 50,000 gallons, respectively. One high service pump station has two pumps with capacities of 90 gpm each.

f. Fairview

The City of Fairview is located in the central portion of the county just south of McKinney. The city estimates its population is approximately 1,600 with 540 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. The total water purchased for 1987 was 119 million gallons and the total water consumption was 103 million gallons. The average daily purchase was 0.326 mgd or 204 gpcd. The average daily water consumption was 0.282 mgd for a 176 gpcd use rate.

Storage facilities include two ground storage tanks and one elevated tank. The ground storage tanks have capacities of 20,000 and 210,000 gallons. The elevated storage tank has a capacity of 50,000 gallons.

g. Farmersville

The City of Farmersville is located in the eastern portion of the county. The population of 2,800 is served by 1,122 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. The City is a member city of NTMWD and resales water to Caddo Basin SUD, North Farmersville WSC and Copeville WSC.

The total water purchased for 1987 was 309 million gallons and the total water consumption was 256 million gallons. The average daily purchase was 0.85 mgd of 133 gpcd. The average daily consumption was 0.70 mgd for a 110 gpcd use rate. The maximum daily purchase was 1.81 mgd for a 280 gpcd production rate.

Storage facilities include one ground storage tank and two elevated storage tanks. The ground storage tank has a capacity of 500,000 gallons. The elevated storage tanks each have a capacity of 200,000 gallons.

h. Frisco

The City of Frisco is located in the western portion of the county. The population of 6,300 is served by 1,900 customer taps. Approximately 98 percent of the population is in Collin County. The remaining two percent is in Denton County.

Groundwater is supplied by four wells. One well is in the Paluxy formation and has a capacity of 85 gpm. The other wells are in the Trinity formation and have capacities of 118, 225, and 1,625 gpm. Frisco also purchases treated surface water from NTMWD.

The total water produced and purchased for 1987 was 402 million gallons. The total water consumption was 245 million gallons. The average daily water produced and purchased was 1.10 mgd or a 175 gpcd. The average daily water consumption was 0.67 mgd for a 110 gpcd use rate. The maximum daily water produced and purchased was 1.977 mgd or 314 gpcd.

Storage facilities include four ground storage tanks and four elevated storage tanks. The ground storage tanks have capacities of 50,000; 75,000; 1,000,000; and 5,000,000 gallons. The elevated tanks have capacities of 50,000; 300,000 and 750,000 gallons.

There are three high service pump stations. The first pump station has one pump with a capacity of 1,500 gpm. The second pump station has two pumps with capacities of 250 and 600 gpm. The third pump station has two pumps each with capacities of 375 gpm.

i. Josephine

The City of Josephine is located in the southeast quadrant of the county. The population of 515 is served by 263 customer taps. Treated surface water from Lake Lavon is purchased by Josephine from Royse City.

The total water purchased in 1987 was 22.7 million gallons and the total water consumption was 19.5 million gallons. The average daily water produced was 0.063 mgd or a 122 gpcd. The average daily water consumption was 0.053 mgd or 104 gpcd.

Storage facilities include one 75,000 gallon elevated storage tank. There is one high service pump station with two pumps of 105 gpm each.

j. Lucas

The City of Lucas is located in the south central portion of the county. Treated surface water from Lake Lavon is purchased from NTMWD.

Storage facilities include three ground storage tanks and two elevated storage tanks. The ground storage tanks have capacities of 50,000; 100,000; and 500,000 gallons. The elevated storage tanks have capacities of 50,000 gallons each.

k. McKinney

The City of McKinney is the County Seat, and is located in the center of the county. The population of 22,000 is served by 6,521 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. McKinney is a member city of the District.

The total water production for 1987 was 1,471 million gallons and the total water consumption was 1,253 million gallons. The average daily water production of 4.03 mgd includes resale of water to the Danville WSC, and North Collin WSC. The average daily water consumption of 3.43 mgd and the maximum daily production of 7.28 mgd also include water that was resold.

Storage facilities include two ground storage tanks and two elevated storage tanks. The ground storage tanks have capacities of 2.0 million gallons (owned by NTMWD) and 6.0 million gallons (owned by the City of McKinney). The elevated storage tanks have capacities of 500,000 and 1,500,000 gallons.

There are two high service pump stations. The first pump station has six pumps. These pumps have capacities of 750, 750, 1,000, 1,500, 1,500, and 1,500 gpm. The second pump station has one pump with a capacity of 3,000 gpm and three pumps of 1,500 gpm each.

l. Melissa

The City of Melissa is located in the northern portion of the county. The population of the service area in 1988 was 800. Country Ridge Development, which is within the city, is not served by the city water system. Groundwater is supplied from two wells in the Woodbine formation with capacities of 100 and 155 gpm.

Storage facilities include two ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 42,000 and 125,000 gallons. The hydropneumatic tanks have capacities of 3,000 and 10,000 gallons.

m. Murphy

The City of Murphy is located in the south central portion of the county. The population of 1,700 is serviced by 549 customer taps. Treated surface water from Lake Lavon is purchased from NTMWD.

The total water purchased for 1987 was 99.6 million gallons. The average daily water purchased was 0.28 mgd or 163 gpcd. The average daily consumption was 0.27 mgd for a 156 gpcd use rate.

Storage facilities include two ground storage tanks and one elevated storage tank. The capacities of the ground storage tanks are 250,000 and 1,000,000 gallons. The capacity of the elevated storage tank is 150,000 gallons.

There is one high service pump station with three pumps. The pumps have capacities of 400, 600, and 1,000 gpm.

n. Parker

The City of Parker is located in the south central portion of the county. The 1988 population was 1,310. Treated surface water from Lake Lavon is purchased from NTMWD.

Storage facilities include three ground storage tanks and one hydropneumatic tank. The ground storage tanks have capacities of 125,000; 200,000; and 300,000. The hydropneumatic tank has a capacity of 6,000 gallons.

o. Plano

The City of Plano is located in the southwest quadrant of the county. The population of 125,000 is served by 38,673 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. Plano is a member city of the NTMWD.

The total water purchased for 1987 was 9,640 million gallons and the total water consumption was 9,507 million gallons. The average daily water purchased was 26,413 mgd or 213 gpcd. The average daily water consumption was 26,047 mgd for a 211 gpcd use rate. The maximum daily purchase was 59,315 mgd or 480 gpcd.

Storage facilities include four ground storage stations and seven elevated storage tanks. The ground storage stations have capacities of 0.5, 2.5, 7.5, and 8.0 million gallons. The elevated storage tanks have capacities of 1.0, 1.5, 1.5, 1.5, 2.0, 2.0, and 2.0 million gallons.

There are four high service pump stations. The first pump station has three pumps with capacities of 500, 750, and 1,500 gpm. The second pump station has four pumps with capacities of 1,275, 2,000, 2,500 and 2,500 gpm.

The third pump station has nine pumps with capacities of 1,780, 1,780, 1,790, 3,500, 3,500, 3,500, 3,500, 3,500, and 5,100 gpm. The fourth pump station has eight pumps with capacities of 1,340, 1,340, 1,640, 1,780, 3,500, 3,500, 5,100, and 5,100 as well as locations for two future pumps.

p. Princeton

The City of Princeton is located in the central portion of the county. The population of 3,500 is served by 1,226 customer taps.

Treated surface water from Lake Lavon is purchased from NTMWD. Princeton is a member city of the NTMWD.

Storage facilities include two ground storage tanks, one elevated tank, and one hydropneumatic tank. The ground storage tanks have capacities of 100,000 and 200,000 gallons. The elevated storage tank has a capacity of 250,000 gallons. The hydropneumatic tank has a capacity of 10,000 gallons.

There are two high service pump stations. The first pump station has three pumps with capacities of 500, 750, and 750 gpm. The second pump station has two pumps with capacities of 500 gpm each.

q. Prosper

The City of Prosper is located in the western portion of the county. The 1988 population was 1,080. Groundwater is produced from a well in the Lower Woodbine formation and one in the Paluxy formation. Both wells have a 200 gpm capacity.

Treated surface water is occasionally purchased from Danville WSC, which purchases the water from McKinney, a member city of NTMWD.

The total 1987 water produced and purchased was 44.5 million gallons. The average daily water produced and purchased was 0.122 mgd and the maximum daily water produced and purchased was 0.222 mgd.

Storage facilities include three ground storage tanks, one elevated storage tank, and one hydropneumatic tank. The ground storage tanks have capacities of 50,000, 50,000 and 75,000 gallons. The elevated storage tank has a capacity of 50,000 gallons. The hydropneumatic tank has a capacity of 1,900 gallons.

r. Richardson

The City of Richardson is located in the southwest quadrant of the county. The population of 76,000 is served by 25,514 customer taps. Approximately 13 percent of the population is in Collin County. The remaining 87 percent is in Dallas County.

Treated surface is purchased from NTMWD. Richardson is a member city of the District.

The total water purchased in 1987 was 6,151 million gallons and the total water consumption was 6,004 million gallons. The average daily water purchased was 16.85 mgd or 222 gpcd. The average daily water consumption was 16.45 mgd for a 217 gpcd use rate. The maximum daily water purchase rate was 42.51 mgd or 560 gpcd.

Storage facilities include three ground storage tanks and seven elevated storage tanks. The ground storage tanks have capacities of 3.0, 5.0, and 13.5 million gallons. The elevated storage tanks have capacities of 0.1, 0.5, 1.0, 1.0, 1.5, 2.0, and 2.0 million gallons.

There are three high service pump stations. The total pumping capacities are 10.1, 11.0, and 38.0 million gallons per day.

s. Royse City

The City of Royse City is located in the southeast quadrant of the county. The current population is 2,520. Approximately 7 percent of the population is in Collin County. The remaining 93 percent is in Rockwall County.

Treated surface water is purchased from NTMWD. Royse City is a member city of the NTMWD.

t. Sachse

The City of Sachse is located in the south central portion of the county. The population of 6,100 is served by 1,700 customer taps. Approximately three percent of the population is in Collin County. The remaining 97 percent is in Dallas County.

Treated surface water is purchased from NTMWD. The total water purchased for 1987 was 230.6 million gallons. The average daily water purchase was 0.63 mgd or 119 gpcd. The maximum daily purchase was 1.98 mgd or 374 gpcd.

Storage facilities include two ground storage tanks, two elevated storage tanks, and one hydropneumatic tank. The ground storage tanks have capacities of 50,000 and 500,000 gallons.

The elevated storage tanks have capacities of 150,000 and 750,000 gallons. The hydropneumatic tank has a capacity of 1,500 gallons.

There are two high service pump stations. The first pump station has three pumps each with 400 gpm capacity. The second pump station has capacities of 100, 500, and 500 gpm.

u. Wylie

The City of Wylie is located in the south central portion of the county. The population of 8,200 is served by 2,711 customer taps.

Treated surface water is purchased from NTMWD. Wylie is a member city of NTMWD.

The total water purchased for 1987 was 351.6 million gallons and the total water consumption was 276.0 million gallons. The average daily water purchase was 0.96 mgd or 118 gpcd. The average daily consumption was 0.76 mgd or 92 gpcd.

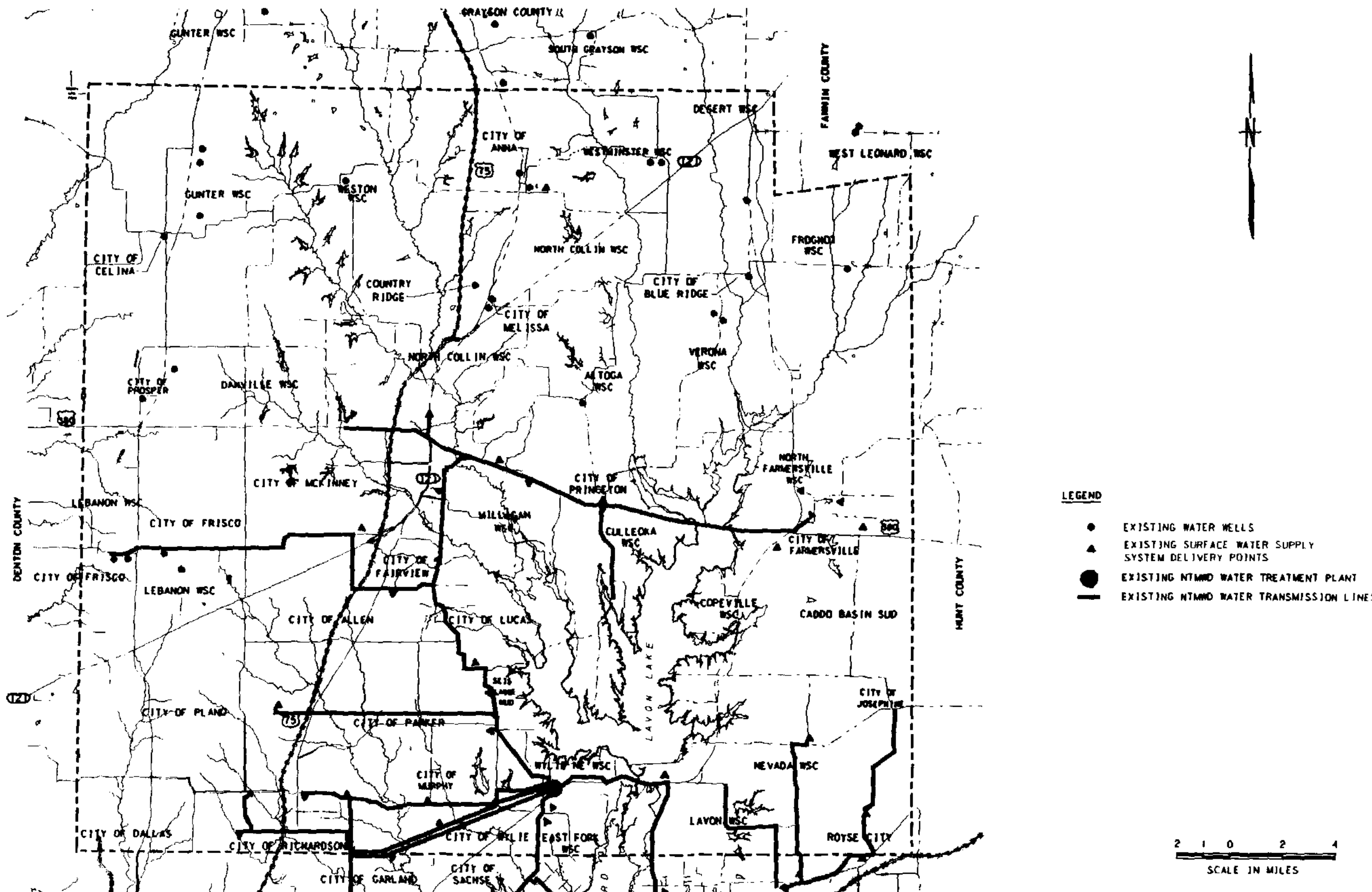
Storage facilities include three ground storage tanks and one elevated storage tank. The ground storage tanks have capacities of 0.052, 1.0, and 5.0 million gallons. The elevated storage tank has a capacity of 0.25 million gallons.

There are three high service pump stations. The first pump station has four pumps with capacities of 500, 500, 1,000, and 1,000 gpm. The second pump station has two pumps with capacities of 600 and 1,000 gpm. The third pump station has three pumps with capacities of 80, 600, and 600 gpm.

3. <u>North Texas Municipal Water District</u>

Currently, the North Texas Municipal Water District provides treated surface water to approximately 770,000 people across 1,600 square miles of North Central Texas. Figure VI-1 illustrates the existing surface water delivery system and delivery points of NTMWD. The NTMWD provides treated water to twenty-three cities, eleven water supply corporations, one municipal utility district and two individual customers.

Two water treatment plants are operated in Wylie, Texas. The capacity of the plants are being increased. An additional 70 mgd of capacity is anticipated for



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

WATER SERVICE SYSTEMS

FIGURE VI - 1

completion by the summer of 1989 to provide an ultimate treatment capacity of 350 mgd at the water treatment plant in Wylie. The maximum daily production recorded to date was 282 mgd.

A pumping station and 72 inch pipeline from Lake Texoma is under construction. The pipeline will deliver untreated water to Sister Grove Creek in the Trinity River Basin and then flow into Lake Lavon. The Texoma diversion will increase the raw water supply of Lake Lavon by approximately 75 mgd.

4. Water Supply Corporations

a. Altoga

Altoga WSC serves approximately 360 people in central Collin County. Groundwater is provided by one well in the Woodbine formation.

Storage facilities include two ground storage tanks and one hydropneumatic tank. The ground storage tanks have capacities of 20,000 gallons each . The hydropneumatic tank has a capacity of 2,500 gallons.

b. Copeville

Copeville WSC serves approximately 1,610 people in southeast Collin County. Treated surface water is purchased from Farmersville, a member city of NTMWD.

Storage facilities include two ground storage tanks and one hydropneumatic tank. The ground storage tanks have capacities of 90,000 gallons each. The hydropneumatic tank has a capacity of 10,000.

c. Culleoka

Culleoka WSC serves approximately 3,150 people in central Collin County. Treated surface water is purchased from Princeton, a member city of NTMWD.

Storage facilities include two ground storage tanks and one elevated storage tank. The ground storage tanks have capacities of 40,000 and 125,000 gallons. The elevated storage tank has a capacity of 200,000 gallons.

d. Danville

Danville WSC serves approximately 1,670 people in western Collin County. Treated surface water is purchased from the City of McKinney, a member city of NTMWD.

Total water purchased in 1987 was 115 million gallons and the total water consumption was 100 million gallons. The average daily water purchase was 0.316 mgd or about 190 gpcd. The average daily water consumption was 0.261 or approximately 156 gpcd.

Storage facilities include two ground storage tanks and one elevated storage tank. The ground storage tanks have capacities of 200,000 and 250,000 gallons. The elevated storage tank has a capacity of 200,000 gallons.

e. Desert

Desert WSC serves an approximate population of 800 people in southeast Grayson County, northeast Collin County and southwest Fannin County. Approximately 25 percent of the population is in Collin County, 57 percent in Grayson County and 18 percent in Fannin County.

Groundwater is supplied from two wells with capacities of 250 gpm each. A third well is inoperable. All three wells are in the Woodbine formation.

The total water production in 1987 was 24.3 million gallons and the total water consumption was 20.4 million gallons. The average daily water production was 0.0676 mgd for an approximate 85 gpcd production rate. The average daily consumption was 0.056 mgd for an approximate 70 gpcd use rate. The maximum daily production was 0.091 mgd for an approximate 114 gpcd production rate.

Storage facilities include two ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 55,000 gallons each. The hydropneumatic tanks have capacities of 3,000 and 8,000 gallons.

f. East Fork

East Fork WSC serves approximately 2,300 people in south central Collin County and in northern Dallas County. Approximately 35 percent of the population is in Collin County. The remaining 65 percent is in Dallas County. Treated surface water is purchased from NTMWD.

Storage facilities include four ground storage tanks, one elevated storage tank, and two hydropneumatic tanks. The ground storage tanks have capacities of

150,000; 150,000; 500,000; and 1,000,000 gallons. The elevated tank has a capacity of 100,000 gallons. The hydropneumatic tanks have 7,400 gallons each.

g. Frognot

Frognot WSC serves approximately 1,610 people through 264 customer taps in northeast Collin County.

Groundwater, supplied by two wells in the Woodbine formation, have capacities of 157 and 212 gpm.

The total water production in 1987 was 24.0 million gallons and the total water consumption was 21.4 million gallons. The average daily water production was 0.067 mgd for a 110 gpcd production rate. The average daily consumption rate was 0.057 mgd for a 95 gpcd use rate. The maximum daily production was 0.090 mgd for a 150 gpcd production rate.

Storage facilities include two ground storage tanks and one hydropneumatic tank. The ground storage tanks have capacities of 70,000 and 200,000 gallons. The hydropneumatic tank has a capacity of 7,000 gallons.

h. Gunter

Gunter WSC serves approximately 1,800 people with 793 customer taps in Collin County and Grayson County. Approximately 60 percent of the population is in Collin County. The remaining 40 percent is in Grayson County.

Three wells, in the Trinity formation, with capacities of 160, 160, and 300 gpm supply groundwater to the Gunter WSC.

Total water production in 1987 was 85.2 million gallons. The average daily water production was 0.233 mgd for an approximately 130 gpcd production rate. The maximum daily water production was 0.355 mgd for an approximate 195 gpcd production rate.

Storage facilities include two ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 150,000 gallons each. The hydropneumatic tanks have capacities of 8,000 gallons each.

i. Lavon

Lavon WSC serves approximately 1,100 people including the City of Lavon (population 260) with 475 customer taps in southeast Collin County. Treated surface water is purchased from NTMWD.

The total water consumption in 1987 was 41.62 million gallons. The average daily water consumption was 0.114 mgd for an approximate 105 gpcd use rate.

Storage facilities include two ground storage tanks and one elevated storage tank. The ground storage tanks have capacities of 60,000 and 70,000 gallons. The elevated storage tank has a capacity of 200,000 gallons.

j. Lebanon

Lebanon WSC serves approximately 560 people with 179 customer taps in western Collin County and seven customer taps in Denton County.

Groundwater from the Paluxy formation supplies a 140 gpm capacity well. A treated surface water pipeline connection to the City of Plano exists for emergency purposes.

The total water production for 1987 was 46.7 million gallons and the total water consumption was 39.9 million gallons. The average daily water production was 0.128 mgd. The average daily water consumption was 0.109 million gallons. The maximum daily use rate was estimated at 0.35 mgd.

Storage facilities include two ground storage tanks with capacities of 75,000 gallons each.

k. Milligan

Milligan WSC serves approximately 1,600 people including the City of Lowry Crossing (population 450) in central Collin County. Milligan WSC purchases treated surface water from NTMWD.

Storage facilities include six ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 40,000; 60,000; 100,000; 198,000; 202,000; and 420,000 gallons. The hydropneumatic tanks have capacities of 3,000 and 4,000 gallons.

l. Nevada

Nevada WSC serves 830 people including the City of Nevada (population 780) with 300 customer taps in southeast Collin County. Treated surface water is purchased from NTMWD.

The total water purchased for 1987 was 25.0 million gallons. The average daily water purchase was 0.069 mgd for an 80 gpcd use.

Storage facilities include two ground storage tanks with capacities of 30,000 gallons each, and one elevated storage tank with a capacity of 25,000 gallons.

m. North Collin

North Collin WSC serves approximately 3,200 people including the City of New Hope (population 540) in northern central Collin County. Treated surface water is purchased from McKinney at two locations: (1) from a McKinney water line and (2) directly from a NTMWD water line.

Storage facilities include six ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 20,000; 80,000; 150,000; 150,000; 420,000; and 420,000. The hydropneumatic tanks have capacities of 5,200 and 7,400 gallons.

n. North Farmersville

North Farmersville WSC serves approximately 230 people in eastern Collin County. Treated surface water is purchased from Farmersville, a member city of NTMWD.

o. South Grayson

South Grayson WSC serves 1,680 people with 860 customer taps in north Collin County and south Grayson County. Approximately 50 percent of the population is in Collin County. The remaining 50 percent is in Grayson County.

Four wells with capacities of 78, 105, 165, and 300 gpm provide groundwater. Treated surface water is also purchased from North Collin WSC.

The total water produced and purchased for 1987 was 100.9 million gallons and total water consumed was 100.9 million gallons. The average daily water produced, purchased and consumed was 0.277 mgd or 165 gpcd. The maximum daily production and purchase was 0.368 mgd or 219 gpcd.

Storage facilities include three ground storage tanks, one elevated storage tank, and three hydropneumatic tanks. The ground storage tanks have capacities of 100,000; 150,000; and 200,000 gallons. The elevated tank has a capacity of 247,000 gallons. The hydropneumatic tanks have capacities of 4,000; 4,300; and 10,000 gallons.

There are three high service pump stations. The first pump station has two pumps with capacities of 500 gpm each. The second pump station has two pumps with capacities of 215 gpm each. The third pump station has two pumps with capacities of 250 gpm each.

p. Verona

Verona WSC serves approximately 1,100 people in northeast Collin County. Woodbine formation groundwater supplies one well.

Storage facilities include five ground storage tanks and two hydropneumatic tanks. The ground storage tanks have capacities of 20,000; 20,000; 20,000; 20,000; and 200,000 gallons. The hydropneumatic tanks have capacities of 1,800 and 10,000 gallons.

q. West Leonard

West Leonard WSC serves approximately 700 people in northeast Collin County. Approximately 29 percent of the population is in Collin County and 71 percent is in Fannin and Hunt Counties. Groundwater is the source of water supply. Storage facilities include one hydropneumatic tank with a capacity of 5,000 gallons.

r. Westminster

Westminster WSC serves approximately 900 people including the City of Westminster (population 350) with 368 customer taps in northern Collin County.

Groundwater is supplied from two wells. One well is in the Woodbine formation and has a capacity of 60 gpm. The other well is in the Paluxy formation. A third well is under construction. The total water consumption in 1987 was 32.4 million gallons. The average daily consumption was 0.089 mgd for an approximate 98 gpcd use rate. The maximum daily water consumption was 0.158 mgd for an approximate 173 gpcd use rate.

Storage facilities include a 50,000 gallon ground storage tank and a 25,000 gallon elevated storage tank.

s. Weston

Weston WSC serves 410 people in the City of Weston in northern Collin County.

Woodbine formation groundwater supplies a 60 gpm capacity well.

The total water production in 1987 was 8.13 million gallons. The average daily water production was 0.022 mgd or 54 gpcd.

Storage facilities include ground and elevated storage tanks with capacities of 63,000 gallons each.

t. Wylie Northeast

Wylie Northeast WSC serves approximately 1,300 people including the City of St. Paul (population 410) in southern Collin County. Treated surface water is purchased from NTMWD.

The total water purchased for 1987 was 81.7 million gallons. The total water consumption was 53.4 million gallons. The average daily water purchase was 0.224 mgd or 170 gpcd. The average daily consumption rate was 0.146 mgd for an approximate 110 gpcd use rate. The maximum daily water purchase was 0.361 mgd or approximately 280 gpcd.

Storage facilities include three ground storage tanks and one hydropneumatic tank. The ground storage tanks have capacities of 25,000; 25,000; and 300,000 gallons. The hydropneumatic tank has a capacity of 5,000 gallons. A high service pump station has four pumps with capacities of 200 ,200 ,200, and 325 gpm.

5. Other Systems

a. Caddo Basin

Caddo Basin Special Utility District (formerly Hopewell WSC) serves 4,515 people with 1,806 customer taps in eastern Collin County and western Hunt County. Approximately 1,400 people reside in Collin County.

Groundwater is provided from a 232 gpm capacity well in the Woodbine formation. Approximately 46 percent of the treated surface water used is purchased from the City of Farmersville and additional treated surface water is purchased from the City of Greenville in Hunt County.

Total water produced and purchased for 1987 was 142.0 million gallons and total water consumption was 110.4 million gallons. The average daily water production and purchase was 0.39 mgd for an 86 gpcd production rate. The average daily water consumption was 0.30 mgd for a 67 gpcd use rate. The maximum daily production and purchase was 0.66 mgd or 146 gpcd.

Storage facilities include seven ground storage tanks and five hydropneumatic tanks. The ground storage tanks have capacities of 30,000; 45,000; 50,000; 67,000; 67,000; 75,000; and 100,000 gallons. The hydropneumatic tanks have capacities of 2,000; 2,000; 3,300; 4,000; and 6,000 gallons.

There are five high service pump stations. The first pump station has two pumps with capacities of 240 gpm each. The second pump station has two pumps with capacities of 240 gpm each. The third pump station has two pumps with capacities of 300 gpm each. The fourth pump station has two pumps with capacities of 260 gpm each. The fifth pump station has two pumps with capacities of 160 gpm each.

b. Seis Lagos

Seis Lagos Municipal Utility District serves approximately 450 people. Treated surface water is purchased from NTMWD. No other information was available from Seis Lagos.

B. WASTEWATER SYSTEMS

Collin County currently has 34 wastewater discharge permits listed with the Texas Water Commission; two are joint discharges (regional), 14 are community discharges (municipalities), and 18 are individual discharges (private). Of the 16 joint and community plants, the NTMWD owns and/or operates ten of these facilities. Of the 18 individual plants, 12 are small package plants operated by the Corps of Engineers at recreational parks near Lake Lavon. In addition, a municipal wastewater treatment plant at Royse City in Rockwall County provides services to portions of Collin County. Table VI-1 lists some pertinent information on each permit holder, including discharge parameters. Typical flows from the joint and community plants are listed on Table IX-1 in Section IX. The locations of these plants are shown on Figure VI-2.

1. Joint Systems (Regional)

a. Rowlett Creek.

The NTMWD owns and operates the Rowlett Creek Wastewater Treatment Plant (WWTP). The plant is located just north of Farm-to-Market (FM) Highway 544 near Los Rios Boulevard along Rowlett Creek. A 2.0 mgd trickling filter facility was originally built at this site in 1959 and later modified in 1964.

TABLE VI-1

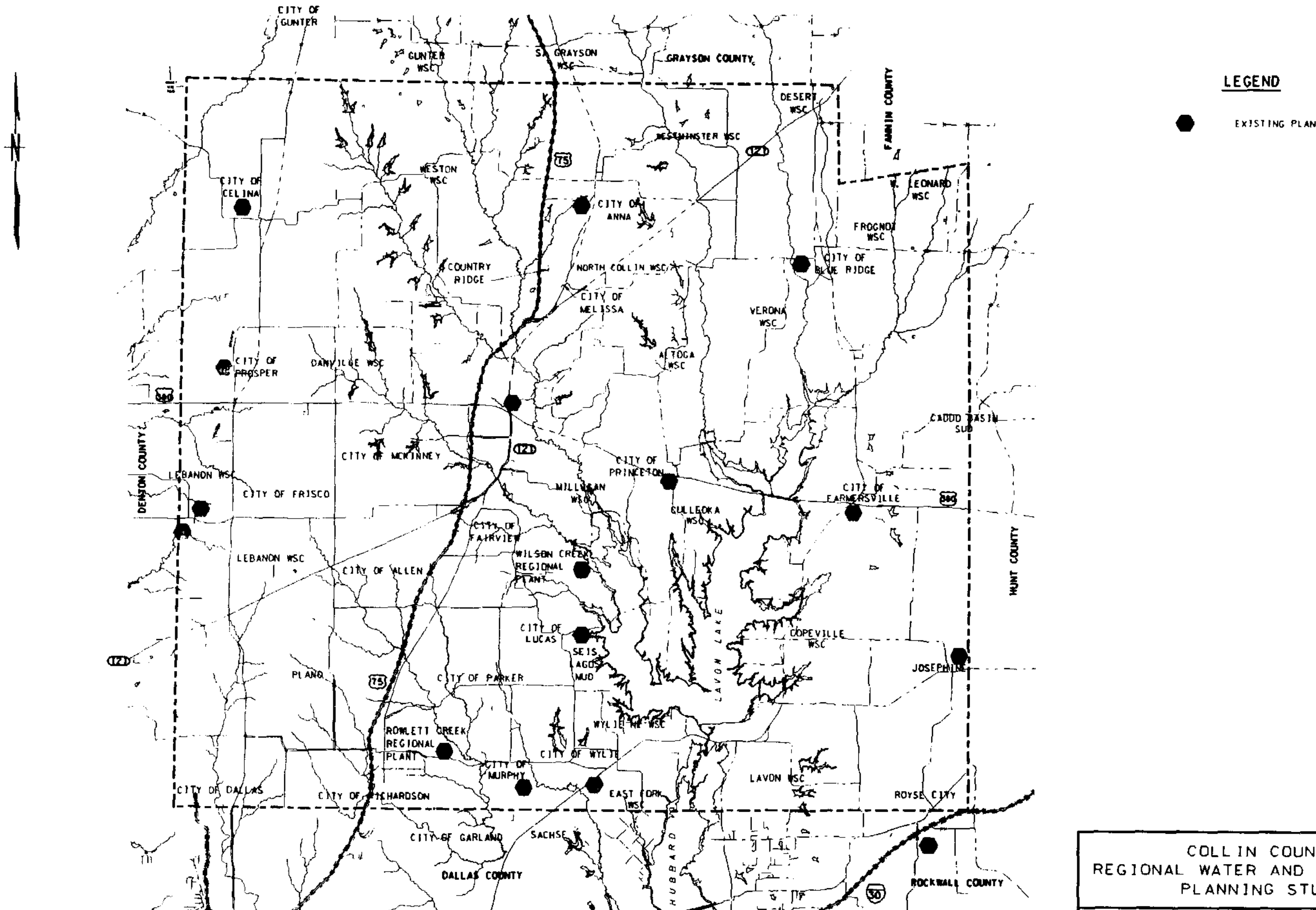
WASTEWATER TREATMENT PLANTS

PERMIT HOLDER	FACILTY NAME	COUNTY	TWC CONTROL NUMBER	STATE STREAM SEGMENT NUMBER	STATE STREAM SEGMENT NAME	DISCHARGE TYPE	DISCHARGE PARAMETERS FLOW (mgd)	BOD (mg/l)	TSS (mg/l)	OTHER (mg/l)
CITY OF ANNA	SLAYTER CREEK WWTP	COLLIN	11283.001	0821	LAKE LAVON	COMMUNITY	0.12	30	90	-
CITY OF BLUE RIDGE	BLUE RIDGE WWTP	COLLIN	10039.001	0821	LAKE LAVON	COMMUNITY	0.09	30	90	-
CITY OF CELINA	CELINA WWTP	COLLIN	10041.001	0823	LAKE LEWISVILLE	COMMUNITY	0.25	20	20	-
CITY OF FARMERSVILLE	FARMERSVILLE WWTP	COLLIN	10442.001	0821	LAKE LAVON	COMMUNITY	0.225	20	20	-
CITY OF FARMERSVILLE	FARMERSVILLE WWTP	COLLIN	10442.002	0821	LAKE LAVON	COMMUNITY	0.53	10	15	-
CITY OF FRISCO	STEWART CREEK WWTP	COLLIN	10772.001	0823	LAKE LEWISVILLE	COMMUNITY	0.70	20	20	-
CITY OF FRISCO	COTTONWOOD CREEK WWTP	COLLIN	10772.002	0823	LAKE LEWISVILLE	COMMUNITY	0.30	20	20	-
CITY OF JOSEPHINE	JOSEPHINE WWTP	COLLIN	10887.001	0507	LAKE TAWAKONI	COMMUNITY	0.07	30	90	-
CITY OF MCKINNEY	NORTH PLANT	COLLIN	10432.002	0821	LAKE LAVON	COMMUNITY	0.20	20	20	-
NORTH TEXAS MWD	SEIS LAGOS WWTP	COLLIN	11451.001	0821	LAKE LAVON	COMMUNITY	0.25	10	15	-
NORTH TEXAS MWD	MURPHY WWTP	COLLIN	11783.001	0820	LAKE RAY HUBBARD	COMMUNITY	0.50	10	15	-
CITY OF PRINCETON	PRINCETON WWTP	COLLIN	10683.001	0821	LAKE LAVON	COMMUNITY	0.30	10	15	-
CITY OF PROSPER	PROSPER WWTP	COLLIN	10915.001	0823	LAKE LEWISVILLE	COMMUNITY	0.15	20	20	-
CITY OF ROYSE CITY	ROYSE CITY WWTP	ROCKWALL	10366.001	0507	LAKE TAWAKONI	COMMUNITY	0.26	20	20	-
CITY OF WYLIE	WYLIE WWTP	COLLIN	10384.001	0820	LAKE RAY HUBBARD	COMMUNITY	2.0	10	15	3 NH3
NORTH TEXAS MWD	ROWLETT CREEK WWTP	COLLIN	10363.001	0820	LAKE RAY HUBBARD	JOINT	16.0	10	15	-
NORTH TEXAS MWD	WILSON CREEK WWTP	COLLIN	12446.001	0821	LAKE LAVON	JOINT	24.0	5	5	2 NH3,1 P
NEIL DAVIS	CLEMMONS CREEK MHP WWTP	COLLIN	12899.001	0821	LAKE LAVON	INDIVIDUAL	0.10	10	15	-
CITY OF GARLAND	RAY OLINGER SES	COLLIN	01923.001	0821	LAKE LAVON	INDIVIDUAL	404.0	-	-	-
LOSCHE, FALK-PETER	FAIRVIEW MHP	COLLIN	11023.001	0821	LAKE LAVON	INDIVIDUAL	0.005	20	20	-
MEAT PRODUCERS, INC.	FEEDLOT WWTP	COLLIN	01274.001	0821	LAKE LAVON	INDIVIDUAL	-0-	-	-	-
NORTH TEXAS MWD	WATER TREATMENT PLANT	COLLIN	10841.001	0820	LAKE RAY HUBBARD	INDIVIDUAL	0.20	-	25	-
ROGERS DELINTED COTTONSEED C	DELINTING PLANT	COLLIN	01898.001	0507	LAKE TAWAKONI	INDIVIDUAL	-0-	-	-	-

TABLE VI-1

WASTEWATER TREATMENT PLANTS

PERMIT HOLDER	FACILITY NAME	COUNTY	TWC CONTROL NUMBER	STATE STREAM SEGMENT NUMBER	STATE STREAM SEGMENT NAME	DISCHARGE TYPE	DISCHARGE PARAMETERS FLOW (mgd)	BOD (mg/l)	TSS (mg/l)	OTHER (mg/l)
US ARMY CORPS OF ENGINEERS	CLEAR LAKE PARK	COLLIN	12049.001	0821	LAKE LAVON	INDIVIDUAL	0.009	10	15	-
US ARMY CORPS OF ENGINEERS	BROOKDALE PARK	COLLIN	12050.001	0821	LAKE LAVON	INDIVIDUAL	0.004	10	15	-
US ARMY CORPS OF ENGINEERS	COLLIN PARK	COLLIN	12051.001	0821	LAKE LAVON	INDIVIDUAL	0.02	10	15	-
US ARMY CORPS OF ENGINEERS	EAST FORK PARK	COLLIN	12052.001	0821	LAKE LAVON	INDIVIDUAL	0.18	10	15	-
US ARMY CORPS OF ENGINEERS	CADDO PARK	COLLIN	12054.001	0821	LAKE LAVON	INDIVIDUAL	0.004	10	15	-
US ARMY CORPS OF ENGINEERS	AVALON PARK	COLLIN	12055.001	0821	LAKE LAVON	INDIVIDUAL	0.018	10	15	-
US ARMY CORPS OF ENGINEERS	COTTONWOOD PARK	COLLIN	12056.001	0821	LAKE LAVON	INDIVIDUAL	0.003	10	15	-
US ARMY CORPS OF ENGINEERS	LITTLE RIDGE PARK	COLLIN	12057.001	0821	LAKE LAVON	INDIVIDUAL	0.005	10	15	-
US ARMY CORPS OF ENGINEERS	PEBBLEBEACH PARK	COLLIN	12058.001	0821	LAKE LAVON	INDIVIDUAL	0.019	10	15	-
US ARMY CORPS OF ENGINEERS	MALLARD PARK	COLLIN	12059.001	0821	LAKE LAVON	INDIVIDUAL	0.012	10	15	-
US ARMY CORPS OF ENGINEERS	LAKELAND PARK	COLLIN	12060.001	0821	LAKE LAVON	INDIVIDUAL	0.005	10	15	-
US ARMY CORPS OF ENGINEERS	LAVONIA PARK	COLLIN	12061.001	0821	LAKE LAVON	INDIVIDUAL	0.017	10	15	-



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

EXISTING WASTEWATER
TREATMENT PLANTS

FIGURE VI-2

In 1976, a 14.0 mgd activated sludge facility was constructed and later modified in 1986. Currently, this 16.0 mgd facility is generally classified as an activated sludge process with final effluent filtration. Sludges are treated by dissolved air flotation and belt presses. Final sludge products are subjected to co-disposal. The discharge parameters for this facility include flow at 16.0 mgd, biochemical oxygen demand (BOD) at 10 milligrams per liter (mg/l), and total suspended solids (TSS) at 15 mg/l. The wastewater discharge is into Rowlett Creek, a tributary to Lake Ray Hubbard. This plant serves portions of the Cities of Allen, Plano, and Richardson. No land is available for expansion at this site. Therefore, 16.0 mgd is the ultimate daily capacity at this location. All flow in excess of 16.0 mgd is pumped to Wilson Creek facility.

b. Wilson Creek

The Wilson Creek WWTP is also owned and operated by the NTMWD. The plant is located along Wilson Creek, south southwest of the City of McKinney and north of Lake Lavon. The original construction in 1987 was an 8.0 mgd activated sludge facility with processes for nitrification, chemical addition, and flocculation. Sludges are treated by dissolved air flotation and belt presses. Final sludge products are also subjected to co-disposal. This plant is in the process of being expanded from 8.0 mgd to 24.0 mgd with the construction of parallel treatment units. The discharge parameters of the new 24.0 mgd plant are 5 mg/l for BOD and TSS, with 2 mg/l for ammonia and 1 mg/l for phosphorus. The wastewater discharge is into Wilson Creek a tributary of Lake Lavon. This plant treats wastewater flows from the Cities of Plano, Allen, and McKinney. With the interconnection between the Rowlett Creek WWTP and the Wilson Creek WWTP, these facilities actually function as one plant. Recently, the South McKinney WWTP was abandoned with flow from this site being diverted to the Wilson Creek WWTP. During the original plant design, the influent structures were sized to accommodate a 32.0 mgd facility. Therefore, an additional 8.0 mgd (from 24 to 32 mgd) expansion could be constructed as needed. Sufficient land is available at this site for further expansion if necessary. Continuing studies will be needed to insure that a wastewater discharge level is not reached which would adversely affect the water quality of Lake Lavon. The plant has not been operational for a long enough period of time to reach a conclusive result on the maximum allowable discharge.

2. <u>Community Systems (Municipal)</u>

a. City of Anna

The City of Anna owns and operates the Slayter Creek WWTP located one mile south and west of the intersection of Highways FM 455 and State Highway

(SH) 5. This 0.12 mgd facility consists of an Imhoff tank followed by a single-cell stabilization lagoon. The plant was originally constructed in 1959. The current discharge parameters include a flow of 0.12 mgd, a BOD of 30 mg/l, and TSS of 90 mg/l. The discharge from Slayter Creek ultimately flows into the East Fork Trinity River and then into Lake Lavon.

b. City of Blue Ridge

The City of Blue Ridge owns and operates a 0.09 mgd Imhoff tank/oxidation pond facility. The oxidation pond has a 0.7 acre cell and a 1.2 acre cell. The plant was built in 1960 and is located west of the City and south of Melissa Road on the east bank of Pilot Grove Creek. The discharge point is approximately seven miles upstream of Lake Lavon. The discharge parameters include a flow of 0.09 mgd, BOD of 30 mg/l, and a TSS of 90 mg/l. Currently, the City is expanding the existing plant by adding an additional 1.3 acre cell to be operated in series. Funding will be provided by a grant from the Texas Department of Commerce.

c. City of Celina

The City of Celina owns and operates a 0.25 mgd extended aeration oxidation ditch facility which was completed in 1988. The original plant was constructed and modified in 1962 and 1965, respectively. This plant consisted of an Imhoff tank and a two-cell oxidation pond. The new facility was constructed at the original site in place of one of the cells. The Imhoff tank was abandoned while the second cell was converted into a wet weather detention pond.

The new facility discharge parameters include a flow of 0.25 mgd, BOD of 20 mg/l, and a TSS of 20 mg/l. The facility is located 0.5 miles west of Loop 423 and 0.5 miles north of FM 455 and discharges into an unnamed creek tributary to Little Elm Creek which ultimately flows into Lake Lewisville.

d. City of Farmersville

The City of Farmersville currently owns and operates two separate wastewater treatment facilities at the same site. This site is located approximately 0.25 miles southeast of the intersection of Highways U.S. 380 and S.H. 78, southwest of the City. The original plant is a trickling filter facility built in 1963 with a capacity of 0.26 mgd. The discharge parameters for this plant include a flow of 0.225 mg/l, a BOD of 20 mg/l, and a TSS of 20 mg/l. The new facility is an extended aeration oxidation ditch facility constructed in 1988. The discharge parameters included for this second permit are: 0.53

mgd for flow, 10 mg/1 for BOD, and 15 mg/1 for TSS. Therefore, the total permitted capacity at this site is 0.76 mgd. These plants discharge into an unnamed creek tributary to Elm Creek which flows into Lake Lavon.

e. City of Frisco

The City of Frisco owns two wastewater treatment facilities at separate locations. These plants are operated by the North Texas Municipal Water District. The existing Stewart Creek Facility is located adjacent to Fifth Street, approximately 1.5 miles north of the intersection with SH 121. The Cottonwood Creek plant is adjacent to Cottonwood Creek near the Saint Louis-San Francisco Railroad, north of the City. The Stewart Creek facility is a contact stabilization plant with a capacity of 0.60 mgd. The plant was constructed in 1982. The discharge parameters include a flow of 0.70 mgd, 20 mg/1 BOD, and 20 mg/1 TSS. The Cottonwood Creek plant is also a contact stabilization facility with a capacity of 0.30 mgd. This plant was originally constructed in 1965 and later modified in 1987. The discharge parameters include a flow of 0.30 mgd, a BOD of 20 mg/1, and a TSS of 20 mg/1. The two plants are interconnected such that wastewater can flow into either plant. A new plant is currently under design which will be located along Stewart Creek but downstream of the existing facility. The existing two plants are anticipated to be abandoned in the future. The two existing plants discharge into a tributary of Lake Lewisville.

f. City of Josephine

The City of Josephine owns and operates a 0.07 mgd lagoon facility. The plant is located approximately 0.2 miles north and 0.7 miles east of the FM 6 and FM 1777 intersection. The plant was originally constructed in 1969 and later expanded in 1988. Currently, the plant consists of an aerated lagoon (similar to an oxidation ditch) followed by a 1.7 acre pond and a 1.45 acre pond operated in series. The discharge permit allows a flow of 0.07 mgd, BOD of 30 mg/l, and TSS of 90 mg/l. The plant discharges into an unnamed creek tributary to Brushy Creek, which ultimately flows into Lake Tawakoni.

g. City of McKinney

The City of McKinney, until recently, had a north and south facility. When the Wilson Creek Plant was completed, the McKinney South Plant was abandoned. The North Plant is currently owned by the City of McKinney and operated by the NTMWD. The North Plant is located east of SH 5, approximately one mile north of US Highway 380. The plant is a trickling filter facility constructed in 1942 with a capacity of 0.20 mgd. The discharge parameters include a flow of 0.20 mgd, BOD of 20 mg/l, and TSS of 20 mg/l. The plant discharges into an unnamed creek tributary to the East Fork Trinity River which flows into Lake Lavon. By the latter part of 1989, wastewater flows from a newly constructed sewer system in Melissa will be discharged into this plant. This additional flow should load the plant to a level near capacity. This facility will be abandoned in the future, with flows being transported to the Wilson Creek Plant.

h. Seis Lagos

The Seis Lagos Community owns a 0.25 mgd activated sludge wastewater treatment plant that was constructed in 1974. This plant is operated by the NTMWD. The facility is located approximately 0.5 miles east of FM 1378 at a location about 0.8 miles southeast of the City of Lucas. The discharge permit includes a flow of 0.25 mgd, a BOD of 10 mg/l, and a TSS of 15 mg/l. This plant discharges into an unnamed creek upstream of Lake Lavon.

i. City of Murphy

The NTMWD owns and operates the 0.25 mgd activated sludge facility that serves the City of Murphy. This plant is located near the Skyline Subdivision about 4,000 east and 6,000 feet south of the FM 544 and FM 2551 intersection. The discharge parameters include a flow of 0.50 mgd, a BOD of 10 mg/l, and a TSS of 15 mg/l. The plant was originally constructed in 1978. The plant discharges into and unnamed creek tributary to Maxwell Creek which flows into Lake Ray Hubbard.

j. City of Princeton

The City of Princeton currently owns a 0.30 mgd activated sludge facility that was originally constructed in 1968 and later modified in 1986. This plant is operated by the NTMWD. The facility is located approximately one mile south of SH 380 near Ticky Creek. The discharge parameters include a flow of 0.30 mgd, a BOD of 10 mg/l, and a TSS of 15 mg/l. The plant discharges into an unnamed creek tributary to Ticky Creek which flows into Lake Lavon.

k. City of Prosper

The City of Prosper owns and operates a 0.15 mgd extended aeration oxidation ditch facility that was constructed in 1979. The plant is located 300 feet west of the Seventh Street and Saint Louis and San Francisco Railroad intersection. The discharge parameters include a flow of 0.15 mgd, a BOD of 20 mg/l, and a TSS of 20 mg/l. The plant discharges into an unnamed creek tributary to Doe Branch Creek, which flows into Lake Lewisville.

l. City of Wylie

In 1973, a 0.80 mgd activated sludge facility was constructed to serve the City of Wylie. This facility is being expanded up to 2.0 mgd for operation in the Fall of 1989. This new facility will be owned and operated by the NTMWD. The site is located south of SH 78 and west of Birmingham Street in the southwest section of Wylie. The discharge parameters for the expanded facility include: 2.0 mgd for flow, 10 mg/1 for BOD, and 15 mg/1 for TSS. The plant discharges into an unnamed creek tributary to Muddy Creek, which flows into Lake Ray Hubbard.

m. City of Royse City

The City of Royse City currently owns a 0.26 mgd activated sludge facility that was constructed in 1973. The plant is operated by the NTMWD. The site is located approximately one mile south and 0.5 miles east of the FM 35 and FM 548 intersection. The discharge parameters include a flow of 0.26 mgd, a BOD of 20 mg/1, and a TSS of 20 mg/1. The plant discharges into the Sabine Creek, a tributary to Lake Tawakoni.

3. <u>Individual Systems (Private)</u>

As of August 1989, 18 individual wastewater discharge permits had been issued in Collin County. Of the 18 permits, 12 were issued to the U.S. Army Corps of

Engineers for small recreational parks in the vicinity of Lake Lavon. The remaining six permits have no significant impact on wastewater flows within the county because of the nature and magnitude of the flows. Information on these permit holders is shown on Table VI-1.

4. Septic Tanks

Except for the City of Sachse, the remaining incorporated cities within the county are served by septic tanks. The City of Sachse has a wastewater collection system that discharges into the Garland system with treatment provided by the Garland Rowlett Creek plant. The remaining Cities in the county on septic tanks include: Lavon, Lowry Crossing, New Hope, Nevada, Westminster, Weston, and Saint Paul. Customers served by water supply corporations' utilize septic tanks for wastewater treatment. Certain isolated areas within some incorporated cities may also be on septic tanks. The population in Collin County served by septic tanks is approximately 25,940 people.

In unincorporated areas, Collin County has the jurisdiction to regulate the use, construction, and operation of septic tanks. These rules and regulations should be compatible with the Construction Standards for On-Site Sewerage Facilities as prepared by the Texas Department of Health, dated January 1, 1988. These standards modified a previous edition of rules and regulations dated November 30, 1977.

On April 4, 1983, Collin County adopted Order No. 83-194-4-4, Rules For Private Sewage Facilities. The primary purpose of this order was to adopt appropriate rules and regulations for private sewage facilities to abate and prevent pollution or injury to public health in Collin County. The general provisions of the Order established a set of procedures for the proper installation and operation of private sewage systems including: (1) adhering to the Texas Department of Health standards, (2) the submission of an application with appropriate fees and supporting technical data, (3) requirements for new subdivisions, and (4) renewals enforcement, and inspections.

In general, this Order adheres to the State regulations, while additionally emphasizing the specific requirements for one acre lots. For lots less than one acre, the facilities must be designed by a registered professional engineer or registered professional sanitarian approved by the county.

This Order does not apply to the area surrounding Lake Ray Hubbard (2,000 horizontal feet from the spillway elevation of 440.5 feet MSL) or Lake Lavon (3,000 horizontal feet from an elevation of 508 MSL), which are covered by Texas Water Quality Board Order Nos. 71-0917-12 and 75-0129-5, respectively.

Individual cities within Collin County that require assistance and technical support regarding private sewage facilities within their jurisdiction may enter into a cooperative agreement with the Collin County Commissioners' Court whereby each contracting city becomes subject to the rules and regulations of the Order.

SECTION VII

POPULATION PROJECTIONS

A. PROJECTIONS

The population within the boundaries of Collin County was estimated to be about 255,000 in 1988. The estimated number residing in incorporated cities was 235,000 and the population of unincorporated areas was approximately 20,000. By year 2020, the populations are projected to increase to approximately 643,000, 612,000, and 31,000, respectively.

The Collin County study area is defined as all of the area in or out of the boundaries of Collin County which are served by an entity providing water or wastewater services in Collin County with the exception of the City of Dallas and NTMWD. The service area of the City of Dallas in and out of Collin County was excluded from the study area. In addition, the entities served by NTMWD which do not have service areas in Collin County were not included in the study area.

The population of the study area, which included portions of surrounding counties, was estimated to be about 314,000 in the year 1988, increasing to about 728,000 by the year 2020.

