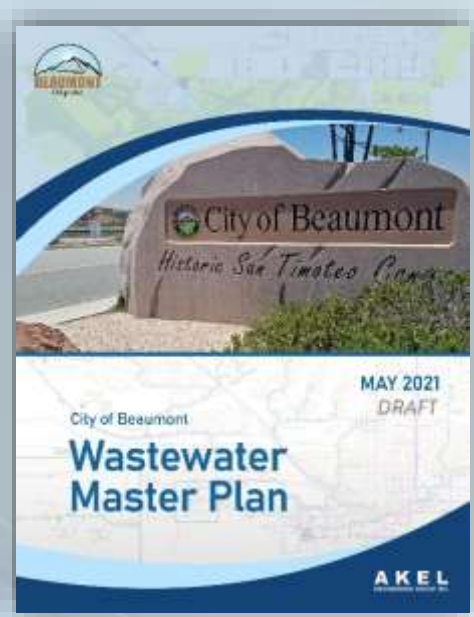


# City of Beaumont *2021 Wastewater Master Plan*



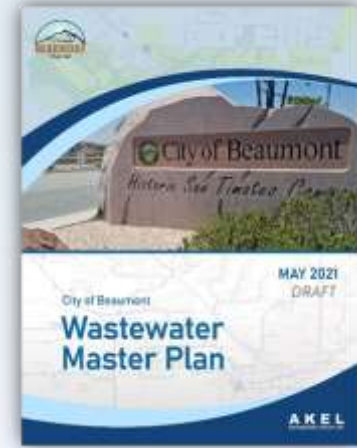
## Workshop – Draft Master Plan

June 22, 2021



# Objectives of the Wastewater Master Plan

The Wastewater Master Plan (WWMP) provides a **capacity adequacy assessment** of the City's sewer collection system to meet the **level of service** expected by **existing customers**, and to service **future growth**.

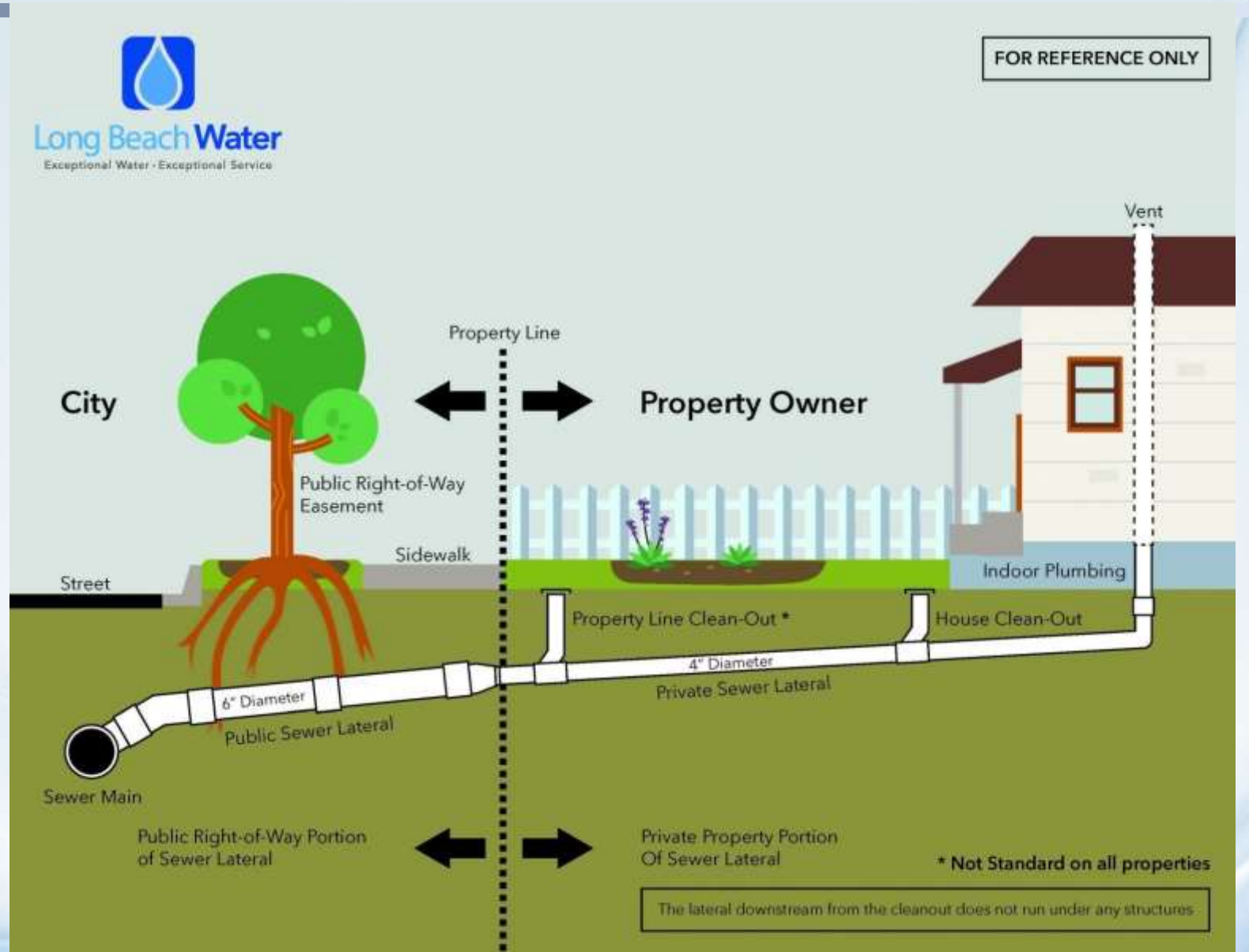


- **What** Infrastructure Needs to be Constructed?
- **When** we do we need it?
- **How much** will it cost?
- **Who** pays for it?

The WWMP is a **defensible** planning and **budgetary** document

# Wastewater Flows are Collected from our Homes

Wastewater Flows are Collected from our homes to the Sewer pipelines in the street



# Wastewater flows continue to WWTP via Gravity Sewers, Lift Stations, and Force Mains

## Force Main Sewer

Flow has to be “forced” through the main because gravity alone is not enough to move it.

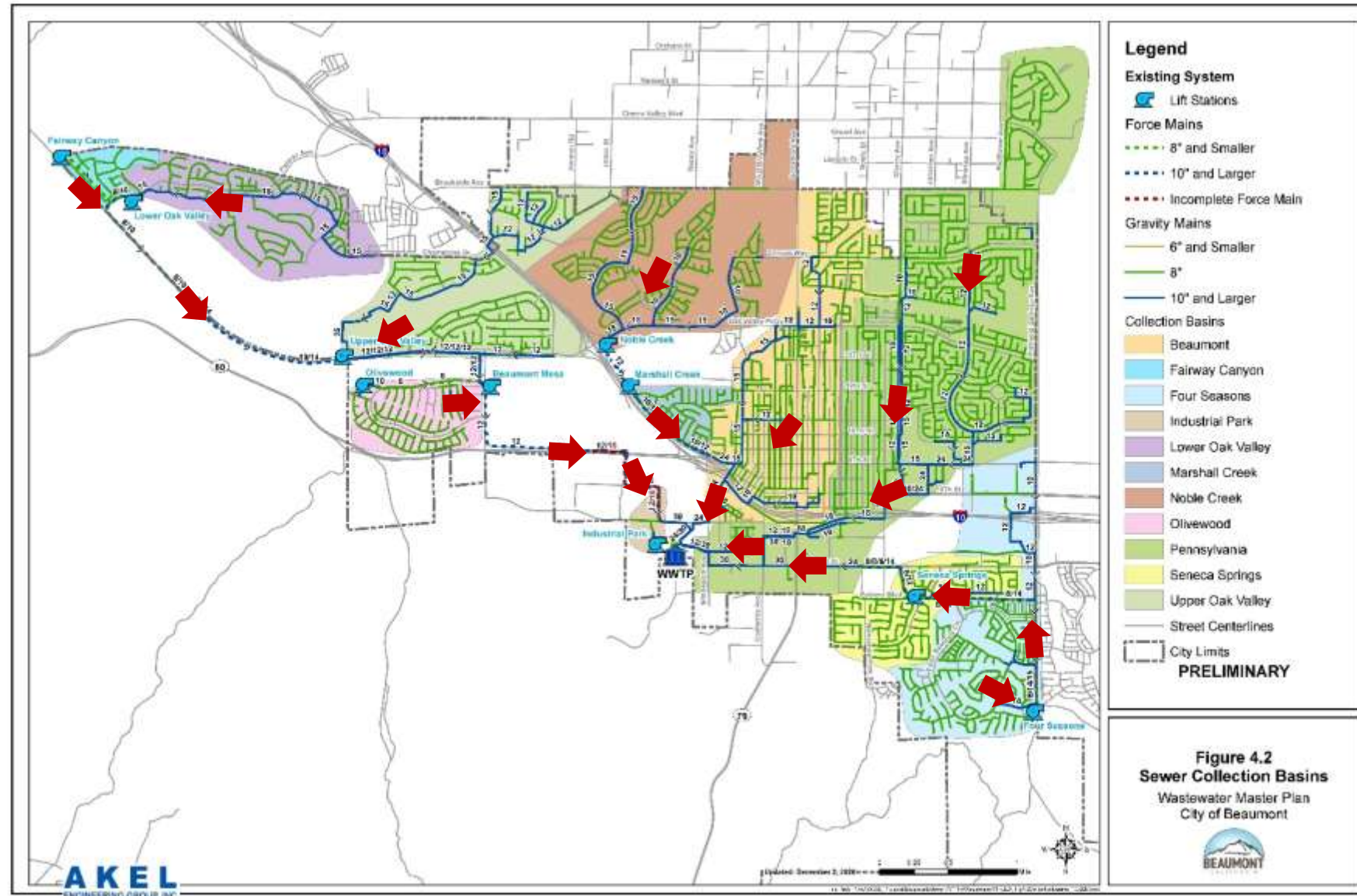
## Gravity Sewer

Flow uses gravity to get to pump stations and treatment plants.



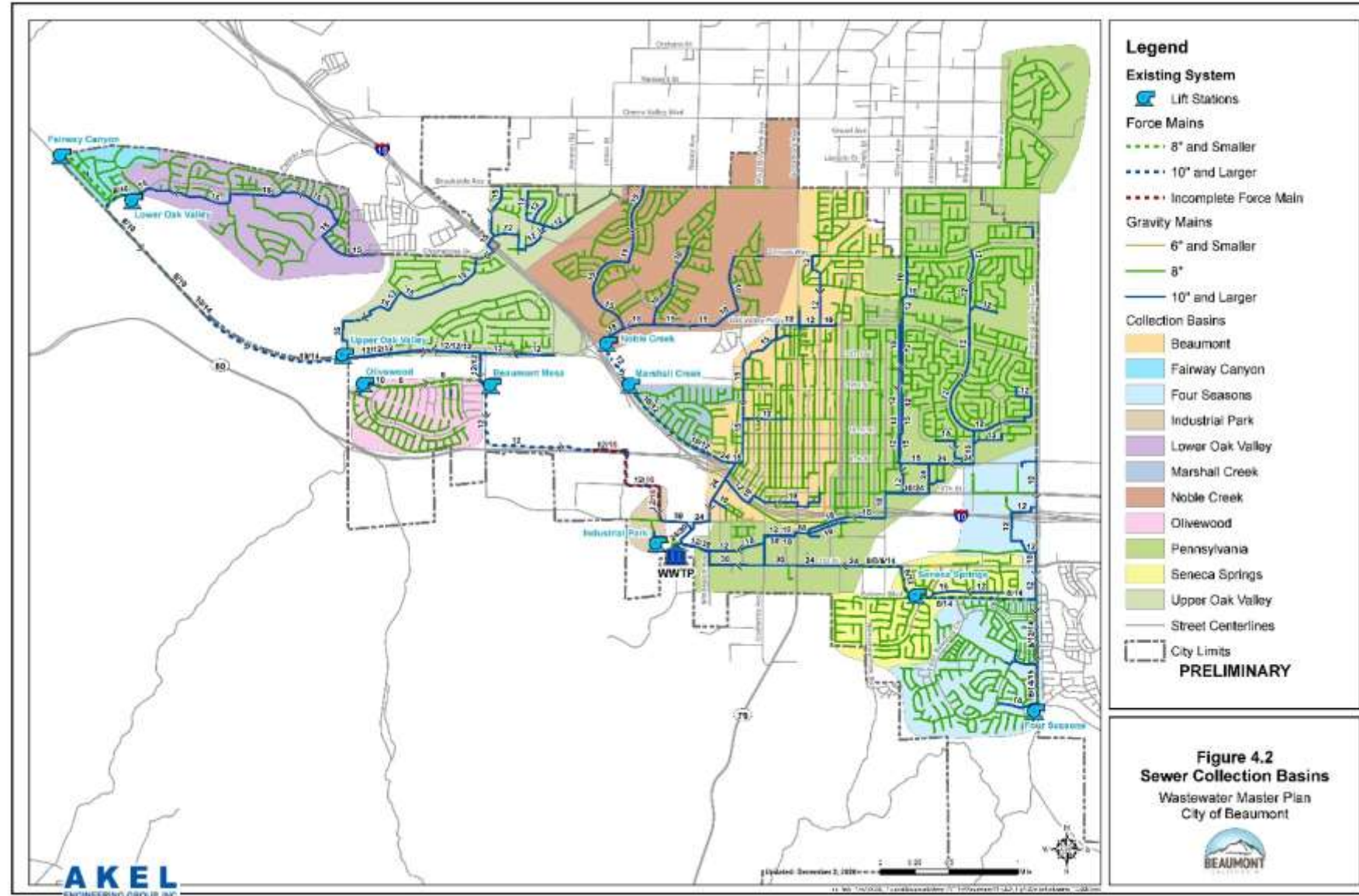
# Beaumont Wastewater is Collected from Tributary Basins and Conveyed to the WWTP

- Green Lines are smaller Gravity Sewers.
- Blue Lines are Large Conveyance Sewers (Backbone).
- Dashed lines are force mains
- RED arrows indicate the direction of wastewater flows



# Existing Wastewater Collection System

- 177 miles of Gravity Sewers
- 20 miles of Force Main
- 10 Lift Stations
- 1 Wastewater Treatment Plant



# The Process for Developing the WWMP

Phase 1

- Data Collection and Review
- Establish Planning Criteria

Phase 2

- Develop and Calibrate Hydraulic Model

Phase 3

- Perform Hydraulic Analysis/Evaluations
- Propose Improvements

Phase 4

- Develop Capital Improvement Program (CIP)

Phase 5

- Prepare Master Plan Report

# AGENDA – Follows WWMP Report Chapters



Chapter	Description
1	Introduction
2	Planning Area <b>Characteristics</b>
3	System Performance and <b>Design Criteria</b>
4	Existing Sewer Collection <b>Facilities</b>
5	Wastewater <b>Flows</b>
6	Hydraulic <b>Model</b> Development
7	Hydraulic Evaluation and <b>Proposed Improvements</b>
8	Capital Improvement Program ( <b>costs</b> )



