WATER AND WASTEWATER MASTER PLAN

AUGUST 2008

Prepared by:

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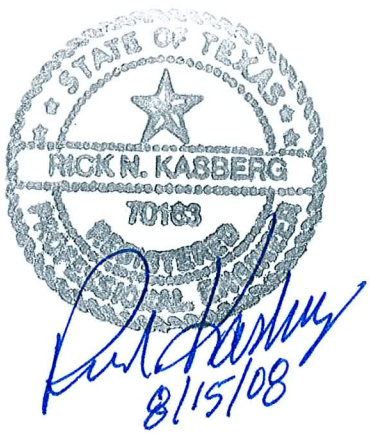
CONSULTING ENGINEERS

TEMPLE, TEXAS

"The 2008 Water and Wastewater Master Plan reflects information compiled during 2007-2008. Current and up to date information regarding the Capital Improvement Program and System Rehabilitation Projects should be requested through the Department of Public Works Administrative Office at (254) 298-5621."

CITY OF TEMPLE TEXAS

WATER AND WASTEWATER MASTER PLAN



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EXECUTIVE SUMMARY

This Water and Wastewater Master Plan provides a comprehensive evaluation and analysis of the City of Temple's current utilities and infrastructure improvements required to serve the Year 2060 population. Further, this Plan documents the City's existing utility related contracts, current extension policies, summary of governing agencies as they relate to municipal utilities and projects and a synopsis of project delivery components.

The Master Planning process began with several work sessions involving City Staff to gain data and information related to the current condition of water and wastewater systems. Staff was given the opportunity to specify projects which they felt were a priority. This information was then utilized in the phasing of capital improvement and rehabilitation projects.

Based on the current Brazos G population projections, historical water use and future land use, water demand projections were established and a water distribution network analysis was performed using the computer model WaterCAD. Based on our analysis, pipe sizes, pump station capacities, treatment capacities and storage needs were determined. Opinions of Probable Cost were prepared and these recommended improvements were phased.

Again utilizing the Brazos G population projections, historical wastewater data and future land use, wastewater peak flows were established and a sewer analysis was performed with the aid of a computer model SewerCAD. From this analysis, trunk sewer and collection line sizes were determined and capacities of the Doshier Farm Wastewater Treatment Plant and Temple Belton Regional Sewerage System were evaluated. Further, elimination of lift stations within the collection system was analyzed. Opinions of Probable Cost were prepared and these recommended improvements were phased.

The projects recommended as part of the Water and Wastewater Master Plan are shown on **Exhibits F and I** and are color coded based upon the phasing plan. The Phasing Plan is included as part of **Section 8** and serves as a timeline and prioritization of projects.

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1. INTRODUCTION

1.01 General

Updates to the City of Temple's Water and Wastewater Master Plans were previously performed in 2000, and primarily outlined new capital improvement projects to be constructed in phases. Because of recent growth, the City has requested that a more comprehensive master plan for water and wastewater be prepared to address not only new projects, but also rehabilitation and maintenance type projects. Further, this plan will contain information on governing agencies, existing utility related contracts and utility related policies which can be utilized by City Staff for reference.

1.02 Purpose and Scope

The purpose of this report is to present a comprehensive plan for the development of water and wastewater treatment, water distribution and wastewater collection systems to serve the City of Temple. In preparing the plan all potential commercial, industrial and residential demands have been considered based on the best available information for future land use. **Exhibit B - Land Use Map** shows the future land uses used in the analysis.

A previous analysis of the water and wastewater systems was performed for the City of Temple in 2000. In the last seven years, there has been significant residential growth in the extra-territorial jurisdiction (ETJ) on the south and west sides of the City. Additionally, the City has experienced growth in the industrial park area. For this reason, and to provide for ongoing development, these system analyses have been prepared to provide guidance in the development of water and wastewater infrastructure improvements to adequately serve its citizens and wholesale customers.

2. SUMMARY OF CONTRACTS

2.01 Water Supply

a.) Brazos River Authority

The following table summarizes the water currently available to Temple pursuant to its existing water rights and contracts as reported by Mathews & Freeland, L.L.P in October 2000:

Water Right/ Contract	Water Available During Severe Drought (acre-feet per Year)	Water Available During Wet Periods (acre-feet per Year)	Date Executed
CF-852/ BRA CF-852 Agreement	0 to 12,500 8,418[1] (best estimate)	12,500	1962
Permit 2052/ BRA Storage Rights Agreement	18,500	20,000[2]	1962
BRA Option Water Contract	9,453	9,453	1992
TOTAL	**36,371**	**41,953**	

[1] This amount was calculated using water availability modeling as part of the Brazos-G RWPG process.

[2] BRA could take the position that this number should be limited to 18,500 acre-feet per year or else Temple would be overdrafting its storage right.

b.) Wholesale Water Customers

The following table summarizes the water currently allocated to customers by contract:

Customer	Allocation		Expiration
City of Troy	600 gpm	968 Ac-ft.	November 28, 2017
City of Little River – Academy	200 gpm	323 Ac-ft.	October 25, 2017
City of Morgan's Point Resort	1,200 gpm	1,935 Ac-ft.	May 1, 2018
Arrowhead Hill	200 gpm	323 Ac-ft.	March 26, 2002 (service continues to date)

Copies of these contracts can be found in Appendix A of the Report. We recommend that each of these contracts be amended to include an annual volume of water in acre-feet and a maximum instantaneous rate in gallons per minute.

2.02 Wastewater

a.) Temple-Belton Regional Sewerage System (TBRSS)

The City of Temple initially executed an agreement with the Brazos River Authority in July 1971 to establish the Temple-Belton Regional Sewerage System. The treatment facility is located on Highway 93 between Temple and Belton and was placed into operation in 1975. The plant was designed to treat an average daily wastewater flow of five million gallons per day. Lift stations and force mains serving both Temple and Belton were designed accordingly. The plant was then expanded in 1988-90 to a design capacity (wet weather) of 10 million gallons per day and a peak capacity of 30 million gallons a day. Subsequent contract amendments were executed and are included along with the original agreement in Appendix A.

The TBRSS generally services the western portion of the City of Temple and also provides wastewater treatment services to the City of Belton. The annual cost to the City is determined by their pro-rata share of the annual flow. Historically, three fourths of the flow is allocated to the City of Temple.

b.) Doshier Farm Wastewater Treatment Plant (DFWWTP)

The Doshier Farm Wastewater Treatment Plant was first built on its present location in 1939. The first major expansion was in 1969 and designed by Forrest and Cotton, Consulting Engineers, Dallas, Texas. This expansion included some of the present facilities including: the main building, the primary clarifiers, the roughing filter, the old chlorine contact basin, and the digester control building. The anaerobic digesters where also renovated at that time.

Since that time, the roughing filter was renovated in 1990 and dechlorination facilities were added in 1991. In 1994, construction was completed on the second major expansion of the treatment plant. Facilities designed by Roming-Parker Associates,

Consulting Engineers, Temple, Texas, as a part of that expansion include: influent junction box, influent meter, screw pump and fine screen structure, roughing filter pumps, biological reactor, two final clarifiers, chlorine contact/dechlorination/cascade aerator, anaerobic digester renovations, digester control building renovation and addition, sludge dewatering building, SO_2 building, the laboratory addition, the maintenance building, and the chlorine storage slab.

The City of Temple contracts with CH2MHILL/OMI for the operation of the Doshier Farm Wastewater Treatment Plant. The treatment facility is located on Loop 363 south of Avenue H. The plant was expanded to a design capacity (wet weather) of 7.5 MGD in 1994.

The Doshier Farm Wastewater Treatment Plant services the eastern portion of the City of Temple.

3. UTILITY EXTENSION POLICY

3.01 Water and Wastewater

The City passed an ordinance in January 2004, which established the policy for extension of water and wastewater mains. The ordinance is applicable to new and existing subdivisions within the City Limits or Extraterritorial Jurisdiction of the City of Temple. A copy of this ordinance is included in Appendix B.

The cost sharing formula as outlined in the ordinance is summarized below:

a.) The City will pay 100% for the first 2500' of the extension

b.) The City will pay 50% of the next 2500' of the extension

c.) The Developer will pay 100% for any required extension beyond 5000'

The ordinance also states that the City shall bear the entire cost of over sizing water and wastewater infrastructure not necessitated by proposed development. All of the cost participation by the City is subject to available funding. Generally, there has been an item in the budget for these types of extensions in the amount of $500,000 annually.

The ordinance is currently under staff review as part of the City's ongoing evaluation of existing ordinances and policies.

4. GOVERNING AGENCIES/REGULATIONS

4.01 Environmental Protection Agency

In July of 1970, the White House and Congress worked together to establish the EPA in response to the growing public demand for cleaner water, air and land. Prior to the establishment of the EPA, the federal government was not structured to make a coordinated attack on the pollutants that harm human health and degrade the environment. The EPA was assigned the task of repairing the damage already done to the natural environment and to establish new criteria to guide Americans in making a cleaner environment a reality.

The EPA works to develop and enforce regulations that implement environmental laws enacted by Congress. EPA is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist the states in reaching the desired levels of environmental quality.

Most of the regulations set forth by the EPA are administered through the Texas Commission on Environmental Quality, which is described more fully below.

4.02 Texas Commission on Environmental Quality

During the 1990s, the Texas Legislature moved to make natural resource protection more efficient by consolidating programs. This trend culminated in the creation of the Texas Natural Resource Conservation Commission in the fall of 1993 as a comprehensive environmental protection agency. Sunset legislation passed by the Texas Legislature in 2000 directed that the agency change its name to Texas Commission on Environmental Quality (TCEQ) on Sept. 1, 2002.

TCEQ is the environmental agency for the state and its responsibilities include rulemaking, permitting, compliance and enforcement and pollution prevention to name a few.

The City of Temple interacts with the TCEQ on a regular basis. Below is a listing of some of the more common topics:

a.) Stormwater Pollution Prevention Plan submittals

b.) Water and Wastewater Treatment Plant permits with associated reporting, inspections and renewals

c.) Water and Wastewater Regulations (Chapters 290-Public Drinking Water and 317-Design Criteria for Sewerage Systems respectively)

It is important to note that TCEQ is proposing to modify the Design Criteria for Sewerage Systems. The changes are encompassed in the new Chapter 217, which will supersede Chapter 317. It is anticipated that the new Chapter 217 criteria will be adopted by early 2008.

With regard to permits associated with the Water and Wastewater Treatment Plants, it is worth noting that expansion or process modifications require notification to TCEQ and likely permit revisions. Further discharge permits typically must be renewed every five years. The permit for Doshier Farm Wastewater Treatment Plant is scheduled to renew in 2009 and includes a provision for the Reclaimed Water used at Wilson Park.

4.03 Texas Water Development Board

The Texas Water Development Board (TWDB) was created in 1957. It currently

a.) Provides loans to local governments for water supply projects; water quality projects including wastewater treatment, municipal solid waste management and nonpoint source pollution control; flood control projects; agricultural water conservation projects; and groundwater district creation expenses

b.) Provides grants and loans for the water and wastewater needs of the state's economically distressed areas

c.) Provides agricultural water conservation funding and water-related research and planning grants

d.) Supports regions in developing their regional water plans that will be incorporated into a statewide water plan for the orderly development, management and conservation of the state's water resources by studying Texas' surface and groundwater resources

e.) Collects data and conducts studies concerning the fresh-water needs of the state's bays and estuaries

f.) Administers the Texas Water Bank, which facilitates the transfer, sale or lease of water and water rights throughout the state, and administers the Texas Water Trust, where water rights are held for environmental flow maintenance purposes

g.) Maintains a centralized data bank of information on the state's natural resources called the Texas Natural Resources Information System and manages the Strategic Mapping Program, a Texas-based, public and private sector cost-sharing program to develop consistent, large-scale computerized base maps describing basic geographic features of Texas.

The Texas Water Development Board's (TWDB) mission is "**To provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas.**" The TWDB mission is a vital part of Texas' overall vision and its mission and goals which relate to maintaining the viability of the state's natural resources, health and economic development.

To accomplish its goals of planning for the state's water resources and for providing affordable water and wastewater services, the TWDB provides water planning, data collection and dissemination, financial assistance and technical assistance services to the citizens of Texas. The tremendous population growth that the state has and will continue to experience, and the continual threat of severe drought, only intensify the need for the TWDB to accomplish its goals in an effective and efficient manner.

4.04 Brazos River Authority

The Brazos River Authority (BRA) was the first river authority established in the US. Its activities include management of flood control operations; operation of wastewater collection and treatment systems; water quality and pollution control operations; and water supply and conservation.

The City of Temple currently has contracts with the BRA for the purchase of raw water and also for the operation of a wastewater treatment plant (Temple-Belton Regional Sewerage System). These contracts are included in Appendix A.

4.05 Region G Water Planning Group

The Regional Water Planning Group (RWPG) was established by the TWDB on February 19, 1998. The purpose of the RWPG is to provide comprehensive regional water planning and to carry out the related responsibilities placed on regional water planning groups by state law, including Texas Water Code Chapter 16 and TWDB rules, including 31 TAC Chapters 355, 357, and 358, in and for the Regional Water Planning Authority.

The 2006 Brazos G Regional Water Plan was approved by the TWDB and contains population projections, per capita water use projections and water demand projections from Year 2010 to Year 2060.

4.06 United States Corps of Engineers

The United States Army Corps of Engineers (USACE) is made up of approximately 34,600 Civilian and 650 military members. Military and civilian engineers, scientists and other specialists work hand in hand as leaders in engineering and environmental matters. The diverse workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals meets the demands of changing times and requirements as a vital part of America's Army.

The USACE's mission is to provide quality, responsive engineering services to the nation including:

a.) Planning, designing, building and operating water resources and other civil works projects (Navigation, Flood Control, Environmental Protection, Disaster Response, etc.)

b.) Designing and managing the construction of military facilities for the Army and Air Force. (Military Construction)

c.) Providing design and construction management support for other Defense and federal agencies. (Interagency and International Services)

The City of Temple typically interacts with USACE on projects which encounter "waters of the US". For this type of project, typically a utility line crossing a creek, a permit must be obtained from the USACE. Generally, utility projects will be covered under a Nationwide 12 Corps Permit.

Coincidentally, there is a Solids Handling and Capacity Improvements Study for the Membrane Plant currently underway that will involve the USACE. As part of the study, there will be discussion regarding the current and historical operation of dam gates at Lake Belton as it relates to the water quality at the City of Temple Intake on the Leon River. The study should be complete by Summer 2008.

4.07 Texas Historical Commission

The Texas Historical Commission (THC) is the state agency for historic preservation. THC staff consults with citizens and organizations to preserve Texas' architectural, archeological and cultural landmarks. The agency is recognized nationally for its preservation programs.

The THC is composed of 17 citizen members appointed by the governor to staggered six-year terms. The agency employs about 100 people who work in various fields, including archeology, architecture, history, economic development, heritage tourism, public administration and urban planning.

The Texas State Legislature established the agency in 1953 as the Texas State Historical Survey Committee with the task to identify important historic sites across the state. The

Texas Legislature changed the agency's name to the Texas Historical Commission in 1973. Along with the name change came more protective powers, an expanded leadership role and broader educational responsibilities.

The City of Temple typically interacts with THC on projects where archeological assessments are performed. Typically these are projects that are through undisturbed land and site tests must be performed to ensure that there is no historical site present. Once it is determined that there is no historical significance, an antiquities permit (THC clearance) may be obtained.

5. PLANNING

5.01 Planning Area

The planning area is not a geographically precise area nor is it a legally described area. It generally reflects a boundary between the city limits and the extra territorial jurisdiction of the City of Temple. The planning area is influenced by areas that reasonably can be served with water and wastewater services and is shown as part of EXHIBITS A through E.

Currently water is being supplied to Morgan's Point Resort, Troy, Arrowhead Hill and to Little River-Academy (previously known as Water Control and Improvement District No. 2). The CCN (Certificate of Convenience and Necessity) Limits of each of these entities is shown on Exhibit A. It is assumed that these relationships will continue indefinitely, and the system facilities have been designed accordingly.

5.02 Land Use

While there are many specifically defined uses of land within the City, the finite differences of each do not affect water demands and wastewater flows for system planning. For example, Temple's Land Use Map separates Commercial Use into Community Retail, Office, Regional Commercial, and Mixed Use Areas. The differences between these four are negligible from a water and wastewater viewpoint. For this reason, these four zones were condensed into one commercial land use category.

Defined land uses utilized in this report are shown on Exhibit B and are:

a.) Low Density Residential
b.) Medium Density Residential
c.) High Density Residential
d.) Commercial
e.) Industrial
f.) Agricultural
g.) Community Facilities

As development occurs in commercial and industrial areas, the projected water demand and wastewater flow from the specific development should be reviewed with respect to this study. The wastewater flows used for each of the various land uses are described in detail under Section 7.07 Design and Analysis Parameters of this report.

5.03 Population

As previously discussed, development of areas in accordance with projected land use will determine the population to be served. Generally, trunk sewer lines have been sized to serve the ultimate population of the drainage area. Depending upon the timing and location of various developments, it may not be possible to construct facilities to serve the ultimate population. If this situation occurs, a deliberate decision can be made to decrease the size of any given facility and the future additions can be identified.

The demand for water is closely related to a city's population. Industrial and commercial development also play an important role in water consumption. The 2000 Temple Water System population, as reported by the U.S. Census Bureau, is shown below in **Table 1.**

TABLE 1
TEMPLE WATER SYSTEM
2000 POPULATION

Temple	54,514
Troy	1,378
Morgan's Point Resort	2,989
Little River-Academy	1,645
Total	**60,526**

Table 2, in Section 6.04, contains the projected population of the Temple Water System from 1990 to 2060. These population projections are from the 2006 Brazos G Water Plan and as made by The Perryman Group as a part of the Report on Water Supply Requirements for Brazos G Regional Planning Group, Senate Bill One, prepared by Roming, Parker & Kasberg, L.L.P. in September 1999, and have been used as the basis for the water demands used in the distribution analysis.

The ultimate water supply and distribution system plan developed herein is capable of serving a future population of approximately 116,000 and should be built in phases as growth occurs. The proposed distribution system is designed so that it may be expanded even further in the distant future as needs require.

5.04 Definitions

The design of the water treatment, storage, and distribution system is based on various rates of water consumption which are generally referred to as water demand. Specifically, they are as follows:

a.) Average Daily Demand - This rate is expressed as gallons per capita per day (gpcd), as million gallons per day (mgd), or as acre-feet per year (ac-ft/yr). When expressed as gallons per capita per day it represents the average daily water consumption for each person over a given year. When expressed as million gallons per day, it represents the average daily water used by the entire system over a given year. When expressed as acre-feet per year, it represents the volume of water required per year for supply purposes.

b.) Maximum Daily Demand - This is the total amount of water used on the day of the heaviest consumption in any given year. The water treatment and water pumping facilities must be capable of supplying this amount of water for that day.

c.) Peak Hourly Demand - This is the rate of water consumption during the peak hour of the maximum day of a given year. This water usage is most economically supplied through a combination of elevated storage and high service pumps. The distribution system and elevated storage must be capable of satisfying this demand.

d.) Minimum Hourly Demand - This is the rate of water consumption during the minimum hour of the maximum day of a given year. This number is important because this is the time of day when the elevated storage tanks are being replenished. This demand rate is used in the water distribution system analysis to determine the capability of pumping and distribution facilities to replenish elevated storage tanks.

6. WATER SYSTEM ANALYSIS

6.01 General

The 2006 Brazos G Regional Water Plan was utilized as the basis to determine population and per capita water usage for the City of Temple Water and Sewer Master Plan. Historical water consumption records provided by the Temple Water Plant and dating back to 1998 have also been used to determine the maximum day demands. After all of the existing data was analyzed to determine design parameters and projections, a water distribution network analysis was performed using the computer model WATERCAD.

The WATERCAD model is based on existing infrastructure in which water lines greater than 6-inch were input. In some areas water lines smaller than 6-inch act as mains were also included in the model. The WATERCAD model determines flow rates and velocities in distribution lines as well as pressures throughout the system based on input system geometry and water demands. The computer model can be used to analyze distribution lines, pump stations or elevated storage tank operations either on a city-wide or subdivision scale. The model used in this analysis was a steady state model and multiple scenarios, such as maximum day, peak hour, minimum hour and fire flow, were evaluated. The ultimate (Year 2060) distribution system was analyzed by WATERCAD to assure that the proposed system improvements provide adequate volumes and pressures throughout the system.

The proposed water system for Year 2060 is designed to accommodate the development of the City based on current development trends. The improvements have been identified and phased into fiscal year cycles. Projects will be constructed as funding allows. The recommendations proposed herein should be re-examined periodically and revised to conform to new conditions or growth patterns which arise. Generally, the Master Plan should be updated at approximate three year intervals during periods of moderate growth or more frequently when major changes in projected land usage occurs.

6.02 Existing Infrastructure

Several work sessions with the City of Temple Engineering, Water Plant and Water Distribution Staff were held to discuss the existing system in order to determine which areas and concerns were most prevalent to the Staff. From these and subsequent work sessions, it was determined what portions of the system would require rehabilitation and/or replacement. Water distribution/transmission lines, tanks, pump stations and the water plants were discussed in detail. Infrastructure Assessment Summaries were prepared and are included in Appendix C. Generally, multiple projects have been identified to replace deteriorating water transmission and distribution lines and rehabilitate tanks and various components at the water treatment plants.

The work sessions and analysis of the existing system showed that the current system lacks redundancy. There are single transmission mains feeding portions of the City, and if compromised, it is very difficult to provide adequate water to preclude interruption of service. Therefore, one of the main concerns being addressed is to provide multiple feed points from the water plant into the City and provide for additional ground storage within the distribution system. Another possibility discussed was to negotiate for a potential emergency connection to an alternative water supply. Two viable connections that could be evaluated are the Central Texas Water Supply Corporation and the City of Belton.

6.03 Pressure Planes

The terrain within the service area of the City of Temple Water System varies from a low ground elevation of about 500 feet to a high ground elevation of about 800 feet. If elevated storage for the entire system were located at a common level which provided satisfactory system pressure at the ground elevation of 800 feet, the pressure at the 500 foot elevation would be much too high (approximately 190 psi compared to a desirable range of 50 to 80 psi). TCEQ requires that the system provide a minimum pressure of 35 psi and 20 psi residual pressure during a fire.

