CITY OF LEAGUE CITY

2023 WASTEWATER MASTER PLAN UPDATE

PREPARED BY:
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PREPARED FOR:
City of League City

Innovative approaches
Practical results
Outstanding service

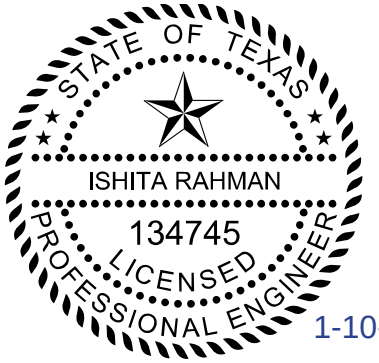
2023 WASTEWATER MASTER PLAN UPDATE

Prepared for:

City of League City

1-10-24

FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144



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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The City of League City (City) is a growing community in Galveston County, Texas. The City has a population of approximately 116,000 and is projected to grow to over 200,000 by buildout. This *2023 Wastewater Master Plan Update* has been prepared to provide League City with a planning tool to guide the implementation of 5-year, 10-year and Buildout capital improvements to the City's wastewater conveyance and treatment infrastructure. This study was performed in conjunction with the City's *2023 Water Master Plan Update* and the *2023 Water and Wastewater Capital Recovery Fee Update*.

Scope of Work

The City of League City retained Freese and Nichols, Inc. (FNI) to update their Water and Wastewater Master Plans (study) that were previously developed in 2018. As part this study, FNI developed this *2023 Wastewater Master Plan Update* (study). FNI retained the Ardurra Group, LLC (Ardurra) to develop the *2023 Water Master Plan Update* which was provided to the City as a separate report. Both studies utilized the land use assumptions developed during this study and documented in this study's report.

The goals of this study included an evaluation of the existing wastewater system and the development of capacity and renewal recommendations for 5-year, 10-year, and Buildout wastewater capital improvement plans (CIPs). These recommended improvements will serve as a basis for the financing, design, and construction of projects required to meet League City's existing and anticipated wastewater capacity and system renewal needs.

2.0 WASTEWATER SYSTEM INFRASTRUCTURE

League City's wastewater collection system includes two water reclamation facilities (WRFs), approximately 375 miles of gravity wastewater lines ranging from 4-inches to 60-inches in diameter, and 78 lift stations including the influent lift stations at the two WRFs.

Water Reclamation Facilities and Service Areas

League City owns and operates the following two WRFs:

- **Dallas Salmon** Water Reclamation Facility
- **Southwest** Water Reclamation Facility

All wastewater flow in League City is treated at one of these two WRFs. The portion of the collection system served by the **West Main Lift Station** currently has the ability to be pumped to the **Southwest WRF** or to the **Dallas Salmon WRF**. Therefore, the following three service areas are delineated:

- **Dallas Salmon WRF** Service Area
- **Southwest WRF** Service Area
- **West Main Lift Station** Service Area

3.0 WASTEWATER FLOW MONITORING

FNI conducted city-wide flow monitoring and rainfall data collection as part of this study. The flow monitoring and rainfall data were utilized to characterize dry weather and wet weather wastewater flows at key points within the collection system and to calibrate the hydraulic model. The flow and rainfall data was also utilized to quantify inflow and infiltration (I/I) throughout the collection system and prioritize flow meter basins for future sanitary sewer evaluation study (SSES) projects.

Flow Monitoring Strategy

For this 2023 update to the Wastewater Master Plan, the strategic decision was made to utilize fewer flow meters than in the 2018 study. **Table ES-1** summarizes the number of flow meters placed throughout the collection system in both studies. This *2023 Wastewater Master Plan Update* utilized 16 flow meters to update the model calibration and conduct the system capacity analyses. Where applicable, flow meter data from the 2018 study was utilized in this 2023 study to inform the SSES program recommendations (discussed further in **Section 9.2**).

Table ES-1: Master Plan Flow Meters

Wastewater Master Plan	No. of Flow Meters
2018	28
2023	16

Inflow and Infiltration (I/I) Summary

The flow meter basins were categorized into **High**, **Moderate**, or **Low** I/I and ranked from 1 (Highest) to 18 (Lowest). The categories are based on the rate of I/I as gallons per linear foot per inch of rainfall (Gal/LF/in) calculated within each basin. The flow meter basins are ranked by the measured rate of I/I in **Table ES-2**.

Table ES-2: Flow Meter Basin Ranking by I/I

Flow Meter Basin	Basin Footage (LF)	Average Volume of I/I (MG)	Average I/I (Gal/LF/in)	Basin Ranking by I/I
FM-17A[(1)]	16,424	0.19	8.0	1
FM-15	17,341	0.09	4.7	2
FM-01	102,523	0.62	4.6	3
FM-12	62,199	0.10	4.1	4
FM-04	21,743	0.10	3.9	5
FM-14	95,149	0.38	3.9	6
FM-07	94,381	0.50	3.6	7
FM-03	386,940	1.58	3.0	8
FM-08	80,011	0.32	2.8	9
FM-13	28,715	0.08	2.7	10
FM-06	10,835	0.03	2.7	11
FM-05	70,359	0.21	2.6	12
FM-10	88,669	0.22	2.6	13
FM-16	115,332	0.35	2.5	14
FM-11	53,026	0.05	2.3	15
FM-09	312,243	0.87	2.2	16
FM-17B[(1)]	5,661	0.02	2.1	17
FM-02	322,666	0.68	1.8	18

In summary, the meter basin I/I ranking results are:

- 4 basins with **high** levels of I/I
- 13 basins with **moderate** levels of I/I
- 1 basin with a **low** level of I/I

This basin I/I ranking was utilized in the development of the updated SSES Program recommendations, discussed further in **Section 9**.

4.0 LAND USE ASSUMPTIONS

This report documents the land use assumptions for both the *2023 Water Master Plan Update* and *2023 Wastewater Master Plan Update*. Population and land use are important elements in the analysis of water distribution and wastewater collection systems. Water demands and wastewater flows are dependent on the residential population and commercial developments served by the system and affect the sizing and location of system infrastructure. During this study, FNI worked with the City's Planning Department to evaluate historical population and develop **5-year**, **10-year**, and **Buildout** land use assumptions and projections.

Water and Wastewater Master Plan Service Areas

Population and commercial acreage projections were developed City-wide and were then applied to the water and wastewater systems based on the water and wastewater service areas discussed with the City. The service areas are largely defined by the City limits with the exception of some select areas as described in **Section 4.2**. **Table ES-3** summarizes the growth in population and commercial acreage within the water and wastewater service areas.

Table ES-3: Projected Growth by Service Area

Service Area	Population Growth			Commercial Acreage Growth		
	5-Year	10-Year	Buildout	5-Year	10-Year	Buildout
Water Service Area[(1)]	11,366	32,597	84,582	580	1,176	3,145
Wastewater Service Area[(2)]	11,377	33,482	86,711	580	1,235	3,205

(1) Septic customers are already served water by the City and are excluded from the water service area projected growth.

(2) The 2,056 septic customers and 58 commercial acres from **Table 4-2** are included in the wastewater service area projected growth.

5.0 WASTEWATER FLOW PROJECTIONS

The performance of wastewater treatment and collection systems is dependent on the amount of flow being conveyed. To develop future wastewater system improvements, existing and future wastewater flow projections must be developed. FNI developed projected average day and peak wastewater flows for the **Existing**, **5-year**, **10-year**, and **Buildout** planning periods based on the land use assumptions.

Summary of Flow Projections by Water Reclamation Facility

The total projected average day wastewater flows within each WRF Service Area in each planning period are included in **Table ES-4**.

Table ES-4: Summary of Projected Average Day Wastewater Flows

Service Area	Projected Average Daily Wastewater Flows[1] (MGD)			
	2023[1]	2028	2033	Buildout
Dallas Salmon WRF	7.4	8.0	8.3	9.8
Southwest WRF	1.1	1.9	3.6	8.0
West Main Lift Station	0.6	0.7	1.0	1.2
Total	**9.1**	**10.6**	**12.9**	**19.0**

(1) Existing flows based on historical annual average flow from 2017 to 2022. Effluent data from the City was utilized for 2017 to 2021. Average flows observed during the flow monitoring period were utilized for 2022 flows.

6.0 HYDRAULIC MODEL UPDATE

League City owns a wastewater hydraulic model of the collection system in the Bentley SewerGEMS® software. The wastewater model was originally developed in 2012 and was updated by FNI during the City's *2018 Wastewater Master Plan Update*. As part of this 2023 study, FNI completed another update of the City's hydraulic wastewater model to include new lines and facilities, as well as new pumping information where pumps were replaced by the City during recent lift station rehabilitation projects. Updated and newly added model components include:

- Updated gravity lines, force mains, and lift stations based on the City's latest GIS and recent project as-built plans
- Updated wastewater loads based on geocoded meter billing and flow monitoring data
- New model catchments for areas developed since 2018
- Updated pumping and operations information

Following the model update process, FNI calibrated the hydraulic wastewater model utilizing the field collected flow monitoring and rainfall data. The model was then utilized to conduct system analyses and to develop wastewater capital improvement plan (CIP) projects.

7.0 WASTEWATER COLLECTION SYSTEM ANALYSES

This study conducted hydraulic capacity analyses of the League City collection system to identify existing capacity deficiencies and assess the need for improvements to convey and treat projected wastewater flows through the Buildout planning period.

The data documented in this report, including the flow monitoring results and wastewater flow projections, were utilized in the capacity analyses. Wastewater hydraulic modeling was performed to assess peak wet weather flows under a design storm. Peak flows were also developed and assessed at a lift station service area level by multiplying the distributed dry weather flow monitoring data by peaking factors for sizing of lift stations.

Various combinations of improvements and modifications were investigated to assess the most appropriate approach for conveying the projected peak wastewater flows and treating the projected annual average wastewater flows. Considerations in developing the wastewater capacity capital improvements plan (CIP) included increasing system reliability, simplifying system operations, conveying peak wet weather flows, and reducing surcharging and sanitary sewer overflows.

8.0 WRF SERVICE AREA OPTIMIZATION AND CAPACITY ANALYSES

The wastewater flow projections developed in **Section 5.0** show that additional treatment capacity is needed by buildout to accommodate the projected average daily flows in the WRF service areas. The City is currently in the process of designing an expansion of the Southwest WRF from 4.0 MGD to 8.0 MGD that is anticipated to be in service within the 5-year planning period. To maximize treatment capacity and optimize flow rates and operations at each WRF, it is recommended to modify the WRF service areas, as discussed below.

Operational Plan to Optimize WRF Service Areas

A proposed operational plan to maximize the treatment capacity at both WRFs, as well as accomplish other operational objectives, is laid out as follows:

- **2023 Planning Period**: Pump all flows from the West Main Lift Station to the **Dallas Salmon WRF** Service Area through the **existing transfer valve** to the Butler Road Lift Station.

- **5-Year Planning Period**: Pump all flows from the Bay Colony 1 Lift Station to the **Southwest WRF** Service Area (via **CIP Project 1**).
- **10-Year Planning Period**: Pump all flows from the Victory Lakes Lift Station to the **Southwest WRF** Service Area (via **CIP Project 16**).

Future Wastewater Treatment Capacity

Treatment capacity expansion recommendations were developed based on the projected average day wastewater flows, the capacity requirements in TCEQ §305.126, and a minimum period of 5-10 years before another projected expansion would be needed for the WRF. The proposed WRF capacities by planning period are summarized in **Table ES-5**.

Table ES-5: Proposed Wastewater Treatment Capacity

Water Reclamation Facility	Average Daily Permitted Treatment Capacity (MGD)			
	2023	2028	2033	Buildout
Dallas Salmon WRF	12.0	12.0	12.0	12.0
Southwest WRF	4.0	8.0	8.0	12.0
Total Treatment Capacity	**16.0**	**20.0**	**20.0**	**24.0**

9.0 WASTEWATER CAPITAL IMPROVEMENTS PLAN

A wastewater system capital improvements plan (CIP) was developed for the City of League City. The complete wastewater CIP consists of the following components:

- Capacity CIP Projects – *documented in **Section 9.1***
- Sanitary Sewer Evaluation Study (SSES) CIP Projects – *documented in **Section 9.2***

The Capacity and SSES CIP projects are based on the wastewater system flow monitoring, land use assumptions, flow projections, hydraulic modeling, and system analyses discussed in the previous report sections. The recommended capacity projects improve the system's ability to convey wastewater flows and provide the required conveyance and treatment capacity to serve the projected residential and commercial growth through the Buildout planning period. Many of the recommended capacity projects also address existing condition and/or capacity issues in the existing wastewater system. The updated

SSES program recommendations reprioritize flow meter basins based on 2023 data with the goal of addressing high I/I areas within the City's collection system.

City's wastewater capacity CIP projects for the **5-year**, **10-year**, and **buildout** planning periods are presented in **Table E-6**. the SSES project recommendations with an updated SSES basin prioritization plan is presented in **Table E-7**.

Table E-6: Wastewater Capacity CIP Summary

Phase	Project Number	Project Name	Cost[(1)] (2023 Dollars)
5-Year (by 2028)	1	Re-Route 18-inch Bay Colony 1 Force Main to Southwest Service Area	$4,395,600
	2	New 42-inch Southwest Area Trunk Line to Southwest WRF	$7,427,700
	3	Expansion of Pedregal Lift Station to 1.5 MGD Firm Capacity	$1,606,800
	4	New Southwest 48-inch Gravity Line Extension and Force Main Re-Route	$2,794,400
	5	Expansion of Butler Road Lift Station to 16.0 MGD Firm Capacity	$9,207,200
	6	Expansion of Countryside No. 2 Lift Station to 2.7 MGD Firm Capacity and Replacement 14-inch Force Main	$3,177,800
	7	New 1.1 MGD Firm Capacity FM 646 Lift Station, New 12-inch Gravity Lines, and New 8-inch Force Main	$6,851,200
	8	New 21-Inch Southwest Area Trunk Line	$1,951,700
	9	Expansion of MUD 6 Lift Station to 1.15 MGD Firm Capacity	$2,213,000
	10	New 21/30-inch Gravity Lines along Bay Area Boulevard (Westside)	$3,280,400
	11	1.7 MGD Lift Station and 10-inch Force Main south of Dickinson Bayou (Westside)	$3,070,100
	12	Wastewater Master Plan and CRF Update	$850,000
		Total 2023 - 2028	**$46,825,900**
10-Year (by 2033)	13	Reconstruction of Meadow Bend STP Lift Station and Replacement 10/15/24-inch Sugar Wood/Edelweiss Dr. Gravity Mains	$8,113,500
	14	Expansion of North Service Area Lift Station to 3.1 MGD Firm Capacity and 30-Inch Replacement Gravity Main	$5,095,400
	15	Expansion of Smith Lane Lift Station to 7.6 MGD Firm Capacity	$7,539,500
	16	Upgrade Pumping HP at Victory Lakes Lift Station and Re-Route/Extend 12-inch Force Main	$7,057,700
	17	New 15-inch Gravity Line along Maple Leaf Drive (Westside)	$2,081,500
	18	27-inch Gravity Line to serve Stedman West, Martron, Sealy Land, Bofysil, and Custer developments (Westside)	$2,645,200
	19	15-inch and 18-inch Gravity Lines, 3.5 MGD lift Station and 12-inch Force Main to serve Custer, Bofysil, Sealy Land and Martron developments (Westside)	$15,814,600
		Total 2029 - 2033	**$48,347,400**
Buildout	20	Expansion of Southwest WRF by 4.0 MGD to a Permitted ADF of 12.0 MGD	$124,800,000
		Total Buildout	**$124,800,000**
		Total Buildout Capacity Wastewater CIP Cost	**$219,973,300**

(1) Existing/under design project costs based on portion of capital cost paid by the City. Planning level costs were developed for proposed future projects and include material costs and contingency. Additional expenses related to engineering, environmental, geotechnical, change order contingency, soft costs, and legal fees are not included.

Note: The FNI Team has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable construction costs provided are based on the information available at the time of preparation and represent only the FNI Team's judgment based on industry experience. The FNI Team cannot and does not guarantee the proposals, bids, or actual construction costs will not vary from the opinion of probable construction costs.

Table E-7: SSES CIP Summary

SSES Basin No.	Length of Gravity Lines (LF)	No. of MHs	SSES Cost (in 2023 Dollars)						Flow Meter Basins Reference	
			Focused Flow Monitoring[1]	Field Inspection[2]	Program Management[3]	Total SSES (w Contingency[4])	Rehab Design[5]	Total SSES Project	2023 Flow Meter Basin	2017 Flow Meter Basin
SSES - 1	16,424	69	-	$86,900	$75,000	$183,700	$100,000	**$283,700**	FM-17A	LC-01
SSES - 2	17,341	137	-	$82,200	$75,000	$173,700	$100,000	**$273,700**	FM-15	LC-11
SSES - 3	62,199	389	$25,500	$135,000	$125,000	$317,600	$150,000	**$467,600**	FM-12	LC-02
SSES - 4	21,743	94	-	$91,800	$75,000	$185,200	$100,000	**$285,200**	FM-04	LC-05
SSES - 5	41,594	226	$17,000	$116,700	$75,000	$235,500	$100,000	**$335,500**	FM-14	LC-13
SSES - 6	49,704	299	$17,000	$118,200	$75,000	$237,300	$100,000	**$337,300**	FM-16	LC-23
SSES - 7	91,915	527	$42,500	$202,100	$125,000	$418,600	$150,000	**$568,600**	FM-03	LC-27
SSES - 8	46,169	341	$17,000	$103,400	$75,000	$219,500	$100,000	**$319,500**	FM-03	LC-28
SSES - 9	133,250	542	$59,500	$277,400	$175,000	$579,300	$225,000	**$804,300**	FM-03	LC-14
SSES - 10	28,715	153	-	$68,900	$75,000	$157,700	$100,000	**$257,700**	FM-13	LC-20
SSES - 11	10,835	62	-	$43,500	$75,000	$127,200	$100,000	**$227,200**	FM-06	LC-08
SSES - 12	70,359	366	$34,000	$159,000	$125,000	$356,600	$150,000	**$506,600**	FM-05	LC-04
SSES - 13	88,669	559	$34,000	$192,500	$125,000	$396,800	$150,000	**$546,800**	FM-10	LC-03
SSES - 14	53,026	245	$25,500	$112,300	$125,000	$290,400	$150,000	**$440,400**	FM-11	LC-17
SSES - 15	45,412	229	$17,000	$98,100	$75,000	$213,200	$100,000	**$313,200**	FM-09	LC-07
SSES - 16	224,271	1,217	$93,500	$523,100	$250,000	$990,000	$300,000	**$1,290,000**	FM-09	LC-10*
SSES - 17	5,661	32	-	$25,100	$75,000	$105,200	$100,000	**$205,200**	FM-17B	-
SSES - 18	29,268	124	-	$70,900	$75,000	$160,100	$100,000	**$260,100**	FM-02	LC-18
SSES - 19	87,622	424	$34,000	$202,000	$125,000	$408,200	$150,000	**$558,200**	FM-02	LC-21
							Total	**$8,280,800**	-	-

(1) Approximately $8,500 per flow meter with at least 2 meters per basin. The number of flow meters utilized is based on 20,000 LF per flow meter and is to be revisited during SSES project implementation.
(2) Assumption of field inspection cost for 50% of lines and manholes for basins over 25,000 LF and 100% of lines and manholes for basins within 25,000 LF. Smoke testing for 10% of the inspected lines.
(3) Approximate program management and development of rehab recommendations based on basin size based and are to be revised based on field inspection data.
(4) SSES costs include 25% contingency on flow monitoring and field inspection efforts.
(*) LC-10 boundary from the 2017 flow monitoring modified to account for new location of FM-15.

1.0 INTRODUCTION

The City of League City (City) is a growing community in Galveston County, Texas. The City has a population of approximately 116,000 and is projected to grow to over 200,000 by buildout. League City is anticipating substantial development in the southwest portion of the City limits, driven in part by the upcoming construction of the Grand Parkway (SH 99). In order to capture the latest growth projections and identify and prioritize capacity and renewal projects, the City initiated an update of their wastewater master plan in 2022. This *2023 Wastewater Master Plan Update* has been prepared to provide League City with a planning tool to guide the implementation of 5-year, 10-year and Buildout capital improvements to the City's wastewater conveyance and treatment infrastructure. This study was performed in conjunction with the City's *2023 Water Master Plan Update* and the *2023 Water and Wastewater Capital Recovery Fee Update*.

1.1 SCOPE OF WORK

The City of League City retained Freese and Nichols, Inc. (FNI) to update their Water and Wastewater Master Plans (study) that were previously developed in 2018. As part this study, FNI developed this *2023 Wastewater Master Plan Update* (study). FNI retained the Ardurra Group, LLC (Ardurra) to develop the *2023 Water Master Plan Update* which was provided to the City as a separate report. Both studies utilized the land use assumptions developed during this study and documented in this study's report.

The goals of this study included an evaluation of the existing wastewater system and the development of capacity and renewal recommendations for 5-year, 10-year, and Buildout wastewater capital improvement plans (CIPs). These recommended improvements will serve as a basis for the financing, design, and construction of projects required to meet League City's existing and anticipated wastewater capacity and system renewal needs.

As part of this study, FNI conducted the following major tasks:

- City-wide flow monitoring and inflow/infiltration analysis
- Land use assumptions for the City's water and wastewater service areas
- Wastewater flow projections
- Wastewater model update and calibration
- Existing and future wastewater collection system analyses
- Wastewater System Capital Improvements Plan and Report

1.2 LIST OF ABBREVIATIONS

The lift of abbreviations utilized in this report are provided in **Table 1-1**.

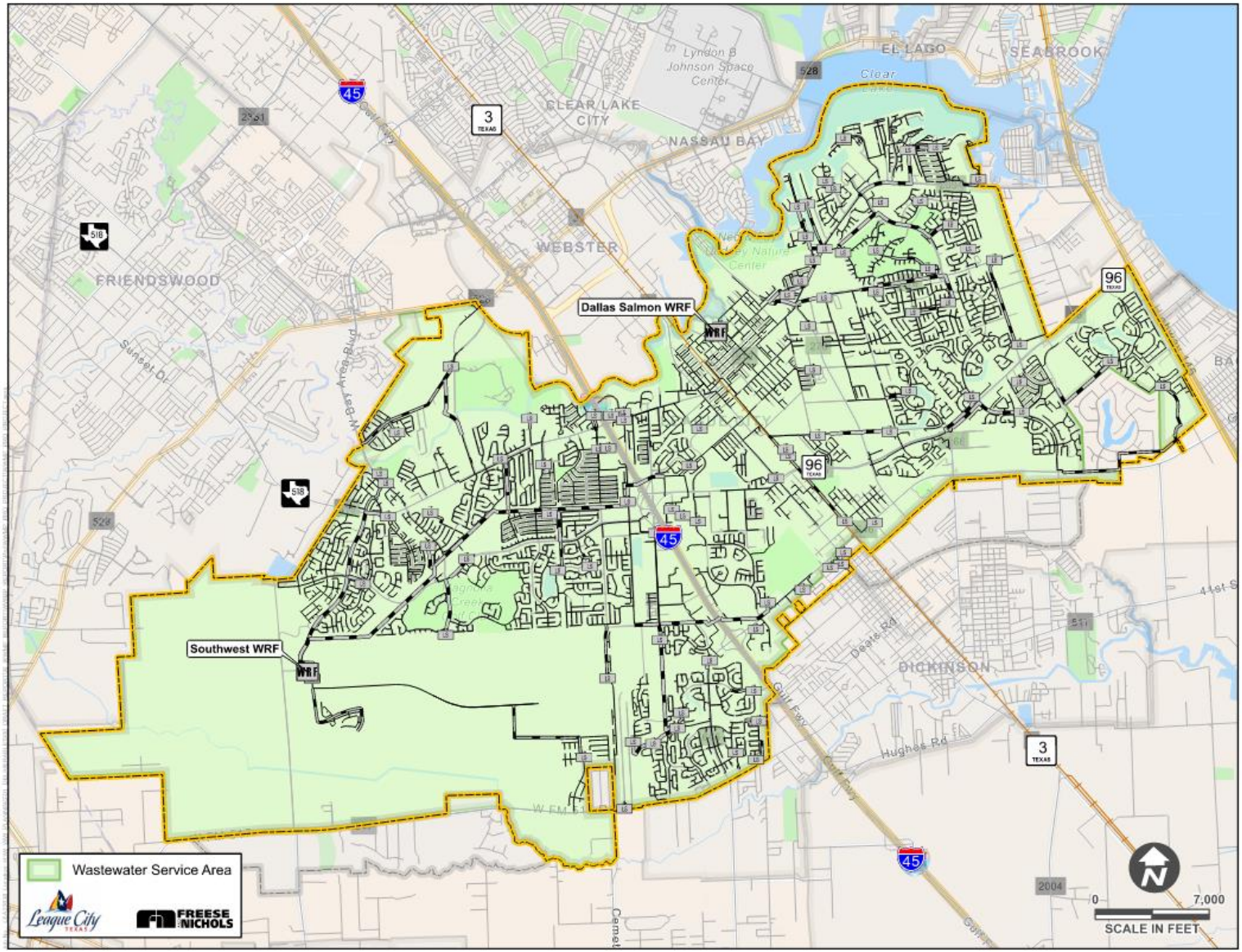
Table 1-1: List of Abbreviations

Abbreviation	Actual
ARKK	ARKK Engineers, LLC
Ardurra	Ardurra Group, LLC
CCTV	Closed Circuit Television
CIP	Capital Improvement Plan
FM	Farm to Market
FNI	Freese and Nichols, Inc.
GIS	Geographic Information System
gpad	Gallons per Acre per Day
gpcd	Gallons per Capita per Day
HGL	Hydraulic Grade Line
in/hr	Inches per hour
ID	Unique ID
I/I	Inflow and Infiltration
LF	Linear Feet
LS	Lift Station
LUA	Land Use Assumptions
MGD	Million Gallons per Day
NOAA	National Oceanic and Atmospheric Administration
OPCC	Opinion of Probable Construction Cost
PVC	Polyvinyl Chloride
RJN	RJN Group, Inc.
SCADA	Supervisory Control and Data Acquisition
SCS	Soil Conservation Service
SSES	Sanitary Sewer Evaluation Survey
TAZ	Traffic Analysis Zones
TCEQ	Texas Commission on Environmental Quality
USGS	United States Geological Survey
WRF	Water Reclamation Facility

1.3 WASTEWATER MASTER PLAN STUDY AREA

The study area for this *2023 Wastewater Master Plan Update* is shown in **green** on **Figure 1-1** and includes the existing and future wastewater service area within the Buildout planning period of this study.

Figure 1-1: Wastewater Master Plan Study Area



2.0 EXISTING WASTEWATER SYSTEM INFRASTRUCTURE

League City's wastewater collection system includes two water reclamation facilities (WRFs), approximately 375 miles of gravity wastewater lines ranging from 4-inches to 60-inches in diameter, and 78 lift stations including the influent lift stations at the two WRFs. The existing wastewater system is shown on **Figure 2-1**.

2.1 WATER RECLAMATION FACILITIES AND SERVICE AREAS

League City owns and operates the following two WRFs:

- **Dallas Salmon** Water Reclamation Facility
- **Southwest** Water Reclamation Facility

Table 2-1 summarizes the permitted capacities of each treatment facility and the year of construction.

Table 2-1: League City Water Reclamation Facilities

Water Reclamation Facility	Permitted Capacity		Year Constructed	Year Upgraded
	Annual Average Flow (MGD)	2-Hour Peak Flow (MGD)		
Dallas Salmon WRF	12.0	36.0	1983	2010
Southwest WRF	4.0	12.0	2012	-

All wastewater flow in League City is treated at one of these two WRFs. The portion of the collection system served by the **West Main Lift Station** currently has the ability to be pumped to the **Southwest WRF** or to the **Dallas Salmon WRF**. Therefore, **Figure 2-1** delineates the following three service areas:

- **Dallas Salmon WRF** Service Area
- **Southwest WRF** Service Area
- **West Main Lift Station** Service Area

As of the development of this study, the City sends flows from the West Main Lift Station service area to the Southwest WRF. In the future, it is recommended to pump West Main Lift Station flows to Dallas Salmon WRF to optimize WRF and lift station operations. The existing operation of the West Main Lift Station, as well as future WRF service areas and operational planning, is discussed further in **Section 8.0**.

Lift Station	Firm Capacity (MGD)	Lift Station	Firm Capacity (MGD)	Lift Station	Firm Capacity (MGD)	Lift Station	Firm Capacity (MGD)
Dallas Salmon WRF LS	36.00	Clear Creek Village	0.70	Hobbs	0.68	South Shore 2	1.39
Southwest WRF LS	12.00	Coastal Point	0.56	Landing	0.58	South Shore 3	1.80
Amber Lane	0.06	Constellation	0.50	Lift Station 21	0.05	South Shore 4	0.22
Autumn Lakes	0.66	Coronado	0.32	Magnolia Creek North	0.91	South Shore Lakes	0.43
Bay Colony 1 - 14-15	5.70	Corum	0.43	Magnolia Creek South	1.20	South Shore MUD 7	1.73
Bay Colony 2 - Parkside	0.86	Countryside 1	2.16	Mar Bella	2.45	Sportsplex 1	0.06
Bay Colony 3 - Meadows	0.78	Countryside 2	1.15	Marina Palms	0.06	Sportsplex 2	0.06
Bay Colony 4 - Retreat	0.31	Countryside Park	0.29	Mary Lane	0.08	Tuscan Lakes 1	1.38
Bay Colony 5 - Lakes	0.31	Countryside STP	1.22	Meadow Bend Parkway	1.51	Tuscan Lakes 2	0.92
Bay Colony 6 - West 1	1.58	Davis Road 1 (North)	0.59	Meadow Bend STP	4.70	Veranda	0.29
Bay Colony 7 - West 2	3.14	Davis Road 2 (South)	1.33	MUD 6	0.86	Victory Lakes	3.24
Bay Ridge	6.91	Dickinson	0.24	New EMS	0.04	Waterford 1	0.43
Bayou Brae	0.47	Dove Meadows 1	0.29	North Service Area	1.76	Waterford 2	0.62
Beacon Island	0.84	Dove Meadows 2	0.32	Old EMS	0.22	Webster	0.20
Brittany Lakes 1	0.6	East Main	9.07	Pedregal	0.56	Westland Ranch	1.44
Brittany Lakes 2	0.76	Glen Cove	3.17	Sedona	0.20	West Main	5.18
Butler Road	14.69	Harbour Park 1	1.67	Shellside	0.73	Westover Park	4.46
Center Pointe 1	0.43	Harbour Park 2	0.33	Smith Lane	5.86	Woodcock	0.86
Center Pointe 2	1.76	Harbour Park 3	0.45	South Hwy 3	0.86		
Clear Creek Crossing	2.27	Hewitt Street	13.54	South Shore 1	1.02		

Dallas Salmon WRF
Permitted Capacity
Average Daily Flow: 12.0 MGD
2-Hr Peak Flow: 36.0 MGD

Southwest WRF
Permitted Capacity
Average Daily Flow: 4.0 MGD
2-Hr Peak Flow: 12.0 MGD

West Main Lift Station Area

Dallas Salmon WRF Service Area

Southwest WRF Service Area

FIGURE 2-1
CITY OF LEAGUE CITY
2023 WASTEWATER MASTER PLAN UPDATE
EXISTING WASTEWATER SYSTEM

LEGEND

- Manhole
- Lift Station
- Water Reclamation Facility
- 8" and Smaller Wastewater Lines
- 10" and Larger Wastewater Line
- 8" and Smaller Force Main
- 10" and Larger Force Main
- Railroad
- City Limits
- ETJ
- Other City Limit

SERVICE AREA

- Dallas Salmon
- Southwest
- West Main Lift Station Service Area

0 2,500 5,000
SCALE IN FEET

FREESE AND NICHOLS

League City TEXAS

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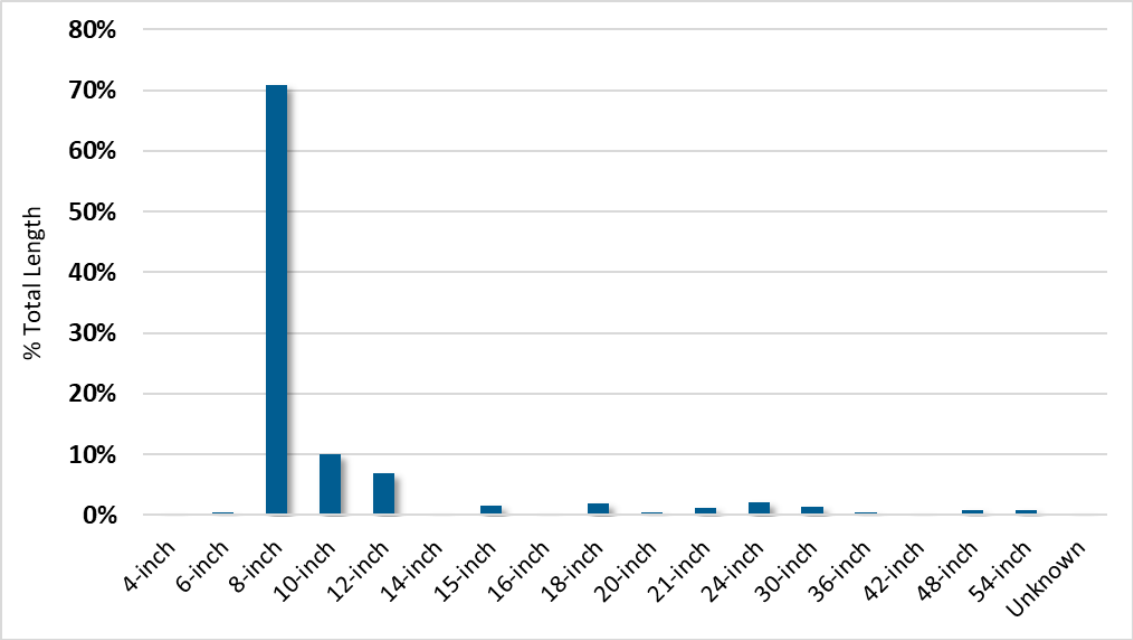
Job No.: GIF17041
Location: H:\W_WW_PLANNING\01_DELIVERABLES\00_DRAFT_REPORT\W_WWMP_REPORT\WWMP_REPORT\Figure_2-1-Existing_Wastewater_System.mxd
Updated: Wednesday, June

2.2 GRAVITY LINES

League City's existing wastewater system includes approximately 375 miles of gravity collection lines. Pipeline diameters range in size from 4-inches to 60-inches. **Figure 2-2** illustrates the percentage of pipe length by diameter. According to the City's geographic information system (GIS), the majority of the wastewater gravity lines (97%) are polyvinyl chloride (PVC).

