

CITY OF VICTORIA

**MASTER WASTEWATER
PLAN UPDATE**

May 2018



*Matt A. Glaze PE
5/2/18*

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1. INTRODUCTION AND SCOPE

This study is an update to the City of Victoria's Master Wastewater Plan prepared in 2009 by Urban Engineering and *Water and Wastewater Treatment Plant Capacity Assessment* prepared by Camp, Dresser & McKee, Inc (CDM) in 2007. This plan will evaluate the existing infrastructure and recommend improvements to meet the City of Victoria's current and future wastewater demands.

2. BACKGROUND

The two previous reports recommended changes to the wastewater system. Significant changes that were made to the wastewater system included:

2.1 Odem Street Wastewater Treatment Plant

The City constructed a new 4.4 million gallon per day (mgd) wastewater treatment plant near the intersection of Odem Street and Hand Road. This project included demolition of the Willow Street Wastewater Treatment Plant and construction of a lift station near the intersection of Southwest Ben Jordan and Bottom Streets.

2.2 U.S. Highway 77 North Annexation Project; Ph I (Navarro/Huvar)

This project consisted of replacement of an 8-inch and 15-inch sewer main along Navarro and Huvar Streets with a 24-inch sewer main. This main will serve future growth to the north and east of Victoria.

2.3 U.S. Highway 77 North Annexation Project; Ph II (North Navarro)

The second phase of the U.S. Highway 77 North Annexation project extended water and sewer mains along Navarro Street north of Northside Road. This project included construction of a lift station and provides service to areas along North Navarro Street.

2.4 Berkman Diversion Sewer

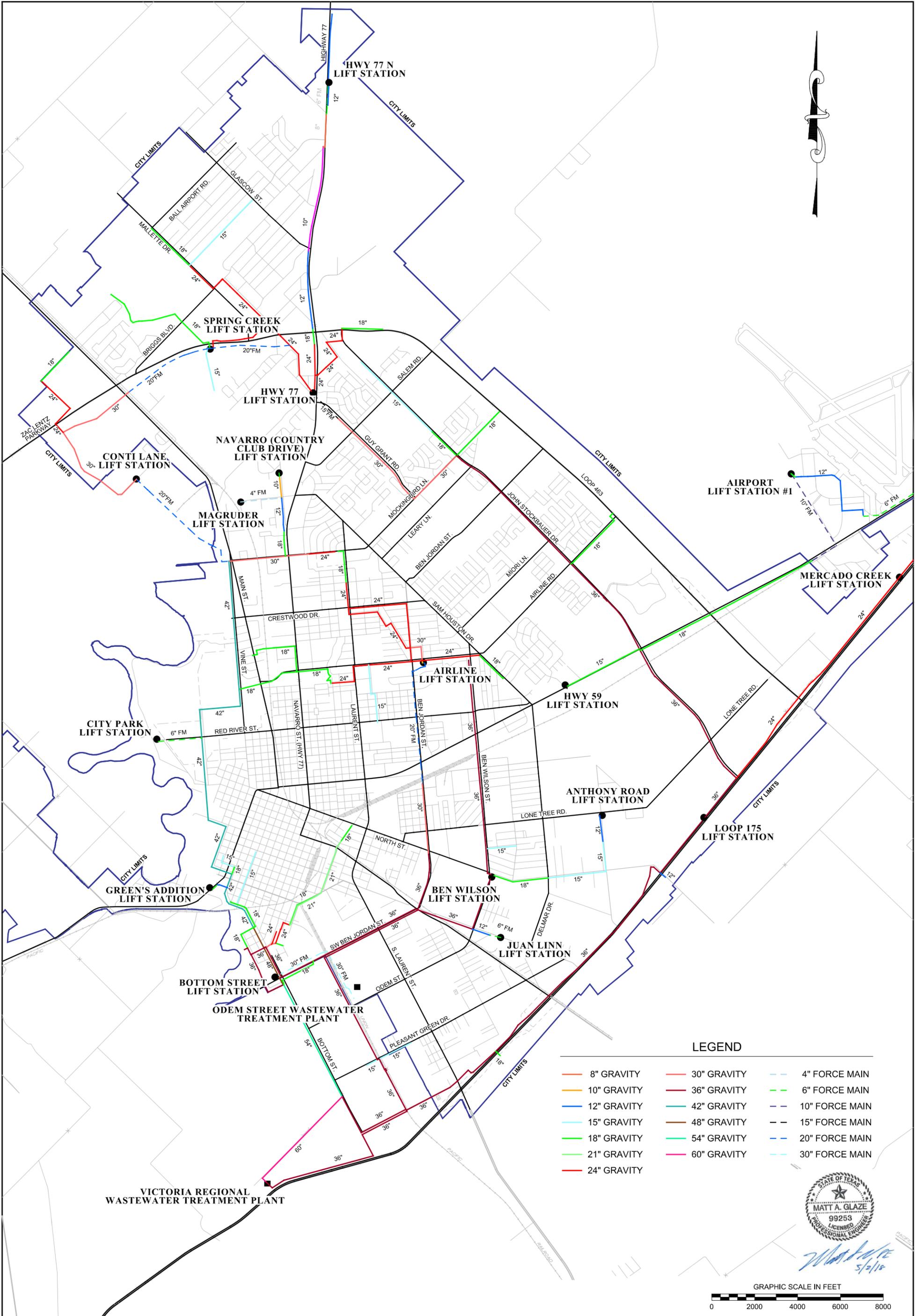
The Berkman Diversion Sewer diverted flows from the Highway 77 Lift Station to the Spring Creek Lift Station. This diversion allows for additional growth along Navarro Street and areas north and east of Victoria.