# Chapter 1 – Introduction



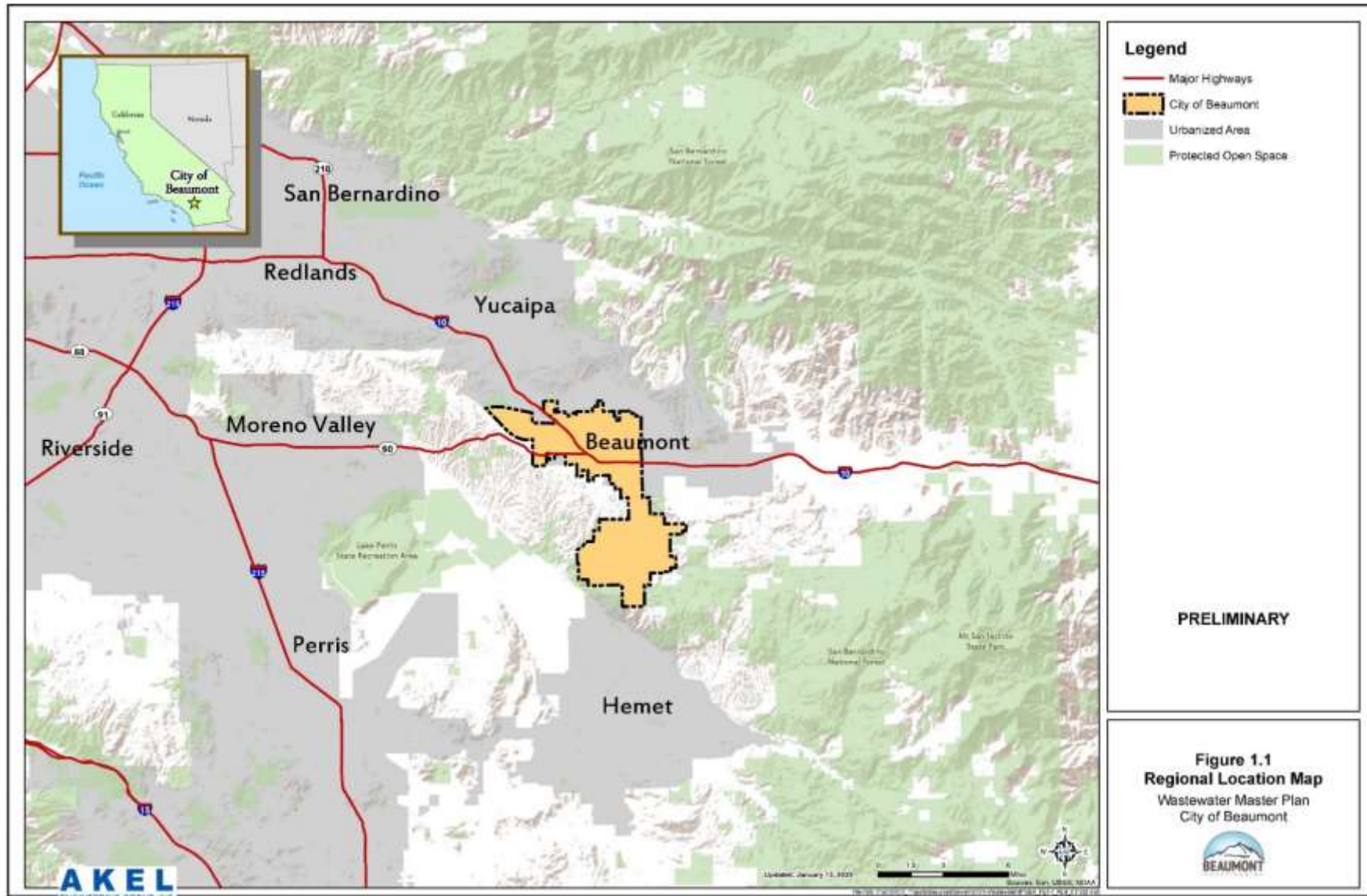
## Purpose of Chapter

The purpose of this chapter is to introduce the **master plan objectives**.

## Key Chapter Elements

- Regional Location Map
- WWMP Objectives
- Definitions
- Abbreviations
- Report Organization

# Regional Location Map



# Objectives of the WWMP

Objective	Description
Characterize Planning Area (Existing Customers, Sewer Flows, Land Use for Future Developments)	How much sewer flows from existing customers? What lands are expected to develop within the planning horizon?
Develop and Calibrate GIS-based Hydraulic Model	The Model is an accurate tool for evaluating the capacity adequacy of pipelines and lift stations. How much flows are generated by Basin?
Evaluate existing pipelines and lift stations system capacities	Do we meet an adequate Level of Service?
Recommend improvements to mitigate existing pipe deficiencies	What improvements are needed to meet an adequate Level of Service?
Perform Lift Station Field Review	We rely on lift stations. What is the overall lift stations structural condition?
Required improvements to service growth	What improvements are required from future developments
Develop Capital Improvement Program (CIP)	How much do the improvements Cost (Existing Users and Future Developments)

# Chapter 2 – Planning Area Characteristics



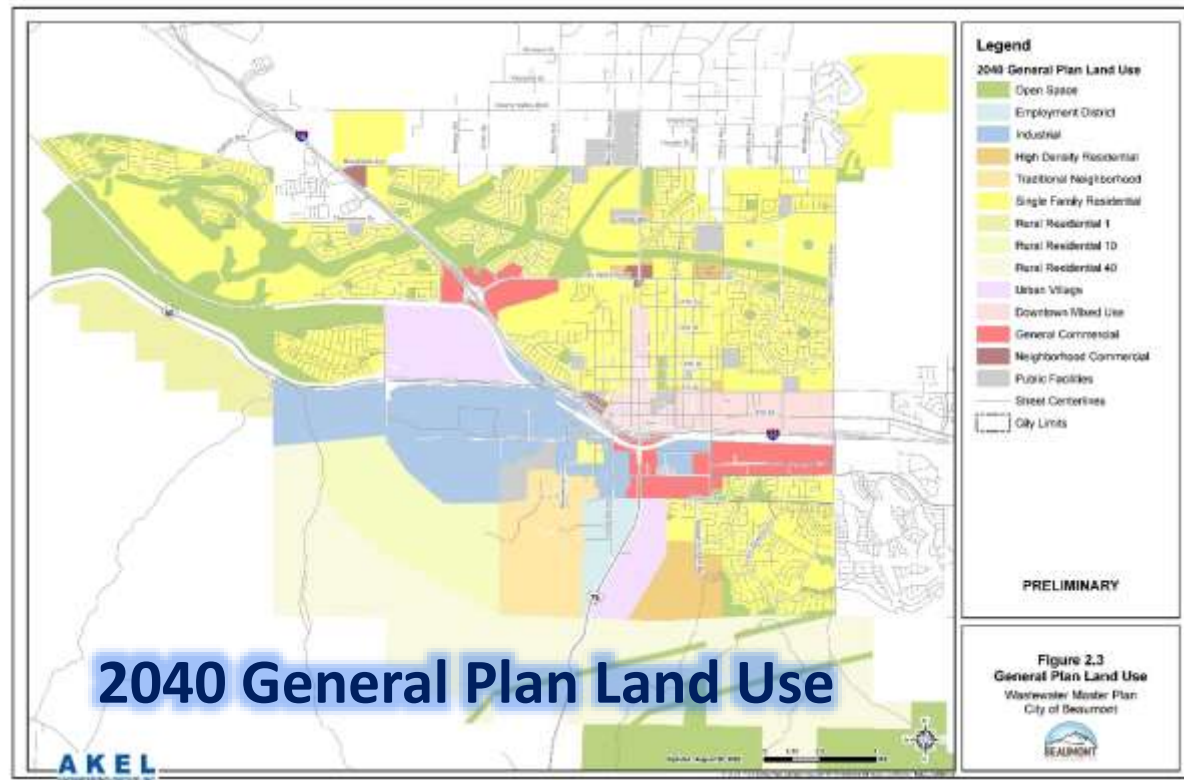
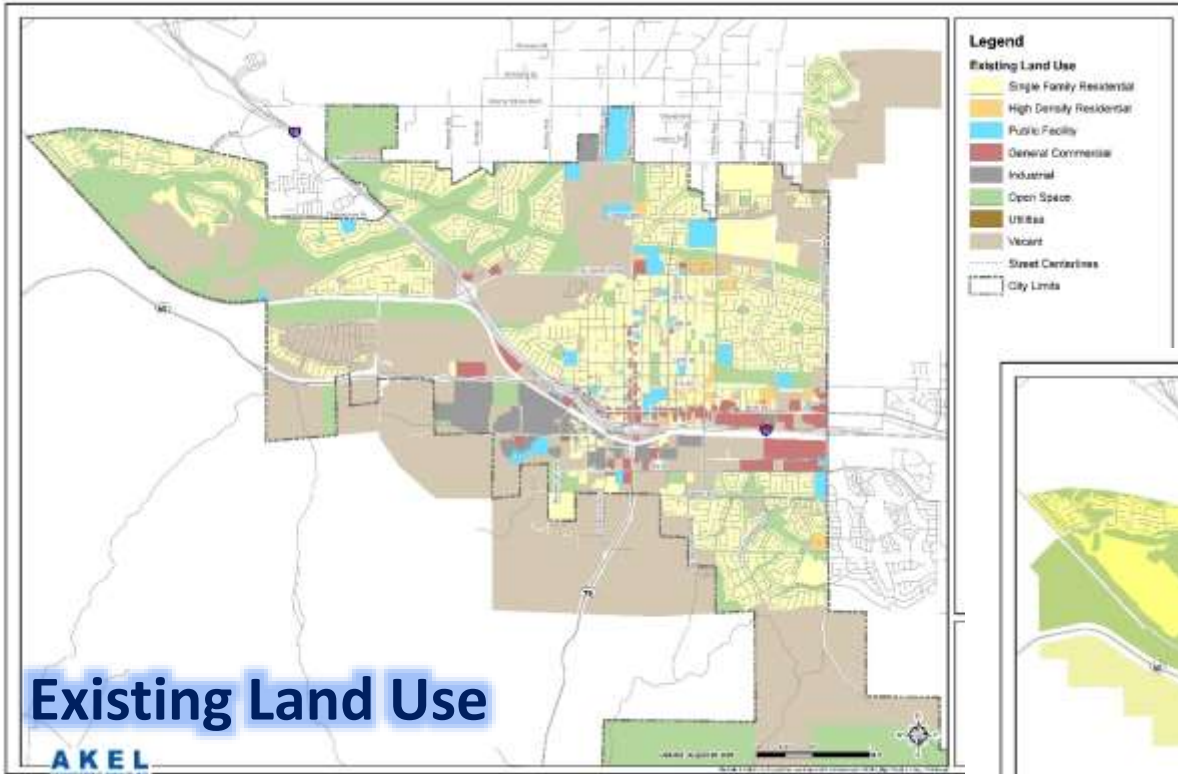
## Purpose of Chapter

The purpose of this chapter is to summarize the City's **service area**, including existing and future **land use** and **population**.

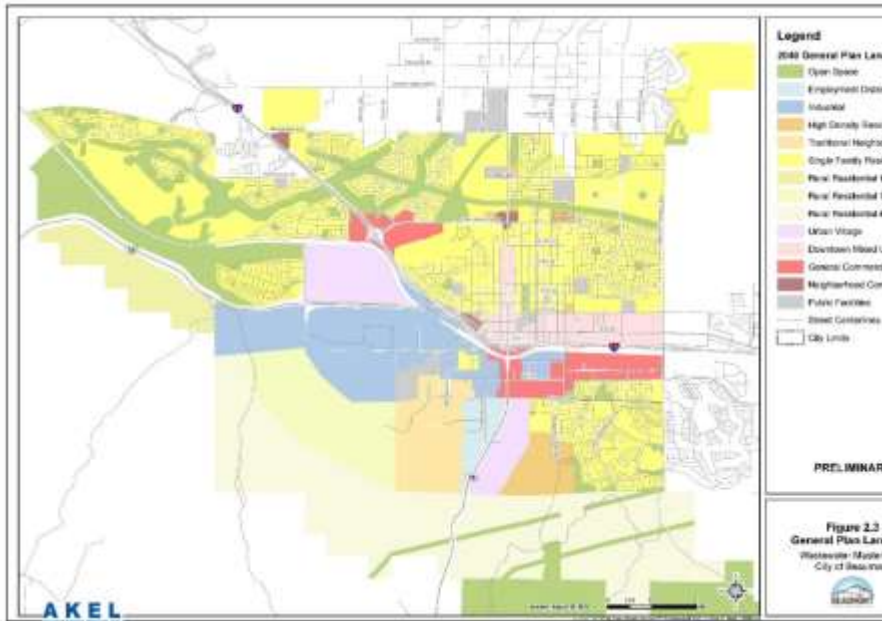
## Key Chapter Elements

- Service Area
- Existing Land Use
- General Plan Land Use
- Land Use Inventory
- Specific Plans
- Population

# Beaumont Land Use and Sewer System Service Area



# Land Use Inventory

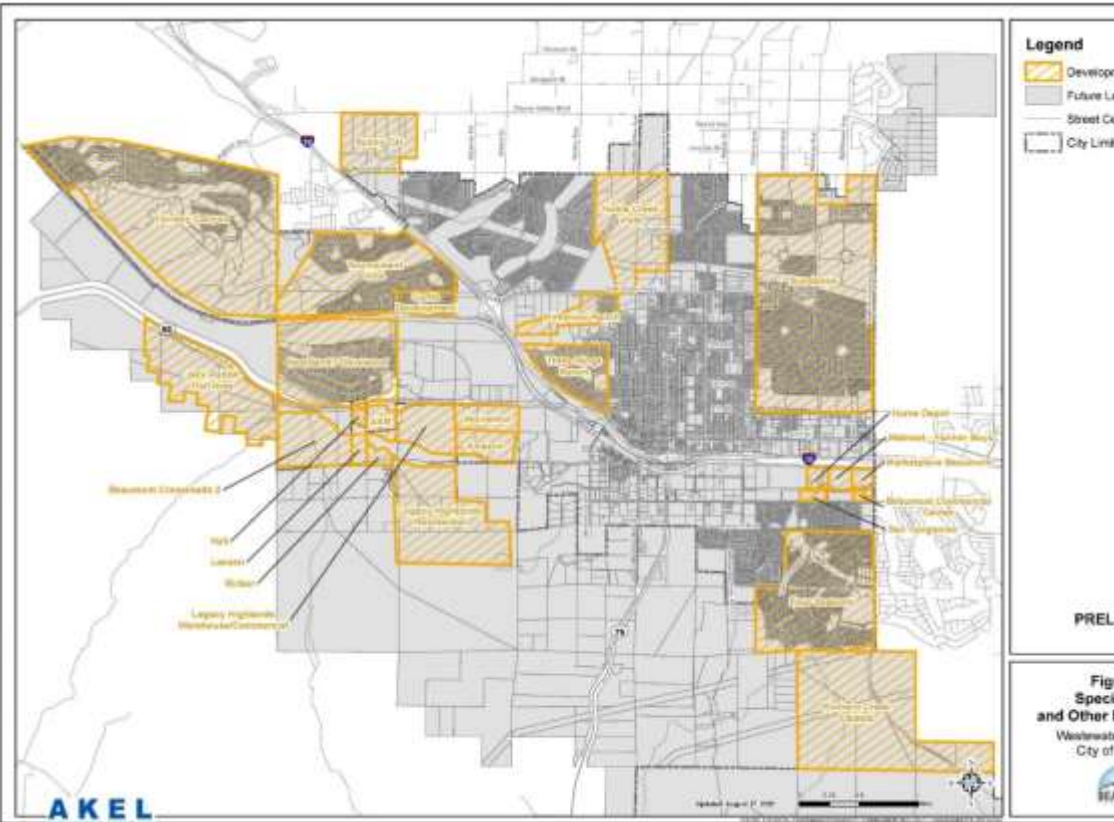


General Plan Land Use Classification <sup>1</sup>	Existing Land Use Classification <sup>2</sup>	Existing Development			Future Development			Total Development
		Existing Development	Existing Lands - Redeveloping	Subtotal Existing Development - Unchanged	New Lands - Redevelopment	New development	Subtotal Future Development	
		(acre)	(acre)	(acre)	(acre)	(acre)	(acre)	
1	2	3	4	5	6	7	8	8
<b>Residential</b>								
Single Family Residential	Single Family Residential Mobile Homes and Trailer Parks Mixed Residential	2,568	-178	2,389	118	588	706	3,096
High Density Residential	Multi-Family Residential	134	-51	83	6	276	282	364
Rural Residential	Rural Residential	0	0	0	2,446	312	2,758	2,758
Traditional Neighborhood	-	0	0	0	76	499	574	574
	<b>Subtotal - Residential</b>	<b>2,701</b>	<b>-229</b>	<b>2,472</b>	<b>2,645</b>	<b>1,676</b>	<b>4,321</b>	<b>6,793</b>
<b>Non-Residential</b>								
General Commercial	Commercial and Services General Office	389	-147	242	28	324	352	595
Neighborhood Commercial	-	0	0	0	34	11	46	46
Industrial	Industrial	280	-69	211	52	315	367	577
Public Facility	Facilities Education	293	-13	280	44	64	107	388
Downtown Mixed Use	-	0	0	0	321	64	386	386
Urban Village	-	0	0	0	107	536	643	643
Employment District	-	0	0	0	0	179	179	179
Specific Plans and Other Developments	-	0	0	0	0	4,200	4,200	4,200
	<b>Subtotal - Non-Residential</b>	<b>962</b>	<b>-229</b>	<b>733</b>	<b>586</b>	<b>5,693</b>	<b>6,280</b>	<b>7,013</b>
<b>Non-Flow Generating</b>								
Open Space	Open Space and Recreation Agriculture	8,533	-221	8,312	0	28	28	8,341
Vacant	Vacant	2,934	0	2,934	0	0	0	2,934
Utilities	Utilities	4	0	4	0	0	0	4
ROW	ROW	155	0	155	0	0	0	155
	<b>Subtotal - Non-Flow</b>	<b>11,626</b>	<b>-221</b>	<b>11,405</b>	<b>0</b>	<b>28</b>	<b>28</b>	<b>11,433</b>
	<b>Total Developed Area</b>	<b>15,289</b>	<b>-679</b>	<b>14,610</b>	<b>3,231</b>	<b>7,397</b>	<b>10,628</b>	<b>25,239</b>