The incorporated and unincorporated areas were projected to increase from about 287,000 and 27,000 respectively, in 1988 to 686,000 and 42,000 in the year 2020.

Projections for population within Collin County are provided in Table VII-1. Study area population projections are provided on Table VII-2. Figure VII-1 is a graphical presentation of these projections.

B. METHODOLOGY

1. Sources of Data

Several sources of population projection data were used in this study. These sources included the United States Census Bureau, TWDB, NCTCOG, cities and their consultants in the study area, and data collected from surveys.

2. Incorporated Cities

The NCTCOG January 1, 1988 population estimates for cities greater than 1,000 were used as the current estimate on which projections were based. The NCTCOG estimates were based on housing completion data provided by each city and revised annually by NCTCOG as cities provide updates and corrections. These estimates were

TABLE VII-1
POPULATION PROJECTION FOR COLLIN COUNTY
POPULATIONS OF MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY

	1988			1990			2000			2010			2020		
WATER SUPPLY	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL
MUNICIPAL SYSTEMS															
ALLEN, CITY OF	17,800	---	17,800	20,000	---	20,000	28,960	---	28,960	38,660	---	38,660	49,540	---	49,540
ANNA, CITY OF	1,340	---	1,340	1,460	---	1,460	2,110	---	2,110	2,820	---	2,820	3,610	---	3,610
BLUE RIDGE, CITY OF	600	---	600	660	---	660	960	---	960	1,280	---	1,280	1,640	---	1,640
CELINA, CITY OF	1,870	---	1,870	2,040	---	2,040	2,950	---	2,950	3,940	---	3,940	5,050	---	5,050
COUNTRY RIDGE DEV. (MELISSA)	120	---	120	160	---	160	230	---	230	310	---	310	400	---	400
DALLAS, CITY OF (PT) (1)	21,490	---	21,490	23,690	---	23,690	31,840	---	31,840	36,190	---	36,190	40,460	---	40,460
FAIRVIEW, CITY OF	1,390	---	1,390	1,530	---	1,530	2,220	---	2,220	2,960	---	2,960	3,790	---	3,790
FARMERSVILLE, CITY OF	2,780	---	2,780	3,080	---	3,080	4,460	---	4,460	5,950	---	5,950	7,620	---	7,620
FRISCO, CITY OF (2)	6,320	---	6,320	6,830	---	6,830	9,890	---	9,890	13,200	---	13,200	16,910	---	16,910
JOSEPHINE, CITY OF	520	---	520	580	---	580	840	---	840	1,120	---	1,120	1,440	---	1,440
LUCAS, CITY OF	2,430	---	2,430	2,670	---	2,670	3,870	---	3,870	5,170	---	5,170	6,620	---	6,620
MCKINNEY, CITY OF	21,950	---	21,950	24,180	---	24,180	35,010	---	35,010	46,730	---	46,730	59,880	---	59,880
MELISSA, CITY OF (SERVICE AREA)	800	---	800	870	---	870	1,260	---	1,260	1,680	---	1,680	2,150	---	2,150
MURPHY, CITY OF	1,740	---	1,740	1,910	---	1,910	2,770	---	2,770	3,700	---	3,700	4,740	---	4,740
PARKER, CITY OF	1,310	---	1,310	1,440	---	1,440	2,080	---	2,080	2,780	---	2,780	3,560	---	3,560
PLANO, CITY OF (2)	125,200	---	125,200	137,560	---	137,560	199,160	---	199,160	265,840	---	265,840	340,630	---	340,630
PRINCETON, CITY OF	3,510	---	3,510	3,970	---	3,970	5,750	---	5,750	7,680	---	7,680	9,840	---	9,840
PROSPER, CITY OF	1,080	---	1,080	1,180	---	1,180	1,710	---	1,710	2,280	---	2,280	2,920	---	2,920
RICHARDSON, CITY OF (PT)	9,660	---	9,660	9,680	---	9,680	12,450	---	12,450	14,510	---	14,510	16,610	---	16,610
ROYSE CITY (PT)	180	---	180	200	---	200	290	---	290	380	---	380	490	---	490
SACHSE, CITY OF (PT)	210	---	210	210	---	210	230	---	230	260	---	260	290	---	290
WYLIE, CITY OF	9,120	---	9,120	10,230	---	10,230	14,810	---	14,810	19,770	---	19,770	25,330	---	25,330
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS															
LAVON WSC/LAVON	260	830	1,090	280	850	1,130	410	970	1,380	550	1,130	1,680	700	1,350	2,050
MILLIGAN WSC/LOWRY CROSSING	450	1,150	1,600	490	1,180	1,670	710	1,330	2,040	950	1,530	2,480	1,220	1,810	3,030
NORTH COLLIN WSC/NEW HOPE	540	2,630	3,170	590	2,700	3,290	850	3,110	3,960	1,130	3,570	4,700	1,450	4,100	5,550
NEVADA WSC/NEVADA	780	50	830	840	50	890	1,210	30	1,240	1,620	20	1,640	2,080	20	2,100
WESTMINSTER WSC/WESTMINSTER	360	550	910	390	570	960	560	650	1,210	750	750	1,500	960	860	1,820
WESTON WSC/WESTON	410	0	410	440	0	440	640	0	640	850	0	850	1,090	0	1,090
WYLIE NE WSC/SAINT PAUL	410	920	1,330	440	910	1,350	640	870	1,510	850	820	1,670	1,090	780	1,870
WSC SERVING UNINCORPORATED AREAS ONLY															
ALTOGA WSC	---	360	360	---	370	370	---	430	430	---	490	490	---	560	560
CADDO BASIN SUD	---	1,370	1,370	---	1,410	1,410	---	1,620	1,620	---	1,860	1,860	---	2,140	2,140
COPEVILLE WSC	---	1,610	1,610	---	1,680	1,680	---	2,040	2,040	---	2,490	2,490	---	3,030	3,030
CULLEOKA WSC	---	3,150	3,150	---	3,280	3,280	---	4,000	4,000	---	4,870	4,870	---	5,940	5,940
DANVILLE WSC	---	1,670	1,670	---	1,690	1,690	---	1,770	1,770	---	1,860	1,860	---	1,960	1,960
DESERT WSC (PT)	---	140	140	---	140	140	---	160	160	---	190	190	---	220	220
EAST FORK WSC (PT)	---	800	800	---	840	840	---	1,020	1,020	---	1,250	1,250	---	1,520	1,520
FROGNOT WSC	---	610	610	---	630	630	---	720	720	---	830	830	---	950	950
GUNTER RURAL WSC (PT)	---	1,090	1,090	---	1,100	1,100	---	1,160	1,160	---	1,220	1,220	---	1,280	1,280
LEBANON WSC (PT)	---	540	540	---	530	530	---	510	510	---	480	480	---	460	460
NORTH FARMERSVILLE WSC	---	230	230	---	240	240	---	270	270	---	310	310	---	360	360
SEIS LAGOS M.U.D.	---	450	450	---	470	470	---	600	600	---	600	600	---	600	600
SOUTH GRAYSON WSC (PT)	---	840	840	---	860	860	---	990	990	---	1,140	1,140	---	1,310	1,310
VERONA WSC	---	1,150	1,150	---	1,180	1,180	---	1,360	1,360	---	1,560	1,560	---	1,790	1,790
WEST LEONARD WSC (PT)	---	200	200	---	210	210	---	240	240	---	270	270	---	310	310
TOTAL(EXCLUDING CITY OF DALLAS)	213,140	20,340	233,480	233,910	20,890	254,800	337,030	23,850	360,880	447,720	27,240	474,960	571,650	31,350	603,000
TOTAL(INCLUDING CITY OF DALLAS)	234,630	20,340	254,970	257,600	20,890	278,490	368,870	23,850	392,720	483,910	27,240	511,150	612,110	31,350	643,460

(1) POPULATIONS FOR THE PORTION OF THE CITY OF DALLAS IN COLLIN COUNTY ARE PRESENTED FOR INFORMATION PURPOSES ONLY. DALLAS WATER UTILITIES PROVIDES WATER TO CITIZENS OF DALLAS AND THUS THIS PLANNING STUDY EXCLUDES THE DALLAS POPULATION.

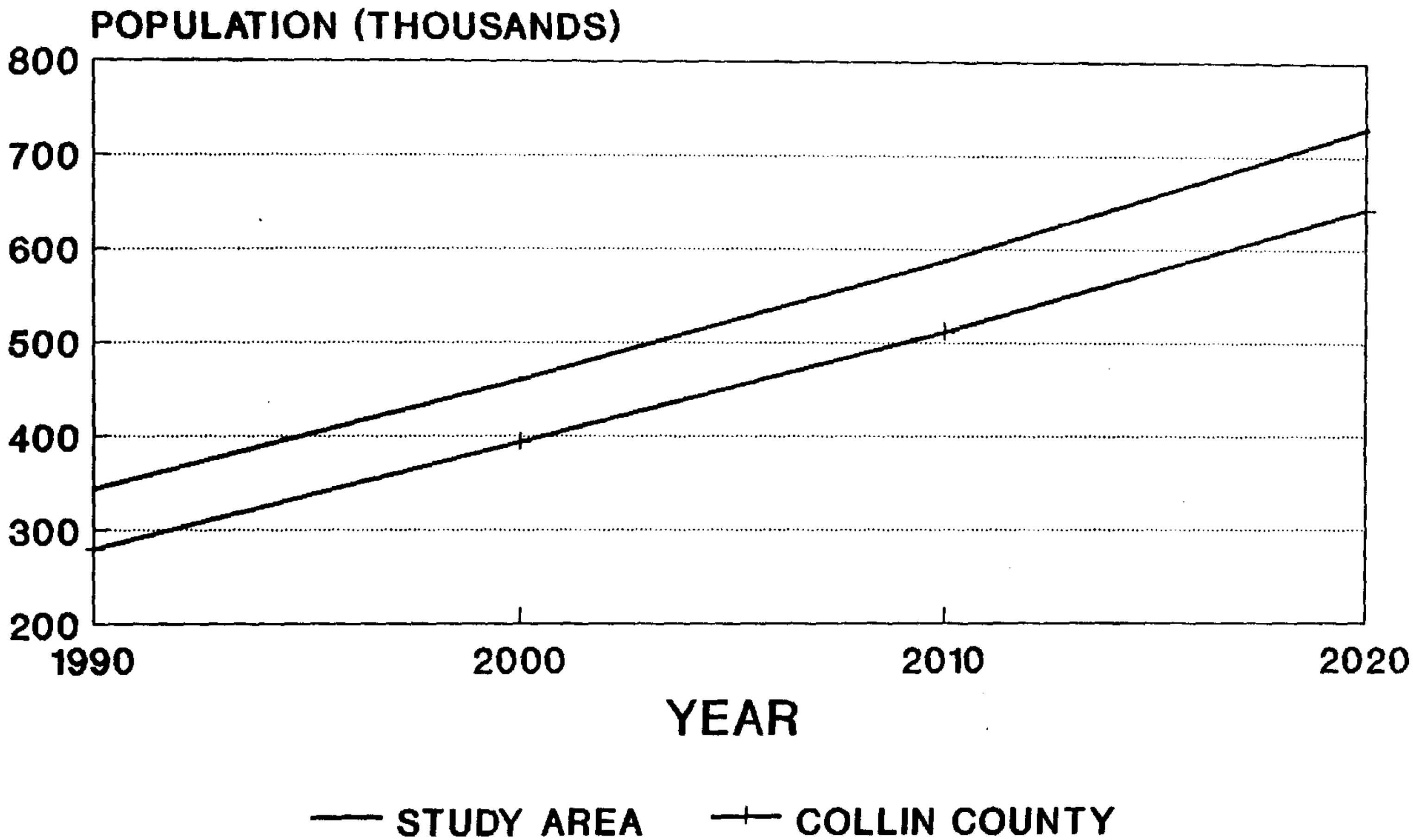
(2) POPULATIONS FOR THE CITY OF FRISCO AND THE CITY OF PLANO INCLUDE 78 AND 48 PERSONS TO RESIDE IN DENTON COUNTY IN 1988,RESPECTIVELY. PROJECTIONS FOR FUTURE YEARS INCLUDE GROWTH IN THESE NUMBERS.

TABLE VII-2
POPULATION PROJECTION FOR COLLIN COUNTY
POPULATIONS OF MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN THE STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY

	1988			1990			2000			2010			2020		
WATER SUPPLY	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL	INCORPORATED	UNINCORPORATED	TOTAL
MUNICIPAL SYSTEMS															
ALLEN, CITY OF	17,800	---	17,800	20,000	---	20,000	28,960	---	28,960	38,660	---	38,660	49,540	---	49,540
ANNA, CITY OF	1,340	---	1,340	1,460	---	1,460	2,110	---	2,110	2,820	---	2,820	3,610	---	3,610
BLUE RIDGE, CITY OF	600	---	600	660	---	660	960	---	960	1,280	---	1,280	1,640	---	1,640
CELINA, CITY OF	1,870	---	1,870	2,040	---	2,040	2,950	---	2,950	3,940	---	3,940	5,050	---	5,050
COUNTRY RIDGE DEV. (MELISSA)	120	---	120	160	---	160	230	---	230	310	---	310	400	---	400
FAIRVIEW, CITY OF	1,390	---	1,390	1,530	---	1,530	2,220	---	2,220	2,960	---	2,960	3,790	---	3,790
FARMERSVILLE, CITY OF	2,780	---	2,780	3,080	---	3,080	4,460	---	4,460	5,950	---	5,950	7,620	---	7,620
FRISCO, CITY OF	6,320	---	6,320	6,830	---	6,830	9,890	---	9,890	13,200	---	13,200	16,910	---	16,910
JOSEPHINE, CITY OF	520	---	520	580	---	580	840	---	840	1,120	---	1,120	1,440	---	1,440
LUCAS, CITY OF	2,430	---	2,430	2,670	---	2,670	3,870	---	3,870	5,170	---	5,170	6,620	---	6,620
MCKINNEY, CITY OF	21,950	---	21,950	24,180	---	24,180	35,010	---	35,010	46,730	---	46,730	59,880	---	59,880
MELISSA, CITY OF (SERVICE AREA)	800	---	800	870	---	870	1,260	---	1,260	1,680	---	1,680	2,150	---	2,150
MURPHY, CITY OF	1,740	---	1,740	1,910	---	1,910	2,770	---	2,770	3,700	---	3,700	4,740	---	4,740
PARKER, CITY OF	1,310	---	1,310	1,440	---	1,440	2,080	---	2,080	2,780	---	2,780	3,560	---	3,560
PLANO, CITY OF	125,200	---	125,200	137,560	---	137,560	199,160	---	199,160	265,840	---	265,840	340,630	---	340,630
PRINCETON, CITY OF	3,510	---	3,510	3,970	---	3,970	5,750	---	5,750	7,680	---	7,680	9,840	---	9,840
PROSPER, CITY OF	1,080	---	1,080	1,180	---	1,180	1,710	---	1,710	2,280	---	2,280	2,920	---	2,920
RICHARDSON, CITY OF	75,480	---	75,480	82,250	---	82,250	92,120	---	92,120	103,890	---	103,890	115,900	---	115,900
ROYSE CITY	2,520	---	2,520	2,940	---	2,940	4,210	---	4,210	5,580	---	5,580	7,160	---	7,160
SACHSE, CITY OF	6,120	---	6,120	6,290	---	6,290	6,970	---	6,970	7,840	---	7,840	8,730	---	8,730
WYLIE, CITY OF	9,120	---	9,120	10,230	---	10,230	14,810	---	14,810	19,770	---	19,770	25,330	---	25,330
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS															
LAVON WSC/LAVON	260	830	1,090	280	850	1,130	410	970	1,380	550	1,130	1,680	700	1,350	2,050
MILLIGAN WSC/LOWRY CROSSING	450	1,150	1,600	490	1,180	1,670	710	1,330	2,040	950	1,530	2,480	1,220	1,810	3,030
NORTH COLLIN WSC/NEW HOPE	540	2,630	3,170	590	2,700	3,290	850	3,110	3,960	1,130	3,570	4,700	1,450	4,100	5,550
NEVADA WSC/NEVADA	780	50	830	840	50	890	1,210	30	1,240	1,620	20	1,640	2,080	20	2,100
WESTMINSTER WSC/WESTMINSTER	360	550	910	390	570	960	560	650	1,210	750	750	1,500	960	860	1,820
WESTON WSC/WESTON	410	0	410	440	0	440	640	0	640	850	0	850	1,090	0	1,090
WYLIE NE WSC/SAINT PAUL	410	920	1,330	440	910	1,350	640	870	1,510	850	820	1,670	1,090	780	1,870
WSC SERVING UNINCORPORATED AREAS ONLY															
ALTOGA WSC	---	360	360	---	370	370	---	430	430	---	490	490	---	560	560
CADDO BASIN SUD	---	4,150	4,150	---	4,270	4,270	---	4,900	4,900	---	5,640	5,640	---	6,480	6,480
COPEVILLE WSC	---	1,610	1,610	---	1,680	1,680	---	2,040	2,040	---	2,490	2,490	---	3,030	3,030
CULLEOKA WSC	---	3,150	3,150	---	3,280	3,280	---	4,000	4,000	---	4,870	4,870	---	5,940	5,940
DANVILLE WSC	---	1,670	1,670	---	1,690	1,690	---	1,770	1,770	---	1,860	1,860	---	1,960	1,960
DESERT WSC	---	650	650	---	670	670	---	770	770	---	880	880	---	1,010	1,010
EAST FORK WSC	---	2,300	2,300	---	2,390	2,390	---	2,920	2,920	---	3,560	3,560	---	4,330	4,330
FROGNOT WSC	---	610	610	---	630	630	---	720	720	---	830	830	---	950	950
GUNTER RURAL WSC	---	1,820	1,820	---	1,840	1,840	---	1,930	1,930	---	2,030	2,030	---	2,130	2,130
LEBANON WSC	---	560	560	---	550	550	---	530	530	---	500	500	---	480	480
NORTH FARMERSVILLE WSC	---	230	230	---	240	240	---	270	270	---	310	310	---	360	360
SEIS LAGOS M.U.D.	---	450	450	---	470	470	---	600	600	---	600	600	---	600	600
SOUTH GRAYSON WSC	---	1,680	1,680	---	1,730	1,730	---	1,990	1,990	---	2,280	2,280	---	2,620	2,620
VERONA WSC	---	1,150	1,150	---	1,180	1,180	---	1,360	1,360	---	1,560	1,560	---	1,790	1,790
WEST LEONARD WSC	---	700	700	---	720	720	---	830	830	---	950	950	---	1090	1,090
TOTAL (1)	287,210	27,220	314,430	315,300	27,970	343,270	427,360	32,020	459,380	549,880	36,670	586,550	686,050	42,250	728,300

(1) POPULATIONS FOR THE PORTION OF THE CITY OF DALLAS IN COLLIN COUNTY ARE NOT INCLUDED AS PART OF THIS STUDY.

POPULATION PROJECTIONS



POPULATION PROJECTION FOR COLLIN COUNTY INCLUDES THE PORTION OF THE CITY OF DALLAS IN COLLIN COUNTY

FIGURE VIII-1

adjusted to July 1, 1988 by applying NCTCOG current growth rates. These estimated populations were then projected to 2020 by applying the TWDB high series growth rates. The high series reflects a continuation of the rate of migration experienced by the State of Texas during the 1970's.

For incorporated cities with a population of less than 1,000, the July 1, 1988 population estimate was based on U.S. Bureau of the Census data, population estimates by cities, and information on the number of water taps. The future estimates for the smaller cities were projected by using the TWDB high series growth rates for a city in close proximity with a population greater than 1,000.

3. Unincorporated Areas

Population estimates for unincorporated areas July 1, 1988 were based primarily on reported water taps from survey data. Future populations for unincorporated areas were projected using growth rates for Collin County estimated by NCTCOG with consideration given for the growth of nearby incorporated areas.

SECTION VIII

WATER DEMAND PROJECTIONS

A. METHODOLOGY

Water use data for entities in the study area was gathered from the TWDB, Texas State Department of Health, NTMWD, planning studies conducted by local entities, historical records and from individual and county-wide meetings. Based on an analysis of this data, four levels of average daily per capita water use were selected for the study area.

These per capita values not only include domestic uses, but also commercial, industrial, and agricultural uses. Of the totals, domestic use is predominant with allowances for the other use types. Agricultural needs are not significant due to the average annual rainfall in this area.

Generally, systems on groundwater and predominately rural systems are projected to have an average daily water use of 145 gpcd by the year 2000 and beyond. Cities on surface water systems in the west and the southeast were projected to use 170 gpcd. Cities with higher population density in the southwest were projected to use 220 gpcd. Two estate-type single family residential developments with large houses on large lots (Country Ridge and Seis Lagos) were assigned a 300 gpcd average daily use rate. The current average daily use rates were increased over time to these levels by the year 2000 as shown in Table VIII-1.

The maximum daily water use rates are based on a ratio of 2.3 times the average daily use rate. The 2.3 ratio was determined by examining water use records of water supply entities in the study area. The peak hourly use rates are based on a ratio of 4.0 times the average daily use rate. The ratio of 4.0 was also determined by examining water use records of water supply entities in the service area.

B. PROJECTED FLOWS

The per capita use rate was applied to the projected populations (Tables VII-1 and VII-2) to derive average daily water demands. For areas within Collin County, Table VIII-4 and Figure VIII-1 show the average daily water demand; Table VIII-5 shows the maximum daily water demand; and Table VIII-6 shows the peak hourly water demand. For areas within the study area, Table VIII-7 and Figure VIII-2 show the average daily water demand; Table VIII-8 shows the maximum daily water demand; and Table VIII-9 shows the peak hourly water demand.

Tables VIII-4 through VIII-9 and Figures VIII-1 and VIII-2 also show the total impact on water demands if a water conservation program reduces water usage by 10 percent.

Ground storage and elevated storage requirements were generally based on criteria established by the Texas Department of Health, the State Board of Insurance, and the

Fire Prevention Engineering Bureau of Texas. Ground storage requirements were based on providing 130 gallons of storage per person per day for diurnal variations. Table VIII-10 shows the total ground storage requirements for each entity within Collin County. Likewise, Table VIII-11 shows the total ground storage requirements for entities within the study area. Figure VIII-3 is a graphical presentation of the ground storage requirements.

Elevated storage requirements, including fire flow capacity, were based on providing 130 gallons per capita per day for a ten hour period plus, for the purpose of planning, an additional 25 percent of the average daily flow to insure adequate fire protection. Table VIII-12 shows the total elevated storage requirements for areas within Collin County. Likewise, Table VIII-13 shows the total elevated storage requirements for entities in the study area. Figure VIII-4 is a graphical presentation of the elevated storage requirements.

Projected minimum elevated storage requirements were based on providing exactly 130 gallons per capita per day for a ten-hour period. Additional elevated storage may be required in order to meet the fire demands above this minimum for areas where land use (commercial, residential, or industrial) requires additional capacity. A detailed analysis should be performed by each entity to assess actual elevated storage requirements. Tables VIII-14 and VIII-15 show the minimum elevated storage requirements for Collin County and the study area, respectively.

TABLE VIII-1
AVERAGE DAILY PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	150	155	170	170	170
ANNA, CITY OF	110	120	145	145	145
BLUE RIDGE, CITY OF	110	120	145	145	145
CELINA, CITY OF	110	120	145	145	145
COUNTRY RIDGE DEV. (MELISSA)	300	300	300	300	300
FAIRVIEW, CITY OF	200	205	220	220	220
FARMERSVILLE, CITY OF	170	170	170	170	170
FRISCO, CITY OF	170	170	170	170	170
JOSEPHINE, CITY OF	130	135	145	145	145
LUCAS, CITY OF	200	205	220	220	220
MCKINNEY, CITY OF	170	170	170	170	170
MELISSA, CITY OF (SERVICE AREA)	110	120	145	145	145
MURPHY, CITY OF	170	170	170	170	170
PARKER, CITY OF	200	205	220	220	220
PLANO, CITY OF	200	205	220	220	220
PRINCETON, CITY OF	150	155	170	170	170
PROSPER, CITY OF	130	135	145	145	145
RICHARDSON, CITY OF	200	205	220	220	220
ROYSE CITY	150	155	170	170	170
SACHSE, CITY OF	150	155	170	170	170
WYLIE, CITY OF	150	155	170	170	170

TABLE VIII-1 (CONTINUED)
AVERAGE DAILY PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	130	135	145	145	145
MILLIGAN WSC/LOWRY CROSSING	110	120	145	145	145
NORTH COLLIN WSC/NEW HOPE	130	135	145	145	145
NEVADA WSC/NEVADA	110	120	145	145	145
WESTMINSTER WSC/WESTMINSTER	110	120	145	145	145
WESTON WSC/WESTON	110	120	145	145	145
WYLIE NE WSC/SAINT PAUL	150	155	170	170	170
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	110	120	145	145	145
CADDO BASIN SUD	110	120	145	145	145
COPEVILLE WSC	110	120	145	145	145
CULLEOKA WSC	110	120	145	145	145
DANVILLE WSC	150	155	170	170	170
DESERT WSC	110	120	145	145	145
EAST FORK WSC	150	155	170	170	170
FROGNOT WSC	130	135	145	145	145
GUNTER RURAL WSC	130	135	145	145	145
LEBANON WSC	170	170	170	170	170
NORTH FARMERSVILLE WSC	145	145	145	145	145
SEIS LAGOS M.U.D.	300	300	300	300	300
SOUTH GRAYSON WSC	145	145	145	145	145
VERONA WSC	110	120	145	145	145
WEST LEONARD WSC	110	120	145	145	145

TABLE VIII-2
MAXIMUM DAILY PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

MAXIMUM DAY/AVERAGE DAY = 2.3

ENTITY	YEAR 1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	350	360	390	390	390
ANNA, CITY OF	250	280	330	330	330
BLUE RIDGE, CITY OF	250	280	330	330	330
CELINA, CITY OF	250	280	330	330	330
COUNTRY RIDGE DEV. (MELISSA)	690	690	690	690	690
FAIRVIEW, CITY OF	460	470	510	510	510
FARMERSVILLE, CITY OF	390	390	390	390	390
FRISCO, CITY OF	390	390	390	390	390
JOSEPHINE, CITY OF	300	310	330	330	330
LUCAS, CITY OF	460	470	510	510	510
MCKINNEY, CITY OF	390	390	390	390	390
MELISSA, CITY OF (SERVICE AREA)	250	280	330	330	330
MURPHY, CITY OF	390	390	390	390	390
PARKER, CITY OF	460	470	510	510	510
PLANO, CITY OF	460	470	510	510	510
PRINCETON, CITY OF	350	360	390	390	390
PROSPER, CITY OF	300	310	330	330	330
RICHARDSON, CITY OF	460	470	510	510	510
ROYSE CITY	350	360	390	390	390
SACHSE, CITY OF	350	360	390	390	390
WYLIE, CITY OF	350	360	390	390	390

TABLE VIII-2 (CONTINUED)
MAXIMUM DAILY PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

MAXIMUM DAY/AVERAGE DAY = 2.3

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	300	310	330	330	330
MILLIGAN WSC/LOWRY CROSSING	250	280	330	330	330
NORTH COLLIN WSC/NEW HOPE	300	310	330	330	330
NEVADA WSC/NEVADA	250	280	330	330	330
WESTMINSTER WSC/WESTMINSTER	250	280	330	330	330
WESTON WSC/WESTON	250	280	330	330	330
WYLIE NE WSC/SAINT PAUL	350	360	390	390	390
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	250	280	330	330	330
CADDO BASIN SUD	250	280	330	330	330
COPEVILLE WSC	250	280	330	330	330
CULLEOKA WSC	250	280	330	330	330
DANVILLE WSC	350	360	390	390	390
DESERT WSC	250	280	330	330	330
EAST FORK WSC	350	360	390	390	390
FROGNOT WSC	300	310	330	330	330
GUNTER RURAL WSC	300	310	330	330	330
LEBANON WSC	390	390	390	390	390
NORTH FARMERSVILLE WSC	330	330	330	330	330
SEIS LAGOS M.U.D.	690	690	690	690	690
SOUTH GRAYSON WSC	330	330	330	330	330
VERONA WSC	250	280	330	330	330
WEST LEONARD WSC	250	280	330	330	330

TABLE VIII-3
PEAK HOUR PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

PEAK HOUR/AVERAGE DAY = 4.0

ENTITY	YEAR 1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	600	620	680	680	680
ANNA, CITY OF	440	480	580	580	580
BLUE RIDGE, CITY OF	440	480	580	580	580
CELINA, CITY OF	440	480	580	580	580
COUNTRY RIDGE DEV. (MELISSA)	1,200	1,200	1,200	1,200	1,200
FAIRVIEW, CITY OF	800	820	880	880	880
FARMERSVILLE, CITY OF	680	680	680	680	680
FRISCO, CITY OF	680	680	680	680	680
JOSEPHINE, CITY OF	520	540	580	580	580
LUCAS, CITY OF	800	820	880	880	880
MCKINNEY, CITY OF	680	680	680	680	680
MELISSA, CITY OF (SERVICE AREA)	440	480	580	580	580
MURPHY, CITY OF	680	680	680	680	680
PARKER, CITY OF	800	820	880	880	880
PLANO, CITY OF	800	820	880	880	880
PRINCETON, CITY OF	600	620	680	680	680
PROSPER, CITY OF	520	540	580	580	580
RICHARDSON, CITY OF	800	820	880	880	880
ROYSE CITY	600	620	680	680	680
SACHSE, CITY OF	600	620	680	680	680
WYLIE, CITY OF	600	620	680	680	680

TABLE VIII-3 (CONTINUED)
PEAK HOUR PER CAPITA WATER USE
(GALLONS PER CAPITA PER DAY)

PEAK HOUR/AVERAGE DAY = 4.0

ENTITY	YEAR 1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	520	540	580	580	580
MILLIGAN WSC/LOWRY CROSSING	440	480	580	580	580
NORTH COLLIN WSC/NEW HOPE	520	540	580	580	580
NEVADA WSC/NEVADA	440	480	580	580	580
WESTMINSTER WSC/WESTMINSTER	440	480	580	580	580
WESTON WSC/WESTON	440	480	580	580	580
WYLIE NE WSC/SAINT PAUL	600	620	680	680	680
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	440	480	580	580	580
CADDO BASIN SUD	440	480	580	580	580
COPEVILLE WSC	440	480	580	580	580
CULLEOKA WSC	440	480	580	580	580
DANVILLE WSC	600	620	680	680	680
DESERT WSC	440	480	580	580	580
EAST FORK WSC	600	620	680	680	680
FROGNOT WSC	520	540	580	580	580
GUNTER RURAL WSC	520	540	580	580	580
LEBANON WSC	680	680	680	680	680
NORTH FARMERSVILLE WSC	580	580	580	580	580
SEIS LAGOS M.U.D.	1,200	1,200	1,200	1,200	1,200
SOUTH GRAYSON WSC	580	580	580	580	580
VERONA WSC	440	480	580	580	580
WEST LEONARD WSC	440	480	580	580	580

TABLE VIII-4
AVERAGE DAILY WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(MILLIONS OF GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	2.67	3.10	4.92	6.57	8.42
ANNA, CITY OF	0.15	0.18	0.31	0.41	0.52
BLUE RIDGE, CITY OF	0.07	0.08	0.14	0.19	0.24
CELINA, CITY OF	0.21	0.24	0.43	0.57	0.73
COUNTRY RIDGE DEV. (MELISSA)	0.04	0.05	0.07	0.09	0.12
FAIRVIEW, CITY OF	0.28	0.31	0.49	0.65	0.83
FARMERSVILLE, CITY OF	0.47	0.52	0.76	1.01	1.30
FRISCO, CITY OF	1.07	1.16	1.68	2.24	2.87
JOSEPHINE, CITY OF	0.07	0.08	0.12	0.16	0.21
LUCAS, CITY OF	0.49	0.55	0.85	1.14	1.46
MCKINNEY, CITY OF	3.73	4.11	5.95	7.94	10.18
MELISSA, CITY OF (SERVICE AREA)	0.09	0.10	0.18	0.24	0.31
MURPHY, CITY OF	0.30	0.32	0.47	0.63	0.81
PARKER, CITY OF	0.26	0.30	0.46	0.61	0.78
PLANO, CITY OF	25.04	28.20	43.82	58.48	74.94
PRINCETON, CITY OF	0.53	0.62	0.98	1.31	1.67
PROSPER, CITY OF	0.14	0.16	0.25	0.33	0.42
RICHARDSON, CITY OF	1.93	1.98	2.74	3.19	3.65
ROYSE CITY	0.03	0.03	0.05	0.06	0.08
SACHSE, CITY OF	0.03	0.03	0.04	0.04	0.05
WYLIE, CITY OF	1.37	1.59	2.52	3.36	4.31

TABLE VIII-4 (CONTINUED)
AVERAGE DAILY WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(MILLIONS OF GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	0.14	0.15	0.20	0.24	0.30
MILLIGAN WSC/LOWRY CROSSING	0.18	0.20	0.30	0.36	0.44
NORTH COLLIN WSC/NEW HOPE	0.41	0.44	0.57	0.68	0.80
NEVADA WSC/NEVADA	0.09	0.11	0.18	0.24	0.30
WESTMINSTER WSC/WESTMINSTER	0.10	0.12	0.18	0.22	0.26
WESTON WSC/WESTON	0.05	0.05	0.09	0.12	0.16
WYLIE NE WSC/SAINT PAUL	0.20	0.21	0.26	0.28	0.32
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	0.04	0.04	0.06	0.07	0.08
CADDO BASIN SUD	0.15	0.17	0.23	0.27	0.31
COPEVILLE WSC	0.18	0.20	0.30	0.36	0.44
CULLEOKA WSC	0.35	0.39	0.58	0.71	0.86
DANVILLE WSC	0.25	0.26	0.30	0.32	0.33
DESERT WSC	0.02	0.02	0.02	0.03	0.03
EAST FORK WSC	0.12	0.13	0.17	0.21	0.26
FROGNOT WSC	0.08	0.09	0.10	0.12	0.14
GUNTER RURAL WSC	0.14	0.15	0.17	0.18	0.19
LEBANON WSC	0.09	0.09	0.09	0.08	0.08
NORTH FARMERSVILLE WSC	0.03	0.03	0.04	0.04	0.05
SEIS LAGOS M.U.D.	0.14	0.14	0.18	0.18	0.18
SOUTH GRAYSON WSC	0.12	0.12	0.14	0.17	0.19
VERONA WSC	0.13	0.14	0.20	0.23	0.26
WEST LEONARD WSC	0.02	0.03	0.03	0.04	0.04
TOTAL	41.96	47.00	71.61	94.39	119.94
TOTAL WITH CONSERVATION MEASURES		42.30	64.45	84.96	107.95

PROJECTED AVERAGE DAILY WATER USE
COLLIN COUNTY

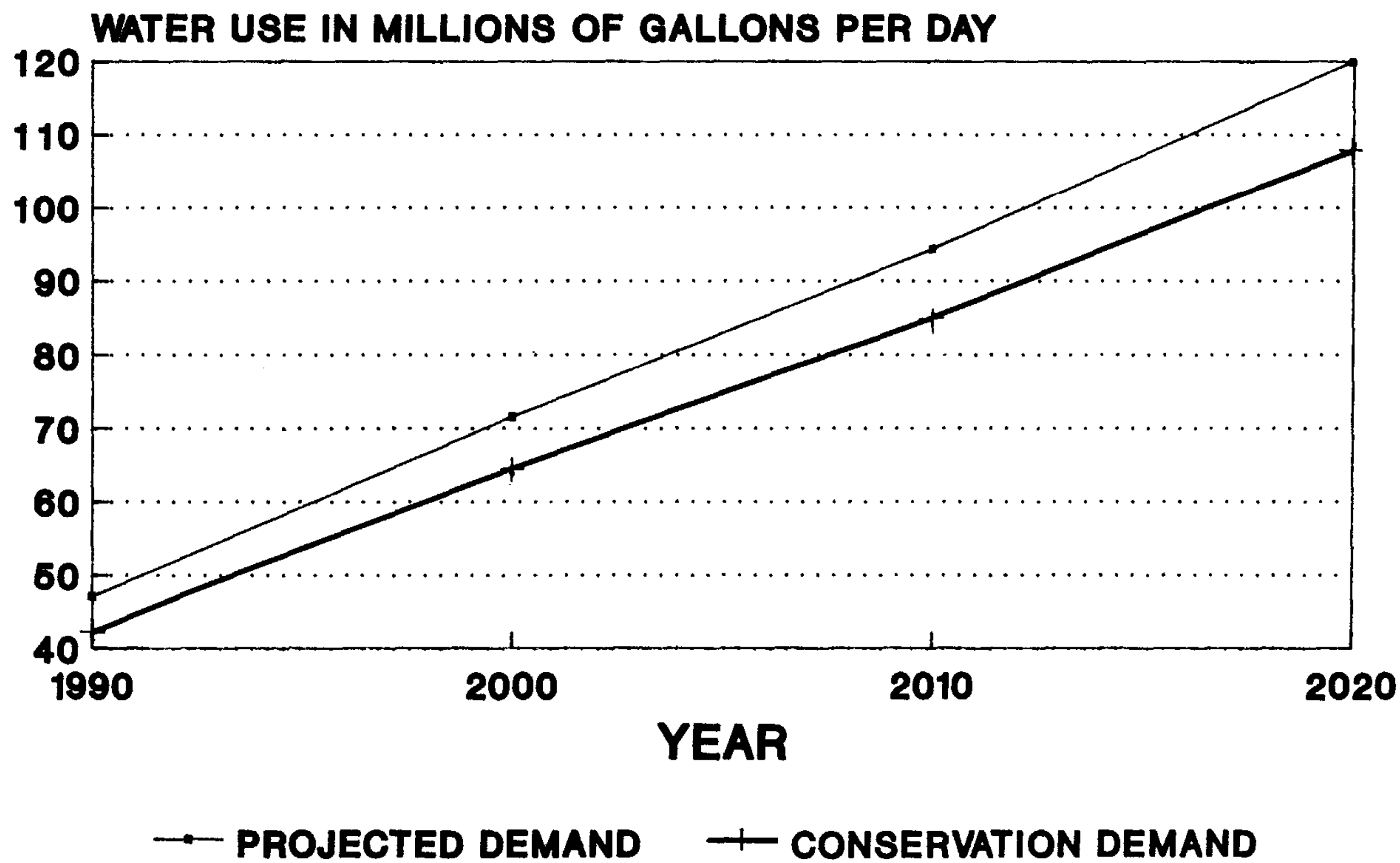


FIGURE VIII-1

TABLE VIII-5
MAXIMUM DAILY WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(MILLIONS OF GALLONS PER DAY)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	6.23	7.20	11.29	15.08	19.32
ANNA, CITY OF	0.34	0.41	0.70	0.93	1.19
BLUE RIDGE, CITY OF	0.15	0.18	0.32	0.42	0.54
CELINA, CITY OF	0.47	0.57	0.97	1.30	1.67
COUNTRY RIDGE DEV. (MELISSA)	0.08	0.11	0.16	0.21	0.28
FAIRVIEW, CITY OF	0.64	0.72	1.13	1.51	1.93
FARMERSVILLE, CITY OF	1.08	1.20	1.74	2.32	2.97
FRISCO, CITY OF	2.46	2.66	3.86	5.15	6.59
JOSEPHINE, CITY OF	0.16	0.18	0.28	0.37	0.48
LUCAS, CITY OF	1.12	1.25	1.97	2.64	3.38
MCKINNEY, CITY OF	8.56	9.43	13.65	18.22	23.35
MELISSA, CITY OF (SERVICE AREA)	0.20	0.24	0.42	0.55	0.71
MURPHY, CITY OF	0.68	0.74	1.08	1.44	1.85
PARKER, CITY OF	0.60	0.68	1.06	1.42	1.82
PLANO, CITY OF	57.59	64.65	101.57	135.58	173.72
PRINCETON, CITY OF	1.23	1.43	2.24	3.00	3.84
PROSPER, CITY OF	0.32	0.37	0.56	0.75	0.96
RICHARDSON, CITY OF	4.44	4.55	6.35	7.40	8.47
ROYSE CITY	0.06	0.07	0.11	0.15	0.19
SACHSE, CITY OF	0.07	0.08	0.09	0.10	0.11
WYLIE, CITY OF	3.19	3.68	5.78	7.71	9.88

TABLE VIII-5 (CONTINUED)
MAXIMUM DAILY WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(MILLIONS OF GALLONS PER DAY)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	0.33	0.35	0.46	0.55	0.68
MILLIGAN WSC/LOWRY CROSSING	0.40	0.47	0.67	0.82	1.00
NORTH COLLIN WSC/NEW HOPE	0.95	1.02	1.31	1.55	1.83
NEVADA WSC/NEVADA	0.21	0.25	0.41	0.54	0.69
WESTMINSTER WSC/WESTMINSTER	0.23	0.27	0.40	0.50	0.60
WESTON WSC/WESTON	0.10	0.12	0.21	0.28	0.36
WYLIE NE WSC/SAINT PAUL	0.47	0.49	0.59	0.65	0.73
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	0.09	0.10	0.14	0.16	0.18
CADDO BASIN SUD	0.34	0.39	0.53	0.61	0.71
COPEVILLE WSC	0.40	0.47	0.67	0.82	1.00
CULLEOKA WSC	0.79	0.92	1.32	1.61	1.96
DANVILLE WSC	0.58	0.61	0.69	0.73	0.76
DESERT WSC	0.04	0.04	0.05	0.06	0.07
EAST FORK WSC	0.28	0.30	0.40	0.49	0.59
FROGNOT WSC	0.18	0.20	0.24	0.27	0.31
GUNTER RURAL WSC	0.33	0.34	0.38	0.40	0.42
LEBANON WSC	0.21	0.21	0.20	0.19	0.18
NORTH FARMERSVILLE WSC	0.08	0.08	0.09	0.10	0.12
SEIS LAGOS M.U.D.	0.31	0.32	0.41	0.41	0.41
SOUTH GRAYSON WSC	0.28	0.28	0.33	0.38	0.43
VERONA WSC	0.29	0.33	0.45	0.51	0.59
WEST LEONARD WSC	0.05	0.06	0.08	0.09	0.10
TOTAL	96.61	108.04	165.37	217.99	276.99
TOTAL WITH CONSERVATION MEASURES		97.24	148.83	196.19	249.30

TABLE VIII-6
PEAK HOUR WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS PER MINUTE)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	7420	8610	13680	18260	23390
ANNA, CITY OF	410	490	850	1140	1450
BLUE RIDGE, CITY OF	180	220	390	520	660
CELINA, CITY OF	570	680	1190	1590	2030
COUNTRY RIDGE DEV. (MELISSA)	100	130	190	260	330
FAIRVIEW, CITY OF	770	870	1360	1810	2320
FARMERSVILLE, CITY OF	1310	1450	2110	2810	3600
FRISCO, CITY OF	2980	3230	4670	6230	7990
JOSEPHINE, CITY OF	190	220	340	450	580
LUCAS, CITY OF	1350	1520	2370	3160	4050
MCKINNEY, CITY OF	10370	11420	16530	22070	28280
MELISSA, CITY OF (SERVICE AREA)	240	290	510	680	870
MURPHY, CITY OF	820	900	1310	1750	2240
PARKER, CITY OF	730	820	1270	1700	2180
PLANO, CITY OF	69560	78330	121710	162460	208160
PRINCETON, CITY OF	1460	1710	2720	3630	4650
PROSPER, CITY OF	390	440	690	920	1180
RICHARDSON, CITY OF	5370	5510	7610	8870	10150
ROYSE CITY	80	90	140	180	230
SACHSE, CITY OF	90	90	110	120	140
WYLIE, CITY OF	3800	4400	6990	9340	11960

TABLE VIII-6 (CONTINUED)
PEAK HOUR WATER DEMAND - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS PER MINUTE)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	390	420	560	680	830
MILLIGAN WSC/LOWRY CROSSING	490	560	820	1000	1220
NORTH COLLIN WSC/NEW HOPE	1140	1230	1600	1890	2240
NEVADA WSC/NEVADA	250	300	500	660	850
WESTMINSTER WSC/WESTMINSTER	280	320	490	600	730
WESTON WSC/WESTON	130	150	260	340	440
WYLIE NE WSC/SAINT PAUL	550	580	710	790	880
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	110	120	170	200	230
CADDO BASIN SUD	420	470	650	750	860
COPEVILLE WSC	490	560	820	1000	1220
CULLEOKA WSC	960	1090	1610	1960	2390
DANVILLE WSC	700	730	840	880	930
DESERT WSC	40	50	60	80	90
EAST FORK WSC	330	360	480	590	720
FROGNOT WSC	220	240	290	330	380
GUNTER RURAL WSC	390	410	470	490	520
LEBANON WSC	260	250	240	230	220
NORTH FARMERSVILLE WSC	90	100	110	120	150
SEIS LAGOS M.U.D.	380	390	500	500	500
SOUTH GRAYSON WSC	340	350	400	460	530
VERONA WSC	350	390	550	630	720
WEST LEONARD WSC	60	70	100	110	120
TOTAL	116,560	130,560	198,970	262,240	333,210
TOTAL WITH CONSERVATION MEASURES		117,500	179,070	236,020	299,890

TABLE VIII-7
AVERAGE DAILY WATER DEMANDS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(MILLION GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	2.67	3.10	4.92	6.57	8.42
ANNA, CITY OF	0.15	0.18	0.31	0.41	0.52
BLUE RIDGE, CITY OF	0.07	0.08	0.14	0.19	0.24
CELINA, CITY OF	0.21	0.24	0.43	0.57	0.73
COUNTRY RIDGE DEV. (MELISSA)	0.04	0.05	0.07	0.09	0.12
FAIRVIEW, CITY OF	0.28	0.31	0.49	0.65	0.83
FARMERSVILLE, CITY OF	0.47	0.52	0.76	1.01	1.30
FRISCO, CITY OF	1.07	1.16	1.68	2.24	2.87
JOSEPHINE, CITY OF	0.07	0.08	0.12	0.16	0.21
LUCAS, CITY OF	0.49	0.55	0.85	1.14	1.46
MCKINNEY, CITY OF	3.73	4.11	5.95	7.94	10.18
MELISSA, CITY OF (SERVICE AREA)	0.09	0.10	0.18	0.24	0.31
MURPHY, CITY OF	0.30	0.32	0.47	0.63	0.81
PARKER, CITY OF	0.26	0.30	0.46	0.61	0.78
PLANO, CITY OF	25.04	28.20	43.82	58.48	74.94
PRINCETON, CITY OF	0.53	0.62	0.98	1.31	1.67
PROSPER, CITY OF	0.14	0.16	0.25	0.33	0.42
RICHARDSON, CITY OF	15.10	16.86	20.27	22.86	25.50
ROYSE CITY	0.38	0.46	0.72	0.95	1.22
SACHSE, CITY OF	0.92	0.97	1.18	1.33	1.48
WYLIE, CITY OF	1.37	1.59	2.52	3.36	4.31

TABLE VIII-7 (CONTINUED)
AVERAGE DAILY WATER DEMANDS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(MILLION GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	0.14	0.15	0.20	0.24	0.30
MILLIGAN WSC/LOWRY CROSSING	0.18	0.20	0.30	0.36	0.44
NORTH COLLIN WSC/NEW HOPE	0.41	0.44	0.57	0.68	0.80
NEVADA WSC/NEVADA	0.09	0.11	0.18	0.24	0.30
WESTMINSTER WSC/WESTMINSTER	0.10	0.12	0.18	0.22	0.26
WESTON WSC/WESTON	0.05	0.05	0.09	0.12	0.16
WYLIE NE WSC/SAINT PAUL	0.20	0.21	0.26	0.28	0.32
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	0.04	0.04	0.06	0.07	0.08
CADDO BASIN SUD	0.46	0.51	0.71	0.82	0.94
COPEVILLE WSC	0.18	0.20	0.30	0.36	0.44
CULLEOKA WSC	0.35	0.39	0.58	0.71	0.86
DANVILLE WSC	0.25	0.26	0.30	0.32	0.33
DESERT WSC	0.07	0.08	0.11	0.13	0.15
EAST FORK WSC	0.35	0.37	0.50	0.61	0.74
FROGNOT WSC	0.08	0.09	0.10	0.12	0.14
GUNTER RURAL WSC	0.24	0.25	0.28	0.29	0.31
LEBANON WSC	0.10	0.09	0.09	0.09	0.08
NORTH FARMERSVILLE WSC	0.03	0.03	0.04	0.04	0.05
SEIS LAGOS M.U.D.	0.14	0.14	0.18	0.18	0.18
SOUTH GRAYSON WSC	0.24	0.25	0.29	0.33	0.38
VERONA WSC	0.13	0.14	0.20	0.23	0.26
WEST LEONARD WSC	0.08	0.09	0.12	0.14	0.16
TOTAL	57.23	64.19	92.19	117.66	146.01
TOTAL WITH CONSERVATION MEASURES		57.77	82.97	105.89	131.41

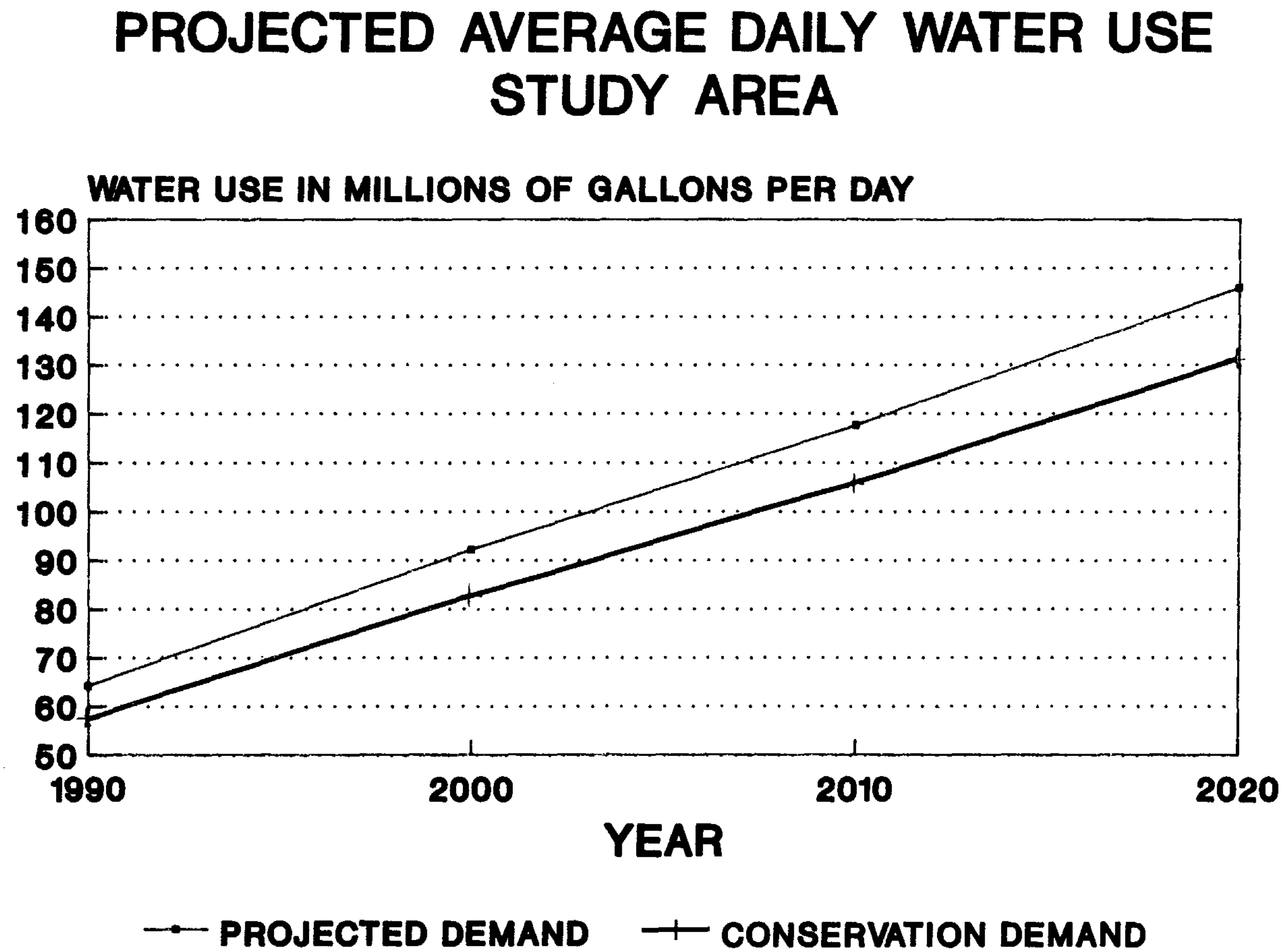


FIGURE VIII-2

TABLE VIII-8
MAXIMUM DAILY WATER DEMAND - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
SERVICE AREA OUTSIDE OF COLLIN COUNTY
(MILLION GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	6.23	7.20	11.29	15.08	19.32
ANNA, CITY OF	0.34	0.41	0.70	0.93	1.19
BLUE RIDGE, CITY OF	0.15	0.18	0.32	0.42	0.54
CELINA, CITY OF	0.47	0.57	0.97	1.30	1.67
COUNTRY RIDGE DEV. (MELISSA)	0.08	0.11	0.16	0.21	0.28
FAIRVIEW, CITY OF	0.64	0.72	1.13	1.51	1.93
FARMERSVILLE, CITY OF	1.08	1.20	1.74	2.32	2.97
FRISCO, CITY OF	2.46	2.66	3.86	5.15	6.59
JOSEPHINE, CITY OF	0.16	0.18	0.28	0.37	0.48
LUCAS, CITY OF	1.12	1.25	1.97	2.64	3.38
MCKINNEY, CITY OF	8.56	9.43	13.65	18.22	23.35
MELISSA, CITY OF (SERVICE AREA)	0.20	0.24	0.42	0.55	0.71
MURPHY, CITY OF	0.68	0.74	1.08	1.44	1.85
PARKER, CITY OF	0.60	0.68	1.06	1.42	1.82
PLANO, CITY OF	57.59	64.65	101.57	135.58	173.72
PRINCETON, CITY OF	1.23	1.43	2.24	3.00	3.84
PROSPER, CITY OF	0.32	0.37	0.56	0.75	0.96
RICHARDSON, CITY OF	34.72	38.66	46.98	52.98	59.11
ROYSE CITY	0.88	1.06	1.64	2.18	2.79
SACHSE, CITY OF	2.14	2.26	2.72	3.06	3.40
WYLIE, CITY OF	3.19	3.68	5.78	7.71	9.88