3. INVENTORY OF INFRASTRUCTURE

The City of Victoria's wastewater system consists of gravity mains, force mains, lift stations and wastewater treatment plants (WWTP). There are numerous gravity mains, sixteen (16) lift stations and two (2) wastewater treatment plants. The locations of all major gravity mains, force mains, lift stations and treatment plants are shown in **Figure 1** titled, "*Major Wastewater Infrastructure Map*".

3.1 Wastewater Treatment Plants

The City of Victoria has two (2) wastewater treatment plants: Victoria Regional WWTP and Odem Street WWTP.



LEGEND

8" GRAVITY	30" GRAVITY	4" FORCE MAIN
10" GRAVITY	36" GRAVITY	6" FORCE MAIN
12" GRAVITY	42" GRAVITY	10" FORCE MAIN
15" GRAVITY	48" GRAVITY	15" FORCE MAIN
18" GRAVITY	54" GRAVITY	20" FORCE MAIN
21" GRAVITY	60" GRAVITY	30" FORCE MAIN
24" GRAVITY		



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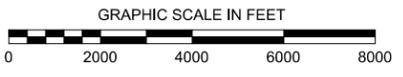


FIGURE 1 - MAJOR WASTEWATER INFRASTRUCTURE MAP
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The Victoria Regional WWTP is located along US Highway 59 near the Guadalupe River. This plant uses a complete mix, activated sludge process that has the capacity of 9.6 mgd.

The Odem Street WWTP is located near the intersection of Odem Street and Hand Road. This plant was new plant was completed in the fall of 2016 and uses an activated sludge process with fine bubble diffusers to treat wastewater. The Odem Street WWTP has the capacity to treat 4.4 mgd.

3.2 Lift stations

The City of Victoria operates sixteen (16) lift stations that range in capacity from 0.12 mgd to 17.6 mgd. Existing lift stations along with their corresponding service areas and discharge routes are shown in **Figure 2**.

3.3 Gravity Wastewater Mains

The City's gravity wastewater system contains mains from 6-inches to 60-inches. These mains are constructed of various materials including concrete, vitrified clay, Polyvinyl Chloride (PVC), fiberglass reinforced and polypropylene (PP).

