Wastewater System Master Plan

City of Lathrop

Integrated Water Resources Master Plan Update

Lathrop

Draft—December 2018 | EKI B60038.00

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577 Airport Blvd, Suite 500 - Burlingame, CA 94010

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CITY OF LATHROP

Wastewater System Master Plan

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LIST OF ABBREVIATIONS

AAF	average annual flow
AAFES	Army & Air Force Exchange Services
ac	acre
ADWF	average dry weather flow
AOI	Area of Interest
BSF	Base sanitary flow
BOD	biological oxygen demand
CCI	Construction Cost Index
CII	commercial, industrial, and institutional
CIP	capital improvement projects
City	City of Lathrop
CLSP	Central Lathrop Specific Plan
d/D	depth to diameter
Depot	Sharpe Army Depot
DOF	Department of Finance
du	dwelling unit
EKI	EKI Environment & Water, Inc.
ENR	Engineering News Record
fps	feet per second
GIS	geographical information system
gpd	gallons per day
I-5	Interstate 5
I&I	Infiltration and Inflow
IWRMP	Integrated Water Resources Master Plan
Lathrop CTF	Lathrop Consolidated Treatment Facility
LF	linear feet
ls	lump sum
LS	Lift Station
MGD	million gallons per day
MWQCF	Manteca Wastewater Quality Control Facility
NPDES	National Pollution Discharge Elimination System
OPC	Opinion of Probable Construction Cost
PS	Pump Station
PVC	polyvinyl chloride
PWWF	Peak Wet Weather Flow
SCADA	Supervisory Control and Data Acquisition
SGMA	Sustainable Groundwater Management Act
SLSP	South Lathrop Specific Plan

SOI	Sphere of Influence
TDH	total dynamic head
UWMP	Urban Water Management Plan
VC	vitrified clay
WDR	Waste Discharge Requirement
WRP-1	Water Recycling Plant No. 1
WWSMP	Wastewater System Master Plan
WWTF	wastewater treatment facility

EXECUTIVE SUMMARY

EKI Environment & Water, Inc. (EKI) has prepared this Wastewater System Master Plan (WWSMP) for the City of Lathrop, California (City). This WWSMP was developed as part of the City's Integrated Water Resources Master Plan (IWRMP) Update, a comprehensive update to the City's Potable Water System, Wastewater System, and Recycled Water System Master Plans. This WWSMP focuses on development of wastewater flow unit factors and projections, hydraulic assessment of the City's existing infrastructure and key planned conveyances, and development of recommended wastewater capital improvement projects (CIPs).

Study and Service Areas

The City of Lathrop is located in San Joaquin County, approximately 10 miles south of the City of Stockton and directly west of the City of Manteca. The City lies east of the Coastal Range that separates California's Central Valley from the San Francisco Bay Area. Interstate 5 (I-5), a major north-south interstate corridor, bisects the City. The community was originally developed primarily east of I-5. However, most major new developments have recently been constructed west of I-5 and others are currently planned or under construction in this area.

The City's wastewater collection system service area is generally contiguous with the City limits, except for several industrial facilities within the City that manage wastewater onsite. The current population within the City is approximately 22,100 (California DOF, 2016). The City anticipates that its population will continue to grow in the future given the existing entitlements for several large residential developments.