TABLE VIII-8 (CONTINUED)
MAXIMUM DAILY WATER DEMAND - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
SERVICE AREA OUTSIDE OF COLLIN COUNTY
(MILLION GALLONS PER DAY)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	0.33	0.35	0.46	0.55	0.68
MILLIGAN WSC/LOWRY CROSSING	0.40	0.47	0.67	0.82	1.00
NORTH COLLIN WSC/NEW HOPE	0.95	1.02	1.31	1.55	1.83
NEVADA WSC/NEVADA	0.21	0.25	0.41	0.54	0.69
WESTMINSTER WSC/WESTMINSTER	0.23	0.27	0.40	0.50	0.60
WESTON WSC/WESTON	0.10	0.12	0.21	0.28	0.36
WYLIE NE WSC/SAINT PAUL	0.47	0.49	0.59	0.65	0.73
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	0.09	0.10	0.14	0.16	0.18
CADDO BASIN SUD	1.04	1.20	1.62	1.86	2.14
COPEVILLE WSC	0.40	0.47	0.67	0.82	1.00
CULLEOKA WSC	0.79	0.92	1.32	1.61	1.96
DANVILLE WSC	0.58	0.61	0.69	0.73	0.76
DESERT WSC	0.16	0.19	0.25	0.29	0.33
EAST FORK WSC	0.81	0.86	1.14	1.39	1.69
FROGNOT WSC	0.18	0.20	0.24	0.27	0.31
GUNTER RURAL WSC	0.55	0.57	0.64	0.67	0.70
LEBANON WSC	0.22	0.21	0.21	0.20	0.19
NORTH FARMERSVILLE WSC	0.08	0.08	0.09	0.10	0.12
SEIS LAGOS M.U.D.	0.31	0.32	0.41	0.41	0.41
SOUTH GRAYSON WSC	0.55	0.57	0.66	0.75	0.86
VERONA WSC	0.29	0.33	0.45	0.51	0.59
WEST LEONARD WSC	0.18	0.20	0.27	0.31	0.36
TOTAL	131.75	147.50	212.97	271.81	337.29
TOTAL WITH CONSERVATION MEASURES		132.75	191.67	244.63	303.56

TABLE VIII-9
PEAK HOUR WATER DEMAND - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS PER MINUTE)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	7420	8610	13680	18260	23390
ANNA, CITY OF	410	490	850	1140	1450
BLUE RIDGE, CITY OF	180	220	390	520	660
CELINA, CITY OF	570	680	1190	1590	2030
COUNTRY RIDGE DEV. (MELISSA)	100	130	190	260	330
FAIRVIEW, CITY OF	770	870	1360	1810	2320
FARMERSVILLE, CITY OF	1310	1450	2110	2810	3600
FRISCO, CITY OF	2980	3230	4670	6230	7990
JOSEPHINE, CITY OF	190	220	340	450	580
LUCAS, CITY OF	1350	1520	2370	3160	4050
MCKINNEY, CITY OF	10370	11420	16530	22070	28280
MELISSA, CITY OF (SERVICE AREA)	240	290	510	680	870
MURPHY, CITY OF	820	900	1310	1750	2240
PARKER, CITY OF	730	820	1270	1700	2180
PLANO, CITY OF	69560	78330	121710	162460	208160
PRINCETON, CITY OF	1460	1710	2720	3630	4650
PROSPER, CITY OF	390	440	690	920	1180
RICHARDSON, CITY OF	41930	46840	56300	63490	70830
ROYSE CITY	1050	1270	1990	2640	3380
SACHSE, CITY OF	2550	2710	3290	3700	4120
WYLIE, CITY OF	3800	4400	6990	9340	11960

TABLE VIII-9 (CONTINUED)
PEAK HOUR WATER DEMAND - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS PER MINUTE)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	390	420	560	680	830
MILLIGAN WSC/LOWRY CROSSING	490	560	820	1000	1220
NORTH COLLIN WSC/NEW HOPE	1140	1230	1600	1890	2240
NEVADA WSC/NEVADA	250	300	500	660	850
WESTMINSTER WSC/WESTMINSTER	280	320	490	600	730
WESTON WSC/WESTON	130	150	260	340	440
WYLIE NE WSC/SAINT PAUL	550	580	710	790	880
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	110	120	170	200	230
CADDO BASIN SUD	1270	1420	1970	2270	2610
COPEVILLE WSC	490	560	820	1000	1220
CULLEOKA WSC	960	1090	1610	1960	2390
DANVILLE WSC	700	730	840	880	930
DESERT WSC	200	220	310	350	410
EAST FORK WSC	960	1030	1380	1680	2040
FROGNOT WSC	220	240	290	330	380
GUNTER RURAL WSC	660	690	780	820	860
LEBANON WSC	260	260	250	240	230
NORTH FARMERSVILLE WSC	90	100	110	120	150
SEIS LAGOS M.U.D.	380	390	500	500	500
SOUTH GRAYSON WSC	680	700	800	920	1060
VERONA WSC	350	390	550	630	720
WEST LEONARD WSC	210	240	330	380	440
TOTAL	158,950	178,290	256,110	326,850	405,610
TOTAL WITH CONSERVATION MEASURES		160,460	230,500	294,170	365,050

TABLE VIII-10
PROJECTED GROUND STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	2,314,000	2,600,000	3,765,000	5,026,000	6,440,000
ANNA, CITY OF	174,000	190,000	274,000	367,000	469,000
BLUE RIDGE, CITY OF	78,000	86,000	125,000	166,000	213,000
CELINA, CITY OF	243,000	265,000	384,000	512,000	657,000
COUNTRY RIDGE DEV. (MELISSA)	16,000	21,000	30,000	40,000	52,000
FAIRVIEW, CITY OF	181,000	199,000	289,000	385,000	493,000
FARMERSVILLE, CITY OF	361,000	400,000	580,000	774,000	991,000
FRISCO, CITY OF	822,000	888,000	1,286,000	1,716,000	2,198,000
JOSEPHINE, CITY OF	68,000	75,000	109,000	146,000	187,000
LUCAS, CITY OF	316,000	347,000	503,000	672,000	861,000
MCKINNEY, CITY OF	2,854,000	3,143,000	4,551,000	6,075,000	7,784,000
MELISSA, CITY OF (SERVICE AREA)	104,000	113,000	164,000	218,000	280,000
MURPHY, CITY OF	226,000	248,000	360,000	481,000	616,000
PARKER, CITY OF	170,000	187,000	270,000	361,000	463,000
PLANO, CITY OF	16,276,000	17,883,000	25,891,000	34,559,000	44,282,000
PRINCETON, CITY OF	456,000	516,000	748,000	998,000	1,279,000
PROSPER, CITY OF	140,000	153,000	222,000	296,000	380,000
RICHARDSON, CITY OF	1,256,000	1,258,000	1,619,000	1,886,000	2,159,000
ROYSE CITY	23,000	26,000	38,000	49,000	64,000
SACHSE, CITY OF	27,000	27,000	30,000	34,000	38,000
WYLIE, CITY OF	1,186,000	1,330,000	1,925,000	2,570,000	3,293,000

TABLE VIII-10 (CONTINUED)
PROJECTED GROUND STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	142,000	147,000	179,000	218,000	267,000
MILLIGAN WSC/LOWRY CROSSING	208,000	217,000	265,000	322,000	394,000
NORTH COLLIN WSC/NEW HOPE	412,000	428,000	515,000	611,000	722,000
NEVADA WSC/NEVADA	108,000	116,000	161,000	213,000	273,000
WESTMINSTER WSC/WESTMINSTER	118,000	125,000	157,000	195,000	237,000
WESTON WSC/WESTON	53,000	57,000	83,000	111,000	142,000
WYLIE NE WSC/SAINT PAUL	173,000	176,000	196,000	217,000	243,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	47,000	48,000	56,000	64,000	73,000
CADDO BASIN SUD	178,000	183,000	211,000	242,000	278,000
COPEVILLE WSC	209,000	218,000	265,000	324,000	394,000
CULLEOKA WSC	410,000	426,000	520,000	633,000	772,000
DANVILLE WSC	217,000	220,000	230,000	242,000	255,000
DESERT WSC	18,000	18,000	21,000	25,000	29,000
EAST FORK WSC	104,000	109,000	133,000	163,000	198,000
FROGNOT WSC	79,000	82,000	94,000	108,000	124,000
GUNTER RURAL WSC	142,000	143,000	151,000	159,000	166,000
LEBANON WSC	70,000	69,000	66,000	62,000	60,000
NORTH FARMERSVILLE WSC	30,000	31,000	35,000	40,000	47,000
SEIS LAGOS M.U.D.	59,000	61,000	78,000	78,000	78,000
SOUTH GRAYSON WSC	109,000	112,000	129,000	148,000	170,000
VERONA WSC	150,000	153,000	177,000	203,000	233,000
WEST LEONARD WSC	26,000	27,000	31,000	35,000	40,000
TOTAL	30,353,000	33,121,000	46,916,000	61,744,000	78,394,000

TABLE VIII-11
PROJECTED GROUND STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	2,314,000	2,600,000	3,765,000	5,026,000	6,440,000
ANNA, CITY OF	174,000	190,000	274,000	367,000	469,000
BLUE RIDGE, CITY OF	78,000	86,000	125,000	166,000	213,000
CELINA, CITY OF	243,000	265,000	384,000	512,000	657,000
COUNTRY RIDGE DEV. (MELISSA)	16,000	21,000	30,000	40,000	52,000
FAIRVIEW, CITY OF	181,000	199,000	289,000	385,000	493,000
FARMERSVILLE, CITY OF	361,000	400,000	580,000	774,000	991,000
FRISCO, CITY OF	822,000	888,000	1,286,000	1,716,000	2,198,000
JOSEPHINE, CITY OF	68,000	75,000	109,000	146,000	187,000
LUCAS, CITY OF	316,000	347,000	503,000	672,000	861,000
MCKINNEY, CITY OF	2,854,000	3,143,000	4,551,000	6,075,000	7,784,000
MELISSA, CITY OF (SERVICE AREA)	104,000	113,000	164,000	218,000	280,000
MURPHY, CITY OF	226,000	248,000	360,000	481,000	616,000
PARKER, CITY OF	170,000	187,000	270,000	361,000	463,000
PLANO, CITY OF	16,276,000	17,883,000	25,891,000	34,559,000	44,282,000
PRINCETON, CITY OF	456,000	516,000	748,000	998,000	1,279,000
PROSPER, CITY OF	140,000	153,000	222,000	296,000	380,000
RICHARDSON, CITY OF	9,812,000	10,693,000	11,976,000	13,506,000	15,067,000
ROYSE CITY	328,000	382,000	547,000	725,000	931,000
SACHSE, CITY OF	796,000	818,000	906,000	1,019,000	1,135,000
WYLIE, CITY OF	1,186,000	1,330,000	1,925,000	2,570,000	3,293,000

TABLE VIII-11 (CONTINUED)
PROJECTED GROUND STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	142,000	147,000	179,000	218,000	267,000
MILLIGAN WSC/LOWRY CROSSING	208,000	217,000	265,000	322,000	394,000
NORTH COLLIN WSC/NEW HOPE	412,000	428,000	515,000	611,000	722,000
NEVADA WSC/NEVADA	108,000	116,000	161,000	213,000	273,000
WESTMINSTER WSC/WESTMINSTER	118,000	125,000	157,000	195,000	237,000
WESTON WSC/WESTON	53,000	57,000	83,000	111,000	142,000
WYLIE NE WSC/SAINT PAUL	173,000	176,000	196,000	217,000	243,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	47,000	48,000	56,000	64,000	73,000
CADDO BASIN SUD	540,000	555,000	637,000	733,000	842,000
COPEVILLE WSC	209,000	218,000	265,000	324,000	394,000
CULLEOKA WSC	410,000	426,000	520,000	633,000	772,000
DANVILLE WSC	217,000	220,000	230,000	242,000	255,000
DESERT WSC	85,000	87,000	100,000	114,000	131,000
EAST FORK WSC	299,000	311,000	380,000	463,000	563,000
FROGNOT WSC	79,000	82,000	94,000	108,000	124,000
GUNTER RURAL WSC	237,000	239,000	251,000	264,000	277,000
LEBANON WSC	73,000	72,000	69,000	65,000	62,000
NORTH FARMERSVILLE WSC	30,000	31,000	35,000	40,000	47,000
SEIS LAGOS M.U.D.	59,000	61,000	78,000	78,000	78,000
SOUTH GRAYSON WSC	218,000	225,000	259,000	296,000	341,000
VERONA WSC	150,000	153,000	177,000	203,000	233,000
WEST LEONARD WSC	91,000	94,000	108,000	124,000	142,000
TOTAL	40,879,000	44,625,000	59,720,000	76,250,000	94,683,000

PROJECTED GROUND STORAGE REQUIREMENTS

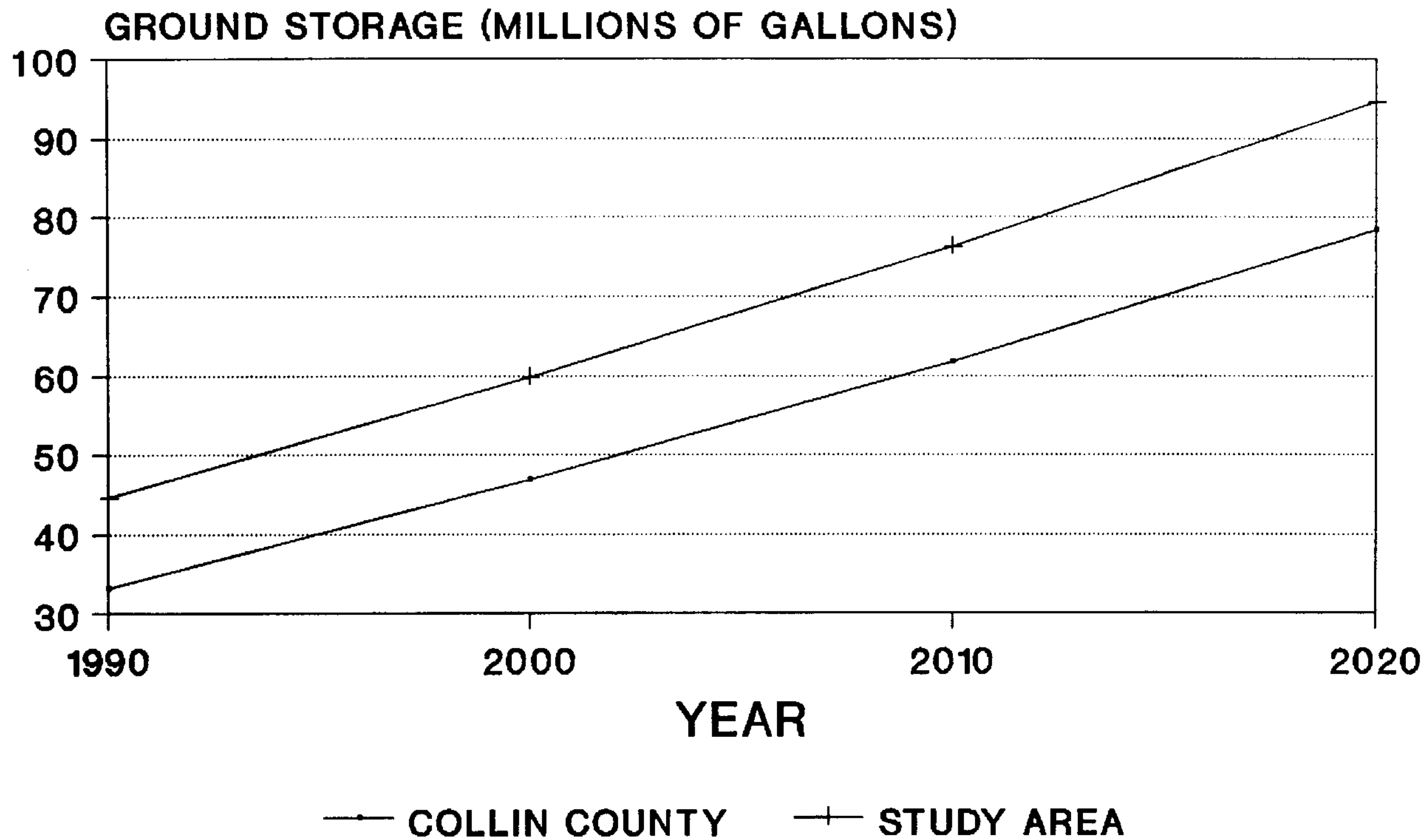


FIGURE VIII-3

TABLE VIII-12
PROJECTED ELEVATED STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	1,632,000	1,858,000	2,799,000	3,737,000	4,789,000
ANNA, CITY OF	109,000	123,000	191,000	255,000	326,000
BLUE RIDGE, CITY OF	49,000	56,000	87,000	116,000	148,000
CELINA, CITY OF	153,000	172,000	267,000	356,000	457,000
COUNTRY RIDGE DEV. (MELISSA)	15,000	21,000	30,000	40,000	52,000
FAIRVIEW, CITY OF	145,000	161,000	242,000	323,000	414,000
FARMERSVILLE, CITY OF	269,000	298,000	431,000	575,000	737,000
FRISCO, CITY OF	611,000	660,000	956,000	1,276,000	1,635,000
JOSEPHINE, CITY OF	45,000	51,000	76,000	101,000	130,000
LUCAS, CITY OF	253,000	281,000	422,000	564,000	723,000
MCKINNEY, CITY OF	2,122,000	2,337,000	3,384,000	4,517,000	5,788,000
MELISSA, CITY OF (SERVICE AREA)	65,000	73,000	114,000	152,000	194,000
MURPHY, CITY OF	168,000	185,000	268,000	358,000	458,000
PARKER, CITY OF	136,000	152,000	227,000	303,000	389,000
PLANO, CITY OF	13,041,000	14,500,000	21,740,000	29,019,000	37,183,000
PRINCETON, CITY OF	322,000	369,000	556,000	742,000	951,000
PROSPER, CITY OF	94,000	104,000	155,000	206,000	264,000
RICHARDSON, CITY OF	1,006,000	1,020,000	1,359,000	1,584,000	1,813,000
ROYSE CITY	16,000	19,000	28,000	37,000	47,000
SACHSE, CITY OF	19,000	20,000	22,000	25,000	28,000
WYLIE, CITY OF	836,000	950,000	1,432,000	1,911,000	2,448,000

TABLE VIII-12 (CONTINUED)
PROJECTED ELEVATED STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	94,000	99,000	125,000	152,000	185,000
MILLIGAN WSC/LOWRY CROSSING	131,000	141,000	184,000	224,000	274,000
NORTH COLLIN WSC/NEW HOPE	275,000	289,000	358,000	425,000	502,000
NEVADA WSC/NEVADA	68,000	75,000	112,000	148,000	190,000
WESTMINSTER WSC/WESTMINSTER	74,000	81,000	109,000	136,000	165,000
WESTON WSC/WESTON	33,000	37,000	58,000	77,000	99,000
WYLIE NE WSC/SAINT PAUL	122,000	125,000	146,000	161,000	181,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	29,000	31,000	39,000	44,000	51,000
CADDO BASIN SUD	112,000	119,000	146,000	168,000	193,000
COPEVILLE WSC	131,000	141,000	184,000	225,000	274,000
CULLEOKA WSC	257,000	276,000	362,000	440,000	537,000
DANVILLE WSC	153,000	157,000	171,000	180,000	189,000
DESERT WSC	11,000	12,000	14,000	17,000	20,000
EAST FORK WSC	73,000	78,000	99,000	121,000	147,000
FROGNOT WSC	53,000	55,000	65,000	75,000	86,000
GUNTER RURAL WSC	94,000	97,000	105,000	110,000	116,000
LEBANON WSC	52,000	51,000	49,000	46,000	44,000
NORTH FARMERSVILLE WSC	21,000	22,000	24,000	28,000	33,000
SEIS LAGOS M.U.D.	58,000	61,000	77,000	77,000	77,000
SOUTH GRAYSON WSC	76,000	78,000	90,000	103,000	118,000
VERONA WSC	94,000	99,000	123,000	141,000	162,000
WEST LEONARD WSC	16,000	18,000	22,000	24,000	28,000
TOTAL	23,133,000	25,552,000	37,448,000	49,319,000	62,645,000

TABLE VIII-13
PROJECTED ELEVATED STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

ENTITY	YEAR 1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	1,632,000	1,858,000	2,799,000	3,737,000	4,789,000
ANNA, CITY OF	109,000	123,000	191,000	255,000	326,000
BLUE RIDGE, CITY OF	49,000	56,000	87,000	116,000	148,000
CELINA, CITY OF	153,000	172,000	267,000	356,000	457,000
COUNTRY RIDGE DEV. (MELISSA)	15,000	21,000	30,000	40,000	52,000
FAIRVIEW, CITY OF	145,000	161,000	242,000	323,000	414,000
FARMERSVILLE, CITY OF	269,000	298,000	431,000	575,000	737,000
FRISCO, CITY OF	611,000	660,000	956,000	1,276,000	1,635,000
JOSEPHINE, CITY OF	45,000	51,000	76,000	101,000	130,000
LUCAS, CITY OF	253,000	281,000	422,000	564,000	723,000
MCKINNEY, CITY OF	2,122,000	2,337,000	3,384,000	4,517,000	5,788,000
MELISSA, CITY OF (SERVICE AREA)	65,000	73,000	114,000	152,000	194,000
MURPHY, CITY OF	168,000	185,000	268,000	358,000	458,000
PARKER, CITY OF	136,000	152,000	227,000	303,000	389,000
PLANO, CITY OF	13,041,000	14,500,000	21,740,000	29,019,000	37,183,000
PRINCETON, CITY OF	322,000	369,000	556,000	742,000	951,000
PROSPER, CITY OF	94,000	104,000	155,000	206,000	264,000
RICHARDSON, CITY OF	7,862,000	8,670,000	10,056,000	11,341,000	12,652,000
ROYSE CITY	231,000	273,000	407,000	539,000	692,000
SACHSE, CITY OF	561,000	584,000	674,000	758,000	844,000
WYLIE, CITY OF	836,000	950,000	1,432,000	1,911,000	2,448,000

TABLE VIII-13 (CONTINUED)
PROJECTED ELEVATED STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	94,000	99,000	125,000	152,000	185,000
MILLIGAN WSC/LOWRY CROSSING	131,000	141,000	184,000	224,000	274,000
NORTH COLLIN WSC/NEW HOPE	275,000	289,000	358,000	425,000	502,000
NEVADA WSC/NEVADA	68,000	75,000	112,000	148,000	190,000
WESTMINSTER WSC/WESTMINSTER	74,000	81,000	109,000	136,000	165,000
WESTON WSC/WESTON	33,000	37,000	58,000	77,000	99,000
WYLIE NE WSC/SAINT PAUL	122,000	125,000	146,000	161,000	181,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	29,000	31,000	39,000	44,000	51,000
CADDO BASIN SUD	339,000	359,000	443,000	510,000	586,000
COPEVILLE WSC	131,000	141,000	184,000	225,000	274,000
CULLEOKA WSC	257,000	276,000	362,000	440,000	537,000
DANVILLE WSC	153,000	157,000	171,000	180,000	189,000
DESERT WSC	53,000	56,000	70,000	80,000	91,000
EAST FORK WSC	211,000	222,000	282,000	344,000	419,000
FROGNOT WSC	53,000	55,000	65,000	75,000	86,000
GUNTER RURAL WSC	158,000	162,000	174,000	184,000	193,000
LEBANON WSC	54,000	53,000	51,000	48,000	46,000
NORTH FARMERSVILLE WSC	21,000	22,000	24,000	28,000	33,000
SEIS LAGOS M.U.D.	58,000	61,000	77,000	77,000	77,000
SOUTH GRAYSON WSC	152,000	156,000	180,000	206,000	237,000
VERONA WSC	94,000	99,000	123,000	141,000	162,000
WEST LEONARD WSC	57,000	61,000	75,000	86,000	99,000
TOTAL	31,336,000	34,636,000	47,926,000	61,180,000	75,950,000

PROJECTED ELEVATED STORAGE REQUIREMENTS

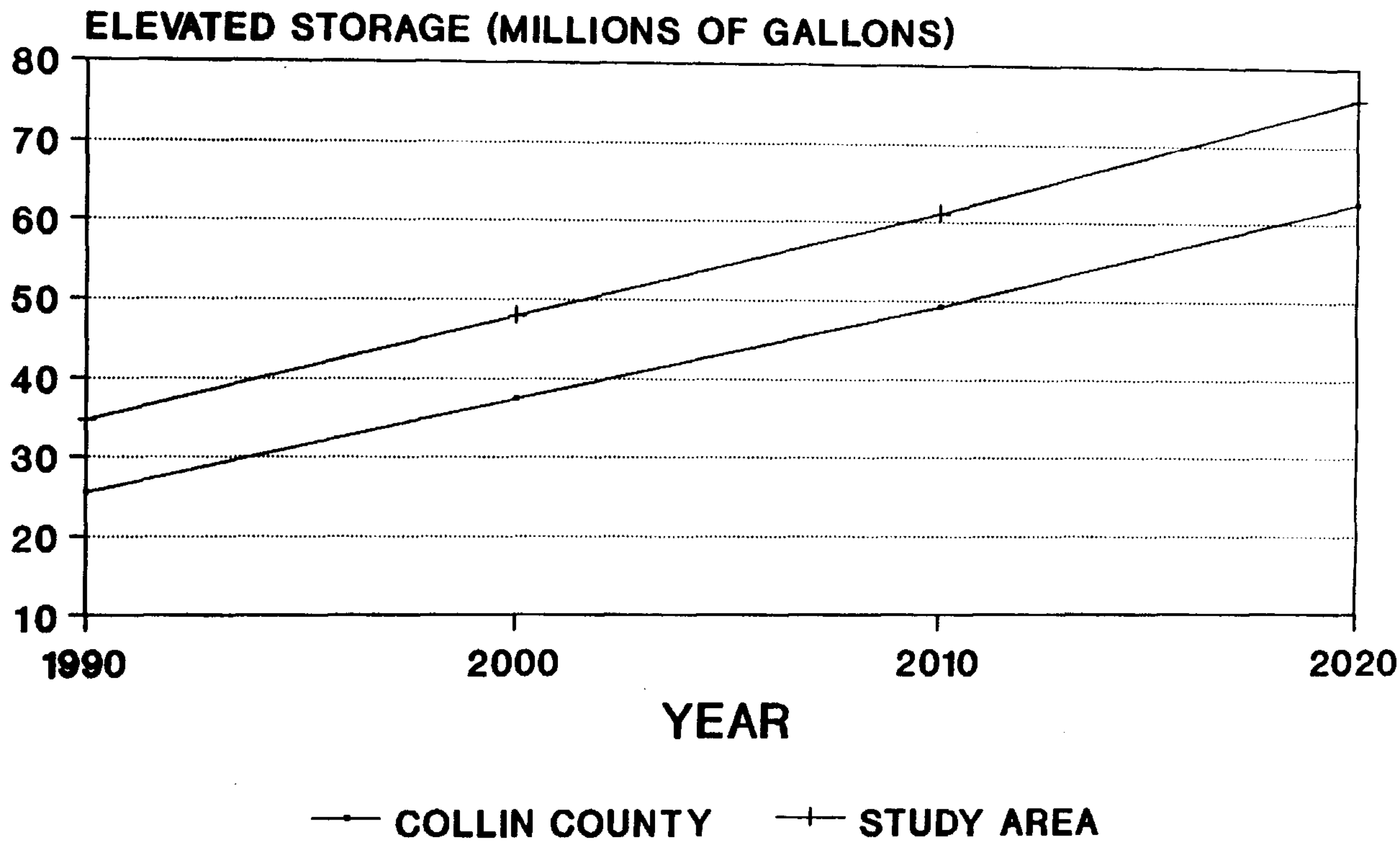


FIGURE VIII-4

TABLE VIII-14
PROJECTED MINIMUM ELEVATED STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	964,000	1,083,000	1,568,000	2,094,000	2,683,000
ANNA, CITY OF	73,000	79,000	114,000	153,000	196,000
BLUE RIDGE, CITY OF	32,000	36,000	52,000	69,000	89,000
CELINA, CITY OF	101,000	110,000	160,000	213,000	274,000
COUNTRY RIDGE DEV. (MELISSA)	6,000	9,000	12,000	17,000	22,000
FAIRVIEW, CITY OF	75,000	83,000	120,000	160,000	205,000
FARMERSVILLE, CITY OF	151,000	167,000	242,000	322,000	413,000
FRISCO, CITY OF	342,000	370,000	536,000	715,000	916,000
JOSEPHINE, CITY OF	28,000	31,000	45,000	61,000	78,000
LUCAS, CITY OF	132,000	145,000	210,000	280,000	359,000
MCKINNEY, CITY OF	1,189,000	1,310,000	1,896,000	2,531,000	3,243,000
MELISSA, CITY OF (SERVICE AREA)	43,000	47,000	68,000	91,000	116,000
MURPHY, CITY OF	94,000	103,000	150,000	200,000	257,000
PARKER, CITY OF	71,000	78,000	113,000	151,000	193,000
PLANO, CITY OF	6,781,000	7,450,000	10,787,000	14,398,000	18,449,000
PRINCETON, CITY OF	190,000	215,000	311,000	416,000	533,000
PROSPER, CITY OF	58,000	64,000	93,000	123,000	158,000
RICHARDSON, CITY OF	523,000	524,000	674,000	786,000	900,000
ROYSE CITY	10,000	11,000	16,000	21,000	27,000
SACHSE, CITY OF	11,000	11,000	12,000	14,000	16,000
WYLIE, CITY OF	494,000	554,000	802,000	1,071,000	1,372,000

TABLE VIII-14 (CONTINUED)
PROJECTED MINIMUM ELEVATED STORAGE REQUIREMENTS - COLLIN COUNTY
MUNICIPAL WATER SYSTEMS AND WSC SERVICE AREAS WITHIN COLLIN COUNTY
(GALLONS)

ENTITY	YEAR				
WATER SUPPLY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	59,000	61,000	75,000	91,000	111,000
MILLIGAN WSC/LOWRY CROSSING	87,000	90,000	110,000	134,000	164,000
NORTH COLLIN WSC/NEW HOPE	172,000	178,000	214,000	255,000	301,000
NEVADA WSC/NEVADA	45,000	48,000	67,000	89,000	114,000
WESTMINSTER WSC/WESTMINSTER	49,000	52,000	66,000	81,000	99,000
WESTON WSC/WESTON	22,000	24,000	35,000	46,000	59,000
WYLIE NE WSC/SAINT PAUL	72,000	73,000	82,000	90,000	101,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	19,000	20,000	23,000	27,000	30,000
CADDO BASIN SUD	74,000	76,000	88,000	101,000	116,000
COPEVILLE WSC	87,000	91,000	110,000	135,000	164,000
CULLEOKA WSC	171,000	178,000	217,000	264,000	322,000
DANVILLE WSC	90,000	92,000	96,000	101,000	106,000
DESERT WSC	8,000	8,000	9,000	10,000	12,000
EAST FORK WSC	43,000	45,000	55,000	68,000	82,000
FROGNOT WSC	33,000	34,000	39,000	45,000	51,000
GUNTER RURAL WSC	59,000	60,000	63,000	66,000	69,000
LEBANON WSC	29,000	29,000	28,000	26,000	25,000
NORTH FARMERSVILLE WSC	12,000	13,000	15,000	17,000	19,000
SEIS LAGOS M.U.D.	24,000	25,000	32,000	32,000	32,000
SOUTH GRAYSON WSC	45,000	47,000	54,000	62,000	71,000
VERONA WSC	62,000	64,000	74,000	84,000	97,000
WEST LEONARD WSC	11,000	11,000	13,000	15,000	17,000
TOTAL	12,641,000	13,799,000	19,546,000	25,725,000	32,661,000

TABLE VIII-15
PROJECTED MINIMUM ELEVATED STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	964,000	1,083,000	1,568,000	2,094,000	2,683,000
ANNA, CITY OF	73,000	79,000	114,000	153,000	196,000
BLUE RIDGE, CITY OF	32,000	36,000	52,000	69,000	89,000
CELINA, CITY OF	101,000	110,000	160,000	213,000	274,000
COUNTRY RIDGE DEV. (MELISSA)	6,000	9,000	12,000	17,000	22,000
FAIRVIEW, CITY OF	75,000	83,000	120,000	160,000	205,000
FARMERSVILLE, CITY OF	151,000	167,000	242,000	322,000	413,000
FRISCO, CITY OF	342,000	370,000	536,000	715,000	916,000
JOSEPHINE, CITY OF	28,000	31,000	45,000	61,000	78,000
LUCAS, CITY OF	132,000	145,000	210,000	280,000	359,000
MCKINNEY, CITY OF	1,189,000	1,310,000	1,896,000	2,531,000	3,243,000
MELISSA, CITY OF (SERVICE AREA)	43,000	47,000	68,000	91,000	116,000
MURPHY, CITY OF	94,000	103,000	150,000	200,000	257,000
PARKER, CITY OF	71,000	78,000	113,000	151,000	193,000
PLANO, CITY OF	6,781,000	7,450,000	10,787,000	14,398,000	18,449,000
PRINCETON, CITY OF	190,000	215,000	311,000	416,000	533,000
PROSPER, CITY OF	58,000	64,000	93,000	123,000	158,000
RICHARDSON, CITY OF	4,088,000	4,455,000	4,989,000	5,627,000	6,277,000
ROYSE CITY	136,000	159,000	228,000	302,000	388,000
SACHSE, CITY OF	331,000	341,000	377,000	425,000	473,000
WYLIE, CITY OF	494,000	554,000	802,000	1,071,000	1,372,000

TABLE VIII-15 (CONTINUED)
PROJECTED MINIMUM ELEVATED STORAGE REQUIREMENTS - STUDY AREA
PROJECTIONS ARE TOTAL FOR ENTITY AND INCLUDES
POPULATION OF SERVICE AREA OUTSIDE OF COLLIN COUNTY
(GALLONS)

	YEAR				
ENTITY	1988	1990	2000	2010	2020
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC/LAVON	59,000	61,000	75,000	91,000	111,000
MILLIGAN WSC/LOWRY CROSSING	87,000	90,000	110,000	134,000	164,000
NORTH COLLIN WSC/NEW HOPE	172,000	178,000	214,000	255,000	301,000
NEVADA WSC/NEVADA	45,000	48,000	67,000	89,000	114,000
WESTMINSTER WSC/WESTMINSTER	49,000	52,000	66,000	81,000	99,000
WESTON WSC/WESTON	22,000	24,000	35,000	46,000	59,000
WYLIE NE WSC/SAINT PAUL	72,000	73,000	82,000	90,000	101,000
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	19,000	20,000	23,000	27,000	30,000
CADDO BASIN SUD	225,000	231,000	265,000	305,000	351,000
COPEVILLE WSC	87,000	91,000	110,000	135,000	164,000
CULLEOKA WSC	171,000	178,000	217,000	264,000	322,000
DANVILLE WSC	90,000	92,000	96,000	101,000	106,000
DESERT WSC	35,000	36,000	42,000	48,000	55,000
EAST FORK WSC	125,000	129,000	158,000	193,000	235,000
FROGNOT WSC	33,000	34,000	39,000	45,000	51,000
GUNTER RURAL WSC	99,000	100,000	105,000	110,000	115,000
LEBANON WSC	30,000	30,000	29,000	27,000	26,000
NORTH FARMERSVILLE WSC	12,000	13,000	15,000	17,000	19,000
SEIS LAGOS M.U.D.	24,000	25,000	32,000	32,000	32,000
SOUTH GRAYSON WSC	91,000	94,000	108,000	123,000	142,000
VERONA WSC	62,000	64,000	74,000	84,000	97,000
WEST LEONARD WSC	38,000	39,000	45,000	51,000	59,000
TOTAL	17,026,000	18,591,000	24,880,000	31,767,000	39,447,000

SECTION IX

WASTEWATER FLOW PROJECTIONS

A. EXISTING DATA REVIEW

Collin County currently has 45 entities providing potable retail water to the residents of the county. Of this total, 21 are municipalities and 24 are other types of water systems (WSC, MUD, districts, private). Seven of these water supply corporations are supplying water to seven incorporated cities that do not have public utilities.

Of the 20 municipalities that own and operate water systems (excluding the City of Dallas), 12 have wastewater collection systems. Of the independent water systems, only Seis Lagos MUD has a wastewater collection system. NTMWD operates ten of the wastewater treatment plants throughout the study area including plants at McKinney, Seis Lagos, Murphy, Princeton, Royse City, Wylie, Rowlett Creek, Wilson Creek and two plants at Frisco.

During the initial phase of this study, the wastewater data section of the questionnaire and all submitted wastewater planning studies were reviewed for compilation of wastewater flow data on a county-wide basis. This existing data was analyzed and evaluated to make wastewater flow projections through the year 2020.

Table IX-1 provides composite wastewater flow information for wastewater treatment facilities serving Collin County residents. The information shown in this table is generally based on data from August 1987 through July 1988. Wastewater flows ranged from 54 gpcd to a high of 169 gpcd, with 117 gpcd being the average. With a sewered population of 209,425, the county-wide average sewer flow was 24.5 mgd. Another wastewater flow parameter shown in this table is the dry sewer flow (no reaction to rainfall). These values represent the three month low flow averages. The dry sewer flow ranged from a low of 38 gpcd to a high of 137 gpcd, with the county-wide average being 98 gpcd. The average daily dry sewer flow for the county was 20.5 mgd. The difference between the average daily sewer flow (24.5 mgd) and the dry sewer flow (20.5 mgd) was 4.0 mgd and is estimated to result from infiltration/inflow entering the wastewater collection systems due to leaking pipes, defective manholes, and/or defective house service lines.

B. METHODOLOGY

In Section VIII of this report, four levels of daily water use were developed:

Low - 145 gpcd

Medium - 170 gpcd

High - 220 gpcd

Estate - 300 gpcd

TABLE IX-1

WASTEWATER RETURN RATES

1	2	3	4	5	6	7	8	9	10	11	12	13
TREATMENT PLANT	CITY	TOTAL POP.	WATER CONSUMPTION MGD	WATER CONSUMPTION GPCD	BASE WATER USAGE (GPCD)	SEWERED POP.	AVERAGE SEWER FLOW MGD	AVERAGE SEWER FLOW GPCD	DRY SEWER FLOW MGD	DRY SEWER FLOW GPCD	ACTUAL RETURN RATE (%)	BASE RETURN RATE (%)
SLAYTER CREEK WWTP	ANNA	1,340	0.078	58	43	1,115	0.093	83	0.052	47	143%	108%
BLUE RIDGE WWTP	BLUE RIDGE	600	0.050	83	72	520	0.028	54	0.020	38	65%	53%
CELINA WWTP	CELINA	1,870	0.157	84	66	1,700	0.174	102	0.129	76	122%	115%
FARMERSVILLE WWTP (2)	FARMERSVILLE	2,780	0.332	119	93	2,480	0.370	149	0.275	111	125%	119%
STEWART/COTTONWOOD (2)	FRISCO	6,330	0.765	121	73	6,080	0.622	102	0.444	73	85%	100%
JOSEPHINE WWTP	JOSEPHINE	520	0.053	102	78	300	0.020	67	0.020	67	65%	85%
NORTH PLANT	MCKINNEY	1,000	0.141	141	97	1,000	0.169	169	0.137	137	120%	141%
MURPHY WWTP	MURPHY	1,740	0.242	139	84	1,620	0.191	118	0.139	86	85%	102%
PRINCETON WWTP	PRINCETON	3,510	0.291	83	64	2,870	0.178	62	0.161	56	75%	88%
PROSPER WWTP	PROSPER	1,120	0.097	87	70	1,120	0.081	72	0.060	54	84%	77%
ROYSE CITY WWTP	ROYSE CITY	2,520	0.322	128	85	2,520	0.199	79	0.157	62	62%	73%
GARLAND-ROWLETT CREEK	SACHSE	6,120	0.558	91	60	5,430	0.470	87	0.374	69	95%	115%
SEIS LAGOS WWTP	SEIS LAGOS	450	0.133	296	123	450	0.044	98	0.039	87	33%	70%
WYLIE WWTP	WYLIE	9,140	0.980	107	69	9,140	0.650	71	0.475	52	66%	75%
ROWLETT CREEK AND WILSON CREEK	ALLEN	17,820	2.251	126	126	17,820	2.226	125	18.000	104	99%	83%
	MCKINNEY	20,350	2.870	141		20,350	2.519	124			88%	
	PLANO	125,270	28.154	225		125,270	15.108	121			54%	
	RICHARDSON	9,640	2.500	259		9,640	1.386	144			55%	
COUNTY-WIDE TOTAL OR AVERAGE		212,120	39.974	188	119	209,425	24.528	117	20.482	98	62%	82%

NOTES FOR DETERMINING COLUMN VALUES

COLUMN 1 = TREATMENT PLANT NAME
COLUMN 2 = CITY RECEIVING TREATMENT
COLUMN 3 = POP. SERVED BY WATER SYSTEM
COLUMN 4 = AVG. DAILY WATER SOLD TO CUSTOMERS
COLUMN 5 = COL. 4 / COL. 3
COLUMN 6 = LOW 3 MONTH AVG. WATER USAGE/PERSON
COLUMN 7 = POPULATION SERVED BY SEWER SYSTEM
COLUMN 8 = AVERAGE DAILY WASTEWATER FLOW
COLUMN 9 = COL. 8 / COL. 7
COLUMN 10 = LOW 3 MONTH AVG. WASTEWATER FLOW
COLUMN 11 = COL. 10 / COL. 7
COLUMN 12 = COL. 9 / COL. 5
COLUMN 13 = COL. 11 / COL. 6
(2) - TWO SEPARATE TRMT. PLANTS

These levels were based on actual usage rates, historical values, and anticipated future uses. The need for four levels indicates different perspectives for water use from the southern to the northern part of the county. The primary needs for four levels are property values and automatic outside irrigation systems. The outside irrigation systems include residential lawn sprinkler systems and commercial landscaping requirements which are governed by city ordinances. Wastewater flows will not generally increase due to outside irrigation systems since this water does not return to the sewer system.

Wastewater flows are generated from domestic water uses, commercial/industrial uses, and infiltration/inflow. Infiltration/inflow is water that enters a defective sewer system as rainfall runoff or as groundwater seepage. In an average system, between 60 and 90 percent of all potable water is returned to the sewer system for wastewater treatment. A representative return rate must be selected to project wastewater flows through the year 2020. Existing return rates for the wastewater treatment plants in Collin County were derived by comparing the water consumption data with measured wastewater flows from August of 1987 through July of 1988 as shown on Table IX-1. Water consumption and wastewater flow gpcd values were determined by dividing the total amounts of water sold (Column 4) and wastewater flows (Column 8) returned to the plants by respective populations. By dividing the average sewer gpcd value (Column 9) by the water consumption gpcd value (Column 5), the actual return rate (Column 12) was defined.

The county-wide actual return rates varied from 33 percent to 143 percent, with an average of 62 percent. The 33 percent value indicates excessive outdoor uses, while the 143 percent value indicates excessive amounts of infiltration/inflow entering a sewer system.

The actual return rates shown in Table IX-1 were affected by the actual conditions (high water usage, low rainfall, etc.) of the 12-month analysis period. The selected return rate for use in this study must attempt to reflect normal water usage and normal rainfall conditions.

A base return rate was also derived. The base return rate (Column 13), also shown in Table IX-1, reflects a value that minimizes the effects of a lack or excess of rainfall. The base return rate was computed by dividing the dry sewer flow gpcd value (Column 11) by the base water usage gpcd value (Column 6). The average base return rate for the county was 82 percent.

The wastewater return rates that occurred in Collin County during the analysis period and the selected return rate adopted for use in this study to project future wastewater flow contributions are shown below.

<u>RETURN RATE SUMMARY</u>

ACTUAL RETURN RATE	62%
BASE RETURN RATE	82%
SELECTED RETURN RATE	75%

The actual return rate during an abnormally dry year was only 62 percent. Independent of rainfall conditions, the base return rate was 82 percent. For the purpose of projecting wastewater flows through the year 2020, a selected value of 75 percent was chosen as a wastewater flow return rate.

C. PROJECTED FLOWS

Using the selected gpcd value for water usage and the selected wastewater return rate, the gpcd values for wastewater flows were derived. Based on the projected populations and the wastewater gpcd values, the average daily flows for each entity and the county totals were computed.

1. GALLONS PER CAPITA PER DAY The following list shows the wastewater GPCD values:

WATER USAGE		RETURN RATE	WASTEWATER FLOW (GPCD)
Low Use	(145 gpcd)	75%	110
Medium Use	(170 gpcd)	75%	130
High Use	(220 gpcd)	75%	130*
Estate	(300 gpcd)	75%	130*

* This 130 wastewater gpcd value was selected for two reasons: (1) wastewater flow data from the Rowlett/Wilson Creek Plants indicates that high water users (Plano) and medium water users (McKinney and Allen) have similar wastewater flows below 130 GPCD, and (2) the difference between high or estate and medium water users is apparently outdoor use which does not return to the sewer system.

2. <u>Average Daily Flow</u> - Using the projected populations and the wastewater gpcd values, the average daily flows for each entity by year is listed in Table IX-2. The average daily wastewater flow expected in the year 2000 for the entire county is 48.2 mgd, with 63.2 mgd in the year 2010, and approximately 80.1 mgd anticipated by the year 2020. These flows are estimates and are independent of whether treatment is provided by conventional plants or by septic tanks. These values were used to determine the average capacity of wastewater plants and the sizes of individual treatment units.

3. <u>Peak Hourly Flow</u> - The peak hourly flows for each entity are also shown in Table IX-2. The peak flows were derived by selecting a peak factor of 2.5 and applying the factor to all average daily flows for each entity. Peak flows are used to size pipelines and lift stations.

4. <u>Water Conservation</u> - Table IX-2 also shows the total anticipated wastewater flows expected if water usage is reduced by ten percent through a conservation program.

TABLE IX-2

WASTEWATER FLOW PROJECTIONS

ENTITIES	PER CAPITA USAGE (GPCD)	1990 POPULATION	1990 AVERAGE FLOW (MGD)	1990 PEAK FLOW (MGD)	2000 POPULATION	2000 AVERAGE FLOW (MGD)	2000 PEAK FLOW (MGD)	2010 POPULATION	2010 AVERAGE FLOW (MGD)	2010 PEAK FLOW (MGD)	2020 POPULATION	2020 AVERAGE FLOW (MGD)	2020 PEAK FLOW (MGD)
MUNICIPAL SYSTEMS													
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	1,460	0.161	0.401	2,110	0.232	0.580	2,820	0.310	0.776	3,610	0.397	0.993
BLUE RIDGE, CITY OF	110	660	0.073	0.182	960	0.106	0.264	1,280	0.141	0.352	1,640	0.180	0.451
CELINA, CITY OF	110	2,040	0.224	0.561	2,950	0.325	0.811	3,940	0.433	1.084	5,050	0.556	1.389
COUNTRY RIDGE DEV. (MELISSA)	130	160	0.027	0.068	230	0.039	0.098	310	0.053	0.132	400	0.068	0.170
FAIRVIEW, CITY OF	130	1,530	0.199	0.497	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
FARMERSVILLE, CITY OF	130	3,080	0.400	1.001	4,460	0.580	1.450	5,950	0.774	1.934	7,620	0.991	2.477
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
JOSEPHINE, CITY OF	110	580	0.064	0.160	840	0.092	0.231	1,120	0.123	0.308	1,440	0.158	0.396
LUCAS, CITY OF	130	2,670	0.347	0.868	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	870	0.096	0.239	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
MURPHY, CITY OF	130	1,910	0.248	0.621	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	1,440	0.187	0.468	2,080	0.270	0.676	2,780	0.361	0.904	3,560	0.463	1.157
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
PRINCETON, CITY OF	130	3,970	0.516	1.290	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
PROSPER, CITY OF	110	1,180	0.130	0.325	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
SACHSE, CITY OF	130	6,290	0.818	2.044	6,970	0.906	2.265	7,840	1.019	2.548	8,730	1.135	2.837
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232

TABLE IX-2

WASTEWATER FLOW PROJECTIONS

ENTITIES	PER CAPITA USAGE (GPCD)	1990 POPULATION	1990 AVERAGE FLOW (MGD)	1990 PEAK FLOW (MGD)	2000 POPULATION	2000 AVERAGE FLOW (MGD)	2000 PEAK FLOW (MGD)	2010 POPULATION	2010 AVERAGE FLOW (MGD)	2010 PEAK FLOW (MGD)	2020 POPULATION	2020 AVERAGE FLOW (MGD)	2020 PEAK FLOW (MGD)
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS													
LAVON WSC/LAVON	110	1,130	0.124	0.311	1,380	0.152	0.380	1,680	0.185	0.462	2,050	0.226	0.564
MILLIGAN WSC/LOWRY CROSSING	110	1,670	0.184	0.459	2,040	0.224	0.561	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	3,290	0.362	0.905	3,960	0.436	1.089	4,700	0.517	1.293	5,550	0.611	1.526
NEVADA WSC/NEVADA	110	890	0.098	0.245	1,240	0.136	0.341	1,640	0.180	0.451	2,100	0.231	0.578
WESTMINSTER WSC/WESTMINSTER	110	960	0.106	0.264	1,210	0.133	0.333	1,500	0.165	0.413	1,820	0.200	0.501
WESTON WSC/WESTON	110	440	0.048	0.121	640	0.070	0.176	850	0.094	0.234	1,090	0.120	0.300
WYLIE NE WSC/SAINT PAUL	130	1,350	0.176	0.439	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
WSC SERVING UNINCORPORATED AREAS ONLY													
ALTOGA WSC	110	370	0.041	0.102	430	0.047	0.118	490	0.054	0.135	560	0.062	0.154
COPEVILLE WSC	110	1,680	0.185	0.462	2,040	0.224	0.561	2,490	0.274	0.685	3,030	0.333	0.833
CULLEOKA WSC	110	3,280	0.361	0.902	4,000	0.440	1.100	4,870	0.536	1.339	5,940	0.653	1.634
DANVILLE WSC	110	1,690	0.186	0.465	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
DESERT WSC	110	670	0.074	0.184	770	0.085	0.212	880	0.097	0.242	1,010	0.111	0.278
EAST FORK WSC	130	2,390	0.311	0.777	2,920	0.380	0.949	3,560	0.463	1.157	4,330	0.563	1.407
FROGNOT WSC	110	630	0.069	0.173	720	0.079	0.198	830	0.091	0.228	950	0.105	0.261
GUNTER WSC	110	1,840	0.202	0.506	1,930	0.212	0.531	2,030	0.223	0.558	2,130	0.234	0.586
CADDO BASIN SUD (HOPEWELL)	110	1,410	0.155	0.388	1,620	0.178	0.446	1,860	0.205	0.512	2,140	0.235	0.589
LEBANON WSC	130	530	0.069	0.172	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
NORTH FARMERSVILLE WSC	110	240	0.026	0.066	270	0.030	0.074	310	0.034	0.085	360	0.040	0.099
SEIS LAGOS M.U.D.	130	470	0.061	0.153	600	0.078	0.195	600	0.078	0.195	600	0.078	0.195
SOUTH GRAYSON WSC	110	1,730	0.190	0.476	1,990	0.219	0.547	2,280	0.251	0.627	2,620	0.288	0.721
VERONA WSC	110	1,180	0.130	0.325	1,360	0.150	0.374	1,560	0.172	0.429	1,790	0.197	0.492
WEST LEONARD WSC	110	720	0.079	0.198	830	0.091	0.228	950	0.105	0.261	1,090	0.120	0.300
TOTALS		267,820	34.211	85.527	376,410	48.182	120.455	493,370	63.223	158.057	624,650	80.200	200.500
TOTALS WITH CONSERVATION			30.790	76.974		43.364	108.409		56.901	142.251		72.180	180.450

SECTION X

FUTURE WATER RESOURCES

A. GROUNDWATER

Groundwater is the primary and sometimes only source of water supply for many communities in the northern part of Collin County. Well logs and water depth records for this area indicate a gradual decrease in groundwater levels and a reduction in available pumping capacity. Groundwater quality is also of concern in many parts of the county. With the uncertainty of groundwater quantity and quality, groundwater as a future resource is not considered a viable alternative for long term supply.