## Notes:

- Source: City of Beaumont Public Draft General Plan (2020)
- Source: Southern California Association of Governments (SCAG) 2016 Existing Land Use file extracted from City of Beaumont Planning Viewer online web application.

# Specific Plan Land Use Inventory



Known Developments	Total Development Area, by Land Use Type <sup>1</sup>					Total (acres)
	Single Family Residential (acres)	Multi-Family Residential (acres)	Commercial (acres)	Industrial (acres)	Public Facilities (acres)	
Amazon	-	-	-	65.7	-	65.7
ASM	-	-	-	49.3	-	49.3
Beaumont Commercial Center	-	-	17.4	-	-	17.4
Beaumont Crossroads II	-	-	-	165.5	-	165.5
Curtis Development	66.7	-	-	-	-	66.7
Fairway Canyon	660.9	-	12.0	-	30.0	702.9
Four Seasons	365.3	3.3	17.0	-	-	385.6
Hall	-	-	-	11.2	-	11.2
Heartland/Olivewood	207.6	-	11.5	50.3	9.2	278.6
Home Depot	-	-	21.8	-	-	21.8
Jack Rabbit Trail	-	-	30.0	225.0	-	255.0
Kirkwood Ranch	123.0	5.0	-	-	-	128.0
Lassen	-	-	-	17.3	-	17.3
Legacy Highlands Residential	541.4	71.3	-	-	20.0	632.7
Legacy Highlands Warehouse	-	-	14.0	92.0	-	106.0
Marketplace Beaumont	-	-	17.4	-	-	17.4
Noble Creek Vistas	181.2	-	-	-	32.6	213.8
Portrero Creek Estates <sup>2</sup>	733.0	-	-	-	-	733.0
Ricker	-	-	-	18.0	-	18.0
San Gorgaonio	-	-	23.0	-	-	23.0
Sundance	874.4	39.0	14.0	-	39.0	966.3
Sunny Cal	112.1	-	-	-	-	112.1
Three Rings Ranch	143.2	10.0	-	-	-	153.2
Tournament Hills	305.4	-	34.4	-	10.0	349.8
Walmart - Farmer Boys	-	-	22.7	-	-	22.7
Wolverine	-	-	-	60.0	-	60.0
<b>Total</b>	<b>4,314</b>	<b>129</b>	<b>235</b>	<b>754</b>	<b>141</b>	<b>5,573</b>



**Notes:**

1. Unless noted otherwise, development information shown based on planning documents provided by City staff on November 25, 2019 and December 5, 2019.
2. Source: City of Beaumont General Plan Public Draft, August 2020

# Service Area Population

- Historical and projected populations documented for informational purposes
- Population of **67,144** by **2038** (Based on City Staff projections)

Year	Population	Percent Growth
	City-Wide	(%)
<b>Historical</b>		
2007	28,250	10.9%
2008	31,317	10.9%
2009	32,403	5.3%
2010	36,877	5.3%
2011	38,201	5.3%
2012	39,317	5.3%
2013	40,472	5.3%
2014	41,659	3.6%
2015	43,370	3.6%
2016	44,821	3.6%
2017	46,179	3.6%
2018	48,237	3.6%
<b>Projected</b>		
2019	49,915	2.3%
2020	51,263	2.3%
2021	52,291	2.3%
2022	53,061	2.3%
2023	53,950	2.3%
2024	54,463	1.8%
2025	55,234	1.8%
2026	56,261	1.8%
2027	57,416	1.8%
2028	58,947	1.8%
2029	59,974	1.3%
2030	60,745	1.3%
2031	61,258	1.3%
2032	61,772	1.3%
2033	62,917	1.3%
2034	63,816	1.3%
2035	64,715	1.3%
2036	65,485	1.3%
2037	66,127	1.3%
2038	67,144	1.3%



# Chapter 3 – System Performance and Design Criteria



## Purpose of Chapter

The purpose of this chapter is to discuss City's **wastewater system performance and design criteria.**

## Key Chapter Elements

- System Performance and Design Criteria
- Wastewater Unit Factor Analysis
- Wastewater Diurnal Pattern

Criteria is consistent with **Eastern Municipal Water District**

# System Performance and Criteria

Criteria consistent with  
*Eastern Municipal Water District*



Dry Weather Flow Criteria (EMWD Wastewater Criteria)	
Sewer Trunk	d/D
Diameter < 15 inches	0.50
Diameter ≥ 15 inches	0.70
Wet Weather Flow Criteria (EMWD Wastewater Criteria)	
Sewer Trunk	d/D
Existing System	1.00
Future System	0.75
Pipe Slope Criteria (EMWD Wastewater Criteria)	
Pipe Size	Minimum Slope (ft/ft)
8"	0.004
10"	0.0032
12"	0.0024
15"	0.0016
18"	0.0014
21"	0.0012
24" and Up	0.001
Pipe Velocity Criteria (EMWD Wastewater Criteria)	
Pipe Type	Minimum / Maximum Velocity (fps)
Gravity Sewer	Minimum 2 / Maximum 10
Force Main	Desired 2 to 6.5 / Maximum 10

Notes:

1. Source: Eastern Municipal Water District Wastewater Collection System Master Plan
2. Wastewater Collection System performance criteria shall be in accordance with EMWD WCSMP.

# Wastewater Unit Factor Analysis

Land Use Classification	Existing Development (acre)	2017 Average Daily Water Demand Unit Factors		2017 Average Dry Weather Sewer Flow Unit Factors							
		2017 Water Consumption <sup>1</sup>		Return to Sewer Ratio	Dry Weather Sewer Flows		Sewer Flows at 100% Occupancy		Sewer Unit Factor		
		Annual Consumption (gpd)	Unadjusted Water Unit Factors (gpd/acre)		Unadjusted Sewer Unit Factor (gpd/acre)	Balance using Recommended Unit Factor (gpd)	Vacancy Rate <sup>2,3</sup>	Projected Flows at 100% Occupancy (gpd)	ADWF Factor (gpd/acre)	Balance Using ADWF Factor (gpd)	
<b>Residential</b>											
Single Family Residential <sup>4</sup>	2,568	5,432,317	2,116	0.50	1,064	2,732,455	10.0%	1,171	3,005,701	1,200	3,081,236
Multi-Family Residential	134	315,111	2,358	0.70	1,660	221,838	10.0%	1,826	244,022	1,850	247,193
<b>Subtotal Residential</b>	<b>2,701</b>	<b>5,747,428</b>				<b>2,954,294</b>			<b>3,249,723</b>		<b>3,328,429</b>
<b>Non-Residential</b>											
Commercial and Services <sup>3</sup>	389	413,338	1,062	0.85	903	351,337	2.0%	921	358,364	925	360,038
Public Facilities <sup>5</sup>	293	286,703	979	0.85	832	243,698	2.0%	849	248,572	850	248,974
Industrial <sup>7</sup>	223	130,310	585	0.85	497	110,764	0.2%	498	110,985	500	111,360
<b>Subtotal Non-Residential</b>	<b>905</b>	<b>830,351</b>				<b>705,798</b>			<b>717,921</b>		<b>720,372</b>
<b>Totals</b>											
	<b>3,606</b>	<b>6,577,779</b>				<b>2017 Average Dry Weather Flows</b>					
						Estimated Sewer Flows			<b>3,967,644</b>		<b>4,048,800</b>
						Measured WWTP Flows <sup>8</sup>					<b>3,662,673</b>



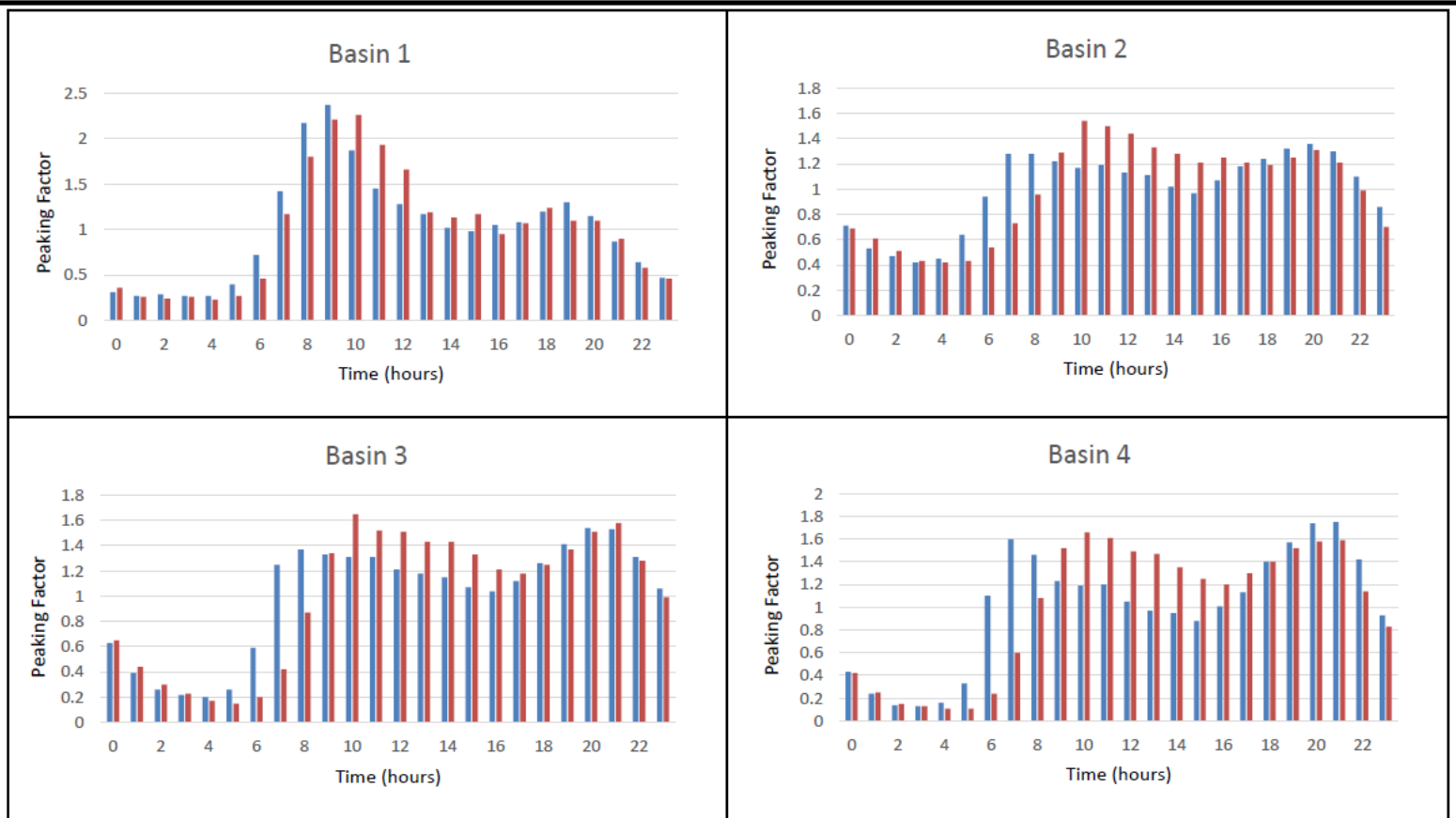
8/24/2020

**Notes:**

1. Water consumption extracted from water billing data received from City staff November 21, 2019.
2. Residential vacancy rate extracted from California Department of Finance E-5 Population estimates.
3. Office Commercial and Industrial vacancy rates extracted from "Beaumont Economic Development Strategic Plan". For planning purposes, Business Commercial vacancy rate assumed equal to Office Commercial.
4. "Single Family Residential" contains development and consumption for "Mobile Homes and Trailer Parks".

Factors applied to Land Use to estimate wastewater flows

# Characterizing WW Flows



Shows hourly variations in wastewater flow

Developed from flow monitoring data.