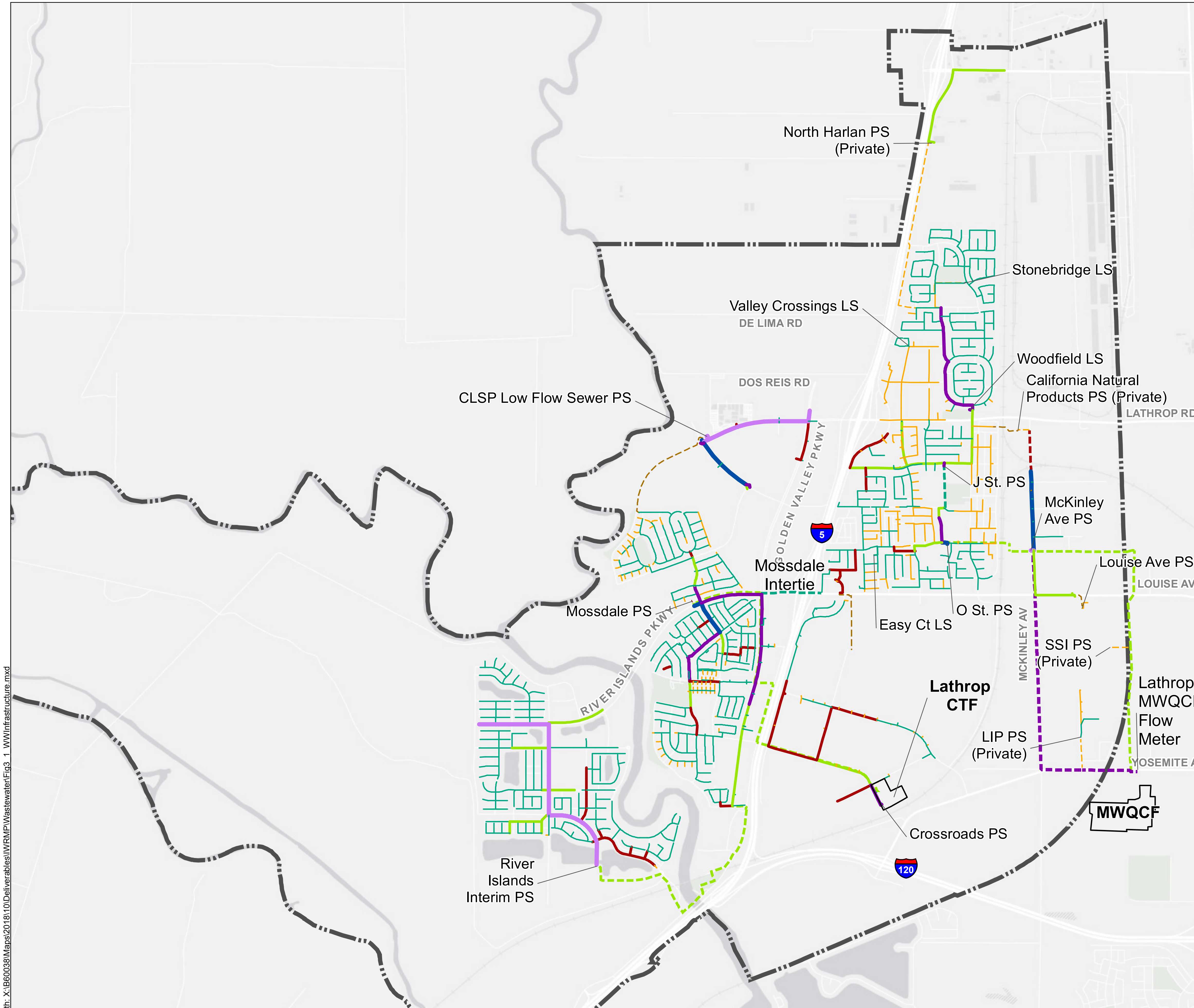
City's Existing Wastewater Infrastructure

Wastewater from the City is treated at two facilities: (1) the Lathrop Consolidated Treatment Facility (Lathrop CTF), and (2) the Manteca Wastewater Quality Control Facility (MWQCF). Most of the City's wastewater generated in the areas east of I-5 is treated at the regional MWQCF. Wastewater generated in the Crossroads industrial area and the areas west of I-5, including the Mossdale, River Islands, and Central Lathrop development areas, is treated at the City-owned Lathrop CTF.

The City's wastewater collection system consists of approximately 72 miles of gravity mains, 21 miles of force mains, as well as 12 lift stations and pump stations. The City has a Supervisory Control and Data Acquisition (SCADA) system for control and monitoring of facilities. The City's wastewater infrastructure is shown on Figure ES-1.

Existing and Future Wastewater Generation

In 2016, the City generated a total average annual flow (AAF) of 1.46 million gallons per day (MGD), including 0.92 MGD treated at the MWQCF (63%) and 0.54 MGD treated at the CTF (37%). The total per capita average dry weather flow (ADWF) varied between 60 and 69 gallons of wastewater per capita per day.



