Regional Wastewater System Master Plan Update

Prepared for City of Longview
Longview, Texas

October 2008

TCB | AECOM

Contents

List of Tables

List of Figures

List of Exhibits

List of Appendices

Appendix A - *City of Longview Waste Water Master Plan 2007 – Lift Station Investigations* by Hayes Engineering

Appendix B - *City of Longview, Texas Flow Monitoring Report* by RJN

Appendix C – *2030 Metropolitan Transportation Plan* by the Metropolitan Planning Organization

Appendix D - *Sanitary Sewer Costs Study* by Hayes Engineering

Executive Summary

TCB INC. (TCB), including subconsultants Hayes Engineering (Hayes) and RJN Group, Inc. (RJN), was retained by the City of Longview (City) to evaluate the City's existing Wastewater System Master Plan, dated 1996, and to update this plan for the years 2005 through 2025. This includes preparation of a 5-year Capital Improvements Program (CIP) and 10-year and 20-year master plans. The Wastewater System Master Plan (WWMP) update also includes an investigation into the feasibility of extending the City's wastewater service into areas of Gregg County.

The City is expecting to experience moderate growth over the next 20 years, most of which will occur north of Loop 281 and along the Eastman Road corridor. Due to this growth, improvements to the City's existing wastewater collection system will need to take place over the next 20 years. The existing average daily dry weather flow, as measured by RJN Group, Inc. (RJN) during dry weather monitoring, is 10.2 million gallons per day (MGD), and the existing peak wet weather flow, measured by RJN during wet weather monitoring, is an estimated 42 MGD.

Hayes Engineering (Hayes) created an updated AutoCAD mapping of the City's sanitary sewer system based on their data collection. TCB then imported the system into ArcGIS and used Bentley's SewerGEMS V8 XM modeling software to model the City's wastewater system. Bentley SewerGEMS uses parameters such as manhole diameters, pipe diameter, material, slope, manhole rim elevations and inverts, pipe length, ground elevations, and system geometry. The models were designed for use by the City and can be updated as needed. Modeling was preformed on all trunk lines, lift stations, force mains, and all collection lines with a diameter of 10-inches and above.

With the model built and calibrated, both existing and future line deficiencies were identified and recommendations for the 5-year CIP and 20-year master plans were made. The total estimated costs for the 5-year CIP and 20-year master plans were $5,746,000, and $283,000 respectively. Costs associated with each rehabilitation project were estimated in terms of 2008 dollars.

A benefit-cost analysis for three alternatives was prepared to determine if it was feasible for the City to add surrounding unincorporated areas of Gregg County into their wastewater system. The first alternative included providing service to an area generally north of FM 1844 up to the county line, the second alternative included an area west of Longview and north of the City of White Oak, while the third alternative included an area just south of Interstate 20 along US Highway 259. The cost required for the residents of the unincorporated areas to maintain their current septic and aerobic systems were compared to the costs required by the City to extend service to these areas. The three alternative areas were analyzed and a benefit-cost analysis was performed for each of the alternatives. Based on the benefit cost ratios obtained it was seen that none of the alternatives were feasible.

Table 1-1. Gregg County Alternative Summary

Alternative	Area (sq. mi.)	# of connections	Annualized Costs		Benefit Cost Ratio
			Sewer Network	Aerobic Systems	
1	25.5	947	$9,932,000	$236,750	0.02
2	2.3	60	$1,005,000	$15,000	0.01
3	2.2	16	$178,000	$4,000	0.02
TOTAL	**30.0**	**1,023**	**$11,115,000**	**$255,750**	**0.02**

Section 1– Introduction

1.1 General

The City of Longview, Texas (City) is located in the northeast portion of the state, about 40 miles from the Louisiana border in East Texas as shown in Exhibit 1. Longview has a current population of approximately 76,520. The City has experienced recent growth and expects a steady increase in population during the foreseeable future. The purpose of this study is to provide the City with the ability to predict and analyze the impact of this growth on its sanitary sewer system, and to be prepared when growth occurs.

The City currently has a Wastewater System Master Plan (WWMP), dated May 1996. The City intends to update this plan to a base year of 2005 and for a 20-year planning period through 2025. This WWMP update also includes an investigation into the feasibility of further extending the City's wastewater service into portions of Gregg County.

1.2 Purpose and Scope

On November 10, 2005, the City authorized TCB INC. (TCB) and its subconsultants to prepare a WWMP update. The TCB Team, including subconsultants Hayes Engineering (Hayes) and RJN Group, Inc. (RJN), performed the following tasks as part of this project:

- Data collection
- Software review and recommendations
- Wastewater system mapping update
- Wastewater system modeling for existing and future conditions
- Temporary flow metering for dry and wet weather conditions
- Modeling of alternatives for possible wastewater service expansion into Gregg County
- Preparation of 5-year Capital Improvements Plan (CIP) with project cost estimates
- Preparation of 10-year and 20-year master plans
- Benefit-cost analysis of expansion alternatives
- Training on the wastewater system model

Section 2– Existing Wastewater System

2.1 Overview

The City limits encompass approximately 53.5 square miles and the City's wastewater system consists of approximately 623 miles of gravity pipelines ranging from 6 inches to 54 inches in diameter. There are also 20 active lift stations (pumping stations) and 20 individual force main lines (approximately 15 miles in length). The City has one wastewater treatment plant (WWTP) located on the south side of the City on FM 1845. The WWTP is currently permitted for an average daily flow of 21 million gallons per day (MGD), but can handle up to 63 MGD for short periods of time. Exhibit 2 shows the study area for the project along with the City limits, lift stations, the WWTP, and major roads in and around the City.

2.2 Sewersheds

The City is divided into 18 sewersheds which are defined by the topography (natural drainage patterns) of the land. The typical sewershed begins with 6-inch or 8-inch piping and ends with a 12-inch or 15-inch pipe where it connects to a larger "interceptor" pipe of 18 to 54 inches in diameter. Interceptors typically follow creek alignments in Longview. Each sewershed has been assigned a two-letter abbreviation used in mapping and modeling. A list of the sewersheds and abbreviations is shown in Table 2-1.

Table 2-1. Sewershed Names and Abbreviations

Sewershed Name	Abbreviation	Service Area (ac)	Largest Pipe Diameter (in)
Eastman Lake Creek	EL	5,498	36
Evergreen Hills Creek	EV	1,196	18
Grace Creek	GR	6,171	54
Greggton Creek	GT	2,063	24
Guthrie Creek	GU	1,896	30
Hawkins Creek	HK	4,008	24
Harris Creek	HR	2,608	36
Iron Bridge Creek	IB	2,823	21
Johnston Creek	JN	608	18
LeTourneau Bottoms	LB	2,417	36
LaFamo	LF	1,762	18
LeTourneau	LT	1,060	24
Mason Creek	MA	1,815	18
Oakland Creek	OA	2,143	18
Oak Branch	OB	3,285	18
Ray Creek	RA	3,368	15
School Branch	SB	1,981	18
Wade Creek	WD	1,834	18

Exhibit 3 shows the service areas and major pipes (generally 10 inches or larger) for the City's wastewater collection system. These pipes and force mains are included in the model and represent approximately 114 miles of sewer, or 19 percent of the total length of active pipes in the City.

2.3 Facilities

Lift stations are shown in Exhibit 2 and are listed in Table 2-2 with the number of pumps and the firm rated capacity of each station. For lift stations with two or more pumps, the firm rated capacity is based on the largest pump being out of service.

Table 2-2. Lift Station Capacity

Lift Station Number	Lift Station Name	Abbreviation	No. of Pumps	Type of Pit	Firm Rated Capacity (gpm) *a
1	LeTourneau	LSLET	2	Wet	1,200
2	Highway 149	LS149	2	Wet	1,720
3	Longview Heights	LSLVH	2	Wet	950
4	Elmira Chapel	LSELC	2	Wet	170
5	Progress Road	LSPRG	2	Wet	300
6	Harrison #1	LSHR1	2	Wet	220
7	Harrison #2	LSHR2	2	Wet	1,320
8	Greggton	LSGGT	3	Wet	2,000
9	Pine Bluff	LSPBL	2	Wet	80
10	Pittman Street	LSPIT	4	Dry	12,600
11	Whatley Road	LSWHA	2	Dry	1,300
12	FM 1845 #2 *b	LSFM2	2	Wet	-
13	Ambassador *b	LSAMB	2	Wet	50
14	Gregg Tex *b	-	2	Wet	-
15	Heritage *b	-	2	-	-
16	Highway 149A *c	-	2	Wet	550
17	Rustic Oaks *b	-	-	-	-
18	Airport #1 *c	LSAP1	2	Wet	500
19	Airport #2 *c	LSAP2	2	Wet	250
20	Airport #3 *c	LSAP3	2	Wet	300

*a Firm rated capacity is based on the largest pump being out of service
*b Not modeled due to small size and small amount of flow
*c Out of Study Area

Of the 20 lift stations, 11 were considered large enough to be included in the model. Seven of these lift stations have a firm rated capacity of 1 MGD (694 gpm or greater). All but two of the lift stations are wet well configuration with submersible pumps. Pittman Street Lift Station and Whatley Road Lift Station have a wet well-dry pit configuration.

Hayes conducted site visits for all the lift stations listed in Table 2-2 to gather available wet well and pump information and to measure the actual pumping capacity. These results can be found in the report *City of Longview Waste Water Master Plan – Lift Station Investigations, 2007* (Appendix A).

2.4 Existing Wastewater Flows

The wastewater flows in a municipal collection system vary during the day due to various factors such as the wastewater discharge source and weather conditions. Flows are typically lower during the summer and fall months and higher in winter and spring. This is indicative of rainfall entering the wastewater collection system, a condition referred to as infiltration and inflow (I/I). This situation exists to some degree in virtually every system in the study area and will be discussed later in greater detail.
Wastewater system flows result from three general sources:

- Sanitary flow from the population at large (“area” loads)
- Sanitary flows from industry, schools and other large facilities (“point” loads)
- Infiltration and inflow (I/I) – storm water and groundwater

Of these, the first two are due to sanitary flow contribution and are the intended use of the wastewater collection system. I/I, however, is due to storm water and groundwater, and is not desired in a sanitary sewer system. However, some amounts of I/I are unavoidable, and systems should be designed accordingly.

2.4.1 Gallons per Capita

The most common index used to evaluate the overall municipal wastewater flow is gallons per capita per day (gpcd). Title 30, Part 1, Texas Administrative Code Chapter 217.32(a)(3) Table B-1 was used to determine daily wastewater flows in gpcd for the sources listed in Table 2-3. Based on the Texas Commission on Environmental Quality (TCEQ) standard daily wastewater flows, 100 gpcd for residential and 25 gpcd for commercial and industrial areas were selected for this study.

Table 2-3. Texas Administrative Code Chapter 217 Wastewater Flows

Source	Remarks	Daily Wastewater Flow (Gallons/Capita/Day)
Municipality	Residential	100
Subdivision	Residential	100
Trailer Park	2.5 persons/trailer	50
Mobile Home Park	3 persons/trailer	75
School w/ Cafeteria	w/ showers	20
	w/out showers	15
Recreational Parks	Overnight user	30
	Day user	5
Office/Factory	-	20
Hospital	Per bed	200

2.4.2 Point Loads

As mentioned previously, sanitary flow contributions result from both the general populations (“area” loading) and point sources such as industry, schools, and other facilities which generate a significant flow at one location.

The City provided data on industries which participate in the City's industrial pretreatment program, as well as data on schools and hospitals. This data contained average monthly flows which were then converted to daily flows. These daily flows were calculated based on a 5 or 7 day work week. Hospitals were assumed to operate 7 days per week while all other industries were assumed to operate 5 days a week. A summary of this data for point sources is presented in Table 2-4.

Table 2-4. Significant Point Sources

Point Source	Average Monthly Flow (GPD)	Average Daily Flow (GPD)
Southwest Steel Casting	*	*
LeTourneau University	*	*
Lebus International, Inc.	*	*
HATCO	300,000	10,000
Aaon Coil Products, Inc.	*	*
Capacity of Texas	*	*
Paramount Carwash	*	*
Darr Lift	*	*
Longview News- Journal	*	*
Groendyke Transport	192,090	6,403
Ryder Truck Rental	*	*
Alpha Omega Recycling	121,920	4,064
Dana Corp.	673,080	22,436
Weatherford	446,790	14,893
Rexam Beverage Can	3,810,000	127,000
Martin Transports, Inc.	454,200	15,140
Stemco Inc.	630,000	21,000
Holt Cat	255,000	8,500
La Fama Foods	376,027	12,534
Schlumberger Inc.	399,390	13,313
Ari/Fleet Services	300,000	10,000
Good Shepherd Mc.	3,120,000	104,000
Longview Reg:Hospital	244,500	8,150
Norris Cylinder Co.	27,000	900
Union Pacific Railroad	9,450	315
Union Tank Car	50,000	1,667
Total	**11,409,447**	**380,315**

* Flow data is unavailable

The total average daily flow for these sources is 0.38 MGD or about 4% of the average daily dry weather flow.

2.5 Temporary Flow Monitoring

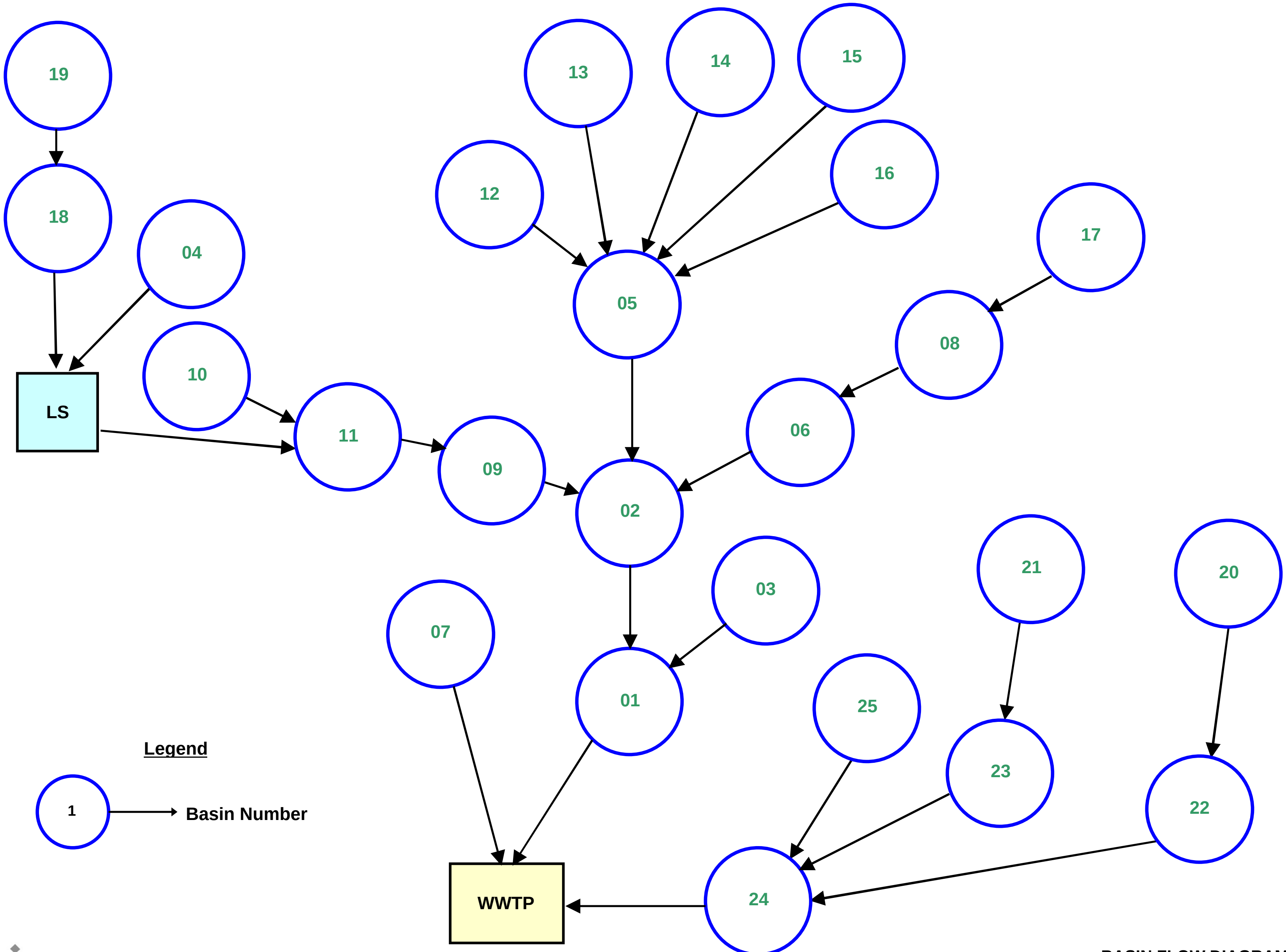
2.5.1 Dry Weather Monitoring

RJN performed a flow metering analysis at 25 locations throughout the City. The 25 flow meters recorded the City's wastewater flows, and the results of the monitoring were compiled into the report, *City of Longview, Texas Flow Monitoring Report* (Appendix B). The locations were selected to obtain the necessary flow data from major interceptors throughout the City. Locations and meter numbers are presented in Table 2-5 and Figure 2-1. A map showing the meter locations is presented in Exhibit 4. Wastewater flows were monitored from May 10, 2006 to July 10, 2006. Infiltration was negligible during the dry weather monitoring period.

Table 2-5. Flow Meter Locations

Meter Number	General Location/Address	Pipe Diameter (in)	Manhole ID	Service Area
1	In easement across from WWTP	54	GR0647	Grace
2	Off of Sabine Street	54	GR0632	Grace
3	East of Bird Song Street and North of FM 1845	24	LT1746	LeTourneau
4	2100 Rocking B Ranch Road	12	LF5007	LaFamo
5	Off of Kings Mountain Drive	42	GR1154	Grace
6	823 W Marshall Avenue	30	GU1415	Guthrie
7	1102 W. Cotton Street	15	GR0120	N/A*
8	Near intersection of Johnston Street and Judson Road	30	GU9171	Guthrie
9	918 W Marshall Avenue	36	HR1262	Harris
10	514 Pine Tree Road	10	LF0053	LaFamo
11	Near W Marshall Avenue and Mosley Parkway	36	HR3299	Harris
12	1428 Fairmont Street	18	EV0003	Evergreen Hills
13	601 W. Loop 281	18	SB9663	School Branch
14	Off of Hawkins Parkway	24	GR9294	Grace
15	In golf course off of Loop 281	15	RA0002	Ray
16	In golf course off of Loop 281	18	OB8063	Oak Branch
17	Near Triple Creek Drive	18	JN1002	Oakland
18	6801 Tenneryville Road	18	HK0009	Hawkins
19	Along Tenneryville Road	18	HK0012	Hawkins
20	2205 U.S Highway 80	18	EL0065	Eastman Lake
21	809 S. Eastman Road	18	IB1048	Iron Bridge
22	Near Gum Spring Road and Eastman Road	30	EL0029	Eastman Lake
23	2920 Estes Parkway	21	IB1011	Iron Bridge
24	1198 FM 1845	36	LB4507	LeTourneau Bottoms
25	Off of Birdsong Street near Loop 281	8	-	LeTourneau

*Serves Rexam Beverage Can Plant; modeled as a point source.



rjngroup
Excellence through Ownership

BASIN FLOW DIAGRAM
CITY OF LONGVIEW, TEXAS
FIGURE 2-1

Twelve rain gauges (Table 2-6 & Exhibit 4) were installed to determine the amount of rainfall that occurred during this time period. Eight of the rain gauge locations were used during the dry weather monitoring and an additional four rain gauge locations were added during wet weather monitoring.

Table 2-6. Rain Gauge Locations

Rain Gauge No.	Location
1	Pump Station behind Exxon at Estes Parkway
2	Pump Station at Highway 80 and Loop 281
3	WWTP at Loop 281
4	Fast Trac
5	Harrison No. 1 Pump Station
6	399 Whatley Road
7	Pump House at Oak Forrest Sport Club at Loop 281
8	2126 Alpine Behind Hayes Engineering
*9	305 Pinetree (Texas Cash Register building)
*10	3800 Gilmer Road
*11	201 South Hawkins (School Aquatic Center)
*12	4508 McCann Fire Station #8

* Installed during wet weather monitoring

The primary purpose of the flow monitoring was to record actual dry weather flows, calibrate the hydraulic models, and observe the operation of the system. RJN selected May 17, 2006 through May 23, 2006 as the representative dry weather period and determined that the average daily dry weather flow for the City of Longview is approximately 10.2 MGD.

Since wastewater flow varies throughout the day in response to water consumption, a peaking factor (ratio of the peak hourly flow rate and the average daily flow rate) was determined for each meter location. Table 2-7 summarizes the metered flows for dry-weather conditions for the 25 meter locations.

Table 2-7. Dry Weather Flows

Meter Basin	Basin Average Daily Dry Weather Flow (mgd)	Cumulative Average Daily Dry Weather Flow (mgd)	Cumulative Peak Dry Weather Flow (mgd)	Cumulative Average Daily Dry Weather Flow Peaking Factor
1*	0.873	8.154	10.445	1.28
2	0.472	6.897	8.831	1.28
3	0.375	0.375	0.520	1.39
4	0.175	0.175	0.260	1.49
5	0.535	2.195	2.900	1.32
6	0.195	1.526	1.960	1.28
7*	0.198	0.198	0.250	1.26
8	0.812	1.331	1.630	1.22
9	0.105	2.704	3.270	1.21
10	0.570	0.570	0.790	1.39
11	1.579	2.600	3.190	1.23

Meter Basin	Basin Average Daily Dry Weather Flow (mgd)	Cumulative Average Daily Dry Weather Flow (mgd)	Cumulative Peak Dry Weather Flow (mgd)	Cumulative Average Daily Dry Weather Flow Peaking Factor
12	0.488	0.488	0.680	1.39
13	0.633	0.633	0.900	1.42
14	0.045	0.045	0.070	1.56
15	0.139	0.139	0.208	1.50
16	0.355	0.355	0.490	1.38
17	0.519	0.519	0.670	1.29
18	0.012	0.276	0.440	1.59
19	0.264	0.264	0.420	1.59
20	0.142	0.142	0.205	1.44
21	0.500	0.500	0.809	1.62
22	0.176	0.318	0.414	1.30
23	0.189	0.688	0.930	1.35
24*	0.832	1.859	2.630	1.41
25	0.020	0.020	0.031	1.55
Total	**10.203**		**Average**	**1.39**

* Meter Basins 1, 7, and 24 were used in calculating the total average daily flow at the WWTP

Figures 2-1and 2-2 show the cumulative average daily dry weather flows and the dry weather peaking factors for the 25 meter basins.

Figure 2-2. Cumulative Average Daily Dry Weather Flow

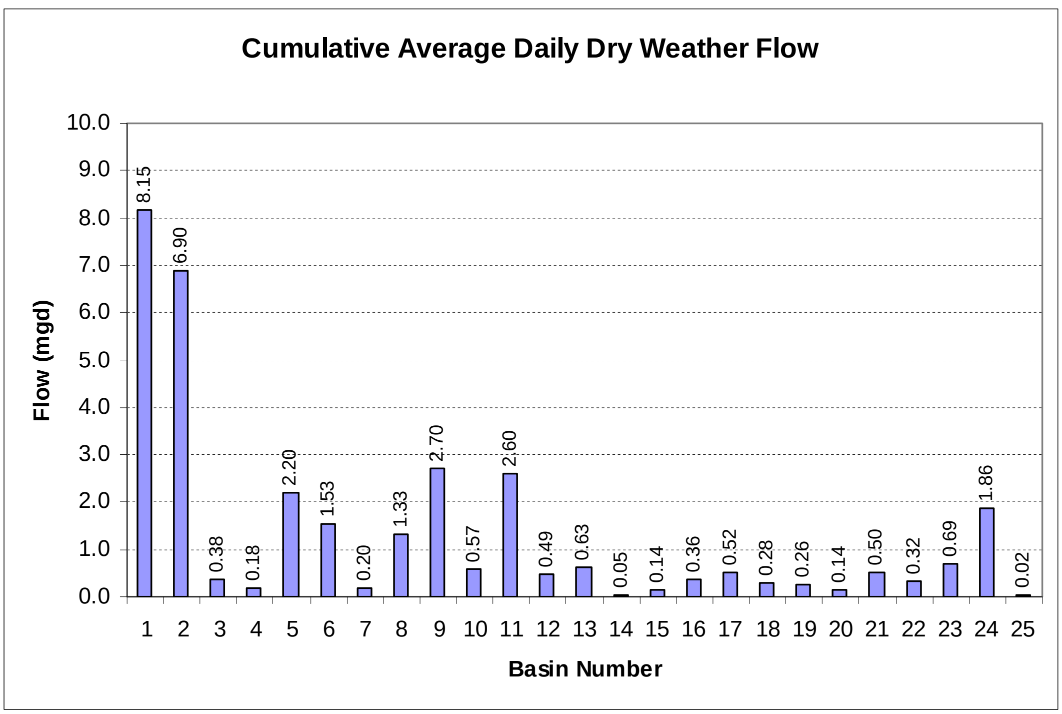
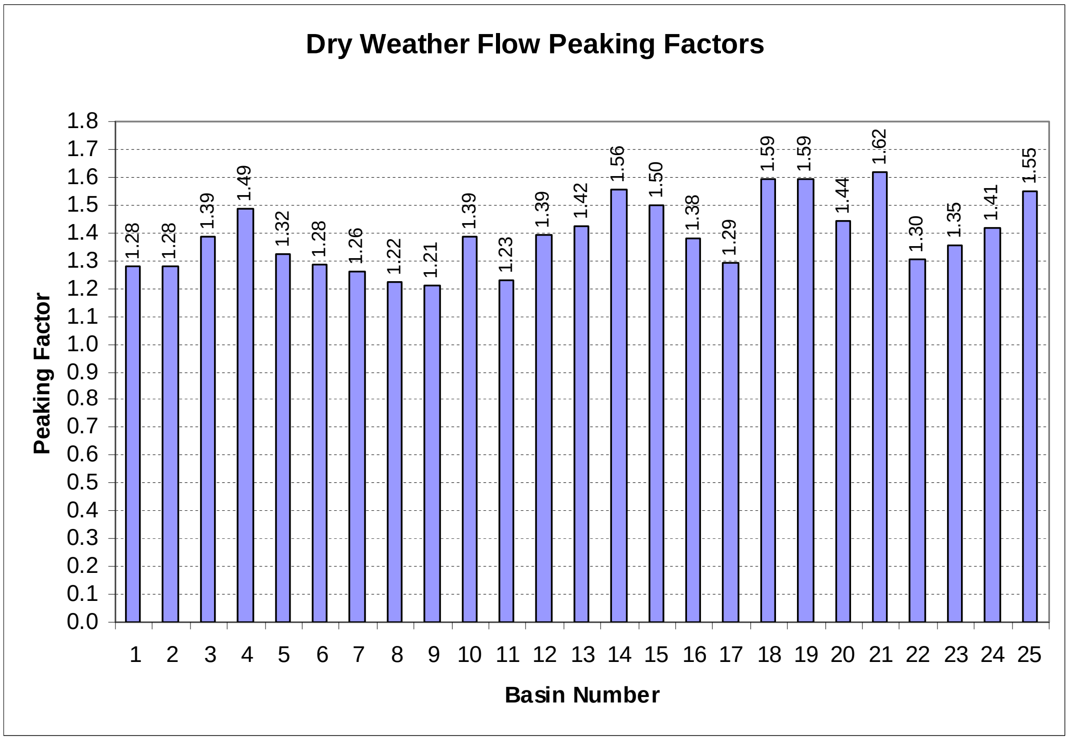


Figure 2-3. Dry Weather Flow Peaking Factors



2.5.2 Wet Weather Monitoring

A secondary benefit of the flow monitoring was the acquisition of the infiltration and inflow (I/I) data during rainfall events. Infiltration may enter the system through pipe joints, sewer line defects (including main sewer lines and building sewer lines), and defective manhole walls, benches, and pipe seals.

During the initial wastewater flow monitoring period, May 10, 2006 to July 10, 2006, there was not enough rain to generate relevant I/I data. Therefore, RJN performed additional flow monitoring in the Spring of 2008, in order to supplement the wet weather flow data. For this analysis, it was determined that eight meters would be sufficient.

RJN performed wet weather monitoring from March 1, 2008 through May 1, 2008 using eight meters (Table 2-8), and according to their metered data the peak wet weather flow was 54 MGD. This was determined by summing the peak dry weather flow and the 5-year inflow at the outfall. This resulted in a wet weather peaking factor of 5.2. For a well-established city with the same population as Longview, it is standard to have a peaking factor closer to 4 (Metcalf and Eddy, "Wastewater Engineering: Treatment and Reuse, 4th Edition).

The City upsized a majority of its large diameter collector lines based on the recommendations in the 1994 WWMP which looked at a period of 20 years as its planning period. The wet weather monitoring performed in 2008 showed the system to surcharge at several meter locations due to inflow problems. After discussions with the City, locations at undersized crossings along creeks were potential sources of these inflows. Based on these facts, it is our opinion that the system is experiencing inflow problems rather than capacity issues.

Reduction of inflow in to the system by applying standard I/I reduction procedures such as raising manholes and bolting manhole rims is a standard approach to address inflow problems in a system. For the City of Longview this reduction value is unknown; however, typically the industry standard for such measures can reduce inflow by as much as 30 percent. Such inflow reduction would immediately increase the available capacity of the system without significant costs. On the other hand, modeling the system based on the base wet weather monitoring data would create an undue need to provide available capacity by upsizing the system.

Therefore, the 30 percent reduction to the 5-year inflow was applied, which dropped the peak wet weather flow to 42 MGD and the wet weather peaking factor to 4.1. As a result, these reduced wet weather flows would accurately represent capacity issues in the system after inflow problems were addressed.

Table 2-8. Wet Weather Flows

Meter Basin	Average Dry Weather Flow (MGD)	Peak Dry Weather Flow (MGD)	5-year Inflow (MGD)	30% Reduced 5-year Inflow (MGD)	Total (30% Reduced 5-year Inflow + Peak dry) (MGD)	Peak Wet Weather Factor
1	8.145	10.445	31.895	22.327	32.772	4.024
2	6.897	8.831	28.335	19.835	28.666	4.156
3	0.375	0.520	3.407	2.385	2.905	7.746
5	2.195	2.900	5.007	3.505	6.405	2.918
6	1.526	1.960	11.371	7.960	9.920	6.500
*7	0.198	0.250	2.977	2.084	2.334	11.79
9	2.704	3.270	9.330	6.531	9.801	3.625
10	0.570	0.790	2.885	2.020	2.810	4.929
24	1.859	2.630	5.341	3.739	6.369	3.426

* Meter 7 was not monitored during wet weather monitoring. Values represent dry weather monitoring data.

Section 3– Modeling

3.1 General

Computer modeling is a method by which flows in the sewer system can be mathematically estimated and compared to the calculated capacity of the system. If the calculated flows are in excess of the capacity, or a certain percentage of the capacity, then the deficient facilities are noted, and a plan to correct them is formulated. Modeling is a means to perform an evaluation of the existing system conditions, as well as to determine the impact of growth on the system.

Modeling begins with the acquisition of data on the existing system. Hayes began this phase of the study by obtaining the City's as-built plans and existing sewer network in a user defined coordinate system to update the existing mapping of the wastewater system. Hayes also performed field investigations to verify questionable data unclear in the as-built plans.

Hayes created an updated AutoCAD mapping of the City's sanitary sewer system based on their data collection. TCB then imported the system into ArcGIS and used Bentley's SewerGEMS V8 XM modeling software to model the City's wastewater system. The models were designed for use by the City and can be updated as needed. The process of creating and calibrating the model is discussed in the following sections.

3.2 Mapping

The project included computer mapping of the sewer system. Hayes transferred the existing wastewater mapping to the correct coordinate system to match current topography and aerial mapping. For the updated sewer system, Hayes digitized the pipes, manholes, lift stations, and other data into an AutoCAD file.

TCB converted the AutoCAD sewer system mapping into an ArcGIS shapefile with attribute tables that contain a link to the sanitary sewer plans located on the City's network server. Where as-built plans were not available, the 2-foot topography was used to assign the manhole rim elevation. Flow-lines for such areas were not changed unless the information was erroneous. In that case, minimum slopes, as per Texas Administrative Code Chapter 317, were used to determine flow-line elevations. TCB also assisted with updating the manhole elevations and inverts and drop structures in manholes in ArcGIS using the as-built plans.

3.3 Sewer Model Overview

As previously stated, Bentley's SewerGEMS V8 XM was selected to model the City's wastewater system. This model was selected based on its ranking in six major objectives. These objectives included ease of use, database capabilities, modeling, exporting capabilities, reporting options, and cost analysis. The City ranked modeling and ease of use as its highest priorities and report options and cost analysis as relatively low priorities.

The model uses parameters such as manhole diameters, pipe diameter, material, slope, manhole rim elevations and inverts, pipe length, ground elevations, and system geometry. Information on the existing City of Longview wastewater system was provided by Hayes. Hayes also created and updated the previously mentioned AutoCAD file to reflect any system improvements. Modeling was performed on all trunk lines, lift stations, force mains, and on all new collection lines with a diameter of 10 inches and above. Exhibit 3 shows the lines that were modeled.

3.4 Population

When analyzing an existing wastewater system, it is important to consider the impacts of existing and future population on that system. Knowledge of the distribution of existing population and current development is necessary to determine the loadings on the system and to identify areas where unusual flows are being experienced (for example high infiltration and inflow areas). A projection of the future population aids in estimating future system loadings and in distributing the location of these loads so that the system can be planned to meet the future needs.

The Texas Water Development Board (TWDB) has population projections for each region in the state. These projections are broken down by city and county (Table 3-1).

Table 3-1. TWDB Population Projections

	City of Longview		Gregg County	
Year	TWDB Projections	Percent Growth	TWDB Projections	Percent Growth
2000	73,344	-	111,379	-
2010	76,827	4.7%	118,770	6.6%
2020	80,433	9.7%	126,421	13.5%
2030	84,160	14.7%	134,330	20.6%
2040	88,473	20.6%	143,481	28.8%
2050	94,312	28.6%	155,871	39.9%
2060	102,661	40.0%	173,587	55.9%

TWDB's population projections were considered for this project; however, since the study area falls beyond the City limits, and is only a portion of Gregg County, it was difficult to apply the TWDB's projections to the study area. Due to this, a different source for obtaining population data for the service area was used.

This study uses two types of information to determine the population during both existing and future conditions. Existing land use was used to distribute the sanitary loads, associated with the population, throughout the areas currently receiving public wastewater services. Traffic Analysis Zone (TAZ) data was used to estimate the increase in residential, commercial, and industrial loadings through the year 2025. The TAZ data is better suited for gaining accurate population data due to the fact that it encompassed more than the study area and the population is broken up in smaller areas of uniform population spread and growth. The TAZ data was overlaid on the land use so that the spatial distribution of residential and commercial populations within each TAZ could be determined. The land use, TAZ data, and sewersheds were intersected in order to estimate residential and commercial populations in each sewershed. Based on the individual sewershed populations, flows were estimated for each sewershed using the values of residential (100 gpcd) and commercial (25 gpcd) flows from Table 2-3.

After comparing the TAZ population projections to the TWDB's projections, it was observed that the TAZ data was 1 percent higher than the TWDB data for year 2010. Based on this correlation the TAZ data was assumed as an acceptable alternative method for finding population projections.

The existing land use was obtained in GIS format from the City. The shapefile given to TCB by the City has assigned each individual parcel a land use code. The land use codes and their corresponding definitions are presented in Table 3-2.

Table 3-2. Land Use Categories

Land Use Code	Land Use	Generalized Land Use
2F	Two-family dwelling	Residential
CO	Commercial	Commercial
ED	Education	Commercial
GV	Government	Commercial
IN	Industrial	Industrial
MF	Multi-family	Residential
MH	Mobile Home	Residential
OF	Office	Commercial
OG	Oil & Gas	Industrial
RE	Retail	Commercial
RL	Religious	Commercial
SF	Single-family	Residential
VC	Vacant	Vacant
PK	Park	Vacant
CE	Cemetery	Vacant
ME	Medical	Commercial
QP	Public parking	Vacant
FS	Fire Station	Commercial
No D	Not developable	Vacant
PU	Stamper Park Community Building	Commercial
RR	Railroad	Vacant
ST	Streets	Vacant

Population data was determined from the City's 1998 and 2030 TAZ data (*2030 Metropolitan Transportation Plan* prepared by the Metropolitan Planning Organization, Appendix C). With the 1998 and 2030 populations for the study area, intermediate populations for the years 2005, 2010, 2015, and 2025 were interpolated. A summary of the historical population, as per historical census and the TWDB Region D 2006 Regional Water Plan, is shown in Table 3-3. Table 3-4 shows the projected study area population, calculated based on existing land use and TAZ data as previously discussed.

Table 3-3. Historical Population for Longview and Gregg County

Year	City of Longview		Gregg County	
	Population	Percent Growth	Population	Percent Growth
1970	45,547	-	72,929	-
1980	62,762	37.8%	99,487	36.4%
1990	70,311	12.0%	104,948	5.5%
2000	73,344	4.3%	111,379	6.1%

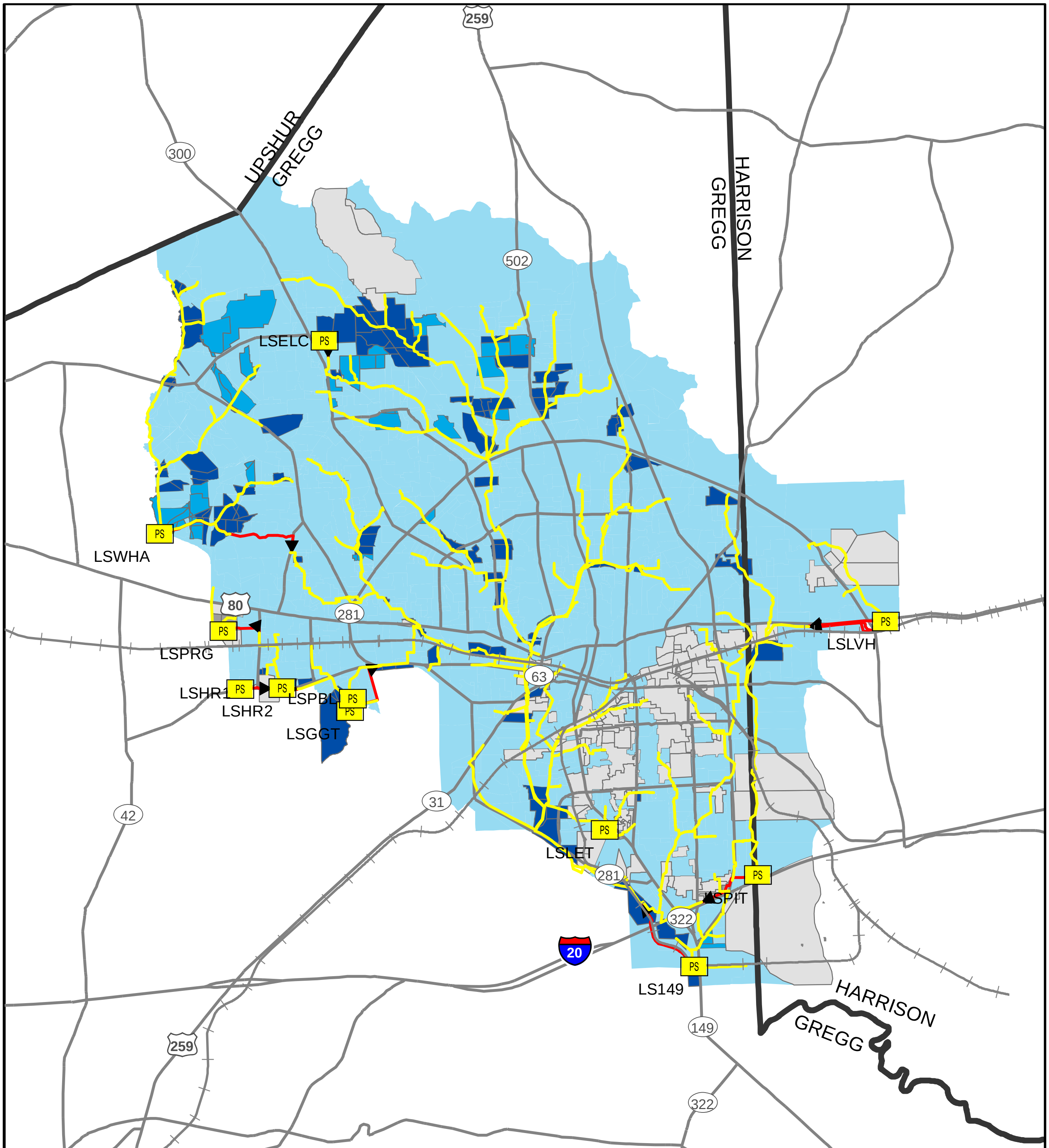
Table 3-4. Projected Study Area Population

Year	Study Area*			
	Population	Percent Growth**	Commercial Population	Percent Growth
2005	83,266	-	79,995	-
2010	84,400	1.36%	83,680	4.61%
2015	85,533	2.72%	87,366	9.21%
2025	87,799	5.44%	94,737	18.43%
2030	88,932	6.80%	98,422	23.04%

* Area is currently being serviced by the WWTP
** Based on base year 2005

A 5.44 percent population growth (4,533 people) and a commercial growth of 18.43 percent is projected within the study area between the years 2005 and 2025.

The projected growth areas for the years 2010, 2015, and 2025 are shown in Figure 3-1, Figure 3-2, and Figure 3-3, respectively.



Source: Transportation 2030 Study,
Longview Metropolitan Planning Organization, 2008.
Note: Percent Change Based on 2005 Data.

Legend

- PS LIFT STATIONS
- GRAVITY SEWER LINE
- FORCE MAIN
- COUNTY BOUNDARY

Percent Change (Population)

- **-100 to -51**
- **-50 to -1**
- **0 to 25**
- **26 to 50**
- **51 to 75**

N

0 2 4 Miles

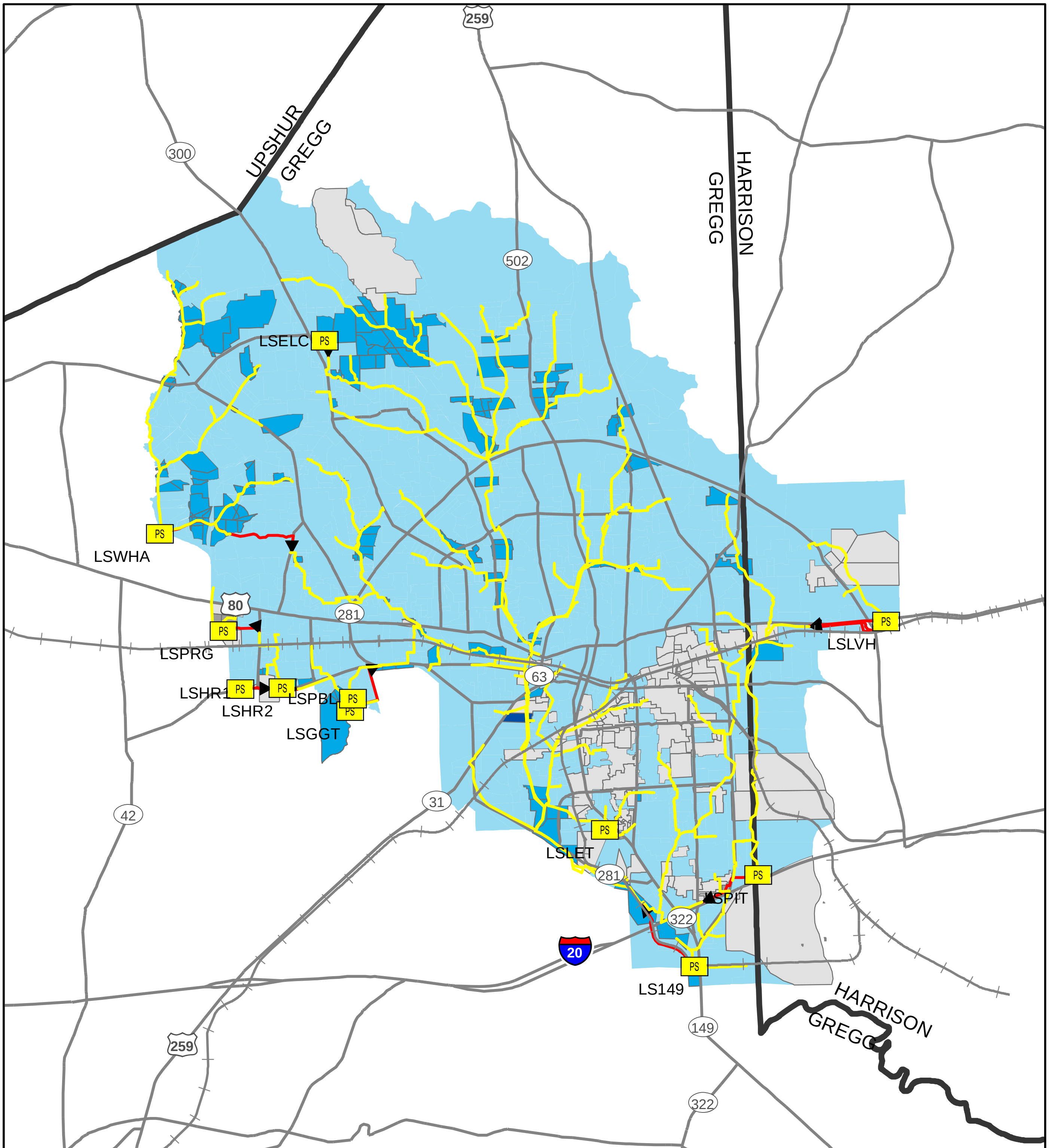
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

2010 PROJECTED GROWTH AREAS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 3-1	Project No.: 52803785	Date 10/08



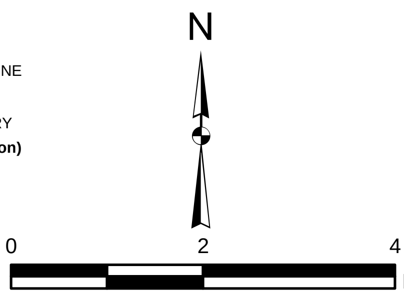
Source: Transportation 2030 Study,
Longview Metropolitan Planning Organization, 2008.
Note: Percent Change Based on 2005 Data.

Legend

- LIFT STATIONS
- GRAVITY SEWER LINE
- FORCE MAIN
- COUNTY BOUNDARY

Percent Change (Population)

- **-100 to -51**
- **-50 to -1**
- **0 to 25**
- **26 to 50**
- **51 to 100**



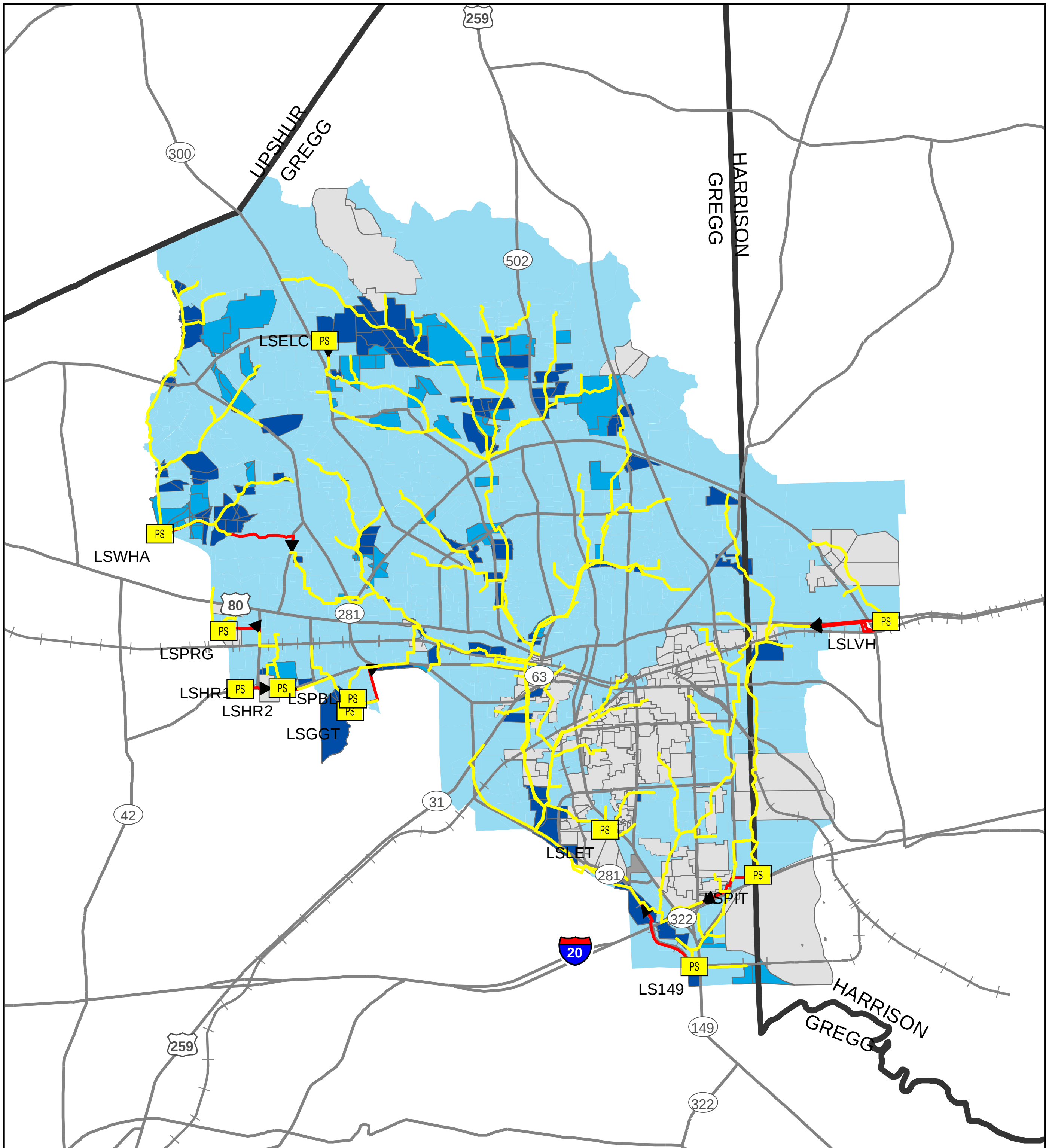
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

2015 PROJECTED GROWTH AREAS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 3-2	Project No.: 52803785	Date 10/08



Source: Transportation 2030 Study,
Longview Metropolitan Planning Organization, 2008.
Note: Percent Change Based on 2005 Data.

Legend

PS LIFT STATIONS
GRAVITY SEWER LINE
FORCE MAIN
COUNTY BOUNDARY

Percent Change (Population)

-100 to -51
-50 to -1
0 to 25
26 to 50
51 to 60

N

0 2 4 Miles

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

2025 PROJECTED GROWTH AREAS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 3-3	Project No.: 52803785	Date 10/08

3.5 Sanitary Flow Calculation

The sanitary flow is defined as the sum of "area" loads (such as residential), "point" loads (industrial), and infiltration/inflow. This section discusses the approach used to calculate each of these.

3.5.1 Existing Flows

The gallons per capita per day flow information (Section 2.4.1) and the TAZ data for the years 1998 and 2030, and the existing land use data was used to calculate the flows for each sewershed. The existing land use data was summarized into four categories: residential, commercial (including industrial), vacant, and non-developable. The non-developable category included streets, railroads, public parking, cemeteries, and parks. The TAZ data included residential and commercial population numbers for each individual TAZ. With this data, 1998 and 2030 flows (GPD) for each sewershed were calculated. The 2005 flow was determined by interpolating between the 1998 flow and proposed 2030 flow.

3.5.2 Future Flows

The projected population for each sewershed for the years 2010, 2015, and 2025 was determined based on the 1998 and 2030 TAZ information. These populations, along with Texas Administrative Code Chapter 317 gallons per capita per day (refer to Section 2.4.1), and the City's 1998 wastewater flows were used to calculate the flows (GPD) for the years 2010, 2015, and 2025.

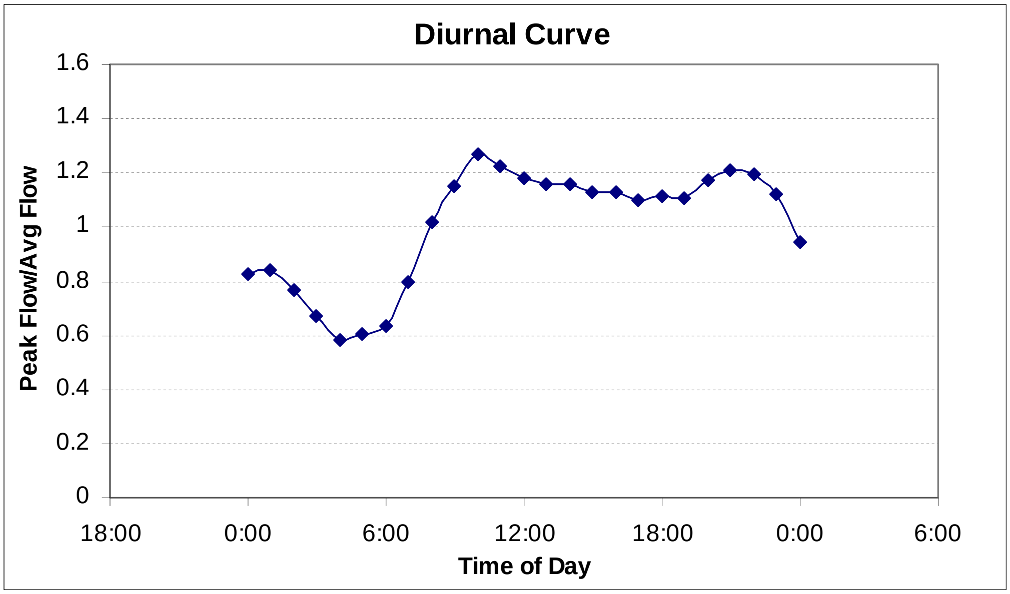
3.5.3 Diurnal Curve

The above calculation is for average daily flow; however, there are significant flow variations over a 24-hour period, and the wastewater system must be designed to convey the highest expected value (peak flow). A diurnal curve is a plot of the wastewater flow over a 24-hour period. Typically, flow is lowest between 2:00 a.m. and 5:00 a.m., and highest in the morning when people are getting ready for work and in the evening when they are preparing dinner.

To evaluate the diurnal flow for Longview, the records for the 25 flow meters were evaluated from May 19, 2006 to May 23, 2006. The meters were grouped and plotted together based on their location in the system. In general, all the meters followed the same typical pattern. The curve for Meter 8, shown in Figure 3-4, was judged to be typical of all the curves, and was selected as the representative diurnal curve to be used for all sewersheds in the model. The y-axis is the recorded hourly flow (MGD) divided by the cumulative average daily dry-weather flow for the meter basin (peak to average flow ratio).

The peak dry weather flow for Meter 8 is about 126 percent of the average dry weather flow and occurs daily at 10 a.m. and 9 p.m.

Figure 3-4. Representative Diurnal Curve for Model



3.6 Calibration

The main objective of model calibration is to adjust model parameters so the model results more closely match the measurements performed in the field. TCB used the flow monitoring from the 25 meter basins and the rainfall measurements performed from May 10, 2006 to July 10, 2006 for dry weather to calibrate the model. The peak flow computed by the model was compared to the peak dry weather flow at the 25 flow meters. A "calibration factor" was then applied to the area loads within each discrete meter basin area in order to match the metered flow. The model was run with the calibrated flows and a revised calibration factor was applied to the flows. This step was iteratively performed until the calibration of the modeled flows was within 10 percent of the metered flows. Once the model was calibrated for peak hourly dry weather flow, the average base flow was compared to the metered average dry weather flow. The comparison of metered and modeled flows is shown on Table 3.5.

During dry weather monitoring in 2006, a parallel 12-inch line to the north of meter 10 was being replaced with an 18-inch line. This sewer line improvement caused flow to be diverted through the 10-inch line; therefore, an unusually high amount of flow was recorded at meter 10. After the 18-inch line was placed in service, the parallel 10-inch line was left to serve local flows. Therefore, the unusually high amount of flow recorded by meter 10 during the dry weather monitoring period is no longer applicable for calibration purposes. As a result, meter basin 10 was not calibrated in the study.

Table 3-5. Comparison of Metered and Modeled Flows

			Average Base Flow (mgd)			Peak Base Flow (mgd)			
Meter Basin	Location	Pipe Diameter (in)	Meter	Model After Calib.	% Diff.	Meter	Model Not Calib.	Model After Calib.	Model Calib. Factor
1	Grace	54	8.15	8.53	-2%	10.45	11.30	10.69	0.95
2	Lower Grace	54	6.90	7.14	-4%	8.83	9.27	9.15	0.99

Meter Basin	Location	Pipe Diameter (in)	Average Base Flow (mgd)			Peak Base Flow (mgd)			
			Meter	Model After Calib.	% Diff.	Meter	Model Not Calib.	Model After Calib.	Model Calib. Factor
3	LeTourneau	24	0.38	0.55	-47%	0.52	1.03	0.76	0.74
4	LaFamo	12	0.18	0.17	1%	0.26	0.35	0.26	0.74
5	Grace	42	2.20	2.19	0%	2.90	3.46	2.90	0.84
6*	Guthrie	30	1.53	-	-	1.96	1.73	-	-
7	Greggton	15	0.20	0.10	50%	0.25	0.13	0.13	0.97
8*	Guthrie	30	1.33	-	-	1.63	1.24	-	-
(6/8)	Guthrie	30	1.53	1.52	0%	1.96	1.73	1.95	1.13
9	Harris	36	2.70	2.52	7%	3.27	4.00	3.05	0.76
10***	Harris	10	0.57	0.57	0%	0.79	.003	0.79	26.33
11	Harris	36	2.60	2.49	4%	3.19	4.04	3.06	0.76
12	Evergreen Hills	18	0.49	0.49	0%	0.68	0.63	0.68	1.07
13	School Branch	18	0.63	0.64	-2%	0.90	0.89	0.91	1.03
14	Grace	24	0.05	0.05	0%	0.07	0.36	0.08	0.21
15	Ray	15	0.14	0.16	-14%	0.21	0.55	0.24	0.43
16	Oak Branch	18	0.36	0.36	0%	0.49	0.47	0.49	1.04
17	Oakland	18	0.52	0.52	0%	0.67	0.61	0.67	1.10
18**	Hawkins	18	0.28	-	-	0.44	0.75	-	-
19**	Hawkins	18	0.26	-	-	0.42	0.45	-	-
(18/19)	Hawkins	18	0.28	0.30	-8%	0.44	0.75	0.48	0.63
20	Upper Eastman Lake	18	0.14	0.14	0%	0.21	0.24	0.21	0.85
21	Iron Bridge	18	0.50	0.50	0%	0.81	0.39	0.81	2.08
22	Eastman Lake	30	0.32	0.39	-23%	0.41	0.85	0.51	0.60
23	Iron Bridge	21	0.69	0.68	1%	0.93	1.07	0.92	0.86
24	Eastman Lake, LeTourneau Bottoms	36	1.86	1.84	1%	2.63	2.83	2.60	0.92
25	LeTourneau	8	0.02	-	-	0.03	-	-	-

* Meters 6 and 8 were combined into one meter basin (Meter 6) due to sewer line diversions (pipe interconnects)
** Meters 18 and 19 were combined into one meter basin due to basin 19 being just upstream of basin 18
***Meter 10 not considered in model calibration

3.7 Lift Stations

The design criteria for lift station pumping is to provide firm pumping capacity to meet 125 percent of the peak wet weather design flows. The firm pumping capacity is defined as the total available pumping capacity with the largest pump out of service. It is therefore necessary to account for the number of pumps and capacity rating of each pump within the system when evaluating an existing station.

For existing stations, all pumps available were allowed to run to best fit current operating conditions. For all future proposed stations, the largest pump was on standby and not allowed to operate.

Hayes collected field data such as the number of pumps, wet well size, wet well inflow, pump firm rated capacity, and the total firm rated capacity for each lift station in *The City of Longview Waste Water Master Plan – Lift Station Investigations, 2007* (Appendix A). From this data, pump curves were acquired from the pump manufacturers (FLYGT, Ebara, and Fairbanks Morse) and input into the model. The pump curve consists of head (feet) versus flow (GPM).

A lift station summary is presented in Table 3-6.

Table 3-6. Lift Station Summary

Lift Station Number	Lift Station Name	Service Area	No. of Pumps	Type of Pit	Firm Rated Capacity (gpm) *a	Firm Measured Capacity (gpm)*a
1	LeTourneau	LT	2	Wet	1,200	1,615
2	Highway 149	LB	2	Wet	1,720	1,601
3	Longview Heights	MA	2	Wet	950	1,439
5	Elmira Chapel	SB	2	Wet	170	128
6	Progress Road	GT	2	Wet	300	313
7	Harrison #1	GT	2	Wet	220	122
8	Harrison #2	GT	2	Wet	1,320	1,146
9	Greggton	GT	3	Wet	2,000	1,883
10	Pine Bluff	GT	2	Wet	80	61
12	Pittman Street	EL	4	Dry	12,600	*b
13	Whatley Road	LF	3	Dry	2,600	1,025

*a Firm rated capacity is based on the largest pump being out of service
*b Firm measured capacity was unavailable due to temporary pump flooding

The firm rated capacity is the maximum flow that each lift station can handle according to the data provided by the pump manufacturers, while the firm measured capacity is the amount of flow physically measured by Hayes at each site. The design criteria for lift station wet wells are to provide adequate volumes to limit pump cycling to once every 10 minutes.

Force mains are pressure pipes found just downstream of lift stations (Table 3-7). Force mains convey the lift station's flows until it reaches a point of re-entry into the gravity sewer system. Lift stations and force mains are generally located in areas where the flow needs to be pumped uphill, before it can then continue by gravity flow to the WWTP.

Table 3-7. Lift Station Pumps and Force Main Information

Lift Station	Number of Pumps	Force Main Diameter (inch)	Plan File
LeTourneau	2	12	056-2005-032
Highway 149	2	14	056-1997-015
Longview Heights	2	10, 8, & 6	056-1996-021 & 051-1972-009 & 050-1981-045
Elmira Chapel	2	6	041-1977-034
Progress Road	2	6	056-1997-016 & 056-2002-004

Lift Station	Number of Pumps	Force Main Diameter (inch)	Plan File
Harrison #1	2	6	039-1978-039 & 056-2002-004
Harrison #2	2	8	056-1996-021
Greggton	3	12	084-2003-021 & 050-1981-045
Pine Bluff	2	4	056-2002-004
Pittman Street	4	20*	050-1985-019
Whatley Road	3	10**	034-1986-009 & 051-1981-145

* Eastman Lake Force Main
** LaFamo Force Main

3.8 Diversions

A diversion is a structure which has more than one pipe exiting the structure. Twenty diversion structures were modeled in the City's system (Exhibit 4). Diversions can be used to model relief sewers for handling peak flow events, overflows, and multi-barrel connections between nodes. SewerGEMS is able to simulate several forms of hydraulically based diversions such as simple flow splits between pipes that are controlled by the hydraulics of the system, passively controlled diversions that are based on the fixed definitions of weirs, orifices or other structures, and actively controlled diversions that are managed through logical controls.

Meter Basin 8 contains simple flow split diversions with Meter Basin 6, which makes it difficult to determine the exact basin area served by Meter Basins 6 and 8. Since the basin boundaries were unclear in this area, Meter Basins 6 and 8 were combined to create one large meter basin that was ultimately metered at the Meter 6 location.

Section 4– Modeling Results and Evaluation

4.1 General

This section discusses the existing and future wastewater requirements for the City. Performance of existing facilities under current conditions is discussed for each of the 18 individual service areas. Future requirements are projected based on population increases determined from TAZ data as previously discussed in section 3.5.2. Proposed project alignments are conceptual and generally follow the alignment of the existing facilities.

Gravity lines 10-inches in diameter and larger were evaluated as were lift stations and force mains associated with those gravity lines. Refer to Exhibit 5 for each of the following service areas.

4.2 Eastman Lake (EL)

Eastman Lake is a large service area of approximately 5,498 acres located in the southeast portion of the City, directly west of the Mason Creek service area. The area is predominately vacant with small amounts of residential, commercial, and industrial development scattered throughout, and a large industrial development in the southern portion of the service area. The sewer lines in this sewershed range up to 36 inches in diameter.

The area is served by a gravity system that picks up flow from the Longview Heights Lift Station and flows to the Pittman Street Lift Station. The Pittman Street Lift Station discharges into the LeTourneau Bottoms gravity system via a 20-inch force main. The 20-inch force main extends from Pittman Street to MLK Boulevard where the force main outfalls into a 20-inch siphon that connects just upstream of where the Iron Bridge gravity system outfalls into the LeTourneau Bottoms system.

The Pittman Street Lift Station is a four-pump station with a manufacturer's firm rated capacity of 12,600 gpm. Hayes was not able to measure Pittman's firm rated capacity due to temporary pump flooding at the time of their tests. The Pittman Street Lift Station and force main are adequate for existing and future conditions

Under existing conditions the peak wet weather flow into the Pittman Street Lift Station, which is from the Eastman Lake gravity system, is 1.77 MGD with the influent 36-inch line having a capacity of 17.85 MGD. The Eastman Lake service basin is expected to have a moderate population growth in its northern portion and a small population growth in its southern portion through the year 2025 (Figure 3-3). This population growth results in a 1.83 MGD peak wet weather flow for this gravity system. It was found that for both existing and future conditions, the gravity system is adequate.

4.3 Evergreen Hills Creek (EV)

Evergreen Hills Creek is a small service area of approximately 1,196 acres located in the northwest portion of the City, south of School Branch. The area is predominately residential and commercial land use with a small amount of industrial development. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that flows into the Grace Creek gravity system. Under existing conditions, the peak wet weather flow for this system is 2.13 MGD with the 18-inch line having a capacity of 3.03 MGD. By the year 2025, Evergreen Hills Creek is expected to experience a moderate population growth, with some areas experiencing a significant population growth. This population increase results in a 2.35 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

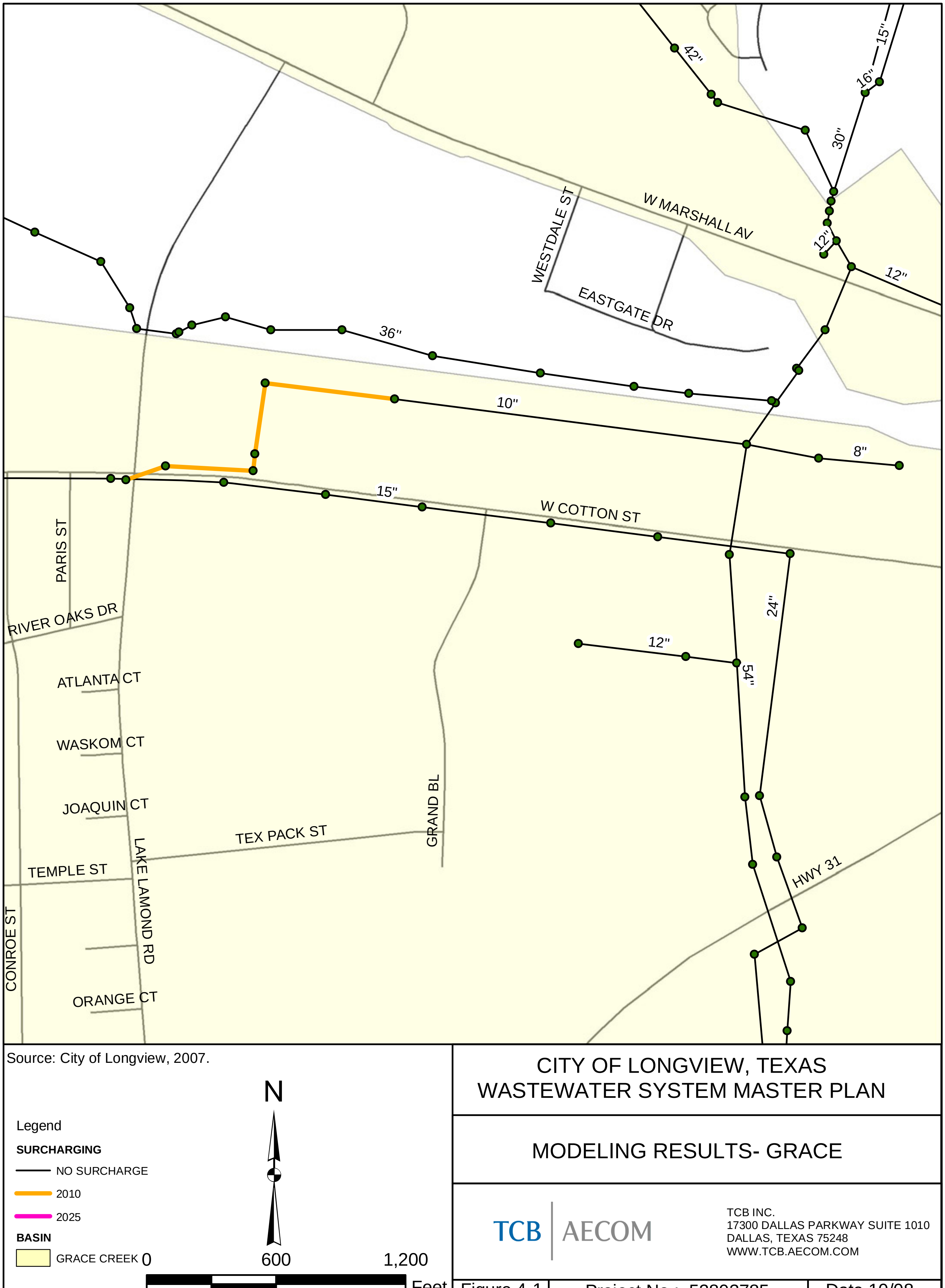
4.4 Grace Creek (GR)

Grace Creek is a large service area of approximately 6,171 acres that runs from the northern limits of the study area through the center of the City down to the WWTP. The northern portion is predominately vacant with residential development in the middle portion and a combination of residential, commercial, and industrial land use scattered throughout the southern portion. The sewer lines in this sewershed range up to 54 inches in diameter.