In order to minimize difficulties from these variations in pressure, the existing system has been designed to utilize five pressure planes (720, 785, 835, 876 and 920). Each pressure plane is named by the maximum elevation in the elevated storage tanks and are shown on Exhibit C and D.

Pressure planes are separated generally along ground elevations, with considerations for subdivision and development boundaries. Since the distribution system cannot be economically constructed to follow ground contours, there is some overlap in pressure planes. Generally, pressure planes are designed to maintain a pressure range of 50 psi to 100 psi within their boundaries. In some instances, these minimum and maximum pressures may be exceeded. As previously stated, the minimum pressure required by TCEQ is 35 psi and if pressure in an area is excessively high a pressure reducing valve is usually installed.

The ground elevation serviceable from each proposed pressure plane is as follows.

Pressure Plane	Ground Elevation
920	690-804
876	645-760
835	605-719
785	555-669
720	490-604

The actual pressure plane boundaries are located within the overlap range and follow existing water lines and streets. The location of existing and proposed pressure planes are shown on **Exhibits C and D**.

6.04 Existing and Projected Water Demand

The demand for water is closely related to population. Based on the census in 2000, the total population for Temple and the cities it serves was 60,526, as Shown in Table 2. This population equates to water usage of 230 gallons per capita per day. The Average and Maximum Day demands, based on water pumped through the High Service Pump Stations, from 1998 to 2006 were as follows:

Year	Average Day	Maximum Day
1998	13.2 MGD	29.9 MGD
1999	13.1 MGD	28.6 MGD
2000	13.9 MGD	24.6 MGD
2001	11.7 MGD	29.6 MGD
2002	10.9 MGD	21.3 MGD
2003	11.3 MGD	24.9 MGD
2004	11.0 MGD	19.7 MGD
2005	12.2 MGD	23.1 MGD
2006	12.9 MGD	25.3 MGD
2007	10.9 MGD	18.5 MGD

Because there is limited metering within the distribution system, customer meters are not identified by pressure plane and the demands represent usage for Temple and its' customers, per capita usage by pressure plane/customer cannot accurately be calculated. We recommend that the data base for customer meters be updated to reflect the pressure plane and that flow meters be installed at all pump stations.

As the City grows, increased commercial and industrial activity will cause the demands to increase. The future demands were calculated using the 2006 Brazos G Plan and the Senate Bill One Report as a basis.

For the City of Temple, the maximum day demands were computed by applying factors of 2.5 for domestic and 1.85 for industrial/commercial to the average day demands (ie 2.5 x avg. day). The maximum day factor is typical for systems of this size and location and was verified with the historical data above. The peak hour demands were then calculated by applying factors of 1.85 for domestic and industrial/commercial to the maximum day demands (ie 1.85 x max day).

Table 2 on the following page illustrates these projections for Average, Maximum Day and Peak Hour water demands through the year 2060 for the City of Temple and its wholesale customers.

TABLE 2
TEMPLE WATER SYSTEM
WATER DEMAND PROJECTIONS
AVERAGE, MAXIMUM DAY AND PEAK HOUR

AREA	HISTORICAL		PROJECTIONS					
	1990	2000	2010	2020	2030	2040	2050	2060
TEMPLE								
Population[1]	46,109	54,514	62,382	71,350	80,830	89,247	97,774	105,519
GPCD -- Domestic[1]		224	301	288	278	269	263	259
Acre Ft per Year -- Domestic		13,678	21,033	23,018	25,170	26,892	28,804	30,613
Acre Ft per Year -- Indust./Comm.			1,560	2,300	2,700	3,500	3,800	4,000
Acre Ft per Year -- Total		13,678	22,593	25,318	27,870	30,392	32,604	34,613
Million Gallons per Day -- Average		12.21	20.18	22.61	24.89	27.14	29.12	30.91
Million Gallons per Day -- Max Day[4]		30.54	49.53	55.19	60.65	65.82	70.58	**74.95**
Million Gallons per Day -- Peak Hour[5]		56.49	91.64	102.10	112.21	121.76	130.58	138.66
LITTLE RIVER - ACADEMY								
Population[1]	1,390	1,645	1,793	1,896	1,989	2,049	2,088	2,116
GPCD -- Domestic[2]		141	140	160	185	185	180	170
Acre Ft per Year -- Domestic		260	281	340	412	425	421	403
Million Gallons per Day -- Average		0.23	0.25	0.30	0.37	0.38	0.38	0.36
Million Gallons per Day -- Max Day		0.58	0.63	0.76	0.92	0.95	0.94	**0.90**
Million Gallons per Day -- Peak Hour		1.07	1.16	1.40	1.70	1.75	1.74	1.66
MORGAN'S POINT RESORT								
Population[2]	1,766	2,989	3,698	4,191	4,637	4,924	5,109	5,243
GPCD -- Domestic[2]		104	150	175	190	190	185	175
Acre Ft per Year -- Domestic		348	621	822	987	1,048	1,059	1,028
Million Gallons per Day -- Average		0.31	0.55	0.73	0.88	0.94	0.95	0.92
Million Gallons per Day -- Max Day[3]		0.78	1.39	1.83	2.20	2.34	2.36	**2.29**
Million Gallons per Day -- Peak Hour		1.44	2.57	3.39	4.07	4.33	4.37	4.24
TROY								
Population[2]	1,395	1,378	1,676	1,982	2,266	2,507	2,686	2,787
GPCD -- Domestic[2]		124	125	140	155	160	155	150
Acre Ft per Year -- Domestic		191	235	311	393	449	466	468
Million Gallons per Day -- Average		0.17	0.21	0.28	0.35	0.40	0.42	0.42
Million Gallons per Day -- Max Day		0.43	0.52	0.69	0.88	1.00	1.04	**1.05**
Million Gallons per Day -- Peak Hour		0.79	0.97	1.28	1.62	1.86	1.93	1.93
STUDY AREA TOTALS								
Population	50,660	60,526	69,549	79,419	89,722	98,727	107,657	115,665
GPCD -- Domestic[6]		214	285	275	268	261	255	251
Acre Ft per Year -- Total		14,478	23,730	26,790	29,663	32,314	34,550	36,512
Million Gallons per Day -- Average		12.93	21.19	23.92	26.49	28.86	30.85	32.60
Million Gallons per Day -- Max Day		**32.32**	**52.07**	**58.47**	**64.65**	**70.11**	**74.93**	**79.19**
Million Gallons per Day -- Peak Hour		59.79	96.33	108.17	119.61	129.70	138.61	146.50

1. per 2006 Brazos G Water Plan
2. per 1999 Report on Water Supply Requirements for Brazos G Regional Group Senate Bill 1 prepared by RPK.
3. 2000 gpm per 2006 Request by Morgan's Point Resort used for Yr. 2060 water model
4. Max Day Totals determined by using a factor of 2.5 for domestic consumption and 1.85 for industrial/commercial.
5. Peak Hour values were calculated using a factor of 1.85.
6. GPCD was calculated using weighted averages from each entity.

6.05 Water Treatment

The treated water for the Temple Water System is currently supplied by the conventional water treatment plant on Parkside Road and the membrane plant on Charter Oak Loop. The source for the water system is the Leon River just downstream of Lake Belton Dam. The water treatment facilities are shown on Exhibit E.

The original Temple Water Treatment Plant was built in 1911 in the vicinity of the existing raw water intake structure, and abandoned in 1938 when the facilities at the present site were constructed. The first stage of the treatment facilities at this site included three rapid sand filtration units with a nominal capacity of 1 MGD each and a circular 3 MGD sedimentation and softening unit. Sedimentation basins were later added with a capacity of 1.5 MGD each; however, no mechanical sludge removal equipment was installed in these basins. The rated capacity of the plant at that time was 3 MGD.

In 1941, an additional 1 MGD rapid sand filter was constructed, and in 1945, a 6 MGD sedimentation and softening basin was built. These improvements brought the nominal capacity of the filters to 4 MGD and the sedimentation basins to 6 MGD; therefore, the effective nominal capacity of the plant was 4 MGD.

The plant remained unchanged until 1958 when the current intake structure and an additional three filters of 2 MGD nominal capacity each were constructed along with two sedimentation basins of 3 MGD each. This addition brought the plant to an effective nominal capacity of 10 MGD. More rehabilitation was completed when the original 3 MGD circular softening unit was abandoned and the 6 MGD softening unit was upgraded with a new lime softening unit (6 MGD) utilizing the existing structure. Although these modifications did not increase the nominal capacity above the 10 MGD level gained in 1958, plant operation was improved and simplified.

Modifications in 1973 brought the existing water treatment plant capacity to 12 MGD. At that time one of the filters built in 1958 was converted to a dual media (anthracite coal and sand) filter with new controller instrumentation and piping to increase its capacity from 2 MGD to 4 MGD. By operation of this filter at its new capacity and the other six filters at

their design rates, the capacity of the treatment plant was increased to 12 MGD. Additional 1973 modifications included the addition of temporary sludge settling lagoons and reworking of the sludge recirculation piping, and the addition of one pump at both the raw water intake structure and high service pump station.

In 1978 an additional three filters of 4 MGD nominal capacity each were constructed along with Settling Basin No. 3. This addition brought the plant to an effective nominal capacity of 22 MGD. Additional 1978 modifications included the additions of permanent sludge settling lagoons with sludge recirculation pumps, a sludge gravity thickener and centrifuge, lagoon supernatant recycle pumps, and the addition of one pump at the raw water intake structure. The existing high service pumps located in the lower level at the administration building were removed and a new high service pump station was constructed on the north end of the site along with two clearwells.

Modifications in 1990 brought the existing water treatment plant capacity to approximately 33 MGD. At the time two filters were built along with one settling basin currently known as Clarifier No. 4. Additional modifications included the addition of two larger sludge settling lagoons and sludge recirculation pumps and the addition of pumps at both the raw water intake structure and high service pump station.

Lastly, in 1993 the existing plant capacity was re-rated to 30 MGD by the TCEQ due to changes in the Surface Water Treatment Rules, which went into effect July 1, 1993. In 2004, the Membrane Plant and a second intake structure were completed. The conventional plant is rated for 29.4 MGD and the membrane plant is rated for 11.6 MGD for a total capacity of 41.0 MGD.

During the summer of 1998 the maximum daily demand was 29.9 MGD, which remains the record maximum daily demand. **Figure 1** shows the historical and projected maximum daily water demand until the year 2060 and the water treatment facilities required to meet those demands. The max day demand projections from this master plan as well as from the 2000 Water Master Plan are shown for clarity. Because the population and per capita projections from the Brazos G Water Plan for the near term (2010-2025), seem much higher than they

were as part of the previous Senate Bill One Report and what would be expected from the historical data; phased treatment plant improvements have been phased accordingly.

With regard to planning for the expansion of treatment facilities, it is typical to generally plan for ten year periods with moderate growth trends. Also, the treatment method and its ease of expansion must be considered. Therefore, expansion of the water treatment plan is shown with 5 to 10 MGD phasing. Within the current structure, 44 modules (4 per rack) can be added which would increase the capacity by approximately 0.6 MGD. The maximum daily demand should be monitored closely so the preliminary planning for a 10 MGD expansion to the membrane plant is initiated approximately three years in advance of the 50 MGD necessity.

The water treatment plant is rated by the TCEQ and as previously noted in Section 4.02 any changes to treatment process and/or expansion of the facility would require review and approval by the TCEQ. As previously stated, the recommendations shown should be re-examined every three years in light of changing trends in growth and growth patterns.

With regard to TCEQ and the implementation of the Disinfection Byproduct Rule (DBPR), the City is in the process of the Initial Distribution System Evaluation (IDSE) to sample the trihalomethane (THM) and haloacetic acid (HAA5) in the system. Because the City did not qualify for the waiver, quarterly sampling began Spring '07 and will conclude in Spring '09. The IDSE Report is due July 1, 2009.

Below is a summary of upcoming projects related to the Water Treatment Facility:

FY 07/08:	Lagoon #4 Rehabilitation, Rehabilitation of Mixed Media Filters, SCADA upgrade
FY 08/09:	Recycle Pump Enclosure, Solids Handling, Raw Water Pumps Rehabilitation, Membrane Modules
FY 09/10:	Clarifier #3 Trough, Membrane Modules, Conventional Plant Rehabilitation, Backwash and Surface Wash Pump Rehabilitation
FY 10/11:	Replace Clarifier #4 Bearings, Backwash Tank, Clearwell Isolation Valves, Membrane Modules
FY 11-14:	High Service Valves, Membrane Modules
FY14-17:	Membrane Plant Expansion, Clearwell, High Service Pump Station #2

6.06 Water Consumption

Water consumption or demands must be allocated to areas throughout the City in order to design the water pumping, distribution and storage for delivery of the water. While it is not practical to determine exact water demands for individual small parts of the City, an analysis of consumption rates for various land uses provides a close approximation of maximum daily demands and peak hour demands expected. These demands are shown in Table 3 below:

TABLE 3
TEMPLE WATER SYSTEM
PROJECTED WATER DEMAND

Service Area	Design Population	Water Demand	
		Max Day	Peak Hour
		MGD	MGD
Temple	105,519	74.95	138.66
Little River - Academy	2,116	0.90	0.90 (1)
Morgan's Point Resort	5,243	2.29	2.29 (1)
Troy	2,787	1.05	1.05 (1)
Total	115,665	79.19	142.9

(1) The City of Temple provides the Maximum Daily Demand to customer systems.

As previously stated in Section 6.04, customer meters are not identified by pressure plane and there are not functional flow meters at all of the booster pump stations. Therefore, an accurate representation of water usage by pressure plane can not be obtained. We recommend that the data base for customer meters be updated to reflect the pressure plane and that flow meters be installed at all pump stations. Installation of flow meters at each pump station would also allow for a more accurate calculation and location of water loss in the distribution system. Generally one would expect an overall water loss of approximately 25% in a system of Temple's size.

For the purpose of determining future water demands for various parts of the City, the City of Temple Future Land Use Map Dated 12/23/06 and Prepared By K. Beimer, was used as a basis for the more generalized land use map shown on **EXHIBIT B.**

This information was used to estimate maximum day demands throughout the City, which were then input in the model at each of the junction nodes. Junction nodes are locations in

the computer model where two or more water pipes are connected. It is at these locations that local water consumption data is input in the model. The model is then able to calculate the flow, velocity and pressure in the pipelines to meet these demands.

The water system design is based on a regional population of approximately 116,000 persons in the Year 2060. Not only does water demand vary according to location, it will vary throughout the day as users turn water faucets, sprinklers, appliances, etc. on and off. **Figure 2** shows a typical distribution of water demand throughout the day. During the minimum hour (3 to 4 a.m.), the demand is 30% of the average for the day. During the peak hour (8 to 9 p.m.), the demand is 170% of the average for the day. The highest instantaneous demand of the year is during the peak hour of the maximum day.

The most cost effective way to provide for this peak demand is through a combination of pumps and elevated storage. If the pumps for a given pressure plane deliver water at the maximum day pump rate all day, two things will happen:

a.) When demand exceeds the pump rate, that demand will be satisfied through the use of water stored in elevated storage tanks.

b.) When the pump rate exceeds the demand, excess water will be stored in the elevated storage tanks.

For this reason, the pump stations are designed for maximum daily flow rates (with the largest pump out of service) and the elevated storage tanks are designed to hold enough water to meet peak hour demands. The pipes in the system are designed to carry the maximum flow rate encountered during the day. This is normally either at the maximum hour or the minimum hour depending on location. The data utilized in the model follows the above parameters.

6.07 Water Pumping

a.) Existing High Service Pump Station (No. 1)

The High Service Pump Station is located at the conventional water treatment plant. It consists of twelve (12) pumps numbered P10 through P20. Pumps P10 to P15 and P-11A, known as Old High Service, are connected to a 36" header pipe which supplies the Loop 363 Pump Station and the Avenue H Ground Storage Tanks through a 30" and an 18" supply line. Depending on the hydraulic conditions in the system, these pumps have a combined capacity of approximately 17,500 gallons per minute (gpm) with the largest pump out of service. All capacities on all pump stations listed hereafter assume the largest pump is out of service. Copies of the Pump Curves for existing Pump Stations are included in Appendix D.

Pumps P16 to P20, known as New High Service, are connected to a 24" header which currently supplies water to the 785 plane, the FM 2305 Pump Station, the Old Howard Road Pump Station, and the Airport Elevated Tank. These pumps have a combined capacity of approximately 7,500 gpm.

b.) Proposed High Service Pump Station (No. 2)

As previously stated, the membrane plant located adjacent to the existing conventional plant was to be constructed in phases. The second phase of that project outlined the construction of clearwells and a high service pump station. The initial capacity of High Service Pump Station No. 2 should be on the order of magnitude of 10 million gallons per day. The High Service Pump Station located at this new plant will pump into the 835, 785 and future 720 pressure planes. This will relieve High Service Pump Station No. 1 and allow for modifications to use as 720 plane supply pumps.

As the new treatment plant is expanded, new supply lines will be required. A 27" supply line is proposed to serve the Highway 317 Pump Station in the future. Also, 30" and 24" supply lines are proposed to serve the South

Temple Pump Station and Proposed 1.5 million gallon (MG) Elevated Storage Tank in the future 720 plane.

c.) Existing Avenue G. Pump Station (876 Plane)

The Avenue G Pump Station contains five pumps which pump water from the Avenue H Ground Storage Tanks to the 876 pressure plane and the West Park Pump Station. The Avenue G Pump Station is used to replenish the West Park, Nugent, 25th Street and Taylor Road Elevated Storage Tanks. This pump station also supplies water to the WCID No. 2 system in Little River-Academy. The pumps have a combined capacity of 9,600 gallons per minute which is adequate for ultimate demands.

This station currently has two flow meters in operation. However, we recommend that these flow meters be replaced as part of the overall Flow Meter project, which is programmed for FY 2012-2014. Currently, Pump No. 2 can only be utilized in conjunction with the other pumps to avoid cavitation. Therefore, this pump station will require some piping modifications to relieve the cavitation problem with Pump No. 2. This piping project is programmed for FY 2010.

d.) Existing Loop 363 Pump Station (785 Plane)

This pump station currently pumps water from the 30" supply line along Charter Oak Drive into the 785 pressure plane. The pump station is used to fill the Apache and Scott Elevated Storage Tanks. The pump station has four pumps with a combined capacity of approximately 8,000 gpm.

This station currently has a venturi type flow meter in operation. However, we recommend that this flow meter be replaced as part of the overall Flow Meter project, which is programmed for FY 2014-2016.

To provide redundancy and as the 785 pressure plane develops, the South Temple and Highway 317 Pump Stations (See sections (j) and (k), below) should be constructed to serve increased demands.

e.) Existing Old Howard Road Pump Station (920 Plane)

The Old Howard Road Pump Station pumps water from the 785 pressure plane into the 920 pressure plane. It is used to replenish the Range Road Elevated Storage Tank and to supply water to the City of Troy. The pump station contains four pumps and has a rated capacity of 2,000 gallons per minute. Pumps 1 and 2 were replaced in 2004 and pump control valves were added along the discharge piping. This station does not currently have a flow meter in operation. We recommend that a flow meter be added as part of the overall Flow Meter project, which is programmed for FY 2014-2016.

As the 920 pressure plane develops, the McLane Pump Station (See section (i), below) should be constructed to serve increased demands.

f.) Existing West Park Pump Station (920 Plane)

The West Park Pump Station pumps water from the 876 pressure plane into the 920 pressure plane supplying water to the Range Road Elevated Storage Tank as well as the City of Troy. This pump station contains three pumps with a combined capacity of 2,920 gallons per minute. As the 920 pressure plane develops, the McLane Pump Station (See section (i), below) should be constructed to serve increased demands.

This station does not currently have a flow meter in operation. We recommend that a flow meter be added as part of the overall Flow Meter project, which is programmed for FY FY 2014-2016.

g.) Existing FM 2305 Pump Station (835 Plane)

The FM 2305 Pump Station pumps water from the 785 pressure plane into the 835 pressure plane supplying the Pepper Creek Elevated Tank as well as the City of MPR. This pump station contains four pumps. As part of the utility relocation project for FM 2305, the transmission lines and pump station capacities were increased. Pressure sustaining valves were installed for Pumps 1 and 2 and the capacity of each is in the range of 1,400 gpm each at

approximately 215 ft. of head. Pumps 3 and 4 each have a capacity of 725 gpm at approximately 149 ft. of head. Because of the differing head conditions, Pumps 3 and 4 do not provide any additional capacity if ran with Pumps 1 and 2. Typically Pumps 3 and 4 are utilized during low demand periods.

The modifications to this pump station increased its rated capacity to approximately 1,400-1,500 gpm. However, continued development within the 835 pressure plane will require additional pumping capacity and most likely require an additional pump station (See sections (h) and (k), below). The flow meter in this station was also replaced as part of the FM 2305 utility relocation project.

h.) Proposed Airport Pump Station (835 Plane)

The 835 plane is currently served by the FM 2305 Pump Station, which was recently upgraded, but will not be able to solely supply the maximum day demands. Ultimately, construction of a new pump station will be required to supply increased demands, both within the City of Temple and to accommodate the request of increasing the water available to MPR from 1,200 gpm to 2,000 gpm. A minimum capacity of 2,000 gpm will be required. Ultimately, the required additional pumping capacity will be approximately 3,700 gpm. These capacities can be achieved by constructing Airport Pump Station with a bank of four 1,250 gpm pumps and installing three pumps initially. This would achieve rated capacities of 2,500 gpm initially and 3,750 gpm ultimately. This scenario would provide for flexibility in operations between the Airport and FM 2305 Pump Stations.

As stated above, the ultimate capacity can be achieved solely within this station, assuming there is continued availability in the Airport Elevated Tank. The capacity necessary at Airport Pump Station must also take into consideration any modifications at the FM 2305 Pump Station that increase its capacity. Another option is to construct a bank of pumps for the 835 Plane within the proposed Highway 317 Pump Station as discussed in (k).

i.) Proposed McLane Pump Station (920 Plane)

The 920 plane and the City of Troy are currently served by the Old Howard Road Pump Station and the West Park Pump Station. As the industrial park grows, the capacity of these pump stations may be exceeded. When this occurs, a new pump station on McLane Blvd. (See **Exhibit F**) will be used to supply increased demands. The increase in available water supply provided by the construction of a new water treatment plant is a prerequisite to this pump station. The proposed capacity of the new pump station is 3,000 gallons per minute.

j.) Proposed South Temple Pump Station (785 and 876 Planes)

The 785 Plane is currently served by the Loop 363 Pump Station. As development occurs in the 785 pressure plane east of 31st Street, the demands of the existing Loop 363 Pump Station Capacity and the existing transmission line will exceed capacity. Initially, these demands may be relieved by pumping from the existing water treatment plant through the existing 18" and 14" lines to the 12" water lines on Hickory Road and South 31st Street (See **Exhibit F**).