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Legend

- Sphere of Influence
- Approximate Area of WWTF
- PS Pump Station or Lift Station

Gravity Main Diameter

- 3" - 4"
- 6
- 8
- 10
- 12
- 14" - 16"
- 18" - 20"
- 24" - 36"

Force Main Diameter

- 3" - 4"
- 6
- 8
- 10
- 12
- 14" - 16"
- 18" - 20"
- 24" - 36"

Abbreviations

CLSP	=	Central Lathrop Specific Plan
CTF	=	Consolidated Treatment Facility
LIP	=	Lathrop Industrial Park
LS	=	lift station
MWQCF	=	Manteca Water Quality Control Facility
PS	=	pump station
SSI	=	Super Store Industries
WWTF	=	wastewater treatment facility

Notes

1. All locations are approximate.
2. Gravity mains north of North Hanlan PS and gravity mains built as part of the LogiCenter project south of McKinley Ave PS were constructed post 2016 and are not evaluated in the hydraulic model.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

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(Scale in Feet)

Existing Wastewater Infrastructure

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Figure ES-1

As part of IWRMP development, new land use-specific wastewater generation factors were established using historic wastewater flow and parcel-level water use data. The wastewater generation factors serve as the basis to estimate ADWF for future developments. The IWRMP updated wastewater generation factors (in units of gallons per day per dwelling unit or gallons per day per acre; gpd/du or gpd/ac) are presented in Table ES-1 below.

Table ES-1
Wastewater Flow Factors

Land Use	Wastewater Flow Factor	
	Historic Lathrop	West Lathrop (a)
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	180 gpd/du	
High Density Residential	170 gpd/du	
Commercial	590 gpd/ac	
Industrial	355 gpd/ac	
Parks	55 gpd/ac	
Schools / Institutional	245 gpd/ac	

Note:

(a) Includes CLSP, Mossdale, and River Islands development areas as well as future new development areas with residential units.

Wastewater ADWF projections were calculated as the sum of the two major components of future wastewater flow: (1) the volume of wastewater that best represents existing wastewater generation within the City, and (2) the anticipated wastewater generation associated with the future development projects and planning areas.

The City's projected wastewater generation by sector and by development area are estimated in five-year increments between 2020 and 2040 and at buildout. It is anticipated that the City's total ADWF in 2040 will be 5.34 MGD, whereas the ADWF at Buildout is estimated to be 6.48 MGD. Of these totals, ADWFs of 1.40 MGD and 1.47 MGD are anticipated to flow to MWQCF from Historic Lathrop in 2040 and at buildout, respectively. The ADWFs of 3.94 MGD in 2040 and 5.01 MGD at buildout are projected to flow to the Lathrop CTF. The vast majority of the anticipated increase in wastewater generation at the CTF is associated with the River Islands and Central Lathrop development areas.

Hydraulic Assessment

EKI constructed a sewer system hydraulic model to assess the City's existing infrastructure and key planned infrastructure against the design criteria discussed in Section 5 and the wastewater flow projections developed in Section 4. The hydraulic model, along with the flow projections, was used to evaluate capacity needs for current and future flow conditions and to complete the hydraulic assessment portion of the WWSMP.

Existing infrastructure and key planned infrastructure were assessed under four scenarios: Existing (2016), Near-term Future (2025), Long-term Future (2040), and Selected Buildout (beyond 2040).

The City's collection system is primarily assessed against the capacity criteria, including depth to diameter (d/D) ratio in gravity mains and maximum velocity in force mains. Model results have shown that approximately 4% of City's existing gravity mains will not meet the capacity criteria by 2040. Areas with capacity deficiencies are mostly consistent in all scenarios, indicating that most capacity deficiencies identified in the future scenarios already exist in the existing system, although the degree of deficiency may increase with projected development. In addition, approximately 43% of the City's existing gravity mains do not meet the minimum velocity and slope criteria. However, minimum velocity and slope are secondary criteria and do not necessarily trigger an improvement if the pipe is able to meet the capacity criteria beyond 2040.

Pump stations are evaluated against the ability to convey peak wet weather flow (PWWF) within a station's firm capacity. Capacity deficiencies are identified in the Stonebridge Lift Station (LS) and Woodfield LS in all scenarios.

The City's existing and planned force mains are able to convey projected wastewater flow beyond 2040.

Recommended Capital Improvement Program

Recommended CIPs were developed to address the potential deficiencies identified in the hydraulic assessment. For each identified gravity sewer capacity deficiency, a project was developed to remove and replace the existing pipe with a larger diameter pipe. Existing pipe slopes and depths were preserved when upsizing sewers in-place. Proposed increases in pipe diameters were optimized to meet the applicable criteria, while preventing oversizing and resulting low velocities during dry weather conditions. Improvements were also identified to address the potential deficiency at the City's pump stations, including construction of parallel force mains and/or pump upgrades. EKI has also suggested installation of permanent flow meter and flow monitoring programs in the Historic Lathrop and Crossroads areas.