Grace Creek is the main gravity system of the City. The northern section of the system collects flow from the Ray Creek, Oak Branch Creek, and School Branch gravity systems. The middle portion of the system collects flow from the Evergreen Hills Creek, Guthrie Creek, and Harris Creek gravity systems. The southern section of the system collects flow from the Wade and LeTourneau gravity systems and meets the LeTourneau Bottoms gravity system at the influent junction box for the WWTP.

Under existing conditions, the peak wet weather flow at the WWTP from the Grace Creek system is 28.10 MGD with the 54-inch line having a capacity of 47.66 MGD. Through the year 2025, Grace Creek is expected to have a significant population growth in its northern region, a moderate population growth in its central region and a minimal population growth in its southern region (Figure 3-3). This population change results in a 34.28 MGD peak wet weather flow at the WWTP from the Grace Creek system.

For existing conditions, the 10-inch line beginning at the intersection of Cotton Street and Lake Lamond Road extending to its confluence with the 54-inch Grace Creek, as shown in Figure 4-1, is surcharging due to the lines being undersized for the current populations in the area. Under existing conditions, the peak wet weather flow through these lines is 2.22 MGD with the 10-inch line having a capacity of 1.95 MGD. It is recommended that the approximately 3,250 feet of 10-inch gravity sewer system be upsized to 10-inch PVC and 15-inch PVC lines. Project GR-1 is shown in greater detail in Figure 4-2.



Source: City of Longview, 2007.

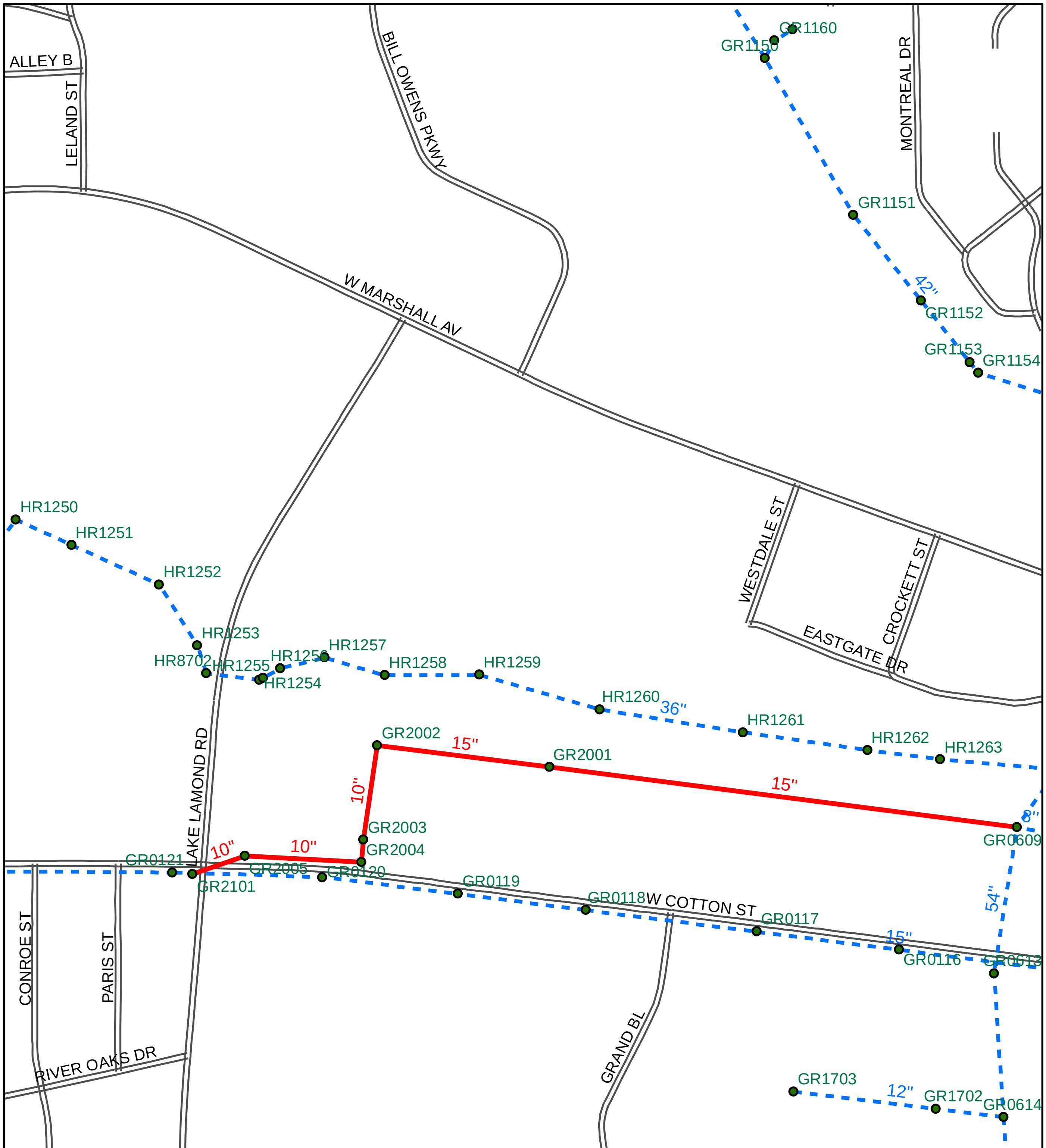
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS- GRACE

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-1	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend

- Existing Line
- Proposed Line
- Manhole

N

0 500 1,000 Feet

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT GR-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-2	Project No.: 52803785	Date 10/08

4.5 Greggton Creek (GT)

Greggton Creek is an average-sized service area of approximately 2,063 acres located on the west side of the City, south of the LaFamo service area. The area is well-mixed with commercial, industrial, and residential development with a fair amount of vacant areas. The sewer lines in this sewershed range up to 18 inches in diameter.

Greggton Creek is served by several small gravity systems connected by lift stations. Flow starts at three separate gravity systems, one in the northwest, one in the southwest, and one in the southeast. These systems flow south to Progress Road Lift Station, east to the Harrison #1 Lift Station, and south to the Greggton Lift Station, respectively. The Progress Road Lift Station and the Harrison #1 Lift Station discharge into a small gravity system. The Progress Road Lift Station discharges in the upper reaches of this system via a 6-inch force main, while the Harrison #1 Lift Station discharges towards the lower reaches of this system via a 6-inch force main.

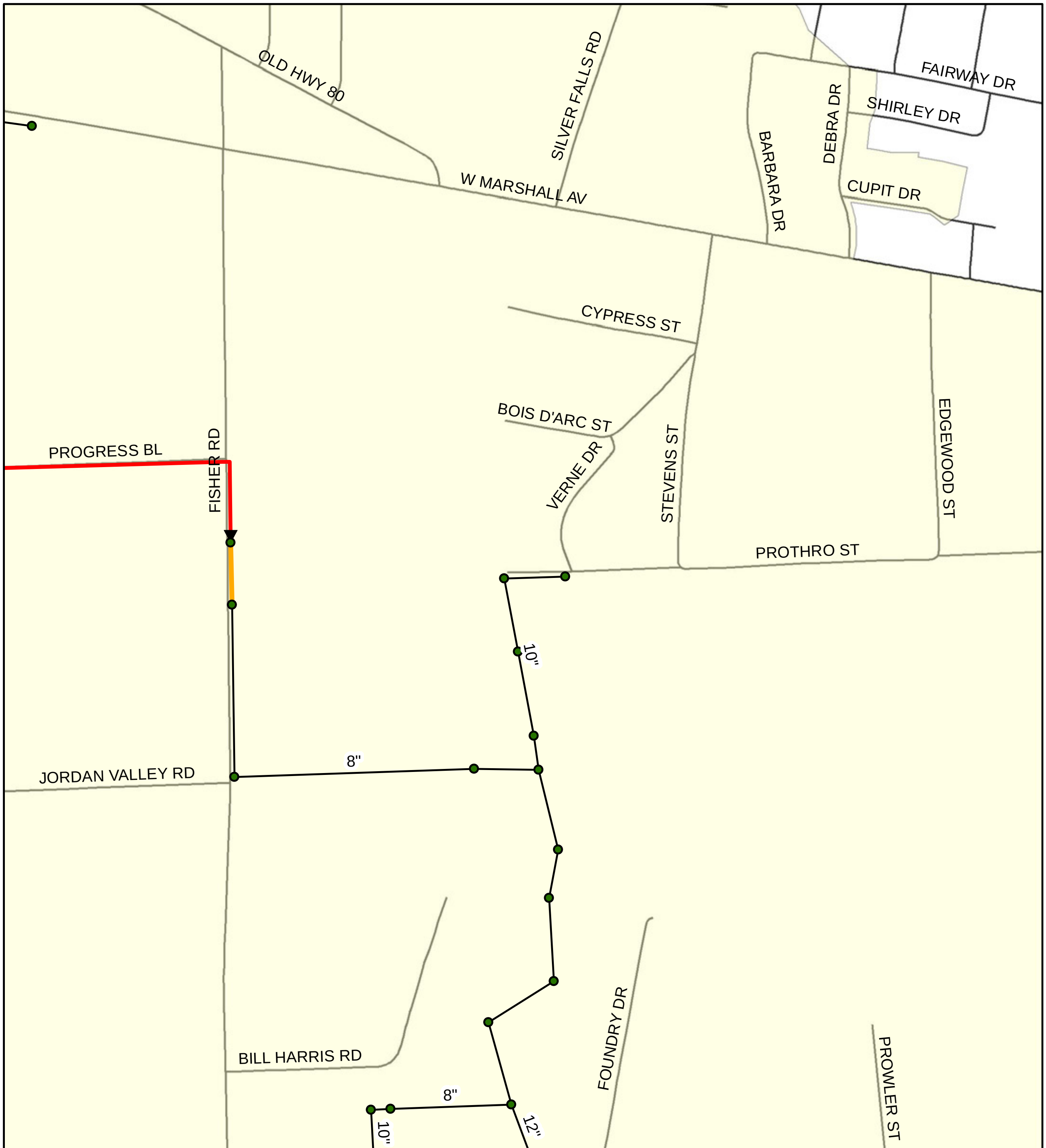
Flow from this small gravity system flows south and east into the Harrison #2 Lift Station, which pumps to the main Greggton Creek gravity system through two parallel 6-inch and 8-inch force mains. This main system flows further south and east into the Greggton Lift Station through a 10-inch siphon line and is pumped, via a 12-inch force main, into an 18-inch gravity line that outfalls into the Harris Creek gravity system.

There are two sets of siphon lines and both sets merge and flow into the Greggton Lift Station. One set is comprised of two parallel siphon lines (6-inch and 8-inch diameter) and the second set contains three parallel lines (two 8-inch and one 10-inch diameter line). The peak inflow, under existing conditions, into the Greggton Lift Station is 1.12 MGD.

The Progress Road Lift Station is a two-pump station with a manufacturer's firm rated capacity of 300 gpm. Hayes performed a field measurement and found the firm rated capacity to be 313 gpm. Harrison #1 and Harrison #2 Lift Stations are both two-pump stations with a manufacturer's firm rated capacities of 220 gpm and 1,320 gpm respectively. Hayes found the firm rated capacities to be 122 gpm and 1,146 gpm for Harrison #1 and Harrison #2. The Greggton Lift Station is a three-pump station with a manufacturer's firm rated capacity of 2,000 gpm and a Hayes field measured firm rated capacity of 1,883 gpm (Table 3-6). All lift stations and force mains were found to be adequate for existing and future conditions

Under existing conditions, the peak wet weather flow for this system is 1.12 MGD with the 24-inch line having a capacity of 19.22 MGD. The Greggton Creek service area is expected to experience only small growth throughout, except for in the southern area, west of Swinging Bridge Road, where significant growth is expected through 2025 (Figure 3-3). This population growth results in a 1.13 MGD peak wet weather flow for the system by year 2025.

For existing conditions, the 8-inch line beginning immediately downstream of the Progress Road Lift Station running south along Fisher Road then turning to the east and extending until it meets the existing 10-inch line that runs south to the Harrison #2 Lift Station, as shown in Figure 4-3, is surcharging due to the lines being undersized for the existing flow in the area. Under existing conditions, the peak wet weather flow through these lines is 0.42 MGD with the 8-inch line having a capacity of 0.19 MGD. It is recommended that the approximately 2,250 feet of 8-inch gravity sewer system be upsized to a 10-inch PVC line. Project GT-1 is shown in greater detail in Figure 4-4.



Source: City of Longview, 2007.

Legend

SURCHARGING

NO SURCHARGE

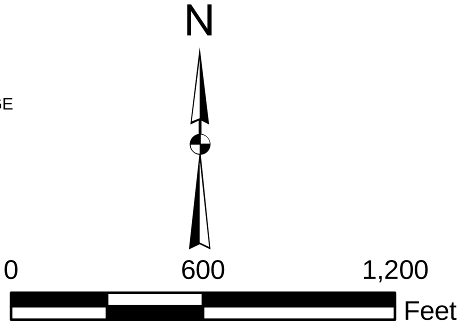
2010

2025

Force Main

BASIN

GREGGTON



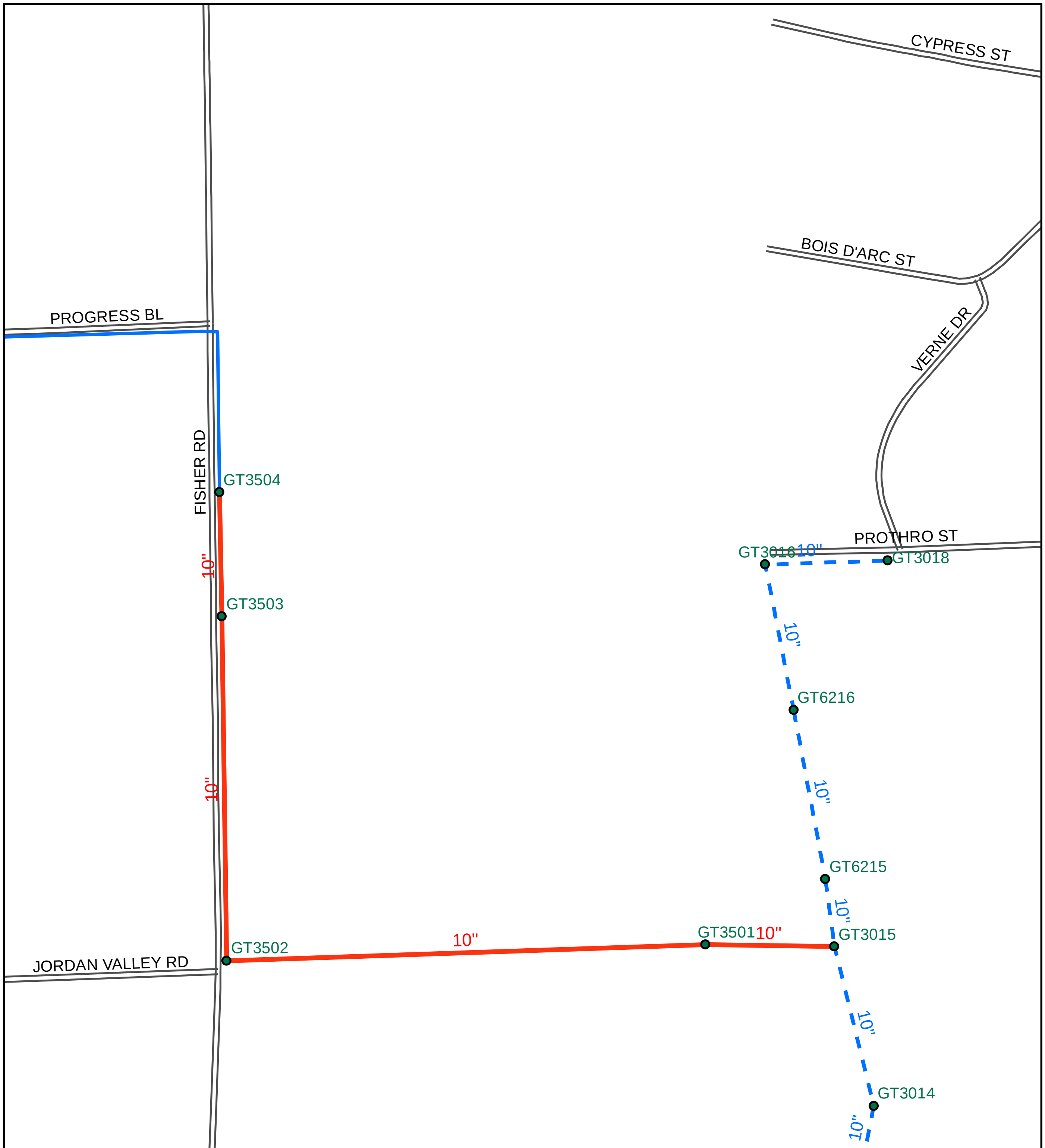
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS- GREGGTON

TCB | AECOM

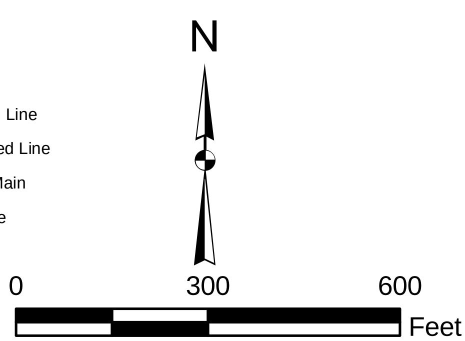
TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-3	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend
- Existing Line
- Proposed Line
- Force Main
- Manhole



CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT GT-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-4	Project No.: 52803785	Date 10/08

4.6 Guthrie Creek (GU)

Guthrie Creek is an average-sized service area of approximately 1,896 acres located in the northeast portion of the City, south of the Oakland Creek and Johnston Creek service areas. The area is predominately residential with a small amount of commercial development. The sewer lines in this sewershed range up to 30 inches in diameter.

The area is served by a gravity system that collects flow from the Johnston Creek and Oakland Creek gravity systems and flows into the Grace Creek gravity system. Under existing conditions, the peak wet weather flow for this system is 6.65 MGD with the 30-inch line having a capacity of 13.5 MGD. Guthrie Creek is expected to experience moderate population growth, with some areas of significant growth in the north through 2025 (Figure 3-3). This population growth results in a 7.15 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

4.7 Harris Creek (HR)

Harris Creek is an average-sized area of approximately 2,608 acres located in the western portion of the City, east of the LaFamo service area. The area is mostly residential with small areas of vacant, commercial, and industrial development. The sewer lines in this sewershed range up to 36 inches in diameter.

The area is served by a gravity system that picks up flow from the LaFamo system and the Greggton Lift Station. The system flows into the Grace Creek system by gravity.

Under existing conditions, the peak wet weather flow for this system is 5.28 MGD with the 36-inch line having a capacity of 34.20 MGD. The Harris Creek service basin is expected to have a slight population growth, with scattered areas of significant growth through the year 2025 (Figure 3-3). This population growth results in a 6.57 MGD peak wet weather flow for the system for the year 2025. It was found that for both existing and future conditions, the gravity system is adequate.

4.8 Hawkins Creek (HK)

Hawkins Creek is a large service area of approximately 4,008 acres located in the northwest corner of the City. The area is mostly vacant with a small amount of residential, commercial and industrial development scattered throughout. The sewer lines in this sewershed range up to 24 inches in diameter.

The area is served by a gravity system that flows into the Whatley Road Lift Station, which is located in the LaFamo service area. The capacity of this lift station will be discussed later under the LaFamo section of this report.

Under existing conditions, the peak wet weather flow for this system is 1.19 MGD with the 18-inch line having a capacity of 2.86 MGD. Significant population growth is expected through the year 2025 (Figure 3-3). This population growth results in a 1.39 MGD peak wet weather flow for this gravity system. It was found that for both existing and future conditions, the gravity system is adequate.

4.9 Iron Bridge Creek (IB)

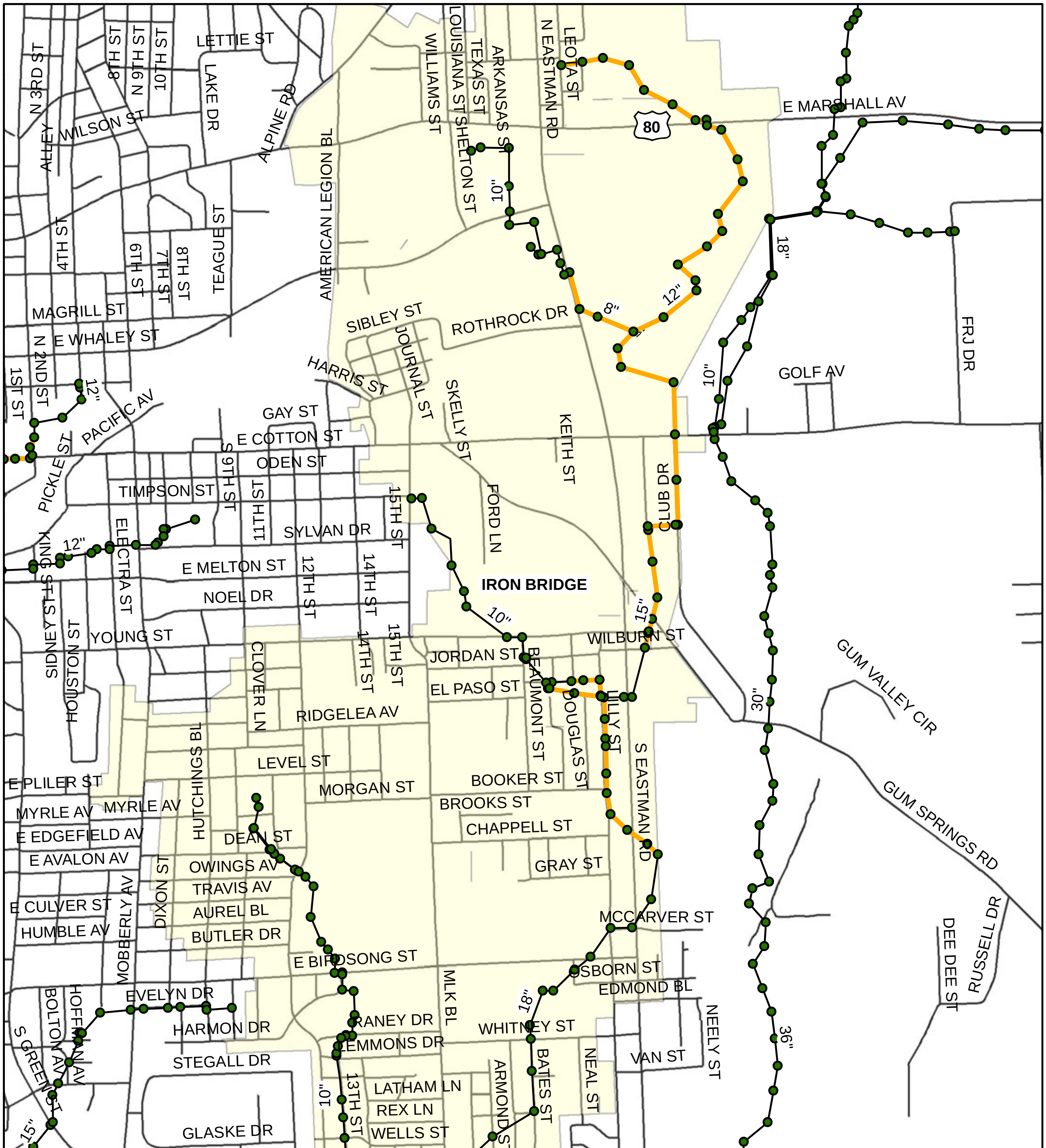
Iron Bridge Creek is an average-sized service area of approximately 2,823 acres located in the southeast portion of the City, just west of the Eastman Lake service area. The area has a fair amount of residential and commercial development with small areas of industrial and vacant land use. The sewer lines in this sewershed range up to 21 inches in diameter.

The area is served by a gravity system that flows into the LeTourneau Bottoms gravity system. Under existing conditions the peak wet weather flow for this system is 2.93 MGD with the 21-inch line having a capacity of 8.29 MGD. Iron Bridge Creek is expected to experience only a small population growth through the year 2025 (Figure 3-3). This population growth results in a 3.28 MGD peak wet weather flow for this gravity system.

For existing conditions, the 12-inch line beginning at Cotton Street and extending north to its confluence with the existing 8- and 12-inch lines, as shown in Figure 4-5, is surcharging due to the lines being undersized for the current population in the area. Under existing conditions, the peak wet weather flow through these lines is 1.32 MGD with the 12-inch line having a capacity of 1.03 MGD. It is recommended that the approximately 2,100 feet of 12-inch gravity sewer system be upsized to a 15-inch PVC line. Project IB-1 is shown in greater detail in Figure 4-6.

For existing conditions, the 12-inch line beginning at Leota Street and running south until it meets the confluence of the aforementioned IB-1 project (Figure 4-5) is surcharging due to the lines being undersized for the current population in the area. Under existing conditions, the peak wet weather flow through these lines is 1.05 MGD with the 12-inch line having a capacity of 0.93 MGD. It is recommended that the approximately 6,550 feet of 12-inch gravity sewer system be upsized to a 15-inch PVC line. Project IB-2 is shown in greater detail in Figure 4-7.

For existing conditions, the 8-inch line beginning at Eastman Road and running south until its confluence with the aforementioned IB-1 project (Figure 4-5) is surcharging due to the lines being undersized for the current population in the area. Under existing conditions, the peak wet weather flow through these lines is 0.69 MGD with the 8-inch line having a capacity of 0.09 MGD. It is recommended that the approximately 1,600 feet of 8-inch gravity sewer system be upsized to a 10-inch PVC line. Project IB-3 is shown in greater detail in Figure 4-8.



Source: City of Longview, 2007.

Legend

SURCHARGING

NO SURCHARGE

2010

2025

BASIN

IRON BRIDGE

N

0 2,000 4,000 Feet

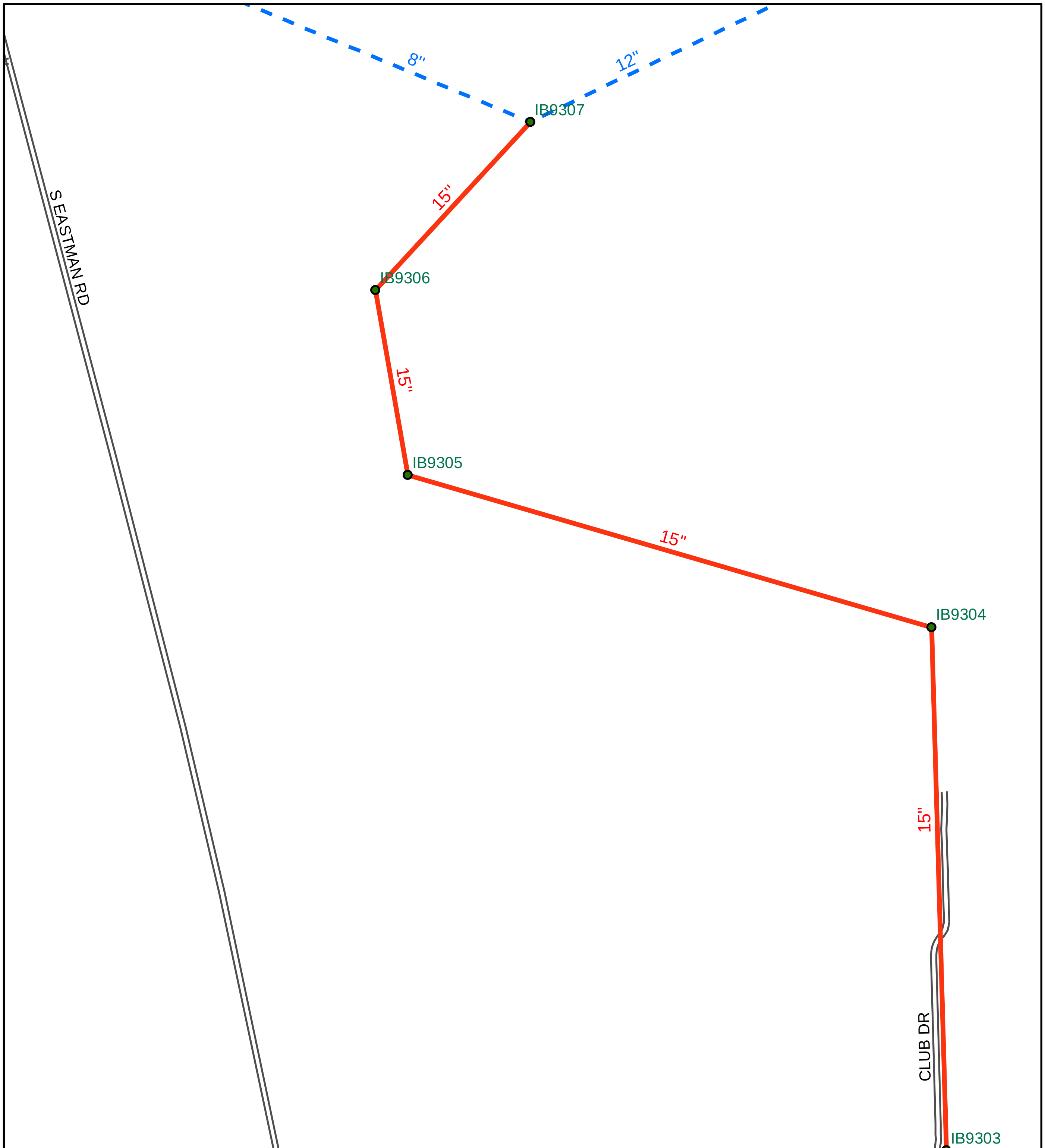
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS- IRON BRIDGE

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-5	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend

- Existing Line; 150
- Proposed Line
- Manhole

0 200 400 Feet

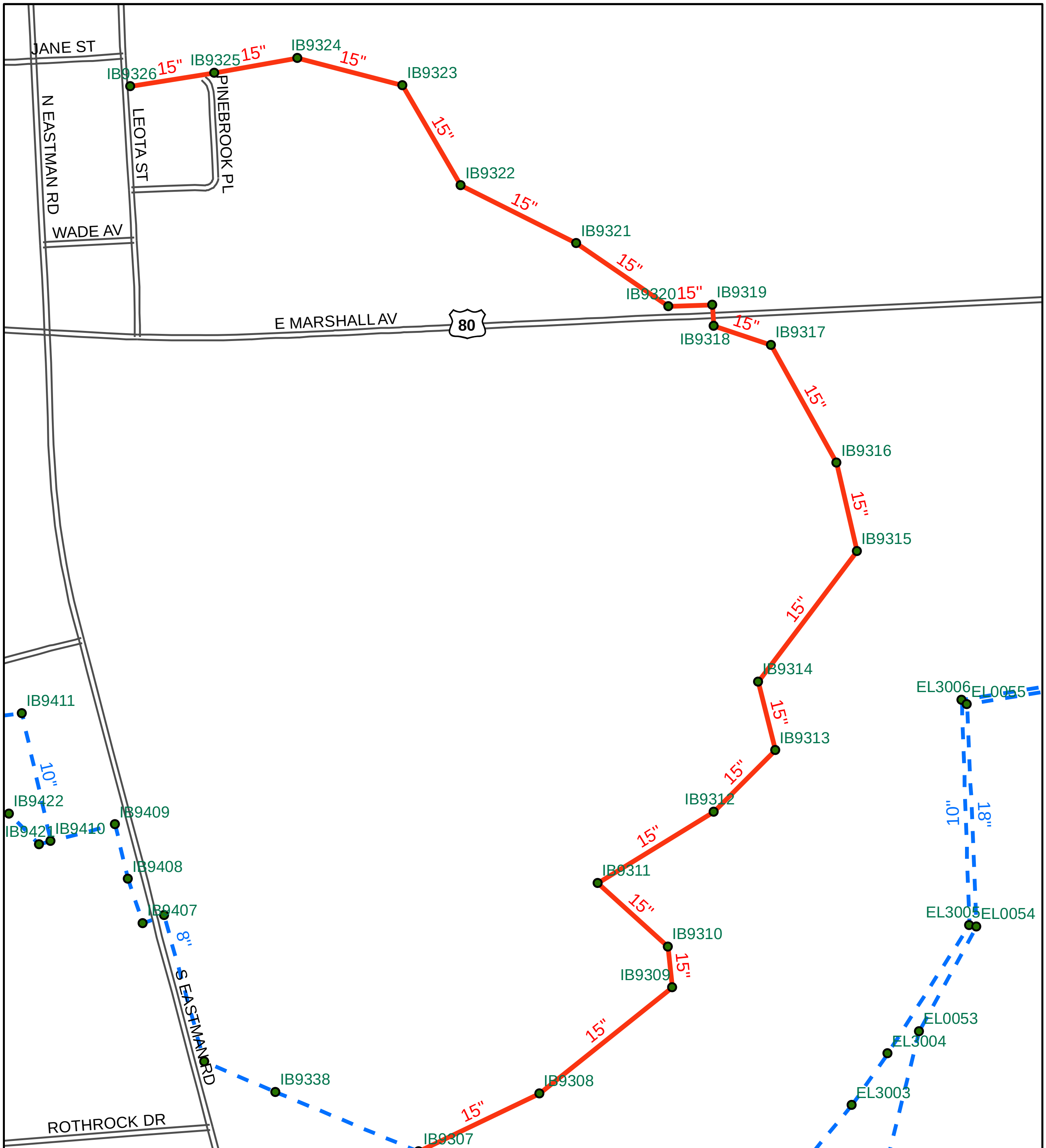
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT IB-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-6	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend
- Existing Line
- Proposed Line
- Manhole

N

0 500 1,000 Feet

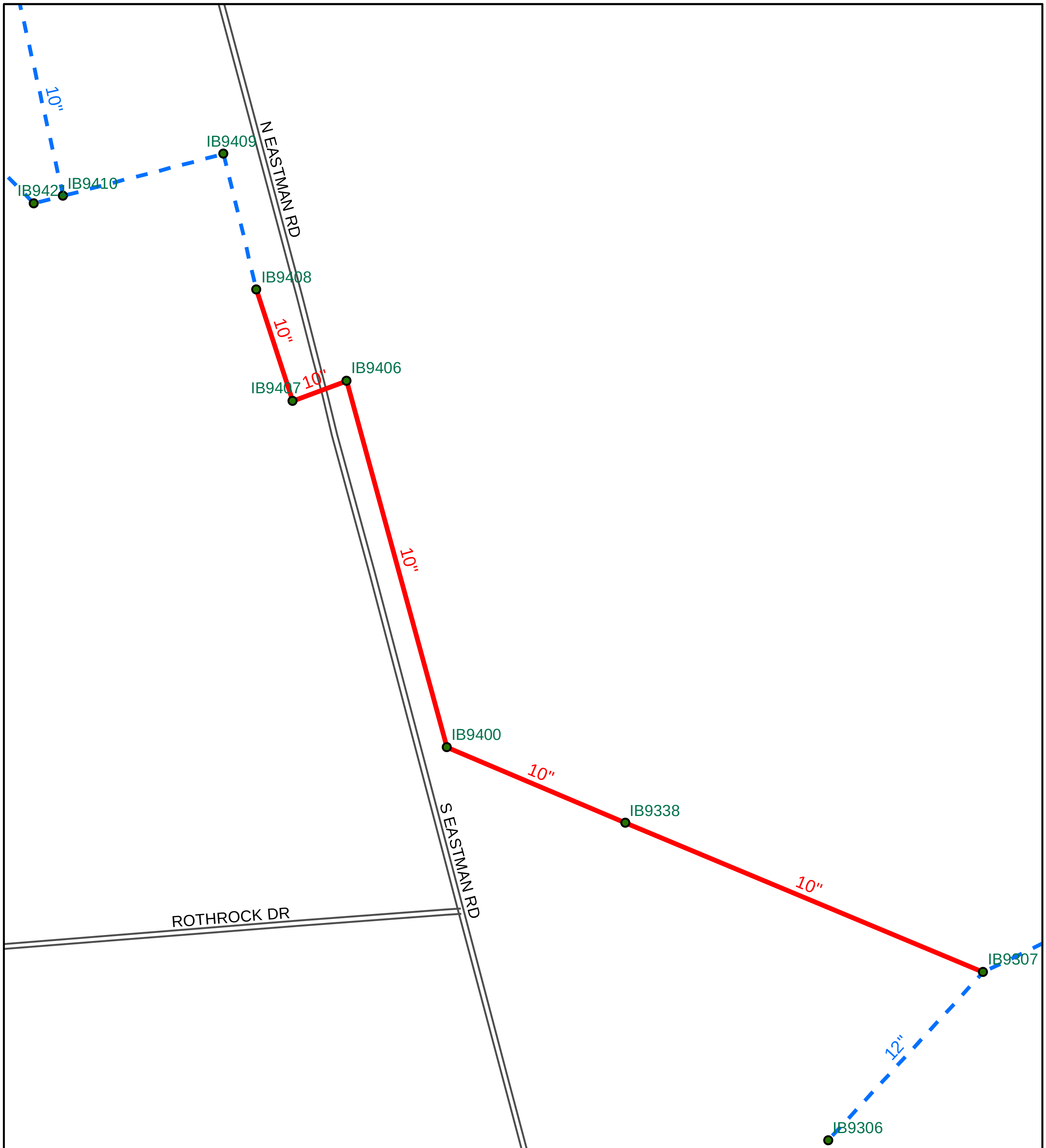
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT IB-2

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-7	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

N

Legend

- Existing Line
- Proposed Line
- Manhole

0 200 400 Feet

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT IB-3

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-8	Project No.: 52803785	Date 10/08

4.10 Johnston Creek (JN)

Johnston Creek is a small service area of approximately 608 acres located in the northeast portion of the City, directly west of the Oakland Creek service area. The area is predominately residential with a fair amount of commercial development. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that drains into the Guthrie Creek system. Under existing conditions, the peak wet weather flow for this system is 1.37 MGD with the 18-inch line having a capacity of 1.96 MGD. Johnston Creek is expected to experience a moderate population growth through the year 2025 (Figure 3-3). This population growth results in a 1.54 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

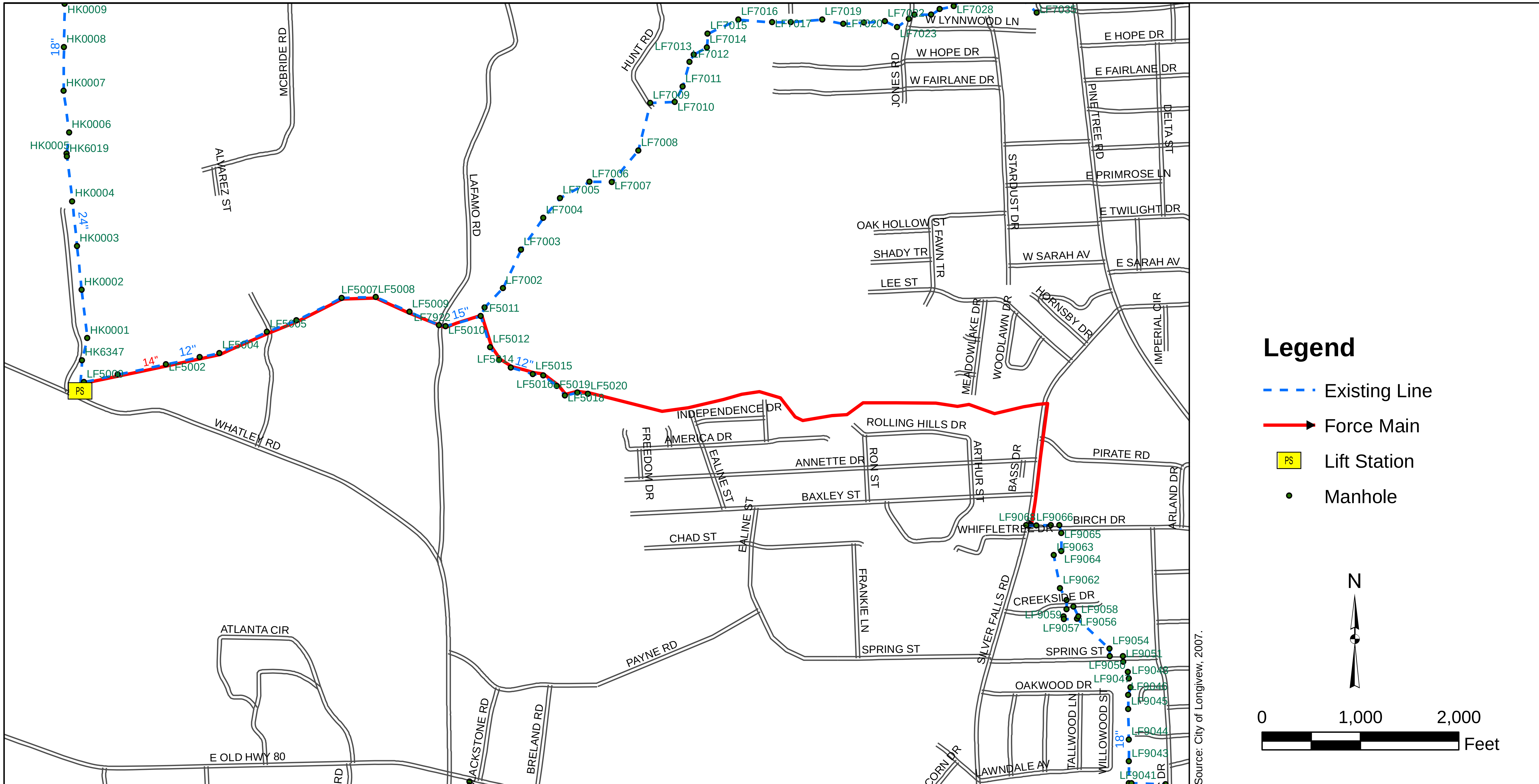
4.11 LaFamo (LF)

LaFamo is a small service area of approximately 1,762 acres located on the west side of the City, south of the Hawkins Creek service area. The area is mostly residential with a fair amount of vacant area in the western region and spots of industrial development in the eastern and southern regions. The sewer lines in this sewershed range up to 18 inches in diameter.

Under existing conditions, the peak wet weather flow for this system is 2.52 MGD with the 18-inch line having a capacity of 4.40 MGD. The north-western portion of the LaFamo service basin is expected to have significant population growth through the year 2025, while the rest of the service basin will experience only a slight population growth (Figure 3-3). This population growth results in a 3.39 MGD peak wet weather flow for the system for the year 2025.

The upper region of LaFamo is served by a gravity system that combines into the Hawkins Creek gravity system at the Whatley Road Lift Station. The Whatley Road Lift Station pumps into the lower region of the LaFamo service area through a 10-inch force main to a gravity system that flows into the Harris Creek system. The peak wet weather inflow under existing conditions into the lift station is 1.98 MGD.

The Whatley Road Lift Station is a three-pump station with a manufacturer's firm rated capacity of 2,600 gpm. Hayes performed field measurements and found the firm rated capacity to be 1,025 gpm (Table 3-6). Based on modeling results, the LaFamo force main was found to be inadequate for both existing and future conditions. The 10-inch force main is undersized resulting in the pumps not being able to deliver the required head needed to pump the desired flow through the force main. It is recommended that the approximately 12,000 feet of 10-inch PVC force main be upsized to a 14-inch PVC force main. Project LF-1 is shown in greater detail in Figure 4-9.



CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT LF-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
T 972.735.3000

Figure 4-9	Project No.: 52803785	Date 10/08

4.12 LeTourneau Bottoms (LB)

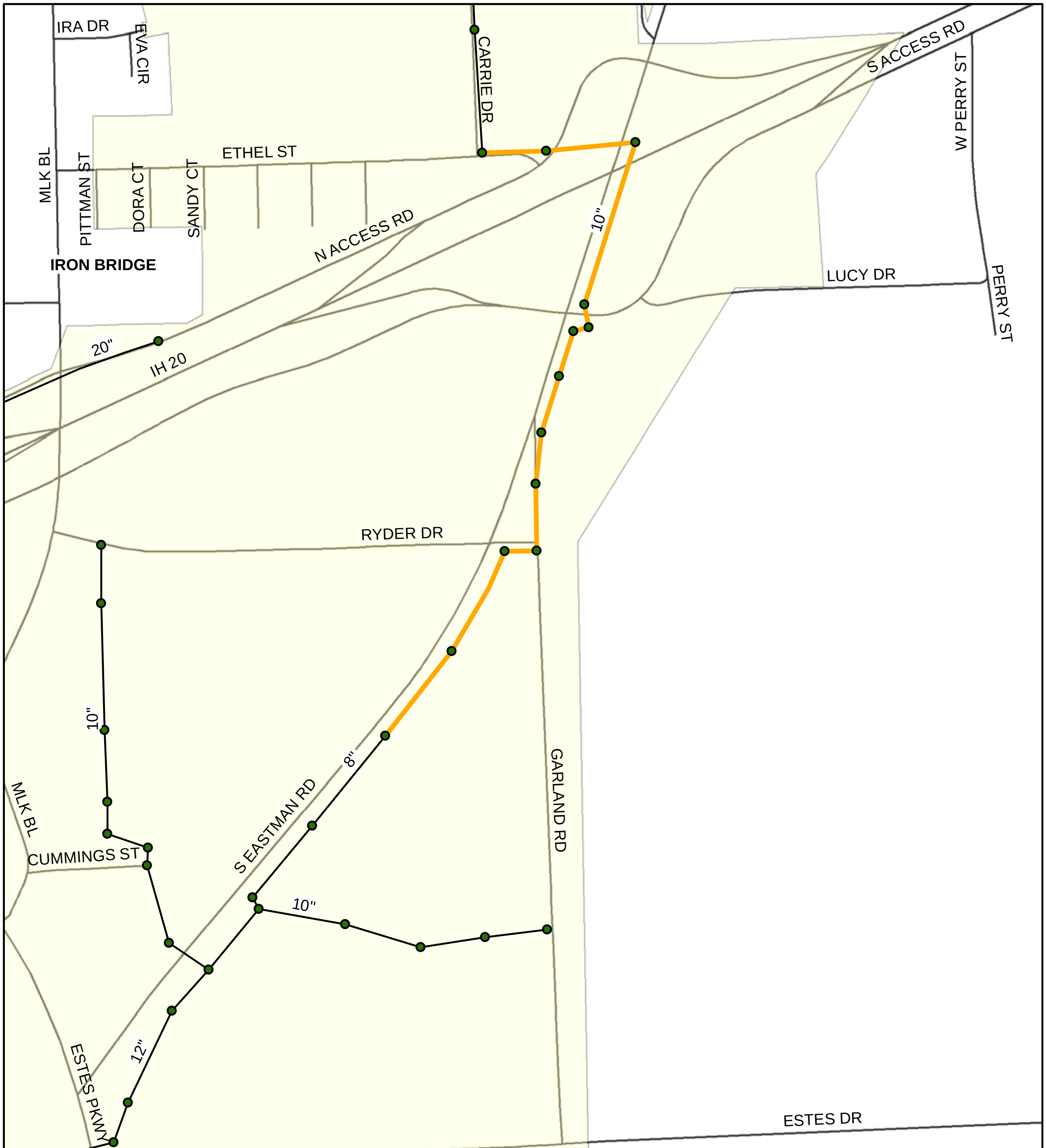
LeTourneau Bottoms is an average-sized service area of approximately 2,417 acres located in the southern portion of the City. The area is primarily vacant with two large industrial developments and a small amount of commercial and residential development. The sewer lines in this sewershed range up to 36 inches in diameter.

LeTourneau Bottoms starts with a small gravity system that flows into the Highway 149 Lift Station. This lift station discharges via a 14-inch force main into a gravity system that collects flow from the Pittman Street Lift Station and the Iron Bridge Creek gravity system. The gravity system then flows to the WWTP from the southeast.

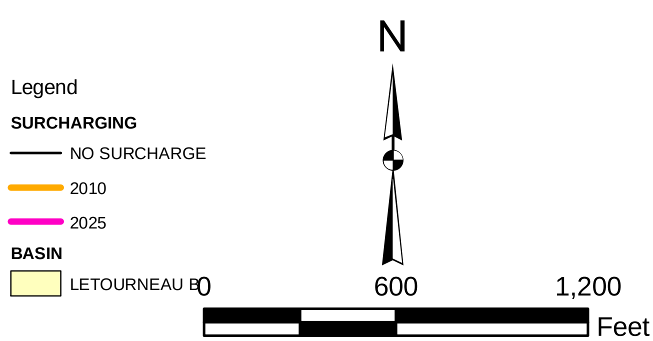
The Highway 149 Lift Station is a two-pump lift station and has a manufacturer's firm rated capacity of 1,720 gpm. Hayes measured its firm rated capacity at 1,601 gpm (Table 3-6). Under existing conditions the peak wet weather flow into the Highway 149 Lift Station is 0.68 MGD. The Highway 149 Lift Station and force main are adequate for both existing and future conditions.

Under existing conditions the peak wet weather flow from this system into the WWTP is 6.32 MGD with the 36-inch line having a capacity of 44.97 MGD. LeTourneau Bottoms is expected to experience moderate to significant population growth through the year 2025 (Figure 3-3). This population increase results in a 7.93 MGD peak wet weather flow from this system into the WWTP.

For existing conditions, the 8- and 10-inch lines beginning south of the Interstate Highway 20 south access road and extending south along Eastman Road, as shown in Figure 4-10, are surcharging due to the lines being undersized for the current population in the area. Under existing conditions, the peak wet weather flow through these lines is 0.49 MGD with the 8-inch line having a capacity of 0.38 MGD. It is recommended that the approximately 1,800 feet of 8- and 10-inch gravity sewer system be upsized to a 12-inch PVC line. Project LB-1 is shown in greater detail in Figure 4-11.



Source: City of Longview, 2007.



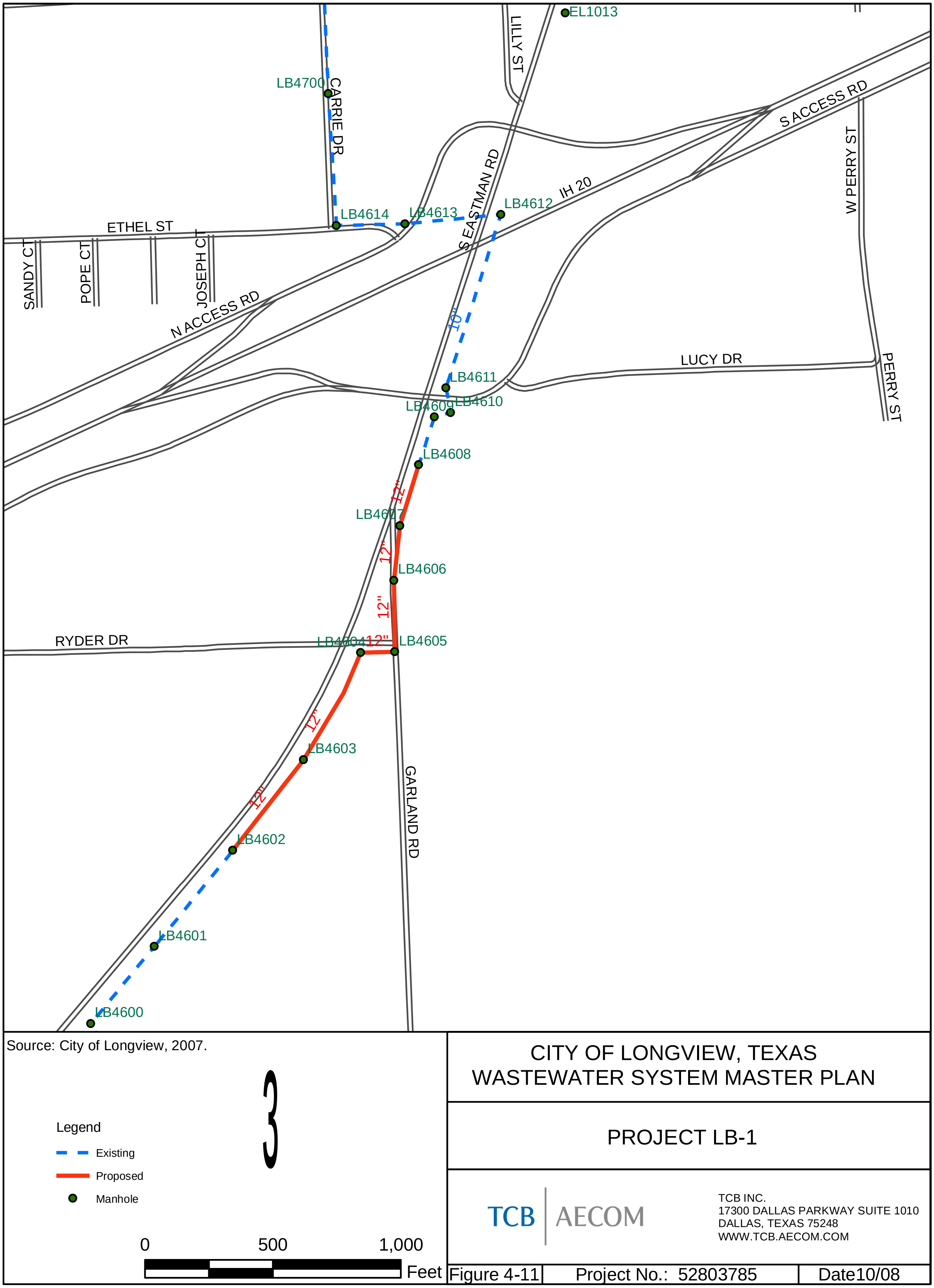
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS
LE TOURNEAU BOTTOMS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-10	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

3

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT LB-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-11	Project No.: 52803785	Date10/08

4.13 LeTourneau (LT)

LeTourneau is a small service area of approximately 1,060 acres located in the eastern portion of the City, west of the Iron Bridge Creek service area and south of the Wade Creek service area. The area is predominately residential with small amounts of commercial development. The sewer lines in this sewershed range up to 24 inches in diameter.

The area is served by a small gravity system that flows into the LeTourneau Lift Station. This lift station discharges via a 10-inch force main into a gravity system that collects flow from the Wade Creek system. The system then flows by gravity to the Grace Creek gravity system.

The LeTourneau Lift Station is a two-pump station with a manufacturer's firm rated capacity of 1,200 gpm. Hayes measured its firm rated capacity at 1,615 gpm. Under existing conditions, the peak wet weather flow coming into the LeTourneau Lift Station is 0.15 MGD. The LeTourneau Lift Station and force main are adequate for both existing and future conditions.

Under existing conditions, the peak wet weather flow for this system is 0.76 MGD with the 24-inch line having a capacity of 15.84 MGD. LeTourneau is expected to experience a minimal population growth through the year 2025 (Figure 3-3). This population growth results in a 0.82 MGD peak wet weather flow for this system. This minimal growth can be attributed to the service area's location in the center of the city in an area that has already experienced a complete build-out. It was found that for both existing and future conditions, the gravity system is adequate.

4.14 Mason Creek (MA)

Mason Creek is an average-sized service area of approximately 1,815 acres located on the east side of the City. The area is predominately vacant with a small amount of residential, commercial, and industrial development scattered throughout. There is also a large industrial center in the central portion of this service area. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that flows into the Longview Heights Lift Station, which discharges into the Eastman Lake gravity system via a 10-inch force main. The Longview Heights Lift Station is a two-pump lift station with a manufacturer's firm rated capacity of 950 gpm. Hayes performed a field measurement at found the firm rated capacity to be 1,439 gpm (Table 3-6). The Longview Heights Lift Station and force main are adequate for existing and future conditions.

Under existing conditions the peak wet weather flow into the Longview Heights Lift Station and for the Mason Creek system totals 0.11 MGD with the 18-inch line having a capacity of 8.07 MGD. On the whole, the Mason Creek service basin is expected to have a population decrease, as per the TAZ data, through the year 2025 (Figure 3-3). This population decrease results in a 0.10 MGD peak wet weather flow for the gravity system. It was found that for both existing and future conditions, the gravity system is adequate.

4.15 Oak Branch (OB)

Oak Branch is an average-sized service area of approximately 3,285 acres located on the north side of the City, northwest of the Oakland Creek service area. The area is predominately vacant with a sporadic mix of residential development and commercial land use in the southern portions along Loop 281. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that flows into the upper reaches of the Grace Creek system. Under existing conditions, the peak wet weather flow for this system is 1.56 MGD with the 18-inch line having a capacity of 7.09 MGD. Oak Branch is expected to experience a moderate population growth through the year 2025 (Figure 3-3). This population increase results in a 1.78 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

4.16 Oakland Creek (OA)

Oakland Creek is an average-sized service area of approximately 2,143 acres located in the northeast portion of the City, northwest of the Eastman Lake service area. The area is predominately vacant with residential development in the upper and lower portion and commercial development near Loop 281. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that flows into the Guthrie Creek gravity system. Under existing conditions the peak wet weather flow for this system is 2.01 MGD with the 18-inch line having a capacity of 2.87 MGD. Oakland Creek is expected to experience moderate to significant population growth through the year 2025 (Figure 3-3). This population growth results in a 2.25 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

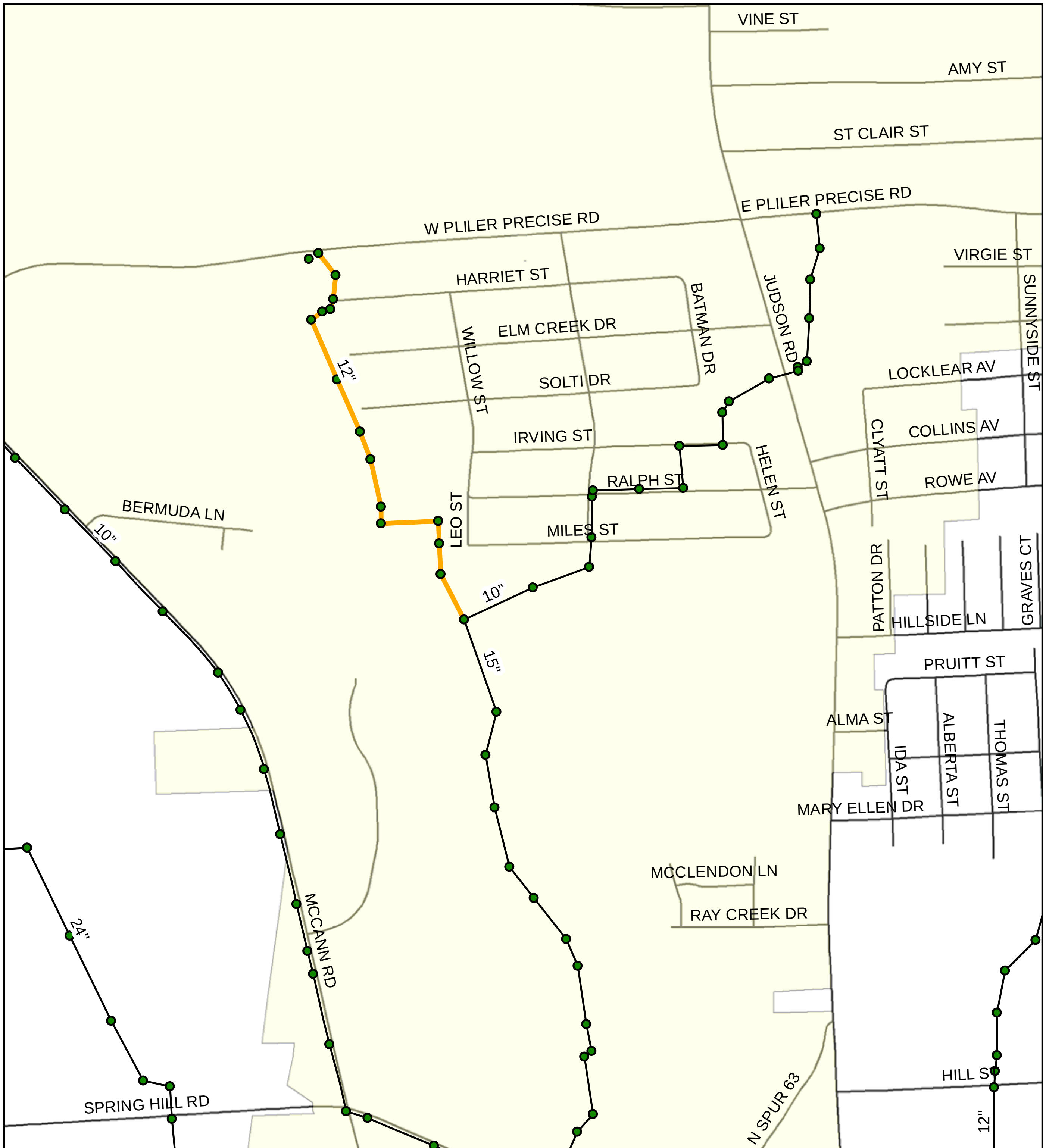
4.17 Ray Creek (RA)

Ray Creek is an average-sized service area of approximately 3,368 acres located on the north side of the City, west of the Oak Branch service area. The area is predominately vacant with a condensed area of residential development in the mid-western portion and minimal commercial and industrial development scattered throughout. The sewer lines in this sewershed range up to 15 inches in diameter.

The area is served by a gravity system that flows into the upper reaches of the Grace Creek system. Under existing conditions, the peak wet weather flow for this system is 0.29 MGD with the 15-inch line having a capacity of 1.74 MGD. Ray Creek is expected to experience a moderate population growth in the northern portions and a significant population growth in the southern portions through the year 2025. This population increases results in a 0.32 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

There is a large undeveloped area (approximately 700 acres) in the northern reaches of the Ray Creek service basin. Based on zoning for this area, it is most likely that it will be developed as 1/3rd acre single family residential lots. A 700-acre tract developed in this manner would produce a sanitary load of approximately 0.5 MGD. The existing 12-inch line beginning at Pliler Precise Road was found to be sufficiently sized to serve the future residential development in the area. Based on preliminary discussions with the City, it was determined that a business development park has been proposed for the 700-acre tract of undeveloped land. At the City's request TCB evaluated the effect of this development on the existing 12-inch line.

According to Metcalf and Eddy "Water Engineering, Treatment and Reuse – 4th Edition", typical unit flow rate allowances for commercial developments, such as the one proposed, generally range from 800 to 1,500 gallons per acre per day (gpad). Using 1,500 gpad, the sanitary flow rate produced by the business park would be approximately 1 MGD. It was found that significant surcharging, as shown in Figure 4-12, occurred in the 12-inch line due to the additional sanitary loading from the proposed business park. Under these conditions, the peak wet weather flow through the 12-inch line exceeds the available capacity by 0.13 MGD. If the proposed business park were constructed, the existing 3,200 feet of 12-inch gravity sewer system would be undersized (based on 1,500 gpad) and would need to be upsized to a 15-inch PVC line to handle the additional sanitary loading produced by the business park. Project RA-1 is shown in greater detail in Figure 4-13.



Source: City of Longview, 2007.

Legend

Surcharge

NO SURCHARGE

2010

2025

BASIN

RAY CREEK

N

0 1,000 2,000 Feet

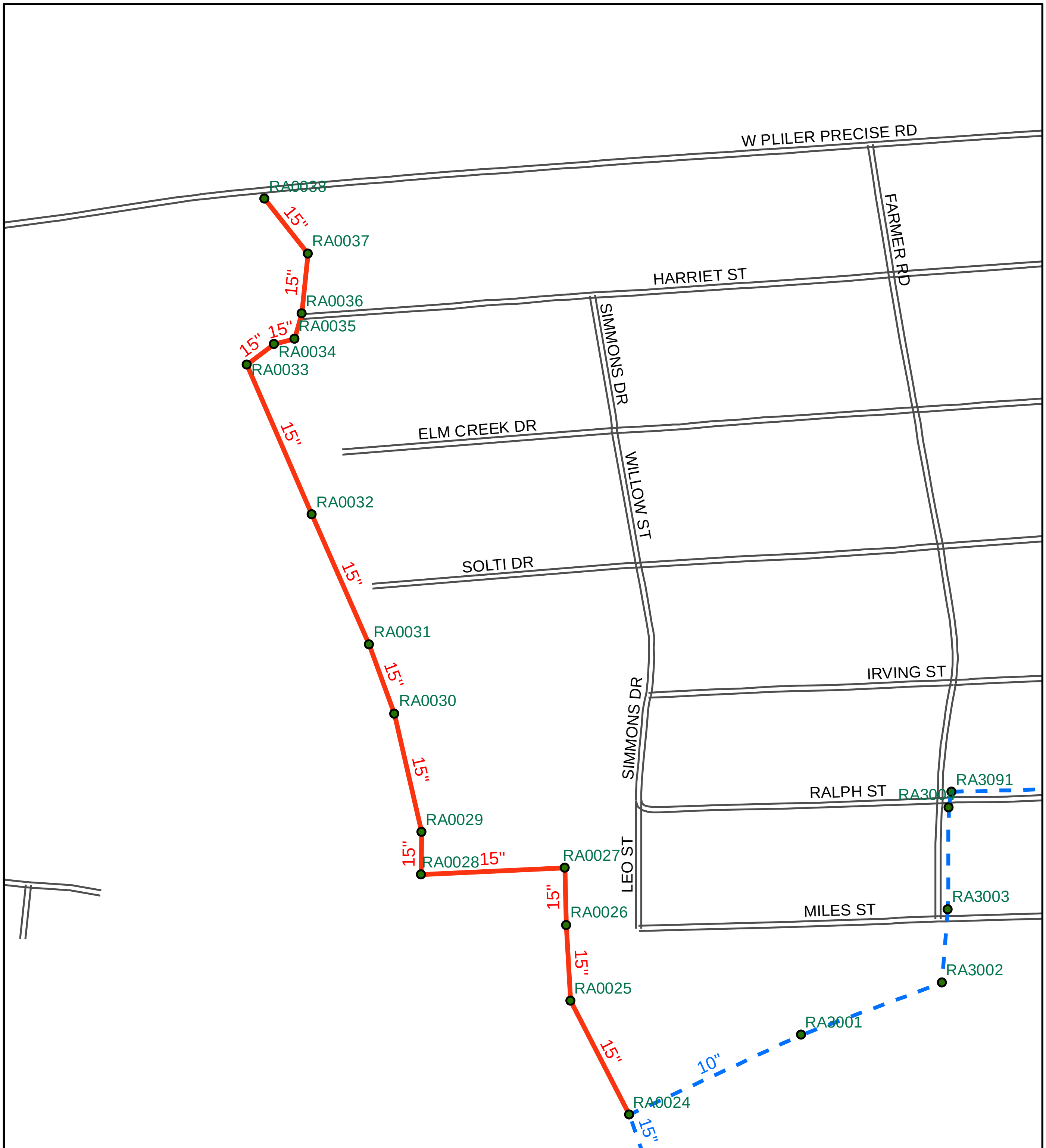
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS-RAY

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-12	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend

- Existing Line
- Proposed Line
- Manhole

N

0 400 800 Feet

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT RA-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-13 | Project No.: 52803785 | Date 10/08

4.18 School Branch (SB)

School Branch is an average-sized service area of approximately 1,981 acres. It is located on the north side of the City, east of Hawkins Creek service area. The area is predominately vacant and residential with a small amount of commercial and industrial development mixed throughout. The sewer lines in this sewershed range up to 18 inches in diameter.

Elmira Chapel Lift Station servers the northern portion of this service area, and discharges into the School Branch gravity system via a 6-inch force main. This lift station is a two-pump station with a manufacturer's firm rated capacity of 170 gpm. Hayes measured its firm rated capacity at 128 gpm. The Elmira Chapel lift station and force main are adequate for both existing and future conditions.

The area is served by a gravity system that flows into the Grace Creek system. Under existing conditions the peak wet weather flow for this system is 2.80 MGD with the 18-inch line having a capacity of 6.17 MGD. School Branch is expected to experience a moderate to significant population growth through the year 2025. This population increase results in a 3.31 MGD peak wet weather flow for this system. It was found that for both existing and future conditions, the gravity system is adequate.

4.19 Wade Creek (WD)

Wade Creek is an average-sized service area of approximately 1,834 acres located in the southeast portion of the City, west of the Iron Bridge Creek service area. The area is predominately commercial in the upper region and residential in the lower region. The sewer lines in this sewershed range up to 18 inches in diameter.

The area is served by a gravity system that flows into the LeTourneau system. Under existing conditions, the peak wet weather flow for this system is 2.65 MGD. The capacity of the 24-inch Ware Interceptor that collects these flows is 5.64 MGD. Wade Creek is fully built out and is expected to experience no population growth through the year 2025 (Figure 3-3). This results in a 2.65 MGD peak wet weather flow for this system for future 2025 conditions.

For existing conditions, the 8- to 12-inch lines beginning north of Cotton Street and extending south to Green Street, as shown in Figure 4-14, are surcharging due to the lines being undersized for the current population in the area. Under existing conditions, the peak wet weather flow through these lines is 0.88 MGD with the 10-inch line having a capacity of 0.74 MGD. It is recommended that the approximately 2,250 feet of existing gravity sewer be upsized to a 15-inch PVC line. Project WD-1 is shown in greater detail in Figure 4-15.

Source: City of Longview, 2007.