The pump station should be initially designed to pump 3,500 gallons per minute into the 785 pressure plane. As demands in the 785 plane west of 31st Street and in the southern 876 pressure plane continue to increase, the capacity of the pump station will be exceeded. When this occurs, a pump station expansion to 7,000 gallons per minute will be required to meet the increased demands.

The 876 Plane is currently served by the Avenue G Pump Station. Further, Avenue G Pump Station, supplied by the high service pumps at the existing water treatment plant, is the only supply for the 876 pressure plane, WCID No. 2, West Park Pump Station, and the Park, Nugent, 25th Street, and Taylor Road Elevated Storage Tanks. However, this alone will not supply adequate water for the ultimate 876 plane demands. Lack of redundancy and reliability are also a concern because of the infrastructure that is dependent on Avenue G.

Construction of the South Temple Pump Station is not only necessary to provide for projected increases in demand, but also to alleviate several other issues. This facility will provide the redundancy necessary to allow for repairs to the Avenue G Pump Station and Avenue H Ground Storage and provide for a more reliable supply.

This South Temple Pump Station, shown on **Exhibit F**, will serve both the 876 and 785 planes by pumping water from the eastern 785 plane to the southern 876 plane including the 25th Street and Taylor Road Elevated Storage.

Preliminary Engineering for these facilities is planned for FY 07/08. It is anticipated that two separate banks of pumps will be housed in one building and take suction out of an adjacent 2 MG Ground Storage Tank. This storage tank will provide additional storage in the system. The initial capacity of the pump station is expected to be in the range of 3,500 gallons per minute for each plane.

k.) Proposed Highway 317 Pump Station (835 and 785 Planes)

This Highway 317 Pump Station will serve both the 835 and 785 planes. Two separate banks of pumps will be housed in one building and pump to the appropriate plane. An adjacent 2 MG Ground Storage Tank will also be constructed and the pump stations will take suction out of this reservoir.

The 835 plane is currently served by the FM 2305 Pump Station. As growth continues to occur, the capacity of this pump station will be exceeded. A new pump station adjacent to the Airport Elevated Tank (See **Exhibit F**) will be used to supply increased demands. The proposed initial capacity of the new pump station is 2,500 gallons per minute.

Development in the 785 plane will lead to the eventual construction of the Highway 317 Pump Station and depending on the growth pattern in the 835 plane it may be reasonable to construct a bank of pumps to further supplement

the 835 plane. In this instance, an evaluation should be performed to determine the appropriate capacities for the pumps as they would be related to the existing capacities of the FM 2305 and Airport Pump Stations. The other determining factor will be whether there will be available capacity from the Airport Elevated Tank to continue to support the Airport Pump Station.

The 785 plane is currently served by the Loop 363 Pump Station. This pump station is currently experiencing problems under peak conditions and will therefore need to be expanded. As growth occurs, additional capacity will be required for the 785 plane. At that time, a new pump station on Highway 317 (See **Exhibit F**) will be used to supply increased demands. The increase in available water supply provided by the construction of a new water treatment plant is a prerequisite to this pump station. The proposed capacity of the new pump station is 4,500 gallons per minute initially with an ultimate capacity of 9,000 gallons per minute.

Many of the pump stations in the Temple Water System are interrelated. For this reason, any consideration of improvements must take the following factors into consideration:

a.) Is there adequate treatment capacity to supply new pump requirements?

b.) Are other pump stations able to supply the new pumps as well as other demands?

c.) Are the water transmission and distribution pipes capable of carrying increased flows caused by new pumps?

Table 4 shows the pump stations which pump into each pressure plane. The existing capacity of each pump station is shown along with expected expanded capacities for each phase of development.

TABLE 4
TEMPLE WATER DISTRIBUTION SYSTEM
SUMMARY OF PUMP STATION CAPACITIES
BY PRESSURE PLANE

Pump Station	Existing Capacity (gpm)	Future Capacities (gpm)	
		Initial	Ultimate
High Service Pumps (No. 1)			
Old High Service	17,500	17,500	17,500
New High Service	7,500	7,500	7,500
High Service Pumps (No. 2)	0	7,000	17,100
876 Pressure Plane			
Avenue G Pumps	9,600	9,600	9,600
South Temple Pumps	0	3,500	7,000
920 Pressure Plane			
West Park Pumps	2,920	2,920	2,920
Old Howard Pumps	2,000	2,000	2,000
McLane Pumps	0	0	3,000
785 Pressure Plane			
Loop 363 Pumps	8,000	8,000	8,000
South Temple Pumps	0	3,500	7,000
Highway 317 Pumps	0	0	9,000
835 Pressure Plane			
FM 2305 Pumps	1,750	1,750	1,750
Airport Pumps	0	2,500	3,750
Highway 317 Pumps	0	0	2,500

6.08 Water Storage

There are two types of water storage: ground storage and elevated storage. Ground storage is located at ground level and is used to provide a supplemental supply of treated water to the system in the event of a water treatment failure. Ground storage is also used to supply a short term demand which is in excess of treatment plant capacity. Elevated storage is used to provide a supplemental supply of water to the distribution system in the event of pump failure. Elevated storage is also used to meet peak hourly demands which exceed pump rates.

The Texas Commission on Environmental Quality (TCEQ) has requirements concerning the amount of storage required in municipal water systems. Systems must have clearwell capacity of 50 gallons per connection or 5% of daily plant capacity, total storage capacity of 200 gallons per connection and elevated capacity of 100 gallons per connection. TCEQ also requires that each tank in the system be inspected annually. Ideally the elevated capacity should be based on the number of connections in a given pressure plane. However, because this information is not available in the meter data base, one can only look at the overall system. The City of Temple System exceeds all of the above the requirements for the system as a whole.

Since demands fluctuate during the day, a combination of pumping and elevated storage is an economical way to meet fluctuating demands while maintaining a constant pump rate. In this operation, water demands which are in excess of the pump rate are met by reserves stored in elevated tanks. During the night, when demands are less than the pump rate, the elevated tanks are replenished.

The more critical requirement of storage is demands within the system. The elevated and ground storage capacity proposed to supply peak demands in the ultimate system meets both the TCEQ and system demand requirements (See Table 5).

TABLE 5
TEMPLE WATER DISTRIBUTION SYSTEM
STORAGE REQUIREMENTS

Location	Storage, Million Gallons			
	Existing System	Required Demands	Ultimate System	Required Demands
WTP	5.4	2.1	8.4	3.8
920 ES	1.0	0.9	2.0	1.6
876 ES	3.5	1.8	3.5	3.3
876 GS	7.0	-	8.0	-
835 ES	0.22	0.61	1.22	1.2
835 GS	-	-	1.0	-
785 ES	3.0	2.5	4.0	4.7
785 GS	-	-	2.0	-
720 ES	1.0	1.3	2.5	2.4

Ground storage and clearwell storage are sufficient per TCEQ requirements. However, additional ground storage is to be constructed as part of the South Temple and Highway 317 Pump Stations to provide for additional storage within the distribution system. Further, additional clearwell storage is to be added as part of the membrane plant expansion.

Currently the elevated capacity in the 835 plane is not adequate, but can be solved by over pumping during peak conditions until such time as the proposed 1.0 MG Tank is completed. The storage required by demands for the 720 Plane shows exceed the existing capacity of 1.0 MG. However, the existing boundaries for the plane are much smaller than what they will be expanded to in the ultimate system, so there is no current cause for concern regarding elevated storage within the 720 plane.

The elevated storage in the 785 and 876 planes will need to be re-evaluated in approximately 10 years to determine if the area near 5th Street will be fed from 876 or 785 and thus the appropriate plane for additional elevated storage. The required elevated storage based on demands and shown in the above table is based on this area being part of the 785 Plane.

As part of the infrastructure inventory, the Water Treatment Plant Staff provided the following summaries of the existing elevated tanks in the system. It should be noted that the summaries provided were generated prior to the construction of the 25th Street EST. A copy of the original document can also be found in Appendix C.

ELEVATED STORAGE TANKS

1. *AIRPORT EST – Erected 1982, steel tank construction. Capacity 1.5 MG, this tank is displacing exterior rust, no interior cleaning had been done since construction until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Bermad Altitude Valve replacement in 2004 the vault and piping was also rehabbed during this valve project. We have not had any problems with this valve and are not having any at this time*

2. *7th AND AVENUE P EST – Erected 1939, steel tank construction. Capacity .500 MG, this tank was refurbished in 1981. No interior cleaning had been done until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. This tank was not chosen to get a new altitude valve being it was going to be taken out of the system by the 25th street Tank.*

3. *NUGENT EST – Erected 1933, steel tank construction. Capacity .500 MG, this tank was refurbished in 1981. No interior cleaning had been done since 1981 until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Bermad altitude valve replacement during West Park EST rehab project. 2005 We have had problems with this valve*

twice in which Jo Cobbler came and did the repairs to the valve. We are not having any problems with this valve at the present time.

4. *WEST PARK EST- Erected 1958, steel tank construction. Capacity 1.000 MG, this tank was refurbished in 1981. No interior cleaning had been done since construction until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Tank was refurbished in 2005 - 06 by Classic Protective Coatings and KPA Bermad Altitude Valve replacement during rehab project. The vault and piping was also rehabbed during this valve project. We have not had any problems with the altitude valve at this tank since the installation of it.*

5. *APACHE EST - Erected 1971, steel tank construction. Capacity .500 MG No interior cleaning had been done since construction until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Tank was refurbished in 2005 - 06 by Classic Protective Coatings and KPA. Bermad Altitude Valve replacement in 2004 the vault and piping was also rehabbed during this valve project. We have had a few problems with the valve leaking water a few times and causing the sump pump to fail and flood. Frank smith has addressed the issue and repaired the problem and we have not had any more problems at this time.*

6. *PEPPERCREEK EST - Erected in 1987, steel tank construction. Capacity .250 MG. No interior cleaning had been done until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Bermad Altitude Valve replacement in 2004. The vault and piping was also rehabbed during this valve project. This valve is not having any problems at this time*

7. *TAYLOR EST - Erected in 1979, steel tank construction. Capacity 1.000 MG. The exterior was refurbished in 2001, the interior was deemed unnecessary at that time by Phoenix Tank Co. No other maintenance was done until Phoenix inspected and pressure washed the exterior and interior in 2002. Bermad Altitude Valve replacement after West Park EST Project in which the vault also got a new cover lid 2005. we have not had any problems with this valve and are not having any at this time*

8. *SCOTT EST - Erected in 1968, steel tank construction with access through center column. Capacity 1.000 MG. No interior cleaning had been done since construction until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Tank was refurbished in 2005 Bermad Altitude Valve replacement in 2004. Frank Smith has been here on numerous occasion for problems with this valve not closing at the desired time, if we make an adjustment for it to close at even an approximate time it closes too soon and sometimes will not open again until we re do the adjustments back to where it was. At the present time we are not having any issues with this valve at the present time.*

9. *RANGE ROAD EST - Erected in 1979, steel tank construction. Capacity 1.000 MG. exterior was repainted in 1995. No interior cleaning had been done since construction until year 2002 when Phoenix Tank inspected and pressure washed interior and exterior. Bermad Altitude Valve replacement in 2001 the valve was supplied by John Pappalardo and Bell contractor done the installation work along with changing out a broken 18" distribution valve in the Tank yard, the also re did the vault with a new metal lid. The Bermad rep could not be there at the time we needed the to do the start up on the valve so Johnnie Reisner and Scott Edwards had to use the manual to set the valve and then the Rep for Bermad checked the valve and said that it was good to go. Frank Smith looked at the valve when he was the Bermad rep for the other tank altitude valve replacement project and re did some of the plumbing and put on the larger filters. We have no problems with this tank at the present time.*

10. *720 EST – Erected in 2004 by Land Mark and RPK, composite tank construction with steel bowl. Capacity 1.000 MG. At the time of the 1 year anniversary inspection done by John Konzen from H.O.T. Tank Inspection and John from KPA the tank had some various interior staining in the bowl. International Diving Service LTD done the cleaning in 2005 Bermad Altitude Valve was installed at the construction of this tank along with a Cla-Valve and Bermad PRV for the function of this tank. The Bermad Altitude valve had a severe problem and lost part of its insides causing the valve to fail. The Bermad Rep. Joe Cobbler came down and did the repair work on this valve in 2005. Frank Smith also had to do some work on both the PRV' s in which he installed some different filters on the valves due to the valve not completely closing in 2004. we are not having any problems with the altitude valve at this time*

6.09 Water Transmission

A schematic of the Temple Water System is shown on Figure 3 and includes the transmission mains. Old High Service Pump Station supplies water through the 30" and 18" lines to the Loop 363 Pump Station and Avenue H Ground Storage. The 18" main is lead joint and has no isolation valves between the Water Plant and 33rd/Avenue K. This transmission main is scheduled to be replaced in FY 2010.

New High Service Pump Station supplies water through the 24" line to the Airport Elevated Tanks, as well as the FM 2305 and Old Howard Road Pump Stations. There have not been any problems reported on this main.

The 18" Water Line, known as the Southwest Transmission Main, supplies water to the 785 Plane. In emergency conditions this transmission main can be utilized to backfeed into the 876 Plane. However, there is a piece of 6" line along Thornton Lane and a piece of 8" line along Hickory road which create a "bottleneck". This 1800' of small diameter line is scheduled to be upgraded to a 12" in FY 2011-2013.

The 12" Water Line from Avenue H Ground Storage to the old Ave. P Tank site was reported to be in bad condition. A 12" Water Line is scheduled for construction and will directly serve the 25th Street Tank and thus provide an alternative route to the new tank.

Within the 920 Plane, the 14" Water Line along Industrial and the 10" Water Line supplying Troy were reported to be in bad condition. These lines are scheduled to be replaced after FY

2026. Some of the problems can be attributed to the line pressure from the Old Howard Road Pump Station and may be somewhat relieved with the construction of the 12" Water Line along Wendland Road and future lines in the area of Moores Mill Road.

All newly installed transmission mains within the City of Temple System shall be ductile iron if greater than 12" diameter and have air valve assemblies installed at all high points.

6.10 Water Distribution

A computer assisted analysis was performed utilizing WaterCAD Software. This provides information on line velocities, system pressures, and elevated tank elevations as they vary through the day.

Distribution lines were analyzed to determine if pressures and velocities were within an acceptable design range and meet the requirements of TCEQ Chapter 290. All newly installed water lines within the City of Temple System shall be a minimum 6" diameter, AWWA C900 PVC pipe (up to 12" diameter) with fire hydrants spaced at a maximum of 500' intervals. The City currently has a program in place to replace many of the very old, deteriorated, small diameter distribution lines within the system. The majority of these lines are in the downtown area. This program is subject to the available O&M funds in the water system budget each year.

Below is a table from Chapter 290, which illustrates the minimum water line size for a certain number of connections. It should be noted that the required sizes are based strictly on the number of customers to be served and not on the distances between connections or differences in elevation or the type of pipe. Further these minimum sizes do not consider fire flows.

Maximum Number of Connections	Minimum Line Size (inches)
10	2
25	2.5
50	3
100	4
150	5
250	6
>250	8 and larger

A fire flow analysis was performed in the model to determine if the system could maintain a residual pressure of 20 psi with a fire demand of 500-2000 gpm placed at various locations throughout the system. As expected, maintaining 20 psi in the far reaches of the system was a challenge, but possible with the proposed infrastructure. In the 835 Plane the construction of the 1.0 MG elevated tank and some water lines to further loop the system will greatly improve the water available for fire flow.

Chapter 290 also requires that the system be designed to maintain a minimum pressure of 35 pounds per square inch (psi) at flow rates of at least 1.5 gallons per minute per connections. It also must be designed to maintain a pressure of 20 psi under combined fire and drinking water flow conditions. TCEQ's that a free chlorine residual of 0.2 mg/L or a chloramine residual of 0.5 mg/L (measure as total chlorine) be maintained throughout the distribution system.

Water line velocities greater than 5 feet per second (fps) may cause low pressures in the system. Pressures less than 40 psi indicate problems in the distribution system. Critical times are during minimum hour when elevated storage tanks are being replenished and during peak hour.

Exhibit F shows the distribution lines required for the ultimate system (116,000 people). **Exhibit F** also shows major improvements prioritized in phases. Minor improvements will be constructed as areas develop.

Desirable pressures range from 50 to 90 psi. Pressures in the distribution system which are below 40 psi or above 100 psi may indicate water distribution lines which are too small or isolated areas of higher ground elevation not readily served by a higher pressure plane.

In some instances, high pressures exist near pump stations. This occurs because of the low ground elevations in the vicinity of the pump station. There are some places in the existing distribution system where peak hour pressures are low because of high ground elevations. Some of these areas may be transferred into another pressure plane and should be examined on a case by case basis to determine if a plane transfer is possible by manipulating existing valves.

6.11 Previous Reports

The following is a list of reports previously completed for the City of Temple regarding the Water System:

a.) Preliminary Design of Water Treatment Plant Modifications - November 1999

b.) Preliminary Engineering Report for the Expansion of the Temple Water Treatment Plant - July 2001

c.) Hydraulic Modeling Analysis for 876 Pressure Plane – June 2005

d.) Update to FM 2305 / Pepper Creek Tank Service Area Study – March 2006

e.) Membrane Water Treatment Plant - Solids Handling and Capacity Improvement Study - 2008

6.12 Recommended Improvements

Exhibit F shows the ultimate water treatment, storage, and distribution system for the Temple Water System as it is currently planned. Improvements are shown in colors representative of the fiscal year in which the project is expected to begin. The detailed Phasing Plan is included in Section 8. The development of these improvements and their phased scheduling has been done in close cooperation with the City of Temple staff. However, as development and growth occur, improvements may be accelerated or delayed and priorities may be changed based on actual growth trends and development conditions.

Although the source and amount of funding is not finalized, the projects have been prioritized by City Staff based on needed upgrades to the system, increased capacity and completion to meet other obligations. Because the improvements to the water system are interrelated, the order of improvements is important. As previously stated, the actual time to schedule design and construction should be based on a continuing examination of growth trends.

One outside obligation is the relocation of utilities within the right-of-way of the State. Many of the TxDOT projects scheduled in and around the City of Temple will require relocation of utilities into a private easement or inside the new right-of-way boundary.

Currently the City is relocating utilities for the Southeast Loop 363, I-35 and FM 2305 projects. The other projects on the letting schedule which will require utility relocation are Northwest Loop, SH 317, North 3rd, FM 93 and US 190. The relocation of utilities for FM 2305 and US 190 is scheduled for completion by TxDOT in Summer 2008, with letting for FM 2305 in July 2008. The letting schedule for the other projects is noted as "To Be Determnined". Included on the following page is the TxDOT Schedule for Temple Area Projects dated December 14, 2007, which TxDOT provided to the City of Temple:

Texas Department of Transportation – Project Schedules

Temple Area Projects

December 14, 2007

	Hwy	CSJ	From	To	Description	ENV Clear	ROW Map Approval	ROW Acquired	City Utility Complete	Other Utility Complete	Projected Letting	Const Complete	Comments
1	LP 363		57TH ST	5TH ST IN TEMPLE	Reconstruct Mainlanes and Frontage Roads	na	na	na	?	Oct 2008	Let	Summer 2009	Under Constrution
2	SP 290		AT South LOOP 363		UP Railroad Bridge replacement				N/A	TBD	Let	Summer 2009	Let 10/2007
3	LP 363	184-04-031	@ SP 290		CONSTRUCT INTERCHANGE	9/03	TBD				TBD		Per MPO Approval with City Participation (ROW Mapping and PS&E on Hold due to reductions in Professional Service Funding
4	LP 363	184-04-030	57TH ST	5TH ST IN TEMPLE	ADD LANE IN EACH DIRECTION (MAIN LANES)						TBD		To reconsider need for project
5	LP 363	184-04-961	@ 57TH ST UNDERPASS	(SBML) (STR #033)	REHABILITATE BRIDGE AND APPROACHES						TBD		Currently Unfunded
6	LP 363	320-06-001 320-06-004	IH 35 NORTH OF TEMPLE @ BNSF RAILROAD	SH 53 (NW LP 363)(MAIN LN)(MAIN & TRACKS)	CONSTRUCT N FTG RD CONSTRUCT GRADE SEPARATION	Summer 2008	4/08	By City if Pass-Thru ?		?	Early 2010 ?		City proposing to let as Pass Through Financing Project (City preparing draft agreement)
7	LP 363	184-04-038	HOPI TRAIL, 0.8 MI W OF IH 35,	SH 36	UPGRADE FREEWAY AND RECONSTRUCT FM 2305 INTERCHANGE	Summer 2008					TBD		City proposing to let as Pass Through Financing Project
8	SH 36	184-03-025	AT LOOP 363 IN TEMPLE		CONSTRUCT ULTIMATE DIRECT CONNECTION						TBD		Unfunded in MTP
9	US 190	185-01-026 185-01-020	SH 95 IN TEMPLE TEMPLE SOUTH CITY LIMIT	TEMPLE SOUTH CL 2.0 MI S OF FM 436 IN HEIDENHEIMER	WIDEN ROADWAY TO FOUR LANES WITH DEPRESSED MEDIAN	6/03	8/05	Spring 2008	Summer 2008	Summer 2008	TBD		Cell Tower clear by 2/08 Construction Delayed due to funding
10	FM 2305	232-04-010 232-04-013	NORTHSIDE OF LAKE BELTON BRDG At SH 317	SH 317	WIDEN ROADWAY TO FOUR LANES WITH TWO WAY LEFT TURN LANE CONSTRUCT INTERCHANGE	2/5	2/05	4/08	Early Summer 2008	10/08	7/08	Late 2010	On hold pending ROW/Utilities
11	SH 317	398-04-059	FM 2305	FM 439	WIDEN ROADWAY TO FOUR LANES WITH RAISED MEDIAN	3/06	TBD				TBD		ROW Mapping on Hold due to Professional Service Funding
12	US 190 Extension	909-36-900	IH 35	SH 36 (EXT OF US 190)	CONSTRUCT NEW LOCATION RURAL DIVIDED HIGHWAY (EXTENSION OF US 190)						TBD		Unfunded in MTP
13	FM 93	1835-02-036 3292-01-010	IH 35 FM 1741	FM 1741 US 190/SH 36	RECONSTRUCT 4 LANE DIVIDED ROADWAY WIDEN TO 4 LANE DIVIDED ROADWAY	TBD	TBD	TBD		TBD	TBD		Highway Project Unfunded but was moving forward with approval of schemaatic in order to construct RR grade separation . Currently on Hold due reduced Professional Service Funds
14	FM 93	3292-01-009	@ UNION PACIFIC RR NEAR	5TH ST IN TEMPLE	CONSTRUCT RAILROAD OVERPASS AND APPROACHES ON MAIN LANES						TBD		Funded - Dependent upon approval of FM 93 proposed improvments
15	FM 2271	909-36-120	FM 439	US 190	BUILD FARM-TO-MARKET ROAD ON NEW LOCATION	Late 2008							Public Hearing Summer 2008 (Working with COE for ROW)
16	SH 36		SH 317	LAKE BELTON BRIDGE	WIDEN TO FOUR LANE DIVIDED HIGHWAY								Unfunded in MTP
17	SH 201		SH 195	I 35	Study	3-5 Years	Last Purblic Meetings held Nov 13 &15, 2007 Next meetings late 2008 or early 2009						Unfunded