Figure ES-2 shows an overview of the collection system capacity project locations, and Table ES-2 summarizes all the identified collection system improvement projects, including location, proposed improvements, estimated planning level costs, and alternatives.

Table ES-2
Summary of Capital Improvement Projects

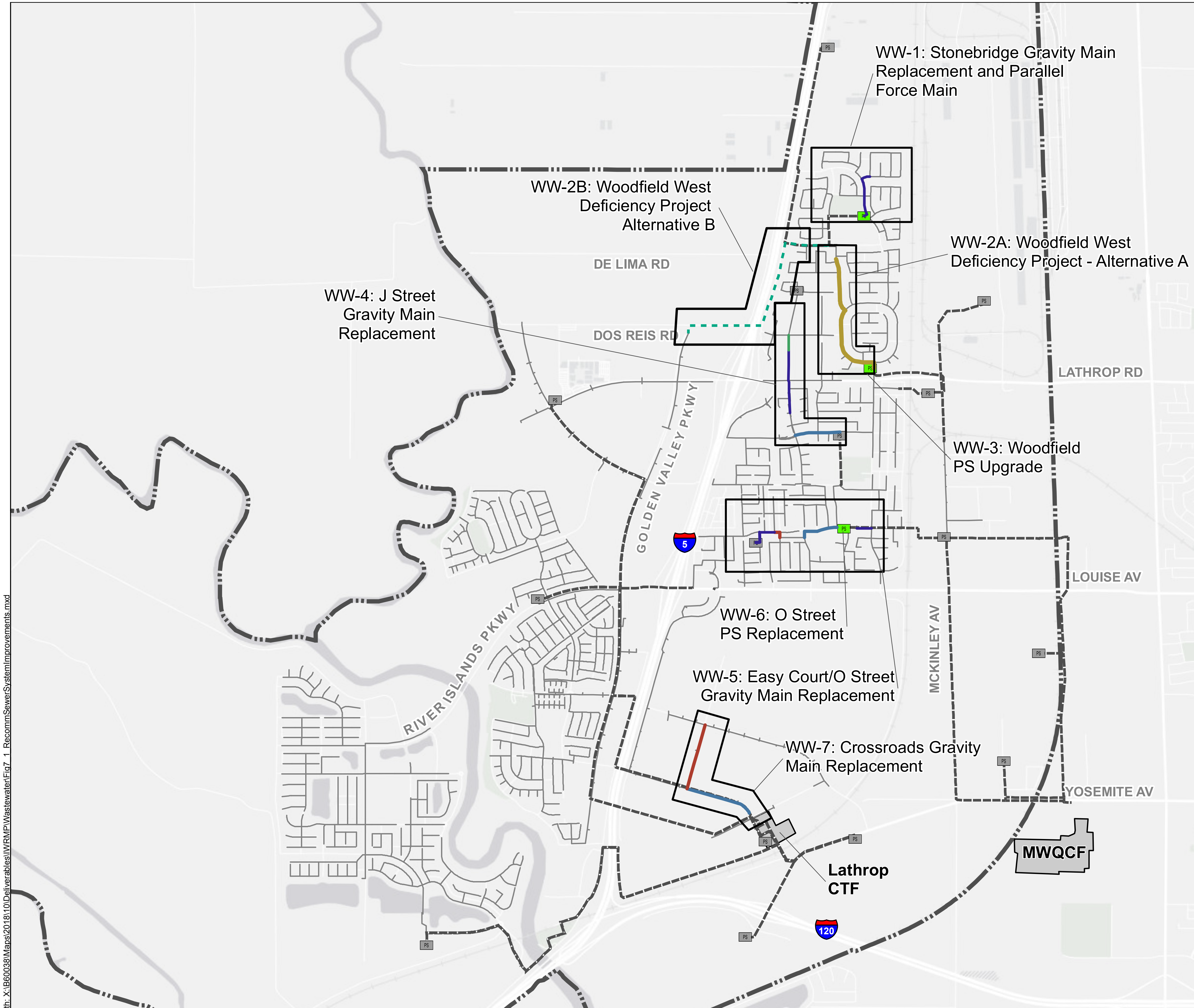
Project Number	Project	Timeframe	Addresses Modeled Surcharging in Existing Scenario	Total Project OPC (a)
Treatment Facility Improvement Projects				
WWT-1	Lathrop CTP Expansion to 5.0 MGD	Long-Term Future	--	$ 36,000,000 (c)
Collection System Improvement Projects				
WW-1	Stonebridge Gravity Main Replacement and Pump Station Upgrade	Existing	No	$ 700,000
WW-2A	Woodfield West Deficiency Project - Alternative A	Existing (b)	No	$ 2,240,000
WW-2B	Woodfield West Deficiency Project - Alternative B	Existing (b)	No	$ 1,970,000
WW-3	Woodfield Pump Station Upgrade	Existing (b)	No	$ 720,000
WW-4	J Street Gravity Main Replacement Project	Existing (b)	Yes	$ 1,390,000
WW-5	Easy Court / O Street Gravity Main Replacement Project	Existing	No	$ 1,130,000
WW-6	O Street Pump Station Upgrade	Existing	No	$ 1,280,000
WW-7	Crossroads Gravity Main Replacement Project	Near-Term Future	No	$ 1,690,000
		Collection System CIP Cost Subtotal	*$ 8,880,000 -*	*$ 9,150,000*
Miscellaneous Collection System Projects				
WW-8	Temporary Flow Monitoring	--	--	$ 100,000
		TOTAL CIP COST	**$ 44,980,000 -**	**$ 45,250,000**

