Wastewater Master Plan

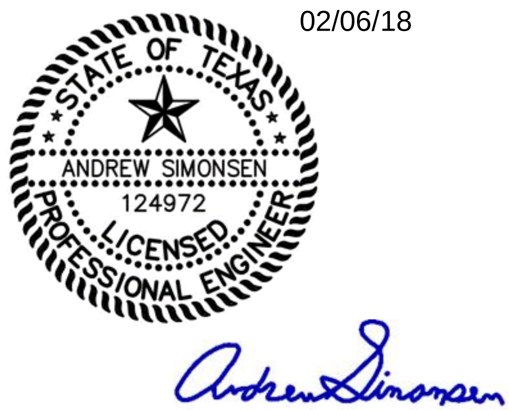
February 2018, Revised March 2024

2017 WASTEWATER SYSTEM

MASTER PLAN

Revision:
Revisions to this report were made to update the Capital Improvement Plan Section on March 2024.

02/06/18



Prepared by:

Kimley-Horn and Associates, Inc.

TBPE No. 928
801 Cherry Street, Unit 11
Suite 950
Fort Worth, TX 76132
(817) 335-6511

Table of Contents

I. EXECUTIVE SUMMARY

This Wastewater System Master Plan Update and Capital Improvement Plan presents analyses, findings, and recommendations for implementing a plan to meet the City of Lake Worth's infrastructure needs until buildout. The City has nearly reached buildout of its City limits and has consequently completed the majority of the necessary wastewater system improvements to serve its citizens. The City has moved from the need to construct new wastewater infrastructure to the need for rehabilitation of existing infrastructure. Therefore, the basis for anticipated infrastructure improvement is for system redundancy and reliability and the need for rehabilitation of existing infrastructure.

Historical wholesale wastewater discharge data and historical customer connections from the last 10 years were provided by the City. Using the historical customer connection count and historical wastewater discharge data, Kimley-Horn projected wastewater discharge values until buildout. The wastewater system was analyzed against established TCEQ criteria for wastewater systems. Kimley-Horn found that the majority of the City is in compliance with TCEQ criteria except for some minor items noted in the report. Additionally, the wastewater system was analyzed using SewerCAD® hydraulic modeling software by Haested Methods.

The Capital Improvement Plan was centered around rehabilitation of the wastewater system and increasing the capacity of the Edgemere and Charbonneau lift stations. These lift stations are anticipated to need additional capacity in the future. An important consideration for the rehabilitation of the system is reducing infiltration and inflow. Reducing inflow and infiltration increases the capacity of the existing system and decreases the cost charged by the City of Fort Worth to treat the wastewater. Rehabilitation projects for the next ten years at a cost of approximately $500,000 per year are outlined in the Capital Improvement Plan. The rehabilitation projects were selected to eliminate existing clay tile pipe, which is frequently found to be a source of inflow and infiltration. The Capital Improvement Plan budget over the next 10-years is approximately $19.4 million**.** The goal of rehabilitating the system is not only to prevent failures of the system but is to reduce the constraints on the downstream system and to save on costs paid to the City of Fort Worth for treatment.

REVISED MARCH 2024

II. INTRODUCTION

The City of Lake Worth (City) has nearly completely built-out to the city limits, except for some small tracts of land and opportunities for infill. Because the City has nearly reached buildout, the focus of this report was to ensure that the existing system is adequately supporting the City's needs and to make recommendations for rehabilitation of the existing system. Historical wastewater discharges and wastewater infrastructure were analyzed and compared to TCEQ criteria to determine improvements needed to provide the City with a reliable wastewater collection system. Kimley-Horn's background knowledge of the history and growth of the City's wastewater system helped facilitate the development of the following Wastewater System Master Plan and Capital Improvement Plan.

Description of Study Area

The Wastewater System Master Plan's study area is defined by the City's existing city limits boundary. The service area is approximately 1,590 acres (approximately 2.5 square miles). Being bound by the City of Fort Worth (Fort Worth) and Lake Worth to the west, the City's service area is not expected to grow into the future. See **Appendix A – Existing Land Use** for an illustration of the City's service area. The City also receives a small portion of wastewater from a Lowe's Home Improvement Store and several homes along Malaga Dr. within the City of Fort Worth.

Objective and Scope of Study

The goal of this report is to develop a strategic plan that allows the City to continue to serve its customers and citizens into the future. All of the major infrastructure necessary for the City's buildout has already been constructed. The focus of this report was to ensure that the wastewater system is adequate to continue to meet the City's expected level of service and to provide recommendations for rehabilitation projects.

III. DATA COLLECTION AND LAND USE

Data Collection

Evaluation of the existing system required collection of physical attributes of the existing wastewater system, historical customer water demands, and wholesale wastewater discharges. City staff provided the collection system network in electronic format, available lift station information, and general wastewater system operating procedures. Manhole inverts at select locations were also measured and provided by City staff. City staff also provided historical wastewater discharge records to the Fort Worth system, monthly customer water billing records for the last 10-years, and annual building permits for the last 10-years. Texas Water Development Board utility profiles for the last 10-years were also provided by City staff.

Existing Land Use

Kimley-Horn utilized land use information available from the Tarrant County Appraisal District as the starting point for the existing land use map. The Tarrant County Appraisal District maintains a database of parcels within Tarrant County, categorized by existing land use type. Kimley-Horn used current aerials of the City and site visits to verify the accuracy of the existing land use. The predominant land use in the City is single family residential. The average residential lot is approximately 1/4 acre. The City also has significant commercial development, specifically along Azle Ave. and Lake Worth Blvd. The commercial developments are a mix of retail and restaurants. The majority of the remainder of the non-residential development is composed of schools, City and County administration buildings, and notably the Ritchie Brothers auction lot. Most of the available land within the city limits has been developed. There are opportunities for infill in residential areas and redevelopment of commercial areas north of Azle Ave. The existing land use was an important part of understanding the wastewater discharges throughout the City. Refer to **Appendix A – Existing Land Use Map** for an illustration of the existing land use map. **Table 1** summarizes the existing land use within the City's service area.

Table 1 – Existing Land Use

Type	Existing Land Use	
	Acreage	% of total
Single Family Residential	518	33%
Multi-Family Residential	9	1%
Commercial	401	25%
Industrial	0	0%
Public / Semi-Public	19	1%
School	66	4%
Church	23	1%
Park	45	3%
Utility	4	0%
Vacant / Open-Space	142	9%
Right-of-Way	361	23%
Total	**1,588**	

Ultimate Land Use

The ultimate land use plan supplemented the existing land use plan. The remainder of the vacant land is generally categorized as infill and is anticipated to develop similar to adjacent tracts. An exception to the infill is a tract of land east of Hodgkins Rd. that is anticipated to develop as multi-family. Refer to **Appendix B – Ultimate Land Use Map** for the ultimate land use plan. The infill and redevelopment is not anticipated to have a significant impact on the wastewater collection system. **Table 2** summarizes the breakout of the anticipated ultimate land use within the City's service area.

Table 2 – Ultimate Land Use

Type	Ultimate Land Use	
	Acreage	% of total
Single Family Residential	594	38%
Multi-Family Residential	20	1%
Commercial	453	29%
Industrial	3	0%
Public / Semi-Public	19	1%
School	66	4%
Church	23	1%
Park	45	3%
Utility	4	0%
Vacant / Open-Space	0	0%
ROW	361	23%
Total	**1,588**	

IV. WASTEWATER DEMAND PROJECTIONS

Because the City of Lake Worth is mostly developed, only two wastewater discharge scenarios were generated: Existing Condition and Buildout Condition. Reviewing historical building permit information and historical number of water connections, the City's growth has been relatively modest in the past 5 years. This growth trend would be expected as the majority of the tracts of land are developed and only infill or redevelopment opportunities are available. Due to a flat historical growth rate and the fact that future development in the City will be decided on a case-by-case basis by home owners and developers, a projected growth rate was not established for the buildout of the City. Instead, analysis for wastewater discharge projections will be presented as Existing Condition and Buildout Condition.

Wastewater discharge projections can be made using population, number of water meter connections, or land use as the basis for projection. Wastewater discharges are projected into the future by determining the historical wastewater discharge per capita, per water connection, or per acre of a land use type and then tying the growth of the wastewater discharge projections to one of these categories. For this report, due to the availability of individual customer water use records by land use type, the land use method was selected as the ideal way to project future wastewater discharges.