Updated December 2007

Changes from Oct 19, 2007 Meeting

Below is a summary of the major water projects outlined for each fiscal year(s):

a.) Fiscal Year 2007/2008

There are several substantial water projects scheduled for FY 07/08. The West Temple Utilities North of FM 2305, which includes an elevated tank and pump station, the Northwest Loop 363 and SH 317 Water Line Relocations and the South Temple Project. There are also various rehabilitation projects including Lagoon #4, the rehabilitation of mixed media filters, SCADA upgrades and water line replacements.

b.) Fiscal Year 2008/2009

Many of the major construction projects listed above continue through FY 08/09. In addition, the construction of Outer Loop Phase III will require the relocation of a 24" Water Line. The enclosure for the Recycle Pump Station, a transmission line valving project, relocations, rehabilitation of Nugent Tank and water line replacements are also scheduled.

c.) Fiscal Year 2009/2010

Relocation of water lines for Outer Loop Phases 4-6, and water lines from I-35 to Range Road EST, Centex Sportsman Road Water Line and Red Barn Road Water Line are all scheduled for FY 09/10. A multitude of water line rehabilitation projects are scheduled along with Pepper Creek Tank Rehab and a generator for Ave. G Pump Station. The Clarifier #3 Trough, additional membrane modules conventional plant and backwash and surface wash pump rehab at the Water Plant are also anticipated.

d.) Fiscal Year 2010/2011

The 18" Transmission Main from the Water Plant to Ave. H Ground Storage is to be replaced in FY 10/11 and the utilities for Spur 290/1st Street are to be relocated. Rehabilitation projects include the Ave. G Pump Station Piping, replacement of Clarifier #4 bearings, backwash tank, Taylor Tank and several water line replacements.

e.) Fiscal Year 2011/2012 – 2013/2014

Water Line construction in the Lucius McCelvey Drive Area and at Taylor's Valley Road and Hwy 93 are slated for FY 11/12-13/14 along with the utility relocations for I-35 and 57th Street. The Hickory and Thornton Water Line Improvements are also scheduled and will alleviate the bottleneck from Southwest Transmission into the 876 Plane. The valves for the high service pumps, interior of the Airport and Range Road Tanks and fire hydrant replacements are also programmed.

f.) Fiscal Year 2014/2015 – 2016/2017

A 10 MGD expansion of the Water Treatment Plant is expected in FY 14/15-16/17 and will include additional membrane filters, a clearwell and high service pump station. Scott, West Park and Apache Tanks also scheduled for rehabilitation along with flowmeters throughout the system.

g.) Fiscal Year 2017/2018 – 2019/2020

Construction of the Highway 317 Pump Station, including ground storage facilities, and Northwest Transmission Main are planned for FY 17/18-19/20. The improvements will increase the water available to the 835 and 785 Pressure Planes. Improvements to the Loop 363 Pump Station and various water line improvements are also scheduled.

h.) Fiscal Year 2020/2021 – 2022/2023

The Hogan Road Water Line and other water line rehabilitation projects are programmed for FY 20/21-22/23.

i.) Fiscal Year 2023/2024 – 2025/2026

Currently there are no specific projects outlined for this cycle.

j.) Fiscal Year 2026/2027 - 2059/2060

There are numerous projects identified for Year 2025 and beyond. These projects include the McLane Pump Station, McLane Water Line Improvements and additional elevated storage in the 920, 720 and 785 Planes. Water line improvements to the Troy Water Line, East Loop, West Loop, Shallow Ford Road, SH 317, Tarrant Park, Industrial Boulevard, Highway 93, Barnhardt Road and Highway 95, South Loop 363, Kegley to Old Waco Road, Water Line East of Old Waco Road, FM 2271, Doshier Farm, South Kegley, North Point Road, Case Road, Sleepy Hollow, South I-35/Loop 363 Interchange and 14" from Slough Road to Lions Park Road are also budgeted.

7. WASTEWATER SYSTEM ANALYSIS

7.01 General

The City of Temple is served by two sewerage systems, the Temple-Belton Regional Sewerage System (T-BRSS) in the west and Doshier Farm in the east. The continued growth and development of the City of Temple necessitates that the existing wastewater system be analyzed for adequacy of service and facilities be planned for newly developing areas.

This report summarizes the analysis and planning of improvements for both the Brazos River Authority Temple-Belton Regional Sewerage System and Doshier Farm service areas. The areas served by the Temple-Belton Regional Sewerage System Treatment Plant as well as the Doshier Farm Wastewater Treatment Plant (DFWWTP) are shown in EXHIBIT I.

The report will also identify and determine the size of those wastewater collection system improvements including gravity lines, force mains and lift stations which will be required to provide service within the planning area, identify the general location of a future treatment plant in the southern part of Temple and review the required treatment capacity at each of the treatment facilities. Within the collection system, gravity lines are generally classified as either a "trunk" or "collector". A trunk sewer differs from a collection line in that it is the principal sewer to which branch sewers (collection lines) are tributary.

7.02 Existing Infrastructure

Several work sessions with the City of Temple Engineering, Wastewater Staff and OMI/CH2MHILL Personnel were held to discuss the existing system in order to determine which areas and concerns were most prevalent. From these and subsequent work sessions, it was determined what portions of the system would require rehabilitation and/or replacement. Wastewater trunks/collection lines, lift stations and the wastewater plants were discussed in detail. Infrastructure Assessment Summaries were prepared and are included in Appendix C. Generally, multiple projects have been identified to address various maintenance issues at the Doshier Farm Wastewater Treatment Plant, eliminate lift stations and replace deteriorating wastewater lines.

The work sessions and analysis of the existing system showed that the current system contains many areas with clay lines that need to be replaced as well as growth areas where trunk sewers need to be constructed to eliminate basin transfers. Further there is an abundance of temporary lift stations that can be abandoned as trunk sewers are constructed. Many of these lift stations were constructed for specific developments or industries where trunk sewers did not exist, with the intent to be abandoned once sewer was available to the area.

7.03 Drainage Basins

Natural topography is important in wastewater collection and trunk lines, since sewers are most economically constructed as gravity flow conduits. Sewage is carried out of a drainage basin much in the same way as rainfall runoff. In areas where the terrain is flat as compared with sloping topography, a gravity conduit following natural ground slope will transport sewage either at a slower rate. To keep pipe size to a minimum, the slope of the pipe can be increased, requiring the conduit to be buried deeper as the line progresses down the slope.

There is a practical limit to depth, due primarily to costs involved in excavation and working conditions. When the practical limit is reached, pipe diameter can be increased, or the sewage can be lifted by pumps where the process of pipe size and depth of excavation can again be evaluated, as described above.

It is often necessary to transport sewage from one drainage basin to another, either by pumping or sometimes by deep cuts through natural divides. Each case must be evaluated based on the areas that can be served, operation and maintenance costs to the City, and treatment plant location.

7.04 Wastewater Flows

Wastewater flows were determined for each drainage basin in the service area by utilizing projected land use and flows related to land use. Many of the proposed sewer lines will not

be constructed for several years, if not decades, in the future. The projected land uses and unit flows should be reviewed periodically to determine if the design criteria are changing.

Wastewater is discharged from residential, commercial and industrial establishments. Water also infiltrates the system through manhole covers, broken pipe, and faulty pipe joints, particularly at house connections. The wastewater flow is collected in laterals, then in trunk mains where it is carried to a plant for treatment and disposal.

Prior to design of pipelines, lift stations or treatment plants, it is necessary to determine the magnitude of wastewater flows. In the City of Temple, where influent flow records are maintained, per capita flow and other parameters can be calculated based on current population data.

Wastewater is not contributed to the trunk lines at a uniform rate throughout the day. Peak flows occur at mid-morning and early evening, much the same as is experienced in the City's water distribution system. These peak flows must be considered in designing pipelines. This study has included peak flows through the use of peaking factors. The peak factors for each of the treatment plants were determined based on historical data and can be found along with the peak flows in Section 7.06.

Infiltration of rainfall and ground water into the sewer lines must also be considered in calculating pipe sizes and plant hydraulics. Extremes in pipeline infiltration can be controlled by making every effort during design and construction of lateral and trunk sewers to utilize improved sewer jointing materials and maintain careful and workmanlike installation practices. Special attention should be given to small sewers since they normally constitute the largest percentage of pipeline length in a system.

Although these current design and construction practices minimize infiltration, a common problem is aging infrastructure. Approximately 70% of the Temple Sewer System is vitrified clay pipe. This pipe material is very susceptible to cracking and joint separation, which then lead to problems with tree roots. All of these factors contribute heavily to the amount of inflow and infiltration seen within the system.

Three of the main trunk sewers within the system are scheduled for replacement in the next fifteen years. The Bird Creek Trunk sewer is in preliminary design phase and the South Jackson Trunk Sewer is programmed in FY 2014/2015. Replacement of the Williamson Creek Trunk Sewer is scheduled for FY 2020/2021.

Also scheduled for construction is the Leon River Trunk Sewer in FY 2014/2015. The timeline for construction of the Leon River Trunk will be triggered by several factors: reaching capacity at the Shallowford Lift Station and/or force main, reaching capacity at the Pea Ridge Lift Station and/or force main or reaching capacity in the 30" Pepper Creek Trunk Sewer. For these reasons, we recommend that flow recorders be installed at key locations to determine that actual flows coming from the Leon River Basin and through the Pepper Creek Trunk Sewer.

7.05 Population

As previously discussed, development of areas in accordance with projected land use will determine the population to be served. Generally within the Temple Sewer System, trunk sewer lines have been sized to serve the ultimate population of the drainage area. Over the life of a project this is a more economical approach because constant upgrades are eliminated. Depending upon the timing and location of various developments, it may not be possible to construct facilities to serve the ultimate population.

If this situation occurs, a deliberate decision can be made to decrease the size of any given facility and the future additions can be identified. As discussed in Section 3.01, the City will participates in the extension utilities and pays for any necessary oversizing to encourage the construction of infrastructure to serve the ultimate population.

Because of developments occurring beyond the sewer service area, there have been numerous temporary lift stations constructed in lieu of the more costly trunk sewer for the basin. When this occurs and creates a basin transfer, the receiving basin must be analyzed to determine if there is sufficient capacity.

7.06 Design and Analysis Parameters

The following summarizes the development of wastewater flows used in the analysis and design of the wastewater collection system:

A. Temple-Belton Regional Sewerage System Treatment Plant

Land Use	Residents per acre	Per Capita GPD	Average Flow GPD/acre	Peaking Factor	Peak Flow GPD/acre
Low Density Residential	4.2	115	483	3.25	1570
Medium Density Residential	8.0	125	1000	3.25	3250
Commercial			500	2.0	1000
Industrial			600	2.0	1200

GPD = Gallons Per Day

B. Doshier Farm Wastewater Treatment Plant

Land Use	Residents per acre	Per Capita GPD	Average Flow GPD/acre	Peaking Factor	Peak Flow GPD/acre
Low Density Residential	4.2	105	483	3.5	1690
Medium Density Residential	8.0	110	1000	3.5	3500
Commercial			500	2.0	1000
Industrial			600	2.0	1200

Infiltration Rates

Pipe Diameter Inches	Infiltration Rate GPD/mi.
8	3500
10	4000
12	4500
15	5000
18	6500
24	10000
30	15000
36	18000

Source: Gravity Sanitary Sewer Design and Construction
American Society of Civil Engineers

7.07 Wastewater Treatment

All of the wastewater from the planning area considered in this report will flow to either the Brazos River Authority Temple-Belton Regional Sewerage System Treatment Plant or the City of Temple Doshier Farm Wastewater Treatment Plant. As the service area develops, it is likely that additional treatment facilities will be required. The general location of a future treatment plant is discussed in Section 7.09.

7.08 Treatment Capacity

The current design criteria for sewer systems are in Chapter 317. However, TCEQ is proposing to modify the Design Criteria for Sewerage Systems. The changes are encompassed in the new Chapter 217, which will supersede Chapter 317. It is anticipated that the new Chapter 217 criteria will be adopted by early 2008.

With regard to treatment capacity TCEQ requires that preliminary design begin when the 30 day average exceeds 75% of the design flow (5.63 MGD) for 3 consecutive months. Once the 30 day average reaches 90% of the design flow, construction must begin

Wastewater Treatment Plants must obtain a discharge permit to release effluent into adjacent streams/tributaries/waters. Typically these permits must be renewed every five years.

a.) Temple-Belton Regional Sewerage System

The Temple-Belton Regional Sewerage System plant was expanded in 1990-91 to treat a peak flow of 30 million gallons per day (MGD) generated from 66,667 people or their equivalent. As shown below, 20 million gallons of peak flow capacity has been allocated to the City of Temple. The design criteria for the plant and allocation of capacity are summarized as follows:

Temple	
Population	46,188
Per Capita Flow, Dry Weather (gpcd)	116
Average Day Flow, annual average (mgd)	5.36
Maximum Day Flow, annual average (mgd)	16.10
Wet Weather Flow, highest 30 day average (mgd)	6.93
Peak Flow, 2 hour wet weather (mgd)	20.00
Belton	
Population	20,479
Per Capita Flow, Dry Weather (gpcd)	112
Average Day Flow, annual average (mgd)	2.29
Maximum Day Flow, annual average (mgd)	6.90
Wet Weather Flow, highest 30 day average (gpcd)	150
Wet Weather Flow, highest 30 day average (mgd)	3.07
Peak Flow, 2 hour wet weather (mgd)	10.00

Total	
Population	66,667
Per Capita Flow, Dry Weather (gpcd)	115
Average Day Flow, annual average (mgd)	7.65
Maximum Day Flow, annual average (mgd)	23.00
Wet Weather Flow, highest 30 day average (gpcd)	150
Wet Weather Flow, highest 30 day average (mgd)	10.00
Peak Flow, 2 hour wet weather (mgd)	30.00

The historical (Temple only) flows experienced at the T-BRSS treatment facility are summarized on Table 6. These flows are based on data from the flow meters at TBRSS on the Shallowford and Friars Creek influent lines. As stated in Section 2.02a, the annual cost to each City is determined by their pro-rata share of the annual flow. Historically, three fourths of the flow is allocated to the City of Temple.

In 2004 the Brazos River Authority initiated an engineering study to evaluate the existing collection system, treatment infrastructure and process, biosolids handling and composting process and outline recommended improvements to expand the Temple-Belton Regional Sewerage System. This preliminary design report was performed by Kasberg, Patrick & Associates, LP, Consulting Engineers and drafts were presented in July 2005. Final Reports were delivered in June 2007. The study concluded that the existing plant could be expanded on the existing site to a wet weather flow capacity of 16 MGD and a peak flow capacity of 50 MGD which is projected in the year 2030. These findings were presented to each city council for consideration.

The City of Temple subsequently initiated a feasibility study to determine if a portion of the Temple flow could be diverted from the TBRSS facility to the Doshier Farm Wastewater Treatment Plant.

Below is a summary of upcoming projects related to the TBRSS Facility:

FY 09/10:	TBRSS Phase I Improvements
FY 10/11:	Leon River LS and Force Main
FY 17/20:	Disinfection – Chlorine Contact and Ultraviolet Disinfection
FY 20/23:	Cascade Aeration and Metering

b.) Doshier Farm Wastewater Treatment Plant

The Temple Doshier Farm Wastewater Treatment Plant underwent a major expansion which was completed in the fall of 1994. The new facility is capable of treating a peak flow of 22.5 million gallons per day and a maximum 30-day average flow of 7.5 million gallons per day from 33,000 people or their equivalent. The design criteria for the plant are summarized as follows:

Temple	
Population	33,000
Average Day Flow, annual average (gpcd)	135
Average Day Flow, annual average (mgd)	4.50
Maximum Day Flow, annual average (mgd)	12.10
Wet Weather Flow, highest 30 day average (gpcd)	225
Wet Weather Flow, highest 30 day average (mgd)	7.50
Peak Flow, 2 hour wet weather (mgd)	22.50

The historical flows experienced at Doshier Farm are summarized in Table 6.

The design flow of the expanded Doshier Farm Wastewater Treatment Plant is 7.5 MGD which is anticipated to be adequate for some 10 years in the future regardless of the source of the flow. According to treatment plant personnel, in June 1997 the 30 day average reached 5.93 MGD and in May 2007 reached 5.74 MGD. These were the wettest months on record for the last 10 years and are the only instances in which the design flow exceeded 75%. TCEQ mandates that if the 30 day average exceeds 75% of the design flow (5.63 MGD) for 3 consecutive months, preliminary design of an expansion must begin. Once the 30 day average reaches 90% of the design flow, construction must begin. Population growth and distribution and treatment plant flows should be reviewed periodically to determine if the design criteria are changing.

Below is a summary of upcoming projects related to the DFWWTP:

FY 07/08: Rehab Screw Pumps

FY 08/09: Permit Renewal, Drain Valves for Chlorine Contact Basin, Polymer Feed System, Rebuild Screw Pump Motors, Belt Press Feed Pump Replacement

FY 09/10: Replace Chlorine Feed Line, Demo and Remove Tanks, LS Transfer Switches, Steeplechase LS Pumps, Friars Creek LS VFD's

FY 10/11: Backup Power

FY 11-14: Clarifier Rehab

FY14-17: LS Generators, Tranum LS Conversion

FY26-60: SCADA Upgrade

The discharge permit for Doshier Farm Wastewater Treatment Plant is scheduled to renew in 2009 and includes a provision for the Reclaimed Water used at Wilson Park.

TABLE 6
WASTEWATER TREATMENT PLANTS
SUMMARY OF HISTORICAL INFLUENT FLOWS
1994-2006

Year	TEMPLE-BELTON REGIONAL SEWERAGE SYSTEM [1] (Temple Flows Only)			DOSHIER FARM WASTEWATER TREATMENT PLANT [2]	
	Avg Day Flow (MGD)	Max Day Flow (MGD)	Peak 2-Hr Flow (MGD)	Avg Day Flow (MGD)	Max Day Flow (MGD)
1994	3.96	5.72	11.80	2.46	3.99
1995	3.90	12.07	18.16	2.21	3.56
1996	3.73	8.85	14.04	2.08	4.37
1997	5.03	14.02	16.45	3.22	11.21
1998	4.72	14.68	22.18	2.92	7.46
1999	4.00	6.05	12.98	2.06	4.89
2000	4.40	13.32	19.05	2.40	17.61
2001	5.30	17.27	24.74	3.13	14.28
2002	4.37	12.19	16.43	2.38	7.31
2003	4.34	16.01	22.30	2.48	21.17
2004	5.13	16.46	23.34	3.21	15.06
2005	4.38	9.57	14.34	2.46	7.88
2006	4.07	10.83	Not Available	2.02	8.58
Average	4.41			2.54	

1. Data from flow meter on Shallowford and Friars Creek influent lines as provided by BRA
2. Data from flow meter on influent line as provided by CH2MHILL/OMI

7.09 Proposed Treatment Plant Location

One of the components of this study was the development and evaluation of a location for a future treatment plant to serve the south and southeast portions of Temple. The anticipated growth pattern of the City of Temple remains to the south and to the west. The majority of this growth will occur to the west which is in the existing T-BRSS Service Area. Growth

south and southeast of the T-BRSS Service Area is not within the service areas at this time. There are three drainage basins in this area outside of the planning area. The proposed future improvements are shown on EXHIBIT I and labeled as:

Taylor's Valley Trunk
Little River Trunk
Boggy Creek Trunk

The new treatment facility will treat these three drainage basins and possibly the existing Friars Creek Trunk Sewer. The diversion of the Friars Creek flow from the T-BRSS Treatment Plant to the new facility would reduce the flow to the T-BRSS Plant and potentially delay a future expansion. Further, this would also allow the City to abandon the Friars Creek Lift Station.

EXHIBIT I also shows a general location for a future treatment plant. As discussed in Section 7.09a, the City of Temple subsequently initiated a feasibility study to determine if a portion of the Temple flow could be diverted from the TBRSS facility to the Doshier Farm Wastewater Treatment Plant. The scope of that study also includes investigation of potential future plant sites.

7.10 Wastewater Collection System

EXHIBIT I is a map of the entire Temple planning area. Included in the map are both the Temple-Belton Regional Sewerage System and Doshier Farm service areas and existing and proposed trunk sewer lines in these service areas. Also included on EXHIBIT I are proposed improvements in the southeastern part of the planning area, which are outside the Temple-Belton Regional Sewerage System and Doshier Farm service areas.

As in most municipalities, the Temple Sewer System was built in phases and the older trunk sewers nearest the treatment facilities are in need of rehabilitation and/or replacement. The City estimates that 70% of the lines are vitrified clay pipe. There are multiple projects identified to replace these lines, which will reduce the amount of inflow/infiltration at the plants.

Also, there are numerous areas within the Temple Sewer System that continue to be served by an On Site Sewage Facility. These areas are illustrated on Exhibit H and separated into two categories: no sewer available and trunk sewer available. Currently, the Lilac Lane area is scheduled for conversion to City sewer service in FY 2007/2008. It is anticipated that each of these areas will be converted as funding is available.