4. PEAK FLOWS

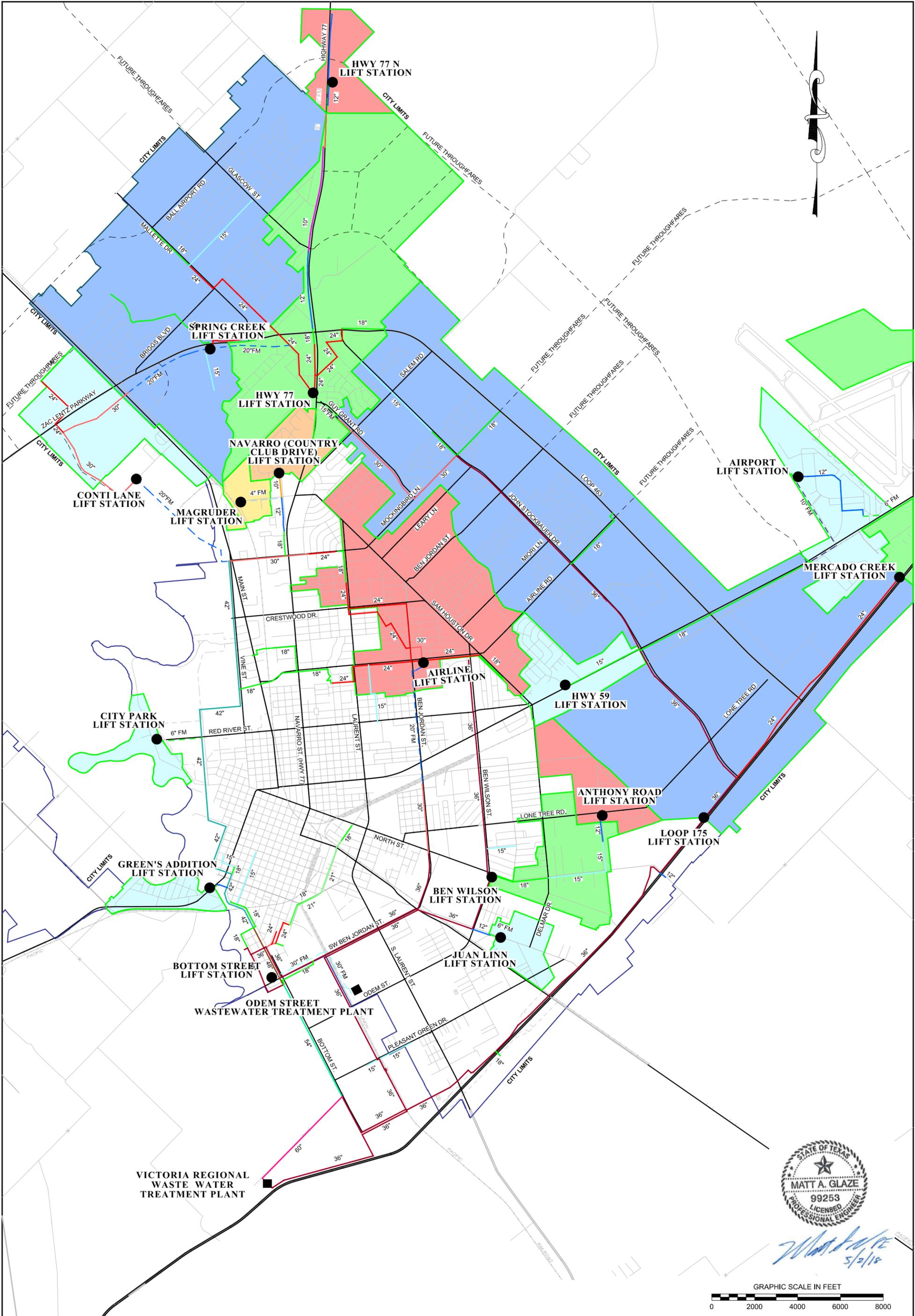
Wastewater collection systems are required to convey peak flows, including inflow and infiltration to satisfy Texas Commission on Environmental Quality (TCEQ) requirements. The City of Victoria's average treated flow is 6.62 mgd, which equates to an approximate 98 gallons per person per day using a current estimated population of 67,670 people. This is approximately equivalent to the recommendations of Title 30 Texas Administrative Code (TAC) Chapter (Ch.) 217.32, which recommends estimating 100 gallons per person per day. For the purpose of this report, it is recommended that the average flow per person be assumed as 100 gallons per person per day.