Land Use Discharge

Land use projections were used to project future wastewater discharges. The City's billing system provided monthly water usage for each water connection in the City. Each connection was correlated with its corresponding land use type. With the known land use type and acreage of the corresponding parcel, a water demand loading factor could be calculated for each parcel by land use type. After comparing 2016 wholesale water consumption and wholesale wastewater discharge, it was determined that the average day wastewater discharge was approximately 93% of the average day water usage. The wholesale wastewater discharge had the metered flow from Fort Worth subtracted out for this calculation. Therefore, an average day wastewater discharge factor was created for each land use type by multiplying the calculated water demand loading factors by 93%. **Table 3** lists the average day wastewater discharge factors for each land use type. It should be noted that 2016 was used as the basis for establishing the average day wastewater discharge rates. Additional historical data from before 2016 and recent wastewater usage from 2017 were used as a comparison to ensure that the factors established were reasonable and representative of the existing wastewater discharge in the City. It should be noted that the existing wastewater model was loaded with the actual water demand information, multiplied by 93%, available for each customer. See **Section V- Methodology** for a discussion of modeling methodology.

Table 3 – Average Day Discharge Factors

Land Use	Average Day Discharge Factors Gal / Acre/ Day
Single Family Residential	600
Multi-Family Residential*1	2,330
Commercial	840
Industrial	470
Public / Semi-Public	800
School	380
Church	100
Park	380
Utility	0
Vacant / Open-Space	0
ROW	0

*1 - Multi-Family Residential includes apartments, mobile home parks, and health care living facilities.

Average Day Discharge

As noted above, a standard growth rate was not used to project future wastewater discharge. Wastewater discharge has been presented as existing discharge and as future buildout discharge. Refer to **Table 4** below for the existing average day discharge and projected buildout average day discharge. The discharges presented below in **Table 4** include discharges that the City receives from the City of Fort Worth. Should any significant redevelopment occur or a large wastewater generator come onto the City's system, Kimley-Horn recommends updating these wastewater projections, and verifying no significant changes.

Table 4 – Average Day Wastewater Discharge

Scenario	Existing	Buildout
Average Wastewater Discharge (MGD)	**0.77**	**0.83**

Peak Discharge

The peak discharge rate for the City was calculated by analyzing the historical data available from the Fort Worth wholesale meter. The Fort Worth wholesale meter is located on the discharge of the Charbonneau lift station. Utilizing the known pump design discharge, the working volume of the lift station, and wholesale meter discharge data, a peak inflow rate into the lift station could be calculated. The peaking of the City system, from average day discharge to peak day discharge, was calculated to be 4.8. The system will infrequently experience peak discharge events; however, all components of the wastewater system must be sized with the capacity to handle peak discharge events. The calculated peaking factor includes inflow and infiltration. Inflow and infiltration is discussed later in the document. Refer to **Table 5** below for the existing peak day discharge and the projected buildout peak day discharge. The discharges presented below in **Table 5** include discharges that the City receives from the City of Fort Worth.

Table 5 – Peak Discharge

Scenario	Existing	Buildout
Peak Wastewater Discharge (MGD)	**3.70**	**3.98**

Existing Basins Discharges

Wastewater drainage basins were delineated for each lift station. See **Appendix C – Existing Sewer Infrastructure** for a depiction of the existing sewer basins. Wastewater discharge rates were calculated for each individual lift station basin based on the discharge factors presented in **Table 3.** Additionally, the total flow was calculated to each lift station. There are several lift stations that cascade into other lift stations, detailed in **Section VII – Existing Infrastructure Analysis and Recommendations**. **Table 6** below summarizes the flow to each lift station.

Table 6 – Existing Wastewater Discharge by Lift Station

	Discharge Generated by Basin		Total Discharge to Lift Station	
Lift Station	**Average Wastewater Discharge (GPM)**	**Peak Wastewater Discharge (GPM)**	**Average Wastewater Discharge (GPM)**	**Peak Wastewater Discharge (GPM)**
Caddo	30	144	30	144
Charbonneau	275	1,319	537	2,576
Clark	5	24	5	24
Edgemere	118	566	131	629
Lakewood	8	38	8	38
Marina	101	485	262	1,258

No changes are recommended to how the City operates the lift stations or the wastewater system. **Table 7** summarizes the wastewater discharge generated for each basin and the total discharge to each lift station at buildout.

Table 7 – Buildout Wastewater Discharge by Lift Station

	Discharge Generated by Basin		Total Discharge to Lift Station	
Lift Station	**Average Wastewater Discharge (GPM)**	**Peak Wastewater Discharge (GPM)**	**Average Wastewater Discharge (GPM)**	**Peak Wastewater Discharge (GPM)**
Caddo	32	152	32	152
Charbonneau	288	1,380	573	2,753
Clark	6	29	6	29
Edgemere	133	640	148	709
Lakewood	9	41	9	41
Marina	106	511	286	1,372

V. METHODOLOGY

Wastewater System Modeling Methodology

To evaluate the existing wastewater system, a wastewater model was created using SewerCAD®. Pipe data was obtained from GIS and consisted of pipe length, location, diameter, and material. Manhole data consisted of rim elevation, manhole invert, diameter and sewer discharge. The existing wastewater model, consisting of pipes and manholes, was built using the SewerCAD® ModelBuilder tool. The physical connectivity of the model was validated to ensure accuracy of connection between pipes and manholes. Manhole rim elevations were assigned to each node using topographic LIDAR of the City using the SewerCAD® TRex tool. Lift station dimensions and operating parameters were obtained from available record drawings provided by the City and input into the model. The lift station pumps were modeled using each pump's characteristic performance curve, when available. The City discharges to the Fort Worth wastewater system at approximately Jacksboro Hwy. and Roberts Cut Off Rd. This discharge point was modeled as an outfall node with a starting hydraulic grade line at the top of the pipe.

The average day wastewater discharge for 2016 was used as the basis for wastewater discharge in the existing model. Each water customer account in the City was paired with the corresponding parcel in GIS to physically locate each account in the City. Each water customer account was multiplied by 93% to obtain the average wastewater discharge for each customer. The customer specific wastewater discharges were distributed throughout the City using the SewerCAD® LoadBuilder tool, allocating the customer discharges to the nearest node in the model. Each customer account was designated as either a residential customer or a commercial customer. A diurnal wastewater curve representative of residential or commercial was applied to the discharges to represent the wastewater discharge throughout a 24-hour period.

Four different scenarios were modeled: Existing Condition-Average Day, Existing Condition-Peak Discharge, Buildout-Average day, and Buildout-Peak Discharge. Average Day and Peak Discharge scenarios were analyzed using an extended period simulation of 24-hrs. Resulting hydraulic grade, pipe velocity, wet well variations, and pump operations were analyzed in each scenario to ensure the system was meeting the established criteria.

VI. DESIGN CRITERIA

Texas Commission on Environmental Quality (TCEQ) Design Criteria

The Texas Commission on Environmental Quality (TCEQ) is charged with establishing statewide design criteria for wastewater collection systems. These design criteria are presented and enforced in the Texas Administrative Code under Title 30 – Environmental Quality, Part I, Chapter 217 – Design Criteria for Domestic Wastewater Systems as adopted in December 2015. The following sections contain pertinent excerpts from the TCEQ regulations:

Pipe Design

A collection system must be designed to transport the peak flow from the service area, plus infiltration and inflow. The design must minimize inflow and infiltration. Flow calculations must be included in the engineering report. The flow calculations must include the details of the average flow, the flow peaking factor, and the infiltration and inflow.

§217.53(a)

An owner must ensure that a collection system's capacity is sufficient to serve the estimated future population of the area served by the project, including institutional, industrial, and commercial flows. An owner must ensure that the collection system has capacity to prevent a surcharge. An owner must ensure that a gravity pipe is at least 6.0 inches in diameter.

§217.53(j)

Table 8 – TCEQ Minimum Pipe Slopes

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

**For lines larger than 39 inches in diameter, the slope shall be determined by Manning's formula (as shown below) to maintain a minimum velocity greater than 2.0 feet per second when flowing full and a maximum velocity less than 10 feet per second when flowing full.*

§217.53(l)

Lift Station Design

Wet Well/Dry Well

Table 9 – TCEQ Wet Well Requirements

Pump Horsepower	*Minimum Cycle Times (minutes)*
less then 50	*6*
50 - 100	*10*
Over 100	*15*

Minimum Wet Well Volume shall be based on the following formula:
*V = (T * Q) / (4 * 7.48)*

V = Working Volume (ft^3)
Q = Pump Capacity (GPM)
T = Cycle Time (Minutes)
7.48 = conversion factor in gallons/cubic foot

§217.61 (b)

Pumps

A lift station must have at least two pumps. The firm pumping capacity of a lift station must handle the peak flow.