Figure 2-2: Gravity Line Length by Diameter



2.3 LIFT STATIONS AND FORCE MAINS

As of June 2023, the City owns and maintains 78 lift stations located throughout both WRF service areas. These lift stations have approximately 43 miles of associated force mains, with diameters ranging from 2-inches to 36-inches. The total number of lift stations per service area is as follows:

- **Dallas Salmon WRF** Service Area: 64 lift stations
- **Southwest WRF** Service Area: 11 lift stations
- **West Main Lift Station** Service Area: 3 lift stations

Lift Station Inventory and Schematic

During the *2018 Wastewater Master Plan*, FNI assembled a lift station inventory and schematic. The lift station inventory included information about the pumping capacities, wet well geometry, influent lines, and other available information for each of the City's lift stations. During this study, FNI updated the

wastewater lift station inventory based on updated pump information and construction drawings for newly constructed lift stations obtained from City staff. The updated lift station inventory is included in **Table 2-2.** Additionally, the schematic of the City's lift stations was updated based on the wastewater GIS network and information provided during interviews with City staff. The lift station schematic shows the WRF service area, relative lift station hierarchy, and firm pumping capacity of each lift station and is illustrated on **Figure 2-3**.

City of League City
2023 Wastewater Master Plan Update
Table 2-2: Lift Station Inventory

General Info. & Firm Capacity						Force Main			Wet Well				Pumps & Operating Levels							Influent Gravity Line(s)		Documentation	
Name	WRF Service Area	Physical Address	No. Pumps	Firm Capacity* (gpm)	(MGD)	Diameter (in)	Length (ft)	Discharge Invert (ft. MSL)	Diameter (ft)	Slab Elevation (ft MSL)	Floor Elevation (ft MSL)	Depth (ft)	Single Pump Design Point (gpm)	Single Pump TDH (ft)	All Pumps OFF (ft MSL)	Pump 1 ON (ft MSL)	Pump 2 ON (ft MSL)	Pump 3 ON (ft MSL)	Pump 4 ON (ft MSL)	Diameter(s) (in)	Invert (ft MSL)	Pump Curve	Drawings
Dallas Salmon WRF LS	Dallas Salmon	703 North Wisconsin Avenue	5	24,998	36.0																		Yes
Southwest WRF LS	Southwest	1220 South Maple Leaf Drive	4	8,333	12.0																		Yes
Amber Lane	Dallas Salmon	380 1/2 Amber Lane	2	40	0.06	2	699	____	4	____	____	____	____	____	____	____	____	N/A	N/A	8	____	No	No
Autumn Lakes	West Main SA	1116 1/2 Hickory Terrace	2	460	0.66	8	____	16.5	7.5	23.5	-4.5	28	460	84	-3.6	1	2	N/A	N/A	15	1.45	Yes	Yes
Bay Colony 1 - 14-15	Dallas Salmon	5551 1/2 FM 646	3	3,958	5.70	18	8,708	19.5	15	17.25	-15	32.25	3,958	60.57	-11.25	-9.75	-8.25	-6.75	N/A	21 / 30	-5.5 / -11.25	Yes	Yes
Bay Colony 2 - Parkside	Dallas Salmon	2102 1/2 W FM 646	2	600	0.86	8	639	20	8	18	-12	30	600	34	-10.5	-3.5	-2	N/A	N/A	10	-3.63	Yes	Yes
Bay Colony 3 - Meadows	Dallas Salmon	3250 1/2 Cross Colony Drive	2	545	0.78	8	1,427	____	____	17	-8.57	25.57	545	29	-6.05	-4	-3.05	N/A	N/A	12	-4	Yes	Yes
Bay Colony 4 - Retreat	Dallas Salmon	309 1/2 Brandy Ridge Lane	2	218	0.31	4	575	____	____	____	____	____	218	34	____	____	____	N/A	N/A	8	____	Yes	No
Bay Colony 5 - Lakes	Dallas Salmon	2822 1/2 Cross Colony Drive	2	215	0.31	6	912	____	4	18.06	-7.66	25.72	215	27	-5.5	-4	-3	N/A	N/A	8	-4	Yes	City
Bay Colony 6 - West 1	Dallas Salmon	6997 1/2 Calder Road	3	1,100	1.58	12	35	21.34	16.5	18.34	-12.5	30.84	1,150	34	-10.81	-9.31	-8.31	-7.31	N/A	10	-7.31	Yes	Yes
Bay Colony 7 - West 2	Dallas Salmon	6601 1/2 Hawkins Hill Lane	3	2,182	3.14	10	1,123	20.5	12	17.5	-15.37	32.87	650	34	-12.87	-11.67	-10.45	____	N/A	10	-10.45	Yes	Yes
Bay Ridge	Dallas Salmon	7605 1/2 South Shore Boulevard	3	4,800	6.91	20	5,142	17.5	16.5	14.5	-20	34.5	2,650	36	-15.42	-12.92	-10.56	____	N/A	30	-10.56	Yes	Yes
Bayou Brae	Dallas Salmon	2227 1/2 FM 2094	2	325	0.47	6	45	12.75	4	16.33	-6.18	22.51	300	17.5	____	____	____	N/A	N/A	12	-0.36	Yes	Yes
Beacon Island	Dallas Salmon	5101 1/2 Lighthouse	3	580	0.84	8	760	____	9	13.7	-5.63	19.33	320	13.5	-2.63	-1.63	0.37	____	N/A	12	0.37	Yes	Yes
Brittany Lakes 1	Dallas Salmon	402 Bent Creek Lane	2	390	0.56	6	1,346	18.53	7	23.7	0.1	23.6	305	37.6	2.6	4.63	5.13	N/A	N/A	12	5.29	Yes	Yes
Brittany Lakes 2	Dallas Salmon	2501 1/2 Brittany Lakes Drive	2	529	0.76	8	2,097	19.5	8	23.1	-2.45	25.55	529	37	____	____	____	N/A	N/A	15	1.58	Yes	Yes
Butler Road	Dallas Salmon	1220 Butler Road	3	10,200	14.7	30	3,349	____	35x22	22.5	-6.5	29	5,035	30.8	-1	1.5	3	8	N/A	42	0.09	Yes	Yes
Center Pointe 1	Dallas Salmon	815 1/2 Center Pointe Drive	2	300	0.43	6	433	23.75	8	22	-4.9	26.9	300	30	-2.4	-1.2	-0.2	N/A	N/A	6	-1.5	Yes	Yes
Center Pointe 2	Dallas Salmon	2281 1/2 West Walker Street	3	1,220	1.76	10	1,917	21.5	14	18.5	-3.4	21.9	950	28	0.6	2.1	3.1	4.1	N/A	18	4.1	Yes	Yes
Clear Creek Crossing	Dallas Salmon	298 North Wesley Drive	2	1,575	2.27	8	419	6.5	8	12.1	-10.75	22.85	1,390	34	-9.75	-7.75	-7	N/A	N/A	15	-6.71	Yes	Yes
Clear Creek Village	Dallas Salmon	1700 1/2 Claiborne Drive	2	487	0.70	8" (1,100') / 12" (200')	1,369	7.43	2x8	15.68	-13.21	28.89	1,206	63	____	____	____	____	N/A	15	-6.47	Yes	Yes
Coastal Point	Dallas Salmon	5020 1/2 Madrid Lane	3	391	0.56	8	12,380	____	10	16	-11.3	27.3	389	57.7	-8.30	-6.30	-5.30	-4.30		12	-6.3	Yes	Yes
Constellation	Dallas Salmon	839 Constellation Boulevard	2	350	0.50	12	3,157	4	8	15.5	-5	20.5	126	____	-3.5	-2	-1	N/A	N/A	8	0.5	No	Yes
Coronado	Dallas Salmon	2627 1/2 Quivera Trace	2	220	0.32	4	170	____	6	18.5	3.65	14.85	130	18	5.73	6.73	7.73	N/A	N/A	8	____	Yes	Yes
Corum	Dallas Salmon	100 North Wesley Drive	2	300	0.43	6	63	9.78	6x6	13.93	2.74	11.19	300	7	3.75	5.3	6.3	N/A	N/A	10	6.94	No	Yes
Countryside 1	Southwest	5684 West Main Street	2	1,500	2.16	10	____	____	16x8	25.75	1.25	24.5	1,650	30.5	____	8.42	9.7	N/A	N/A	24	20.25	Yes	Yes
Countryside 2	Southwest	1002 Summer Place	2	800	1.15	10	____	____	10	25.5	-1.5	27	809	64	0.5	5.5	8	____	N/A	18	5.56	Yes	Yes
Countryside Park	Southwest	100 Alderwood	1	200	0.29	____	____	____	4	____	____	____	____	____	____	____	____	____	N/A	____	____	No	Yes
Countryside STP	Southwest	455 N Bay Area	3	850	1.22	8	500	7.2	10	19.25	2.75	16.5	400	98	6	7	8	11	N/A		24	8.74	Yes
Davis Road 1 (North)	Dallas Salmon	793 Davis Road	2	410	0.59	12	1,349	7.31	10	13.67	-7.63	21.3	1510	32.5	-6.38	-3.38	-0.38	N/A	N/A	12 / 15	-3.58 / -3.53	Yes	Yes
Davis Road 2 (South)	Dallas Salmon	499 Davis Road	2	925	1.33	8	1,711	3.37	9	8.9	-6.7	15.6	490	20	-5.7	-4.2	-2.7	N/A	N/A	8 / 10 / 12	-2.91 / 1.3 / -3.21	Yes	Yes
Dickinson	Dallas Salmon	1535 Dickinson	2	170	0.24	2.5in/8in	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Dove Meadows 1	Dallas Salmon	3202 Blue Wing Drive	2	200	0.29	4	1,281	9.25	6	13.75	-3.58	17.33	200	19	-2	____	____	N/A	N/A	12 / 12 / 8	2.4 / 3.6 / 5.7	No	Yes
Dove Meadows 2	Dallas Salmon	3613 Dove Meadows Drive	2	225	0.32	6	951	9.67	5	14	-4	18	225	21	-2	2	3	N/A	N/A	10	3.05	No	Yes
East Main	Dallas Salmon	2651 FM 2094	3	6,300	9.07	24	4,919	____	33.5x14	19.5	-13	32.5	6,300	50	-7.92	-2.5	-1.48	____	N/A	24	4	Yes	Yes
Glen Cove	Dallas Salmon	506 Seminole	3	2,200	3.17	14	5,371	____	24.5x6.5	9.79	-29.21	39	2,200	69.4	-26.21	-25.21	-24.21	-22.96	N/A	18/24	-5.61/-22.96	Yes	Yes
Harbour Park 1	Dallas Salmon	2015 Harbour Park	2	1,160	1.67	10	8,337	6	12x14	12	-12	24	1,150	45	____	____	____	N/A	N/A	18	-4	Yes	Yes
Harbour Park 2	Dallas Salmon	2203 1/2 Shore Point Drive	2	226	0.33	6	355	7.5	7	12.3	-9	21.3	226	17	-7.5	-5.5	-5	N/A	N/A	10	-5	Yes	Yes
Harbour Park 3	Dallas Salmon	2102 1/2 Barrington Point Drive	2	310	0.45	8	375	5.25	7	11.4	-10.5	21.9	310	18	-8.5	-6	-5.5	N/A	N/A	8	-5.5	Yes	Yes

No Data | GIS Data | Plan/As-Built/Curves | 2012 Master Plan/Model | From City

City of League City
2023 Wastewater Master Plan Update
Table 2-2: Lift Station Inventory

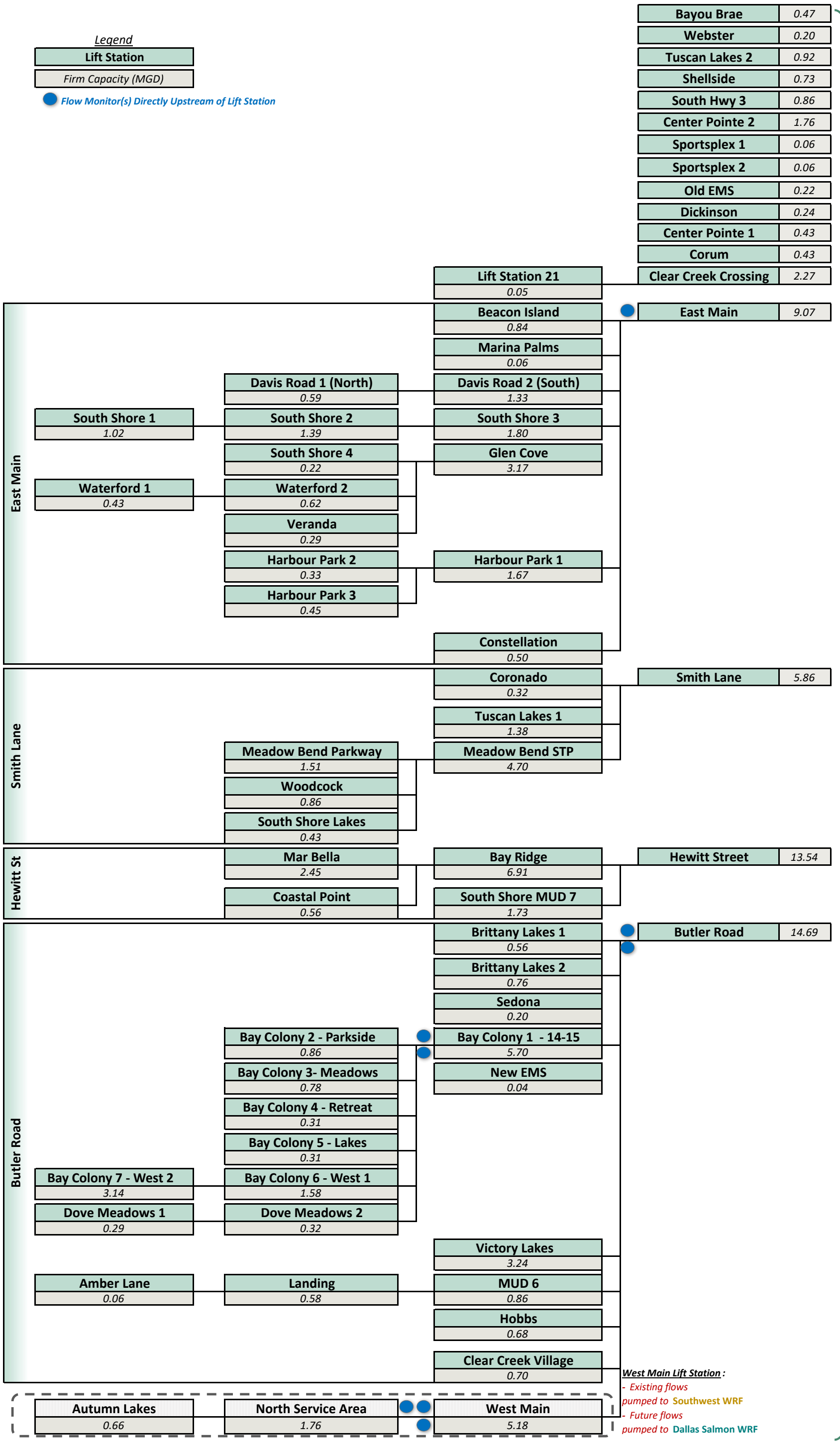
General Info. & Firm Capacity						Force Main			Wet Well				Pumps & Operating Levels							Influent Gravity Line(s)		Documentation	
Name	WRF Service Area	Physical Address	No. Pumps	Firm Capacity* (gpm)	(MGD)	Diameter (in)	Length (ft)	Discharge Invert (ft. MSL)	Diameter (ft)	Slab Elevation (ft MSL)	Floor Elevation (ft MSL)	Depth (ft)	Single Pump Design Point (gpm)	Single Pump TDH (ft)	All Pumps OFF (ft MSL)	Pump 1 ON (ft MSL)	Pump 2 ON (ft MSL)	Pump 3 ON (ft MSL)	Pump 4 ON (ft MSL)	Diameter(s) (in)	Invert (ft MSL)	Pump Curve	Drawings
Hewitt Street	Dallas Salmon	2551 1/2 Hewitt Street	3	9,400	13.5	30	3,717	____	16.5	21	-13	34	5,800	26	-10	-5	-3	N/A	N/A	30	-4.82	Yes	Yes
Hobbs	Dallas Salmon	322 1/2 Hobbs Road	2	470	0.68	6	30	____	8	17.75	-9	26.75	470	29.7	-6	-3.5	-4.5	N/A	N/A	12	-3	City	City
Landing	Dallas Salmon	450 Landing Boulevard	2	400	0.58	8	185	16.7	7	21.5	-2.89	24.39	400	25	-0.45	2	3	N/A	N/A	10	____	Yes	Yes
Lift Station 21	Dallas Salmon	1610 1/2 West Main Street	2	37	0.05	____	____	____	____	____	____	____	37	15	____	____	____	____	N/A	____	____	No	No
Magnolia Creek North	Southwest	4122 1/2 Brittany Bay	2	633	0.91	10	1,675	____	8	26.25	-3	29.25	633	28	-1.5	1	1.5	N/A	N/A	12	1.07	Yes	Yes
Magnolia Creek South	Southwest	2150 1/2 Bay Area Boulevard	2	830	1.20	10	3,398	21	8	25.5	-10.5	36	830	38	-8.5	-3.7	-2.7	N/A	N/A	12	-3.7	Yes	Yes
Mar Bella	Dallas Salmon	2321 1/2 Isla Vista Circle	3	1,700	2.45	14	4,504	20	14.5	17	-11.6	28.6	1,100	35	-8.6	-7.1	-6.1	-5.1	N/A	12	-5.3	Yes	Yes
Marina Palms	Dallas Salmon	308 1/2 Lighthouse Boulevard	2	40	0.06	8	371	10	4	12	1.1	10.9	42	16	2.75	3.27	4.27	N/A	N/A	8	3.27	Yes	Yes
Mary Lane	City of Dickinson	3420 1/2 Mary Lane	2	59	0.08	____	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Meadow Bend Parkway	Dallas Salmon	217 Meadow Parkway	2	1,050	1.51	8	1,502	____	____	____	____	____	1,050	50	____	____	____	N/A	N/A	12	____	City	City
Meadow Bend STP	Dallas Salmon	3029 1/2 Keva Glen Drive	3	*3,267*	4.70	16	9,637	____	22x6	20	-3	23	2178	40	0.66	2.16	3.66	4.66	N/A	18	1.41	Yes	Yes
MUD 6	Dallas Salmon	2516 Jeb Stuart	3	*600*	0.86	12	2,288	____	____	22.67	-3.58	26.25	400	56	____	____	____	____	N/A	8 / 24 / 10	8.34 / -2.12 / 3.67	No	Yes
New EMS	Dallas Salmon	260 FM 270	2	30	0.04	____	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
North Service Area	West Main SA	2304 1/2 West Nasa Road	2	1,220	1.76	16	5,085	____	16	20.3	-6.7	27	1224	37.5	-3.7	-3.2	-1.97	N/A	N/A	21	-0.58	City	City
Old EMS	Dallas Salmon	300 West Walker	2	150	0.22	____	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Pedregal	Southwest	3319 Pedregal	3	389	0.56	8	2,488	____	10	21.1	-18.7	39.8	389	48.2	-8.30	-6.30	-5.30	-4.30	N/A	12	-11.73	Yes	Yes
Samara	Southwest		3	750	1.08	10	____	____	12	24.5	-15.8	40.3	500	29	-13.30	-9.80	-7.80	-6.80	N/A	24	-9.8	Yes	Yes
Shellside	Dallas Salmon	500 1/2 Pear	2	510	0.73	8	8,979	____	8	18.5	-5	23.5	510	62	-3.2	-2	0.5	N/A	N/A	15	0	Yes	Yes
Smith Lane	Dallas Salmon	2850 FM Road 518 East	2	4,068	5.86	20	3,467	9.22	18x18	15.15	-9.32	24.47	4,050	29.5	-4.95	-2.45	-0.95	____	N/A	24 / 30	-1.0 / -2.7	Yes	Yes
South Hwy 3	Dallas Salmon	1500 Highway 3	2	600	0.86	18	197	6	7	21.85	-4.86	26.71	600	32	-2.86	0.39	1.39	____	N/A	15	4.14	No	Yes
South Shore 1	Dallas Salmon	4700 Masters Drive	2	705	1.02	8	2,442	17.16	8	15.65	-7.02	22.67	950	56	-3.8	-2.9	-2.2	N/A	N/A	12	-0.29	Yes	Yes
South Shore 2	Dallas Salmon	2742 Masters Drive	2	966	1.39	12	111	12.59	8	17	-5.67	22.67	966	31	-3.67	2.77	3.77	N/A	N/A	12	2.77	No	Yes
South Shore 3	Dallas Salmon	2200 1/2 Pebble Beach Drive	2	1,250	1.80	10	409	11.56	8	17.17	-7.1	24.27	1,236	46	-5.1	3.14	4.64	N/A	N/A	18	3.14	No	Yes
South Shore 4	Dallas Salmon	1599 Enterprise Avenue	2	150	0.22	4	331	7.16	6	12.17	-1.89	14.06	150	23	0.11	1.11	2.11	N/A	N/A	8	1.11	Yes	Yes
South Shore Lakes	Dallas Salmon	3852 FM 518	2	300	0.43	6	1,436	____	8	10.5	-3.25	13.75	305	22	1.5	2.25	3	5	N/A	10	2.25	Yes	Yes
South Shore MUD 7	Dallas Salmon	6500 1/2 South Shore Boulevard	2	1,200	1.73	12	3,246	____	8	19	-6.5	25.5	1,200	57	-4.26	-1.15	0.58	N/A	N/A	14	-1.15	Yes	Yes
Sportsplex 1	Dallas Salmon	1401 Link Road	2	40	0.06	____	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Sportsplex 2	Dallas Salmon	1401 Link Road	2	40	0.06	____	____	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Tuscan Lakes 1	Dallas Salmon	2798 1/2 Austin Street	2	960	1.38	10	1,633	____	8	21	-10	31	960	32	-8	-4	-3	N/A	N/A	12	-1.02	Yes	Yes
Tuscan Lakes 2	Dallas Salmon	2111 1/2 Hewitt Street	2	636	0.92	8	30	____	7	20	5.6	14.4	636	17.8	____	____	____	____	N/A	10	0	No	No
Veranda	Dallas Salmon	1580 1/2 Enterprise Dr.	2	200	0.29	4	436	____	____	____	____	____	____	____	____	____	____	N/A	N/A	____	____	No	No
Victory Lakes	Dallas Salmon	2812 Drywood Creek	3	*2,250*	3.24	12	9,129	23	8	21	-8.66	29.66	750/670	38/44	-6.91	-3.41	0	____	N/A	36	0.59	Yes	Yes
Waterford 1	Dallas Salmon	210 Admiralty Way	2	300	0.43	6	1,291	16.5	8	14.39	-4.5	18.89	300	46.9	-2.1	-1.1	-0.5	N/A	N/A	10	-0.17	No	Yes
Waterford 2	Dallas Salmon	790 Waterford Way	2	429	0.62	10	1,888	16.7	10x10	14.64	-6	20.64	429	24.4	-3.6	-2.6	-2.0	-6.0	N/A	21	-0.08	No	Yes
Webster	Dallas Salmon	1633 Webster Street	2	136	0.20	4	948	____	5	17.6	5.6	12	80	55	____	____	____	N/A	N/A	8	8.3	No	Yes
Westland Ranch	Southwest		3	1,001	1.44	10		____	12	28.5	-6.7	35.2	667	67	-4.7	-1.2	-0.2	1.0	N/A	15	-1.2	No	Yes
West Main	West Main SA	2998 1/2 West Main Street	4	3,600	5.18	18/10/16-inch	____	19.5	16	17	-12	29	1,200	90.5	-7	-4	-2.5	-1	6	30	-1.27	Yes	Yes
Westover Park	Southwest	5401 1/2 Westover Park Avenue	3	3,100	4.46	14	____	____	16.5	28.8	-6.9	35.7	2,230	70	____	____	____	____	N/A	24	2.51	Yes	Yes
Woodcock	Dallas Salmon	2661 1/2 Woodcock Street	2	600	0.86	8	4346	15.5	7	13.5	-7.25	20.75	600	57	-5.5	-1.5	-1.25	N/A	N/A	15	-0.99	Yes	Yes

__ No Data | GIS Data | Plan/As-Built/Curves | 2012 Master Plan/Model | From City

City of League City

2023 Wastewater Master Plan Updat

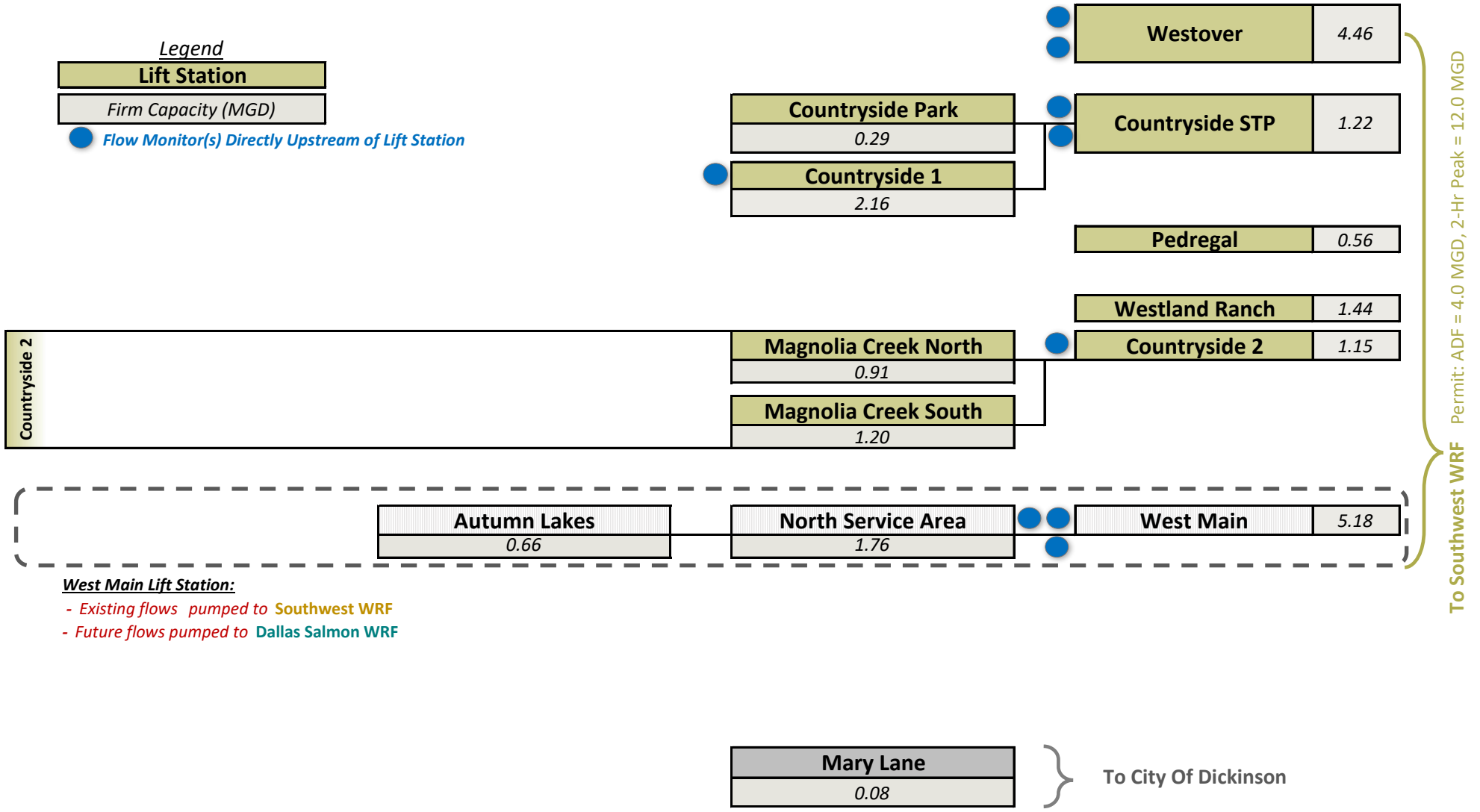
Figure 2-3: Dallas Salmon WRF Service Area Lift Station Schematic



City of League City

2023 Wastewater Master Plan Update

Figure 2-3: Southwest WRF Service Area Lift Station Schematic



3.0 WASTEWATER FLOW MONITORING

FNI conducted city-wide flow monitoring and rainfall data collection as part of this study. The flow monitoring and rainfall data were utilized to characterize dry weather and wet weather wastewater flows at key points within the collection system and to calibrate the hydraulic model. The flow and rainfall data was also utilized to quantify inflow and infiltration (I/I) throughout the collection system and prioritize flow meter basins for future sanitary sewer evaluation study (SSES) projects, discussed further in **Section 9.0**. The sections below summarize the field collected flow and rainfall data, as well as the characterization of I/I levels within the City's collection system.

Flow Monitoring Strategy

For this 2023 update to the Wastewater Master Plan, the strategic decision was made to utilize fewer flow meters than in the 2018 study. **Table 3-1** summarizes the number of flow meters placed throughout the collection system in both studies. This *2023 Wastewater Master Plan Update* utilized 16 flow meters to update the model calibration and conduct the system capacity analyses. Where applicable, flow meter data from the 2018 study was utilized in this 2023 study to inform the SSES program recommendations (discussed further in **Section 9.2**).