## LEGEND

- Weekday Dry Weather Flow Diurnal
- Weekend Dry Weather Flow Diurnal

Note: Detailed flow monitor locations provided in Appendix A

PRELIMINARY

**Figure 3.1**  
Hydraulic Model Diurnals  
Wastewater Master Plan  
City of Beaumont



# Chapter 4 – Existing Wastewater Collection Facilities

## Purpose of Chapter

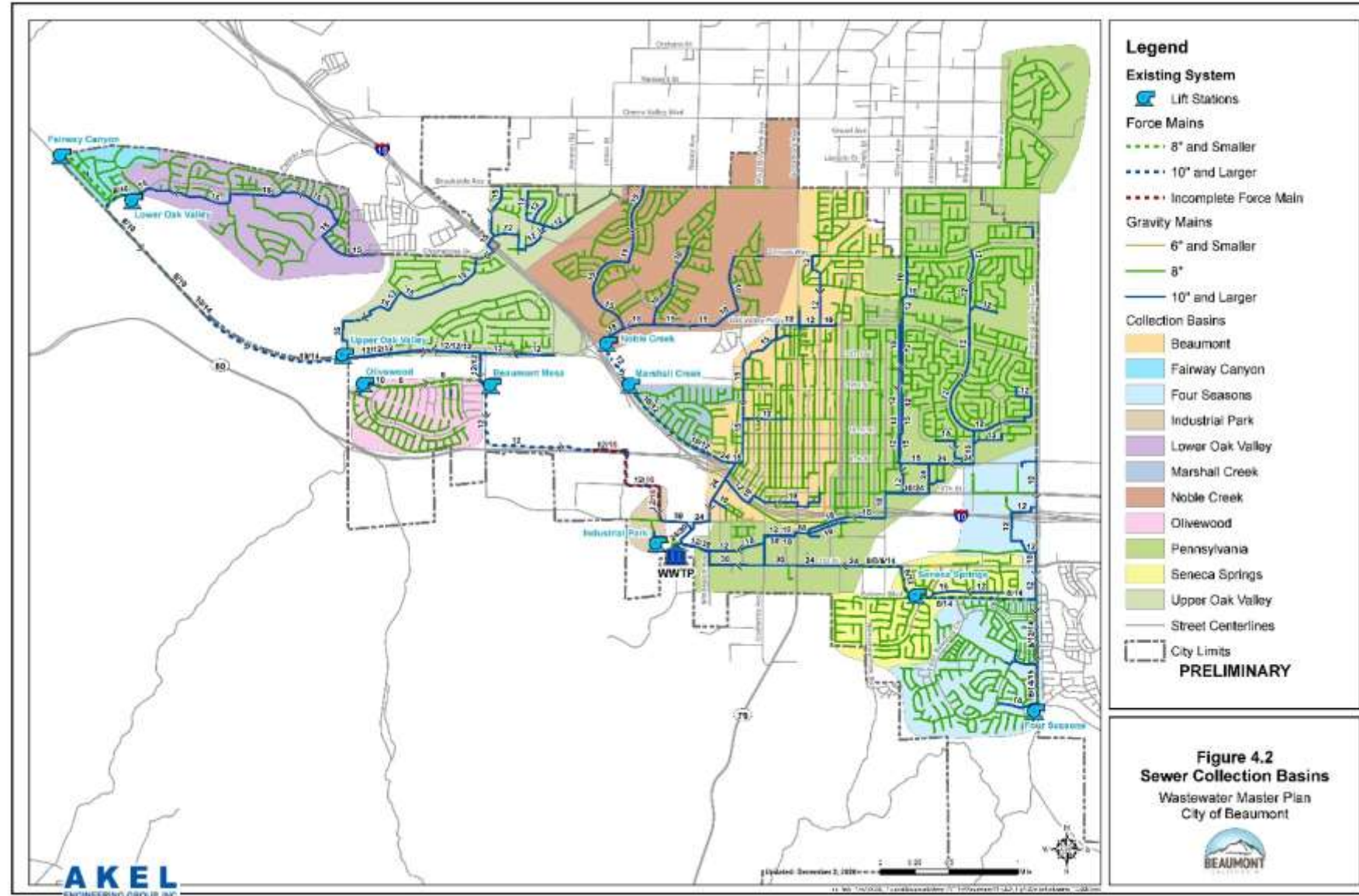
The purpose of this chapter is to discuss City's **existing wastewater system**.

## Key Chapter Elements

- Existing Pipelines Inventory
- Lift Station Inventory

# Existing Wastewater Collection System

- 177 miles of Gravity Sewers
- 19 miles of Force Main
- 10 Lift Stations
- 1 Wastewater Treatment Plant

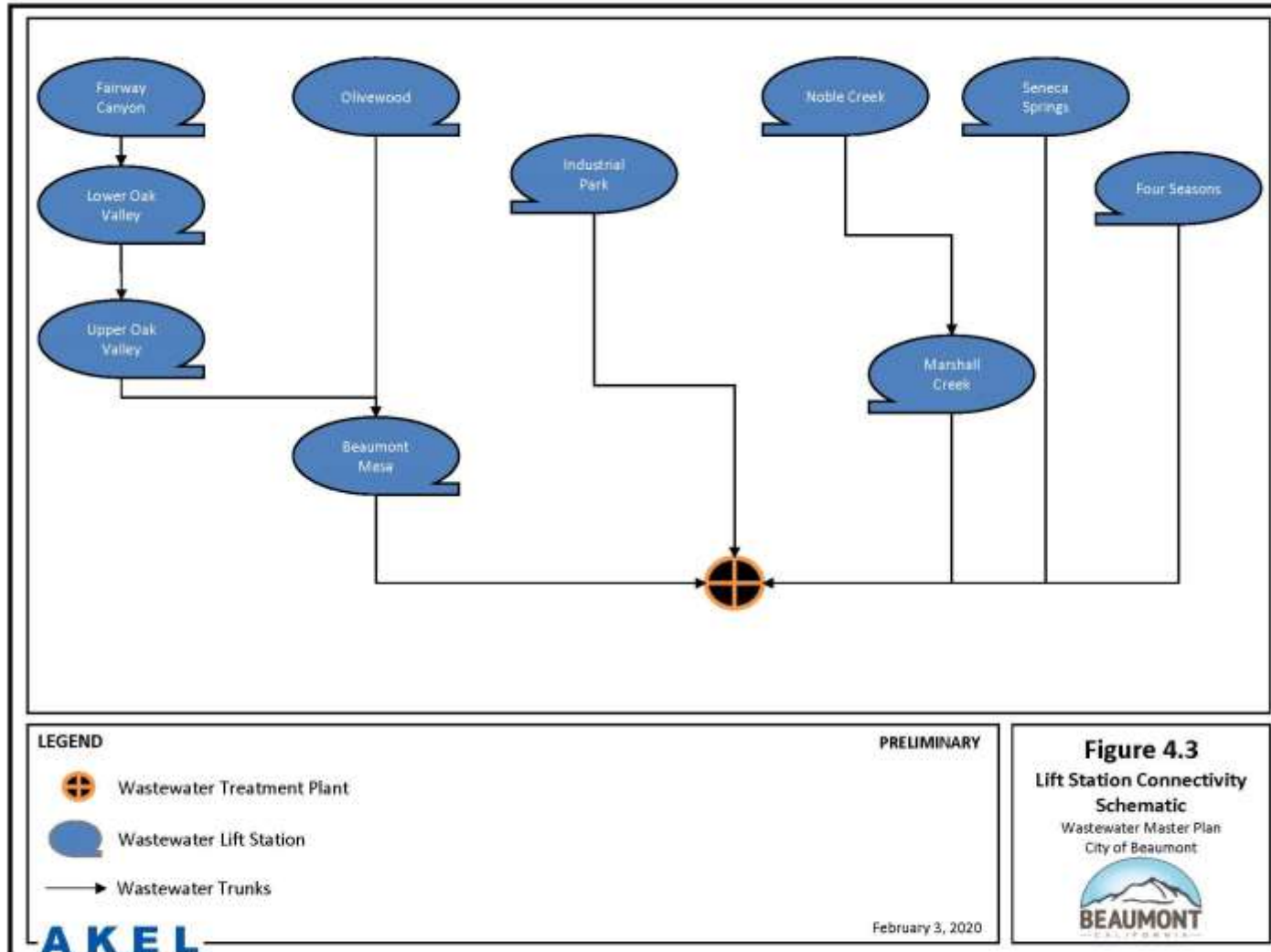


# Existing System Pipeline Inventory

PRELIMINARY

Pipeline Diameter (in)	Length		Percent Contribution % Total
	(ft)	(mi)	
<b>Gravity Mains</b>			
4	883	0.2	0.1%
6	2,612	0.5	0.3%
8	759,884	143.9	73.4%
10	28,526	5.4	2.8%
12	59,788	11.3	5.8%
15	48,929	9.3	4.7%
16	1,898	0.4	0.2%
18	7,782	1.5	0.8%
24	13,012	2.5	1.3%
30	8,890	1.7	0.9%
48	222	0.04	0.02%
Unknown	226	0.04	0.02%
<b>Subtotal - Gravity Mains</b>	<b>932,653</b>	<b>176.6</b>	<b>90.1%</b>
<b>Force Mains</b>			
6	1,060	0.2	0.1%
8	33,208	6.3	3.2%
10	17,254	3.3	1.7%
12	31,787	6.0	3.1%
14	18,776	3.6	1.8%
<b>Subtotal - Force Mains</b>	<b>102,086</b>	<b>19.3</b>	<b>9.9%</b>
<b>Total Sewer Pipe</b>			
<b>Total</b>	<b>1,034,739</b>	<b>196.0</b>	<b>100.0%</b>

# Lift Station Connectivity Schematic





# Lift Station Inventory

Lift Station Information		Pumps <sup>1</sup>				Pump Controls <sup>2</sup>						Wet Well Dimensions <sup>2</sup>		
No.	Location	Quantity	Full Capacity (gpm)	Firm Capacity (gpm)	Current Capacity (gpm)	High Level (ft)	Low Level (ft)	Lead On (ft)	Lag 1 Off (ft)	Lag 2 On (ft)	Lag 2 Off (ft)	Area (ft <sup>2</sup> )	Depth (ft)	Volume (gal)
Beaumont Mesa	12940 Potrero Blvd.	2 @ 1,797 gpm	3,594	1,797	3,594	21.50	2.00	9.50	7.00	12.00	7.00	697.4	21.0	109,593
Fairway Canyon <sup>3</sup> (Little Lower Oak Valley)	34003 Crenshaw St.	2 @ 400 gpm	800	400	800	8.33	2.92	6.61	3.58	7.83	6.61	50.3	11.50	2,022
Lower Oak Valley	11246 Palmer Ave.	2 @ 650 gpm 1 @ 400 gpm	1,700	1,050	1,700	7.50	1.50	4.00	2.00	7.00	2.00	212.7	16.5	26,252
Marshall Creek	990 Ring Ranch Rd.	2 @ 1,150 gpm	2,300	1,150	2,300	10.75	8.08	9.75	8.25	10.50	8.25	223.9	18.0	30,149
Noble Creek	1899 W Oak Valley Pkwy.	2 @ 1,865 gpm	3,730	1,865	3,730	6.00	1.50	4.25	2.00	5.75	2.00	180.8	14.5	19,606
Seneca Springs	1390 Potrero Blvd.	3 @ 450 gpm	1,350	900	1,125	6.00	1.25	4.50	2.50	5.50	2.50	184.7	31.50	43,519
Upper Oak Valley	35980 Oak Valley Pkwy.	2 @ 1,350 gpm 1 @ 2,300 gpm	5,000	2,700	5,000	7.50	1.00	4.50	2.50	7.00	2.50	345.7	19.5	51,283
Four Seasons	1075 S Highland Springs Ave.	2 @ 1,675 gpm 1 @ 365 gpm	3,715	1,740	1,675	9.50	1.50	4.75	2.25	9.00	4.75	249.6	22.0	41,078
Industrial Park <sup>4</sup> (Coopers Creek)	715 W 4th St.	1 @ 112 gpm 1 @ 150 gpm	262	112	262	6.00	1.00	5.75	2.00	5.75	2.00	58.7	16.0	7,022
Olivewood	North of Artisan Pl.	2 @ 310gpm	620	310	620	6.25	2.00	5.25	3.00	5.75	3.00	50.3	19.5	7,332

Notes:

1. Source: Pumps information provided by City staff on December 13, 2019.
2. Unless noted otherwise, pump controls and wet well dimensions provided by City staff on March 04, 2020.
3. Fairway Canyon wet well dimensions provided by City staff on April 28, 2021.

# Chapter 5 – Wastewater Flows



## Purpose of Chapter

The purpose of this chapter is to summarize **historical wastewater flows** at City's WWTP and **project flows for future growth**.

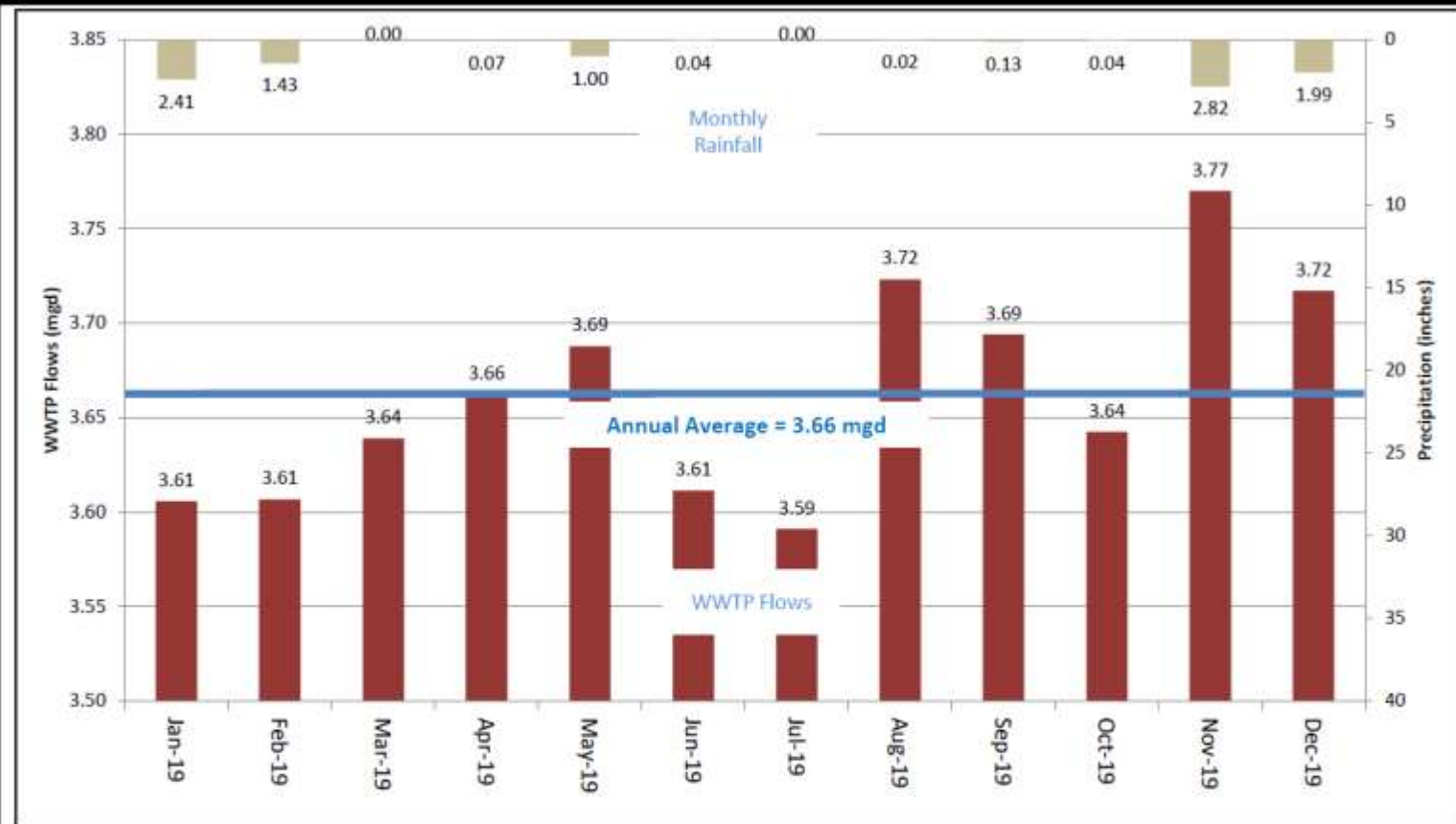
## Key Chapter Elements

- Historical Flow Summary
- Buildout Wastewater Flows

# 2019 WWTP Flows (January-December)

Highest months are August and November.