The Utility Department fields calls from the public regarding problems with the collection system. These calls are logged into a database and specific concerns are prioritized and addressed with the funding available in the operations and maintenance budget.

As growth continues to expand outward, the sewer system must also be extended. There are numerous projects currently underway and scheduled in future years to continue the extension of sewer service. Improvements are shown in colors representative of the fiscal year in which the project is expected to begin. The detailed Phasing Plan is included in Section 8.

TCEQ requires that all sewer systems be designed in accordance with Chapter 317, which is in the process of being superseded by Chapter 217. Because Chapter 217 will be the more stringent guideline, we have incorporated those requirements. The tables on the following page illustrate the minimum and maximum pipe slopes and maximum manhole spacing:

Minimum and Maximum Pipe Slopes		
Size of Pipe (inches)	Minimum Slope (%)	Maximum Slope (%)
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	Calculate based on Manning's formula	

Maximum Manhole Spacing	
Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
6-15	500
18-30	800
36-48	1000
54 or larger	2000

7.11 Temple-Belton Regional Sewerage System Service Area

The Temple-Belton Regional Sewerage System service area is comprised of approximately 26,000 acres which will have an ultimate population of approximately 84,000.

Ultimately, the peak flow generated by this service area will be approximately 46 million gallons per day. In Section 7.09 it was stated that the T-BRSS treatment facility could be expanded to a wet-weather flow capacity of 16.0 MGD. The expanded T-BRSS facility will be capable of handling the projected flows until the year 2030.

The existing peak flow capacity of 20 MGD is adequate for the existing population of 42,000 being served. The capacity, however, likely will be exceeded in the next few years depending upon the growth rate in the service area.

It is difficult to allocate exact flows to the T-BRSS Treatment Plant due to the need to provide inter-basin transfers for phased construction considerations. Decisions concerning inter-basin transfer and treatment capacity will have to be made when specific developments occur.

For some period in the future, flows from the Friars Creek drainage basin will be pumped to the T-BRSS Treatment Plant. As development occurs in the Leon River basin above IH 35 and densities increase in the Pepper's Creek and adjacent drainage areas, flows to the plant will increase and additional treatment capacity will be required. This will involve both the expansion of the T-BRSS Treatment Plant and construction of another plant downstream on the Leon River.

Projected flows from the various drainage basins in the Temple-Belton Regional Sewerage System service area are summarized in Table 7.

TABLE 7

CITY OF TEMPLE WASTEWATER MASTER PLAN
TEMPLE-BELTON REGIONAL SEWERAGE SYSTEM SERVICE AREA
SUMMARY OF EXISTING AND PROJECTED FLOWS

Basin Description	Population Served	Area Acres	Avg. Flow MGD	Peaking Factor	Peak Flow MGD
[a] **Ultimate T-BRSS System**					
Leon River Trunk	24,295	6,581	3.23	3.25	10.38
Pepper Creek and West Side Trunk	38,226	13,132	9.84	3.25	25.80
Forest Hills Trunk	8,536	2,519	1.35	3.25	4.02
Friars Creek	12,853	3,614	1.97	3.25	5.94
Ultimate System Totals					
[b] Without Friars Creek	71,057	22,232	14.42		40.20
[c] With Friars Creek	83,910	25,846	16.39		46.14
Future Plant Collection System					
Friars Creek	17,760	3,991	2.38	3.25	7.75
Taylor's Valley Trunk	1,260	402	0.24	3.25	0.78
Little River Trunk	5,180	1,272	0.60	3.25	1.95
Boggy Creek Trunk	10,800	2,353	0.97	3.25	3.15
Future Plant System Totals	35,000	8,018	4.19		13.63

[a] Determined from projected land use and population figures.
[b] Friars Creek will eventually be served by the new treatment facility.
[c] Initially Friars Creek will be pumped to T-BRSS.

The timeline for construction of the Leon River Trunk will be triggered by several factors: reaching capacity at the Shallowford Lift Station and/or force main, reaching capacity at the Pea Ridge Lift Station and/or force main or reaching capacity in the 30" Pepper Creek Trunk Sewer. For these reasons, we recommend that flow recorders be installed at key locations to determine that actual flows coming from the Leon River Basin and through the Pepper Creek Trunk Sewer.

7.12 Doshier Farm Wastewater Treatment Plant Service Area

The Doshier Farm Wastewater Treatment Plant service area is comprised of approximately 17,000 acres. Area which is not currently within the Doshier Farm service area is shown in orange on Exhibit G. Little Elm basin is not currently served by trunk sewer, however, it

has been included in the service area. The existing land use for most of these areas is agricultural, but has been modeled as residential.

Areas which are south of Loop 363 and east of the Temple-Belton Regional Sewerage System (T-BRSS) service will eventually be served by a new wastewater treatment facility whose general location is shown on EXHIBIT I. This area should be examined in greater detail when the area begins to develop.

Projected flows from the various drainage basins in the Doshier Farm Wastewater Treatment Plant service area are summarized in Table 8.

TABLE 8

CITY OF TEMPLE WASTEWATER MASTER PLAN
DOSHIER FARM SERVICE AREA
SUMMARY OF EXISTING AND PROJECTED FLOWS

Basin Description	Population Served	Area Acres	Avg. Flow MGD	Peaking Factor	Peak Flow MGD
[a]Ultimate Doshier Farm System					
Williamson Creek Trunk Extension	8,552	2,615	1.51	3.5	4.63
Little Elm Creek Trunk	15,554	8,444	4.33	3.5	13.42
Southeast Trunk	4,880	2,422	1.38	3.5	3.66
Existing Trunks	7,093	3,071	1.80	3.5	4.97
Ultimate System Totals	36,079	16,552	9.02		26.68

[a] Determined from projected land use and population figures.

7.13 Capacity, Management, Operations and Maintenance (CMOM) / Sanitary Sewer Overflow (SSO) Initiative

CMOM is a flexible, dynamic framework for municipalities to identify accepted wastewater practices to better manage, operate and maintain collection systems, investigate capacity constrained areas and respond to SSO events.

For CMOM planning the City selects goals and activities to meet those goals. Further, data collection and management are used to track performance and whether overall system efficiency is improving.

A sanitary sewer overflow (SSO) is any overflow, spill, release, discharge or diversion of wastewater from a sanitary sewer system. SSO's include:

a.) overflows or releases of wastewater that reach waters of the United States

b.) overflows or releases of wastewater that do not reach waters of the United States

c.) wastewater backups into buildings and on private property that are caused by lockages or flow conditions in a sanitary sewer, other than a building lateral. Wastewater backups into buildings caused by a blockage or other malfunction of a building lateral that is privately owned is a SSO when sewage is discharged off of private property into streets, stormdrains, or waters of the State.

SSO's of untreated or partially treated wastewater from collection systems which may reach waters of the U.S. are violations of Section 301 of the Clean Water Act (CWA) and the provisions of NPDES permits, and therefore subject to enforcement actions. In addition, federal regulations [40 CFR Part 122.41(1)(6)] require that all such discharges which may endanger health or the environment must be reported to EPA. The Region's approach to addressing SSO's is to require permittees to develop and implement an SSO corrective action program which will result in locating and eliminating overflows in the shortest possible time period. Each permittee is responsible for aggressively pursuing solutions for both the technical and fiscal problems which may arise during the implementation of a corrective action program, and EPA expects permittees to utilize state-of-the-art methods and expertise in evaluating their system.

The City of Temple submitted a Sanitary Sewer Overflow Outreach Program in March 2007 for inclusion in the overall TCEQ Program. The Temple Program includes a description of the causes of SSO's, corrective measures, timelines and completion dates and funding sources.

7.14 Previous Reports

The following is a list of reports previously completed for the City of Temple regarding the Sewer System:

a.) Southeast Temple Water and Sewer Improvements - June 2008

b.) Preliminary Engineering Report for the Bird Creek Trunk Sewer - 2008

c.) West Temple Wastewater Improvements - April 2003 (Exhibit Only)

d.) Sanitary Sewer Overflow Outreach Program - March 2007

7.15 Recommended Improvements

EXHIBIT I shows improvements to the City of Temple wastewater collection system in the Temple-Belton Regional Sewerage System and Doshier Farm service areas. Improvements are shown in colors representative of the fiscal year in which the project is expected to begin. The detailed Phasing Plan is included in Section 8 and includes the Opinion of Probable Cost for each project. The development of these improvements and their phased scheduling has been done in close cooperation with the City of Temple staff.

One outside obligation is the relocation of utilities within the right-of-way of the State. Many of the TxDOT projects scheduled in and around the City of Temple will require relocation of utilities into a private easement or inside the new right-of-way boundary.

Currently the City is relocating utilities for the Southeast Loop 363, I-35 and FM 2305 projects. The other projects on the letting schedule which will require utility relocation are Northwest Loop, SH 317, North 3rd, FM 93 and US 190. The relocation of utilities for FM 2305 and US 190 is scheduled for completion by TxDOT in Summer 2008, with letting for FM 2305 in July 2008. The letting schedule for the other projects is noted as "To Be Determnined". Included on the following page is the TxDOT Schedule for Temple Area Projects dated December 14, 2007:

Texas Department of Transportation – Project Schedules

Temple Area Projects

December 14, 2007

	Hwy	CSJ	From	To	Description	ENV Clear	ROW Map Approval	ROW Acquired	City Utility Complete	Other Utility Complete	Projected Letting	Const Complete	Comments
1	LP 363		57TH ST	5TH ST IN TEMPLE	Reconstruct Mainlanes and Frontage Roads	na	na	na	?	Oct 2008	Let	Summer 2009	Under Constrution
2	SP 290		AT South LOOP 363		UP Railroad Bridge replacement				N/A	TBD	Let	Summer 2009	Let 10/2007
3	LP 363	184-04-031	@ SP 290		CONSTRUCT INTERCHANGE	9/03	TBD				TBD		Per MPO Approval with City Participation (ROW Mapping and PS&E on Hold due to reductions in Professional Service Funding
4	LP 363	184-04-030	57TH ST	5TH ST IN TEMPLE	ADD LANE IN EACH DIRECTION (MAIN LANES)						TBD		To reconsider need for project
5	LP 363	184-04-961	@ 57TH ST UNDERPASS	(SBML) (STR #033)	REHABILITATE BRIDGE AND APPROACHES						TBD		Currently Unfunded
6	LP 363	320-06-001 320-06-004	IH 35 NORTH OF TEMPLE @ BNSF RAILROAD	SH 53 (NW LP 363)(MAIN LN)(MAIN & TRACKS)	CONSTRUCT N FTG RD CONSTRUCT GRADE SEPARATION	Summer 2008	4/08	By City if Pass-Thru ?		?	Early 2010 ?		City proposing to let as Pass Through Financing Project (City preparing draft agreement)
7	LP 363	184-04-038	HOPI TRAIL, 0.8 MI W OF IH 35,	SH 36	UPGRADE FREEWAY AND RECONSTRUCT FM 2305 INTERCHANGE	Summer 2008					TBD		City proposing to let as Pass Through Financing Project
8	SH 36	184-03-025	AT LOOP 363 IN TEMPLE		CONSTRUCT ULTIMATE DIRECT CONNECTION						TBD		Unfunded in MTP
9	US 190	185-01-026 185-01-020	SH 95 IN TEMPLE TEMPLE SOUTH CITY LIMIT	TEMPLE SOUTH CL 2.0 MI S OF FM 436 IN HEIDENHEIMER	WIDEN ROADWAY TO FOUR LANES WITH DEPRESSED MEDIAN	6/03	8/05	Spring 2008	Summer 2008	Summer 2008	TBD		Cell Tower clear by 2/08 Construction Delayed due to funding
10	FM 2305	232-04-010 232-04-013	NORTHSIDE OF LAKE BELTON BRDG At SH 317	SH 317	WIDEN ROADWAY TO FOUR LANES WITH TWO WAY LEFT TURN LANE CONSTRUCT INTERCHANGE	2/5	2/05	4/08	Early Summer 2008	10/08	7/08	Late 2010	On hold pending ROW/Utilities
11	SH 317	398-04-059	FM 2305	FM 439	WIDEN ROADWAY TO FOUR LANES WITH RAISED MEDIAN	3/06	TBD				TBD		ROW Mapping on Hold due to Professional Service Funding
12	US 190 Extension	909-36-900	IH 35	SH 36 (EXT OF US 190)	CONSTRUCT NEW LOCATION RURAL DIVIDED HIGHWAY (EXTENSION OF US 190)						TBD		Unfunded in MTP
13	FM 93	1835-02-038 3292-01-010	IH 35 FM 1741	FM 1741 US 190/SH 36	RECONSTRUCT 4 LANE DIVIDED ROADWAY WIDEN TO 4 LANE DIVIDED ROADWAY	TBD	TBD	TBD		TBD	TBD		Highway Project Unfunded but was moving forward with approval of schemaatic in order to construct RR grade separation. Currently on Hold due reduced Professional Service Funds
14	FM 93	3292-01-009	@ UNION PACIFIC RR NEAR	5TH ST IN TEMPLE	CONSTRUCT RAILROAD OVERPASS AND APPROACHES ON MAIN LANES						TBD		Funded - Dependent upon approval of FM 93 proposed improvments
15	FM 2271	909-36-120	FM 439	US 190	BUILD FARM-TO-MARKET ROAD ON NEW LOCATION	Late 2008							Public Hearing Summer 2008 (Working with COE for ROW)
16	SH 36		SH 317	LAKE BELTON BRIDGE	WIDEN TO FOUR LANE DIVIDED HIGHWAY								Unfunded in MTP
17	SH 201		SH 195	I 35	Study	3-5 Years	Last Purblic Meetings held Nov 13 &15, 2007. Next meetings late 2008 or early 2009						Unfunded

Updated December 2007

Changes from Oct 19, 2007 Meeting

Below is a summary of the major wastewater projects outlined for each fiscal year(s):

a.) Fiscal Year 2007/2008

There are multiple wastewater construction, extension and replacement projects scheduled for FY 07/08. The improvements include extension of the wastewater line from Pea Ridge Road to west of Highway 317, construction of the East Airport Trunk Sewer and the Preliminary Engineering and Design for the Bird Creek Interceptor. Also, projects scheduled for the Doshier Farm Wastewater Treatment Plant include rehabilitation of the screw pumps. There are numerous projects for replacement of deteriorated collection lines as well.

b.) Fiscal Year 2008/2009

The construction for the Bird Creek Interceptor begins in FY 08/09. Improvements scheduled for Doshier include drain valves for the chlorine contact basins, polymer feed system, belt press feed pump replacement and rebuilding the screw pump motors. Also, numerous collection line replacement projects are planned.

c.) Fiscal Year 2009/2010

The Bird Creek Interceptor is scheduled to complete construction in FY 09/10 and the expansion of the TBRSS Plant is expected to begin. Improvements scheduled for Doshier include demo and removal of tanks and chlorine feed line replacement. Multiple Collection line projects are programmed and also Friars Creek Lift Station Improvements, lift station transfer switches and the replacement of pumps at the Steeplechase Lift Station.

d.) Fiscal Year 2010/2011

Phase I of the Leon River Trunk Sewer and Force Main is programmed for FY 10/11. The timeline for construction of the Leon River Trunk will be triggered by several factors: reaching capacity at the Shallowford Lift Station and/or force main, reaching capacity at the Pea Ridge Lift Station and/or force main or reaching capacity in the 30" Pepper Creek Trunk Sewer. Also, we would anticipate replacement of collection lines identified during CIP Planning as well as any operations and maintenance items that may arise.

e.) Fiscal Year 2011/2012 - 2013/2014

There are two wastewater lines projects to be constructed during FY 11/12-13/14. The construction of Southeast Temple Trunk Sewer Part "C" including the Barnhardt Lift Station and force main will complete the projects outlined in the 1998 Preliminary Design Report for Southeast Temple Water and Sewer Improvements by Roming-Parker Associates, L.L.P. The second project is the Hartick Bluff Trunk Sewer, which also includes a lift station and force main. Clarifier Rehab for the Doshier Farm Wastewater Treatment Plant is also programmed.

f.) Fiscal Year 2014/2015 - 2016/2017

Replacement of the South Jackson Trunk Sewer, Lift Station Generators and Conversion of the Tranum Lift Station to submersible pumps are scheduled for FY 14/15-16/17.

g.) Fiscal Year 2017/2018 - 2019/2020

In addition to collection line rehab, there are two wastewater trunks to be constructed during FY 17/18-19/20. Construction of the Forrest Hills Trunk Sewer and Force Main will allow the Existing Hickory Lift Station and Cliffs Lift Station to be eliminated and will divert flow from this basin out of the Shallowford Lift Station. The Knob Creek Trunk Sewer will eliminate the 30th Street Lift Station and extend sewer to the north. Also, disinfection improvements at TBRSS are anticipated.

h.) Fiscal Year 2020/2021 - 2022/2023

Improvements to the Williamson Creek Basin are planned for FY 20/21-22/23. The projects include the construction of the Williamson Creek Trunk and Little Elm Lift Station and Force, which will eliminate the existing Williamson Creek Lift Station. Also, rehabilitation of the existing Williamson Creek Trunk is programmed for this cycle. In addition, a cascade aeration and metering project is scheduled for TBRSS.

i.) Fiscal Year 2023/2024 - 2025/2026

Phase II of the Leon River Trunk sewer is planned for FY 23/24-25/26. This phase of the project will provide a sewer line adjacent and east of the Leon River from north of Charter Oak Drive to Hogan Road and will likely eliminate the Oak Hills Lift Station

j.) Fiscal Year 2026/2027 - 2059/2060

There are numerous projects that have been identified and programmed for years beyond 2025. Depending on the growth patterns and trends some of these may need to be constructed sooner. The Southern Little Elm Trunk Sewer and Force Main as well as the Northeast and Northwest Little Elm Trunks are outside the current service are for Doshier, but should be constructed as development occurs to the east and it becomes practical to expend the capital.

The West Airport Trunk Sewer will extend service north from FM 2305 to the Airport and subsequently eliminate the Airport Lift Station.

Phase III of the Leon River Trunk Sewer will extend sewer service farther west and toward Lake Belton and construction timing will depend on the continued development of that area and the implementation of Phases I and II.

The second phase of the East Airport Trunk Sewer project and the Howard Road Trunk Sewer will extend sewer north to the Pepper Creek Basin boundary. Industrial and/or Commercial growth will likely spur these extensions.

The Knob Creek Force Main and Lift Station Improvements are required to accommodate the ultimate flow its service drainage area. The capacity of the existing Knob Creek Lift Station should be monitored as development in the area increases.

8. PHASING PLAN

8.01 General

Exhibits F and I show the ultimate Water and Wastewater Systems need to serve the projected Year 2060 Population. The proposed improvements are shown in colors representative of the fiscal year in which the project is expected to begin and correspond to the shading on the Phasing Plan. The Phasing Plan is included in this section on the following pages.

The development of these improvements and their phased scheduling has been done in close cooperation with the City of Temple staff. However, as development and growth occur, improvements may be accelerated or delayed and priorities may be changed based on actual growth trends and development conditions. Although the source and amount of funding is not finalized, the projects have been prioritized by City Staff based on needed upgrades to the system, increased capacity and completion to meet other obligations.

Upcoming TxDOT, Economic Development and Reinvestment Zone projects could also result in reprioritization of projects, so the City must maintain communication with the staff and/or members of each entity. Also it is imperative that the staff be fully aware of the timelines associated with major construction projects from conceptual phase to completion. These considerations are discussed in detail in Section 9.

2008 WATER & WASTEWATER MASTER PLAN UPDATE
PHASING PLAN (7/23/08)

	Water					Wastewater				
	Project Description	Source of Funding				Project Description	Source of Funding			
		CIP	O&M	TRZ-1	In-House		CIP	O&M	TRZ-1	In-House
Fiscal Year 2007/08	**New Projects**					**New Projects**				
	Expansion of 835 Pressure Plane to Include West Temple Water & Wastewater Extension North of FM 2305	$4,950,000				Expansion of 835 Pressure Plane to Include West Temple Water & Wastewater Extension North of FM 2305	(Total funding shown in Water CIP)			
	Northwest Loop 363 Utilities Relocation	$500,000				Northwest Loop 363 Utilities Relocation	(Total funding shown in Water CIP)			
	317 Waterline Relocation	$350,000				East Airport Trunk Sewer Phase I			$500,000	
	South Temple Water Improvement Project	$1,600,000								
	Water Business Office Relocation	$200,000				**Rehab Projects**				
	Master Plan Recommendations	$2,150,000				Bird Creek Interceptor	$2,000,000			
	Waterline from Avenue G PS to 25th Street Tank ($1,350,000)					Doshier - Rehab Screw Pumps	$460,000			
	Lilac Lane Project ($500,000)					WWL replacement along Avenue L and 19th Street		$510,000		
	Tarver to Old Waco Road Utility Relocates ($200,000)					WWL replacement from Elm Ave. to Jackson Branch				$144,000
	Right of Way Allowance	$2,000,000				WWL replacement from Avenue G to Avenue K				$168,000
						WWL replacement from Ave. P to M between 39th and 41st		$165,000		
	Rehab Projects					WWL replacement along Antelope and Deer Trail		$165,000		
	Replace perimeter fence at tank & PS sites	$80,000				WWL replacement along George Dr. to Ave. P from 49th to 57th		$785,000		
	Upgrade SCADA	$400,000				WWL replacement along S Main & 2nd Between Ave K & Ave H				$112,800
	WTP - Rehab of Mixed Media Filters	$1,915,000				WWL replacement along 19th, 21st, 23rd from Adams to dead end				$595,000
	WTP - Lagoon #4 Rehabilitation	$250,000								
	Somerville Waterline Project - Phase II	$335,000								
	WL replacement along 17th Street between Ave I & M		$210,000							
	WL replacement from Ave G to I between 1st & 3rd		$100,000							
	Sub-Total	**$14,730,000**	**$310,000**	**$0**	**$0**	**Sub-Total**	**$2,460,000**	**$1,625,000**	**$500,000**	**$1,019,800**
	CIP TOTAL $17,190,000		**O&M TOTAL $1,935,000**			**TRZ-1 TOTAL $500,000**		**OTHER TOTAL $1,019,800**		
	TOTAL (FY 2007/08) $20,644,800									
Fiscal Year 2008/09	**New Projects**					**New Projects**				
	South Temple Water Improvement Project	$8,660,000				Northwest Loop 363 Utilities Relocation	(Total funding shown in Water CIP)			
	Water Treatment Plant Solids Handling	$3,665,000								
	317 Waterline Relocation	$1,900,000				**Rehab Projects**				
	Outer Loop Phase III Waterline Relocation	$900,000				Doshier Permit Renewal	$50,000			
	Northwest Loop 363 Utilities Relocation	$2,200,000				Doshier Drain Valves for Chlorine Contact Basin	$75,000			
	Recycle Pump Enclosure	$200,000				Doshier - Polymer Feed System	$50,000			
	WTP - Additional Membrane Module (1 Rack)	$245,000				Doshier - Rebuild Screw Pump Motors (Unfunded)	$250,000			
	720 Pressure Plane Expansion (Unfunded)	$1,000,000				Doshier Belt Press Feed Pump Replacement	$120,000			
	Right of Way Allowance	$3,000,000				WWL replacement along West Killeen, West Welton	$400,000			
						WWL replacement between French to Adams, from 4th to 12th	$1,200,000			
	Rehab Projects					WWL replacement from Marlandwood to Canyon Creek	$1,200,000			
	Nugent Tank	$600,000				Various Wastewater Line Replacement Projects		$700,000		
	Valves for Transmission Lines (Unfunded)	$500,000				WWL replacement from Ave I to Ave G between S Main & 1st				$159,390
	WTP - Raw Water Pump Rehab (Unfunded)	$320,000				WWL replacement along MLK & NE 6th between Adams Ave & Ave D				$213,000
	Various Waterline Improvements Projects		$300,000			WWL replacement along S 37th & S 39th between Ave H & Ave R				$248,000
	Sub-Total	**$23,190,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$3,345,000**	**$700,000**	**$0**	**$620,390**
	CIP TOTAL $26,535,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**		**OTHER TOTAL $620,390**		
	TOTAL (FY 2007/08) $28,155,390									

Note: All costs are representative of 2007 Pricing, and Right of Way Costs are not included in individual project pricing.