Table 3-1: Master Plan Flow Meters

Wastewater Master Plan	No. of Flow Meters
2018	28
2023	16

3.1 FIELD DATA COLLECTION

Field data collection was performed in the wastewater collection system over a 100-day period from September 15, 2022 to December 27, 2022. Dry weather and wet weather system responses within the two WRF service areas were evaluated by installing wastewater flow meters to observe and document existing flow conditions. Rainfall data was also collected utilizing rain gauges. A total of sixteen (16) flow meters and four (4) rain gauges were utilized for this study. ADS Environmental Services, Inc. (ADS) was retained by FNI to install and maintain the flow meters and rain gauges and provide an evaluation of the collected data.

3.1.1 Flow Meter and Rain Gauge Placement

Flow monitoring locations were chosen in coordination with the City to support the goal of developing capacity and renewal CIPs for the *2023 Wastewater Master Plan Update*. The flow meters were placed to capture flows directly upstream of the WRFs or near larger capacity lift stations. The rain gauges were installed throughout the WRF service areas to capture rainfall during the field testing period.

Flow Meter Relocations

During the flow monitoring period, two flow meters (FM-11 and FM-12) were moved to the FM-17A and FM-17B locations to capture flows to the Countryside STP Lift Station. These flow meter locations and their corresponding data collection periods are shown in **Table 3-2**.

Table 3-2: Flow Meter Relocations and Data Collection Periods

Flow Meter Locations	Data Collection Period
FM-11 and **FM-12**	September 15, 2022 – November 14, 2022
FM-17A and **FM-17B**	November 14, 2022 – December 27, 2022

Due to the relocation of these two flow meters, data was captured for a total of 18 flow meter basins. All 18 flow meter basins were delineated and are discussed in the following sections.

Flow Meter and Rain Gauge Locations

The flow meter installation locations and corresponding gravity line diameters and GIS manhole IDs are provided in **Table 3-3.** The rain gauge installation locations are provided in **Table 3-4.** All flow monitoring and rain gauge locations are shown on **Figure 3-1**. Flow meter and rain gauge site installation reports with more detailed location information are provided in the *Sewer System Performance Report* (by ADS) located in **Appendix B.** FNI also developed a schematic to show the relationship between each upstream and downstream flow meter. This flow meter schematic is organized by WRF Service Area and is shown on **Figure 3-2.**

Table 3-3: Flow Meter Locations

Flow Meter ID	WRF Basin	Pipe Inner Diameter[2] (in)	Address/Location	GIS Manhole ID
FM-01	Dallas Salmon WRF	23.5	703 N Wisconsin Ave	SSMH-1557
FM-02	Dallas Salmon WRF	46.5	Outside 703 N Wisconsin Ave	SSMH-1659A
FM-03	Dallas Salmon WRF	52	911 N Kansas Ave	SSMH-1634
FM-04	West Main LS	21	N of 103 Meadow Gate Dr	SSMH-2760
FM-05	West Main LS	22	N of 4308 Running Pine Ct	SSMH-3739
FM-06	West Main LS	12	113 Raven Knoll Ct	SSMH-855
FM-07	Dallas Salmon WRF	29.75	703 N Wisconsin Ave	SSMH-1561
FM-08	Dallas Salmon WRF	20.5	1281 Butler Rd	SSMH-8310
FM-09	Dallas Salmon WRF	42	W of Butler Rd	SSMH-4390
FM-10	Southwest WRF	18	5305 Summer Pl	SSMH-4792
FM-11	Southwest WRF	16.5	N of 501 Burham Ln	SSMH-6939
FM-12	Southwest WRF	15	Near 6150 New Castle Ln	SSMH-5310
FM-13	Southwest WRF	24	115 Country Ln	SSMH-4465
FM-14	Dallas Salmon WRF	21	S of 2927 Millstream Ct	SSMH-5697
FM-15	Dallas Salmon WRF	15	E of 6619 Blue Hollow Ln	SSMH-5780
FM-16	Dallas Salmon WRF	24	W of 2310 Flagship Ct	SSMH-745
FM-17A[1]	Southwest WRF	24	S 1st Dog Park, 175 Bay Area Blvd	SSMH-9836
FM-17B[1]	Southwest WRF	11.38	S 1st Dog Park, 175 Bay Area Blvd	SSMH-9835

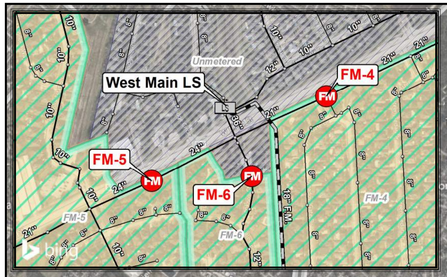
(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.
(2) Diameters from ADS' *Sewer System Performance Report* (**Appendix B**) measured during installation of flow meters.

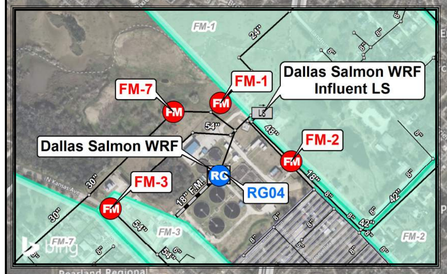
Table 3-4: Rain Gauge Locations

Rain Gauge ID	WRF Basin	Address/Location	Installed Facility
RG-01	Dallas Salmon WRF	6601 Blue Hollow Ln	Bay Colony LS
RG-02	Southwest WRF	Behind 6152 New Castle Ln	Westover LS
RG-03	Dallas Salmon WRF	498 Landing Blvd	Landing LS
RG-04	Dallas Salmon WRF	N Kansas Ave	Dallas Salmon WRF

3.1.2 Flow Meter Basins

FNI utilized the City's wastewater geographic information system (GIS) database and the flow meter locations to delineate 18 flow meter basins. These basins represent the portion of the collection system upstream of each flow meter and will be utilized for wastewater flow projections, hydraulic model calibration, and system wide I/I analysis. **Figure 3-1** shows the 18 flow meter locations and their associated flow meter basins.





Dallas Salmon WRF
Permitted Capacity
Average Daily Flow: 12.0 MGD
2-Hr Peak Flow: 36.0 MGD

Southwest WRF
Permitted Capacity
Average Daily Flow: 4.0 MGD
2-Hr Peak Flow: 12.0 MGD

Veranda LS
Glen Cove LS
Waterford 2 LS
South Shore Harbour 4 LS
Waterford 1 LS
Beacon Island LS
Marina Palms LS
Harbour Park 2 LS
Davis Road 2 LS
Fairway Apt LS
Harbour Park 1 LS
Constellation LS
FM-16
South Shore Harbour 2 LS
Harbour Park 3 LS
Davis Road 1 LS
Davis Rd LS
South Shore Lakes LS
South Shore Harbour 3 LS
East Main LS
Bayou Brae LS
South Shore Harbour 1 LS
Coronado LS
Access Storage LS
Meadow Bend STP
Smith Lane LS
Meadow Bend Parkway LS
New EMS LS
Woodcock LS
Webster LS
Mar Bella LS
Madrid Ln Coastal Point Sec 3 LS
Tuscan Lakes 1 LS
Bay Ridge LS
South Shore MUD 7 LS
Bay Ridge LS
Tuscan Lakes 2 LS
Old EMS LS
Line Repair Building LS
Dickinson LS
Hewitt Street LS
Center Pointe 1 LS
South Hwy 3 LS
Sportsplex 2 LS
Sportsplex 1 LS
Shellside LS
Center Pointe 2 LS
Business Park LS
Kid City LS
Bay Oil and Gas LS
Brookside LS
Brittany Lakes 1 LS
Brittany Lakes 2 LS
Space Storage 646 LS
Victory Lakes LS
Target LS
Bay Colony 2 Parkside LS
Mag Creek Church LS
Bay Colony 3 Meadows LS
Sedona LS
Bay Colony 5 Lakes LS
Dove Meadows 2 LS
Bay Colony 1 14-15 LS
Bay Colony 7 West 2 LS
Dove Meadows 1 LS
Bay Colony 6 West 1 LS
Bay Colony 4 Retreat LS
Pedregal LS
Mary Lane LS
League City North Area LS
Clear Creek Village LS
Lift Station 21
Clear Creek Crossing LS
Amber Lane LS
Corum LS
Autumn Lakes LS
Hobbs LS
Space RV LS
Countryside Park LS
Landing LS
Countryside STP LS
Butler Road LS
Countryside 1 LS
Knights of Columbus LS
MUD 6 LS
Countryside 2 LS
Magnolia Creek North LS
Westover LS
Magnolia Creek South LS
SW WRF Influent LS
Dallas Salmon WRF Influent LS
RG03
RG02
RG01
FM-4
FM-5
FM-6
FM-7
FM-8
FM-9
FM-10
FM-11
FM-12
FM-13
FM-14
FM-15
FM-16
FM-17A
FM-17B
RG04
FM-1
FM-2
FM-3

SERVICE AREA
- Dallas Salmon
- Southwest
- West Main Lift Station Service Area

0 2,500 5,000
SCALE IN FEET

FIGURE 3-1
CITY OF LEAGUE CITY
2023 WASTEWATER MASTER PLAN UPDATE
FLOW METER AND RAIN GAUGE LOCATIONS

LEGEND

- Flow Meter
- Rain Gauge
- Lift Station
- Water Reclamation Facility
- Manhole
- 8" and Smaller Wastewater Lines
- 10" and Larger Wastewater Line
- 8" and Smaller Force Main
- 10" and Larger Force Main
- Railroad
- Unmetered Basin
- City Limits
- ETJ
- Other City Limit

League City TEXAS

FREESE AND NICHOLS

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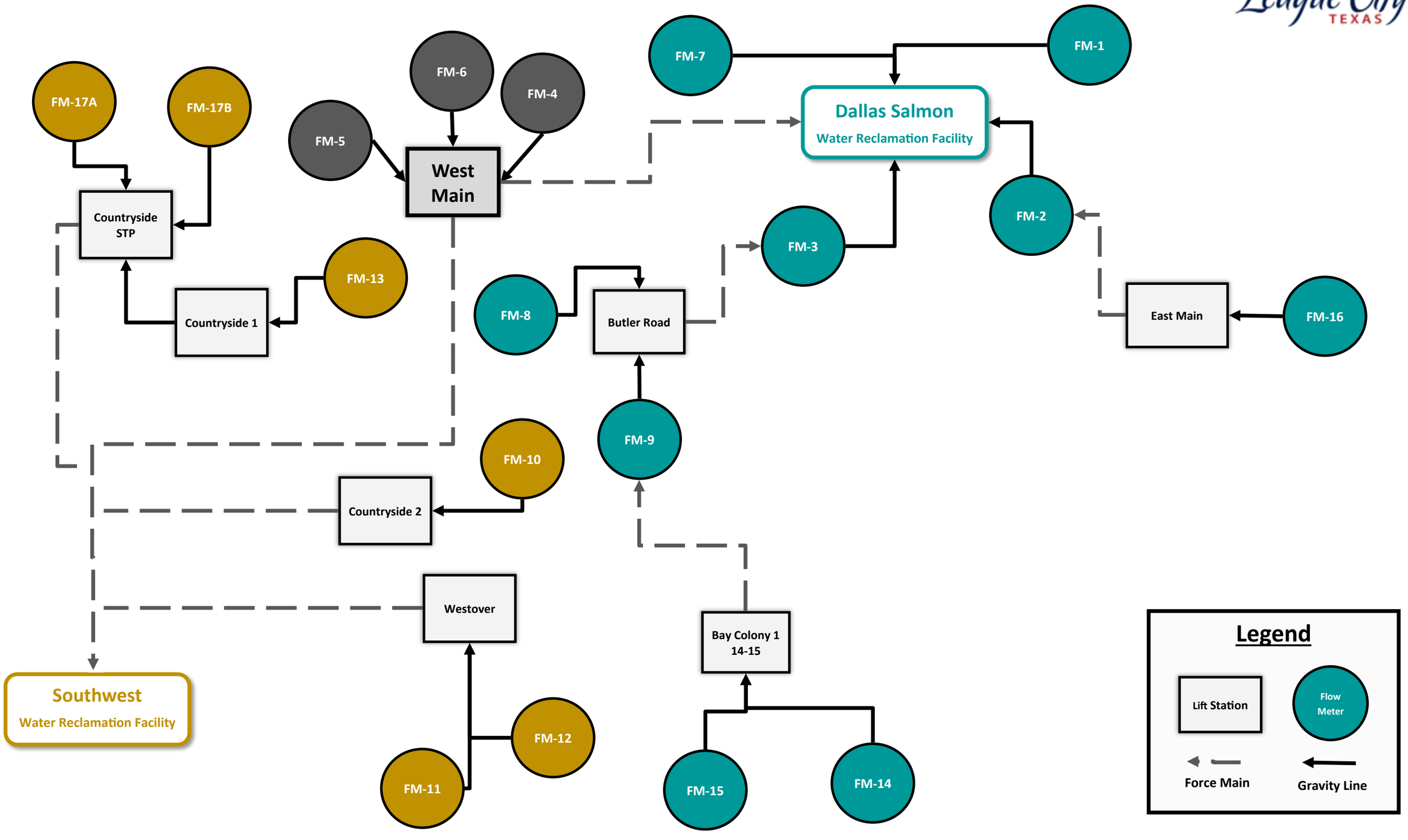
Job No.: DFF17041
Location: H:\W_WW_PLANNING\01_DELIVERABLES\00_DRAFT_REPORT\W_WWMP_REPORT\WWMP_REPORT\Figure_3-1-FM_RG_Locations.mxd
Updated: Thursday, June 22, 2023 12:14:17 PM

City of League City
2023 Wastewater Master Plan Update
Figure 3-2: Flow Meter Schematic



3.1.3 Flow Meter and Rain Gauge Data

Flow monitoring and rain gauge data were collected in 5-minute time step intervals. Hydrographs and flow depth plots for each flow meter site are provided in **Appendix C**. The hydrographs display flow rate data vs. time for the duration of the field testing period, along with the observed rainfall intensities. Similarly, the depth plots show the depth of flow vs. time.

3.1.4 Flow Meter and Rain Gauge Equipment

Wastewater flow monitoring was performed utilizing Triton+® flow meters manufactured, installed, and maintained by ADS. Flow meters were mounted near the top of each manhole and were connected to depth and velocity sensors positioned in the incoming wastewater pipe. Each flow meter was equipped with an ultrasonic depth sensor and a velocity sensor. A pressure depth sensor was also mounted at or near the invert to measure water depths during surcharge events. Rainfall during the study period was captured using ADS RainAlert III rainfall monitors and tipping buckets. **Figure 3-3** shows an ADS Triton+ flow meter and RainAlert III rainfall monitor.

Figure 3-3: ADS Flow Meter and Rain Gauge Equipment

3.2 FLOW METER AND RAIN GAUGE DATA EVALUATION

FNI reviewed and evaluated the flow meter and rain gauge data collected during the field testing period. The following sections discuss the evaluation of the observed dry weather flow, wet weather flow, and rainfall data.

3.2.1 Rain Gauge Data Evaluation

A total of 11 rainfall events were observed during the flow monitoring period and utilized during the inflow and infiltration evaluation. This rainfall data and associated flow responses were utilized to calibrate the

hydraulic model to observed wet weather conditions. Total rainfall depths and durations for the observed rainfall events during the field-testing period are shown in **Table 3-5**. The observed 5-minute rainfall intensities are plotted along with the flow meter data on the hydrographs in **Appendix C**.

Table 3-5: Observed Rainfall Events During Flow Monitoring

Rain Event Date (2022)	Total Rainfall[(1)] (in)
10/13/2022	1.70
10/17/2022	0.47
10/27/2022	0.86
11/1/2022	0.69
11/11/2022	0.40
11/14/2022	0.59
11/18/2022	1.23
11/21/2022	1.63
11/24/2022	1.04
11/25/2022	2.48
12/11/2022	0.55

(1) Total rainfall based on the average of all four rain gauges

3.2.2 Flow Meter Data Evaluation

Flow Rates and Peaking Factors

The average dry weather and peak wet weather flow rates observed at each flow meter site are provided in **Table 3-6.** Dry weather flow conditions are characterized by evaluating flow meter data during normal and repeatable conditions, excluding wet weather events and the periods associated with the recovery from these events. The wet weather to dry weather peaking factors are also provided in **Table 3-6**. Wet weather peaking factors greater than four are generally considered to be high and are highlighted in **red** in **Table 3-6.**

Table 3-6: Dry Weather and Wet Weather Flow Data

Flow Meter ID	Average Dry Weather Flow (MGD)	Peak Wet Weather Flow (MGD)	Wet Weather Peaking Factor Peak Wet Flow / Average Dry Flow
FM-01	0.28	4.67	16.7
FM-02	1.60	8.75	5.5
FM-03	3.43	19.60	5.7
FM-04	0.11	0.81	7.3
FM-05	0.33	1.66	5.0
FM-06	0.06	0.28	4.7
FM-07	0.33	5.43	16.5
FM-08	0.26	2.94	11.3
FM-09	1.88	11.63	6.2
FM-10	0.62	1.73	2.8
FM-11	0.14	0.54	3.7
FM-12	0.34	2.95	8.6
FM-13	0.18	0.87	4.7
FM-14	0.42	3.19	7.6
FM-15	0.12	1.36	11.5
FM-16	0.43	2.75	6.4
FM-17A[(1)]	0.23	1.65	7.1
FM-17B[(1)]	0.03	0.11	4.0

(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.

Dry Weather Depths (d/D)

The American Society of Civil Engineers (ASCE) and the Water Environment Federation (WEF) recommend that sewers with diameters up to 15 inches be designed to flow with dry weather d/D ratios of ≤ 0.5, and sewers with diameters 18 inches and larger be designed to flow with dry weather d/D ratios of ≤ 0.75.

The dry weather d/D ratios for all but one flow meter location meet the recommended criteria. This indicates adequate capacity in the system to convey existing dry weather flows at the majority of the flow meter sites. **One site in the Southwest WRF service area, FM-12, had an observed dry weather d/D ratio that exceeded the ASCE and WEF criteria.** This ratio is highlighted green in **Table 3-7**.

Wet Weather Depths (d/D)

Wet weather d/D ratios should not exceed 1.0, as this indicates surcharging in the collection system. **Thirteen sites recorded wet weather d/D ratios greater than 1.0, indicating insufficient capacity to convey the observed maximum wet weather flows**. These ratios are **highlighted brown** in **Table 3-7.**

Surcharge Height and Depth from Rim

The last two columns in **Table 3-7** show the maximum **surcharge height** above the top of the gravity pipe, as well as the resulting **depth** from the rim (top) of the manhole. Thirteen (13) of the meter sites indicated a surcharge during the flow monitoring period. **At one of these locations, the water level rose to within 3 feet of the manhole rim,** indicating a lack of conveyance or pumping capacity in the system. This is **highlighted red** in **Table 3-7**.

Table 3-7: Flow Depths and Surcharging Summary

Flow Meter ID	Pipe Inner Diameter[2] (in)	Manhole Depth[2] (ft)	Dry Weather		Wet Weather		Surcharge Height Water Level Above Pipe (ft)	Depth Water Level From MH Rim (ft)
			Max Flow depth (in)	depth/ Diameter d/D	Max Flow depth (in)	depth/ Diameter d/D		
FM-01	23.5	12	7	0.30	110.0	4.7	7.2	2.8
FM-02	46.5	17	12	0.26	105.3	2.3	4.9	8.2
FM-03	52	18	18	0.35	98.1	1.9	3.8	9.8
FM-04	21	16.6	6	0.29	47.4	2.3	2.2	12.7
FM-05	22	19.5	7.5	0.34	46.6	2.1	2.0	15.6
FM-06	12	10.83	3.5	0.29	5.4	0.5	-	10.4
FM-07	29.75	12	7	0.24	88.4	3.0	4.9	4.6
FM-08	20.5	n/a	8.5	0.41	147.8	7.2	10.6	-
FM-09	42	20	14	0.33	153.5	3.7	9.3	7.2
FM-10	18	17.2	12.5	0.69	159.0	8.8	11.7	4.0
FM-11	16.5	19	6	0.36	124.8	7.6	9.0	8.6
FM-12	15	20	13	0.87	122.8	8.2	9.0	9.8
FM-13	24	n/a	6	0.25	8.8	0.4	-	-
FM-14	21	20	6.5	0.31	95.0	4.5	6.2	12.1
FM-15	15	19.33	4	0.27	54.8	3.7	3.3	14.8
FM-16	24	14.33	7.5	0.31	13.5	0.6	-	13.2
FM-17A[1]	24	10.91	3	0.13	15.2	0.6	-	9.6
FM-17B[1]	11.38	8.75	1.8	0.16	3.2	0.3	-	8.5

(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.
(2) Field measured diameters and manhole depths measured during flow meter installations. *Source*: ADS *Sewer System Performance Report* (**Appendix B**).

3.2.3 Infiltration and Inflow Analysis

A wet weather analysis was performed to calculate the rate of inflow and infiltration (I/I) observed in each flow meter basin. The wet weather analysis calculated the discrete volume of I/I in each flow meter basin during each rainfall event. During the calculation, the average dry weather flows in each basin were subtracted, isolating the flows due to I/I. The results of the analyses are shown below. **Figure 3-8** shows the volume (in millions of gallons) of I/I generated within each flow meter basin during each rainfall event. **Figure 3-9** show the normalized I/I generated within each flow meter basin during each rainfall event. The results are shown in gallons of I/I per linear foot of sewer line per inch of rainfall. Normalized I/I above 4 Gal/LF/in is considered to be high and indicates the need for future sanitary sewer evaluation study (SSES) projects.

Table 3-8: Million Gallons (MG) of I/I per Rainfall Event

Flow Meter ID	Linear Footage of Gravity Lines	Oct 13th	Oct 17th	Oct 27th	Nov 1st	Nov 11th	Nov 14th	Nov 18th	Nov 21st	Nov 24th	Nov 25th	Dec 11th[2]	Average I/I (MG)
FM-01	102,523	0.14	0.01	0.39	0.45	0.02	0.19	0.70	1.38	1.02	1.95	-	0.62
FM-02	322,666	0.21	0.03	0.53	0.82	0.06	0.38	1.04	1.72	0.87	1.13	-	0.68
FM-03	386,940	0.64	0.01	0.86	1.01	0.10	0.64	1.34	3.10	2.10	5.95	-	1.58
FM-04	21,743	0.06	0.00	0.07	0.09	0.01	0.05	0.13	0.24	0.14	0.19	-	0.10
FM-05	70,359	0.13	0.04	0.14	0.19	0.01	0.14	0.13	0.51	0.34	0.46	-	0.21
FM-06	10,835	0.02	0.00	0.03	0.04	0.00	0.02	0.04	0.10	0.05	0.04	-	0.03
FM-07	94,381	0.20	0.00	0.28	0.29	0.01	0.11	0.52	0.94	0.56	2.08	-	0.50
FM-08	80,011	0.13	0.00	0.15	0.22	0.01	0.09	0.36	0.76	0.46	1.03	-	0.32
FM-09	312,243	0.92	0.11	0.51	0.83	0.12	0.37	1.02	1.98	0.92	1.96	-	0.87
FM-10	88,669	0.19	0.03	0.21	0.24	0.04	0.13	0.26	0.48	0.15	0.51	-	0.22
FM-11	53,026	0.04	0.01	0.08	0.09	0.02	n/a	n/a	n/a	n/a	n/a	n/a	0.05
FM-12	62,199	0.13	0.01	0.17	0.19	0.02	n/a	n/a	n/a	n/a	n/a	n/a	0.10
FM-13	28,715	0.06	0.01	0.05	0.07	0.00	0.04	0.13	0.13	0.10	0.20	0.09	0.08
FM-14	95,149	0.25	0.01	0.24	0.46	0.09	0.24	0.47	0.77	0.37	0.89	-	0.38
FM-15	17,341	0.09	0.00	0.03	0.11	0.02	0.06	0.09	0.19	0.07	0.19	-	0.09
FM-16	115,332	0.09	0.02	0.28	0.24	0.05	0.19	0.47	0.67	0.45	1.02	-	0.35
FM-17A[1]	16,424	n/a	n/a	n/a	n/a	n/a	n/a	0.14	0.22	0.21	0.33	0.06	0.19
FM-17B[1]	5,661	n/a	n/a	n/a	n/a	n/a	n/a	0.01	0.02	0.01	0.03	0.01	0.02

(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.
(2) December 11th rain event excluded from I/I analysis for most flow meters due to anomalous responses.
'n/a' due to flow meter relocation during flow monitoring period.

Table 3-9: Normalized I/I (Gal/LF/in) per Rainfall Event

Flow Meter ID	Linear Footage of Gravity Lines	Oct 13th	Oct 17th	Oct 27th	Nov 1st	Nov 11th	Nov 14th	Nov 18th	Nov 21st	Nov 24th	Nov 25th	Dec 11th[2]	Average I/I (MG)
FM-01	102,523	0.94	0.21	3.01	4.61	0.63	3.41	5.59	8.75	11.34	7.46	-	4.59
FM-02	322,666	0.45	0.25	1.31	2.65	0.63	2.19	2.65	3.48	3.09	1.37	-	1.81
FM-03	386,940	1.17	0.05	1.75	2.74	0.91	3.07	2.84	5.22	6.20	6.03	2.50	2.95
FM-04	21,743	2.60	0.25	3.90	6.34	2.06	3.91	4.56	6.45	5.64	3.65	-	3.93
FM-05	70,359	1.67	1.08	2.35	4.37	0.55	3.32	1.47	4.24	4.30	2.64	-	2.60
FM-06	10,835	1.82	0.72	2.90	5.33	0.18	2.67	2.82	5.27	3.68	1.57	-	2.70
FM-07	94,381	1.50	0.02	2.31	3.18	0.33	2.17	4.54	6.48	6.79	8.63	-	3.59
FM-08	80,011	0.83	0.04	1.53	2.98	0.34	1.93	3.65	5.86	5.67	5.14	-	2.80
FM-09	312,243	1.47	1.28	1.33	2.91	1.47	2.06	2.64	3.90	2.91	2.51	-	2.25
FM-10	88,669	2.61	0.66	3.85	5.83	1.26	2.26	2.26	3.14	1.45	2.38	-	2.57
FM-11	53,026	1.45	0.25	3.34	5.46	0.95	n/a	n/a	n/a	n/a	n/a	n/a	2.29
FM-12	62,199	3.72	0.36	6.30	9.74	0.70	n/a	n/a	n/a	n/a	n/a	n/a	4.16
FM-13	28,715	2.42	0.58	2.54	5.34	0.13	2.11	3.54	2.63	2.83	2.91	5.35	2.76
FM-14	95,149	1.43	0.35	4.06	10.49	2.86	4.03	3.85	4.69	3.26	3.84	-	3.88
FM-15	17,341	2.84	0.59	2.62	13.41	3.60	5.88	4.16	6.20	3.54	4.47	-	4.73
FM-16	115,332	0.53	0.50	1.89	2.21	1.61	2.98	3.35	3.78	4.46	3.47	-	2.48
FM-17A[1]	16,424	n/a	n/a	n/a	n/a	n/a	n/a	6.41	7.85	10.98	8.28	6.58	8.02
FM-17B[1]	5,661	n/a	n/a	n/a	n/a	n/a	n/a	1.74	2.22	1.92	2.27	2.63	2.15

(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.
(2) December 11th rain event excluded from I/I analysis for most flow meters due to anomalous responses.
'n/a' due to flow meter relocation during flow monitoring period.

3.2.4 Inflow and Infiltration (I/I) Summary

The flow meter basins were categorized into **High**, **Moderate**, or **Low** I/I and ranked from 1 (Highest) to 18 (Lowest). The categories are based on the rate of I/I as gallons per linear foot per inch of rainfall (Gal/LF/in) calculated within each basin. **Table 3-10** shows the categories of I/I.

Table 3-10: Categories of I/I

I/I (Gal/LF/in)	Description
I/I Greater than 4.0	High I/I
I/I between 2.0 – 3.9	Moderate I/I
I/I less than 2.0	Low I/I

All 18 flow meter basins are ranked by the measured rate of I/I in **Table 3-11**.

Table 3-11: Flow Meter Basin Ranking by I/I

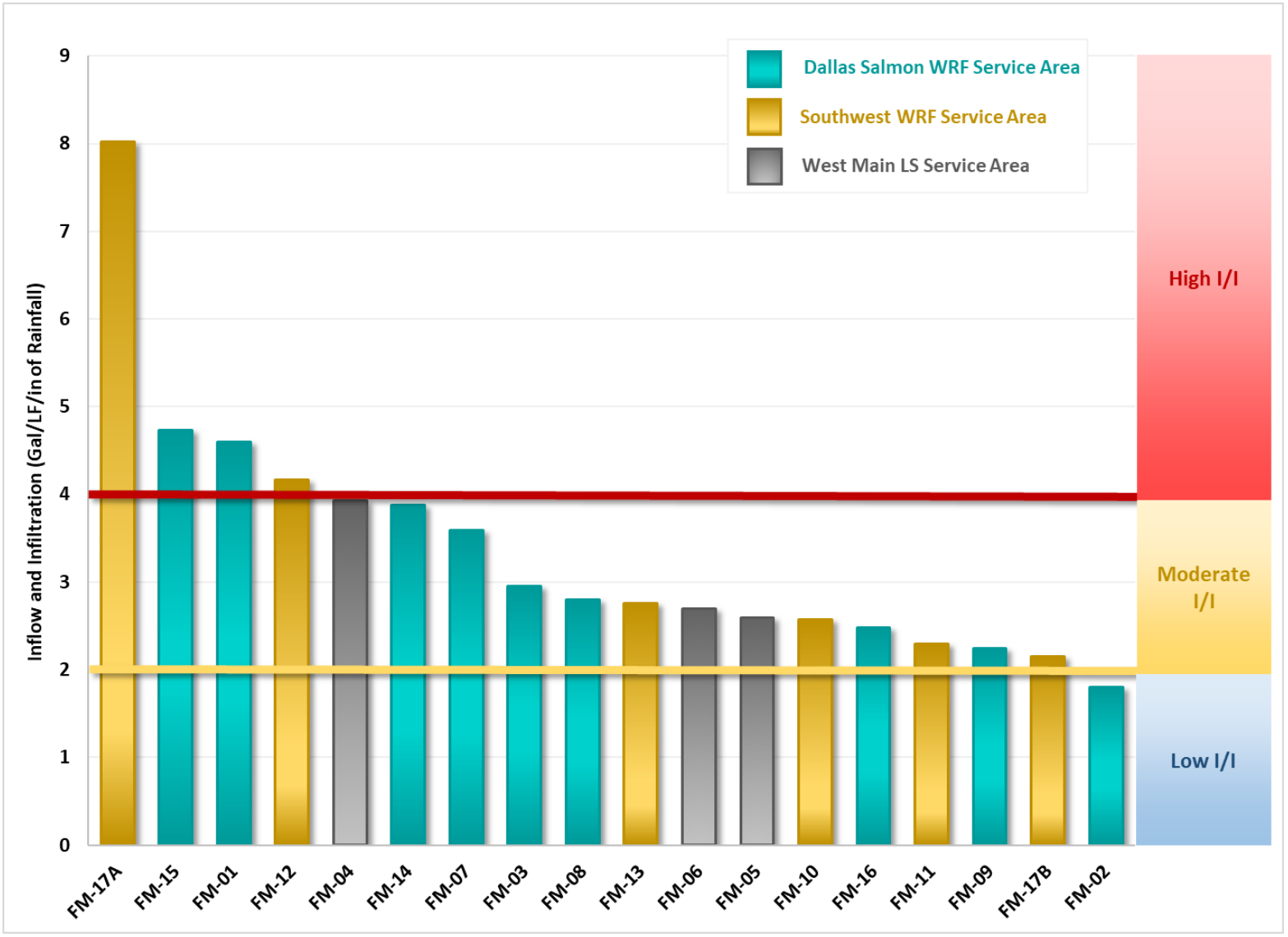
Flow Meter Basin	Basin Footage (LF)	Average Volume of I/I (MG)	Average I/I (Gal/LF/in)	Basin Ranking by I/I
FM-17A[1]	16,424	0.19	8.0	1
FM-15	17,341	0.09	4.7	2
FM-01	102,523	0.62	4.6	3
FM-12	62,199	0.10	4.1	4
FM-04	21,743	0.10	3.9	5
FM-14	95,149	0.38	3.9	6
FM-07	94,381	0.50	3.6	7
FM-03	386,940	1.58	3.0	8
FM-08	80,011	0.32	2.8	9
FM-13	28,715	0.08	2.7	10
FM-06	10,835	0.03	2.7	11
FM-05	70,359	0.21	2.6	12
FM-10	88,669	0.22	2.6	13
FM-16	115,332	0.35	2.5	14
FM-11	53,026	0.05	2.3	15
FM-09	312,243	0.87	2.2	16
FM-17B[1]	5,661	0.02	2.1	17
FM-02	322,666	0.68	1.8	18

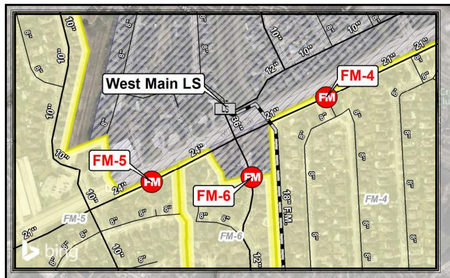
In summary, the meter basin I/I ranking results are:

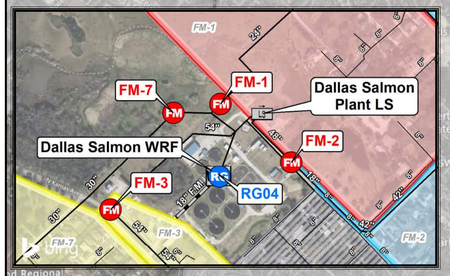
- 4 basins with **high** levels of I/I
- 13 basins with **moderate** levels of I/I
- 1 basin with a **low** level of I/I

This basin I/I ranking was utilized in the development of the updated SSES Program recommendations, discussed further in **Section 9**.