§217.61 (c)

Force Mains

A force main must be a minimum of 4.0 inches in diameter, unless it is used in conjunction with a grinder pump station. For a lift station with two pumps, the minimum velocity is 3.0 feet per second with one pump in operation. For a lift station with three or more pumps the minimum velocity in a force main is 2.0 feet per second with only the smallest pump operating at full speed and a minimum flushing velocity of 5.0 feet per second or greater must occur in a force main at least twice daily. The engineering report must certify that a pipeline with a velocity greater than 6.0 feet per second can withstand high and low negative surge pressures in the event of sudden pump failure.

§217.67 (a)

VII. EXISTING INFRASTRUCTURE ANALYSIS AND RECOMMENDATIONS

The City discharges wastewater to the City of Fort Worth wastewater system at one wholesale meter point, located approximately at the intersection of Jacksboro Hwy. and Roberts Cut Off Rd. The City wastewater system consists of 6 submersible lift stations and various sizes of gravity trunk mains. The City is divided into six separate wastewater drainage basins, named by the lift station to which they drain. The City wastewater system either flows by gravity or is pumped from the other five lift stations to the Charbonneau lift station before being discharged into the Fort Worth system. In addition to the flow generated by the City, the City receives unmetered flow from several homes within the City of Fort Worth along Malaga Dr. and receives flow from a Lowe’s Home Improvement Store within the City of Fort Worth through a metered location at the intersection of Northwest Centre Dr. and Jacksboro Hwy.

The City service area ranges from approximately 785’ at its highest elevation on the east side of the City to approximately 615’ at its lowest elevation on the west side of the City. In general, the topography of the City falls from east to west towards Lake Worth. The six City lift stations are located on the west side of the City. See **Appendix C – Existing Sewer Infrastructure** for an illustration of the City’s existing wastewater facilities. **Figure 1** below shows the schematic wastewater flow path from the City’s six lift stations to the Fort Worth wholesale meter.

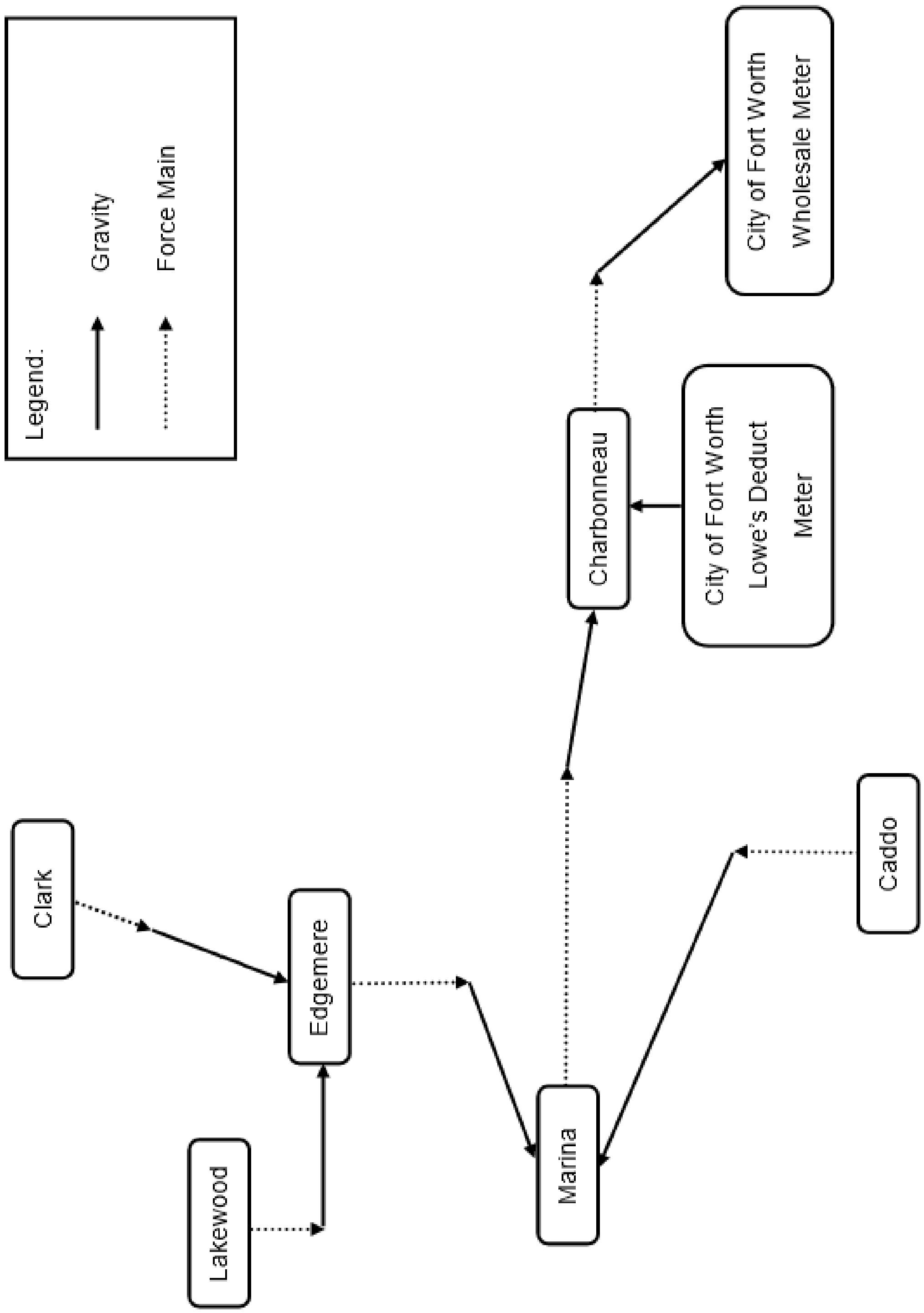


Figure 1: City Schematic Wastewater Flow Path

Gravity Lines

The City currently owns and maintains over 34 miles of sanitary sewer lines that range from 4-inches in diameter to 16-inches in diameter. The gravity lines were analyzed using the SewerCAD® wastewater model for average day discharge and peak condition discharge for existing condition and buildout condition. The majority of the existing gravity system was found to have adequate capacity to convey the existing condition discharge for both the average day and peak conditions. The additional wastewater discharge from existing condition to buildout condition is expected to be very minimal.

There were several select sections of pipe in both existing and buildout conditions that had a calculated hydraulic grade line above the top of pipe but not exceeding the top of manholes. These pipes could possibly be candidates for upsizing, however, rather than upsizing these lines, Kimley-Horn recommends that the City focus on rehabilitation and replacement of existing wastewater trunk and collection lines to limit the amount of inflow and infiltration in the system. A peaking factor of 4.8 from peak discharge to average day discharge indicates a fairly high amount of infiltration and inflow entering the system. Because the existing system has been operating with minimal failures or overflows and the buildout conditions are not expected to contribute significant additional flow, the optimal method would be to focus on rehabilitation. Inflow and infiltration is discussed further below.

Most of the gravity flow lines in the system consist of PVC and clay tile pipe. **Table 10** below presents a breakdown of the gravity sewer lines in the system by diameter and **Table 11** has a breakdown of the gravity sewer lines by material type.

Table 10 – Gravity Sewer Line Summary by Diameter

Pipe Diameter	Linear Footage (LF)
4”	1,162
6”	97,530
8”	65,932
10”	4,909
12”	6,347
15”	4,859
16”	665
Total	181,404

Table 11 – Gravity Sewer Line Summary by Material

Pipe Material	Linear Footage (LF)
PVC	86,273
Vitrified Clay	82,659
HDPE	7,891
Ductile Iron	2,280
Concrete	1,664
Unknown	637
Total	181,404

There are some sections of 4-inch pipe that still exist within the City. According to TCEQ criteria, the minimum pipe size allowed is 6-inches. The 4-inch sections of pipe should be replaced during the systematic replacement and rehabilitation of the system. Additionally, there are numerous sections of the system that consist of clay tile and ductile iron pipe. Although not necessarily an indicator of condition, clay tile pipe is frequently found to have cracks or breaks that allow ground water infiltration into the system. Additionally, ductile iron and concrete pipe are frequently subject to corrosion problems. **Appendix D – Sewer Pipe Material** highlights the different pipe materials in the wastewater system. Kimley-Horn recommends investigating the sections of clay, ductile iron, and concrete pipe for replacement or rehabilitation.