PHASING PLAN (cont.) (7/23/08)

	Water					Wastewater				
	Project Description	Source of Funding				Project Description	Source of Funding			
		CIP	O&M	TRZ-1	In-House		CIP	O&M	TRZ-1	In-House
Fiscal Year 2009/10	**New Projects**					**New Projects**				
	Outer Loop Phase 4-6 Waterline Relocation	$600,000				TBRSS Plant Expansion	$5,000,000			
	IH35 to Range Road EST Water Line	$600,000				Friars Creek Lift Station Improvements	$100,000			
	Centex Sportsman Road Waterline	$435,000								
	Red Barn Road Waterline	$400,000				**Rehab Projects**				
	Right of Way Allowance	$400,000				Bird Creek Interceptor	$14,500,000			
						Doshier - Demo and Remove Tanks	$150,000			
	Rehab Projects					Doshier Chlorine Feed Line Replacement	$200,000			
	Pepper Tank Rehabilitation	$500,000				Friars Creek Lift Station VFD's	$225,000			
	Replace pump at Ave. G with generator	$500,000				Lift Station Transfer Switches	$200,000			
	WTP Clarifier #3 Trough	$200,000				Steeplechase Lift Station Pumps	$200,000			
	WTP - Additional Membrane Module (2 Racks)	$490,000				WWL replacement near Monticello and Fannin Loop Area	$430,000			
	WTP - Conventional Plant Rehabilitation	$5,000,000				WWL replacement from 3800 Valley View to dead end	$240,000			
	WTP - Backwash and Surface Wash Pump Rehab	$100,000				WWL replacement along Las Casas to Pepper Creek	$285,000			
	WL replacement along Victory, Virginia, Shell from 3rd to Mayborn	$470,000				WWL replacement between 31st & 33rd from Ave. H to Ave. R	$365,000			
	WL replacement along Pea Ridge from Alabama to dead end	$975,000				WWL replacement between 33rd & 35th from Ave. H to Ave. R	$365,000			
	WL replacement along French between 2nd and 10th	$350,000				WWL replacement Trunk main from MLK to 6th	$170,000			
	WL replacement along 33rd, 35th, 39th & 41st between Ave. T and Ave. H	$4,100,000				WWL replacement along 14th from Houston to Munroe	$255,000			
	WL replacement along Poison Oak from Ridgeway to Hwy. 317	$525,000				WWL replacement along 5th to Jackson Creek between 3rd and 5th	$365,000			
	WL replacement along 3rd between Irvin & Nugent	$550,000				WWL replacement along 802 N. Main to 1217 N. Main	$460,000			
	WL replacement along Eagle Rd. and Briar Cliff Area	$175,000				Various Wastewater Line Replacement Projects		$700,000		
	WL replacement along General Bruce from 57th to Ira Young	$350,000				WWL replacement from S 6th & S 4th between Ave B & Ave D				$75,600
	WL replacement along Alamo Ct, Bowie Ct, Crockett Ct, Duval Ct, Erath Dr	$525,000				Right of Way Allowance	$2,200,000			
	WL replacement along Tanglewood	$700,000								
	WL replacement along 45th from Ave. T to Scott Blvd.	$175,000								
	WL replacement along 49th & 47th between Ave. T & Scott	$175,000								
	Various Waterline Improvements Projects		$300,000							
	Sub-Total	**$18,295,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$25,710,000**	**$700,000**	**$0**	**$75,600**
	CIP TOTAL $44,005,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**			**OTHER TOTAL $75,600**	
	TOTAL (FY 2009/10) $45,080,600									
Fiscal Year 2010/11	**New Projects**					**New Projects**				
	Replacement of 18" WL from WTP to Ground Storage	$10,000,000				TBRSS Plant Expansion	$10,000,000			
	Spur 290 / 1st Street Utility Relocation	$250,000				Leon River Trunk Sewer and Force Main Phase I (Pea Ridge to BRA)	$7,100,000			
	Right of Way Allowance	$2,000,000								
						Rehab Projects				
	Rehab Projects					Doshier Backup Power	$1,500,000			
	Ave. G GST / Ave. H PS	$8,000,000				Various Wastewater Line Replacement Projects		$700,000		$300,000
	Taylor Tank	$605,000								
	WTP - Conventional Plant Rehabilitation	$10,000,000								
	WTP - Replace Clarifier #4 Bearings	$250,000								
	WTP - Backwash Tank	$450,000								
	WTP - Additional Membrane Module (3 Racks)	$735,000								
	WTP - Clearwell Seperation Valves	$300,000								
	Avenue G Pump Station Piping	$500,000								
	WL replacement along 51st & Terrace	$230,000								
	WL replacement along 55th from Ave. T to Scott Blvd.	$230,000								
	WL replacement along Ave. S from 57th to Ave. T	$175,000								
	WL replacement along Dunbar & Ave. N Area	$280,000								
	WL replacement along Cottonwood & Jackrabbit	$160,000								
	Various Waterline Improvements Projects		$300,000							
	Sub-Total	**$34,165,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$18,600,000**	**$700,000**	**$0**	**$300,000**
	CIP TOTAL $52,765,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**			**OTHER TOTAL $300,000**	
	TOTAL (FY 2010/11) $54,065,000									

Note: All costs are representative of 2007 Pricing, and Right of Way Costs are not included in individual project pricing.

PHASING PLAN (cont.) (7/23/08)

	Water					Wastewater				
	Project Description	Source of Funding				Project Description	Source of Funding			
		CIP	O&M	TRZ-1	In-House		CIP	O&M	TRZ-1	In-House
Fiscal Years 2011/12 - 2013/14	**New Projects**					**New Projects**				
	Lucius McCelvey Drive Area Water Lines	$280,000				TBRSS Plant Expansion	$5,000,000			
	Hickory and Thornton Waterline Improvements	$250,000				Southeast Trunk Sewer & Barnhardt Lift Station	$1,210,000			
	12" WL at Taylor's Valley Road and Highway 93 Intersection	$245,000				Hartrick Bluff Trunk Sewer & Lift Station	$455,000			
	Utilities Relocation at I-35 and 57th	$6,000,000				Right of Way Allowance	$340,000			
	Right of Way Allowance	$1,400,000								
						Rehab Projects				
	Rehab Projects					Doshier Farm Clarifier Rehab	$450,000			
	Airport and Range Road Tanks Interior	$1,000,000				Various Wastewater Line Replacement Projects		$700,000		$300,000
	WTP - High Service Valves	$510,000								
	WTP - Additional Membrane Modules (3 Racks in 2012, 2 Racks in 2013)	$1,225,000								
	Fire Hydrant Replacement	$500,000								
	Various Waterline Improvements Projects		$300,000							
	Sub-Total	**$11,410,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$7,455,000**	**$700,000**	**$0**	**$300,000**
	CIP TOTAL $18,865,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**			**OTHER TOTAL $300,000**	
	TOTAL (FY 2011/12 - FY 2013/14) $20,165,000									
Fiscal Years 2014/15 - 2016/17	**New Projects**					**New Projects**				
	WTP - Membrane Plant Clearwell	$1,500,000				Right of Way Allowance	$1,400,000			
	WTP - High Service Pump Station at Membrane Plant	$1,500,000								
	WTP - Plant Expansion (10 MGD)	$11,100,000				**Rehab Projects**				
						Lift Station Generators	$1,000,000			
	Rehab Projects					Tranum Lift Station Conversion	$325,000			
	Scott, West Park, Apache Tank Rehab	$1,500,000				South Jackson Trunk Sewer Rehab	$3,145,000			
	Flowmeters	$250,000				Wastewater Line Rehab	$1,000,000			
	Various Waterline Improvements Projects	$1,000,000	$300,000			Various Wastewater Line Replacement Projects		$700,000		$300,000
	Sub-Total	**$16,850,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$6,870,000**	**$700,000**	**$0**	**$300,000**
	CIP TOTAL $23,720,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**			**OTHER TOTAL $300,000**	
	TOTAL (FY 2014/15 - FY 2016/17) $25,020,000									
Fiscal Years 2017/18 - 2019/20	**New Projects**					**New Projects**				
	Loop 363 Pump Station Improvements	$247,000				Knob Creek Trunk Sewer	$475,000			
	Hwy 317 GST	$1,410,000				Hickory Interceptor and Lift Station	$2,655,000			
	Hwy 317 Pump Station	$935,000				TBRSS Disinfection Improvements	$1,500,000			
	Northwest Transmission Line	$3,600,000								
	Right of Way Allowance	$1,200,000				Right of Way Allowance	$600,000			
	Rehab Projects					**Rehab Projects**				
	Various Waterline Improvements Projects	$1,000,000	$300,000			Wastewater Line Rehab	$1,000,000	$700,000		$300,000
	Sub-Total	**$8,392,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$6,230,000**	**$700,000**	**$0**	**$300,000**
	CIP TOTAL $14,622,000		**O&M TOTAL $1,000,000**			**TRZ-1 TOTAL $0**			**OTHER TOTAL $300,000**	
	TOTAL (FY 2017/18 - FY 2019/20) $15,922,000									

Note: All costs are representative of 2007 Pricing, and Right of Way Costs are not included in individual project pricing.

PHASING PLAN (cont.) (7/23/08)

Fiscal Years 2020/21 - 2022/23

Water					Wastewater				
Project Description	Source of Funding				Project Description	Source of Funding			
	CIP	O&M	TRZ-1	In-House		CIP	O&M	TRZ-1	In-House
New Projects					**New Projects**				
Hogan Road Water Line	$1,015,000				Williamson Creek Trunk Sewer	$7,875,000			
Right of Way Allowance	$200,000				TBRSS Cascade Aeration and Metering	$112,500			
					Right of Way Allowance	$1,500,000			
Rehab Projects									
Various Waterline Improvements Projects	$1,000,000	$300,000			**Rehab Projects**				
					Williamson Creek Trunk Sewer Rehab	$3,725,000			
					Wastewater Line Rehab	$1,000,000	$700,000		$300,000
Sub-Total	**$2,215,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$14,212,500**	**$700,000**	**$0**	**$300,000**

CIP TOTAL $16,427,500 | **O&M TOTAL $1,000,000** | **TRZ-1 TOTAL $0** | **OTHER TOTAL $300,000**

TOTAL (FY 2020/21 - FY 2022/23) $17,727,500

Fiscal Year 2023/24 - 2025/26

New Projects					**New Projects**				
					Leon River Trunk Sewer Phase II (Parkside Drive to Hogan Road)	$1,990,000			
Rehab Projects					Right of Way Allowance	$400,000			
Various Waterline Improvements Projects	$1,000,000	$300,000							
					Rehab Projects				
					Wastewater Line Rehab	$1,000,000	$700,000		$300,000
Sub-Total	**$1,000,000**	**$300,000**	**$0**	**$0**	**Sub-Total**	**$3,390,000**	**$700,000**	**$0**	**$300,000**

CIP TOTAL $4,390,000 | **O&M TOTAL $1,000,000** | **TRZ-1 TOTAL $0** | **OTHER TOTAL $300,000**

TOTAL (FY 2023/24 - FY 2025/26) $5,690,000

Fiscal Year 2026/27 - 2059/60

New Projects					**New Projects**				
10" Water Line to Troy	$1,135,000				Southern Little Elm Trunk Sewer	$6,155,000			
McLane Pump Station	$455,000				Northeast Little Elm Trunk Sewer	$1,720,000			
720 Plane - 1.5 MG Elevated Storage Tank	$3,315,000				Northwest Little Elm Trunk Sewer	$1,700,000			
785 Plane - 1.0 MG Elevated Storage Tank	$1,670,000				Howard Road Trunk Sewer	$815,000			
East Loop 363 Water Line	$2,275,000				East Airport Trunk Sewer Phase II	$935,000			
920 Plane - 0.5 MG Elevated Storage Tank	$1,215,000				West Airport Trunk Sewer	$1,400,000			
West Loop 363 Water Line	$2,165,000				Knob Creek Force Main and Lift Station Improvements	$1,660,000			
Shallow Ford Road Water Line	$610,000				Leon River Trunk Sewer Phase III (West of SH 317)	$2,015,000			
SH 317 from FM 2305 to Prairie View Road Water Line	$800,000								
Tarrant Park Water Line	$1,060,000				**Rehab Projects**				
Industrial Blvd. Water Line	$250,000				SCADA Upgrade	$400,000			
Highway 93 Water Line from Old Taylors Valley Road to City Limits	$1,120,000				Reclaimed Water System	$500,000			
Barnhardt Road and Highway 95 Water Line	$825,000				Wastewater Line Rehab		$700,000		$300,000
South Loop 363 Water Line	$445,000								
McLane Water Line	$2,175,000								
12" WL Connection from Hatrick Bluff Road to Little River Road	$1,045,000								
Kegley to Old Waco Connection Water Line	$570,000								
Water Line East of Old Waco	$565,000								
FM 2271 Water Line from FM 2305 south to the City Limits	$210,000								
Doshier Farm Water Line	$365,000								
14" Water Line from Slough Road to Lions Park Road	$510,000								
South Kegley Road Water Line	$235,000								
South IH-35 and Loop 363 Interchange Water Line	$660,000								
North Point Road Water Line (Additional MPR Feed)	$125,000								
Case Road Water Line	$275,000								
Sleepy Hollow Water Line	$160,000								
Sub-Total	**$24,235,000**	**$0**	**$0**	**$0**	**Sub-Total**	**$17,300,000**	**$700,000**	**$0**	**$300,000**

CIP TOTAL $41,535,000 | **O&M TOTAL $700,000** | **TRZ-1 TOTAL $0** | **OTHER TOTAL $300,000**

TOTAL (FY 2026/27 - FY 2059/60) $42,535,000

Note: All costs are representative of 2007 Pricing, and Right of Way Costs are not included in individual project pricing.

9. PROJECT DELIVERY

9.01 Selection of Engineer

The Texas Engineering Practice Act dates back to 1937 and was established following the tragic explosion at the school in New London, Texas. This law provided for the regulation of the practice of engineering and the creation of the State Board of Registration for Professional Engineers in order to protect public health, safety and welfare. Along the same line, the Professional Services Procurement Act was enacted to ensure that governmental entities selected professionals (accounting, architecture, landscape architecture, land surveying, medicine, optometry, professional engineering, real estate appraising, professional nursing) on the basis of demonstrated competence and qualifications and precludes selection based on competitive bidding.

The selection of an engineer can range from an informal request for a proposal to an extensive process requiring statements of qualification. Should the project require that the City seek qualification statements, the process of reviewing, short listing and presentation can take 30-60 days.

Once an engineer is selected, a proposal including scope and fee is provided. If agreeable to all parties and approved by the City Council, a contract for the work is executed.

9.02 Right-of-Way

a.) Right of Entry

In order to perform topographic surveys and archeological and environmental investigations rights of entry must be obtained from each property owner along the proposed alignment or for the site. Once the affected property owners are identified a letter describing the project and work to be performed is mailed to the property owner along with a consent form to sign.

The right of way agent will typically follow up with each property owner on a weekly basis until each right of entry is obtained or they are convinced that it will require action

by the court system. According to the Legal Staff, there is case law that provides the City the right to conduct topographic surveys on private property so long as there is no disturbance. Many times a letter from the City asserting this right will alleviate the situation and work may proceed. However, if the property owner is not agreeable to test holes for archeological purposes this must be evaluated on a case by case basis.

Should neither of these methods prove successful, the City can file for a temporary restraining order to obtain entry. Again, consideration must be given to the archeological aspect of the investigation.

b.) Easement Acquisition

Once the project is designed to the point where easement dimensions are known a metes and bounds description and drawing are provided so that negotiation for the easement may begin. Typically the right of way agent will request donation of the easement and if the property owner is not agreeable then the negotiation process begins.

Negotiations may be as simple as agreeing to service connections and very little compensation. However, an appraisal may be required to establish the fair market value of the property. If both parties are not able to agree on the terms of the transaction, the City has the right to file eminent domain proceedings. These proceedings are a long, expensive process, but sometimes are the only means to obtain the property needed for construction of a project.

c.) Land Acquisition

Land acquisition works much the same way as easement acquisition. The difference is the City acquires the property in fee title. The appraisal process differs slightly in that there is no discounted value in the property owner maintaining title. The negotiation process and eminent domain protocol is the same

9.03 Permitting

An important aspect of any project that is often misunderstood is the permitting process. The following are some of the more common assessments, investigations, clearances and permits that will be required to complete a project:

a.) Archeological

Archeological investigations are required for Texas Historical Commission (THC) clearance. Generally, when a project is in undisturbed terrain an archeological investigation is performed.

b.) Environmental

Phase I Environmental Site Assessments identify areas with a potential need for remediation during construction. Examples would be underground fuel storage tanks, wetlands and endangered species. If an area is designated as a "wetlands", Streambed remediation may be required by the US Corps of Engineers.

c.) US Corps of Engineers

A Corps of Engineers (COE) permit is required for construction affecting "waters of the U.S.". This permit process is generally a 6-month to 1-year process and should be initiated as soon as the proposed alignment is confirmed.

d.) Texas Point Discharge Elimination System (TPDES)

TPDES coordination is required for construction sites larger than one acre in order to obtain authorization to discharge stormwater under an TPDES construction stormwater

permit. Typically, the Contractor is responsible for the the stormwater pollution prevention plan and permit as part of their contract.

e.) Texas Department of Transportation (TxDOT)

The most common permits obtained from TxDOT are utility crossings and driveways. A utility permit is required if a utility line is to be placed in or cross State of Texas Right-of-Way. Permit forms are available online and are to be submitted to the Area Office with plans for the project prior to construction.

Driveway permits are required for any new drive to be installed along a state maintained roadway.

f.) Bell County

A permit from Bell county is required if a utility line is to be placed in or cross a county maintained roadway. Permit forms are available from the County Engineer's Office and are to be submitted with plans for the project prior to construction.

Driveway permits are required for any new drive to be installed along a state maintained roadway.

g.) Railroad

Railroad permits are required if a utility line is to be placed in or across a railroad. The prmit forms are available online and are to be submitted to the appropriate railway with plans for the project. Typically there are fees associated with these permits and some require additional insurance. Permits for crossing the railroad with a utility line can be obtained for a reasonable fee. However, a permit to lay a utility line parallel to the railroad and within the railroad right-of-way can be cost prohibitive.

9.04 Preliminary Engineering

Preliminary engineering services are typically utilized for projects that require advance planning, permitting and/or route selection. This process allows time for analysis and determination of the most economical project. Generally, the findings and recommendations are presented in a report to the City which also contains the Engineer's Opinion of Probable Cost.

This preliminary work allows for a smooth transition into final design of the project.

9.05 Final Engineering

Final Engineering on a project consists of producing the plans and specifications required for construction. Projects range from very straightforward with limited permitting to a project that requires multiple disciplines and substantial permitting and right-of-way acquisition. The timeline and cost for engineering services varies based on these same factors.

Typically, the City contracts with a single Consultant for final engineering as well as construction phase services. The contract is presented to council for award and the City issues a Notice to Proceed once the contracts are fully executed. Once the design work is substantially complete, it is submitted for review by the City. When comments are addressed, final plans and specifications are completed, permits and right-of-way are obtained the project moves into the bidding phase.

9.06 Bidding

Once the review process is complete, a bidding schedule is established. Typically, the project is advertised on two consecutive Sundays, followed by a pre-bid conference the following Tuesday. A final addendum is issued on Friday of the same week and bids are opened the following Tuesday. The Engineer reviews the bids and prepares a tabulation of all bids received and provides a letter of recommendation to the Project Manager.

The Project Manager will place the item on the City Council Agenda for Award and if approved, contracts are executed.

9.07 Construction Administration

Most engineering contracts contain construction administration work. Generally the scope includes conducting a pre-construction conference, reviewing submittals, processing pay requests, communicating and coordinating with the contractor, conducting site visits and progress meetings. Construction Administration services differ from Daily On Site Representation in that site visits are made **periodically** to insure general conformance with plans and specifications.

At the conclusion of the project there is usually a walk through with City personnel and a "punch list" is generated for completion by the contractor. Once the punch list items are completed to the satisfaction of the Owner, final acceptance is recommended..

9.08 On-Site Representation

On-Site Representation may be provided by City Staff or by Engineering Consultant. On-Site Representation normally consist of daily site visits and observation of utility installations, bedding material, compaction, concrete, asphalt, testing, etc. For the benefit of all parties, a daily log documenting construction activity should be maintained.