*November high flows due to Wet weather flows*



**LEGEND**

■ Monthly Flows

■ Monthly Rainfall

— 2019 Average Flow

Note: WWTP Flow data provided by City staff on February 18, 2020.  
- Rainfall data extracted from CIMIS Station in Hemet (Year 2019)

PRELIMINARY

**Figure 5.1**  
2019 WWTP Flows  
Wastewater Master Plan  
City of Beaumont



February 17, 2021

# Historical Wastewater Flows Data

- 3.66 mgd is the average flow
- 1.33 times higher than average during maximum day dry weather
- 1.88 times higher than average during maximum day wet weather

Year	Average Annual Flow (AAF) (mgd)	Percentage Change	Seasonal Average		Maximum Month		Maximum Day	
			ADWF <sup>1</sup> (mgd)	AWWF <sup>2</sup> (mgd)	MMDWF (mgd)	MMWWF (mgd)	MDDWF (mgd)	MDWWF (mgd)
2012	2.68		2.70	2.67	2.74	2.80	3.12	3.18
2013	2.79	3.9%	2.68	2.90	2.82	3.12	3.40	3.50
2014	2.98	6.9%	2.97	2.99	3.02	3.19	3.50	3.62
2015	2.92	-1.8%	2.91	2.94	2.97	3.05	3.86	3.58
2016	2.83	-3.4%	2.80	2.86	2.91	3.29	3.27	5.26
2017	3.27	15.8%	-	-	-	-	-	-
2018	3.39	3.7%	3.40	3.38	3.51	3.51	-	-
2019	3.66	8.0%	3.66	3.67	3.72	3.77	4.14	5.07
2020	-	-	-	-	-	4.01	-	4.57

Historical Peaking Factors (Applied to ADWF)								
Year	ADWF	AWWF	MMDWF	MMWWF	MDDWF	MDWWF	ADWF	AWWF
2012	1.00	0.99	1.02	1.04	1.16	1.18	1.00	0.99
2013	1.04	1.08	1.05	1.17	1.27	1.31	1.00	1.08
2014	1.00	1.01	1.02	1.07	1.18	1.22	1.00	1.01
2015	1.00	1.01	1.02	1.05	1.33	1.23	1.00	1.01
2016	1.01	1.02	1.04	1.18	1.17	1.88	1.01	1.02
2017	-	-	-	-	-	-	-	-
2018	1.00	0.99	1.03	1.03	-	-	1.00	0.99
2019	1.00	1.00	1.02	1.03	1.13	1.39	1.00	1.00
2020	-	-	-	-	-	-	-	-
Recommended Evaluation Peaking Factor								
		1.08	1.05	1.18	1.33	1.88		

# Projected Buildout Wastewater Flows

Land Use Type 1	Existing Development			Future Development within Study Area					Total Development at Buildout of Study Area 10	Total Average Dry Weather Flow	
	Existing Lands, No Redevelopment 2	Sewer Unit Factor 3	Average Daily Flow 4	Lands Planned for Redevelopment 5	New Development 6	Subtotal Future Development 7	Sewer Unit Factor 8	Average Dry Weather Flow 9		(gpd)	(gpd)
	(acre)	(gpd/acre)	(gpd)	(acre)	(acre)	(acre)	(gpd/acre)	(gpd)		(acre)	(gpd)
<b>General Plan Residential</b>											
Single Family Residential	2,389	1,396	3,335,391	118	588.3	706	1,396	986,125	3,096	4,321,516	4.32
High Density Residential	83	2,609	215,334	6	276.1	282	2,609	735,343	364	950,677	0.95
Rural Residential	0	611	0	2,446	312.3	2,758	611	1,685,107	2,758	1,685,107	1.69
<b>Subtotal - General Plan Residential</b>	<b>2,472</b>		<b>3,550,725</b>	<b>2,570</b>	<b>1,176.7</b>	<b>3,746</b>		<b>3,406,575</b>	<b>6,218</b>	<b>6,957,301</b>	<b>6.96</b>
<b>General Plan Non-Residential</b>											
General Commercial	242	1,175	284,837	28	323.8	352	1,175	413,753	595	698,590	0.70
Neighborhood Commercial	0	1,175	0	34	11.5	46	1,175	53,539	46	53,539	0.05
Industrial	211	1,763	371,281	52	315.2	367	1,763	646,780	577	1,018,062	1.02
Public Facility	280	800	224,260	44	63.6	107	800	85,932	388	310,191	0.31
<b>Subtotal - General Plan Non-Residential</b>	<b>733</b>		<b>880,378</b>	<b>158</b>	<b>714.0</b>	<b>872</b>		<b>1,200,004</b>	<b>1,605</b>	<b>2,080,381</b>	<b>2.08</b>
<b>General Plan Overlays</b>											
Traditional Neighborhood <sup>1</sup>	0	-	0	76	498.8	574	-	692,049	574	692,049	0.69
Downtown Mixed Use <sup>1</sup>	0	-	0	321	64.4	386	-	578,272	386	578,272	0.58
Urban Village <sup>1</sup>	0	-	0	107	536.0	643	-	1,041,439	643	1,041,439	1.04
Employment District <sup>1</sup>	0	-	0	0	179.1	179	-	216,814	179	216,814	0.22
<b>Subtotal - General Plan Overlays</b>	<b>0</b>		<b>0</b>	<b>504</b>	<b>1,278.4</b>	<b>1,782</b>		<b>2,528,575</b>	<b>1,782</b>	<b>2,528,575</b>	<b>2.53</b>
<b>Known Developments</b>											
Specific Plan and Other Developments <sup>2</sup>	0	-	0	0	4,199.7	4,200	-	6,214,824	4,200	6,214,824	6.21
<b>Subtotal - Known Developments</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>4,199.7</b>	<b>4,200</b>		<b>6,214,824</b>	<b>4,200</b>	<b>6,214,824</b>	<b>6.21</b>
<b>Total</b>											
	<b>3,205</b>		<b>4,431,103</b>	<b>3,231</b>	<b>7,368.8</b>	<b>10,600</b>		<b>13,349,978</b>	<b>13,805</b>	<b>17,781,081</b>	<b>17.78</b>

1. Development flows for Overlay Areas documented in Table 2, General Plan Overlay Development and Flows
2. Specific Plan and Other Development flows documented in Table 5, Specific Plan and Other Development, Remaining Development Flows

# Chapter 6 – Hydraulic Model Development

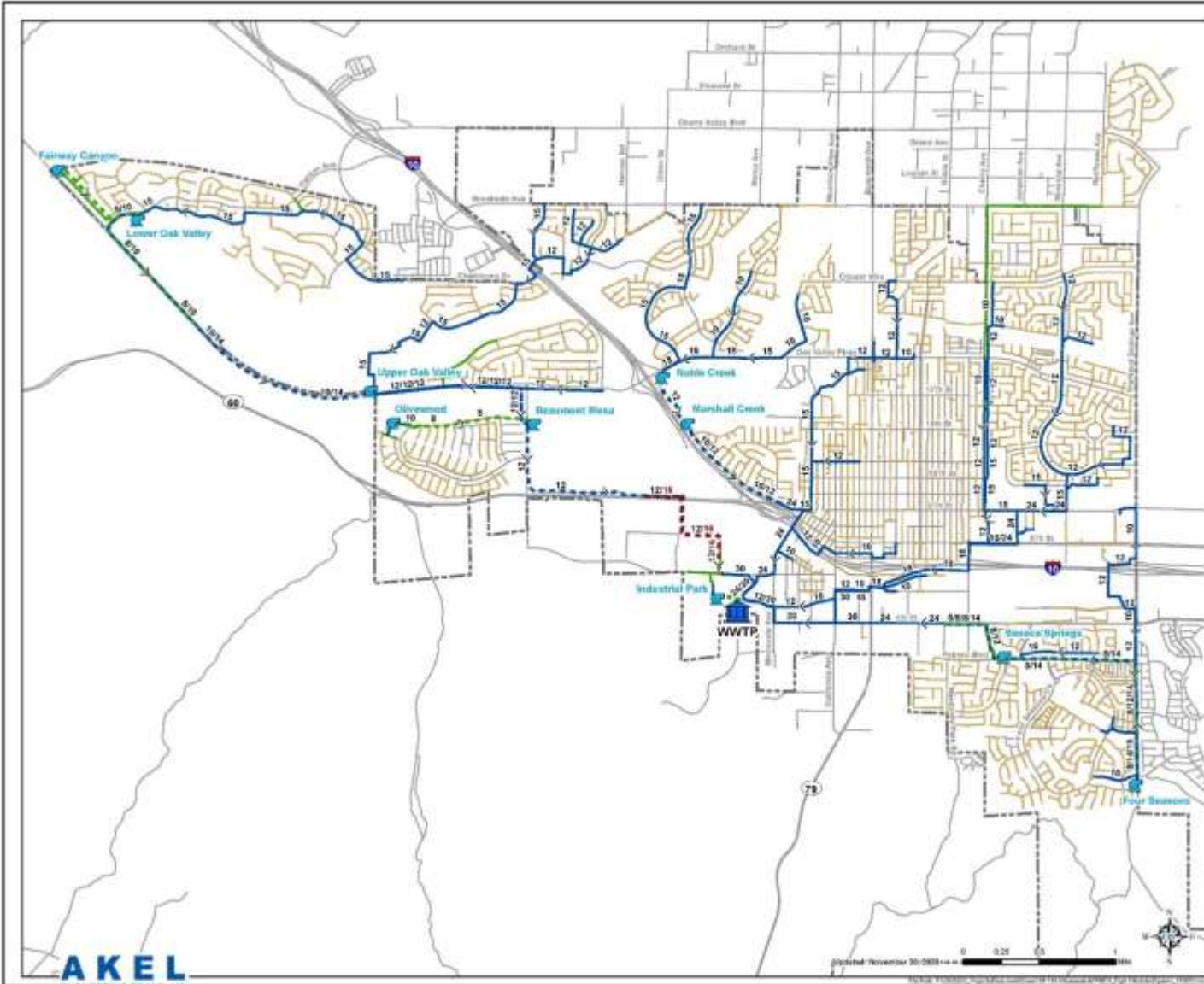
## Purpose of Chapter

The purpose of this chapter is to discuss the **hydraulic model development** and **calibration process** of the wastewater collection system.

## Key Chapter Elements

- Hydraulic Model Development
- Flow Monitoring Program
- Hydraulic Model Calibration

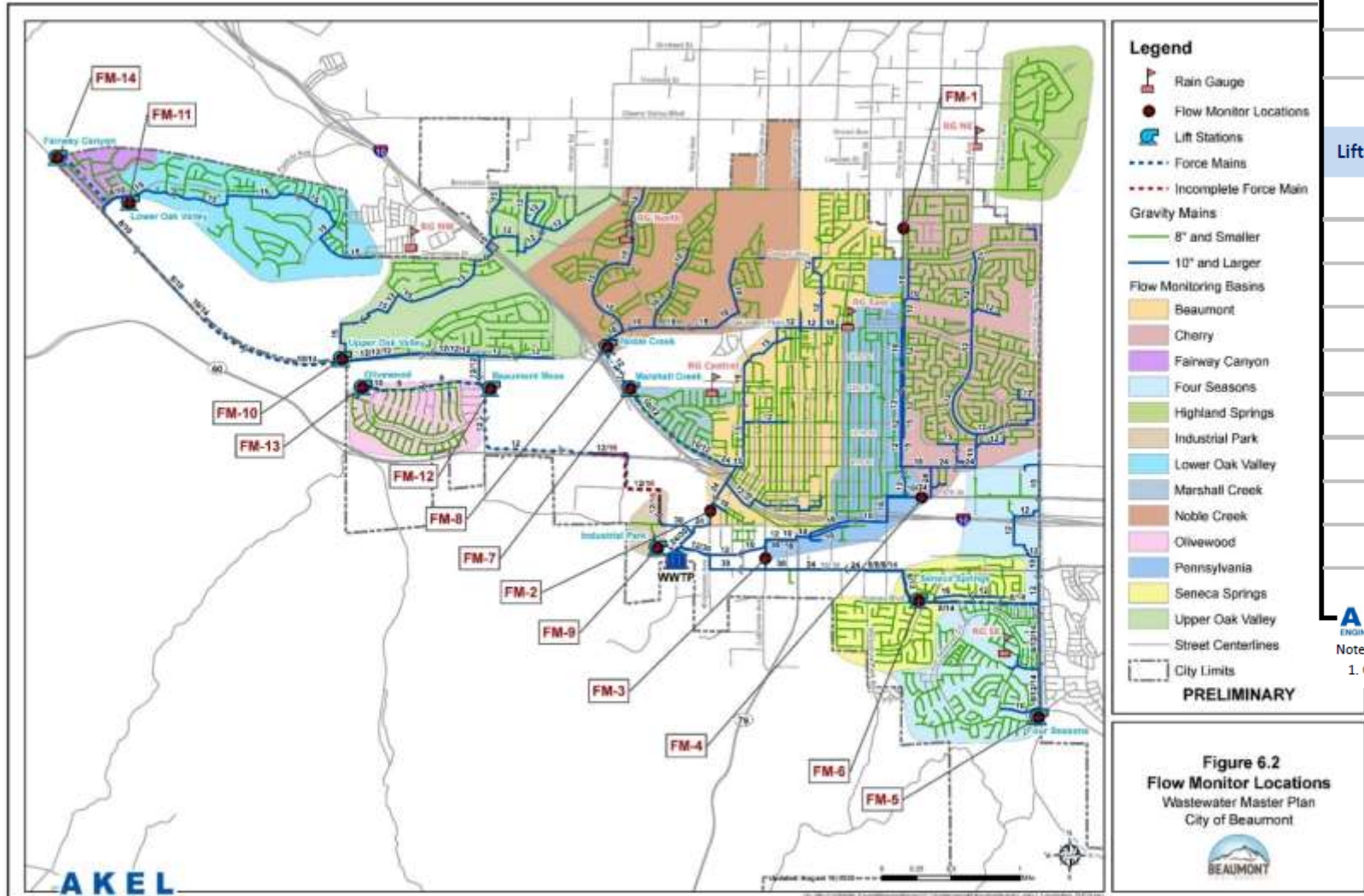
# Existing Modeled WW System



Pipeline Diameter (in)	Length		Percent Contribution % Total
	(ft)	(mi)	
<b>Gravity Mains</b>			
8	18,847	3.6	6.4%
10	27,947	5.3	9.5%
12	59,569	11.3	20.3%
15	48,834	9.2	16.6%
16	1,898	0.4	0.6%
18	7,829	1.5	2.7%
24	12,336	2.3	4.2%
30	8,890	1.7	3.0%
<b>Subtotal</b>	<b>186,151</b>	<b>35.3</b>	<b>63.4%</b>
<b>Force Mains</b>			
6	1,060	0.2	0.4%
8	33,212	6.3	11.3%
10	17,260	3.3	5.9%
12	31,796	6.0	10.8%
14	18,941	3.6	6.5%
16	5,058	1.0	1.7%
<b>Subtotal</b>	<b>107,327</b>	<b>20.3</b>	<b>36.6%</b>
<b>Total Modeled Pipe</b>			
<b>Total</b>	<b>293,478</b>	<b>55.6</b>	<b>100.0%</b>

# Flow Monitoring Program

## 14 Flow Monitoring Sites



Site ID	Location Description	Pipe Size (in)	Manhole ID
<b>Gravity Main Flow Monitors</b>			
FM-1	Cherry Avenue north of Mary Lane	8" N (In Pipe)	SSMH01048
FM-2	Minnesota Avenue approx 500' north of 4th Street	24" N (In Pipe)	SSMH01728
FM-3	California Avenue approx 400' north of 1st Street	30" N (In Pipe)	SSMH00381
FM-4	6th Street approx 400' west of American Avenue	24" E (In Pipe)	SSMH00330
<b>Lift Station Flow Monitors</b>			
FM-5	1075 South Highland Springs Road	-	LS-1 (Four Seasons)
FM-6	1390 Potrero Boulevard	-	LS-2 (Seneca Springs)
FM-7	990 Ring Ranch Road	-	LS-3 (Marshall Creek)
FM-8	1899 West Oak Valley Parkway	-	LS-4 (Noble Creek)
FM-9	715 West 4th Street	-	LS-5 (Industrial Park)
FM-10	35980 Oak Valley Parkway	-	LS-6 (Upper Oak Valley)
FM-11	11246 Palmer Avenue	-	LS-7 (Lower Oak Valley)
FM-12	34003 Crenshaw Street	-	LS-8 (Beaumont Mesa)
FM-13	12940 Potrero Boulevard	-	LS-9 (Olivewood)
FM-14	Castello Lane approx 450' north of Artisan Place	-	LS-10 (Fairway Canyon)