Inflow and Infiltration (I&I)

I&I is non-wastewater discharges entering the wastewater system. The most common contributors of I&I are storm water runoff and groundwater. Infiltration is defined as the water entering the collection system and private service lines from the ground, through defective pipe joints, broken pipes, cracks in manhole walls, and bad pipe-to-pipe and pipe-to-manhole connections. Inflow is defined as the water entering the collection system and service lines from direct surface connections such as roof drains, yard drains, holes in manhole covers, etc. I&I flows are almost always responsible for the peak flow rates experienced in wastewater systems. The City has a calculated peaking factor of 4.8 to 1 from peak discharge to average day discharge condition. Although not as high as some communities, a 4.8 peaking factor is still indicative of significant I&I inflows into the system.

Sources of I&I are difficult to locate and furthermore are costly to fix, however, there are several advantages of reducing I/I. Reducing I/I has the following advantages:

- Increases available system capacity by decreasing the amount of extraneous flow transported by the collection system.
- Decreases charges from Fort Worth by reducing total flow sent to Fort Worth for treatment.
- Decreases the frequency of lift station pumping, saving on electricity costs and wear and tear on the pumps.
- Revenues remain constant. Therefore, reducing I/I has no effect on revenue generation, it only lowers operational costs.
- Reduces potential for future illegal overflows (overflows are costly to clean up and the TCEQ could levy fines).

Lift Station Facilities

The City operates and maintains six lift station facilities utilizing force mains ranging in size from six-inches in diameter to sixteen-inches in diameter to transport wastewater to either a separate wastewater drainage basin or directly to the Fort Worth discharge point. See **Appendix C – Existing Sewer Infrastructure** for an illustration of the City's existing wastewater facilities. **Figure 1** on page 16 shows the schematic wastewater flow path from the City's six lift stations to the Fort Worth wholesale meter. **Table 12** below summarizes the information provided by the City for each lift station. The Charbonneau lift station was rehabilitated in 2017. Improvements to the lift station included lining the wet well, replacing discharge piping, and replacing submersible pumps. An improvement to the Charbonneau force main is currently under design and expected to begin construction in 2018.

Table 12 – Existing Lift Station Summary

Lift Station	Working Volume of Wet Well (gal)	Force Main Size (in)	Number of Pumps	Firm Pump Capacity (gpm)	Date of Last Improvement
Caddo	580	6	2	200	2002
Charbonneau	7,780	12/16	3	2,500	2017
Clark	800	6	2	Unavailable	2009
Edgemere	1,763	6	2	635	2008
Lakewood	750	6	2	150	2017
Marina	Unavailable	10/12	3	1,800	2017

Each force main was analyzed according to the TCEQ criteria limiting the velocity in the force main to 6 ft/s. Above 6 ft/s, it must be certified that the pipeline can withstand high and low surge pressures in the event of sudden pump failure. The force main was analyzed using the greatest pumping rate or the maximum flow that could be expected through the force main. **Table 13** below summarizes the results of the force main analysis.

Table 13 – Force Main Analysis

Lift Station	Existing Force Main Size (in)	Existing Firm Pump Capacity (gpm)	Recommended Buildout Firm Pump Capacity (gpm)	Recommended Buildout Force Main Size (in)
Caddo	6	200	200	6
Charbonneau	12/16	2,500	2,750	16
Clark	6	24*1	29*1	6
Edgemere	6	635	800	8
Lakewood	6	150	150	6
Marina	10/12	1,800	1,800	10

*1 – Pump information for Clark lift station is unknown. The force main velocity was calculated based on the calculated existing and buildout discharges.

The twelve-inch portion of the Charbonneau force main and the Edgemere force main are below the recommended force main size in existing conditions and ultimate conditions. These force mains have velocities in excess of the 6 ft/s TCEQ criteria. The Edgemere lift station force main should be analyzed to ensure that they can handle high and low surge pressures. An update to the Charbonneau force main is currently under design and is expected to begin construction in 2018.

The wet wells at each lift station were analyzed according to the TCEQ criteria detailed in **Section VI – Design Criteria. Table 14** below summarizes the wet well calculations. Required wet well sizes were calculated based on the horsepower of the existing pumps. It should be noted that wet well volumes shown are the wet well working volume and not the volume of the entire wet well.

Table 14 – Wet Well Analysis

Lift Station	Working Volume of Wet Well (gal)	Buildout Required Wet Well Working Volume (gal)	Recommended Buildout Wet Well Working Volume (gal)
Caddo	580	300	580
Charbonneau	7,780	6,875	7,780
Clark	800	43	800
Edgemere	1,763	1,200	1,763
Lakewood	750	225	750
Marina	---	4,500	4,500

All of the lift stations both have adequate volume for the buildout conditions. The working volume of the Marina wet well was unknown and could not be verified.

The pumps at each lift station were also analyzed according to the TCEQ criteria, stipulating that each station should have sufficient firm pumping capacity to pump the peak event. **Table 15** below summarizes the pumping calculations at each lift station.

Table 15 – Pumping Analysis

Lift Station	Existing Firm Pump Capacity (gpm)	Existing Required Pump Capacity (gpm)	Recommended Buildout Firm Pump Capacity (gpm)
Caddo	200	150	200
Charbonneau	2,500	2,580	2,750
Clark	---	24	29
Edgemere	635	630	710
Lakewood	150	40	150
Marina	1,800	1,260	1,800

The Caddo, Lakewood, and Marina pump station all have satisfactory firm pumping capacity to meet the buildout conditions. The Charbonneau lift station is undersized in both existing and buildout conditions, however, the Charbonneau lift station has a fourth empty slot that is available to add additional pumping in the future. The Charbonneau force main is also being upsized which is expected to increase the capacity of the lift station. The Edgemere lift station is anticipated to be slightly undersized at buildout. If the City is able to successfully rehabilitate the collection system and decrease the I&I into the system, upgrades to the Edgemere and Charbonneau lift stations may not be necessary. Kimley-Horn recommends monitoring the performance of the Charbonneau and Edgemere lift stations during wet weather events.

Table 16 below has a breakdown of the force mains in the system by diameter.

Table 16 – Force Main Summary

Pipe Size	Linear Footage (LF)
6”	4,256
10”	2,472
12”	4,478
16”	4,973
Total	**16,178**

Kimley-Horn did not perform onsite evaluations of the lift stations or the force mains. Kimley-Horn recommends that the City periodically inspect the lift stations for wear and corrosion. Electricity for pumping costs can be an expensive part of operating a wastewater system, therefore ensuring that the pumps in the system are operating efficiently either through inspection or pump testing is an important part of maintenance. Additionally, if an upgrade of the existing SCADA system becomes necessary, Kimley-Horn recommends that the City add level sensors to all the lift stations.

CAPITAL IMPROVEMENT PLAN

From the Master Planning process, a recommended list of Capital Improvements has been developed. The City has almost reached complete buildout of the City service area. Therefore, no projects have been developed tied to new growth. The Capital Improvement list focuses on setting up a system for replacement and rehabilitation of the existing collection system and for correcting a few minor deficiencies. Replacement and rehabilitation projects have been selected to maintain an annual budget of approximately $500,000. Project locations should be adjusted based on the results of field investigation or City staff input. All improvements are shown in **Appendix E – Capital Improvement Plan**. The following opinion of probable costs for each capital project assumes no design completed, based on 2024 dollars, no inflation increases, and does not include any property acquisitions.