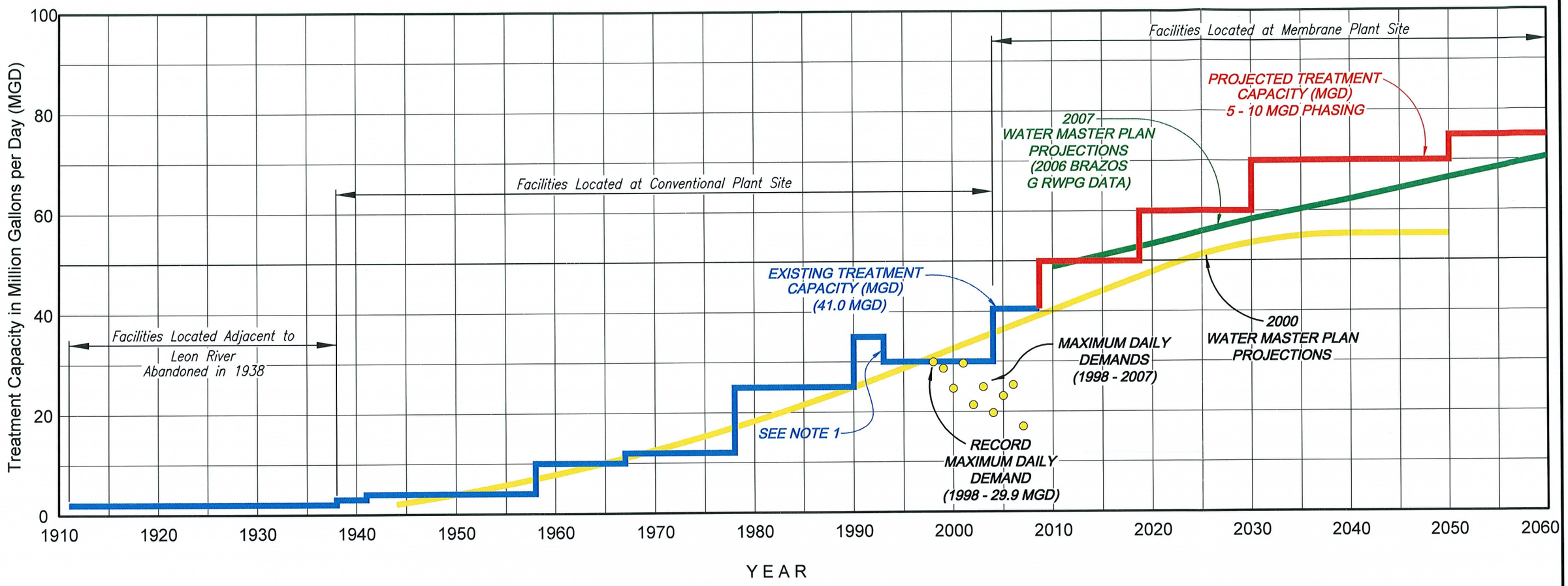
9.09 Final Acceptance

When the improvements are complete and the final inspection has been performed, the City issues a certificate of acceptance. It is usually as this time that the final payment for the project is processed and released to the Contractor.

9.10 Warranty

The City of Temple contract provides for a One Year Warranty by the Contractor. In some cases, specific items may be warrantied for a longer period so long as it is clearly specified in the contract documents.

Typically, a warranty inspection is conducted during the eleventh anniversary of the project to determine if all items are in working condition and the site is appropriately restored. The contractor is obligated to correct any deficiencies at no cost to the City.



NOTE:

1. THE EXISTING PLANT WAS RE-RATED AT A CAPACITY OF 30 MGD UNDER THE TCEQ SURFACE WATER TREATMENT RULE, EFFECTIVE JULY 1, 1993.

CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN

HISTORICAL AND PROJECTED MAXIMUM DAILY DEMAND

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | **FIGURE 1**

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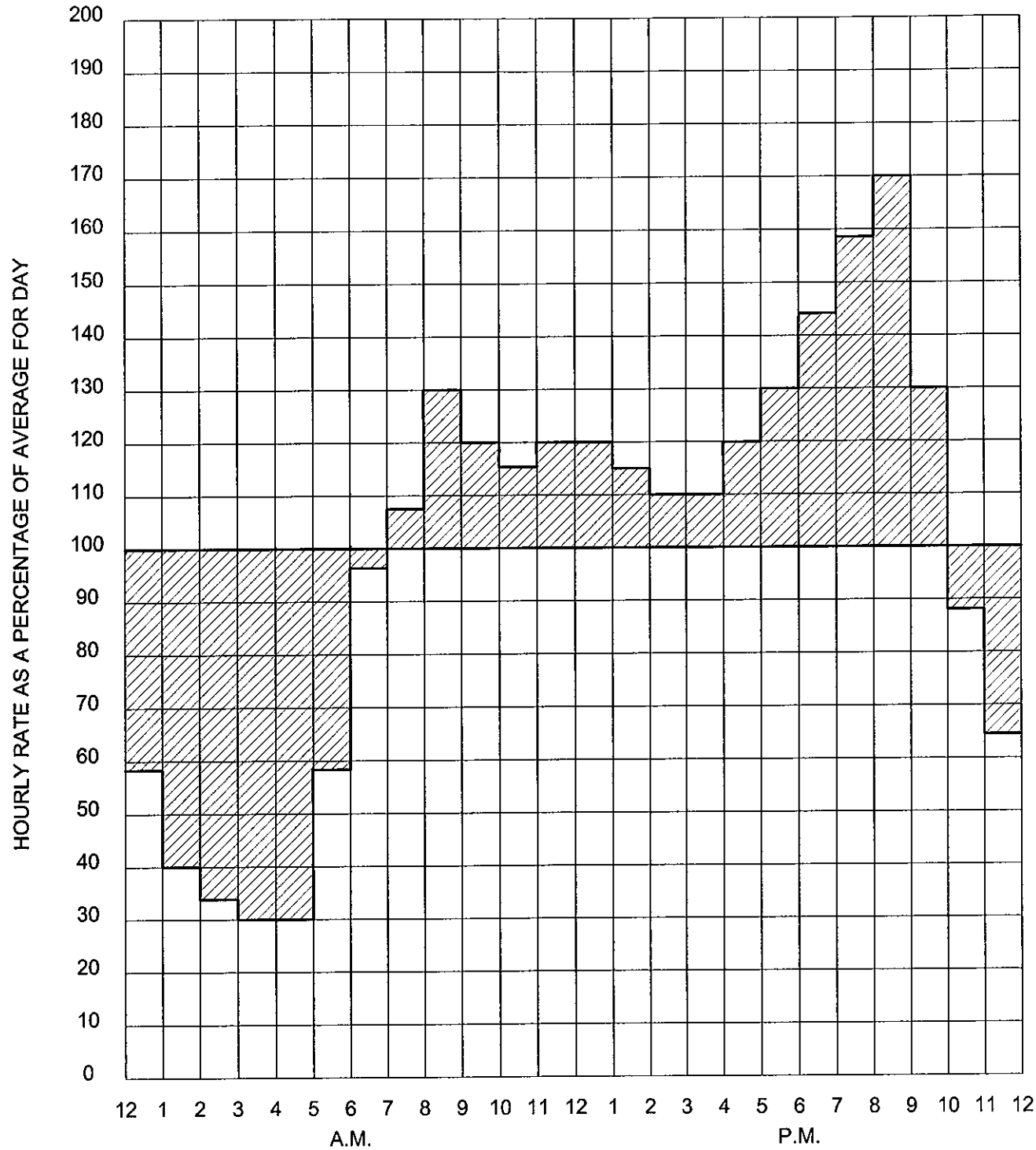

CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN

ESTIMATED TYPICAL HOURLY WATER DEMAND CURVE

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | **FIGURE 2**

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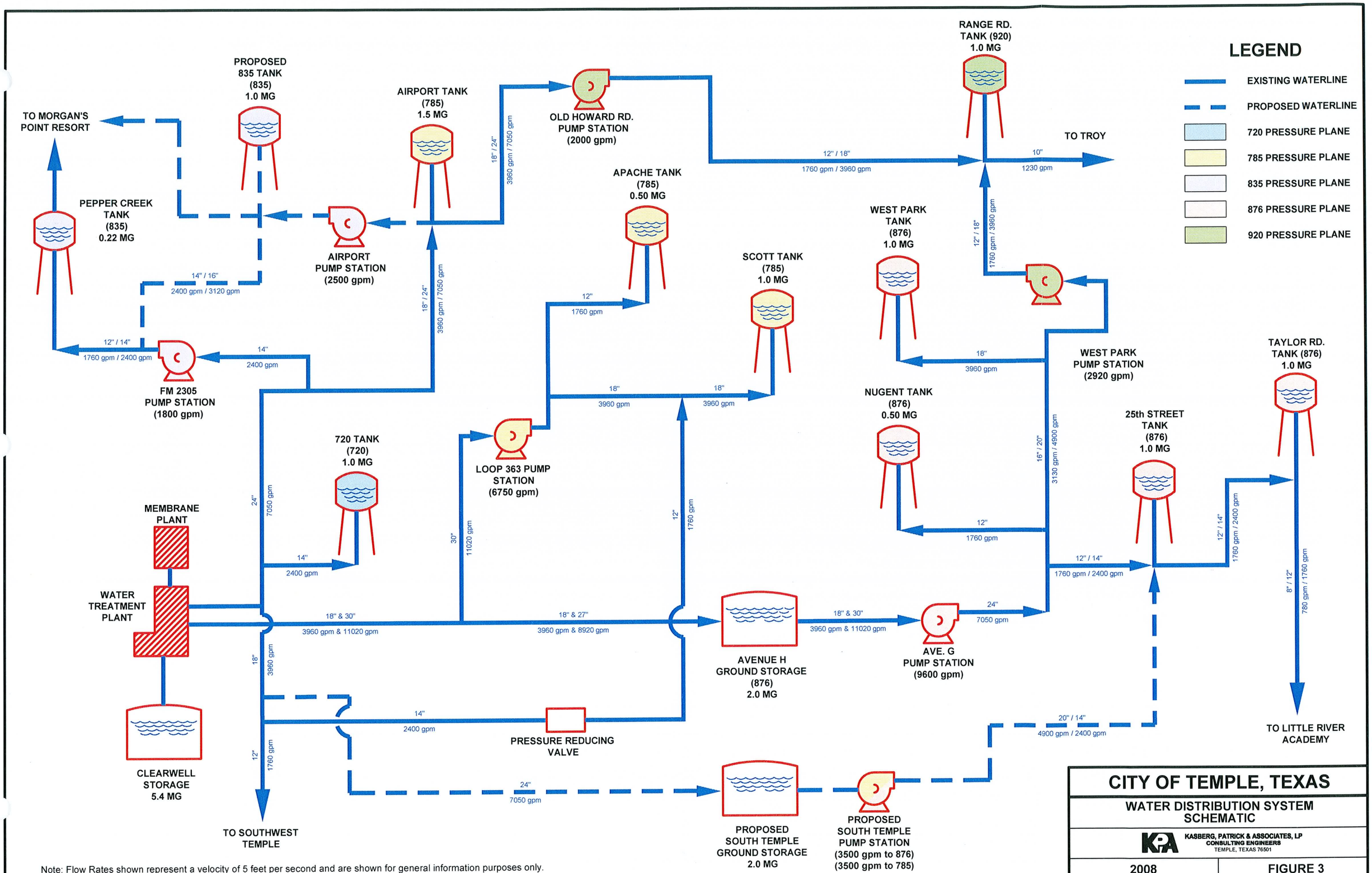

Note: Flow Rates shown represent a velocity of 5 feet per second and are shown for general information purposes only.

CITY OF TEMPLE, TEXAS

WATER DISTRIBUTION SYSTEM SCHEMATIC

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | FIGURE 3

NORTH

NOT TO SCALE

GROVE

PENDLETON WSC

TROY

TEMPLE CCN

MOFFAT WSC

Planning Area

Temple City Limits

ETJ

LITTLE ELM WSC

BELTON LAKE

MORGANS POINT

OENAVILLE - BELFALLS

BELL-MILAM- FALLS

WESTPHALIA

439 WSC

BELTON

DOG RIDGE WSC

Lampasas River

Salado Creek

Little River

BELL CO. WCID #2

LITTLE RIVER ACADEMY

EAST BELL

SALADO

SALADO WSC

ARMSTRONG WSC

BELL-MILAM-FALLS

ROGERS

JARRELL-SCHWERTNER

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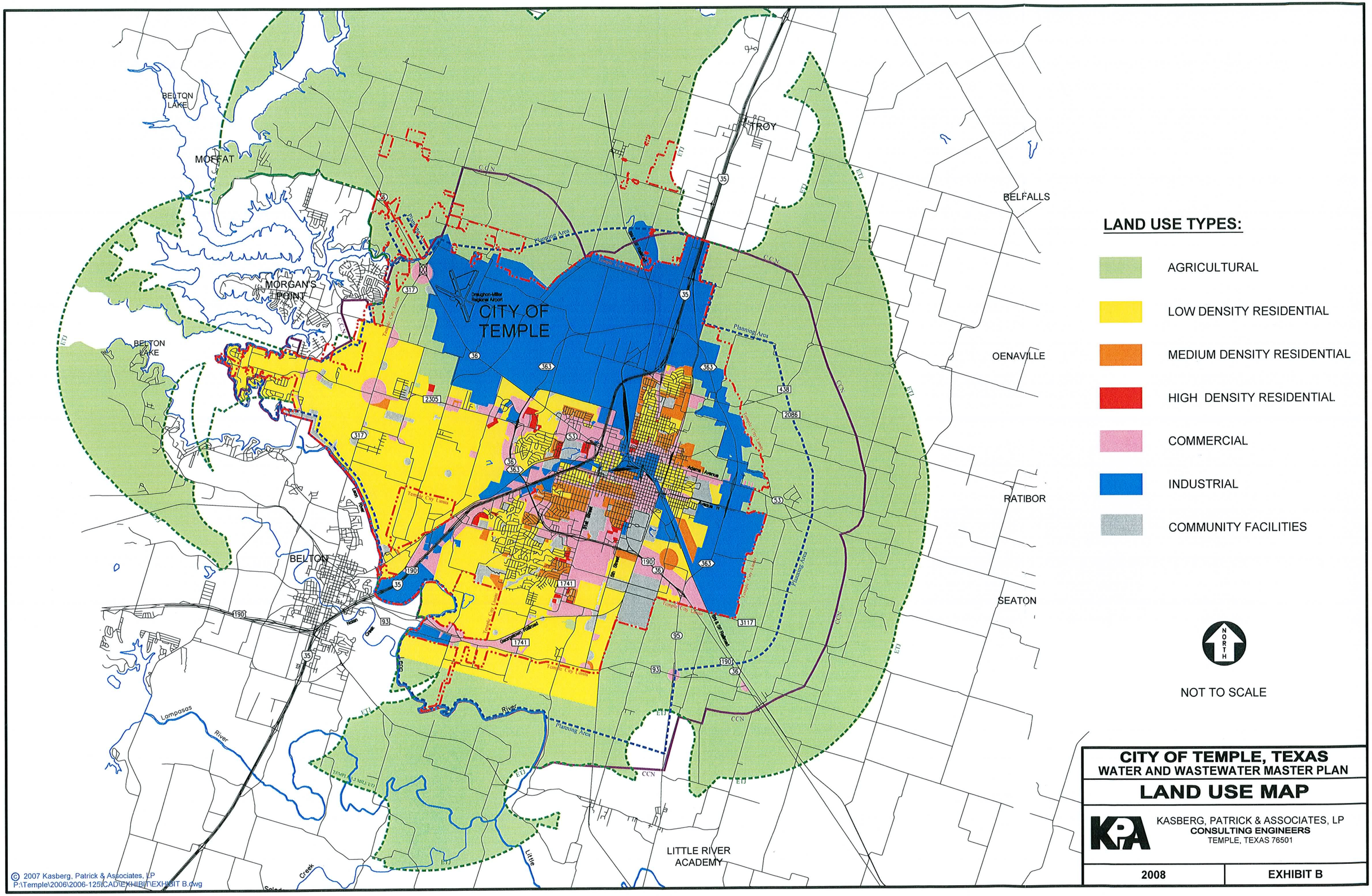
CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN

CCN MAP

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008

EXHIBIT A



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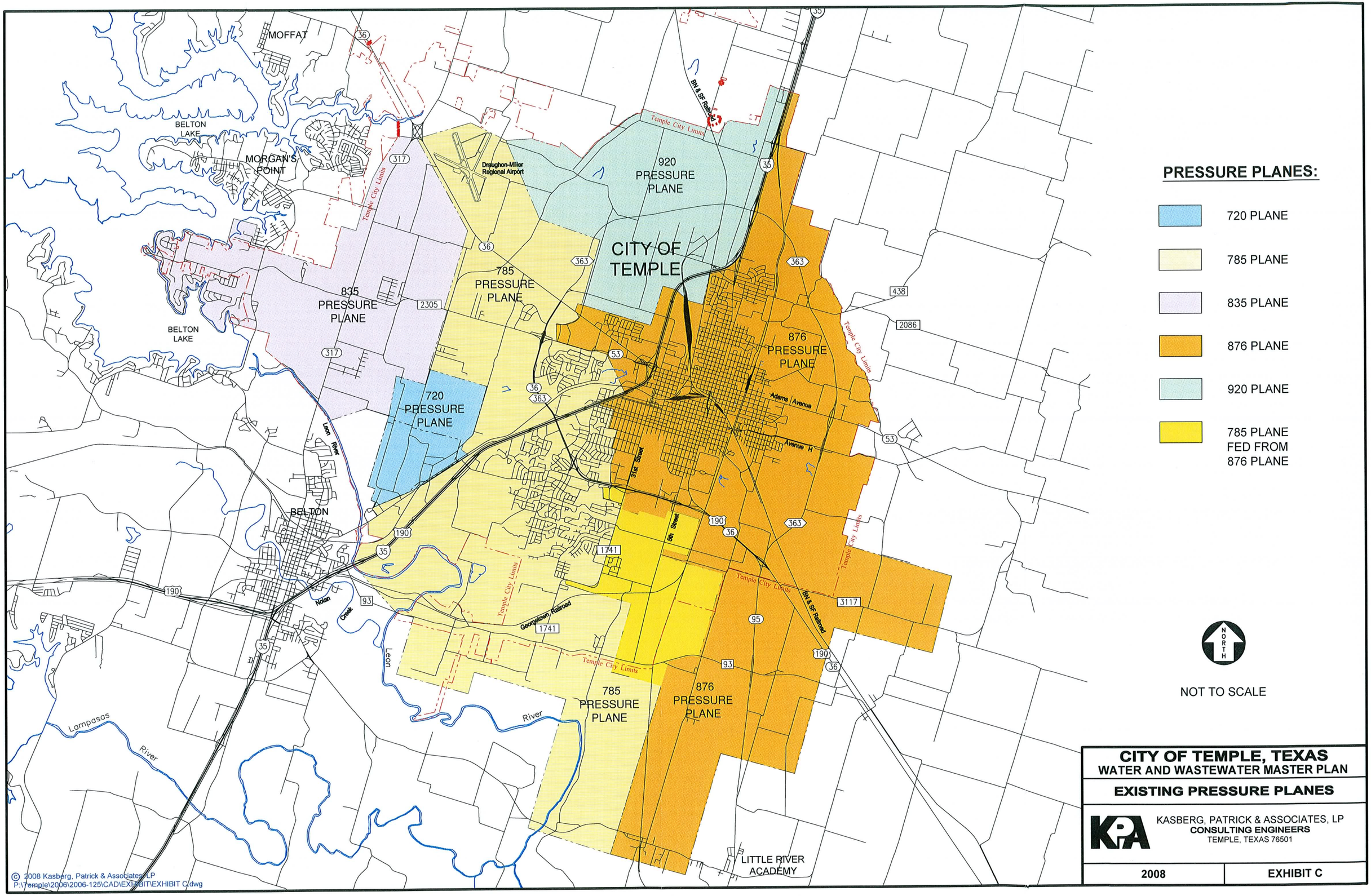
CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN

LAND USE MAP

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | **EXHIBIT B**



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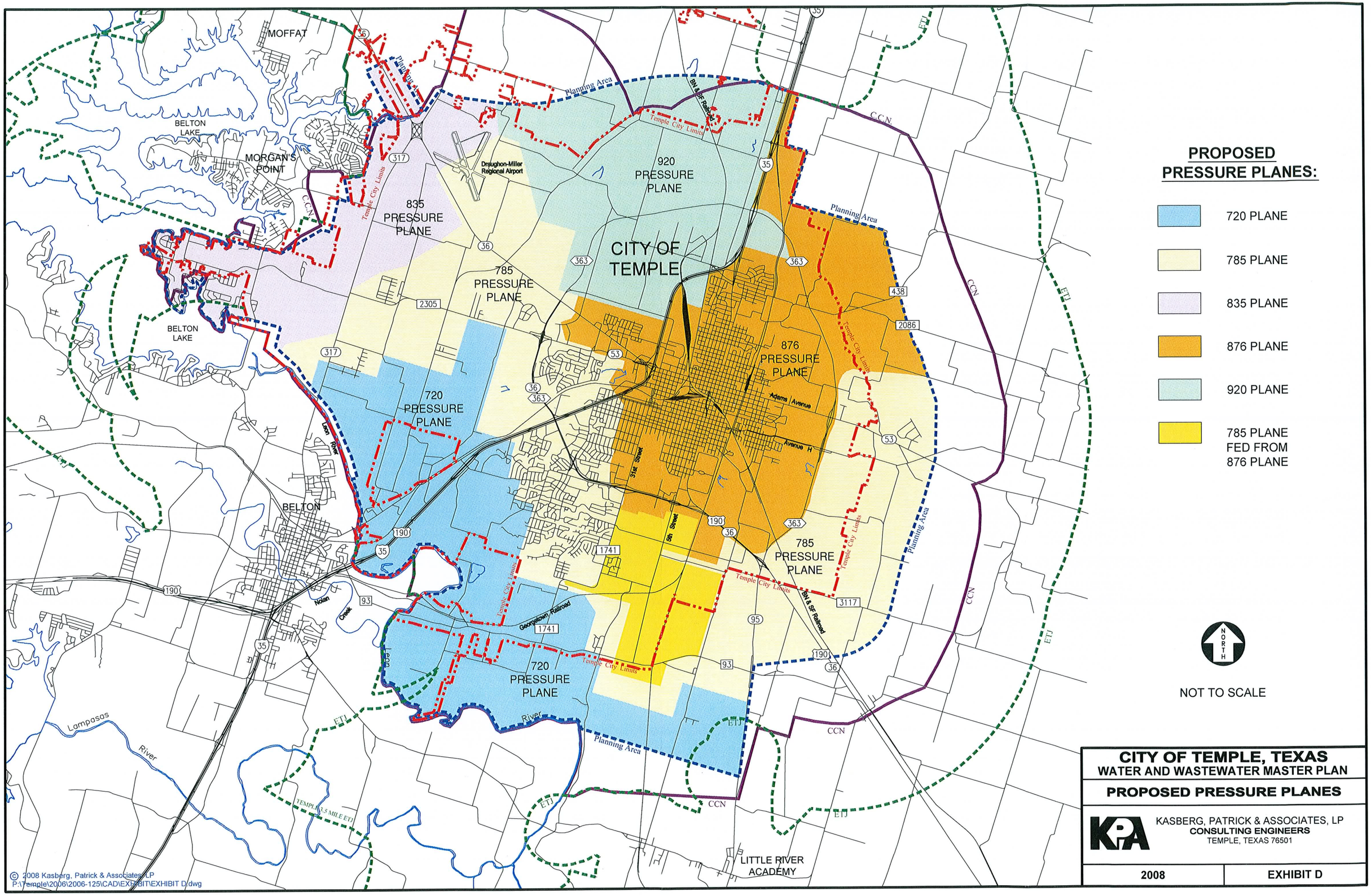
CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN
EXISTING PRESSURE PLANES