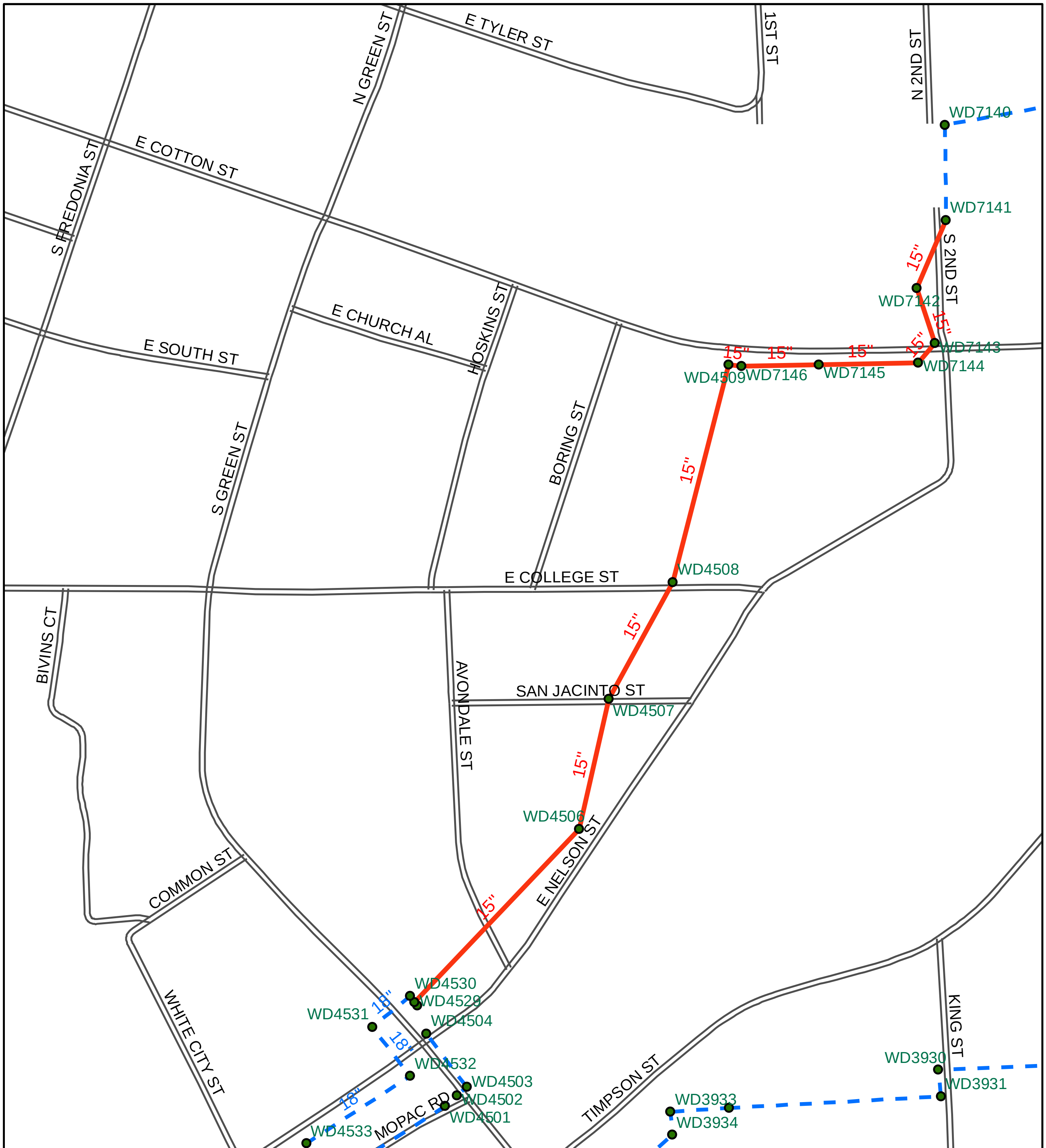
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS- WADE

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-14	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend

- Existing Line
- Proposed Line
- Manhole

N

0 300 600 Feet

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROJECT WD-1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Figure 4-15	Project No.: 52803785	Date 10/08

4.20 Future Conditions Results Summary

All future condition model simulations were performed under peak wet weather conditions based on a 5-year inflow. New lines were sized to flow at 80 percent capacity during peak wet weather conditions.

4.20.1 Year 2010 Projects

The 2010 model simulation resulted in the need for numerous upgrades throughout the City. A summary of the projects identified is provided in Table 4-1. A majority of the projects slated for 2010 are the result of an existing peak wet weather line deficiency.

Table 4-1. Year 2010 Projects

Service Area	Project Name	Location	Linear Feet (ft)	Existing			2025 Flow (MGD)	Proposed		
				Dia (in)	Capacity (MGD)	Flow (MGD)		Dia (in)	Replace/ Parallel	Capacity (MGD)
Iron Bridge	IB-1	Begin at Cotton Street extend 2,100 feet north	2,070	12	1.03	1.32	1.82	15	Replace	2.38
Iron Bridge	IB-2	Begin at Leota Street extend 6,500 feet south	6,555	12	0.93	1.05	1.31	15	Replace	2.14
Ray Creek*	RA-1	Spring Hill Rd to Loop 281 & Pliler Precise Rd south to confluence with 15" line	3,212	12	1.14	1.27	1.27	15	Replace	2.27
Grace Creek	GR-1	Begin at Cotton Street and Lamond extend to Grace 54-inch	3,257	10	1.95	2.22	2.32	10 & 15	Replace	2.66
Greggtion	GT-1	Immediately D/S of Progress Road Lift Station	2,251	8	0.19	0.42	0.48	10	Replace	0.50
LeTourneau Bottoms	LB-1	Begin at I-20 extend south along Eastman Road	1,796	8	0.38	0.49	0.65	12	Replace	1.53
LaFamo	LF-1	Whatley Road Force Main	12,040	10	1.76*	1.92	3.09	14	Replace	3.46*
Wade Creek	WD-1	Cotton Street to Green Street	2,251	10	0.74	0.88	0.94	15	Replace	2.96

* Based on a maximum velocity of 5 feet per second.

4.20.2 Year 2015 Projects

The 2015 model simulation resulted in the need for no upgrades throughout the City.

4.20.3 Year 2025 Projects

The 2025 model simulation resulted in the need for some upgrades throughout the City. A summary of the projects identified is provided in Table 4-2.

Table 4-2. Year 2025 Projects

Service Area	Project Name	Location	Linear Feet (ft)	Existing			2025 Flow (MGD)	Proposed		
				Dia (in)	Capacity (MGD)	Flow (MGD)		Dia (in)	Replace/ Parallel	Capacity (MGD)
Iron Bridge	IB-3	1,600 south feet along Eastman Road to confluence w/ 12-inch line	1,581	8	0.09	0.40	0.05	10	Replace	1.06

Section 5– CIP and Master Plan

5.1 General

This Capital Improvement and Master Plan is an update to the previous 1996 City Waste Water Master Plan. Table 5-1 lists the projects that were recommended in the 1996 master plan and have subsequently been completed. Two projects from the list were not constructed, as denoted in Table 5-1.

Table 5-1. 1996 Waste Water Master Plan Improvements

Project Number	Service Area	Project Location	Action Taken
1	Greggton Creek	From Harrison Road to siphon line	10" pipe was replaced with 320 LF 15" (2003), 470 LF 16" (2003), and 1,240 LF 18" (1999). Two 8" pipes were added in 1996 to parallel existing siphon line.
2	Harris Creek	Berkley Street to Marshall	Pipe was replaced with 24" pipe in 2002
		Marshall Avenue to Grace Creek	Pipe was replaced with 36" pipe in 2002
3	LeTourneau Bottoms	Between LeTourneau Drive and the WWTP	Pipes were replaced with 36" pipe in 2004
4	Oakland Creek	Between Loop 281 and Delwood Drive	Pipe was replaced with 12" pipe in 2004
		Delwood Drive to Triple Drive Creek	Pipe was replaced with 18" pipe in 1998
5	Johnson Creek	Along Triple Creek Drive	Replaced parallel lines with single 18" pipe
		Rick Drive to west of Ramblewood Drive	Pipe was replaced with 12" pipe in 2005
		Ramblewood Drive to north of Pegues Place	Pipe was replaced with 3,400 LF 18" pipe and 300 LF 24" pipe in 2005
6	Guthrie Creek	East of Judson Road to east of McCann Road	One of the parallel pipes (15" diameter) still remains. The other parallel pipe was replaced by a 30" pipe in 1998, 1999, and 2000.
7	Wade Creek	Whaley Street to Nelson Street	Pipe was replaced with 12" pipe in 1996
		Green Street to Lacy Drive	Pipe was replaced with 15" pipe in 2003
8	LeTourneau	Betty Street to west of railroad	Pipe was replaced with 18" pipe in 2003
		West of railroad to Fuller Drive	Pipe was replaced with 24" pipe in 2003
9	Oak Branch	Pebble Creek Drive to west of Airline Road	Pipe was replaced with 12" pipe in 2004

Project Number	Service Area	Project Location	Action Taken
		East Hawkins Parkway to Loop 281	Pipe was replaced with 18" pipe in 2004
10	School Branch	Bill Owens Parkway to Loop 281	Pipe was replaced with 18" pipe in 2005
		Gilmer Road to Bill Owens parkway	Pipe was replaced with 5,050 LF 12" pipe and 2,550 LF 18" pipe in 2005
11	Grace Creek	Marshall Avenue and the WWTP	One of the parallel pipes (24" diameter) still remains. The other parallel pipe was replaced by a 54" pipe in 1998.
12	Grace Creek	Between Loop 281 and Grayson Court	Parallel pipe system was replaced with 36" pipe in 2001.
		Between Grayson Court and Marshall Avenue	Parallel pipe system was replaced with 42" pipe in 2001.
13	Eastman Lake	Pittman Street Lift Station	Repair one existing pump to provide backup capability
14	LaFamo	Between Silver Falls Road and Avenue B	Pipe was replaced with 18" pipe in 2006
15	LaFamo	Pipe parallel to force main between Whatley Lift Station to Silver Falls Road	Not Constructed
16	LaFamo	Whatley Road Lift Station	Not Constructed

Tables 5-4 through 5-12 show the recommended projects based on the CIP and Master Plan updates. Based on the model analysis, the simulation runs did not show any problems with the projects constructed from the 1996 WWMP.

Proposed projects are recommended on a priority basis. If a line was showing a significant amount of surcharging under existing and 2010 conditions then that project was recommended for 2010. The same holds true for the 2015 and 2025 conditions. Lines showing only a minimal amount of surcharging under existing and 2010 conditions were a lower priority, and in most cases were not recommended until 2015 or 2025.

According to the model, a majority of the projects are recommended in the 5-year CIP (2010) because of the need for immediate improvements to the system. The remaining projects are scheduled for the 20-year master plan (2025). In developing the 5-year CIP and 20-year master plans, projects were prioritized based on the differences between the existing capacity and the existing and projected flows. The lines that are currently not providing the needed capacity for the existing flows, resulting in a large surcharge, are scheduled ahead of lines that are only slightly surcharging. Projects that show up as problems in multiple years will be reported in the earliest year's recommendations plan. All recommended projects will accommodate 2025 flows.

5.2 Cost Estimating Basis

The timing and costs of the improvements identified in this section are based upon the analytical results of the sewer model. Generally, the recommended improvements are due to inadequate capacity to handle existing or projected flows. Additional capital improvements may be required to correct maintenance problems or to replace pipes which are in poor structural condition. This section discusses costs, in 2008 dollars, for the individual projects identified in Section 4.

Individual item costs were estimated from ten different sanitary sewer construction projects which were representative of the Longview area. These jobs were evaluated in *Sanitary Sewer Costs Study* (Appendix D) by Hayes. A list of jobs evaluated and their bid year is shown in Table 5-2. Although the bid years range from 2004 to 2007, all costs were converted to 2008 dollars using *ENR's* Construction Cost Index.

Table 5-2. Jobs Evaluated for Cost Basis

Job Number	Bid Date	Job Description	Location
1	2007	Willow Lake Business Park Utilities	White Oak
2	2006	LaFamo Wastewater Improvements	Longview
3	2006	Clayton Place Properties, LLC	Longview
4	2006	Water and Sewer Improvements	Gilmer
5	2006	Beacer, Dogan, Water and Sewer	Marshall
6	2006	State HWY. 154 & Loop 390 Utilities Relocation	Marshall
7	2005	Johnston Creek Sanitary Sewer Improvements	Longview
8	2003	LeTourneau Wastewater System Improvements	Longview
9	2004	Cypress Street Waste & Sewer Improvements	Gilmer
10	2004	Estes Pkwy Utilities Relocation	Longview

In order to estimate the cost of the recommended improvements, a cost basis was determined which included pipe cost, manhole cost, and an extra depth adjustment. Right-of-way (ROW) acquisition, contingency, and engineering and administration costs were included as separate line items.

The pipe cost was broken down into standard depth cost (cost per linear foot) and extra depth cost ($2 per linear foot per vertical foot) for pipes with depth of embedment greater than 6 feet below ground. A standard manhole was assumed to cost $2,500 each. For manholes with depths greater than 6 feet, an extra depth adjustment of $185 per vertical foot was added to the cost of the project. Other unit costs used for the project are presented in Table 5-3.

Table 5-3. Estimated Unit Costs in Year 2008 Dollars

Items	Unit	Cost / Unit
10" PVC Sanitary Sewer Line & Appurtenances	LF	$105
12" PVC Sanitary Sewer Line & Appurtenances	LF	$117
15" PVC Sanitary Sewer Line & Appurtenances	LF	$134
18" DIP Sanitary Sewer Line & Appurtenances	LF	$152
21" DIP Sanitary Sewer Line & Appurtenances	LF	$169
24" DIP Sanitary Sewer Line & Appurtenances	LF	$186
14" PVC Force Main	LF	$50

Items	Unit	Cost / Unit
Avg. Extra Depth of SS Line	VF/LF	$2
Std. 4' Manhole	EA	$2,500
Avg. Extra Depth of Manhole	VF	$185

5.3 Sewer Line Improvements

The sewer line improvements identified in Section 4 are discussed here in further detail with opinion of probable construction cost estimates.

5.3.1 Project GR-1

Project GR-1 (Figure 4-2), located in the Grace Creek service area, was identified during the 2010 model simulation run. This project consists of replacing pipe beginning at the intersection of Cotton Street and Lake Lamond Road and extending to its confluence with the 54-inch Grace Creek Interceptor as shown in Exhibit 6. It is recommended that the approximately 3,250 feet of 10-inch gravity sewer system be upsized to 10-inch PVC and 15-inch PVC lines by year 2010. The first 1,000 feet of line will be replaced with a 10-inch PVC line and the remaining line, extending to the Grace Creek Interceptor, will be upsized to a 15-inch PVC line. This change in diameter is due to a sudden reduction in the slope of the line as it flows downstream. The area around the project is expected to have minimal growth through the year 2025 (Figure 3-3). This project will cross West Cotton, and has an estimated cost of **$702,000** as shown in Table 5-4.

Table 5-4. Opinion of Probable Construction Cost for Project GR-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
GR-1, Begin at Cotton Street and Lamond extend to Grace 54-inch	10" PVC Sanitary Sewer Line & Appurtenances	1,010	LF	$105	$106,261
	Avg. Extra Depth of SS Line	0	VF/LF	$2	$0
	Std. Manhole	5	EA	$2,500	$12,500
	Avg. Extra Depth of MH	0	VF	$185	$0
	15" DIP Sanitary Sewer Line & Appurtenances	2,247	LF	$134	$301,494
	Avg. Extra Depth of SS Line	6	VF/LF	$2	$26,298
	Std. Manhole	6	EA	$2,500	$15,000
	Avg. Extra Depth of MH	6	VF	$185	$1,083
				Subtotal	$462,635
				Contingency (20%)	$92,527
				Total Construction Cost	$555,162
				Engineering and Administration (15%)	$83,274
				Subtotal	$638,436
				R.O.W. Cost (10%)	$63,844
				Total Project Cost	**$702,000**

5.3.2 Project GT-1

Project GT-1 (Figure 4-4), located in the Greggton Creek service area, was identified during the 2010 model simulation run. The project consists of replacing pipe starting immediately downstream of the Progress Road Lift Station running south along Fisher Road then turning to the east and extending until it meets the existing 10-inch line that runs south to the Harrison #2 Lift Station as shown in Exhibit 6. It is recommended that the approximately 2,250 feet of existing 8-inch gravity sewer system be upsized to a 10-inch PVC line by year 2010. The area around the project is expected to have a small amount of growth through the year 2025 (Figure 3-3). Project GT-1 has an estimated cost of **$386,000** as shown in Table 5-5.

Table 5-5. Opinion of Probable Construction Cost for Project GT-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
GT-1, Immediately D/S of Progress Road Lift Station	10" PVC Sanitary Sewer Line & Appurtenances	2,251	LF	$105	$236,857
	Avg. Extra Depth of SS Line	0	VF/LF	$2	$0
	Std. Manhole	7	EA	$2,500	$17,500
	Avg. Extra Depth of MH	0	VF	$185	$0
				Subtotal	$254,357
				Contingency (20%)	$50,871
				Total Construction Cost	$305,228
				Engineering and Administration (15%)	$45,784
				Subtotal	$351,013
				R.O.W. Cost (10%)	$35,101
				Total Project Cost	**$386,000**

5.3.3 Project IB-1

Project IB-1 (Figure 4-6), located in the Iron Bridge Creek service area, was identified during the 2010 model simulation run. This project consists of replacing pipe beginning at the confluence with existing 8-inch and 12-inch lines and extending south to Cotton Street as shown in Exhibit 6. It is recommended that the approximately 2,100 feet of 12-inch gravity sewer system be upsized to a 15-inch PVC line by year 2010. The area around the project is expected to have moderate growth through the year 2025 (Figure 3-3). Project IB-1 has an estimated cost **of $455,000** as shown in Table 5-6.

Table 5-6. Opinion of Probable Construction Cost for Project IB-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
IB-1, Begin at Cotton Street extend 2,100 feet north	15" PVC Sanitary Sewer Line & Appurtenances	2,070	LF	$134	$277,822
	Avg. Extra Depth of SS Line	1	VF/LF	$2	$4,234
	Std. Manhole	7	EA	$2,500	$17,500
	Avg. Extra Depth of MH	1	VF	$185	$189
				Subtotal	$299,745
				Contingency (20%)	$59,949
				Total Construction Cost	$359,694
				Engineering and Administration (15%)	$53,954

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
				Subtotal	$413,648
				R.O.W. Cost (10%)	$41,365
				Total Project Cost	**$455,000**

5.3.4 Project IB-2

Project IB-2 (Figure 4-7), located in the Iron Bridge Creek service area, was identified during the 2010 model simulation run. This project consists of replacing pipe beginning at Leota Street and running south until it meets the upstream end of Project LB-1 as shown in Exhibit 6. It is recommended that the approximately 6,550 feet of 12-inch gravity sewer system be upsized to a 15-inch PVC line by year 2010. The area around the project is expected to have moderate growth through the year 2025 (Figure 3-3). Project IB-2 has an estimated to cost of **$1,493,000** as shown in Table 5-7.

Table 5-7. Opinion of Probable Construction Cost for Project IB-2

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
IB-2, Begin at Leota Street extend 6,500 feet south	15" PVC Sanitary Sewer Line & Appurtenances	6,555	LF	$134	$879,642
	Avg. Extra Depth of SS Line	4	VF/LF	$2	$47,979
	Std. Manhole	22	EA	$2,500	$55,000
	Avg. Extra Depth of MH	4	VF	$185	$677
				Subtotal	$983,298
				Contingency (20%)	$196,660
				Total Construction Cost	$1,179,957
				Engineering and Administration (15%)	$176,994
				Subtotal	$1,356,951
				R.O.W. Cost (10%)	$135,695
				Total Project Cost	**$1,493,000**

5.3.5 Project IB-3

Project IB-3 (Figure 4-8), located in the Iron Bridge Creek service area, was identified during the 2010 model simulation run. This project consists of replacing lines beginning at Eastman Road and running south until its confluence with the aforementioned IB-1 project as shown in Exhibit 6. It is recommended that the approximately 1,600 feet of gravity sewer system be upsized to a 10-inch PVC line by year 2025. It is also recommended that, if possible, the slope of the line crossing under Eastman Road be decreased to 6 ft/1000ft and the slope of the next downstream line be increased to 4ft/1000ft. This will eliminate the chance of the pipe surcharging under future conditions. The area around the project is expected to have minimal growth through the year 2025 (Figure 3-3). Project IB-3 has an estimated cost of **$283,000** as shown in Table 5-8.

Table 5-8. Opinion of Probable Construction Cost for Project IB-3

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
IB-3, 1600 feet south along Eastman Road to confluence	10" PVC Sanitary Sewer Line & Appurtenances	1,581	LF	$105	$166,378
	Avg. Extra Depth of SS Line	0	VF/LF	$2	$0

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
with 12-inch line	Std. Manhole	8	EA	$2,500	$20,000
	Avg. Extra Depth of MH	0	VF	$185	$0
				Subtotal	$186,378
				Contingency (20%)	$37,276
				Total Construction Cost	$223,653
				Engineering and Administration (15%)	$33,548
				Subtotal	$257,201
				R.O.W. Cost (10%)	$25,720
				Total Project Cost	**$283,000**

5.3.6 Project LB-1

Project LB-1 (Figure 4-11), located in the LeTourneau Bottoms service area, was identified during the 2010 model simulation run. The project consists of replacing pipe beginning just south Interstate Highway 20 south access road and extending south along Eastman Road. It is recommended that the approximately 1,800 feet of 8-inch gravity sewer system be upsized to a 12-inch PVC line by year 2010. The area around the project is expected to have minimal growth, with a few isolated areas of significant growth, through the year 2025 (Figure 3-3). Project LB-1 will cross Ryder Drive, and has an estimated cost of **$387,000** as shown in Table 5-9.

Table 5-9. Opinion of Probable Construction Cost for Project LB-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
LB-1, Begin at I-20 extend south along Eastman Road	12" PVC Sanitary Sewer Line & Appurtenances	1,796	LF	$117	$209,731
	Avg. Extra Depth of SS Line	8	VF/LF	$2	$28,664
	Std. Manhole	6	EA	$2,500	$15,000
	Avg. Extra Depth of MH	8	VF	$185	$1,477
				Subtotal	$254,872
				Contingency (20%)	$50,974
				Total Construction Cost	$305,846
				Engineering and Administration (15%)	$45,877
				Subtotal	$351,723
				R.O.W. Cost (10%)	$35,172
				Total Project Cost	**$387,000**

5.3.7 Project RA-1

Project RA-1 (Figure 4-13), located in the Ray Creek service area, was identified during the 2010 model simulation run. The project is a result of an additional 1 MGD sanitary load produced by a 700 acre business park being applied to the top of the 12-inch line beginning at Pliler Precise Road. As discussed in Section 4 this business park is in the planning phases and not constructed. The project consists of replacing pipe beginning at Pliler Precise Road extending south until its confluence with the existing 10- and 15-inch lines. It is recommended that the approximately 3,200 feet of 12-inch gravity sewer system be upsized to a 15-inch PVC line by the year 2010. Project RA-1has an estimated cost of **$715,000** as shown in Table 5-10.

Table 5-10. Opinion of Probable Construction Cost for Project RA-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
RA-1, Spring Hill Rd to Loop 281 & Pliler Precise Rd extending south to confluence with 15" line	15" PVC Sanitary Sewer Line & Appurtenances	3,212	LF	$134	$431,031
	Avg. Extra Depth of SS Line	3	VF/LF	$2	$21,722
	Std. Manhole	7	EA	$2,500	$17,500
	Avg. Extra Depth of MH	3	VF	$185	$626
				Subtotal	$470,879
				Contingency (20%)	$94,176
				Total Construction Cost	$565,055
				Engineering and Administration (15%)	$84,758
				Subtotal	$649,813
				R.O.W. Cost (10%)	$64,981
				Total Project Cost	**$715,000**

5.3.8 Project WD-1

Project WD-1 (Figure 4-15), located in the Wade Creek service area, was identified during the 2010 model simulation. The project consists of replacing pipe beginning just north of Cotton Street and extending south to Green Street as shown in Exhibit 6. This section consists of approximately 2,250 feet of existing gravity sewer with a size ranging from 8 inches to 12 inches. It is recommended that this gravity sewer system be upsized to a 15-inch PVC line by year 2010. The area around the project is expected to have only a small amount of growth through the year 2025 (Figure 3-3). Project WD-1 will require crossing four roads (Cotton Street, East College, San Jacinto, and Avondale), and has an estimated cost of **$512,000** as shown in Table 5-11.

Table 5-11. Opinion of Probable Construction Cost for Project WD-1

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
WD-1, Cotton Street to Green Street	15" PVC Sanitary Sewer Line & Appurtenances	2,251	LF	$134	$302,004
	Avg. Extra Depth of SS Line	2	VF/LF	$2	$7,789
	Std. Manhole	11	EA	$2,500	$27,500
	Avg. Extra Depth of MH	2	VF	$185	$320
				Subtotal	$337,613
				Contingency (20%)	$67,523
				Total Construction Cost	$405,135
				Engineering and Administration (15%)	$60,770
				Subtotal	$465,906
				R.O.W. Cost (10%)	$46,591
				Total Project Cost	**$512,000**

5.4 Force Main Improvements

The timing and costs of the improvements identified in this section are based upon the analytical results of the sewer model. Generally, the recommended improvements are due to inadequate capacity to handle existing or projected flows. This section discusses costs, in 2008 dollars, for the individual force main projects identified in Section 4.

In order to estimate the cost of the force main quotes were obtained from general contractors in the area. All modeled lift stations were adequate for both existing and future conditions.

5.4.1 LaFamo Force Main Improvement (Project LF-1)

Project LF-1 (Figure 4-9) is located in the LaFamo service area and consists of replacing the 10-inch force main serving the Whatley Road Lift Station. The upper regions of LaFamo and all of Hawkins Creek flows into the lift station, which then pumps into the lower region of the LaFamo service area into a gravity system via the LaFamo force main. Exhibit 5 shows the location of this project.

Currently, the lift station has three pumps installed. The firm rated capacity of the lift station is 2,600 gpm, while the firm measured capacity of the lift station is 1,025 gpm. During the existing conditions model run, it was found that all pumps were operating during peak flow conditions, and that the 10-inch force main was limiting the amount of flow that could be pumped to the gravity system. It is recommended that the approximately 12,040 feet of 10-inch force main be replaced with a 14-inch force main. After discussions with Flygt representatives, it was determined that the two variable frequency drive pump impellers (CT 3300 63-462) be trimmed from its existing 365 millimeter configuration to a 335 millimeter configuration. The reduction in impeller size is recommended to prevent the possibility of cavitation when the proposed 14-inch force main is placed in service. Project LF-1 has an estimated cost of **$914,000**, as shown in Table 5-12, and includes only the significant cost associated with replacing the force main. It should be noted that this project was also identified and recommended in the 1996 WWMP update (Projects 15 & 16 in Table 5-1).

Table 5-12 Opinion of Probable Construction Cost for Project LF-2

Project Name	Construction Items	Estimated Quantity	Unit	Unit Price	Cost
LF-1, LaFamo Force Main Improvements	14" PVC Force Main & Appurtenances	12,040	LF	$50	$602,000
				Subtotal	$602,000
				Contingency (20%)	$120,400
				Total Construction Cost	$722,400
				Engineering and Administration (15%)	$108,360
				Subtotal	$830,760
				R.O.W. Cost (10%)	$83,076
				Total Project Cost	$914,000

As presented earlier in Table 5-1, Project Numbers 15 and 16 were suggested in the 1996 WWMP; however, they were not constructed.

5.5 CIP and Master Plan Project Costs

Tables 5-13 and 5-14 present a summary of the CIP and master plan project costs. All costs are presented in 2008 dollars. No projects were identified for the 2011 through 2015 period.

Table 5-13. Opinion of Probable Construction Cost for CIP & MDP

Project Name	Project Description	Quantity	Unit	2009	2010	Years 2011-2015	Years 2016-2025
IB-1	15" PVC Sanitary Sewer Line & Appurtenances	2,070	LF	$ 455,000			
IB-2	15" PVC Sanitary Sewer Line & Appurtenances	6,555	LF	$ 1,493,000			
RA-1	15" PVC Sanitary Sewer Line & Appurtenances	3,212	LF	$ 715,000			
GR-1	10" & 15" PVC Sanitary Sewer Line & Appurtenances	3,257	LF		$ 702,000		
GT-1	10" PVC Sanitary Sewer Line & Appurtenances	2,251	LF		$ 386,000		
LB-1	12" PVC Sanitary Sewer Line & Appurtenances	1,796	LF		$ 387,000		
LF-1	14" PVC Force Main & Appurtenances	12,040	LF		$ 914,000		
WD-1	15" PVC Sanitary Sewer Line & Appurtenances	2,251	LF		$ 512,000		
IB-3	10" PVC Sanitary Sewer Line & Appurtenances	1,581	LF				$ 283,000
			TOTAL	**$ 2,663,000**	**$ 2,901,000**	**$ -**	**$ 283,000**

Section 6 – Gregg County

6.1 General

As part of this master plan update, TCB investigated providing sanitary sewer service to parts of Gregg County which are currently not served by the City of Longview system. Three alternative areas were identified to be included in this analysis. The first alternative included providing service to an area generally north of FM 1844 up to the county line. The second alternative was providing service to an area west of Longview and north of the City of White Oak, while the third alternative included an area just south of Interstate 20 along State Highway 149. The three alternatives are presented in Exhibit 7.

All three alternatives are currently served by individually owned aerobic systems that require an annual maintenance fee of approximately $250 per system. The purpose of this analysis was to provide people living in these areas sanitary sewer service and determine the cost associated with providing this service to Gregg County. The benefit of this analysis is the cost savings to the citizens of these areas for the maintenance and upkeep of the aerobic systems that they currently use. In order to perform the analysis, TCB determined the flows produced by each alternative area, laid out a sewer line network, determined costs associated with constructing the network, and estimated the benefit of such a system in comparison to aerobic systems.

To determine flows from each alternative, TCB used existing 2-foot contours, provided by the City, to delineate sewersheds for each of the alternatives. For areas of Gregg County where the City's mapping did not exist, USGS quadrangle maps along with street and stream information was used to delineate sewershed boundaries.

Hayes provided information regarding the number of connections in each sewershed based on existing available local Water Supply Corporation (WSC) data for the area. Based on the TAZ data received from the 2030 Metropolitan Transportation Plan, it was observed that on an average there were 2.64 people per connection. This factor was applied to the connection information received from the WSCs to determine the number of people in each sewershed. In order to determine the flow produced by each sewershed, 100 gpcd was assumed, per chapter 317 of the Texas Administrative Code. Also, based on the TAZ data received, no population or employment growth was foreseen through the year 2025 in the Gregg County areas under consideration. Therefore, for the future years no additional flow is expected to be added to the City's system.

Hayes prepared a base layout of the sanitary sewer system that would potentially serve this area based on the current streets and streams. The layout included gravity sewer lines ranging from 8-inch to 12-inch, force mains and packaged lift stations. Some areas in Alternative 1 that are towards the northern limits of the County required multiple lift stations to transfer flow south in to the City's system. The sewer line layout for Alternatives 1, 2, and 3 are presented in Exhibits 8-1, 8-2, and 8-3, respectively.

This section describes each alternative in further detail along with costs associated with the sewer line network in each area. Furthermore, a benefit cost analysis was performed for each alternative in order to determine its feasibility of incorporation in to the City of Longview's sewer system. The benefit-cost analysis was performed over a life of 20 years with an assumed discount rate of 7 percent. Benefit cost ratio was calculated as the ratio of the annual cost of maintaining an aerobic system to the annualized cost of a constructing a sewer system network.

In order to obtain annualized costs, a present value coefficient, or discount coefficient as it is generally known, is determined based on the life of the project and discount rate. The annualized project cost is then obtained by dividing the total project cost by the discount coefficient. The discount coefficient used for this analysis is 10.59.

6.2 Alternative 1

Alternative 1 generally incorporates a 25.5 square mile area of Gregg County north of FM 1844 up to the Gregg County line, and a limb that runs along the eastern edge of Tryon Road from CR-1560 in the north to Williams Road in the south. There are 947 connections in this alternative that produce a combined peak wet weather flow of approximately 1.1 MGD, of which approximately 0.02 MGD is proposed to enter the City's network through the upper Grace Creek system, approximately 0.9 MGD through the Ray Creek system, approximately 0.07 MGD through the Oak Branch system, and approximately 0.06 MGD through the Oakland Creek system.

The total and annualized estimated cost of installing a sewer collection system in this area is approximately $105,185,000 and $9,932,000, respectively, while the annual cost of maintaining aerobic systems in this alternative is $236,750 ($250 annually per connection) providing a benefit cost ratio of 0.02.

Alternative 1 is a relatively large area and was subdivided in to smaller sewersheds that would have dedicated lift stations and force mains responsible for collecting flow from the sewersheds and transferring it in to the City's systems of Grace, Ray, Oak Branch or Oakland. These sewersheds are discussed in further detail below.

6.2.1 Unincorporated Sewer Area GR-1

This service area is approximately 500 acres in area bordered by FM 1844 to south, the Gregg County line to the west, and Fuller Road to east as shown in Exhibit 8-1. The area has 20 connections that discharge approximately 5,300 gallons per day (gpd) into an 8-inch gravity sewer line in the upper Grace Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is approximately **$371,000** as presented in Table 6-1 below, while the cost associated with maintaining aerobic systems is approximately $5,000 providing a benefit-cost ratio of 0.01.

Table 6-1. Opinion of Probable Construction Cost for Area GR-1

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	15,369	LF	$95	$1,463,897
Std. 4' Manhole	31	EA	$2,500	$77,500
10" PVC Pipe	3,441	LF	$105	$362,024
Std. 4' Manhole	7	EA	$2,500	$17,500
Force Main	9,872	LF	$50	$493,600
Lift Station Small	1	EA	$75,000	$75,000
Lift Station Large	1	EA	$100,000	$100,000
			Subtotal	$2,589,521
			Contingency (20%)	$517,904
			Total Construction Cost	$3,114,615
			Engineering and Administration (15%)	$467,192

Item	Estimated Quantity	Unit	Unit Price	Cost
			Subtotal	$3,573,540
			R.O.W. Cost (10%)	$357,354
			Total Project Cost	$3,931,000
			Annualized Project Cost	**$371,000**

6.2.2 Unincorporated Sewer Area RA-1

This service area is approximately 4,000 acres in area bordered by FM 1844 in the south, Mackey Road in the north, Fuller Road and the Gregg County line to the west, and US Highway 259 to the east as shown in Exhibit 8-1. The area has 320 connections that discharge approximately 84,500 gpd into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$2,796,000** as presented in Table 6-2 below, while the cost associated with maintaining aerobic systems is approximately $80,000 providing a benefit-cost ratio of 0.03.

Table 6-2. Opinion of Probable Construction Cost for Area RA-1

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	106,771	LF	$95	$10,169,938
Std. 4' Manhole	214	EA	$2,500	$535,000
10" PVC Pipe	24,941	LF	$105	$2,624,018
Std. 4' Manhole	50	EA	$2,500	$125,000
12" PVC Pipe	42,024	LF	$117	$4,908,529
Std. 4' Manhole	85	EA	$2,500	$212,500
Force Main	18,670	LF	$50	$933,500
			Subtotal	$19,508,485
			Contingency (20%)	$3,901,697
			Total Construction Cost	$23,550,387
			Engineering and Administration (15%)	$3,532,558
			Subtotal	$26,921,709
			R.O.W. Cost (10%)	$2,692,171
			Total Project Cost	$29,614,000
			Annualized Project Cost	**$2,796,000**

6.2.3 Unincorporated Sewer Area RA-2

This service area is approximately 1,000 acres in area bordered by Mackey Road to south, the Gregg County line to the north and west, and US Highway 259 to the east as shown in Exhibit 7-1. The area has 24 connections that discharge approximately 6,300 gallons per day into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$450,000** as presented in Table 6-3 below while, the cost associated with maintaining aerobic systems is approximately $6,000 providing a benefit-cost ratio of 0.01.

Table 6-3. Opinion of Probable Construction Cost for Area RA-2

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	17,045	LF	$95	$1,623,536
Std. 4' Manhole	35	EA	$2,500	$87,500
12" PVC Pipe	7,278	LF	$117	$850,092
Std. 4' Manhole	15	EA	$2,500	$37,500
Force Main	8,837	LF	$50	$441,850
Lift Station Large	1	EA	$100,000	$100,000
			Subtotal	$3,140,478
			Contingency (20%)	$628,096
			Total Construction Cost	$3,783,832
			Engineering and Administration (15%)	$567,575
			Subtotal	$4,333,860
			R.O.W. Cost (10%)	$433,386
			Total Project Cost	$4,767,000
			Annualized Project Cost	**$450,000**

6.2.4 Unincorporated Sewer Area RA-3

This service area is approximately 3,500 acres in area, bordered by the Gregg County line to the north, US Highway 259 to the west, English Lane to south, and FM 2751 to the east as shown in Exhibit 8-1. The area has 164 connections that discharge approximately 43,300 gallons per day into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$1,910,000** as presented in Table 6-4 below while, the cost associated with maintaining aerobic systems is approximately $41,000 providing a benefit-cost ratio of 0.02.

Table 6-4. Opinion of Probable Construction Cost for Area RA-3

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	73,574	LF	$95	$7,007,924
Std. 4' Manhole	148	EA	$2,500	$370,000
10" PVC Pipe	31,091	LF	$105	$3,271,053
Std. 4' Manhole	63	EA	$2,500	$157,500
12" PVC Pipe	17,532	LF	$117	$2,047,790
Std. 4' Manhole	36	EA	$2,500	$90,000
Force Main	4,679	LF	$50	$233,950
Lift Station Small	2	EA	$75,000	$150,000
			Subtotal	$13,328,217
			Contingency (20%)	$2,665,643
			Total Construction Cost	$15,993,860
			Engineering and Administration (15%)	$2,399,079
			Subtotal	$18,392,939
			R.O.W. Cost (10%)	$1,839,294
			Total Project Cost	$20,232,000
			Annualized Project Cost	**$1,910,000**

6.2.5 Unincorporated Sewer Area RA-4

This service area is approximately 2,500 acres in area, bordered by the Gregg County line to the east, US Highway 259 to the west, and FM 449 to the north as shown in Exhibit 8-1. The area has 192 connections that discharge approximately 50,700 gallons per day into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$1,786,000** as presented in Table 6-5 below while, the cost associated with maintaining aerobic systems is approximately $48,000 providing a benefit-cost ratio of 0.03.

Table 6-5. Opinion of Probable Construction Cost for Area RA-4

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	102,801	LF	$95	$9,791,795
Std. 4' Manhole	206	EA	$2,500	$515,000
12" PVC Pipe	9,009	LF	$117	$1,052,278
Std. 4' Manhole	19	EA	$2,500	$47,500
Force Main	21,042	LF	$50	$1,052,100
			Subtotal	$12,458,673
			Contingency (20%)	$2,491,735
			Total Construction Cost	$14,950,408
			Engineering and Administration (15%)	$2,242,561
			Subtotal	$17,192,969
			R.O.W. Cost (10%)	$1,719,297
			Total Project Cost	$18,912,000
			Annualized Project Cost	**$1,786,000**

6.2.6 Unincorporated Sewer Area RA-5

This service area is approximately 1,500 acres in area, bordered by the Gregg County line to the east and FM 449 to the south as shown in Exhibit 8-1. The area has 56 connections that discharge approximately 14,800 gallons per day into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$852,000** as presented in Table 6-6 below, while the cost associated with maintaining aerobic systems is approximately $14,000 providing a benefit-cost ratio of 0.02.

Table 6-6. Opinion of Probable Construction Cost for Area RA-5

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	29,039	LF	$95	$2,765,965
Std. 4' Manhole	59	EA	$2,500	$147,500
10" PVC Pipe	17,888	LF	$105	$1,881,979
Std. 4' Manhole	36	EA	$2,500	$90,000
12" PVC Pipe	2,416	LF	$117	$282,196
Std. 4' Manhole	5	EA	$2,500	$12,500
Force Main	10,250	LF	$50	$512,500
Lift Station Small	2	EA	$75,000	$150,000

Item	Estimated Quantity	Unit	Unit Price	Cost
Lift Station Large	1	EA	$100,000	$100,000
			Subtotal	$5,942,639
			Contingency (20%)	$1,188,528
			Total Construction Cost	$7,131,167
			Engineering and Administration (15%)	$1,069,675
			Subtotal	$8,200,842
			R.O.W. Cost (10%)	$820,084
			Total Project Cost	$9,021,000
			Annualized Project Cost	**$852,000**

6.2.7 Unincorporated Sewer Area RA-6

This service area is approximately 1,900 acres in area, bordered by the Gregg County line to the east and north, and Northridge Road to the west as shown in Exhibit 8-1. The area has 59 connections that discharge approximately 15,600 gallons per day into an 8-inch gravity sewer line in the upper Ray Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$727,000** as presented in Table 6-7 below, while the cost associated with maintaining aerobic systems is approximately $14,750 providing a benefit-cost ratio of 0.02.

Table 6-7. Opinion of Probable Construction Cost for Area RA-6

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	27,762	LF	$95	$2,644,331
Std. 4' Manhole	56	EA	$2,500	$140,000
10" PVC Pipe	15,271	LF	$105	$1,606,647
Std. 4' Manhole	31	EA	$2,500	$77,500
Force Main	8,998	LF	$50	$449,900
Lift Station Small	2	EA	$75,000	$150,000
			Subtotal	$5,068,377
			Contingency (20%)	$1,013,675
			Total Construction Cost	$6,082,053
			Engineering and Administration (15%)	$912,308
			Subtotal	$6,994,360
			R.O.W. Cost (10%)	$699,436
			Total Project Cost	$7,694,000
			Annualized Project Cost	**$727,000**

6.2.8 Unincorporated Sewer Area OB-1

This service area is approximately 575 acres in area, bordered by the Gregg County line to the east, Wiley Page Road to the north, and Sam Page Road to the west as shown in Exhibit 8-1. The area has 60 connections that discharge approximately 15,800 gallons per day into an 8-inch gravity sewer line in the upper Oak Branch system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$508,000** as presented in Table 6-8 below while, the cost associated with maintaining aerobic systems is approximately $15,000 providing a benefit-cost ratio of 0.03.

Table 6-8. Opinion of Probable Construction Cost for Area OB-1

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	16,452	LF	$95	$1,567,053
Std. 4' Manhole	33	EA	$2,500	$82,500
10" PVC Pipe	9,913	LF	$105	$1,042,937
Std. 4' Manhole	20	EA	$2,500	$50,000
Force Main	10,989	LF	$50	$549,450
Lift Station Small	2	EA	$75,000	$150,000
Lift Station Large	1	EA	$100,000	$100,000
			Subtotal	$3,541,940
			Contingency (20%)	$708,388
			Total Construction Cost	$4,250,328
			Engineering and Administration (15%)	$637,549
			Subtotal	$4,887,877
			R.O.W. Cost (10%)	$488,788
			Total Project Cost	$5,377,000
			Annualized Project Cost	**$508,000**

6.2.9 Unincorporated Sewer Area OA-1

This service area is approximately 450 acres in area, bordered the Gregg County line to the east, Sam Page Road to the west, and Tad Williams Road to the South as shown in Exhibit 8-1. The area has 52 connections that discharge approximately 13,700 gallons per day into an 8-inch gravity sewer line in the upper Oakland Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$532,000** as presented in Table 6-9 below, while the cost associated with maintaining aerobic systems is approximately $13,000 providing a benefit-cost ratio of 0.02.

Table 6-9. Opinion of Probable Construction Cost for Area OA-1

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	24,316	LF	$95	$2,316,099
Std. 4' Manhole	49	EA	$2,500	$122,500
10" PVC Pipe	1,272	LF	$105	$133,826
Std. 4' Manhole	3	EA	$2,500	$7,500
12" PVC Pipe	5,924	LF	$117	$691,941
Std. 4' Manhole	12	EA	$2,500	$30,000
Force Main	6,725	LF	$50	$336,250
Lift Station Small	1	EA	$75,000	$75,000
			Subtotal	$3,713,116
			Contingency (20%)	$742,623
			Total Construction Cost	$4,455,739
			Engineering and Administration (15%)	$668,361

Item	Estimated Quantity	Unit	Unit Price	Cost
			Subtotal	$5,124,100
			R.O.W. Cost (10%)	$512,410
			Total Project Cost	$5,637,000
			Annualized Project Cost	**$532,000**

TCB evaluated the existing City system with the additional flows from Alternative 1 and found that the 15-inch line on the main Ray Creek collector would experience moderate surcharging during existing and future conditions. The 15-inch Ray Creek collector would need rehabilitation to an 18-inch line to prevent surcharging. Based on the benefit cost ratios of this alternative, it is evident that the project is not feasible and hence construction costs for the Ray Creek project was not estimated.

6.3 Alternative 2

Alternative 2 generally incorporates a 2.3 square mile area of Gregg County bordered by the county line to the north, the City of White Oak to the south, the City of Longview to the east, and Morgan Road to the west as shown in Exhibit 8-2. The area has 60 connections that discharge approximately 15,800 gallons per day into an 8-inch gravity sewer line in the upper Hawkins Creek system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$1,005,000** as presented in Table 6-10 below while, the cost associated with maintaining aerobic systems is approximately $15,000 providing a benefit-cost ratio of 0.02.

Table 6-10. Opinion of Probable Construction Cost for Alternative 2

Item	Estimated Quantity	Unit	Unit Price	Cost
8" PVC Pipe	42,305	LF	$95	$4,029,551
Std. 4' Manhole	85	EA	$2,500	$212,500
10" PVC Pipe	11,776	LF	$105	$1,238,941
Std. 4' Manhole	24	EA	$2,500	$60,000
12" PVC Pipe	9,345	LF	$117	$1,091,524
Std. 4' Manhole	19	EA	$2,500	$47,500
Force Main	3,568	LF	$50	$178,400
Lift Station Small	2	EA	$75,000	$150,000
			Subtotal	$7,008,416
			Contingency (20%)	$1,401,683
			Total Construction Cost	$8,410,100
			Engineering and Administration (15%)	$1,261,515
			Subtotal	$9,671,615
			R.O.W. Cost (10%)	$967,161
			Total Project Cost	$10,639,000
			Annualized Project Cost	**$1,005,000**

Based on further analysis of Alternative 2, it was observed that the sewer network serving this area crosses Hawkins Creek to tie in to a 12-inch line running on the east bank of the creek. Currently, there is a parallel City of White Oak line running on the west bank of the Creek which would better serve the system. Furthermore, far western portions of this area naturally drain towards the City of

White Oak and connecting with their system would eliminate the need for a lift station and force main to transfer flow from those portions of the area to the City of Longview system. Also, inclusion of Alternative 2 flows into the City's system did not indicate a need to rehabilitate any of the City's existing lines in the area.

6.4 Alternative 3

Alternative 3 generally incorporates a 2.2 square mile area of Gregg County bordered by the county line to the northeast, the City of Longview to the north, the City of Lakeport to the southeast, and FM 349 to the south as shown in Exhibit 8-3. The area has 16 connections that discharge approximately 4,200 gallons per day into an 8-inch gravity sewer line in the lower LeTourneau Bottoms system. The area has scattered residential development with individual aerobic systems in place to handle sewage treatment on site. The annualized cost associated with installing a sewer collection system in this sewershed is **$178,000** as presented in Table 6-11 below, while the cost associated with maintaining aerobic systems is approximately $4,000 providing a benefit-cost ratio of 0.02.

Table 6-11. Opinion of Probable Construction Cost for Alternative 3

Item	Estimated Quantity	Unit	Unit Price	Cost
10" PVC Pipe	5,949	LF	$105	$625,888
Std. 4' Manhole	12	EA	$2,500	$30,000
Force Main	10,224	LF	$50	$511,200
Lift Station Small	1	EA	$75,000	$75,000
			Subtotal	$1,242,088
			Contingency (20%)	$248,418
			Total Construction Cost	$1,242,088
			Engineering and Administration (15%)	$248,418
			Subtotal	$1,714,082
			R.O.W. Cost (10%)	$171,408
			Total Project Cost	$1,885,000
			Annualized Project Cost	**$178,000**

Alternative 3 currently houses a distribution unit for Sysco which currently has a dedicated lift station for its needs. Therefore, the sewer network in Alternative 3 could get tied in to this lift station and thereby eliminate the need for a separate lift station and force main. This could potentially reduce the annualized cost of Alternative 3 to $94,000, which increases the benefit-cost to 0.04. Also, inclusion of Alternative 3 flows into the City's system did not indicate a need to rehabilitate any of the City's existing lines in the area.

6.5 Recommendations

The incorporation of portions of Gregg County into the City of Longview's wastewater network was performed to ascertain the costs and feasibility associated with providing sewer service to Gregg County. For a project to be feasible over an assumed project life, the benefit cost ratio needs to be greater than 1 which is not the case for any of the alternatives discussed in this section. It is recommended that the Gregg County unincorporated areas remain on aerobic systems until there is sufficient growth to warrant a centralized collection system.

Section 7– Summary and Recommendations

TCB along with its subconsultants, Hayes Engineering and RJN Group were retained by the City of Longview to perform an update to the 1996 Wastewater System Master Plan prepared by Boyle Engineering. As part of this update the TCB Team converted the City's mapping system to a defined projection system, performed dry and wet weather monitoring at 25 locations across the City, selected SewerGEMS V8 XM as the software of choice to aid the City in its future wastewater modeling needs, provided modeling results for the years 2010, 2015, and 2025, prepared CIP and Master Plan project costs, and analyzed three alternatives for Gregg County as part of the City's agreement with TWDB.

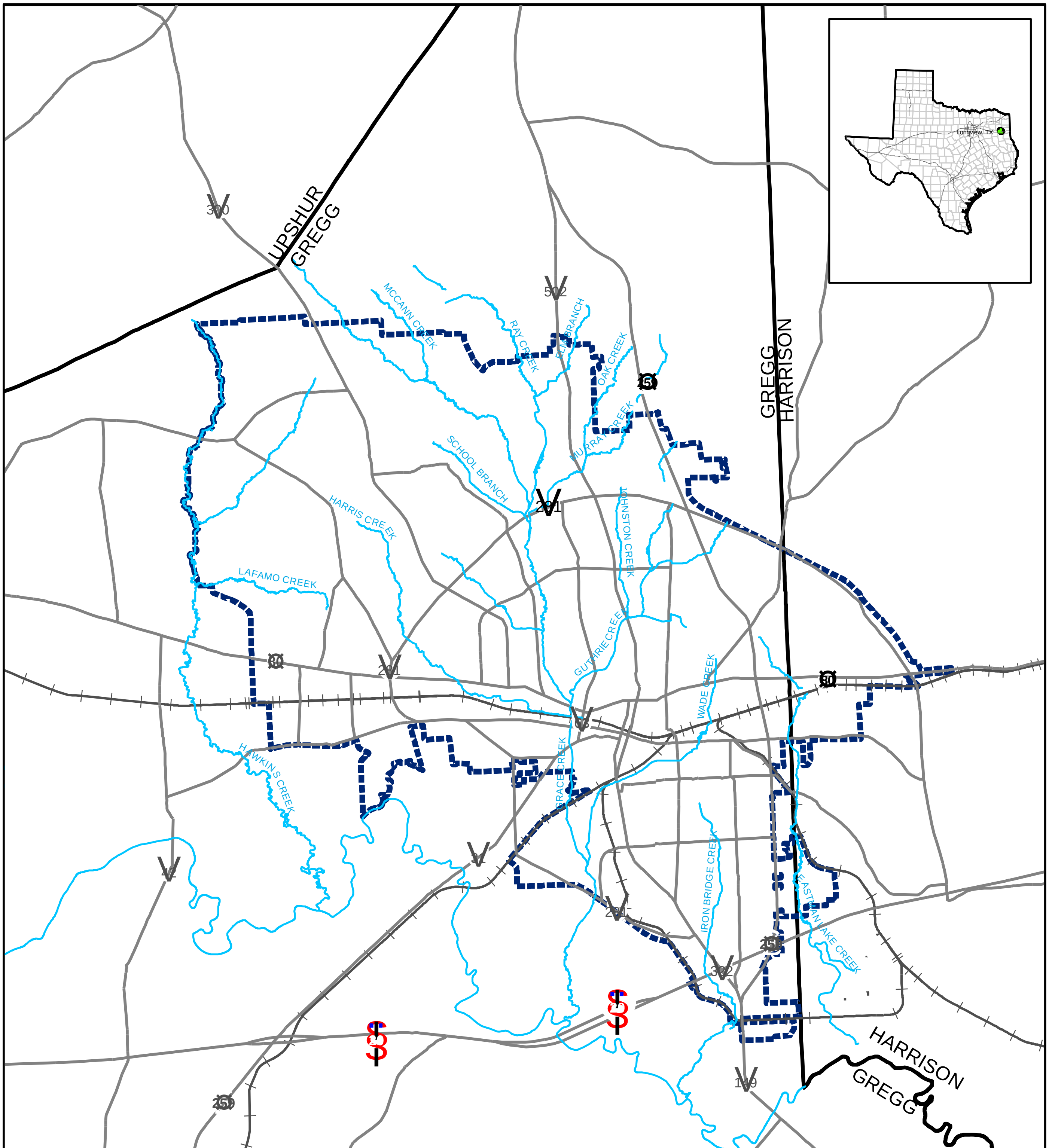
Based on the dry and wet weather monitoring performed by RJN (Appendix B), it was seen that the system did not experience high infiltration. The average dry weather and peak wet weather flows observed by RJN at the WWTP were estimated to be 10.2 MGD and 42 MGD, respectively. The peak wet weather factor was found to be 4.1 based on the 30 percent reduced 5-year inflow as mentioned in Section 2.5.2. The reduction was performed to accurately represent capacity issues in the system after standard procedures like raising manholes and bolting rims to reduce inflow problems in the system were addressed.

TCB calibrated the SewerGEMS model to the flows measured by RJN at the 25 metered locations. The results of the calibration are presented in Table 3-5. Lift Station capacities were measured and verified with Hayes' report (Appendix A) and modeled with pump curves obtained from the pump manufacturers.

Based on the modeling results, projects were identified for the 2010 CIP and 2025 Master Plan. Individual projects are discussed in Section 5. The 2010 CIP was estimated at approximately $5,746,000 and the 2025 Master Plan was estimated at approximately $283,000. No projects were identified for the period ranging from 2011 to 2015.

As part of the City's agreement with TWDB, parts of Gregg County were analyzed for feasibility of incorporation in to the City's sewer network. As part of this analysis, three alternatives were identified and opinions of probable construction costs were prepared for each. TCB also performed a benefit cost analysis for the alternatives as discussed in Section 6. The benefit cost analysis was based on comparing the annualized cost of constructing a sewer network to the annual cost of maintaining aerobic systems. The annualized costs for the Alternatives 1, 2, and 3 were estimated at $9,932,000, $1,005,000, and $178,000, respectively. The benefit cost ratios for all alternatives were calculated to be 0.02. In order for a project to be feasible for construction, the benefit cost ratio must be greater than 1. Therefore, it is recommended that providing sewer service to the Gregg County alternatives is not feasible until there is sufficient growth to warrant a centralized collection system.

EXHIBITS



Source: City of Longview, 2007.

Legend

- ROAD
- RAILROAD
- Streams
- CITY LIMIT
- COUNTY BOUNDARY

0 2 4 Miles

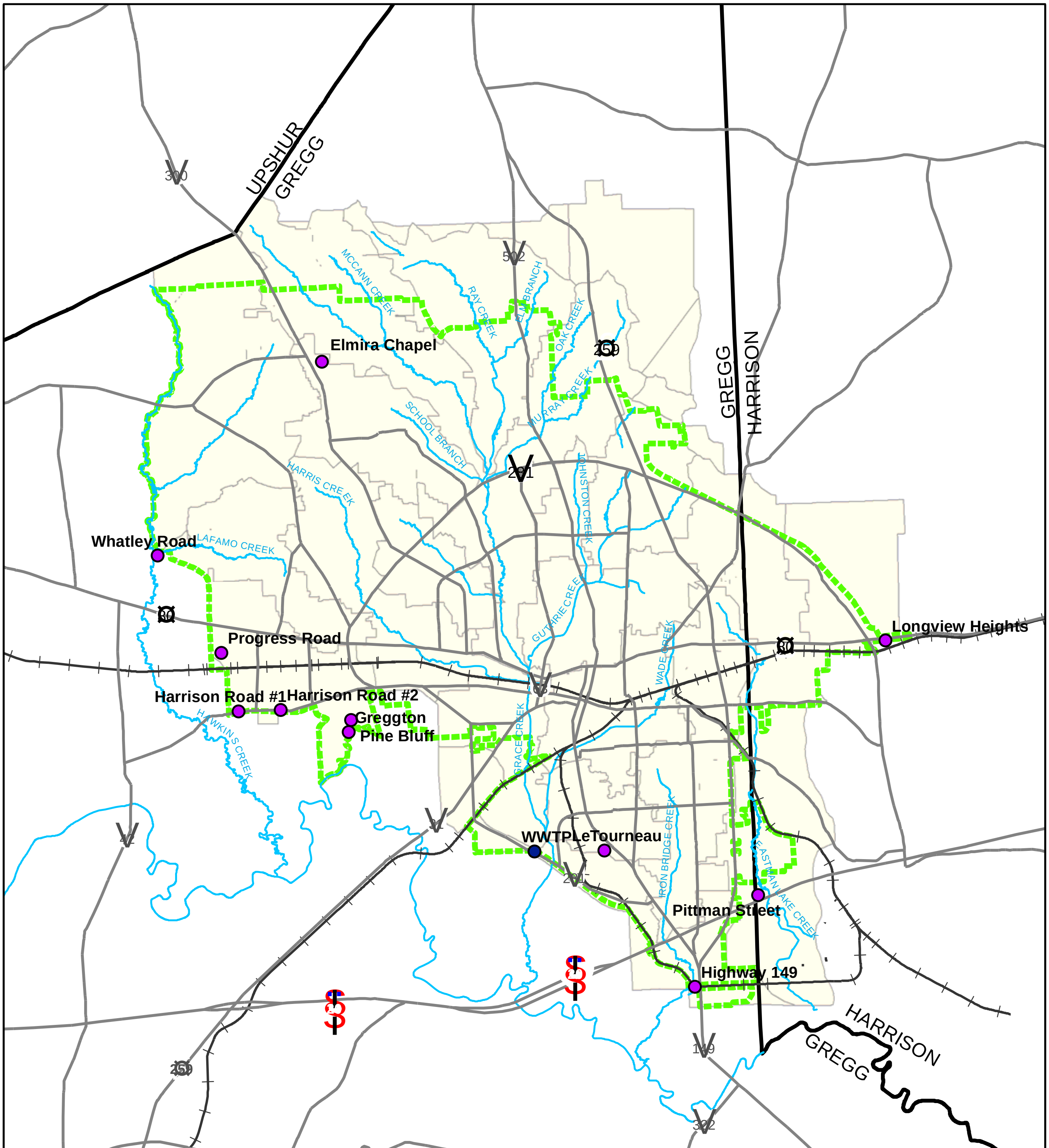
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

VICINITY MAP

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 1	Project No.: 52803785	Date 10/08



Source: City of Longview, 2007.

Legend

- OUTFALL
- LIFT STATIONS
- Streams
- COUNTY BOUNDARY
- CITY LIMIT
- STUDY AREA

0 2 4 Miles

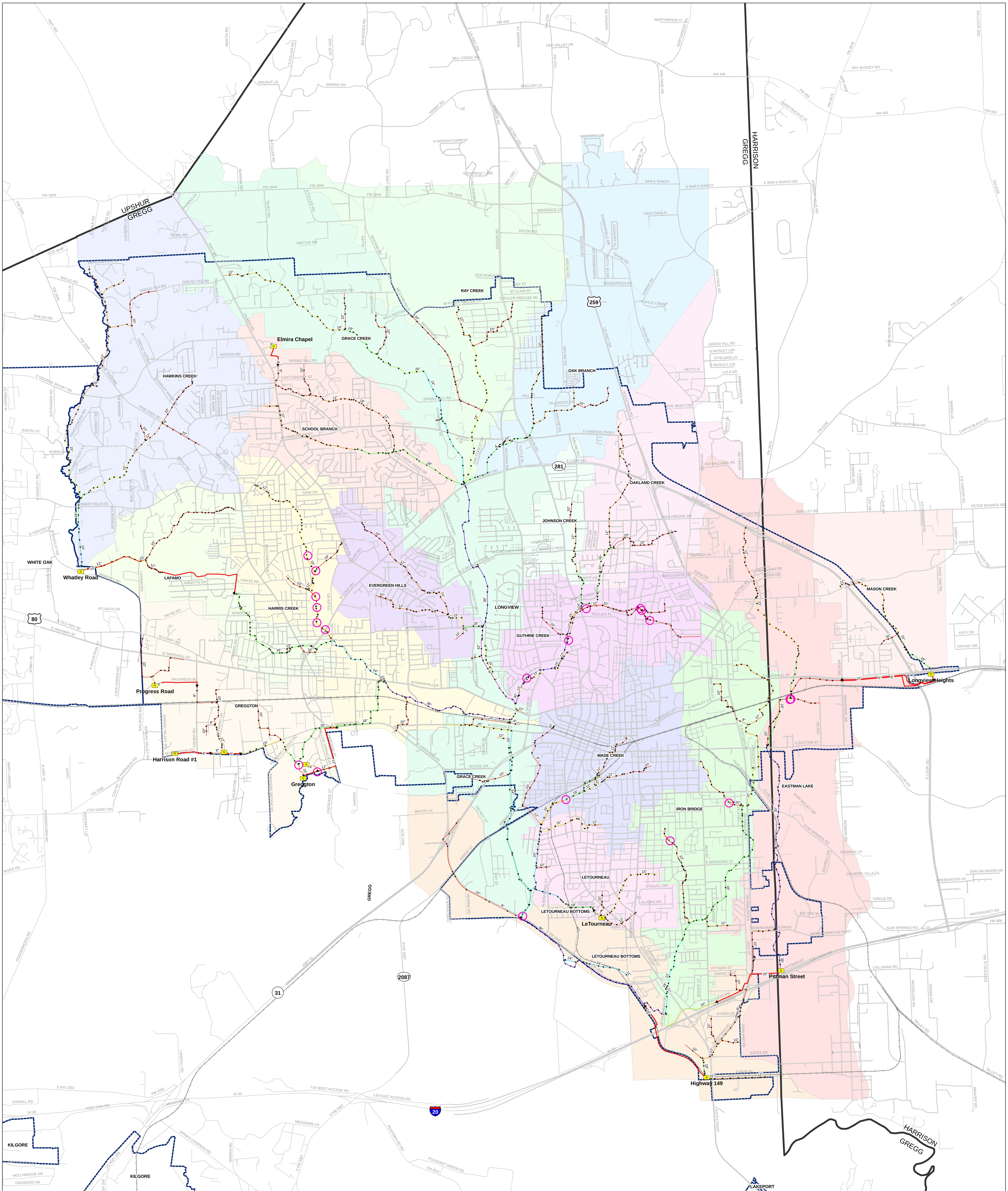
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

CITY STUDY AREA LIMITS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 2	Project No.: 52803785	Date 10/08



LEGEND

LIFT STATIONS

GRAVITY SEWER DIAMETER

8	20	
10	21	
12	24	
14	27	
15	30	
16	36	
18	42	
	48	
	54	

FORCE MAIN

CITY LIMIT

COUNTY BOUNDARY

BASIN

EASTMAN LAKE	LAFAMO
EVERGREEN HILLS	LETOURNEAU
GRACE CREEK	LETOURNEAU BOTTOMS
GREGGTON	MASON CREEK
GUTHRIE CREEK	OAK BRANCH
HARRIS CREEK	OAKLAND CREEK
HAWKINS CREEK	RAY CREEK
IRON BRIDGE	SCHOOL BRANCH
JOHNSON CREEK	WADE CREEK

DIVERSION

N

0 2,000 4,000 Feet

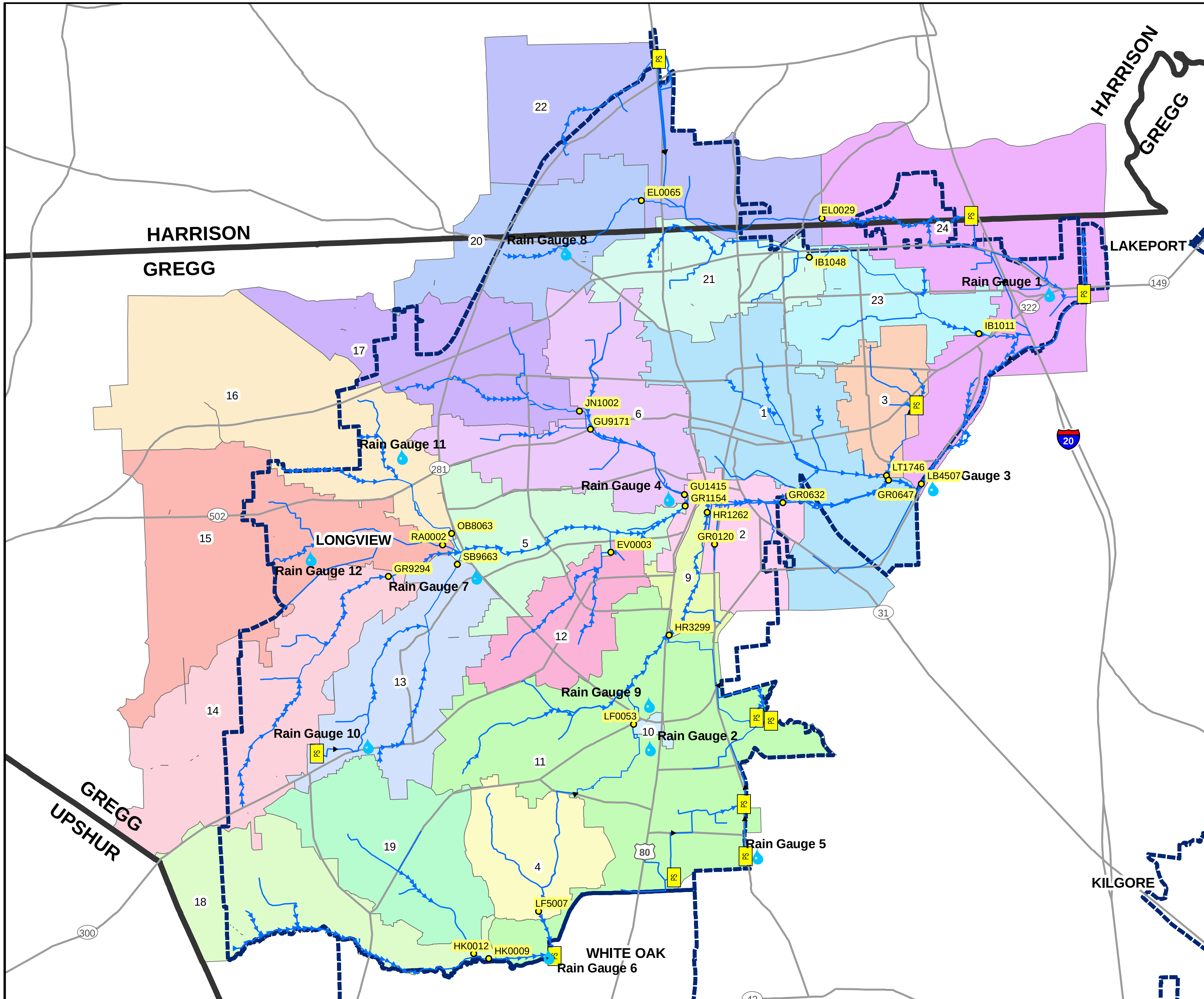
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

SYSTEM MAP

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 3	Project No.: 52803785	Date 10/08



Meter Number	Manhole ID
1	GR0647
2	GR0632
3	LT1746
4	LF5007
5	GR1154
6	GU1415
7	GR0120
8	GU9171
9	HR1262
10	LF0053
11	HR3299
12	EV0003
13	SB9663
14	GR9294
15	RA0002
16	OB8063
17	JN1002
18	HK0009
19	HK0012
20	EL0065
21	IB1048
22	EL0029
23	IB1011
24	LB4507
25	-

Legend

- LIFTSTATIONS
- GR 0632 MANHOLE ID
- GRAVITY SEWER DIAMETER
- METER BASIN
- RAIN GAUGES
- CITY LIMIT
- COUNTY BOUNDARY

N

0 6,000 12,000 Feet

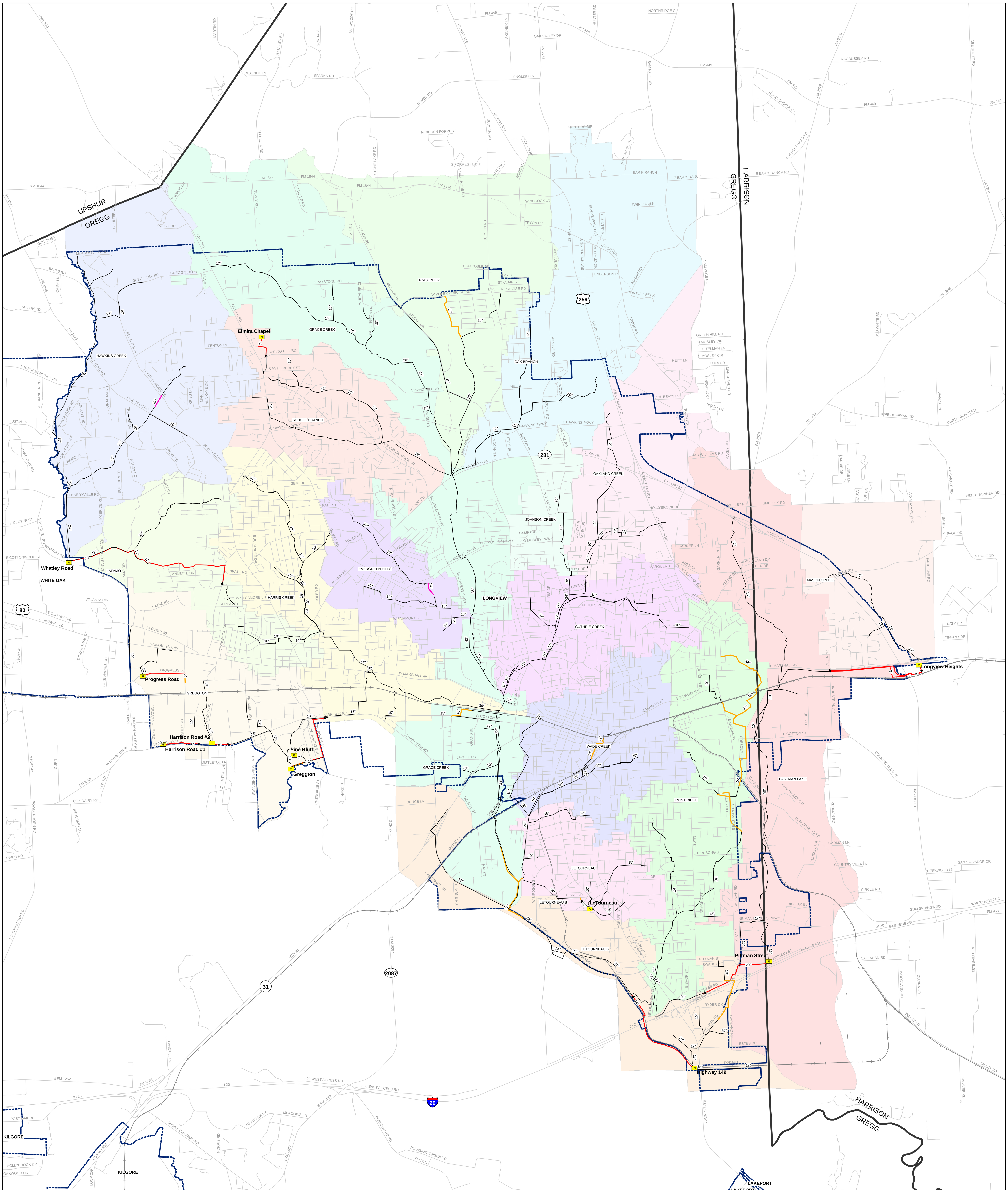
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

TEMPORARY FLOW METER LOCATIONS

TCB AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
T 972.735.3000

Exhibit 4 | Project No.: 52803785 | Date 10/08



LEGEND

- LIFTSTATIONS
- FORCE MAIN
- CITY LIMIT
- COUNTY BOUNDARY

Surcharge

- NO SURCHARGE
- 2010
- 2025

BASIN

EASTMAN LAKE	LAFAMO
EVERGREEN HILLS	LETOURNEAU
GRACE CREEK	LETOURNEAU BOTTOMS
GREGGTON	MASON CREEK
GUTHRIE CREEK	OAK BRANCH
HARRIS CREEK	OAKLAND CREEK
HAWKINS CREEK	RAY CREEK
IRON BRIDGE	SCHOOL BRANCH
JOHNSON CREEK	WADE CREEK

N

0 2,000 4,000 Feet

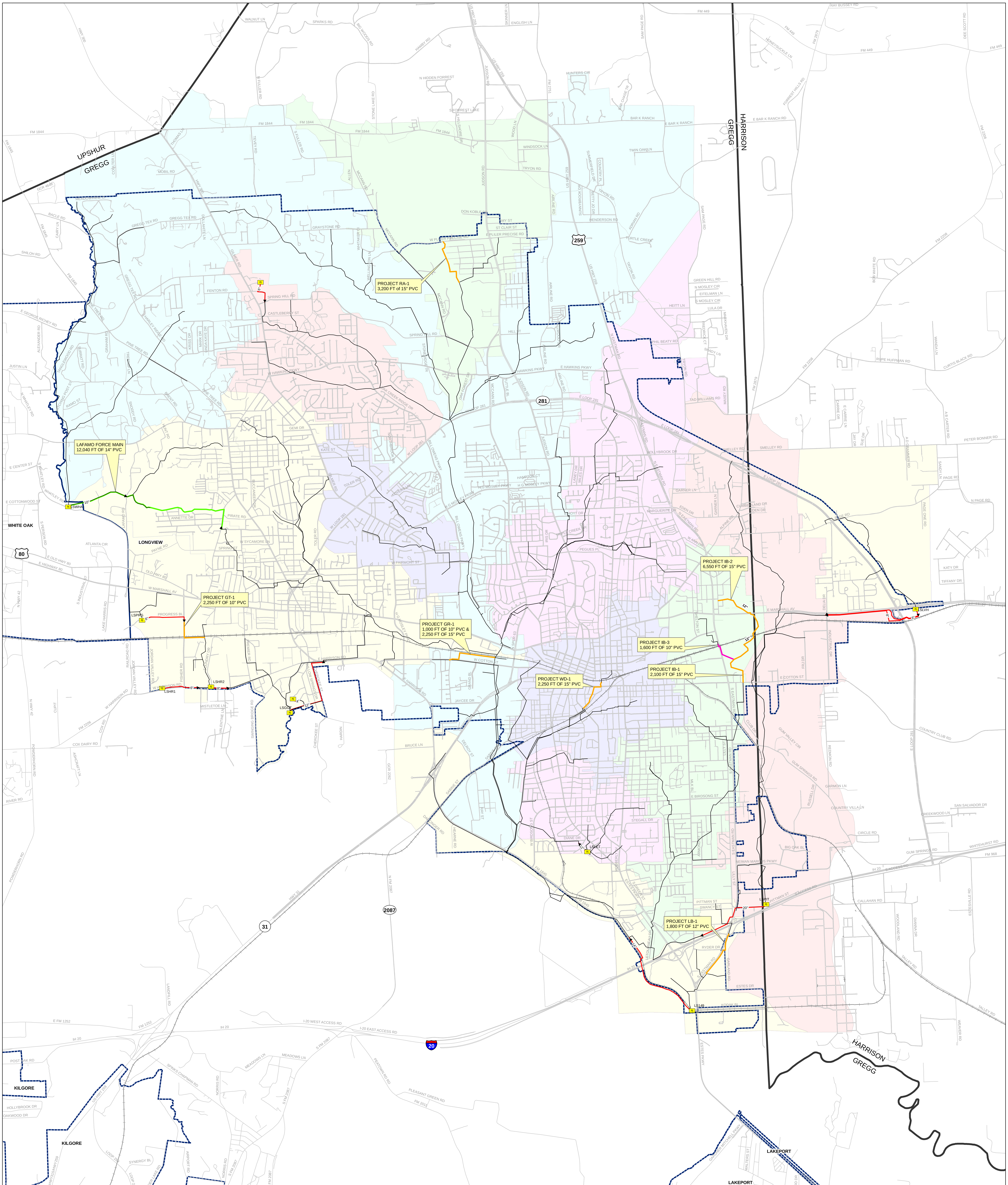
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

MODELING RESULTS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 5 | Project No.: 52803785 | Date 10/08



Source: City of Longview, 2007.