Table 17 – Capital Improvements Plans

PROJECT NAME		PROJECT COST
1	Rehabilitation Projects – Year 1	$2,400,000
2	Rehabilitation Projects – Year 2	$2,300,000
3	Rehabilitation Projects – Year 3	$2,800,000
4	Rehabilitation Projects – Year 4	$2,750,000
5	Rehabilitation Projects – Year 5	$2,600,000
6	Rehabilitation Projects – Year 6	$1,450,000
7	Rehabilitation Projects – Year 7	$1,550,000
8	Rehabilitation Projects – Year 8	$2,500,000
9	Edgemere Force Main and Pump Upgrade	$900,000
10	Charbonneau Pump Addition	$150,000
	TOTAL:	**$19,400,000**

REVISED MARCH 2024

#1 – Rehabilitation Projects – Year 1

PROJECT COST: $ 2,400,000

NOTES: This is the second phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#2 – Rehabilitation Projects – Year 2

PROJECT COST: $2,300,000

NOTES: This is the third phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#3 – Rehabilitation Projects – Year 3

PROJECT COST: $2,800,000

NOTES: This is the fourth phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#4 – Rehabilitation Projects – Year 4

PROJECT COST: $ 2,750,000

NOTES: This is the fifth phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#5 – Rehabilitation Projects – Year 5

PROJECT COST: $2,600,000

NOTES: This is the sixth phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

REVISED MARCH 2024

#6 – Rehabilitation Projects – Year 6

PROJECT COST: $1,450,000

NOTES: This is the seventh phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#7 – Rehabilitation Projects – Year 7

PROJECT COST: $1,550,000

NOTES: This is the ninth phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#8 – Rehabilitation Projects – Year 8

PROJECT COST: $2,500,000

NOTES: This is the tenth phase for systematically replacing the old and clay tile pipes in the wastewater collection system. Project locations may be adjusted based on the findings of the I&I study or City staff input.

#9 – Edgemere Force Main and Pump Upgrade

PROJECT COST: $900,000

NOTES: This project consists of approximately 1,100 linear feet of force main along Caddo Trail and new pumps at the Caddo lift station. This project will be necessary with buildout of the system to meet peak demands and TCEQ criteria.

#10 – Charbonneau Pump Addition

PROJECT COST: $150,000

NOTES: This project will add a pump to the Charbonneau lift station’s empty fourth pump slot. This project will be necessary with buildout of the system to meet peak demands and TCEQ criteria.

REVISED MARCH 2024

VIII. APPENDICES

Appendix A – Existing Land Use Map

Appendix B – Ultimate Land Use Map (Revised March 2024)

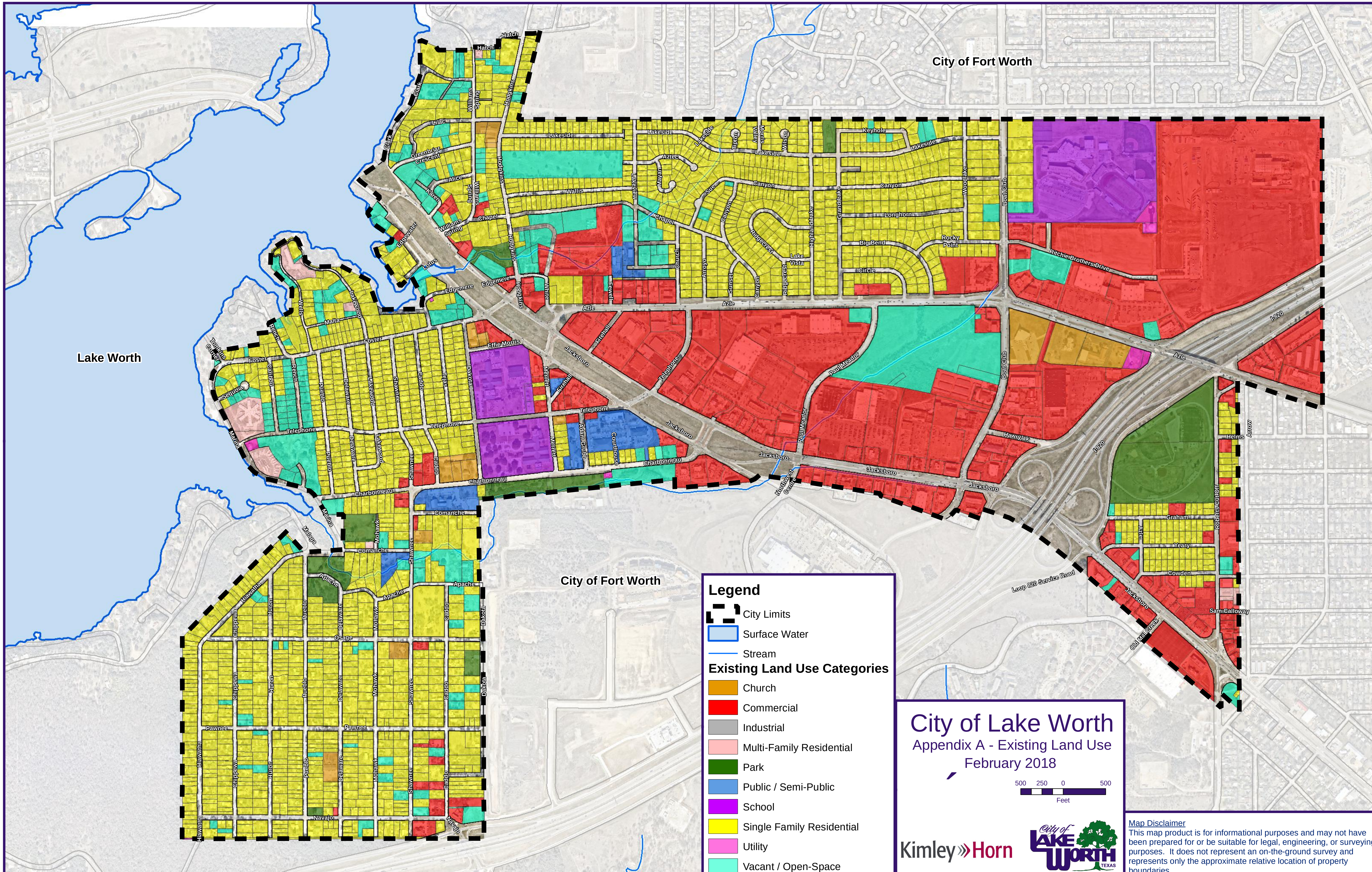
Appendix C – Existing Sewer Infrastructure (Revised March 2024)

Appendix D – Sewer Line Material (Revised March 2024)

Appendix E – Capital Improvement Plan (Revised March 2024)

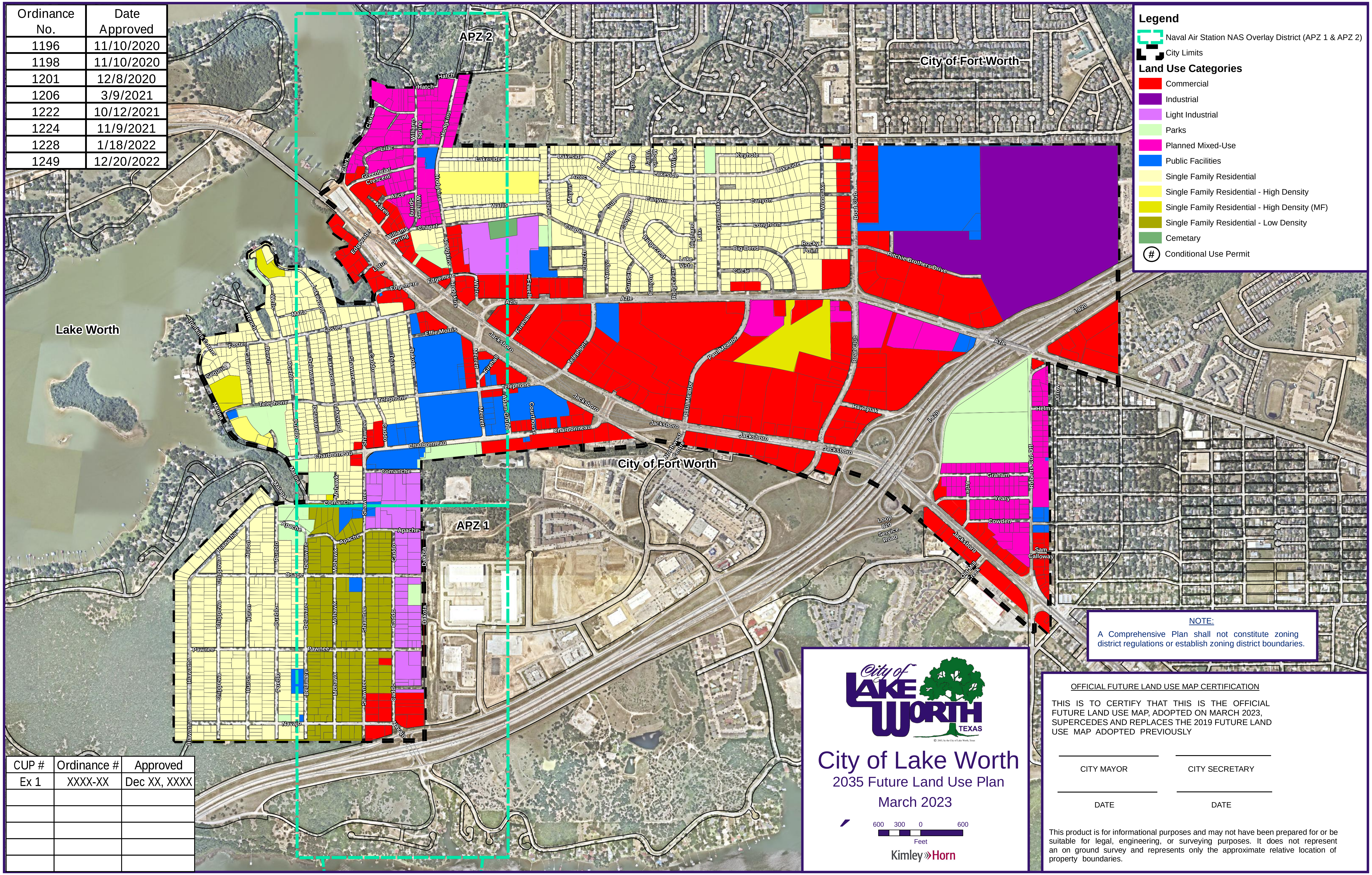
Appendix F – Opinions of Probable Construction Costs (Revised March 2024)