Though data are available for plant flows, there are no flow measuring devices located within the collection system. Title 30 TAC Ch. 217.32 (a)(2) recommends using a peaking factor of 4.0, if site specific data are not available. The peak flow for each person is estimated to be 400 gallons per person per day as directed by the TCEQ.

5. WASTEWATER FLOWS

Population data were used to estimate wastewater flows in existing lift stations and mains. Population for each area was determined by counting the numbers of houses and apartments in each area and applying the average of 2.62 people per residence as determined by the 2010 Census. This equates to an average flow of 262 gallons per day per residence and a peak flow of 1,048 gallons per day per residence.

6. COLLECTION SYSTEM



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FIGURE 2 - EXISTING LIFT STATION SERVICE AREAS & DISCHARGE ROUTES

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6.1 Lift Stations

Lift stations were evaluated based on their rated capacity, which by TCEQ regulation is the firm capacity of the pumps. Firm capacity is defined as the sum of pumping capacity with the largest pump out of service.

The capacity was then compared to estimate peak flow of the service area. Service areas were identified by the City of Victoria's Geographic Information System (GIS). GIS also contains information on main size and materials.

6.2 Major Mains

Evaluation of major mains is a critical component of this study. Capacity of major mains was identified by calculating flow using the Manning Equation as defined in TCEQ Chapter 217.53. Slopes used in the calculation were taken from data on the City's grid maps and construction plans.

Major mains were selected to be studied were located in areas with potential growth. These mains are typically located along the east and west sides of the City as these are the main conveyance routes for wastewater. The Navarro Street 12-inch main was also studied as it was identified in the 2009 study as critical. Several other internal mains were not studied in this report because the 2009 study identified them as having ample capacity.

7. FUTURE FLOWS

The City of Victoria's Comprehensive Plan 2035 projects a 2040 population of 84,400 people. The Plan also identifies areas of potential growth and projects that the majority of the growth to be north and north east of the city along Loop 463. These coincide with areas identified in the City of Victoria's 2009 Master Wastewater Plan as "Future Growth Areas". In addition, infill development is possible, the existing sewer mains have sufficient capacity to accommodate this growth.

Chart 1 shows the existing lift stations with corresponding capacity, current peak flows, peak flows for a population of 84,400 people and ultimate build out of 122,000 people.

Chart 2 shows major mains with existing capacity and existing peak flow. The estimated flows for the 84,400 population and ultimate build out population of 122,000 people are also shown.

		67,670 Population	84,400 Population		122,000 Population	
	Lift Station Capacity (mgd)	Current Peak Flow (mgd)	Projected Growth (mgd)	Total with Projected Growth (mgd)	Ultimate Growth Area Amount (mgd)	Total with Ultimate Growth Area (mgd)
Hwy 77	4.39	1.35	1.85	3.20	3.9	5.25
Loop 175	8.78	6.43	3.19	9.63	14.3	20.73
Airline	10.37	2.92	0.17	3.09	0.00	3.09
Mercado Creek	4.46	0.02	0.00	0.02	3.80	3.82
Airport	0.92	.03	0.01	0.04	0.01	0.05
Juan Linn	0.36	0.08	0.17	0.24	0.17	0.25
Ben Wilson	2.98	0.35	0.17	0.52	0.17	0.52
Hwy 59 B	2.16	0.47	0.00	0.47	0.00	0.47
Green's Addition	0.36	0.26	0.00	0.26	0.00	0.26
City Park	0.5	0.05	0.00	0.05	0.00	0.05
Magruder	0.29	0.09	0.00	0.09	0.0	0.09
Navarro	0.65	0.26	0.00	0.26	0.00	0.26
Anthony Road	1.58	0.20	0.17	0.37	0.17	0.37
Spring Creek	5.8	3.12	1.01	4.12	4.9	8.02
Hwy 77 N	0.50	0.00	0.10	0.10	0.40	0.50
Conti Lane	7.63	3.15	2.86	6.00	7.2	10.35

* - Indicates the projected flow exceeds capacity.