LEGEND

- LIFTSTATION
- YEAR OF IMPROVEMENT
- NO IMPROVEMENT
- 2010
- 2015
- 2025
- FORCE MAIN IMPROVEMENT
- FORCE MAIN
- CITY LIMIT
- COUNTY BOUNDARY

BASIN

- EASTMAN LAKE
- EVERGREEN HILLS
- GRACE CREEK
- GREGGTON
- GUTHRIE CREEK
- HARRIS CREEK
- HAWKINS CREEK
- IRON BRIDGE
- JOHNSON CREEK
- LAFAMO
- LETOURNEAU
- LETOURNEAU B
- MASON CREEK
- OAK BRANCH
- OAKLAND CREEK
- RAY CREEK
- SCHOOL BRANCH
- WADE CREEK

N

0 2,000 4,000 Feet

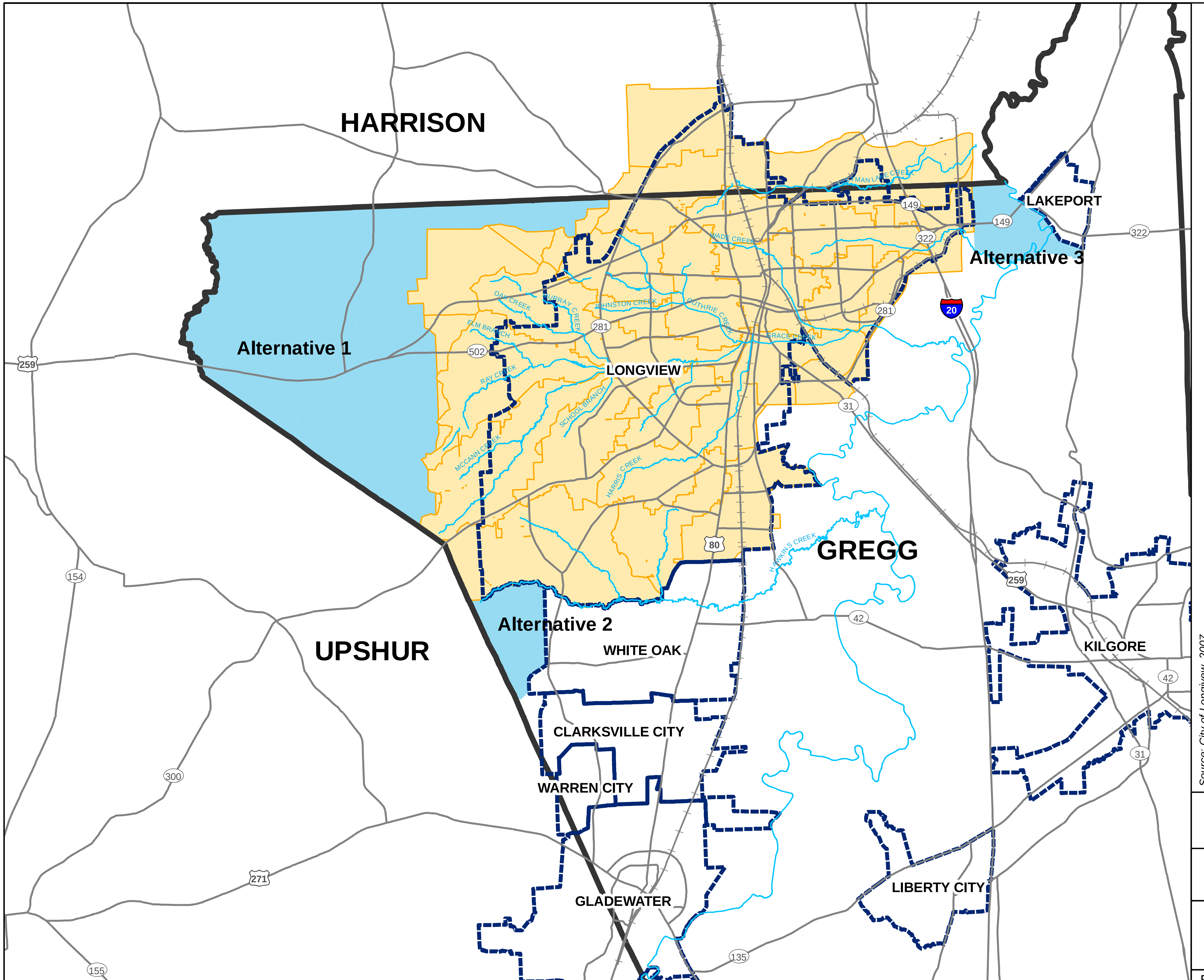
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

RECOMMENDED PROJECTS

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 6	Project No.: 52803785	Date 10/08



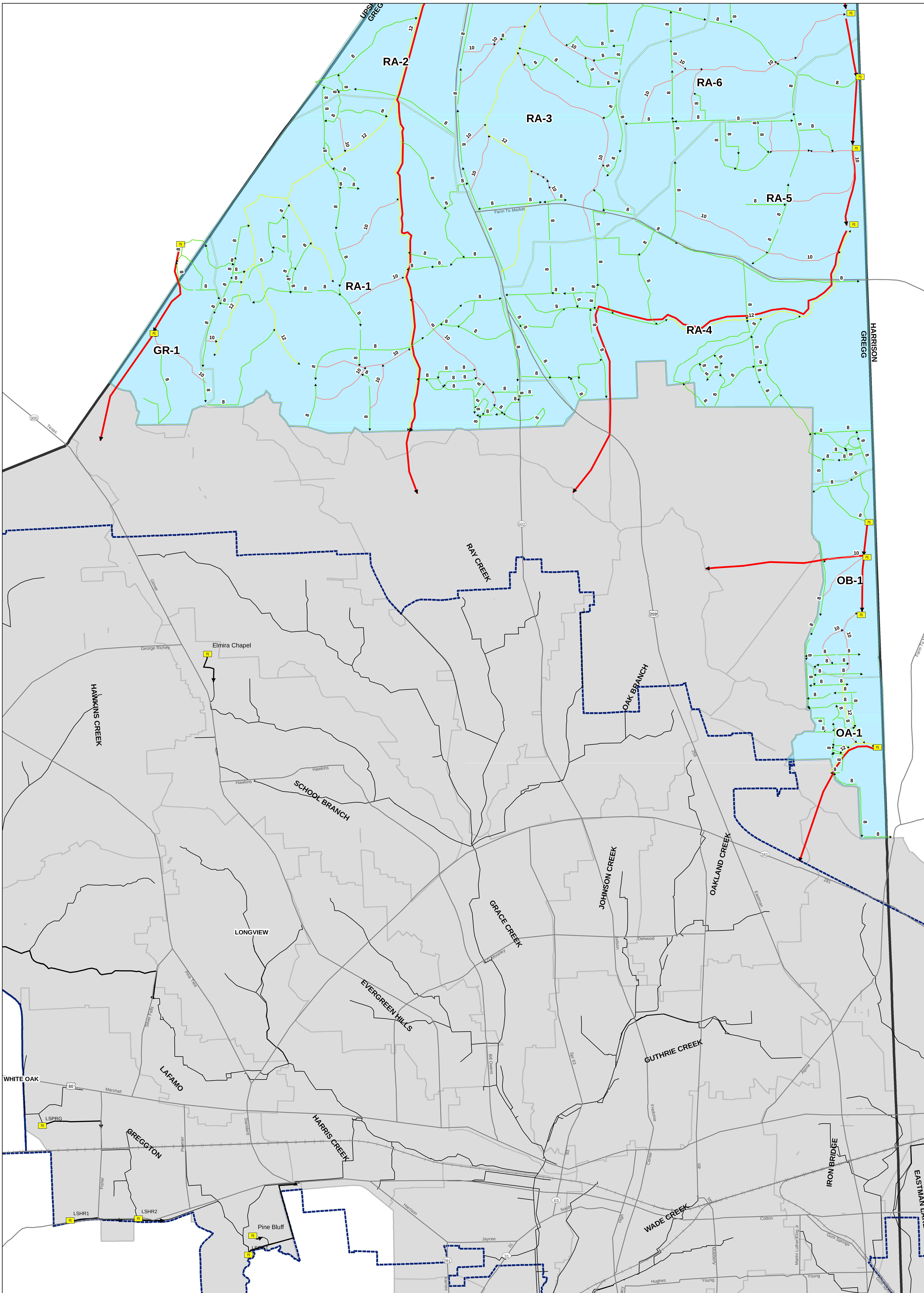
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

GREGG COUNTY ALTERNATIVES

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
T 972.735.3000

Exhibit 7 | Project No.: 52803785 | Date 10/08



LEGEND

GRAVITY SEWER DIAMETER

- 8
- 10
- 12
- CITY OF LONGVIEW EXISTING GRAVITY SEWER
- FORCE MAINS
- LIFT STATIONS
- GREGG COUNTY ALTERNATIVE 1
- CITY LIMIT
- COUNTY BOUNDARY

N

0 2,000 4,000 Feet

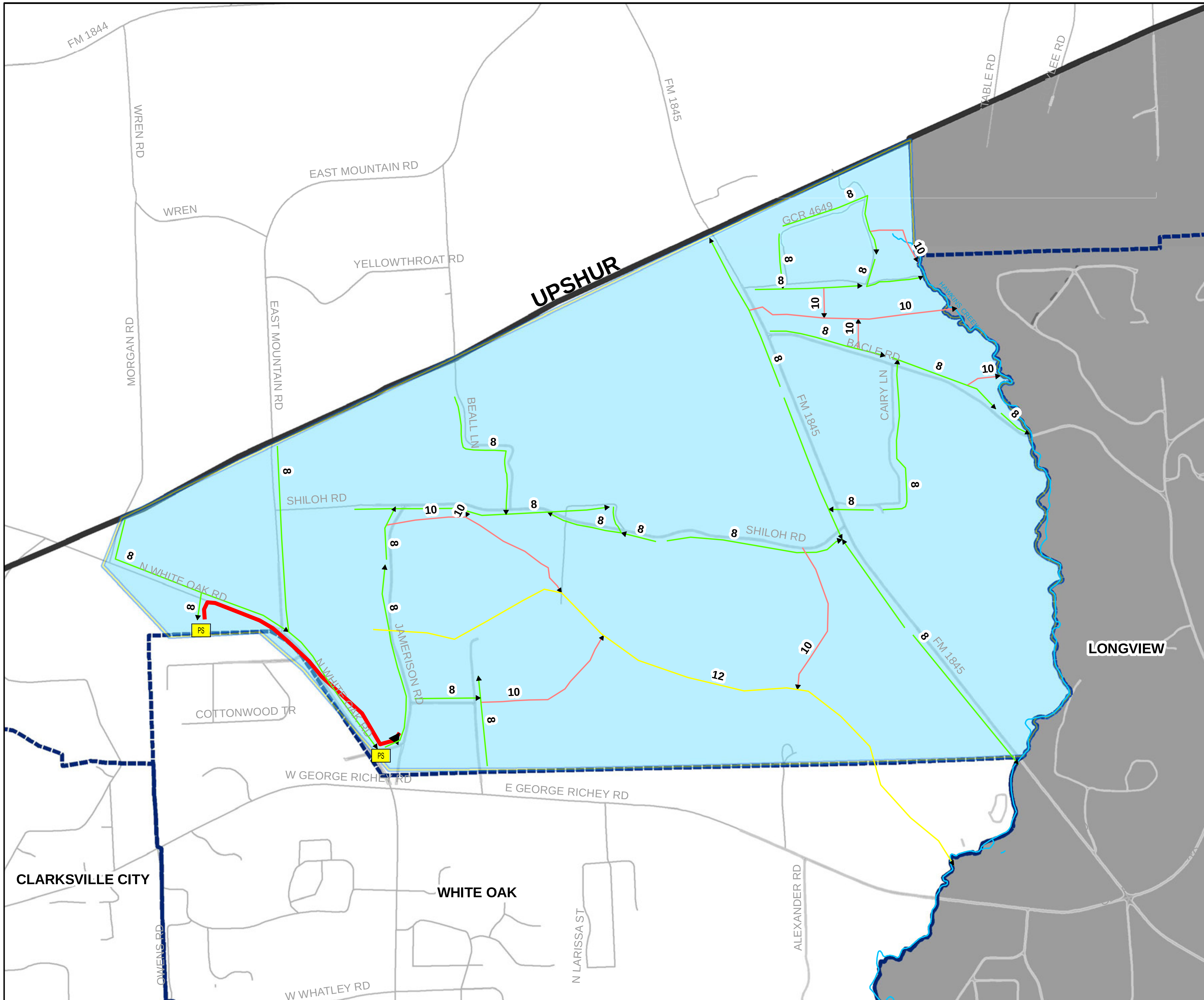
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROPOSED SEWER LINE LAYOUT
ALTERNATIVE 1

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
WWW.TCB.AECOM.COM

Exhibit 8-1	Project No.: 52803785	Date 10/08



LEGEND

- LIFT STATIONS
- GRAVITY SEWER DIAMETER
  - 8
  - 10
  - 12
- FORCE MAIN
- Streams
- GREGG COUNTY ALTERNATIVE 2
- CITY LIMIT
- COUNTY BOUNDARY

N

0 0.25 0.5 Miles

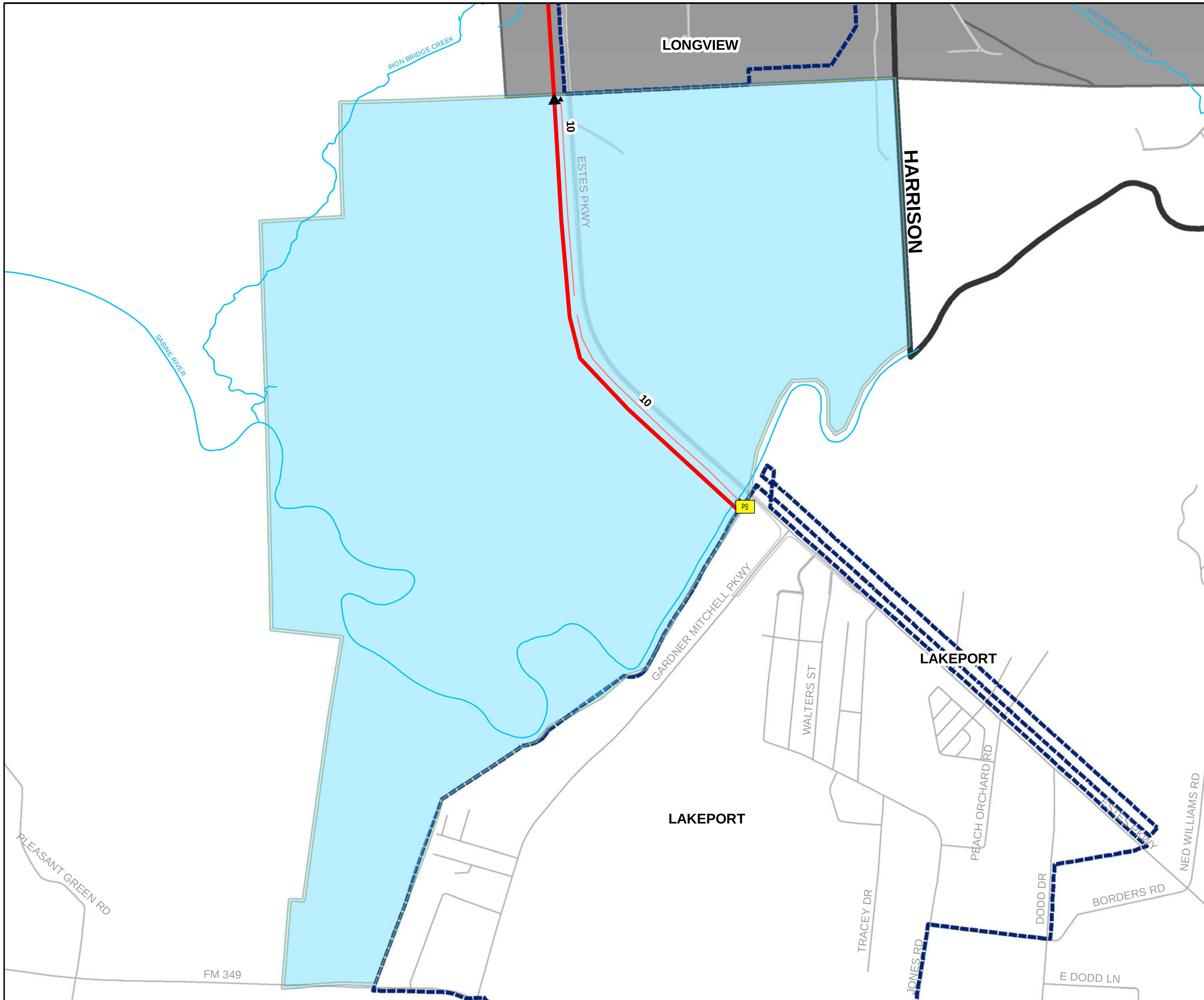
CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROPOSED SEWER LINE LAYOUTS
ALTERNATIVE 2

TCB AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
T 972.735.3000

Exhibit 8-2 | Project No.: 52803785 | Date 10/08



LEGEND

- LIFT STATIONS
- GRAVITY SEWER DIAMETER
  - 8
  - 10
  - 12
- FORCE MAINS
- Streams
- GREGG COUNTY ALTERNATIVE 3
- CITY LIMIT
- COUNTY BOUNDARY

N

0 0.25 0.5 Miles

Source: City of Longview, 2007.

CITY OF LONGVIEW, TEXAS
WASTEWATER SYSTEM MASTER PLAN

PROPOSED SEWER LINE LAYOUTS
ALTERNATIVE 3

TCB | AECOM

TCB INC.
17300 DALLAS PARKWAY SUITE 1010
DALLAS, TEXAS 75248
T 972.735.3000

Exhibit 8-3	Project No.: 52803785	Date 10/08

Appendix A – Lift Station Investigations

City of Longview

Wastewater Master Plan

Lift Station Investigations

2007

HAYES ENGINEERING
2126 Alpine St. Longview, TX 75601-3401

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
Task #4.4 - Lift Station Investigations

LIFT STATION INDEX			
TESTED	LIFT STATION NO.	LIFT STATION NAME	COMMENTS
X	1	LeTourneau	
X	2	Hwy. 149	
X	3	Longview Heights	
Abandoned	4	~~FM 1845 # 1~~	
X	5	FM 1845 # 2	
Abandoned	6	Abandoned	
Abandoned	7	~~Hwy. 300~~	
X	8	Elmira Chapel	
Abandoned	9	~~Cheryl~~	
Abandoned	10	Abandoned	
Abandoned	11	Abandoned	
X	12	Progress Road	
X	13	Harrison # 1	
X	14	Harrison # 2	
X	15	Greggton	
X	16	Pine Bluff	
Abandoned	17	~~Jaycee Drive~~	
X	18	Ambassador	
---	19	Pittman Street	flooded, did not test
X	20	Whatley Road	
Abandoned	21	~~Greystone~~	
X	Airport # 1	Airport # 1	also called "Hwy. 149 A"
---	Airport # 2	Airport # 2	no inflow
---	Airport # 3	Airport # 3	no inflow
---	Airport # 4	Airport # 4	no inflow
X		Gregg Tex	no number
---		Rustic Oaks	no inflow
X		Heritage	

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 1 LIFT STATION NAME: LeTourneau
LOCATION: 113 Peterson
DATE: April 14, 2006 TIME: 11:30 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			10

WET WELL AREA (SF): 78.5 GALLONS PER FT: 587

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	2	20	16.41	15.30

DIFFERENCE (T2-T1):	2.33	MIN
DIFFERENCE (D1-D2):	1.11	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	652	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	279	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	43	14.17	18.17

DIFFERENCE (T2-T1):	1.72	MIN
DIFFERENCE (D2-D1):	4.00	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	2349	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1368	GPM
GROSS PUMPING (NET+INFLOW):	1648	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	41	14.25	18.08

DIFFERENCE (T2-T1):	1.68	MIN
DIFFERENCE (D2-D1):	3.83	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	2249	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1336	GPM
GROSS PUMPING (NET+INFLOW):	1615	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	8	15.16	18.21

DIFFERENCE (T2-T1):	1.13	MIN
DIFFERENCE (D2-D1):	3.05	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1791	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1580	GPM
GROSS PUMPING (NET+INFLOW):	1860	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 1 LIFT STATION NAME: LeTourneau

NAMEPLATE DATA

PUMP 1: N / **S** / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3201.090 MT	
S/N		
MOTOR:	HP	40
	RPM	1160
	V	460
	OTHER	1200 GPM @ 52 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	8"
FORCE MAIN	12"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: **N** / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3201.090 MT	
S/N		
MOTOR:	HP	40
	RPM	1160
	V	460
	OTHER	1200 GPM @ 52 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	8"
FORCE MAIN	12"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

new station, wet well -1/2 of surface area

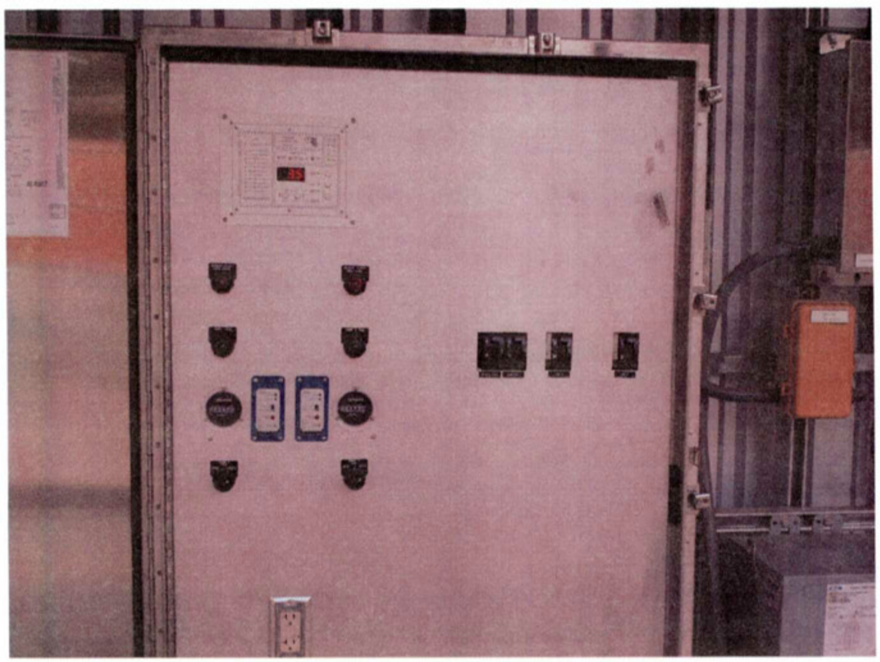
floating material

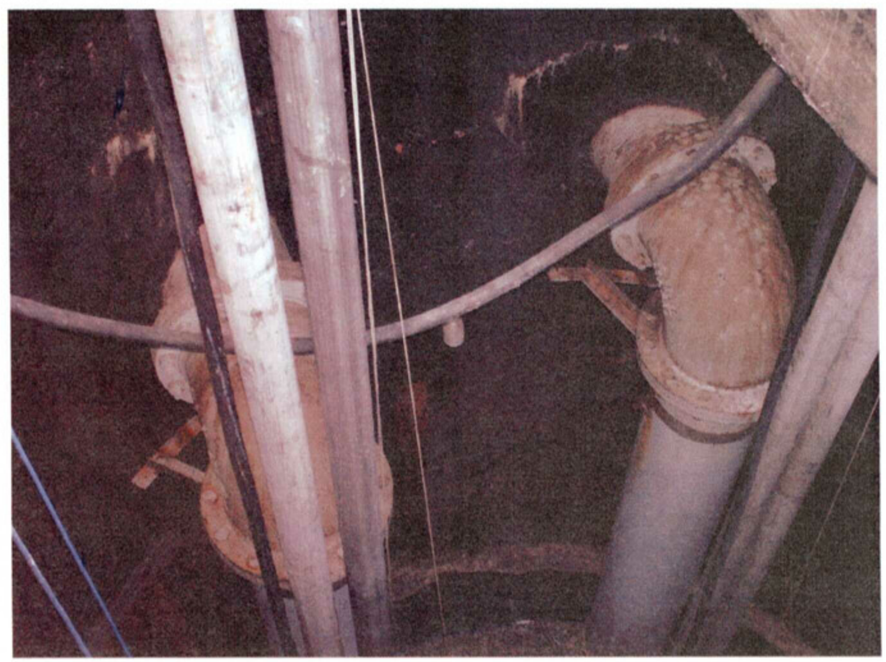
LeTOURNEAU LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: CONTROL PANEL

LOWER RIGHT: INSIDE WET WELL





WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 2 LIFT STATION NAME: Hwy. 149
LOCATION: south of railroad, west of Hwy. 149
DATE: April 20, 2006 TIME: 1:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:	24.33	12	

WET WELL AREA (SF): 292 GALLONS PER FT: 2184

CALCULATE INFLOW:

TIME 1 (MIN)	TIME 1 (SEC)	TIME 2 (MIN)	TIME 2 (SEC)	DIST 1 (FT)	DIST 2 (FT)
0	0	7	20	23.75	20.83

DIFFERENCE (T2-T1):	7.33	MIN
DIFFERENCE (D1-D2):	2.92	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	6377	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	870	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1 (MIN)	TIME 1 (SEC)	TIME 2 (MIN)	TIME 2 (SEC)	DIST 1 (FT)	DIST 2 (FT)
0	0	2	42	21.54	23.67

DIFFERENCE (T2-T1):	2.70	MIN
DIFFERENCE (D2-D1):	2.13	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	4652	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1723	GPM
GROSS PUMPING (NET+INFLOW):	2592	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1 (MIN)	TIME 1 (SEC)	TIME 2 (MIN)	TIME 2 (SEC)	DIST 1 (FT)	DIST 2 (FT)
0	0	2	55	21.83	23.92

DIFFERENCE (T2-T1):	2.92	MIN
DIFFERENCE (D2-D1):	2.09	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	4564	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1565	GPM
GROSS PUMPING (NET+INFLOW):	2434	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1 (MIN)	TIME 1 (SEC)	TIME 2 (MIN)	TIME 2 (SEC)	DIST 1 (FT)	DIST 2 (FT)
0	0	1	30	19.67	21.08

DIFFERENCE (T2-T1):	1.50	MIN
DIFFERENCE (D2-D1):	1.41	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	3079	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	2053	GPM
GROSS PUMPING (NET+INFLOW):	2922	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 2 LIFT STATION NAME: Hwy. 149

NAMEPLATE DATA

PUMP 1: N / S / E / **W** PUMP

BRAND	FLYGT	
MODEL	CP 3300	
S/N		
MOTOR:	HP	88
	RPM	1720
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	24.33 X 12
SUCTION	
DISCHARGE	
FORCE MAIN	10"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / **E** / W PUMP

BRAND	FLYGT	
MODEL	CP 3300	
S/N		
MOTOR:	HP	88
	RPM	1720
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	24.33 X 12
SUCTION	
DISCHARGE	
FORCE MAIN	10"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

Pump #2 ran 1 time out of 6 cycles

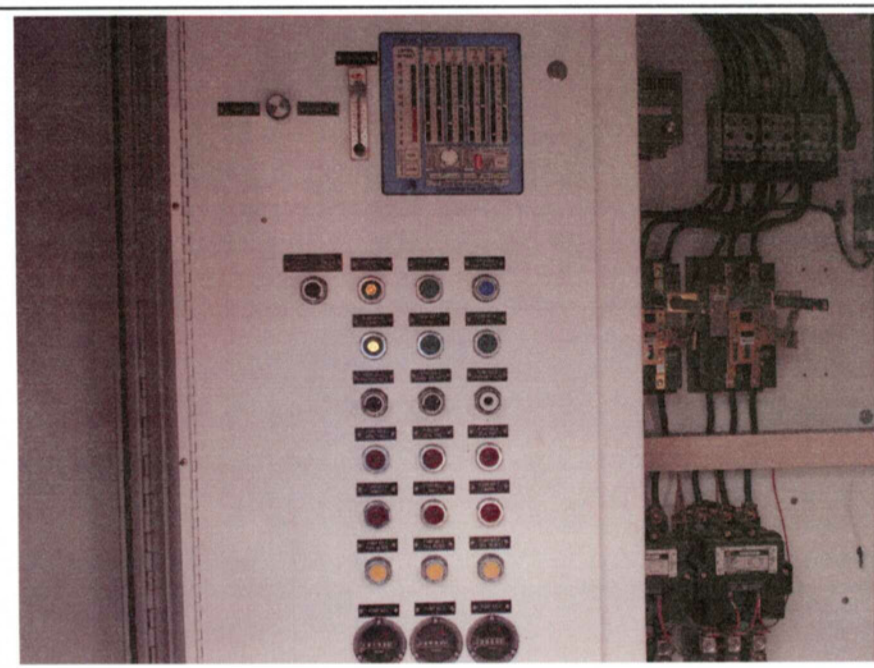
Unable to run both (switches don't operate with doors open)

HIGHWAY 149 LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT: CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW

TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 3 LIFT STATION NAME: Longview Heights

LOCATION: US Hwy. 80

DATE: April 25, 2006 TIME: 11:00 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			10

WET WELL AREA (SF): 78.5 GALLONS PER FT: 587

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	20	24.33	22.37

DIFFERENCE (T2-T1):	1.33	MIN
DIFFERENCE (D1-D2):	1.96	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1151	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	863	GPM

PUMP TEST:

CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	22	22.33	23.67

DIFFERENCE (T2-T1):	1.37	MIN
DIFFERENCE (D2-D1):	1.34	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	787	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	576	GPM
GROSS PUMPING (NET+INFLOW):	1439	GPM

PUMP TEST:

CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	10	22.83	24.41

DIFFERENCE (T2-T1):	1.17	MIN
DIFFERENCE (D2-D1):	1.58	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	928	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	795	GPM
GROSS PUMPING (NET+INFLOW):	1658	GPM

PUMP TEST:

CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	21.83	23.5

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	1.67	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	981	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	981	GPM
GROSS PUMPING (NET+INFLOW):	1844	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 3   LIFT STATION NAME: Longview Heights

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP-3300	
S/N	9530015	
MOTOR:	HP	88
	RPM	
	V	480
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP-3300	
S/N	9530016	
MOTOR:	HP	88
	RPM	
	V	480
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

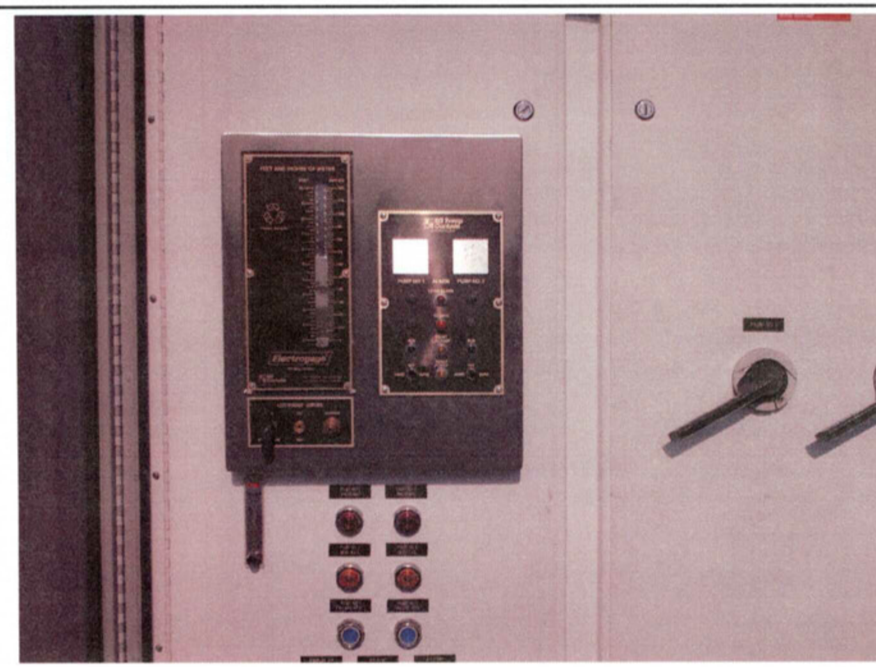
GENERAL NOTES

LONGVIEW HEIGHTS LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT: CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 5 LIFT STATION NAME: FM 1845 # 2
LOCATION:
DATE: April 27, 2006 TIME: 8:30 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			3

WET WELL AREA (SF): 7.1 GALLONS PER FT: 53

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0		

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D1-D2):	0	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	0	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	0.0	GPM

NO INFLOW

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	2	30	2.19	3.42

DIFFERENCE (T2-T1):	2.50	MIN
DIFFERENCE (D2-D1):	1.23	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	65	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	26	GPM
GROSS PUMPING (NET+INFLOW):	26	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	2	0	3.42	4.48

DIFFERENCE (T2-T1):	2.00	MIN
DIFFERENCE (D2-D1):	1.06	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	56	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	28	GPM
GROSS PUMPING (NET+INFLOW):	28	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	2	30	4.46	6.06

DIFFERENCE (T2-T1):	2.50	MIN
DIFFERENCE (D2-D1):	1.6	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	85	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	34	GPM
GROSS PUMPING (NET+INFLOW):	34	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 5 LIFT STATION NAME: FM 1845 # 2

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND ______
MODEL ______
S/N ______
MOTOR: HP ______
RPM ______
V ______
OTHER ______

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	3'
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	X
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND ______
MODEL ______
S/N ______
MOTOR: HP ______
RPM ______
V ______
OTHER ______

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	3'
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	X
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND ______
MODEL ______
S/N ______
MOTOR: HP ______
RPM ______
V ______
OTHER ______

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 8 LIFT STATION NAME: Elmira Chapel
LOCATION: 3602 Clemens
DATE: April 12, 2006 TIME: 3:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			6

WET WELL AREA (SF): 28.26 GALLONS PER FT: 211

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	22	14.09	12.50

DIFFERENCE (T2-T1):	6.37	MIN
DIFFERENCE (D1-D2):	1.59	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	336	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	52.8	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	2	1	13.06	13.78

DIFFERENCE (T2-T1):	2.02	MIN
DIFFERENCE (D2-D1):	0.72	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	152	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	75	GPM
GROSS PUMPING (NET+INFLOW):	128	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	4	57	13.64	15.44

DIFFERENCE (T2-T1):	4.95	MIN
DIFFERENCE (D2-D1):	1.8	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	380	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	77	GPM
GROSS PUMPING (NET+INFLOW):	130	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	14.64	15.22

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	0.58	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	123	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	123	GPM
GROSS PUMPING (NET+INFLOW):	175	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 8 LIFT STATION NAME: Elmira Chapel

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	EBARA	
MODEL	100 DLFU - 6 - 3.7 - 2	
S/N		
MOTOR:	HP	5
	RPM	
	V	230
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	
FORCE MAIN	6"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	EBARA	
MODEL	100 DLFU - 6 - 3.7 - 2	
S/N		
MOTOR:	HP	5
	RPM	
	V	230
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	
FORCE MAIN	6"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

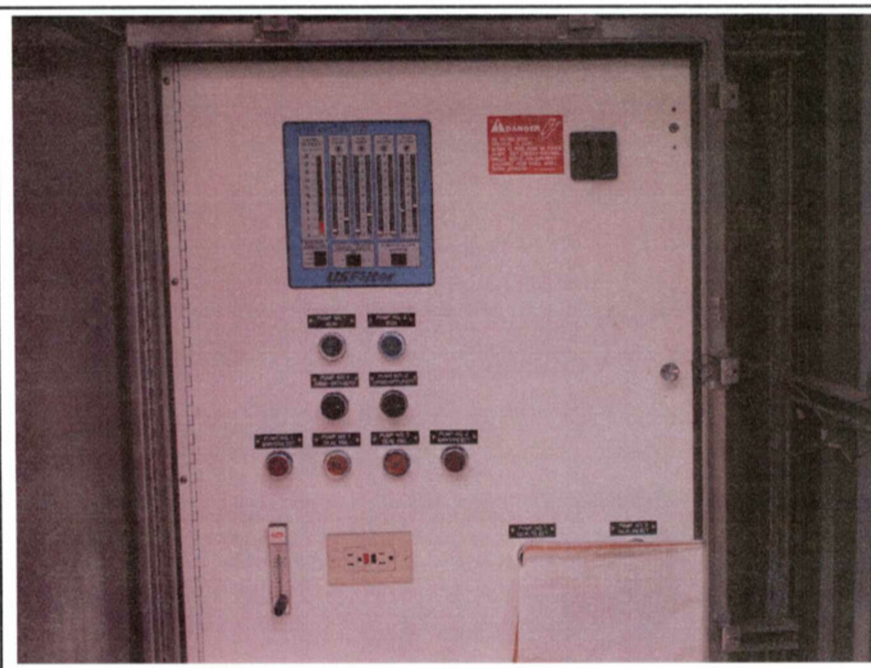
submerged inlet

ELMIRA CHAPEL LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT: CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 12 LIFT STATION NAME: Progress
LOCATION: 1000 Progress Road
DATE: April 24, 2006 TIME: 2:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			8

WET WELL AREA (SF): 50.24 GALLONS PER FT: 376

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	1	21.38	17.96

DIFFERENCE (T2-T1): 6.02 MIN
DIFFERENCE (D1-D2): 3.42 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 1285 GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)): 213.6 GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	45	19.17	20.08

DIFFERENCE (T2-T1): 1.75 MIN
DIFFERENCE (D2-D1): 0.91 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 342 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 195 GPM
GROSS PUMPING (NET+INFLOW): 409 GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	43	19.42	20.5

DIFFERENCE (T2-T1): 1.72 MIN
DIFFERENCE (D2-D1): 1.08 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 406 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 236 GPM
GROSS PUMPING (NET+INFLOW): 450 GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	18	20.42	21.08

DIFFERENCE (T2-T1): 1.30 MIN
DIFFERENCE (D2-D1): 0.66 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 248 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 191 GPM
GROSS PUMPING (NET+INFLOW): 404 GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 12 LIFT STATION NAME: Progress

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3152	
S/N		
MOTOR:	HP	20
	RPM	1750
	V	460
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	8'
SUCTION	
DISCHARGE	
FORCE MAIN	6"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3152	
S/N		
MOTOR:	HP	20
	RPM	1750
	V	460
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	8'
SUCTION	
DISCHARGE	
FORCE MAIN	6"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

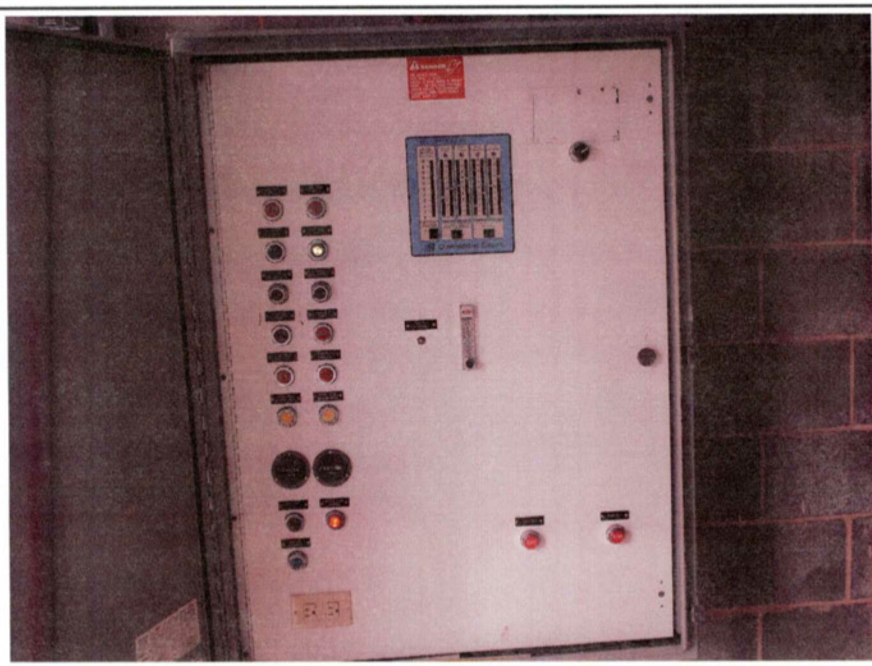
Pump 2 runs every time, no alternating with Pump 1

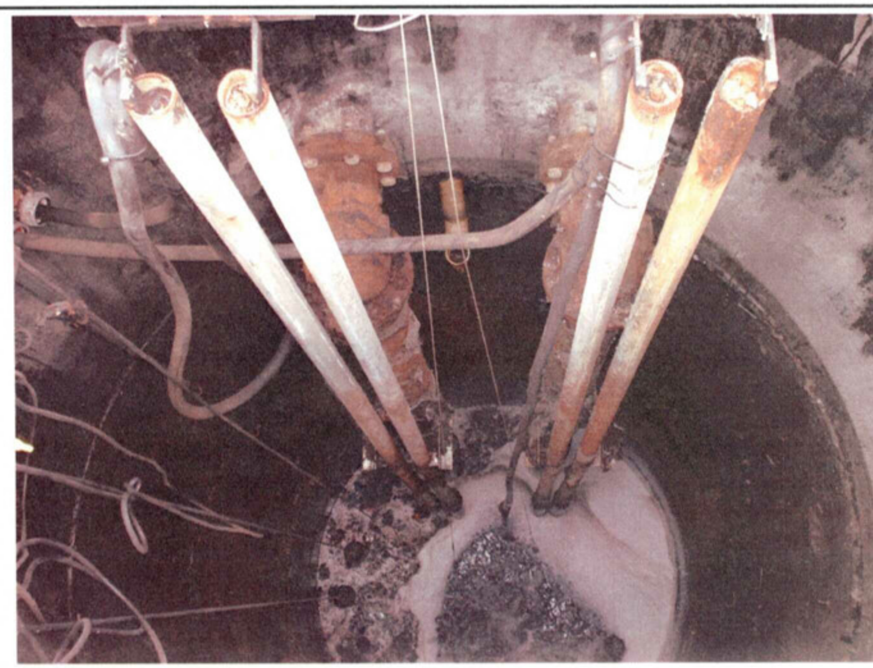
PROGRESS RD LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: CONTROL PANEL

LOWER RIGHT: INSIDE WET WELL





WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 13 LIFT STATION NAME: Harrison #1
LOCATION: 5541 Harrison Road
DATE: April 28, 2006 TIME: 12:30 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			7

WET WELL AREA (SF): 38.465 GALLONS PER FT: 288

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	5	50	28.08	27.83

DIFFERENCE (T2-T1):	5.83	MIN
DIFFERENCE (D1-D2):	0.25	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	72	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	12.3	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	27.17	27.79

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	0.62	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	178	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	178	GPM
GROSS PUMPING (NET+INFLOW):	191	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	27.79	28.17

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	0.38	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	109	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	109	GPM
GROSS PUMPING (NET+INFLOW):	122	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	28.17	28.96

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	0.79	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	227	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	227	GPM
GROSS PUMPING (NET+INFLOW):	240	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 13   LIFT STATION NAME: Harrison #1

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	EBARA	
MODEL	80 DLMFU - 6	
S/N	15633-2-1	
MOTOR:	HP	7.5
	RPM	
	V	460
	OTHER	220 GPM @ 62 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	7'
SUCTION	
DISCHARGE	
FORCE MAIN	6"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	EBARA	
MODEL	80 DLMFU - 6	
S/N	15633-2-2	
MOTOR:	HP	7.5
	RPM	
	V	460
	OTHER	220 GPM @ 62 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	7'
SUCTION	
DISCHARGE	6"
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 14 LIFT STATION NAME: Harrison # 2
LOCATION: NW corner Harrison Rd. @ Foundry
DATE: April 12, 2006 TIME: 10:00 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			10

WET WELL AREA (SF): 78.5 GALLONS PER FT: 587

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	22	21.08	20.67

DIFFERENCE (T2-T1):	1.37	MIN
DIFFERENCE (D1-D2):	0.41	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	241	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	176.2	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	17	19.17	21.29

DIFFERENCE (T2-T1):	1.28	MIN
DIFFERENCE (D2-D1):	2.12	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1245	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	970	GPM
GROSS PUMPING (NET+INFLOW):	1146	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	12	19.17	21.29

DIFFERENCE (T2-T1):	1.20	MIN
DIFFERENCE (D2-D1):	2.12	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1245	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1037	GPM
GROSS PUMPING (NET+INFLOW):	1214	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	45	19.42	21.58

DIFFERENCE (T2-T1):	0.75	MIN
DIFFERENCE (D2-D1):	2.16	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1268	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1691	GPM
GROSS PUMPING (NET+INFLOW):	1867	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 14 LIFT STATION NAME: Harrison # 2

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3201	
S/N	9140010	
MOTOR:	HP	47
	RPM	
	V	460
	OTHER	1320 GPM

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3201	
S/N	9180175	
MOTOR:	HP	47
	RPM	
	V	460
	OTHER	1320 GPM

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	10'
SUCTION	
DISCHARGE	
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

heavy solids floating in 75% of wet well

1st MH (4' dia.) outside of lift station broken grout & some missing

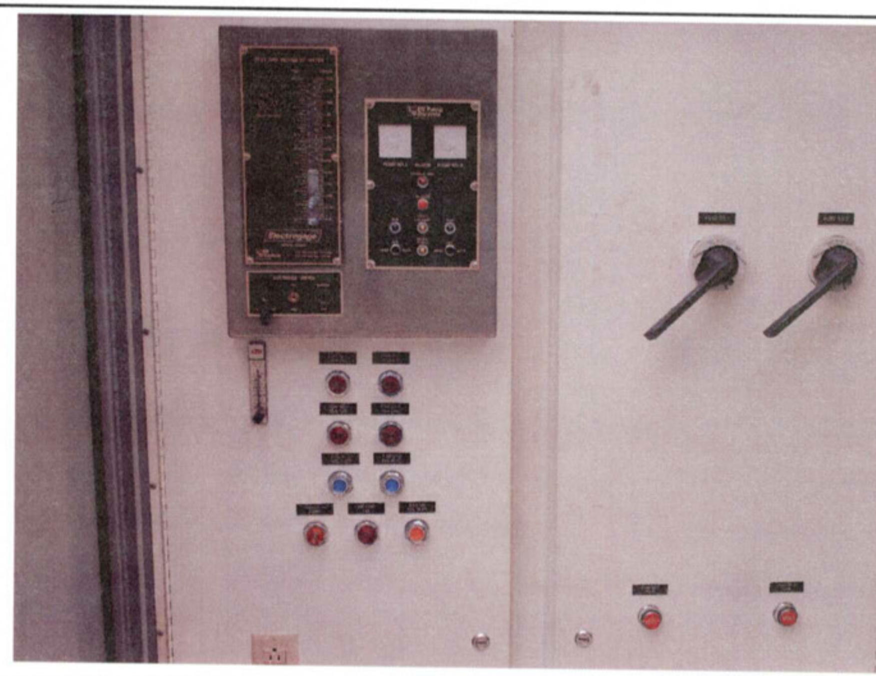
2nd MH (5' dia. flat top) broken grout & some missing

HARRISON RD NO. 2 LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: CONTROL PANEL

LOWER RIGHT: INSIDE CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 15 LIFT STATION NAME: Greggton
LOCATION: south of Sabine River Water Plant
DATE: April 28, 2006 TIME: 11:00 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:	12	11.67	

WET WELL AREA (SF): 140.04 GALLONS PER FT: 1047

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	46	6.25	5.00

DIFFERENCE (T2-T1): 1.77 MIN
DIFFERENCE (D1-D2): 1.25 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 1309 GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)): 741.2 GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	45	4.17	5.83

DIFFERENCE (T2-T1): 1.75 MIN
DIFFERENCE (D2-D1): 1.66 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 1739 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 994 GPM
GROSS PUMPING (NET+INFLOW): 1735 GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: Middle PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	18	5.5	6.67

DIFFERENCE (T2-T1): 1.30 MIN
DIFFERENCE (D2-D1): 1.17 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 1226 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 943 GPM
GROSS PUMPING (NET+INFLOW): 1684 GPM

PUMP TEST:
CALCULATE PUMP 3:

PUMP 3: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	4.67	5.08

DIFFERENCE (T2-T1): 1.00 MIN
DIFFERENCE (D2-D1): 0.41 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 429 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 429 GPM
GROSS PUMPING (NET+INFLOW): 1171 GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW

TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 15 LIFT STATION NAME: Greggton

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	6.58	8.17

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	1.59	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1666	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1666	GPM
GROSS PUMPING (NET+INFLOW):	2407	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 3:

PUMP 1 & PUMP 3					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	7	8.17

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	1.17	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1226	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1226	GPM
GROSS PUMPING (NET+INFLOW):	1967	GPM

PUMP TEST:
CALCULATE PUMPS 2 & 3:

PUMP 2 & PUMP 3					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	5.16	6.25

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	1.09	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1142	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1142	GPM
GROSS PUMPING (NET+INFLOW):	1883	GPM

PUMP TEST:
CALCULATE PUMPS 1, 2,& 3:

PUMPS 1, 2, & 3					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	10	4.16	5.58

DIFFERENCE (T2-T1):	1.17	MIN
DIFFERENCE (D2-D1):	1.42	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1487	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	1275	GPM
GROSS PUMPING (NET+INFLOW):	2016	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 15 LIFT STATION NAME: Greggton

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3300	
S/N	9551028	
MOTOR:	HP	120
	RPM	
	V	460
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	12 x 11.67
SUCTION	
DISCHARGE	8"
FORCE MAIN	12"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: Middle PUMP

BRAND	FLYGT	
MODEL	CP 3300	
S/N	9551030	
MOTOR:	HP	120
	RPM	
	V	460
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	12 x 11.67
SUCTION	
DISCHARGE	8"
FORCE MAIN	12"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

3 pumps, Pump # 3 runs continuously

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 16   LIFT STATION NAME: Pine Bluff
LOCATION: 1119 Pine Bluff St.
DATE: April 11, 2006   TIME: 3:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			6

WET WELL AREA (SF): 28.26   GALLONS PER FT: 211

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	38	35	12.73	12.42

DIFFERENCE (T2-T1): 38.58 MIN
DIFFERENCE (D1-D2): 0.31 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 66 GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)): 1.7 GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
50	0	51	40	12.29	12.76

DIFFERENCE (T2-T1): 1.67 MIN
DIFFERENCE (D2-D1): 0.47 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 99 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 60 GPM
GROSS PUMPING (NET+INFLOW): 61 GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	12.67	12.98

DIFFERENCE (T2-T1): 1.00 MIN
DIFFERENCE (D2-D1): 0.31 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 66 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 66 GPM
GROSS PUMPING (NET+INFLOW): 67 GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	30	12.94	13.15

DIFFERENCE (T2-T1): 0.50 MIN
DIFFERENCE (D2-D1): 0.21 FT
EQUIVALENT GALLONS (D2-D1*GAL/FT): 44 GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)): 89 GPM
GROSS PUMPING (NET+INFLOW): 90 GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 16 LIFT STATION NAME: Pine Bluff

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3102 MT	
S/N	3102.090.0140169	
MOTOR:	HP	3.2
	RPM	1740
	V	230
	OTHER	80 @ 29 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	3"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	FLYGT	
MODEL	CP 3102 MT	
S/N	3102.090.0140170	
MOTOR:	HP	3.2
	RPM	1740
	V	230
	OTHER	80 @ 29 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	3"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

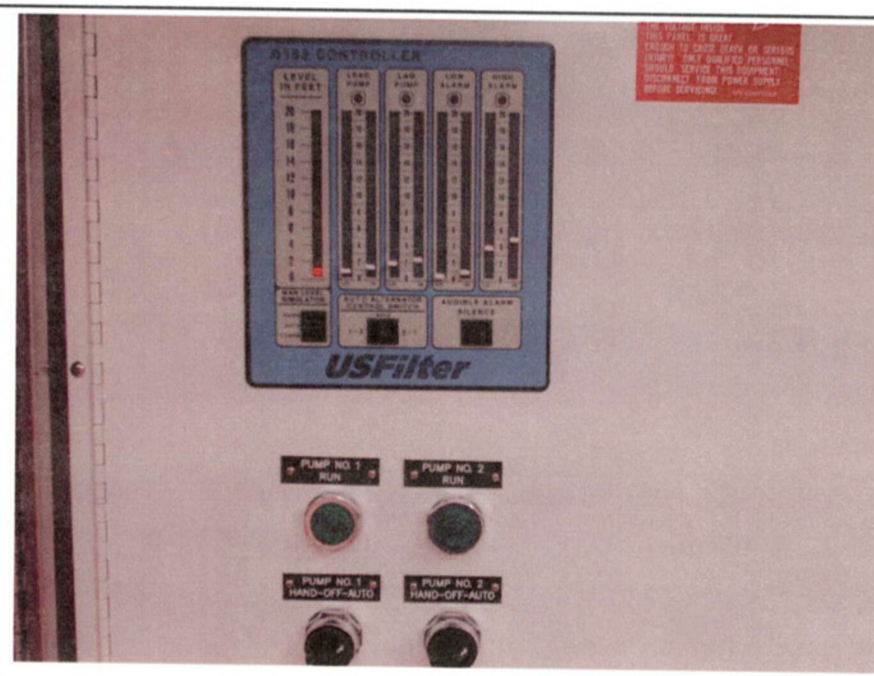
clean station, low flow

PINE BLUFF LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT: CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: **18** LIFT STATION NAME: **Ambassador**
LOCATION: 402 Ambassador Drive
DATE: April 17, 2006 TIME: 3:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			4

WET WELL AREA (SF): 12.56 GALLONS PER FT: 94

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	10	49	20.33	20.04

DIFFERENCE (T2-T1):	10.82	MIN
DIFFERENCE (D1-D2):	0.29	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	27	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	2.5	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	5	37	20.06	20.92

DIFFERENCE (T2-T1):	5.62	MIN
DIFFERENCE (D2-D1):	0.86	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	81	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	14	GPM
GROSS PUMPING (NET+INFLOW):	17	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	27	20.56	21.36

DIFFERENCE (T2-T1):	6.45	MIN
DIFFERENCE (D2-D1):	0.8	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	75	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	12	GPM
GROSS PUMPING (NET+INFLOW):	14	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	3	1	20.98	21.54

DIFFERENCE (T2-T1):	3.02	MIN
DIFFERENCE (D2-D1):	0.56	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	53	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	17	GPM
GROSS PUMPING (NET+INFLOW):	20	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: 18 LIFT STATION NAME: Ambassador

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	EBARA	
MODEL	CP 3067	
S/N		
MOTOR:	HP	1.6
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	3"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	EBARA	
MODEL	CP 3067	
S/N		
MOTOR:	HP	1.6
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	3"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

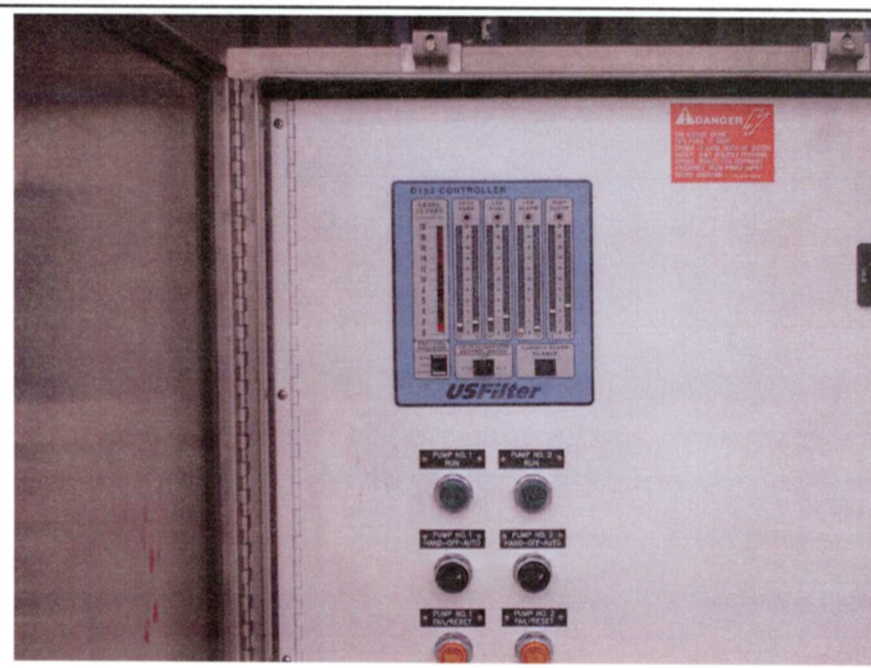
GENERAL NOTES

AMBASSADOR ROW LIFT STATION

UPPER LEFT: SITE

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT: CONTROL PANEL



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: **20** LIFT STATION NAME: **Whatley**
LOCATION: 399 Whatley Road
DATE: October 3, 2008 TIME: 11:00 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:	20.33	10.33	

WET WELL AREA (SF): 210.0089 GALLONS PER FT: VARIES From 1140 To 1571

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	0	19.5	18.25

DIFFERENCE (T2-T1):	6.00	MIN
DIFFERENCE (D1-D2):	1.25	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	1440	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	240.0	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	0	17	19.75

DIFFERENCE (T2-T1):	6.00	MIN
DIFFERENCE (D2-D1):	2.75	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	3132	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	522	GPM
GROSS PUMPING (NET+INFLOW):	762	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	6	0	17	19.83

DIFFERENCE (T2-T1):	6.00	MIN
DIFFERENCE (D2-D1):	2.83	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	3228	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	538	GPM
GROSS PUMPING (NET+INFLOW):	778	GPM

PUMP TEST:
CALCULATE PUMP 3:

PUMP 3: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	3	0	14.42	15.75

DIFFERENCE (T2-T1):	3.00	MIN
DIFFERENCE (D2-D1):	1.33	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	2088	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	696	GPM
GROSS PUMPING (NET+INFLOW):	936	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: **20** LIFT STATION NAME: **Whatley**

PUMP TEST:

CALCULATE PUMPS 1 & 3:

PUMP 1 & PUMP 3					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0	16.25	16.92

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D2-D1):	0.67	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	785	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	785	GPM
GROSS PUMPING (NET+INFLOW):	1025	GPM

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	FLYGT	
MODEL		
S/N		
MOTOR:	HP	120
	RPM	1770
	V	480
	OTHER	1300 GPM @ 188 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	20.33 X 10.33
SUCTION	8"
DISCHARGE	8"
FORCE MAIN	10"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	FLYGT	
MODEL		
S/N		
MOTOR:	HP	120
	RPM	1770
	V	480
	OTHER	1300 GPM @ 188 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	20.33 X 10.33
SUCTION	8"
DISCHARGE	8"
FORCE MAIN	10"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND	FAIRBANKS MORSE	
MODEL	5446	
S/N		
MOTOR:	HP	125
	RPM	1785
	V	460
	OTHER	1300 GPM @ 199 TDH

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	20.33 X 10.33
SUCTION	8"
DISCHARGE	5"
FORCE MAIN	10"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

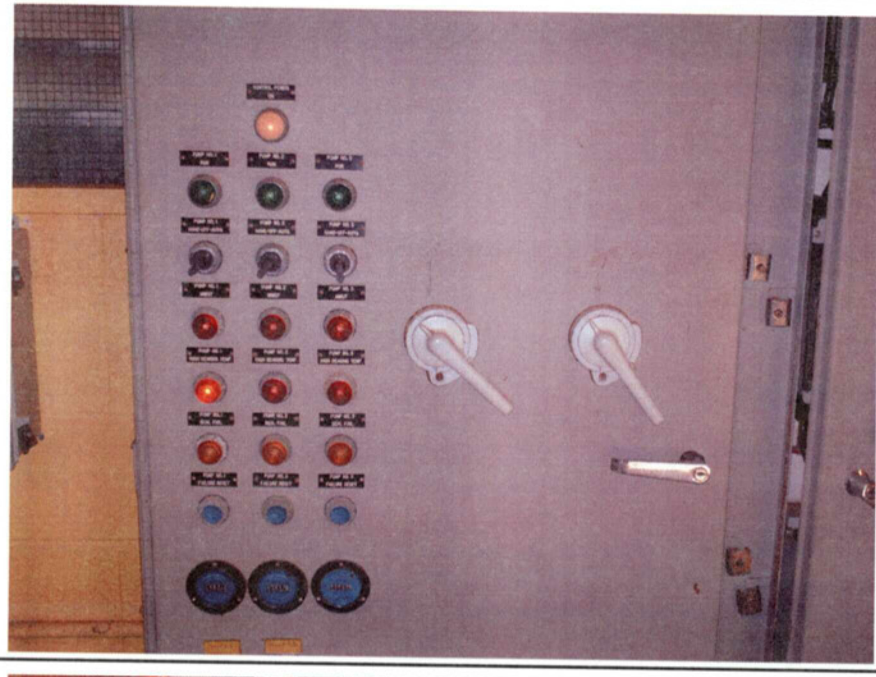
WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW

TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: **20** LIFT STATION NAME: **Whatley**

GENERAL NOTES

wet well has a sloping bottom

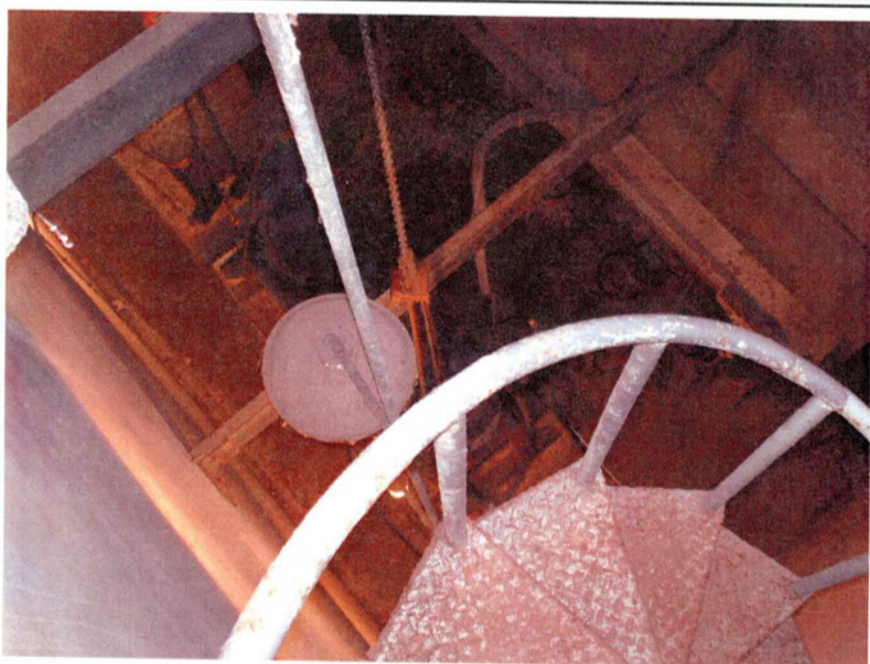


WHATLEY RD LIFT STATION

UPPER LEFT: CONTROL PANEL

LOWER LEFT: INSIDE WET WELL

LOWER RIGHT:



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: **Airport #1** LIFT STATION NAME: **Hwy. 149 A**
LOCATION: north side oil road west off Exxon on Hwy. 149
DATE: April 27, 2006 TIME: 3:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			6

WET WELL AREA (SF): 28.26 GALLONS PER FT: 211

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0		

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D1-D2):	0	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	0	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	0.0	GPM

NO INFLOW

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	30	9.58	11

DIFFERENCE (T2-T1):	0.50	MIN
DIFFERENCE (D2-D1):	1.42	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	300	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	600	GPM
GROSS PUMPING (NET+INFLOW):	600	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	30	11	12.33

DIFFERENCE (T2-T1):	0.50	MIN
DIFFERENCE (D2-D1):	1.33	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	281	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	562	GPM
GROSS PUMPING (NET+INFLOW):	562	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	15	12.33	13.25

DIFFERENCE (T2-T1):	0.25	MIN
DIFFERENCE (D2-D1):	0.92	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	194	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	778	GPM
GROSS PUMPING (NET+INFLOW):	778	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: Airport #1 LIFT STATION NAME: Hwy. 149 A

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	6"
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	6"
FORCE MAIN	8"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

over temp & seal fail lights burning on both pumps, low flow

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: ________ LIFT STATION NAME: **Gregg Tex**
LOCATION: 4800 Gregg Tex Road
DATE: April 19, 2006 TIME: 1:00 ~~A.M.~~ P.M.