Groundwater as a supply source should continue as appropriate until treated surface water is available. This report assumes that surface water will be made available to all entities in the study area by the year 2020.

B. RIVER BASIN RESOURCES

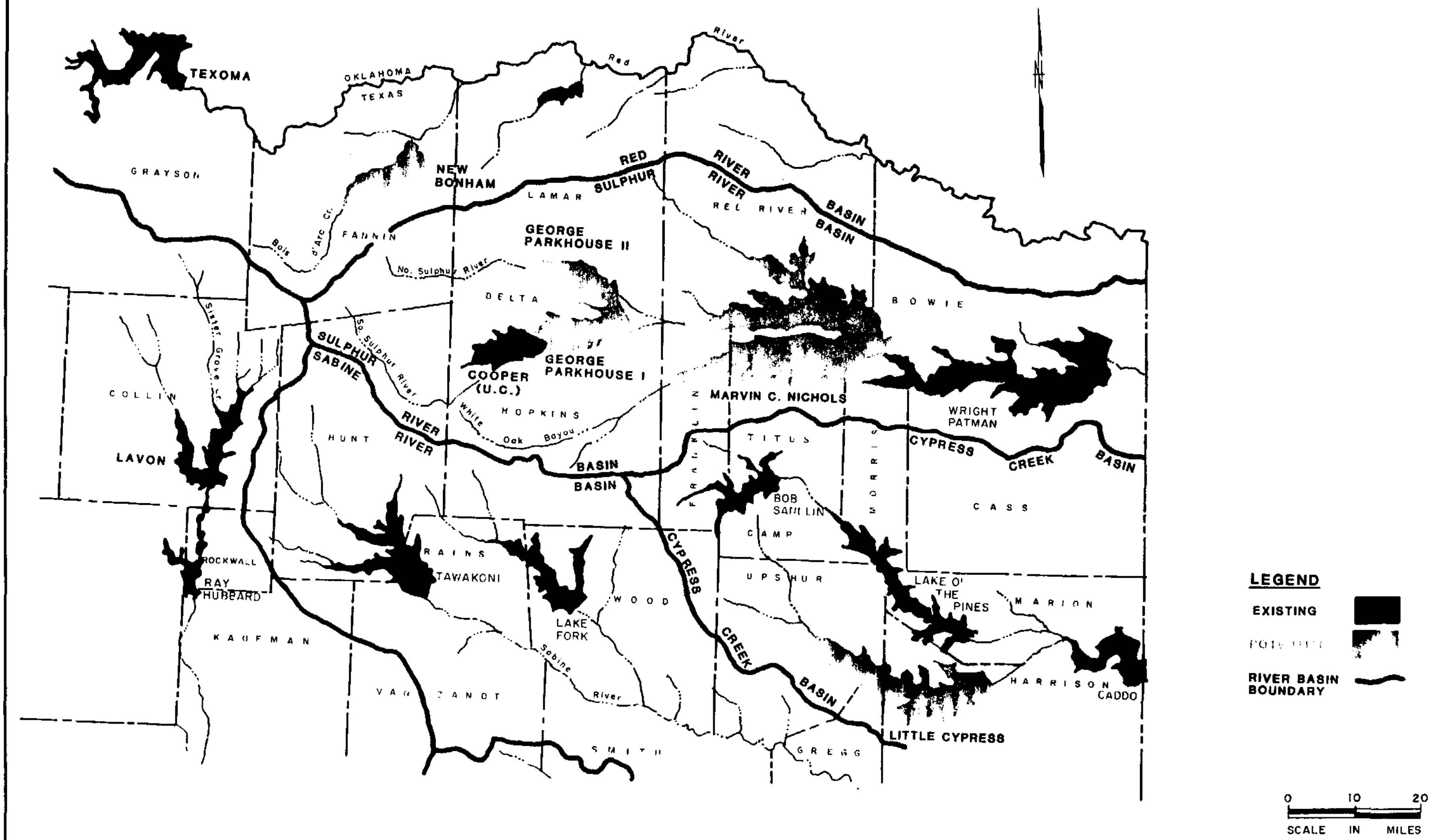
River basins which appear to provide the best opportunity for developing future sources of water are the Red River Basin downstream of Lake Texoma, the Sulphur River Basin below Lake Cooper and the Little Cypress Creek in the Cypress Creek Basin. These basins and potential reservoir sites are shown on Figure X-1. Availability of water for exportation to the study area is discussed in the following paragraphs.

1. Red River Basin

Because of high salinity, releases from Denison Dam on the Red River are not considered for municipal use without dilution with low salinity water from other sources. For this reason, the only sources considered at this time would be from reservoirs constructed in the basin on streams tributary to the Red River. Availability of water will be influenced by the Red River Compact which governs use of waters of the Red River Basin by the States of Texas, Oklahoma, Arkansas, and Louisiana. The Compact allows and provides for the construction of reservoirs on tributary streams in Texas. The New Bonham Reservoir site on Bois d'Arc Creek is one such source.

2. Sulphur River Basin

The Sulphur River Basin has significant quantities of developable water resources in addition to the Cooper Lake Project that could be made available for export to the study area. The George Parkhouse Reservoir and Marvin C. Nichols Reservoir sites, if fully developed, have the potential to meet not only water shortages in the study area, but to also supply shortages of others in the upper Trinity Basin.



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER PLANNING STUDY

EXISTING AND PROPOSED WATER SUPPLY RESERVOIRS

FIGURE X-1

3. Cypress Creek Basin

The Cypress Creek Basin has sufficient surface water resources developable from existing projects and potential reservoir sites to meet in-basin demands and export surplus water to the study area. Development of the Little Cypress Reservoir site could provide this surplus.

C. POTENTIAL RESERVOIR SITES

1. General

Information on potential sites is provided in the following paragraphs. General locations are shown on Figure X-1.

2. New Bonham Reservoir

This site was investigated by NTMWD as an alternative to the Texoma-Lavon Diversion. The dam site is located on Bois d'Arc Creek in Fannin County, approximately 15 miles northeast of the City of Bonham. If constructed to provide a conservation storage capacity of 353,000 acre-feet, this reservoir would have a firm yield of about 125,000 acre-feet/year (112 mgd). This 112 mgd is approximately the maximum yield that can be developed at this site. No water quality problems are anticipated at this site.

3. George Parkhouse Reservoir

This potential site, located downstream of the Cooper Lake project, would include impoundment of the waters of both the North and South Sulphur Rivers. This project as proposed by the TWDB could be implemented in two stages, with Stage I constructed initially on the South Sulphur River or the ultimate project could be completed with simultaneous construction of dams on both tributaries. The ultimate project would have a conservation storage capacity of 750,000 acre-feet and a firm yield of about 263,900 acre-feet/year (236 mgd). This supply would potentially be available for export to the study area and other areas of the upper Trinity River Basin. It is expected that most of the Sulphur River Basin surface water needs can be met from existing sources through year 2030. Based on the report entitled, WATER FOR TEXAS, published by the Texas Department of Water Resources, dated November 1984, the cost of Stage I was $120 million. The cost of Stage II was $36 million.

4. Marvin C. Nichols Reservoir

This potential reservoir project would consist of a dam downstream of the Parkhouse Reservoir site on the Sulphur River and a dam across White Oak Bayou.

This project would be constructed in two stages with the first stage being the dam across Sulphur River. This project as proposed by the TWDB would provide an additional reallocation of flood control storage from Lake Wright Patman to increase its firm yield. The ultimate conservation storage capacity would be 2,220,000 acre-feet. With Cooper Lake and George Parkhouse Reservoir fully operational, the Marvin Nichols Reservoir would have a firm yield of approximately 829,100 acre-feet per year (740 mgd). The cost of Stage I as listed in WATER FOR TEXAS, November 1984, was $29 Million. No cost of Stage II was available.

5. Cypress Creek Reservoir

This potential reservoir project is located on Little Cypress Creek near the City of Marshall. With a conservation storage capacity of 782,300 acre-feet this project would yield 284,100 acre-feet of water per year (254 mgd). Some of this yield may be needed to meet in basin demands but as much as 100,000 acre-feet per year (89 mgd) could potentially be available for export to the study area. The cost of this reservoir was $329 million as shown in the November 1984, WATER FOR TEXAS report.

D. PROPOSED WATER RESOURCE DEVELOPMENT

Each of these reservoir sites could potentially be developed to provide the new water supply source needed for the study area and for other customers of the NTMWD. Because of its proximity to the study area, the New Bonham site becomes a prime candidate for development. Its size, in terms of cost and supply, is such that its development could probably be by a single entity such as the NTMWD. The Little Cypress Creek site is more distant from the study area resulting in higher conveyance system costs. Although the yield of the site is almost twice that of the New Bonham site, the amount of firm supply that would be available for export from the basin is probably less. Only the George Parkhouse and Marvin C. Nichols sites in the Sulphur River Basin offer the potential for a region-wide program to meet the future water supply needs of the greater Dallas - Fort Worth region. If fully developed, the Sulphur River Basin could potentially provide approximately 1,000 mgd in excess of in-basin demands for export to the Dallas-Fort Worth region. This Sulphur River Basin import along with existing supplies and other proposed imports from sources in the Sabine, Neches, and middle Trinity Basins could supply municipal requirements of the greater Dallas/Fort Worth region including the Collin County study area beyond the year 2030.

Advantages to the Collin County study area and NTMWD of participating in a region-wide program as opposed to participating in a smaller single-entity development project are:

1. Spreading of up-front financing, permitting efforts and risks.

2. Greater flexibility in financing.

3. Opportunities for inter-agency exchange of water to optimize conveyance distribution costs.

4. Longer term (beyond year 2030) development of supply sources.

5. Ability to pursue multiple sites for development to prevent loss of momentum if any one site is found to be undevelopable.

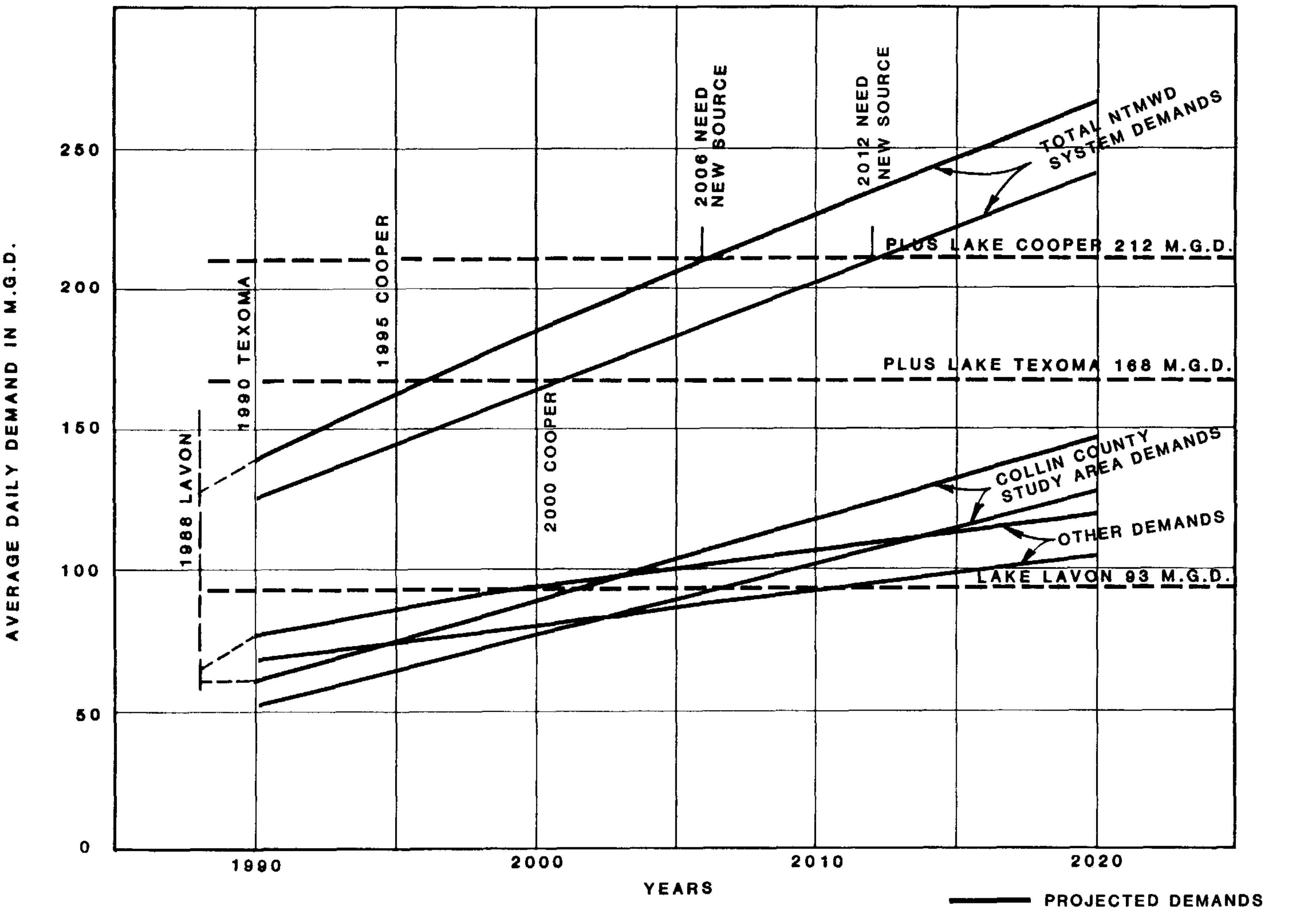
Disadvantages of the region-wide concept are the timing of initial development and the reality of creating a region-wide agency to coordinate the program.

Study area projections indicate that an additional source of water will be needed by 2006 (Figure X-2). This figure shows that if water conservation reduces consumption by 10 percent, then a new source will not be required until the year 2012. The development time allowed for a project from site selection to first water delivery should be no less than 15 years for a reservoir such as the New Bonham site. The time allowance includes preliminary design, cooperative agreements with local entities, project authorizations and permits, financial arrangements, land acquisition and relocations, reservoir and conveyance system construction and initial filling of the reservoir.

A great deal of interest has been expressed at area wide water study coordination meetings in participating in a region-wide program for development of the Sulphur River Basin as a primary new source of water for the north central Texas area. It is recommended that Collin County encourage and participate in the development of a region-wide program because of the benefits accruing from such a program. However, if by the end of year 1991 the program has not developed to the extent of assurance of a new water source, the New Bonham site should be adopted for development. The Cypress Creek Site should remain as a fall back source in the event of irreconcilable problems with development of the New Bonham site.

E. COST OF WATER

The cost of water from the New Bonham site in 1989 dollars will be on the order of $126 million or $0.60/1,000 gallons of average water usage during the project pay-out period. For the purpose of this estimate, the average use is defined



AVERAGE DAILY WATER DEMANDS VERSUS AVAILABLE SUPPLIES

FIGURE X-2

as sixty percent of the firm yield of the reservoir. This unitized average cost includes capital costs and operation, maintenance and energy costs for both the reservoir and the conveyance system to Lake Lavon. This cost does not include treatment costs or the cost of transmission facilities needed to deliver treated water to individual take points. This source of raw water is less than one-third of the total supply. The effect of the New Bonham project on the total average cost of water for the entire NTMWD service area is dependent on the combined cost from all sources.

SECTION XI

WATER SERVICE PLANS

A. CONCEPTUAL APPROACH

1. Water Demand Projections

The average daily and maximum daily demands tabulated in Section VIII of this report provided the basis for planning the expansion of existing water supply and delivery system facilities. The average daily demands were used to estimate the average annual water supply requirements in future years and the expected flow of revenues to finance the system. Raw water diversion facilities, treatment plant capacities, and treated water delivery systems were sized on the basis of maximum daily demands. Peak hour demands were used to formulate distribution facility requirements.

2. Water Supply Sources

Existing, under construction, and future water supply projects are discussed in Section V and Section X of this report. All water will continue to be supplied through Lake Lavon. The yield of the reservoir is approximately 93 mgd, which is less than the present demand of the

NTMWD service area. The Texoma-Lavon diversion, which is expected to be in service in year 1990, will increase the total supply from Lake Lavon to 168 mgd. This supply will meet projected demands until Cooper Lake with the Cooper-Lavon diversion system are completed. The first delivery of water to Lake Lavon is expected by the year 1995. The Cooper project will increase the total supply to approximately 212 mgd. According to demand projections, (Figure X-2) a new source of water will be needed by the year 2006. This supply, required to meet expected demands to the year 2020, could be met from the construction of a reservoir at the New Bonham site in the Red River Basin or from reservoir sites in the Sulphur River Basin. For purposes of developing a conceptual plan and for projecting future water costs, the New Bonham site, and a conveyance pipeline to Lake Lavon were assumed to provide the new water supply source. Projected in-service dates are shown on Table XI-1.

3. Water Treatment

The existing water treatment facilities located at Wylie have a total capacity of 350 mgd. According to water demand projections, new plant capacity will be needed in the year 1993. At that time, maximum daily demands of

TABLE XI-1

WATER TREATMENT AND DELIVERY

SYSTEM EXPANSIONS

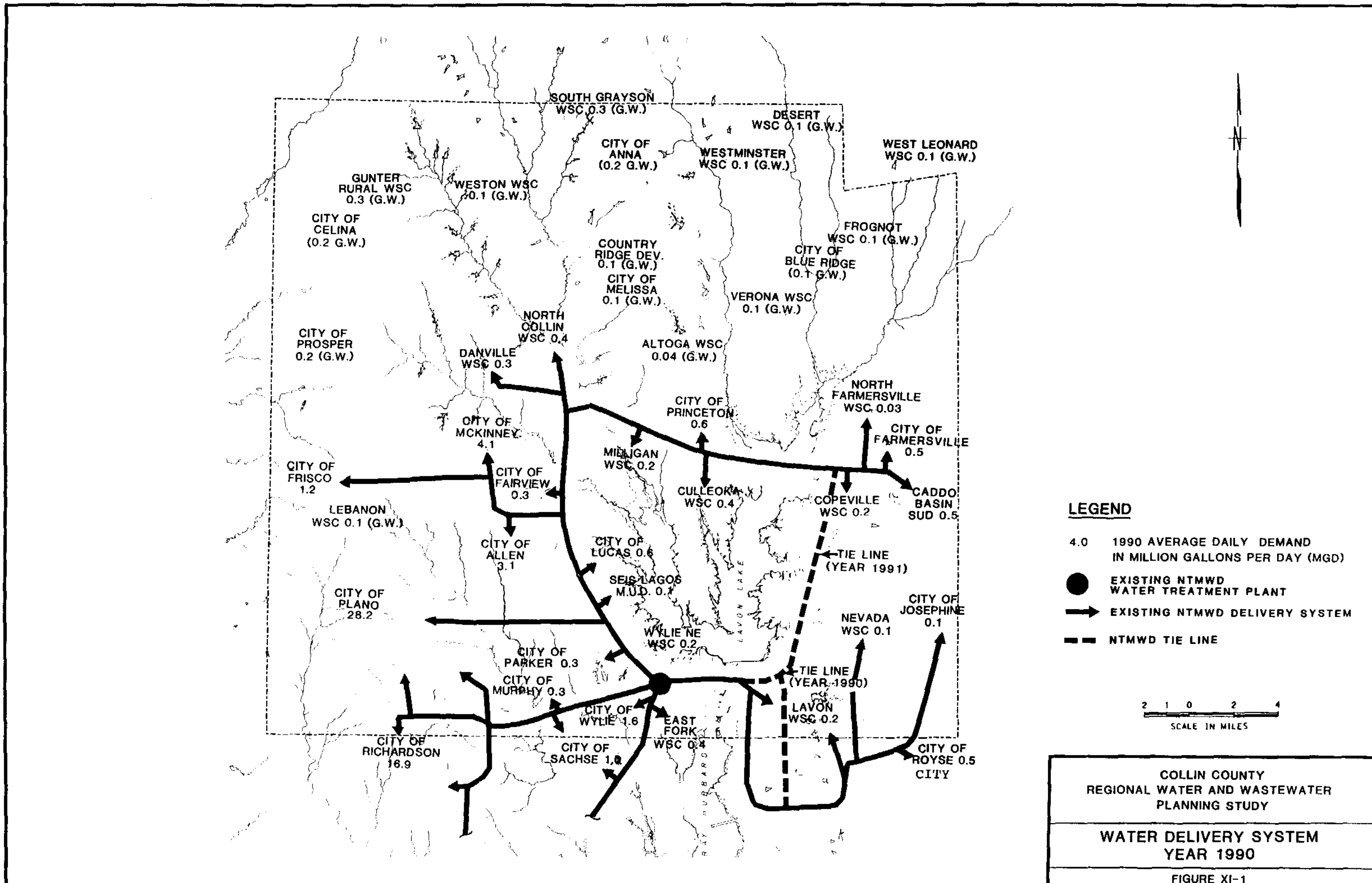
DESCRIPTION	CAPACITY MGD	PROJECTED IN-SERVICE DATE
Water Supply		
Texoma-Lavon Diversion	75	1990
Cooper Reservoir and Pipeline to Lake Lavon	44	1995
New Bonham Reservoir and Pipeline to Lake Lavon	112	2006
New Treatment Plant and	1) 100	1993
Diversion from Lake Lavon	1) 100	2002
	1) 60	2013
Segment A	80	1993
Segment B	70	1995
	70	2005
Segment C	50	1995
	50	2005
Segment D	30	2005
Segment E	14	1990
Segment F	14	1990
Segment G	6	1995
Segment H	4	1995
Segment I	2	2005
Segment J	12	1995
Segment K	3	2005
East Side Tie-Line	10	1991

1) Sized for the entire NTMWD service area.

the study area are expected to be 167 mgd. This 167 mgd is estimated to be 46 percent of total 350 mgd capacity. Study area maximum daily demands are projected to increase to 337 mgd by year 2020. This 337 mgd is estimated to represent up to 55 percent of the total requirements of the NTMWD service area. The increased ratio is a result of projected higher growth rates in the study area. Selection of a new plant site, whether it be adjacent to the existing plant or at a new location, has not been made by NTMWD. The addition of water treatment plant capacity was planned in three increments with 100 mgd in 1993, 100 mgd in 2002 and 60 mgd in 2013. The capacity expansions are based on total needs of the NTMWD service area. The study area would require about 170 mgd of the 260 mgd additional capacity. The addition of plant capacity is shown in Table XI-1.

4. Lake Lavon Raw Water Diversion

These new treatment facilities will require an intake structure, a pumping station, and a pipeline to the new treatment plant. The intake structure may or may not be at the existing in-take location, but, because of the lake configuration and minimum pool level, it will most likely be located near the lower end of the lake.



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PLANNING STUDY

WATER DELIVERY SYSTEM
YEAR 1990

FIGURE XI-1

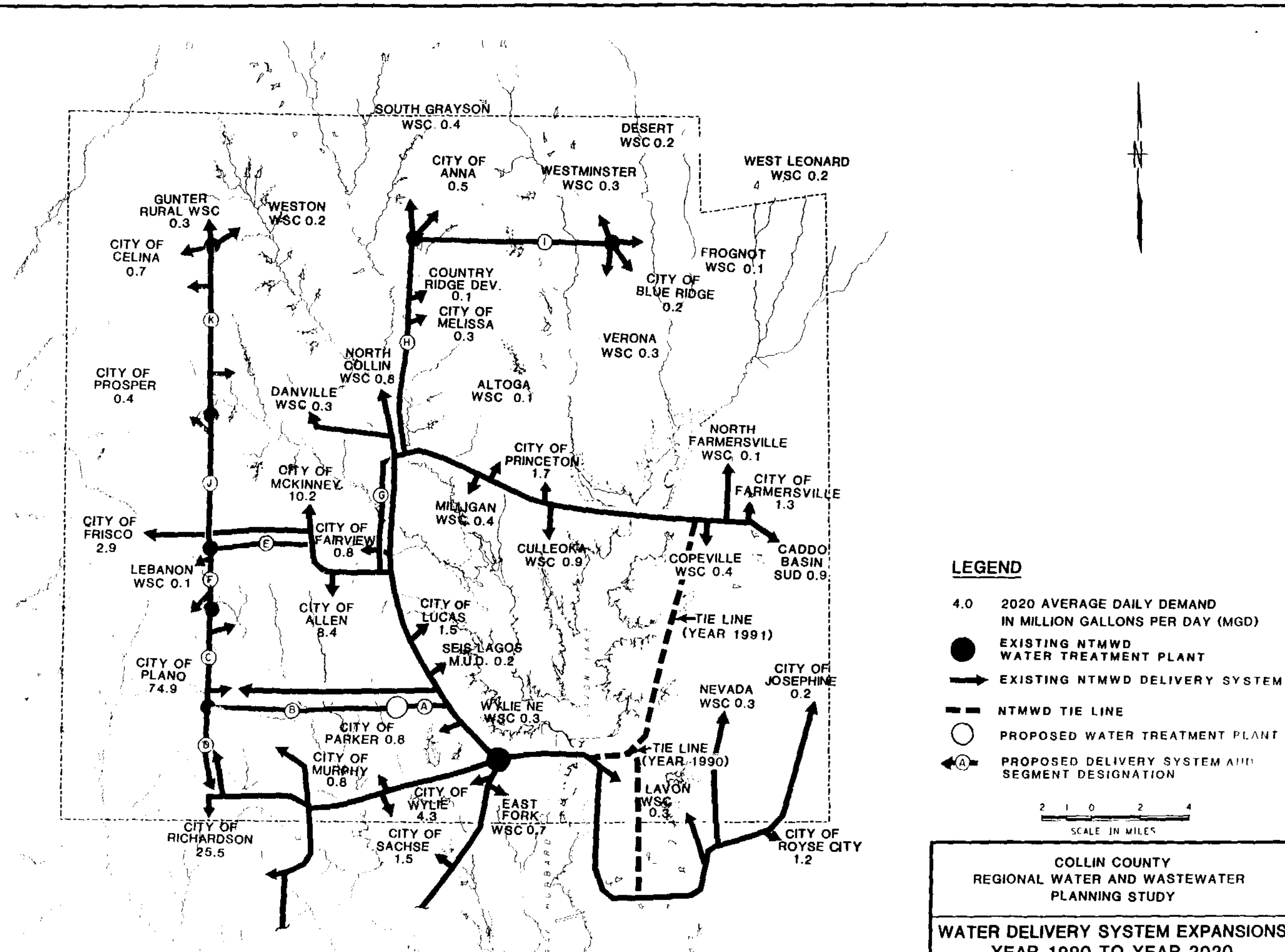
Initial and incremental expansion capacities will be sized to accommodate total treatment plant requirements. Capacities and projected in-service dates to meet study area demands are shown in Table XI-1 with the new treatment plant expansion.

5. Treated Water Delivery System

A conceptual layout of the existing system (also, year 1990 system) is shown on Figure XI-1. A plan for expanding the system to meet the demands of the study area to the year 2020 is shown on Figure XI-2. Indicated expansions are proposed to provide for demands of present users of surface water and to provide, when appropriate, the opportunity for groundwater users to convert to surface water. Segments of delivery system expansions are indicated by letters A through K.

Projected in-service dates and delivery system capacities are provide in Table XI-1. Service to be provided by the expansions are as follows:

Segment A connects the new treatment plant to the existing system. Segment B will deliver a large part of the new treatment plant output to areas along the western side of the county. Segments C and D provide service from Segment B to delivery points in Plano and



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER PLANNING STUDY

WATER DELIVERY SYSTEM EXPANSIONS YEAR 1990 TO YEAR 2020

FIGURE XI-2

Richardson. Segments E and F are installed initially to provide service from the existing system to the west side of Plano prior to completion of the new treatment plant and Segment B. Segment F and later Segments J and K provide service northward along the western side of the county. The timing of this northerly expansion will depend on growth in the area and on desire of entities to convert from groundwater. Segment G is an expansion of the existing system. Segment H will provide additional service to North Collin WSC and provide the opportunity for Melissa, Country Ridge, Anna and South Grayson WSC to convert from groundwater to surface water. Segment I is a later extension to the northeast corner of the county to afford the opportunity for conversion from groundwater. Altoga WSC could at some future date obtain service from the existing delivery system.

It is the intent of this plan to provide treated surface water to all water supply entities where there is need, desire, and financial ability to do so. In most cases the conversion to surface water will require a joint effort from several entities sharing common pipelines, take points, and storage facilities.

The tie-line (see Figure XI-2) indicated for completion in 1991 is under consideration by NTMWD.

This line would increase delivery capacity to the Farmersville area. The tie-line southward, proposed by NTMWD to be completed in 1990, would provide increased capacity to the Rockwall area.

6. <u>Storage Requirements</u>

a. Ground Storage

Ground storage requirements were satisfied by assuming construction of nominal tank sizes such as 100,000, 500,000, 1.0 million, or 5.0 million gallons. The units selected were based on a 20-year life of facilities. This approach coupled with a 30-year planning period ending in the year 2020 would project a reduced need for storage near the year 2020. However, additional ground storage facilities would need to be constructed just prior to the year 2020 to serve population growth beyond the limits of the original planning period.

The total ground storage capacity for each entity in the study area at the end of each decade is shown in Table VIII-10. Projected ground storage capacities needed to meet study area demands are provided on Table XI-2.

TABLE XI-2

STORAGE TANK CAPACITY REQUIREMENTS
(MILLIONS OF GALLONS)

GROUND STORAGE

DECADE	CAPACITY
1990-2000	17.0
2000-2010	16.6
2010-2020	0.2

ELEVATED STORAGE

DECADE	CAPACITY
1990-2000	27.8
2000-2010	5.7
2010-2020	9.9

NOTE: This table shows estimated storage tank capacities needed to be constructed by decades to meet water demands of the study area.

b. Elevated Storage

The criteria for elevated storage capacity through the end of the planning period is identical to ground storage in that a reduced need appears near the year 2020. As with ground storage, additional elevated storage capacity will be required prior to the year 2020 to serve the population beyond the year 2020.

The total elevated storage capacity for each entity in the study area at the end of each decade is shown in Table VIII-11. Projected elevated storage capacities needed to meet study area demands are provided in Table XI-2.

B. COST ESTIMATES

1. Water Supply, Treatment And Delivery System Costs

a. General

Table XI-3 shows the capital costs of the water service plan. The capital costs include construction items, a 10 percent contingency amount, 15 percent for engineering and administrative fees, and the estimated price of land. The capital cost for each item is listed by the decade in which it should occur. All costs are in millions of 1989 dollars.

Table XI-4 shows the annual cost in millions of 1989 dollars for each item in the water service plan for the study area. An annual cost is shown for each item for the specific years of 1990, 2000, 2010, and 2020. The costs include debt service from prior commitments, operation and maintenance, administration, and the debt service for the capital costs listed on Table XI-3. The costs were derived by assuming an interest rate of eight percent and a 30-year debt service period for reservoir construction and a 20-year debt service period for treatment and transmission systems.

b. Water Cost Analyses

(1) Table XI-5 is essentially a summary of the total costs shown for the entire study area and specifically for Collin County. This table shows the average daily water demand, the total annual cost, and a cost per 1,000 gallons for treated wholesale water at the delivery points for the years 1990, 2000, 2010, and 2020

(2) The year 1990 cost per 1,000 gallons is estimated to be approximately equal to the present charges to member cities and contract customers. Charge rates based on a minimum take or pay formula are

TABLE XI-3

CAPITAL COSTS

WATER SERVICE PLAN
(MILLIONS OF 1989 DOLLARS)

ITEM	YEAR 1990	1991-2000	2001-2010	2011-2020
1. Texoma Diversion*	$33.2			
2. Segment E	3.0			
3. Segment F	1.4			
4. East Tie-Line		$ 5.8		
5. New Treatment Plant*		81.0		
6. Lavon Diversion*		22.0		
7. Segment A*		5.3		
8. Cooper to Lavon Diversion*		50.9		
9. Segment B		9.7		
10. Segment C		4.2		
11. Segment G		1.2		
12. Segment H		2.3		
13. Segment J		2.6		
14. Treatment Plant Expansion*			$ 53.0	
15. Lavon Diversion Expansion*			15.6	
16. Segment B			8.7	
17. Segment C			3.6	
18. Segment D			2.7	
19. Segment I			1.6	
20. Segment K			1.4	
21. New Bonham Reservoir*			125.7	
22. Treatment Plant Expansion*				$31.8
23. Lavon Diversion*				9.4
TOTAL	$37.6	$198.9	$212.3	$41.2

* These facilities are required to serve the entire NTMWD service area. The cost of these facilities are apportioned to the study area by a ratio of study area demand to the total NTMWD service area demand.

TABLE XI-4

DEBT SERVICE COSTS FOR FUTURE WATER PROJECTS
(ANNUAL COST IN MILLIONS OF 1989 DOLLARS)

ITEM	YEAR			
	1990	2000	2010	2020
1. Texoma Diversion*	$1.49	$ 1.66		
2. Segment E	0.31	0.31		
3. Segment F	0.14	0.14		
4. East Tie-Line		0.59	$ 0.59	
5. New Treatment Plant*		4.04	4.29	
6. Lavon Diversion*		1.10	1.17	
7. Segment A*		0.26	0.28	
8. Cooper to Lavon Diversion*		2.21	2.35	$ 2.49
9. Segment B		0.99	0.99	
10. Segment C		0.43	0.43	
11. Segment G		0.12	0.12	
12. Segment H		0.24	0.24	
13. Segment J		0.27	0.27	
14. Treatment Plant Expansion*			2.81	2.97
15. Lavon Diversion Expansion*			0.83	0.87
16. Segment B			0.89	0.89
17. Segment C			0.37	0.37
18. Segment D			0.27	0.27
19. Segment I			0.16	0.16
20. Segment K			0.14	0.14
21. New Bonham Reservoir*			5.75	6.08
22. Treatment Plant Expansion*				1.78
23. Lavon Diversion*				0.53
TOTAL FUTURE PROJECTS	$1.94	$12.36	$21.95	$16.55

* Where appropriate, costs apportioned to study area by ratio of study area demand to total NTMWD service area demand.

TABLE XI-5

WATER COST ANALYSES
(ANNUAL COST IN MILLIONS OF 1989 DOLLARS)

ITEM	1990	2000	2010	2020
STUDY AREA:				
Surface Water Demand (mgd)	61.69	90.29	117.66	146.01
Projected Annual Cost	$14.04	$25.54	$ 35.26	$ 33.60
Cost in Cents/1,000 Gallons	62.40	77.50	82.10	63.00
COLLIN COUNTY:				
Surface Water Demand (mgd)	45.34	70.01	94.39	119.94
Projected Annual Cost	$10.33	$19.80	$28.28	$ 27.58
Cost in Cents/1,000 Gallons	62.40	77.50	82.10	63.00

NOTES: Projected Annual Costs include: existing debt service; future debt service (1990-2020); and operation, maintenance and administration.

Cost per 1,000 gallons in the year 2020 is lower than expected since the cost of facilities required beyond the end of the planning period is not included.

61.9 cents per 1000 gallons for member cities and 66.9 cents per 1,000 gallons for customers. The weighted average rate is 62.4 cents per 1,000 gallons. Costs per 1,000 gallons of water use shown on Table XI-5 are average for all users.

(3) The projections shown on Table XI-5 indicate that the cost of water will increase to approximately 79 cents per 1,000 gallons by the year 2000 and to 82 cents by the year 2010 and reduce to 63 cents by the year 2020 as debt service on earlier projects are eliminated. The year 2020 costs do not include debt service costs of projects that would need to be initiated towards the end of the 2011 to 2020 decade to meet additional requirements beyond the planning period that ends in the year 2020.

3. <u>Cost of Storage Facilities</u>

The costs of storage facilities in 1989 dollars include only construction costs. Debt service, maintenance and operation, and administration costs are not considered. The cost of storage facilities are not included in water delivery system costs.

a. Ground Storage

Figure XI-3 shows the construction costs by decade to meet required ground storage facilities in the study area. The cost for the decade of years 1990 to 2000, 2000 to 2010, and 2010 to 2020 are 6.3, 5.3, and 0.2 million dollars respectively. By 1990, 16 of 42 entities, because of deficiencies, will need to begin construction of ground storage facilities to meet storage requirements of their systems.

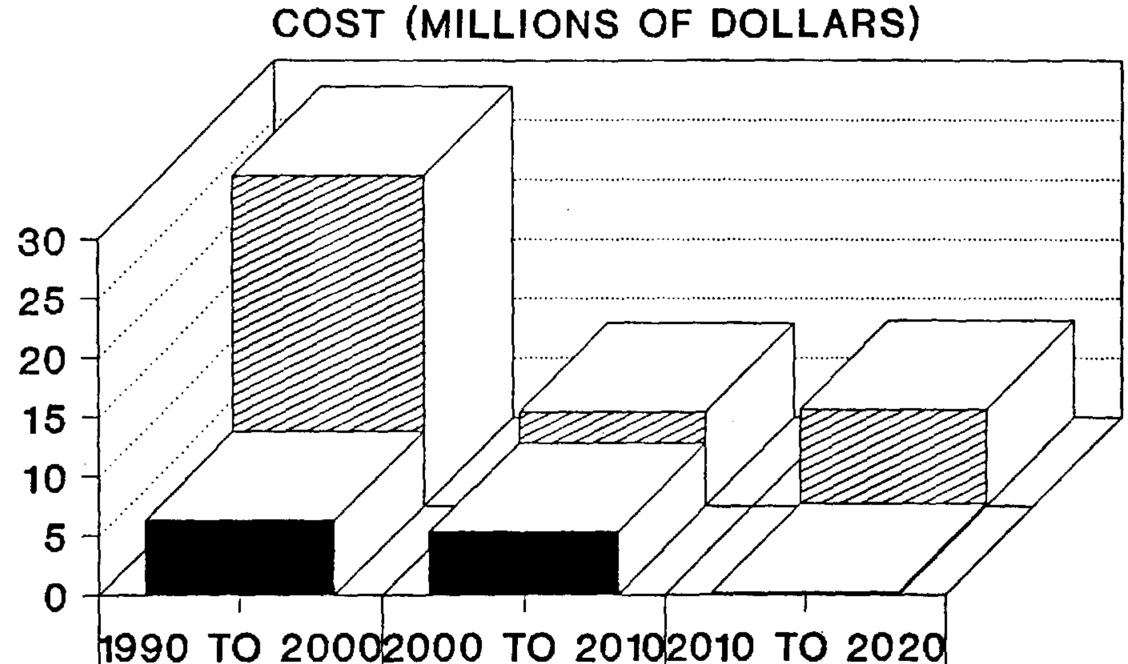
b. Elevated Storage

Figure XI-3 shows the construction costs by decade to meet required elevated storage facilities in the study area. The cost for the decade of years 1990 to 2000, 2000 to 2010, and 2010 to 2020 are 27.8, 7.9, and 8.2 million dollars respectively. Because of deficiencies by 1990, 32 of 43 entities will need to begin construction of elevated storage facilities to meet shortage requirements of their systems.

C. WATER CONSERVATION IMPACTS

The conservation of water should extend the life of water supply reservoirs and delay the need for major transmission lines and treatment facilities. With the expected growth anticipated in Collin County, conservation will only delay the schedule of facilities but should not affect the ultimate need for new water supply sources or system expansion to serve this projected population. This delay will postpone new bond indebtedness and will reduce the cost of interest during this period. As shown in Figure X-2, a 10 percent reduction in water usage will delay the need for a new water source from the year 2006 to 2012.

COST OF STORAGE FACILITIES BY DECADE



	1990 TO 2000	2000 TO 2010	2010 TO 2020
ELEVATED STORAGE	27.819	7.895	8.166
GROUND STORAGE	6.258	5.307	0.228

DECADE

GROUND STORAGE ELEVATED STORAGE

FIGURE XI-3

Water conservation will affect the annual cost of operation and maintenance (O&M). Table XI-6 shows the average annual savings in operation and maintenance costs by decade for the study area and Collin County.

TABLE XI-6

WATER CONSERVATION IMPACTS

AVERAGE ANNUAL O&M SAVINGS

DECADE	STUDY AREA	COLLIN COUNTY
1990-2000	$ 790,000	$ 600,000
2000-2010	$1,160,000	$ 920,000
2010-2020	$1,520,000	$1,280,000

As shown in the preceding table, approximately $790,000 to $1,520,000 per year can be saved in the study area if water usage is reduced by 10 percent. Likewise, approximately $600,000 to $1,280,000 per year can be saved specifically in Collin County if water usage is reduced by 10 percent. These annual savings accumulated over the entire planning period from the year 1990 through the year 2020 in the study area and Collin County are shown in the table on the following page.

TABLE XI-7

ACCUMULATED WATER CONSERVATION SAVINGS
(Millions of Dollars)

DECADE	STUDY AREA	COLLIN COUNTY
1990-2000	$ 7.90	$ 6.00
2000-2010	$11.60	$ 9.20
2010-2020	$15.20	$12.80
TOTAL	$34.70	$28.00

As shown above, approximately $34.70 million and $28.00 million could be saved in the study area and Collin County, respectively, in water transmission and treatment O&M costs over the planning period with a 10 percent reduction in water usage.

D. WATER REUSE

With the anticipated growth expected in Collin County over the next several years, the increasing demands placed on water supply dictates that every avenue of supplementing supplementing the existing sources must be explored. As the procurement and development of future water supplies become increasingly expensive and difficult, water reuse becomes a significant consideration, especially for Collin County.

Generally speaking, water reuse may be divided into two categories. The first classification is associated with reclamation which indirectly results from water pollution control measures. The second category is that of deliberate or direct reclamation of wastewater for specific uses. The direct or indirect reuse of water can be further divided as municipal, industrial, agricultural, recreational, or groundwater recharge.

The indirect reuse of municipal wastewater is currently practiced in Collin County. All wastewater treatment plants that discharge into Lake Lavon or one of the tributaries is a form of indirect reuse. The continued pollution of Lake Lavon by partially-treated septic tank effluent could have an adverse effect on the reuse of water in Lake Lavon. This practice is also referred to as return flows, which is discussed in Section XIII of the report. The other primary type of indirect reuse is that of groundwater recharge occurring through natural percolation or injection.

Many types of direct reuse of municipal wastewater are common and include: park or golf course watering, cooling tower water, boiler feed water, process water, irrigation of certain agricultural lands, and forming artificial lakes for boating and swimming. Some of these types may currently be in successful use in Collin County today. The opportunity should continuously be explored to directly or indirectly reuse water as the possibilities arise.

E. ENVIRONMENTAL CONCERNS

Water delivery system facilities generally do not result in changes in land use. Development of new reservoir projects do, however, involve inundation of large acreages of land, generally used for agriculture, ranching and forestry. The inundation results in the conversion of terrestrial and stream wildlife habitats to lake and shoreline wildlife habitats. Objections to new reservoir projects will no doubt be raised on environmental grounds as they have in the past. Therefore, lengthy and costly delays in developing reservoir projects should be anticipated. It is incumbent upon project developers to plan for such delays and to start the preliminary design and permitting effort as soon as a project site is selected.

F. LEGAL CONSIDERATIONS

The NTMWD has the authority to construct, own and operate projects for supply, treatment and delivery of water in the study area. The newly created Collin County Water Authority also has broad authority to develop, own and operate water supply projects. The legislation creating this authority is provided in Appendix E.

SECTION XII

WATER CONSERVATION PLAN

The per capita water use rate in Collin County changes significantly from the southern part of the county to the northern part. The per capita water rate has also increased over the last 10 years in many parts of the county. These changes have resulted from population growth, availability of water, and economic activity. With the adoption of landscaping ordinances in some of the southern parts of the county, outdoor water usage is increasing. With the continued growth expected in Collin County, the conservation of potable water is vital to insuring an adequate, reasonable-priced water supply in the future.

Water conservation measures in the past have usually been short-term efforts to minimize the effects of a drought or other temporary water shortages. Now, because of increasing demands on limited water resources, water conservation measures should be viewed as long-term methods of reducing municipal water use. Long-term measures require a somewhat different planning approach than do short-term efforts. Water conservation programs not only help extend supplies, but also reduce energy consumption, decrease wastewater flows, and help alleviate the demands of a rapidly growing population, especially in the southern part of the county. An effective conservation program requires a plan that sets both the policies, facts, figures, expected results, and recommendations that will lead to program implementation.

The State of Texas recognizes the need for water conservation measures. A water conservation plan and a drought contingency plan are now required as a part of an application submitted by any political subdivision to the TWDB for financial assistance. The origin of these requirements is action taken by the 69th Texas Legislature in 1985. The conservation requirements were established by House Bill (HB) 2 and House Joint Resolution (HJR) 6. On November 5, 1985, Texas voters approved an amendment to the Texas Constitution that provided for the implementation of HB 2.

The TWDB has promulgated Financial Assistance Rules which specify water conservation planning requirements. These rules provide the guidelines for developing a water conservation plan and a drought contingency plan that will meet the regulatory requirements of the TWDB. The TWDB guidelines as written are included in this report as Appendix D to encourage all water entities in the county to adopt a water conservation/drought contingency plan.

Also included in Appendix D are three tables that present examples of methods, structural techniques, and behavioral changes that can be used in designing and implementing a water conservation plan. Three additional tables list water conserving devices for retrofit and new construction and the expected energy savings associated with various water conserving devices. A sample review checklist is also provided in Appendix D. This checklist provides a convenient method of insuring that all components important in developing a water conservation plan have been considered.

At the present time, the Collin County Water Authority does not own or operate any water systems. However, the Authority can strongly encourage each entity in the County to develop a program. When the Authority does acquire any systems, loans money to make system improvements, or creates any sub-districts, then water conservation programs can be required.

Water conservation programs in Collin County would vary somewhat based on the different types of entities operating in the county. The TWDB encourages a review of nine principal methods of water conservation for consideration:

1. Education and Information,
2. Plumbing Codes,
3. Retrofit Programs,
4. Water Rate Structures,
5. Universal Metering,
6. Water Conserving Landscaping,
7. Leak Detection,
8. Recycling and Reuse, and
9. Implementation and Enforcement;

and a drought contingency plan must include the six elements shown on the following page:

1. Trigger Conditions,
2. Drought Contingency Measures,
3. Information and Education,
4. Initiation and Procedures,
5. Termination Notification, and
6. Implementation Procedures.

Due to the different types of governmental entities, one water conservation and drought contingency plan would not be appropriate or applicable to all water systems in the county. For consideration of plan development, the entities in the county could be divided into five categories for similar plans:

1. Large Cities (Home Rule),
2. Small Cities (General Law),
3. Private Water Companies (WSC, MUD, SUD)
4. NTMWD, and
5. Collin County Water Authority.

Even though the powers of home rule cities and general law cities differ greatly, a water conservation and drought contingency plan for all cities would be similar. Every city should educate and inform their customers about the methods for conserving water, water-conserving plumbing codes and landscape ordinances should be adopted, retrofit programs implemented, water rates should be set to encourage conservation, and water system personnel should be required to test and replace malfunctioning meters and be skilled to identify and repair leaks.

The private water companies including water supply corporations, municipal utility districts, and special utility districts only have limited authority. But as an owner of a water system, each governing board can continually educate and provide information on water conservation methods, adopt water rates that encourage less water use, maintain accurate meters, and develop an effective leak detection program.

At the end of this section (following page XII-11) is a table prepared by the TWDB that shows the authority of cities, water utilities, and water districts to require and enforce water conservation measures. Additional helpful information on water conservation is also available from the TWDB.

The NTMWD can also play an important role in the conservation of water. A conservation program in this case would be directed toward large users including the member cities and contract customers. Information about conservation should be provided by the NTMWD to their wholesale customers, which would probably differ somewhat from information provided to individual retail customers. The NTMWD could encourage member cities and contract customers to adopt appropriate plumbing codes, landscape ordinances, rate structures, retrofit programs, meter maintenance schedules, and leak detection programs. The NTMWD can and does practice water reuse since the Wilson Creek wastewater treatment plant discharges into Lake Lavon.

At the present time, the Collin County Water Authority can contribute toward water conservation by actively providing public information and education throughout the county. Some methods include:

1. Provide qualified speakers at periodic seminars conducted throughout Collin County,
2. Publish a monthly newsletter that emphasizes suggestions for water conservation,
3. Sponsor exhibits that demonstrate water conserving devices and other methods to achieve conservation,
4. Distribute brochures to the residents of Collin County as appropriate, and
5. Provide technical and administrative assistance to all entities as required for the preparation of annual water audits.

The most readily available and lowest cost method of promoting water conservation is to inform water users about ways to save water inside homes and other buildings, in landscaping and lawn uses, and in recreational uses.

Each water conservation plan should contain ways to communicate water saving practices. Among the methods for public education about water conservation are: television, radio, and newspaper announcements; posters and public displays, flyers, contests, and school programs; bill stuffers and newsletters; and sales events.

The appropriate combination of educational materials and the methods used to communicate with residential users will depend on the location of each entity, the type of media available, and other factors unique to each entity. The educational process should also include local builders, plumbers, and plumbing suppliers.

Cities and utilities that have the authority to adopt plumbing codes should modify or develop a code to include the installation of water conserving devices in new construction and replacement of plumbing in existing structures. The standards for residential and commercial fixtures could be:

Tank-type toilets	No more than 3.5 gallons per flush
Flush valve toilets	No more than 3.0 gallons per flush
Tank-type urinals	No more than 3.0 gallons per flush
Flush valve urinals	No more than 1.0 gallon per flush
Shower heads	No more than 3.00 gpm
Indoor faucets	No more than 2.75 gpm
All hot water lines	Insulated
Swimming pools	New pools must have recirculating filtration equipment.

All entities that provide water or are responsible for water billings should have a master meter. In addition, each water consumer should have individual meters including each living unit at apartments, townhomes, or duplexes. A regularly scheduled maintenance program of meter repair and replacement should be established with the following suggested time intervals:

1. Master Meter - test once per year

2. Meters larger than one inch - test once per year

3. Meters one inch and smaller - test once per ten years.

A continuous leak detection, location, and repair program can be an important part of a water conservation plan. An annual water accounting or audit should be part of the program. Sources of unaccounted for water include defective hydrants, abandoned services, unmetered water used for fire fighting or other municipal uses, inaccurate or leaking meters, illegal hook-ups, unauthorized use of fire hydrants, and leaks in mains and services. Once located, corrective repairs or actions need to be undertaken immediately.

Metering and meter repair and replacement, combined with an annual water accounting or auditing, can be used in conjunction with other programs such as leak detection and repair and thereby save significant quantities of water.

A drought contingency plan is also specifically related to each individual water system. Information and education of drought contingency measures, trigger conditions, and termination notification can be communicated by bill stuffers, newspapers, radio and television, and by personal contact if necessary. These methods of communication would be adequate for all water users in Collin County.

Trigger conditions for cities should focus on high service pump operating times and water levels in elevated storage tanks. Trigger conditions for the rural systems should focus on well pump operating times and water levels in ground storage tanks. Drought conditions for the NTMWD should be primarily triggered by monitoring water levels in Lake Lavon.

More detailed information and specific examples relating to the nine principal water conservation methods and the six drought contingency elements are described in the TWDB guidelines located in Appendix D.

The Collin County Water Authority should provide assistance to every entity, as needed, to insure development of water conservation and drought contingency plans throughout the county. The use of funds provided by the Authority should require an adopted plan consistent with the TWDB guidelines and approval of the Authority.

Using a 10 percent reduction in water usage as a goal, water conservation would have the following impact on the average daily water demand in the study area:

TABLE XII-1

WATER DEMAND REDUCTIONS WITH CONSERVATION

YEAR	WITHOUT CONSERVATION	WITH CONSERVATION
1990	64.19 MGD	57.77 MGD
2000	92.19 MGD	82.97 MGD
2010	117.66 MGD	105.89 MGD
2020	146.01 MGD	131.41 MGD

As shown above, a 10 percent reduction in water usage would definitely affect the total water demands. For the purpose of this study, the conservative, larger values are used to size facilities. If water conservation is successful in the future, then the actual design sizes can be reduced.