			67,670 Population	84,400 Population		122,000 Population	
Location	Existing Main Size (in)	Capacity (mgd)	Current Peak Flow (mgd)	Projected Growth (mgd)	Total with Projected Growth(mgd)	Ultimate Growth Area Amount (mgd)	Total with Ultimate Growth Area (mgd)
Navarro @ Loop 463	12	1.02	0.67	0.1	0.77	0.25	1.02
Stockbauer @ Mockingbird	36	12.24	2.64	3.50	6.14	5.55	8.19
Stockbauer @ Airline	36	12.24	5.75	5.54	11.29	6.45	12.20
Stockbauer @ Highway 59	36	12.24	6.47	5.88	12.35	7.35	13.82

* - Indicates the projected flow exceeds capacity.

8. GROWTH AREAS

As development occurs outside the city limits, the wastewater collection system must be expanded to accommodate the growth. The ultimate build-out boundary was identified based upon the service area of the water system, major drainage divides and reasonable extension of the wastewater collection system. Areas outside this boundary will likely develop rurally before being annexed into the City.

This boundary was subdivided into 11 drainage areas based upon the Master Thoroughfare Plan and existing topography located outside of the 100-year floodplain. These growth areas are shown on **Figure 3**. Peak wastewater flows were projected for each area and wastewater mains were sized to serve these areas.

8.1 Area A

Area A is located north of Loop 463 and west of Highway 87 and contains 4,600 acres. This area is served by an 18-inch main along Highway 87 and a 12-inch main along West Tropical Drive. Ultimate build out for this area is expected to produce peak flows of 2.28 mgd. The existing mains have capacity for this area.

8.2 Area B

Area B is located between Highway 87 and Spring Creek. This area contains 2,300 acres outside of the 100-year floodplain. Maximum wastewater flows from this area are expected to reach 2.3 mgd. The existing 18-main along Spring Creek will serve this area. This main can also serve areas between Spring Creek and Mallette Drive. Any proposed development should evaluate crossing Spring Creek or constructing a lift station to pump to Mallette Drive.