Figure 3-4: Plot of Normalized I/I by Flow Meter Basin (Gal/LF/in)







Dallas Salmon WRF
Permitted Capacity
Average Daily Flow: 12.0 MGD
2-Hr Peak Flow: 36.0 MGD

Southwest WRF
Permitted Capacity
Average Daily Flow: 4.0 MGD
2-Hr Peak Flow: 12.0 MGD

FIGURE 3-5
CITY OF LEAGUE CITY
2023 WASTEWATER MASTER PLAN UPDATE
NORMALIZED INFLOW/INFILTRATION BY FLOW METER BASIN

LEGEND

- Flow Meter
- Rain Gauge
- Manhole
- Lift Station
- Water Reclamation Facility
- 8" and Smaller Wastewater Lines
- 10" and Larger Wastewater Line
- 8" and Smaller Force Main
- 10" and Larger Force Main
- Railroad
- Unmetered Basin
- City Limits
- ETJ
- Other City Limit

INFLOW/INFILTRATION

- Less than 2.0 gal/LF/in (Low I/I)
- 2.0 - 4.0 gal/LF/in (Moderate I/I)
- Greater than 4.0 gal/LF/in (High I/I)

0 2,500 5,000
SCALE IN FEET

League City TEXAS

FREESE AND NICHOLS

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4.0 LAND USE ASSUMPTIONS

This section describes the land use assumptions for both the *2023 Water Master Plan Update* and *2023 Wastewater Master Plan Update*. Population and land use are important elements in the analysis of water distribution and wastewater collection systems. Water demands and wastewater flows are dependent on the residential population and commercial developments served by the system and affect the sizing and location of system infrastructure. During this study, FNI worked with the City's Planning Department to evaluate historical population and develop **5-year**, **10-year**, and **Buildout** land use assumptions and projections. A description of the methodology utilized is included in the following sections.

The land use assumptions documented below also served as the basis for the capital recovery fee (CRF) land use assumptions in the *2023 Water and Wastewater CRF Update* report. It should be noted that the land use assumptions documented in the *2023 Water and Wastewater CRF Update* report included only the population and commercial acreage that fell within the water and wastewater CRF service areas. The projections in the following sections of this report include developments that are currently outside of the CRF service areas but are anticipated to be served by the City.

Historical Population

Historical City-wide population provided by the City is presented in **Table 4-1**. The City's population data shows that since 2011, League City has experienced an approximately 2.9% annual average growth in population.

Table 4-1: Historical Population

Year	City Limits Population[1]	Annual Growth Rate
2011	85,026	-
2012	87,260	2.6%
2013	89,257	2.3%
2014	92,714	3.9%
2015	96,209	3.8%
2016	100,053	4.0%
2017	102,634	2.6%
2018	104,857	2.2%
2019	106,803	1.9%
2020	114,392	7.1%
2021	115,747	1.2%
2022	116,834	0.9%
Average Annual Growth Rate		**2.9%**

(1) Historical population from City staff.

4.1 PROJECTED FUTURE DEVELOPMENT

FNI worked with the City's Planning Department to develop population and commercial acreage projections for the **5-year**, **10-year**, and **Buildout** planning periods. The data sources utilized to develop population and commercial acreage projections included:

- League City's latest Future Land Use Plan (FLUP), received in September 2022
- Information on known developments (including Westside Developments)
- Latest parcel shapefile
- Active water meter billing data (December 2018 to July 2022)
- Existing septic connections within City limits
- Density and growth projection assumptions from the City's Planning Department

Utilizing the data sources listed above, FNI developed projections for the following three categories of future growth: **Known Developments**, **Infill Growth**, and **Septic Conversions**. A brief description of the methodology utilized for each of these categories is included below.

Known Developments

The City staff identified areas where future residential and non-residential developments are anticipated to occur as well as an expected timeline of each development. These anticipated known developments are shown on **Figure 4-1.** Where available, the City supplied development-specific information such as number of single-family lots, number of multi-family units, and commercial acreage. This includes the developments in the southwestern part of the City (Westside Area), where the growth projections were provided within polygons developed by the City (**black** boundaries shown on **Figure 4-3**). For ease of documentation for this study, FNI utilized letters A through M to identify these polygons, as shown on **Figure 4-3**. The growth projections by polygon are included in **Table 4-2.**

Infill Growth

Where development information was unknown, FNI utilized active water meter locations and future land use information from the City's latest FLUP as shown on **Figure 4-2** to identify developable areas. These areas included currently vacant parcels outside of known developments that are not within the *Park, Open Space, Natural* land use type per the FLUP. The identified parcels are shown as **purple** colored infill parcels on **Figure 4-1.** Density and growth assumptions for infill parcels were developed in coordination with the City's Planning Department to calculate projected population and commercial acreage by planning period.

Septic Conversions

This category includes the City's water customers who are currently within the City limits but are not served wastewater by the City. The City provided the location of existing septic customers within the League City limits. FNI worked with the Planning Department and Engineering staff to identify the areas anticipated to be served by the City in the future and the timeline for conversion. The locations anticipated to be served by the City are shown in **teal** polygons on **Figure 4-1.**

Town Harbour Estates
Veranda Townhomes
Beacon Island
Davis Harbor
River Bend at Clear Creek Point
Clearfield
Marbella
Coastal Point
Tuscan Lakes
Elva Lobit Park
Westwood
Stedman West
Georgetown
Lloyd Tract
Samara
Sedona
Pinnacle Park
Bay Colony Park
Bay Colony West
Stedman West Land
Martron
Bofysil
Custer
Sealy Land
Westland Ranch
Pedregal

0 2,500 5,000
SCALE IN FEET

FIGURE 4-1
CITY OF LEAGUE CITY
2023 WASTEWATER MASTER PLAN UPDATE
ANTICIPATED DEVELOPMENTS
LEGEND

- Railroad
- Known Development
- Infill
- Septic
- Proposed Development
- City Limit
- ETJ
- Other City Limit

FREESE NICHOLS

League City TEXAS

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FIGURE 4-2

CITY OF LEAGUE CITY

2023 WASTEWATER MASTER PLAN UPDATE FUTURE LAND USE

LAND USE

- Enhanced Auto Dominant Commercial
- Enhanced Auto Dominant Residential
- Park, Open Space, Natural
- Public, Institutional
- Rural, Estate Residential
- Suburban Commercial
- Suburban Residential
- Suburban Village
- Urban High
- Urban Low

LEGEND

- Railroad
- Stream
- Lake/Pond
- City Limit
- ETJ
- Other City Limit

0 2,500 5,000

SCALE IN FEET

FREESE AND NICHOLS

League City TEXAS

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FIGURE 4-3

CITY OF LEAGUE CITY

2023 WASTEWATER MASTER PLAN UPDATE

WESTSIDE DEVELOPMENTS

LEGEND

- Road
- Westside Developments
- City Limits
- ETJ
- Other City Limit

FUTURE LAND USE

- Enhanced Auto Dominant Commercial
- Enhanced Auto Dominant Residential
- Park, Open Space, Natural
- Public, Institutional
- Rural, Estate Residential
- Suburban Commercial
- Suburban Residential
- Suburban Village
- Urban High
- Urban Low

0 2,500

SCALE IN FEET

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Table 4-2: City-Wide Population and Commercial Acreage Projections

Category	Westside Polygon ID	Development[1]	Total Population[2]				Total Commercial Acreage			
			Existing	5-Year	10-Year	Buildout	Existing	5-Year	10-Year	Buildout
Known Developments	A	Georgetown	0	296	809	2,175	0	0	0	0
	B	Stedman West	0	1,840	2,845	5,579	0	2	12	24
	C	Stedman West Land, Martron	0	0	2,384	9,350	0	43	213	425
	D	Custer, Bofysil, Sealy Land, Martron	0	0	872	6,841	0	0	0	251
	E	Stedman West, Martron	0	0	0	0	0	0	0	96
	F	Sealy Land, Martron, Lloyd Tract (West)	0	0	2,042	4,004	0	0	0	0
	G	Westland Ranch	0	1,563	2,416	4,738	0	7	34	67
	H	Lloyd Tract	0	104	2,431	4,767	0	0	12	47
	I	Lloyd Tract	0	438	2,462	9,966	0	5	113	452
	J	Lloyd Tract	0	210	2,440	4,786	0	0	12	48
	K	Samara, Pedregal	780	3,723	5,908	11,585	0	5	25	50
	L	Samara	0	0	791	3,102	0	14	71	142
	M	Stedman West	0	255	1,184	2,323	0	0	0	0
	-	Westwood	0	780	780	780	0	14	21	28
		Town Harbour Estates	0	131	152	299	0	0	0	0
		Bay Colony West	-	-	-	-	0	11	17	22
		Coastal Point	969	1,563	1,563	1,563	0	0	0	0
		Marbella	-	-	-	-	0	37	54	72
		Pinnacle Park	0	298	345	678	28	39	78	78
		River Bend at Clear Creek Point	406	535	675	1,324	0	8	16	16
		Tuscan Lakes	-	-	-	-	35	58	81	81
		Davis Harbor	0	114	133	261	0	0	0	0
		Clearfield	0	0	2,774	4,645	0	0	81	121
		Veranda Townhomes	0	187	217	426	0	0	0	0
		Beacon Island	0	136	158	310	0	0	0	0
		Sedona Section 7	0	252	252	252	0	0	0	0
		Marina Townhomes	0	51	59	116	0	0	0	0
Infill Growth			0	1,091	1,107	7,180	0	402	402	1,208
Septic Conversions[3]			0	0	874	2,056	0	0	58	58

(1) Elva Lobit Park and Bay Colony Park shown on Figure 4-1 are not included in this table. Water demand and wastewater flow projections from these areas are calculated based on similar development types in League City.
(2) Population from City and/or based on density of approximately 2.83 people/unit for single family residential developments and 1.9 people/unit for multi-family residential developments.
(3) These customers are currently served water and are included in the existing City limits population.

The City-wide population projections are graphed along with historical population data on **Figure 4-4**. City-wide growth in commercial acreage is shown on **Figure 4-5.** The average annual growth for buildout is not included, as the exact timing of buildout is unknown.

Figure 4-4: Historical and Projected City-Wide Population

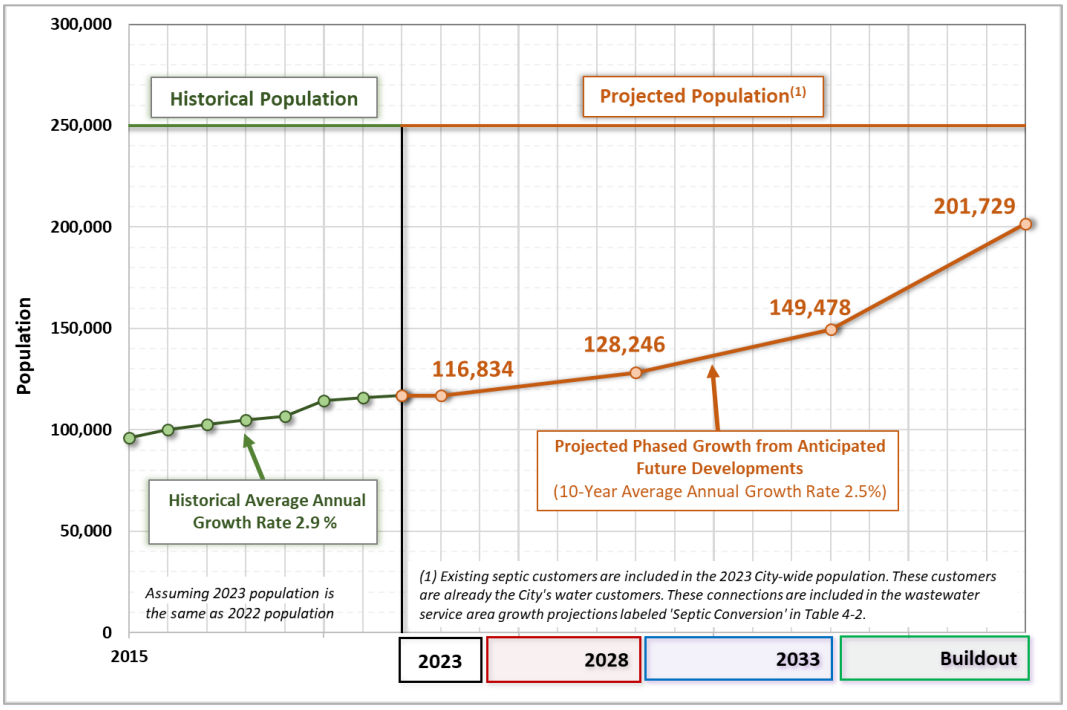
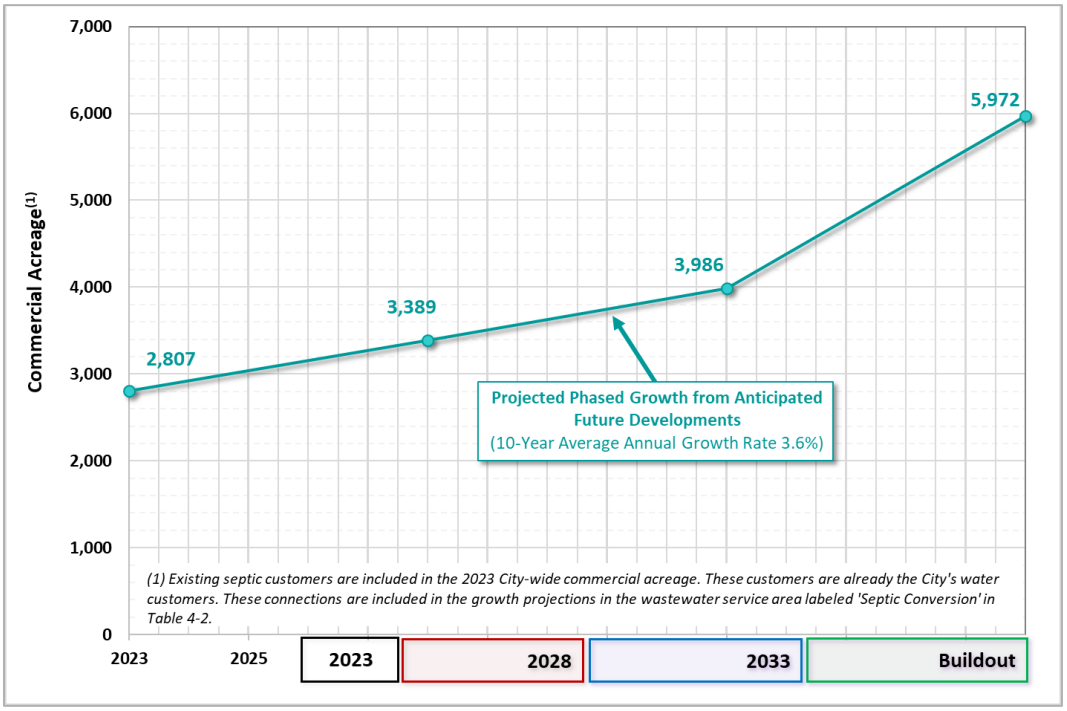


Figure 4-5: Projected City-Wide Commercial Acreage



4.2 WATER AND WASTEWATER SERVICE AREAS

Population and commercial acreage projections were developed City-wide and were then applied to the water and wastewater systems based on the water and wastewater service areas discussed with the City. The service areas are largely defined by the City limits with the exception of some select areas as described below. **Table 4-3** summarizes the growth in population and commercial acreage within the water and wastewater service areas.

Table 4-3: Projected Growth by Service Area

Service Area	Population Growth			Commercial Acreage Growth		
	5-Year	10-Year	Buildout	5-Year	10-Year	Buildout
Water Service Area[(1)]	11,366	32,597	84,582	580	1,176	3,145
Wastewater Service Area[(2)]	11,377	33,482	86,711	580	1,235	3,205

(1) Septic customers are already served water by the City and are excluded from the water service area projected growth.

(2) The 2,056 septic customers and 58 commercial acres from **Table 4-2** are included in the wastewater service area projected growth.

Water Master Plan Service Area

The water service area includes the existing City limits with the exception of areas that are not currently served or planned to be served water, including the area north of Highway 96 near Lawrence Road and select parcels along FM 646. The water service area also includes approximately 130 acres northwest of the existing City limits near FM 528 and approximately 70 acres towards the southern portion of the City limits along FM 517 that the City anticipates serving in the near future.

Wastewater Master Plan Service Area

The wastewater service area includes the existing City limits with the exception of areas that are not currently served or planned to be served wastewater, including the Whispering Lakes Neighborhood and select parcels along FM 646. The wastewater service area includes the residences along Mary Lane and Tallow Forest Street that are not currently served wastewater by the City but are anticipated to connect to the City's system in the future. The wastewater service area also includes approximately 130 acres northwest of the existing City limits near FM 528 and approximately 70 acres towards the southern portion of the City limits along FM 517 that the City anticipates serving in the near future.

5.0 WASTEWATER FLOW PROJECTIONS

The performance of wastewater treatment and collection systems is dependent on the amount of flow being conveyed. To develop future wastewater system improvements, existing and future wastewater flow projections must be developed. FNI developed projected average day and peak wastewater flows for the **Existing**, **5-year**, **10-year**, and **Buildout** planning periods based on the land use assumptions discussed in **Section 4.0.** These flows were utilized in the hydraulic modeling and system planning to develop future wastewater treatment and collection system improvements. Water reclamation facilities are sized for average day flows, while the collection system infrastructure, including lift stations, are sized to convey peak wet weather wastewater flows.

5.1 HISTORICAL WASTEWATER FLOWS

The City provided WRF effluent flow data from 2017 through 2022. FNI analyzed the historical flow data and population to assess the historical trends in system-wide average daily wastewater flow and per-capita flow, discussed further in **Section 5.1.1**. The historical average day and peak 2-hour flows for each WRF are summarized in **Table 5-1**. Historical annual average wastewater flows from 2017 to 2022 are graphed against the current TCEQ permitted capacity for the **Dallas Salmon** and **Southwest** WRFs on **Figure 5-1** and **Figure 5-2**, respectively.

Table 5-1: Historical WRF Effluent Flows

Year	Annual Average Daily Effluent Flow[1] (MGD)			Maximum 2-Hour Peak Flow[1] (MGD)	
	Dallas Salmon WRF	Southwest WRF	Total	Dallas Salmon WRF	Southwest WRF
2017	7.2	1.6	8.8	46.1	8.8
2018	7.2	1.8	9.1	35.5	8.0
2019	8.1	1.5	9.6	35.0	6.8
2020	8.0	1.4	9.4	35.0	8.6
2021	7.2	1.5	8.7	35.5	6.4
2022[2]	5.5	1.6	7.0	20.2	4.9
Average	**7.2**	**1.6**	**8.8**	**34.6**	**7.3**
Maximum	**8.1**	**1.8**	**9.6**	**46.1**	**8.8**

(1) Annual average daily effluent and maximum 2-hour peak flow based on data received from City.
(2) 2022 annual average daily effluent data includes January to November 2022.

Figure 5-1: Dallas Salmon WRF Historical Annual Average Wastewater Flow

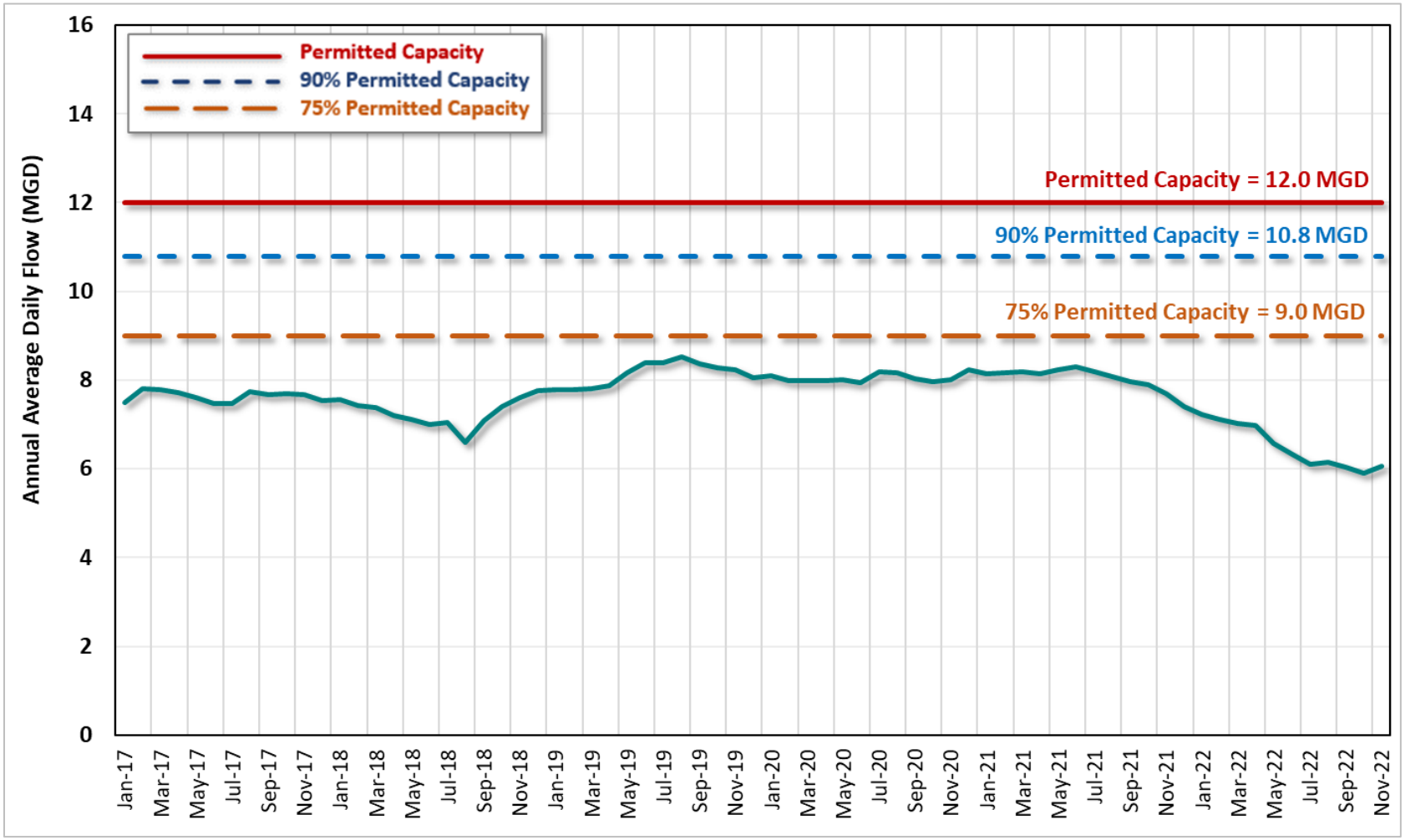
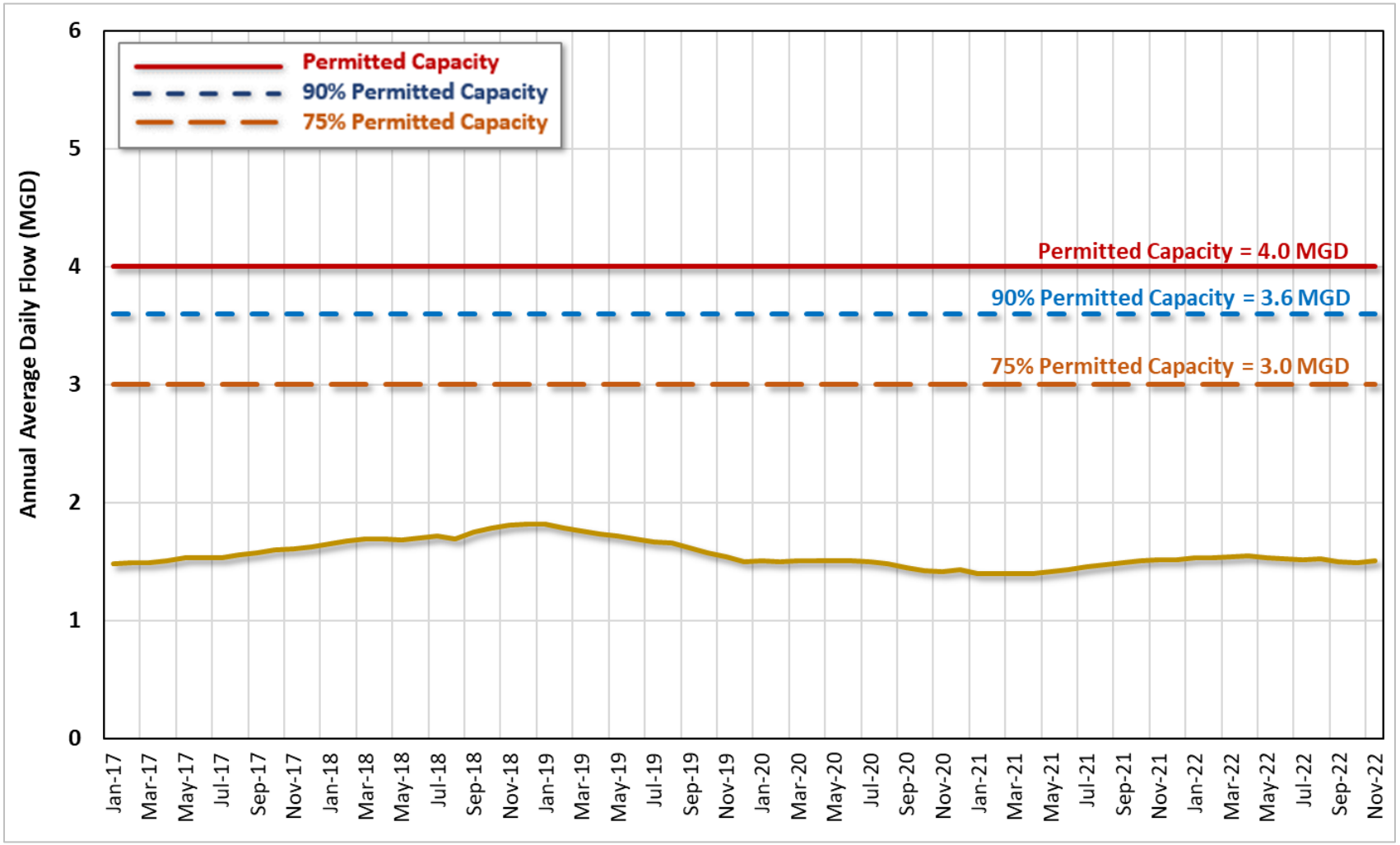


Figure 5-2: Southwest WRF Historical Annual Average Wastewater Flow



5.1.1 Wastewater Planning Criteria

Planning criteria for average day wastewater flows for the **5-year**, **10-year**, and **Buildout** planning periods were developed by analyzing historical WRF effluent flows, water meter billing records, service area population, and commercial acreage. FNI utilized water meter billing data provided by the City to attribute percentages of the total WRF effluent flow to residential and commercial sources. The City's population and commercial acreage was then utilized to calculate historical wastewater flows per person (gpcd) and per commercial acre (gpad). This breakdown of historical WRF flows, population, and commercial acreages and the resulting gpcd and gpad values are shown in **Table 5-2**.

Table 5-2: Wastewater Planning Criteria Analysis

Year	City-Wide Population	Commercial Acreage[1] (acres)	Total WRF Effluent Flow[2] (MGD)	Residential		Commercial	
				Residential WW Flow[3] (MGD)	Per Capita WW Flow (gpcd)	Commercial WW Flow[3] (MGD)	Commercial WW Flow (gpad)
2019	106,803	2,455	9.6	8.0	75	1.6	667
2020	114,392	2,572	9.4	8.1	71	1.3	513
2021	115,747	2,690	8.7	7.4	64	1.3	485
2022	116,834	2,807	7.0	5.9	51	1.1	401
			Average	**7.4**	**65**	**1.4**	**517**
			Maximum	**8.1**	**75**	**1.6**	**667**

(1) Commercial acreage obtained from GIS based on geocoded commercial meters active in July 2022. Total parcel's acreage is used. 2018 acreage from 2018 Wastewater Master Plan. 2019 to 2021 acreage is linearly interpolated.
(2) Sum of annual average daily effluent flow at the Dallas Salmon and Southwest WRFs.
(3) Residential and commercial user percentages developed using the water consumption database (meter billing) for January 2019 through July 2022. Irrigation meters were excluded from the analysis.

A rate of 70 gallons per capita per day (gpcd) was chosen for future residential wastewater flows. A wastewater flow rate of 1,200 gallons per acre per day (gpad) was chosen for future commercial acreage. This planning criteria considered the historical information in **Table 5-3** as well as anticipated flows from future commercial developments in League City. The average day wastewater flow rate planning criteria are summarized in **Table 5-3**.

Table 5-3: Wastewater Planning Criteria

Wastewater Flow Type	Average Day Wastewater Flow Rate
Residential	70 gpcd
Commercial	1,200 gpad

5.2 PROJECTED WASTEWATER FLOWS

The future population and commercial acreage discussed in **Section 4.0** were utilized to develop flow projections for the **Existing (2023)**, **5-year (2028)**, **10-year (2033)**, and **Buildout** planning periods utilizing the methodology described below. The population and commercial acreage projections were broken down by WRF service area, as shown in **Table 5-4** based on the location of the developments**.** Projections were also broken down by flow meter basin, discussed further below.

Table 5-4: Population and Commercial Acreage Growth by Service Area

WRF Service Area	2028		2033		Buildout	
	Population Growth	Comm. Acreage Growth	Population Growth	Comm. Acreage Growth	Population Growth	Comm. Acreage Growth
Dallas Salmon	2,559	397	3,406	543	10,881	1,343
Southwest	8,690	113	27,009	540	69,916	1,661
West Main	128	71	3,067	152	5,914	201
Total	**11,377**	**580**	**33,482**	**1,235**	**86,711**	**3,205**

Average Day Wastewater Flows

All future average day wastewater flows were calculated by applying the planning criteria in **Table 5-3** to only the new residential population and commercial acreage. The average day wastewater flow projections for future anticipated residential and commercial developments were added to the existing flows to calculate the total projected average day wastewater flows for each future planning period.