A water conservation plan is an effective way to reduce the current use of water and thereby reduce the costs of water supply development and wastewater treatment. The implementation of a plan is also a cost-effective means of protecting a valuable natural resource for future needs. In order for a conservation plan to be successful, the program must be carefully planned, well managed, properly monitored, and must include a good public education effort. Every entity in Collin County is facing long-term water supply concerns and can benefit from a water conservation program and drought contingency plan. Each entity will need to examine its specific situation and plan its own water conservation and drought contingency program composed of the water conservation and drought contingency measures that most appropriately fit its needs.

SECTION XIII

WASTEWATER SERVICE PLANS

A. PARAMETERS FOR SYSTEM PLANS

One of the purposes of this study was to evaluate several options regarding wastewater collection and treatment. The various options were used to formulate a general county-wide wastewater plan. The proposed plan provides a strategy and implementable goals to direct and coordinate the planning and implementation of county-wide wastewater treatment facilities.

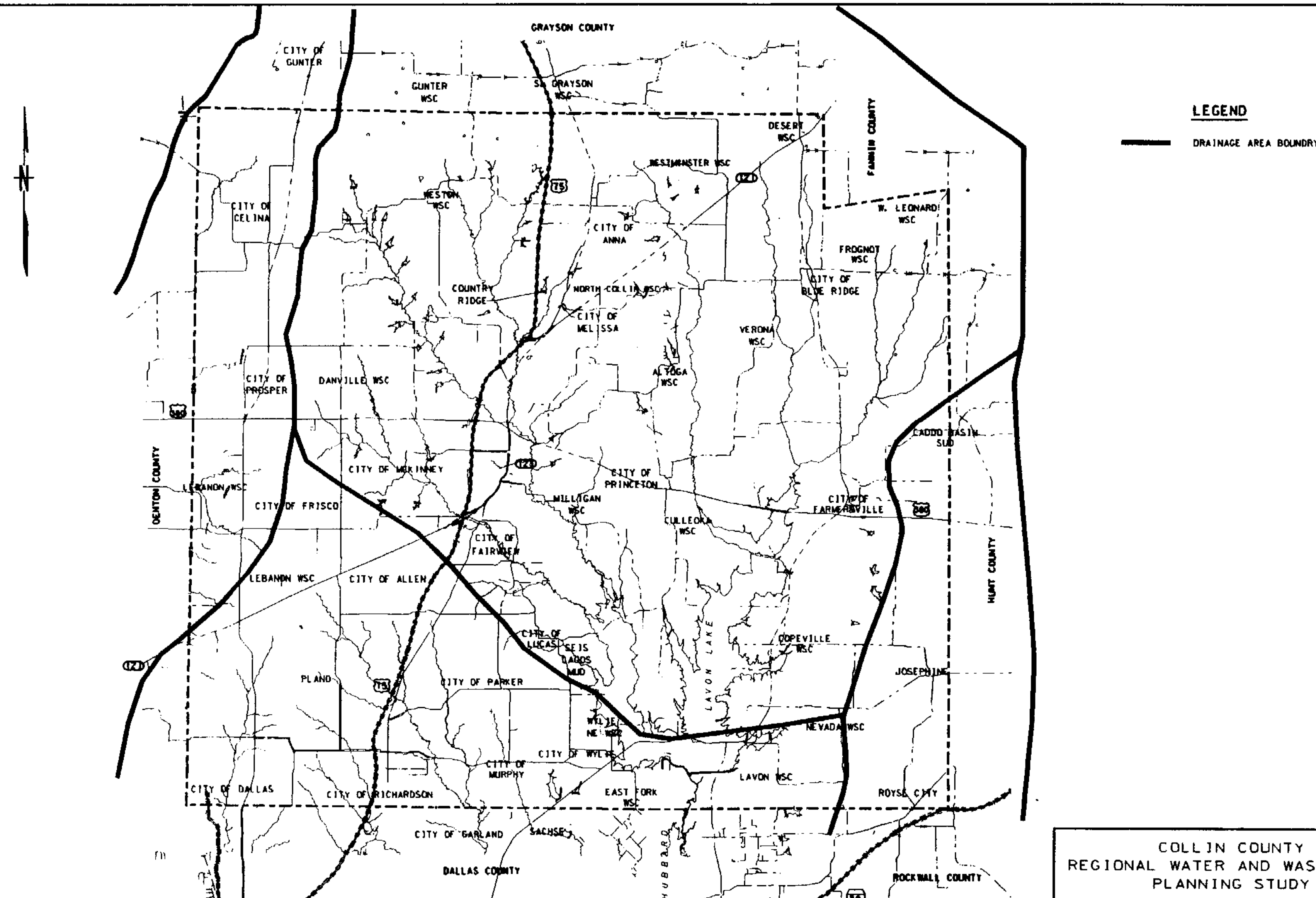
The development of these wastewater service plan options was based on the following factors and assumptions:

1. A 30-year planning period (1990 through the year 2020),
2. Projected population estimates as presented in Section VII of this report,
3. Two levels of per capita wastewater return flows (110 gpcd and 130 gpcd),
4. Wastewater treatment plant capacity would be provided for the entire population,
5. Service plan options include only major collecting interceptors and treatment facilities,
6. Service plans do not include individual collection systems, house laterals or house service connections,
7. Capacity of existing facilities and expansion capabilities were considered.

8. The construction of new facilities would utilize natural drainage basins,
9. All proposed facilities would be implemented over three 10-year increments including the years 1990-2000, 2000-2010, and 2010-2020.
10. Growth would occur from the south to the north (i.e., the southern part of the county would require complete service by the year 2000, while the very northern part of the county would not require service until the year 2020).
11. Wastewater discharge parameters for treatment plants discharging directly into Lake Lavon were assumed to be 5 mg/l BOD, 5 mg/l TSS, 2 mg/l ammonia nitrogen and 1 mg/l phosphorous. Other discharges were assumed at 10 mg/l for BOD and 15 mg/l for TSS with considerations for advanced treatment, if necessary.
12. NTMWD will continue to own and operate wastewater treatment facilities in Collin County and will play an integral role in providing wastewater treatment in the future.

B. <u>SERVICE AREA DELINEATION</u>

Several natural drainage basins exist in Collin County. Figure XIII-1 shows the major drainage basins covering Collin County. Wastewater flows can be transported in the county by gravity lines or by pump stations. Gravity line systems require very little energy and are usually less costly than operation of force mains which require pumping. Therefore, wastewater treatment service areas should utilize



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
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MAJOR DRAINAGE BASINS

FIGURE XIII-1

the topography of natural drainage basins to minimize cost of wastewater collection. For the purposes of evaluating various wastewater service plans, the following service areas have been defined:

1. Rowlett Creek/Wilson Creek - This service area includes the Lake Lavon Watershed and the City of Plano. This service area is characterized as the central portion of Collin County.

2. Frisco - This service area includes the upper northwest side of the County. This area drains into Lake Lewisville and encompasses the Cities of Frisco, Prosper and Celina.

3. Wylie - This service area includes the south-central portion of the county that is directly south of Lake Lavon and includes the Cities of Wylie, Lucas, Murphy, portions of Parker, and Saint Paul. This service area has two possible lower boundaries. One boundary extends only to the city limits of Wylie. The other boundary would extend into Dallas County, which would encompass flows from the Cities of Sachse and Rowlett.

4. Farmersville - This service area is located in the northeast part of the county. It includes areas which could contribute to a collection system leading to regional facilities located at Farmersville. The other city in this area is Blue Ridge.

5. Princeton - This service area is a part of the Rowlett Creek/Wilson Creek service area, but has been separately designated to objectively evaluate different wastewater treatment options. The area is the portion of the county which could contribute to a treatment plant at the City of Princeton, and also includes the Culleoka Community.

6. Royse City - This service area includes the southeast part of the county and encompasses the Cities of Royse City, Josephine and Nevada.

The Frisco service area and the Royse City service area are the same in all options.

C. CONCEPTUAL APPROACHES

1. Septic Tank Systems

Three approaches to septic tanks are possible: (1) establish no direction at all regarding septic tank use, (2) encourage the use and installation of septic tank systems, or (3) limit and control the use of septic tanks by promulgating and enforcing rules and regulations.

With the passage of Collin County Court Order No. 83-194-4-4 in April of 1983 regarding the regulation of private sewage facilities, Collin County established its position on issues related to preserving the health, safety and welfare of the residents in the rural areas of the county. Provisions in this Order include a requirement that whenever a wastewater collection system is developed to within 300 feet from any part of a private sewage facility, that private facility shall be connected to the newly installed collection system, and no license will be issued for a private septic tank system if an existing collection system is within 300 feet of the proposed private system location.

The Texas Water Commission (TWC) and the Texas Department of Health have defined the potential health hazards and contamination risks of malfunctioning septic systems. Based on a review of soil types in Collin County and corresponding permeabilities, Collin County septic systems have a great potential to create public health hazards. Septic tank systems do not function properly in the clayey soils of Collin County, and their use could jeopardize the water quality of Lake Lavon.

Therefore, the options regarding wastewater service plans in Collin County do not include provisions for the use of septic tanks in any subdivisions, but only for isolated, rural farm-type applications. All proposed alternatives for wastewater treatment include plans for general elimination of septic tanks in the county by the year 2020. As a conservative approach, this assumption will provide wastewater treatment plant as development occurs (such as remote subdivisions or mobile home parks) independent of city boundaries, or (3) municipal facilities could be abandoned as appropriate with flows being transported to regional facilities.

The first general approach includes the construction, operation, and maintenance of a wastewater treatment facility for each entity in Collin County. Currently, that concept would mean a total of 51 plants ultimately operating in the county. The second general approach would create an unlimited number of treatment plants discharging flows throughout the county. Several problems exist with these two approaches.

First, with increasing environmental concerns of stream quality, the effluent quality of the discharge parameters is expected to become more stringent in the future. These requirements will probably result in a BOD of 10 mg/l and a TSS of 15 mg/l becoming the maximum value for these discharge parameters. If these parameters are adopted, many of the wastewater treatment plants in Collin County will become obsolete and require major renovation. The cost of a 10/15 plant would be prohibitive for most small municipalities. Another cost increase associated with this type of a plant would be for operation and maintenance. These plants are more complex, requiring highly skilled operators. These operators, because of their training and experience, have salary requirements that would be unaffordable by many small communities.

Another consideration is plant performance. Without skilled operators, these plants will not operate as designed. Treatment plants operating in violation of their permits would generate fines for the city, and cause stream degradation, groundwater pollution, a loss of environmental aesthetics, fish kills and public health risks. Rather than spending funds on small complex treatment facilities, these funds would be used to construct interceptors that transport wastewater flows to larger and more cost efficient regional plants.

Therefore, the conceptual assumption made for this study includes the use of some of the existing municipal facilities until plant capacity is reached. At that time, the plants would be abandoned and flows transported to a regional facility. The use of package plants should be thoroughly investigated through a vigorous review and approval process.

3. Regional Systems

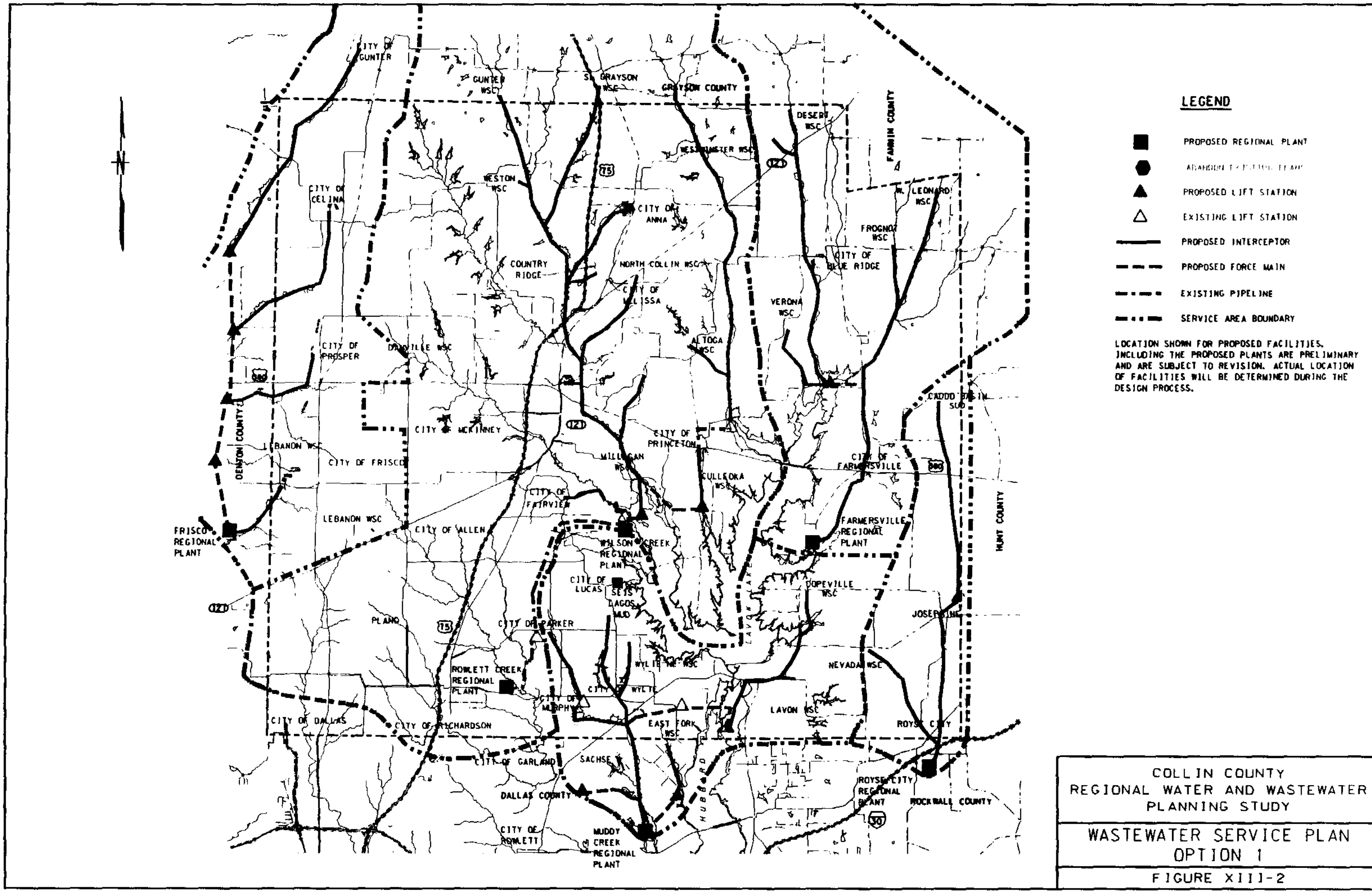
Presently, two regional treatment plants are operating in Collin County; Rowlett Creek WWTP and Wilson Creek WWTP. Regional plants are generally strategically located to treat all wastewater flow from an entire designated drainage basin. The regional concept is desirable for two primary reasons: (1) facilities are centralized at fewer locations, and (2) the large volume of wastewater treated significantly reduces the unit cost of treatment. The TWC and the Environmental Protection Agency strongly urge regionalization. Most discharge permits give the TWC the authority to require a smaller municipal system to connect to a regional system when available. Every wastewater service plan option evaluated in this report assumed the ultimate use of regionalization for wastewater collection and treatment.

D. PROPOSED ALTERNATIVES

1. Option 1

This option provides regional wastewater treatment utilizing five service areas: (1) Rowlett/Wilson Creek, (2) Frisco, (3) Wylie (Muddy Creek), (4) Farmersville, and (5) Royse City. Figure XIII-2 shows the components of this wastewater service plan. Based on projected flows, Table XIII-1 shows the average daily flow in MGD for each service area in the years 1990, 2000, 2010 and 2020. The Rowlett/Wilson Creek Service Area has 89 percent of the flow in 1990, 84 percent in the year 2000, 83 percent in the year 2010, and 82 percent in the year 2020. Tables XIII-2 through XIII-6 provide specific information on each service area including: (1) entities in each service area, (2) per capita, population, and flow estimates for each entity, and (3) the assumed design interval in which regional treatment would become available for each entity.

In the Rowlett/Wilson Creek service area, regional treatment would be available in 1990 to the Cities of Allen, McKinney, Plano, and Richardson. Wastewater treatment would be provided by the existing Rowlett Creek Plant (16 mgd) and the newly expanded Wilson Creek Plant (24 mgd). By the year 2000, regional treatment should be additionally available to Country Ridge, Fairview, Melissa, Parker, Princeton, and Danville. During the



COLLIN COUNTY
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WASTEWATER SERVICE PLAN
OPTION 1

FIGURE XIII-2

TABLE XIII-1

Projected Wastewater Design Flow Summary

OPTION NO. 1

SERVICE AREA	1990	2000	2010	2020
	AVERAGE DAILY FLOW (MGD)			
Rowlett/Wilson Creek	24.9	37.4	51.2	65.8
Frisco	0.9	1.5	2.5	3.3
Wylie (Muddy Creek)	1.3	4.4	6.1	7.5
- Seis Lagos	0.1	0.1	0.1	0.1
Farmersville	0.4	0.6	0.9	1.9
Royse City	0.4	0.5	1.0	1.6
TOTAL	28.0	44.5	61.8	80.2

Notes: 1. The Muddy Creek Regional Plant must have wastewater capacity for the City of Rowlett (an additional 4.0 mgd by the year 2010) if a regional plant is constructed in this area.

2. The Seis Lagos Plant will continue to service the Seis Lagos Community. This facility is located within the Wylie service area.

TABLE XIII-2

ROWLETT/WILSON CREEK SERVICE AREA

DESIGN FLOWS

OPTION 1

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	2,820	0.310	0.776	3,610	0.397	0.993
COUNTRY RIDGE DEV. (MELISSA)	130	0	0.000	0.000	230	0.030	0.075	310	0.040	0.101	400	0.052	0.130
FAIRVIEW, CITY OF	130	0	0.000	0.000	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	0	0.000	0.000	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
PRINCETON, CITY OF	130	0	0.000	0.000	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
MILLIGAN WSC/LOWRY CROSSING	110	0	0.000	0.000	0	0.000	0.000	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	4,700	0.517	1.293	5,550	0.611	1.526
WESTON WSC/WESTON	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
ALTOGA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	560	0.062	0.154
CULLEOKA WSC	110	0	0.000	0.000	0	0.000	0.000	4,870	0.536	1.339	5,940	0.653	1.634
DANVILLE WSC	110	0	0.000	0.000	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,620	0.288	0.721
TOTAL		191,420	24.885	62.212	287,850	37.360	93.400	396,490	51.175	127.939	510,045	65.754	164.386

TABLE XIII-3

FRISCO SERVICE AREA

DESIGN FLOWS

OPTION 1

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
CELINA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	3,940	0.433	1.084	5,050	0.556	1.389
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
PROSPER, CITY OF	110	0	0.000	0.000	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
LEBANON WSC	130	0	0.000	0.000	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
TOTAL		6,830	0.888	2.220	12,110	1.540	3.850	19,900	2.463	6.157	26,405	3.252	8.130

TABLE XIII-4

WYLIE SERVICE AREA

DESIGN FLOWS

OPTION 1

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
SEIS LAGOS M.U.D.	130	470	0.061	0.153	600	0.078	0.195	600	0.078	0.195	600	0.078	0.195
LUCAS, CITY OF	130	0	0.000	0.000	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MURPHY, CITY OF	130	0	0.000	0.000	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
SACHSE, CITY OF	130	0	0.000	0.000	6,970	0.906	2.265	7,840	1.019	2.548	8,730	1.135	2.837
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232
LAVON WSC/LAVON	110	0	0.000	0.000	0	0.000	0.000	1,680	0.185	0.462	2,050	0.226	0.564
WYLIE NE WSC/SAINT PAUL	130	0	0.000	0.000	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
COPEVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	2,490	0.274	0.685	3,030	0.333	0.833
EAST FORK WSC	130	0	0.000	0.000	2,920	0.380	0.949	3,560	0.463	1.157	4,330	0.563	1.407
TOTAL		10,230	1.330	3.325	33,890	4.406	11.014	47,270	6.062	15.154	58,480	7.501	18.752

TABLE XIII-5

FARMERSVILLE SERVICE AREA

DESIGN FLOWS

OPTION 1

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
BLUE RIDGE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,280	0.141	0.352	1,640	0.180	0.451
FARMERSVILLE, CITY OF	130	3,080	0.400	1.001	4,460	0.580	1.450	5,950	0.774	1.934	7,620	0.991	2.477
WESTMINSTER WSC/WESTMINSTER	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,820	0.200	0.501
DESERT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,010	0.111	0.278
FROGNOT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	950	0.105	0.261
NORTH FARMERSVILLE WSC	110	0	0.000	0.000	270	0.030	0.074	310	0.034	0.085	360	0.040	0.099
VERONA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,790	0.197	0.492
WEST LEONARD WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
TOTAL		3,080	0.400	1.001	4,730	0.609	1.524	7,540	0.948	2.371	16,280	1.943	4.858

TABLE XIII-6

ROYSE CITY SERVICE AREA

DESIGN FLOWS

OPTION 1

ENTITIES	PER CAPITA USAGE (GPCD)	1990 POPULATION	1990 AVERAGE FLOW (MGD)	1990 PEAK FLOW (MGD)	2000 POPULATION	2000 AVERAGE FLOW (MGD)	2000 PEAK FLOW (MGD)	2010 POPULATION	2010 AVERAGE FLOW (MGD)	2010 PEAK FLOW (MGD)	2020 POPULATION	2020 AVERAGE FLOW (MGD)	2020 PEAK FLOW (MGD)
JOSEPHINE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,120	0.123	0.308	1,440	0.158	0.396
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
NEVADA WSC/NEVADA	110	0	0.000	0.000	0	0.000	0.000	1,640	0.180	0.451	2,100	0.231	0.578
CADDO BASIN (HOPEWELL)	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,140	0.235	0.589
TOTAL		2,940	0.382	0.956	4,210	0.547	1.368	8,340	1.029	2.573	12,840	1.556	3.889

period, the McKinney North Plant and the Princeton Plant would reach capacity and be abandoned with flows being diverted to the regional facilities. By the year 2010, regional facilities would encompass Milligan WSC, North Collin WSC, Culleoka WSC and finally by the year 2020, regional facilities would reach Weston WSC, Altoga WSC, Gunter WSC, and the South Grayson WSC. The Wilson Creek Plant would need an additional 25.8 mgd expansion at the existing site by the year 2020 to meet the total flow demands.

The Frisco service area is a part of the Lake Lewisville Watershed and naturally drains outside Collin County into Denton County. Currently, the City of Frisco has a treatment plant under design for a location along Stewart Creek. This new facility will ultimately replace the two existing plants in Frisco.

The Denton County Water and Wastewater Master Plan recommended that a regional treatment plant be located in this area to serve this drainage basin. For planning purposes, this new facility under design for Frisco on Stewart Creek will serve as the regional facility for this service area. The size of this facility is based on population projections that are encompassed in the Collin County study area only. The actual size of facilities could also incorporate Denton County population.

The regional facilities would initially serve the City of Frisco. By the year 2000, regional service should be available to Lebanon WSC and the City of Prosper. The Prosper treatment plant should be near capacity by the year 2000, which would result in the need for new facilities. By the year 2010, the City of Celina should be ready for regionalization. The City of Celina has just placed into service a new facility, which should meet their needs through the year 2010. By the year 2020, regional service should be available for Gunter WSC.

Currently, discussions are proceeding for regional treatment in the Wylie service area. The present plan under consideration includes the construction of a regional facility located near Lake Ray Hubbard along Muddy Creek in Dallas County. The primary participants of this discussion include the Cities of Wylie, Sachse, Murphy, and Rowlett. The City of Rowlett and most of the City of Sachse are located in Dallas County. Option 1 generally parallels the present discussion for this regional plant. However, this Report incorporates the entire population from the defined Wylie service area as tributary to the regional facility. The Seis Lagos Plant would continue to operate in the Wylie service area and serve only the residents of the Seis Lagos Community.

By the year 2000, the Wylie regional plant would be in service and provide treatment capacity to Lucas, Murphy, Parker, Sachse, Wylie, Wylie NE WSC, and the East Fork WSC. Additional capacity would have to be included for the City of Rowlett which is outside the study area. The City of Rowlett estimates that 4.0 mgd would need to be available through the year 2010. By the year 2010, regional service would be available to the Lavon WSC and the Copeville WSC.

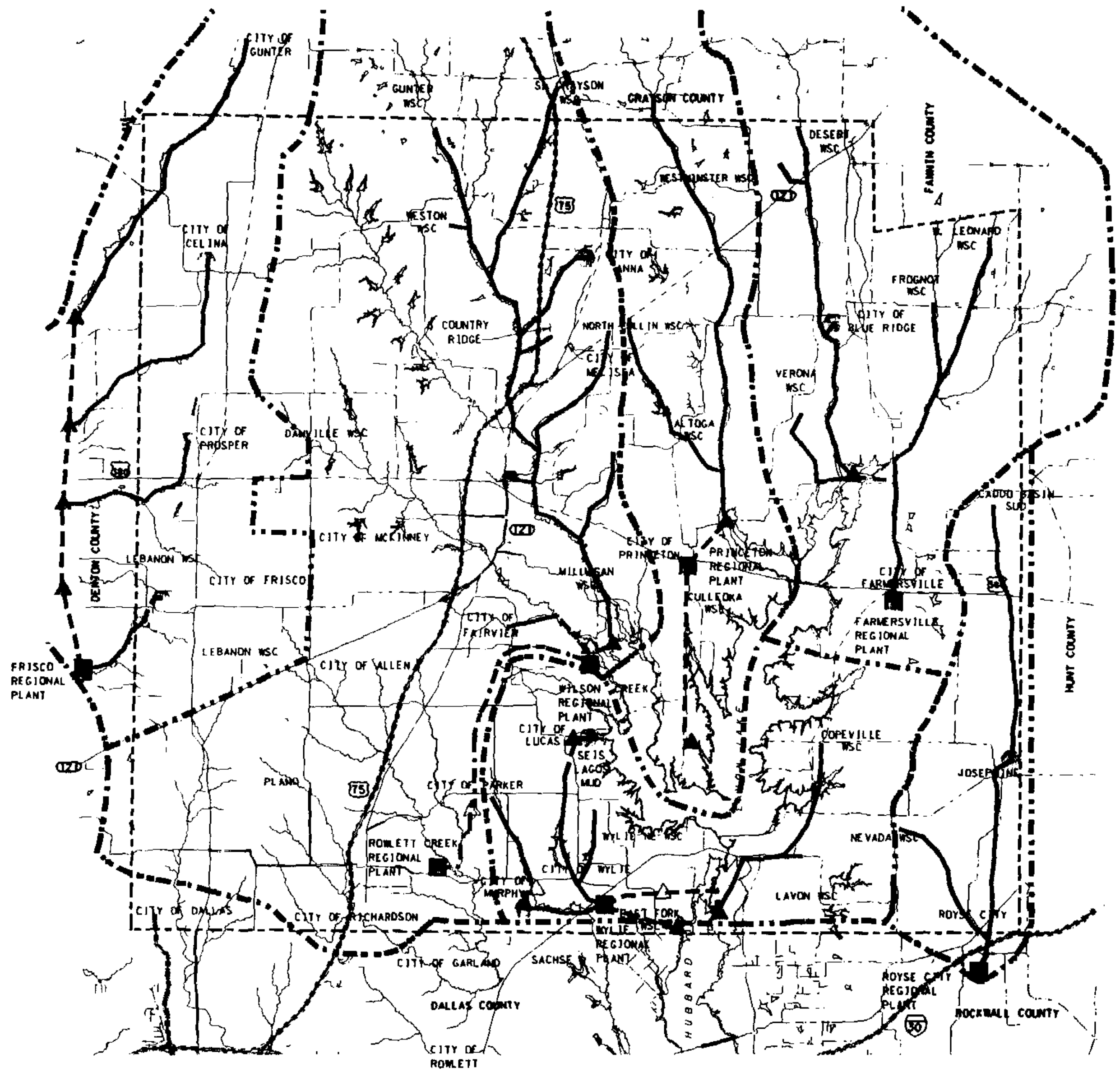
The northeast portion of the county would be provided wastewater treatment by a regional facility located near the City of Farmersville. To serve the entire population of Farmersville by gravity flow, a wastewater treatment plant site near Elm Creek and Highway 78 would be adequate. A facility near this location would allow the City of Farmersville to abandon its existing plants. Initially, the existing plants in Farmersville would be designated as regional facilities and serve the City of Farmersville and North Farmersville WSC through the year 2000. By the year 2010, the City of Blue Ridge would probably require regional service because of the age of its existing facilities. By the year 2020, regional service could be available to the other entities in this service area as shown on Table XIII-5. These entities include Westminster WSC, Desert WSC, Frognot WSC, Verona WSC, and West Leonard WSC.

The southeast part of the county is defined as the Royse City service area. The existing Royse City Wastewater treatment plant would be designated as a regional facility. This facility would serve the residents of Royse City through the year 2000. By the year 2010, regional service would be available to the City of Josephine and the Nevada WSC. The existing treatment plant at Josephine should be at or near capacity by the year 2010. Sometime prior to the year 2020, regional service should be accessible to the newly formed Caddo Basin Special Utility District (formerly Hopewell WSC). The flow estimates from Caddo Basin include only that portion actually located within this drainage basin.

Figure XIII-2 indicates the location of all existing plants to be abandoned, all sites for regional facilities, drainage area boundaries, and a proposed interceptor network to transport all flows to regional facilities.

2. Option 2

Option 2, shown in Figure XIII-3 includes the use of six service areas to provide regional treatment to the Collin County area placing emphasis on the use of existing facilities. These six service areas include: (1) Rowlett/Wilson Creek, (2) Frisco, (3) Wylie, (4) Farmersville, (5) Princeton, and (6) Royse City. Based on the projected flows, Table XIII-7 shows the average



LEGEND

- PROPOSED REGIONAL PLANT
- ABANDON EXISTING PLANT
- PROPOSED LIFT STATION
- EXISTING LIFT STATION
- PROPOSED INTERCEPTOR
- PROPOSED FORCE MAIN
- EXISTING PIPELINE
- SERVICE AREA BOUNDARY

LOCATION SHOWN FOR PROPOSED FACILITIES, INCLUDING THE PROPOSED PLANTS ARE PRELIMINARY AND ARE SUBJECT TO REVISION. ACTUAL LOCATION OF FACILITIES WILL BE DETERMINED DURING THE DESIGN PROCESS.

COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

WASTEWATER SERVICE PLAN
OPTION 2

FIGURE XIII-3

TABLE XIII-7

Projected Wastewater Design Flow Summary

OPTION NO. 2

SERVICE AREA	AVERAGE DAILY FLOW (MGD) 1990	2000	2010	2020
Rowlett/Wilson Creek	24.9	36.6	49.4	63.3
Frisco	0.9	1.5	2.5	3.3
Wylie	1.3	3.3	4.9	6.1
Farmersville	0.4	0.6	0.9	1.9
Princeton	0.5	0.7	1.5	2.4
Royse City	0.4	0.5	1.0	1.6
TOTAL	28.4	43.2	60.2	78.6

TABLE XIII-8

ROWLETT/WILSON CREEK SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990 POPULATION	1990 AVERAGE FLOW (MGD)	1990 PEAK FLOW (MGD)	2000 POPULATION	2000 AVERAGE FLOW (MGD)	2000 PEAK FLOW (MGD)	2010 POPULATION	2010 AVERAGE FLOW (MGD)	2010 PEAK FLOW (MGD)	2020 POPULATION	2020 AVERAGE FLOW (MGD)	2020 PEAK FLOW (MGD)
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	2,820	0.310	0.776	3,610	0.397	0.993
COUNTRY RIDGE DEV. (MELISSA)	130	0	0.000	0.000	230	0.030	0.075	310	0.040	0.101	400	0.052	0.130
FAIRVIEW, CITY OF	130	0	0.000	0.000	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	0	0.000	0.000	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
MILLIGAN WSC/LOWRY CROSSING	110	0	0.000	0.000	0	0.000	0.000	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	2,350	0.259	0.646	2,775	0.305	0.763
WESTON WSC/WESTON	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
DANVILLE WSC	110	0	0.000	0.000	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,310	0.144	0.360
TOTAL		191,420	24.885	62.212	282,100	36.612	91.531	381,590	49.383	123.457	489,620	63.311	158.277

TABLE XIII-9

FRISCO SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990 POPULATION	1990 AVERAGE FLOW (MGD)	1990 PEAK FLOW (MGD)	2000 POPULATION	2000 AVERAGE FLOW (MGD)	2000 PEAK FLOW (MGD)	2010 POPULATION	2010 AVERAGE FLOW (MGD)	2010 PEAK FLOW (MGD)	2020 POPULATION	2020 AVERAGE FLOW (MGD)	2020 PEAK FLOW (MGD)
CELINA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	3,940	0.433	1.084	5,050	0.556	1.389
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
PROSPER, CITY OF	110	0	0.000	0.000	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
LEBANON WSC	130	0	0.000	0.000	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
TOTAL		6,830	0.888	2.220	12,110	1.540	3.850	19,900	2.463	6.157	26,405	3.252	8.130

TABLE XIII-10

WYLIE SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
SEIS LAGOS M.U.D.	130	0	0.000	0.000	0	0.000	0.000	600	0.078	0.195	600	0.078	0.195
LUCAS, CITY OF	130	0	0.000	0.000	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MURPHY, CITY OF	130	0	0.000	0.000	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232
LAVON WSC/LAVON	110	0	0.000	0.000	0	0.000	0.000	1,680	0.185	0.462	2,050	0.226	0.564
WYLIE NE WSC/SAINT PAUL	130	0	0.000	0.000	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
COPEVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	2,490	0.274	0.685	3,030	0.333	0.833
EAST FORK WSC	130	0	0.000	0.000	1,020	0.133	0.332	1,250	0.163	0.406	1,520	0.198	0.494
TOTAL		10,230	1.330	3.325	25,020	3.253	8.132	37,720	4.820	12.051	47,540	6.079	15.197

TABLE XIII-11

FARMERSVILLE SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
BLUE RIDGE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,280	0.141	0.352	1,640	0.180	0.451
FARMERSVILLE, CITY OF	130	3,080	0.400	1.001	4,460	0.580	1.450	5,950	0.774	1.934	7,620	0.991	2.477
WESTMINSTER WSC/WESTMINSTER	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,820	0.200	0.501
DESERT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,010	0.111	0.278
FROGNOT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	950	0.105	0.261
NORTH FARMERSVILLE WSC	110	0	0.000	0.000	270	0.030	0.074	310	0.034	0.085	360	0.040	0.099
VERONA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,790	0.197	0.492
WEST LEONARD WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
TOTAL		3,080	0.400	1.001	4,730	0.609	1.524	7,540	0.948	2.371	16,280	1.943	4.858

TABLE XIII-12

PRINCETON SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
PRINCETON, CITY OF	130	3,970	0.516	1.290	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,775	0.305	0.763
ALTOGA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	560	0.062	0.154
CULLEOKA WSC	110	0	0.000	0.000	0	0.000	0.000	4,870	0.536	1.339	5,940	0.653	1.634
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,310	0.144	0.360
TOTAL		3,970	0.516	1.290	5,750	0.748	1.869	12,550	1.534	3.835	20,425	2.444	6.109

TABLE XIII-13

ROYSE CITY SERVICE AREA

DESIGN FLOWS

OPTION 2

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
JOSEPHINE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,120	0.123	0.308	1,440	0.158	0.396
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
NEVADA WSC/NEVADA	110	0	0.000	0.000	0	0.000	0.000	1,640	0.180	0.451	2,100	0.231	0.578
CADDO BASIN (HOPEWELL)	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,140	0.235	0.589
TOTAL		2,940	0.382	0.956	4,210	0.547	1.368	8,340	1.029	2.573	12,840	1.556	3.889

daily flow in MGD for each service area in the design year intervals. The Rowlett/Wilson Creek service area serves a large percentage of the county population. In Option 2 the Rowlett/Wilson Plant provides service to less people than in Option 1, since a Princeton service area was created out of the original Rowlett/Wilson Creek area. Also, the Seis Logos plant will be abandoned in Option 2. The Frisco (Table XIII-9) and Royse City (Table XIII-13) service areas are identical in Option 1 and in Option 2.

The Rowlett/Wilson Creek service area would continue to utilize the existing facilities at the Rowlett Creek site (16 mgd) and at the Wilson Creek plant (24 mgd). In Option 2, the service area has been reduced somewhat in size and would require facilities for an average daily capacity of 63.3 mgd. This design flow would require expansion of the Wilson Creek plant from 24 to 48.3 mgd, or double in size by the year 2020. This plant currently has the influent structures in place for an additional 8.0 mgd above the existing 24.0 mgd. The actual entities now tributary to these regional facilities in this option, with flows expected in the design year intervals, are listed in Table XIII-8.

In Option 2, the Farmersville service area is about the same as in Option 1 except that the existing Farmersville facilities will be designated as regional with expansion occurring at or near the existing site. A new downstream facility will not be built. Flows for the Farmersville service area are shown on Table XIII-10.

Option 2 is different from Option 1 with regard to the Wylie service area. Option 2 provides regional service to only Collin County residents and extends only to the southern boundary of the City of Wylie. This option designates the existing Wylie treatment plant as regional and it would be expanded as necessary. This alternative for this service area has been included as a choice for regionalization if the present discussion for a Muddy Creek Regional Plant in Dallas County does not materialize. Wastewater treatment for Sachse and Rowlett would continue to be provided by the City of Garland. The entities and their corresponding flows for the Wylie service area are listed in Table XIII-11.

Option 2 includes utilization of the existing Princeton treatment plant and corresponding service area as a regional treatment facility. This plant would initially serve the City of Princeton through the year 2000. By the year 2010, wastewater service should be furnished to the Culleoka WSC. By the year 2020, regional treatment capacity should be available to the North Collin WSC, Altoga WSC, and the South Grayson WSC. Table XIII-12 provides flow data for this service area.

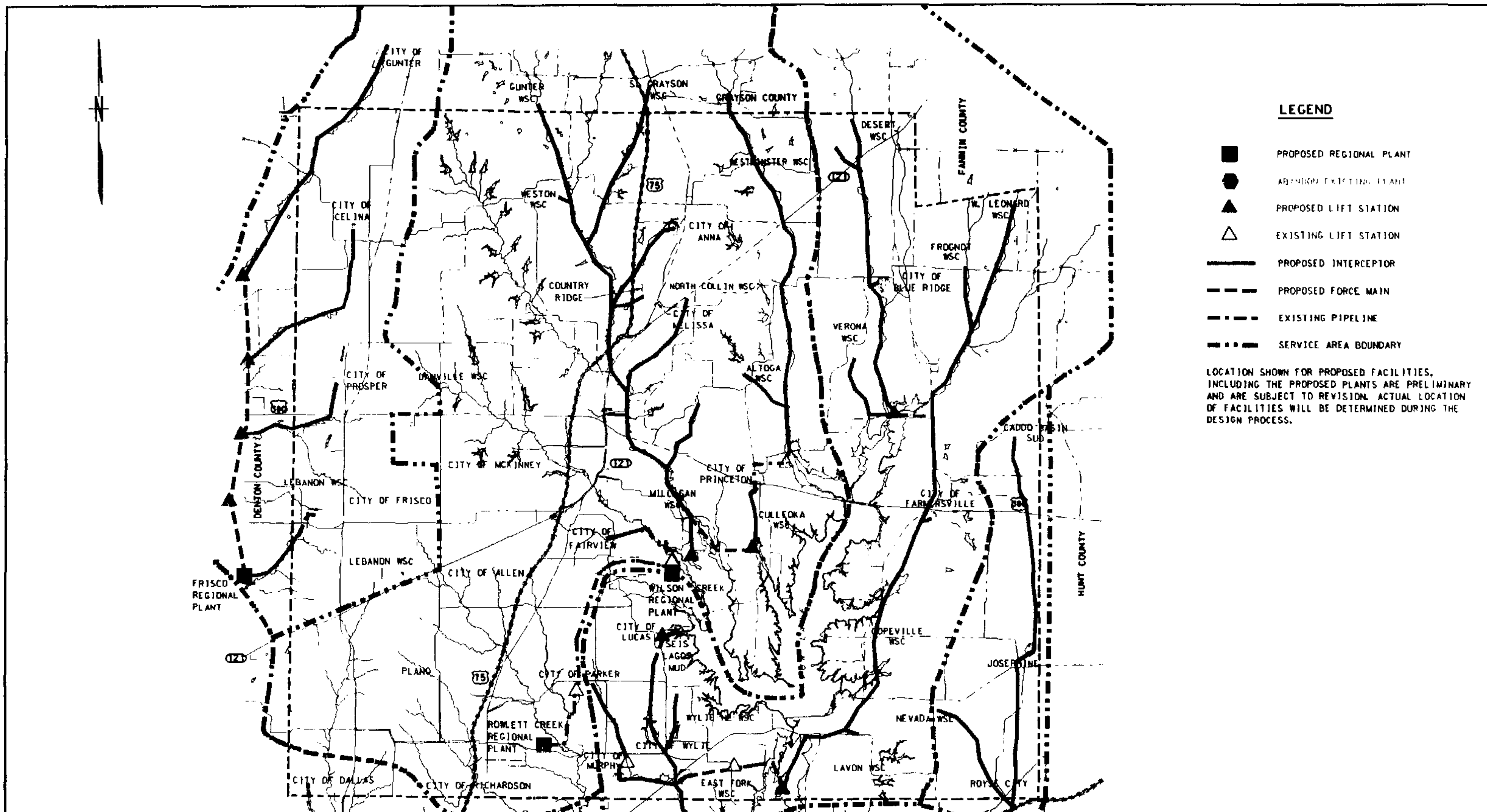
Figure XIII-3 provides a graphic view of Option 2 including study area boundaries, plants to be abandoned, regional plant sites and the overall interceptor system.

3. Option 3

The basis for Option 3 is using the minimum number of wastewater treatment plants necessary to serve the residents of Collin County. This concept is shown in Figure XIII-4. This option explores the use of only four service areas: (1) Rowlett/Wilson Creek, (2) Frisco, (3) Wylie, and (4) Royse City. The Rowlett/Wilson Creek, Frisco, and Royse City service areas remain unchanged from those presented in Option 1. The primary difference occurs in the Wylie and Farmersville Service Areas.

In Option 3, a regional facility is not designated for the Farmersville area. Instead, when the Farmersville plants reach capacity near the year 2010, all flow will be transported to the proposed Muddy Creek Regional Plant in Dallas County (similar to Option 1). This concept eliminates one regional facility, while enlarging the Wylie service area.

Table XIII-14 lists the average daily flows by service area for the design year intervals. Again, as in previous options, the Rowlett/Wilson Creek Service Area represents over 80 percent of all wastewater flows during each design year interval. Tables XIII-15 through 18 provide the detailed information for the overall development of each service area. Figure XIII-4 illustrates the four service area boundaries, the proposed regional plants, and the interceptor system necessary to transport all flows to the proposed facilities.



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

WASTEWATER SERVICE PLAN
OPTION 3

FIGURE XIII-4

TABLE XIII - 14

Projected Wastewater Design Flow Summary

OPTION NO. 3

SERVICE AREA	AVERAGE DAILY FLOW (MGD) 1990	2000	2010	2020
Rowlett/Wilson Creek	24.9	37.4	51.2	65.8
Frisco	0.9	1.5	2.5	3.3
Wylie (Muddy Creek)	1.3	4.4	7.1	9.5
Royse City	0.4	0.5	1.0	1.6
TOTAL	27.5	43.8	61.8	80.2

Notes: 1. The Muddy Creek Regional Plant must have wastewater capacity for the City of Rowlett (an additional 4.0 mgd through the year 2010) if a regional plant is constructed in this area.

2. The Seis Lagos Plant has been abandoned in this option.

TABLE XIII-15

ROWLETT/WILSON CREEK SERVICE AREA

DESIGN FLOWS

OPTION 3

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	2,820	0.310	0.776	3,610	0.397	0.993
COUNTRY RIDGE DEV. (MELISSA)	130	0	0.000	0.000	230	0.030	0.075	310	0.040	0.101	400	0.052	0.130
FAIRVIEW, CITY OF	130	0	0.000	0.000	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	0	0.000	0.000	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
PRINCETON, CITY OF	130	0	0.000	0.000	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
MILLIGAN WSC/LOWRY CROSSING	110	0	0.000	0.000	0	0.000	0.000	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	4,700	0.517	1.293	5,550	0.611	1.526
WESTON WSC/WESTON	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
ALTOGA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	560	0.062	0.154
CULLEOKA WSC	110	0	0.000	0.000	0	0.000	0.000	4,870	0.536	1.339	5,940	0.653	1.634
DANVILLE WSC	110	0	0.000	0.000	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,620	0.288	0.721
TOTAL		191,420	24.885	62.212	287,850	37.360	93.400	396,490	51.175	127.939	510,045	65.754	164.386

TABLE XIII-16

FRISCO SERVICE AREA

DESIGN FLOWS

OPTION 3

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
CELINA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	3,940	0.433	1.084	5,050	0.556	1.389
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
PROSPER, CITY OF	110	0	0.000	0.000	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
LEBANON WSC	130	0	0.000	0.000	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
TOTAL		6,830	0.888	2.220	12,110	1.540	3.850	19,900	2.463	6.157	26,405	3.252	8.130

TABLE XIII-17

WYLIE SERVICE AREA

DESIGN FLOWS

OPTION 3

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
BLUE RIDGE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,280	0.141	0.352	1,640	0.180	0.451
FARMERSVILLE, CITY OF	130	0	0.000	0.000	0	0.000	0.000	5,950	0.774	1.934	7,620	0.991	2.477
LUCAS, CITY OF	130	0	0.000	0.000	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MURPHY, CITY OF	130	0	0.000	0.000	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
SACHSE, CITY OF	130	0	0.000	0.000	6,970	0.906	2.265	7,840	1.019	2.548	8,730	1.135	2.837
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232
COPEVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	2,490	0.274	0.685	3,030	0.333	0.833
DESERT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,010	0.111	0.278
EAST FORK WSC	130	0	0.000	0.000	2,920	0.380	0.949	3,560	0.463	1.157	4,330	0.563	1.407
FROGNOT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	950	0.105	0.261
LAVON WSC/LAVON	110	0	0.000	0.000	0	0.000	0.000	1,680	0.185	0.462	2,050	0.226	0.564
NORTH FARMERSVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	310	0.034	0.085	360	0.040	0.099
SEIS LAGOS M.U.D.	130	0	0.000	0.000	0	0.000	0.000	600	0.078	0.195	600	0.078	0.195
WYLIE NE WSC/SAINT PAUL	130	0	0.000	0.000	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
VERONA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,790	0.197	0.492
WESTMINSTER WSC/WESTMINSTER	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,820	0.200	0.501
WEST LEONARD WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
TOTAL		10,230	1.330	3.325	33,890	4.406	11.014	55,410	7.088	17.720	75,360	9.522	23.805

TABLE XIII-18

ROYSE CITY SERVICE AREA

DESIGN FLOWS

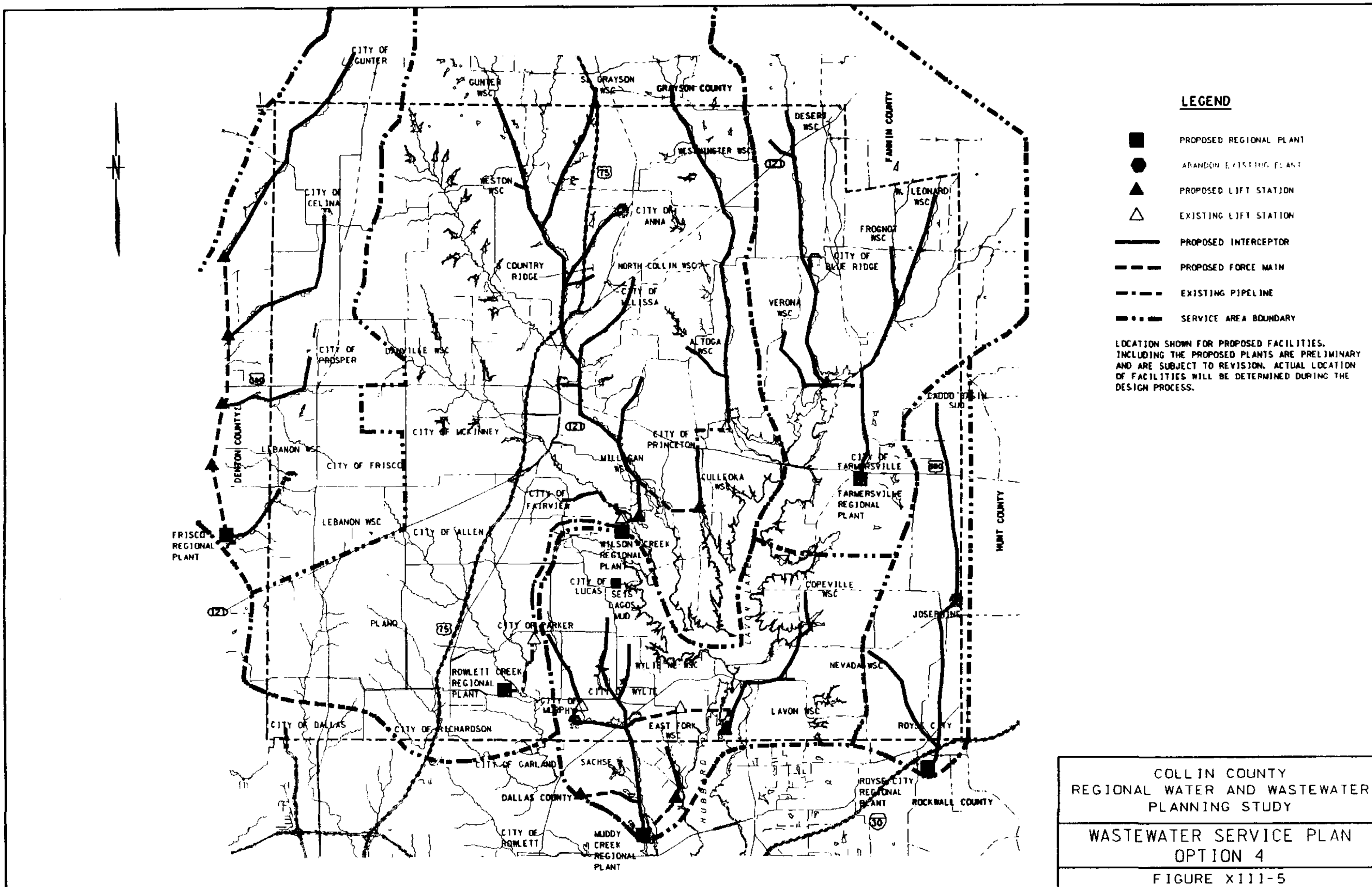
OPTION 3

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
JOSEPHINE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,120	0.123	0.308	1,440	0.158	0.396
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
NEVADA WSC/NEVADA	110	0	0.000	0.000	0	0.000	0.000	1,640	0.180	0.451	2,100	0.231	0.578
CADDO BASIN (HOPEWELL)	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,140	0.235	0.589
TOTAL		2,940	0.382	0.956	4,210	0.547	1.368	8,340	1.029	2.573	12,840	1.556	3.889

4. Option 4

Option 4 has been developed based on a preliminary analysis of all service areas defined in Options 1 through 3 including initial cost estimates and overall feasibility and is presented in Figure XIII-5. Option 4 combines the Rowlett/Wilson Creek, Frisco, Wylie, and Royse City service areas from Option 1 with the Farmersville service area from Option 2.

The Rowlett/Wilson Creek service area will include regional treatment at the existing Rowlett Creek treatment plant and the existing Wilson Creek treatment plant. The proposed regional facility in the Frisco service area, as in Option 1, is located along Stewart Creek in Frisco. Regional treatment in the Wylie service area, also as in Option 1, will be provided by a plant located on Muddy Creek in Dallas County and will treat flows from the Cities of Sachse and Rowlett. The Royse City service area will be provided with regional treatment by designating the existing Royse City plant as a regional facility, with expansion as necessary. The use of the existing Farmersville plant as a regional facility (as in Option 2) appears more economical than the downstream construction of a completely new regional facility with the need for additional transportation facilities (Option 1). Option 4 also includes the continued use of the Seis Lagos Plant. Tables XIII-19 through XIII-24 provide the detailed information describing Option 4. Figure XIII-5 shows the overall county layout of Option 4.



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

WASTEWATER SERVICE PLAN
OPTION 4

FIGURE XIII-5

TABLE XIII-19

Projected Wastewater Design Flow Summary

OPTION NO. 4

SERVICE AREA	AVERAGE DAILY FLOW (MGD) 1990	2000	2010	2020
Rowlett/Wilson Creek	24.9	37.4	51.2	65.8
Frisco	0.9	1.5	2.5	3.3
Wylie (Muddy Creek)	1.3	4.4	6.1	7.5
- Seis Lagos	0.1	0.1	0.1	0.1
Farmersville	0.4	0.6	0.9	1.9
Royse City	0.4	0.5	1.0	1.6
TOTAL	28.0	44.5	61.8	80.2

Note: The Muddy Creek Regional Plant must have wastewater capacity for the City of Rowlett (an additional 4.0 mgd in the year 2010) if a regional plant is constructed in this area.