Appendix A – Existing Land Use Map


City of Fort Worth
Lake Worth
City of Fort Worth
Legend
City Limits
Surface Water
Stream
Existing Land Use Categories
Church
Commercial
Industrial
Multi-Family Residential
Park
Public / Semi-Public
School
Single Family Residential
Utility
Vacant / Open-Space
City of Lake Worth
Appendix A - Existing Land Use
February 2018
500 250 0 500
Feet
Kimley»Horn
City of Lake Worth Texas
Map Disclaimer
This map product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.
Hatch
Lakeside
Keyhole
Wallis
Canyon
Longhorn
Big Bend
Rocky Point
Circle
Chapel
Azle
Ritchie Brothers Drive
Jacksboro
Telephone
Charbonneau
Comanche
Apache
Osage
Pawnee
Navajo
Effie Morris
Foster
Malta
Edgemere
Boat Club
Paul Meador
Hawaylak
Graham
Yeary
Cowden
Sam Calloway
Old Mill Creek
Loop 820 Service Road
I-820
Roberts Cutoff
Helms
Arrow
Hiawatha
Chippewa
Huron
Pueblo
Delaware
Mohawk
Shawnee
Caddo
Dakota
Lakewood
Tejas

Appendix B – Ultimate Land Use Map

Ordinance No.	Date Approved
1196	11/10/2020
1198	11/10/2020
1201	12/8/2020
1206	3/9/2021
1222	10/12/2021
1224	11/9/2021
1228	1/18/2022
1249	12/20/2022



Legend

- Naval Air Station NAS Overlay District (APZ 1 & APZ 2)
- City Limits

Land Use Categories

- Commercial
- Industrial
- Light Industrial
- Parks
- Planned Mixed-Use
- Public Facilities
- Single Family Residential
- Single Family Residential - High Density
- Single Family Residential - High Density (MF)
- Single Family Residential - Low Density
- Cemetary
- (#) Conditional Use Permit

CUP #	Ordinance #	Approved
Ex 1	XXXX-XX	Dec XX, XXXX

NOTE:
A Comprehensive Plan shall not constitute zoning district regulations or establish zoning district boundaries.

City of Lake Worth

2035 Future Land Use Plan

March 2023

600 300 0 600
Feet

Kimley»Horn

OFFICIAL FUTURE LAND USE MAP CERTIFICATION

THIS IS TO CERTIFY THAT THIS IS THE OFFICIAL FUTURE LAND USE MAP, ADOPTED ON MARCH 2023, SUPERCEDES AND REPLACES THE 2019 FUTURE LAND USE MAP ADOPTED PREVIOUSLY

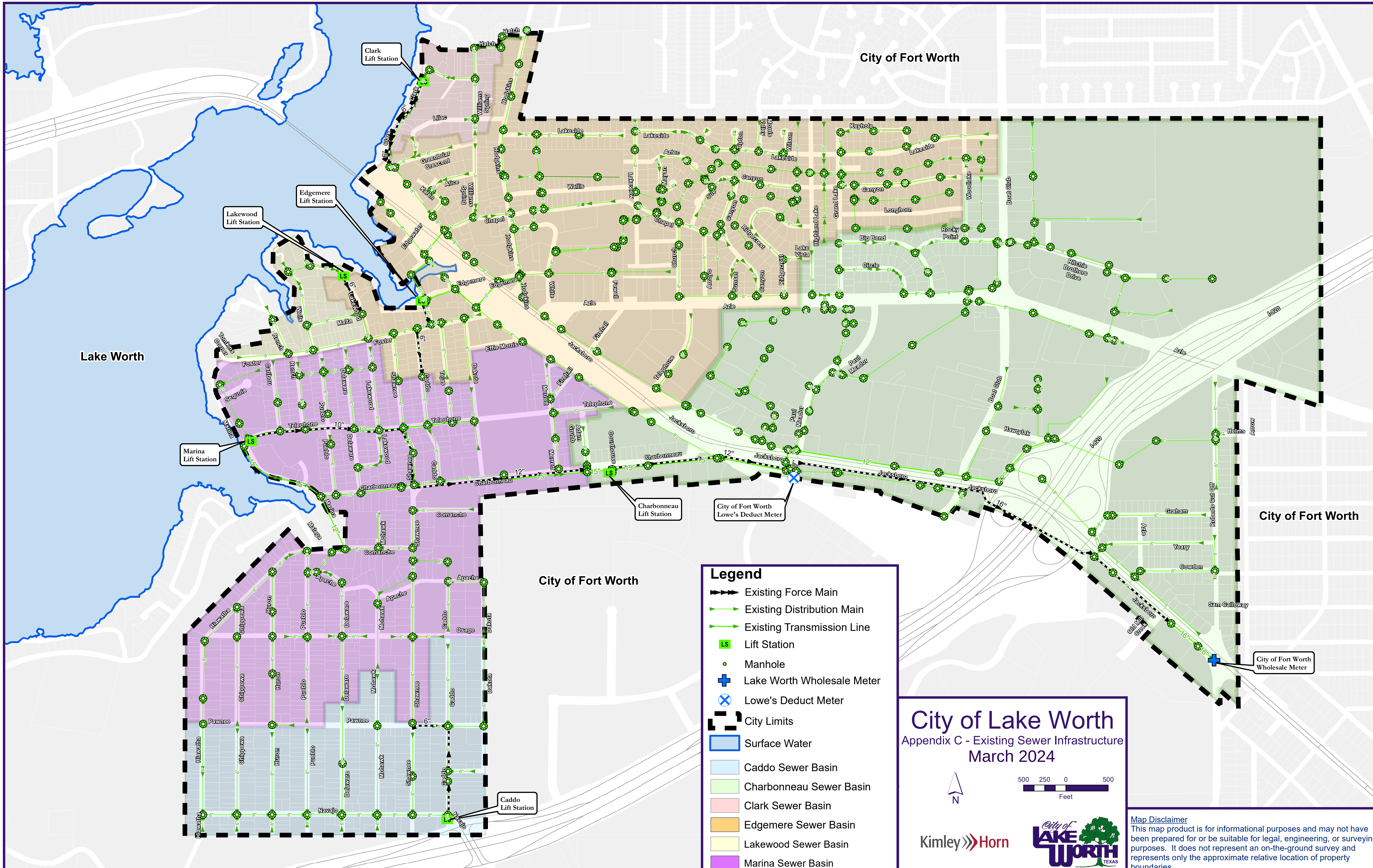
CITY MAYOR ____________ CITY SECRETARY ____________

DATE ____________ DATE ____________

This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on ground survey and represents only the approximate relative location of property boundaries.