8.3 Area C

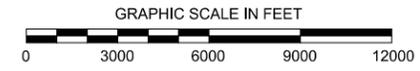
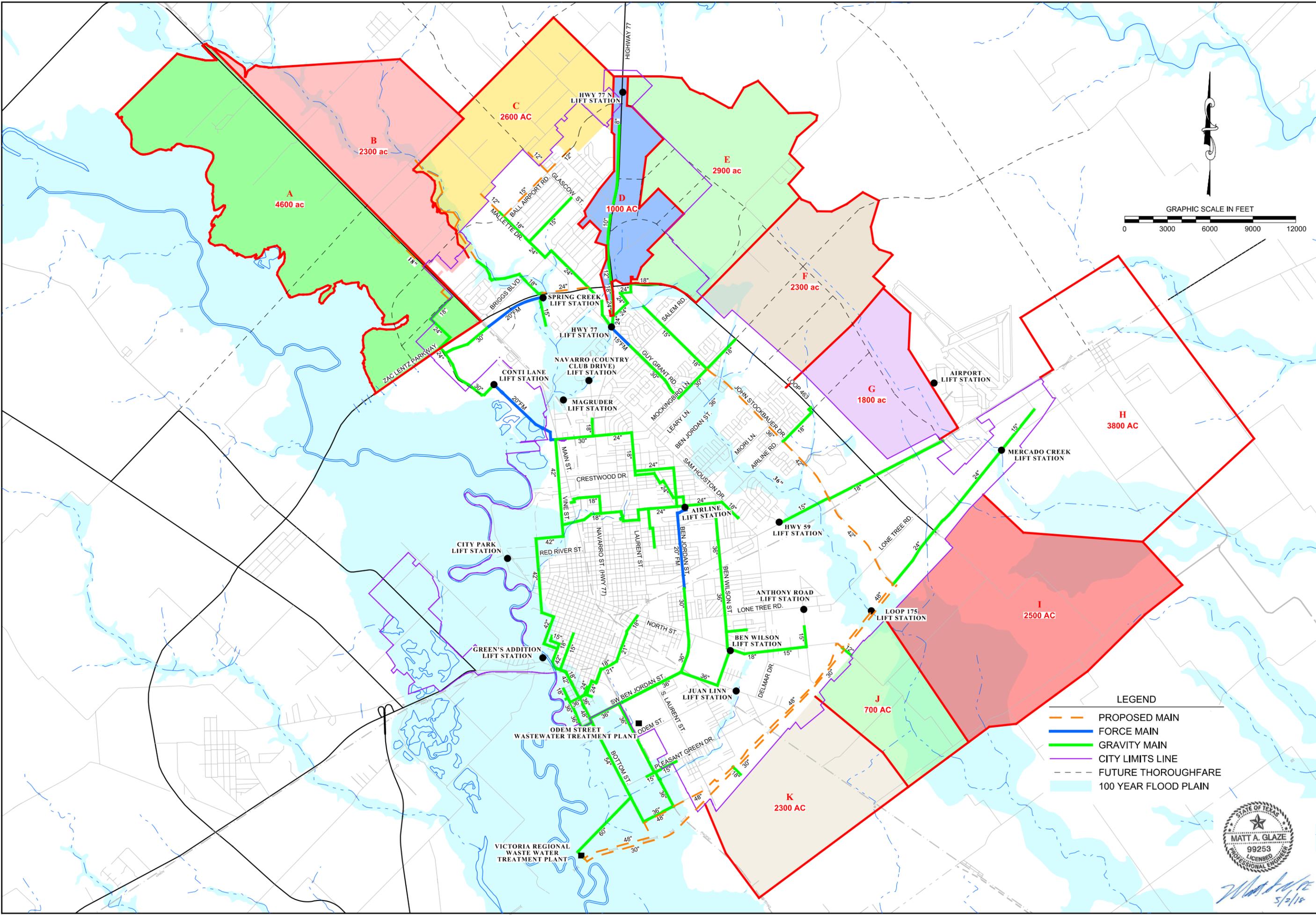
The area between Spring Creek and Highway 77 encompass Area C. This area contains 2,000 acres. Projected peak flows from the ultimate build out are estimated to be 2.6 mgd. The existing 12-inch main along Mallette Drive and 15-inch main along Ball Airport Road will adequately serve this area.

8.4 Area D

Area D is the undeveloped area along Highway 77. This is the area that is projected to fill the 12-inch main in Navarro Street to capacity. Areas adjacent to Navarro Street should be given priority to utilize this main.

8.5 Area E

Area E is located east of Highway 77 and north of Salem Road. The north and east boundary of this area is the watershed boundary for the master drainage plan. This area includes the proposed Placido Benavides Drive. Peak flows from this area are expected to be 2.9 mgd. Service for this area is provided by an 18-inch main along Loop 463, which has sufficient capacity to serve this area.



- LEGEND**
- PROPOSED MAIN
 - FORCE MAIN
 - GRAVITY MAIN
 - CITY LIMITS LINE
 - FUTURE THOROUGHFARE
 - 100 YEAR FLOOD PLAIN



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FIGURE 3 - GROWTH AREAS
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8.6 Area F

Area F is projected to be served by the 18-inch main in Mockingbird Lane. This area contains 2,300 acres east of Loop 463. Peak flows from this area are estimated to be 2.3 mgd. The Mockingbird Lane main has sufficient capacity to serve this area.

8.7 Area G

Area G is located between Loop 463 and Victoria Regional Airport. Projected flows from this area are expected to be 1.8 mgd. This area is served by an 18-inch main in Airline Road and an 18-inch main in Highway 59 Business. These mains provide sufficient capacity to serve this area, but downstream upgrades are required to serve a population beyond 82,000.

8.8 Area H

Area H contains 3,800 acres of developed and undeveloped areas east of Victoria along Highway 59. This area is served by existing 24-inch and 15-inch mains in Highway 59. The area has the potential for 3.8 mgd wastewater flows. These mains have sufficient capacity to serve this area, but downstream upgrades in John Stockbauer Drive and Highway 59 are required for buildout of this area as identified in Section 9.1.