**AKEL**  
ENGINEERING GROUP, INC.

Notes:

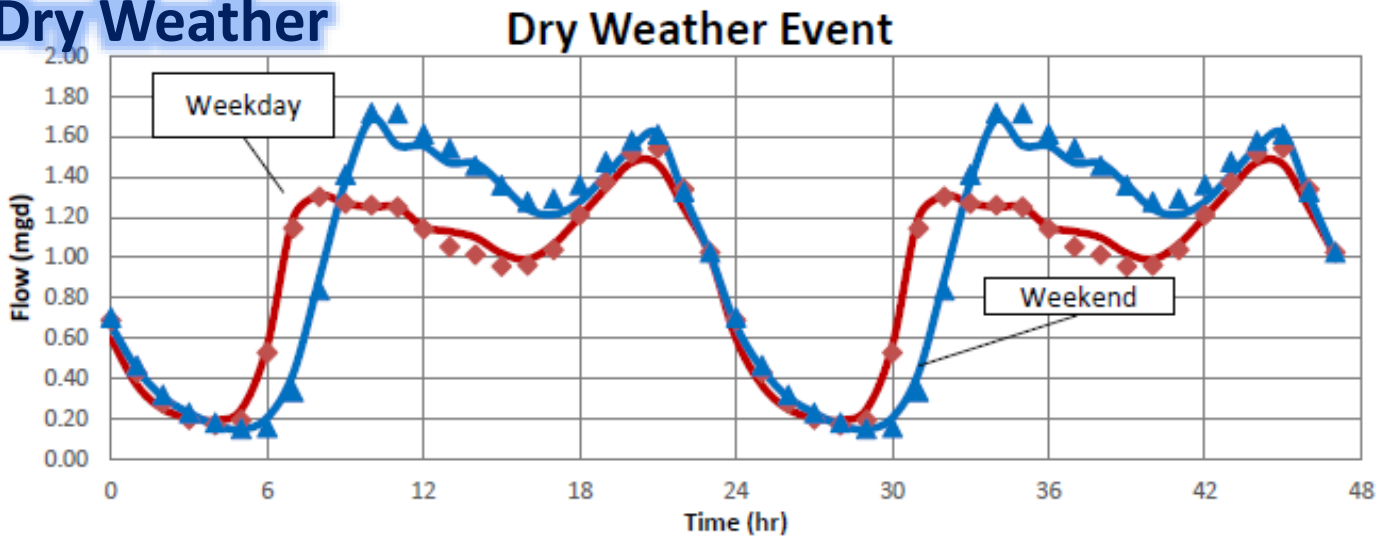
1. GIS Manhole IDs based on GIS shapefiles provided by City staff November 18, 2019.

2/11/2022

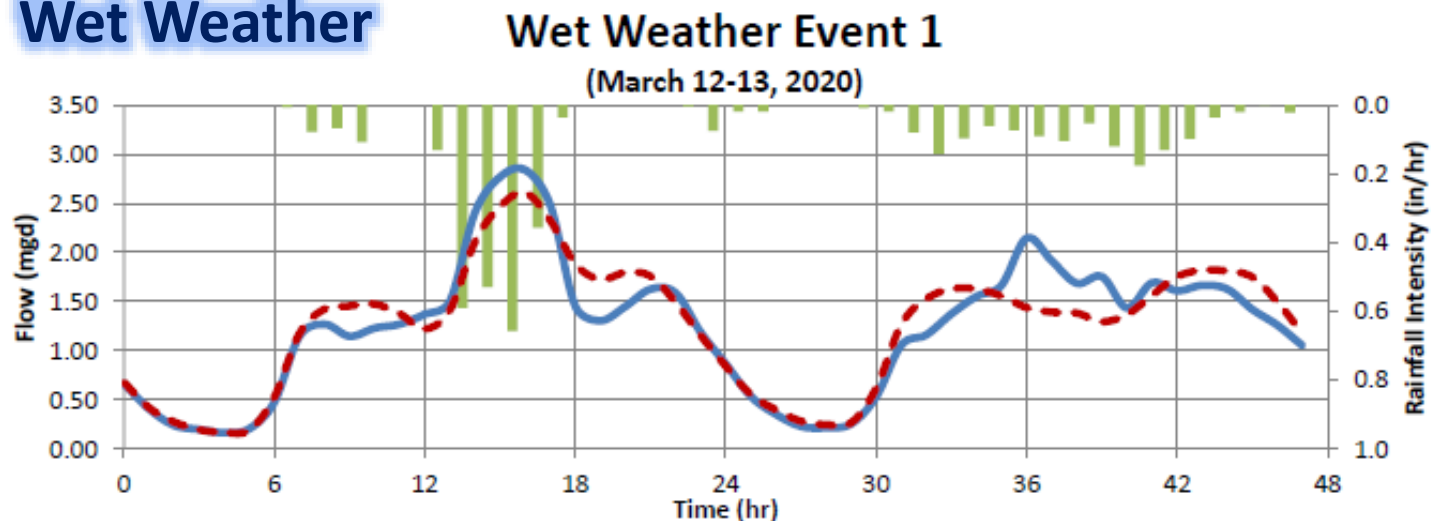


# Hydraulic Model Calibration

## Dry Weather



## Wet Weather



- Dry and Wet Weather
- Benchmark for future evaluations
- Calibration results were acceptable

# Chapter 7 - Hydraulic Evaluation and Proposed Improvements



## Purpose of Chapter

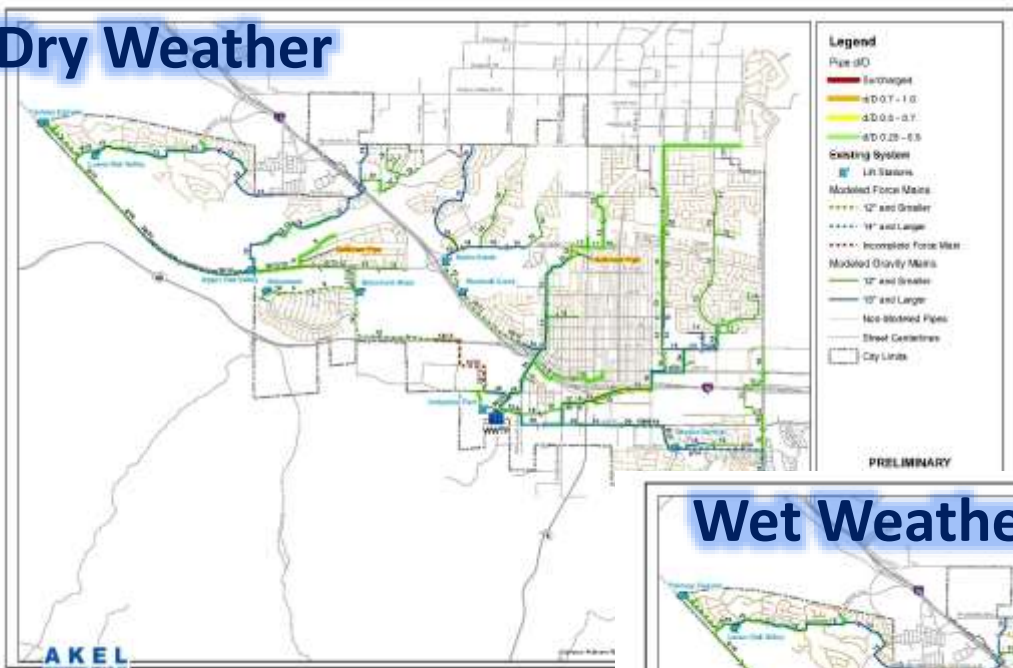
The purpose of this chapter is to evaluate the **existing wastewater system** and recommend improvements to **mitigate existing deficiencies** and **serve future growth**.

## Key Chapter Elements

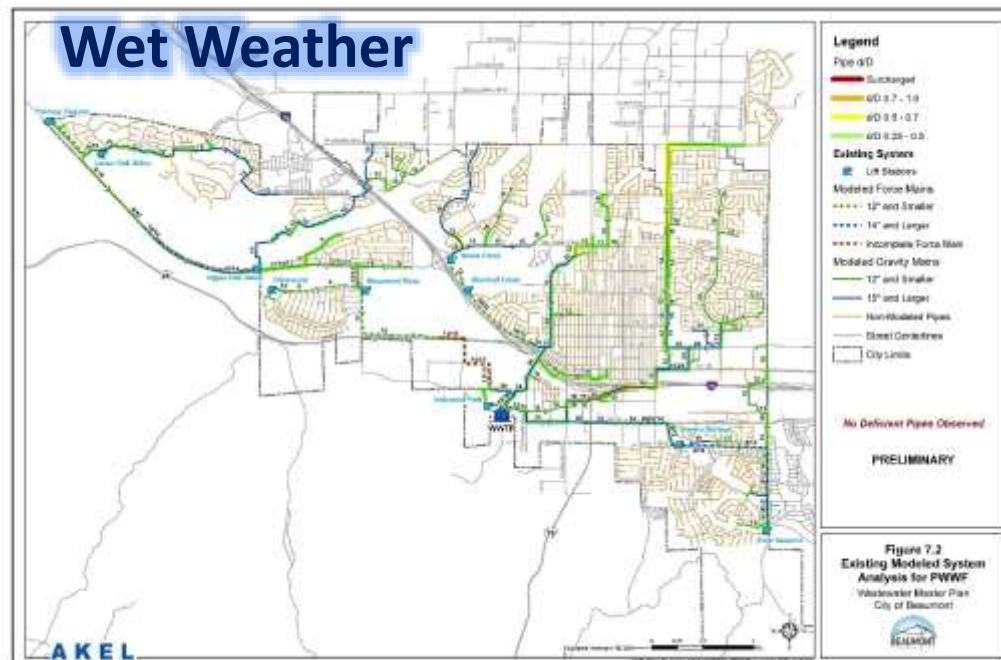
- Existing System Evaluation
- Recommended Improvements
- Future System Evaluation

# Existing System Evaluations

## Dry Weather

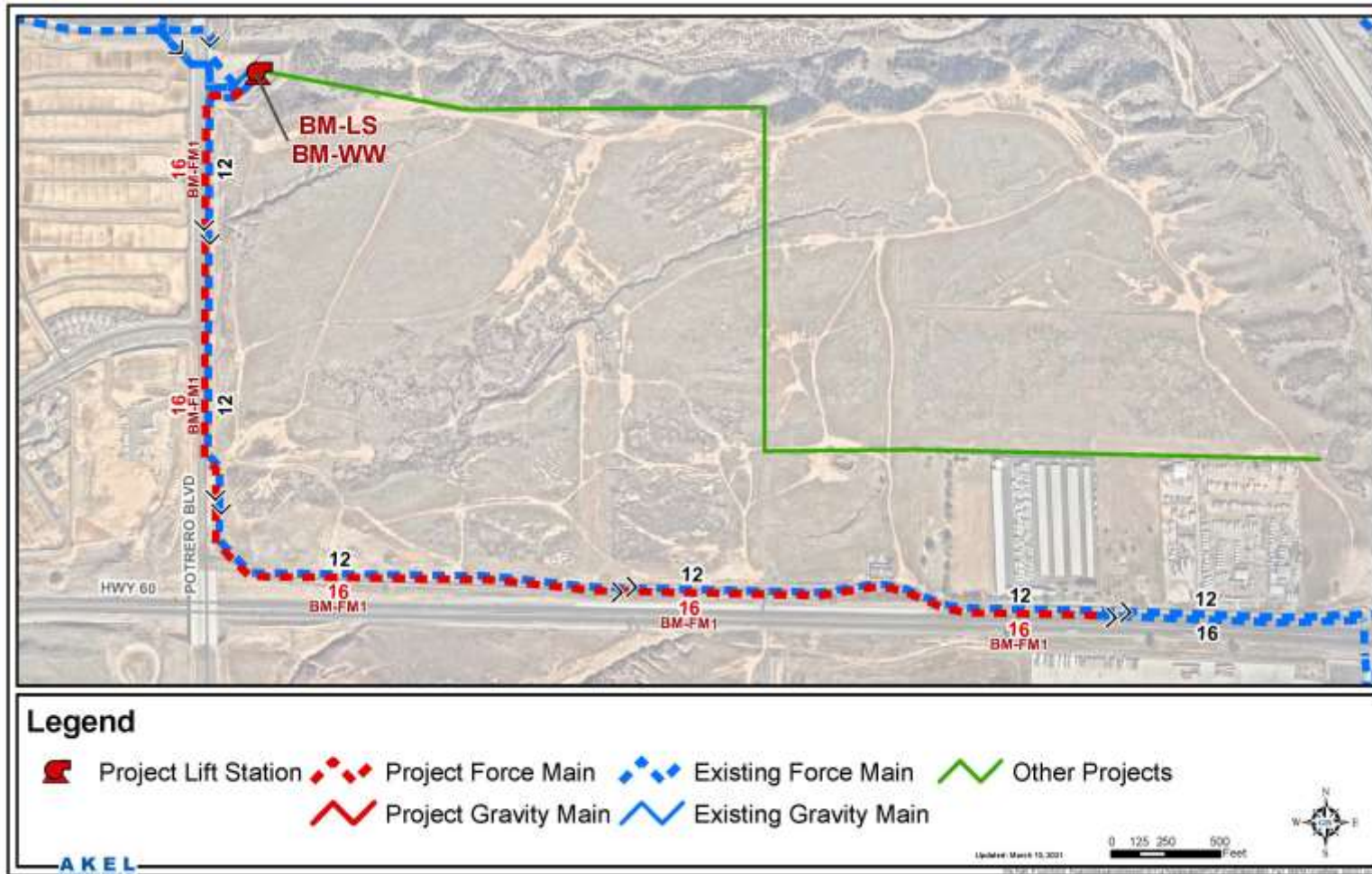


## Wet Weather



- Evaluated for peak dry and wet conditions
- Considered 10-Year 24-Hour Design Storm
- Capacity of Existing Pipelines is Good.