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			6

WET WELL AREA (SF): 28.26 GALLONS PER FT: 211

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	0		

DIFFERENCE (T2-T1):	1.00	MIN
DIFFERENCE (D1-D2):	0	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	0	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	0.0	GPM

NO INFLOW

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	30	19.58	20.32

DIFFERENCE (T2-T1):	0.50	MIN
DIFFERENCE (D2-D1):	0.74	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	156	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	313	GPM
GROSS PUMPING (NET+INFLOW):	313	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	15	20.32	20.75

DIFFERENCE (T2-T1):	0.25	MIN
DIFFERENCE (D2-D1):	0.43	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	91	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	364	GPM
GROSS PUMPING (NET+INFLOW):	364	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	1	3	16.58	18.5

DIFFERENCE (T2-T1):	1.05	MIN
DIFFERENCE (D2-D1):	1.92	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	406	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	387	GPM
GROSS PUMPING (NET+INFLOW):	387	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: ________ LIFT STATION NAME: Gregg Tex

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	10
	RPM	
	V	240
	OTHER	1995

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	4"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	10
	RPM	
	V	240
	OTHER	1995

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	6'
SUCTION	
DISCHARGE	4"
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

BRAND		
MODEL		
S/N		
MOTOR:	HP	
	RPM	
	V	
	OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

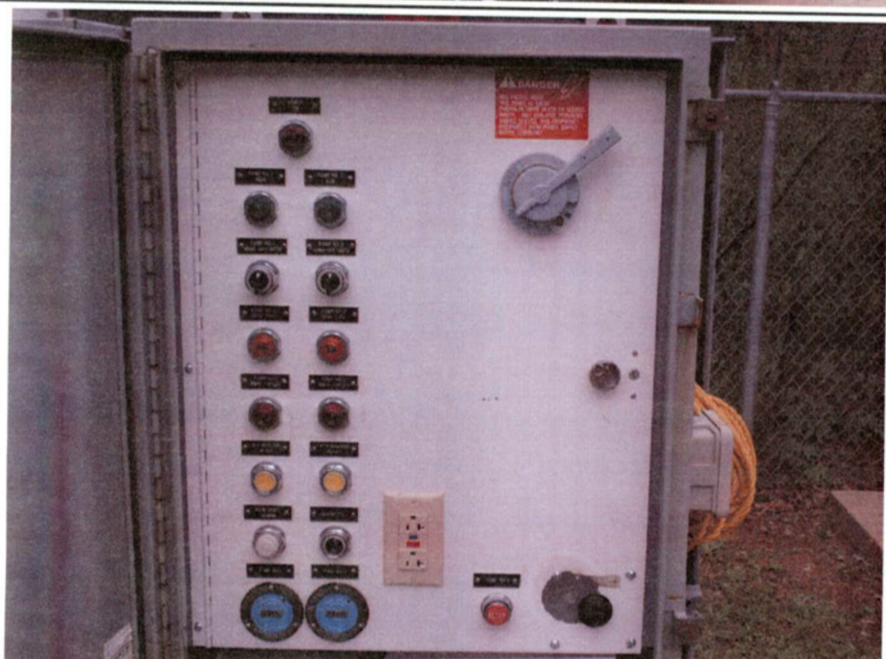
no flow 1 p.m.-2 p.m.

GREGGTEX RD LIFT STATION

UPPER LEFT: INSIDE WET WELL

LOWER LEFT: CONTROL PANEL

LOWER RIGHT: SITE



WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: ________ LIFT STATION NAME: Heritage
LOCATION: 2607 Heritage Blvd.
DATE: April 13, 2006 TIME: 9:00 A.M. ~~P.M.~~

FIELD PARTY: Bob Wink, Hayes Engineering

PUMP TEST

WET WELL:

	LENGTH (FT)	WIDTH (FT)	DIAM. (FT)
DIMENSIONS:			5

WET WELL AREA (SF): 19.625 GALLONS PER FT: 147

CALCULATE INFLOW:

TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	11	30	17.47	17.35

DIFFERENCE (T2-T1):	11.50	MIN
DIFFERENCE (D1-D2):	0.12	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	18	GALLONS
INFLOW (EQUIVALENT GALLONS/(T2-T1)):	1.5	GPM

PUMP TEST:
CALCULATE PUMP 1:

PUMP 1: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	20	17.4	17.71

DIFFERENCE (T2-T1):	0.33	MIN
DIFFERENCE (D2-D1):	0.31	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	46	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	137	GPM
GROSS PUMPING (NET+INFLOW):	138	GPM

PUMP TEST:
CALCULATE PUMP 2:

PUMP 2: N / S / E / W PUMP					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	20	17.44	17.73

DIFFERENCE (T2-T1):	0.33	MIN
DIFFERENCE (D2-D1):	0.29	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	43	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	128	GPM
GROSS PUMPING (NET+INFLOW):	129	GPM

PUMP TEST:
CALCULATE PUMPS 1 & 2:

PUMP 1 & PUMP 2					
TIME 1		TIME 2		DIST 1	DIST 2
(MIN)	(SEC)	(MIN)	(SEC)	(FT)	(FT)
0	0	0	20	17.67	18.04

DIFFERENCE (T2-T1):	0.33	MIN
DIFFERENCE (D2-D1):	0.37	FT
EQUIVALENT GALLONS (D2-D1*GAL/FT):	54	GALLONS
NET PUMPING (EQUIVALENT GALLONS/(T2-T1)):	163	GPM
GROSS PUMPING (NET+INFLOW):	164	GPM

WASTEWATER MASTER PLAN FOR THE CITY OF LONGVIEW
TASK # 4.4 - LIFT STATION INVESTIGATIONS

LIFT STATION #: ________ LIFT STATION NAME: Heritage

NAMEPLATE DATA

PUMP 1: N / S / E / W PUMP

BRAND	
MODEL	
S/N	
MOTOR: HP	
RPM	
V	
OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	5'
SUCTION	
DISCHARGE	
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 2: N / S / E / W PUMP

BRAND	
MODEL	
S/N	
MOTOR: HP	
RPM	
V	
OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	5'
SUCTION	
DISCHARGE	
FORCE MAIN	4"
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

PUMP 3: N / S / E / W PUMP

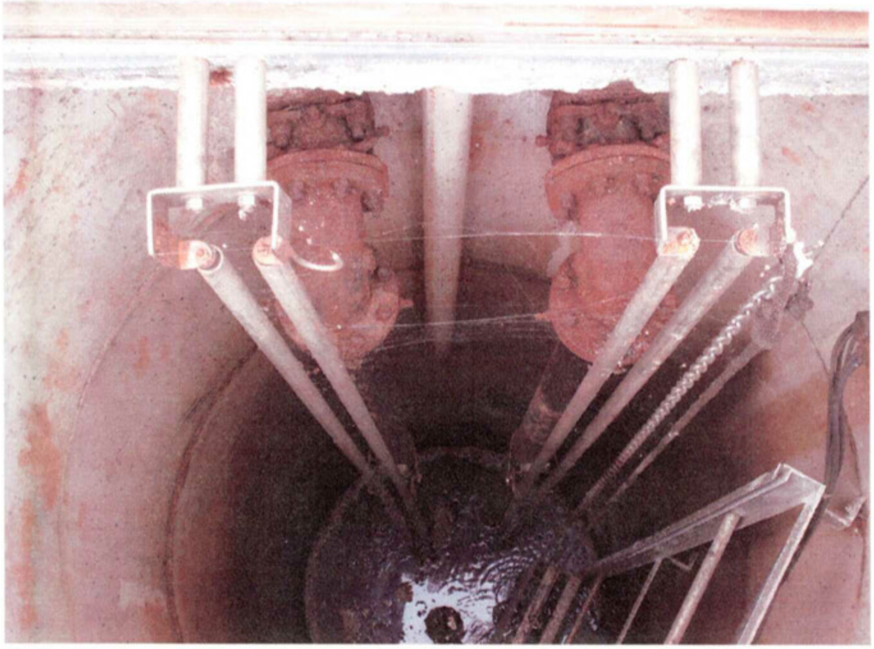
BRAND	
MODEL	
S/N	
MOTOR: HP	
RPM	
V	
OTHER	

NOTES:

FLOODED SUCTION	
DRY PIT	
CONCRETE WET WELL	
SUCTION	
DISCHARGE	
FORCE MAIN	
SELF PRIMER	
STEEL CAN	
SUBMERSIBLE DUPLEX	
GRINDER STATION	
OTHER:	

GENERAL NOTES

8" FL - 186.5" from top (15'-6 1/2"), water service leaking @ hose bib, meter was turned off, discovered when turned meter on to use water

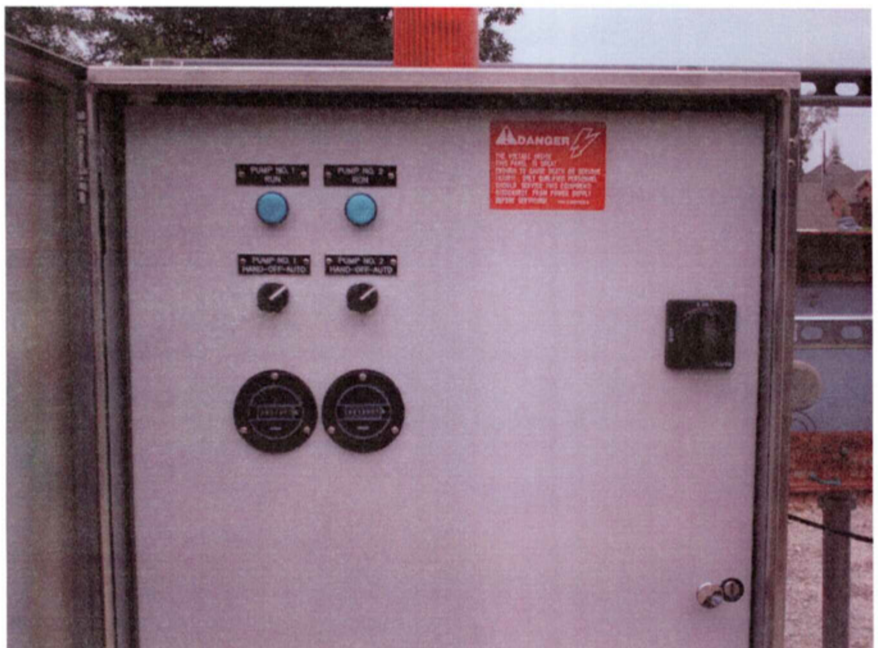


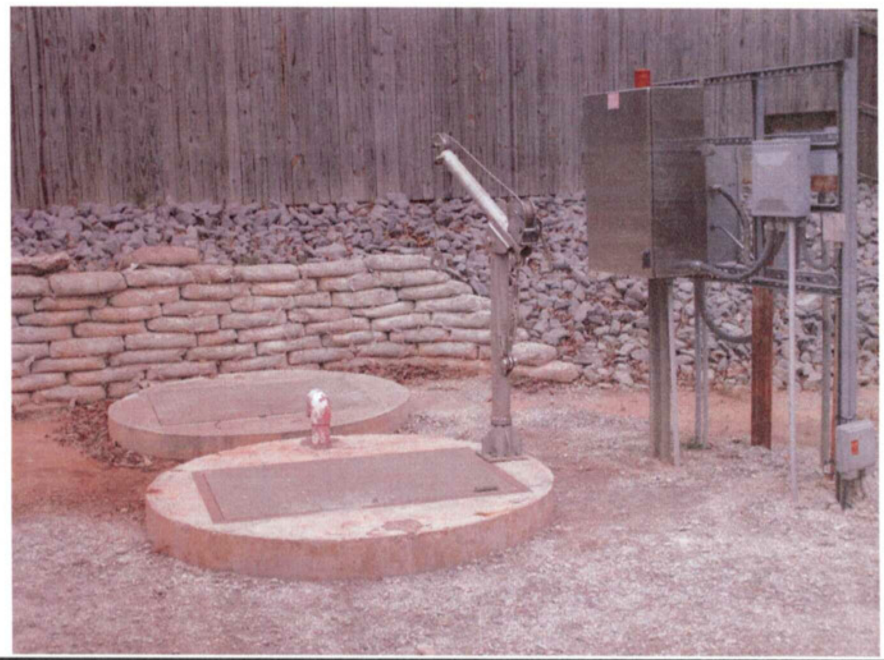
HERITAGE RD LIFT STATION

UPPER LEFT: INSIDE WET WELL

LOWER LEFT: CONTROL PANEL

LOWER RIGHT: SITE





Appendix B – Flow Monitoring Report

July 2008

City of Longview, Texas

Flow Monitoring Report

rjngroup

Excellence through Ownership

12160 Abrams Road, Suite 400, Dallas, TX 75243 • 972-437-4300 • rjndallas@rjn.com

July 9, 2008

Ms. Brenda Gasperich, P.E., CFM
Project Manager
Turner Collie & Braden, Inc.
17300 Dallas Parkway, Suite 1010
Dallas, TX 75248

Subject: Flow Monitoring in City of Longview, Texas

Dear Ms. Gasperich:

According to the February 26, 2008 Engineering Agreement, RJN is pleased to present this Letter Report for the above referenced project. The analyses projected 10.202 mgd of average dry-weather flow and 28.115 mgd of 1-year inflow. All the basins were ranked and prioritized based on inflow in gpd per 1,000 feet as indicated in the report.

If you have any questions regarding this submittal or you require additional information, please do not hesitate to call us.

Very truly yours,
RJN GROUP, INC.

Peter Z. Lai, P.E.
Project Manager

PZL/kb/18-2104-00
Enclosure

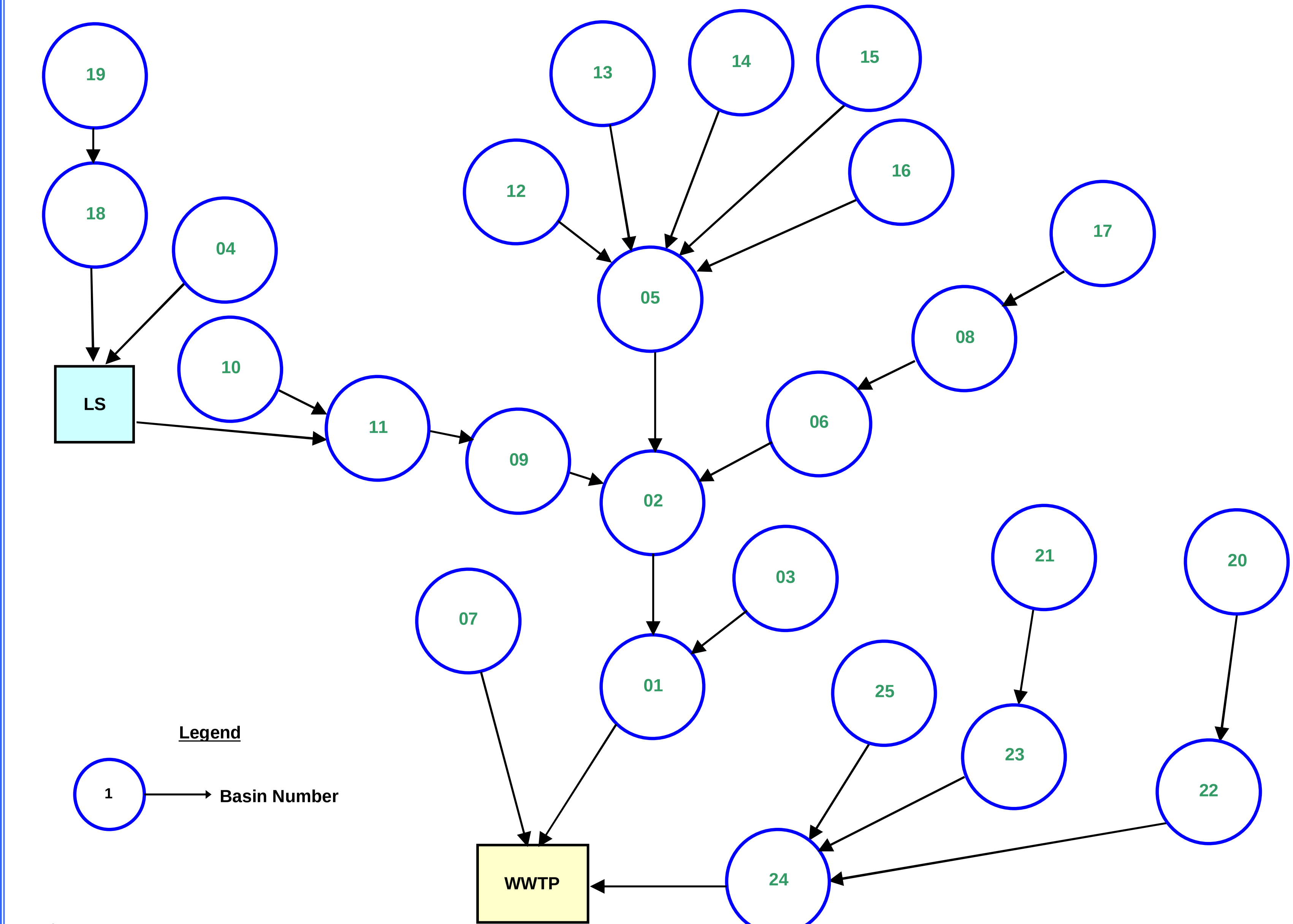
Flow Monitoring

Longview, Texas

A total of twenty-five ISCO meters were used to monitor wastewater flow in the City of Longview, Texas during the period May 10, 2006 to July 10, 2006. The flow monitoring locations are given in Table 1. Eight rain gauges were installed to determine the amount of rainfall that occurred during the above stated period. Rain gauge locations are listed in Table 2. However, none of the recorded rain events during the period were homogenous over the entire city. The large spread of rainfall presented difficulty establishing inflow for the basins monitored.

Therefore, a follow up study was conducted March 6, 2008 to May 6, 2008 using Eight Sigma meters installed at major interceptors monitored during the 2006 Flow monitoring period. Twelve Telog rain gauges were installed to establish a better representation of rainfall distribution. Eight of the rain gauges were placed in the same location as in the 2006 Flow Monitoring Period; the additional four rain gauges were installed at new locations to get a better rain distribution. The additional four rain gauge locations are listed in Table 2. A map showing flow meter and rain gauge locations and basin boundaries is included in the back of this report. A basin flow diagram indicating direction of flow from one basin to another is shown on Exhibit 1. Table 2A lists the rain event dates, total daily rainfall and peak hourly intensity.

Engineering review and input of additional calibration data were performed in order to finalize the flow data collected in the field. Manual depth and velocity readings (Velocity Profiles) were taken on a weekly basis to verify the metered data. Average flow rates for one hour intervals were determined for each monitor location. The hourly, average flow rates from the flow monitoring period in 2006 were used to determine dry-weather flow rates. Wet-weather flow rates were determined using the eight meters installed in 2008 and the 2006 monitoring locations not monitored in 2008. Flow data collected during the rainfall events was evaluated to determined peak instantaneous inflow rates.



BASIN FLOW DIAGRAM
CITY OF LONGVIEW, TEXAS
EXHIBIT 1

Table 1

FLOW METER LOCATIONS
CITY OF LONGVIEW, TEXAS

Meter Basin	Manhole Number	Address	Pipe Width (in)
01	See Map	In easement across from treatment plant	57.06
02	See Map	Off of Sabine	57.06
03	See Map	Near Bird Song and Loop 281	22.88
04	LF5006	2100 Rocking B Ranch Road	14.31
05	GR0400	Off of Kings Mountain Drive	43.75
06	GR1421	823 Marshall Avenue W	30.75
07	GR0119	1102 W. Cotton Street	14.44
08	GU9172	Near intersection of Johnston and Judson	31.25
09	See Map	918 Marshall	37.94
10*	LF0053	514 Pine Tree	11.62 / 18
11	HR1042	Near Marshall and Mosley	37.81
12	EV0002	1428 Fairmont Street	17.75
13	See Map	601 W. Loop 281	17.38
14	See Map	Off of Hawkins Parkway	24.62
15	See Map	In golf course off of Loop 281	15.00
16	See Map	In golf course off of Loop 281	17.85
17	JN1003		18.75
18	See Map	6801 Tenneryville Road	17.62
19	See Map	Off of Tenneryville Road	17.75
20	EC0064	2205 Hwy 80	14.81
21	IB1048	809 S. Eastman Road	17.25
22	EL0032	Near Gum Spring Road and Eastman Road	30.94
23	See Map	2920 Estes Parkway	20.50
24	CB4003	1198 FM1845	37.33
25	See Map	Off of Birdsong near Loop 281	7.62

** Pipe size changed from 12” in 2006 to 18” in 2008.*

Table 2

RAIN GAUGE LOCATIONS
CITY OF LONGVIEW, TEXAS

Rain Gauge No.	Location
1	Pump Station behind Exxon at Estes Parkway
2	Pump Station at Hwy. 80 & Loop 281
3	WWTP at Loop 281
4	Fast Trac
5	Harrison No. 1 Pump Station
6	399 Whatley Road
7	Pump House at Oak Forrest Sport Club at Loop 281
8	2126 Alpine Behind Hayes Eng.
9	305 Pinetree (Texas Cash Register building)
10	3800 Gilmer Rd.
11	201 South Hawkins (School Aquatic Center)
12	4508 McCan Fire station #8

Table 2A

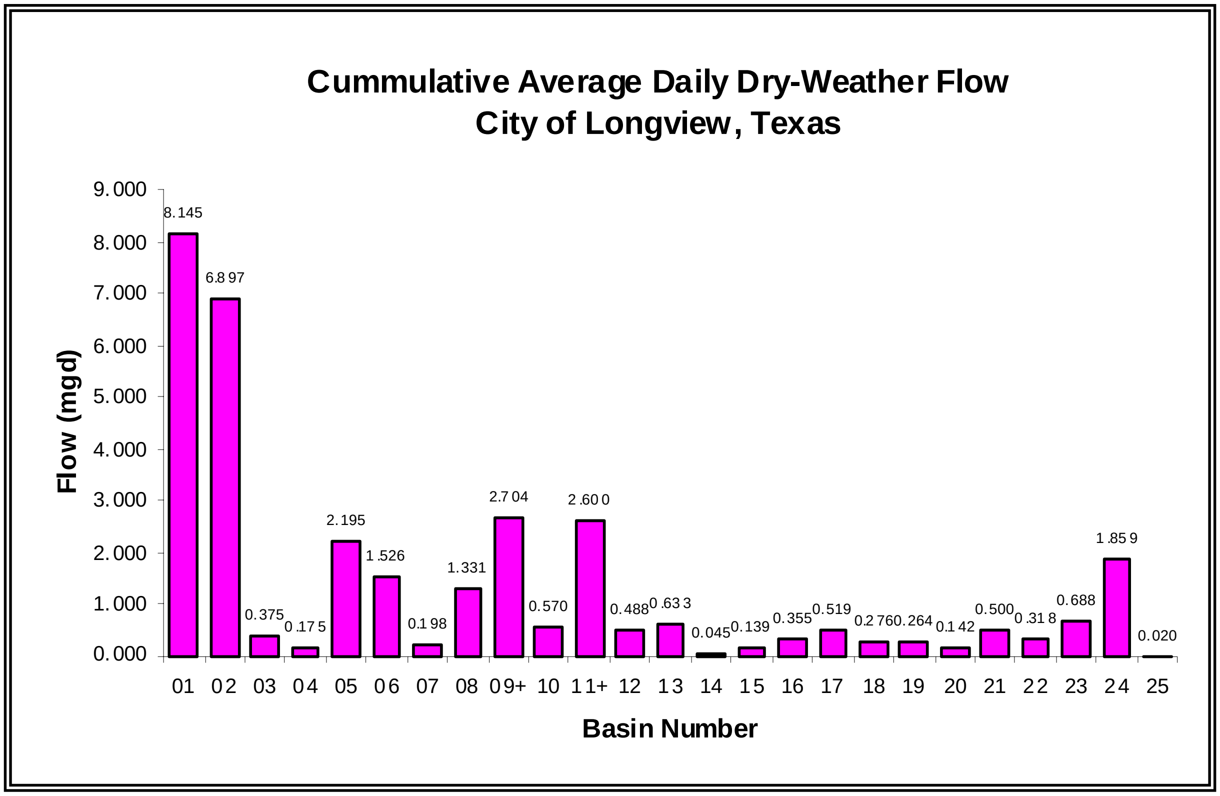
RAINFALL SUMMARY

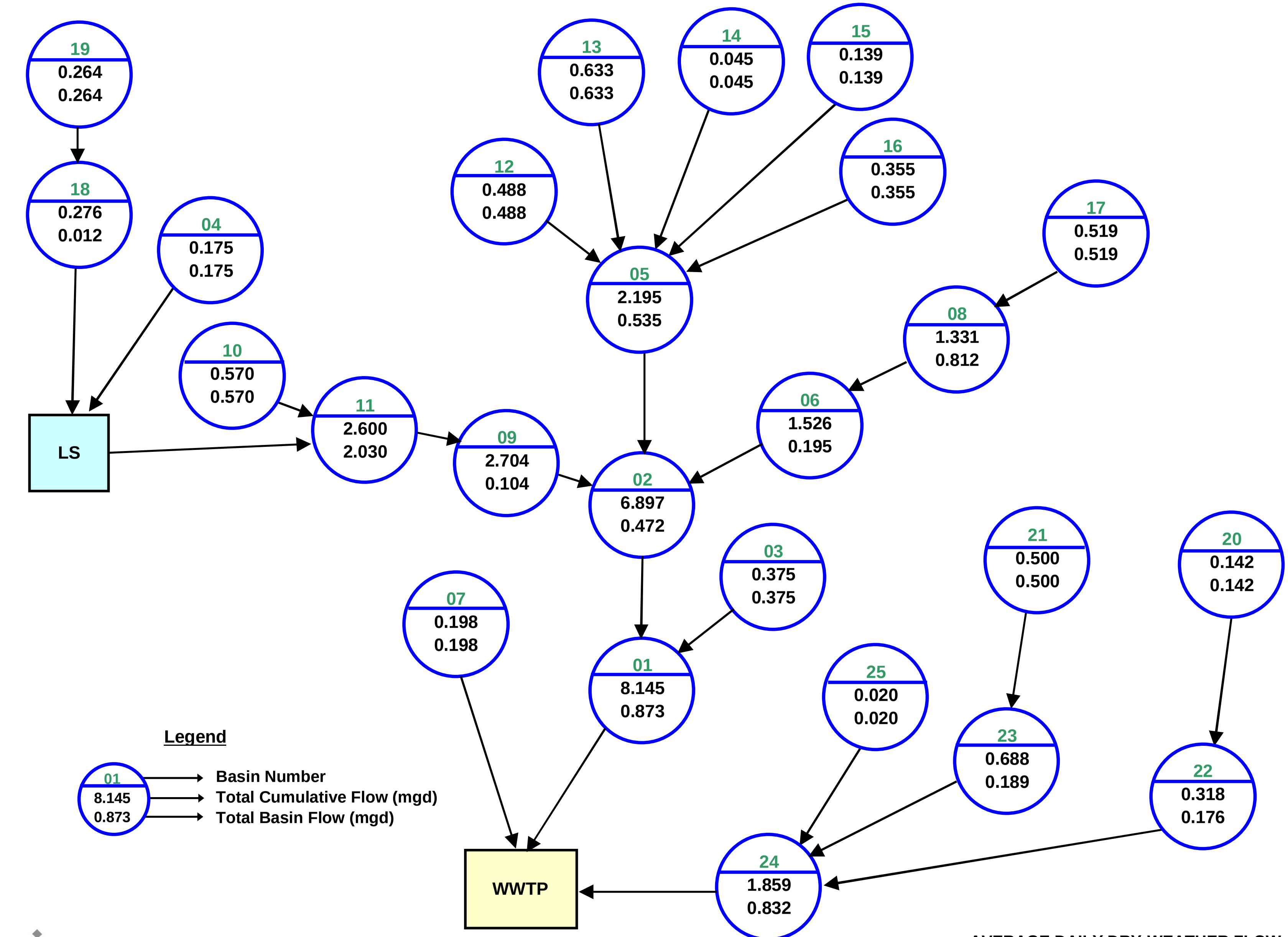
Date 2008	Average Daily Rainfall (in)	Peak 60-Minute Rainfall Intensity (in/hr)	Date 2008	Average Daily Rainfall (in)	Peak 60-Minute Rainfall Intensity (in/hr)
6-Mar	**0.825**	0.244	7-Apr	0.000	
7-Mar	**0.390**	0.071	8-Apr	**0.111**	
8-Mar	0.000		9-Apr	**0.054**	0.039
9-Mar	0.000		10-Apr	**0.651**	0.506
10-Mar	**0.538**	0.158	11-Apr	**0.094**	0.093
11-Mar	**0.116**	0.032	12-Apr	**0.001**	
12-Mar	0.000		13-Apr	**0.085**	
13-Mar	0.000		14-Apr	**0.086**	0.054
14-Mar	**0.002**		15-Apr	0.000	
15-Mar	0.000		16-Apr	0.000	
16-Mar	0.000		17-Apr	0.000	
17-Mar	0.000		18-Apr	**0.695**	0.445
18-Mar	**1.145**	0.957	19-Apr	0.000	
19-Mar	**0.157**	0.063	20-Apr	0.000	
20-Mar	0.000		21-Apr	0.000	
21-Mar	0.000		22-Apr	0.000	
22-Mar	0.000		23-Apr	0.000	
23-Mar	0.000		24-Apr	**0.158**	0.108
24-Mar	0.000		25-Apr	0.000	
25-Mar	0.000		26-Apr	0.000	
26-Mar	0.000		27-Apr	**0.460**	0.392
27-Mar	0.000		28-Apr	0.000	
28-Mar	**0.003**		29-Apr	0.000	
29-Mar	**0.911**	0.802	30-Apr	0.000	
30-Mar	**4.137**	1.206	1-May	0.000	
31-Mar	0.000		2-May	**0.838**	0.710
1-Apr	**0.016**	0.015	3-May	0.000	
2-Apr	0.000		4-May	0.000	
3-Apr	0.000		5-May	0.000	
4-Apr	**0.918**	0.428	6-May	**0.091**	0.079
5-Apr	0.000		7-May	**1.334**	0.746
6-Apr	0.000		8-May	0.000	

Determination of Average Daily Dry-Weather Flow

Flow data collected during dry-weather/low-groundwater periods was analyzed to determine the average daily dry-weather flow for each basin. The dry-weather period selected for this analysis was from May 17 through May 23, 2006. The analysis determined that the average daily dry-weather flow for the City of Longview is approximately 10.202 mgd.

A summary of average daily dry-weather flow by basin is given in Table 3 and is shown graphically below. A basin flow diagram giving average daily dry-weather flow by basin is shown on Exhibit 2. Hydrographs of the dry-weather period for each basin are included in the Appendix at the end of this report.





rjngroup
Excellence through Ownership

AVERAGE DAILY DRY-WEATHER FLOW
CITY OF LONGVIEW, TEXAS
EXHIBIT 2

Table 3

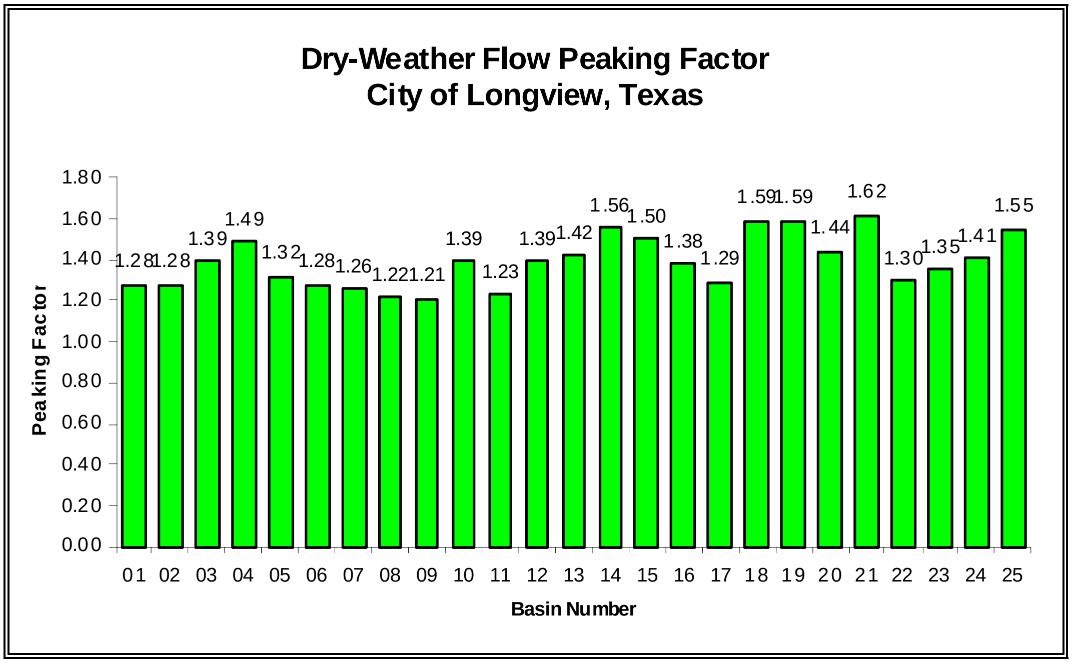
AVERAGE DAILY DRY-WEATHER FLOW
CITY OF LONGVIEW, TEXAS

Meter Basin	**Cumulative Average Daily Dry-Weather Flow (mgd)**	**Basin Average Daily Dry-Weather Flow (mgd)**
01	8.145	0.873
02	6.897	0.472
03	0.375	0.375
04	0.175	0.175
05	2.195	0.535
06	1.526	0.195
07	0.198	0.198
08	1.331	0.812
09+	2.704	0.105
10	0.570	0.570
11+	2.600	1.579
12	0.488	0.488
13	0.633	0.633
14	0.045	0.045
15	0.139	0.139
16	0.355	0.355
17	0.519	0.519
18	0.276	0.012
19	0.264	0.264
20	0.142	0.142
21	0.500	0.500
22	0.318	0.176
23	0.688	0.189
24	1.859	0.832
25	0.020	0.020
Total		10.203

+ *Basin 11 Combined into Basin 09.*

Average Daily Dry-Weather Flow Peaking Factor

Wastewater flow during dry-weather periods will vary during the day in response to water consumption. By examining the diurnal curves for each monitored drainage basin, a peaking factor was determined. The peaking factor is the ratio of the peak hourly dry weather flow rate and the average daily flow. Peaking factors for the City of Longview varied from 1.21 to 1.62 and are given for each basin in Table 4 and shown graphically below.



Infiltration Conditions

Infiltration may enter the system through pipe joints, sewer line defects (including main sewer lines and building sewer lines), and defective manhole walls, benches, and pipe seals. There are two types of infiltration that can be determined during a study, permanent infiltration and peak infiltration. Permanent infiltration is defined as extraneous flow that enters the sewer system through the ground during periods of dry-weather and low-groundwater. Peak infiltration is defined as the maximum extraneous flow that enters the sanitary sewer system during high-groundwater conditions after the inflow effects of a rain event have ended. Peak infiltration was used to evaluate the effects of infiltration on the sewer system.

Table 4

DRY-WEATHER FLOW PEAKING FACTOR
CITY OF LONGVIEW, TEXAS

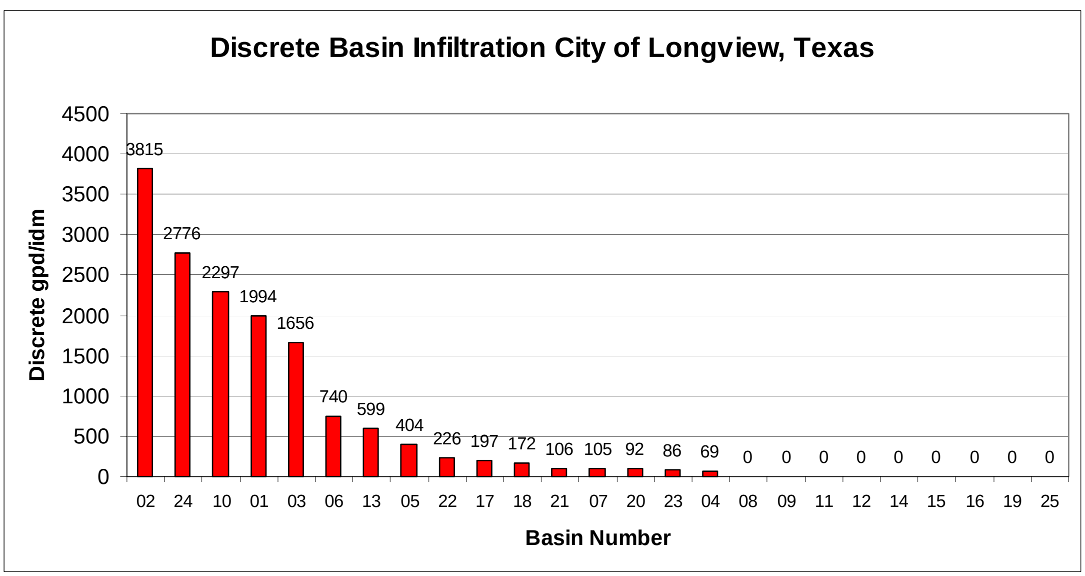
Meter Basin	Cumulative Average Daily Dry-Weather Flow (mgd)	Cumulative Peak Hourly Flow Rate (mgd)	Cumulative Average Daily Dry-Weather Flow Peaking Factor
01	8.145	10.445	1.28
02	6.897	8.831	1.28
03	0.375	0.520	1.39
04	0.175	0.260	1.49
05	2.195	2.900	1.32
06	1.526	1.960	1.28
07	0.198	0.250	1.26
08	1.331	1.630	1.22
09+	2.704	3.270	1.21
10	0.570	0.790	1.39
11+	2.600	3.190	1.23
12	0.488	0.680	1.39
13	0.633	0.900	1.42
14	0.045	0.070	1.56
15	0.139	0.208	1.50
16	0.355	0.490	1.38
17	0.519	0.670	1.29
18	0.276	0.440	1.59
19	0.264	0.420	1.59
20	0.142	0.205	1.44
21	0.500	0.809	1.62
22	0.318	0.414	1.30
23	0.688	0.930	1.35
24	1.859	2.630	1.41
25	0.020	0.031	1.55
			1.39 (Average)

+ *Basin 11 Combined into Basin 09.*

Determination of Peak Infiltration

Determining peak infiltration requires analysis of the flow data obtained during dry-weather/high-groundwater conditions. Care must be exercised in the analysis to exclude days that are too close to rainfall events. This is necessary to avoid including residual inflow (rainfall induced infiltration) that may lead to an overestimation of peak infiltration. Generally, periods following significant rainfall, excluding the day immediately following a rain event, are used for determining peak infiltration.

Analyses of the flow data following major rain events indicated very minor infiltration entering the wastewater collection system. In almost all cases with the exception of two Basins (Basin 02 and Basin 24), the system responded to rainfall with a quick and dramatic increase in flow then returned to almost antecedent level after the rain has stopped. Systems with infiltration problems typically demonstrate a pattern of elevated level of flow after the rain has passed indicating slow percolation of groundwater into the sewer system through pipe defects. Analyses concluded that many basins have negligible infiltration that is beyond the accuracy level of what the meters can measure. Of the few basins with detectable infiltration, the rates expressed in gpd per inch-diameter-mile (idm), gpd/idm of pipe are all below 3,815 as illustrated in the graph below. As a reference, the EPA's threshold for excessive infiltration is 5,000 gpd/idm. As a result of our infiltration study Basin 02 exhibited the highest infiltration at 3,815 gpd/idm, followed by Basin 24 with 2,776 gpd/idm. We believe the City of Longview wastewater collection system does not appear to have an infiltration problem. The flow monitoring period for 2008 demonstrated favorable wet weather and ground saturation conditions for infiltration analysis.

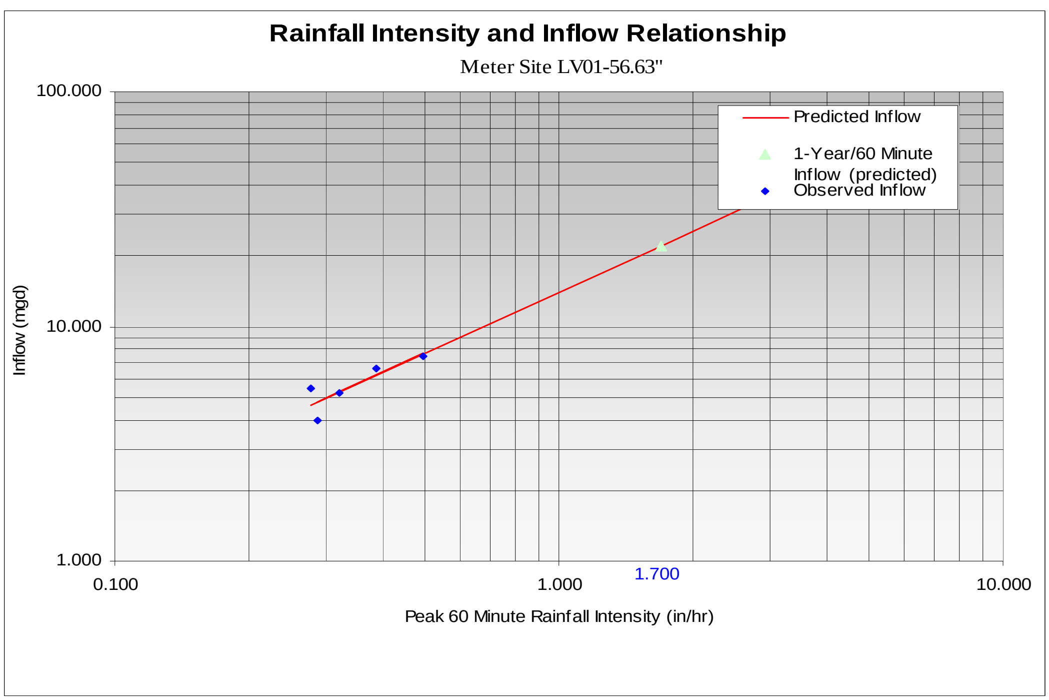


Inflow Conditions

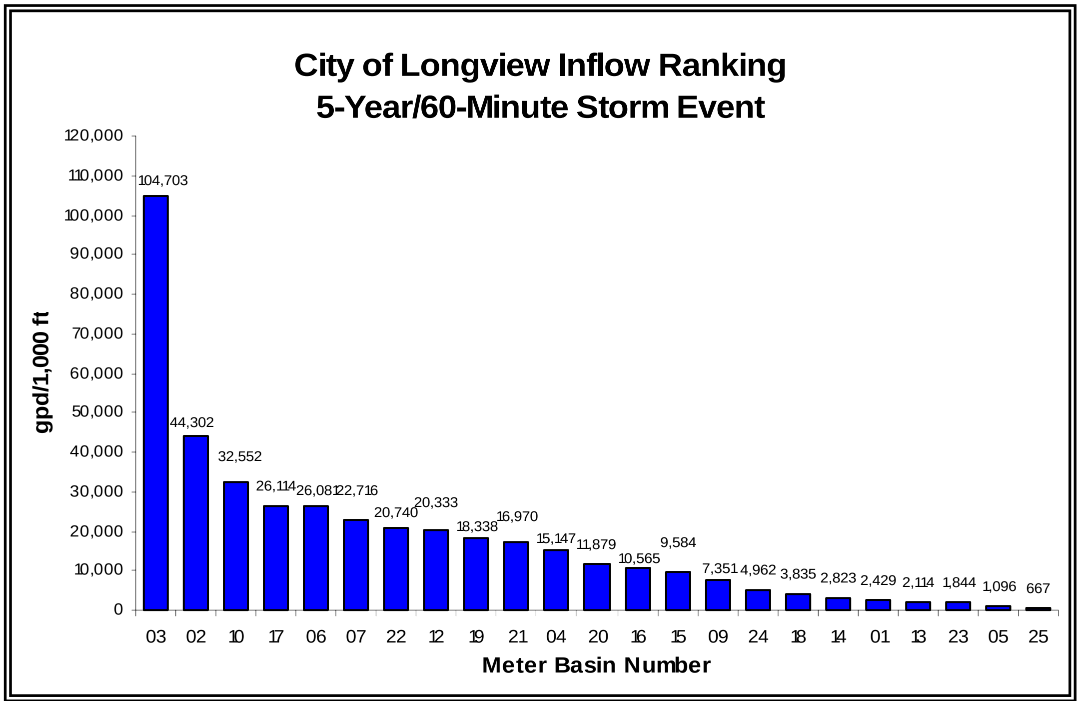
Inflow in a sanitary sewer system is defined as extraneous flow that is a direct result of stormwater runoff. Inflow may enter the sanitary sewer system through directly connected downspouts, area drains, cleanouts, and building sewers. Stormwater may also enter the system through direct or indirect connections between the sanitary sewers and storm drains or ditches and sewer line defects, and through defective manhole covers, frame seals, corbels, and manhole walls.

Determination of Inflow

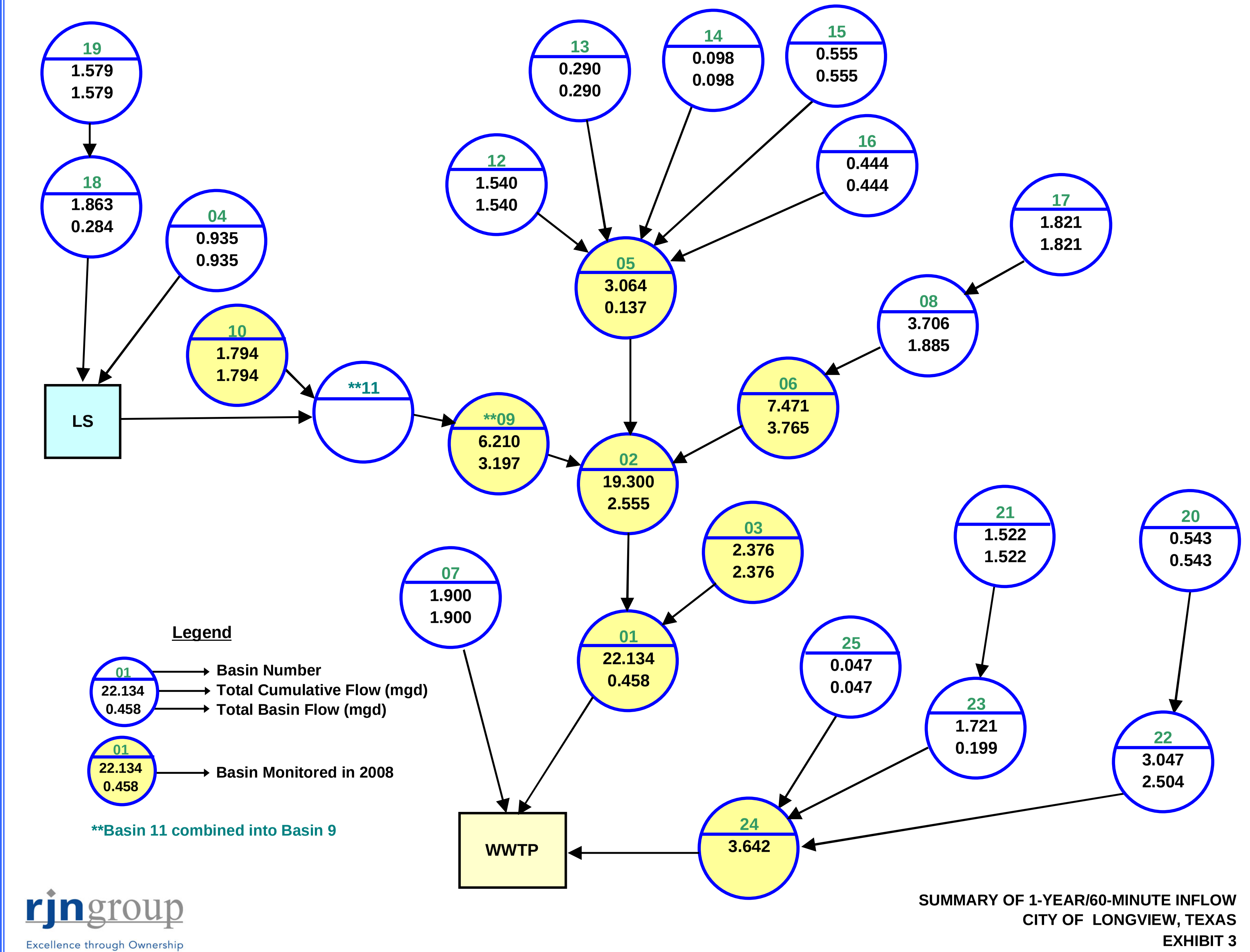
Flow data collected during wet-weather periods is generally analyzed to determine peak inflow originating in each basin. To determine the peak inflow rate, the sum of base flow and infiltration is subtracted from the peak instantaneous flow observed immediately following a rain event. Base flow and infiltration is generally determined from flow data 24 hours prior to the time that the maximum flow rate occurred following the rainfall event. The peak inflow rate is then plotted against the 60-minute rainfall intensity for the corresponding rain event. Regression analysis is then used to determine the "best fit" relationship between the various sets of data points, as shown below. Generally, several storm events of various intensities are required to establish the rainfall intensity/inflow relationship. It is also important to use rain events that do not surcharge the sewer system. Using data from rain events that surcharge the sewer system would greatly underestimate the inflow potential in each basin.



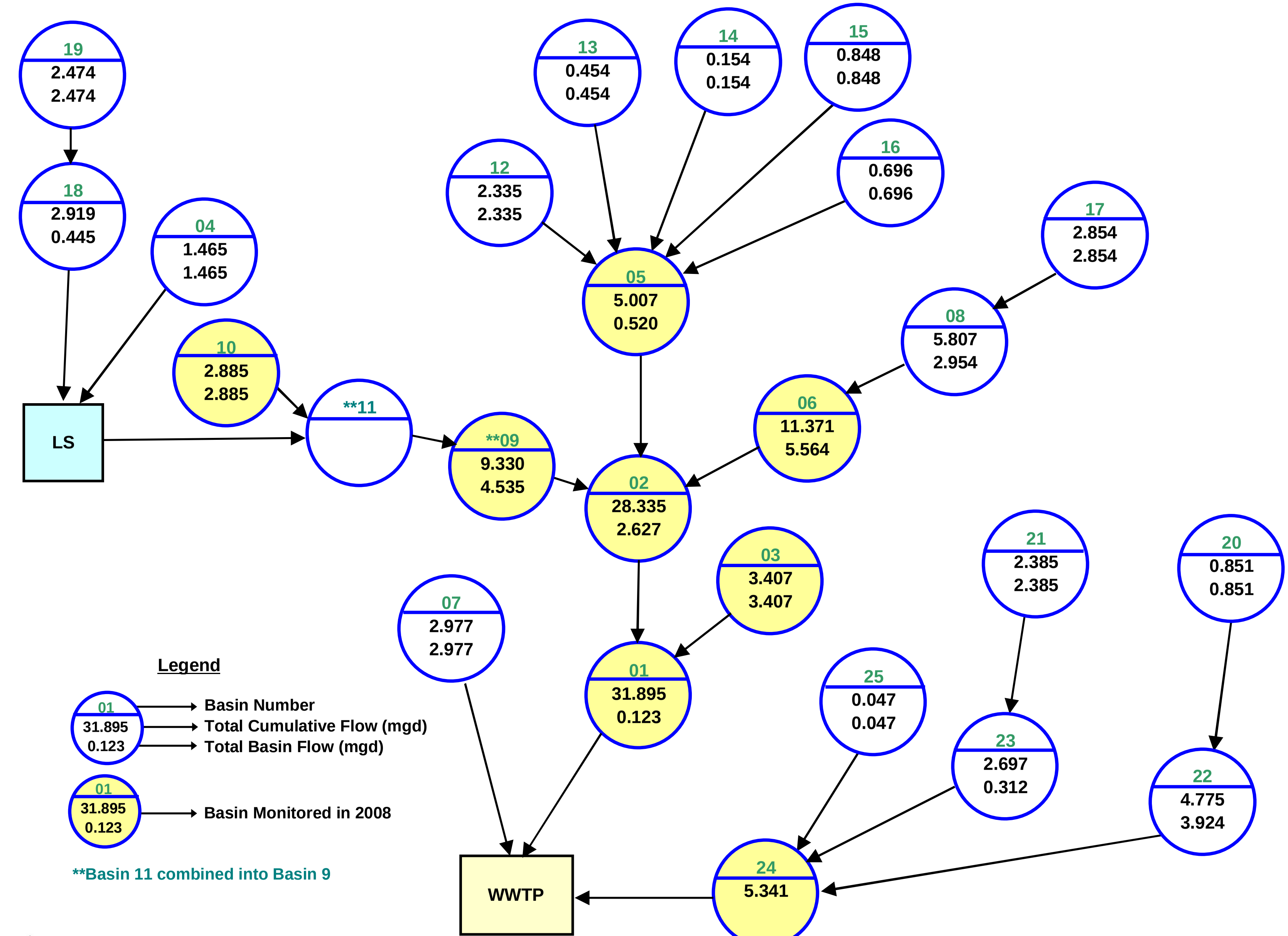
The analysis projected the peak 1-year/60-minute storm (1.70 inches/hour) inflow rate to be 28.115 mgd. A summary of the projected peak wet-weather flow rates during a 1-year/60-minute storm event is given in Table 5 and shown graphically below. The basin unit inflow rate is expressing the magnitude of peak inflow relative to other basins. A basin flow diagram giving 1-year/60-minute storm inflow rates is shown on Exhibit 3, while 5-year/60-minute storm (2.60 inches/hour) inflow rates are shown on Exhibit 4.



During the 2008 flow monitoring period, eleven rain events were recorded with a peak 60-minute rainfall intensity greater than 0.15 inches/hour. These intensities ranged from 0.15 inches/hour to 1.21 inches/hour. Every effort was made to identify the best matched rain gauges for each basin based on the timing and magnitude of meter response. The results of the inflow analysis are based on the available rain events during the flow monitoring period. Basin 9 was combined into Basin 11 during the 2008 study to allow for better comparison to the data collected during the 2006 Flow Monitoring period. The rain events recorded during the 2008 Flow monitoring period should provide adequate data in the subsequent hydraulic model calibration and validation for the basins that were re-monitored in 2008. During the 2006 flow monitoring period, most of the rain events were scattered and varied dramatically from one rain gauge to another. In 2008 four (4) additional rain gauges were installed to establish a better representation of rainfall distribution.



SUMMARY OF 1-YEAR/60-MINUTE INFLOW
CITY OF LONGVIEW, TEXAS
EXHIBIT 3



rjngroup
Excellence through Ownership

SUMMARY OF 5-YEAR/60-MINUTE INFLOW
CITY OF LONGVIEW, TEXAS
EXHIBIT 4

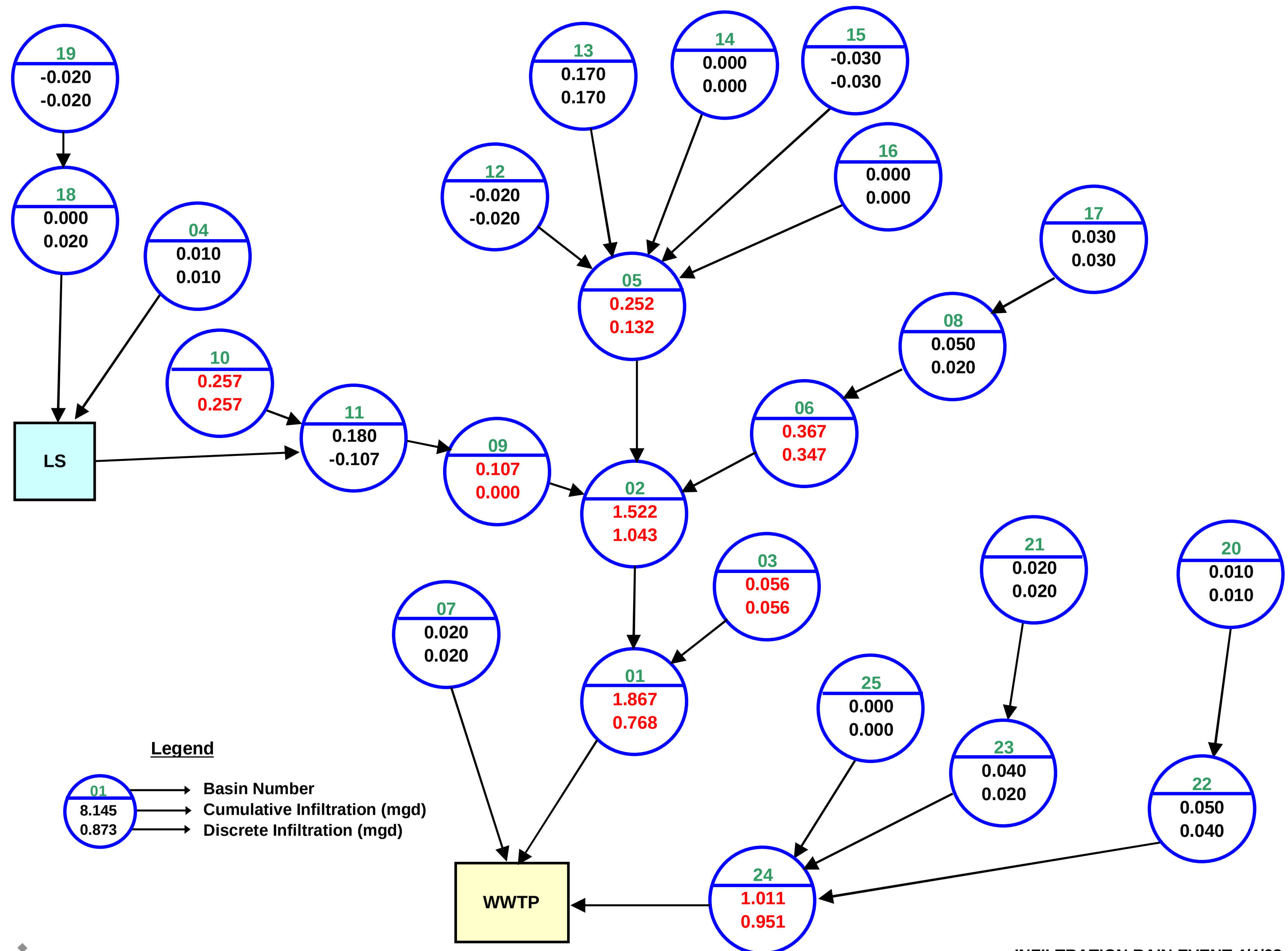
Table 5

SUMMARY OF INFLOW RATES
CITY OF LONGVIEW, TEXAS

Meter Basin	Length (lf)	Basin Peak 1-Year/60-Minute Discrete Inflow (mgd)	Basin Peak 5-Year/60-Minute Discrete Inflow (mgd)	Basin Peak 1-Year/60-Minute Discrete Inflow (gpd/1,000 ft)	Basin Peak 5-Year/60-Minute Discrete Inflow (gpd/1,000 ft)	Rank
01	288,194	0.458	0.700	1,589	2,429	19
02	88,213	2.555	3.908	28,964	44,302	2
03	34,698	2.376	3.633	68,477	104,703	1
04	94,408	0.935	1.430	9,904	15,147	11
05	191,638	0.137	0.210	715	1,096	22
06	331,312	5.650	8.641	17,053	26,081	5
07	127,925	1.900	2.906	14,852	22,716	6
08	1/	N/A	N/A	N/A	N/A	N/A
09	336,842	1.618	2.476	4,803	7,351	15
10	84,266	1.794	2.743	21,290	32,552	3
11	N/A+	N/A+	N/A+	N/A+	N/A+	N/A+
12	115,822	1.540	2.355	13,296	20,333	8
13	209,580	0.290	0.443	1,384	2,114	20
14	53,127	0.098	0.150	1,845	2,823	18
15	88,585	0.555	0.849	6,265	9,584	14
16	64,266	0.444	0.679	6,909	10,565	13
17	106,646	1.821	2.785	17,075	26,114	4
18	63,501	0.284	0.434	4,472	6,835	16
19	131,693	1.579	2.415	11,990	18,338	9
20	69,766	0.543	0.830	7,783	11,897	12
21	137,187	1.522	2.328	11,094	16,970	10
22	96,480	1.308	2.001	13,557	20,740	7
23	164,857	0.199	0.304	1,207	1,844	21
24	142,686	0.462	0.708	3,238	4,962	17
25	3.106,465	0.047	0.071	441	667	23
Total	3,128,158	28.115	42.999	268,205 (average)	410,163 (average)	

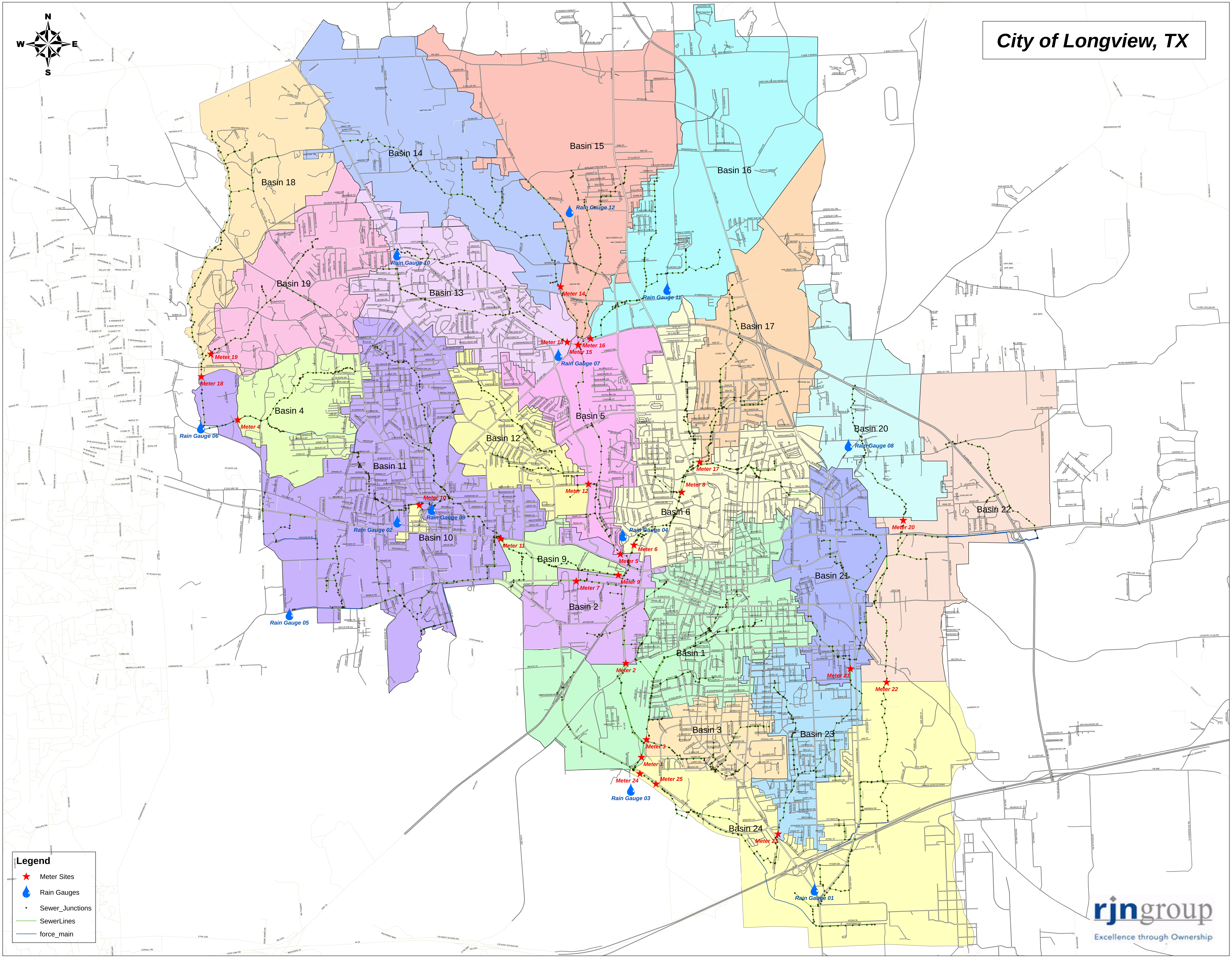
1/ *Exact basin boundary is not clear until a more detailed field inspection is completed. Footage is included with Meter Basin 06.*

N/A+ *Basin 11 combined into Basin 9.*



rjngroup
Excellence through Ownership

INFILTRATION RAIN EVENT 4/4/08
CITY OF LONGVIEW, TEXAS
EXHIBIT 5


City of Longview, TX
N
S
E
W
Basin 1
Basin 2
Basin 3
Basin 4
Basin 5
Basin 6
Basin 9
Basin 10
Basin 11
Basin 12
Basin 13
Basin 14
Basin 15
Basin 16
Basin 17
Basin 18
Basin 19
Basin 20
Basin 21
Basin 22
Basin 23
Basin 24
Meter 1
Meter 2
Meter 3
Meter 4
Meter 5
Meter 6
Meter 7
Meter 8
Meter 9
Meter 10
Meter 11
Meter 12
Meter 13
Meter 14
Meter 15
Meter 16
Meter 17
Meter 18
Meter 19
Meter 20
Meter 21
Meter 22
Meter 23
Meter 24
Meter 25
Rain Gauge 01
Rain Gauge 02
Rain Gauge 03
Rain Gauge 04
Rain Gauge 05
Rain Gauge 06
Rain Gauge 07
Rain Gauge 08
Rain Gauge 09
Rain Gauge 10
Rain Gauge 11
Rain Gauge 12
Legend
Meter Sites
Rain Gauges
Sewer_Junctions
SewerLines
force_main
rjngroup
Excellence through Ownership

Appendix C – 2030 Metropolitan Transportation Plan

TCB
17300 Dallas Parkway, Suite 1010, Dallas, Texas 75248
T 972.735.3000 F 972.735.3001 www.tcb.aecom.com

Memorandum

Date	October 15, 2008
To	Rolin McPhee, P.E.
From	Zubin Sukheswalla, P.E., CFM
Subject	City of Longview Waste Water Master Plan: Population Projections

TCB received population data from the Texas Water Development Board's (TWDB) 2006 Regional Water Plan Population Projections for 2000 – 2060. The data was available at the City/County level and did not contain spatial distribution patterns for the City. Furthermore, there was no commercial/industrial population numbers included in the data. The population data contained information for the City of Longview and Gregg and Harrison Counties. Since the project study area boundaries extend beyond the City limits the TWDB data would require some broad assumptions if it were to be applied to estimate population for areas outside the City limits. Such population estimates would have a larger quotient of error in the areas outside the City limits.

Instead, TCB obtained population data from the City's Metropolitan Transportation Plan (attached) in the form of Traffic Analysis Zones (TAZ). The TAZ data contains residential and employment population numbers for 1998 and 2030, as well as population numbers for special generators (hospitals, schools, public buildings and university areas). The TAZ data extends beyond the project study area with the study area overlaping approximately 180 TAZ polygons. Based on comparison of available TWDB and TAZ population data, it is our professional opinion that the TAZ data is better suited in estimating the population and the sanitary sewer loadings for the project study area.

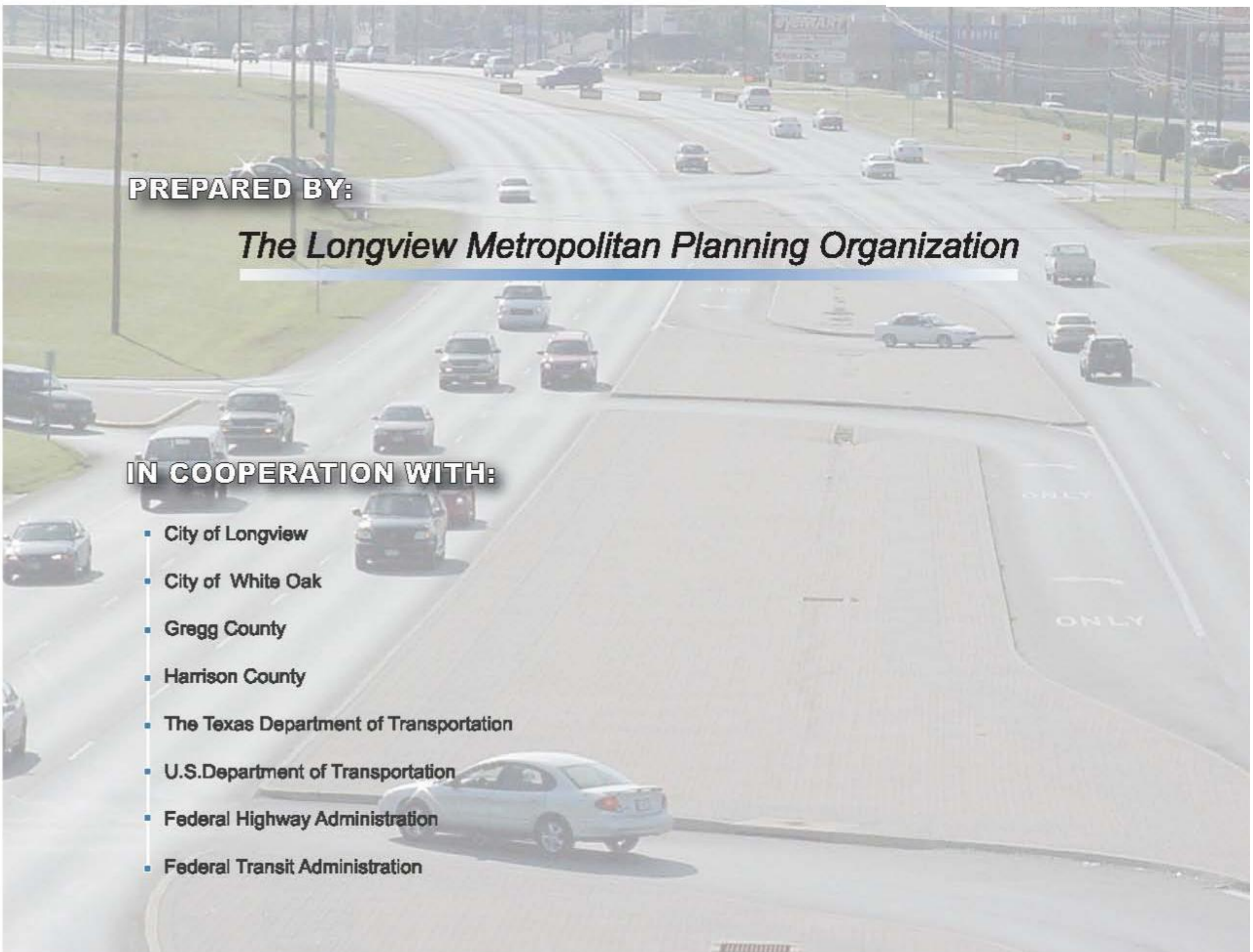
The 180 TAZ polygons determined to be included within the project study area were overlaid with the land use and sewersheds in ArcMap 9.2. Next, residential, commercial, and vacant area percentages were calculated for each individual sewershed based on the TAZ areas for 1998. Finally, residential and commercial populations for each sewershed were calculated based on the TAZ polygon populations and the aforementioned percentage area breakdown (Table C-1).

A TAZ residential and commercial growth rate, from 1998 to 2030, for each individual traffic zone, was calculated. Growth rates for years 2005, 2010, 2015, and 2025 were linearly interpolated from the 1998 to 2030 growth rates (Table C-1). Based on the growth rates and 2005 population numbers, future population for years 2010, 2015, and 2025 were estimated. Finally sanitary flows for each sewershed were calculated based on 100 gallons per capita per day (gpcd) and 25 gallons per capital per day (gpcd) for residential and commercial areas, respectively.