Peak Wet Weather Wastewater Flows

Existing peak flows in each flow meter basin were developed by applying the two-year 24-hour design storm to the calibrated hydraulic model, discussed further in **Section 7.0**. Future peak wastewater flows were calculated utilizing a peak wet weather to average day peaking factor of 4.0.

Projected Flow Summary

The projected growth in residential populations, growth in commercial acreage, and average day flows for each flow meter basin within each of the wastewater service areas are presented in **Table 5-5**. The projected average day wastewater flows within each existing flow meter basin and Westside polygon (discussed in **Section 4.0**) are shown on **Figure 5-3**. The infrastructure recommendations in this study are based on the projected average day and peak wastewater flows per planning period.

City of League City
2023 Wastewater Master Plan Update
Table 5-5: Projected Average Day and Peak Wastewater Flows

WRF Service Area	Basin FM-ID	2023	2028			2033			Buildout		
		Average Daily Flow[1] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)
Dallas Salmon	FM-01	0.36	274	46	0.44	303	51	0.45	1,385	75	0.55
	FM-02	1.52	127	50	1.59	321	59	1.61	1,330	174	1.82
	FM-03	1.68	845	221	2.00	1,138	297	2.11	2,995	716	2.75
	FM-07	0.43	182	16	0.46	323	24	0.48	1,286	68	0.60
	FM-08	0.34	18	8	0.35	18	8	0.35	121	25	0.38
	FM-09	1.74	458	56	1.84	564	104	1.91	1,915	160	2.07
	FM-14	0.55	48	0	0.55	49	0	0.55	332	37	0.61
	FM-15	0.16	0	0	0.16	0	0	0.16	0	9	0.17
	FM-16	0.56	602	0	0.60	684	0	0.61	1,465	18	0.68
	Unmetered	0.05	6	0.0	0.05	6	0	0.05	54	61	0.13
	Sub Total	7.4	2,559	397	8.0	3,406	543	8.3	10,881	1,343	9.8
West Main	FM-04	0.12	0	0	0.12	0	0	0.12	2	0	0.12
	FM-05	0.36	128	71	0.45	3,067	152	0.76	5,912	201	1.02
	FM-06	0.07	0	0	0.07	0	0	0.07	0	0	0.07
	Unmetered	0.05	0	0	0.05	0	0	0.05	0	0	0.05
	Sub Total	0.6	128	71	0.7	3,067	152	1.0	5,914	201	1.2
Southwest	FM-10	0.4	4	11	0.44	4	11	0.44	27	11	0.44
	FM-11	0.1	785	14	0.17	785	21	0.18	817	28	0.19
	FM-12	0.2	0	0	0.24	0	0	0.24	0	0	0.24
	FM-13	0.1	0	0	0.12	0	0	0.12	0	0	0.12
	FM-17A[1]	0.2	0	0	0.16	0	0	0.16	0	0	0.16
	FM-17B[1]	0.0	0	0	0.02	0	0	0.02	0	0	0.02
	Unmetered	0.0	252	11	0.03	416	17	0.05	637	19	0.07
	Sub Total	1.1	1,041	36	1.2	1,205	49	1.2	1,480	58	1.2
Total		9.0	3,728	505	9.9	7,678	744	10.5	18,275	1,603	12.2

Westside Polygons

WRF Service Area	Westside Polygon ID	2023	2028			2033			Buildout		
		Average Daily Flow[1] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)	Population Growth	Commercial Acreage Growth	Average Daily Flow[2] (MGD)
Southwest	A	0.0	296	0	0.02	809	0	0.06	2,175	0	0.15
	B	0.0	1,840	2	0.13	2,845	12	0.21	5,579	24	0.42
	C	0.0	0	43	0.05	2,384	213	0.42	9,350	425	1.16
	D	0.0	0	0	0.00	872	0	0.06	6,841	251	0.78
	E	0.0	0	0	0.00	0	0	0.00	0	96	0.12
	F	0.0	0	0	0.00	2,042	0	0.14	4,004	0	0.28
	G	0.0	1,563	7	0.12	2,416	34	0.21	4,738	67	0.41
	H	0.0	104	1	0.01	2,431	12	0.18	4,767	47	0.39
	I	0.0	438	1	0.03	2,462	12	0.19	9,966	48	0.76
	J	0.0	210	5	0.02	2,440	113	0.31	4,786	452	0.88
	K	0.05	2,943	5	0.27	5,128	25	0.44	10,805	50	0.87
	L	0.0	0	14	0.02	791	71	0.14	3,102	142	0.39
	M	0.0	255	0	0.02	1,184	0	0.08	2,323	0	0.16
	Sub Total	0.05	7,649	77	0.7	25,804	491	2.4	68,436	1,603	6.8
Total WW Service Area		9.1	11,377	581	10.6	33,482	1,235	12.9	86,711	3,205	19.0

(1) Discrete 2023 average daily flow calculated based on 2022 flow monitoring data and historical five year annual average effluent. Flow for unmetered areas including Westside poplygons was calculated based on existing water meter distribution and planning criteria of 70 gpcd.

(2) Based on planning criteria of 70 gpcd for residential developments and 1,200 gpad for commercial developments.

FIGURE 5-3

CITY OF LEAGUE CITY

2023 WASTEWATER MASTER PLAN UPDATE PROJECTED AVERAGE DAY WASTEWATER FLOWS

LEGEND

- Road
- Railroad
- Flow Meter Basin (Multiple Colors)
- City Limits
- Other City Limit

Basin
2023 Avg. Day Flows (MGD)
2028 Avg. Day Flows (MGD)
2033 Avg. Day Flows (MGD)
Buildout Avg. Day Flows (MGD)

League City TEXAS

FREESE AND NICHOLS

WRF SERVICE AREAS

- Dallas Salmon WRF
- West Main Lift Station
- Southwest WRF

City of Pasadena
City of El Lago
City of Seabrook
City of Houston
City of Clear Lake Shores
Galveston Bay
City of Nassau Bay
City of Kemah
City of Webster
City of Bacliff
City of Friendswood
City of Dickinson
City of Alvin
City of Texas City

FM-16
0.56
0.60
0.61
0.68

FM-2
1.52
1.59
1.61
1.82

FM-1
0.36
0.44
0.45
0.55

Dallas Salmon Unmetered
0.05
0.05
0.05
0.05

FM-7
0.43
0.46
0.48
0.60

Dallas Salmon WRF Service Area

FM-3
1.68
2.00
2.11
2.75

FM-5
0.36
0.45
0.76
1.02

West Main Unmetered
0.05
0.05
0.05
0.05

FM-8
0.34
0.35
0.35
0.38

FM-4
0.12
0.12
0.12
0.12

FM-17A
0.16
0.16
0.16
0.16

FM-6
0.07
0.07
0.07
0.07

FM-13
0.12
0.12
0.12
0.12

FM-12
0.24
0.24
0.24
0.24

FM-11
0.10
0.17
0.18
0.19

FM-10
0.43
0.44
0.44
0.44

FM-9
1.74
1.84
1.91
2.07

Dallas Salmon Unmetered
0.00
0.00
0.00
0.07

FM-14
0.55
0.55
0.59
0.61

Southwest WRF Service Area

A
0.00
0.02
0.06
0.15

B
0.00
0.13
0.21
0.42

C
0.00
0.05
0.42
1.16

D
0.00
0.00
0.06
0.76

E
0.00
0.00
0.00
0.12

F
0.00
0.00
0.14
0.28

G
0.00
0.12
0.21
0.41

H
0.00
0.01
0.18
0.39

I
0.00
0.03
0.19
0.76

J
0.00
0.02
0.31
0.88

K
0.05
0.27
0.44
0.87

L
0.00
0.02
0.14
0.39

M
0.00
0.02
0.08
0.16

Southwest Unmetered
0.00
0.03
0.05
0.07

FM-15
0.16
0.16
0.16
0.17

0 2,500 5,000
SCALE IN FEET

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

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User Name: GS12

5.3 SUMMARY OF FLOW PROJECTIONS BY WATER RECLAMATION FACILITY

The total projected average day wastewater flows within each WRF Service Area in each planning period are included in **Table 5-6** and are graphed on **Figure 5-4** and **Figure 5-5. The projected average day wastewater flows show that additional wastewater treatment capacity will be needed.** The projected flows from the West Main Lift Station service area are included in the flow projections for the Southwest WRF on **Figure 5-5** to reflect the existing operations. It is recommended to transfer the West Main Lift Station flows to the Dallas Salmon WRF in future planning periods. The existing operation of the West Main Lift Station, as well as future WRF service areas and operational planning, is discussed further in **Section 8.0**. Recommended WRF capacity expansions are also discussed further in **Section 8.0.**

Table 5-6: Summary of Projected Average Day Wastewater Flows

Service Area	Projected Average Daily Wastewater Flows[1] (MGD)			
	2023[1]	2028	2033	Buildout
Dallas Salmon WRF	7.4	8.0	8.3	9.8
Southwest WRF	1.1	1.9	3.6	8.0
West Main Lift Station	0.6	0.7	1.0	1.2
Total	**9.1**	**10.6**	**12.9**	**19.0**

(1) Existing flows based on historical annual average flow from 2017 to 2022. Effluent data from the City was utilized for 2017 to 2021. Average flows observed during the flow monitoring period were utilized for 2022 flows.

TCEQ Evaluation Criteria (75/90 Rule)

Figure 5-4 and **Figure 5-5** each include three lines showing the *existing* **permitted annual average day flow (ADF) capacity of the WRF**, **90% of the permitted ADF capacity**, and **75% of the permitted ADF capacity**. These are based on TCEQ §305.126, commonly referred to as the 75/90 rule, which requires a WRF permit holder to begin planning for expansion of the treatment facility when the average day or average annual flow reaches 75% of the permitted capacity for three consecutive months. When the average day or average annual flow reaches 90% of the permitted capacity, the permit holder shall obtain necessary authorization from the Commission to commence construction of the necessary additional treatment facilities.

Figure 5-4: Projected Average Day Flows in Dallas Salmon WRF Service Area

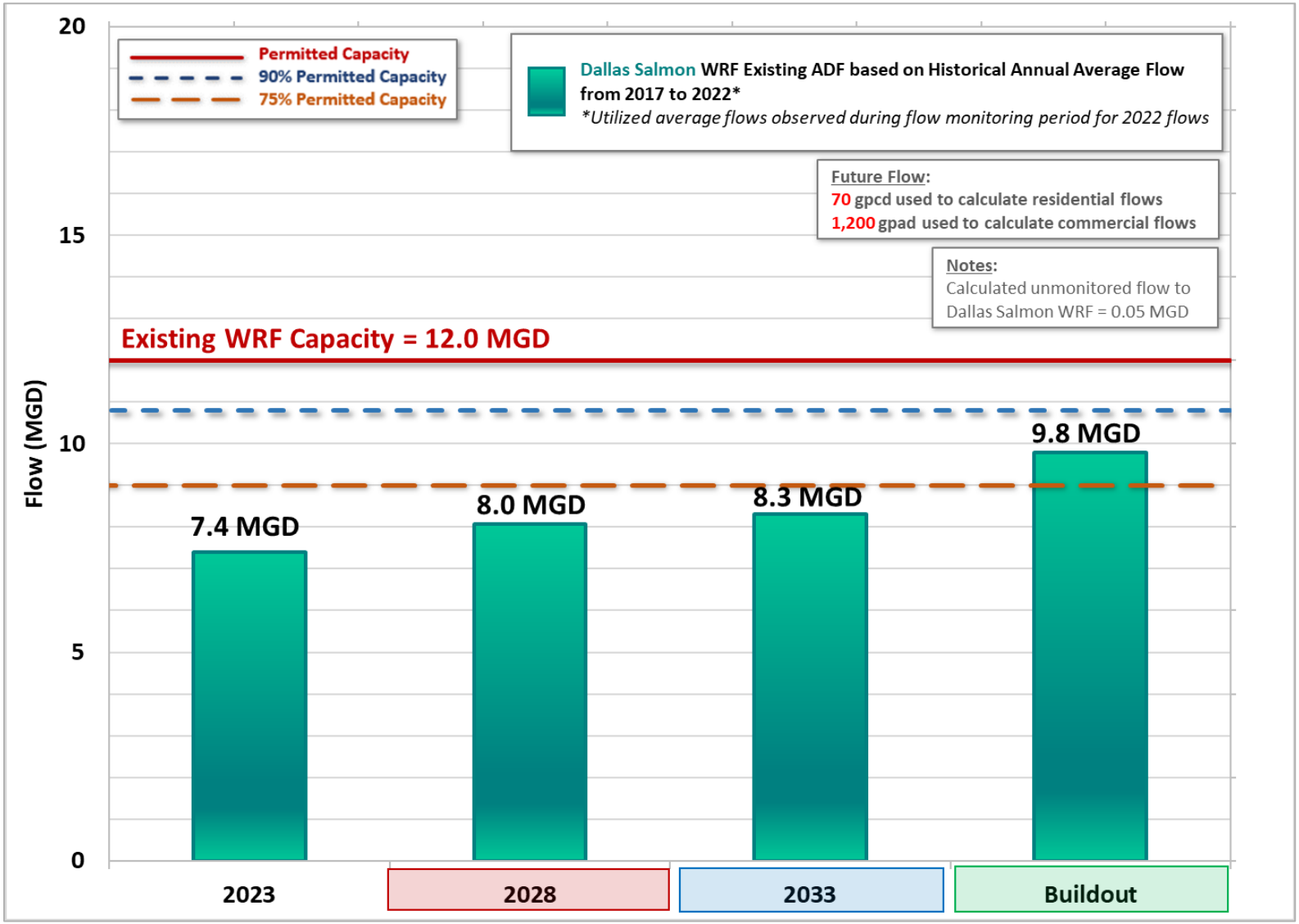
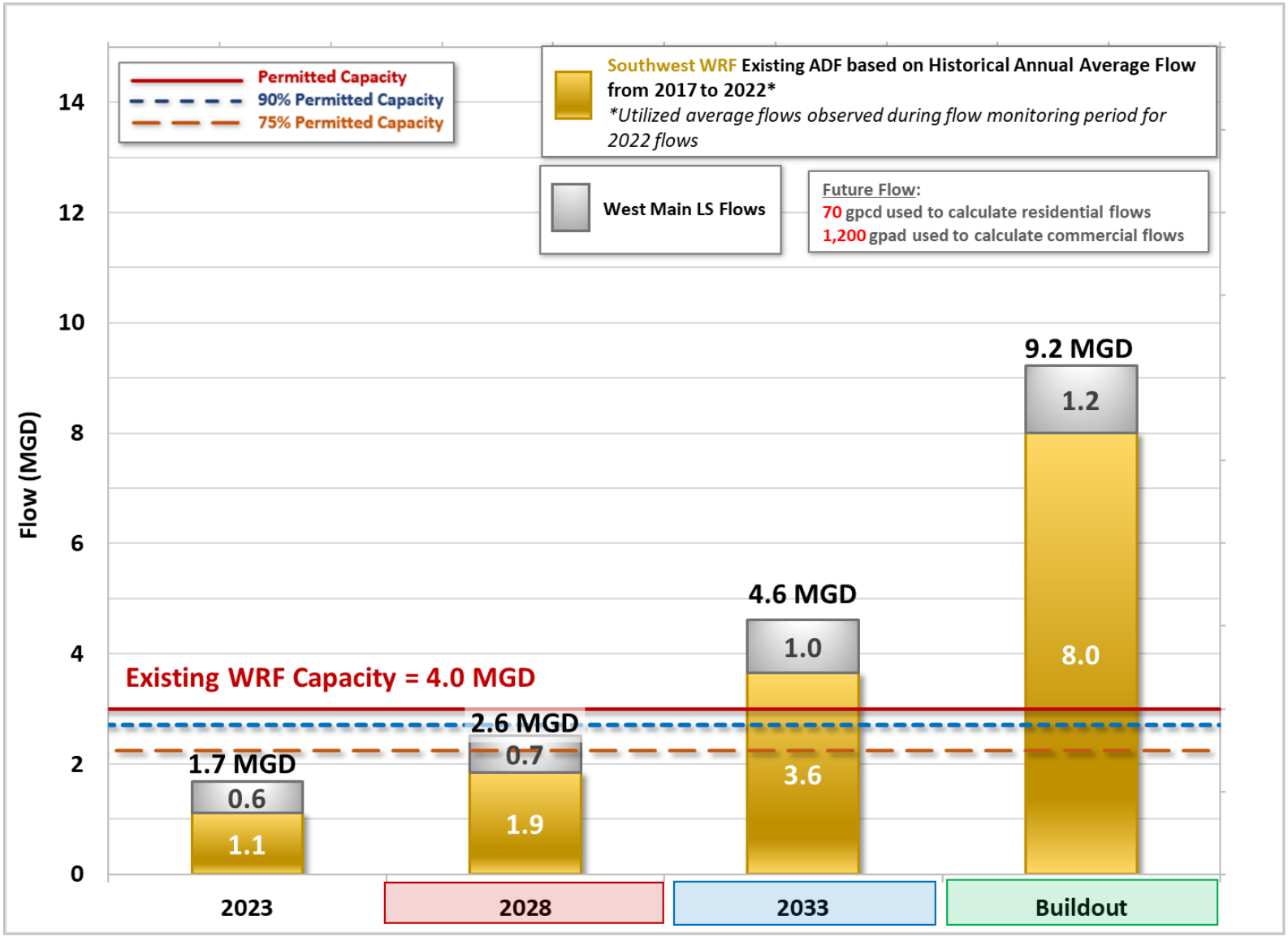


Figure 5-5: Projected Average Day Flows in Southwest WRF Service Area



6.0 HYDRAULIC MODEL UPDATE

League City owns a wastewater hydraulic model of the collection system in the Bentley SewerGEMS® software. The wastewater model was originally developed in 2012 and was updated by FNI during the City's *2018 Wastewater Master Plan Update*. As part of this 2023 study, FNI completed another update of the City's hydraulic wastewater model to include new lines and facilities, as well as new pumping information where pumps were replaced by the City during recent lift station rehabilitation projects. Updated and newly added model components include:

- Updated gravity lines, force mains, and lift stations based on the City's latest GIS and recent project as-built plans
- Updated wastewater loads based on geocoded meter billing and flow monitoring data
- New model catchments for areas developed since 2018
- Updated pumping and operations information

Following the model update process, FNI calibrated the hydraulic wastewater model utilizing the field collected flow monitoring and rainfall data. The model was then utilized to conduct system analyses and to develop wastewater capital improvement plan (CIP) projects.

6.1 MODELED NETWORK UPDATE

During this study, FNI incorporated recently constructed gravity wastewater lines with diameters of 8-inches or larger into the City's wastewater model. For this process, FNI utilized the City's GIS shapefiles of the collection system components (lift stations, gravity lines and force mains) received in October 2022. The GIS information was imported into the SewerGEMS® model and the wastewater network was reviewed for proper connectivity. Lines were reviewed to check for missing invert levels and diameters, and manholes were reviewed to check for missing ground levels (manhole rim elevations) and diameters. FNI also coordinated with the City to identify recently completed wastewater collection system infrastructure projects that had not yet been added to the City's GIS as of October 2022. The City provided as-built plans and record drawing for these recently completed projects which FNI utilized to complete the model network update process. The gravity main and lift station plans that were incorporated into the model by FNI during this update are presented in **Table 6-1** and **Table 6-2**, respectively.

Table 6-1: Updated Gravity Lines in SewerGEMS Model

Plan/File Name	Diameter (in)	WRF Service Area
Coastal Point - Section 4	8/12	Dallas Salmon
Cypress Bay Subdivision	8	Dallas Salmon
Hidden Lakes - Section 7B	10	Dallas Salmon
Magnolia Creek - Section 15	12	Southwest
Pedregal - Section 1	12	Southwest
Sedona - Section 6B	8	Southwest
Westwood Subdivision - Section 3 - Rev 1 and 2	12	Southwest
Westwood Subdivision - Section 9 and Maple Leaf Drive	12	Southwest
Bay View - Section 3 & 4	30	Dallas Salmon
Westwood Subdivision - Section 9 and Maple Leaf Drive	12	Southwest
2020 Grand Bargain Water and Sanitary Plans	48/54	Southwest

Table 6-2: Updated Lift Stations and Force Mains in SewerGEMS Model

Lift Station Name	WRF Service Area	CIP/Rehab Project No./Plan Name	Pump Curves Available?
Bay Colony 1 - 14-15	Dallas Salmon	CIP Project: WW 1206	Yes
Coastal Point	Dallas Salmon	2018 Coastal Point Lift Station Plans	Yes
Countryside 1	Southwest	Rehab Project: WW 1705	Yes
Davis Road 1 (North)	Dallas Salmon	Rehab Project: WW 1901A	Yes
Davis Road 2 (South)	Dallas Salmon	Rehab Project: WW 1901A	Yes
Glen Cove	Dallas Salmon	Rehab Project: WW 1901D	Yes
Pedegral	Southwest	2020 Pedregal Lift Station Plans	Yes
Sedona	Dallas Salmon	2019 Sedona Lift Station and Force Main Plans	Yes
Smith Lane	Dallas Salmon	Rehab Project: WW 1502A	Yes
South Shore 1	Dallas Salmon	Rehab Project: WW 1901C	Yes
Waterford 1	Dallas Salmon	Rehab Project: WW 1901B	N/A
Waterford 2	Dallas Salmon	Rehab Project: WW 1901B	N/A
Westland Ranch	Southwest	2020 Westland Ranch Lift Station Plans	Design Point
Westover Park	Southwest	Rehab Project: WW 1801B	Yes

6.2 COLLECTION SYSTEM UNIQUE IDENTIFIERS

Unique IDs are required by modeling software and are a best practice for maintaining and updating utility system assets in a GIS database. FNI utilized the City's Unique IDs where available. Where unique IDs were not available or where FNI created wastewater assets in GIS based on as-built plans, FNI assigned

unique IDs to each component (manholes, gravity lines, and force mains) based on the format established and utilized during the 2018 model update. The format of the assigned unique IDs is shown in **Table 6-3**.

Table 6-3: Format of Unique IDs for Wastewater Collection System Components

Wastewater System Component	Unique ID from City	Unique ID format used where IDs not available from City
Manholes	SSMH-####	FNI_MH_###
Gravity Main	SSGM-###	FNI_####
Force Main	-	FN_PM_###

6.3 NETWORK UPDATE AND INFORMATION FLAGGING

FNI maintained information flags in the wastewater model during network review and development. These information flags indicate the source of the information utilized to populate the model component data fields such as pipe diameter, manhole rim elevation, etc. A summary of the information flags utilized in the League City wastewater model is included in **Table 6-4**. All information from the City's GIS shapefiles was flagged as LGIS.

Table 6-4: Wastewater Model Information Flags

Information Flag	Description
LGIS	League City GIS
AB	As Built Drawings / Plans
MDL	SewerGEMS Model from 2012 Master Plan
CONT	2-foot Ground Elevation Contours
INT	Interpolation
Min	TCEQ Minimum Slope Assumption
SFT	Shift Due to Local Datum Adjustment
CS	Information from City Staff
FNI	FNI Modified Data

6.4 MODEL LOAD ALLOCATION

FNI allocated wastewater loads to the hydraulic model based on geocoded water meter billing data. GIS tools were used to associate the geocoded meter billing data (loads) with the model catchments. These loads were then applied to the hydraulic model at the outflow manholes associated with the catchments. The loading was then adjusted during the model calibration process.

6.5 HYDRAULIC MODEL CALIBRATION

6.5.1 Dry Weather Calibration

Dry weather calibration is conducted so that the hydraulic model closely matches observed dry weather flows. These dry weather flows represent residential, commercial, and groundwater flows during a period without any additional measurable I/I due to rainfall. FNI chose a seven-day period from October 3 to October 10, 2023, for the dry weather calibration.

Diurnal patterns for each flow meter basin were developed and loaded into the model, based on the patterns observed during the flow monitoring period (included in **Appendix D**). The loading based on the geocoded water meter billing data was then factored as necessary until the aggregate flows in each flow meter basin closely matched the observed flow meter data. For this study, a tolerance of +/- 10% between observed and modeled average daily flow was selected for dry weather calibration, and this was achieved at 15 out of the 16 flow meter sites. For site FM-14, the difference was greater than 10%; however, the modeled flows were within 0.1 MGD (negligible difference) and the calibration was considered to be acceptable. Calibration results are discussed in **Section 6.5.3** and individual plots demonstrating the dry weather model calibration results are provided in **Appendix E**.

6.5.2 Wet Weather Calibration

Wet weather calibration builds upon the dry weather calibration and is performed so that the model closely matches observed wet weather flows during rainfall. During this process, FNI also utilized the City's lift station runtime and depth Supervisory Control and Data Acquisition (SCADA) information (shown in **Appendix F**). These wet weather flows represent the sum of the dry weather flows plus the additional I/I that enters the wastewater system during a rainfall event. FNI utilized two storm events to perform the wet weather calibration and verification of results. These events occurred on October 13, 2022 and November 18, 2022. The latter storm event was utilized to calibrate flow meters FM-17A and FM-17B after they were moved from their previous locations (FM-11 and FM-12) on November 14, 2022.

FNI utilized the RTK hydrograph method to model the additional flows that entered the wastewater system during the observed calibration storms. This method utilizes three hydrographs that each contain three parameters which are adjusted to achieve calibration: flow of water into the system (R), the time to peak flow (T), and the ratio of time until normalization of flow to time to peak (K). The combination of the three component hydrographs form the total response (additional I/I) that is observed in the

wastewater system. The RTK parameters and the component hydrographs are illustrated on **Figure 6-1** and **Figure 6-2**.

Figure 6-1: RTK Parameters

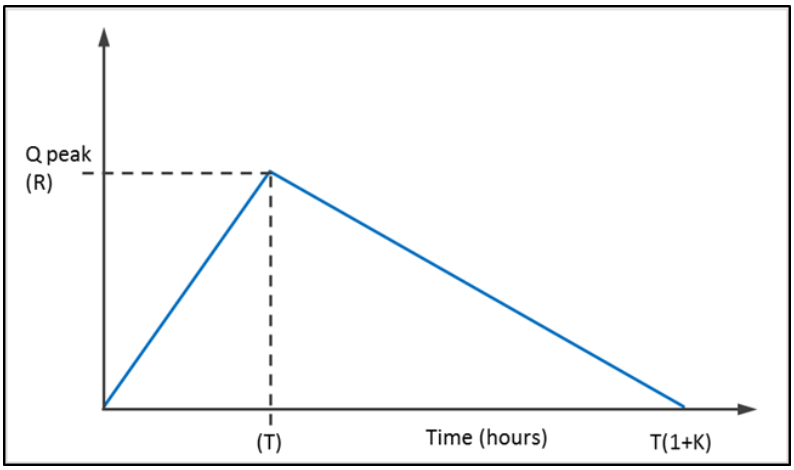
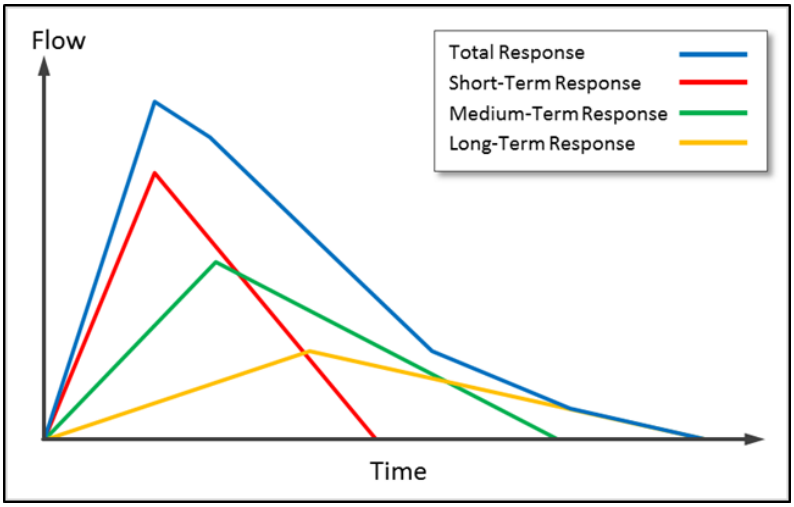


Figure 6-2: RTK Component Hydrographs



Separate RTK hydrographs were developed for each flow meter basin to account for the different land uses, soil properties, amounts of impervious cover, and condition of the wastewater lines in each basin. In the SewerGEMS model, the RTK hydrographs were applied to the catchments in each wastewater basin. The observed rainfall hyetographs measured during the calibration rainfall events were then applied to the model. The model calculates the I/I that enters the wastewater system utilizing the values in the RTK hydrographs and the contributing area of each catchment. These values were adjusted until the modeled wet weather flows closely matched the observed wet weather flows. For this study, a tolerance of +/- 20%

of the observed peak flows was selected for wet weather calibration, and this was generally achieved across the sixteen original flow meter sites. For FM-17A, the modeled results differed by more than 20% from observed; however, the absolute difference in flow was not significant. Calibration results are discussed in **Section 6.5.3** and individual plots demonstrating the wet weather model calibration results are provided in **Appendix E**.

6.5.3 Calibration Results

The summary of calibration results is presented in **Table 6-5** and on **Figure 6-3** and **Figure 6-4**. The dry and wet weather calibration results provide a high level of confidence that the model is closely matching real world conditions and is suitable to use for hydraulic analyses and CIP development.

Table 6-5: Summary of Calibration Results

Flow Meter	Average Dry Weather Flow (MGD)			Peak Wet Weather Flow (MGD)		
	Flow Meter Data	Modeled Data	Difference (%)	Flow Meter Data	Modeled Data	Difference (%)
FM-01	0.32	0.31	**2.2%**	1.61	1.53	**4.9%**
FM-02	1.61	1.69	**4.7%**	3.97	4.67	**17.7%**
FM-03	3.80	4.13	**8.9%**	15.88	15.00	**5.5%**
FM-04	0.10	0.10	**2.3%**	0.83	0.76	**8.9%**
FM-05	0.28	0.26	**7.4%**	1.77	1.88	**6.2%**
FM-06	0.07	0.07	**2.9%**	0.39	0.38	**1.0%**
FM-07	0.33	0.34	**3.8%**	2.22	2.35	**5.6%**
FM-08	0.26	0.25	**1.9%**	2.14	1.96	**8.7%**
FM-09	1.84	1.71	**7.1%**	9.65	9.18	**4.9%**
FM-10[2]	0.63	0.65	**4.5%**	1.72	1.55	**10.0%**
FM-11[3]	0.14	0.15	**5.7%**	0.79	0.69	**12.5%**
FM-12[3]	0.35	0.35	**0.1%**	3.29	2.81	**14.7%**
FM-13	0.20	0.18	**7.5%**	0.62	0.55	**11.8%**
FM-14	0.44	0.54	**21.0%**	3.12	3.29	**5.6%**
FM-15	0.14	0.14	**2.9%**	1.41	1.42	**0.8%**
FM-16	0.42	0.42	**0.3%**	1.57	1.48	**5.4%**
FM-17A[1,2]	-	0.29	-	0.52	0.67	**29.5%**
FM-17B[1,2]	-	0.02	-	0.07	0.07	**1.7%**

(1) Average dry weather flow calibrated over the calibration period of October 3 - 9, 2022
(2) Peak wet weather calibration period was October 12-13, 2022 for all meters with exception to FM-17A, FM-17B, and FM-10 for which the calibration period was November 18-20, 2022.
(3) FM-11 and FM-12 flow meters were moved to FM-17A and 17B locations on 11/14/2022.