# Beaumont Mesa LS Improvements



- Critical Regional Lift Station
- Planned improvements to mitigate deficiencies
  - Replace existing pumps (*undersized*)
  - Complete parallel force main (*segment currently offline*)
  - Expand wet well (*lacks sufficient emergency capacity*)

# Lift Station Capacity Evaluation

- Capacity of Existing Lift Stations not adequate.
- Future growth requires additional lift station capacity

Pump Station	Design Firm Capacity (gpm)	Total Capacity (Includes Standby) (gpm)	Existing System Analysis			Future System Analysis			Recommended Improvements
			Peak Wet Weather Flows <sup>1</sup>		Surplus/ Deficiency	Peak Wet Weather Flows <sup>1</sup>		Surplus/ Deficiency	
			(gpm)	(mgd)	(gpm)	(gpm)	(mgd)	(gpm)	
<b>Existing System</b>									
Beaumont Mesa <sup>3</sup>	1,797	3,594	2,020	2.91	-223	4,530	6.52	-2,733	Construct two 3,500 gpm and two 1,500 gpm pumps, three duty and one standby, for total capacity of 10,000 gpm.
Fairway Canyon <sup>2</sup>	400	800	77	0.11	323	90	0.13	310	
Lower Oak Valley	1,050	1,700	965	1.39	85	1,217	1.75	-167	Construct three 625 gpm pumps, two duty and one standby, for total capacity of 1,875 gpm
Marshall Creek	1,150	2,300	778	1.12	372	1,696	2.44	-546	Construct two 1,700 gpm pumps, one duty and one standby, for total capacity of 3,400 gpm
Noble Creek	1,865	3,730	465	0.67	1,400	958	1.38	907	
Seneca Springs	900	1,350	201	0.29	699	378	0.54	522	
Upper Oak Valley	2,700	5,000	1,914	2.76	786	3,634	5.23	-934	Construct three 1,850 gpm pumps, two duty and one standby, for total capacity of 5,550 gpm
Four Seasons	1,740	3,715	442	0.64	1,298	2,616	3.77	-876	Construct three 1,350 gpm pumps, two duty and one standby, for total capacity of 4,050 gpm
Industrial Park	112	262	106	0.15	6	288	0.41	-176	Construct two 300 gpm pumps, one duty and one standby, for total capacity of 600 gpm
Olivewood	310	620	53	0.08	257	612	0.88	-302	Construct two 625 gpm pumps, one duty and one standby, for total capacity of 1,300 gpm
<b>Future System</b>									
Beaumont Ave South	-	-	-	-	-	1,788	2.57	-1,788	Construct three 900 gpm pumps, two duty and one standby, for total capacity of 2,700 gpm
Beaumont Crossroads	-	-	-	-	-	4,659	6.71	-4,659	Construct three 2,350 gpm pumps, two duty and one standby, for total capacity of 7,050 gpm
Brookside Ave	-	-	-	-	-	278	0.40	-278	Construct two 300 gpm pumps, one duty and one standby, for total capacity of 600 gpm
Tukwet Canyon	-	-	-	-	-	709	1.02	-709	Construct three 375 gpm pumps, two duty and one standby, for total capacity of 1,125 gpm

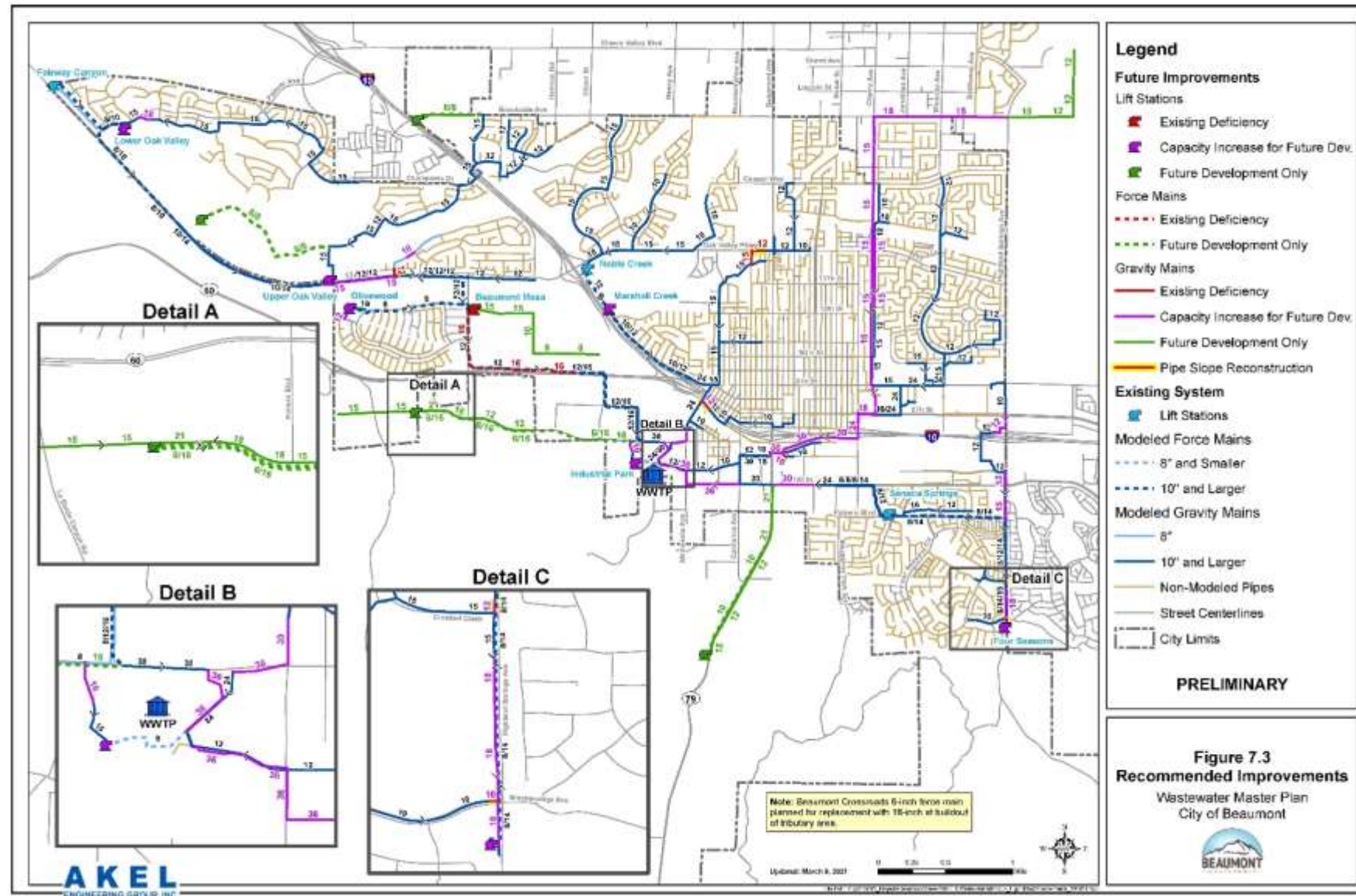


Notes:

1. Maximum average hour flows extracted from sewer system hydraulic model.
2. Lift station current capacity is different than Design Capacity as directed by City staff December 15, 2020.
3. Pump information provided by Xylem staff March 02, 2021.

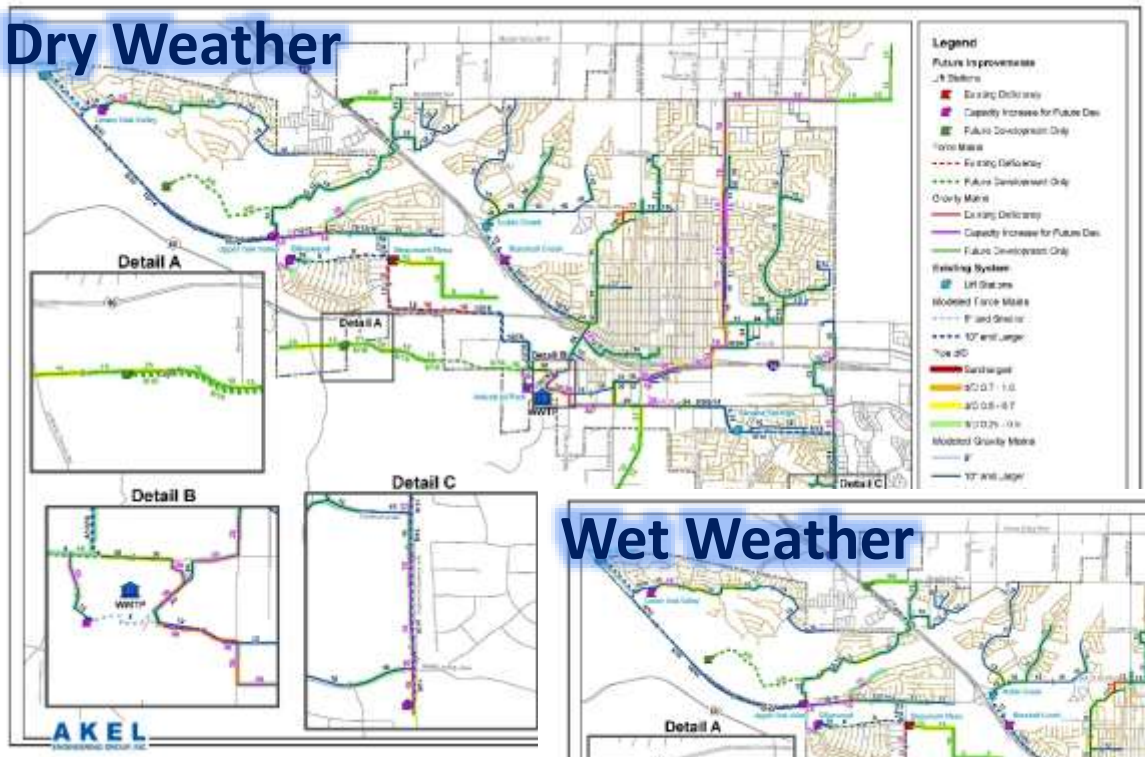
# Future Capacity Improvements

- **Red** represent existing pipe deficiencies.
- **Purple** represent existing pipes needing upgrade to service growth
- **Green** lines represent New pipes to service growth



# Future System Evaluations

## Dry Weather



## Wet Weather



- Evaluated for peak dry and wet conditions
- Validates the recommended improvements

# Chapter 8 – Capital Improvement Program



## Purpose of Chapter

The purpose of this chapter is to summarize the City's **Buildout and 10-Year Capital Improvement Programs.**

## Key Chapter Elements

- Unit Costs
- Buildout Capital Improvement Program
- 10-Year CIP



# Units Costs

- Documenting Cost Assumptions

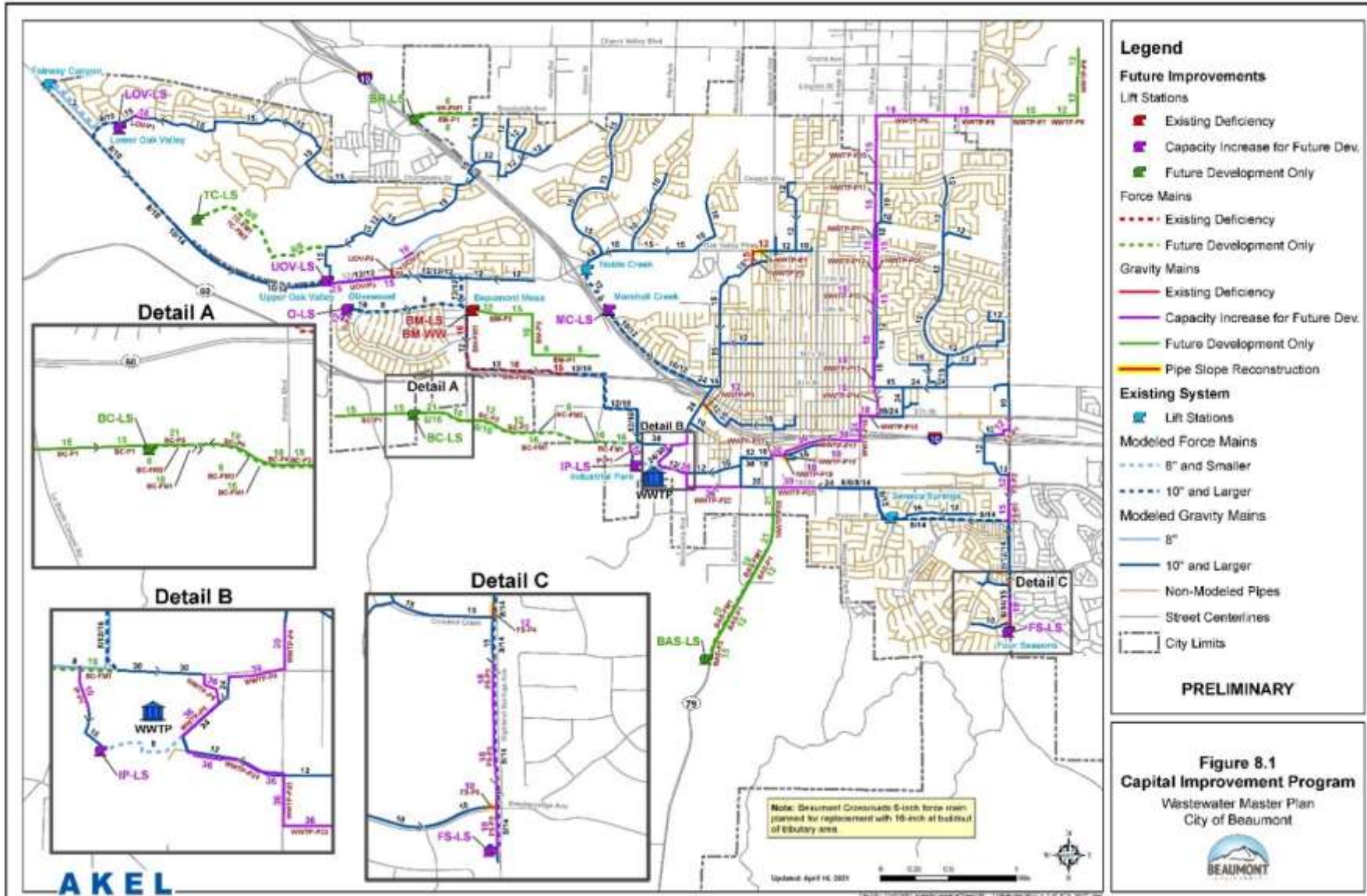
PRELIMINARY

Pipeline	
<b>Gravity Main<sup>1</sup></b>	
Pipe Size	Cost <sup>1</sup>
(in)	(\$/lineal foot)
8	\$188
10	\$196
12	\$204
15	\$226
18	\$242
21	\$325
24	\$388
27	\$459
30	\$517
36	\$657
<b>Force Main<sup>2</sup></b>	
6	\$215
8	\$263
10	\$277
16	\$374
<b>Operational and Maintenance<sup>2</sup></b>	
Sewer Pipeline CCTV	\$2.04
Sewer Pipeline Cleaning	\$1.78
<b>Lift Station<sup>3</sup></b>	
Estimated Lift Station Project Cost = $9,484*Q^2 + 308,219*Q + 358,874$ , where Q is in mgd	

Notes :

1. Unit costs indexed using the Engineering News Record (ENR) Construction Cost Index of 11,628 for January 2021.
2. Sewer pipeline operational and maintenance costs based on Akel Engineering Group experience on similar projects.
3. Lift Station costs based on Akel Engineering Group experience on similar projects and escalated using the Engineering News Record (ENR) Construction Cost Index of 11,628 for January 2021.