TRANSPORTATION 2030

THE LONGVIEW METROPOLITAN TRANSPORTATION PLAN

Adopted November 18, 2004
Revised January 29, 2008



PREPARED BY:

The Longview Metropolitan Planning Organization

IN COOPERATION WITH:

- City of Longview
- City of White Oak
- Gregg County
- Harrison County
- The Texas Department of Transportation
- U.S.Department of Transportation
- Federal Highway Administration
- Federal Transit Administration

A PATH FOR PURSUING TRANSPORTATION EXCELLENCE

TABLE OF CONTENTS

This Plan has been funded with federal Metropolitan Planning (PL) funds through the Federal Highway Administration, Section 5303 Funds through the Federal Transit Administration, and State of Texas matching funds.

The contents of this report reflect the views of the authors who are responsible for the opinions; findings do not necessarily reflect the views or policies of the Federal Highway Administration, the Federal Transit Administration, or the Texas Department of Transportation.

MTP MAP INDEX

MAP #	DESCRIPTION
I-a	MPO Boundary
II-a	1998 Base Yr. Volume/Capacity
II-b	Residential Permits & Demolitions, 1983 - 1999
II-c	Commercial Permits & Demolitions, 1983 - 1999
II-d	Population Growth, 1998 to 2030
II-e	Employment Growth, 1998 to 2030
II-f	Annual Household Income, 1998
II-g	Annual Household Income, 2030
III-a	Wetlands
IV-a	East Texas Hourglass Conceptual Corridor
IV-b	Major Streets & Highways
IV-c	Loop 281 Design Concept
VI-a	Truck Routes
VI-b	Percent Truck Volume – 2002
VII-a	Longview Transit Routes
X-a	Pavement Quality Index
B-a	Traffic Analysis Zones
C-a	Traffic Counts
D-a	Highway Functional Classification
E-a	National Highway System
F-a	Future Land Use

TRANSPORTATION 2030

METROPOLITAN TRANSPORTATION PLAN
FOR THE LONGVIEW METROPOLITAN AREA
1998-2030

Introduction

The transportation network is an essential element in advancing the economy, safety and the quality of life for the community. Simply stated, a transportation system is a means of moving people and goods. The costs of a transportation system are not only the direct costs of concrete, steel, and asphalt, but also the indirect costs: the drivers' cost for vehicles, fuel, and time; the cost to society in environmental impacts; and the cost in lives and injuries related to accidents. A transportation system which limits mobility for certain segments of the population, such as the disabled or elderly, restricts their ability to support and care for themselves and increases their dependence on social services and charitable organizations, thus shifting additional costs to the community. All these costs must be considered in planning for an efficient and affordable transportation system for the future. Investments in our transportation system provide various benefits, such as improving access to jobs, the efficient movement of freight, promoting safety and preserving the pavement integrity of the existing transportation infrastructure.

The Metropolitan Transportation Plan is Longview's strategy to respond to the transportation needs of the community for the next twenty-five years. It includes plans for meeting existing and projected transportation needs identified through the continuing, comprehensive, and cooperative planning efforts of the Longview Metropolitan Planning Organization.

This is the fourth major transportation plan for the Longview Metropolitan Area developed under the auspices of the Metropolitan Planning Organization. The Metropolitan Area encompasses the cities of Longview and White Oak, as well as portions of Gregg, Harrison, Rusk, and Upshur Counties. (Refer to Map I-a for boundary) The initial concept for the thoroughfare plan was published in 1965. This effort was updated and expanded after the establishment of the Metropolitan Planning Organization, with updates published in 1976, 1988, 1994 and 1999.

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) was signed into law. This transportation bill placed a renewed emphasis on planning, and outlined new requirements for developing transportation plans. Plans must address multiple transportation modes and consider a number of transportation issues, including connectivity, land use, and management systems. Efficient use of existing systems is emphasized. The current update broadens the approach of the earlier plans by including other transportation modes, such as bicycle and pedestrian transportation, and by including strategies for maintaining and enhancing existing transportation systems. A precedent setting component of ISTEA is the requirement that a financial element must be included in the long-range plan and the Transportation Improvement Program. The purpose of the financial plan element is to demonstrate consistency of proposed transportation investments with currently available, projected and proposed sources of revenue.

The reauthorization of ISTEA, known as the Transportation Equity Act for the 21st Century (TEA-21), was formally approved into law by President Clinton on June 9, 1998. TEA-21 reinforces and retains the metropolitan transportation planning process goals and concepts of ISTEA. Specifically, TEA-21 is designed to meet the challenges of improving safety as traffic continues to increase at record levels, protecting and enhancing communities and the natural environment as we provide transportation, and advancing America's economic growth and competitiveness domestically and internationally through efficient and flexible transportation. Although, TEA-21 expired on October 1, 2003, Congress issued several extensions in 2003 & 2004 until the reauthorization can be finalized and consented within the approval of both the House & Senate.

The Metropolitan Transportation Plan was prepared with the assistance and cooperation of many public entities and private citizens, and success in preparing the plan and achieving its implementation will be due in large measure to their efforts. Refer to the appendix section of this document, Appendix F, for acknowledgements.

Transportation Plan Objectives

The objectives of this long-range transportation plan are:

1. To develop a unified transportation plan encompassing all transportation modes that will effectively accommodate future growth for a twenty-five year period and address the mobility needs of all residents.

2. To promote efficient use of existing transportation systems.

3. To identify and prioritize improvements to transportation systems to enable transportation development to occur in conjunction with future development of the urban area.

4. To identify and preserve transportation corridors for future growth.

5. To evaluate the resources of the community and to implement necessary improvements.

6. To develop methods of maintaining existing infrastructure.

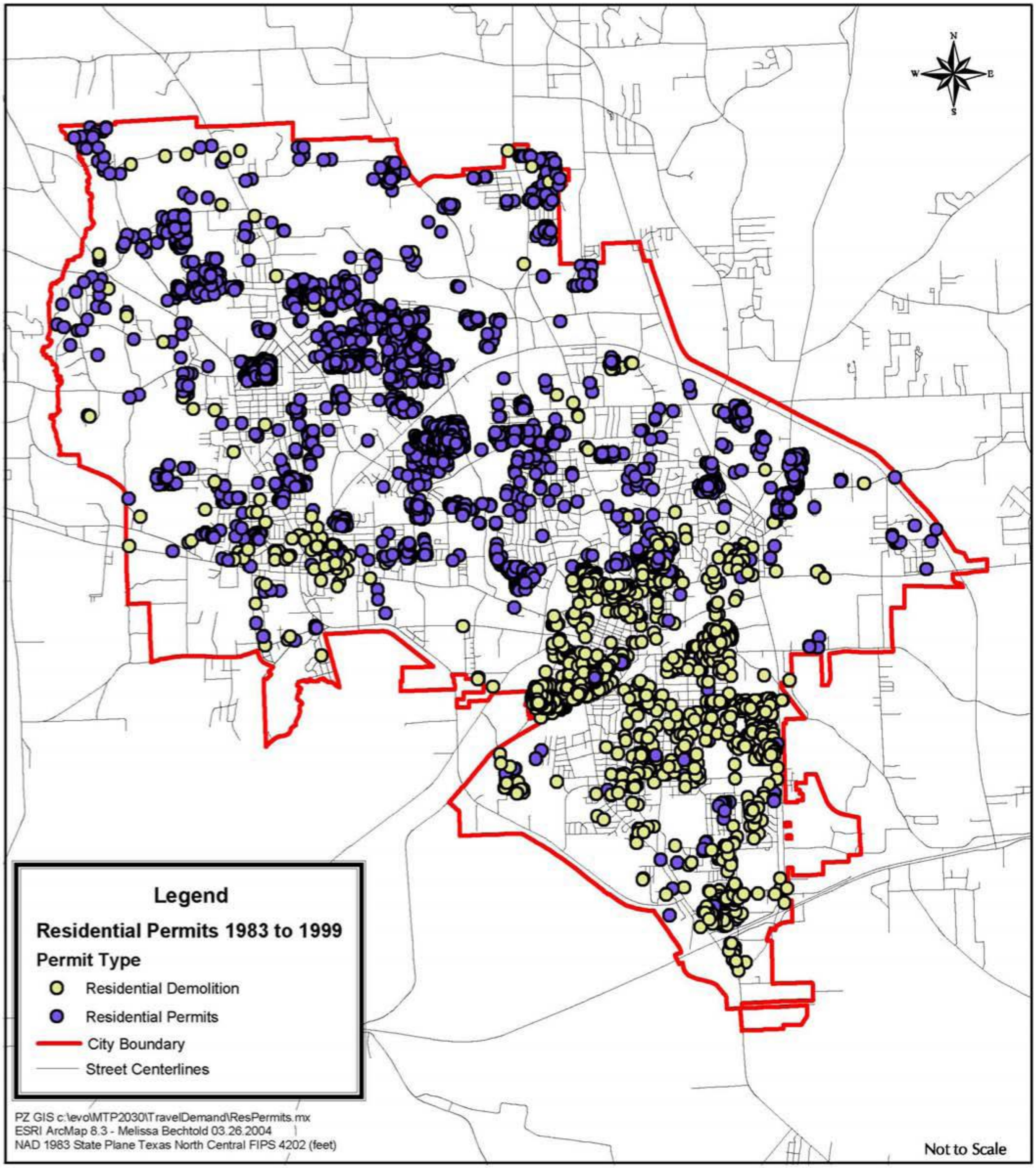
Transportation Planning Process

Transportation planning is a process of projecting future transportation needs, investigating and evaluating alternative actions for meeting those needs, assessing the financial ability of the community to implement those actions, and recommending reasonable strategies based on needs and available resources. Elected officials and others in decision-making roles need access to this information to help them develop policies, programs, and projects.

The transportation planning process is continuous. Conditions affecting the transportation system, such as population growth, land use patterns, employment changes and traffic volumes are monitored. All transportation modes for the entire metropolitan area are studied and addressed in a comprehensive manner. The transportation planning process is structured to include cooperative input and direction from participating cities, counties, agencies, and the public.

As an urbanized area with a population of over 50,000, the City of Longview was designated as a Metropolitan Planning Organization (MPO) by the Governor. The MPO is governed by a Policy Committee composed of elected officials and senior staff members from Longview, White Oak, Gregg County, Harrison County, and the Texas Department of Transportation. Representatives of the Federal Highway Administration, The Texas Commission on Environmental Quality (TCEQ), the Texas Department of Transportation-Aviation Division, and the State Representatives serve as non-voting members of the Policy Committee. The MPO Technical Committee, constituted of staff members from participating public entities and agencies, develop policies, plans, and projects for recommendation to the Policy Committee. The Citizens Advisory Committee also reviews plans and projects and assists with public involvement and participation. Daily operations of the MPO are accomplished by the City of Longview Planning Department staff. Federal metropolitan planning funds and state matching funds for transportation planning are provided to the MPO through the Texas Department of Transportation. The Longview Metropolitan Planning Organization's website is www.ci.longview.tx.us/services/metropolitan_planning_organization_mpo.

The Metropolitan Transportation Plan development process involves data collection and analysis, socioeconomic data projection, special studies and citizen input. The Metropolitan Transportation Plan serves as a framework for project development, and guides public entities in selecting projects from the Plan for implementation through the State's Transportation Improvement Program (TIP), the City of Longview's Capital Improvements Program (CIP), and other transportation programs.



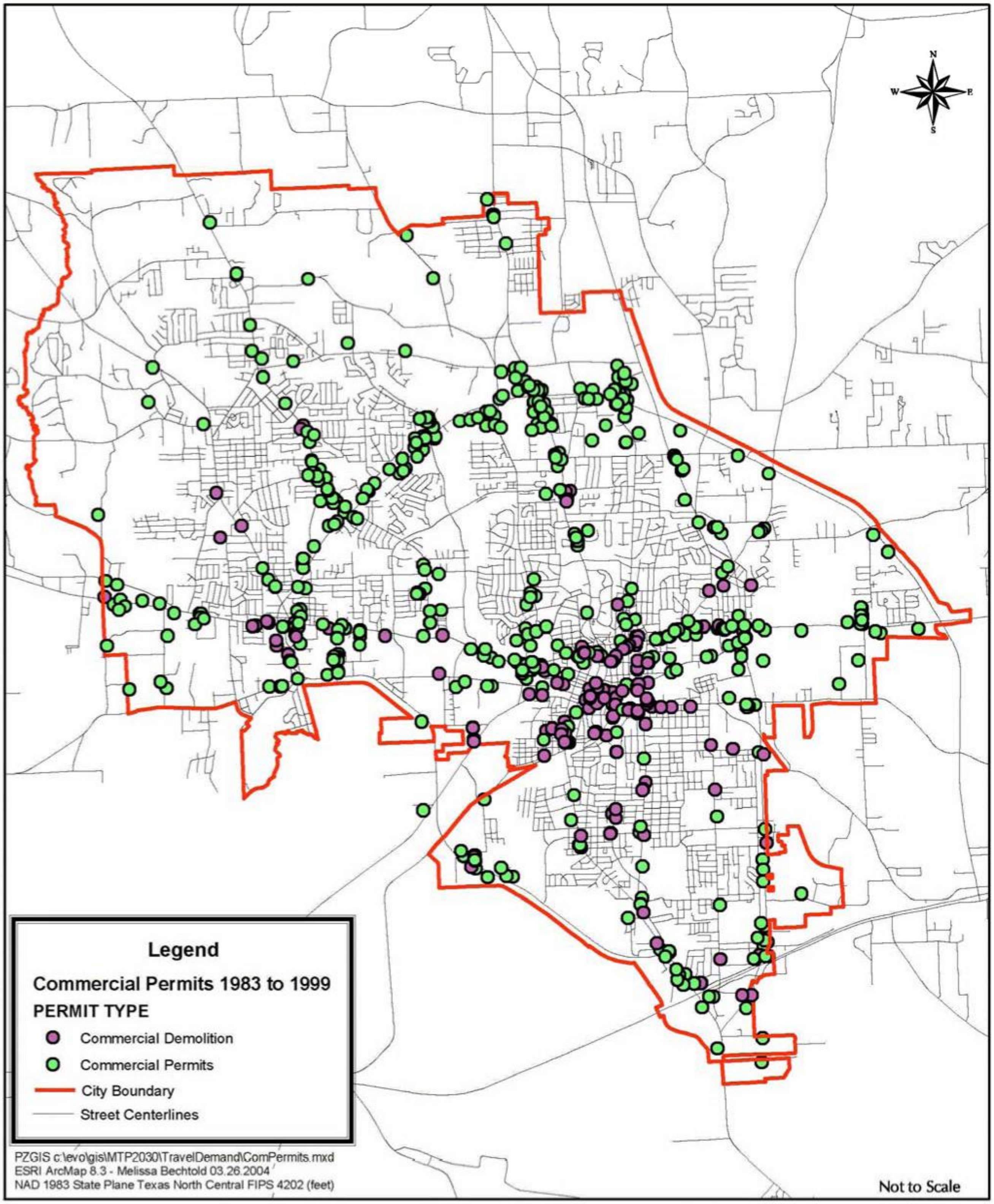
Residential Permits & Demolitions 1983 - 1999

Longview Metropolitan Transportation Plan

1998-2030

CITY OF LONGVIEW TEXAS

Map II-b

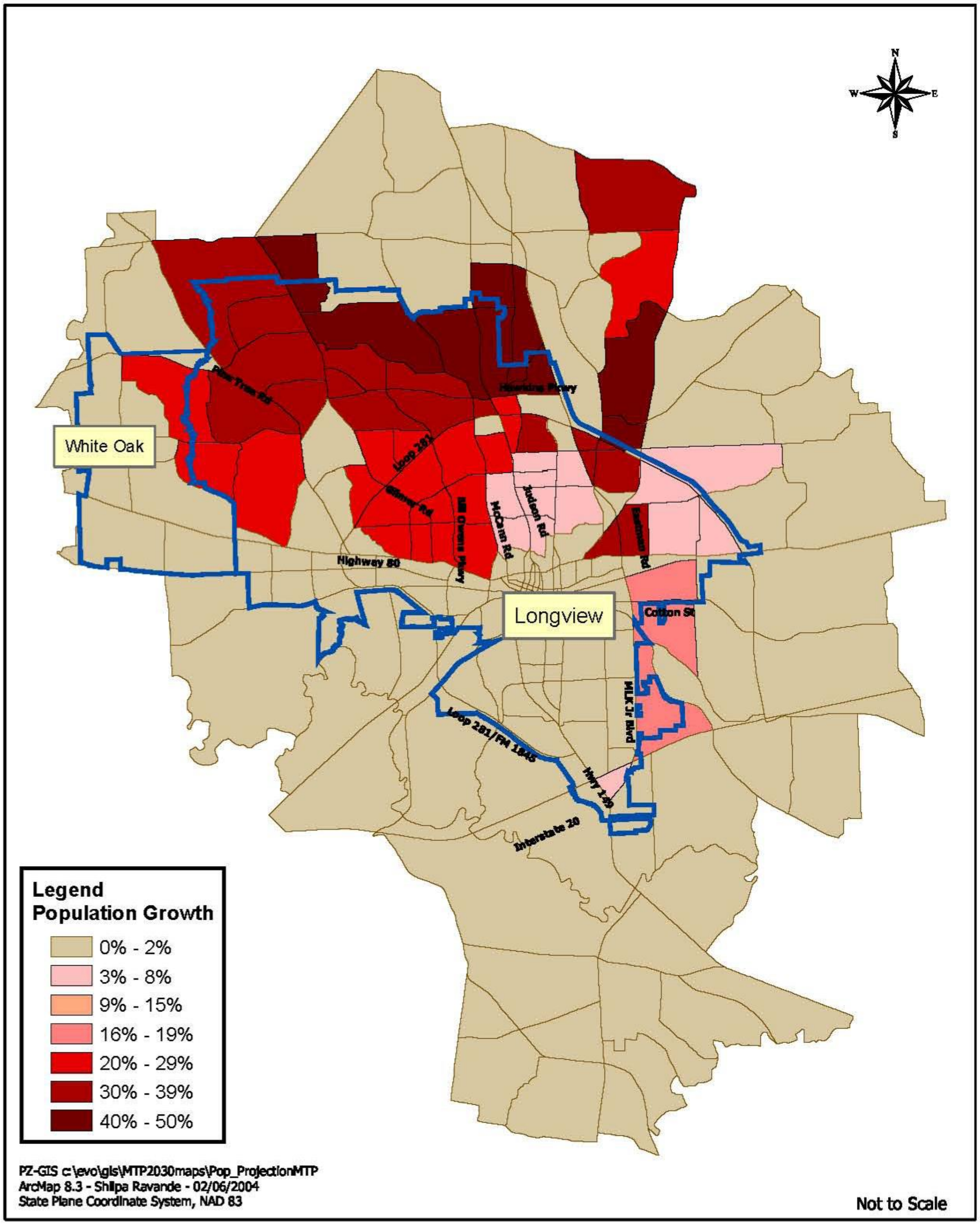


Commercial Permits and Demolitions 1983 - 1999

Longview Metropolitan Transportation Plan 1998-2030

CITY OF LONGVIEW TEXAS

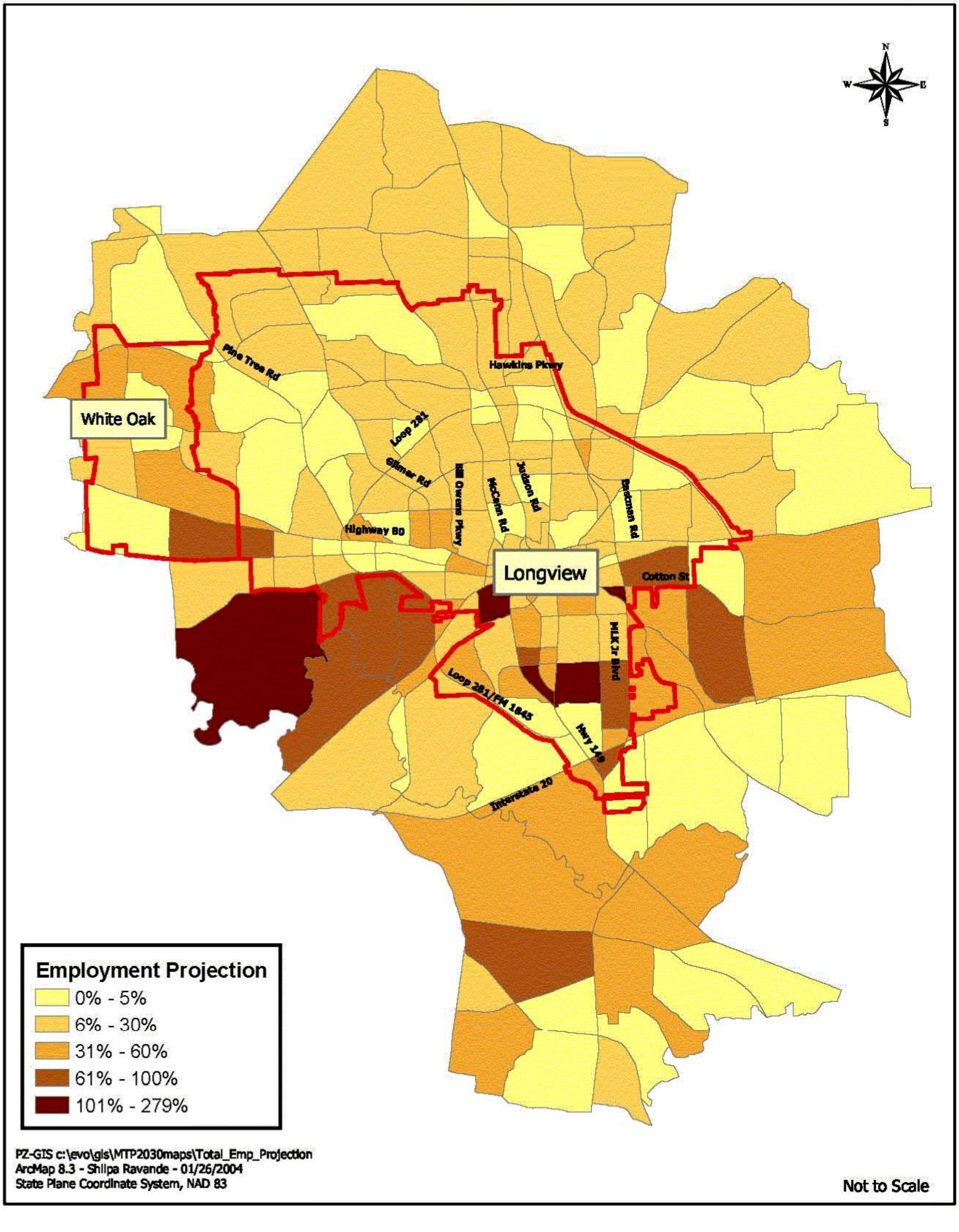
Map II-c



POPULATION GROWTH 1998 TO 2030

Longview Metropolitan Transportation Plan
1998-2030

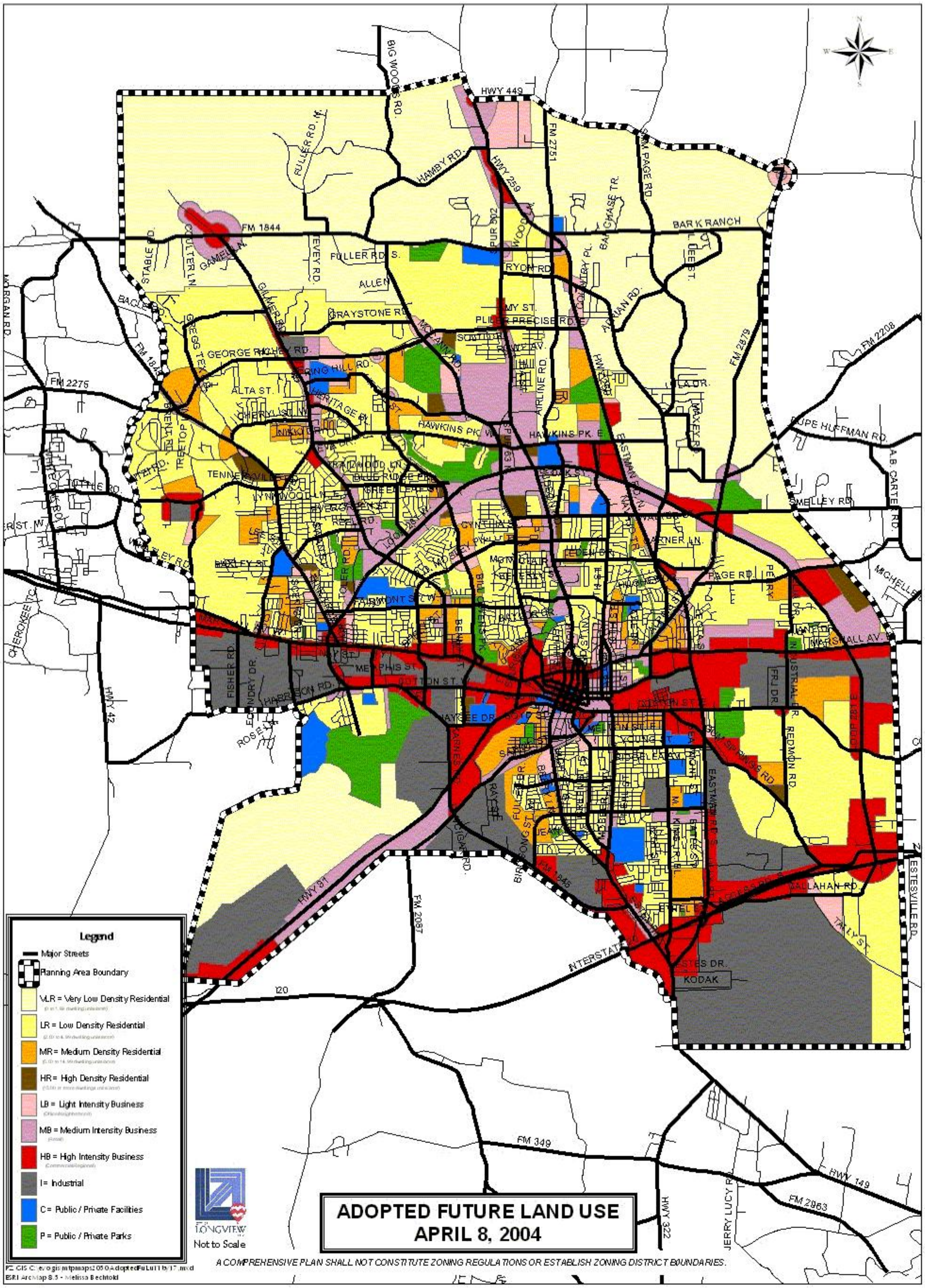
Map II-d



EMPLOYMENT GROWTH 1998 - 2030

Longview Metropolitan Transportation Plan
1998-2030

Map II-e



Future Land Use

Longview Metropolitan Transportation Plan

1998-2030

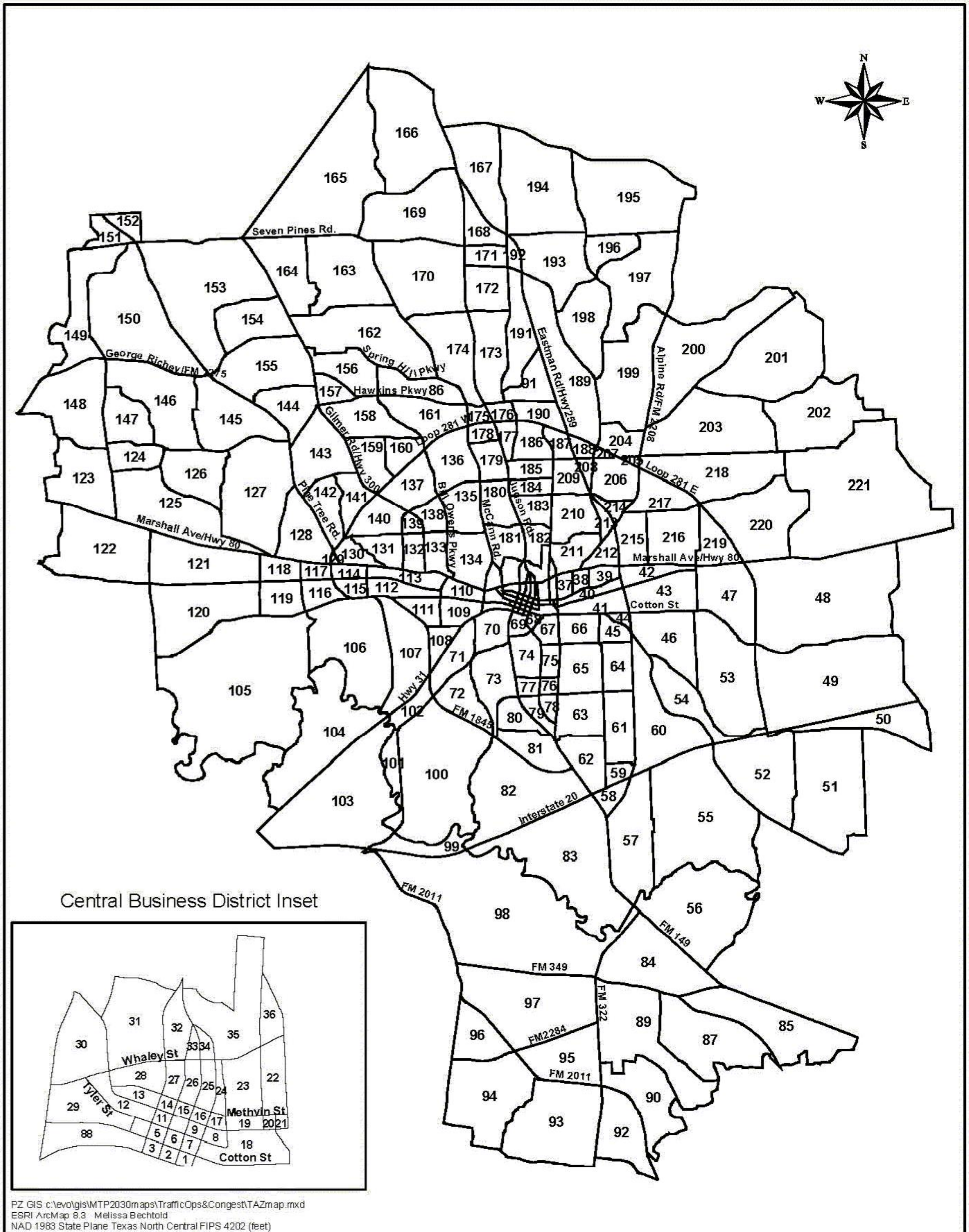
Map F-a

APPENDIX B
TRAFFIC ANALYSIS ZONES

Traffic analysis zones, also known as TAZs, are geographic units used in the travel demand modeling process. The primary definition for traffic analysis zones is the major street network and in a few cases the zones are delineated by rivers or creeks.

For travel demand modeling purposes, the socio-economic data, such as population, households, median income, and employment are loaded into the 221 traffic analysis zones for the Longview Metropolitan Area.

On the following page, Map B-a identifies the 221 traffic analysis zones for the Longview Metropolitan Area. The detailed socio-economic data used in the travel demand model follow Map B-a. The 1998 and 2030 socio-economic data is broken down by TAZ for population, number of households, median income, and three types of employment: basic, service and retail.



Traffic Analysis Zones

Longview Metropolitan Transportation Plan

1998-2030

Map B-a

Longview Socioeconomic Data Used in Travel Demand Model 1998 and 2030 Data
(Table III)

1998 BASE YEAR SOCIO-ECONOMIC DATA							
TAZ	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
1	0	0	0	0	0	68	68
2	1	1	9300	0	7	330	337
3	0	0	0	0	4	23	27
4	0	0	0	0	8	2	10
5	0	0	0	0	12	10	22
6	0	0	0	17	35	80	132
7	0	0	0	45	11	3	59
8	2	1	9300	426	0	10	436
9	0	0	0	15	33	215	263
10	0	0	0	9	33	66	108
11	5	2	9300	336	10	107	453
12	3	1	9300	10	34	27	71
13	3	1	9300	6	21	86	113
14	2	2	9300	0	0	33	33
15	0	0	0	0	0	348	348
16	0	0	0	13	3	32	48
17	0	0	0	12	9	256	277
18	45	11	16500	192	13	56	261
19	17	16	9300	12	0	62	74
20	2	2	18300	0	10	18	28
21	0	0	0	0	7	10	17
22	14	13	18300	6	5	154	165
23	41	29	9300	49	119	269	437
24	0	0	9300	0	15	56	71
25	9	3	9300	5	21	128	154
26	8	5	9300	7	5	174	186
27	4	2	9300	16	11	139	166
28	112	93	9300	64	62	42	168
29	24	12	9300	71	156	17	244
30	0	0	0	0	253	97	350
31	176	72	11400	108	64	144	316
32	39	11	11400	34	68	188	290
33	0	0	11400	11	3	6	20
34	0	0	0	0	18	42	60
35	210	88	11400	31	27	256	314
36	60	21	16500	0	21	199	220
37	122	54	44200	0	60	540	600
38	33	9	18800	14	22	23	59
39	85	35	18800	189	214	10	413
40	6	2	18800	85	0	19	104
41	102	28	10100	124	28	27	179
42	81	43	31400	101	66	19	186
43	101	41	31400	148	0	71	219
44	0	0	0	2	8	2	12
45	313	106	16500	245	40	423	708
46	322	124	31800	25	0	64	89
47	55	26	31800	796	103	21	920
48	111	44	38000	24	3	8	35
49	479	157	38000	77	6	39	122
50	306	104	38000	0	0	2	2
51	0	0	0	7	2	15	24
52	352	133	31800	6	47	0	53
53	546	184	31800	135	67	63	265
54	251	88	31800	123	0	1	124
55	0	0	0	41	0	9	50
56	246	72	31800	45	38	3	86
57	17	11	31800	769	28	80	877
58	29	13	13800	0	71	45	116
59	454	149	9700	15	19	21	55
60	211	114	31800	53	129	63	245
61	1184	378	28000	26	105	159	290
62	1152	381	23000	75	211	464	750

2030 FORECAST YEAR SOCIO-ECONOMIC DATA							
TAZ	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
1	0	0	0	0	0	83	83
2	1	1	13711	0	6	401	407
3	0	0	0	0	4	28	32
4	0	0	0	0	8	3	11
5	0	0	0	0	12	12	24
6	0	0	0	16	35	101	152
7	0	0	0	43	11	4	58
8	2	1	13711	405	0	12	417
9	0	0	0	14	33	272	319
10	0	0	0	9	33	84	126
11	4	2	13711	320	10	135	465
12	3	1	13711	10	34	34	78
13	3	1	13711	5	20	109	134
14	2	2	13711	0	0	42	42
15	0	0	0	0	0	441	441
16	0	0	0	12	3	40	55
17	0	0	0	12	9	324	345
18	42	10	24428	182	13	71	266
19	16	15	13711	12	0	78	90
20	2	2	27107	0	10	23	33
21	0	0	0	0	7	12	19
22	13	12	27107	5	5	195	205
23	38	27	13711	46	118	340	504
24	0	0	13711	0	15	71	86
25	9	3	13711	4	20	162	186
26	7	5	13711	6	5	220	231
27	4	2	13711	15	11	176	202
28	105	88	13711	61	61	53	175
29	22	11	13711	68	155	21	244
30	0	0	0	0	333	109	442
31	167	68	16863	106	61	202	369
32	37	10	16863	33	64	264	361
33	0	0	16863	11	3	8	22
34	0	0	0	0	17	59	76
35	199	83	16863	30	26	360	416
36	57	20	24428	0	20	279	299
37	109	48	65404	0	60	656	716
38	29	8	27895	13	22	28	63
39	76	31	27895	181	213	12	406
40	5	2	27895	81	0	23	104
41	92	25	14972	117	27	33	177
42	72	38	46492	101	75	19	195
43	118	48	46492	157	0	54	211
44	0	0	0	2	8	3	13
45	291	99	24428	266	41	535	842
46	373	143	47122	27	0	49	76
47	51	24	47122	843	132	16	991
48	99	39	56263	23	4	6	33
49	411	135	56263	76	7	32	115
50	270	92	56263	0	0	1	1
51	1	0	0	7	3	10	20
52	311	117	47122	6	54	0	60
53	472	159	47122	143	85	48	276
54	219	77	47122	130	0	1	131
55	1	0	0	42	0	5	47
56	217	64	47122	54	35	4	93
57	17	11	47122	934	26	95	1055
58	30	13	20488	0	66	53	119
59	428	140	14342	15	18	25	58
60	244	132	47122	56	165	48	269
61	1101	352	41449	28	108	201	337
62	1084	359	34199	76	196	554	826

Note: Employment Data DOES NOT INCLUDE Special Generator employment.

f:\mpo\model\98model\techcomreports\1998_2030DataTableIII-Final.xls

Longview Socioeconomic Data Used in Travel Demand Model 1998 and 2030 Data (Table III)

TAZ	1998 BASE YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT BASIC	RETAIL	SERVICE	TOTAL
63	2016	473	27400	236	31	26	293
64	662	248	12300	22	67	882	971
65	2164	776	14900	43	15	214	272
66	1045	372	32000	52	18	187	257
67	539	173	17600	95	37	197	329
68	85	31	17600	20	4	912	936
69	231	89	10100	47	6	125	178
70	472	209	9100	16	21	159	196
71	37	12	13800	20	36	35	91
72	86	38	20200	281	4	15	300
73	1429	585	38900	19	40	531	590
74	1166	474	28200	92	30	87	209
75	619	227	17000	28	16	466	510
76	370	123	19700	6	25	25	56
77	493	183	28000	0	6	29	35
78	407	192	16600	20	47	83	150
79	391	163	28000	1	117	443	561
80	879	313	20500	1	47	32	80
81	265	107	13800	0	4	13	17
82	197	79	13800	32	118	88	238
83	15	5	13800	30	27	52	109
84	500	191	40500	160	33	39	232
85	700	301	30900	149	1	44	194
86	241	91	44300	4	0	0	4
87	360	129	40500	0	5	15	20
88	10	4	9300	18	50	160	228
89	33	14	40500	152	10	90	252
90	424	201	40500	0	0	10	10
91	12	6	15900	23	0	2	25
92	216	69	40500	89	2	16	107
93	441	148	32800	0	8	4	12
94	232	78	32800	0	0	0	0
95	65	25	32800	85	0	11	96
96	55	19	32800	0	0	1	1
97	107	41	32800	25	0	0	25
98	373	148	32800	256	0	182	438
99	37	11	32800	0	0	0	0
100	28	11	13700	128	4	51	183
101	7	2	13700	1	0	0	1
102	15	6	13700	27	0	6	33
103	60	28	30900	43	16	0	59
104	16	4	30900	32	40	0	72
105	624	201	38900	182	1	35	218
106	504	194	28000	100	15	859	974
107	11	4	16200	414	24	58	496
108	265	124	23300	104	44	11	159
109	288	152	23300	65	125	125	315
110	1	1	23300	36	156	65	257
111	381	150	23300	0	0	62	62
112	144	48	23300	133	18	38	189
113	59	16	23300	181	104	98	383
114	45	12	16300	330	28	163	521
115	15	8	16300	113	113	234	460
116	232	93	28400	376	2	16	394
117	307	106	28400	3	15	51	69
118	64	32	28400	29	0	70	99
119	1	1	28400	331	0	0	331
120	37	12	38900	272	6	119	397
121	199	95	38900	175	0	8	183
122	392	130	34000	342	49	102	493
123	836	308	37700	30	20	97	147
124	716	254	38800	66	2	3	71

TAZ	2030 FORECAST YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT BASIC	RETAIL	SERVICE	TOTAL
63	1814	426	40503	223	29	37	289
64	616	231	18282	24	69	1116	1209
65	1946	697	22064	41	14	261	316
66	940	335	47438	49	17	228	294
67	485	156	26004	90	35	239	364
68	77	28	26004	19	4	1110	1133
69	208	80	14972	45	5	152	202
70	447	198	13554	18	20	220	258
71	35	11	20488	22	35	48	105
72	81	36	29944	317	4	20	341
73	1356	556	57524	21	39	735	795
74	1049	426	41764	86	28	106	220
75	557	204	25216	27	15	567	609
76	332	110	29156	5	23	30	58
77	444	164	41449	0	5	36	41
78	366	173	24586	19	45	101	165
79	352	147	41449	1	109	539	649
80	833	296	30417	1	45	45	91
81	251	101	20488	0	4	18	22
82	189	76	20488	36	115	122	273
83	14	5	20488	34	27	72	133
84	439	168	60046	194	30	46	270
85	615	265	45704	181	1	53	235
86	317	119	65562	4	0	0	4
87	317	114	60046	0	4	18	22
88	9	3	13711	17	4	19	40
89	30	13	60046	184	9	108	301
90	373	177	60046	0	0	12	12
91	18	9	23482	22	0	4	26
92	191	61	60046	108	2	19	129
93	388	130	48541	0	8	6	14
94	205	69	48541	0	0	0	0
95	59	23	48541	100	0	16	116
96	50	18	48541	0	0	2	2
97	95	36	48541	32	0	0	32
98	330	131	48541	328	0	350	678
99	34	10	48541	0	0	0	0
100	27	11	20330	165	4	98	267
101	7	2	20330	1	0	0	1
102	14	6	20330	35	0	12	47
103	53	25	45704	47	31	0	78
104	15	4	45704	41	44	0	85
105	553	178	57524	233	0	68	301
106	484	186	41449	113	14	960	1087
107	11	4	23955	468	23	65	556
108	257	120	34514	117	43	12	172
109	279	148	34514	74	121	140	335
110	1	1	34514	41	150	73	264
111	368	145	34514	0	0	69	69
112	139	46	34514	134	17	45	196
113	57	15	34514	182	100	116	398
114	43	11	24113	334	27	192	553
115	14	7	24113	114	109	276	499
116	222	89	42079	380	2	19	401
117	294	101	42079	3	14	61	78
118	61	31	42079	32	0	128	160
119	1	1	42079	365	0	0	365
120	34	11	57524	300	12	218	530
121	177	84	57524	163	0	9	172
122	348	115	50432	359	169	109	637
123	717	265	55790	31	69	104	204
124	614	219	57524	61	4	4	69

Note: Employment Data DOES NOT INCLUDE Special Generator employment.

f:\mpo\model\98model\techcomreports\1998_2030DataTableIII-Final.xls

Longview Socioeconomic Data Used in Travel Demand Model 1998 and 2030 Data
(Table III)

TAZ	1998 BASE YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
125	1337	467	38800	257	53	61	371
126	151	44	38800	14	0	0	14
127	3303	1122	36500	91	10	121	222
128	3377	1181	27000	40	98	1595	1733
129	22	5	17200	14	38	54	106
130	344	97	17200	164	121	121	406
131	857	345	46300	9	2	19	30
132	1236	687	18800	31	60	166	257
133	415	244	22000	252	41	96	389
134	1629	708	50300	16	280	287	583
135	655	250	57100	1	0	18	19
136	1394	529	43000	11	529	274	814
137	1712	676	82600	15	297	108	420
138	388	158	57100	0	0	48	48
139	182	70	74000	1	15	55	71
140	868	285	74000	12	2	1573	1587
141	368	198	28600	33	710	278	1021
142	1896	684	38800	11	122	131	264
143	2840	1062	45300	18	77	129	224
144	1322	479	23800	60	39	141	240
145	649	221	32900	1	5	100	106
146	536	167	40400	0	0	12	12
147	1117	356	40400	1	1	1	3
148	456	118	36700	12	10	8	30
149	151	61	36000	41	0	0	41
150	349	76	24200	9	0	8	17
151	90	36	24200	0	0	3	3
152	112	32	24200	0	0	2	2
153	500	173	24200	53	7	4	64
154	305	120	24200	1	3	16	20
155	2212	726	48100	77	51	39	167
156	969	199	37800	16	4	54	74
157	356	248	31500	10	4	59	73
158	2219	794	56700	38	69	144	251
159	1385	668	44300	39	370	232	641
160	1265	506	61800	20	129	393	542
161	723	272	44200	87	396	610	1093
162	312	106	42700	87	16	69	172
163	447	142	42700	5	3	3	11
164	321	116	42700	28	10	3	41
165	326	107	42700	4	0	1	5
166	141	52	40100	50	5	1	56
167	319	96	57400	209	8	0	217
168	60	22	57400	0	0	5	5
169	447	135	40100	24	0	11	35
170	96	32	40100	2	42	1123	1167
171	117	40	57500	38	0	13	51
172	249	88	47900	0	33	8	41
173	739	265	32800	0	3	58	61
174	971	512	32800	22	15	150	187
175	9	3	27900	20	856	256	1132
176	676	414	33200	24	88	97	209
177	333	129	29800	14	176	179	369
178	0	85	0	10	621	163	794
179	1411	733	58500	8	38	278	324
180	969	487	58500	26	53	358	437
181	769	344	25700	74	323	1054	1451
182	265	104	83300	99	12	86	197
183	323	132	83300	1	105	140	246
184	748	344	21700	1	61	52	114
185	785	333	41600	34	15	102	151
186	392	71	41600	39	67	1112	1218

TAZ	2030 FORECAST YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
125	1142	399	57524	247	53	73	373
126	184	54	57524	12	0	0	12
127	4054	1379	54057	92	10	142	244
128	3388	1185	40030	40	94	1879	2013
129	21	5	25531	13	47	63	123
130	329	93	25531	158	159	136	453
131	1049	421	68556	9	3	21	33
132	1556	864	27738	29	79	187	295
133	523	308	32623	242	54	108	404
134	2051	892	74545	15	368	323	706
135	825	315	84631	1	0	21	22
136	1755	667	63670	11	696	308	1015
137	2095	828	122298	14	391	121	526
138	488	198	84631	0	0	56	56
139	230	88	109532	1	19	64	84
140	1063	349	109532	12	3	1829	1844
141	450	242	42394	32	886	323	1241
142	1902	687	57524	10	336	179	525
143	2849	1067	67138	17	212	176	405
144	1738	630	35302	68	79	151	298
145	853	290	48698	1	17	108	126
146	650	202	59888	0	0	12	12
147	955	304	59888	1	2	1	4
148	393	102	54372	12	20	9	41
149	133	53	53269	38	0	0	38
150	302	66	35775	8	0	9	17
151	81	32	35775	0	0	4	4
152	100	29	35775	0	0	3	3
153	657	227	35775	49	20	5	74
154	401	158	35775	1	4	19	24
155	2910	954	71235	73	68	46	187
156	1275	262	55948	15	5	64	84
157	468	327	46650	10	5	69	84
158	2921	1047	84001	37	86	167	290
159	1695	819	65562	36	490	275	801
160	1548	619	91566	19	609	811	1439
161	951	358	65404	82	1868	1258	3208
162	455	154	63198	82	76	184	342
163	376	120	63198	4	15	4	23
164	468	169	63198	27	49	4	80
165	279	92	63198	4	0	2	6
166	124	46	59415	47	25	2	74
167	274	82	84946	198	39	0	237
168	56	21	84946	0	0	11	11
169	380	115	59415	23	0	23	46
170	86	29	59415	2	198	2317	2517
171	103	35	85104	45	0	14	59
172	363	128	70920	0	45	9	54
173	1074	385	48541	0	5	64	69
174	1410	742	48541	26	25	166	217
175	12	4	41291	24	1437	283	1744
176	838	514	49171	28	148	107	283
177	412	160	44128	17	295	198	510
178	0	0	0	13	1043	188	1244
179	1750	907	86680	11	64	320	395
180	998	502	86680	35	89	412	536
181	792	354	38139	99	543	1213	1855
182	273	107	123401	133	20	99	252
183	332	136	123401	2	176	161	339
184	770	355	32150	2	127	74	203
185	808	342	61622	48	31	144	223
186	513	93	61622	55	140	1576	1771

Note: Employment Data DOES NOT INCLUDE Special Generator employment.

f:\mpo\model\98model\techcomreports\1998_2030DataTableIII-Final.xls

Longview Socioeconomic Data Used in Travel Demand Model 1998 and 2030 Data
(Table III)

TAZ	1998 BASE YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
187	1	1	44200	14	4	323	341
188	225	202	15900	0	4	159	163
189	802	277	51300	5	24	116	145
190	227	115	51300	58	444	154	656
191	168	71	65700	5	0	96	101
192	138	46	57500	3	4	6	13
193	289	90	57500	6	1	27	34
194	96	27	57500	7	0	511	518
195	18	8	57500	17	0	0	17
196	150	48	57500	16	0	1	17
197	82	24	57700	4	1	0	5
198	237	78	57700	2	0	5	7
199	786	256	57700	81	1	20	102
200	102	41	53700	0	0	0	0
201	373	125	53700	0	0	3	3
202	80	31	53700	0	0	1	1
203	718	229	53700	19	0	30	49
204	57	22	51300	0	1	10	11
205	0	0	0	0	0	0	0
206	464	123	34100	0	5	9	14
207	3	2	34100	2	0	0	2
208	378	216	16000	0	0	14	14
209	1018	405	44200	2	22	177	201
210	1397	632	34700	19	0	642	661
211	1561	597	16700	48	213	724	985
212	812	288	22600	23	282	76	381
213	618	322	39400	33	12	65	110
214	0	0	0	25	34	161	220
215	647	251	22600	0	26	198	224
216	609	178	40900	55	36	22	113
217	446	156	40900	88	0	263	351
218	24	11	53700	15	22	0	37
219	756	302	37900	35	7	7	49
220	841	249	53700	82	6	113	201
221	1012	344	41500	20	28	26	74
Total	94006	35745		13113	11242	29631	53986

TAZ	2030 FORECAST YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
187	1	1	65404	43	9	511	563
188	295	266	23482	0	9	252	261
189	671	232	75963	15	53	183	251
190	55	28	75963	55	2189	242	2486
191	240	101	97239	4	0	151	155
192	121	40	85104	3	20	10	33
193	248	78	85104	5	4	33	42
194	86	24	85104	6	0	805	811
195	24	11	85104	17	0	0	17
196	131	42	85104	17	0	1	18
197	104	31	85419	4	1	0	5
198	203	67	85419	2	0	4	6
199	1107	361	85419	76	1	18	95
200	91	37	79588	0	0	0	0
201	320	108	79588	0	0	3	3
202	72	27	79588	0	0	1	1
203	608	194	79588	20	0	31	51
204	80	31	75963	0	2	14	16
205	0	0	0	0	0	0	0
206	608	161	50432	0	11	12	23
207	4	3	50432	3	0	0	3
208	495	283	23640	0	0	16	16
209	1048	418	65404	2	20	248	270
210	1438	651	51378	27	0	910	937
211	1479	567	24743	57	322	1022	1401
212	1065	378	33411	32	588	108	728
213	585	305	58312	46	25	93	164
214	0	0	0	23	48	128	199
215	848	329	33411	0	36	158	194
216	638	187	60518	49	69	17	135
217	468	164	60518	82	0	210	292
218	26	11	79588	13	42	0	55
219	792	317	56106	33	9	6	48
220	710	210	79588	73	12	86	171
221	861	293	61464	18	53	20	91
Total	99959	38215		13899	19001	38460	71360

1998 SPECIAL GENERATORS							
22				0	0	2000	2000
38				0	0	0	0
43				89	0	0	89
47				843	0	300	1143
48				381	0	0	381
55				2693	0	0	2693
60				400	0	0	400
1998 SPECIAL GENERATORS							
60				N/A	N/A	N/A	N/A
63	875	297		0	0	411	2916
69				0	0	66	3075
81				1250	0	0	1250
89				0	0	285	285
91				0	0	0	0
111				339	0	0	339
116				104	0	0	104
118				80	0	0	80
119				942	0	0	942
120				257	0	0	257
121				215	0	0	215
125				0	0	165	1518
140				0	0	143	1166

2030 SPECIAL GENERATORS							
22				0	0	2000	2000
38				0	0	0	0
43				70	0	0	70
47				2440	0	300	2740
48				381	0	0	381
55				2200	0	0	2200
60				400	0	0	400
2030 SPECIAL GENERATORS							
60				400	0	0	400
63	1407	475		0	0	651	4651
69				0	0	66	3075
81				1200	0	0	1200
89				0	0	985	985
91				0	0	16	1156
111				N/A	N/A	N/A	N/A
116				160	0	0	160
118				75	0	0	75
119				942	0	0	942
120				257	0	0	257
121				255	0	0	255
125				0	0	245	2298
140				0	0	125	1175

Note: Employment Data DOES NOT INCLUDE Special Generator employment.

f:\mpo\model\98model\techcomreports\1998_2030DataTableIII-Final.xls

Longview Socioeconomic Data Used in Travel Demand Model 1998 and 2030 Data (Table III)

TAZ	1998 BASE YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
141				0	0	0	0
162				0	0	180	1820
176				0	0	192	2513
178				0	850	0	850
183				0	0	350	350
186				0	0	600	600
190				0	640	0	640
Total				7593	1490	4692	25626

TAZ	2030 FORECAST YEAR SOCIO-ECONOMIC DATA						
	POPULATION	HOUSEHOLDS	MEDIAN INCOME	EMPLOYMENT			
				BASIC	RETAIL	SERVICE	TOTAL
141				0	0	0	0
162				0	0	300	3580
176				0	0	192	2513
178				0	850	0	850
183				0	0	1000	1000
186				0	0	1100	1100
190				0	730	0	730
Total				8780	1580	6980	34193

22	GOOD SHEPHERD HOSPITAL
38	TEAGUE PARK
43	E. INDUSTRIAL PARK (LEBUS)
47	E. INDUSTRIAL PARK (STEMCO,ZIMMERMAN)
48	TRINITY INDUSTRIES
55	EASTMAN CHEMICAL
60	NEIMAN MARCUS DISTRIBUTION CENTER
63	LE TOURNEAU UNIVERSITY
69	KILGORE COLLEGE
81	LE TOURNEAU INDUSTRIES
89	GREGG COUNTY AIRPORT
91	ZONE DID NOT EXIST IN 1994 MODEL
111	STROH'S BREWERY (closed in 1999)
116	W. INDUSTRIAL PARK (CAPACITY)
118	W. INDUSTRIAL PARK (ARI/ACF IND.)
119	W. INDUSTRIAL PARK (TRINITY,FLEETWD, LEBUS)
120	W. INDUSTRIAL PARK (TRINITY)
121	W. INDUSTRIAL PARK (TRINITY, REXAM)
125	WHITE OAK SCHOOLS
140	PINE TREE HIGH SCHOOL
141	MC WHORTER PARK
162	SPRING HILL SCHOOLS
176	LONGVIEW HIGH SCHOOL
178	LONGVIEW MALL
183	SITEL
186	LONGVIEW REGIONAL HOSPITAL
190	SAMS, WALMART SUPERCENTER, HINSLEY PARK

22	GOOD SHEPHERD HOSPITAL
38	TEAGUE PARK
43	E. INDUSTRIAL PARK (LEBUS)
47	E. INDUSTRIAL PARK (STEMCO,ZIMMERMAN)
48	TRINITY INDUSTRIES
55	EASTMAN CHEMICAL
60	NEIMAN MARCUS DISTRIBUTION CENTER
60	DANA CORP.
63	LE TOURNEAU UNIVERSITY
69	KILGORE COLLEGE
81	LE TOURNEAU INDUSTRIES
89	GREGG COUNTY AIRPORT
91	HINSELY PK./UT LGV. UNIV. CENTER (opened 2000)
116	W. INDUSTRIAL PARK (CAPACITY)
118	W. INDUSTRIAL PARK (ARI/ACF IND.)
119	W. INDUSTRIAL PARK (TRINITY,FLEETWD, LEBUS)
120	W. INDUSTRIAL PARK (TRINITY)
121	W. INDUSTRIAL PARK (TRINITY, REXAM)
125	WHITE OAK SCHOOLS
140	PINE TREE HIGH SCHOOL
141	MC WHORTER PARK
162	SPRING HILL SCHOOLS
176	LONGVIEW HIGH SCHOOL
178	LONGVIEW MALL
183	SITEL
186	LONGVIEW REGIONAL HOSPITAL
190	SAMS, WALMART SUPERCENTER

Note: Employment Data DOES NOT INCLUDE Special Generator employment.

f:\mpo\model\98model\techcomreports\1998_2030DataTableIII-Final.xls

TABLE C-1 - STUDY AREA POPULATION BREAKDOWN

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
1	WD4702	0	68	0	68	0	68	0	68	0	68	0	68
1	WD4529	0	0	0	0	0	0	0	0	0	0	0	0
2	WD4702	0	337	0	337	0	337	0	337	0	337	0	337
3	WD4702	0	27	0	28	0	29	0	30	0	31	0	32
3	WD1019	0	0	0	0	0	0	0	0	0	0	0	0
4	WD0013	0	0	0	0	0	0	0	1	0	1	0	1
4	WD1019	0	10	0	10	0	10	0	10	0	10	0	10
5	WD4702	0	11	0	11	0	11	0	11	0	11	0	11
5	WD1019	0	11	0	11	0	11	0	11	0	11	0	11
6	WD4702	0	132	0	136	0	140	0	143	0	149	0	152
6	WD4509	0	0	0	0	0	0	0	0	0	0	0	0
6	WD1019	0	0	0	0	0	0	0	0	0	0	0	0
7	WD4702	0	20	0	20	0	20	0	19	0	19	0	19
7	WD4529	0	0	0	0	0	0	0	0	0	0	0	0
7	WD4509	0	39	0	39	0	39	0	39	0	39	0	39
8	WD4509	0	436	0	436	0	436	0	436	0	436	0	436
9	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
9	WD4509	0	263	0	263	0	263	0	263	0	263	0	263
10	WD4702	0	108	0	112	0	115	0	118	0	123	0	126
10	WD4509	0	0	0	0	0	0	0	0	0	0	0	0
10	WD1019	0	0	0	0	0	0	0	0	0	0	0	0
11	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
11	WD1019	0	453	0	453	0	453	0	453	0	453	0	453
12	GR0560	0	14	0	14	0	14	0	14	0	14	0	15
12	WD1019	3	56	3	58	3	59	3	60	3	62	3	63
12	GU1048	0	1	0	1	0	1	0	1	0	1	0	1
13	WD1019	3	113	3	118	3	121	3	124	3	131	3	134
14	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
14	WD1019	2	33	2	35	2	36	2	38	2	41	2	42
15	WD4702	0	348	0	348	0	348	0	348	0	348	0	348
15	WD4509	0	0	0	0	0	0	0	0	0	0	0	0
16	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
16	WD4509	0	48	0	50	0	51	0	52	0	54	0	55
17	WD4509	0	277	0	277	0	277	0	277	0	277	0	277
18	WD3915	0	0	0	0	0	0	0	0	0	0	0	0
18	WD4529	0	69	0	69	0	69	0	69	0	69	0	70
18	WD7139	0	0	0	0	0	0	0	0	0	0	0	0
18	WD7138	7	22	7	22	7	22	7	23	7	23	7	23
18	WD7112	0	33	0	33	0	33	0	33	0	33	0	33
18	WD7140	14	10	14	10	13	10	13	10	13	10	13	11
18	WD4509	24	73	24	74	24	74	23	74	23	75	23	75
18	WD7143	0	54	0	55	0	55	0	55	0	55	0	55
19	WD7112	7	53	7	55	7	57	7	58	7	62	7	64
19	WD4509	10	21	10	22	10	23	10	24	9	26	9	26
20	WD7112	2	28	2	28	2	28	2	28	2	28	2	28
21	WD7112	0	17	0	17	0	18	0	18	0	19	0	19
22	WD7112	14	2165	14	2165	14	2165	14	2165	14	2165	14	2165
23	WD7112	40	404	39	417	39	426	38	436	38	454	37	463
23	WD4509	1	33	1	34	1	36	1	37	1	39	1	41
24	WD7112	0	11	0	11	0	11	0	11	0	11	0	11
24	WD4509	0	60	0	63	0	65	0	68	0	72	0	75
25	WD4702	4	36	4	39	4	42	4	45	4	50	4	53
25	WD7112	5	35	5	38	5	40	5	43	5	47	5	50
25	WD4509	0	84	0	84	0	84	0	84	0	84	0	84
26	WD4702	3	95	3	95	3	95	3	95	3	95	3	95
26	WD7112	5	15	5	20	5	24	5	28	5	35	5	39
26	WD1019	0	76	0	81	0	84	0	87	0	94	0	97
27	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
27	WD1019	4	166	4	166	4	166	4	166	4	166	4	166
28	WD1019	112	148	110	150	109	151	108	152	106	154	105	155
28	GU1048	0	20	0	20	0	20	0	20	0	20	0	20
29	WD0013	0	0	0	0	0	0	0	0	0	0	0	0
29	WD0021	0	37	0	37	0	37	0	37	0	37	0	37
29	GR0560	0	28	0	28	0	28	0	28	0	28	0	28
29	WD0014	0	0	0	0	0	0	0	0	0	0	0	0
29	GR0605	3	6	3	6	3	6	3	6	3	6	3	6
29	GR0611	0	82	0	82	0	82	0	82	0	82	0	82
29	GR0618	0	0	0	0	0	0	0	0	0	0	0	0
29	WD1019	21	72	20	72	20	72	20	72	20	72	20	72
29	GR1426	0	19	0	19	0	19	0	19	0	19	0	19
30	GR0560	0	99	0	99	0	99	0	99	0	99	0	99
30	GR1426	0	0	0	0	0	0	0	0	0	0	0	0
30	GU1048	0	19	0	19	0	19	0	19	0	19	0	19
30	GU1026	0	7	0	7	0	7	0	7	0	7	0	7
30	GU1024	0	47	0	47	0	47	0	47	0	47	0	47
30	GU1022	0	178	0	178	0	178	0	178	0	178	0	178
31	WD1019	3	34	3	34	3	34	3	34	3	34	3	34
31	GU9000	0	0	0	0	0	0	0	0	0	0	0	0
31	GU1048	163	239	161	247	160	253	159	259	158	270	157	276
31	GU1026	11	43	10	46	10	49	9	51	8	56	8	59
32	WD1019	0	77	0	77	0	77	0	77	0	77	0	77
32	GU9000	39	213	39	229	38	240	38	251	37	273	37	284
32	GU1048	0	0	0	0	0	0	0	0	0	0	0	0
33	WD7112	0	0	0	0	0	0	0	0	0	0	0	0
33	WD1019	0	0	0	0	0	0	0	0	0	0	0	0
33	GU9000	0	20	0	20	0	21	0	21	0	22	0	22
33	GU1048	0	0	0	0	0	0	0	0	0	0	0	0
34	WD7112	0	0	0	0	0	0	0	0	0	0	0	0
34	GU9000	0	0	0	0	0	0	0	0	0	0	0	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
34	GU1048	0	60	0	64	0	66	0	69	0	74	0	76
35	WD7112	1	137	1	138	1	139	1	139	1	140	1	141
35	GU9011	129	112	128	122	127	128	126	135	125	149	124	156
35	GU9000	34	0	33	1	33	2	33	4	33	6	33	7
35	GU1048	46	65	45	75	45	83	44	90	42	105	41	113
36	WD7112	60	220	59	237	59	250	58	262	57	287	57	299
37	WD7112	122	600	119	625	117	644	115	662	111	698	109	716
38	IB1062	14	48	14	48	14	49	13	49	13	49	13	49
38	WD7112	19	11	18	11	18	12	17	12	17	13	16	14
39	IB1062	71	70	70	68	68	67	67	66	64	64	63	63
39	IB9312	0	0	0	0	0	0	0	0	0	0	0	0
39	IB9415	0	131	0	131	0	131	0	131	0	131	0	131
39	IB9413	0	132	0	132	0	132	0	132	0	132	0	132
39	IB9410	0	19	0	19	0	19	0	19	0	19	0	19
39	IB9417	14	40	13	40	13	40	13	40	13	40	13	40
39	IB9326	0	21	0	21	0	21	0	21	0	21	0	21
40	IB1062	6	75	6	75	6	75	6	75	6	75	6	75
40	WD3915	0	0	0	0	0	0	0	0	0	0	0	0
40	IB9312	0	0	0	0	0	0	0	0	0	0	0	0
40	IB9400	0	0	0	0	0	0	0	0	0	0	0	0
40	IB9413	0	0	0	0	0	0	0	0	0	0	0	0
40	IB9410	0	15	0	15	0	15	0	15	-1	15	-1	15
40	WD7139	0	0	0	0	0	0	0	0	0	0	0	0
40	WD7138	0	0	0	0	0	0	0	0	0	0	0	0
40	WD7112	0	14	0	14	0	14	0	14	0	14	0	14
40	WD4509	0	0	0	0	0	0	0	0	0	0	0	0
41	IB1062	48	62	47	62	47	61	46	61	45	61	45	61
41	WD3915	48	18	48	18	47	18	46	18	45	18	45	18
41	IB9400	0	84	-1	84	-1	84	-2	84	-3	84	-3	83
41	WD4509	6	15	6	15	6	15	6	15	6	15	6	15
42	EL3040	0	0	0	0	0	0	0	0	0	0	0	0
42	EL0057	0	10	-1	11	-1	11	-1	12	-2	12	-2	13
42	EL0053	0	0	0	0	0	0	0	0	0	0	0	0
42	IB9312	0	35	-1	37	-2	37	-3	38	-5	40	-6	41
42	IB9400	0	0	0	0	0	0	0	0	0	0	0	0
42	IB9304	0	2	0	2	0	2	0	2	0	2	0	2
42	IB9415	0	0	0	0	0	0	0	0	0	0	0	0
42	IB9410	0	0	0	0	0	0	0	0	0	0	0	0
42	EL4010	0	0	0	0	0	0	0	0	0	0	0	0
42	EL4006	0	87	0	87	0	87	0	87	0	87	0	87
42	IB9318	74	48	74	48	73	48	73	48	73	48	73	48
42	IB9326	7	5	7	5	7	5	7	5	7	5	7	5
43	EL3040	0	248	1	246	2	245	3	243	4	241	5	240
43	EL0057	0	0	0	0	0	0	0	0	0	0	0	0
43	EL0053	0	0	1	-1	1	-2	2	-3	3	-5	4	-6
43	IB9312	0	0	0	0	0	0	0	0	0	0	0	-1
43	EL1016	83	27	84	26	84	25	85	24	86	22	86	22
43	IB9400	0	7	0	7	0	7	0	7	0	7	0	7
43	IB9304	0	26	1	25	1	24	2	23	3	21	4	20
43	IB9303	18	0	18	0	18	0	18	0	18	0	18	0
43	EL4006	0	0	0	0	0	0	0	0	0	-1	0	-1
44	IB9107	0	7	0	7	0	7	0	7	0	7	0	7
44	IB9106	0	0	0	0	0	0	0	0	0	0	0	0
44	IB1062	0	5	0	5	0	5	0	5	0	5	0	5
44	IB1059	0	0	0	0	0	0	0	0	0	0	0	0
44	IB9400	0	0	0	0	0	0	0	0	0	0	0	0
45	IB9104	0	10	0	10	0	10	0	10	0	10	0	10
45	IB9106	0	99	0	99	0	99	0	99	0	99	0	99
45	IB1056	35	197	35	198	35	199	35	200	34	201	34	202
45	IB1055	116	26	116	26	116	26	116	26	116	26	116	26
45	IB1062	74	29	74	30	74	31	74	32	74	33	73	34
45	IB1059	48	293	44	316	41	333	38	349	33	382	30	399
45	WD3915	40	53	39	57	39	60	38	63	37	69	37	72
46	EL0020	19	0	20	0	21	0	22	-1	24	-1	25	-1
46	EL0042	26	0	27	0	28	0	29	0	30	-1	31	-1
46	EL0038	28	0	29	0	30	-1	32	-1	34	-2	35	-2
46	IB9107	13	0	13	0	14	0	14	0	15	0	15	0
46	IB9109	58	0	58	0	58	0	58	0	58	0	58	0
46	IB9105	0	1	0	1	0	1	0	1	0	1	0	1
46	IB9106	9	12	9	12	9	12	9	12	9	12	9	12
46	IB9300	31	0	31	0	31	0	31	0	31	0	31	0
46	EL0034	45	14	49	13	51	13	54	12	58	11	61	10
46	EL0029	4	54	7	53	9	53	12	52	16	51	18	50
46	IB9100	0	0	0	0	0	0	0	0	0	0	0	0
46	EL3040	21	7	21	7	21	7	21	7	21	7	21	7
46	EL1016	69	0	69	0	69	0	69	0	69	0	69	0
46	IB9400	0	0	0	0	0	0	0	0	0	0	0	0
46	IB9304	0	0	0	0	0	0	0	0	0	0	0	0
46	IB9303	0	0	0	0	0	0	0	0	0	0	0	0
47	EL3040	12	1053	12	1053	12	1053	12	1053	12	1053	12	1053
47	EL4010	43	1010	42	1375	41	1636	40	1896	39	2418	39	2678
53	EL1041	0	85	0	85	0	85	-1	85	-1	86	-1	86
53	EL0020	149	80	142	81	137	82	132	83	121	84	116	85
53	EL0014	285	100	276	101	271	102	265	103	253	104	247	105
53	EL3040	112	0	112	0	111	0	111	0	110	0	110	0
54	EL1041	5	0	5	0	5	0	5	0	4	0	4	0
54	EL0020	123	0	120	1	117	1	115	2	110	3	108	3
54	EL0014	123	0	120	1	118	1	116	1	112	2	110	3
54	EL0029	0	0	-1	0	-1	0	-1	0	-2	0	-3	1
55	LB4107	0	13	0	13	0	13	0	13	0	13	0	13