REVISED MARCH 2023

Appendix C – Existing Sewer Infrastructure



City of Lake Worth

Appendix C - Existing Sewer Infrastructure

March 2024

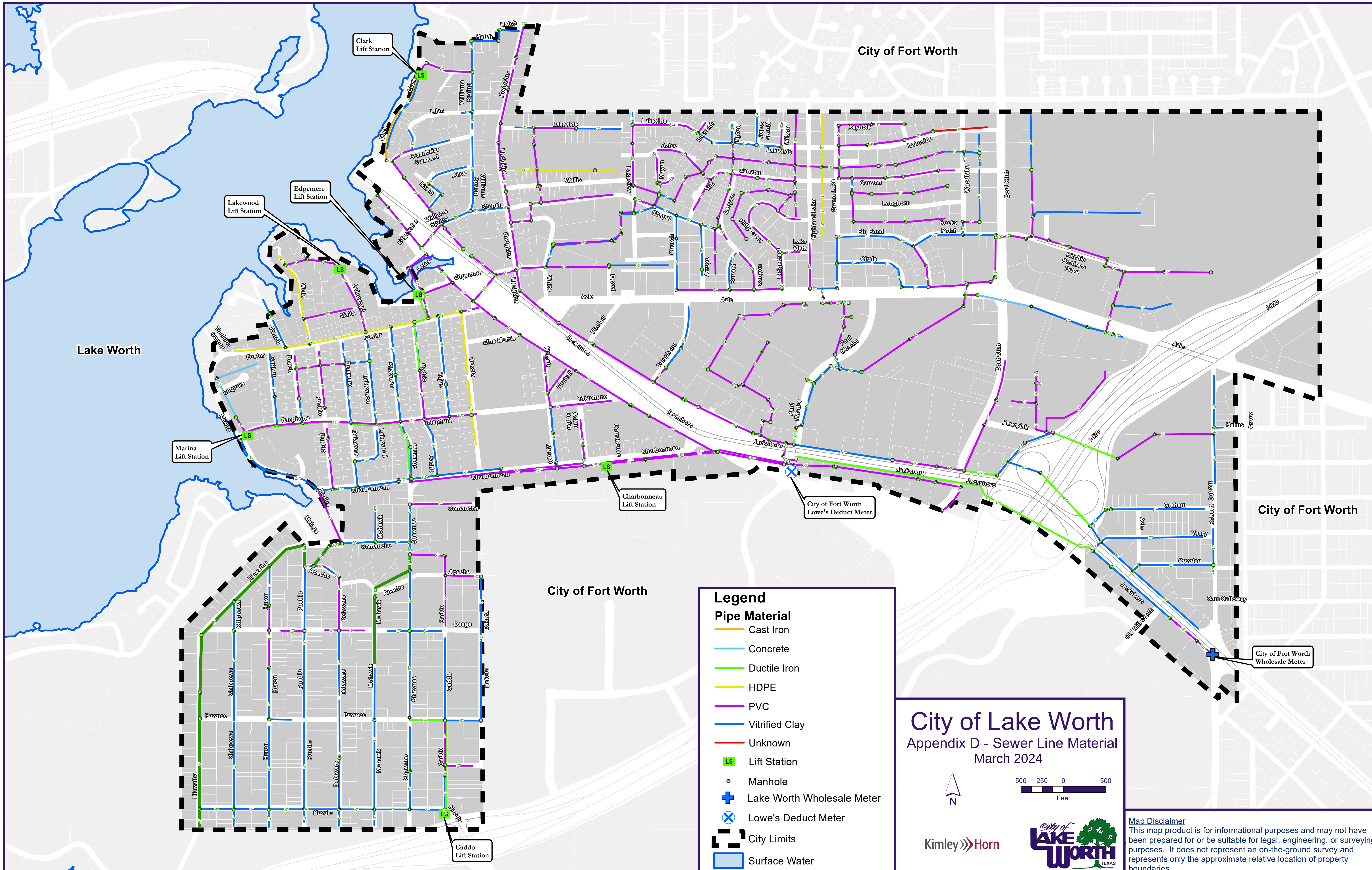
Kimley»Horn

City of Lake Worth Texas

Map Disclaimer
This map product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

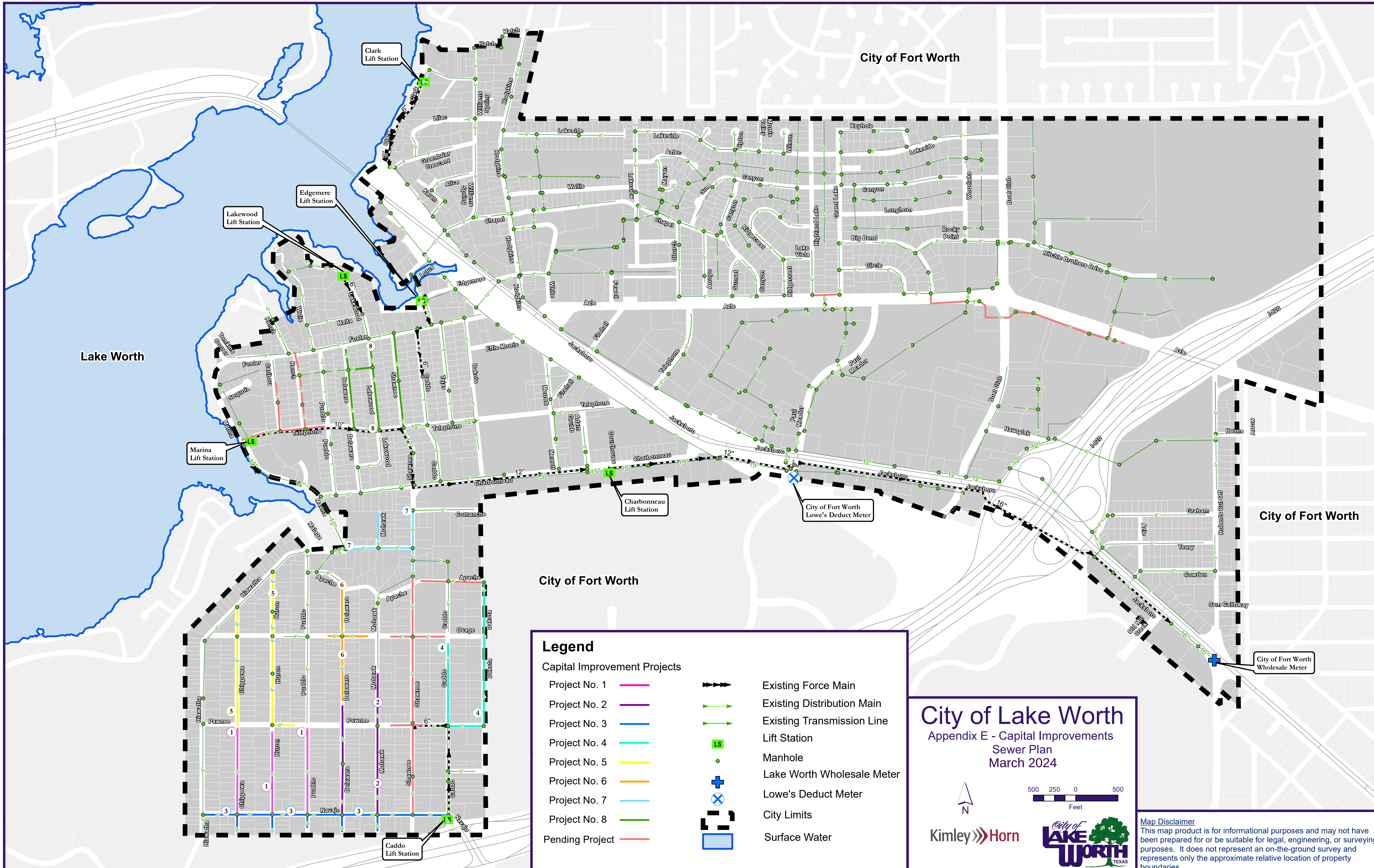
REVISED MARCH 2024

Appendix D – Sewer Line Material



REVISED MARCH 2024

Appendix E – Capital Improvement Plan



REVISED MARCH 2024

Appendix F – Opinions of Probable Construction Costs

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 1. Rehabiliation Projects - Year 1

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$146,000	$146,000
2	Traffic Control	1	LS	$29,000	$29,000
3	Erosion Control	1	LS	$28,000	$28,000
4	6" SDR-26 PVC Sanitary Sewer	3,050	LF	$150.00	$458,000
5	4" Sanitary Sewer Service Connection	82	EA	$3,000.00	$246,000
6	4' Standard Concrete Manhole	9	EA	$10,000.00	$90,000
7	Sewer Line Trench Safety	3,050	LF	$3.00	$10,000
8	Curb and Gutter Repair	410	LF	$125.00	$52,000
9	Pavement Repair	2,711	SY	$200.00	$543,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$1,602,000
Conting. (%,+/-)	25	$400,500
Professional Services (%,+/-)	15	$300,375
Total:		**$2,302,875**
Budget		**$2,400,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 2. Rehabiliation Projects - Year 2