TABLE XIII-20

ROWLETT/WILSON CREEK SERVICE AREA

DESIGN FLOWS

OPTION 4

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	2,820	0.310	0.776	3,610	0.397	0.993
COUNTRY RIDGE DEV. (MELISSA)	130	0	0.000	0.000	230	0.030	0.075	310	0.040	0.101	400	0.052	0.130
FAIRVIEW, CITY OF	130	0	0.000	0.000	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	0	0.000	0.000	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
PRINCETON, CITY OF	130	0	0.000	0.000	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
MILLIGAN WSC/LOWRY CROSSING	110	0	0.000	0.000	0	0.000	0.000	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	4,700	0.517	1.293	5,550	0.611	1.526
WESTON WSC/WESTON	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
ALTOGA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	560	0.062	0.154
CULLEOKA WSC	110	0	0.000	0.000	0	0.000	0.000	4,870	0.536	1.339	5,940	0.653	1.634
DANVILLE WSC	110	0	0.000	0.000	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,620	0.288	0.721
TOTAL		191,420	24.885	62.212	287,850	37.360	93.400	396,490	51.175	127.939	510,045	65.754	164.386

TABLE XIII-21

FRISCO SERVICE AREA

DESIGN FLOWS

OPTION 4

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
CELINA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	3,940	0.433	1.084	5,050	0.556	1.389
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
PROSPER, CITY OF	110	0	0.000	0.000	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
LEBANON WSC	130	0	0.000	0.000	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
TOTAL		6,830	0.888	2.220	12,110	1.540	3.850	19,900	2.463	6.157	26,405	3.252	8.130

TABLE XIII-22

WYLIE SERVICE AREA

DESIGN FLOWS

OPTION 4

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
SEIS LAGOS M.U.D.	130	470	0.061	0.153	600	0.078	0.195	600	0.078	0.195	600	0.078	0.195
LUCAS, CITY OF	130	0	0.000	0.000	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MURPHY, CITY OF	130	0	0.000	0.000	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
SACHSE, CITY OF	130	0	0.000	0.000	6,970	0.906	2.265	7,840	1.019	2.548	8,730	1.135	2.837
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232
LAVON WSC/LAVON	110	0	0.000	0.000	0	0.000	0.000	1,680	0.185	0.462	2,050	0.226	0.564
WYLIE NE WSC/SAINT PAUL	130	0	0.000	0.000	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
COPEVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	2,490	0.274	0.685	3,030	0.333	0.833
EAST FORK WSC	130	0	0.000	0.000	2,920	0.380	0.949	3,560	0.463	1.157	4,330	0.563	1.407
TOTAL		10,230	1.330	3.325	33,890	4.406	11.014	47,270	6.062	15.154	58,480	7.501	18.752

TABLE XIII-23

FARMERSVILLE SERVICE AREA

DESIGN FLOWS

OPTION 4

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
BLUE RIDGE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,280	0.141	0.352	1,640	0.180	0.451
FARMERSVILLE, CITY OF	130	3,080	0.400	1.001	4,460	0.580	1.450	5,950	0.774	1.934	7,620	0.991	2.477
WESTMINSTER WSC/WESTMINSTER	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,820	0.200	0.501
DESERT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,010	0.111	0.278
FROGNOT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	950	0.105	0.261
NORTH FARMERSVILLE WSC	110	0	0.000	0.000	270	0.030	0.074	310	0.034	0.085	360	0.040	0.099
VERONA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,790	0.197	0.492
WEST LEONARD WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
TOTAL		3,080	0.400	1.001	4,730	0.609	1.524	7,540	0.948	2.371	16,280	1.943	4.858

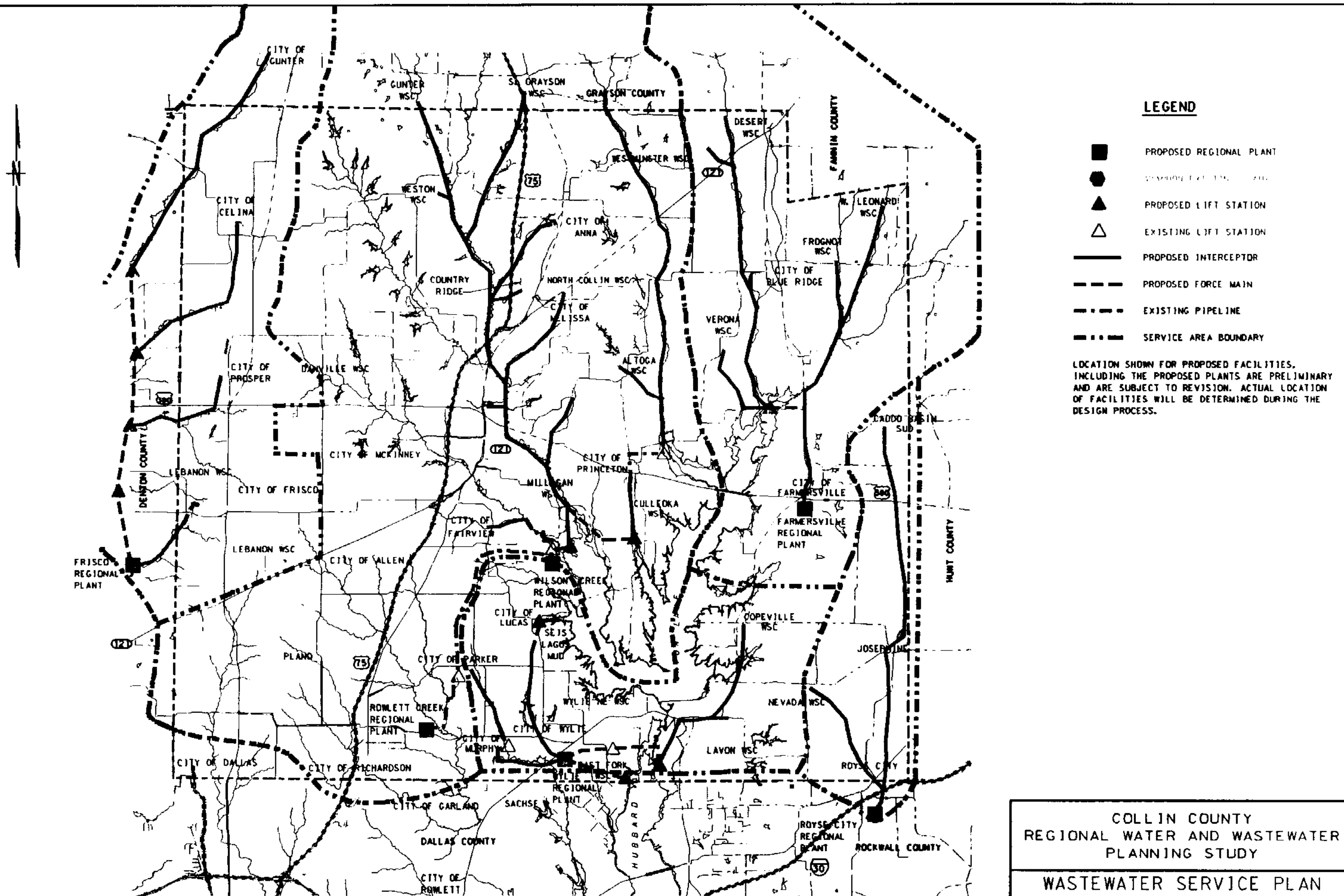
TABLE XIII-24

ROYSE CITY SERVICE AREA

DESIGN FLOWS

OPTION 4

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
JOSEPHINE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,120	0.123	0.308	1,440	0.158	0.396
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
NEVADA WSC/NEVADA	110	0	0.000	0.000	0	0.000	0.000	1,640	0.180	0.451	2,100	0.231	0.578
CADDO BASIN (HOPEWELL)	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,140	0.235	0.589
TOTAL		2,940	0.382	0.956	4,210	0.547	1.368	8,340	1.029	2.573	12,840	1.556	3.889



COLLIN COUNTY
REGIONAL WATER AND WASTEWATER
PLANNING STUDY

WASTEWATER SERVICE PLAN
OPTION 5

FIGURE XIII-6

TABLE XIII-25

Projected Wastewater Design Flow Summary

OPTION NO. 5

	AVERAGE DAILY FLOW (MGD)			
	1990	2000	2010	2020
SERVICE AREA				
Rowlett/Wilson Creek	24.9	37.4	51.2	65.8
Frisco	0.9	1.5	2.5	3.3
Wylie	1.3	3.3	4.9	6.1
Farmersville	0.4	0.6	0.9	1.9
Royse City	0.4	0.5	1.0	1.6
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TOTAL	27.9	43.3	60.5	78.7

TABLE XIII-26

ROWLETT/WILSON CREEK SERVICE AREA

DESIGN FLOWS

OPTION 5

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
ALLEN, CITY OF	130	20,000	2.600	6.500	28,960	3.765	9.412	38,660	5.026	12.565	49,540	6.440	16.101
ANNA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	2,820	0.310	0.776	3,610	0.397	0.993
COUNTRY RIDGE DEV. (MELISSA)	130	0	0.000	0.000	230	0.030	0.075	310	0.040	0.101	400	0.052	0.130
FAIRVIEW, CITY OF	130	0	0.000	0.000	2,220	0.289	0.722	2,960	0.385	0.962	3,790	0.493	1.232
MCKINNEY, CITY OF	130	24,180	3.143	7.859	35,010	4.551	11.378	46,730	6.075	15.187	59,880	7.784	19.461
MELISSA, CITY OF	110	0	0.000	0.000	1,260	0.139	0.347	1,680	0.185	0.462	2,150	0.237	0.591
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
PLANO, CITY OF	130	137,560	17.883	44.707	199,160	25.891	64.727	265,840	34.559	86.398	340,630	44.282	110.705
PRINCETON, CITY OF	130	0	0.000	0.000	5,750	0.748	1.869	7,680	0.998	2.496	9,840	1.279	3.198
RICHARDSON, CITY OF	130	9,680	1.258	3.146	12,450	1.619	4.046	14,510	1.886	4.716	16,610	2.159	5.398
MILLIGAN WSC/LOWRY CROSSING	110	0	0.000	0.000	0	0.000	0.000	2,480	0.273	0.682	3,030	0.333	0.833
NORTH COLLIN WSC/NEW HOPE	110	0	0.000	0.000	0	0.000	0.000	4,700	0.517	1.293	5,550	0.611	1.526
WESTON WSC/WESTON	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
ALTOGA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	560	0.062	0.154
CULLEOKA WSC	110	0	0.000	0.000	0	0.000	0.000	4,870	0.536	1.339	5,940	0.653	1.634
DANVILLE WSC	110	0	0.000	0.000	1,770	0.195	0.487	1,860	0.205	0.512	1,960	0.216	0.539
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
SOUTH GRAYSON WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,620	0.288	0.721
TOTAL		191,420	24.885	62.212	287,850	37.360	93.400	396,490	51.175	127.939	510,045	65.754	164.386

TABLE XIII-27

FRISCO SERVICE AREA

DESIGN FLOWS

OPTION 5

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
CELINA, CITY OF	110	0	0.000	0.000	0	0.000	0.000	3,940	0.433	1.084	5,050	0.556	1.389
FRISCO, CITY OF	130	6,830	0.888	2.220	9,890	1.286	3.214	13,200	1.716	4.290	16,910	2.198	5.496
PROSPER, CITY OF	110	0	0.000	0.000	1,710	0.188	0.470	2,280	0.251	0.627	2,920	0.321	0.803
GUNTER WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,065	0.117	0.293
LEBANON WSC	130	0	0.000	0.000	510	0.066	0.166	480	0.062	0.156	460	0.060	0.150
TOTAL		6,830	0.888	2.220	12,110	1.540	3.850	19,900	2.463	6.157	26,405	3.252	8.130

TABLE XIII-28

WYLIE SERVICE AREA

DESIGN FLOWS

OPTION 5

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
SEIS LAGOS M.U.D.	130	0	0.000	0.000	0	0.000	0.000	600	0.078	0.195	600	0.078	0.195
LUCAS, CITY OF	130	0	0.000	0.000	3,870	0.503	1.258	5,170	0.672	1.680	6,620	0.861	2.152
MURPHY, CITY OF	130	0	0.000	0.000	2,770	0.360	0.900	3,700	0.481	1.203	4,740	0.616	1.541
PARKER, CITY OF	130	0	0.000	0.000	1,040	0.135	0.338	1,390	0.181	0.452	1,780	0.231	0.579
WYLIE, CITY OF	130	10,230	1.330	3.325	14,810	1.925	4.813	19,770	2.570	6.425	25,330	3.293	8.232
LAVON WSC/LAVON	110	0	0.000	0.000	0	0.000	0.000	1,680	0.185	0.462	2,050	0.226	0.564
WYLIE NE WSC/SAINT PAUL	130	0	0.000	0.000	1,510	0.196	0.491	1,670	0.217	0.543	1,870	0.243	0.608
COPEVILLE WSC	110	0	0.000	0.000	0	0.000	0.000	2,490	0.274	0.685	3,030	0.333	0.833
EAST FORK WSC	130	0	0.000	0.000	1,020	0.133	0.332	1,250	0.163	0.406	1,520	0.198	0.494
TOTAL		10,230	1.330	3.325	25,020	3.253	8.132	37,720	4.820	12.051	47,540	6.079	15.197

TABLE XIII-29

FARMERSVILLE SERVICE AREA

DESIGN FLOWS

OPTION 5

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
BLUE RIDGE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,280	0.141	0.352	1,640	0.180	0.451
FARMERSVILLE, CITY OF	130	3,080	0.400	1.001	4,460	0.580	1.450	5,950	0.774	1.934	7,620	0.991	2.477
WESTMINSTER WSC/WESTMINSTER	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,820	0.200	0.501
DESERT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,010	0.111	0.278
FROGNOT WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	950	0.105	0.261
NORTH FARMERSVILLE WSC	110	0	0.000	0.000	270	0.030	0.074	310	0.034	0.085	360	0.040	0.099
VERONA WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,790	0.197	0.492
WEST LEONARD WSC	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	1,090	0.120	0.300
TOTAL		3,080	0.400	1.001	4,730	0.609	1.524	7,540	0.948	2.371	16,280	1.943	4.858

TABLE XIII-30

ROYSE CITY SERVICE AREA

DESIGN FLOWS

OPTION 5

ENTITIES	PER CAPITA USAGE (GPCD)	1990			2000			2010			2020		
		POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)	POPULATION	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
JOSEPHINE, CITY OF	110	0	0.000	0.000	0	0.000	0.000	1,120	0.123	0.308	1,440	0.158	0.396
ROYSE CITY, CITY OF	130	2,940	0.382	0.956	4,210	0.547	1.368	5,580	0.725	1.814	7,160	0.931	2.327
NEVADA WSC/NEVADA	110	0	0.000	0.000	0	0.000	0.000	1,640	0.180	0.451	2,100	0.231	0.578
CADDO BASIN (HOPEWELL)	110	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	2,140	0.235	0.589
TOTAL		2,940	0.382	0.956	4,210	0.547	1.368	8,340	1.029	2.573	12,840	1.556	3.889

E. COST ESTIMATES

Cost estimates developed for each service area in the five options are for planning purposes only and provide conceptual cost ranges for alternative comparisons. Actual costs can only be determined when the scope of work for specific projects has been clearly defined. The cost estimates in this report are based on recent bid information on similar construction items in the Collin County area, provided by engineers and contractors and recently completed projects built for the NTMWD. All costs shown represent 1989 dollars.

Three types of costs are included: (1) capital costs, (2) operation and maintenance costs, and (3) annual costs. Capital costs include the price of construction, a 10 percent contingency amount, and a 15 percent fee to cover engineering and administrative costs.

The cost of interceptors, lift stations, and force mains is based on peak flow rates and United States Geological Survey (USGS) topographic maps. Treatment plant costs are based on a 5/5/2/1 effluent quality for plants discharging directly into Lake Lavon and a 10/15 effluent quality with considerations for advanced treatment for all other facilities. The actual cost of new facilities will depend on future discharge limitations at specific sites. Requirements for nitrification, dechlorination, denitrification, etc. will probably increase the costs of

10/15 facilities as shown in this report. The cost of land and the acquisition of right-of-way are also not included in this report.

Operation and maintenance costs include those cost items associated with the daily operation and maintenance of the facilities. These items generally include labor, supplies, materials, chemicals, and energy. The annual cost distributes the total cost to construct, operate and maintain the facilities and to retire bond indebtedness on a yearly basis. The debt service is based on 20 year bonds at 8 percent interest.

The cost estimates and corresponding construction for each option are categorized into one of three design year intervals, either by the year 2000, between the years 2000 and 2010, or between the years 2010 and 2020. This approach provides flexibility and allows for variations in population growth, location of population growth, and the timing of required facilities. The cost for each design period for each service area is shown in a range, on a per household basis using the initial population and the estimated population at the end of each 10-year period. The monthly cost for each household is based on a distribution of cost over the entire population for each service area. Tables XIII-31 through XIII-35 present cost data on all five wastewater service plan options. Table XIII-36 is a summary of capital cost for the wastewater collection and treatment options. Total cost for the options range from about $90 million for Option 5 to about $110 million for Option 3.

TABLE XIII-31

WASTEWATER SERVICE PLANS

COST ESTIMATES

OPTION NO. 1

SERVICE AREA	DESIGN YEAR INTERVALS 1990-2000	2000-2010	2010-2020	TOTAL
ROWLETT/WILSON CREEK				
- CAPITAL COST	$ 9.05	$ 15.67	$ 21.82	$46.54
- ANNUAL DEBT SERVICE	0.92	2.52	3.82	
- ANNUAL O&M COST	6.81-10.23	10.23-14.01	14.01-18.00	
- TOTAL ANNUAL COST	7.72-11.15	12.75-16.53	17.83-21.82	
- COST/MONTH/HOME	10.08- 9.66	11.07-10.41	11.25-10.71	
FRISCO				
- CAPITAL COST	$ 8.97	$ 1.64	$ 3.40	$14.01
- ANNUAL DEBT SERVICE	0.91	1.08	0.52	
- ANNUAL O&M COST	0.16- 0.28	0.28- 0.45	0.45- 0.59	
- TOTAL ANNUAL COST	1.07- 1.19	1.36- 1.53	0.97- 1.11	
- COST/MONTH/HOME	39.17-24.57	28.08-19.22	12.19-10.51	
WYLIE				
- CAPITAL COST	$ 16.80	$ 9.38	$ 3.50	$29.68
- ANNUAL DEBT SERVICE	1.71	2.67	1.32	
- ANNUAL O&M COST	0.36- 1.21	1.21- 1.66	1.66- 2.05	
- TOTAL ANNUAL COST	2.07- 2.92	3.88- 4.33	2.98- 3.37	
- COST/MONTH/HOME	50.59-21.54	28.62-22.90	15.76-14.41	
FARMERSVILLE				
- CAPITAL COST	$ 0.00	$ 8.55	$ 2.89	$11.44
- ANNUAL DEBT SERVICE	0.00	0.87	1.16	
- ANNUAL O&M COST	0.11- 0.17	0.17- 0.26	0.26- 0.53	
- TOTAL ANNUAL COST	0.11- 0.17	1.04- 1.13	1.42- 1.69	
- COST/MONTH/HOME	8.93- 8.99	54.96-37.47	47.08-25.95	
ROYSE CITY				
- CAPITAL COST	$ 3.35	$ 1.83	$ 0.93	$ 6.11
- ANNUAL DEBT SERVICE	0.34	0.54	0.28	
- ANNUAL O&M COST	0.07- 0.10	0.10- 0.19	0.19- 0.28	
- TOTAL ANNUAL COST	0.41- 0.44	0.64- 0.73	0.47- 0.56	
- COST/MONTH/HOME	34.86-26.12	38.00-21.88	14.09-10.90	

Note: (1) All costs in 1989 million dollars except for Cost/Month/Home, which is shown in 1989 dollars.

(2) No assumption of debt is included for existing facilities.

TABLE XIII-32

WASTEWATER SERVICE PLANS

COST ESTIMATES

OPTION NO. 2

SERVICE AREA	DESIGN YEAR INTERVALS 1990-2000	2000-2010	2010-2020	TOTAL
ROWLETT/WILSON CREEK				
- CAPITAL COST	$ 6.34	$ 13.19	$ 19.39	$38.92
- ANNUAL DEBT SERVICE	0.65	1.99	3.32	
- ANNUAL O&M COST	6.81-10.02	10.02-13.52	13.52-17.33	
- TOTAL ANNUAL COST	7.46-10.67	12.01-15.51	16.84-20.65	
- COST/MONTH/HOME	9.74- 9.46	10.64-10.16	11.03-10.54	
FRISCO				
- CAPITAL COST	$ 8.97	$ 1.64	$ 3.40	$14.01
- ANNUAL DEBT SERVICE	0.91	1.08	0.52	
- ANNUAL O&M COST	0.16- 0.28	0.28- 0.45	0.45- 0.59	
- TOTAL ANNUAL COST	1.07- 1.19	1.36- 1.53	0.97- 1.11	
- COST/MONTH/HOME	39.17-24.57	28.08-19.22	12.19-10.51	
WYLIE				
- CAPITAL COST	$ 10.00	$ 2.04	$ 2.75	$14.79
- ANNUAL DEBT SERVICE	1.02	1.23	0.49	
- ANNUAL O&M COST	0.24- 0.59	0.59- 0.88	0.88- 1.11	
- TOTAL ANNUAL COST	1.26- 1.61	1.82- 2.11	1.37- 1.60	
- COST/MONTH/HOME	30.79-16.09	18.19-13.98	9.08- 8.41	
FARMERSVILLE				
- CAPITAL COST	$ 0.00	$ 5.11	$ 2.89	$ 8.00
- ANNUAL DEBT SERVICE	0.00	0.52	0.81	
- ANNUAL O&M COST	0.07- 0.11	0.11- 0.17	0.17- 0.35	
- TOTAL ANNUAL COST	0.07- 0.11	0.63- 0.69	0.98- 1.16	
- COST/MONTH/HOME	5.68- 5.81	33.30-22.88	32.49-17.81	
PRINCETON				
- CAPITAL COST	$ 3.00	$ 0.75	$ 5.14	$ 8.89
- ANNUAL DEBT SERVICE	0.31	0.39	0.60	
- ANNUAL O&M COST	0.09- 0.14	0.14- 0.28	0.28- 0.45	
- TOTAL ANNUAL COST	0.40- 0.45	0.53- 0.67	0.88- 1.05	
- COST/MONTH/HOME	25.19-19.57	23.04-13.35	17.53-12.85	
ROYSE CITY				
- CAPITAL COST	$ 3.35	$ 1.83	$ 0.93	$ 6.11
- ANNUAL DEBT SERVICE	0.34	0.54	0.28	
- ANNUAL O&M COST	0.07- 0.10	0.10- 0.19	0.19- 0.28	
- TOTAL ANNUAL COST	0.41- 0.44	0.64- 0.73	0.47- 0.56	
- COST/MONTH/HOME	34.86-26.12	38.00-21.88	14.09-10.90	

Note: (1) All costs in 1989 million dollars except for Cost/Month/Home, which is shown in dollars.

(2) No assumption of debt is included for existing facilities.

TABLE XIII-33

WASTEWATER SERVICE PLANS

COST ESTIMATES

OPTION NO. 3

SERVICE AREA	DESIGN YEAR INTERVALS 1990-2000	2000-2010	2010-2020	TOTAL
ROWLETT/WILSON CREEK				
- CAPITAL COST	$ 9.05	$ 15.67	$ 21.82	$46.54
- ANNUAL DEBT SERVICE	0.92	2.52	3.82	
- ANNUAL O&M COST	6.81-10.23	10.23-14.01	14.01-18.00	
- TOTAL ANNUAL COST	7.72-11.15	12.75-16.53	17.83-21.82	
- COST/MONTH/HOME	10.08-9.66	11.07-10.41	11.25-10.71	
FRISCO				
- CAPITAL COST	$ 8.97	$ 1.64	$ 3.40	$14.01
- ANNUAL DEBT SERVICE	0.91	1.08	0.52	
- ANNUAL O&M COST	0.16- 0.28	0.28- 0.45	0.45- 0.59	
- TOTAL ANNUAL COST	1.07- 1.19	1.36- 1.53	0.97- 1.11	
- COST/MONTH/HOME	39.17-24.57	28.08-19.22	12.19-10.51	
WYLIE				
- CAPITAL COST	$ 28.38	$ 8.51	$ 8.89	$45.78
- ANNUAL DEBT SERVICE	2.89	3.76	1.78	
- ANNUAL O&M COST	0.36- 1.21	1.21- 1.94	1.94- 2.61	
- TOTAL ANNUAL COST	3.25- 4.10	4.97- 5.70	3.72- 4.39	
- COST/MONTH/HOME	79.42-30.29	36.67-25.72	16.78-14.56	
ROYSE CITY				
- CAPITAL COST	$ 3.35	$ 1.83	$ 0.93	$ 6.11
- ANNUAL DEBT SERVICE	0.34	0.54	0.28	
- ANNUAL O&M COST	0.07- 0.10	0.10- 0.19	0.19- 0.28	
- TOTAL ANNUAL COST	0.41- 0.44	0.64- 0.73	0.47- 0.56	
- COST/MONTH/HOME	34.86-26.12	38.00-21.88	14.09-10.90	

Note: (1) All costs in 1989 million dollars except for Cost/Month/Home, which is shown in dollars.

(2) No assumption of debt is included for existing facilities.

TABLE XIII-34

WASTEWATER SERVICE PLANS

COST ESTIMATES

OPTION NO. 4

SERVICE AREA	DESIGN YEAR INTERVALS 1990-2000	2000-2010	2010-2020	TOTAL
ROWLETT/WILSON CREEK				
- CAPITAL COST	$ 9.05	$ 15.67	$ 21.82	$46.54
- ANNUAL DEBT SERVICE	0.92	2.52	3.82	
- ANNUAL O&M COST	6.81-10.23	10.23-14.01	14.01-18.00	
- TOTAL ANNUAL COST	7.72-11.15	12.75-16.53	17.83-21.82	
- COST/MONTH/HOME	10.08- 9.66	11.07-10.41	11.25-10.71	
FRISCO				
- CAPITAL COST	$ 8.97	$ 1.64	$ 3.40	$14.01
- ANNUAL DEBT SERVICE	0.91	1.08	0.52	
- ANNUAL O&M COST	0.16- 0.28	0.28- 0.45	0.45- 0.59	
- TOTAL ANNUAL COST	1.07- 1.19	1.36- 1.53	0.97- 1.11	
- COST/MONTH/HOME	39.17-24.57	28.08-19.22	12.19-10.51	
WYLIE				
- CAPITAL COST	$ 16.80	$ 9.38	$ 3.50	$29.68
- ANNUAL DEBT SERVICE	1.71	2.67	1.32	
- ANNUAL O&M COST	0.36- 1.21	1.21- 1.66	1.66- 2.05	
- TOTAL ANNUAL COST	2.07- 2.92	3.88- 4.33	2.98- 3.37	
- COST/MONTH/HOME	50.59-21.54	28.62-22.90	15.76-14.41	
FARMERSVILLE				
- CAPITAL COST	$ 0.00	$ 5.11	$ 2.89	$ 8.00
- ANNUAL DEBT SERVICE	0.00	0.52	0.81	
- ANNUAL O&M COST	0.07- 0.11	0.11- 0.17	0.17- 0.35	
- TOTAL ANNUAL COST	0.07- 0.11	0.63- 0.69	0.98- 1.16	
- COST/MONTH/HOME	5.68- 5.81	33.30-22.88	32.49-17.81	
ROYSE CITY				
- CAPITAL COST	$ 3.35	$ 1.83	$ 0.93	$ 6.11
- ANNUAL DEBT SERVICE	0.34	0.54	0.28	
- ANNUAL O&M COST	0.07- 0.10	0.10- 0.19	0.19- 0.28	
- TOTAL ANNUAL COST	0.41- 0.44	0.64- 0.73	0.47- 0.56	
- COST/MONTH/HOME	34.86-26.12	38.00-21.88	14.09-10.90	

Note: (1) All costs in 1989 million dollars except for Cost/Month/Home, which is shown in dollars.

(2) No assumption of debt is included for existing facilities.

TABLE XIII-36

WASTEWATER SERVICE PLAN

CAPITAL COST SUMMARY

1990 - 2020

	WASTEWATER OPTIONS				
SERVICE AREA	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5
Rowlett/Wilson Creek	$ 46.54 M	$ 38.92 M	$ 46.54 M	$ 46.54 M	$ 46.54 M
Frisco	$ 14.01 M	$ 14.01 M	$ 14.01 M	$ 14.01 M	$ 14.01 M
Wylie	$ 29.68 M	$ 14.79 M	$ 45.78 M	$ 29.68 M	$ 14.79 M
Farmersville	$ 11.44 M	$ 8.00 M	**	$ 8.00 M	$ 8.00 M
Princeton	*	$ 8.89 M	*	*	*
Royse City	$ 6.11 M	$ 6.11 M	$ 6.11 M	$ 6.11 M	$ 6.11 M
TOTAL	$107.78 M	$ 90.72 M	$112.44 M	$104.34 M	$ 89.45 M

NOTES: 1. All costs shown in 1989 Million dollars (M).
2. Capital Costs include construction costs, 10% contingency, and 15% for engineering and administration.

* Included in the Rowlett/Wilson Creek Service Area

** Included in the Wylie Service Area

Conclusions which can be made after reviewing the cost estimates are:

1. Option 5 is the most economical alternative,
2. The capital costs for the five options range from a low of $89.45 million to a high of $112.44 million,
3. The capital costs for the five options vary within a 20 percent cost range. Cost estimates developed for planning purposes which are within a 20 percent range are not considered to be significantly different,
4. The monthly user costs (cost/month/home) only include regional collection and treatment,
5. The monthly user costs are significantly higher in the less populated areas and in many cases could be cost prohibitive,
6. The capital cost of the Rowlett/Wilson Creek service area in Option 1 is essentially equivalent to the combined cost of the Rowlett/Wilson Creek and Princeton service areas in Option 2,
7. The elimination of the Farmersville plant as a regional facility in Option 3 is significantly more cost prohibitive than other options.

F. WATER CONSERVATION IMPACTS

Water conservation does have an impact on the cost and timing for the need of wastewater treatment facilities. With a reduction in water usage, the life of existing treatment plants can be extended and the need for new facilities can be delayed. This delay will postpone the need for new bond indebtedness and will reduce the cost of interest. Water conservation will not significantly affect the cost of construction, but will have a major impact on the cost of operation and maintenance (O&M).

Table XIII-37 shows the average annual savings by decade for each service area in Option No. 4 if the annual volume of wastewater flows is reduced by 10 percent. Option No. 4 has been selected as a representative alternative.

TABLE XIII-37

WATER CONSERVATION IMPACTS

AVERAGE ANNUAL O&M SAVINGS

SERVICE AREA	1990-2000	2000-2010	2010-2020
Rowlett/ Wilson Creek	$340,000	$470,000	$630,000
Frisco	10,000	10,000	15,000
Wylie	35,000	55,000	70,000
Farmersville	5,000	10,000	15,000
Royse City	5,000	10,000	15,000
TOTAL	$395,000	$555,000	$745,000

As shown on the preceding page, $395,000 can be saved every year through the year 2000, $555,000 can be saved annually from the year 2000 through the year 2010, and approximately $745,000 can be saved every year from 2010 to 2020. These annual savings accumulated over the entire planning period are shown for each service area in the following table.

TABLE XIII-38

ACCUMULATED WATER CONSERVATION SAVINGS
(Millions of Dollars)

SERVICE AREA	1990-2000	2000-2010	2010-2020	TOTAL
Rowlett/ Wilson Creek	$3.40	$4.70	$6.30	$14.40
Frisco	0.10	0.10	0.15	0.35
Wylie	0.35	0.55	0.70	1.60
Farmersville	0.05	0.10	0.15	0.30
Royse City	0.05	0.10	0.15	0.30
TOTAL	$3.95	$5.55	$7.45	$16.95

As shown above, almost $17 million could be saved in wastewater treatment O&M costs over the planning period with a 10 percent reduction in water usage.

G. RECOMMENDED PLAN

A rigid county-wide plan is not the best approach for Collin County. A rigid plan cannot account for: (1) unforeseen changes which may occur in the future, (2) diverse locations of population centers occurring within the county, (3) changes in the expected growth patterns, (4) the distinct drainage basins, and (5) the overlapping jurisdiction of several governmental entities. A rigid plan could not be responsive to economical and political needs and realities. The best overall direction for Collin County to pursue to insure public health and welfare regarding wastewater treatment needs includes a cooperative effort from several perspectives based on the following criteria:

1. The Collin County Water Authority should assume a leadership role in county water and sewer issues.

2. More rigid and enforceable rules and regulations should be adopted to regulate the installation and use of septic tanks and other private systems.

3. The Authority should work jointly with all water entities in the county to insure that all new water services are provided with approved wastewater treatment systems.

4. The Collin County Water Authority should establish an engineering position to oversee the use of septic tanks and to coordinate all water and wastewater activities in the county.

5. All municipal and regional wastewater treatment facilities should be owned or at least operated by NTMWD.

6. Regional wastewater treatment should be implemented when practical, feasible, and cost-effective.

7. Prior to the expansion of the existing municipal wastewater treatment facilities in the county, an evaluation of complete abandonment and connection to a regional system should be initiated and considered.

8. Wastewater treatment schemes should be confined to within regional service area boundaries.

9. Based on the analysis of the five service plan options, the following service areas should be defined for Collin County: (1) Rowlett/Wilson Creek, (2) Frisco, (3) Wylie, (4) Farmersville, and (5) Royse City.

10. The actual regional wastewater collection and treatment facilities developed for each service area should be based upon the population, characteristics, and needs of that specific area.

11. The Rowlett Creek Plant and the Wilson Creek Plant should continue to function as one facility. The Wilson Creek Plant should be expanded as necessary to treat all wastewater flows in the Rowlett/Wilson Creek service area.

12. When the Princeton treatment plant reaches capacity, a detailed study should be conducted at that time to determine if that plant should be abandoned with flows diverted to the Wilson Creek Plant or if the Princeton facility should be expanded and designated as a regional facility for a small drainage basin as defined in Option 2. At this time, the total capital costs of a separate Princeton service area versus Princeton being part of the Rowlett/Wilson Creek service area are essentially equivalent.

13. Currently, a wastewater treatment facility is being designed on Stewart Creek in Frisco. This facility should be designated as a regional site, and treat flows from the Frisco service area. This concept is similar to a plan developed in the Denton County Water and Wastewater Master Plan.

14. The wastewater facilities at Farmersville and Royse City should be designated as regional treatment sites and serve their respective service areas.

15. Discussions are in progress to construct a regional facility along Muddy Creek in the Wylie service area. This facility would be located in Dallas County and also serve the residents of Sachse and Rowlett. This alternative should be pursued as long as it remains feasible, practical, cost-effective, and politically

acceptable for this area. Another option for this service area would be to designate the existing Wylie facilities as a regional plant and make expansions as necessary for this part of the county.

H. <u>RETURN FLOWS</u>

Return flow is defined as wastewater effluent discharged into water supply reservoirs with the specific purpose of increasing the safe yield of that reservoir. With future water supplies being limited, the use of return flows will begin to play a more important role in meeting future water demands.

The location of the Wilson Creek Wastewater Treatment Plant provides NTMWD with the opportunity to utilize return flows into Lake Lavon. Currently, between 7.0 and 8.0 mgd is being discharged back into Lake Lavon. Studies are presently in progress to determine the overall impact of this effluent on water quality and to predict the total amount of return flows that could be discharged into the lake without affecting water quality. With the future discharge of water from Lake Texoma and Cooper Reservoir into Lake Lavon, any adverse impact of return flows would be minimized. Results from appropriate studies would verify the continued use of return flows.

I. ENVIRONMENTAL CONCERNS

The primary environmental concern is the public health of the residents of Collin County. The public health aspect is affected by the malfunctioning of septic tanks in the county and by stream degradation. Stream degradation is caused primarily by point and non-point source pollution. Point source pollution generally includes wastewater discharges from wastewater treatment plants. Non-point source pollution occurs from such sources as agricultural runoff, stormwater runoff, street and urban runoff, and watershed runoff. These environmental problems are considered as long-term concerns.

The soils in Collin County generally have permeability characteristics that do not support the use of septic tanks. The construction of septic tanks with inadequate holding tanks, insufficient drain fields, or installed in densely populated areas will continue to threaten and jeopardize the public health and will provide a source of serious illness or death.

Wastewater treatment facilities that are overloaded or improperly operated will continually violate the standards defined by the discharge permit. These plants are generally smaller in size and do not have adequately trained and experienced personnel. The flows from these plants pollute creeks and downstream water supplies. Poorly operating treatment plants are a constant threat to biological life in streams and rivers. Polluted streams can also create health hazards in farm animals, which are part of the natural food chain. The elimination of malfunctioning septic tanks and small improperly operated wastewater treatment plants would create a positive impact on the Collin County environment.

J. LEGAL CONSIDERATIONS

The major legal issues associated with wastewater treatment in Collin County include the regulation of septic tanks, county-wide water and sewer authority, regional authority to provide wastewater treatment, and the discharge permitting process.

Section 26.032 of the Texas Water Code grants the authority to any county to enter an order, resolution or other rule to abate or prevent pollution or injury to public health arising out of the use of private sewage facilities. In April of 1983, the Commissioners' Court of Collin County entered Order No. 83-194-4-4 to regulate the installation and use of private sewage facilities. This Order provides the legal framework to insure that the public health will not be threatened due to improperly constructed or operating septic tanks.

The Collin County Commissioners' Court submitted to a special session of the 1989 Texas Legislature a legislative act that created a special district coterminous with the boundaries of Collin County. This act, upon passage by the legislature and signing of the Governor, established a county-wide water and sewer authority capable of coordinating the orderly development of the unincorporated areas of the county with regard to water and sewer facilities. The passage of this act greatly enhanced the County's ability to protect public health.

Currently, the NTMWD has regional authority for water and wastewater treatment in Collin County. This authority allows the NTMWD to own, operate, or regionalize any facilities in the county as necessary to implement the recommendations of this report. A final legal issue, which could be managed by NTMWD, is the discharge permitting process for wastewater treatment plants. NTMWD has the resources to work with the TWC to obtain, transfer, or modify discharge permits as necessary for regionalization of wastewater treatment.

SECTION XIV

INSTITUTIONAL ORGANIZATION AND FINANCING

A. INTRODUCTION

A work task in the Collin County Regional Water and Wastewater Planning Study was to review and evaluate the types of institutional organizations which could be used to regionally plan, finance, develop, operate and maintain water and wastewater infrastructure in Collin County. In addition, a review was to be made of financing alternatives for water and wastewater projects.

The Texas Constitution authorizes the creation of districts to provide water and wastewater services under Article III, Section 52 and Article XVI, Section 59. Most districts today operate under Article XVI, Section 59 because it is not as restrictive as Article III, Section 52.

Districts may be general law or special law. General law districts are created in accordance with existing laws, rules and regulations. The powers and authorities of general law districts are limited to those granted under the general law. Special law districts are created by specific acts of the Texas Legislature with powers and authorities as granted by the special laws.

Regional planning and development of water and wastewater infrastructure requires an authority that has the ability to serve the entire region. However, political considerations would seem to require that unique sub-districts of that authority retain control over projects within that unique sub-district. General law districts do not provide for sub-district controls in the district. Thus, a special law district, conveniently termed a water authority, is deemed most appropriate to provide water and wastewater services in Collin County. The water authority created by the special law would have oversight responsibility for the planning, financing, development and operation of water and wastewater infrastructure. Within the water authority, sub-districts would be formed with the responsibility to plan and develop projects in accordance with the regional plan of the water authority. Power of taxation would be vested in voters within each sub-district for projects within that sub-district.

Primary alternatives to the proposed water authority are: (1) existing regional entities expand as requested into Collin County, and (2) interlocal cooperative agreements among entities in the county. These alternatives are not attractive because they are not truly regional in scope, do not provide coverage to all of the county and promotes competition between entities.

Financing for proposed projects can be accomplished by loans, selling of bonds or privatization of projects. Public works projects are usually financed by selling revenue bonds and/or general obligation bonds. In addition to the sale of bonds on the open market, programs administered by the Texas Water Development Board offer attractive financing for water and wastewater infrastructure projects. Some of the financing programs at the state require "hardship" tests as a part of the eligibility criteria. However, the state financing programs are designed to encourage regional projects.

Privatization of water and wastewater infrastructure or portions of the overall system can be financially attractive. However, each individual project must be closely examined to determine the benefits of using privatization for that specific project.

B. INSTITUTIONAL ORGANIZATION

1. General

The Constitution of the State of Texas contains two provisions under which "districts" can be formed to plan, implement, operate and maintain water and wastewater projects. These provisions are Article III, Sections 52(b)(1) and (2), and Article XVI, Section 59.

DISTRICTS CREATED UNDER ARTICLE III, SECTION 52

The Texas Constitution was amended in 1904 to allow for creation of districts which are authorized to:

- Provide for drainage by improving river flows;
- Improve navigation;

- o Provide for irrigation;

- o Do anything in aid of these purposes; and

- o Engage in fire-fighting activities.

The 1904 Amendment was found to be restrictive in its limitation as to the maximum amount of indebtedness which a district might create to accomplish water conservation purposes. Thus, in 1917, Article XVI, Section 59 was added to the constitution to allow creation of districts as governmental agencies with power to incur such debts as might be necessary. Most, if not all districts today operate today under Article XVI, Section 59.

DISTRICTS CREATED UNDER ARTICLE XVI, SECTION 59

Article XVI, Section 59, authorizes districts created under that provision to:

- o Control, store, preserve, and distribute water and floodwater and the water of rivers and streams for irrigation, power, and all other useful purposes;

- o Reclaim and irrigate arid land which needs irrigation;

- o Reclaim, drain, conserve and develop forest, water, and hydroelectric power;

- Provide for the navigation of coastal and inland water;

- Control, abate, and change shortage and harmful excess of water;

- Protect, preserve and restore the purity and sanitary condition of water;

- Preserve and conserve all natural resources of the State; and,

- Engage in fire-fighting activities.

2. Methods of Creation

The legislature allows districts under both Constitution provisions to be created in two ways:

a. General Law

General Statutes in the Water Code and elsewhere allow the public to petition County Commissioners Courts or the Texas Water Commission for creation of a general law district. Commission records show over 800 active "districts" created as general law districts.

b. Special Law

The Legislature creates special law districts. Each district operates under one or more special laws which apply only to that district. Commission records show over 400 active "districts" created under special law.

3. Types of Districts

a. General Law Districts

Several major types of General Law Districts are in the water code and could be applicable to Collin County's needs. These include:

- o Water Control and Improvement Districts (WCID)
- o Fresh Water Supply Districts (FWSD)
- o Municipal Utility Districts (MUD)
- o Water Improvement Districts (WID)

b. Special Law Districts

Special Law Districts are usually patterned after one of the types of General Law Districts, but their duties and powers may vary greatly from General Law Districts. There are dozens of variations by many different names as illustrated by the following:

- o Water Authorities
- o Utility Districts
- o Public Utility Districts
- o Municipal Utility Districts
- o Municipal Water Supply Districts

4. Comparison of General Law and Special Law Districts

a. General Law Districts

The various types of General Law Districts offer a wide latitude for operation and organization. The Water Control and Improvement type district under the general law, while not incorporating all features that may be desired for Collin County, does provide several of the features that a district would generally desire. This is reflected in the fact that there are over 250 districts of this type active in Texas. The Water Control and Improvement type of district could maximize the economic and industrial development potential of the County.

b. Special Law Districts

Special Law Districts have the advantage of being able to incorporate into their powers and controls features that would be of benefit to the organizing entity but these features would undoubtedly have to be in harmony with the Texas Water Commission and other affected regulating bodies.

The disadvantage of forming a Special Law District is that time and money will be involved. A special law must be passed by the legislature to create the district.

Features desired for a water authority to serve Collin County should include the following which are generally not available for a general law district:

- o The ability to create sub-districts within the county which have authority to implement water/sewer related projects to benefit that sub-district.

- o The unique feature of allowing the authority to have no power of taxation, but the sub-districts having power of taxation, with voter approval.

5. Alternatives to a County-wide Authority

There are two alternatives to a county-wide authority which could be used to plan, provide, operate and maintain regional water and wastewater infrastructure in Collin County.

- o Existing authorities provide regional services throughout the county.

- o Have multiple interlocal cooperation projects where specific entities join for specific regional projects.

There may be many variations of these general alternatives but the variations will have characteristics typical of their primary alternatives.

a. Alternative 1 - Use Existing Regional Authorities

The North Texas Municipal Water District, the Trinity River Authority, the City of Dallas Water Utilities and Tarrant County Water Control and Improvement District No. 1 are all regional authorities which could contract to provide water and wastewater services to entities in Collin County. Then regional authorities are able to contract to provide services to existing entities but do not have the ability to create new authorities to give geographic coverage to the entire county.

Use of an existing regional authority will not bring the entire county into a district which can plan and implement regional water and wastewater projects. The use of an existing authority is not a complete regional approach to providing services. Authorities would tend to be protective of "self" first when providing services beyond their current customers.

It should be noted that existing regional authorities are important to insuring the long term supply of water to Collin County and the importance should not be minimized.

b. Alternative 2 - Multiple Interlocal Cooperation Projects

Regional water and wastewater projects could be encouraged by entities entering into a multiple number of interlocal cooperation agreements. However, the disadvantages for this alternative are that not all areas of the county would be covered by the agreements and "regional" planning and implementation would only be between specific parties entering the interlocal cooperation agreements. In addition, there would be no ability to regulate water quality in unincorporated areas.

6. Conclusions

The type of district best suited for Collin County appears to be a special law district (water authority) drafted in accordance with Article XVI, Section 59 of the Texas Constitution.

The special district (water authority) will enable Collin County to incorporate those features deemed most appropriate and in accordance with the needs of the county, the large number of existing entities in the county and the rapidly changing nature of the county.

TABLE XIV-1

MATRIX OF POWERS & CONTROLS OF MAJOR TYPES OF GENERAL LAW DISTRICTS[1]

POWERS & CONTROLS	TYPE OF DISTRICT: Water Control & Improvement District	Fresh Water Supply District	Municipal Utility District	Water Improvement District
1) CREATION				
By Commissioner's Court	Yes	Yes	No	Yes
By Texas Water Commission	No[2]	No	Yes	No
2) BONDS				
Revenue Bonds Approval by Voters	Yes	Yes	No	No
Tax Bonds Approval by Voters	Yes	Yes	Yes	Yes
3) POWERS AND DUTIES				
Develop & Sell Water for Beneficial Purposes	Yes	Yes	Yes	Yes
Flood & Drainage Control	Yes	No	Yes	No
May Provide Fire Fighting Protection	Yes	Yes	Yes	Yes
Irrigation	Yes	No	Yes	Yes
Promote Navigation	Yes	No	Yes	No
Waste Disposal or Sewer System	Yes	Yes	Yes	Yes
Broad Rule Making Powers	Yes	Limited	Yes	Limited
Condemnation Power	Yes	Yes	Yes	Yes
4) CONTROLS BY STATE				
Bond Approval	Yes	Yes	Yes	Yes
State Approvals & Permit	Yes	Yes	Yes	Yes
Continuing Right of Supervision	Yes	Yes	Yes	No

[1]This matrix gives only a general overview of power and controls that apply to major general law type districts. See the text in this section for specific details.

[2]Single county district only.

C. LEGISLATIVE ACT

In August of 1989, the Governor of the State of Texas signed into law the creation of a conservation and reclamation district called the Collin County Water Authority. This Legislative Act with 18 sections, is divided into two parts: (1) the Authority and (2) Subdistricts Within Authority.

The intent of this Act is to establish a mechanism that can provide on an orderly basis for the water and wastewater needs of the unincorporated territory of Collin County without impairment of powers of the incorporated municipalities of the county or other governmental agencies including water supply corporations.

Part I, THE AUTHORITY, provides for the creation; management; procedures; general powers and duties, specific powers and duties; bonds, notes, and contracts; contracts by municipalities and others; regulatory power; and asset disposition.

The boundaries of the Authority are coterminous with the existing boundaries of the county, but authority may extend beyond the County boundary as necessary to fulfill the purpose of the Authority. The Authority will be governed by a five member Board of Directors to be appointed by the Commissioners' Court. All actions of the Board are subject to approval by the Commissioners' Court. The rights, powers, privileges of the Authority do not supercede or have jurisdiction over any municipality, water supply corporation, water district, or any other political subdivision.

The Authority does not have the power to levy or collect ad valorem taxes, but does have the authorization to issue, sell, and deliver revenue bonds, notes, or other obligations without the need for an election.

The Authority may plan, layout, purchase, construct, acquire, contract for, lease, rent, own, operate, maintain, repair and improve, inside or outside it's boundaries any facilities that are necessary, helpful, or incidental to insure that adequate water and wastewater facilities are available for the residents of the study area. The Authority may also apply for and receive grants from any state, federal or local agency. Additionally, the Authority may adopt rules and regulations for the development of water and wastewater systems within the unincorporated territory of the county, but may not adopt rules and regulations that conflict or are inconsistent with existing rules and regulations of any municipality or water supply corporation.

The Authority also has limited powers of eminent domain for land, easements, and rights-of-way. These powers do not include property owned by the County, any municipality or other agency, or to acquire water and/or wastewater facilities owned by a municipality, private parties, or by any non-profit water supply corporation.

Part II, SUBDISTRICTS WITHIN AUTHORITY, provides for the creation of subdistricts; meetings of the Board of Supervisors; subdistrict offices and meeting places; collection of taxes within subdistricts; and the conversion of water supply corporations to subdistricts.

A subdistrict can be created, beginning with the submission of a petition that is signed by at least twenty-five people who own property within the boundaries of the proposed subdistrict. The petition must include a metes and bounds description of the boundaries and the general nature of the improvements to be acquired, constructed or otherwise implemented. The petition must additionally state the necessity and feasibility of the improvements, and must state whether the power to levy and collect ad valorem taxes within the subdistrict is being requested.

A public hearing, with proper notification, will be conducted by the Commissioners' Court to hear the supporting or opposing views of the subdistrict creation. Based on the findings, the Commissioners' Court shall enter an order for granting the petition for creation or for dismissal of the petition. The Commissioners' Court shall not order the creation of a subdistrict inside the boundaries of an incorporated city, or any portion of land within two miles of the incorporated boundary of a city or the extraterritorial jurisdiction of such city, without the express approval of that incorporated city with the same being applied to water supply corporations. If the Commissioners' Court orders the creation of a subdistrict that requested the power to levy and collect ad valorem taxes, then a confirmation election must be conducted within the proposed boundaries of the subdistrict. In this election, a majority of the qualified voters must approve the creation of the subdistrict.

The subdistricts in the Act shall be conservation and reclamation districts. A subdistrict shall not be authorized to provide services outside its boundaries except within its certified service area and shall never be expanded into the corporate limits of a municipality or inside a certificated water supply corporation service area without consent. The subdistrict shall also not have the power to issue bonds, notes or other securities.

The subdistrict shall be governed by a board of three supervisors appointed by the Commissioners' Court from among the residents of the subdistrict, or if none, from the County. The Board of Supervisors shall have general management powers in the subdistricts, but all budgets, rates, contracts, regulations, and fees must be approved by the Commissioners' Court. The County tax assessor-collector of the County shall maintain the tax rolls and collect all taxes for any subdistricts having taxing power. Taxes and other revenues collected within a subdistrict shall be used solely for purposes within that subdistrict, except for costs of administration by the Authority.

Upon the adoption of a resolution by the Board of Directors of any non-profit water supply corporation and the submission of a petition, the Commissioners' Court can consider the conversion of a water supply corporation into a subdistrict.

The preceding discussion has provided an overview of the Legislative Act that created the Collin County Water Authority. The entire Act, as written, is included in Appendix E of this Report.

D. FINANCING ALTERNATIVES

1. General

Conventional terminology divides the external market for funds into the money market and the capital market. The money market encompasses short-term debt securities (securities that will mature in less than one year). Money market securities include such issues as Treasury bills, commercial paper, bankers' acceptances, and certificates of deposit.

The capital market is for longer-term funds, that is, sources of financing with a time horizon of more than one year. Securities with a maturity of more than one but less than ten years may be generally considered to be intermediate-term securities. Long-term securities are considered to have a maturity of ten or more years.

In recent years the persistence of inflation and high interest rates has caused a shift toward more extensive use of intermediate-term debt in place of long-term debt. Bankers, investors and other lenders have become increasingly reluctant to commit funds to traditional fixed-rate, long-term bonds and loans. This reluctance has also resulted in the use of floating rate bonds which have interest rates that fluctuate with market rates.