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | EXHIBIT C



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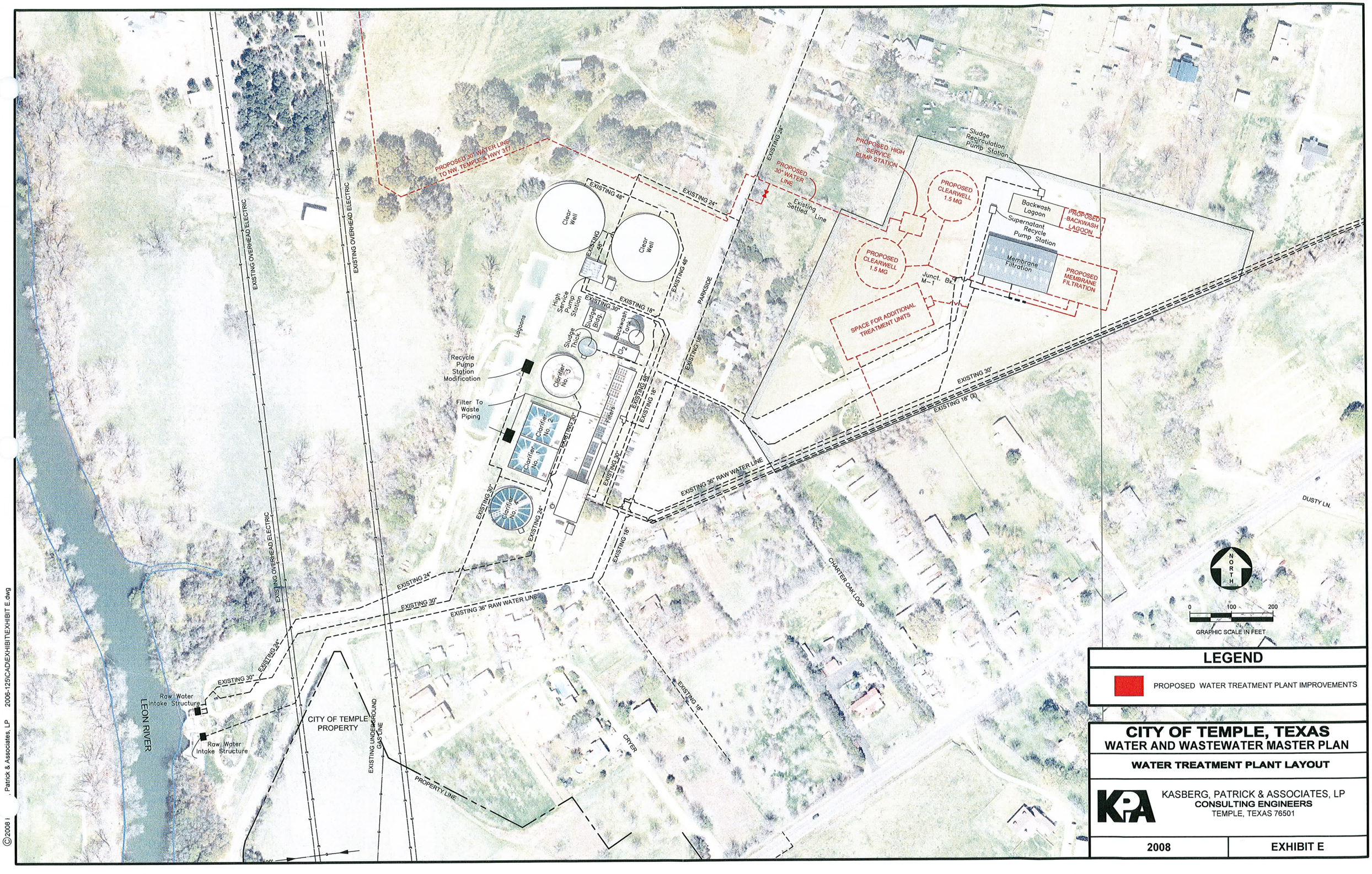


LEGEND

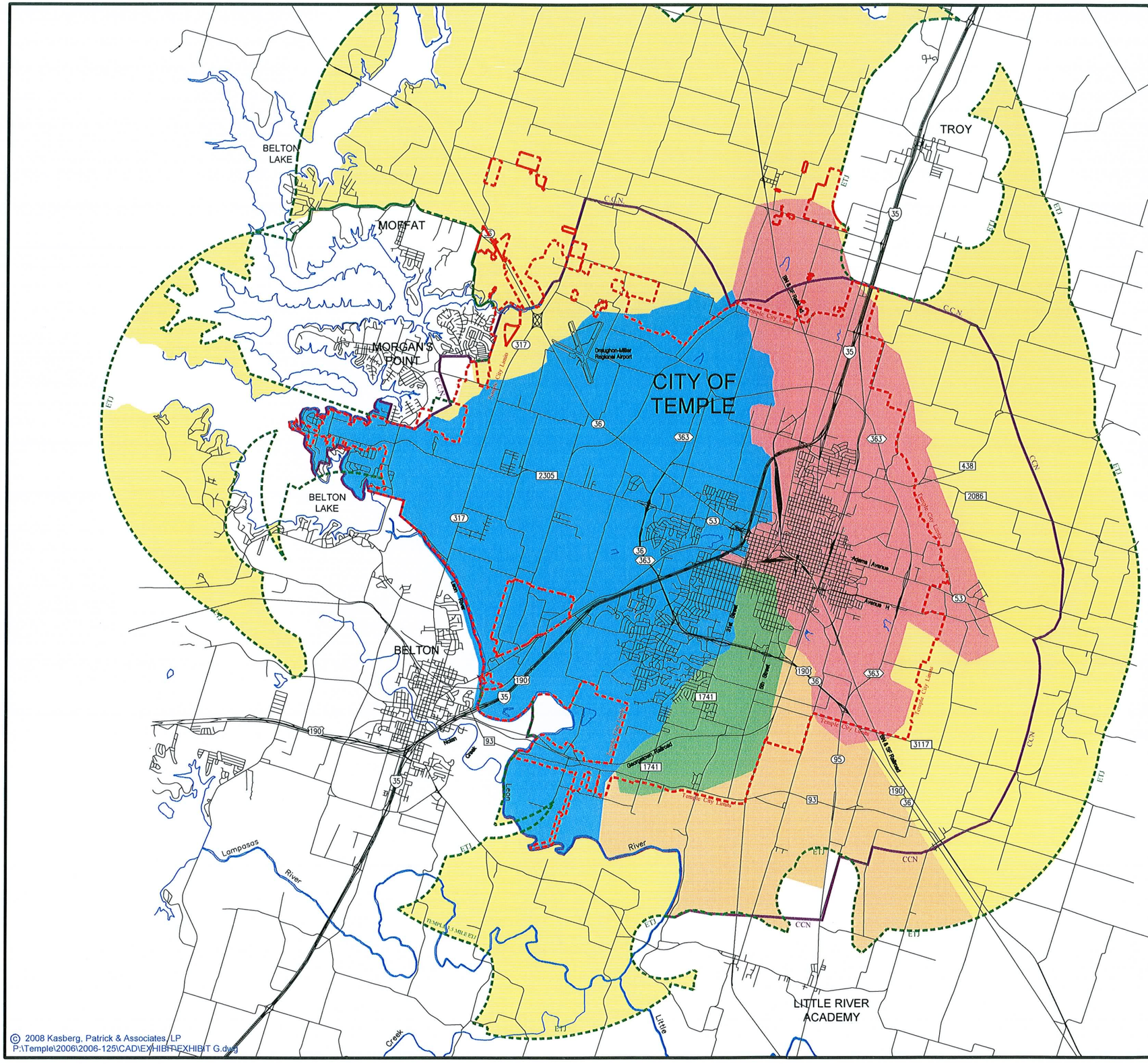
PROPOSED WATER TREATMENT PLANT IMPROVEMENTS

CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN

WATER TREATMENT PLANT LAYOUT

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008	EXHIBIT E



SERVICE AREAS:

- TEMPLE - BELTON REGIONAL SEWERAGE SYSTEM SERVICE AREA
- DOSHIER FARM SERVICE AREA
- FRIARS CREEK TRUNK BASIN
- FUTURE TREATMENT PLANT SERVICE AREA
- OUTSIDE OF SERVICE AREA

NOTE:

FRIARS CREEK TRUNK WILL INITIALLY BE SERVED BY THE T-BRSS FACILITY. IN THE FUTURE, FLOW MAY BE TRANSFERRED TO A FUTURE TREATMENT PLANT.

AREAS OUTSIDE EXISTING SERVICE AREAS MAY BE SERVED BY USING LIFT STATIONS TO PUMP WASTEWATER INTO AN ADJACENT SERVICE AREA.

NORTH

NOT TO SCALE

CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN
WASTEWATER SERVICE AREA MAP

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | EXHIBIT G

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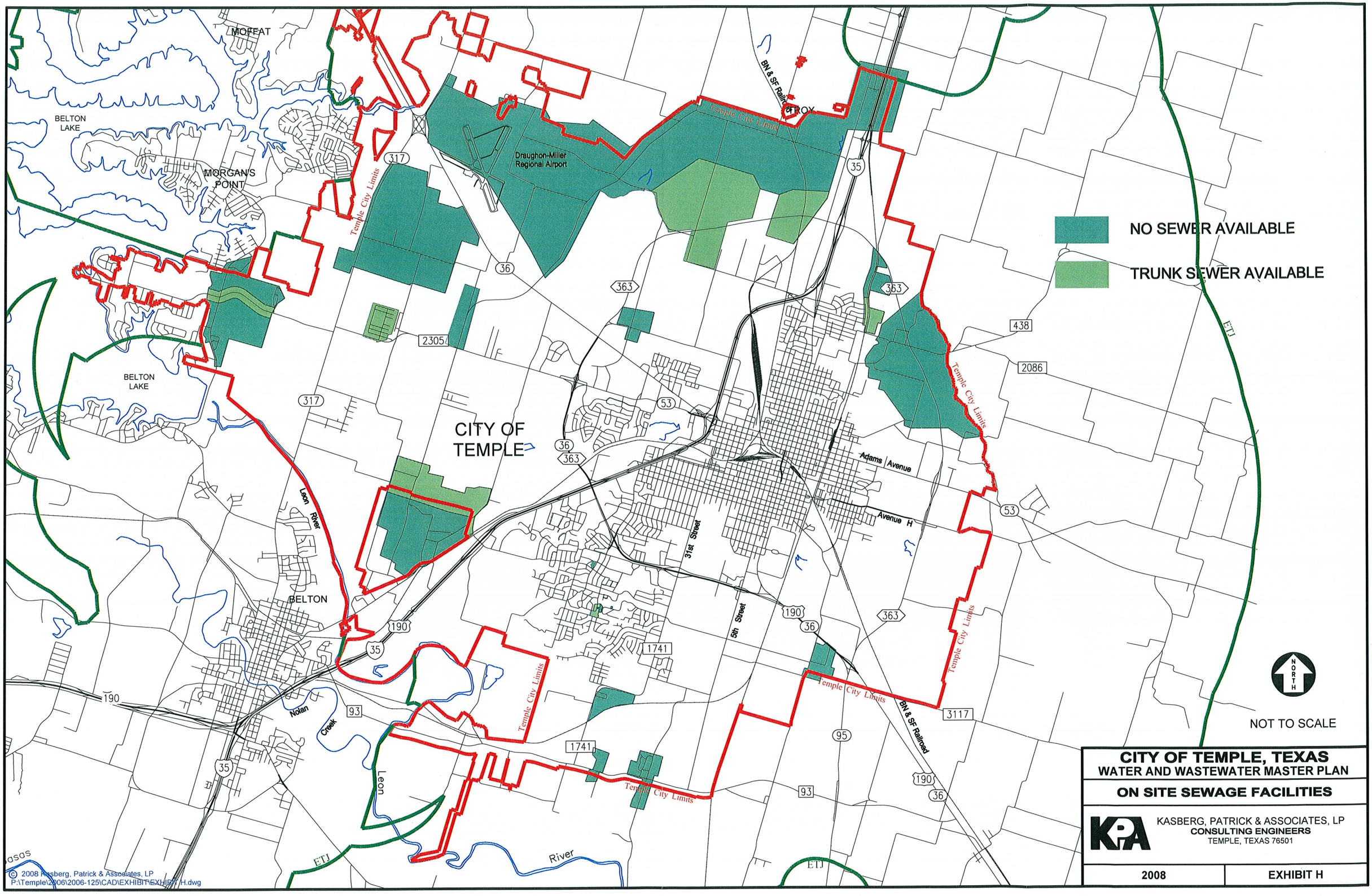
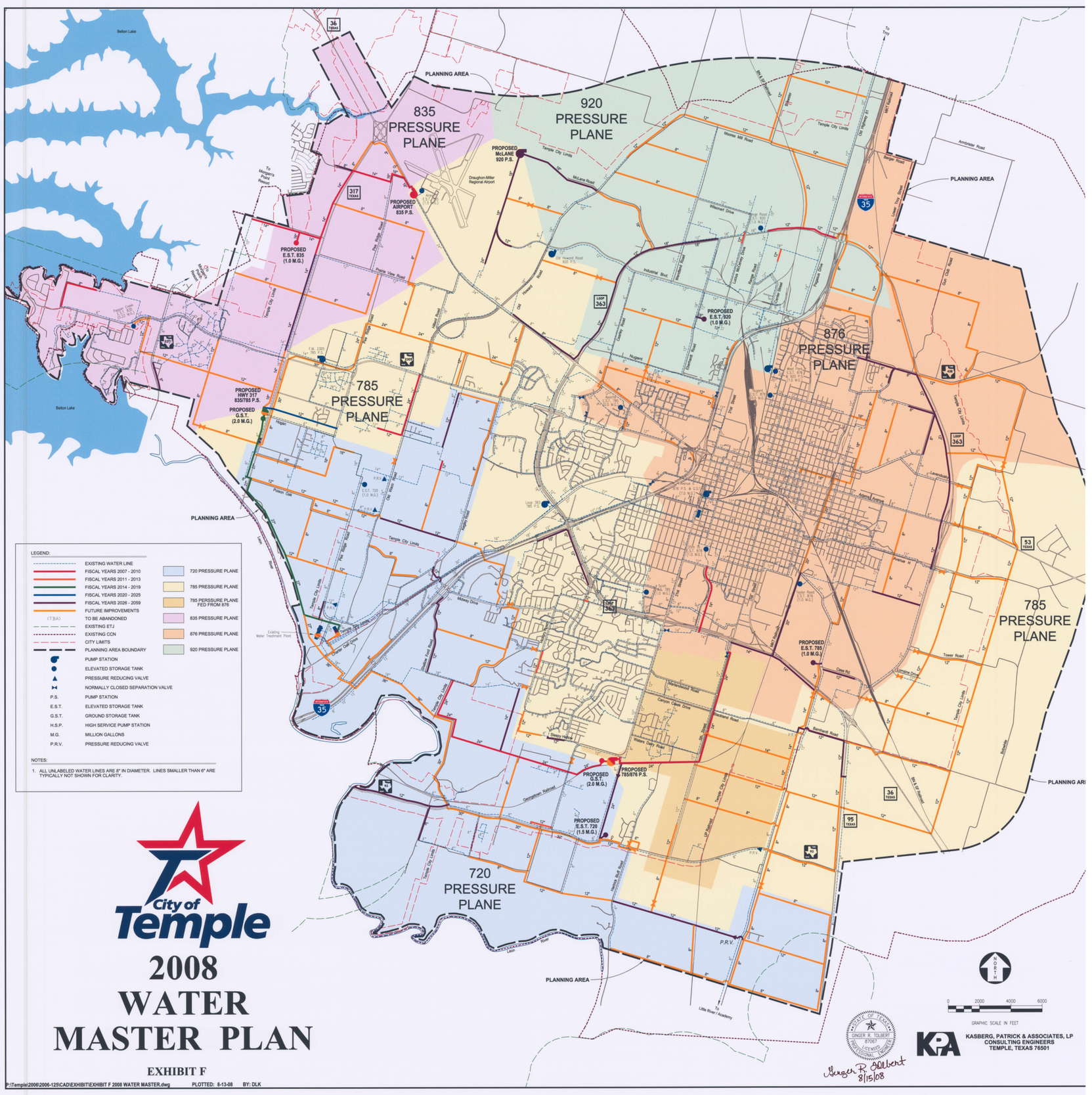


CITY OF TEMPLE, TEXAS
WATER AND WASTEWATER MASTER PLAN
ON SITE SEWAGE FACILITIES

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501

2008 | EXHIBIT H



City of Temple

2008 WATER MASTER PLAN

EXHIBIT F

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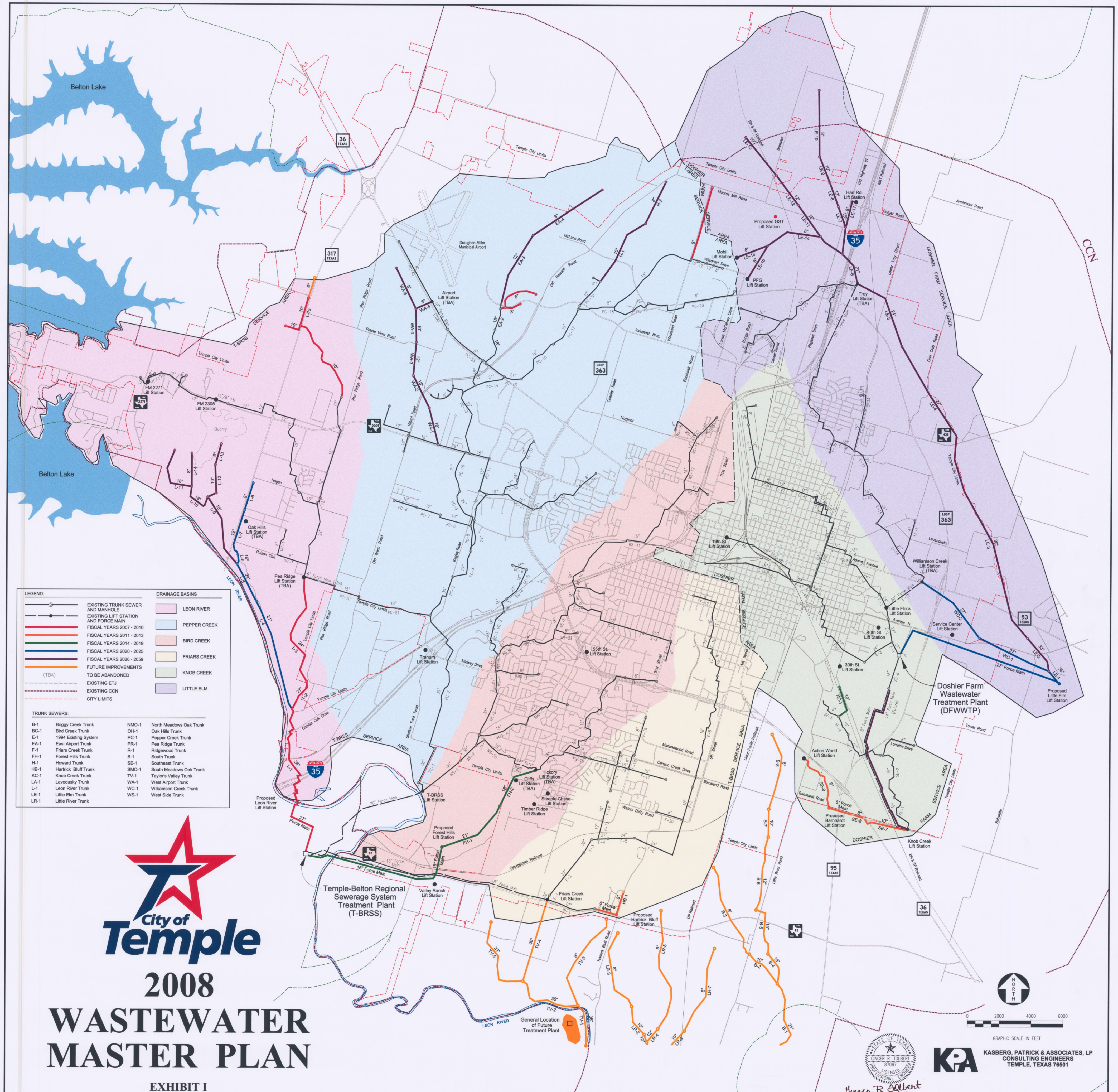
STATE OF TEXAS
GINGER R. TOLBERT
87067
LICENSED
PROFESSIONAL ENGINEER

Ginger R. Tolbert
8/15/08

KASBERG, PATRICK & ASSOCIATES, LP
CONSULTING ENGINEERS
TEMPLE, TEXAS 76501



2008 WASTEWATER MASTER PLAN

EXHIBIT I