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$145,000	$145,000
2	Traffic Control	1	LS	$29,000	$29,000
3	Erosion Control	1	LS	$28,000	$28,000
4	8" SDR-26 PVC Sanitary Sewer	2,950	LF	$175.00	$517,000
5	4" Sanitary Sewer Service Connection	72	EA	$3,000.00	$216,000
6	4' Standard Concrete Manhole	8	EA	$10,000.00	$80,000
7	Sewer Line Trench Safety	2,950	LF	$3.00	$9,000
8	Curb and Gutter Repair	360	LF	$125.00	$45,000
9	Pavement Repair	2,622	SY	$200.00	$525,000

Basis for Cost Projection:

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

Subtotal:		$1,594,000
Conting. (%,+/-)	25	$398,500
Professional Services (%,+/-)	15	$298,875
Total:		**$2,291,375**
Budget:		**$ 2,300,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 3. Rehabiliation Projects - Year 3

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$176,000	$176,000
2	Traffic Control	1	LS	$35,000	$35,000
3	Erosion Control	1	LS	$34,000	$34,000
4	6" SDR-26 PVC Sanitary Sewer	1,000	LF	$150.00	$150,000
5	8" SDR-26 PVC Sanitary Sewer	2,900	LF	$175.00	$508,000
6	4" Sanitary Sewer Service Connection	52	EA	$3,000.00	$156,000
7	4' Standard Concrete Manhole	13	EA	$10,000.00	$130,000
8	Sewer Line Trench Safety	3,900	LF	$3.00	$12,000
9	Curb and Gutter Repair	260	LF	$125.00	$33,000
10	Pavement Repair	3,467	SY	$200.00	$694,000

Basis for Cost Projection:

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

Subtotal:		$1,928,000
Conting. (%,+/-)	25	$482,000
Professional Services (%,+/-)	15	$361,500
Total:		**$2,771,500**
Budget:		**$2,800,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 4. Rehabiliation Projects - Year 4

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$172,000	$172,000
2	Traffic Control	1	LS	$34,000	$34,000
3	Erosion Control	1	LS	$33,000	$33,000
4	6" SDR-26 PVC Sanitary Sewer	4,100	LF	$150.00	$615,000
5	4" Sanitary Sewer Service Connection	55	EA	$3,000.00	$165,000
6	4' Standard Concrete Manhole	9	EA	$10,000.00	$90,000
7	Sewer Line Trench Safety	4,100	LF	$3.00	$13,000
8	Curb and Gutter Repair	280	LF	$125.00	$35,000
9	Pavement Repair	3,644	SY	$200.00	$729,000

Subtotal:		$1,886,000
Conting. (%,+/-)	25	$471,500
Professional Services (%,+/-)	15	$353,625
Total:		**$2,711,125**
Budget:		**$2,750,000**

Basis for Cost Projection:

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 5. Rehabiliation Projects - Year 5

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$162,000	$162,000
2	Traffic Control	1	LS	$32,000	$32,000
3	Erosion Control	1	LS	$32,000	$32,000
4	6" SDR-26 PVC Sanitary Sewer	3,500	LF	$150.00	$525,000
5	4" Sanitary Sewer Service Connection	81	EA	$3,000.00	$243,000
6	4' Standard Concrete Manhole	10	EA	$10,000.00	$100,000
7	Sewer Line Trench Safety	3,500	EA	$3.00	$11,000
8	Curb and Gutter Repair	410	LF	$125.00	$52,000
9	Pavement Repair	3,111	SY	$200.00	$623,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$1,780,000
Conting. (%,+/-)	25	$445,000
Professional Services (%,+/-)	15	$333,750
Total:		**$2,558,750**
Budget:		**$2,600,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 6. Rehabiliation Projects - Year 6

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$89,000	$89,000
2	Traffic Control	1	LS	$18,000	$18,000
3	Erosion Control	1	LS	$18,000	$18,000
4	6" SDR-26 PVC Sanitary Sewer	1,900	LF	$150.00	$285,000
5	4" Sanitary Sewer Service Connection	42	EA	$3,000.00	$126,000
6	4' Standard Concrete Manhole	7	EA	$10,000.00	$70,000
7	Sewer Line Trench Safety	1,900	LF	$3.00	$6,000
8	Curb and Gutter Repair	210	LF	$125.00	$27,000
9	Pavement Repair	1,689	SY	$200.00	$338,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$977,000
Conting. (%,+/-)	25	$244,250
Professional Services (%,+/-)	15	$183,188
Total:		**$1,404,438**
Budget:		**$1,450,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 7. Rehabiliation Projects - Year 7

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$97,000	$97,000
2	Traffic Control	1	LS	$19,000	$19,000
3	Erosion Control	1	LS	$19,000	$19,000
4	6" SDR-26 PVC Sanitary Sewer	875	LF	$150.00	$132,000
5	8" SDR-26 PVC Sanitary Sewer	1,150	LF	$175.00	$202,000
6	4" Sanitary Sewer Service Connection	43	EA	$3,000.00	$129,000
7	4' Standard Concrete Manhole	7	EA	$10,000.00	$70,000
8	Sewer Line Trench Safety	2,025	LF	$3.00	$7,000
9	Curb and Gutter Repair	220	LF	$125.00	$28,000
10	Pavement Repair	1,800	SY	$200.00	$360,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$1,063,000
Conting. (%,+/-)	25	$265,750
Professional Services (%,+/-)	15	$199,313
Total:		**$1,528,063**
Budget:		**$1,550,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Client:	**City of Lake Worth**	**Date:**	**3/4/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060072**	**Checked By:**	**NRS**

Title: 8. Rehabiliation Projects - Year 8

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$156,000	$156,000
2	Traffic Control	1	LS	$31,000	$31,000
3	Erosion Control	1	LS	$30,000	$30,000
4	6" SDR-26 PVC Sanitary Sewer	3,350	LF	$150.00	$503,000
5	4" Sanitary Sewer Service Connection	86	EA	$3,000.00	$258,000
6	4' Standard Concrete Manhole	12	EA	$10,000.00	$120,000
7	Sewer Line Trench Safety	3,350	LF	$3.00	$11,000
8	Curb and Gutter Repair	60	LF	$125.00	$8,000
9	Pavement Repair	2,978	SY	$200.00	$596,000

Basis for Cost Projection:

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

Subtotal:		$1,713,000
Conting. (%,+/-)	25	$428,250
Professional Services (%,+/-)	15	$321,188
Total:		**$2,462,438**
Budget:		**$2,500,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**	**3/13/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**	**HNH**
KHA No.:	**061060050**	**Checked By:**	**NRS**

Title: 9. Edgemere Force Main and Pump Upgrade

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$56,000	$56,000
2	Traffic Control	1	LS	$11,000	$11,000
3	Erosion Control	1	LS	$11,000	$11,000
4	8" AWWA C-900 DR-18 PVC Pipe	1,100	LF	$150.00	$165,000
5	Sewer Line Trench Safety	1,100	LF	$10.00	$11,000
6	Connect to Existing Lift Station	1	EA	$10,000.00	$10,000
7	4' Standard Concrete Manhole	1	EA	$10,000.00	$10,000
8	Curb and Gutter Repair	100	LF	$125.00	$13,000
9	Pavement Repair	980	SY	$200.00	$196,000
10	Edgemere Electrical Upgrades	1	LS	$50,000.00	$50,000
11	Bypass Pumping	1	LS	$50,000.00	$50,000
12	Edgemere Pump Replacement	2	EA	$15,000.00	$30,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$613,000
Conting. (%,+/-)	25	$153,250
Professional Services (%,+/-)	15	$114,938
Total:		**$881,188**
Budget:		**$900,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**City of Lake Worth**	**Date:**			**3/13/2024**
Project:	**Wastewater System Master Plan**	**Prepared By:**			**HNH**
KHA No.:	**061060050**	**Checked By:**			**NRS**
Title:	**10 Charbonneau Pump Addition**				
Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Charbonneau Pump Addition and Piping	1	LS	$100,000.00	$100,000

Basis for Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

Subtotal:		$100,000
Conting. (%,+/-)	25	$25,000
Professional Services (%,+/-)	15	$18,750
Total:		**$143,750**
Budget:		**$150,000**

The Engineer 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 costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

REVISED MARCH 2024