8.9 Area I

Area I is centered off a projection off the end of Loop 463. This area contains 2,500 acres outside of the 100-year floodplain and is estimated to produce 2.5 mgd of maximum wastewater flow. Currently, a 24-inch main serves this area, but system upgrades will be required to serve this area in the future as described in Section 9.1.

8.10 Area J

Area J contains approximately 700 acres near Hanselman Road. Peak wastewater flow for this area is estimated to be 0.70 mgd. This area is currently served by a 12-inch main under Highway 59, which is sufficient to serve this area. Downstream upgrades are required if significant growth occurs along Highway 59 and Loop 463 as identified in Section 9.1.

8.11 Area K

Area K is currently served by an 18-inch main, which has sufficient capacity for the future build out of this area. Service to this area will come at an increased cost due to the topography and the need for construction of lift stations. Discharges for future lift stations shall be directed to this main, until upgrades identified in Section 9.1 are completed.

8.12 Areas West of Guadalupe River

Areas west of the Guadalupe River were evaluated for the extension of wastewater service. Connection to the existing wastewater system requires the crossing of a wide non-developable floodplain of the Guadalupe River, which is cost prohibitive. It is not recommended that the City of Victoria extend wastewater service to the west side of the Guadalupe River. If a large development plans construction on the west side of the

Guadalupe River and requests service, the City should evaluate construction of a new wastewater treatment plant and collection system.

8.13 Future Growth Summary

As growth occurs beyond 82,000 residences, major upgrades in the system will be required. The areas identified as future growth areas will facilitate growth of approximately 53,000 people. With proper planning and system upgrades, the City of Victoria's wastewater collection system will be able to accommodate this growth.

9. RECOMMENDATIONS

9.1 John Stockbauer/Highway 59 Main

Based on areas of projected growth identified in the Comprehensive Plan 2035 the current wastewater system will accommodate approximately 82,000 residences. The 36-inch main in John Stockbauer Drive and Highway 59 along with the Loop 175 lift station does not have the capacity to serve the estimated population. Furthermore, this main is approximately 50 years old and is in need of repair.

It is recommended that the 36-inch main from Mockingbird Lane to Airline Road be repaired using cured in place pipe (CIPP). The John Stockbauer Drive main from Airline Road to Highway 59 should be pipe bursted to a 42-inch main. This main from Loop 463 to the Loop 175 Lift Station and from downstream of the Loop 175 Lift Station to the Victoria Regional WWTP should be pipe bursted to a 48-inch main. Furthermore, if growth occurs as projected and the population nears 82,000, the Loop 175 Lift Station will require larger pumps to increase capacity.

As more growth occurs south of Highway 59 downstream of the Loop 175 lift station, a parallel 30-inch main should be constructed on the south side of Highway 59 and connected to the Victoria Regional WWTP. This main will serve the proposed developments on the south side of Highway 59.

9.2 Maintenance

Large areas of the collection system are constructed with concrete and vitrified clay pipe. Concrete pipes are subject to deterioration from gasses produced by wastewater and vitrified clay pipes are subject to leaking joints and cracks. Repair of these pipe materials is critical to prevent pipe failures with the focus on major mains.

These pipes can be a major source of inflow and infiltration. Inflow and infiltration into a wastewater collection system greatly increases the demands on collection system components and wastewater treatment plants. It is recommended that efforts be made to reduce these flows into the wastewater system. Smoke testing is a common method to identify leaks within a collection system and identifies areas where maintenance needs to be performed.

Furthermore, the 36-inch concrete main in Southwest Ben Jordan Street installed with extremely shallow cover, is subject to leaking joints. This main should be replaced from Bottom Street to Hand Road.

9.3 Data Collection

Collecting data on the existing wastewater system is important to estimating the peak flows. This flows in this study are based on average daily flows with the TCEQ recommended peak flow multiplier of four (4). It is recommended that flow meters be installed on the City's major mains and real data be used to calculate peak flow. Furthermore, this helps identify areas of inflow and infiltration.