Two primary sources of intermediate and long-term debt are term loans and bonds. A term loan is a loan that is paid off over some number of years (term of the loan). These loans are usually negotiated with a commercial bank, insurance company, or some other financial institution. Term loans can usually be negotiated fairly quickly and at a low administrative cost. Most term loans are fully amortized in that the principal and interest are paid off in installments over the life of the loan.

Bonds are intermediate to long-term debt agreements issued generally in units of $1,000 principal value per bond. Each bond represents two "promises" by the issuing organization: the promise to pay the stated interest rate (the "coupon rate") when due. Most bonds pay interest semiannually at a rate equal to one-half of the annual coupon rate. The term coupon rate arises from the fact that bond certificates have coupons attached that may be detached and redeemed for each interest payment. The second promise is to repay the principal when due.

Bonds may be sold directly to the public through investment bankers, or they may be privately placed with a financial institution such as a commercial bank, insurance company, corporate pension fund, or university endowment fund. A complete statement of the legal obligations of the issuing organization to the bondholders is contained in a document called the indenture. If the bond is publicly marketed, a trustee is a commercial bank or investment banker. In the case of a privately placed issue, the purchasing institution normally acts as its own trustee.

The bond indenture normally specifies a number of restrictive covenants to which the issuing entity must adhere. These covenants are designed to protect the interests of the bondholders and generally describe various standards that the issuer must meet or action that the issuer may not take.

If the issuer should violate any terms of the indenture, then the bond is in default. The trustee will then take whatever steps are necessary to remedy the default. In extreme cases the trustee may demand immediate repayment of the entire bond principal and any accrued interest. Such an action will force refinancing of the issue or can even force the issuer into bankruptcy.

2. Sources and Forms

The financing method for implementation of public works projects have been traditionally bonds of various types. Financing for implementation of projects can be in a variety of sources or forms. Three primary sources and forms of funding are: bond sales by the entity, funding assistance from state and federal loan and grant programs and privatization.

3. Bonds

Implementation of feasible projects may be financed using bonds issued by the user or other sponsoring entity. The bonds may be revenue bonds, contract revenue bonds, general obligation bonds, combination bonds and other types of bonds. The type of bond selected for use will be determined by consultation with a financial advisor and/or bond counsel.

The following types of bonds may be considered for use:

a. Revenue Bonds

Revenue Bonds are secured and repayable solely from revenues derived from the operation of a facility acquired or constructed with the proceeds of the bond.

b. Contract Revenue Bonds

Contract revenue bonds are revenue bonds issued by an entity who in turn has a contract or contracts to provide services to another entity or other entities.

c. General Obligation Bond (Tax Bond)

General obligation bonds are backed by the full faith and credit and taxing power of the entity toward the repayment of these bonds.

d. Limited General Obligation Bonds

"Limited general obligation bonds" are similar to general obligation bonds but the bonds have a taxing power limited to the maximum tax rate of the issuing entity.

e. Combination Bonds

Combination bonds are issued to use a combination of revenue from the operation of a facility (revenue bonds) and the full faith and credit and taxing power of the entity (general obligation bonds) to secure funds for a project.

f. Tax Increment Bonds

Tax increment bonds are those which are secured by the increased value of property or retail sales occurring in a specific geographic area.

g. Private Activity Bonds

Private activity bonds could be issued but would not constitute an obligation by the entity. Instead, security for the bonds comes in the form of lease rentals paid by the private concern using the facility constructed or improved with the proceeds from the bond.

h. Tax Anticipation Bonds

Tax anticipation bonds are short-term notes issued to generate cash and are repayable from tax revenues receivable at a later time.

i. Bond Anticipation Notes

Bond anticipation notes are short-term securities issued to provide funds for construction or other activities until such time as long-term bond financing is secured.

j. Special Assessments

Special assessment bonds are paid for by charges assessed against property owners based on the benefit gained from an improvement.

4. Governmental Grants and Loans

Federal and state grants and loans have been a source of financing for eligible water and wastewater projects. The federal agencies which have been most active in loans and grants for water and wastewater projects are the Environmental Protection Agency, the Department of Housing and Urban Development and the Farmers Home Administration.

The State agencies most commonly associated with loans and grants for water and wastewater projects are the Texas Water Development Board and the Texas Department of Commerce. It should be understood that the loan programs are in fact, bond programs where the state agency purchases bonds issued by the entity implementing a project.

a. Environmental Protection Agency

The Environmental Protection Agency (EPA) historically provided grants for wastewater system construction through its Construction Grants Program. However, this program is now being phased out and funds shifted to a new program termed the "State Revolving Loan" (SRL) program. The operation of the SRL program in Texas has been delegated to Texas Water Development Board and will be further discussed under that heading.

b. Housing and Urban Development

The Housing and Urban Development Act of 1974 established a Community Development Block Grant program which provides direct grants to entities for the benefit of low and moderate income families, to prevent urban blight and to meet urgent needs. The purposes of the program include infrastructure projects much as water and wastewater.

The Act is administered by the Department of Housing and Urban Development (HUD) for those cities with populations greater than 50,000 or cities which are hubs of standard metropolitan statistical areas. The Texas Department of Commerce is delegated authority for administering the program for areas not administered by HUD.

The cities of Plano and Richardson are eligible to receive Community Block Grants from HUD, but must apply to HUD to receive grants. Other cities may apply to the Texas Department of Commerce. In Fiscal Year 1989, Texas will receive about $48 million in Community Development Block Grants.

c. Farmers Home Administration

The Farmers Home Administration has a program to loan funds for water supply projects for rural water supply systems. In Texas, these loans are ordinarily available to non-profit water supply corporations.

d. Texas Water Development Board

The Texas Water Development Board (TWDB) administers a number of loan programs for water and wastewater infrastructure.

(1) State Revolving Loan Program

The State Revolving Loan (SRL) Program was established as a replacement program for the Construction Grants Program. Funds are available from the SRL, which is administered by the TWDB, for wastewater system improvements and additions.

The SRL is funded at $165 million for Fiscal Year 1989. Funds are allocated to applicants based on a priority list. The priority list is established using a rating system which considers a number of factors including the capacity of current facilities versus current flows, the compliance history of an applicant with its discharge permit and the impact of the facility on downstream water quality. The May 1989 interest rate for these loans is 5-1/2 percent and the competition for these funds is intense.

(2) Texas Water Development Fund

The Texas Water Development Fund is a program whereby the state sells general obligation bonds to raise funds for the purchase of bonds issued by cities and districts in the state. The Texas Water Development Fund includes accounts for water quality enhancement and water supply.

The Water Quality Enhancement Loan Program is available for "hardship" applicants for improvements to wastewater facilities. The entity must prepare a preliminary engineering report which is used to justify a state loan. The May 1989 interest rate for these loans is 8 percent.

The hardship requirement is to ensure that the state is a "lender of last resort." The owners must be unable to obtain financing from the open market at reasonable interest rates to be eligible for the program. An exception is regional projects. Regional projects can be financed by the loan program without the hardship test. This is done to promote regionalization.

The Water Supply Development Loan Program is structured similar to the Water Quality Enhancement Loan Program. The Water Supply Development Loan Program is oriented to water supply development projects.

5. Privatization

Privatization is becoming an attractive alternative for funding and development of public works projects. In general, privatization involves contracting with a private sector provider to plan, finance, develop, operate and maintain facilities for the public sector. The public entity enters into a contract with the private provider which ensures the private provider with the funds to recover its investment and expected profit.

Privatization is most attractive when the entity does not have the ability to publicly finance projects, when the entity desires to divest itself of the build-up employees required to operate facilities or when an entity may not have the staff capability to operate specific projects.

Privatization of public services can be a lower cost method of providing services. However, the individual needs and requirements of each project and entity should be considered prior to proceeding with this method of financing.

6. Conclusions

Numerous financing methods exist for water and wastewater projects. Revenue bonds and tax bonds seem to offer the most viable and attractive methods of financing. This is the case because the amount of money that could be raised is greater than the other financing alternatives provided. Initially, the only monies available would be from tax and revenue bonds with taxes coming from the area served and revenues generated by services provided by facilities constructed with revenue bonds. The district initially would own no facilities which would produce revenues. The same could be said for private activity bonds. It may be possible to induce a user of the district's services to pay money up front to reduce charges in the future.

After services, which were created by the facilities constructed by tax and revenue bond proceeds, are being provided, revenue bonds should be more attractive for district financing. The revenue bonds would be serviced by the district's revenue from the facilities in place and operating.

State loan programs are attractive because of their low interest rates. The "hardship and lender of last resort" criteria may preclude use of these loans for some areas and projects.

SECTION XV

IMPLEMENTATION

A. GENERAL

The successful implementation of water and wastewater services within Collin County will require a unified and coordinated effort on the part of all levels of government. Numerous rules, regulations, laws, permits and other governmental requirements can result in loss of momentum and lack of progress by entities without long-term commitment or resources to address and successfully satisfy each of the steps in the process of project development.

The Collin County Water Authority must serve as the focal point that brings together the required resources to meet the needs of the projected population.

B. ORGANIZATIONAL STRATEGY

The Collin County Water Authority is the organization charged with insuring orderly development of water and wastewater services for Collin County. The purposes of the authority are defined in the Legislative Act that created the Authority. This Act provides for a Board of Directors, responsibilities and powers available to the Authority, ability to provide funding, and the ability to create sub-districts as a mechanism to facilitate the construction of water or sewer facilities.

Once the Board of Directors is appointed by the Commissioners' Court, the Collin County Water Authority must take immediate steps to gain recognition and credibility as a useful and effective organization. The Authority must become highly visible to all entities in the county. This visibility will create a positive image and the on-going necessity for the Collin County Water Authority.

Ultimately, for the Authority to function as designed, a staff of administrative, financial, and engineering personnel will be required. The size of the staff will be governed by the operations of the Authority.

Even though many functions of the Authority may not be exercised initially, several efforts can be immediately utilized to show the usefulness of the Authority. The Authority, acting initially through one technical staff member can:

1. Represent the County on all water/sewer issues locally, regionally and state-wide.
2. Oversee the application, review process, installation, and inspection of private sewage facilities (septic tanks).
3. Develop rules and regulations regarding water and sewer facilities in the unincorporated areas.

4. Oversee inspection of water/sewer construction in the unincorporated areas.
5. Direct and administer all construction projects funded by the Collin County Water Authority.
6. Responsible for collection of water/sewer data base for all entities in the County.
7. Oversee publication of the County-wide water/sewer newsletter on a monthly basis.
8. Provide technical assistance when necessary to the water supply corporations, smaller cities, and other water/sewer companies that do not have adequate staff.
9. Provide support information to the Collin County Water Authority Board of Directors and the North Texas Municipal Water District as needed.
10. Develop and update county-wide water/sewer maps showing existing facilities.
11. Assist any entity or group of entities in planning studies that are consistent with water or wastewater regionalization.

The Organizational Chart on the following page illustrates the overall organization process.

C. INTER-GOVERNMENTAL COOPERATION

The accumulative success of the Collin County Water Authority is primarily based on cooperation. The Authority must be willing to work on a daily basis with the smaller cities and the water supply corporations by completely understanding the operation of small systems and their financial constraints. The Authority must develop a special relationship with the larger cities and the North Texas Municipal Water District, who will ultimately provide treated surface water and regional wastewater treatment to the residents of Collin County. The Authority must interface with other water authorities in the area including: (1) Dallas Water Utilities, (2) Upper Trinity Municipal Water District, (3) the Trinity River Authority, (4) Tarrant County Water Control and Improvement District No. 1, and (5) the City of Fort Worth.

The Collin County Water Authority should take an active role in coordinating information with the North Central Texas Council of Governments. Finally, the Authority must maintain a working relationship with the appropriate state agencies, including the Texas Water Development Board, the Texas Water Commission, the Texas Department of Health, and the Texas Department of Commerce.

D. SCHEDULE OF FACILITIES

1. Years 1990 through 2000

a. Lake Texoma discharges into Lake Lavon.
b. Lake Cooper discharges into Lake Lavon.

ORGANIZATIONAL CHART

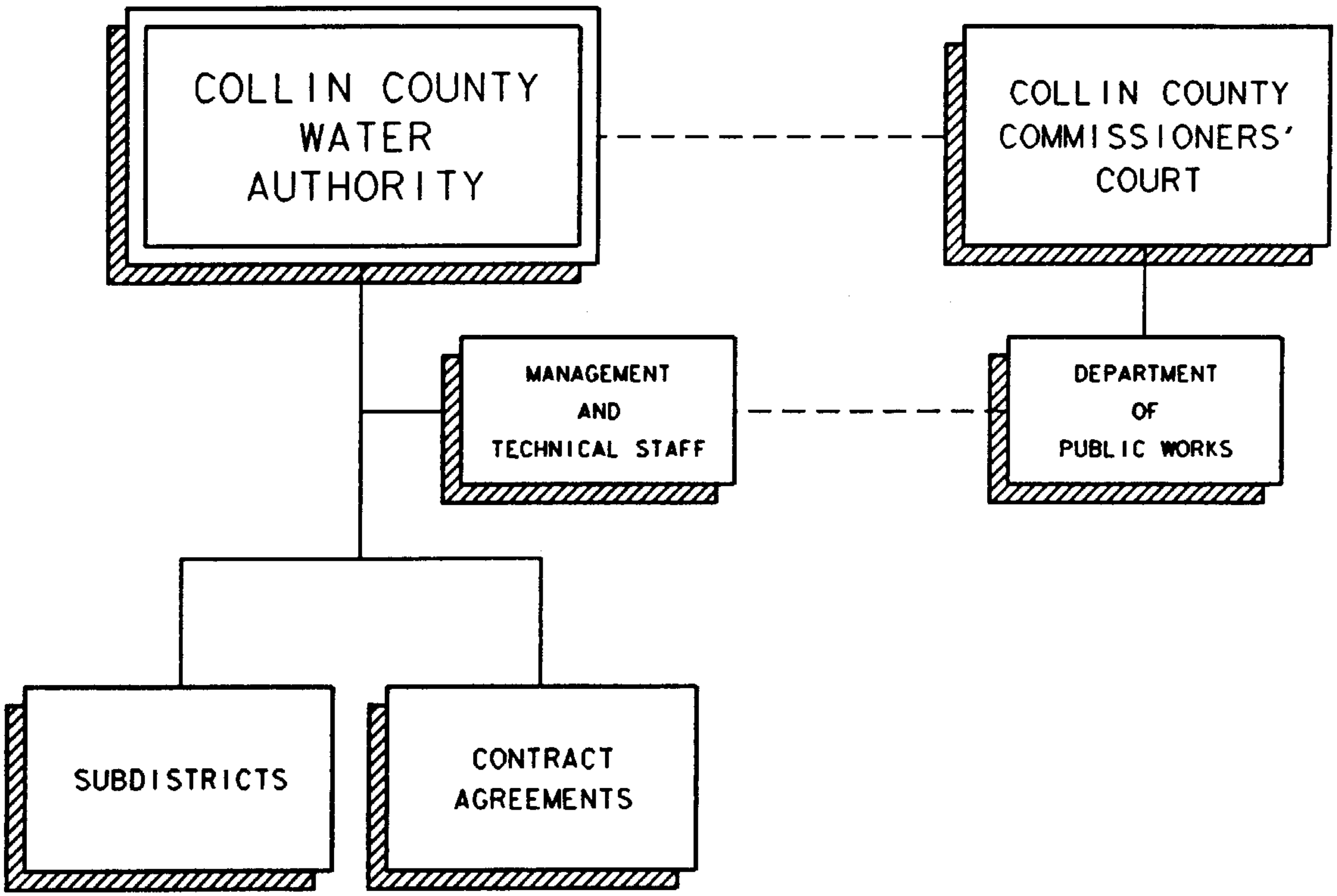

FIGURE XV-1

c. The new NTMWD water treatment plant begins operation.

d. Additional water delivery points are available for segments A, B, C, E, F, G, H, J, and the East Side Tie Line.

e. Wilson Creek treatment plant expansion completed from 8 mgd to 24 mgd.

f. In addition to Allen, McKinney, Plano, and Richardson, regional wastewater treatment will be made available to Country Ridge, Fairview, Melissa, Parker, Princeton and Danville WSC in the Rowlett/Wilson Creek Service Area.

g. A new regional facility on Stewart Creek near Frisco will become operational and serve Frisco, Prosper and Lebanon WSC.

h. A regional facility will be constructed along Muddy Creek in Dallas County and will serve Lucas, Murphy, Parker, Sachse, Wylie NE WSC, East Fork WSC, and the City of Rowlett. If this facility is not constructed, the existing Wylie plant will be designated as a regional facility and expanded as necessary. The Wylie facility will not serve Sachse or Rowlett.

i. The existing facilities in Farmersville will be designated as regional and serve the residents of the City of Farmersville and the N. Farmersville WSC during this period.

j. The Royse City facilities will be designated as regional and expanded to serve only the population for Royse City during this period.

2. <u>Years 2000 through 2010</u>

a. Additional surface water take points will be made available to entities on Segments B, C, D, I and K.

b. A new source of water supply will be required, probably from the New Bonham Reservoir.

c. The water treatment plant will require expansion.

d. The Wilson Creek WWTP will require expansion.

e. In addition to the existing customers, regional treatment will be available to Anna, Milligan WSC, North Collin WSC and Culleoka WSC in the Rowlett/Wilson Creek service area.

f. In the Frisco service area, regional treatment will be available to the City of Celina.

g. In the Wylie service area, plant expansion may be required and regional treatment will be extended to Lavon WSC and Copeville WSC.

h. By the year 2010, regional treatment will be available to the City of Blue Ridge in the Farmersville service area. The plant will also require expansion.

i. In the Royse City service area, regional treatment will be provided to Josephine and Nevada WSC.

3. Years 2010 through 2020

a. The water treatment plant will require additional expansion.
b. The Wilson Creek treatment plant will require expansion with regional treatment available to Weston WSC, Altoga WSC, portions of Gunter WSC, and South Grayson WSC.
c. The Frisco Regional Plant will require expansion with regional treatment provided to the portion of the Gunter WSC in the Frisco service area.
d. The regional facilities in the Wylie service area must be expanded.
e. In the Farmersville service area, regional treatment will be available to Westminster WSC, Desert WSC, Frognot WSC, Verona WSC, and West Leonard WSC.
f. In the Royse City service area, regional treatment will be available to Caddo Basin Special Utility District (formerly Hopewell WSC).

E. CASH FLOW PROJECTIONS

The following list shows the combined annual costs for water and wastewater facilities in the Collin County study area. The annual costs include debt service for future projects, and operation and maintenance costs anticipated in the years 2000, 2010, and 2020.

TABLE XV-1

COMBINED ANNUAL COSTS
(MILLIONS OF 1989 DOLLARS)

YEAR	WATER	WASTEWATER (Option 4)	TOTAL
2000	$19.80	$15.81	$35.61
2010	$28.28	$23.81	$52.09
2020	$27.58	$28.02	$55.60

As shown in the preceding table, an annual cost of $35.61 million will be required in the year 2000 to operate and maintain all regional water and wastewater facilities. Using the projected population in the year 2000, this annual amount is equivalent to an average of $8.20 per month per person. The $52.09 and $55.60 million in the years 2010 and 2020, respectively, is equivalent to a cost per month per person of an average of $9.10 and $7.70, respectively.

F. PLAN REVIEW AND UPDATE

The vision of facilities through the year 2020 in Collin County has been based on the preparation of the 1989 Water and Wastewater Planning Study using data primarily through the year 1988. Continued growth in Collin County is anticipated to be significant beyond the year 2020. Many additional facilities will obviously be required to meet the needs of this future population. This study has focused on the specific needs only through the year 2020, but has laid the foundation for the future planning necessary to accommodate the total build-out population of the county regardless of the actual timetable of growth.

In order for the Collin County Water Authority to be effective now and in the future, water and sewer data should be continuously collected from each entity on an annual basis. Using local information and data from NCTCOG, population projections and subsequent water demand projections should be updated at least every two years. Finally, the entire Planning Study should be reviewed and revised every five years beginning in 1995. This five-year incremental update will allow the planning process to continually project the facilities necessary to serve the ultimate population of Collin County.

SECTION XVI

RECOMMENDATIONS

A. GENERAL

1. During the preparation of this Report (August 1989) the Governor of the State of Texas signed into law the creation of a conservation and reclamation district known as the Collin County Water Authority. The purpose of this Authority is to provide on an orderly basis for the water and wastewater needs of the unincorporated territory of Collin County. With a sense of urgency, Collin County must quickly create a positive, helpful and useful image for this newly formed Authority. It is recommended that the Board of Directors be appointed by the Commissioners' Court as soon as possible and that a staff position be established to initially manage the daily affairs. It is imperative that the Collin County Water Authority immediately create a positive, non-threatening working relationship with all entities in the County that provide water and/or sewer service to the residents. A very special and unique partnership must be developed in the spirit of cooperation between the Collin County Water Authority and the NTMWD to insure that adequate water and sewer facilities will be available in the future for Collin County.

2. The Authority should develop a program to continually collect water and wastewater data on an annual basis; update population and water demand projections every two years based on information from TWDB, NCTCOG, U.S. Census Bureau, and each entity; and prepare an updated supplement to the original Planning Study every five years.

3. The Collin County Water Authority should work toward the development of standard rules, regulations, and procedures for the construction of water and wastewater facilities in the unincorporated areas. These standards should address fireflow requirements by reviewing current regulations of the Texas Department of Health, the State Board of Insurance, and the Fire Prevention Engineering Bureau. These standards along with the existing Collin County Subdivision Regulations would represent a comprehensive set of guidelines for the orderly development of the unincorporated areas.

B. <u>WATER</u>

1. The Collin County Water Authority should recognize the North Texas Municipal Water District as the regional authority for the treatment and delivery of potable surface water to serve the residents of the study area through the year 2020. By the year 2020, the study area could represent up to 55 percent of the water usage in the entire NTMWD service area.

2. Collin County and the NTMWD should participate and promote an area-wide program for the development of the Sulphur River Basin as a primary source of water to meet the joint needs of the regional water authorities located throughout the Dallas-Fort Worth area.

3. If the joint development of the Sulphur River Basin does not proceed on a schedule compatible with the water demands of Collin County, then the NTMWD should proceed with the development of the New Bonham Site. This facility needs to be operational by the year 2006.

4. Based on the projected growth of the NTMWD service area, including Collin County, additional water treatment facilities will be needed by the year 1993. With the anticipated diversion of flows from Lake Texoma, Cooper Reservoir, and the New Bonham Reservoir into the northern part of Lake Lavon, the new water treatment facilities must be located in proximity to the existing facilities on the southern side of Lake Lavon.

5. With the uncertainty of adequate groundwater as a long-term future supply, it is expected that by the year 2020 every entity in Collin County will be using treated surface water provided by the NTMWD. Remote parts of the extreme eastern and western portions of the county may be

more feasibly served by other sources. The proposed delivery system to supply water county-wide will be an expansion of the existing conveyance facilities. This conceptual plan is shown on Figure XI-2.

6. The actual distribution of water to retail customers is currently the responsibility of each entity. If requested by a subdistrict, the Authority could provide retail water service. Every entity should carefully examine the adequacy of their distribution system with regard to pressure, fireflow, and ground and elevated storage requirements. The Collin County Water Authority should develop a program capable of assisting entities both technically and financially, if desired.

7. The Collin County Water Authority should encourage and promote the adoption and enforcement of a water conservation plan and drought contingency measures by each entity. A realistic goal to reduce water consumption by 10 percent is recommended. The success of water conservation is strictly based on the attitude of each entity.

C. <u>WASTEWATER</u>

1. The Collin County Water Authority should recognize the North Texas Municipal Water District as the authority for regional wastewater collection and treatment. As the sole authority, the NTMWD should own and operate all regional wastewater treatment facilities that serve the residents in the Collin County study area.

2. The development of the rural, unincorporated areas of the county should not be done at the expense of the public health or the environment. The Soil Conservation Service has classified 99 percent of the soils in Collin County as having severe limitations regarding to the use of septic tanks. Septic tank use should be permitted only for truly rural farm-type applications to protect the health and welfare of the citizens. Even the use of temporary wastewater treatment facilities should be prohibited considering examples of both financial and water quality inadequacies experienced in some regions of the state where this practice has been allowed. The existing regulations for septic tanks should be reviewed for adequacy, revised if necessary, then strictly interpreted and enforced.

3. Every entity in Collin County that owns or operates a municipal wastewater treatment plant should investigate the possibility of allowing the NTMWD to purchase and/or operate their treatment facilities.

4. Regional wastewater treatment should be provided to the residents of Collin County within five separate service areas. The Rowlett/Wilson Creek service area would be provided with treatment by the existing Rowlett Creek Plant and the Wilson Creek Plant that would ultimately require expansion. This service area represents over 80 percent of the total treatment capacity required for the entire study area. The Frisco service area would be provided with treatment by a facility currently under

design on Stewart Creek near Frisco. A similar plan for this service area is identified in the Denton County Water and Wastewater Study. The existing facilities in Farmersville and Royse City should be designated as regional and expanded as necessary to serve the Farmersville service area and Royse City service area, respectively. Regional wastewater treatment for the Wylie service area could be provided by designating the existing Wylie Plant as regional or by constructing a new facility on Muddy Creek in Dallas County. The final choice will hinge upon the site most feasible to the entities in the immediate area.

5. All existing municipal facilities should continue to operate until existing flows approach the as-built plant capacity. At that time, plant expansion versus abandonment and connection to a regional system should be compared; focusing particular attention on cost, environmental concerns, and other important local issues.

APPENDIX A

LIST OF COLLIN COUNTY ENTITIES

REGIONAL WATER AND WASTEWATER PLANNING STUDY

DIRECTORY OF COLLIN COUNTY OFFICIALS

ENTITIES	REPRESENTATIVE	TITLE	MAILING ADDRESS		TELEPHONE NUMBER
COLLIN COUNTY	MR. CLARENCE DAUGHERTY	DIRECTOR PW	210 S. MCDONALD ST.	MCKINNEY, TX 75069	548-4619, 231-7170
NORTH TEXAS MWD	MR. CARL RIEHN	DIRECTOR	P.O. DRAWER C	WYLIE, TX 75098	442-5405 (OFFICE)
MUNICIPAL SYSTEMS					
ALLEN, CITY OF	MR. TOM GLAB, P.E.	CITY ENGINEER	ONE BUTLER CIRCLE	ALLEN, TX 75002	727-0100 (OFFICE)
ANNA, CITY OF	MR. JON HENDRICKS	MAYOR	P.O. BOX 767	ANNA, TX 75003	924-3325 (OFFICE)
BLUE RIDGE, CITY OF	MR. COTTON SAGELY	MAYOR	P.O. BOX 728	BLUE RIDGE, TX 75004	752-5791 (OFFICE)
CELINA, CITY OF	MR. STEVE SHUTT	CITY MANAGER	P.O. DRAWER D	CELINA, TX 75009	382-2682 (OFFICE)
COUNTRY RIDGE (MELISSA)	MR. JIM MASON	OWNER	4007 TRAVIS STREET	DALLAS, TX 75204	522-6070 (WORK)
FAIRVIEW, CITY OF	MS. JOYCE SECONDINE	CITY SECRETARY	P.O. BOX 551	MCKINNEY, TX 75069	542-0522 (OFFICE)
FARMERSVILLE, CITY OF	MR. BOB BRADY	CITY MANAGER	303 S. MAIN ST.	FARMERSVILLE, TX 75031	782-6151 (OFFICE)
FRISCO, CITY OF	MR. GEORGE PUREFOY	CITY MANAGER	P.O. BOX 177	FRISCO, TX 75034	377-2161 (OFFICE)
JOSEPHINE, CITY OF	MR. JOHN LEMLEY	MAYOR	P.O. BOX 129	JOSEPHINE, TX 75064	694-3111 (OFFICE)
LUCAS, CITY OF	MS. ANN GUZMAN	MAYOR	ROUTE 7 BOX 229	LUCAS, TX 75069	442-5562 (OFFICE)
MCKINNEY, CITY OF	MR. HAROLD CLARY, P.E.	DPW	P.O. BOX 517	MCKINNEY, TX 75069	238-0091 (OFFICE)
MELISSA, CITY OF	MR. BOB MILLER	MAYOR PRO-TEM	P.O. BOX 409	MELISSA, TX 75071	837-2338 (OFFICE)
MURPHY, CITY OF	MS. LINDA MARLEY	CITY SECRETARY	205 N. MURPHY RD.	MURPHY, TX 75094	424-6021 (OFFICE)
PARKER, CITY OF	MS. BETTY MCMENAMY	CITY ADMIN.	100 E. PARKER RD.	PARKER, TX 75069	442-6811 (OFFICE)
PLANO, CITY OF	MR. JIM EATON	DIR. UTILITIES	P.O. BOX 860358	PLANO, TX 75086-0358	964-4160 (OFFICE)
PRINCETON, CITY OF	MR. LLOYD BEHM	CITY MANAGER	P.O. BOX 970	PRINCETON, TX 75077	736-2416 (OFFICE)
PROSPER, CITY OF	MR. GRADY SMOTHERMON	MAYOR	P.O. BOX 297	PROSPER, TX 75078	347-2304 (OFFICE)
RICHARDSON, CITY OF	MR. CLAY GOOCH, P.E.	ENGINEER	P.O. BOX 830309	RICHARDSON, TX 75083-0309	238-4224 (OFFICE)
ROYSE CITY, CITY OF	MS. DORIS WILLIAMS	CITY SECRETARY	P.O. DRAWER 638	ROYSE CITY, TX 75089	635-2250 (OFFICE)
SACHSE, CITY OF	MR. LLOYD HENDERSON	CITY MANAGER	3033 6TH STREET	SACHSE, TX 75048	495-1212 (OFFICE)
WYLIE, CITY OF	MR. RON HOMEYER, P.E.	CITY ENGINEER	P.O. BOX 428	WYLIE, TX 75098	442-2236 (OFFICE)

REGIONAL WATER AND WASTEWATER PLANNING STUDY

DIRECTORY OF COLLIN COUNTY OFFICIALS

ENTITIES	REPRESENTATIVE	TITLE	MAILING ADDRESS		TELEPHONE NUMBER
WSC SERVING INCORPORATED CITIES AND UNINCORPORATED AREAS					
LAVON WSC	MR. WILL MORROW	PRESIDENT	P.O. BOX 188	LAVON, TX 75066	853-2101 (OFFICE)
MILLIGAN WSC	MR. GLEN EASTHAM	PRESIDENT	365 BRIDGEFARMER RD.	MCKINNEY, TX 75069	542-1143 (HOME)
NORTH COLLIN WSC	MR. JOE BRALEY	PRESIDENT	P.O. BOX 383	MELISSA, TX 75071	837-2331 (OFFICE)
NEVADA WSC	MR. JOHN COOMER	PRESIDENT	ROUTE 1 BOX 115	NEVADA, TX 75073	457-5086 (WORK)
WESTMINSTER WSC	MRS. RUTH ANN INGRAM	PRESIDENT	P.O. BOX 730	WESTMINSTER, TX 75096	924-3611 (WORK)
WESTON WSC	MR. KENNETH COWAN	PRESIDENT	P.O. BOX 158	WESTON, TX 75097	382-2419 (HOME)
WYLIE NE WSC	MR. DUANE HOLLOWAY	PRESIDENT	P.O. BOX H	WYLIE, TX 75098	442-2075 (OFFICE)
WSC SERVING UNINCORPORATED AREAS ONLY					
ALTOGA WSC	MR. J.W. MILLER	PRESIDENT	ROUTE 1 BOX 59	PRINCETON, TX 75077	542-7917 (HOME)
COPEVILLE WSC	MR. MORGAN BAKER	PRESIDENT	ROUTE 3 BOX 45	FARMERSVILLE, TX 75031	995-5914 (WORK)
CULLEOKA WSC	MRS. JUDY GILLIAM	SECRETARY	P.O. BOX 909	PRINCETON, TX 75077	736-2592 (OFFICE)
DANVILLE WSC	MR. PHIL RICHARDSON	SECRETARY	100 E. UNIVERSITY	MCKINNEY, TX 75069	542-0035 (OFFICE)
DESERT WSC	MR. E.P. TODD	MANAGER	ROUTE 1 BOX 19	TRENTON, TX 75490	364-2082 (HOME)
EAST FORK WSC	MRS. FAYE BOZMAN	SECRETARY	1610 TROY RD.	WYLIE, TX 75098	442-2505 (HOME)
FROGNOT WSC	MR. MARCUS TOMEK	PRESIDENT	ROUTE 1 BOX 219	BLUE RIDGE, TX 75004	952-4539 (WORK)
GUNTER WSC	MS. DONNA LOISELLE	SECRETARY	P.O. BOX 427	GUNTER, TX 75058	382-3222 (OFFICE)
CADDO BASIN (HOPEWELL)	MR. EDDY DANIEL	MANAGER	P.O. BOX L	CADDO MILLS, TX 75005	527-3504 (OFFICE)
LEBANON WSC	MR. SAM ROACH	PRESIDENT	P.O. BOX 340	FRISCO, TX 75034	377-3163 (OFFICE)
NORTH FARMERSVILLE WSC	MR. LARRY PUTTMAN	PRESIDENT	ROUTE 1 BOX 234 F	FARMERSVILLE, TX 75031	995-4136 (OFFICE)
SEIS LAGOS M.U.D.	MR. LYNDON BOSEMAN	PRESIDENT	P.O. BOX 861051	PLANO, TEXAS 75086	519-0064 (WORK)
SOUTH GRAYSON WSC	MR. JOHN SPENCER	MANAGER	P.O. BOX 2	VAN ALYSTYNE, TX 75095	482-6231 (OFFICE)
VERONA WSC	MR. BILL STROUP	PRESIDENT	ROUTE 1 BOX 62	BLUE RIDGE, TX 75004	995-1395 (WORK)
WEST LEONARD WSC	MR. BOB MILSAP	MANAGER	P.O. BOX 327	LEONARD, TX 75452	587-3503 (HOME)

REGIONAL WATER AND WASTEWATER PLANNING STUDY

DIRECTORY OF COLLIN COUNTY OFFICIALS

ENTITIES	REPRESENTATIVE	TITLE	MAILING ADDRESS		TELEPHONE NUMBER
CITIES WITHOUT UTILITIES					
LAVON, CITY OF	MR. DAVE STANFIELD	CITY MANAGER	P.O. BOX 26	LAVON, TX 75066	853-3783 (HOME)
LOWRY CROSSING, CITY OF	MRS. PEGGY SIMPSON	MAYOR	P.O. BOX 100 CR 401	PRINCETON, TX 75077	736-3140 (HOME)
NEVADA, CITY OF	MR. GILES CALDWELL	MAYOR	ROUTE 1 BOX 20	NEVADA, TX 75073	853-2631 (HOME)
NEW HOPE, CITY OF	MR. BUD GAY	MAYOR	P.O. BOX 562	MCKINNEY, TX 75069	548-2489 (OFFICE)
SAINT PAUL, TOWN OF	MR. BILL BUTSCHER	COUNCILMAN	745 PARKER RD LOOP	WYLIE, TX 75098	442-2486 (OFFICE)
WESTMINSTER, CITY OF	MR. RICHARD DAVIS	MAYOR	P.O. BOX 639	WESTMINSTER, TX 75096	924-3425 (HOME)
WESTON, CITY OF	MR. KENNETH COWAN	MAYOR	P.O. BOX 158	WESTON, TEXAS 75097	382-2419 (HOME)
OTHER AGENCIES					
NORTH CENTRAL TEXAS COG	MR. JOHN PROMISE	DIRECTOR	P.O. DRAWER COG	ARLINGTON, TX 76005-5888	817-640-3300
DALLAS WATER UTILITIES	MR. MICHAEL DAY	DEP. DIRECTOR	DWU CITY HALL	DALLAS, TX 75201	214-670-5209
TRINITY RIVER AUTHORITY	MR. BILL SMITH	MANAGER	P.O. BOX 240	ARLINGTON, TX 76010	817-467-4223
TARRANT CO. WCID # 1	MR. JAMES M. OLIVER	GEN. MANAGER	P.O. BOX 4508	FORT WORTH, TX 76106	817-335-2491
CITY OF LEWISVILLE	MR. STEVEN L. BACCHUS	DIRECTOR	151 W. CHURCH ST.	LEWISVILLE, TX 75067	214-219-3501
TEXAS WATER DEV. BOARD	MR. T. JAMES FRIES	CONSERVATION	P.O. BOX 13231	AUSTIN, TX 78711-3231	512-463-7940

APPENDIX B

LIST OF EXISTING REPORTS

AND REFERENCES

LIST OF EXISTING REPORTS/REFERENCES

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APPENDIX C

QUESTIONNAIRE USED FOR DATA COLLECTION

COLLIN COUNTY
Department of Public Works

November 23, 1988

Sent to Collin County Cities & Water Companies

Subject: Collin County Water and Wastewater Planning Study

Dear ____________________:

The Collin County Regional Water and Wastewater Planning Study has officially started. An initial public meeting was held in McKinney, Texas on November 16, 1988 to begin the study process and to inform entities of the action that will take place in the next few weeks.

The first vital step in the planning process will be to collect basic data and information on all existing water systems and wastewater facilities in the County. A questionnaire has been prepared for this purpose and is being sent to each entity in the County. A copy of the questionnaire is enclosed. Although this form is similar to one which was prepared for the Water and Wastewater Committee of the Collin County Planning Board about two years ago, it is important that the requested information be supplied at this time. For the most part, the requested data and information will be a compilation of past performance with a few questions regarding your future plans.

Please review and complete the attached questionnaire as soon as possible and send the completed form to:

Alan V. Thompson, P.E.
Brown & Root U.S.A., Inc.
% Hartwell Engineers
1216 Highway 75, Suite 101
McKinney, Texas 75069

McKinney, Texas 75069 • (214) 548-4619 • 231-7170 ext. 4619 (Metro)

If you need assistance or have questions, you may wish to contact one of the following members of the study team by telephone:

Alan V. Thompson, Brown & Root, Houston (713) 676-4613
Bill Price, Brown & Root, Dallas (214) 630-3447
Charles E. Nemir, Brown & Root, Austin (512) 346-3056
Gary R. Hartwell, Hartwell Engineers, McKinney, (214) 548-9944)

A member of the study team will contact you in a few days to offer assistance in this process. Another public meeting has been scheduled for 7:30 p.m., December 15, 1988, in the Collin County Courthouse, (Central Jury Room, 5th Floor), McKinney,Texas, to review the data and information and to discuss future actions. We urge your attendance.

Your cooperation and prompt response to the questions will be appreciated.

Sincerely,

Clarence Daugherty
Director of Public Works

cc: Judge Roberts and County Commissioners

DATA FOR THE COLLIN COUNTY REGIONAL WATER/WASTEWATER STUDY - PART I - WATER

General Information

Water System ______________________________ Date ____________
(city, town, water supply, MUD, other)

Contact Person ____________________________ State ID No. ____________

Address ______________________________________

Telephone No. (____) ________________ Population ______________ (CURRENT)

Customers (taps) _______ 1988 _______ 1987 _______ 1986 _______ 1985 _______ 1984

Water Rates $__________/__________ gallons Base Amount
$__________/__________ gallons Above Base Amount
$__________/__________ gallons Additional

Tap Fee $____________________ Other/Impact Fee $____________________

Ground Water Supply (If not applicable, go to Surface Water Supply)

No. of Wells Owned _______ Purchase Groundwater _______

Well No.	Capacity (gpm)	Formation (Woodbine, Paluxy, Trinity)	Depth (feet)
1			
2			
3			

Please provide copies of latest water quality analyses.

Surface Water Supply

Purchase Surface Water _______ if yes, goto next section on Purchased Water
(Y/N)

Own Supply _________ Source of Supply __________________________
(Y/N) (Name of Lake)

Intake Pump Capacity No. 1 __________ gpm No 2. ____________ gpm
No. 3 __________ gpm, Total ____________ gpm

Purchased Water

Source(s) of Purchase ____________________ Location __________________
(City, WSC, District) (Well-Formation or Lake)

Cost of Purchased Water __________ cents/1000 gal.

Other Financial Arrangements ____________________________________

Average Quantity Available __________________ million gallons/day

Maximum Quantity Available __________________ million gallons/day

Water Usage

Total Water Production: ________ million gallons (1987)
(as metered from Supply)

Total Water Consumption: ________ million gallons (1987)
(as used by customers)

Average Daily Water Production ________ mgd (1987) ________ gpcd

Average Daily Water Consumption ________ mgd (1987) ________ gpcd

Maximum Daily Production ________ mgd (1987)

Monthly Flow (1987) - million gallons

Month	Production	Consumption	Month	Production	Consumption
Jan.			July		
Feb.			August		
March			Sept.		
April			Oct		
May			Nov.		
June			Dec.		

Please attach monthly production/consumption data for 1982-86 and 10 months of 1988

Facilities

Ground Storage

Unit No.	Capacity (gallons)	Type (Welded, bolted, concrete-underground/aboveground)
1		
2		
3		
Total		

Elevated Storage

Unit No.	Capacity (gallons)
1	
2	
3	
Total	

Hydropneumatic (Pressure) Tanks

Unit No.	Capacity (gallons)
1	
2	
3	
Total	

High Service Pump Station

Station No.	Pump #1 (gmp)	Pump #2 (gpm)	Pump #3 (gpm)
1			
2			
3			

PART II - WASTEWATER TREATMENT

General Information Expiration Date________

Contact Person ______________________________ Permit No. __________

Address ____
Street or P.O. Box City State Zip Code

Date ____________________ Telephone No. (___)_________________

Owns Treatment Plant ________ (Y/N) Uses Septic Tanks ___________ (Y/N)

Discharges Into Another System ____________ (Y/N)

No.of Sewer Taps _____1988___1987 ___1986 Septic Tanks ___1988___1987___1986

Sewer Rates ________________(cents/1000 gal. or monthly fee)

Tap Fee $_______________ Other/Impact Fees $ __________________ (if used)

Treatment Plant

Type of Plant(s)-(describe) __________________________________
(Process, units-package or custom)

____

Average Capacity ____________mgd Peak Capacity ____________gpm

Discharge Parameters (30 day) _________mg/l BOD, ________mg/l TSS
________other ________mgd Average Flow ________mgd Max. flow

Flow Data (As listed on Monthly Self Reporting Form)-1987

Month	Flow mgd	BOD mg/l	TSS mg/l	Month	Flow mgd	Bod mg/l	TSS mg/l
Jan.				July			
Feb.				August			
Mar.				Sept.			
April				Oct.			
May				Nov.			
June				Dec.			

Average Daily Flow ____________mgd (current)
Maximum Daily Flow ____________mgd (current)
Peak Flow Rate ________________gph (current)
Please attach monthly data for 1982-1986 and 10 months of 1988

System Discharge

Discharge into what System/Stream ______________________________
(City, MUD, District, Stream, Other)

Terms of Agreement (if treatment provided by others)_________

____

Average Daily Discharge _________mgd
Cost of Treatment ______________cents/1000 gallons

Part III - General

Do you sell water to wholesale customers, who then resale the water on a retail basis to others? ____yes___no. If yes, what percentage is to wholesale customers? ____________

Do you sell water outside of Collin County? ___yes___no. If yes, what percentage is sold outside of Collin County? _________

Is a current Map of your water and/or wastewater system available? Yes______, No______

What are the population projections for your service area for the following years? 1990________, 2000___________, 2010__________, 2020____________.

What do you consider your most pressing water system needs? (Please rate from 1 to 6 with 1 being greatest need) Supply _____, Pressure ______, Storage ______, Fire Protection ______, Money ______, Other ______

What does your system provide for firefighting capabilities? 6" fire hydrants ______, fire hydrants less than 6" ______, flush valves ______, 6" and larger mains ______, other ____________________________________

Briefly describe any water system improvements you have planned:

____

____

____

Please list the name and date of any planning reports completed for your water/wastewater systems: ____________________

____

____

Please provide a copy of the reports.

Describe any water conservation programs you have in your service area. ____

____

What are your greatest wastewater system needs? ______________

____

____

Briefly describe any wastewater system improvements you have planned. ____

____

____

Please describe any problems you are having with your water wells. ____

____

____

APPENDIX D

TWDB GUIDELINES FOR WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN DEVELOPMENT

GUIDELINES FOR WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN DEVELOPMENT

I. INTRODUCTION

Water used in the residential and commercial sector involves the day-to-day activities of all citizens for the state and includes water used for drinking, bathing, cooking, toilet flushing, fire protection, lawn watering, swimming pools, laundry, dish washing, car washing, and sanitation. Since the early 1960's, per capita water use in the state has increased about four gallons per person per decade. More important, per capita water use during droughts is usually about one-third greater than during periods of average precipitation.

The objective of a conservation program is to reduce the quantity required for each water using activity, insofar as is practical, through the implementation of efficient water use practices. A drought contingency program provides procedures for voluntary and mandatory actions to be put into effect to temporarily reduce the demand placed upon a water supply system during a water shortage emergency. Drought contingency procedures include conservation but may also include prohibition of certain uses. Both programs are tools that water surveyors should have available to operate effectively in all situations.

Many communities throughout the United States have used conservation measures to successfully cope with various water and wastewater problems. Reductions in water use of as much as 25 percent or more have been achieved, but normal range is from 5 percent to 15 percent. As a result of reduced water use, wastewater flows have also been reduced by 5 percent to 10 percent.

A drought contingency program includes those measures that a city or utility can use to cause a significant, but temporary, reduction in water use. These measures usually involve either temporary use of water from sources other than the established supplies. Communities that have used drought contingency programs have achieved short-term water use reductions in excess of 50 percent during drought emergency situations. Because the onset of emergency conditions is often rapid, it is important that a city or utility be prepared in advance. Further, the citizen or customer must know that certain measures not used in an ongoing conservation program may be necessary if drought or other emergency conditions occur.

II. WATER CONSERVATION PLAN

A water conservation plan and a drought contingency plan specify and explain the actions a specific city or utility will take to implement a water conservation program. The implementation of a water conservation plan is considered to be the water conservation program. The Texas Water Development Board will carefully review each applicant's plan to insure that the specific methods and actions described in the plan will accomplish water conservation. The nine principal water conservation methods to be examined and considered in preparing a water conservation plan that will meet the Board's regulations are as follows:

1. Education and Information;
2. Plumbing Codes or ordinances for water conserving devices in new construction;
3. Retrofit Programs to improve water use efficiency in existing buildings;
4. Conservation-oriented Water Rate Structures;
5. Universal Metering and meter repair and replacement;
6. Water Conserving Landscaping;
7. Leak Detection and repair;
8. Recycling and Reuse; and
9. Means of Implementation and Enforcement.

The applicant's water conservation plan will include one or more of these methods, or equivalent methods, as appropriate, in order to reduce per capita water use so that total water use and sewage flow rates are reduced. The water conservation methods are described and illustrated on the following pages.

Education and Information: The most readily available and lowest cost method of promoting water conservation is to inform water users about ways to save water inside homes and other buildings, in landscaping and lawn uses, and in recreational uses. In-home water use accounts for an average of 65 percent of total residential use, while the remaining 35 percent is used for exterior residential purposes such as lawn watering and car washing. Average residential in-home water use data indicate that about 40 percent is used for toilet flushing, 35 percent for bathing, 11 percent for kitchen uses, and 14 percent for clothes washing. Water saving methods that can be practiced by the individual water user are listed below.

In the Bathroom, Customers Should be Encouraged to:

- Take a shower instead of filling the tub and taking a bath. Showers usually use less water than tub baths.

- Install a low-flow shower head which restricts the quantity of flow at 60 psi to no more than 3.0 gallons per minute.

- Take short showers and install a cutoff valve or turn the water off while soaping and back on again only to rinse.

- Not use hot water when cold will do. Water and energy can be saved by washing hands with soap and cold water; hot water should only be added when hands are especially dirty.

- Reduce the level of the water being used in a bath tub by one or two inches if a shower is not available.

- Turn water off when brushing teeth until it is time to rinse.

- Not let water run when washing hands. Instead, hands should be wet, and water should be turned off while soaping and scrubbing and turned on again to rinse. A cutoff valve may also be installed on the faucet.

- Shampoo hair in the shower. Shampooing in the shower takes only a little more water than is used to shampoo hair during a bath and much less than shampooing and bathing separately.

- Hold hot water in the basin when shaving instead of letting the faucet continue to run.

- Test toilets for leaks. To test for a leak, a few drops of food coloring can be added to the water in the tank. The toilet should not be flushed. The customer can then watch to see of the coloring appears in the bowl within a few minutes. If it does, the fixture needs adjustment or repair.

- Use a toilet tank replacement device. A one-gallon plastic milk bottle can be filled with stones or with water, recapped, and placed in the toilet tank. This will reduce the amount of water in the tank but still provide enough for flushing. (Bricks which some people use for this purpose are not recommended since they crumble eventually and could damage the working mechanism, necessitating a call to the plumber). Displacement devices should never be used with new low-volume flush toilets.

o Install faucet aerators to reduce water consumption.

o Never use the toilet to dispose of cleaning tissues, cigarette butts, or other trash. This can waste a great deal of water and also places an unnecessary load on the sewage treatment plant or septic tank.

o Install a new low-volume flush toilet that uses 3.5 gallons or less per flush when building a new home or remodeling a bathroom.

In the Kitchen, Customers Should be Encouraged to:

o Use pan of water (or place a stopper in the sink) for rinsing pots and pans and cooking implements when cooking rather than turning on the water faucet each time a rinse is needed.

o Never run the dishwater without a full load. In addition to saving water, expensive detergent will last longer and a significant energy saving will appear on the utility bill.

- Use the sink disposal sparingly, and never use it for just a few scraps.

- Keep a container of drinking water in the refrigerator. Running water from the tap until it is cool is wasteful. Better still, both water and energy can be saved in keeping cold water in a picnic jug on a kitchen counter to avoid opening the refrigerator door frequently.

- Use only a little water in the pot and put a lid on it for cooking most food. Not only does this method save water, but food is more nutritious since vitamins and minerals are not poured down the drain with the extra cooking water.

- Use a pan of water for rinsing when hand washing dishes rather than a running faucet.

- Always keep water conservation in mind, and think of other ways to save in the kitchen. Small kitchen savings from not making too much coffee or letting ice cubes melt in the sink can add up in a year's time.

In the Laundry, Customers Should be Encouraged to:

- Wash only a full load when using an automatic washing machine (32 to 59 gallons are required per load).

- Use the lowest water level setting on the washing machine for light loads whenever possible.

- Use cold water as often as possible to save energy and to conserve the hot water for uses which cold water cannot serve. (This is also better for clothing made of today's synthetic fabrics).

For Appliances and Plumbing, Customers Should be Encouraged to:

- Check water requirements of various models and brands when considering purchasing any new appliance that uses water. Some use less water than others.

- Check all water line connections and faucets for leaks. If the cost of water is $1.00 per 1,000 gallons, one could be paying a large bill for water that simply goes down the drain because of leakage. A slow drip can waste as much as 170 gallons of water EACH DAY, or 5,000 gallons per month, and can add as much as $5.00 per month to the water bill.

- Learn to replace faucet washers so that drips can be corrected promptly. It is easy to do, costs very little, and can represent a substantial amount saved in plumbing and water bills.

- Check for water leakage that the customer may be entirely unaware of, such as a leak between the water meter and the house. To check, all indoor and outdoor faucets should be turned off, and the water meter should be checked. If it continues to run or turn, a leak probably exists and needs to be located.

- Insulate all hot water pipes to avoid the delays (and wasted water) experienced while waiting for the water to "run hot".

- Be sure the hot water heater thermostat is not set too high. Extremely hot settings waste water and energy because the water often has to be cooled with cold water before it can be used.

- Use a moisture meter to determine when house plants need water. More plants die from over-watering than from being on the dry side.

For Out-of-Door Use, Customers Should be Encouraged to:

- Water lawns early in the morning during the hotter summer months. Much of the water used on the lawn can simply evaporate between the sprinkler and grass.

- Use a sprinkler that produces large drops of water, rather than a fine mist, to avoid evaporation.

- Water slowly for better absorption, and never water on windy days.

- Forget about watering the streets or walks or driveways. They will never grow a thing.

- Condition the soil with compost before planting grass or flower beds so that water will soak in rather than run off.

- Fertilize lawns at least twice a year for root stimulation. Grass with a good root system makes better use of less water.

- Learn to know when grass needs watering. If it has turned a dull gray-green or if footprints remain visible, it is time to water.

- Not water too frequently. Too much water can overload the soil so that air cannot get to the roots and can encourage plant diseases.

- Not over-water. Soil can absorb only so much moisture and the rest simply runs off. A timer will help, and either a kitchen timer or an alarm clock will do. An inch and one-half of water applied once a week will keep most Texas grasses alive and healthy.

- Operate automatic sprinkler systems only when the demand on the town's water supply is lowest. Set the system to operate between four and six a.m.