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
55	EL0001	0	0	0	-1	0	-2	0	-2	0	-4	0	-5
55	LB4610	0	2730	0	2623	0	2546	1	2469	1	2316	1	2239
57	LB4107	0	1	0	7	0	12	0	17	0	26	0	31
57	LB4117	14	269	14	280	14	288	14	296	14	312	14	320
57	LB4118	0	0	0	0	0	0	0	0	0	0	0	0
57	LB4604	0	0	0	0	0	0	0	0	0	0	0	0
57	LB4310	0	10	0	11	0	12	0	13	0	14	0	15
57	LB4308	0	61	0	63	0	64	0	65	0	67	0	68
57	LB4304	1	0	1	2	1	3	1	5	1	7	1	9
57	LB4407	0	0	0	0	0	0	0	0	0	0	0	0
57	LB4301	0	0	0	0	0	0	0	0	0	0	0	0
57	LB4302	0	2	0	4	0	5	0	7	0	10	0	11
57	EL0003	0	0	0	0	0	0	0	0	0	1	0	1
57	EL0001	0	0	0	1	0	1	0	1	0	2	0	2
57	LB4610	2	535	2	548	2	558	2	568	2	588	2	598
57	LB4611	0	0	0	0	0	0	0	0	0	0	0	0
58	LB4604	1	71	1	71	1	72	1	72	1	72	1	72
58	LB4310	0	0	0	0	0	0	0	0	0	0	0	0
58	LB4304	0	0	0	0	0	0	0	0	0	0	0	0
58	LB4403	14	0	14	0	14	0	14	0	15	1	15	1
58	LB4404	4	31	4	31	4	31	4	31	4	31	4	31
58	LB4406	1	4	1	4	1	4	1	4	1	4	1	4
58	LB4407	3	5	3	5	3	5	3	5	3	5	3	5
58	LB4401	6	0	6	0	6	0	6	0	6	0	6	0
58	LB4301	0	6	0	6	0	6	0	6	0	6	0	6
58	LB4208	0	0	0	0	0	0	0	0	0	0	0	0
58	LB4611	0	0	0	0	0	0	0	0	0	0	0	0
58	IB1009	0	0	0	0	0	0	0	0	0	0	0	0
59	EL1013	0	0	0	0	0	0	0	0	0	0	0	0
59	LB4613	0	2	0	2	0	3	-1	3	-1	3	-1	3
59	LB4611	0	0	0	0	0	0	0	0	0	0	0	0
59	LB4614	30	3	28	3	27	3	26	4	24	4	23	4
59	LB4615	171	30	169	30	167	30	165	30	161	31	159	31
59	LB4616	69	0	69	0	69	0	69	0	68	0	68	0
59	LB4680	90	0	89	0	89	0	88	0	88	0	87	0
59	IB1011	94	20	94	20	94	20	93	20	93	20	93	20
59	IB1009	0	0	0	0	0	0	0	0	-1	0	-1	0
60	EL1040	0	73	0	73	0	73	0	73	0	73	0	73
60	EL1041	0	100	1	101	2	102	3	103	5	104	6	105
60	EL1002	25	168	25	169	25	169	25	169	25	169	26	169
60	EL1005	4	26	4	26	4	26	4	26	4	26	4	26
60	EL0003	17	64	19	66	20	67	21	67	24	69	25	70
60	EL0001	24	9	24	9	24	10	25	10	26	11	26	11
60	EL1013	6	27	6	27	6	27	6	27	6	27	6	27
60	LB4610	0	0	0	0	0	0	0	0	0	0	0	0
60	LB4611	0	3	0	3	0	3	0	3	0	3	0	3
60	EL0020	68	19	69	19	70	20	71	20	72	21	73	22
60	IB1041	21	13	22	13	22	13	22	13	22	13	22	13
60	EL0014	40	76	41	77	42	78	43	79	45	80	46	81
60	IB9103	7	0	7	0	7	0	7	0	7	0	7	0
60	IB9104	0	3	0	3	0	3	0	3	0	3	0	3
60	IB9105	0	8	0	8	0	8	0	8	0	8	0	8
60	IB9106	0	0	0	0	0	0	0	0	0	0	0	0
60	EL0034	0	0	0	0	0	0	0	0	0	0	0	0
60	EL0029	0	0	0	0	1	1	1	1	2	1	2	1
60	IB9100	0	55	0	55	0	55	0	55	0	55	0	55
61	EL1005	471	97	469	98	467	99	466	100	463	101	462	102
61	EL1013	3	2	3	2	3	2	3	2	3	2	3	2
61	IB5504	11	0	11	0	11	0	11	0	11	0	11	0
61	LB4615	6	9	6	9	6	9	6	9	6	9	5	9
61	LB4680	0	0	-11	6	-19	11	-27	16	-44	25	-52	29
61	IB1040	0	0	0	0	0	0	0	0	0	0	0	0
61	IB1041	28	2	28	2	28	2	28	2	28	2	28	2
61	EL0014	0	0	0	0	0	0	0	0	0	0	0	0
61	IB1035	21	2	18	4	16	5	14	6	10	9	8	10
61	IB1034	73	121	72	121	72	121	72	121	72	121	72	121
61	IB1032	180	34	179	35	178	36	177	36	176	37	175	38
61	IB1031	130	0	130	0	130	0	130	0	130	0	130	0
61	IB1030	98	0	98	0	98	0	98	0	98	0	98	0
61	IB1039	38	0	38	0	38	0	38	0	37	0	37	0
61	IB1028	98	21	98	21	97	21	97	21	97	21	97	21
61	IB5500	19	0	19	0	19	0	18	0	18	0	18	0
61	IB4113	9	0	9	0	9	0	9	0	9	0	9	0
61	IB4109	0	0	0	0	0	0	0	0	0	0	0	0
61	IB4107	0	0	0	0	0	0	0	0	0	0	0	0
62	IB1021	24	0	23	0	23	1	23	1	23	1	22	1
62	IB1019	53	0	52	0	52	1	52	1	51	1	51	2
62	IB1018	35	0	34	1	33	2	32	3	31	5	30	5
62	IB1017	204	0	203	2	201	4	200	5	197	8	196	9
62	IB1016	80	10	80	11	80	11	80	11	79	12	79	12
62	IB1014	220	44	218	45	217	47	216	48	214	50	212	51
62	IB1012	6	18	4	20	3	21	2	23	-1	26	-2	27
62	IB1011	211	49	207	54	203	58	200	61	194	69	190	72
62	IB1009	154	259	153	261	151	262	150	264	148	266	147	268
62	IB1008	0	0	0	0	0	0	0	0	0	0	0	0
62	IB1006	0	0	0	0	0	0	0	0	0	0	0	0
62	LB4553	114	365	112	366	111	367	110	368	108	371	107	372
62	IB1028	52	5	51	5	51	5	51	6	51	6	51	6
62	LB4545	0	0	0	0	0	0	0	0	0	0	0	0
63	IB1022	56	0	55	7	55	12	54	17	53	28	52	33

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
63	IB1021	63	0	58	50	53	86	49	121	41	192	37	228
63	IB1019	47	0	47	0	47	0	47	0	47	0	47	0
63	IB1017	51	26	51	27	51	28	51	29	51	31	51	32
63	LB4553	0	24	-2	41	-3	53	-5	65	-8	89	-9	101
63	IB1035	0	0	0	0	0	0	0	0	0	0	0	0
63	IB1028	114	0	108	49	104	84	100	119	92	189	88	224
63	IB1025	56	0	55	7	55	12	54	17	53	27	53	32
63	IB1024	51	0	50	9	49	16	49	23	47	36	46	43
63	IB1026	23	0	23	0	23	1	23	1	23	2	23	2
63	IB4113	60	0	54	50	50	85	45	121	37	192	33	227
63	IB4171	0	0	0	0	0	0	0	0	0	0	0	0
63	IB4109	162	23	157	70	153	104	149	138	141	206	137	240
63	LT4520	79	0	79	4	78	6	78	9	78	14	77	17
63	LT4516	73	8	73	10	72	12	72	14	72	17	72	19
63	LT4517	72	0	72	0	72	0	72	0	72	0	72	0
63	LT4518	19	0	19	0	19	0	19	0	19	0	19	0
63	LT4519	70	0	70	0	70	0	70	0	70	0	70	0
63	IB4105	192	0	192	0	192	0	192	0	192	0	192	0
63	IB4104	115	0	115	0	115	0	115	0	115	0	115	0
63	IB4101	60	0	59	2	59	4	59	6	59	9	59	11
63	IB4107	246	0	242	30	240	51	237	73	232	115	230	137
63	LT4514	0	20	0	20	0	20	0	20	0	20	0	20
63	LT4515	0	0	-5	43	-9	75	-12	106	-20	168	-23	199
63	IB4181	321	11	315	54	312	86	308	117	301	179	297	211
63	IB4189	73	0	73	5	72	8	72	11	71	18	71	21
63	LT4512	0	0	0	0	0	0	0	0	0	0	0	0
63	LT4513	0	0	0	0	0	0	0	0	0	0	0	0
63	LT4509	0	0	0	0	0	0	0	0	0	0	0	0
63	LT4258	0	0	0	0	0	0	0	0	0	0	0	0
63	LT4257	11	104	9	113	9	120	8	127	6	142	5	149
63	LT4260	0	2995	0	2995	0	2995	0	2995	0	2995	0	2995
64	IB1040	1	350	0	353	0	355	0	357	-1	361	-2	363
64	IB1041	0	0	0	0	0	1	0	1	0	2	0	2
64	IB1039	30	19	30	22	30	23	29	25	29	28	28	30
64	IB4116	1	35	1	35	1	35	1	35	1	35	1	35
64	IB4113	8	130	6	141	5	149	3	157	0	173	-1	180
64	IB9103	0	8	0	8	0	8	0	8	0	8	0	8
64	IB9104	0	0	0	0	0	0	0	0	0	0	0	0
64	IB1049	178	235	175	246	174	255	172	263	169	279	167	287
64	IB9100	2	92	2	94	2	94	1	95	1	97	1	98
64	IB9512	2	0	2	0	2	0	2	0	2	0	2	0
64	IB9513	18	3	18	4	17	5	17	6	17	8	17	9
64	IB1047	21	22	21	23	21	24	20	24	20	26	20	26
64	IB1046	240	13	237	24	236	32	234	40	231	56	230	64
64	IB1056	46	20	46	22	46	23	45	24	45	26	45	28
64	IB1055	16	5	16	6	16	6	16	6	16	7	16	7
64	IB9508	7	0	7	0	7	0	7	0	7	1	7	1
64	IB9507	4	0	4	0	4	0	4	1	4	1	4	1
64	IB1053	80	38	79	42	79	46	78	49	77	56	76	59
64	IB1051	4	0	4	1	4	2	3	3	3	4	3	5
64	IB7734	3	0	3	1	3	2	3	2	2	4	2	5
65	IB4116	127	176	121	177	117	178	113	179	105	180	101	181
65	IB4117	163	0	154	2	148	3	143	4	131	6	125	8
65	IB4113	0	51	0	51	0	51	0	51	0	51	0	51
65	IB4114	32	1	32	1	32	1	32	1	32	1	32	1
65	IB4171	35	1	35	1	35	1	35	1	35	1	35	1
65	LT4520	20	0	20	0	20	0	20	0	20	0	20	0
65	LT4516	54	2	54	2	54	2	54	2	54	2	54	2
65	IB4181	0	0	0	0	0	0	0	0	0	0	0	0
65	LT4512	42	7	41	7	40	7	38	7	36	8	35	8
65	IB1049	5	12	1	13	-1	13	-4	14	-9	15	-12	15
65	IB1046	0	0	0	0	0	0	0	0	0	0	0	0
65	IB1056	37	0	30	1	25	3	19	4	9	6	4	7
65	IB4121	972	7	966	9	961	9	957	10	948	12	943	13
65	IB4123	515	5	500	8	490	10	480	12	459	16	449	18
65	WD3921	152	0	152	1	151	1	151	1	151	1	150	1
65	WD4808	11	11	11	11	11	11	11	11	10	11	10	11
66	IB1062	31	43	29	44	27	44	26	45	23	46	21	46
66	IB4121	0	0	0	0	0	0	0	0	0	0	0	0
66	IB4123	23	0	23	0	23	0	23	0	23	0	23	0
66	WD3915	567	132	552	138	541	141	531	145	509	153	498	157
66	WD3916	12	0	11	0	10	1	9	1	8	1	7	2
66	WD3919	207	0	203	1	201	2	198	3	194	5	191	5
66	WD3921	204	79	202	79	201	79	200	80	198	81	197	81
66	WD4509	2	3	2	3	2	3	2	3	2	3	2	3
67	WD3921	167	72	165	73	164	74	163	74	162	76	161	76
67	WD4504	0	0	0	0	0	0	0	0	0	0	0	0
67	WD4506	0	1	0	2	-1	2	-1	2	-2	3	-2	3
67	WD4507	0	19	0	19	0	19	0	19	0	19	0	19
67	WD4502	0	125	-3	127	-6	128	-8	130	-13	133	-15	134
67	WD3924	82	0	80	1	79	2	78	3	75	4	74	5
67	WD3929	0	0	0	0	0	0	0	0	0	0	0	0
67	WD3930	0	12	0	12	0	12	0	12	0	12	0	12
67	WD3932	0	12	0	12	0	12	0	12	0	12	0	12
67	WD3933	0	15	0	15	0	15	0	15	0	15	0	15
67	WD3935	164	0	162	1	161	2	160	3	157	5	156	5
67	WD3936	127	11	125	12	124	13	123	14	121	15	120	16
67	WD4509	0	47	-2	48	-3	49	-4	50	-7	51	-8	52
67	WD4508	0	14	0	14	0	14	0	14	0	14	0	14
68	WD4504	5	37	5	39	5	40	5	41	5	43	5	44

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
68	WD4506	6	0	6	12	5	21	5	30	4	47	4	56
68	WD4507	0	0	0	6	0	11	-1	15	-1	25	-1	29
68	WD4529	74	660	73	675	73	686	72	696	71	718	71	728
68	WD4509	0	68	0	68	0	68	0	68	0	68	0	68
68	WD4508	0	171	0	179	-1	185	-1	191	-1	202	-2	208
69	WD4504	28	745	27	746	26	747	25	748	24	749	23	750
69	WD4704	142	350	140	353	138	355	136	357	133	360	131	362
69	WD4702	61	2157	60	2159	58	2160	57	2161	55	2164	54	2165
69	WD4529	0	0	0	0	0	0	0	0	0	0	0	0
70	WD4702	170	53	169	54	169	56	168	57	167	59	167	60
70	WD5603	46	4	46	5	45	5	45	5	45	6	45	7
70	WD0013	99	94	98	96	97	99	96	101	95	105	94	107
70	WD0010	16	0	16	0	16	0	16	0	16	0	16	0
70	WD0011	0	6	0	6	0	6	0	6	0	6	0	6
70	WD0005	28	4	28	4	28	4	28	4	28	5	28	5
70	WD0006	21	2	21	3	21	3	21	3	20	3	20	3
70	WD0003	18	4	18	4	18	5	17	5	17	5	17	5
70	GR0627	11	26	10	27	10	28	10	29	9	31	9	32
70	GR0631	0	3	-1	5	-1	6	-2	8	-3	11	-4	13
70	GR0632	0	0	0	0	0	0	0	0	0	0	0	0
70	GR0635	55	0	55	2	54	3	54	4	53	6	52	7
70	GR0638	0	0	0	1	0	1	-1	1	-1	2	-1	3
70	GR0639	0	0	0	0	0	0	0	0	0	0	0	0
70	WD0014	0	0	0	1	0	1	0	1	-1	2	-1	3
70	GR0618	0	0	0	0	0	0	0	1	0	1	0	1
70	GR0626	0	0	-1	1	-1	2	-1	3	-2	5	-2	6
70	WD0008	2	0	2	0	2	0	2	0	2	0	2	0
70	WD0009	6	0	6	0	6	0	6	0	6	0	6	0
71	GR0646	0	0	0	0	0	0	0	0	0	0	0	0
71	GR0627	0	0	0	0	0	0	0	0	0	0	0	0
71	GR0631	0	16	0	16	0	16	0	16	0	17	0	17
71	GR0632	0	0	0	0	0	1	0	1	0	1	0	2
71	GR0635	0	0	0	0	0	0	0	0	0	0	0	0
71	GR0638	0	4	0	5	0	6	0	6	0	7	0	8
71	GR0639	1	6	1	6	1	6	1	7	1	7	1	7
71	GR0640	0	0	0	0	0	0	0	0	0	1	0	1
71	LB3014	28	6	28	6	28	6	28	6	28	7	28	7
71	LB3005	0	41	0	41	0	41	0	41	0	41	0	41
71	LB3008	8	19	8	20	8	20	8	21	7	21	7	22
71	GR1504	0	0	0	0	0	0	0	0	0	0	0	0
71	GR0618	0	0	0	0	0	0	0	0	0	0	0	0
71	GR0626	0	0	0	0	0	0	0	0	0	0	0	0
72	LB4515	0	0	0	0	0	0	0	0	0	0	0	0
72	LB3000	0	0	0	0	0	0	0	0	0	0	0	0
72	LB3002	0	49	0	49	0	49	0	49	0	49	0	49
72	GR0642	0	11	0	12	0	12	0	13	0	14	0	14
72	GR0645	0	0	0	1	0	1	0	1	0	2	0	2
72	GR0646	86	204	85	208	85	211	85	214	84	220	84	223
72	GR0651	0	24	0	24	0	24	0	24	0	25	0	25
72	GR0653	0	0	0	2	0	3	0	4	-1	6	-1	8
72	LT1745	0	0	0	0	0	0	0	0	0	0	0	0
72	LB4505	0	0	0	1	0	2	0	3	-1	5	-1	6
72	GR0639	0	0	0	0	0	0	0	0	0	0	0	1
72	GR0640	0	12	0	12	0	12	0	12	0	13	0	13
72	LB3005	0	0	0	0	0	0	0	0	0	0	0	0
72	LB3008	0	0	0	0	0	0	0	0	0	0	0	0
73	LB4515	0	0	0	0	0	0	0	0	0	0	0	0
73	LT1741	111	291	110	292	110	293	110	294	109	296	109	297
73	LT0103	71	0	71	0	71	0	71	0	71	0	71	0
73	LT0100	30	0	30	0	30	0	29	0	29	0	29	1
73	LT0101	98	0	98	0	98	0	98	0	98	0	98	0
73	LT0102	82	0	82	0	82	0	82	0	82	0	82	0
73	GR0642	185	0	182	7	180	12	179	17	175	27	173	32
73	GR0645	0	0	-1	3	-2	6	-3	8	-5	13	-6	16
73	GR0648	0	0	-1	4	-2	7	-4	10	-6	16	-7	19
73	GR0653	0	0	0	1	0	1	-1	2	-1	2	-1	3
73	LT1721	48	0	48	0	48	0	48	0	48	0	48	0
73	LT1722	104	66	104	66	104	67	103	67	103	68	103	68
73	LT1723	0	0	-1	3	-2	5	-2	7	-4	11	-5	13
73	LT1724	47	0	47	0	47	0	47	0	47	0	47	0
73	LT1725	40	0	40	0	40	0	40	0	40	0	40	0
73	LT1745	0	0	-1	3	-2	5	-3	7	-4	12	-5	14
73	LB4505	0	0	0	1	-1	2	-1	3	-2	5	-2	6
73	WD4702	0	0	0	0	0	0	0	0	0	0	0	0
73	LT0157	0	0	0	0	0	0	0	0	0	0	0	0
73	LT0155	58	164	58	164	58	165	58	165	58	165	58	166
73	WD4546	74	0	74	0	74	0	74	0	74	0	74	0
73	WD4701	12	0	12	0	12	0	11	1	11	1	11	1
73	WD5603	14	1	14	2	14	2	14	2	14	2	14	2
73	WD0001	0	0	-1	3	-2	5	-3	7	-4	11	-5	14
73	WD4699	0	19	-1	23	-2	25	-3	28	-5	34	-6	37
73	WD5601	4	0	2	5	1	9	0	13	-3	20	-4	24
73	LT0106	280	45	280	46	280	47	280	47	279	49	279	49
73	LT0107	45	0	45	0	45	0	45	0	45	0	45	0
73	LT0152	64	0	64	0	64	0	64	0	64	0	64	0
73	WD0003	29	4	29	4	29	4	29	4	28	4	28	4
73	GR0635	0	0	0	0	0	0	0	0	0	0	0	0
73	GR0638	15	0	15	0	15	0	15	0	15	0	15	0
73	GR0639	0	0	-1	3	-2	5	-2	7	-4	11	-5	13
73	GR0640	18	0	17	4	16	7	15	9	13	15	12	17

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
74	LT1741	15	0	15	0	15	0	15	0	15	0	15	0
74	LT1722	0	0	0	0	0	0	0	0	0	0	0	0
74	WD4504	0	0	0	0	0	0	0	0	0	0	0	0
74	WD4506	0	0	0	0	0	0	0	0	0	0	0	0
74	WD4502	0	7	0	7	0	7	0	7	0	7	0	7
74	WD4808	127	16	122	17	119	17	115	17	108	18	105	18
74	WD4705	21	26	20	26	20	26	19	26	18	27	18	27
74	WD4706	298	0	296	0	294	0	292	1	288	1	287	1
74	WD4500	0	26	0	26	0	26	0	26	0	26	0	26
74	WD4704	37	68	33	69	31	69	29	69	24	70	22	70
74	WD4702	0	0	0	0	0	0	0	0	-1	0	-1	0
74	WD4703	199	14	195	15	193	15	190	15	186	16	183	16
74	LT0158	20	0	19	0	18	0	18	0	16	0	16	0
74	LT0160	116	0	115	0	114	0	113	0	112	0	111	0
74	LT0162	222	0	221	0	220	0	219	0	217	0	216	1
74	WD1005	10	0	10	0	10	0	10	0	10	0	10	0
74	WD1004	24	0	24	0	24	0	24	0	24	0	24	0
74	WD1003	15	0	15	0	15	0	15	0	15	0	15	0
74	LT0157	9	35	5	36	2	36	-1	36	-7	37	-10	37
74	WD4546	0	0	0	0	0	0	0	0	0	0	0	0
74	WD3936	54	16	52	16	50	16	49	16	46	16	44	16
74	WD4699	0	0	-1	0	-2	0	-2	0	-4	0	-4	0
74	WD5601	0	0	0	0	0	0	0	0	0	0	0	0
75	LT4512	12	9	11	10	11	11	10	11	10	13	9	13
75	IB4121	39	164	38	166	38	167	37	168	35	170	35	171
75	IB4123	54	8	53	10	52	11	52	12	50	14	50	15
75	WD3921	12	58	11	58	11	58	11	59	11	59	11	59
75	WD4808	205	186	200	194	196	200	192	206	185	218	181	224
75	WD4706	227	76	222	84	219	89	215	95	209	105	205	111
75	WD3936	71	9	70	10	69	11	68	12	67	14	66	15
76	LT4512	316	47	308	47	302	47	296	48	285	48	279	48
76	WD4808	54	9	54	10	54	10	53	10	53	10	53	10
77	LT4512	69	5	67	6	65	6	64	6	60	6	59	7
77	LT4707	0	0	0	0	0	0	0	0	0	0	0	0
77	LT4704	1	0	1	0	1	0	1	0	1	0	1	0
77	LT1741	405	8	401	8	398	9	395	9	390	10	387	10
77	LT1722	4	0	-1	1	-4	1	-7	1	-14	2	-17	3
77	WD4808	5	22	5	22	5	22	5	22	5	22	5	22
77	LT0160	0	0	0	0	0	0	0	0	0	0	0	0
77	LT0162	10	0	10	0	10	0	10	0	10	0	10	0
78	LT4514	0	8	0	8	0	8	0	8	0	8	0	8
78	LT4511	52	2	52	2	52	2	52	2	52	2	52	2
78	LT4512	164	8	160	10	158	10	155	11	150	13	148	14
78	LT4513	10	72	9	72	8	72	8	72	6	73	6	73
78	LT4509	48	8	47	8	47	8	47	8	46	9	46	9
78	LT4258	8	22	5	23	4	24	2	25	-2	26	-4	27
78	LT4257	0	0	0	0	0	0	0	0	0	0	0	0
78	LT4206	0	0	0	0	0	0	0	0	0	0	0	0
78	LT4505	0	0	0	0	0	0	0	0	0	0	0	0
78	LT4506	0	0	0	0	0	0	0	0	0	0	0	0
78	LT4507	126	30	124	30	123	31	122	31	120	32	119	32
79	LT4254	0	47	0	47	0	47	0	47	0	48	0	48
79	LT4204	0	5	0	5	0	5	0	5	0	5	0	5
79	LT4252	0	0	0	0	0	0	0	0	0	0	0	0
79	LT4253	0	0	0	0	0	0	0	0	0	0	0	0
79	LB4553	0	13	0	13	0	13	0	13	0	13	0	13
79	LT4512	0	0	0	0	0	0	0	0	0	0	0	0
79	LT4707	110	19	110	19	109	19	109	19	109	19	109	20
79	LT4258	0	13	-1	15	-1	16	-2	17	-3	19	-3	21
79	LT4257	0	34	-2	39	-4	42	-6	46	-9	54	-10	57
79	LT4206	10	63	9	66	8	68	7	69	6	73	5	74
79	LT4503	20	8	19	11	18	14	17	16	15	20	14	22
79	LT4504	19	0	17	3	16	5	15	7	14	11	13	13
79	LT4505	6	0	5	2	5	3	4	5	3	8	2	9
79	LT4506	15	0	15	0	15	0	15	0	15	0	15	0
79	LT4507	23	48	23	49	22	50	22	51	21	53	21	54
79	LT4704	97	92	97	92	96	93	96	93	96	94	96	94
79	LT4705	32	0	32	0	32	0	32	0	32	0	32	0
79	LT4706	33	93	33	93	33	93	33	93	33	93	33	93
79	LT4710	21	0	21	0	21	0	21	0	21	0	21	0
79	LT1741	6	125	6	125	6	126	6	126	6	126	6	126
80	LT4254	0	0	0	0	0	0	0	0	0	0	0	0
80	LT4251	0	8	0	8	0	8	0	8	0	8	0	8
80	LT4252	2	11	2	11	2	11	2	11	2	11	1	11
80	LT4253	0	2	0	2	0	2	-1	2	-1	2	-1	2
80	LB5016	0	1	0	1	0	1	0	1	0	1	0	1
80	LB4553	0	0	0	0	0	0	0	0	0	0	0	0
80	LB4530	0	36	0	36	0	36	0	36	-1	36	-1	36
80	LB4515	207	0	206	0	205	0	205	1	203	1	202	1
80	LT4700	14	0	14	0	14	0	14	0	14	0	14	0
80	LT4701	161	0	161	0	161	0	160	0	160	0	160	0
80	LT4704	77	10	77	10	77	10	77	10	77	10	77	10
80	LT4500	18	0	18	0	18	0	17	1	17	1	16	1
80	LT4250	2	2	1	2	1	2	1	2	1	3	1	3
80	LT4710	0	0	0	0	0	0	0	0	0	0	0	0
80	LT4713	21	0	21	0	21	0	21	0	21	0	21	0
80	LT4714	33	0	33	0	33	0	33	0	33	0	33	0
80	LT1735	85	0	85	0	85	0	85	0	85	0	85	0
80	LT1741	260	10	257	11	255	11	253	12	249	13	247	13
80	LT1723	0	0	-3	1	-5	1	-7	2	-11	3	-13	3

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
80	LT1745	0	0	-2	1	-4	1	-6	1	-9	2	-10	3
80	LB4505	0	0	0	0	0	0	0	0	0	0	0	0
81	IB1008	20	14	20	14	20	14	20	14	20	14	20	14
81	LB4555	0	0	0	0	0	0	0	0	0	0	0	0
81	LT4254	0	0	0	0	0	0	0	0	0	0	0	0
81	LT4251	0	2	0	2	0	2	0	2	0	2	0	2
81	LT4252	0	0	0	0	0	0	0	0	0	0	0	0
81	LT4253	0	0	0	0	0	0	0	0	0	0	0	0
81	LB5019	3	136	3	135	3	135	3	134	2	133	2	133
81	LB5016	0	467	0	466	0	465	-1	465	-1	464	-1	463
81	LB4553	242	184	241	184	241	183	241	183	241	182	241	181
81	LB4536	0	0	0	-1	0	-1	0	-2	-1	-3	-1	-3
81	LB4540	0	0	0	0	0	-1	0	-1	0	-1	0	-1
81	LB4530	0	449	-1	447	-1	446	-1	444	-2	442	-2	441
81	LB4516	0	0	0	-1	-1	-2	-1	-2	-1	-4	-1	-4
81	LB4515	0	0	-1	-2	-1	-3	-1	-5	-2	-7	-3	-9
81	LB4505	0	0	0	0	0	0	0	0	0	0	0	0
81	LB4545	0	15	-1	13	-1	12	-1	10	-2	8	-3	6
82	LB4207	0	0	0	0	0	0	0	0	0	0	0	0
82	LB4200	0	0	0	1	0	1	0	2	-1	3	-1	4
82	LB4564	19	0	19	0	19	0	19	0	19	0	19	0
82	IB1009	0	0	0	0	0	0	0	0	0	0	0	0
82	IB1008	32	14	32	14	32	14	32	14	32	14	32	14
82	IB1006	51	7	51	7	51	7	51	7	51	7	51	7
82	IB1007	0	12	0	13	0	14	0	14	-1	15	-1	16
82	IB1005	57	0	57	0	57	0	57	0	57	0	57	0
82	IB1004	38	0	38	0	38	0	38	0	38	0	38	0
82	LB4558	0	90	0	90	0	90	0	91	0	91	0	91
82	LB4554	0	0	-1	3	-1	5	-2	8	-3	12	-3	14
82	LB4555	0	18	0	19	0	19	0	20	-1	20	-1	21
82	LB5016	0	0	0	0	0	0	0	0	0	0	0	0
82	LB4553	0	7	0	7	0	7	0	7	0	8	0	8
82	LB4536	0	3	0	4	0	4	0	4	-1	5	-1	6
82	LB4540	0	0	0	0	0	0	0	1	0	1	0	1
82	LB4530	0	86	0	86	0	87	0	87	0	87	0	87
82	LB4516	0	0	0	0	0	1	0	1	0	2	-1	2
82	LB4515	0	0	0	0	0	0	0	0	0	0	0	0
82	LB4505	0	0	0	0	0	0	0	0	0	0	0	1
83	LB4117	0	7	0	7	0	7	0	7	0	7	0	7
83	LB4118	0	0	0	0	0	1	0	1	0	2	0	2
83	LB4301	15	3	15	3	15	3	15	3	15	3	15	3
83	LB4206	0	10	0	11	0	11	0	11	0	12	0	12
83	LB4207	0	0	0	1	0	1	0	2	0	3	0	4
83	LB4200	0	79	0	82	0	85	0	87	-1	92	-1	94
83	LB4208	0	10	0	10	0	10	0	10	0	11	0	11
83	IB1009	0	0	0	0	0	0	0	0	0	0	0	0
86	OB0006	0	0	1	0	1	0	1	0	2	0	3	0
86	RA0005	0	0	0	0	0	0	0	0	0	0	0	0
86	RA0007	0	0	1	0	1	0	2	0	3	0	3	0
86	OB0009	0	0	0	0	0	0	1	0	1	0	1	0
86	RA0012	0	0	1	0	1	0	2	0	3	0	4	0
86	RA0010	0	1	1	1	2	1	3	1	4	1	5	1
86	RA0008	0	0	0	0	0	0	0	0	0	0	0	0
86	RA3182	160	0	160	0	161	0	161	0	162	0	162	0
86	GR9119	24	0	26	0	28	0	30	0	34	0	36	0
86	GR9251	0	0	1	0	2	0	3	0	4	0	5	0
86	GR9267	0	0	3	0	4	0	6	0	10	0	12	0
86	GR9294	0	0	1	0	1	0	2	0	3	0	4	0
86	SB8007	9	0	12	0	15	0	17	0	22	0	25	0
86	SB8005	0	0	1	0	2	0	3	0	4	0	5	0
86	SB8011	0	0	0	0	0	0	0	0	0	0	0	0
86	SB8010	48	0	49	0	49	0	50	0	51	0	51	0
86	RA6004	0	2	0	2	1	2	1	2	1	2	2	2
86	SB9671	0	0	0	0	0	0	0	0	0	0	0	0
88	WD4702	0	3	0	3	0	3	0	3	0	3	0	3
88	WD0013	2	127	2	124	2	122	2	120	2	117	2	115
88	WD0021	0	0	0	0	0	0	0	0	0	0	0	0
88	WD0019	8	14	8	7	8	1	8	-4	8	-15	8	-20
88	WD0014	0	39	0	8	0	-14	0	-36	-1	-80	-1	-102
88	GR0611	0	0	0	0	0	0	0	0	0	0	0	0
88	GR0618	0	45	0	45	0	45	0	45	0	45	0	45
88	WD1019	0	0	0	0	0	0	0	0	0	0	0	0
91	OA0035	0	0	0	0	0	0	0	0	0	0	0	0
91	JN0026	0	0	0	0	0	0	0	0	0	0	0	0
91	OB8015	0	0	0	47	0	81	1	115	1	183	1	217
91	OB8009	0	0	0	0	0	1	0	1	0	1	0	2
91	OB8020	0	0	0	0	0	0	0	0	0	1	0	1
91	OA0042	0	0	0	0	0	0	0	0	0	0	0	0
91	OA0047	0	0	0	2	0	4	0	6	0	9	0	11
91	OB8035	0	0	1	193	2	330	2	468	4	743	5	881
91	OB8038	12	0	12	10	12	17	12	24	12	38	12	45
91	OB8041	0	25	0	25	0	25	0	25	0	25	0	25
91	OB0041	0	0	0	0	0	0	0	0	0	0	0	0
91	OB0031	0	0	0	0	0	0	0	0	0	0	0	0
100	LB3000	0	113	0	115	0	117	0	118	0	122	0	123
100	LB4505	0	1	0	4	0	6	0	7	0	11	0	13
100	LB3004	0	65	0	77	0	86	0	95	-1	113	-1	122
100	LB3005	0	4	0	5	0	6	0	7	0	8	0	9
100	LB3011	0	0	0	0	0	0	0	0	0	0	0	0
102	LB3005	1	0	1	1	1	1	1	1	1	2	1	2

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
102	LB3008	0	0	0	0	0	0	0	0	0	0	0	0
102	LB3011	14	0	14	2	14	4	14	6	13	10	13	11
104	GT1000	0	0	0	0	0	0	0	0	0	0	0	0
105	GT2007	281	15	280	16	279	17	278	18	277	19	276	20
105	GT1014	343	0	343	0	343	0	343	0	343	0	343	0
105	GT3102	0	203	-13	218	-22	229	-31	240	-50	261	-59	272
105	GT5110	0	0	0	0	0	0	0	0	0	0	0	0
105	GT1000	0	0	-2	2	-3	3	-4	5	-6	7	-8	9
106	GT1018	0	0	-1	5	-1	8	-2	11	-3	18	-4	21
106	GT1805	43	170	42	171	42	171	42	171	42	172	42	172
106	GT1804	55	0	55	0	55	1	55	1	55	2	55	2
106	GT1803	29	0	29	0	29	0	29	0	29	1	29	1
106	GT1802	73	0	73	2	73	3	73	4	72	7	72	8
106	GT1020	0	0	0	0	0	0	0	0	0	0	0	0
106	HR3312	0	0	0	1	0	2	-1	3	-1	5	-1	6
106	GT1010	0	0	0	1	0	2	-1	3	-1	5	-1	6
106	GT1007	23	129	23	130	23	131	23	132	22	135	22	136
106	HR1354	0	0	0	1	0	2	0	3	-1	4	-1	5
106	GT1006	164	52	164	52	164	53	164	53	164	53	164	53
106	GT2007	35	22	35	22	35	22	35	22	35	22	35	22
106	GT2008	10	17	10	17	10	17	10	17	10	17	10	17
106	GT1003	0	566	-1	569	-1	572	-2	574	-2	579	-3	582
106	GT1014	71	1	71	2	71	2	71	3	71	4	71	5
106	GT2031	0	18	0	18	0	19	0	19	0	20	0	20
106	GT1000	0	0	-1	7	-2	12	-3	17	-5	27	-6	32
107	LB3014	0	0	0	0	0	0	0	0	0	0	0	0
107	LB3005	0	0	0	0	0	0	0	0	0	0	0	0
107	LB3008	0	0	0	0	0	0	0	0	0	0	0	0
107	LB3011	7	242	7	250	7	255	7	260	7	271	7	277
107	GR1515	3	252	3	257	3	260	3	263	3	269	3	272
107	GR2101	0	1	0	1	0	2	0	2	0	2	0	2
107	HR1316	0	0	0	0	0	1	0	1	0	1	0	2
107	HR1315	0	0	0	0	0	1	0	1	0	2	0	2
107	HR1354	0	0	0	0	0	0	0	0	0	1	0	1
108	GR0631	0	0	0	0	0	0	0	0	0	0	0	0
108	GR0632	0	0	0	0	0	0	0	0	0	0	0	0
108	GR0638	0	0	0	0	0	0	0	0	0	0	0	0
108	LB3014	89	86	89	87	89	87	88	88	88	89	87	89
108	LB3008	0	0	0	0	0	0	0	0	0	0	0	0
108	LB3011	0	0	0	0	0	0	0	0	0	0	0	0
108	GR1504	109	48	109	49	109	49	109	49	109	49	108	49
108	GR1515	61	19	60	21	59	22	59	23	57	25	57	26
108	GR0618	6	5	6	6	5	6	5	7	5	7	5	8
108	GR2101	0	0	0	0	0	0	0	0	0	0	0	0
109	GR0631	0	0	0	0	0	0	0	0	0	0	0	0
109	GR1515	0	8	0	8	0	8	0	8	0	8	0	8
109	GR1703	0	175	0	175	0	175	0	175	0	176	0	176
109	GR0609	0	0	0	0	0	0	0	0	0	0	0	0
109	GR0611	0	0	0	0	0	0	0	0	0	0	0	0
109	GR0614	0	60	-1	62	-2	63	-2	65	-4	68	-4	69
109	GR0618	69	28	68	30	67	31	66	33	65	36	64	37
109	GR2004	0	0	0	0	0	0	0	0	0	0	0	0
109	GR2101	219	44	219	45	219	45	219	45	219	45	219	45
109	GR2005	0	0	0	0	0	0	0	0	0	0	0	0
110	HR8702	0	0	0	0	0	0	0	0	0	0	0	0
110	GR0560	0	0	0	0	0	0	0	0	0	0	0	0
110	GR0605	0	5	0	5	0	5	0	5	0	5	0	5
110	GR0609	0	145	0	145	0	145	0	145	0	145	0	146
110	GR0611	0	31	0	31	0	31	0	31	0	31	0	31
110	GR0614	0	0	0	0	0	0	0	0	0	0	0	0
110	GR0618	0	0	0	0	0	0	0	0	0	0	0	0
110	GR1424	0	0	0	0	0	0	0	0	0	0	0	0
110	GR1426	0	18	0	18	0	18	0	19	0	19	0	19
110	HR1260	0	0	0	0	0	1	0	1	0	2	0	2
110	HR1262	0	57	0	58	0	59	0	59	0	60	0	60
110	GR2005	0	1	0	1	0	1	0	1	0	1	0	1
111	GR1515	0	36	0	36	0	36	0	36	0	36	0	36
111	GR2101	381	327	381	327	381	327	381	327	381	327	381	327
111	GR2005	0	0	0	0	0	0	0	0	0	0	0	0
111	HR1235	0	0	0	0	0	0	0	0	0	0	0	0
111	HR1241	0	38	0	38	0	38	0	38	0	38	0	38
111	HR1315	0	0	0	0	0	0	0	0	0	0	0	0
112	GR2005	0	48	0	48	0	48	0	48	0	48	0	48
112	HR1330	0	0	0	1	-1	1	-1	1	-1	2	-2	2
112	HR1233	8	0	8	0	8	0	8	0	8	0	8	0
112	HR1235	0	46	0	46	0	46	0	46	0	46	0	46
112	HR1241	0	39	0	39	0	40	0	40	-1	40	-1	40
112	HR3304	23	0	23	0	23	0	23	1	22	1	22	1
112	HR3310	0	0	0	0	0	0	0	0	0	1	0	1
112	HR1315	0	16	0	16	0	16	0	16	0	16	0	16
112	HR2801	113	41	113	41	113	41	113	41	112	42	112	42
113	HR8702	0	0	0	1	0	1	0	2	0	2	0	3
113	GR1424	0	0	0	0	0	0	0	0	0	0	0	0
113	HR1260	0	0	0	0	0	0	0	0	0	0	0	0
113	HR1262	0	63	0	63	0	64	0	64	0	65	0	66
113	GR2005	0	0	0	0	0	0	0	0	0	0	0	0
113	HR1330	0	0	0	0	0	0	0	0	0	0	0	0
113	HR1233	0	0	0	0	0	0	0	1	0	1	0	1
113	HR1235	0	0	0	0	0	0	0	0	0	1	0	1
113	HR1241	0	0	0	1	0	1	0	2	0	2	0	3

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
113	HR3304	0	2	0	2	0	2	0	2	0	2	0	2
113	HR1227	0	0	0	0	0	0	0	0	0	1	0	1
113	HR1228	0	189	0	190	0	190	0	190	0	191	0	191
113	HR3299	0	0	0	0	0	0	0	0	0	0	0	0
113	HR2801	59	129	59	129	59	130	59	130	59	131	59	131
113	HR2703	0	0	0	0	0	0	0	0	0	0	0	0
113	HR1044	0	0	0	0	0	0	0	0	0	0	0	0
114	GT1007	0	76	0	78	0	80	0	81	0	83	-1	85
114	HR2801	45	445	45	450	44	453	44	457	44	465	44	468
114	HR1214	0	0	0	0	0	0	0	0	0	0	0	0
114	HR8711	0	0	0	0	0	0	0	0	0	0	0	0
115	GT1007	15	218	15	219	15	220	15	222	15	224	15	225
115	HR2801	0	242	0	249	0	254	0	259	-1	269	-1	274
116	GT1008	5	9	5	9	5	9	5	9	5	9	5	9
116	GT1007	31	146	30	153	29	158	29	163	27	172	26	177
116	GT1006	0	0	0	0	0	0	0	0	0	0	0	0
116	GT2007	0	0	0	1	0	2	0	3	-1	5	-1	6
116	GT2008	13	343	12	346	12	349	11	351	11	356	10	358
116	GT2015	25	0	24	2	24	3	24	5	24	7	23	9
116	GT2012	45	0	45	0	45	0	45	1	45	1	45	1
116	GT2011	80	0	80	0	80	0	80	0	80	1	80	1
116	GT2010	34	0	34	0	34	0	34	0	34	0	34	1
117	GT1007	96	42	95	43	94	44	94	44	92	45	91	46
117	GT2008	0	0	0	0	0	0	0	0	0	0	0	0
117	GT2015	111	7	109	8	108	9	107	9	105	11	104	11
117	LF0053	46	6	46	6	46	6	46	7	45	7	45	7
117	LF9027	54	13	54	13	54	13	54	13	53	14	53	14
118	GT2015	11	71	11	73	11	75	11	76	10	79	10	81
118	GT3018	53	55	53	58	53	60	53	62	53	67	52	69
118	GT3501	0	41	0	41	0	41	0	41	0	41	0	41
118	GT3502	0	0	0	0	0	0	0	0	0	0	0	0
118	GT3013	0	0	0	0	0	0	0	0	0	1	0	1
118	GT3011	0	2	0	2	0	2	0	2	0	2	0	2
118	GT4009	0	2	0	4	0	5	0	6	0	8	0	9
118	GT3504	0	8	0	13	0	17	-1	21	-1	29	-1	33
119	GT2007	0	0	0	0	0	0	0	0	0	0	0	0
119	GT2015	0	480	0	480	0	480	0	480	0	480	0	480
119	GT2012	0	91	0	92	0	92	0	92	0	93	0	93
119	GT2302	0	0	0	1	0	1	0	2	0	3	0	3
119	GT2304	0	161	0	161	0	161	0	161	0	161	0	161
119	GT3502	0	0	0	0	0	0	0	0	0	0	0	0
119	GT3013	0	56	0	56	0	57	0	58	0	59	0	60
119	GT3201	0	137	0	137	0	137	0	137	0	138	0	138
119	GT3011	0	92	0	93	0	93	0	93	0	94	0	94
119	GT3005	0	7	0	10	0	13	0	15	0	19	0	21
119	GT3102	0	249	0	250	0	250	0	250	0	250	0	251
119	GT3204	0	0	0	0	0	1	0	1	0	1	0	1
119	GT6212	0	0	0	1	0	2	0	2	0	4	0	5
120	GT3502	0	201	0	201	0	201	0	202	0	202	0	202
120	GT3201	21	38	21	39	21	40	21	40	21	42	21	43
120	GT3102	15	0	15	2	15	3	15	4	15	6	15	8
120	GT5110	0	415	-1	441	-1	460	-1	479	-2	516	-3	535
120	GT3204	0	0	0	0	0	0	0	0	0	0	0	0
121	GR0122	0	25	0	25	0	25	0	25	0	25	0	25
121	GT3501	0	0	0	0	0	0	0	0	0	0	0	0
121	GT3503	0	113	0	113	0	113	0	113	0	114	0	114
121	GT3502	0	0	0	0	0	0	0	0	0	0	0	0
121	GT5110	0	0	0	0	0	0	0	0	0	0	0	0
121	GT4009	0	86	0	86	0	86	0	86	0	86	0	86
121	GT4008	0	0	0	0	0	0	0	0	0	0	0	0
121	GT6004	0	0	0	0	0	0	0	0	0	0	0	0
121	GT6003	0	30	-1	30	-1	31	-1	32	-2	33	-3	33
121	GT4007	0	22	-1	22	-1	23	-1	24	-2	25	-3	25
121	GT4006	0	20	0	20	0	20	0	20	0	20	0	20
121	GT4001	0	87	-1	89	-2	90	-3	91	-5	94	-6	95
121	GT4003	0	9	-2	11	-3	13	-5	15	-7	18	-9	20
121	GT3504	199	8	199	8	198	8	198	8	198	9	198	9
125	GT4009	1337	755	1325	805	1316	840	1307	876	1289	948	1280	984
125	GT4008	0	59	-8	90	-13	113	-19	135	-30	180	-36	202
125	GT6008	0	596	-20	675	-34	731	-48	788	-76	900	-90	957
125	GT6004	0	480	-3	490	-5	498	-6	506	-10	521	-12	528
125	GT6003	0	0	0	0	0	0	0	0	0	0	0	0
126	LF7003	0	0	0	0	0	0	1	0	1	0	1	0
126	LF5009	0	0	0	0	1	0	1	0	1	0	1	0
126	LF7922	0	5	0	5	1	5	1	5	2	4	2	4
126	LF5007	0	0	0	0	0	0	0	0	0	0	0	0
126	LF5006	0	6	1	6	2	6	3	6	6	6	7	6
126	HK6019	76	0	77	0	78	0	78	0	80	0	81	0
126	LF5003	58	0	58	0	59	0	59	0	59	0	60	0
126	LF5002	9	0	9	0	9	0	9	0	10	0	10	0
126	HK0001	3	0	5	0	6	0	7	0	10	0	11	-1
126	LF5005	6	0	6	0	6	0	6	0	6	0	6	0
126	HK0018	0	2	0	2	0	2	0	2	0	2	0	2
126	HK6026	0	0	0	0	0	0	0	0	0	0	0	0
126	HK0007	0	0	1	0	1	0	2	0	2	0	3	0
126	HK0008	0	1	0	1	1	1	1	1	1	1	1	1
127	GT3018	0	0	0	0	0	0	0	0	0	0	0	0
127	LF3102	0	0	0	0	0	0	0	0	0	0	0	0
127	GT4009	181	10	201	10	216	11	231	11	260	12	275	12
127	GT6008	249	0	257	0	262	0	268	1	280	1	285	1

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
127	HR8004	318	0	318	0	318	0	318	0	318	0	318	0
127	LF7009	0	0	2	0	3	0	4	0	7	0	8	0
127	LF7008	468	0	485	1	497	1	509	1	534	2	546	2
127	LF7007	0	0	3	0	6	0	8	0	13	0	15	0
127	LF7006	0	0	2	0	4	0	6	0	9	0	11	0
127	LF5017	0	0	8	0	13	0	18	1	29	1	35	1
127	LF5020	1264	38	1313	40	1348	41	1384	42	1454	44	1489	45
127	LF7003	0	0	8	0	13	0	19	1	30	1	35	1
127	LF5011	0	0	8	0	13	0	19	1	30	1	35	1
127	LF7922	66	7	71	7	74	7	78	7	84	7	87	7
127	LF5002	0	0	0	0	0	0	0	0	0	0	0	0
127	HR1120	0	0	0	0	0	0	0	0	0	0	0	0
127	LF7035	83	0	83	0	83	0	83	0	83	0	83	0
127	LF7031	32	8	33	8	34	8	34	8	36	8	37	8
127	LF7030	26	0	26	0	26	0	26	0	26	0	26	0
127	LF7029	0	4	3	4	4	4	6	4	10	4	12	4
127	LF7024	61	1	62	1	62	1	63	1	64	1	64	1
127	LF7021	229	4	230	4	230	4	231	4	233	4	233	4
127	LF7020	0	60	1	61	2	61	3	61	4	61	5	61
127	LF7019	13	81	15	81	17	81	19	81	22	81	24	81
127	LF7018	106	9	106	9	107	9	108	9	109	9	109	9
127	LF7015	34	0	43	0	49	0	55	1	67	1	73	1
127	LF7016	3	0	8	0	11	0	15	0	22	1	26	1
127	LF7012	0	0	2	0	4	0	6	0	9	0	11	0
127	HK6348	0	0	0	0	0	0	0	0	0	0	0	0
127	LF9069	47	0	49	0	50	0	51	0	54	0	55	0
127	LF9068	0	0	0	0	0	0	0	0	0	0	0	0
127	LF9051	85	0	89	0	93	0	97	0	104	1	107	1
127	LF9048	0	0	0	0	0	0	0	0	0	0	0	0
127	LF9043	40	0	41	0	43	0	44	0	47	0	48	0
128	GT2015	0	0	0	0	0	0	0	0	0	0	0	0
128	GT3018	169	75	170	80	170	84	170	88	170	95	170	99
128	LF0049	0	0	0	0	0	0	0	0	0	0	0	0
128	LF0053	54	233	55	237	55	239	55	242	55	248	55	251
128	LF0901	165	0	165	0	165	0	165	0	165	0	165	0
128	LF3102	51	0	51	0	51	0	51	0	51	0	51	0
128	LF0024	227	28	227	30	227	32	227	34	227	38	227	40
128	GT4009	0	0	0	0	0	0	0	0	0	0	0	0
128	HR8000	0	0	0	0	0	0	0	0	0	0	0	0
128	HR8003	0	0	0	0	0	0	0	0	0	0	0	0
128	HR8004	9	771	9	773	10	774	10	776	10	779	10	780
128	LF5020	0	0	0	0	0	0	0	0	0	0	0	0
128	HR8707	468	212	469	221	469	228	469	235	470	249	470	256
128	LF9069	0	0	0	0	0	0	0	0	0	0	0	0
128	LF9068	30	18	30	19	30	20	30	22	30	24	31	25
128	LF9065	0	168	0	170	0	171	0	173	0	175	0	176
128	LF9062	0	0	0	6	0	11	1	15	1	25	1	29
128	LF9051	180	42	180	52	181	59	181	67	182	81	182	89
128	LF9048	117	0	117	0	117	0	117	0	117	0	117	0
128	LF9046	33	0	33	0	33	0	33	0	33	0	33	0
128	LF9044	39	0	39	0	39	0	39	0	39	0	39	0
128	LF9043	492	0	492	3	492	5	492	7	492	11	492	12
128	LF9041	58	0	58	2	58	4	59	6	59	9	59	11
128	LF9031	85	0	85	0	85	0	85	0	85	0	85	0
128	LF9030	345	0	345	0	345	0	345	0	345	0	345	0
128	LF9027	442	93	442	98	442	102	443	106	443	114	443	118
128	LF9026	67	0	67	1	67	2	67	3	67	5	67	6
128	LF9025	100	0	100	0	100	1	100	1	100	2	100	2
128	LF9022	103	47	103	47	103	47	103	47	103	47	103	47
128	LF9020	12	9	12	9	12	9	12	10	12	10	12	10
128	LF9015	3	0	3	3	3	5	3	7	3	12	3	14
128	LF9014	128	38	128	40	128	42	128	43	128	47	128	48
129	LF0049	0	5	0	5	0	5	0	5	0	5	0	5
129	LF0053	22	89	22	93	22	95	21	98	21	103	21	106
129	LF9003	0	12	0	12	0	12	0	12	0	12	0	12
130	HR3299	0	0	0	0	0	0	0	0	0	0	0	0
130	HR2801	0	0	0	0	0	0	0	0	0	0	0	0
130	HR2703	0	17	0	18	-1	18	-1	19	-1	20	-1	21
130	HR1045	0	0	0	0	0	0	0	0	0	1	0	1
130	HR1044	0	0	0	0	0	0	0	0	0	0	0	0
130	HR1135	0	0	0	0	0	0	0	0	0	0	0	0
130	HR1068	0	0	0	0	0	0	0	0	0	0	0	0
130	HR1066	0	0	0	1	0	1	0	1	-1	2	-1	3
130	LF0048	23	0	23	0	23	0	23	1	23	1	23	1
130	HR1214	11	80	11	81	11	81	11	82	10	83	10	83
130	HR1215	15	2	15	3	15	3	15	4	14	5	14	5
130	HR1217	0	0	0	0	0	0	0	0	0	0	0	0
130	HR1221	0	0	0	0	0	0	0	1	0	1	0	1
130	HR1222	0	0	0	0	0	0	0	0	0	0	0	0
130	HR1223	0	0	0	0	0	1	0	1	0	2	-1	2
130	LF0049	14	73	14	73	14	73	14	73	14	73	14	73
130	LF0053	0	0	0	0	0	0	0	0	0	0	0	0
130	LF9006	17	5	16	5	16	6	16	6	16	6	16	7
130	LF9003	118	90	118	91	117	93	117	94	116	96	116	98
130	HR8719	0	42	0	42	0	42	0	42	0	42	0	42
130	HR8718	19	9	19	10	19	11	18	12	18	13	18	14
130	HR8714	0	0	0	0	0	0	0	0	0	0	0	0
130	HR8713	0	0	0	0	0	0	0	0	0	0	0	0
130	HR8711	127	88	126	91	125	94	125	96	123	100	123	103
131	EV1013	0	0	0	0	0	0	0	0	1	0	1	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
131	HR3299	0	0	0	0	0	0	0	0	0	0	0	0
131	HR1045	0	0	0	0	0	0	1	0	1	0	1	0
131	HR1044	396	27	421	27	439	28	457	28	493	29	511	29
131	HR1066	23	0	25	0	26	0	27	0	30	0	31	0
131	HR1214	0	3	3	3	4	3	6	3	10	3	12	3
131	HR1215	23	0	23	0	23	0	24	0	24	0	24	0
131	HR1217	31	0	31	0	31	0	31	0	31	0	31	0
131	HR1221	2	0	2	0	2	0	2	0	3	0	3	0
131	HR1222	130	0	131	0	131	0	132	0	133	0	133	0
131	HR1223	0	0	1	0	2	0	3	0	5	0	6	0
131	HR1224	63	0	65	0	66	0	67	0	70	0	71	0
131	HR8718	0	0	1	0	1	0	1	0	2	0	2	0
131	HR8714	142	0	144	0	145	0	146	0	149	0	151	0
131	HR8713	0	0	2	0	4	0	5	0	9	0	10	0
131	HR8711	47	0	50	0	53	0	55	0	59	0	61	0
132	HR1262	0	0	0	0	0	0	0	0	0	0	0	0
132	HR1228	46	153	84	157	111	161	138	164	193	170	220	173
132	EV2500	294	39	294	39	294	39	294	39	294	39	294	39
132	EV2601	82	46	98	48	110	49	121	51	144	53	155	55
132	EV1013	2	0	2	0	2	0	2	0	2	0	2	0
132	HR1044	812	19	827	21	839	22	850	24	873	26	885	28
133	GR1424	23	276	26	277	28	277	30	277	34	278	36	278
133	HR1262	0	0	0	0	0	0	0	0	0	0	0	0
133	HR1228	133	69	133	69	134	69	134	69	134	69	134	69
133	GR1139	0	0	0	0	0	0	0	0	0	0	0	0
133	EV2500	75	28	75	28	75	28	75	28	75	28	75	28
133	GR6005	13	16	18	16	22	17	25	17	32	18	36	19
133	EV2601	171	0	186	2	197	4	208	5	231	8	242	10
134	GR1418	0	0	9	3	15	4	21	6	34	10	40	12
134	GU1018	0	83	7	86	12	87	17	88	27	91	32	93
134	GR0560	0	49	3	50	5	50	8	51	12	52	15	53
134	GU1093	0	1	8	3	13	4	18	6	29	9	35	11
134	GU1135	0	12	0	12	0	12	0	12	0	12	0	12
134	GU1415	611	2	618	4	623	5	627	7	637	10	642	11
134	GR1424	0	157	13	160	23	163	32	166	51	171	60	174
134	GR1152	43	0	45	1	47	1	48	2	52	3	53	3
134	GR1153	12	0	12	0	12	0	12	0	12	0	12	0
134	GR1154	0	0	4	1	6	2	9	3	14	4	17	5
134	GU1401	0	0	0	0	0	0	0	0	0	0	0	0
134	GU9132	0	0	0	0	0	0	0	0	0	0	0	0
134	GU9155	0	0	0	0	0	0	0	0	0	0	0	0
134	GR0414	8	0	9	0	10	0	11	1	12	1	13	1
134	GR0413	121	0	122	0	123	1	124	1	126	1	127	2
134	GR0412	48	0	48	0	48	0	48	0	48	0	49	0
134	GU1024	0	0	0	0	0	0	0	0	0	0	0	0
134	GU1022	0	115	0	115	0	115	1	115	1	115	1	115
134	GR0407	39	0	39	0	39	0	40	0	40	1	41	1
134	GR0406	23	0	24	0	25	1	26	1	28	2	29	2
134	GR0410	16	0	16	0	16	0	16	0	16	0	16	0
134	GR0409	58	0	58	0	58	0	58	0	58	0	58	0
134	GR0408	47	0	48	0	48	0	49	0	49	1	50	1
134	GR0411	65	0	65	0	65	0	65	0	65	0	65	0
134	GU1407	419	144	423	145	426	146	429	147	435	149	438	149
134	GU1411	0	0	1	0	2	1	3	1	5	2	6	2
134	GU1096	0	0	0	0	1	0	1	0	2	1	2	1
134	GU1416	0	21	4	22	8	23	11	24	17	26	20	27
134	GR1139	0	0	0	0	1	0	1	0	2	1	2	1
134	GR1140	33	0	34	0	35	1	36	1	37	1	38	1
134	GR1141	60	0	60	0	60	0	60	0	61	0	61	0
134	GR1142	27	0	28	0	28	0	28	0	28	0	28	0
134	GR1143	0	0	0	0	0	0	0	0	0	0	0	0
134	GR1145	0	0	23	7	39	11	55	16	87	25	103	30
134	GR1147	0	0	0	0	0	0	0	0	0	0	0	0
134	GR1150	0	0	0	0	0	0	0	0	0	0	0	0
134	GR6005	0	0	0	0	0	0	0	0	0	0	0	0
135	GU9155	18	0	18	0	18	0	18	0	18	0	18	0
135	GU1407	30	2	30	2	30	2	30	2	30	2	30	2
135	GR1134	14	0	17	0	19	0	21	0	26	0	28	0
135	GR1135	15	0	17	0	17	0	18	0	20	0	20	0
135	GR1137	342	11	344	11	345	11	346	11	349	11	350	12
135	GR1138	4	0	4	0	4	0	5	0	5	0	6	0
135	GR1139	0	0	0	0	0	0	0	0	1	0	1	0
135	GR1140	9	0	9	0	9	0	9	0	9	0	9	0
135	GR1141	0	0	0	0	0	0	0	0	0	0	0	0
135	JN0013	0	0	0	0	0	0	0	0	0	0	0	0
135	GR1126	0	0	3	0	5	0	7	0	12	0	14	0
135	GR1130	129	6	145	6	156	6	168	7	191	7	202	7
135	GR1131	0	0	3	0	5	0	7	0	11	0	13	0
135	GR1132	95	0	95	0	95	0	96	0	96	0	96	0
135	GR1133	0	0	8	0	14	0	20	0	32	1	38	1
136	JN0013	0	0	0	0	0	0	0	0	0	0	0	0
136	GR0066	75	1	77	3	79	4	81	4	84	6	86	7
136	GR1126	54	64	58	66	60	67	62	69	67	71	70	73
136	GR1130	269	0	271	1	273	2	275	3	278	5	280	6
136	GR1119	0	88	8	92	14	96	20	99	32	106	38	109
136	GR1121	0	0	13	7	22	12	31	17	50	28	59	33
136	GR1122	267	150	275	154	280	158	286	161	297	167	303	170
136	GR1109	0	0	0	0	0	0	0	0	0	0	0	0
136	GR1112	0	322	3	323	5	325	8	326	12	328	14	330
136	GR1114	0	104	6	107	10	109	14	112	22	116	26	118

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
136	GR1115	332	65	349	75	362	82	374	89	398	102	410	109
136	GR1116	0	20	11	26	18	30	26	34	41	42	48	47
136	GR1117	396	0	402	3	406	5	410	8	418	12	422	14
137	EV1013	0	0	0	0	0	0	0	0	0	0	0	0
137	EV1016	0	0	0	0	0	0	0	0	0	0	0	0
137	GR1126	0	9	20	14	33	18	47	22	75	30	89	34
137	EV0031	26	1	29	1	30	2	32	2	35	3	37	4
137	EV0032	60	0	60	0	61	0	61	0	62	1	63	1
137	EV0014	163	0	169	1	173	3	177	4	184	6	188	7
137	EV0016	0	0	0	0	0	0	0	0	0	0	0	0
137	EV0017	0	0	12	3	21	6	30	8	47	13	56	15
137	EV0023	43	0	44	0	44	0	44	0	45	1	45	1
137	EV0024	52	0	53	0	53	0	54	0	55	1	55	1
137	EV0027	25	0	25	0	25	0	25	0	25	0	25	0
137	EV0028	338	0	342	1	345	2	348	3	354	4	357	5
137	EV0030	117	0	122	1	126	2	129	3	137	5	140	6
137	EV0026	38	0	38	0	38	0	38	0	38	0	38	0
137	EV3021	94	0	96	0	97	1	98	1	100	2	102	2
137	GR1119	405	305	425	310	439	314	454	318	482	326	496	330
137	GR1121	266	0	268	0	269	1	271	1	273	2	274	2
137	GR1122	0	0	0	0	1	0	1	0	1	0	2	0
137	EV0033	0	34	5	35	8	36	12	37	18	39	22	40
137	EV1017	0	0	0	0	0	0	0	0	0	0	0	0
137	EV1019	71	0	76	1	80	2	83	3	90	5	94	6
137	EV1020	12	72	12	72	12	72	12	72	12	72	12	72
137	EV7025	0	0	0	0	0	0	0	0	0	0	0	0
137	EV7026	0	0	0	0	0	0	0	0	0	0	0	0
138	GR1134	40	0	47	1	53	1	58	1	68	2	74	3
138	GR1139	0	0	3	0	4	0	6	1	10	1	12	1
138	EV0005	49	0	49	0	49	0	49	0	49	0	49	0
138	EV0006	29	0	29	0	29	0	29	0	29	0	30	0
138	EV2500	0	23	1	23	2	23	3	23	5	24	6	24
138	EV0011	0	0	5	0	9	1	12	1	20	2	23	2
138	EV0007	74	0	74	0	75	0	75	0	75	0	75	0
138	EV0008	29	0	29	0	29	0	29	0	29	0	29	0
138	EV0010	40	0	41	0	42	0	42	0	43	0	44	0
138	EV1001	10	0	10	0	10	0	10	0	10	0	10	0
138	EV1002	67	0	67	0	68	0	68	0	68	0	68	0
138	EV1005	0	0	0	0	0	0	0	0	0	0	0	0
138	EV1004	1	25	1	25	1	25	1	25	2	25	2	25
138	EV1013	0	0	0	0	0	0	0	0	0	0	0	0
138	GR1126	0	0	2	0	3	0	5	0	7	1	9	1
138	GR1133	0	0	0	0	0	0	0	0	0	0	0	0
138	EV0014	0	0	1	0	1	0	2	0	3	0	4	0
138	EV0016	48	0	49	0	49	0	50	0	51	0	51	0
138	EV0017	0	0	0	0	1	0	1	0	2	0	2	0
138	EV9107	0	0	0	0	0	0	0	0	0	0	0	0
139	EV2500	20	53	23	54	25	55	27	55	32	56	34	57
139	EV1005	15	6	17	7	19	7	20	8	24	9	25	9
139	EV1011	56	5	59	6	60	6	62	7	65	7	67	8
139	EV1004	0	0	0	0	0	0	0	0	0	0	0	0
139	EV1013	16	3	17	3	17	3	17	3	18	4	18	4
139	HR1044	9	0	9	0	9	0	9	0	9	0	9	0
139	EV9107	66	4	68	4	70	5	72	5	75	6	77	7
140	EV1013	128	0	130	2	131	3	132	5	134	8	135	9
140	EV1015	0	1245	0	1245	0	1245	0	1245	0	1245	0	1245
140	EV1016	70	0	70	0	70	0	70	0	70	0	70	0
140	HR1044	0	0	7	10	12	17	18	24	28	38	33	45
140	HR1135	0	0	0	0	0	0	0	0	0	0	0	0
140	HR1068	2	306	34	350	57	381	80	412	126	475	149	506
140	HR1066	134	0	136	3	138	4	139	6	141	10	143	12
140	HR1222	0	80	0	80	0	80	0	80	0	80	0	80
140	EV1017	45	0	45	0	45	0	45	0	45	0	45	0
140	EV1018	66	0	66	0	66	0	66	0	66	0	66	0
140	EV1019	73	0	73	0	73	0	73	0	73	0	73	0
140	EV1020	237	1123	237	1123	237	1123	237	1123	237	1123	237	1123
140	EV7026	0	0	0	0	0	0	0	0	0	0	0	0
140	HR8714	113	0	113	0	113	0	113	0	113	0	113	0
141	HR1139	0	100	0	100	0	100	0	100	0	100	0	100
141	HR1135	0	95	0	95	0	95	0	95	0	95	0	95
141	HR1068	0	130	1	132	1	133	2	135	3	138	3	139
141	HR1076	0	90	0	90	0	90	0	90	0	90	0	90
141	EV1020	3	404	5	412	8	417	10	423	14	434	16	440
141	HR4007	0	65	0	66	1	66	1	67	1	69	2	69
141	HR4602	10	75	10	75	10	75	10	75	10	75	10	75
141	HR4003	13	0	13	0	13	0	13	0	13	0	13	0
141	HR4004	59	22	59	22	59	22	59	22	59	22	59	22
141	HR4002	103	0	104	3	105	4	106	6	107	10	108	12
141	HR4001	76	0	76	1	77	2	77	3	78	6	78	7
141	HR1082	0	0	4	11	7	19	10	27	16	43	19	51
141	HR1142	0	0	2	6	4	10	5	14	8	22	10	26
141	EV7026	23	39	25	43	26	45	27	48	28	53	29	56
141	HR1093	0	0	0	0	0	0	0	0	0	0	0	0
141	HR1088	82	1	82	2	82	3	82	3	83	4	83	5
141	HR1092	0	0	0	0	0	0	0	0	0	0	0	0
141	HR1149	0	0	0	0	0	0	0	0	0	0	0	0
141	HR1084	0	0	4	12	8	20	11	29	17	46	20	54
141	HR1080	0	0	0	0	0	0	0	0	0	1	0	1
141	HR8707	0	1	0	1	0	1	0	1	0	1	0	1
142	HR1139	0	7	0	7	0	7	0	7	0	7	0	7