Figure 6-3: Dry Weather Calibration Results

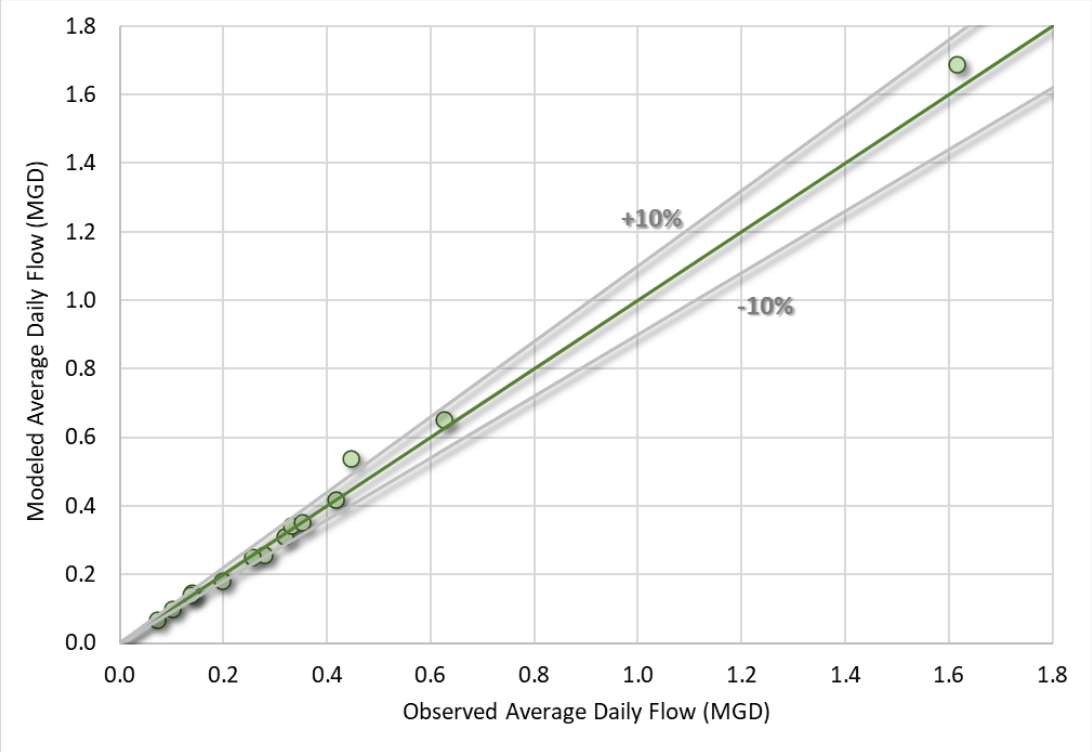
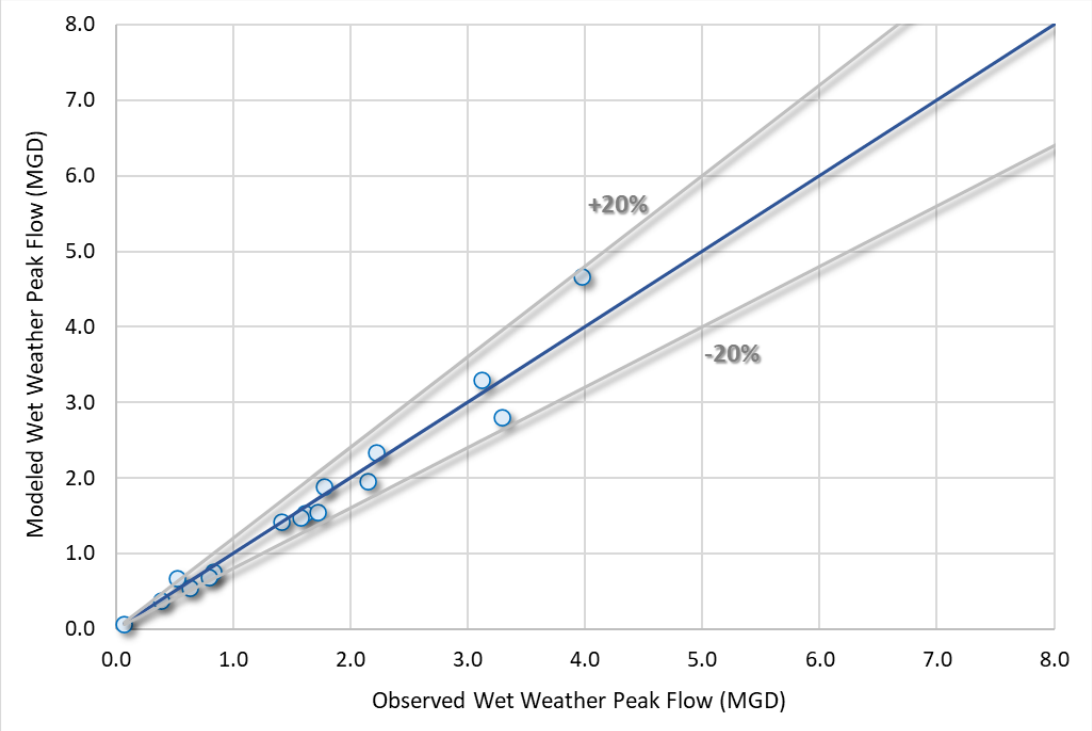


Figure 6-4: Wet Weather Calibration Results



7.0 WASTEWATER COLLECTION SYSTEM ANALYSES

This study conducted hydraulic capacity analyses of the League City collection system to identify existing capacity deficiencies and assess the need for improvements to convey and treat projected wastewater flows through the Buildout planning period.

The data documented in this report, including the flow monitoring results and wastewater flow projections, were utilized in the capacity analyses. Wastewater hydraulic modeling was performed to assess peak wet weather flows under a design storm. Peak flows were also developed and assessed at a lift station service area level by multiplying the distributed dry weather flow monitoring data by peaking factors for sizing of lift stations.

Various combinations of improvements and modifications were investigated to assess the most appropriate approach for conveying the projected peak wastewater flows and treating the projected annual average wastewater flows. Considerations in developing the wastewater capacity capital improvements plan (CIP) included increasing system reliability, simplifying system operations, conveying peak wet weather flows, and reducing surcharging and sanitary sewer overflows.

7.1 DESIGN STORM

Design storms are utilized in wastewater hydraulic models to develop peak wastewater flows that inform the sizing and cost of capital improvements. A 2-year, 24-hour design storm was utilized for this study. This design storm is commonly used in Texas and provides a reasonable balance between level of service and wastewater infrastructure cost. Information from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 database was utilized to develop the depth, peak intensity, and distribution characteristics of the 2-year, 24-hour design storm for analyzing League City's collection system. The two-year 24-hour design storm for the City of League City is an approximately 5.42-inch rainfall event.

When the design storm is applied to the calibrated model, the effects of I/I in the system can be seen. The model determines the point in time at which the amount of water from the design storm event reaches the peak within the system. This peak represents the most taxing load the system experiences under the design storm event.

7.2 DESIGN CRITERIA AND LIFT STATION INFLUENCE

7.2.1 Design Criteria for Manholes and Gravity Lines

When determining the number of manholes for proposed wastewater lines, the TCEQ provides specific design criteria. TCEQ §217.55 (g) dictates the manhole spacing requirements found in **Table 7-1**.

Table 7-1: TCEQ Maximum Manhole Spacing

Diameter of Pipe *(inches)*	Maximum Manhole Spacing *(feet)*
6-15	500
18-30	800
36-48	1,000
54 or larger	2,000

When determining the size of proposed wastewater lines, the TCEQ provides specific design criteria. TCEQ §217.53 (l)(1) dictates that collection systems must be designed to maintain a minimum velocity of 2 feet/second. Maintaining these velocities discourages the settling of solids. In accordance with this, the TCEQ has established minimum slope guidelines in §217.53 (l)(2)(A). These are shown in **Table 7-2**. Additionally, TCEQ §217.53 (j)(3) states "An owner must ensure that the collection system has capacity to prevent a surcharge."

Table 7-2: TCEQ Minimum Slopes

Diameter of Gravity Line (in)	Minimum Slope (ft/ft)
6	0.00500
8	0.00335
10	0.00250
12	0.00200
15	0.00150
18	0.00115
21	0.00095
24	0.00080
27	0.00070
30	0.00060
33	0.00055
36	0.00045
39	0.00040

For pipelines greater than 39-inches in diameter, the slope is determined by Manning's formula to maintain a velocity greater than 2.0 feet/second and less than 10 feet/second when flowing full.

7.2.2 Design Criteria for Lift Stations and Force Mains

TCEQ design criteria §217.61 (c) states "The firm pumping capacity of a lift station must handle the peak flow." Firm pumping capacity is defined as the maximum pumping capacity with the largest pumping unit out of service. TCEQ §217.67 (a) also states that force mains shall be sized to convey the lift station pumping capacity at a minimum velocity of 3 feet/second for duplex lift stations and 2 feet/second with one pump operating at a lift station with three or more pumps.

At lift stations where expansion in firm pumping capacity is recommended, the existing wet wells were evaluated for capacity based on the TCEQ minimum pump cycle times. These cycle times are listed in **Table 7-3**.

Table 7-3: TCEQ Minimum Pump Cycle Times

Pump Horsepower	Minimum Cycle Times (minutes)
< 50	6
50 – 100	10
> 100	15

The proposed wastewater lines, force mains, and lift station firm pumping capacities in the wastewater CIP (**Section 9.0**) are sized to convey the projected peak wastewater flows in accordance with these TCEQ criteria.

7.2.3 Lift Station Influence

The majority of the wastewater in the League City collection system is pumped by one or more lift stations en-route to a water reclamation facility. A lift station schematic was created (**Figure 2-3**) to document the hierarchy and relationship of each lift station to any upstream and downstream lift stations. The existing and future system analyses in this study considered the firm pumping capacities of any upstream lift stations, as detailed on the lift station schematic.

7.3 COLLECTION SYSTEM CAPACITY ANALYSES

The sections below summarize the results of the capacity analyses under peak wet weather flow conditions for existing lift stations and gravity lines.

7.3.1 Lift Station Firm Pumping Capacity Analyses

The flow monitoring results, lift station SCADA, wastewater flow projections, hydraulic modeling, and lift station service area peak flow analyses showed that the six lift stations in **Table 7-4** have a lack of firm pumping capacity to convey the combination of existing and future projected peak wastewater flows.

Table 7-4: Lift Station Capacity Analyses Results

Lift Station	Firm Pumping Capacity (MGD)		Wet Well Capacity Analysis
	Existing	Required *(Buildout Flow)*	
Butler Road	14.7	16.0	Existing wet well has available capacity
Countryside 2	1.15	2.7	New wet well required
MUD 6	0.86	1.15	New wet well required
North Service Area	1.76	3.1	Existing wet well has available capacity
Pedregal	0.56	1.5	New wet well required
Smith Lane	5.83	7.6	New wet well required

In addition to the facilities listed in **Table 7-4**, the analysis identified a capacity reduction project at the Bay Colony 7 West 2 LS. Separately, the Harbour Park 1 lift station has an ongoing capacity increase to 3.0 MGD.

Recommended Lift Station Transfers

Based on analysis of the collection system and WRF capacities, FNI recommends the following transfers:

- Transfer the West Main LS from the **Southwest WRF** to the **Dallas Salmon WRF** service area
- Transfer the Bay Colony 1 14-15 and Victory Lakes Lift Stations from the **Dallas Salmon WRF** service area to the **Southwest WRF** service area.

These recommended lift station transfers are discussed further in **Section 8.0**.

7.3.2 Gravity Line Conveyance Capacity Analyses

The flow monitoring results, wastewater flow projections, hydraulic modeling, and lift station service area peak flow analyses showed that the **existing 21/24-inch gravity line along West Main Street from Palomino Lane to the West Main LS** does not have capacity to convey the Buildout projected peak wastewater flows.

8.0 WRF SERVICE AREA OPTIMIZATION AND CAPACITY ANALYSES

The wastewater flow projections developed in **Section 5.0** show that additional treatment capacity is needed by buildout to accommodate the projected average daily flows in the WRF service areas. The City is currently in the process of designing an expansion of the Southwest WRF from 4.0 MGD to 8.0 MGD that is anticipated to be in service within the 5-year planning period. To maximize treatment capacity and optimize flow rates and operations at each WRF, it is recommended to modify the WRF service areas, as discussed below.

Operational Plan to Optimize WRF Service Areas

A proposed operational plan to maximize the treatment capacity at both WRFs, as well as accomplish other operational objectives, is laid out as follows:

- **2023 Planning Period**: Pump all flows from the West Main Lift Station to the **Dallas Salmon WRF** Service Area through the **existing transfer valve** to the Butler Road Lift Station.
- **5-Year Planning Period**: Pump all flows from the Bay Colony 1 Lift Station to the **Southwest WRF** Service Area (via **CIP Project 1**).
- **10-Year Planning Period**: Pump all flows from the Victory Lakes Lift Station to the **Southwest WRF** Service Area (via **CIP Project 16**).

The WRF service area optimizations and operational plan is illustrated on **Figure 8-1**. The CIP projects referenced above are discussed in **Section 9.0**. Additional information and background for the lift stations discussed in the operational plan is included below. The **Southwest WRF** capacity expansions referenced herein are discussed in **Section 8.1**.

West Main Lift Station

The portion of the collection system served by the West Main Lift Station currently has the ability to be pumped to the **Southwest WRF** or to the **Dallas Salmon WRF**. Under existing operations, the City sends flows from the West Main Lift Station service area to the **Southwest WRF** via an 18-inch force main that reduces to a 10-inch diameter force main. The 10-inch force main connects to the 10-inch diameter force main from the Countryside 2 LS and continues as a 14-inch shared force main to the Southwest WRF. This manifold force main operation results in the West Main and Countryside 2 Lift Stations pumping against each other and restricts the West Main Lift Station from utilizing its full firm capacity.

There is an existing transfer valve on the 18-inch force main downstream of the West Main Lift Station that has the ability to divert flows to the **Dallas Salmon WRF** service area. **It is recommended to close this valve, sending all flows (average day and peak) to the Dallas Salmon WRF** to allow the West Main Lift Station to pump at a higher capacity and reduce upstream surcharging.

Bay Colony 1 14-15 Lift Station

The Bay Colony 1 14-15 Lift Station currently pumps to the **Dallas Salmon WRF** via the Butler Road Lift Station. It is recommended in the 5-Year planning period (by 2028) to construct an additional section of 18-inch force main and transfer valve (**CIP Project 1**), allowing for flows from the Bay Colony 1 14-15 Lift Station to be diverted to the Southwest WRF Service Area. This would allow flow to be maintained in the 48-inch trunk line in the near-term while development occurs in the **Southwest WRF** Service Area.

Victory Lakes Lift Station

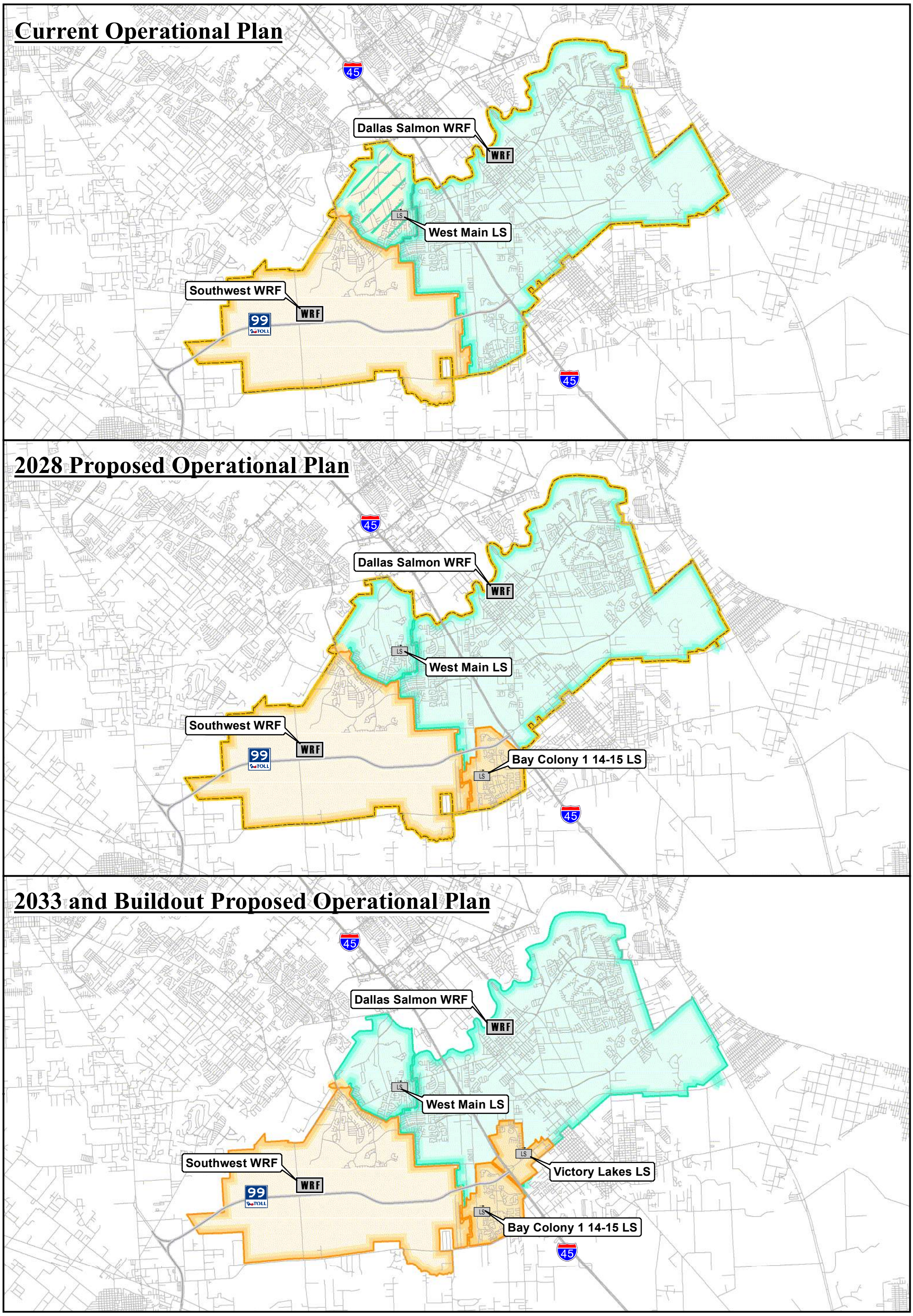
The Victory Lakes Lift Station currently pumps to the **Dallas Salmon WRF** via the Butler Road Lift Station. It is recommended to extend the existing 12-inch force main and upgrade pumping to send all flows to the **Southwest WRF** via **CIP Project 16** in the 10-year planning period (by 2033).

CITY OF LEAGUE CITY
FIGURE 8-1: SERVICE AREA OPTIMIZATION AND OPERATIONAL PLAN

Current Operational Plan

2028 Proposed Operational Plan

2033 and Buildout Proposed Operational Plan



League City TEXAS

FREESE AND NICHOLS

Dallas Salmon WRF Service Area

Southwest WRF Service Area

N

0 11,500

SCALE IN FEET

8.1 WATER RECLAMATION FACILITY CAPACITY EVALUATION

The Dallas Salmon and Southwest WRFs were evaluated for future capacity incorporating the service area optimizations and operational plan. The resulting adjustments to the projected average day flows to both facilities by planning period are shown on **Figure 8-2** and **Figure 8-3**.

8.1.1 TCEQ Evaluation Criteria (75/90 Rule)

Lines showing the *recommended* **permitted average day flow (ADF) capacity**, **90% of the permitted ADF capacity**, and **75% of the permitted ADF capacity** are shown on **Figure 8-2** and **Figure 8-3.** These lines are based on TCEQ §305.126, commonly referred to as the 75/90 rule, which requires a WRF permit holder to begin planning for expansion of the treatment facility when the average day or average annual flow reaches 75% of the permitted capacity for three consecutive months. When the average day or average annual flow reaches 90% of the permitted capacity, the permit holder shall obtain necessary authorization from the commission to commence construction of the necessary additional treatment facilities.

8.1.2 Future Wastewater Treatment Capacity

The proposed treatment capacity expansions for each Wastewater Reclamation Facility are as follows:

- **Dallas Salmon**: No expansion of treatment capacity recommended.
- **Southwest**: Expansion of treatment capacity to 8.0 MGD by 2028 and further expansion of treatment capacity to 12.0 MGD in the Buildout planning period (after 2033).

These treatment capacity expansion recommendations were developed based on the projected average day wastewater flows, the capacity requirements in TCEQ §305.126, and a minimum period of 5-10 years before another projected expansion would be needed for the WRF.

It should be noted that these proposed treatment capacity expansions are based on best available data, incorporating the projected wastewater flows and planning criteria discussed previously. If development locations, timing, or projected flows differ from those assumed in this study, the recommended WRF capacities and/or timing of expansions should be re-evaluated. The proposed WRF capacities by planning period are summarized in **Table 8-1.**

Table 8-1: Proposed Wastewater Treatment Capacity

Water Reclamation Facility	Average Daily Permitted Treatment Capacity (MGD)			
	2023	2028	2033	Buildout
Dallas Salmon WRF	12.0	12.0	12.0	12.0
Southwest WRF	4.0	8.0	8.0	12.0
Total Treatment Capacity	**16.0**	**20.0**	**20.0**	**24.0**

Figure 8-2: Dallas Salmon Projected Average Day Flows (as per Operational Plan)

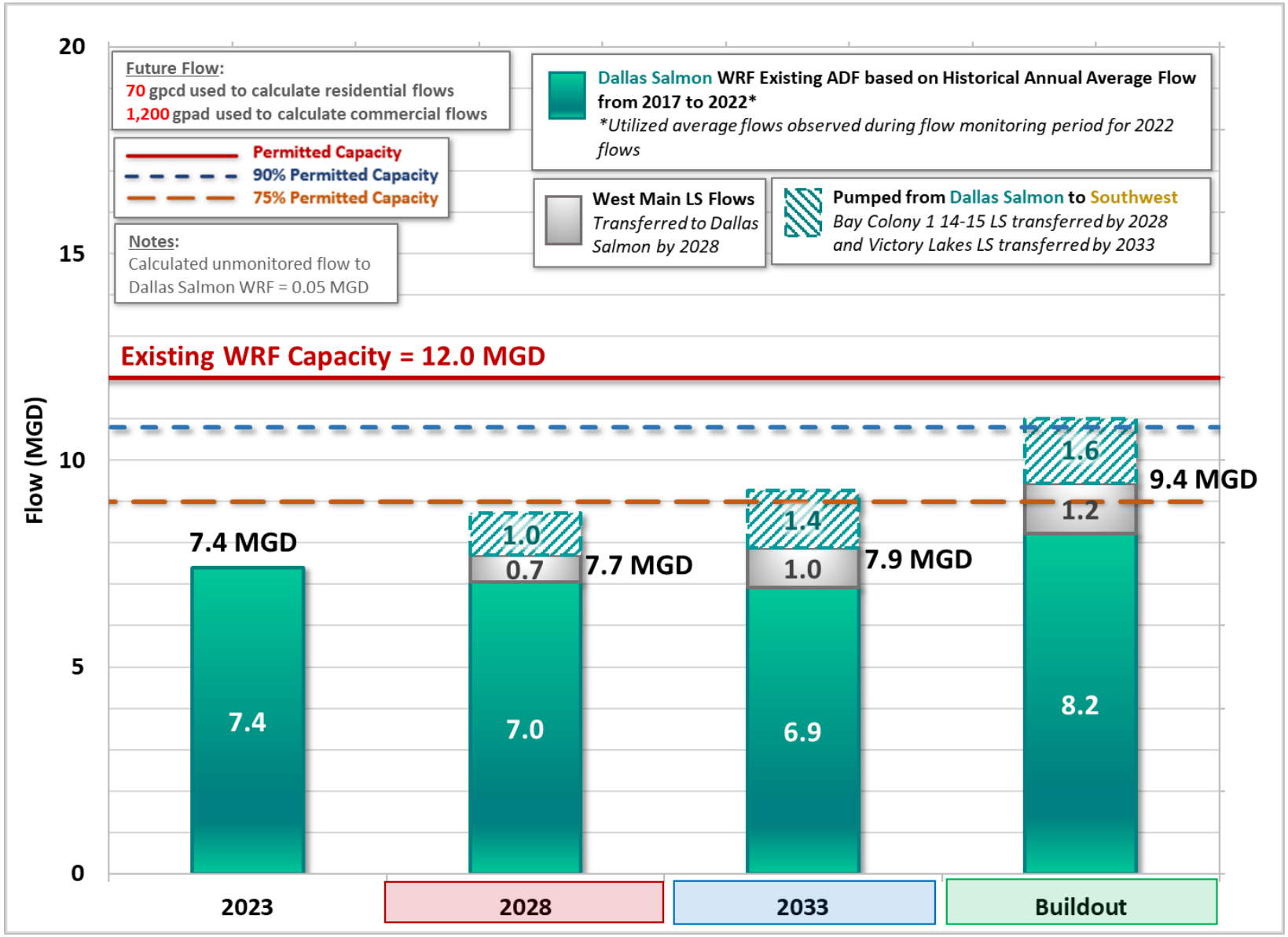
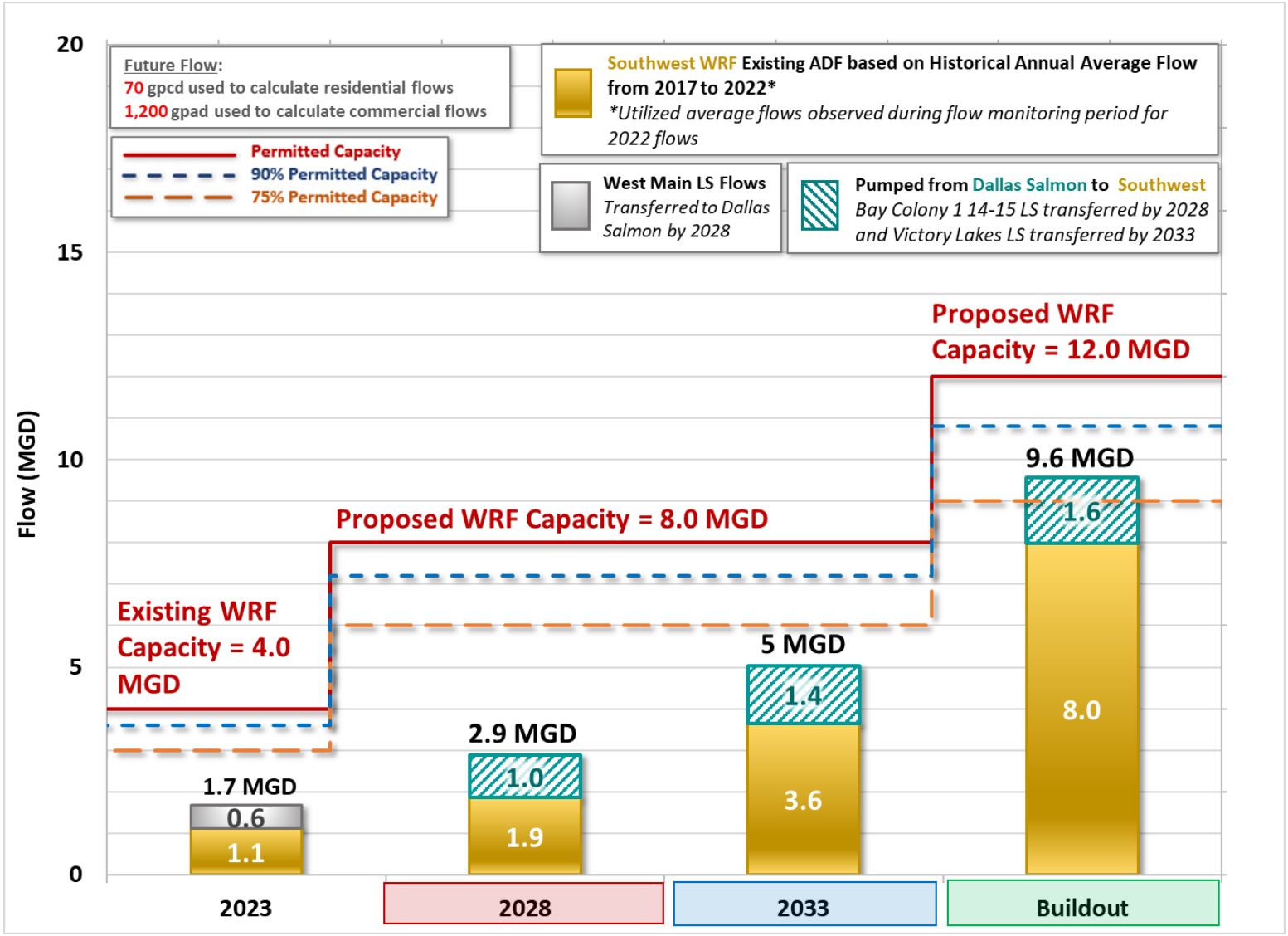


Figure 8-3: Southwest WRF Projected Average Day Flows (as per Operational Plan)



9.0 WASTEWATER CAPITAL IMPROVEMENTS PLAN

A wastewater system capital improvements plan (CIP) was developed for the City of League City. The complete wastewater CIP consists of the following components:

- Capacity CIP Projects – *documented in* ***Section 9.1***
- Sanitary Sewer Evaluation Study (SSES) CIP Projects – *documented in* ***Section 9.2***

The Capacity and SSES CIP projects are based on the wastewater system flow monitoring, land use assumptions, flow projections, hydraulic modeling, and system analyses discussed in the previous report sections. The recommended capacity projects improve the system's ability to convey wastewater flows and provide the required conveyance and treatment capacity to serve the projected residential and commercial growth through the Buildout planning period. Many of the recommended capacity projects also address existing condition and/or capacity issues in the existing wastewater system. The updated SSES program recommendations reprioritize flow meter basins based on 2023 data with the goal of addressing high I/I areas within the City's collection system.

9.1 CAPACITY CIP PROJECTS

The recommended wastewater collection and treatment projects are shown in **Table 9-1** and on **Figure 9-1.** The planning level OPCCs for each project are included in **Appendix A**. Wastewater projects currently under design by the City are not included in the CIP and are shown in **orange** on **Figure 9-1.** The wastewater CIP projects are arranged and prioritized by planning period (**5-year**, **10-year**, and **Buildout**) based on projected timing of development and the priority of the projects. The projects and planning periods are shown as follows:

- **5-Year Projects**: These are shown **in red** and are recommended to be designed and constructed within the next 5 years (by 2028)
- **10-Year Projects**: These are shown **in blue** and are recommended to be designed and constructed within the next 10 years (by 2033)
- **Buildout Projects**: These are shown **in green** and are recommended to be designed and constructed by Buildout.

It is recommended that these projects be constructed generally in the order presented; however, development patterns may make it necessary to construct some projects sooner than anticipated. Locations shown for new lines and lift stations are generalized for hydraulic analyses. Specific alignments and sites will be determined as part of the design process. The recommended infrastructure is sized to

convey the projected Buildout peak wet weather wastewater flows. The sections below include the project description and purpose for each capacity CIP project.

Table 9-1: Wastewater Capacity CIP Summary

Phase	Project Number	Project Name	Cost[(1)] (2023 Dollars)
5-Year (by 2028)	1	Re-Route 18-inch Bay Colony 1 Force Main to Southwest Service Area	$4,395,600
	2	New 42-inch Southwest Area Trunk Line to Southwest WRF	$7,427,700
	3	Expansion of Pedregal Lift Station to 1.5 MGD Firm Capacity	$1,606,800
	4	New Southwest 48-inch Gravity Line Extension and Force Main Re-Route	$2,794,400
	5	Expansion of Butler Road Lift Station to 16.0 MGD Firm Capacity	$9,207,200
	6	Expansion of Countryside No. 2 Lift Station to 2.7 MGD Firm Capacity and Replacement 14-inch Force Main	$3,177,800
	7	New 1.1 MGD Firm Capacity FM 646 Lift Station, New 12-inch Gravity Lines, and New 8-inch Force Main	$6,851,200
	8	New 21-Inch Southwest Area Trunk Line	$1,951,700
	9	Expansion of MUD 6 Lift Station to 1.15 MGD Firm Capacity	$2,213,000
	10	New 21/30-inch Gravity Lines along Bay Area Boulevard (Westside)	$3,280,400
	11	1.7 MGD Lift Station and 10-inch Force Main south of Dickinson Bayou (Westside)	$3,070,100
	12	Wastewater Master Plan and CRF Update	$850,000
		Total 2023 - 2028	**$46,825,900**
10-Year (by 2033)	13	Reconstruction of Meadow Bend STP Lift Station and Replacement 10/15/24-inch Sugar Wood/Edelweiss Dr. Gravity Mains	$8,113,500
	14	Expansion of North Service Area Lift Station to 3.1 MGD Firm Capacity and 30-Inch Replacement Gravity Main	$5,095,400
	15	Expansion of Smith Lane Lift Station to 7.6 MGD Firm Capacity	$7,539,500
	16	Upgrade Pumping HP at Victory Lakes Lift Station and Re-Route/Extend 12-inch Force Main	$7,057,700
	17	New 15-inch Gravity Line along Maple Leaf Drive (Westside)	$2,081,500
	18	27-inch Gravity Line to serve Stedman West, Martron, Sealy Land, Bofysil, and Custer developments (Westside)	$2,645,200
	19	15-inch and 18-inch Gravity Lines, 3.5 MGD lift Station and 12-inch Force Main to serve Custer, Bofysil, Sealy Land and Martron developments (Westside)	$15,814,600
		Total 2029 - 2033	**$48,347,400**
Buildout	20	Expansion of Southwest WRF by 4.0 MGD to a Permitted ADF of 12.0 MGD	$124,800,000
		Total Buildout	**$124,800,000**
		Total Buildout Capacity Wastewater CIP Cost	**$219,973,300**

(1) Existing/under design project costs based on portion of capital cost paid by the City. Planning level costs were developed for proposed future projects and include material costs and contingency. Additional expenses related to engineering, environmental, geotechnical, change order contingency, soft costs, and legal fees are not included.