# Capital Improvement Program



- Prepare Capital Improvement Projects based on recommended improvements

# 10-Year CIP

CIP ID	Funding Type	Type of Improvement	Project Name	Project Description	Fiscal Year Improvement Phasing										Total Improvement Cost		
					FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24	FY 2024/25	FY 2025/26	FY 2026/27			
<b>Gravity Main Improvements<sup>2</sup></b>																	
SDN-F2	Existing Capacity Deficiency		Agnes Lane Pipeline Replacement	Replace existing 8-inch gravity main with new 12-inch gravity main in Agnes Ln			\$1,000										\$1,000
WWRP-F2	Existing Capacity Deficiency		Edgar Ave Pipeline Replacement	Replace existing 12-inch gravity main with new 15-inch gravity main in Edgar Ave		206,700											206,700
Subtotal - Gravity Main Improvements					0	206,700	\$1,000	0	0	0	0	0	0	0	0	0	207,700
<b>Beaumont Mesa Improvements</b>																	
	New Force Main	Force Main Design and Pump Design	Design of new force main and pump additions		450,000												450,000
		Pump Replacement/Station Construction	Construction of replacement pump and additional pumps for LS			750,000											750,000
		Force Main Construction	Construction of new 18-inch force main			4,800,000											4,800,000
	New Wet Well	Wet Well Design	Design of New Wet Well		400,000												400,000
		Wet Well Construction	Construction of New Wet Well				4,000,000										4,000,000
Subtotal - Beaumont Mesa Improvements					850,000	4,750,000	0	4,800,000	0	0	0	0	0	0	0	0	5,600,000
<b>Lift Station Condition Assessment Improvements</b>																	
	Lift Station Condition		Ongoing lift station improvements to include new electrical, new pumps, repairs to wetwells, repairs to components at the LS etc.		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	3,600,000
Subtotal - Lift Station Condition Assessment Improvements					0	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	3,600,000
<b>Operation and Maintenance Improvements</b>																	
		CCTV Program	IEI/TV Wastewater System every 3-years (approx. 50 miles/year) - contracts & study			150,000								150,000			150,000
		Ongoing Pipeline Replacement Program	Accelerated pipeline replacement for ongoing system improvements			300,000	500,000	500,000	600,000	600,000	600,000	700,000	750,000				4,000,000
Subtotal - Operation and Maintenance Improvements					0	0	450,000	1,000,000	1,100,000	1,200,000	1,200,000	1,300,000	1,450,000	1,750,000			5,100,000
<b>Wastewater Treatment Plant</b>																	
	Study	Wastewater Rate Study	Rate Study for F121 - F122		200,000												200,000
	Construction	IEI Project - Flow Meters	Installation of Flow Meters at LS		200,000												200,000
	Construction	IEI System Repairs - Phase II	Various needed repairs system wide			300,000											300,000
	Design/Construction	Office Expansion	WWTP office and staff workspace building				100,000										100,000
	Construction	UV Bulk Replacement	WWTP UV bulk replacement					50,000									50,000
	Construction	RO Module Replacement	WWTP RO module replacement						50,000								50,000
Subtotal - Wastewater Treatment Plant					400,000	300,000	550,000										1,250,000
<b>Total Improvement Costs</b>																	
					Fiscal Year Total	1,250,000	5,550,700	1,897,000									
					Cumulative Total	1,250,000	6,800,700	8,697,700									

- Gravity Pipeline Improvements: \$0.3 million
- Beaumont Mesa LS Improvements: \$9.6 million
- Lift Station Condition Assessment Improvements: \$3.6 million
- Operation and Maintenance Improvements: \$5.1 million
- Wastewater Treatment Plant Improvements: \$2.0 million

**10-Year CIP Cost: \$20.6 million**



Notes:  
 1. Unless noted otherwise, budgetary planning estimate provided by City staff as of June 30, 2013.  
 2. Existing Wastewater System capacity deficiencies Capital Improvement Program.

# Buildout CIP

Table S-1 Capital Improvement Programs  
Wastewater System Plan  
City of Sacramento

Program No.	Type of Improvement	Alignment	Location	Existing Facilities	Proposed Facilities	Structure Length	Start Year	End Year	Estimated Construction Cost	Estimated Annual Cost	Estimated Annual Operation & Maintenance Cost	Estimated Annual Total Cost	Project Size	Service Location	Construction Program
<b>Upper Oak Valley Lift Station Tributary Area</b>															
Capacity Main Improvements															
UCV-01	Force Capacity Increase	Waste W	From Project 22 to Project Ave	18	Replace	32	247	125,621	128,700	165,780	302,000	696,500	Within City Limit	Approximately 200 EDUs	
Lift Station Improvements															
UCV-14	Lift Station Replacement	Lower Oak Valley Lift Station			Replace	1 @ 600 gpm			1,294,238	1,384,308	1,941,200	2,809,808	Within City Limit	Approximately 300 EDUs	
Subtotal - Upper Oak Valley Lift Station Tributary Area Improvements															
									1,422,866	1,513,008	2,243,200	3,116,308			
<b>Tulsalet Canyon (Main) Lift Station Tributary Area</b>															
Force Main Improvements															
TC-01	New Force Main	Soledad St/Price St	From Tulsalet Canyon Lift Station to approx. 1,000' x/n Upper Oak Valley Lift Station		New	6	6,383	294	1,852,858	1,002,708	1,083,300	2,578,306	Within City Limit	As Development Occurs	
TC-02	New Force Main	Soledad St/Price St	From Tulsalet Canyon Lift Station to approx. 1,000' x/n Upper Oak Valley Lift Station		New	6	6,389	294	1,852,858	1,002,708	1,083,300	2,578,306	Within City Limit	As Development Occurs	
Lift Station Improvements															
TC-03	New Lift Station	Tulsalet Canyon Lift Station			New	1 @ 475 gpm			890,526	905,000	1,000,000	1,404,500	Within City Limit	As Development Occurs	
Subtotal - Tulsalet Canyon (Main) Lift Station Tributary Area Improvements															
									2,783,890	5,009,696	5,566,600	13,359,586			
<b>Upper Oak Valley Lift Station Tributary Area</b>															
Capacity Main Improvements															
UCV-01	Force Capacity Increase	Highway 20	From Project 22 to (50' x/n) Sycamore St	6	Replace	30	890	48,818	75,000	54,800	179,200	399,000	Within City Limit	Approximately 70 EDUs	
UCV-02	Force Capacity Increase	Agnes Ln	From Tulsalet Canyon Lift Station to (50' x/n) Sycamore St	6	Replace	21	900	280	62,260	74,800	97,600	234,660	Within City Limit	PI 2021/24	
UCV-03	Force Capacity Increase	Oak Valley Road	From Project 22 to 2,400' x/n Agnes Ln	12	Replace	30	1,090	320	575,740	575,500	691,000	1,266,500	Within City Limit	Approximately 1,800 EDUs	
Lift Station Improvements															
UCV-04	Lift Station Replacement	Upper Oak Valley Lift Station			Replace	1 @ 1,800 gpm			1,493,320	3,483,400	4,132,100	5,449,200	Within City Limit	Approximately 2,000 EDUs	
Subtotal - Upper Oak Valley Lift Station Tributary Area Improvements															
									4,261,660	6,244,680	6,844,700	17,351,180			
<b>Delwood Lift Station Tributary Area</b>															
Capacity Main Improvements															
DLV-01	Force Capacity Increase	Agnes Ln	From Project 22 to (50' x/n) Sycamore St	6	Replace	21	900	280	62,260	74,800	97,600	234,660	Within City Limit	PI 2021/24	
DLV-02	Force Capacity Increase	Delwood Rd	From Project 22 to (50' x/n) Sycamore St	12	Replace	30	1,090	320	575,740	575,500	691,000	1,266,500	Within City Limit	Approximately 1,800 EDUs	
Lift Station Improvements															
DLV-03	Lift Station Replacement	Delwood Lift Station			Replace	1 @ 600 gpm			887,577	907,600	1,182,300	1,540,200	Within City Limit	Approximately 700 EDUs	
Subtotal - Delwood Lift Station Tributary Area Improvements															
									1,475,577	1,969,900	2,770,900	3,341,360			

Program No.	Type of Improvement	Alignment	Location	Existing Facilities	Proposed Facilities	Structure Length	Start Year	End Year	Estimated Construction Cost	Estimated Annual Cost	Estimated Annual Operation & Maintenance Cost	Estimated Annual Total Cost	Project Size	Service Location	Construction Program
<b>Delwood Lift Station Tributary Area</b>															
Capacity Main Improvements															
DLV-01	Force Capacity Increase	Agnes Ln	From Project 22 to (50' x/n) Sycamore St	6	Replace	21	900	280	62,260	74,800	97,600	234,660	Within City Limit	PI 2021/24	
DLV-02	Force Capacity Increase	Delwood Rd	From Project 22 to (50' x/n) Sycamore St	12	Replace	30	1,090	320	575,740	575,500	691,000	1,266,500	Within City Limit	Approximately 1,800 EDUs	
Lift Station Improvements															
DLV-03	Lift Station Replacement	Delwood Lift Station			Replace	1 @ 600 gpm			887,577	907,600	1,182,300	1,540,200	Within City Limit	Approximately 700 EDUs	
Subtotal - Delwood Lift Station Tributary Area Improvements															
									1,475,577	1,969,900	2,770,900	3,341,360			

Program No.	Type of Improvement	Alignment	Location	Existing Facilities	Proposed Facilities	Structure Length	Start Year	End Year	Estimated Construction Cost	Estimated Annual Cost	Estimated Annual Operation & Maintenance Cost	Estimated Annual Total Cost	Project Size	Service Location	Construction Program
<b>Delwood Lift Station Tributary Area</b>															
Capacity Main Improvements															
DLV-01	Force Capacity Increase	Agnes Ln	From Project 22 to (50' x/n) Sycamore St	6	Replace	21	900	280	62,260	74,800	97,600	234,660	Within City Limit	PI 2021/24	
DLV-02	Force Capacity Increase	Delwood Rd	From Project 22 to (50' x/n) Sycamore St	12	Replace	30	1,090	320	575,740	575,500	691,000	1,266,500	Within City Limit	Approximately 1,800 EDUs	
Lift Station Improvements															
DLV-03	Lift Station Replacement	Delwood Lift Station			Replace	1 @ 600 gpm			887,577	907,600	1,182,300	1,540,200	Within City Limit	Approximately 700 EDUs	
Subtotal - Delwood Lift Station Tributary Area Improvements															
									1,475,577	1,969,900	2,770,900	3,341,360			

Program No.	Type of Improvement	Alignment	Location	Existing Facilities	Proposed Facilities	Structure Length	Start Year	End Year	Estimated Construction Cost	Estimated Annual Cost	Estimated Annual Operation & Maintenance Cost	Estimated Annual Total Cost	Project Size	Service Location	Construction Program
<b>Delwood Lift Station Tributary Area</b>															
Capacity Main Improvements															
DLV-01	Force Capacity Increase	Agnes Ln	From Project 22 to (50' x/n) Sycamore St	6	Replace	21	900	280	62,260	74,800	97,600	234,660	Within City Limit	PI 2021/24	
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Subtotal - Delwood Lift Station Tributary Area Improvements															
									1,475,577	1,969,900	2,770,900	3,341,360			

- Pipeline Capacity Improvements: \$32.3 million
  - Force Main Capacity Improvements: \$21.2 million
  - Lift Station Improvements: \$34.6 million
  - Other Wastewater System Improvements: \$10.7 million
- Total Cost: \$98.9 million**

# Sewer System MP Summary Points

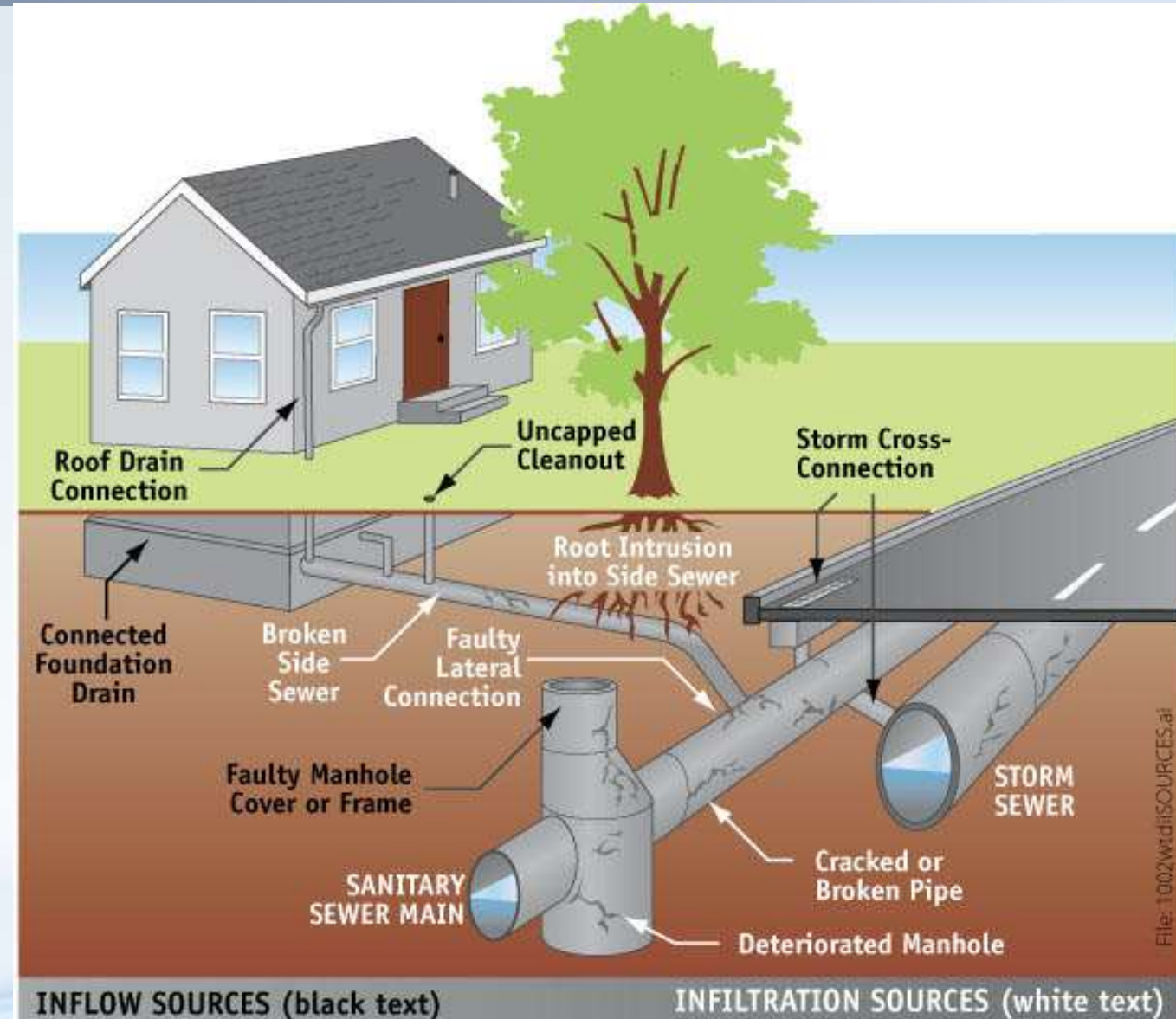
- **Serving Existing Customers**
  - Capacity of Existing Sewer System is good.
  - Capacity of Most Existing Lift Stations not adequate.
- **Extending Service to Future Growth**
  - Future Capacity Pipeline Projects are Developer Driven.
- **Deliverables**
  - Master Plan Document
  - Hydraulic Model

# Next Steps!

- Rate Study
- Pipeline Condition Assessment  
*(State and Federal Regulations)*
- Lift Station Condition Assessment
- Update Master Plans every 5 years

# Next Steps: Evaluate Condition of the Sewer System

Sewer system pipes age over the years, and if not replaced on time, they will fail



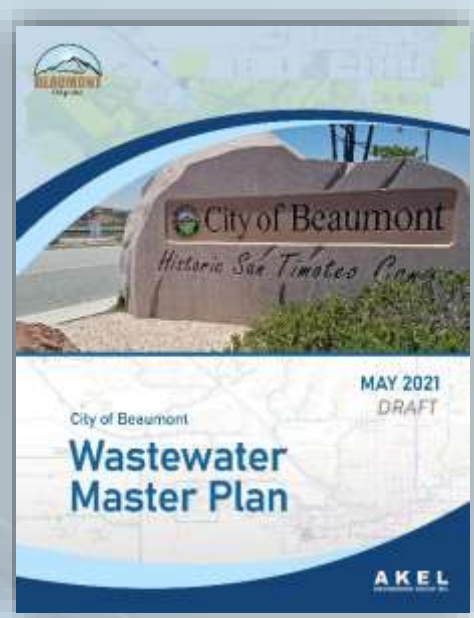
# Methods for Evaluating Pipe Condition

- Age-based Replacement Program
- Risk-based Replacement Program
  - Evaluate the **Likelihood** of Failure
  - Evaluate the **Consequence** of Failure
  - Evaluate the total **Risk Score**





# City of Beaumont *2021 Wastewater Master Plan*



## Workshop – Draft Master Plan

June 22, 2021