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
142	HR1135	0	40	0	40	0	40	0	40	0	40	0	40
142	HR1068	0	0	0	0	0	0	0	0	0	0	0	0
142	HR1066	47	0	47	3	47	4	47	6	47	10	47	12
142	HR1076	0	9	0	9	0	9	0	9	0	9	0	9
142	HR1072	133	0	134	6	134	10	134	14	134	22	134	26
142	LF0049	0	0	0	0	0	0	0	0	0	0	0	0
142	LF0053	0	0	0	0	0	0	0	0	0	0	0	0
142	LF0051	0	10	0	10	0	10	0	10	0	10	0	10
142	HR1082	0	0	0	0	0	0	0	0	0	0	0	0
142	HR1142	5	0	6	8	6	14	6	20	6	32	6	37
142	HR1093	0	0	0	0	0	0	0	0	0	0	0	0
142	HR1088	0	0	0	0	0	0	0	0	0	0	0	0
142	HR1092	105	0	105	0	105	0	105	0	105	0	105	0
142	HR1149	18	0	18	1	18	2	18	3	18	5	18	6
142	HR1146	86	0	86	0	86	0	86	0	86	0	86	0
142	HR1084	0	0	0	0	0	0	0	0	0	0	0	0
142	HR8000	613	35	613	43	613	48	613	53	613	64	613	69
142	HR1080	0	0	0	0	0	0	0	0	0	0	0	0
142	HR8003	86	0	86	0	86	0	86	0	86	0	86	0
142	HR8004	307	13	307	21	307	26	307	31	308	42	308	48
142	HR8707	431	99	431	111	431	120	432	128	432	146	432	155
142	LF9014	35	33	35	34	35	35	35	37	35	39	35	40
142	LF9009	0	14	0	16	0	17	0	19	0	22	0	23
142	LF9003	30	3	30	12	30	18	30	24	30	37	30	43
143	HR4602	102	77	102	78	102	79	102	80	102	82	102	82
143	HR1097	92	0	92	4	92	7	93	10	93	16	93	18
143	HR1096	155	0	155	0	155	0	155	0	155	0	155	0
143	HR1095	0	42	0	42	0	42	0	42	0	42	0	42
143	HR1093	106	0	106	0	106	0	106	0	106	0	106	0
143	HR1092	30	16	30	17	30	17	30	17	30	17	30	17
143	HR8000	113	0	113	0	113	0	113	0	113	0	113	0
143	HR8004	708	15	709	18	709	20	709	22	709	26	709	28
143	HR1102	267	0	267	1	267	1	267	1	267	2	267	2
143	HR1101	0	0	0	0	0	0	0	1	0	1	0	1
143	HR1100	342	22	342	27	342	30	342	33	343	40	343	44
143	HR1105	9	0	9	2	9	3	9	4	10	7	10	8
143	HR1103	301	0	301	7	302	12	302	17	303	27	303	32
143	HR1108	92	0	92	2	92	3	92	4	92	6	92	7
143	HR1117	6	0	6	0	6	0	6	0	6	1	6	1
143	HR1120	29	0	29	1	30	2	30	3	30	5	30	6
143	HR1119	24	0	24	0	24	0	24	0	24	0	24	0
143	HR1116	212	0	212	0	212	1	212	1	212	2	212	2
143	HR1115	10	0	10	0	10	0	10	0	10	1	10	1
143	HR1112	134	0	134	7	134	12	135	16	135	26	135	31
143	LF7035	54	7	54	8	54	9	54	10	54	11	54	12
143	HR6150	22	0	22	0	22	0	22	1	22	1	22	1
143	SB1030	0	0	0	0	0	0	0	0	0	0	0	0
143	SB9628	34	45	34	50	34	54	34	57	35	65	35	69
143	SB9633	0	0	0	0	0	0	0	0	0	0	0	0
144	HR1120	134	53	140	53	144	54	149	55	157	56	161	56
144	HR1116	143	0	152	1	158	2	165	3	177	5	184	6
144	LF7035	0	0	0	0	0	0	0	0	0	0	0	0
144	LF7031	14	0	14	0	15	0	15	0	15	0	16	0
144	SB1040	76	17	76	17	76	17	76	17	76	17	76	17
144	SB1030	177	0	186	1	192	2	199	3	212	5	218	6
144	HK0043	72	0	72	0	72	0	73	0	73	0	73	0
144	HK6178	66	10	87	13	102	15	117	17	146	21	161	23
144	HK0030	6	0	15	1	20	2	26	3	38	4	43	5
144	HK6175	0	0	27	4	47	7	66	9	105	15	124	17
144	SB9622	634	160	643	162	650	163	657	164	672	166	679	167
144	SB9628	0	0	1	0	1	0	2	0	3	0	3	0
145	HR1120	0	0	0	0	0	0	0	0	0	0	0	0
145	LF7031	4	14	6	14	7	14	8	14	10	14	11	14
145	LF7030	0	0	0	0	0	0	0	0	0	0	0	0
145	LF7019	0	0	0	0	0	0	0	0	0	0	0	0
145	LF7018	0	0	0	0	0	0	0	0	0	0	0	0
145	LF7015	12	0	12	0	13	0	13	0	14	0	14	0
145	LF7016	0	0	0	0	0	0	0	0	0	0	0	0
145	HK0025	8	0	11	0	13	0	14	1	18	1	20	1
145	HK0018	0	0	6	1	10	1	15	1	23	2	27	3
145	HK0019	70	1	71	2	73	2	74	2	77	2	78	2
145	HK6150	9	0	10	0	10	0	11	0	11	0	12	0
145	HK0015	43	15	43	15	44	15	44	15	44	15	45	15
145	HK0008	0	0	0	0	0	0	0	0	1	0	1	0
145	HK6178	4	0	4	0	4	0	4	0	4	0	4	0
145	HK0301	0	0	0	0	0	0	0	0	0	0	1	0
145	HK6180	0	0	0	0	0	0	0	0	0	0	0	0
145	HK0030	223	52	235	53	243	54	251	55	267	56	275	57
145	HK0029	3	0	3	0	4	0	4	0	5	0	5	0
145	HK6199	78	0	83	0	86	1	89	1	96	2	99	2
145	HK1101	84	16	84	16	85	16	85	16	85	16	85	16
145	HK0111	21	3	22	3	23	3	23	3	24	3	25	3
145	HK6175	0	0	0	0	1	0	1	0	1	0	2	0
145	HK6348	32	1	40	1	46	2	51	2	62	4	68	4
145	HK6350	57	4	62	5	66	5	70	5	78	6	82	7
145	HK1018	0	0	0	0	0	0	0	0	0	0	0	0
146	HK6150	29	0	31	0	32	0	33	0	35	0	36	0
146	HK0014	7	2	8	2	8	2	9	2	9	2	10	2
146	HK0015	75	1	77	1	78	1	80	1	83	1	85	1
146	HK0106	71	0	72	0	72	0	73	0	74	0	74	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
146	HK0102	24	2	25	2	26	2	27	2	29	2	31	2
146	HK0105	135	2	138	2	139	2	141	2	145	2	146	2
146	HK0010	0	0	1	0	2	0	3	0	5	0	6	0
146	HK0011	0	0	1	0	2	0	2	0	4	0	4	0
146	HK0101	0	0	0	0	0	0	0	0	1	0	1	0
146	HK0008	6	0	7	0	7	0	8	0	9	0	10	0
146	HK1101	3	0	4	0	4	0	5	0	6	0	6	0
146	HK1010	0	0	1	0	1	0	2	0	3	0	3	0
146	HK1001	21	0	26	0	30	0	34	0	42	0	46	0
146	HK0111	165	5	171	5	175	5	179	5	187	5	191	5
150	HK6062	0	0	0	0	-1	0	-1	0	-1	0	-1	0
150	HK1101	349	15	348	15	347	15	345	15	343	15	342	15
150	HK1012	0	2	-6	2	-11	2	-15	2	-24	2	-29	2
150	HK1010	0	0	-2	0	-4	0	-5	0	-9	0	-10	0
150	HK1018	0	0	0	0	0	0	0	0	0	0	0	0
153	HK6062	0	0	0	0	0	0	0	0	0	0	0	0
153	HK1101	0	0	0	0	0	0	0	0	0	0	0	0
153	GR9076	0	0	0	0	0	0	0	0	0	0	0	0
153	HK6232	0	0	0	0	0	0	0	0	0	0	0	0
153	HK6235	0	0	0	0	0	0	0	0	0	0	0	0
153	HK6112	39	0	39	0	40	0	40	0	40	0	40	0
153	HK6096	9	9	9	9	10	9	10	9	11	10	11	10
153	HK6075	105	6	106	6	106	6	107	6	108	6	109	6
153	HK6310	0	0	0	0	0	0	0	0	1	0	1	0
153	HK6126	0	0	1	0	2	0	3	0	5	0	6	0
153	HK6121	34	0	34	0	35	0	35	0	36	0	36	0
153	HK6120	0	0	1	0	1	0	1	0	2	0	3	0
153	HK6130	0	0	2	0	4	0	5	0	9	1	10	1
153	HK1018	101	17	104	17	107	17	109	18	113	18	115	18
153	HK6238	87	0	92	0	95	1	99	1	107	1	110	2
153	HK6346	108	31	127	33	140	33	154	34	181	36	194	37
153	GR9042	17	0	18	0	19	0	20	0	22	0	23	0
154	SB4126	28	0	29	0	29	0	29	0	30	0	30	0
154	HK0043	126	8	129	9	131	9	133	9	137	9	139	9
154	HK6232	53	0	54	0	55	0	56	0	57	0	58	0
154	HK6235	12	0	12	0	12	0	12	0	13	0	13	0
154	HK6112	0	0	3	0	4	0	6	0	10	0	11	0
154	HK6096	1	1	13	1	21	2	30	2	47	3	56	3
154	HK6130	0	0	0	0	0	0	0	0	0	0	0	0
154	HK1018	37	0	37	0	38	0	38	0	39	0	39	0
154	GR9042	48	11	50	11	51	11	52	11	54	11	55	11
155	SB4124	0	0	0	0	0	0	0	0	0	0	0	0
155	18207843	28	10	28	10	28	10	28	10	28	10	28	10
155	SB4126	112	24	117	24	120	24	124	24	131	25	134	25
155	SB1040	44	0	44	0	44	0	45	0	45	0	45	0
155	SB1042	4	16	5	16	6	16	7	16	9	16	9	16
155	SB1043	30	5	30	5	30	5	30	5	30	5	30	5
155	SB1044	12	0	12	0	12	0	12	0	12	0	12	0
155	HK0040	9	0	20	0	28	1	35	1	51	1	59	1
155	HK0042	247	12	249	12	251	12	253	12	256	12	258	12
155	HK0043	1225	57	1291	59	1339	61	1387	62	1482	65	1529	66
155	HK0039	179	2	182	2	185	2	187	2	191	2	194	2
155	HK0037	68	4	82	4	92	5	102	5	122	6	131	6
155	HK6178	42	7	42	7	42	7	42	7	43	7	43	7
155	HK0032	27	26	52	27	71	28	89	28	125	29	144	30
155	HK0035	28	4	29	4	29	4	30	4	31	4	31	4
155	HK6051	61	0	65	0	68	0	71	0	78	0	81	1
155	HK0301	0	0	0	0	0	0	1	0	1	0	1	0
155	HK6180	4	0	4	0	4	0	4	0	4	0	4	0
155	HK0030	0	0	0	0	1	0	1	0	2	0	2	0
155	HK6199	8	0	20	0	28	1	36	1	52	1	61	2
155	HK1018	86	0	92	0	96	0	101	1	110	1	115	1
156	GR9237	0	1	0	1	0	1	0	1	0	1	0	1
156	SB8007	0	0	0	0	0	0	0	0	0	0	0	0
156	SB8005	51	0	51	0	51	0	51	0	51	0	51	0
156	SB8012	45	11	47	11	48	12	49	12	51	12	53	12
156	SB8011	159	2	161	2	162	2	163	2	164	2	165	2
156	SB8010	78	0	78	0	78	0	79	0	79	0	80	0
156	SB4107	2	13	2	13	2	13	2	13	2	13	2	13
156	SB4112	144	7	146	7	148	7	149	7	152	7	154	7
156	SB4111	0	4	6	4	11	4	15	4	24	4	28	5
156	SB4108	64	1	66	1	67	1	68	1	71	1	72	1
156	SB4170	140	0	140	0	140	0	140	0	140	0	140	0
156	SB9529	18	4	37	5	50	5	63	6	89	7	102	7
156	SB4121	0	0	4	0	7	0	9	0	15	0	17	1
156	SB4119	0	0	2	0	4	0	5	0	8	0	9	0
156	SB4115	11	11	30	12	45	12	59	12	87	13	102	14
156	SB4124	0	0	1	1	2	1	3	1	5	1	5	1
156	18207843	0	16	1	16	1	16	2	16	3	16	4	16
156	SB4126	0	3	3	4	5	4	6	4	10	4	12	4
156	SB1030	0	0	1	0	2	0	3	0	5	0	6	0
156	GR9224	0	0	0	0	0	0	0	0	0	0	0	0
156	SB9672	177	0	181	0	183	0	186	0	191	1	193	1
156	SB9671	80	0	80	0	80	0	80	0	80	0	80	0
156	SB9640	0	0	0	0	0	0	0	0	0	0	0	0
157	SB4111	82	0	82	0	82	0	82	0	82	0	82	0
157	SB4119	30	0	35	1	39	1	43	1	50	2	54	2
157	SB4124	6	11	9	12	12	12	15	12	20	13	23	13
157	SB1040	8	10	8	10	8	10	8	10	8	10	8	10
157	SB1030	40	5	43	5	45	6	47	6	51	6	53	6

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	Manhole ID	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
157	SB1038	0	9	2	9	4	9	5	9	8	9	10	10
157	SB9622	0	0	0	0	0	0	0	0	0	0	0	0
157	SB9624	55	29	59	29	62	29	65	29	70	30	73	30
157	SB9628	136	10	142	10	147	11	152	11	161	12	165	12
157	SB9640	0	0	0	0	0	0	0	0	0	0	0	0
158	SB8001	66	0	68	0	69	0	71	0	74	0	76	1
158	HR1100	95	93	101	93	106	93	110	93	119	94	123	94
158	SB8005	37	0	38	0	39	0	40	0	41	0	42	0
158	SB4170	0	0	0	0	0	0	0	0	0	0	0	0
158	SB1030	54	112	70	113	82	113	93	114	117	115	128	116
158	SB9628	0	0	0	0	0	0	0	0	0	0	0	0
158	SB9633	228	21	233	21	237	21	241	22	249	22	253	22
158	SB9634	15	0	18	0	20	0	22	0	27	1	29	1
158	SB9637	22	0	26	0	29	0	32	1	38	1	41	1
158	SB9638	338	0	349	1	357	1	365	2	381	2	389	3
158	SB9640	75	0	128	3	166	5	204	7	279	11	317	13
158	SB9641	71	0	71	0	71	0	71	0	72	0	72	0
158	SB9642	83	0	84	0	85	0	86	0	87	0	88	0
158	SB9643	27	0	29	0	31	0	33	0	36	0	37	1
158	SB9645	585	0	627	2	657	4	687	6	748	9	778	11
158	SB9648	15	0	17	0	18	0	20	0	22	0	24	0
158	SB9651	250	0	251	0	251	0	252	0	253	0	254	0
158	SB9659	112	17	114	17	115	17	117	17	119	17	120	17
158	SB9661	0	0	0	0	0	0	0	0	0	0	0	0
158	SB9663	146	9	147	9	148	9	148	9	150	9	151	9
159	EV1020	0	0	0	0	0	0	0	0	0	0	0	0
159	HR4007	0	0	0	0	0	0	0	0	0	0	0	0
159	HR4602	0	0	0	0	0	0	0	0	0	0	0	0
159	EV7017	8	0	8	0	8	0	8	0	8	0	8	0
159	EV7018	139	0	139	0	139	0	139	0	140	0	140	0
159	EV7019	24	263	40	271	51	277	62	283	84	294	95	300
159	EV7025	45	9	46	9	46	9	47	10	48	10	49	11
159	EV7026	141	307	170	322	191	332	211	343	252	364	273	375
159	EV0045	643	26	646	28	648	29	650	30	655	32	657	34
159	HR1100	45	36	57	43	66	47	75	52	93	61	102	66
159	SB9645	340	0	347	4	352	6	357	9	367	14	372	16
160	GR1119	594	103	607	146	617	177	627	208	646	270	656	301
160	EV7018	33	0	33	0	33	0	33	0	33	0	33	0
160	EV7025	115	61	126	96	134	122	142	147	158	197	166	223
160	SB9645	53	56	53	56	53	56	53	56	53	56	53	56
160	SB9651	0	0	0	0	0	0	0	0	0	0	0	0
160	SB9663	470	322	507	440	534	524	560	608	613	775	640	859
161	OB0006	66	0	66	0	66	0	66	0	66	0	66	0
161	OB8052	0	0	0	0	0	0	0	0	0	0	0	0
161	OB8060	4	272	4	272	4	272	4	272	4	272	4	272
161	OB8061	151	0	151	0	151	0	151	0	151	0	151	0
161	OB8064	0	0	0	0	0	0	0	0	0	0	0	0
161	RA0003	20	0	20	0	20	0	20	0	20	0	20	0
161	RA0005	43	0	49	54	53	93	57	131	65	209	70	247
161	RA0006	31	0	31	3	31	5	31	8	32	12	32	14
161	RA0001	0	0	1	5	1	8	1	12	2	19	2	22
161	RA0002	22	0	22	0	22	0	22	0	22	0	22	0
161	GR9258	0	0	15	138	25	236	36	335	57	531	68	630
161	SB1009	47	9	56	99	63	163	70	227	84	356	91	421
161	SB8001	184	0	184	6	185	10	185	14	186	23	187	27
161	SB8000	3	0	4	2	4	3	4	4	4	6	4	7
161	GR1109	0	28	1	34	1	38	1	41	2	49	3	53
161	GR1114	0	2	0	2	0	2	0	2	0	2	0	2
161	OB8066	0	0	0	0	0	0	0	0	0	0	0	0
161	18207475	0	0	0	0	0	0	0	0	0	0	0	0
161	RA0008	9	0	10	8	10	13	11	19	12	30	13	36
161	GR9251	0	0	0	0	0	0	0	0	0	0	0	0
161	GR9267	3	447	4	456	4	463	5	470	7	484	7	490
161	SB8005	0	0	1	10	2	18	3	25	4	40	5	48
161	SB9507	22	0	24	13	25	22	26	31	28	49	28	58
161	RA6004	0	0	0	0	0	0	0	0	0	0	0	0
161	SB9648	7	0	8	0	8	1	8	1	8	2	8	2
161	SB9651	22	0	24	14	25	24	26	35	28	55	29	65
161	SB9655	0	0	0	0	0	0	0	0	0	1	0	1
161	SB9657	16	0	17	5	17	9	18	12	18	19	19	23
161	SB9659	43	0	50	65	55	112	60	159	70	252	75	299
161	SB9661	28	0	28	3	28	5	28	7	29	12	29	14
161	SB9663	1	335	5	366	7	389	9	411	14	455	17	477
162	RA0017	0	87	0	87	0	87	0	87	0	87	0	87
162	RA0020	2	0	2	1	2	2	2	3	2	5	2	5
162	RA0012	0	0	0	0	0	0	0	0	0	0	0	0
162	RA3182	0	0	0	1	0	2	0	3	0	4	0	5
162	GR9119	26	57	29	99	32	130	34	160	38	221	41	251
162	GR9127	18	0	18	1	18	2	18	3	18	4	18	5
162	GR9237	0	0	2	32	4	54	6	77	9	122	11	145
162	SB8012	0	0	0	0	0	0	0	0	0	1	0	1
162	SB8011	2	0	2	1	2	1	2	2	2	3	2	3
162	SB9529	0	0	0	2	0	3	0	4	0	6	1	7
162	18207843	0	24	0	24	0	24	0	24	0	24	0	24
162	SB4126	34	1318	34	1325	35	1330	35	1335	36	1345	36	1350
162	RA0028	0	204	0	207	0	209	0	210	1	214	1	216
162	RA3125	71	0	72	6	72	10	72	14	73	23	73	27
162	GR9065	95	0	95	3	96	5	96	7	96	11	96	13
162	GR9058	6	0	7	18	8	31	9	45	11	71	12	84
162	GR9233	0	0	3	42	5	73	8	103	12	163	14	194

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
162	GR9034	2	0	2	1	2	2	2	3	3	5	3	6
162	GR9039	40	0	41	5	41	8	41	12	42	18	42	22
162	GR9143	0	0	1	17	2	30	3	42	5	67	6	80
162	GR9224	0	0	3	41	5	70	8	99	12	157	14	186
162	GR9288	0	0	4	51	6	88	9	124	15	197	17	233
162	GR9076	5	1	7	31	9	52	10	74	14	116	15	138
162	18208548	0	0	0	2	0	4	0	5	1	8	1	10
162	GR9042	0	120	0	122	0	124	0	125	1	128	1	129
162	GR9227	0	0	3	38	5	65	7	92	11	146	13	172
162	GR9242	10	180	16	256	20	311	24	365	32	474	36	528
163	RA3125	223	0	221	0	220	1	219	1	216	1	215	1
163	GR9034	0	0	0	0	0	0	0	0	0	0	0	0
163	GR9039	68	11	57	13	49	14	40	16	24	19	15	20
163	GR9076	156	0	154	0	152	1	151	1	148	1	146	2
164	GR9039	6	0	8	1	10	1	12	2	15	2	17	3
164	GR9076	232	18	258	25	276	29	295	34	331	44	349	49
164	GR9100	40	0	43	1	44	1	46	1	49	2	50	3
164	HK6346	5	23	6	23	6	23	7	24	8	24	8	24
164	GR9042	37	0	39	0	40	1	40	1	42	1	43	2
165	RA3125	0	0	-3	0	-4	0	-6	0	-10	0	-11	0
165	GR9039	0	0	-3	0	-5	0	-7	0	-12	0	-14	0
165	GR9076	326	0	321	0	318	0	314	0	308	0	304	0
169	RA3015	0	0	0	0	0	0	0	0	0	0	0	0
169	RA3125	447	0	432	2	422	4	411	6	390	9	380	11
170	RA3015	11	38	11	43	10	47	10	51	10	58	10	62
170	RA3155	3	496	3	497	3	498	3	498	3	500	3	500
170	RA0038	0	0	0	2	0	3	0	4	0	7	0	8
170	RA0028	0	0	0	0	0	0	0	0	0	0	0	0
170	RA3125	83	633	81	920	79	1126	78	1331	75	1741	73	1947
170	GR9065	0	0	0	0	0	0	0	0	0	0	0	0
170	GR9039	0	0	0	0	0	0	0	0	0	0	0	0
171	RA3015	117	51	114	53	112	54	110	55	105	58	103	59
172	OB0041	0	0	0	0	0	0	0	0	0	0	0	0
172	RA3015	249	41	274	44	291	46	309	48	344	52	362	54
172	RA3155	0	0	0	0	0	0	0	0	0	0	0	0
172	OB0031	0	0	0	0	0	0	1	0	1	0	1	0
173	18200537	7	18	10	18	12	18	13	18	17	18	19	18
173	OB8008	0	0	2	0	4	0	6	0	9	0	11	0
173	OB8036	0	0	0	0	0	0	0	0	0	0	0	0
173	OB8038	0	0	1	0	2	0	2	0	4	0	5	0
173	OB0030	146	5	149	5	152	5	154	5	159	5	161	5
173	OB0026	0	0	3	0	4	0	6	0	10	0	12	0
173	OB0027	21	4	26	4	30	4	33	4	40	4	43	4
173	OB0029	33	0	40	0	44	0	49	0	58	1	63	1
173	OB0018	0	0	5	0	8	0	12	0	18	0	22	1
173	OB0021	47	0	48	0	49	0	50	0	52	0	52	0
173	OB0023	0	0	6	0	11	0	15	0	24	1	29	1
173	RA2138	0	0	0	0	0	0	0	0	0	0	0	0
173	OB8040	0	0	3	0	6	0	8	0	12	0	15	0
173	OB8041	0	0	4	0	7	0	10	0	15	0	18	0
173	OB8042	0	0	1	0	2	0	2	0	4	0	5	0
173	OB8043	0	0	4	0	7	0	10	0	15	0	18	0
173	OB8045	0	0	2	0	3	0	4	0	6	0	7	0
173	OB8049	0	0	0	0	0	0	0	0	0	0	0	0
173	OB0041	46	0	50	0	52	0	54	0	59	0	62	0
173	OB0038	32	0	34	0	36	0	38	0	41	0	43	0
173	RA3013	92	0	97	0	101	0	104	0	112	0	116	1
173	RA3015	36	0	38	0	39	0	40	0	42	0	43	0
173	RA3155	90	21	91	21	93	21	94	21	96	21	98	21
173	OB0036	23	0	25	0	27	0	28	0	31	0	33	0
173	OB0037	20	0	22	0	24	0	26	0	29	0	30	0
173	OB0031	0	0	0	0	0	0	0	0	0	0	0	0
173	OB0032	11	0	16	0	19	0	22	0	28	0	31	0
173	OB0033	117	0	118	0	118	0	118	0	119	0	119	0
173	RA0023	16	14	17	14	18	14	18	14	19	14	20	14
174	18200537	0	31	0	31	0	31	0	31	0	31	0	31
174	OB0006	0	0	0	0	0	0	0	0	0	0	0	0
174	OB8052	0	0	0	0	0	0	0	0	0	0	0	0
174	OB0009	152	0	153	0	153	0	154	0	155	0	155	0
174	18207475	0	20	0	20	0	20	0	20	0	20	0	20
174	RA0017	0	0	9	1	15	1	21	1	34	2	40	3
174	RA0020	7	3	16	3	22	4	29	4	42	5	48	5
174	RA0012	111	0	124	1	133	2	142	2	161	3	170	4
174	RA2138	0	0	9	1	15	1	22	1	35	2	41	3
174	OB8049	0	0	3	0	4	0	6	0	9	1	11	1
174	RA3155	203	18	205	19	206	19	208	19	211	19	212	19
174	RA3008	80	0	81	0	82	0	82	0	83	0	84	0
174	RA3006	76	0	76	0	76	0	76	0	76	0	76	0
174	RA3003	111	0	113	0	114	0	115	0	117	0	119	0
174	RA0023	9	1	27	2	39	3	52	4	77	6	89	7
174	RA0024	0	0	4	0	7	1	10	1	17	1	20	1
174	RA0036	96	6	98	7	99	7	101	7	103	7	104	7
174	RA0038	37	0	37	0	38	0	38	0	38	0	38	0
174	RA0027	45	0	50	0	53	1	57	1	64	1	68	2
174	RA0028	43	107	63	108	77	109	91	110	120	112	134	113
174	RA3125	0	0	0	0	0	0	0	0	0	0	0	0
175	18200537	0	555	0	590	0	616	0	641	1	691	1	717
175	OB0006	0	0	0	9	0	15	0	21	0	33	0	40
175	OB8052	0	0	0	8	0	14	0	20	0	31	0	37
175	OB8060	0	0	0	0	0	0	0	0	0	0	0	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
175	GR1112	0	0	0	0	0	0	0	0	0	0	0	0
175	OB0009	0	0	0	2	0	3	0	5	0	8	0	9
175	18207475	0	577	0	657	1	714	1	771	2	885	2	942
176	18200537	676	1463	676	1463	676	1463	676	1463	676	1463	676	1463
176	JN0026	0	897	0	897	0	897	0	897	0	897	0	897
176	GR1112	0	0	0	0	0	0	0	0	0	0	0	0
176	OB8041	0	362	0	362	0	362	0	362	0	362	0	362
177	JN0020	20	96	22	100	24	102	25	105	28	110	30	112
177	JN0026	310	262	325	289	336	308	347	328	369	367	380	386
177	JN2305	3	7	3	7	3	7	3	7	3	7	3	7
177	GR1112	0	0	0	0	0	0	0	0	0	0	0	0
177	GR1115	0	4	0	4	0	4	0	4	0	4	0	4
178	JN0026	0	0	0	0	0	0	0	0	0	0	0	0
178	GR1112	0	853	0	853	0	853	0	853	0	853	0	853
178	GR1115	0	791	0	890	0	960	0	1030	0	1171	0	1241
179	JN0020	152	56	177	61	195	65	213	69	249	76	266	80
179	JN0013	734	205	749	209	760	211	771	213	792	218	803	220
179	JN0026	106	0	121	3	132	5	143	8	164	12	175	14
179	GR1115	418	62	437	66	451	69	465	72	492	78	506	81
180	GU9004	0	0	0	0	0	0	0	0	0	0	0	0
180	GU9007	0	0	0	0	0	0	0	0	0	0	0	0
180	GU9151	16	0	16	0	16	0	16	0	16	0	16	0
180	GU9178	306	115	309	126	312	134	314	142	319	157	321	165
180	GU9173	0	3	0	3	0	3	0	3	0	3	0	3
180	GU9175	0	0	0	0	0	0	0	0	0	0	0	0
180	GU9177	77	0	78	2	78	4	79	6	80	9	80	11
180	GU9160	80	0	80	0	80	0	80	0	80	0	80	0
180	GU9155	120	0	121	1	121	1	121	2	121	3	122	4
180	GU9156	28	0	28	0	28	0	28	0	28	0	28	0
180	GU9158	32	0	32	0	32	0	32	0	32	0	32	0
180	JN0013	300	319	302	324	303	328	304	332	306	339	307	342
180	GR1130	9	0	10	2	11	4	11	6	12	9	13	10
180	JN2933	0	0	0	0	0	0	0	0	0	0	0	0
181	GU9003	20	103	23	150	25	184	27	217	31	285	33	318
181	GU9004	0	142	0	142	0	142	0	142	0	142	0	142
181	GU9007	0	0	0	0	0	0	0	0	0	0	0	0
181	GU1056	31	0	31	6	31	10	31	14	32	23	32	27
181	GU9000	30	296	30	300	30	303	31	306	31	312	31	315
181	GU9002	42	8	43	27	44	40	45	54	46	80	47	94
181	GU9151	70	0	70	0	70	0	70	0	70	0	70	0
181	GU9152	118	30	118	30	118	30	118	30	118	30	118	30
181	GU1052	79	0	79	2	80	3	80	4	80	6	80	7
181	GU1049	8	0	8	0	8	0	8	0	8	0	8	0
181	GU1048	47	15	47	19	47	22	48	24	48	30	48	32
181	GU1026	19	0	19	1	19	2	19	3	19	5	19	6
181	GU9175	0	0	0	0	0	0	0	0	0	0	0	0
181	GU9177	32	0	32	0	32	0	32	0	32	0	32	0
181	GU1399	0	0	0	0	0	0	0	0	0	0	0	0
181	GU1401	84	304	84	304	84	304	84	304	84	304	84	304
181	GU1403	0	0	0	0	0	0	0	0	0	0	0	0
181	GU9193	0	1	0	1	0	1	0	1	0	1	0	1
181	GU9192	0	0	0	0	0	0	0	0	0	0	0	0
181	GU9132	90	249	90	249	90	249	90	249	90	249	90	249
181	GU9137	0	0	0	6	1	10	1	14	1	22	1	26
181	GU9155	52	20	52	20	52	20	52	20	52	20	52	20
181	GU9156	47	0	47	0	47	0	47	0	47	0	47	0
181	GU1024	0	167	0	167	0	167	0	167	0	167	0	167
181	GU1022	0	0	0	0	0	0	0	0	0	0	0	0
181	GU1406	0	0	0	0	0	0	0	0	0	0	0	0
181	GU1407	0	116	0	116	0	116	0	116	0	116	0	116
182	GU9124	0	0	0	0	0	0	0	0	0	0	0	0
182	GU9011	135	9	136	17	137	23	138	29	140	40	141	46
182	GU9007	47	133	47	134	47	134	47	135	47	136	47	136
182	GU9000	83	55	83	58	84	60	84	63	85	67	85	70
183	GU9014	0	0	0	9	0	15	0	21	0	33	0	40
183	GU9121	53	0	53	6	53	10	53	15	53	23	53	28
183	GU9124	0	0	0	0	0	0	0	0	0	0	0	0
183	GU9123	0	0	0	0	0	0	0	0	0	0	0	0
183	GU9168	35	0	35	39	36	67	36	95	37	151	37	179
183	GU9016	14	0	14	6	14	11	14	15	14	24	14	28
183	GU9011	21	0	21	9	21	16	22	22	22	35	22	42
183	GU9109	0	0	0	11	0	19	0	27	1	43	1	51
183	GU9007	1	0	2	8	2	14	2	21	2	33	2	39
183	JN1005	0	69	0	91	0	106	1	122	1	152	1	168
183	GU9178	3	117	3	117	3	117	3	117	3	117	3	117
183	GU9171	0	0	0	1	0	2	0	3	0	5	0	6
183	GU9173	0	0	0	0	0	0	0	0	0	0	0	0
183	JN0013	0	0	0	0	0	0	0	0	0	0	0	0
183	OA1039	0	0	0	0	0	0	0	0	0	0	0	0
183	OA1040	51	0	51	22	51	37	52	53	52	84	52	100
183	OA1041	4	0	4	0	4	0	4	0	4	0	4	0
183	OA1043	46	0	46	0	46	0	46	0	46	0	46	0
183	OA1044	17	0	17	3	17	6	17	8	17	13	17	16
183	OA1046	32	0	32	4	32	7	33	10	33	15	33	18
183	JN2933	4	100	4	100	4	100	4	100	4	100	4	100
183	JN2938	39	25	39	29	39	31	39	34	39	39	39	41
183	GU9195	3	284	3	302	3	315	3	328	3	354	4	366
184	GU9123	0	0	0	0	0	0	0	0	0	0	0	0
184	OA0011	49	0	49	0	49	0	49	0	49	0	49	0
184	OA0801	53	0	53	0	53	0	53	0	53	0	53	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
184	OA0700	43	0	44	1	44	1	44	2	44	3	44	3
184	JN0017	0	17	0	18	1	19	1	20	1	22	2	23
184	OA0007	23	0	23	0	23	0	23	0	23	0	23	0
184	JN0013	0	89	2	95	3	100	4	104	6	113	7	117
184	OA1036	199	0	200	4	201	7	201	10	203	16	203	19
184	OA1039	231	0	232	3	233	6	233	8	235	13	235	15
184	OA1040	0	0	0	0	0	0	0	0	0	0	0	0
184	OA1041	0	0	0	0	0	0	0	0	0	0	0	0
184	OA1046	37	0	37	0	37	0	37	0	37	0	37	0
184	JN2923	26	0	26	0	26	0	26	0	26	0	26	0
184	JN2933	86	8	87	11	88	14	88	17	90	22	90	25
185	OA1004	37	0	37	0	37	0	37	0	37	0	37	0
185	OA1005	15	0	15	0	15	0	15	0	15	0	15	0
185	OA1003	85	0	85	0	85	0	85	0	85	0	85	0
185	OA0011	0	0	0	0	0	0	0	0	0	0	0	0
185	OA0801	46	0	46	0	46	0	46	0	46	1	46	1
185	OA0700	257	0	259	5	260	9	261	13	264	21	265	25
185	JN0020	38	81	39	84	40	87	40	89	42	94	43	97
185	JN0021	50	36	50	36	50	36	50	36	50	36	50	36
185	JN0017	0	0	0	0	0	0	0	0	0	0	0	0
185	JN0013	32	34	32	34	32	34	32	34	32	34	32	34
185	OA1067	20	0	21	1	21	2	21	3	22	5	22	6
185	OA1068	27	0	28	1	28	3	29	4	29	6	30	7
185	OA1069	16	0	16	1	16	1	16	1	16	2	17	3
185	OA1072	26	0	26	0	26	1	26	1	26	1	26	1
185	JN2305	0	0	0	0	0	0	0	0	0	0	0	0
185	OA1060	0	0	0	0	0	0	0	0	0	0	0	0
185	OA1066	28	0	28	1	29	3	29	4	30	6	30	7
185	JN2922	108	0	109	1	109	3	110	4	110	6	111	7
185	JN2923	0	0	0	0	0	0	0	0	0	0	0	0
186	OA1003	0	0	0	0	0	0	0	0	0	0	0	0
186	OA0700	0	0	0	0	0	0	0	0	0	0	0	0
186	JN0020	0	0	0	0	0	0	0	0	0	0	0	0
186	OA0029	0	0	0	0	0	0	0	0	0	0	0	0
186	JN0026	269	255	277	328	283	380	289	432	301	536	307	588
186	JN2305	63	82	64	93	65	101	66	109	68	125	69	133
186	OA1051	0	312	2	329	3	342	5	354	8	379	9	391
186	OA1057	32	481	34	496	35	507	36	518	39	540	40	551
186	OA1058	0	318	0	318	0	318	0	318	0	318	0	318
186	OA1060	28	0	30	14	31	23	32	33	34	52	35	62
186	OA1061	0	370	11	470	20	542	28	613	44	756	52	827
186	OA1066	0	0	0	0	0	0	0	0	0	0	0	0
187	OA1019	1	12	1	27	1	37	1	48	1	69	1	79
187	OA1004	0	83	0	83	0	83	0	83	0	83	0	83
187	OA0029	0	0	0	0	0	0	0	0	0	0	0	0
187	OA1051	0	81	0	81	0	81	0	81	0	81	0	81
187	OA1053	0	0	0	1	0	1	0	2	0	3	0	4
187	OA1054	0	0	0	15	0	25	0	36	0	57	0	68
187	OA1055	0	18	0	24	0	28	0	32	0	40	0	44
187	OA1057	0	0	0	0	0	0	0	0	0	0	0	0
187	OA1058	0	147	0	148	0	149	0	150	0	152	0	152
187	OA1060	0	0	0	5	0	9	0	13	0	21	0	25
187	OA4012	0	0	0	6	0	10	0	15	0	23	0	27
188	OA1802	0	0	11	16	20	27	28	39	44	62	52	73
188	OA1019	213	0	215	3	216	5	218	6	220	10	222	12
188	OA0029	12	0	13	2	14	3	15	4	17	7	18	8
188	OA1054	0	0	1	1	1	2	2	2	3	4	3	5
189	OA1802	5	0	5	0	5	0	5	1	4	1	4	1
189	OA0035	0	0	-2	2	-4	3	-5	4	-9	7	-10	8
189	OA0029	14	54	7	60	1	64	-5	69	-16	78	-22	83
189	OB8015	113	0	107	5	102	9	98	12	89	20	84	23
189	OB8020	274	5	272	6	271	7	270	8	268	10	267	11
189	OA0042	149	86	140	93	134	98	128	103	116	112	110	117
189	OA0047	0	0	0	0	0	0	0	0	0	0	0	0
189	OB8035	0	0	0	0	0	0	0	0	0	0	0	0
189	OB0031	247	0	245	2	243	3	242	4	239	6	238	8
190	OA0032	0	231	-1	239	-1	245	-2	251	-3	263	-3	269
190	OA0033	0	0	-11	119	-18	204	-26	289	-41	460	-49	545
190	OA0034	0	10	-4	50	-6	79	-9	109	-14	167	-17	196
190	OA0035	0	149	0	150	0	150	0	150	0	151	0	152
190	OA0029	51	834	49	859	47	876	46	894	42	929	41	946
190	JN0026	12	72	7	128	3	168	0	208	-8	289	-11	329
190	OA0047	0	0	0	0	0	0	0	0	0	0	0	0
190	OB8035	164	0	149	171	138	292	127	414	105	658	94	780
190	OB8041	0	0	0	0	0	0	0	0	0	0	0	0
191	OB8015	19	0	24	4	27	7	31	9	38	15	42	18
191	OB8009	9	0	9	0	9	0	10	0	10	0	10	0
191	OB8008	50	0	51	0	51	0	51	0	51	1	52	1
191	OB8032	11	0	11	0	11	0	11	0	11	0	11	0
191	OB8034	8	0	8	0	8	0	8	0	8	0	8	0
191	OB8035	0	0	0	0	1	0	1	1	1	1	2	1
191	OB8036	8	0	8	0	8	0	8	0	8	0	8	0
191	OB8038	0	0	0	0	0	0	1	0	1	1	1	1
191	OB0026	0	0	0	0	0	0	0	0	0	0	0	0
191	OB0029	0	0	0	0	0	0	0	0	0	0	0	0
191	OB0041	0	0	0	0	0	0	0	0	0	0	0	0
191	RA3015	20	0	20	0	20	0	20	0	21	0	21	1
191	OB0031	43	101	53	108	60	113	67	119	80	129	87	134
193	OB8015	61	0	53	2	47	3	41	4	29	6	23	8
193	OB0031	228	0	227	0	227	0	227	0	226	0	225	0

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
198	OB8015	0	0	0	0	0	0	0	0	0	0	0	0
198	OA0042	237	0	229	0	224	0	219	-1	208	-1	203	-1
199	EL0104	440	0	458	0	471	-1	485	-1	511	-2	525	-2
199	OA1802	0	0	0	0	0	0	0	0	0	0	0	0
199	OA0029	106	0	139	-1	162	-1	186	-2	233	-3	256	-3
199	OA0042	241	0	259	0	273	-1	286	-1	313	-2	326	-2
203	MA0030	0	0	0	0	0	0	0	0	0	0	0	0
203	EL0104	0	0	-24	0	-41	1	-58	1	-93	2	-110	2
204	EL0104	54	11	59	12	62	13	65	13	72	15	75	16
204	EL0102	0	0	0	0	0	0	0	0	0	0	0	0
204	OA1802	3	0	3	0	4	0	4	0	4	0	5	0
205	EL0104	0	0	0	0	0	0	0	0	0	0	0	0
205	EL0102	0	0	0	0	0	0	0	0	0	0	0	0
206	GU9125	5	0	5	0	5	0	5	0	5	0	5	0
206	EL0104	0	0	0	0	0	0	0	0	0	0	0	0
206	EL0102	2	1	10	1	16	2	22	2	34	3	39	3
206	EL0100	62	2	63	2	65	2	66	2	68	3	69	3
206	EL0097	39	2	45	2	49	2	53	3	60	3	64	3
206	EL0096	38	0	38	0	38	0	38	0	38	0	38	0
206	EL0091	76	3	84	4	89	4	95	4	106	5	112	6
206	EL0094	202	3	207	3	211	3	215	3	223	4	227	4
206	OA1802	39	3	42	4	44	4	47	4	51	4	53	4
207	EL0104	0	0	0	0	0	0	0	0	0	0	0	0
207	EL0100	0	0	0	0	0	0	0	0	0	0	0	0
207	OA1802	3	0	3	0	3	0	3	0	4	1	4	1
208	GU9125	0	0	0	0	0	0	0	0	0	0	0	0
208	EL0094	24	1	25	1	25	1	26	1	28	1	28	1
208	OA1802	189	9	212	9	228	9	243	9	275	10	291	10
208	OA1017	0	0	0	0	0	0	0	0	0	0	0	0
208	OA1018	0	0	0	0	0	0	0	0	0	0	0	0
208	OA1019	159	4	159	4	159	4	159	4	159	4	159	4
208	OA1011	6	1	8	1	10	1	11	1	15	1	16	1
209	GU9125	66	40	66	40	66	40	66	40	66	40	66	40
209	GU9123	60	0	60	0	60	0	60	0	60	0	60	0
209	OA1017	45	0	45	0	45	0	45	0	45	0	45	0
209	OA1018	45	10	46	13	47	16	49	18	51	23	52	26
209	OA1019	0	1	0	1	0	1	0	1	0	1	0	1
209	OA1009	132	0	132	0	132	0	132	0	132	0	132	0
209	OA1011	146	109	150	118	152	125	155	131	161	144	164	151
209	OA1004	200	40	201	42	201	43	201	44	202	45	203	46
209	OA1005	26	0	26	0	26	0	26	0	26	0	26	0
209	OA1006	93	0	93	0	93	0	93	0	93	1	93	1
209	OA0801	0	0	0	0	0	0	0	0	0	0	0	0
209	OA1039	206	0	207	1	207	2	207	3	208	4	209	5
209	OA1060	0	0	0	0	0	0	0	0	0	0	0	0
210	IB9323	0	0	0	0	0	0	0	0	0	0	0	0
210	GU9041	41	0	41	1	41	1	41	1	42	2	42	2
210	GU5107	188	0	190	13	191	22	193	32	196	50	197	60
210	GU9034	26	235	27	236	27	237	27	238	27	240	27	241
210	GU9035	5	0	5	0	5	0	5	0	5	0	5	0
210	GU9036	145	0	145	1	145	2	145	2	146	4	146	4
210	GU9037	2	0	2	0	2	0	2	0	2	0	2	0
210	GU9038	39	0	40	4	40	7	40	9	41	15	42	17
210	GU5104	103	0	103	0	103	0	103	0	103	0	103	0
210	GU9029	7	35	7	36	8	37	8	38	8	40	8	41
210	GU9032	6	305	6	305	6	305	6	305	6	305	6	305
210	GU9127	44	0	44	1	44	2	45	3	45	5	45	6
210	GU5100	5	0	5	0	5	0	5	1	5	1	5	1
210	GU5103	30	0	30	1	30	1	30	1	31	2	31	2
210	GU9125	521	0	521	1	521	2	521	3	522	5	522	5
210	GU9024	0	0	2	10	3	17	4	24	6	38	7	45
210	GU9124	141	77	145	100	147	116	149	132	154	165	157	181
210	GU9123	92	0	92	3	93	5	93	7	94	12	94	14
210	GU9011	0	8	0	9	0	9	0	9	0	9	0	9
211	IB9417	33	86	33	86	33	86	33	86	33	86	33	86
211	WD7112	467	759	455	821	446	865	438	909	420	997	412	1041
211	GU9041	48	19	48	21	48	22	48	23	47	26	47	27
211	GU9034	437	0	436	6	435	10	435	14	433	23	432	27
211	GU9037	48	0	48	0	48	0	48	0	48	0	48	0
211	GU9038	42	0	42	0	42	0	42	0	42	0	42	0
211	GU9039	25	0	25	0	25	0	25	0	25	0	25	0
211	GU9040	319	106	318	112	317	116	316	120	314	129	313	133
211	GU9124	108	0	105	14	103	24	102	33	98	53	96	63
211	GU9011	33	15	33	17	32	19	32	20	31	23	31	25
212	IB1062	0	0	0	0	0	0	0	0	0	0	0	0
212	IB9417	240	262	274	309	299	342	323	376	372	442	396	476
212	WD7112	0	0	0	0	0	0	0	0	0	0	0	0
212	IB9323	107	52	107	53	107	53	107	53	107	53	107	53
212	IB9326	323	20	340	43	352	60	364	76	388	109	400	126
212	GU9041	142	46	147	52	150	57	153	61	159	69	162	74
212	GU9040	0	0	0	0	0	0	0	0	0	0	0	0
213	EL0080	0	0	-1	2	-2	3	-3	5	-5	8	-6	9
213	IB9323	275	101	270	109	267	114	264	119	258	129	255	135
213	GU9041	19	0	18	1	18	2	17	3	16	4	16	5
213	GU5107	307	2	307	2	307	3	306	3	306	4	306	4
213	GU9125	18	6	17	8	16	8	16	9	15	11	14	12
214	EL0080	0	30	0	26	0	23	0	20	0	14	0	11
214	EL0079	0	4	0	4	0	4	0	4	0	4	0	4
214	IB9323	0	0	0	0	0	0	0	0	0	0	0	0
214	GU5107	0	135	0	135	0	135	0	135	0	135	0	135

		Population											
		1998		2005		2010		2015		2025		2030	
TAZ ID	**Manhole ID**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
214	GU9125	0	0	0	0	0	0	0	0	0	0	0	0
214	EL0091	0	50	0	50	0	50	0	49	0	49	0	49
214	EL0090	0	0	0	0	0	0	0	0	0	0	0	0
215	EL0065	2	0	7	-1	10	-1	13	-2	19	-3	22	-3
215	EL0074	3	0	7	-1	10	-1	13	-2	20	-2	23	-3
215	EL0080	35	0	36	0	37	0	38	0	39	-1	40	-1
215	EL0079	0	0	9	-1	16	-2	23	-3	36	-5	43	-6
215	IB9320	4	70	6	70	8	69	10	69	13	69	15	68
215	IB9318	6	37	21	35	31	34	41	32	62	29	72	27
215	IB9323	449	75	455	74	460	73	464	72	473	71	478	70
215	IB9325	37	0	38	0	38	0	38	0	39	0	39	0
215	IB9326	81	42	82	42	82	42	82	42	83	42	84	42
215	EL0082	29	0	30	0	30	0	31	0	32	0	32	0
215	EL9069	0	0	0	0	0	0	0	0	0	0	0	0
216	EL0057	0	0	0	0	0	0	0	0	0	0	0	0
216	MA0015	203	0	203	0	203	0	203	0	203	0	203	0
216	MA2026	80	38	80	38	80	38	80	38	80	38	80	38
216	EL4010	0	0	0	0	0	0	0	0	0	0	0	0
216	EL4006	0	55	0	55	1	55	1	56	2	56	2	56
216	EL0065	88	0	91	2	93	3	95	5	98	8	100	9
216	EL0074	193	0	195	2	196	3	198	4	201	6	202	7
216	EL0079	0	0	0	0	1	0	1	0	1	1	1	1
216	IB9318	0	0	0	0	0	0	0	0	0	0	0	0
216	MA0033	36	20	36	20	37	20	37	20	37	20	37	21
216	EL9069	9	0	10	0	10	1	10	1	11	2	12	2
217	EL0074	148	0	149	-3	150	-5	150	-7	152	-10	153	-12
217	EL0079	0	1	0	0	0	0	0	0	1	0	1	-1
217	MA0026	0	0	0	0	0	0	0	0	0	0	0	0
217	MA0030	0	0	0	0	0	0	0	0	0	0	0	0
217	MA0033	55	0	56	-2	56	-4	57	-6	58	-9	59	-11
217	EL0104	0	0	0	0	0	0	0	0	0	0	0	0
217	EL0102	0	0	0	0	0	0	0	0	0	0	0	0
217	EL0097	0	0	0	-1	0	-1	1	-2	1	-3	1	-3
217	EL0085	21	0	21	0	21	0	21	0	21	0	21	0
217	EL0091	0	0	0	0	0	0	0	0	0	0	0	0
217	EL0090	97	0	99	-5	101	-9	102	-13	105	-21	106	-25
217	EL0087	22	0	22	0	22	0	22	0	22	0	22	0
217	EL0083	0	350	0	350	0	350	0	350	0	349	0	349
217	EL0082	56	0	56	-1	56	-2	57	-3	57	-4	58	-5
217	EL0089	47	0	47	0	47	0	47	0	47	0	47	0
218	MA0018	0	0	0	0	0	0	0	0	0	0	0	0
218	MA0020	2	0	2	1	2	1	2	1	2	1	2	1
218	MA0026	0	0	0	0	0	0	0	1	0	1	0	1
218	MA0030	22	3	23	6	23	9	23	11	23	15	24	17
218	MA0033	0	0	0	0	0	0	0	0	0	0	0	0
218	EL0104	0	33	0	34	0	34	0	34	0	35	0	36
219	MA0015	240	27	243	27	245	27	247	27	251	27	253	27
219	MA2002	23	0	23	0	23	0	23	0	23	0	23	0
219	MA2026	353	0	357	0	359	0	361	0	366	0	368	0
219	EL4010	0	0	0	0	0	0	0	0	0	0	0	0
219	MA0026	0	0	0	0	0	0	0	0	0	0	0	0
219	MA0033	0	21	0	21	0	21	1	21	1	21	1	21
219	MA5043	139	1	141	1	142	1	143	1	146	1	147	1
220	MA0002	0	0	0	0	0	0	0	0	0	0	0	0
220	MA0015	0	201	-9	199	-16	197	-22	196	-36	193	-42	191
220	MA2026	0	0	0	0	0	0	0	0	0	0	0	0
220	EL4010	0	0	0	0	0	0	0	0	0	0	0	0
220	MA0018	535	0	526	-2	520	-3	515	-5	503	-7	497	-9
220	MA0020	11	0	9	0	7	-1	6	-1	3	-2	1	-2
220	MA0026	139	0	139	0	138	0	138	0	137	0	137	-1
220	MA0030	157	0	156	0	156	0	156	0	155	0	155	0
220	MA0033	0	0	0	0	0	0	0	0	0	0	0	0
220	MA5043	0	0	-8	-2	-14	-3	-20	-5	-32	-7	-37	-9
	TOTAL	**81,680**	**74,835**	**83,266**	**79,995**	**84,399**	**83,680**	**85,532**	**87,366**	**87,799**	**94,737**	**88,932**	**98,422**

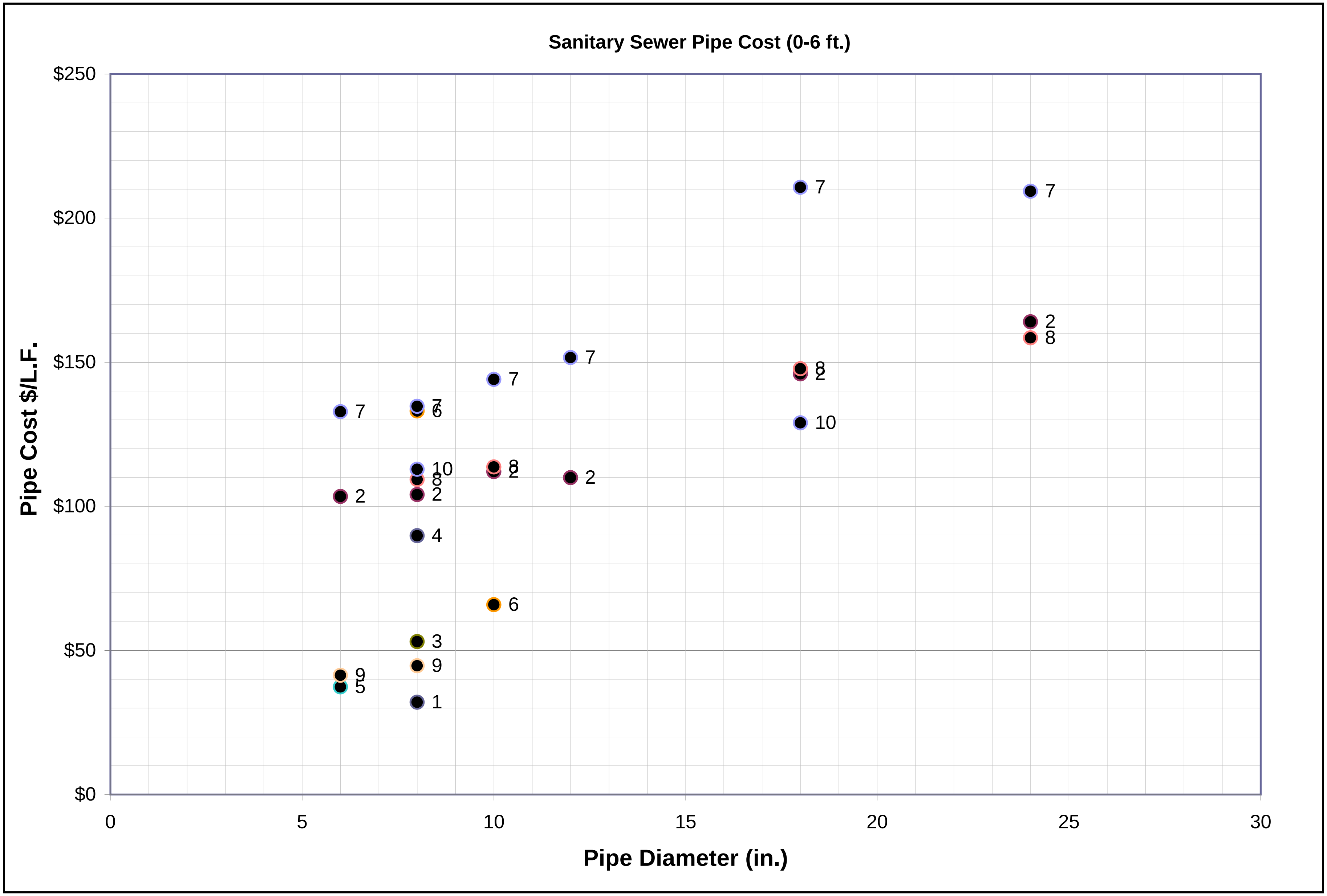
Appendix D – Sanitary Sewer Costs Study

City of Longview Waste Water Master Plan
Table of Costs

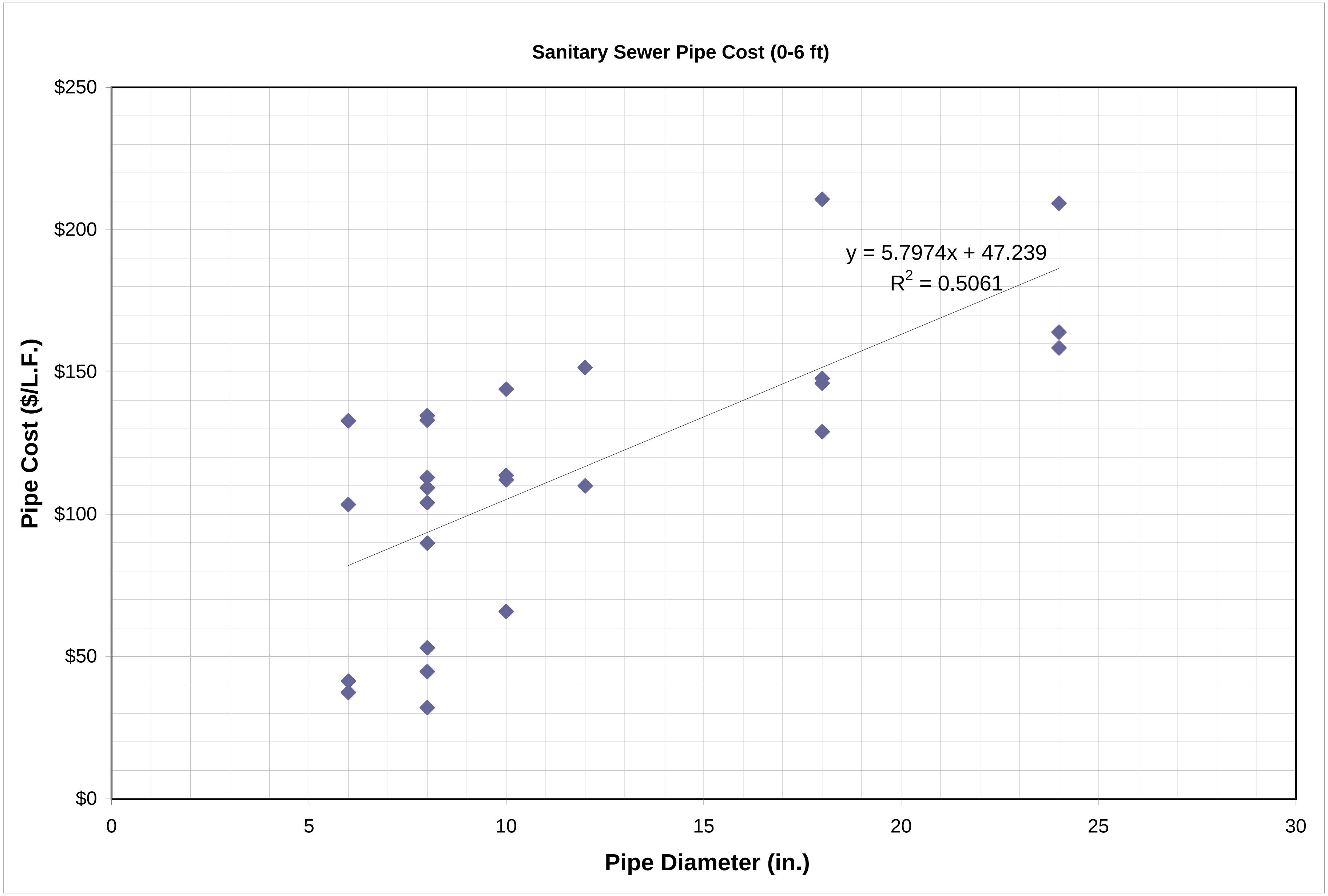
Table of Costs

Job No.	Job Location & Desciption	Bid Date	Average Job Cost	Diameter (in.)	Length (ft.)	Average Installed Cost of Pipe	Average Installed Cost/ft. (0-6 ft.)	Average Depth (ft.)	Cost for Veritcal Feet > 6 ft.	STD 4' Manhole Cost	STD 5' Manhole Cost	STD 6' Manhole Cost	Standard Manhole Cost $/VF > 6 ft.	Developed or Undeveloped
1	Willow Lake Business Park Utilities (White Oak)	2007	$134,123	8"	1796	$57,510	$32	6.8	$2.03	$2,133	-	-	-	Undeveloped
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	6"	30	$3,102	$103	6.5	$2.34	$2,115	$2,926	$5,415	$185	Developed
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	8"	562	$58,493	$104	7.4	$2.18	$2,115	$2,926	$5,415	$185	Developed
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	10"	97	$10,869	$112	7.0	$1.00	$2,115	$2,926	$5,415	$185	Developed
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	12"	40	$4,398	$110	14.3	$1.56	$2,115	$2,926	$5,415	$185	Developed
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	18"	9885	$1,443,006	$146	10.3	$1.00	$2,115	$2,926	$5,415	$185	Developed
2	LaFamo Wastewater Improvements (Longview)	2006	$2,189,889	24"	1917	$314,429	$164	10.6	$1.18	$2,115	$2,926	$5,415	$185	Developed
3	Clayton Place Properties, LLC	2006	$422,849	8"	698	$37,006	$53	7.3	$2.21	$2,763	-	-	-	Undeveloped
4	City of Gilmer (Water & Sewer Improvements)	2006	$207,560	8"	429	$38,531	$90	6	$0.00	$4,017	-	-	-	Developed
5	Beacer, Dogan, ….. Water & Sewer (Marshall)	2006	$351,214	6"	650	$24,264	$37	9.7	$2.10	$2,000	-	-	$132	Undeveloped
6	State HWY. 154 / Loop 390 Utilities Relocation (Marshall)	2006	$576,911	8"	428	$56,946	$133	10.9	$1.73	$2,015	-	-	$132	Developed
6	State HWY. 154 / Loop 390 Utilities Relocation (Marshall)	2006	$576,911	10"	703	$46,286	$66	10.6	1.08	$2,015	-	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	24"	320	$66,981	$209	6.7	$2.10	$3,007	$3,967	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	18"	2308	$486,247	$211	8.3	$1.78	$3,007	$3,967	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	12"	2312	$350,415	$152	9.5	$3.36	$3,007	$3,967	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	10"	69	$9,935	$144	8.7	$0.81	$3,007	$3,967	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	8"	294	$39,586	$135	8.4	$1.53	$3,007	$3,967	-	$132	Developed
7	Johnson Creek Sanitary Sewer Improvements (Longview)	2005	$1,112,479	6"	95	$12,618	$133	7.0	$1.50	$3,007	$3,967	-	$132	Developed
8	LeTourneu Waste Water System Improvements (Longview)	2003	$895,838	24"	1774	$281,105	$158	10.0	$2.13	$2,562	$3,456	-	-	Developed
8	LeTourneu Waste Water System Improvements (Longview)	2003	$895,838	18"	2434	$359,578	$148	9.5	$2.06	$2,562	$3,456	-	-	Developed
8	LeTourneu Waste Water System Improvements (Longview)	2003	$895,838	10"	947	$107,647	$114	7.8	$1.38	$2,562	$3,456	-	-	Developed
8	LeTourneu Waste Water System Improvements (Longview)	2003	$895,838	8"	197	$21,535	$109	8.0	$1.35	$2,562	$3,456	-	-	Developed
9	Cypress Street Waste & Sewer System Improvements (Gilmer)	2004	$197,904	8"	3101	$138,579	$45	6.0	-	$1,585	-	-	-	Developed
9	Cypress Street Waste & Sewer System Improvements (Gilmer)	2004	$197,904	6"	1030	$42,584	$41	6.0	-	$1,585	-	-	-	Developed
10	Estes Parkway Utilities Relocation (Longview)	2004	$1,388,407	18"	131	$16,896	$129	6.0	-	$2,156	$4,495	-	-	Developed
10	Estes Parkway Utilities Relocation (Longview)	2004	$1,388,407	8"	3282	$370,437	$113	6.0	-	$2,156	$4,495	-	-	Developed

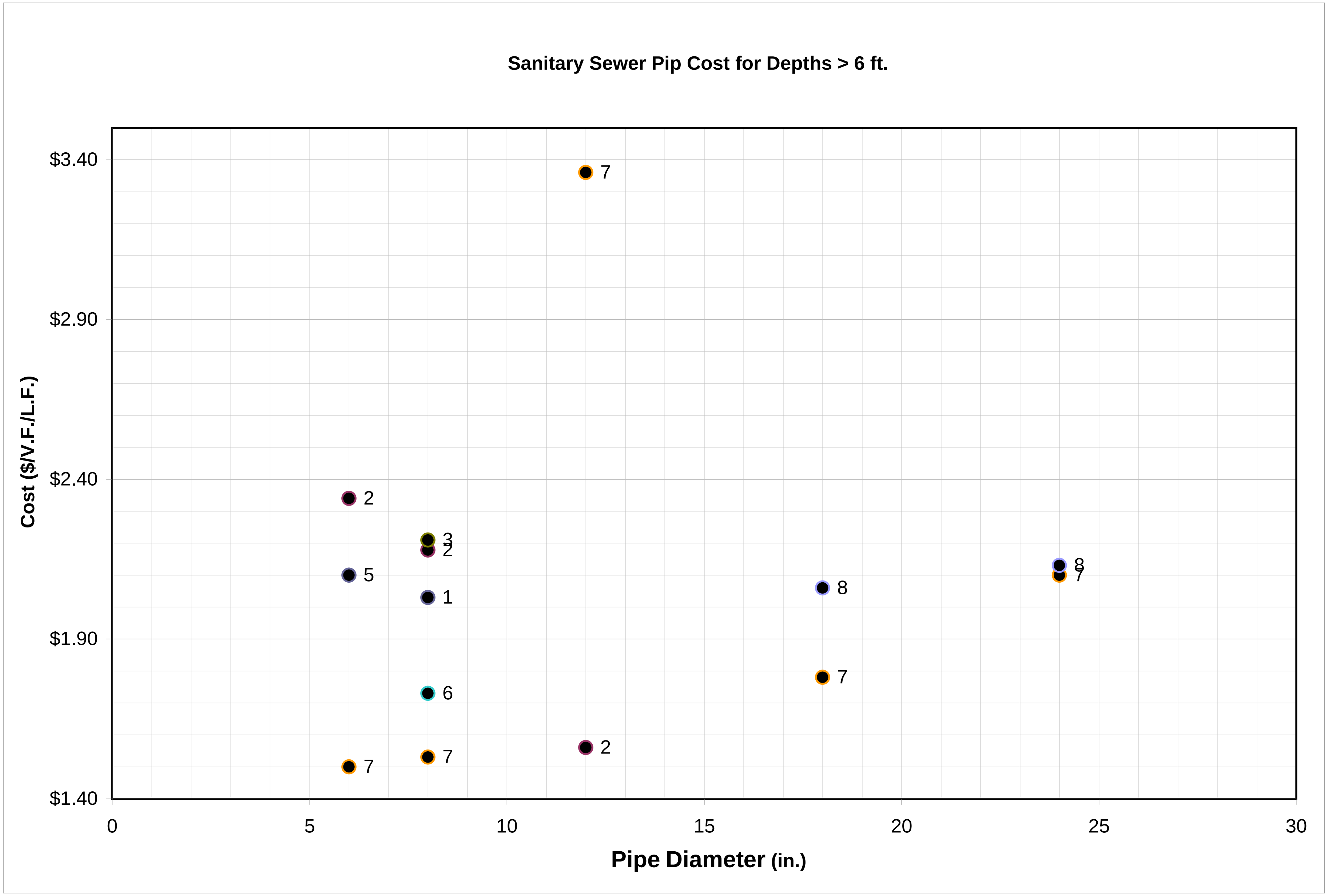
Graph 1



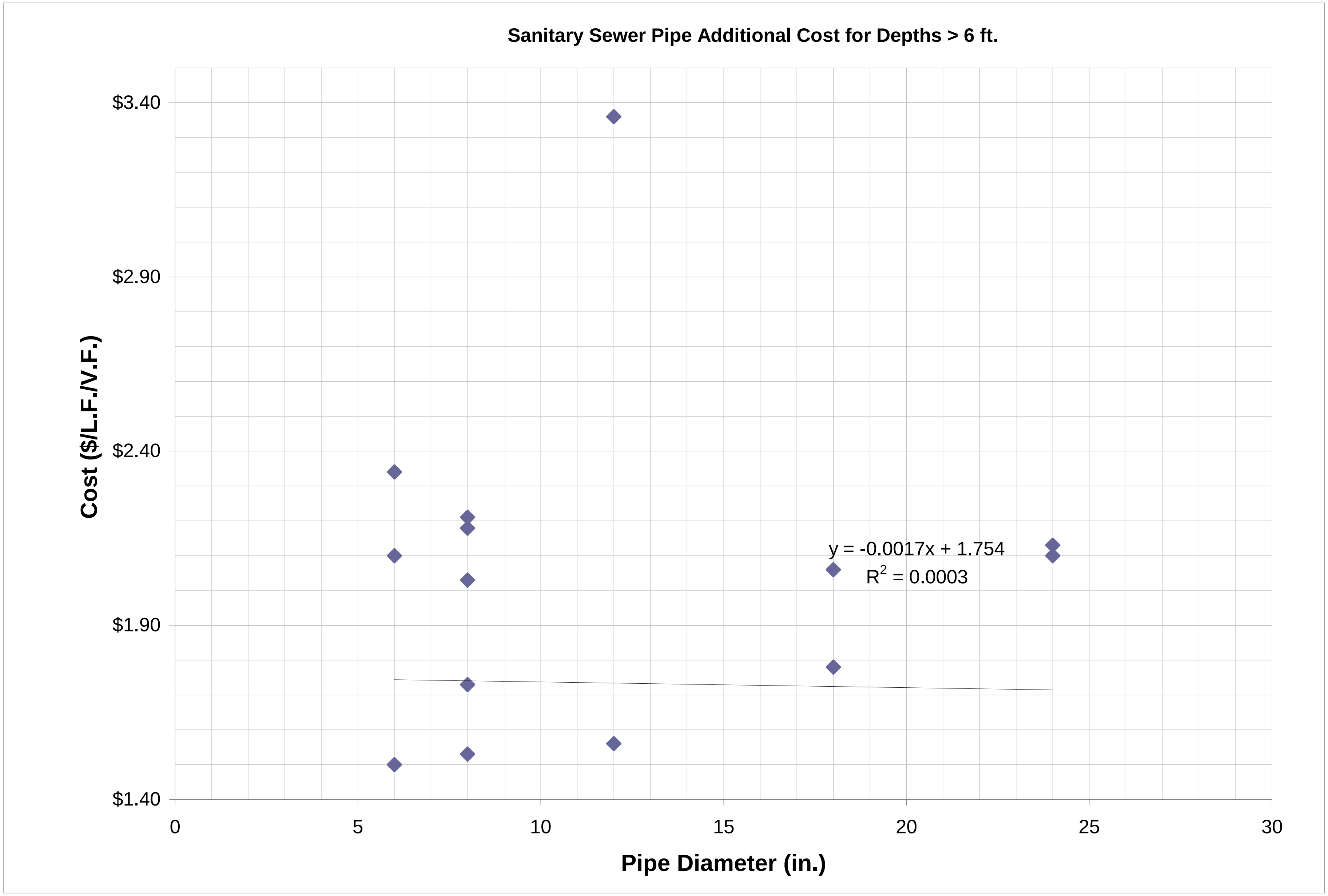
Number next to data point idicates Job No.


Sanitary Sewer Pipe Cost (0-6 ft)
$250
$200
$150
$100
$50
$0
0
5
10
15
20
25
30
Pipe Cost ($/L.F.)
Pipe Diameter (in.)
y = 5.7974x + 47.239
R2 = 0.5061

Graph 3



Number next to data point indicates Job No.



Note: Because the coeficient of correlation is so low the trend line is useless and the average of the costs should be used. (Avg. = $1.70)

City of Longview Waste Water Master Plan
Accuracy of Estimate

Accuracy of Cost Estimates

Job No.	Project	Total Job Cost	Est. Job Cost	Cost Difference	% Difference
1	Willow Lake Business Park Utilities (White Oak)	$70,682	$71,025	$343	0.49%
2	LaFamo Wastewater Improvements (Longview)	$2,189,889	$2,209,289	$19,400	0.89%
3	Clayton Place Properties, LLC	$47,107	$47,301	$194	0.41%
4	City of Gilmer (Water & Sewer Improvements)	$42,548	$42,548	$0	0.00%
5	Beacer, Dogan, ….. Water & Sewer (Marshall)	$36,255	$36,169	$86	0.24%
6	State HWY. 154 / Loop 390 Utilities Relocation (Marshall)	$132,916	$132,912	$4	0.00%
7	Johnson Creek Sanitary Sewer Improvements (Longview)	$1,112,479	$1,112,434	$45	0.00%
8	LeTourneau Waste Water System Improvements (Longview)	$895,838	$875,632	$20,206	2.26%
9	Cypress Street Waste & Sewer System Improvements (Gilmer)	$197,904	$197,013	$891	0.45%
10	Estes Parkway Utilities Relocation (Longview)	$430,997	$431,002	$5	0.00%