Note: The FNI Team has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable construction costs provided are based on the information available at the time of preparation and represent only the FNI Team's judgment based on industry experience. The FNI Team cannot and does not guarantee the proposals, bids, or actual construction costs will not vary from the opinion of probable construction costs.

Development of Capital Costs

Planning level opinions of probable construction costs (OPCCs) were developed for all recommended improvements in 2023 dollars based on previous similar engineering experience and include allowances for the following:

- **Contingencies:** A 30% contingency was utilized for all future projects. This is the cost assigned to the unknowns in the definition of the project. The contingency is intended to account for construction costs that have not yet been identified due to the project's maturity and should be expected to be fully utilized during construction.

- **Engineering/Survey:** For this study, engineering and survey was set at 20% for projects including facilities and at 15% for linear-only projects. The engineering and survey portion of the OPCC accounts for costs projected to be incurred for design, geotechnical, subsurface, environmental engineering, and survey tasks during the design of a project.

Costs do not include financing, inflation, individual service connections or subdivision lines, easements, or land acquisition. The pipeline and manhole unit costs utilized in the development of the OPCCs are provided in **Table 9-2.**

Table 9-2: Wastewater Capital Improvements Plan Unit Costs

Pipelines		Cost/Diam-in/LF
Force Mains		$18
Gravity Lines < 8-feet deep		$17
Gravity Lines 8 - 16-feet deep		$18
Gravity Lines > 16-feet deep		$20
Manholes		**Cost/Manhole**
4-ft Diameter	8-ft – 16-ft depth	$17,500
	>16ft – 24-ft depth	$21,500
	>24-ft – 30-ft depth	$25,500
5-ft Diameter	8-ft – 16-ft depth	$21,500
	>16ft – 24-ft depth	$25,500
	>24-ft – 30-ft depth	$29,500
6-ft Diameter	8-ft – 16-ft depth	$23,500
	>16ft – 24-ft depth	$28,500
	>24-ft – 30-ft depth	$33,500

Westside CIP Service Areas

The City's Westside area has multiple anticipated future developments. The projects that are included in the proposed CIP are expected to serve multiple future developments. The figure included in **Appendix G** shows the anticipated service areas for the proposed CIP projects in the Westside area. These service areas were developed by analyzing ground elevation, existing site constraints such as waterbodies, and future development plans.

Lift Station Capacity Reduction Project

Based on the pump capacity information collected during this study, it appears the Bay Colony 7 West 2 Lift Station is oversized for its service area. Bay Colony 7 West 2 LS is repumped by Bay Colony 6 West 1 LS which has a lower pumping capacity. It is recommended that the City conduct flow monitoring and a pump drawdown test to confirm the existing Bay Colony 7 West 2 LS flow and firm capacity and consider a capacity reduction plan if warranted.

Developer Projects

Wastewater infrastructure anticipated to be constructed by future development is indicated in **purple** on **Figure 9-1.** The City anticipates infrastructure that will serve a single development will be constructed by the developer. A portion of these lines are in the Westside area.


FIGURE 9-1
CITY OF LEAGUE CITY
WASTEWATER SYSTEM
CAPACITY CAPITAL IMPROVEMENTS PLAN
LEGEND
Under Design/Construction
Lift Station
Water Reclamation Facility
Gravity Main
5 Year Improvements
Valve
Lift Station
Gravity Main
Force Main
10 Year Improvements
Lift Station
Gravity Main
Force Main
Existing System
Manhole
Force Main
Developer Improvements
Lift Station
Valve
Lift Station
Water Reclamation Facility
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Railroad
City Limits
ETJ
Other City Limit
The timing of projects shown is subject to change based on development patterns. The utility alignments shown in this figure are for illustration purposes only and do not set the alignments. The alignment of each utility will be determined at the time of the engineering design.
12 Wastewater Master Plan & CRF Update
Southwest WRF
Permitted Capacity
Average Daily Flow: 4.0 MGD
Peak Flow: 12.0 MGD
Proposed ADF Capacity = 8.0 MGD
Expansion to 12.0 MGD
Countryside 2 LS
Firm Capacity = 1.2 MGD
Proposed Capacity = 2.7 MGD
Dallas Salmon WRF
Permitted Capacity
Average Daily Flow: 12.0 MGD
Peak Flow: 36.0 MGD
North Service Area LS
Firm Capacity = 1.7 MGD
Proposed Capacity = 3.1 MGD
Smith Lane LS
Firm Capacity = 5.7 MGD
Proposed Capacity = 7.6 MGD
Meadow Bend STP
Firm Capacity = 4.7 MGD
Lift Station Reconstruction
Harbour Park 1 LS
Firm Capacity = 1.7 MGD
Design Capacity = 3.0 MGD
Proposed Lift Station
Firm Capacity = 0.35 MGD
MUD 6 LS
Firm Capacity = 0.86 MGD
Proposed Capacity = 1.15 MGD
Butler Road LS
Firm Capacity = 14.7 MGD
Proposed Capacity = 16.0 MGD
FM 646 LS
Proposed Capacity = 1.1 MGD
South Hwy 3 LS
Firm Capacity = 0.86 MGD
Shellside LS
Firm Capacity = 0.73 MGD
Victory Lakes LS
Firm Capacity = 3.2 MGD
Pump HP Upgrade and Force Main Extension
Bay Colony 7 West 2 LS
Firm Capacity = 2.48 MGD
Firm Capacity Reduction = 0.44 MGD
Pedregal LS
Firm Capacity = 0.56 MGD
Proposed Capacity = 1.5 MGD
Lloyd Tract LS
Firm Capacity = 1.7 MGD
Westside LS
Firm Capacity = 0.86 MGD
Proposed Capacity = 3.5 MGD
Davis Road 1 (North) LS
Firm Capacity = 1.3 MGD
Davis Road 2 (South) LS
Firm Capacity = 1.7 MGD
Re-route Force Mains to Gravity Line
Proposed Transfer Valves
Existing Transfer Valve
South Shore Harbour 4 LS
Waterford 2 LS
Glen Cove LS
Waterford 1 LS
Beacon Island LS
Marina Palms LS
Harbour Park 2 LS
Constellation LS
Fairway Apt LS
South Shore Harbour 2 LS
Harbour Park 3 LS
East Main LS
South Shore Harbour 3 LS
South Shore Lakes LS
Bayou Brae LS
South Shore Harbour 1 LS
Access Storage LS
Coronado LS
Meadow Bend Parkway LS
Old EMS LS
Woodcock LS
Webster LS
Tuscan Lakes 1 LS
Mar Bella LS
Bay Ridge LS
Costal Pointe LS
South Shore MUD 7 LS
Clear Creek Crossing LS
Lift Station 21
Old EMS LS
Clear Creek Village LS
Corum LS
Tuscan Lakes 2 LS
Hewitt Street LS
Line Repair Building LS
Dickenson LS
Hobbs LS
Landing LS
Center Pointe 1 LS
Autumn Lakes LS
Amber Lane LS
West Main LS
Countryside Park LS
Countryside STP LS
Knights of Columbus LS
Countryside 1 LS
Sportsplex 2 LS
Center Pointe 2 LS
Sportsplex 1 LS
Brookside LS
Buisness Park LS
Brittany Lakes 1 LS
Bay Oil and Gas LS
Magnolia Creek North LS
Brittany Lakes 2 LS
Kid City LS
Westover Park LS
Space Storage 646 LS
Magnolia Creek South LS
Target LS
Bay Colony 2 Parkside LS
Sedona LS
Bay Colony 3 Meadows LS
Bay Colony 5 Lakes LS
Dove Meadows 2 LS
Bay Colony 1 14-15 LS
Dove Meadows 1 LS
Bay Colony 6 West 1 LS
Bay Colony 4 Retreat LS
Mary Lane LS
SCALE IN FEET
0 2,500 5,000
FREESE AND NICHOLS
League City TEXAS

9.1.1 Ongoing Wastewater Capital Improvement Projects

The following projects are under design or planned to begin design in 2023. A brief description of planned improvements, as understood by FNI, is provided for each project.

Project A - Southwest WRF 4.0 MGD Expansion from 4.0 MGD to 8.0 MGD

The City is beginning planning and design work for the expansion of the Southwest WRF from 4.0 MGD to 8.0 MGD average daily flow capacity in summer of 2023. This expansion is anticipated to be online within the 5-year planning period.

Project B - Harbour Park 1 Lift Station Expansion

This project includes the expansion of the Harbour Park 1 Lift Station from 1.7 MGD to 3.0 MGD. It is also recommended that the upstream 10/16/18-inch gravity line along South Compass Rose Boulevard be expanded to 21-inches.

Project C - Replacement 15-Inch Willow Branch and 21-Inch FM 518 Gravity Lines

This project includes the construction of replacement 15-inch and 21-inch gravity lines along Willow Branch and FM 518.

9.1.2 Capacity CIP: Five-Year Projects (2023 - 2028)

Project 1 – Re-Route 18-inch Bay Colony 1 Force Main to Southwest Service Area

Project Description: This project includes the construction of a segment of 18-inch force main to allow for pumped flow from the Bay Colony 1 14-15 Lift Station to be conveyed to the Southwest WRF via the 48-inch Grand Parkway Trunk Line.

Project Drivers: This project allows for wastewater flows to be maintained in the recently constructed trunk line in the near-term while development occurs in the Southwest WRF Service Area. This project is also part of the WRF service area optimization to maximize treatment capacities at both treatment facilities.

Project 2 – New 42-inch Southwest Area Trunk Line to Southwest WRF

Project Description: This project includes the construction of a 42-inch gravity trunk line in the Southwest WRF service area, west of the Southwest WRF. This project is anticipated to approximately follow the future Grand Parkway alignment.

Project Drivers: This project is sized to convey the projected buildout peak wastewater flows west of McFarland Road. This project is planned to tie into the recently constructed Grand Parkway Trunk Line.

Project 3 – Expansion of Pedregal Lift Station to 1.5 MGD Firm Capacity

Project Description: This project includes the expansion of the firm pumping capacity to 1.5 MGD. The expansion is planned to utilize the existing wet well and force main.

Project Drivers: The projected peak buildout wastewater flows indicate the need for additional pumping capacity and force main capacity due to anticipated future development to the south.

Project 4 – New Southwest 48-inch Gravity Line Extension and Force Main Re-Route

Project Description: This project includes the construction of approximately 1,800 feet of 48-inch gravity line within the Southwest WRF service area, and the re-routing of two 14-inch force mains.

Project Drivers: The force mains from the Westover Park and Countryside 2 Lift Stations currently discharge into a manhole adjacent to the Southwest WRF Influent Lift Station near the facility headworks. This creates a turbulent environment where H2S gasses are corroding the manhole. This CIP project includes the re-routing of those force mains into a new manhole and 48-inch gravity line on the northern portion of the Southwest WRF, thereby moving the corrosive gasses away from sensitive equipment. The 48-inch gravity line is sized for the buildout projected peak flows from the Westover Park and Countryside 2 Lift Stations, including additional room for the West Main lift stations to continue to pump into the Southwest WRF if needed.

Project 5 – Expansion of Butler Road Lift Station to 16.0 MGD Firm Capacity

Project Description: This project includes expansion of the firm pumping capacity at the Butler Road Lift Station to 16.0 MGD. This project only includes replacement pumps, electrical and piping. It is expected that the wet well would not need to be upgraded for this expansion.

Project Drivers: The Butler Road lift station repumps multiple lift stations, including Bay Colony 1 14-15. The West Main lift station can also convey flows to Butler LS. It is recommended that the future flows from Bay Colony 1 14-15 are directed to the recently constructed trunk line along Grand Parkway and the West Main LS is pumped to the Dallas Salmon WRF via Butler. The capacity expansion will allow Butler LS to repump the ultimate flows directed to this lift station. It is recommended that the City conduct draw down tests at the lift station pumps to identify the actual pumping capacity during the PER phase.

Project 6 – Expansion of Countryside No. 2 Lift Station to 2.7 MGD Firm Capacity and Replacement 14-inch Force Main

Project Description: This project includes the reconstruction of the Countryside 2 Lift Station at 2.7 MGD firm pumping capacity and a replacement 14-inch force main from the lift station to the existing 14-inch along the canal to the Southwest WRF.

Project Drivers: The lift station expansion and replacement force main is sized to convey the projected buildout peak wastewater flows and upstream pumping capacities.

Project 7 – New 1.1 MGD Firm Capacity FM 646 Lift Station, New 12-inch Gravity Lines, and New 8-inch Force Main

Project Description: This project includes the construction of a new 1.1 MGD firm capacity lift station along FM 646, and the construction of 12-inch gravity lines and a 8-inch force main.

Project Drivers: The proposed lift station and gravity mains would serve development along FM 646 east of FM 270 and west of FM 1266. This project is sized to convey the projected buildout peak wastewater flows in this area.

Project 8 – New 21-Inch Southwest Area Trunk Line

Project Description: This project includes the construction of a 21-inch gravity trunk line in the Southwest WRF service area, west of the Southwest WRF. This project is anticipated to approximately follow the future Grand Parkway alignment.

Project Drivers: This project is sized to convey the projected buildout peak wastewater flows from west of McFarland Road. This project is planned to tie into the 42-inch gravity line (Project 2).

Project 9 – Expansion of MUD 6 Lift Station to 1.15 MGD Firm Capacity

Project Description: This project includes the expansion of the MUD 6 Lift Station from 0.86 MGD to a firm pumping capacity of 1.15 MGD.

Project Drivers: The SCADA of the MUD 6 lift station shows surcharging within the lift station wet well during one of the flow monitored wet weather events. The lift station expansion is needed to serve existing and projected buildout flows from future developments in the MUD 6 lift station service area and the upstream Amber Lane and Landing Lift Stations.

Project 10 – New 21/30-inch Gravity Lines along Bay Area Boulevard (Westside)

Project Description: This project includes the construction of a 21-inch gravity main from Dickinson Bayou going up to a 30-inch gravity main and flowing to the existing Grand Parkway Trunk Line.

Project Drivers: This proposed gravity main would serve the Lloyd Tract development south of the Grand Parkway Trunk Line. This project is sized to convey the projected buildout peak wastewater flow from these developments.

Project 11 – 1.7 MGD Lift Station and 10-inch Force Main south of Dickinson Bayou (Westside)

Project Description: This project includes the construction of a new 1.7 MGD lift station and 1,500 LF of 10-inch force main to carry flow for developments south of Dickinson Bayou.

Project Drivers: This proposed gravity main would serve the Lloyd Tract, Westland Ranch, Sealy Land, Martron and Lloyd Tract west developments . This project is sized to convey the projected buildout peak wastewater flow from these developments across Dickinson Bayou.

Project 12 – Wastewater Master Plan and CRF Update

Project Description: This project includes an update to the City's Wastewater Master Plan and CRF study. This project also includes additional flow monitoring with the intent of capturing updated inflow and infiltration (I/I) levels throughout the City.

Project Drivers: Texas Local Government Code (TLGC) Chapter 395 requires 5-year updates to the wtaer and wastewater capital recovery fees.

9.1.3 Capacity CIP: Ten-Year Projects (2029 - 2033)

Project 13 – Reconstruction of Meadow Bend STP Lift Station and Replacement 10/15/24-inch Sugar Wood/Edelweiss Dr. Gravity Mains

Project Description: This project includes the reconstruction of the Meadow Bend STP Lift Station with a deeper wet well, and the construction of replacement 12/15/24-inch gravity lines upstream of the lift station.

Project Drivers: The 2017 flow monitoring data and historical design plans indicate surcharging during dry weather and the need for a deeper wet well with more active volume. Reconstruction of the Meadow Bend STP lift station with a deeper wet well will provide adequate active volume and will remove the observed surcharging from the influent pipes as required per TCEQ §217.60(a)(1).

Project 14 – Expansion of North Service Area Lift Station to 3.1 MGD Firm Capacity and 30-Inch Replacement Gravity Main

Project Description: This project includes the installation of a third pump at the recently constructed North Service Area lift station to bring the firm pumping capacity to 3.1 MGD. There is currently a third slot for a future pump. The wet well has adequate capacity. This project also includes approximately 1,900 feet of 30-inch gravity line along West Main Street from Palomino Lane to the West Main Lift Station.

Project Drivers: The projected buildout wastewater flow indicate the need for additional pumping and gravity line conveyance in this area.

Project 15 – Expansion of Smith Lane Lift Station to 7.6 MGD Firm Capacity

Project Description: This project includes the expansion of the Smith Lane Lift Station from 5.7 MGD to a firm pumping capacity of 7.6 MGD. This project assumes the construction of a second wet well for the required additional volume.

Project Drivers: This project is sized to convey the projected buildout peak wastewater flows from the Smith Lane service area.

Project 16 – Upgrade Pumping HP at Victory Lakes Lift Station and Re-Route/Extend 12-inch Force Main

Project Description: This project includes electrical and pump upgrades at the Victory Lakes Lift Station and approximately 17,600 feet of 12-inch force main.

Project Drivers: This project will re-direct wastewater flows from the Dallas Salmon WRF service area to the Southwest WRF service area to optimize flow rates and operations at each WRF.

Project 17 – New 15-inch Gravity Line along Maple Leaf Drive (Westside)

Project Description: This project includes the construction of a new 15-inch gravity main along Maple Leaf Drive going to the proposed Grand Parkway Trunk Line.

Project Drivers: This proposed gravity main would serve the Martron, Lloyd Tract West developments. This project is sized to convey the projected buildout peak wastewater flow from these developments.

Project 18 – 27-inch Gravity Line to serve Stedman West, Martron, Sealy Land, Bofysil, and Custer developments (Westside)

Project Description: This project includes the construction of a new 27-inch gravity main conveying flow from the Stedman West, Martron, Sealy Land, Bofysil, and Custer developments to the proposed Southwest Area Trunk Line.

Project Drivers: This project is sized to convey the projected buildout peak wastewater flow from the Stedman West, Martron, Sealy Land, Bofysil, and Custer developments.

Project 19 – 15-inch and 18-inch Gravity Lines, 3.5 MGD lift Station and 12-inch Force Main to serve Custer, Bofysil, Sealy Land and Martron developments (Westside)

Project Description: This project includes the gravity mains, lift station and force main needed to serve the Custer, Bofysil, Sealy Land and Martron developments and convey projected flows to the 27-inch gravity (Project 18).

Project Drivers: The gravity mains are sized to convey the buildout peak wet weather flows to the new lift station which is sized to handle the cumulative flows from the lines and convey them across Dickinson Bayou to the 27-inch gravity line (Project 18).

9.1.4 Capacity CIP: Buildout Projects (Beyond 2033)

Project 20 – Expansion of Southwest WRF by 4.0 MGD to a Permitted ADF of 12.0 MGD

Project Description: This project includes expansion of the existing Southwest WRF average daily flow capacity to 12 MGD (4.0 MGD Expansion).

Project Drivers: The wastewater flow projections in the Southwest WRF Service Area show the need for additional treatment capacity at this facility beyond 10 years.

9.2 SSES CIP PROGRAM

Flow Monitoring Correlation (2023 vs. 2017)

Flow monitoring data collected during this study was utilized to review and update the City's SSES plan developed in 2017 (**Appendix H**). This update included a revision of the SSES basin prioritization plan to address the sewer basins contributing the greatest amounts of inflow and infiltration (I/I) throughout the City based on the latest flow monitoring data collected during this study. The 2017 study utilized 28 flow meters. During the 2023 study, the strategic decision was made to utilize 16 flow meters. The 2023 flow monitoring data was utilized and combined where applicable with the 2017 flow monitoring data to update League City's SSES Program recommendations. **Table 9-3** provides correlation between the 2017 flow meter basins and the 2023 flow meter basins. It should be noted that the 2023 flow meter locations in the Dallas Salmon service area cover larger areas (i.e. combine multiple basins from the 2017 study). As such, the 2023 Update to the SSES Program recommendations primarily utilized the 2017 flow meter I/I basin data in the Dallas Salmon WRF service area.

Table 9-3: Flow Monitoring Basins References between 2017 and 2023 studies

2023 Flow Meter Basin	2017 Flow Meter Basin(s)
FM-01	LC-19, part of LC-15
FM-02	LC-18, LC-21, LC-22, LC-24, LC-25, LC-26
FM-03	LC-14, LC-16, LC-27, LC-28
FM-04	LC-05
FM-05	LC-04
FM-06	LC-08
FM-07	part of LC-15
FM-08	LC-09
FM-09	LC-07, LC-10
FM-10	LC-03
FM-11	LC-17
FM-12	LC-02
FM-13	LC-20
FM-14	LC-12, LC-13
FM-15	LC-11
FM-16	LC-06, LC-23
FM-17A(1)	LC-01
FM-17B(1)	-

(1) Flow meters FM-11 and FM-12 were moved to the FM-17 location on 11/14/2022 to capture flows to the Countryside STP LS.

9.2.1 Existing SSES Program

The results of the 2017 flow monitoring and I/I calculations were utilized to develop a prioritized list of basins in which to conduct SSES field investigations and subsequently perform rehab design and construction. Since 2017, the City has packaged multiple flow meter basins into three phases of an SSES Program. **Table 9-4** summarizes the progress on SSES field investigations and rehab for each phase to date.

The SSES field investigation activities have included various combinations of CCTV, dye water flooding, manhole inspections, and smoke testing. The rehab recommendations were developed based on the field inspections and included point repairs, line rehabilitation and replacement, manhole rehabilitation and replacement, and replacement and rehab of service lines (laterals). A comprehensive list of the recommended replacement and rehabilitation work and corresponding address locations by the City's SSES Rehab work consultant, AARK Engineering, is provided in **Appendix I**.

Table 9-4: Existing SSES Program Overview (2017 – 2023)

League City SSES Program Phase	2017 Basins	2023 Basin Reference	SSES Field Investigations Completed?	Rehab Completed?	Notes
Phase 1	LC-19	Part of FM-01	Yes	Yes	All Priority 1 and Priority 2 lines were rehabilitated or repaired, except for two (2) private sewer lines located in Rancho Del Rey Trailer Park as of 5/9/2023.
	LC-22	Part of FM-02			
	LC-09	FM-08			
Phase 2	LC-06	Part of FM-16	Yes	No	Rehab ongoing - Three (3) Priority 1 lines were rehabilitated recently and it appears that seven (7) concrete lines have been rehabilitated as of 5/9/2023.
	LC-09	FM-08			
	LC-15	FM-07 and Part of FM-01			
	LC-24	FM-02			
Phase 3	LC-25	Part of FM-02	Yes	No	SSES report completed in December 2023. Rehab work has not started as of 5/9/2023.
	LC-26	Part of FM-02			
	LC-12	Part of FM-14			
	LC-16	Part of FM-03			

9.2.2 2023 Update to SSES Program

SSES Basins 1-5

FNI utilized the City's 2017 SSES priority recommendations (**Appendix H**) and the 2023 flow monitoring I/I analysis data discussed in **Section 3.0** to update the City's SSES Program recommendations. Four of the sixteen 2023 meter basins (FM-17A, FM-15, FM-01, FM-12) in this study were identified as high I/I basins (greater than 4.0 Gal/LF/inch) during the 2023 flow monitoring phase. Three additional 2023 meter basins (FM-04, FM-14, and FM-07) had a calculated I/I rate above 3.5 Gal/LF/inch. Of these seven basins, the City already started SSES work on the FM-01 and FM-07 basins. The remaining five basins listed above are recommended to be the highest priority basins in the updated SSES Program recommendations.

SSES Basin 6

This basin was identified as a Priority 3 basin the 2017 SSES plan, but field inspections have not yet been performed in this area.

SSES Basins 7 - 19

SSES Basins 7-19 prioritize areas of the collection system based on the 2023 flow monitoring basin I/I ranking presented on **Figure 3-4**. Where multiple 2017 meter basins fell inside of a single 2023 flow meter basin in the Dallas Salmon service area, FNI utilized the 2017 basin boundaries and I/I prioritization ranking for the updated SSES Program recommendations. **Table 9-5** shows the updated, prioritized SSES basin information and **Figure 9-2** provides a map of these basins.

Table 9-5: Updated Wastewater SSES CIP Basins Prioritization

SSES Basin Prioritization No.	Flow Meter Basins		Length of Gravity Lines (LF)	No. of MHs
	2023 Flow Meter Basin	2017 Flow Meter Basin		
SSES - 1	FM-17A	LC-01	16,424	69
SSES - 2	FM-15	LC-11	17,341	137
SSES - 3	FM-12	LC-02	62,199	389
SSES - 4	FM-04	LC-05	21,743	94
SSES - 5	FM-14	LC-13	41,594	226
SSES - 6	FM-16	LC-23	49,704	299
SSES - 7	FM-03	LC-27	91,915	527
SSES - 8	FM-03	LC-28	46,169	341
SSES - 9	FM-03	LC-14	133,250	542
SSES - 10	FM-13	LC-20	28,715	153
SSES - 11	FM-06	LC-08	10,835	62
SSES - 12	FM-05	LC-04	70,359	366
SSES - 13	FM-10	LC-03	88,669	559
SSES - 14	FM-11	LC-17	53,026	245
SSES - 15	FM-09	LC-07	45,412	229
SSES - 16	FM-09	LC-10*	224,271	1,217
SSES - 17	FM-17B	-	5,661	32
SSES - 18	FM-02	LC-18	29,268	124
SSES - 19	FM-02	LC-21	87,622	424

(1) LC-10 boundary from the 2017 flow monitoring modified to account for new location of FM-15.

Veranda LS
Glen Cove LS
Waterford 2 LS
South Shore Harbour 4 LS
SSES-6
Beacon Island LS
Waterford 1 LS
Marina Palms LS
Harbour Park 2 LS
Davis Road 2 LS
Fairway Apt LS
Constellation LS
Harbour Park 1 LS
South Shore Harbour 2 LS
Davis Road 1 LS
Harbour Park 3 LS
Davis Rd LS
South Shore Lakes LS
South Shore Harbour 3 LS
East Main LS
Bayou Brae LS
South Shore Harbour 1 LS
SSES-18
Coronado LS
Access Storage LS
Meadow Bend STP
Smith Lane LS
Meadow Bend Parkway LS
Dallas Salmon WRF
Permitted Capacity
Average Daily Flow: 12.0 MGD
2-Hr Peak Flow: 36.0 MGD
WWTP
Dallas Salmon WRF Influent LS
New EMS LS
Woodcock LS
League City North Area LS
Webster LS
SSES-8
SSES-7
SSES-19
Mar Bella LS
Madrid Ln Coastal Point Sec 3 LS
Tuscan Lakes 1 LS
SSES-12
Bay Ridge LS
Lift Station 21
Clear Creek Village LS
Clear Creek Crossing LS
Amber Lane LS
South Shore MUD 7 LS
Old EMS LS
Autumn Lakes LS
Tuscan Lakes 2 LS
Bay Ridge LS
Corum LS
Line Repair Building LS
Dickinson LS
Hewitt Street LS
West Main LS
Hobbs LS
Space RV LS
Center Pointe 1 LS
Countryside Park LS
Landing LS
South Hwy 3 LS
SSES-1
SSES-4
Countryside STP LS
Butler Road LS
Sportsplex 2 LS
Countryside 1 LS
SSES-11
Sportsplex 1 LS
Shellside LS
Knights of Columbus LS
Center Pointe 2 LS
Business Park LS
SSES-17
MUD 6 LS
SSES-15
Brookside LS
SSES-9
Countryside 2 LS
Brittany Lakes 1 LS
Kid City LS
Bay Oil and Gas LS
SSES-10
Westover LS
Magnolia Creek North LS
SSES-5
Brittany Lakes 2 LS
SSES-16
Space Storage 646 LS
SSES-13
Victory Lakes LS
SSES-3
Target LS
SSES-14
Southwest WRF
Permitted Capacity
Average Daily Flow: 4.0 MGD
2-Hr Peak Flow: 12.0 MGD
Magnolia Creek South LS
Mag Creek Church LS
Bay Colony 2 Parkside LS
WWTP
Sedona LS
Bay Colony 3 Meadows LS
SW WRF Influent LS
54"
48"
Bay Colony 5 Lakes LS
Dove Meadows 2 LS
Bay Colony 1 14-15 LS
Bay Colony 7 West 2 LS
Dove Meadows 1 LS
Bay Colony 6 West 1 LS
Bay Colony 4 Retreat LS
Pedregal LS
SSES-2
Mary Lane LS
0
2,500
5,000
SCALE IN FEET

FIGURE 9-2

CITY OF LEAGUE CITY

2023 WASTEWATER MASTER PLAN UPDATE

SSES BASIN PRIORITIZATION

LEGEND

- Manhole
- Lift Station
- Water Reclamation Facility
- 8" and Smaller Wastewater Lines
- 10" and Larger Wastewater Line
- 8" and Smaller Force Main
- 10" and Larger Force Main
- Railroad
- Future SSES Basin
- Ongoing/Completed SSES Basin
- City Limits
- ETJ
- Other City Limit

League City TEXAS

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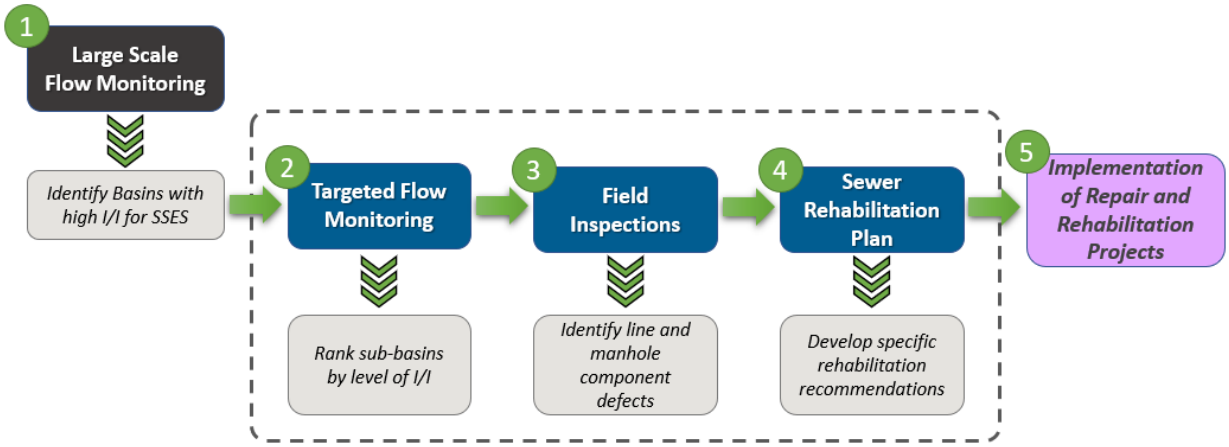
9.2.3 SSES Capital Improvements Plan

FNI recommends an SSES project approach for I/I reduction as shown on **Figure 9-3**.