- Not scalp lawns when mowing during hot weather. Taller grass holds moisture better. Rather, grass should be cut fairly often, so that only 1/2 to 3/4 inch is trimmed off. A better looking lawn will result.

- Use a watering can or hand water with the hose in small areas of the lawn that need more frequent watering (those near walks or driveways or in especially hot, sunny spots).

- Learn what types of grass, shrubbery, and plants do better in the area and in which parts of the lawn, and then plant accordingly. If one has a heavily shaded yard, no amount of water will make roses bloom. In especially dry sections of the state, attractive arrangements of plants that are adapted to arid or semi-arid climates should be chosen.

- Consider decorating areas of the lawn with rocks, gravel, wood chips, or other materials now available that require no water at all.

- No "sweep" walks and driveways with the hose. Use a broom or rake instead.

- Use a bucket of soapy water and use the hose only for rinsing when washing the car.

The water conservation plan will need to contain ways to communicate water saving practices, such as those listed above, to the public. Among the methods for public education about water conservation are television, radio, and newspaper announcements and advertisements; posters and public displays, flyers, contests, and school programs; bill stuffers, flyers and newsletters; and sales events. The appropriate combination of educational materials and the methods used to communicate with residential users will depend on the location of the applicant, the type of media available, and other factors unique to the applicant's conditions.

Plumbing Codes: Cities of 5,000 population or more and utilities and cities with general plumbing codes will need to adopt water saving plumbing codes for the new construction and replacement of plumbing in existing structures. The standards for residential and commercial fixtures should be:

Tank-type toilets	No more than 3.5 gallons per flush
Flush valve toilets	No more than 3.0 gallons per flush
Tank-type urinals	No more than 3.0 gallons per flush
Flush valve urinals	No more than 1.0 gallons per flush
Shower heads	No more than 3.0 gpm
Indoor faucets	No more than 2.75 gpm
All hot water lines	Insulated
Swimming pools	New pools must have recirculating filtration equipment

These standards are recommended because they represent readily available products and technology and do not involve additional costs when compared to "standard" fixtures. For example, conventional toilets using 1.0, 1.5, 2.5, and 3.5 gallons per flush are available at list prices that range from about $50 to $150 each. Insulated hot water lines decrease water wasted by reducing the amount of time it takes to receive hot water at the tap. Water lines can be insulated for about $0.50 per linear foot. In addition, new swimming pools should contain recirculating filtration and disinfection equipment to eliminate the need to fill and drain the pool daily.

Utilities and cities that do not have a plumbing code will need to adopt a water saving plumbing code or distribute information to their customers and builders to guide them in purchasing and installing water saving plumbing devices.

Retrofit Programs: A city or utility should make information available through its education program for plumbers and customers to use when purchasing and installing plumbing fixtures, lawn watering equipment, or water using appliances. Information regarding retrofit devices such as low-flow shower heads or toilet dams that reduce water use by replacing or modifying existing fixtures or appliances should also be provided. A city or utility may wish to provide certain devices (toilet dams, low-flow shower heads, faucet aerators, etc.) free or at reduced cost to the customer.

Water Rate Structures: A city or utility should adopt a conservation-oriented water rate structure. Such a rate structure usually takes the form of an increasing block rate, although continuously increasing rate structures, peak or seasonal load rates, excess use fees, and other rate forms can be used. The increasing block rate structure is the most commonly used water conservation rate structure. Under the structure, the price per unit of water increases in steps or block as certain customer use levels are reached. For example, the first 5,000 gallons a month may have a base rate of $5.00, the next 3,000 gallons a month may cost $2.50 per thousand gallons, and all use above 8,000 gallons a month may cost $2.00 per thousand gallons. Generally, when using a block rate structure, the first block accounts for minimal residential water requirements and normally is 5,000 gallons per month or less. The next block accommodates all but the larger residential customers, and blocks beyond the second tier are set high enough to discourage the use of large quantities of water. Under no circumstance, however, should the price for the first block or base level be established below the actual cost of providing the service. In the event that increased prices for the base level place an excessive burden on the poor, life-line rates may need to be established. In addition, separate rate structures will probably be needed for commercial, institutional, and industrial customers.

Universal Metering: All water users, including the utility, city and other public facilities, should be metered. In addition, the utility should have a master meter. For new multi-family dwellings that are easily metered individually (such as duplexes and fourplexes) or apartments with more than five living units or apartments, each living unit should be metered separately. A regularly scheduled maintenance program of meter repair and replacement will need to be established in accordance with the following time intervals:

1. Production (master) meters - test once a year;
2. Meters larger than 1" - test once a year; and
3. Meters 1" or smaller - test every 10 years.

Most important, metering can provide an accurate accounting of water uses throughout the system when both the utility and customers are metered. In addition, utilities may be able to identify and bill previously unbilled users and, thereby, generate additional revenues. Metering and meter repair and replacement, coupled with an annual water accounting or auditing, can be used in conjunction with other programs such as leak detection and repair and, thereby, save significant quantities of water.

Water Conservation Landscaping: As stated previously, annual in-home water use accounts for an average of 65 percent of total residential use, while the remaining 35 percent is used for exterior residential purposes, such as lawn watering and car washing. However, during the summer months, as much as 50 percent of the water used in urban areas is applied to lawns and gardens and adds greatly to the peak demands experienced by most water utilities.

In order to reduce the demands placed on a water system by landscape watering, the city or utility should consider methods that either encourage, by education and information, or require, by code or ordinance, water conserving landscaping by residential customers and commercial establishments engaged in the sale or installation of landscape plants or watering equipment. Some methods that should be considered include the following:

1. Establishing platting regulations for new subdivision that require developers, contractors, or homeowners to use only adapted, low water using plants and grasses for landscaping new homes;
2. Initiating a Xeriscape or Texscape program that demonstrates the use of adapted, low water using plants and grasses;
3. Encouraging or requiring landscape architects to use adapted, low water using plants and grasses and efficient irrigation systems in preparing all site and facility plans;
4. Encouraging or requiring licensed irrigation contractors to always use drip irrigation systems when possible and to design all irrigation systems with water conservation features, such as sprinklers that emit large drops rather than a fine mist and a sprinkler layout that accommodates prevailing wind direction;

5. Encouraging or requiring commercial establishments to use drip irrigation for landscaping watering when possible and to install only ornamental fountains that recycle and use the minimum amount of water; and

6. Encouraging or requiring nurseries and local businesses to offer adapted, low water using plants and grasses and efficient landscape watering devices, such as drip irrigation systems.

Leak Detection and Repair: A continuous leak detection, location, and repair program can be an important part of a water conservation plan. An annual water accounting or audit should be part of the program Sources of unaccounted for water include defective hydrants, abandoned services, unmetered water used for fire fighting or other municipal uses, inaccurate or leaking meters, illegal hook-ups, unauthorized use of fire hydrants, and leaks in mains and services. Once located, corrective repairs or actions need to be undertaken. An effective leak detection, location, and repair program will generally pay for itself, especially in many older systems. For example, a utility that produces an average of one million gallons per day at an average water rate of $0.95 per one thousand gallons will lose approximately $35,000 in revenue each year when system losses amount to 10 percent.

Recycling and Reuse: A city or utility should evaluate the potential of recycling and reuse because these methods may be used to increase water supplies in the applicant's service area. Reuse can be especially important where the

III. DROUGHT CONTINGENCY PLAN

Drought or a number of other uncontrollable circumstances can disrupt the normal availability of community or utility water supplies. Even though a city may have an adequate water supply, the supply could become contaminated, or a disaster could destroy the supply. During drought periods, consumer demand is often significantly higher than normal. Some older systems, or systems serving rapidly growing areas, may not have the capacity to meet higher than average demands without system failure or unwanted consequences. System treatment, storage, or distribution failures can also present a city or utility with an emergency demand management situation.

The following guidelines pertain to the preparation of drought contingency plans. It is important to distinguish drought contingency planning from water conservation planning. While water conservation involves implementing permanent water use efficiency or reuse practices, drought contingency plans establish temporary methods or techniques designed to be used only as long as an emergency exists.

An effective drought contingency plan will need to include the following six elements:

1. Trigger Conditions signaling the start of an emergency period;

use of treated effluent from an industry or a municipal system or agricultural return flows replace an existing use that currently requires fresh water from a city's or utilities' supply. Recycling of in-plant process or cooling water can reduce the amount of fresh water required by many industrial operations.

As an example, several cities in Texas now provide treated municipal effluent to industries and irrigation projects in their areas. In industry, the use of treated wastewater for cooling purposes has a long and very successful history. The same is true for irrigation. One farm near Lubbock has been irrigated with treated wastewater from Lubbock since the 1930s. The City of El Paso has in operation a major aquifer recharge project through which up to 10 million gallons per day of highly treated municipal wastewater will be injected into the aquifer from which the City obtains its water supply.

Implementation and Enforcement: Each city or utility that adopts a water conservation program must have the authority and means to implement and enforce the provisions of the program if the goal of conserving water is to be achieved. Enforcement may be provided by utility personnel, local police, or special employees hired to administer and enforce the program. The applicant's water conservation plan will need to include a description of the means to implement and enforce a program, and to annually report on program effectiveness.

III. DROUGHT CONTINGENCY PLAN

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The following guidelines pertain to the preparation of drought contingency plans. It is important to distinguish drought contingency planning from water conservation planning. While water conservation involves implementing permanent water use efficiency or reuse practices, drought contingency plans establish temporary methods or techniques designed to be used only as long as an emergency exists.

An effective drought contingency plan will need to include the following six elements:

1. Trigger Conditions signaling the start of an emergency period;

2. Drought Contingency Measures;
3. Information and Education;
4. Initiation Procedures;
5. Termination Notification actions; and
6. Means of Implementation.

Trigger Conditions: The city or utility will need to establish a set of trigger or threshold conditions, such as lake or well levels or peak use volumes, that will indicate when drought contingency measures need to be put into effect. Since each city or utility has different circumstances, trigger conditions will be unique for each system. In most cases, several trigger levels will be needed to distinguish among mild, moderate, or severe drought conditions. For example, mild conditions may include the following situations:

1. Water demand is approaching the safe capacity of the system;
2. Lake levels are still high enough to provide an adequate supply, but the levels are low enough to disrupt some other beneficial activity, such as recreation; and
3. The water supply is still adequate, but the water levels or reservoir capacities are low enough that there is a real possibility that the supply situation may become critical if the drought or emergency continues. (An example is a reservoir that has an 18 month supply in storage, if no more rains occur).

Moderate conditions may include the following situations:

1. Water levels are still adequate, but they are declining at such a rapid rate that a more serious problem may result in the very near future if some type of formal action is not taken;
2. Water demand occasionally reaches what has been determined to be the safe limit of the system, beyond which the failure of a pump or some other piece of equipment could cause a serious disruption of service to part or all of the system; and
3. Reservoir levels, well levels, or river flows are low enough to disrupt some major economic activity or cause unacceptable damage to a vital ecosystem.

Severe conditions could include a number of situations ranging from the inability to provide certain services to the impairment of health and safety. Some examples include:

1. The imminent or actual failure of a major component of the system which would cause an immediate health or safety hazard;
2. Lake, river, or well levels are so low that diversion or pumping equipment will not function properly;
3. Water levels are low enough in the distribution system storage reservoirs to hinder adequate fire protection; and

4. Water demand is exceeding the systems' capacity on a regular basis, thus presenting the real danger of a major system failure.

Trigger conditions for the phase-out or a downgrade of the condition's severity should also be considered. Further, unforeseen events can occur so as to require the initiation of an emergency demand management response program for which no trigger condition has been established.

Drought Contingency Measures: The city or utility will need to establish a list of emergency measures and a plan for their implementation when preselected trigger conditions are reached. The types of measures will depend on local conditions, but in most cases there should be different types of measures that apply to the various levels of severity (i.e., mild, moderate, severe) for drought or emergency conditions Specific measures could include the following:

1. Imposing restrictions or bans on non-essential uses such as lawn watering, car washing, and pool filling;
2. Communicating methods to reduce the quantity of water needed for the essential purposes of drinking, cooking, bathing, and clothes washing;
3. Implementing rationing plans;
4. Establishing pricing structures that incorporate surcharges and penalties or fines for non-compliance;

5. Locating and assessing additional sources including wells, ponds, or reservoirs; reactivating abandoned wells or dams; purchasing water form others on an emergency basis; building emergency facilities; and considering temporary reuse of wastewater for non-potable uses; and
6. Designing means of enforcement.

The measures for each level of severity should include continued implementation of relevant requirements and actions imposed under the preceding level. examples of some of the measures that could be employed for mild, moderate, and severe conditions include:

1. Mild Condition Measures

   (a) Inform public by mail and through the news media that a trigger condition has been reached, and that water users should look for ways to reduce water.

   (b) Activate an information center and discuss the situation in the news media.

   (c) Advise the public of the trigger condition situation daily.

   (d) Advertise a voluntary daily lawn watering schedule.

2. Moderate Condition Measures

(a) Mandatory lawn watering schedule.

(b) Fine water wasters.

(c) Institute and extensive use fee, special pricing structure, or surcharge.

(d) Prohibit certain uses such as ornamental water fountains or other non-essential water uses.

(e) Request industries or other non-municipal water users to stop certain uses, find additional sources, increase recycling, or modify production processes where possible.

3. Severe Condition Measures

(a) Prohibit all outdoor water use.

(b) Limit the amount of water each customer can use and establish legal penalties for those who fail to comply.

(c) Require industrial or commercial water users to stop operations so that remaining water is available for essential health and safety related uses.

Information and Education: Once trigger conditions and emergency measures have been established, the public should be informed of what will be expected during a drought or emergency situation. The material should describe trigger conditions and emergency measures and the need to implement the measures. Possible methods of educating and informing the public include:

1. Radio and television public service announcements and news stories;
2. Newspaper stories; and
3. Letters, bill stuffers, and brochures to water customers.

Initiation Procedures: The city or utility should have written procedures that contain adequate methods of informing customers, other utilities, and government entities as far in advance as possible that a trigger condition is being approached or that it has been reached, and that a certain phase of the drought contingency plan must be implemented.

These written procedures may include:

1. Automatic regulatory implementation provisions;
2. Prearranged media notification or press release procedures;
3. Direct notification procedures including mail or, if needed, telephone notification systems;
4. Prearranged contract procedures to obtain emergency water supplies from other sources if needed; and
5. Checklists or operating procedures as necessary.

Termination Notification: The city or utility should have a written procedure to inform the customers and other directly affected parties that the emergency has passed. The establishment of termination triggers and the decision to terminate must be based on sound judgment by proper city or utility authorities.

Implementation: The primary reason for developing a plan is to have a guide for implementing a drought contingency program if the need occurs. It is to the full intention of the Texas Water Development Board that the city or utility develop a workable plan that customers understand and which can be used in the event it is needed. In order to accomplish this, each city or utility will need to develop and adopt legal and regulatory documents or instruments that are appropriate.

Legal and regulatory components that may be necessary for implementation are listed below:

1. Ordinances, bylaws, or other implementing legal documents.
2. Changes in plumbing codes;
3. New or revised contracts with potential water suppliers.
4. Conditions in contracts with industries or commercial water users who may have water supplies cut off or curtailed.
5. Changes or conditions to water rights permits or contracts with current water suppliers.

Table 1. Examples of Methods Used to Implement Water Use Efficiency Practices

Education and Information	Economic and Price	Regulatory
1.Setting a good public example.	1.Providing low interest loans or grants to install water saving irrigation equipment.	1.Instituting plumbing codes requiring that water saving fixtures be used.
2.Using radio and TV public service announcements.	2.Sending out free shower heads and toilet dams to customers.	2.Passing laws which fine or penalize water wasters.
3.Teaching about water resources in public schools.	3.Providing coupons for discounts on water saving devices.	3.Requiring industries and irrigators to use water efficient equipment.
4.Using TV, newspaper, and radio to disseminate information.	4. Giving tax breaks to those who modify agricultural or industrial practices.	4.Restricting the sale of equipment that wastes water.
5.Providing bill "stuffers" and brochures.	5.Giving breaks on water rates for those who save.	5.Requiring the use of certain water saving plants or grasses or restrict the sale of water wasting plants by nurseries.
6.Conducting public meetings and seminars.	6.Using increasing block rate structures.	
7.Setting up an information "hot line."	7.Assessing tax or price increases on those who fail to save.	
8.Inviting public input.	8.Assessing fines.	
9.Providing information on water saving appliances and plumbing fixtures.	9.Providing free customer assistance and conservation device installation.	
10.Setting up demonstration projects.		

Table 2. Examples of Structural Techniques that Increase Water Use Efficiency

Municipal and Commercial	Industrial	Agricultural
1.Repairing water distribution leaks and meters.	1.Employing recirculation of water in the plant.	1.Lining canals and repairing transmission systems.
2.Retrofitting toilets, faucets, and showers with dams, (or similar devices), aerators, and low flow shower heads, respectively.	2.Using air cooling.	2.Controlling phreatophytes.
3.Installing low-flush or dual-flush toilets.	3.Modifying the plant's production process.	3.Installing water control structures.
4.Insulating hot water pipes.	4.Repairing leaks.	4.Using furrow dikes.
5.Repairing leaks.	5.Repairing steam traps.	5.Using drip or improved LEPA irrigation systems.
6.Using water efficient appliances.	6.Practicing energy conservation.	6.Recovering tailwater.
7.Installing drip or efficient lawn watering equipment.	7.Replacing high water use processes with new process technologies that use less water.	7.Installing moisture measuring devices.
8.Using low water using and drought resistance plants and grass.	8.Using low water use fixtures in office facilities.	8.Contouring land or using levees.
9.Using moisture sensing controls to determine the need to water the lawn.	9.Using drip or water efficient landscape watering equipment.	9.Consolidating canal systems.
10.Using pressure reduction.	10.Using low water using and drought resistant plants and grass.	10.Applying watershed management.
11.Practicing water harvesting.	11.Installing moisture sensing controls.	
12.Installing water meters.		

Table 3. Examples of Behavioral Changes that Increase Water Use Efficiency

Municipal and Commercial	Industrial	Agricultural
1.Taking shorter showers.	1.Minimizing the use of hosedown practices for the work area.	1.Practicing irrigation scheduling.
2.Turning off water when brushing teeth.	2.Instructing employees on water saving practices.	2.Practicing improved tillage.
3.Washing only full loads in dish and clothes washers.	3.Employing the same practices as commercial operations in the office area.	3.Practicing periodic deep plowing.
4.Using a broom to clean driveway instead of waterhose.	4.Setting good community examples and aiding in water resource information dissemination.	4.Mulching.
5.Using lawn watering equipment carefully.		5.Employing system efficiency evaluation.
6.Maintaining a high level of water conservation awareness.		6.Maintaining irrigation equipment.
7.Scheduling lawn watering.		
8.Washing the car with a bucket and hose with a shutoff valve.		
9.Demanding good conservation practices by utility and governmental authorities.		

Table 4. Water Conserving Retrofit Devices

Application	Device	Function	Water Savings	Estimated Unit Water Savings gpcd	Estimated Cost $	Service Life Years
Toilet	Two displacement bottles	Reduces flush volume	0.5 gal/flush	2.3	0-0.20	5
Toilet	Water closet dam	Reduces flush volume	1.0 gal/flush	4.5	1.50-3.00	5
Toilet	Dual-flush	Variable-flush volume	3.5 gal/flush	15.7	15.00	15
Shower	Flow restrictor	Limits flow to 3 gpm	1.5 gpm	6.7	0.50	5
Shower	Reduce-flow shower head	Limits flow to 3 gpm	1.5 gpm	6.7	3.00-20.00	15
Shower	Reduce-flow shower head with cutoff valve	Limits flow to 2.5 gpm	2 gpm	8.0	5.00-20.00	15
Shower	Cutoff valve	Facilitates "navy" shower"	-	-	2.50-5.00	15
Faucets	Aerator	Reduces splashing, enhances flow aesthetics, creates appearance of greater flow	-	0.5	0.50-2.00	15
Hot water pipes	Insulation	Reduces warm-up time	-	0.5	0.50/ft	25
Water hook-up	Pressure-reducing valve	Reduces available water pressure at fixtures and, hence, flow rate	-	3.0	85.00	25

gpcd = gallons per capita per day; gpm = gallons per minute

Table 5. Water Conserving Devices for New Construction

Application	Device	Function	Water Savings	Estimated Unit Water Savings gpcd	Estimated Additional Cost $	Service Life Years
Toilet	Low-flush, 3.5 gal/flush	Reduced flush volume	1.5 gal/flush	7.5	0	25
Toilet	Low-flush, 2.5 gal/flush	Reduced flush volume	2.5 gal/flush	12.5	0	25
Toilet	Low-flush, 1.0 gal/flush	Reduced flush volume	4.0 gal/flush	20.0	*	25
Shower	Reduced-flow shower head	Reduces shower flow rate to 3.0 gpm	1.5 gpm	6.7	0	15
Shower	Reduced-flow shower head with cutoff valve	Reduces shower flow rate to 2.5 gpm	2.0 gpm	8.0	0	15
Shower	Cutoff valve	Facilitates "navy shower"	-	-	2.50-5.00	15
Faucet	Aerator	Reduces splashing, enhances flow aesthetics, creates appearance of greater flow	-	0.5	0.50-2.00	15
Water hook-up	Pressure-reducing valve	Reduces available water pressure at fixtures and, hence, flow rate	-	3.0	45.00	25
Appliances	Water-efficient dish-washing appliances	Reduced water require-ment	6-gal/cycle	2.0	0	15
Appliances	Water-efficient clothes-washing machine	Reduced water require-ment	14-gal/cycle	3.5-7.0	70.00	15

*Some are expensive, but others are available at costs comparable to 3.5 gallon per flush models.

Table 6. Estimated Energy Savings Associated with Residential Water Conservation

Device	Hot Water Saved[a]	Amount of Energy Saved		Value of Energy Saved	
		Gas Water Heaters[c]	Electric Water[e]	Gas[f]	Electric[g]
	(Gal/day/D.U.)[b]	(Therms/year/D.U.)[d]	(Kw-hr/year/D.U.)	(Dollars/year/D.U.)	
Showerhead, 3.0 gpm	8.0	22.9	541	12.6	32.4
Water saving dishwashers	4.7	13.6	320	7.5	19.2
Water saving clothes-washing machines	2.4	6.8	160	3.7	9.6
Subtotal	15.1	43.3	1,021	23.8	61.2
Insulation of hot water pipes	4.7	13.6	320	7.5	19.2
Total	19.8	56.9	1,341	31.3	80.4

a/ 140° F water saved as follows: shower 3.4 gallons per capita per day (gpcd); dishwasher 2.0 gpcd; washing machines 1.0 gpcd; thermal pipe insulation 2.0 gpcd.
b/ D.U.= dwelling units; 2.37 persons per dwelling unit.
c/ 79 percent efficiency. Source: The California Appliance Efficiency Program - Revised Staff Rept. California Energy Resources Conservation & Devel. Comm. Conservation Div. (Nov. 1977).
d/ One Therm = 100,000 BTU.
e/ 98 percent efficiency. Source: ibid.
f/ $0.55/therm.
g/ $0.06/kw-hr.

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.) ________________________________

____

M. Average Annual Revenues from Water or Wastewater Rates ____________ (Dollars)

N. Average Annual Revenue from Non-Rate Derived Sources ____________ (Dollars)

O. Average Annual Fixed Costs of Operation ____________ (Dollars)

P. Average Annual Variable Costs of Operation ____________ (Dollars)

Q. Average Annual Water or Wastewater Revenues for Other Purposes (if applicable) ____________ (Dollars)

R. Copies of Applicable Local Regulations (List) ____________

____

S. Copies of Applicable State, Federal or Other Regulations (List) ____________

T. Special Information (List) ____________

2. Public Involvement in Planning Process

A. Public at Large (List) ____________

B. Special Interest Groups (List) ____________

____

____

3. Conservation Plan Procedure. A checklist of items to be considered and, as appropriate, incorporated in the plan.

	Considered	Incorporated/Addressed Yes	Incorporated/Addressed No
A. Step 1 - Identify Need(s) and Establish Goals			
(1) System audit			
(a) Establish current average, seasonal, and peak use patterns	☐	☐	☐
(b) Determine unaccounted water volumes and likely causes	☐	☐	☐
(c) Determine adequacy of treatment, storage, and distribution systems	☐	☐	☐
(d) Define limits of existing supply and identify potential new sources	☐	☐	☐

	Considered	Incorporated/Addressed Yes	No
(e) Determine capacity of wastewater collection and treatment system	☐	☐	☐
(2) Define problems from audit			
(a) Peak use problem	☐	☐	☐
(b) Average use problem	☐	☐	☐
(3) Establish goal as percentage of reduction to achieve	☐	☐	☐
B. Step 2 - Assess Supply and Demand Management Potentials			
(1) Supply management methods			
(a) Metering and meter repair	☐	☐	☐
(b) Leak detection and repair	☐	☐	☐
(c) Pressure regulation	☐	☐	☐
(d) Watershed management	☐	☐	☐
(e) Evaporation suppression	☐	☐	☐
(f) Reuse	☐	☐	☐
(2) Demand management methods			
(a) Pricing	☐	☐	☐
(b) Regulation	☐	☐	☐
(c) Education	☐	☐	☐
C. Step 3 - Analyze the Cost Effectiveness and Impacts of the Management Program			
(1) Supply management methods			
(a) Metering and meter repair	☐	☐	☐
(b) Leak detection and repair	☐	☐	☐
(c) Pressure regulation	☐	☐	☐
(d) Watershed management	☐	☐	☐
(e) Evaporation Suppression	☐	☐	☐
(f) Reuse	☐	☐	☐

	Considered	Incorporated/Addressed Yes	No
(2) Demand management methods			
(a) Pricing	☐	☐	☐
(b) Regulation	☐	☐	☐
(c) Education	☐	☐	☐
D. Step 4 - Identify the Actions to Minimize Adverse Impacts			
(1) Supply management programs			
(a) Costs of program result in operating deficit	☐	☐	☐
(b) Costs of program not covered by revenue	☐	☐	☐
(c) Lack of cooperation from local government or board	☐	☐	☐
(d) Community opposition	☐	☐	☐
(2) Demand management programs			
(a) Revenue decrease	☐	☐	☐
(b) Additional expenditures needed to pay for program	☐	☐	☐
(c) User expenditures required for retrofit devices	☐	☐	☐
(d) Users water bill increases	☐	☐	☐
(e) Large volume user problems	☐	☐	☐
(f) Public and political opposition	☐	☐	☐
(g) Equity of program	☐	☐	☐
(h) Lack of cooperation of community departments	☐	☐	☐

	Considered	Incorporated/Addressed Yes	No
E. Step 5 - Choose Management Program(s) and Design the Specifics of Each			
(1) Supply management programs			
(a) Metering and meter repair	☐	☐	☐
(b) Leak detection and repair	☐	☐	☐
(c) Pressure regulation	☐	☐	☐
(d) Watershed management	☐	☐	☐
(e) Evaporation suppression	☐	☐	☐
(f) Reuse	☐	☐	☐
(2) Demand management programs			
(a) Pricing	☐	☐	☐
(b) Regulation	☐	☐	☐
(c) Education	☐	☐	☐
F. Step 6 - Evaluate and Select the Needed Hardware and Software			
(1) Supply management programs			
(a) Metering and meter repair	☐	☐	☐
(b) Leak detection and repair	☐	☐	☐
(c) Pressure regulation	☐	☐	☐
(d) Watershed management	☐	☐	☐
(e) Evaporation suppression	☐	☐	☐
(f) Reuse	☐	☐	☐
(2) Demand management programs			
(a) Water-saving fixtures	☐	☐	☐
(b) Reuse and recycle systems	☐	☐	☐
(c) User habit changes	☐	☐	☐

	Considered	Incorporated/Addressed Yes	Incorporated/Addressed No
G. Step 7 - Summarize the Conservation Plan			
(1) Conservation Goal	☐	☐	☐
(2) Supply management program	☐	☐	☐
(3) Demand management program	☐	☐	☐
(4) Public involvement	☐	☐	☐

4. Drought Contingency Plan Procedure

	Considered	Incorporated/Addressed Yes	No
A. Step 1 - Identify System Constraints			
(1) Source-related problems			
(a) Aquifer and well yield	☐	☐	☐
yield	☐	☐	☐
level	☐	☐	☐
well capacity	☐	☐	☐
(b) Reservoirs (specific)	☐	☐	☐
yield	☐	☐	☐
level	☐	☐	☐
special concerns	☐	☐	☐
(c) Surface water diversion (general)	☐	☐	☐
flow variation	☐	☐	☐
levels	☐	☐	☐
water rights	☐	☐	☐
environmental	☐	☐	☐
recreational	☐	☐	☐
water quality impacts	☐	☐	☐
(2) System-related problems			
(a) Peak or high demands	☐	☐	☐
(b) System limits	☐	☐	☐
(c) Public health & safety	☐	☐	☐
(d) Storage capacity	☐	☐	☐

	Considered	Incorporated/Addressed Yes	No
B. Step 2 - Locate and Assess Alternate Sources			
(1) Existing wells, ponds, or reservoirs	☐	☐	☐
(2) Reactivate abandoned wells or dams	☐	☐	☐
(3) Purchase water from others on emergency basis	☐	☐	☐
(4) Build emergency facilities	☐	☐	☐
(5) Reuse wastewater	☐	☐	☐
C. Step 3 - Assess System Management and Rank Severity of Impacts			
(1) Determine impacts drought or emergency conditions would have	☐	☐	☐
(2) Rank impacts by order of severity	☐	☐	☐
(3) Group causal condition by order of impact severity	☐	☐	☐
(4) Set "Trigger Conditions"	☐	☐	☐
D. Step 4 - Design Emergency Management Program			
(1) Evaluate measures			
(a) Information	☐	☐	☐
(b) Media programs	☐	☐	☐
(c) Economic incentives	☐	☐	☐
(d) Fines	☐	☐	☐
(e) Limits on amounts (Rationing)	☐	☐	☐
(f) Prohibition of certain uses	☐	☐	☐
(g) Legal penalties	☐	☐	☐
(2) Rank measures by order of severity of conditions determined in Step 3	☐	☐	☐

	Considered	Incorporated/Addressed Yes	Incorporated/Addressed No
E. Step 5 - Evaluate Procedure and Regulations and Implement Plan			
(1) Procedural considerations to address in the plan			
(a) Notification procedure	☐	☐	☐
(b) Public information on "Trigger Conditions"	☐	☐	☐
(c) Method to update plan	☐	☐	☐
(d) Utility guidebook or check list	☐	☐	☐
(2) Legal or regulatory considerations			
(a) Utility ordinances or bylaws	☐	☐	☐
(b) Changes to plumbing codes	☐	☐	☐
(c) Revised or alternate contracts with suppliers	☐	☐	☐
(d) Amended contracts with major customers to provide for cut-off procedures	☐	☐	☐
(e) Changes to water rights or other contracts	☐	☐	☐

APPENDIX E

LEGISLATIVE ACT

AN ACT

relating to the creation, administration, and powers, including the power of eminent domain subject to limitations, and to the duties, operations, and financing of Collin County Water Authority, and to the creation therein of subdistricts with the power to levy and collect ad valorem taxes within the subdistricts; relating to the power of the county and of municipalities, other political subdivisions, and nonprofit water supply corporations to enter into and give security for contracts with the authority.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. PURPOSE. It is the purpose and intent of this Act to establish a mechanism that can provide on an orderly basis for the water and wastewater needs of the unincorporated territory of Collin County, a growing urban county, without impairment of the powers of an incorporated municipality of the county within its corporate limits or within two miles thereof or in its extraterritorial jurisdiction, whichever is greater, or the other governmental agencies therein, or water supply or sewer service corporations within the service areas certificated to such corporations under Chapter 13, Water Code, to assume their proper and historic roles in the performance of such services as expansions of municipal boundaries occur or sound water and wastewater practices dictate. To accomplish this purpose a conservation district, without taxing power, is created, with the power included to create subdistricts having the power of taxation, subject to limitations, all for the purpose of providing for such services on a coordinated but voluntary basis within such territory and in conjunction with the other agencies and municipalities located within the county.

SECTION 2. DEFINITIONS. In this Act:

(1) "Authority" means Collin County Water Authority created in Section 4 of this Act.

(2) "Board" means the governing board of directors of the authority.

(3) "Board of supervisors" means the governing board of a subdistrict.

(4) "Commissioners court" means the commissioners court of the county.

(5) "County" means Collin County, Texas.

(6) "Municipality" means any incorporated city or town within the county and any other governmental agency, water district, conservation district, or political subdivision doing business therein.

(7) "State" means the State of Texas.

(8) "Subdistrict" means one or more of the subdistricts authorized to be created under Section 13 of this Act.

(9) "Water supply or sewer service corporation" means any nonprofit water supply or sewer service corporation organized under Chapter 76, Acts of the 43rd Legislature, 1st Called Session, 1933 (Article 1434a, Vernon's Texas Civil Statutes).

SECTION 3. LEGISLATIVE FINDINGS. (a) It is hereby found by the legislature that the creation and establishment of the authority and the creation and establishment of subdistricts within the authority are essential to the accomplishment of the purposes of Article XVI, Section 59, of the Texas Constitution.

(b) It is hereby found by the legislature that all of the land and other property included in the boundaries of the authority and in the boundaries of a subdistrict will be benefitted by the improvements, works, and projects that are to be provided by the authority and by subdistricts pursuant to the powers conferred on the authority and subdistricts by this Act and that the authority is created to serve a public use and benefit and any subdistrict created will serve a public use and will be for a public purpose.

(c) The legislature specifically finds and declares that the requirements of Article XVI, Section 59(d) and Section 59(e), of the Texas Constitution, to the extent applicable, have been met and accomplished in due course, time, and order and that all notices required to be given relating to this Act have been given, that all approvals required to be obtained pursuant thereto have been obtained, and that the legislature has the authority and power to enact this Act.

SECTION 4. CREATION. (a) A conservation and reclamation district having the boundaries prescribed herein is hereby created and shall be known as Collin County Water Authority.

(b) The authority is a conservation and reclamation district under Article XVI, Section 59, of the Texas Constitution and is a governmental agency, body corporate and politic, and a political subdivision of the state.

(c) The boundaries of the authority are coterminous with the duly established and existing boundaries of the county, and the territory of the county shall be the territory of the authority.

(d) An election confirming the creation of the authority is not required.

SECTION 5. MANAGEMENT OF AUTHORITY. (a) The authority shall be governed by a board of directors of five persons who are residents of the authority appointed by the commissioners court. The terms of office shall be four years. The members of the board are subject to removal with or without cause by duly adopted order of the commissioners court. The board shall have complete authority over the management and affairs of the authority under this Act; provided, however, that any and all budgets, rates, and contracts for the acquisition, construction, improvement, extension, or disposition of water or wastewater systems of the authority shall not become effective until they are approved by order of the commissioners court.

(b) Vacancies on the board shall be filled by the commissioners court.

(c) No member of the board shall receive any compensation for serving as a member of the board, but all directors may be reimbursed for actual expenses incurred on behalf of the authority in the discharge of their duties.

SECTION 6. BOARD PROCEDURES. (a) The board shall prepare and adopt bylaws for the authority and shall hold such regular, special, or emergency meetings at such times and on such days or dates as are specified therein.

(b) A majority of the members of the board constitutes a quorum for the transaction of business of the authority, and approval of at least a majority of the members of the board present at a meeting is necessary for approval of any matter coming before the board.

(c) The board shall provide in its bylaws for the method of execution for all contracts, the signing of checks, and the handling of any other matters approved by the board. After each appointment cycle and at any other times the board may consider appropriate, the board shall reorganize and elect new officers.

(d) The officers of the board shall consist of the president, one or more vice-presidents, a secretary, and a treasurer. The board may designate one or more assistant secretaries and an assistant treasurer, who are not required to be members of the board. The secretary of the board or one of the assistant secretaries shall be responsible for keeping the minutes of the meetings of the board and all official records of the board and may certify the accuracy or authenticity of any actions, proceedings, minutes, or records of the board or of the authority.

(e) The regular meeting place of the board shall be designated in the bylaws.

SECTION 7. GENERAL POWERS AND DUTIES. (a) Subject to the specific provisions of this Act, the authority has the rights, powers, privileges, authority, and functions granted, conferred, contemplated, and described in Article XVI, Section 59, of the Texas Constitution, including the rights, powers, privileges, authority, and functions conferred by the general laws of the state applicable to water control and improvement districts and to municipal utility districts operating under the applicable provisions of the Water Code, together with the additional rights, powers, privileges, authority, and functions enumerated, described, expressed, or implied by this Act.

(b) The authority shall not have the power to levy or collect ad valorem taxes.

(c) If any general law applicable to water control and improvement districts or to municipal utility districts is in conflict or inconsistent with this Act, this Act shall prevail, except as provided by Subsection (d) of this section.

(d) The provisions of Chapter 13, Water Code, shall be applicable to the authority and to any subdistrict in the same manner and to the extent that these provisions are otherwise applicable to conservation and reclamation districts created under Article XVI, Section 59, of the Texas Constitution.

SECTION 8. SPECIFIC POWERS AND DUTIES OF AUTHORITY. (a) The authority has the additional rights, powers, privileges, authorities, and functions provided by this section.

(b) The authority may plan, lay out, purchase, construct, acquire, contract for, lease, rent, own, operate, maintain, repair, and improve inside or outside its boundaries any land, buildings, works, improvements, facilities, plants, equipment, and appliances, including any administrative properties and facilities, any permits, franchises, licenses, or contract or property rights, and any levees, drains, waterways, lakes, reservoirs, channels, conduits, sewers, dams, stormwater detention facilities, or other similar facilities and improvements, whether for municipal, industrial, agricultural, flood control, or related purposes, that are necessary, helpful, or incidental to the exercise of any right, power, privilege, authority, or function provided by this Act.

(c) The authority may acquire by purchase or by exercise of the power of eminent domain, which power is hereby granted subject to the limitations imposed by this subsection, any land, easements, rights-of-way, or other property or improvements within or without the boundaries of the authority which are needed or are appropriate to carry out the powers and functions of the authority, as herein described and contemplated; provided, however, that the power of eminent domain shall be exercised in the manner and with the privileges, rights, and immunities available under the laws of the state, including specifically the Property Code. It is provided further that the authority shall not exercise the power of eminent domain: (1) against any property owned by the county or by any municipality or any agency or instrumentality thereof; or (2) to acquire a waterworks system or a wastewater system that is owned by any municipality, by private parties, or by any nonprofit water supply or sewer service corporation.

(d) In addition to its other powers, the authority is authorized to purchase by agreement with any owner, to maintain and operate, and to construct new extensions and additions to existing waterworks systems and wastewater systems wholly or partially within the county.

(e) None of the authority's works, projects, or facilities may be placed in or extended into or across any land within a city without the express consent of the governing body of the city.

SECTION 9. BONDS, NOTES, AND CONTRACTS OF AUTHORITY. (a) The authority is authorized to issue, sell, and deliver its revenue bonds, notes, or other obligations for any and all of its purposes, without an election and upon such terms as the board shall determine appropriate. Such bonds may be made payable from all or any part of the revenues of the authority derived from any lawful source, including but not limited to any contract with any municipality or with any subdistrict or from the ownership and operation of any waterworks system, wastewater system, sewer system, or any combined system. The issuance of revenue bonds by the authority shall be governed by the provisions of the Water Code applicable to the issuance of revenue bonds by municipal utility districts and by Chapter 656, Acts of the 68th Legislature, Regular Session, 1983 (Article 717q, Vernon's Texas Civil Statutes), and Chapter 1078, Acts of the 70th Legislature, Regular Session, 1987 (Article 717k-6, Vernon's Texas Civil Statutes).

(b) The authority is authorized to enter voluntarily into any contracts, including the interlocal contracts herein authorized, with the county, with any municipality, with nonprofit water supply or sewer service corporations, and with any other party, public, private, or nonprofit, considered necessary in the exercise of its other powers and purposes. Contracts requiring a payment of money by the authority may be made payable from any source of funds, general or specific, as may be determined by the board.

(c) The authority is authorized to apply for and receive grants in aid of its purposes and projects from any state, federal, or local agency or person.

(d) Any bonds of the authority issued on behalf of a subdistrict which are payable through an ad valorem tax levy must be approved by the Texas Water Commission as provided in Chapter 54 of the Water Code.

SECTION 10. CONTRACTS BY MUNICIPALITIES AND OTHERS. (a) Any and all municipalities, any nonprofit water supply or sewer service corporation doing business wholly or partially within the authority, and all subdistricts are expressly authorized to enter into any contracts with the authority that are deemed appropriate by the respective governing bodies thereof. Such governing bodies are authorized to pledge to the payment of any such contracts any source of revenue that may be available to the governing body, including the levy and collection of ad valorem taxes, if such municipality or subdistrict has the power to levy and collect such taxes, subject only to the elections that are required by this Act to be held by subdistricts prior to the levy of ad valorem taxes by this Act. To the extent a governing body pledges funds to the payment of any such contract that are to be derived from its own waterworks system or its sewer system or its combined system, such payments shall constitute an operating expense of such system.

(b) The county and each municipality may enter into interlocal agreements with the authority in which the authority agrees to provide for planning, administering, and developing the water and wastewater resource needs as the parties may agree and approve and, to the extent agreed, for the performance of other services on behalf of the contracting party or parties, and the county and each municipality executing such agreements may appropriate and expend their funds for such purposes. Such agreements may be on such terms and for such periods of time as the parties may agree.

SECTION 11. REGULATORY POWER. (a) The authority may adopt rules and regulations for the development of water and wastewater systems within the unincorporated territory of the county but may not adopt rules or regulations that conflict or are inconsistent with any valid order or ordinance of a municipality or of the county or with any requirements or protections in effect under Chapter 13, Water Code, or Chapter 178, Acts of the 49th Legislature, 1945 (Article 4477-1, Vernon's Texas Civil Statutes), for a water supply or sewer service corporation.

(b) This Act does not exempt the authority or any subdistrict or any land situated within the authority from the terms and provisions of any applicable ordinance, code, resolution, platting and zoning requirement, rule, or regulation of any municipality.

(c) It being one of the essential purposes of this Act to enable the county and the municipalities and existing nonprofit water supply or sewer service corporations to provide for the orderly development and distribution of the water and wastewater resources of and within the unincorporated territory of the county, the authority shall have full standing to appear before any local or state agency having jurisdiction and to be heard to oppose or support the creation of additional municipal utility districts within the county, it being the declared intention of the legislature that subdistricts, when defined districts are needed in the county, should be utilized to perform the services and functions ordinarily performed by municipal utility districts except in those instances where any extraordinary public benefit can be accomplished only by a municipal utility district.

SECTION 12. ASSET DISPOSITION. The authority is empowered to sell or otherwise dispose of the facilities it owns. The authority and the purchaser shall agree on the terms and provisions of any such sale, the terms and provisions to be approved by the commissioners court prior to becoming effective. Any funds received by the authority on the disposition of such property shall be applied to the debt, if any, incurred by the authority to finance the purchase, construction, improvements, or other acquisition of the property and improvements. If no debt was issued for acquisition or improvement, all funds received by the authority on the disposition of the property shall be deposited into the general funds of the authority.

SECTION 13. CREATION OF SUBDISTRICTS. (a) A petition requesting the creation of subdistricts within the authority may be presented to the Commissioners Court of Collin County. Any such petition must be signed by at least 25 persons who own property within the boundaries of the proposed subdistrict and must have been approved by the board. Any such petition shall specify, at a minimum, a metes and bounds description of the boundaries of the proposed subdistrict, the general nature of the improvements to be acquired, constructed, or otherwise implemented within the subdistrict, and the necessity and feasibility of such improvements. The petition shall state on its face whether the power to levy and collect ad valorem taxes solely within the subdistrict is requested.

(b) The commissioners court shall set a date for a hearing on such petition not less than 14 nor more than 45 days after the day the petition is presented to the commissioners court. Notice of such hearing shall be given to each municipality within whose territory, as defined below, the proposed subdistrict would be located and to each water supply or sewer service corporation within whose certificated service area the proposed subdistrict would be located. For this purpose a municipality's territory includes land within its corporate limits and land included within two miles of its limits or its extraterritorial jurisdiction, whichever is greater. A copy of the notice of the hearing shall also be posted in three public places located within the proposed subdistrict and at the county courthouse at least 14 days prior to the date set for the hearing. Notice of the hearing shall also be published at least one time in a newspaper of general circulation published in the county at least 10 days prior to the date of the hearing.

(c) Any interested person may appear at the hearing for the purpose of supporting or opposing the creation of the subdistrict in accordance with the petition. The hearing shall be conducted in accordance with the procedures established by the commissioners court.

(d) After the public hearing, the commissioners court shall enter an order making its findings in the official records of the commissioners court. If the commissioners court deems the creation of a subdistrict to be feasible and practical and finds that the creation of the proposed subdistrict will be beneficial to the public, will benefit the residents of and the land included in the proposed subdistrict, and will contribute to the orderly growth and development of the county, then the commissioners court shall enter an order granting the petition and ordering the creation of the subdistrict in accordance with Subsection (e) of this section. If the commissioners court finds to the contrary, it shall enter an order dismissing the petition and the proposed subdistrict shall not be created, but a dismissal order shall be without prejudice to the ability to petition for the creation of a subdistrict covering the same territory at a later time. The commissioners court shall not order the creation of a subdistrict which includes within its boundaries any portion of an incorporated city or any portion of land within two miles of the incorporated boundary of a city or the extraterritorial jurisdiction of the city, whichever is greater, without the express written approval of the governing body of the incorporated city, nor shall the commissioners court order the creation of a subdistrict which includes within its boundaries any portion of an area certificated to a water supply or sewer service corporation under Chapter 13, Water Code, without the express written approval of the governing body of the water supply or sewer service corporation. In giving approval prior to the creation of the subdistrict, the approving city or water supply or sewer service corporation by agreement with the commissioners court may impose special conditions and terms regarding the financing, operations, and dissolution of the subdistrict and the disposition of its works and projects. If the conditions are not accepted by the subdistrict within 60 days of its creation or modified with the agreement of the city or cities or water supply or sewer service corporation or corporations, as applicable, the commissioners court shall enter an order dissolving the subdistrict, and the same shall thereby be dissolved.

(e) If the commissioners court orders the creation of a subdistrict for which the power to levy and collect ad valorem taxes was not requested in the petition, the subdistrict shall be created and in existence from and after the date stated in the order of the commissioners court, without the necessity of a confirmation election within the boundaries of the subdistrict, and a subdistrict shall not have the power to levy or collect ad valorem taxes. If the commissioners court enters an order granting a petition that seeks the power to levy and collect ad valorem taxes within the subdistrict, then the subdistrict shall not be created until and unless a confirmation election is called, conducted, and held by the commissioners court within the proposed boundaries of the subdistrict and a majority of the qualified voters confirm the creation of the subdistrict in accordance with the provisions of Subsection (f) of this section. If the creation of the subdistrict is confirmed at an election, then the subdistrict shall have the power to levy and collect ad valorem taxes for the maintenance and operation of the subdistrict and for the payment of contracts of the district, provided that the taxes shall not be levied and collected until and unless previously approved at elections held in accordance with Subsection (f) of this section.

(f) A confirmation election, when required by this section, and any election to authorize the levy and collection of ad valorem taxes within a subdistrict for maintenance purposes shall be conducted in the manner required by Chapter 54, Water Code, for the levy and collection of maintenance taxes by municipal utility districts. Elections to levy taxes in support of contracts shall be held in the manner and with the effect provided by Chapter 54, Water Code, for the issuance of bonds by municipal utility districts. The confirmation election required by this subsection, a maintenance tax election, and an election authorizing the levy of taxes to support contracts of the subdistrict may be combined into a single election, and any or all of such elections may be held on any day or date selected by the commissioners court. Each such election shall be called, convened, and held by the commissioners court in accordance with the Election Code and Chapter 54, Water Code.

(g) A subdistrict, if created in accordance with this section, shall be a conservation and reclamation district under Article XVI, Section 59, of the Texas Constitution with the limited powers granted in this section. The subdistrict constitutes a political subdivision and a corporate and politic body under the laws of this state. A subdistrict shall have the powers specified herein and shall have the same powers as the authority, subject to the same limitations, and provided that: (1) a subdistrict shall not be authorized to provide services outside its boundaries, except that it may provide certain water and sewer services within its customer service area as certificated by the Texas Water Commission or its successor, and such service area shall never be expanded into the corporate limits of a municipality or within two miles thereof or into the extraterritorial jurisdiction thereof, whichever is greater, without the written consent of the affected municipality, beyond the certificated area that may have been located within the corporate limits of the municipality on the date on which the system was acquired by the subdistrict; (2) the service area for any such subdistrict shall never be expanded into the service area certificated to a water supply or sewer service corporation without the written consent of the affected corporation, beyond the certificated area that may have been located within the certificated service area of the water supply or sewer service corporation on the date on which the system was acquired by the subdistrict; and (3) a subdistrict shall not have the power to issue bonds, notes, or other securities, all such powers to be exercised by the authority pursuant to contracts with the subdistrict.

(h) When a subdistrict is created as specified in this section, the subdistrict shall be governed by a board of supervisors consisting of three supervisors appointed by the commissioners court from among the residents of the subdistrict or, if none, of the county. The commissioners court shall make the appointments for terms specified in the order creating the subdistrict but not exceeding four years from the date of appointment. Supervisors are subject to removal, with or without cause, upon duly adopted order of the commissioners court. All vacancies shall be filled by the commissioners court.

(i) The subdistrict shall have all the powers provided elsewhere in this Act and shall have ownership of and general management powers over the affairs, works, and projects of the subdistrict subject to the provisions of any contracts with the authority. However, any and all budgets, rates, contracts, regulations, and fees of a subdistrict shall not be effective until they are approved by order of the commissioners court, after notice to and a right to be heard by the authority.

(j) In those subdistricts having the power to levy and collect ad valorem taxes, the rates shall be established by the board of supervisors on the basis of annual budgets established at the same time and in the same manner as for counties, and taxes shall be levied by the board of supervisors. It is provided, however, that the rate of taxes each year shall not be levied until and unless approved by the commissioners court.

(k) The members of the board of supervisors may receive such compensation, as an expense of the subdistrict, as the commissioners court shall approve.

SECTION 14. MEETINGS OF BOARD OF SUPERVISORS. The board of supervisors of a subdistrict shall hold regular, special, or emergency meetings at those times and on those dates the board determines.

SECTION 15. SUBDISTRICT OFFICE; MEETING PLACE. The board of supervisors of each subdistrict shall designate a place within the subdistrict as the regular office and meeting place, except that the regular meeting place may be at the regular meeting place of the commissioners court if approved by order of the commissioners court.

SECTION 16. COLLECTION OF TAXES WITHIN SUBDISTRICTS. (a) The county tax assessor-collector shall maintain the tax rolls and collect taxes for any subdistrict having taxing power in the same manner as for taxes for the county. The terms of the tax-collection services shall be set forth in a contract for services between the subdistrict and the commissioners court.

(b) Reimbursement of the costs of the county tax assessor-collector for the services shall be paid by the subdistrict.

(c) Taxes and other revenues collected within a subdistrict shall be used solely for purposes within the subdistrict, except that the costs of administration of the affairs of a subdistrict may be paid to the authority in accordance with contracts approved by the commissioners court between the authority and the subdistricts. All taxes and revenues of a subdistrict as collected shall be deposited as public funds into accounts of the subdistrict approved by the commissioners court. All accounts of a subdistrict may be audited by the county auditor. The funds may be deposited or invested as permitted by law for county funds.

SECTION 17. CONVERSION OF WATER SUPPLY CORPORATION TO SUBDISTRICTS. (a) Upon the adoption of a resolution by the board of directors of any nonprofit water supply or sewer service corporation doing business wholly or partially within the county requesting such action and when accompanied by the petition and approval required in other cases under Subsection (a) of Section 13 of this Act, the commissioners court may consider the question of converting the nonprofit water supply corporation to a subdistrict by following the same procedures otherwise required by Section 13 of this Act and Subsection (b) of this section.

(b) The resolution of the board of directors required in Subsection (a) of this section shall include a plan of conversion, including among other items: (1) the proposed method for the transfer of assets and the assumption of debts to the subdistrict;

(2) the proposed size of the board of supervisors, which size may be greater than as specified herein for other subdistricts; and (3) a plan for the selection of the board of supervisors that may include a plan for the election of the board by the qualified electors of the subdistrict or by appointment as herein otherwise provided.

(c) If the commissioners court finds the plan of conversion to be in the interests of the public, it shall approve the conversion and the plan and shall detail in its order the specifications of the conversion. If an election plan is established for the board of supervisors, the commissioners court shall not have the power of removal.

(d) Nothing contained in this section shall be interpreted or applied in any manner so as to deny or limit the rights of a water supply or sewer service corporation to convert to a special utility district as provided by Chapter 65, Water Code.

SECTION 18. EMERGENCY. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended, and that this Act take effect and be in force from and after its passage, and it is so enacted.