Figure 9-3: SSES Project Approach for I/I Reduction



SSES Steps

1. The **Large Scale Flow Monitoring** was completed as part of this wastewater master plan project and is described in **Section 3.0**.
2. The **Targeted Flow Monitoring** breaks down the ten high I/I basins into smaller sub-basins and ranks these sub-basins based on observed I/I.
3. Results from Targeted Flow Monitoring inform decisions for the **Field Inspections**, that may include manhole inspection and CCTV/smoke testing on lines, in the appropriate sub basins.
4. Based on the findings from Field Inspections, a prioritized **Sewer Rehabilitation Plan** will be developed for the SSES areas.
5. The Sewer Rehabilitation Plan is implemented.

Step 1 was completed as part of this Wastewater Master Plan Update. The flow monitoring discussed in **Section 3.0** served as the large-scale flow monitoring discussed above.

Budgetary costs for Steps 2 – 4 were developed for each of the re-prioritized SSES basins in 2023 dollars utilizing the unit costs shown in **Table** 9-6**.** These unit costs are based on previous similar SSES studies. GIS information was utilized to approximate the linear footage of gravity lines and number of manholes for field inspections (Step 3). The inspection costs include smoke testing, line cleaning, and closed-caption television (CCTV) inspections and manhole survey/inspection. The planning level costs also include

allowances for 25% contingencies and approximate program management and rehab design costs. It should be noted that the costs in the SSES Potential Plan are only for investigation and design activities, and do not include the capital cost of infrastructure rehabilitation or replacement. The updated SSES Plan with planning level SSES costs are presented in **Table 9-7**.

Table 9-6: SSES Planning Level Unit Costs

Line Cleaning	Cost/LF
6-10-inch	$1.70
12-15-inch	$2.10
16-18-inch	$5.30
19-24-inch	$7.90
25-30-inch	$9.50
CCTV Inspection	**Cost/LF**
<21-inch	$1.60
>21-inch	$2.10
Smoke Testing	
Cost/LF	$0.50
Manhole Inspection	
Cost/Manhole	$135.00
Contingency	
Percentage	25%
Focused Flow Monitoring	
Cost/Flow Meter	$8,500

Table 9-7: SSES CIP Cost (Steps 2-4)

SSES Basin No.	Length of Gravity Lines (LF)	No. of MHs	SSES Cost (in 2023 Dollars)						Flow Meter Basins Reference	
			Focused Flow Monitoring[1]	Field Inspection[2]	Program Management[3]	Total SSES (w Contingency[4])	Rehab Design[5]	Total SSES Project	2023 Flow Meter Basin	2017 Flow Meter Basin
SSES - 1	16,424	69	-	$86,900	$75,000	$183,700	$100,000	**$283,700**	FM-17A	LC-01
SSES - 2	17,341	137	-	$82,200	$75,000	$173,700	$100,000	**$273,700**	FM-15	LC-11
SSES - 3	62,199	389	$25,500	$135,000	$125,000	$317,600	$150,000	**$467,600**	FM-12	LC-02
SSES - 4	21,743	94	-	$91,800	$75,000	$185,200	$100,000	**$285,200**	FM-04	LC-05
SSES - 5	41,594	226	$17,000	$116,700	$75,000	$235,500	$100,000	**$335,500**	FM-14	LC-13
SSES - 6	49,704	299	$17,000	$118,200	$75,000	$237,300	$100,000	**$337,300**	FM-16	LC-23
SSES - 7	91,915	527	$42,500	$202,100	$125,000	$418,600	$150,000	**$568,600**	FM-03	LC-27
SSES - 8	46,169	341	$17,000	$103,400	$75,000	$219,500	$100,000	**$319,500**	FM-03	LC-28
SSES - 9	133,250	542	$59,500	$277,400	$175,000	$579,300	$225,000	**$804,300**	FM-03	LC-14
SSES - 10	28,715	153	-	$68,900	$75,000	$157,700	$100,000	**$257,700**	FM-13	LC-20
SSES - 11	10,835	62	-	$43,500	$75,000	$127,200	$100,000	**$227,200**	FM-06	LC-08
SSES - 12	70,359	366	$34,000	$159,000	$125,000	$356,600	$150,000	**$506,600**	FM-05	LC-04
SSES - 13	88,669	559	$34,000	$192,500	$125,000	$396,800	$150,000	**$546,800**	FM-10	LC-03
SSES - 14	53,026	245	$25,500	$112,300	$125,000	$290,400	$150,000	**$440,400**	FM-11	LC-17
SSES - 15	45,412	229	$17,000	$98,100	$75,000	$213,200	$100,000	**$313,200**	FM-09	LC-07
SSES - 16	224,271	1,217	$93,500	$523,100	$250,000	$990,000	$300,000	**$1,290,000**	FM-09	LC-10*
SSES - 17	5,661	32	-	$25,100	$75,000	$105,200	$100,000	**$205,200**	FM-17B	-
SSES - 18	29,268	124	-	$70,900	$75,000	$160,100	$100,000	**$260,100**	FM-02	LC-18
SSES - 19	87,622	424	$34,000	$202,000	$125,000	$408,200	$150,000	**$558,200**	FM-02	LC-21
							Total	**$8,280,800**	-	-

(1) Approximately $8,500 per flow meter with at least 2 meters per basin. The number of flow meters utilized is based on 20,000 LF per flow meter and is to be revisited during SSES project implementation.
(2) Assumption of field inspection cost for 50% of lines and manholes for basins over 25,000 LF and 100% of lines and manholes for basins within 25,000 LF. Smoke testing for 10% of the inspected lines.
(3) Approximate program management and development of rehab recommendations based on basin size based and are to be revised based on field inspection data.
(4) SSES costs include 25% contingency on flow monitoring and field inspection efforts.
(*) LC-10 boundary from the 2017 flow monitoring modified to account for new location of FM-15.

APPENDIX A
Wastewater CIP Opinions of Probable Construction Costs (OPCCs)

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 1 **Phase:** by 2028

Project Name:	**Re-Route 18-inch Bay Colony 1 Force Main to Southwest Service Area**

Project Description:

This project includes the construction of a segment of 18-inch force main to allow for pumped flow from the Bay Colony 1 14-15 Lift Station to be conveyed to the Southwest WRF via the 48-inch Grand Parkway Trunk Line.

Project Drivers:

This project allows for wastewater flows to be maintained in the recently constructed trunk line in the near-term while development occurs in the Southwest WRF Service Area. This project is also part of the WRF service area optimization to maximize treatment capacities at both treatment facilities.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Force Main < 8 feet deep	8,400	LF	$ 324	$ 2,721,600
2	Transfer Valve	2	EA	$ 50,000	$ 100,000
3	Pavement Repair	350	LF	$ 150	$ 52,500
4	30" Boring and Casing	100	LF	$ 660	$ 66,000
				SUBTOTAL:	**$ 2,940,100**
		CONTINGENCY		30%	$ 882,100
				SUBTOTAL:	**$ 3,822,200**
		ENG/SURVEY		15.0%	$ 573,400
				SUBTOTAL:	**$ 4,395,600**
				Estimated Project Total:	**$ 4,395,600**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 2 **Phase:** by 2028

Project Name:	**New 42-inch Southwest Area Trunk Line to Southwest WRF**

Project Description:

This project includes the construction of a 42-inch gravity trunk line in the Southwest WRF service area, west of the Southwest WRF. This project is anticipated to approximately follow the future Grand Parkway alignment.

Project Drivers:

This project is sized to convey the projected buildout peak wastewater flows west of McFarland Road. This project is planned to tie into the recently constructed Grand Parkway Trunk Line.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	42" Pipe > 16 feet deep	5,500	LF	$ 840	$ 4,620,000
2	72 Diameter Manhole (16 - 24 feet deep)	7	EA	$ 28,500	$ 199,500
3	Pavement Repair	200	LF	$ 150	$ 30,000
4	54" Boring and Casing	100	LF	$ 1,188	$ 118,800
				SUBTOTAL:	**$ 4,968,300**
		CONTINGENCY		30%	$ 1,490,500
				SUBTOTAL:	**$ 6,458,800**
		ENG/SURVEY		15%	$ 968,900
				SUBTOTAL:	**$ 7,427,700**
				Estimated Project Total:	**$ 7,427,700**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 3 **Phase:** by 2028

Project Name:	**Expansion of Pedregal Lift Station to 1.5 MGD Firm Capacity**

Project Description:

This project includes the expansion of the firm pumping capacity to 1.5 MGD. The expansion is planned to utilize the existing wet well and force main.

Project Drivers:

The projected peak buildout wastewater flows indicate the need for additional pumping capacity and force main capacity due to anticipated future development to the south.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pedregal LS Replacement Pumps	1	LS	$ 250,000	$ 250,000
2	Pedregal LS Replacement Electrical	1	LS	$ 345,000	$ 345,000
3	Pedregal LS Replacement Generator	1	LS	$ 165,000	$ 165,000
4	Pedregal LS Replacement Piping and Valves	1	LS	$ 220,000	$ 220,000
5	Pedregal Surge Analysis	1	LS	$ 50,000	$ 50,000
				SUBTOTAL:	**$ 1,030,000**
		CONTINGENCY		30%	$ 309,000
				SUBTOTAL:	**$ 1,339,000**
		ENG/SURVEY		20%	$ 267,800
				SUBTOTAL:	**$ 1,606,800**
				Estimated Project Total:	**$ 1,606,800**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 4 **Phase:** by 2028

Project Name:	**New Southwest 48-inch Gravity Line Extension and Force Main Re-Route**

Project Description:

This project includes the construction of approximately 1,800 feet of 48-inch gravity line within the Southwest WRF service area, and the re-routing of two 14-inch force mains.

Project Drivers:

The force mains from the Westover Park and Countryside 2 Lift Stations currently discharge into a manhole adjacent to the Southwest WRF Influent Lift Station near the facility headworks. This creates a turbulent environment where H2S gasses are corroding the manhole. This CIP project includes the re-routing of those force mains into a new manhole and 48-inch gravity line on the northern portion of the Southwest WRF, thereby moving the corrosive gasses away from sensitive equipment. The 48-inch gravity line is sized for the buildout projected peak flows from the Westover Park and Countryside 2 Lift Stations, including additional room for the West Main lift stations to continue to pump into the Southwest WRF if needed.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	48" Pipe 8- 16 feet deep	1,800	LF	$ 864	$ 1,555,200
2	72" Diameter Manhole (8 - 16 feet deep)	4	EA	$ 23,500	$ 94,000
3	14" Force Main < 8 feet deep	200	LF	$ 252	$ 50,400
4	Pavement Repair	250	LF	$ 150	$ 37,500
5	60" Boring and Casing	100	LF	$ 1,320	$ 132,000
				SUBTOTAL:	**$ 1,869,100**
		CONTINGENCY		30%	$ 560,800
				SUBTOTAL:	**$ 2,429,900**
		ENG/SURVEY		15%	$ 364,500
				SUBTOTAL:	**$ 2,794,400**
				Estimated Project Total:	**$ 2,794,400**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 5 **Phase:** by 2028

Project Name:	**Expansion of Butler Road Lift Station to 16.0 MGD Firm Capacity**

Project Description:

This project includes expansion of the firm pumping capacity at the Butler Road Lift Station to 16.0 MGD. This project only includes replacement pumps, electrical and piping. It is expected that the wet well would not need to be upgraded for this expansion.

Project Drivers:

The Butler Road lift station repumps multiple lift stations, including Bay Colony 1 14-15. The West Main lift station can also convey flows to Butler LS. It is recommended that the future flows from Bay Colony 1 14-15 are directed to the recently constructed trunk line along Grand Parkway and the West Main LS is pumped to the Dallas Salmon WRF via Butler. The capacity expansion will allow Butler LS to repump the ultimate flows directed to this lift station. It is recommended that the City conduct draw down tests at the lift station pumps to identify the actual pumping capacity during the PER phase.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Butler Road LS Pumps	1	LS	$ 2,136,000	$ 2,136,000
2	Butler Road LS Electrical	1	LS	$ 3,230,000	$ 3,230,000
3	Butler Road LS Piping and Valves	1	LS	$ 536,000	$ 536,000
				SUBTOTAL:	**$ 5,902,000**
		CONTINGENCY		30%	$ 1,770,600
				SUBTOTAL:	**$ 7,672,600**
		ENG/SURVEY		20%	$ 1,534,600
				SUBTOTAL:	**$ 9,207,200**
				Estimated Project Total:	**$ 9,207,200**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 6 **Phase:** by 2028

Project Name:	**Expansion of Countryside No. 2 Lift Station to 2.7 MGD Firm Capacity and Replacement 14-inch Force Main**

Project Description:

This project includes the reconstruction of the Countryside 2 Lift Station at 2.7 MGD firm pumping capacity and a replacement 14-inch force main from the lift station to the existing 14-inch along the canal to the Southwest WRF.

Project Drivers:

The lift station expansion and replacement force main is sized to convey the projected buildout peak wastewater flows and upstream pumping capacities.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Countryside 2 Wet Well Replacement	1	LS	$ -	$ -
2	Countryside 2 Pumps	1	LS	$ 405,000	$ 405,000
3	Countryside 2 Electrical	1	LS	$ 561,000	$ 561,000
4	Countryside 2 Generator	1	LS	$ 297,000	$ 297,000
5	Countryside 2 Piping and Valves	1	LS	$ 225,000	$ 225,000
6	Countryside 2 Odor Control	1	LS	$ 78,000	$ 78,000
7	14" Force Main < 8 feet deep	1,600	LF	$ 252	$ 403,200
8	Pavement Repair	100	LF	$ 150	$ 15,000
9	24" Boring and Casing	100	LF	$ 528	$ 52,800
				SUBTOTAL:	**$ 2,037,000**
		CONTINGENCY		30%	$ 611,100
				SUBTOTAL:	**$ 2,648,100**
		ENG/SURVEY		20%	$ 529,700
				SUBTOTAL:	**$ 3,177,800**
				Estimated Project Total:	**$ 3,177,800**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 7 **Phase:** by 2028

Project Name:	**New 1.1 MGD Firm Capacity FM 646 Lift Station, New 12-inch Gravity Lines, and New 8-inch Force Main**

Project Description:

This project includes the construction of a new 1.1 MGD firm capacity lift station along FM 646, and the construction of 12-inch gravity lines and an 8-inch force main.

Project Drivers:

The proposed lift station and gravity mains would serve development along FM 646 east of FM 270 and west of FM 1266. This project is sized to convey the projected buildout peak wastewater flows in this area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	FM 646 Wet Well	1	LS	$ 650,000	$ 650,000
2	FM 646 Pumps	1	LS	$ 220,000	$ 220,000
3	FM 646 Electrical	1	LS	$ 273,000	$ 273,000
4	FM 646 Generator	1	LS	$ 121,000	$ 121,000
5	FM 646 Piping and Valves	1	LS	$ 123,000	$ 123,000
6	FM 646 Odor Control	1	LS	$ 58,500	$ 58,500
7	8" Force Main < 8 feet deep	3,100	LF	$ 144	$ 446,400
8	12" Pipe 8- 16 feet deep	9,000	LF	$ 216	$ 1,944,000
9	48" Diameter Manhole (8 - 16 feet deep)	19	EA	$ 17,500	$ 332,500
10	20" Boring and Casing	200	LF	$ 440	$ 88,000
11	24" Boring and Casing	100	LF	$ 528	$ 52,800
12	Pavement Repair	550	LF	$ 150	$ 82,500
				SUBTOTAL:	**$ 4,391,700**
		CONTINGENCY		30%	$ 1,317,600
				SUBTOTAL:	**$ 5,709,300**
		ENG/SURVEY		20%	$ 1,141,900
				SUBTOTAL:	**$ 6,851,200**
				Estimated Project Total:	**$ 6,851,200**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 8 **Phase:** by 2028

Project Name: New 21-Inch Southwest Area Trunk Line

Project Description:

This project includes the construction of an 21-inch gravity trunk line in the Southwest WRF service area, west of the Southwest WRF. This project is anticipated to approximately follow the future Grand Parkway alignment.

Project Drivers:

This project is sized to convey the projected buildout peak wastewater flows from west of McFarland Road. This project is planned to tie into the 42-inch gravity line (Project 2).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	3,000	LF	$ 378	$ 1,134,000
2	60" Diameter Manhole (8 - 16 feet deep)	4	EA	$ 21,500	$ 86,000
3	Pavement Repair	100	LF	$ 150	$ 15,000
4	32" Boring and Casing	100	LF	$ 704	$ 70,400
				SUBTOTAL:	**$ 1,305,400**
		CONTINGENCY		30%	$ 391,700
				SUBTOTAL:	**$ 1,697,100**
		ENG/SURVEY		15%	$ 254,600
				SUBTOTAL:	**$ 1,951,700**
				Estimated Project Total:	**$ 1,951,700**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 9 **Phase:** by 2028

Project Name: Expansion of MUD 6 Lift Station to 1.15 MGD Firm Capacity

Project Description:

This project includes the expansion of the MUD 6 Lift Station from 0.86 MGD to a firm pumping capacity of 1.15 MGD.

Project Drivers:

The lift station expansion is needed to serve existing and projected buildout flows from future developments in the MUD 6 lift station service area and the upstream Amber Lane and Landing Lift Stations.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	MUD 6 Wet Well Replacement	1	LS	$ 650,000	$ 650,000
2	MUD 6 Pumps	1	LS	$ 174,000	$ 174,000
3	MUD 6 Electrical	1	LS	$ 282,000	$ 282,000
4	MUD 6 Generator	1	LS	$ 127,000	$ 127,000
5	MUD 6 Piping and Valves	1	LS	$ 127,000	$ 127,000
6	MUD 6 Odor Control	1	LS	$ 58,500	$ 58,500
				SUBTOTAL:	**$ 1,418,500**
		CONTINGENCY		30%	$ 425,600
				SUBTOTAL:	**$ 1,844,100**
		ENG/SURVEY		20%	$ 368,900
				SUBTOTAL:	**$ 2,213,000**
				Estimated Project Total:	**$ 2,213,000**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 10 **Phase:** by 2028

Project Name: New 21/30-inch Gravity Lines along Bay Area Boulevard (Westside)

Project Description:

This project includes the construction of a 21-inch gravity main from Dickinson Bayou going up to a 30-inch gravity main and flowing to the existing Grand Parkway Trunk Line.

Project Drivers:

This proposed gravity main would serve the Lloyd Tract development south of the Grand Parkway Trunk Line. This project is sized to convey the projected buildout peak wastewater flow from these developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	1,900	LF	$ 378	$ 718,200
2	30" Pipe 8- 16 feet deep	2,400	LF	$ 540	$ 1,296,000
3	60" Diameter Manhole (8 - 16 feet deep)	4	EA	$ 21,500	$ 86,000
4	72" Diameter Manhole (8 - 16 feet deep)	4	EA	$ 23,500	$ 94,000
				SUBTOTAL:	**$ 2,194,200**
		CONTINGENCY		30%	$ 658,300
				SUBTOTAL:	**$ 2,852,500**
		ENG/SURVEY		15%	$ 427,900
				SUBTOTAL:	**$ 3,280,400**
				Estimated Project Total:	**$ 3,280,400**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 11 **Phase:** by 2028

Project Name: 1.7 MGD Lift Station and 10-inch Force Main south of Dickinson Bayou (Westside)

Project Description:

This project includes the construction of a new 1.7 MGD lift station and 1,500 LF of 10-inch force main to carry flow for developments south of Dickinson Bayou.

Project Drivers:

This proposed gravity main would serve the Lloyd Tract, Westland Ranch, Sealy Land, Martron and Lloyd Tract west developments . This project is sized to convey the projected buildout peak wastewater flow from these developments across Dickinson Bayou.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lloyd Tract Lift Station	1	LS	$ 1,654,000	$ 1,654,000
2	10" Force Main < 8 feet deep	1,500	LF	$ 180	$ 270,000
3	20" Boring and Casing	100	LF	$ 440	$ 44,000
				SUBTOTAL:	**$ 1,968,000**
		CONTINGENCY		30%	$ 590,400
				SUBTOTAL:	**$ 2,558,400**
		ENG/SURVEY		20%	$ 511,700
				SUBTOTAL:	**$ 3,070,100**
				Estimated Project Total:	**$ 3,070,100**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 12 **Phase:** by 2028

Project Name: Wastewater Master Plan and CRF Update

Project Description:

This project includes an update to the City's Wastewater Master Plan and CRF study. This project also includes additional flow monitoring with the intent of capturing updated inflow and infiltration (I/I) levels throughout the City.

Vicinity Map

Project Drivers:

Texas Local Government Code (TLGC) Chapter 395 requires 5-year updates to the wtaer and wastewater capital recovery fees.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Wastewater Master Plan and CRF Update	1	LS	$ 850,000	$ 850,000
				SUBTOTAL:	**$ 850,000**
		CONTINGENCY		0%	$ -
				SUBTOTAL:	**$ 850,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 850,000**
				Estimated Project Total:	**$ 850,000**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 13 **Phase:** by 2033

Project Name:	**Reconstruction of Meadow Bend STP Lift Station and Replacement 10/15/24-inch Sugar Wood/Edelweiss Dr. Gravity Mains**

Project Description:

This project includes the reconstruction of the Meadow Bend STP Lift Station with a deeper wet well, and the construction of replacement 12/15/24-inch gravity lines upstream of the lift station.

Project Drivers:

The 2017 flow monitoring data and historical design plans indicate surcharging during dry weather and the need for a deeper wet well with more active volume. Reconstruction of the Meadow Bend STP lift station with a deeper wet well will provide adequate active volume and will remove the observed surcharging from the influent pipes as required per TCEQ §217.60(a)(1).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Meadow Bend STP Wet Well Replacement	1	LS	$ 1,000,000	$ 1,000,000
2	Meadow Bend STP Pumps	1	LS	$ 705,000	$ 705,000
3	Meadow Bend STP Electrical	1	LS	$ 996,000	$ 996,000
4	Meadow Bend STP Generator	1	LS	$ 517,000	$ 517,000
5	Meadow Bend STP Piping and Valves	1	LS	$ 307,000	$ 307,000
6	Meadow Bend STP Odor Control	1	LS	$ 136,500	$ 136,500
7	10" Pipe 8- 16 feet deep	1,200	LF	$ 180	$ 216,000
8	15" Pipe 8- 16 feet deep	700	LF	$ 270	$ 189,000
9	24" Pipe > 16 feet deep	1,200	LF	$ 480	$ 576,000
10	48" Diameter Manhole (8 - 16 feet deep)	10	EA	$ 17,500	$ 175,000
11	60" Diameter Manhole (16 - 24 feet deep)	5	EA	$ 25,500	$ 127,500
12	36" Boring and Casing	200	LF	$ 792	$ 158,400
13	Pavement Repair	650	LF	$ 150	$ 97,500
				SUBTOTAL:	**$ 5,200,900**
			CONTINGENCY	30%	$ 1,560,300
				SUBTOTAL:	**$ 6,761,200**
			ENG/SURVEY	20%	$ 1,352,300
				SUBTOTAL:	**$ 8,113,500**
				Estimated Project Total:	**$ 8,113,500**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 14 **Phase:** by 2033

Project Name: Expansion of North Service Area Lift Station to 3.1 MGD Firm Capacity and 30-Inch Replacement Gravity Main

Project Description:

This project includes the installation of a third pump at the recently constructed North Service Area lift station to bring the firm pumping capacity to 3.1 MGD. There is currently a third slot for a future pump. The wet well has adequate capacity. This project also includes approximately 1,900 feet of 30-inch gravity line along West Main Street from Palomino Lane to the West Main Lift Station.

Project Drivers:

The projected buildout wastewater flow indicate the need for additional pumping and gravity line conveyance in this area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	North SA Pumps	1	LS	$ 465,000	$ 465,000
2	North SA Electrical	1	LS	$ 708,000	$ 708,000
3	North SA Generator	1	LS	$ 341,000	$ 341,000
4	North SA Piping and Valves	1	LS	$ 299,000	$ 299,000
5	North Service Area Odor Control	1	LS	$ 97,500	$ 97,500
6	30" Pipe > 16 feet deep	1,900	LF	$ 600	$ 1,140,000
7	72 Diameter Manhole (16 - 24 feet deep)	4	EA	$ 28,500	$ 114,000
8	Pavement Repair	150	LF	$ 150	$ 22,500
9	36" Boring and Casing	100	LF	$ 792	$ 79,200
				SUBTOTAL:	**$ 3,266,200**
		CONTINGENCY		30%	$ 979,900
				SUBTOTAL:	**$ 4,246,100**
		ENG/SURVEY		20%	$ 849,300
				SUBTOTAL:	**$ 5,095,400**
				Estimated Project Total:	**$ 5,095,400**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 15 **Phase:** by 2033

Project Name: **Expansion of Smith Lane Lift Station to 7.6 MGD Firm Capacity**

Project Description:

This project includes the expansion of the Smith Lane Lift Station from 5.7 MGD to a firm pumping capacity of 7.6 MGD. This project assumes the construction of a second wet well for the required additional volume.

Project Drivers:

This project is sized to convey the projected buildout peak wastewater flows from the Smith Lane service area

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Smith Lane New Wet Well	1	LS	$ 638,000	$ 638,000
2	Smith Lane Pumps	1	LS	$ 1,140,000	$ 1,140,000
3	Smith Lane Electrical	1	LS	$ 1,718,000	$ 1,718,000
4	Smith Lane Generator	1	LS	$ 836,000	$ 836,000
5	Smith Lane Piping and Valves	1	LS	$ 345,000	$ 345,000
6	Smith Lane Odor Control	1	LS	$ 156,000	$ 156,000
				SUBTOTAL:	**$ 4,833,000**
		CONTINGENCY		30%	$ 1,449,900
				SUBTOTAL:	**$ 6,282,900**
		ENG/SURVEY		20%	$ 1,256,600
				SUBTOTAL:	**$ 7,539,500**
				Estimated Project Total:	**$ 7,539,500**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 16 **Phase:** by 2033

Project Name: **Upgrade Pumping HP at Victory Lakes Lift Station and Re-Route/Extend 12-inch Force Main**

Project Description:

This project includes electrical and pump upgrades at the Victory Lakes Lift Station and approximately 11,200 feet of 12-inch force main.

Project Drivers:

This project will re-direct wastewater flows from the Dallas Salmon WRF service area to the Southwest WRF service area to optimize flow rates and operations at each WRF.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Force Main < 8 feet deep	11,200	LF	$ 216	$ 2,419,200
2	Victory Lakes Pumps	1	LS	$ 486,000	$ 486,000
3	Victory Lakes Electrical	1	LS	$ 734,000	$ 734,000
4	Victory Lakes Generator	1	LS	$ 358,000	$ 358,000
5	Victory Lakes Piping and Valves	1	LS	$ 301,000	$ 301,000
6	Pavement Repair	450	LF	$ 150	$ 67,500
7	24" Boring and Casing	300	LF	$ 528	$ 158,400
				SUBTOTAL:	**$ 4,524,100**
		CONTINGENCY		30%	$ 1,357,300
				SUBTOTAL:	**$ 5,881,400**
		ENG/SURVEY		20%	$ 1,176,300
				SUBTOTAL:	**$ 7,057,700**
				Estimated Project Total:	**$ 7,057,700**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 17 **Phase:** by 2033

Project Name: New 15-inch Gravity Line along Maple Leaf Drive (Westside)

Project Description:

This project includes the construction of a new 15-inch gravity main along Maple Leaf Drive going to the proposed Grand Parkway Trunk Line.

Project Drivers:

This proposed gravity main would serve the Martron, Lloyd Tract West developments. This project is sized to convey the projected buildout peak wastewater flow from these developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe > 16 feet deep	3,600	LF	$ 300	$ 1,080,000
2	60" Diameter Manhole (16 - 24 feet deep)	9	EA	$ 25,500	$ 229,500
3	Pavement Repair	200	LF	$ 150	$ 30,000
4	24" Boring and Casing	100	LF	$ 528	$ 52,800
				SUBTOTAL:	**$ 1,392,300**
		CONTINGENCY		30%	$ 417,700
				SUBTOTAL:	**$ 1,810,000**
		ENG/SURVEY		15%	$ 271,500
				SUBTOTAL:	**$ 2,081,500**
				Estimated Project Total:	**$ 2,081,500**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 18 **Phase:** by 2033

Project Name:	**27-inch Gravity Line to serve Stedman West, Martron, Sealy Land, Bofysil, and Custer developments (Westside)**

Project Description:

This project includes the construction of a new 27-inch gravity main conveying flow from the Stedman West, Martron, Sealy Land, Bofysil, and Custer developments to the proposed Southwest Area Trunk Line.

Project Drivers:

This project is sized to convey the projected buildout peak wastewater flow from the Stedman West, Martron, Sealy Land, Bofysil, and Custer developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	27" Pipe > 16 feet deep	2,800	LF	$ 540	$ 1,512,000
2	72" Diameter Manhole (24 - 30 feet deep)	5	EA	$ 33,500	$ 167,500
3	Pavement Repair	100	LF	$ 150	$ 15,000
4	34" Boring and Casing	100	LF	$ 748	$ 74,800
				SUBTOTAL:	**$ 1,769,300**
		CONTINGENCY		30%	$ 530,800
				SUBTOTAL:	**$ 2,300,100**
		ENG/SURVEY		15%	$ 345,100
				SUBTOTAL:	**$ 2,645,200**
				Estimated Project Total:	**$ 2,645,200**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* | **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 19 **Phase:** by 2033

Project Name:	**15-inch and 18-inch Gravity Lines, 3.5 MGD lift Station and 12-inch Force Main to serve Custer, Bofysil, Sealy Land and Martron developments (Westside)**

Project Description:

This project includes the gravity mains, lift station and force main needed to serve the Custer, Bofysil, Sealy Land and Martron developments and convey projected flows to the 27-inch gravity (Project 18).

Project Drivers:

The gravity mains are sized to convey the buildout peak wet weather flows to the new lift station which is sized to handle the cumulative flows from the lines and convey them across Dickinson Bayou to the 27-inch gravity line (Project 18).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	15,000	LF	$ 270	$ 4,050,000
2	18" Pipe > 16 feet deep	3,000	LF	$ 360	$ 1,080,000
3	60" Diameter Manhole (16 - 24 feet deep)	20	EA	$ 25,500	$ 510,000
4	60" Diameter Manhole (>24 - 30 feet deep)	4	EA	$ 29,500	$ 118,000
5	12" Force Main < 8 feet deep	4,300	LF	$ 216	$ 928,800
6	Westside Development Lift Station	1	LS	$ 3,217,000	$ 3,217,000
7	Pavement Repair	150	LF	$ 150	$ 22,500
8	24" Boring and Casing	400	LF	$ 528	$ 211,200
				SUBTOTAL:	**$ 10,137,500**
		CONTINGENCY		30%	$ 3,041,300
				SUBTOTAL:	**$ 13,178,800**
		ENG/SURVEY		20%	$ 2,635,800
				SUBTOTAL:	**$ 15,814,600**
				Estimated Project Total:	**$ 15,814,600**

City of League City

Wastewater CIP - Opinion of Probable Construction Cost* **June 23, 2023**

Planning Level Cost in 2023 Dollars

CIP Project Number: 20 **Phase:** by Buildout

Project Name: **Expansion of Southwest WRF by 4.0 MGD to a Permitted ADF of 12.0 MGD**

Project Description:

This project includes expansion of the existing Southwest WRF average daily flow capacity to 12 MGD (4.0 MGD Expansion).

Project Drivers:

The wastewater flow projections in the Southwest WRF Service Area show the need for additional treatment capacity at this facility beyond 10 years.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4 MGD WRF Expansion to 12 MGD	1	LS	$ 80,000,000	$ 80,000,000
				SUBTOTAL:	**$ 80,000,000**
		CONTINGENCY		30%	$ 24,000,000
				SUBTOTAL:	**$ 104,000,000**
		ENG/SURVEY		20%	$ 20,800,000
				SUBTOTAL:	**$ 124,800,000**
				Estimated Project Total:	**$ 124,800,000**