Notes:

(a) Costs shown are presented in November 2018 dollars based on an ENR CCI of 11,184 (20-city average).

(b) Project addresses existing deficiencies, however future development influences recommended pipe or pump sizes to be installed.

(c) Total project OPC consists of construction OPC developed based on a unit cost of $9 per gallon additional ADWF capacity, 25% construction contingency, and 35% engineering and administration costs.



Legend
- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Pump Station or Lift Station Upgrade
- Force Main
- Gravity Main

Diameter of Replacement Sewer
- 8"
- 10"
- 12"
- 15"
- 18"

Diameter of New Force Main
- 6"

Abbreviations
CTF = Consolidated Treatment Facility
MWQCF = Manteca Water Quality Control Facility
WWTF = wastewater treatment facility

Notes
1. All locations are approximate.
2. A detailed map for each project is included in Appendix E.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 14 December 2018.

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(Scale in Feet)

Recommended Collection System Improvement Projects

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Figure ES-2

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1. INTRODUCTION

EKI Environment & Water, Inc. (EKI) has prepared this Wastewater System Master Plan (WWSMP) for the City of Lathrop, California (City). This WWSMP was developed as part of the City's Integrated Water Resources Master Plan (IWRMP) Update, a comprehensive update to the City's Potable Water System, Wastewater System, and Recycled Water System Master Plans. The IWRMP Update was completed through a coordinated effort between multiple City departments and provides a unifying framework to support utility operations and Capital Improvement Project (CIP) development and implementation.

This WWSMP updates and supersedes the City's prior Wastewater System Master Plan and subsequent studies prepared by Nolte between 2001 and 2006, including:

- Historic Lathrop Water and Sewer Studies Central Core Sewer Collection System Master Plan (Nolte, 2006);
- East Lathrop Water and Sewer Studies O Street Pump Station and McKinley Avenue Pump Station Mini-Master Plan (Nolte, 2005); and
- City of Lathrop Master Plan (Nolte, 2001).

1.1 Project Background

Since its last master plan updates, the City has added new development, updated its assumptions regarding anticipated future development, experienced volatility in terms of water use and wastewater flows, made significant infrastructure improvements, and changed its assumptions regarding future water supplies. These factors, in addition to recent regulatory changes, prompted reevaluation of the City's previous planning assumptions. The IWRMP project was thus initiated in summer of 2016.

The IWRMP is a major planning effort that will provide critical information and a unifying framework to support the City's General Plan, utility operations, CIP development and implementation, annual budgets and rate studies, and land use planning and development fees. It is also informing the City's response to regulatory requirements, such as development of the City's Sewer System Management Plan update, 2015 Urban Water Management Plan (UWMP) update, future Water Supply Assessments, and its strategic response to the Sustainable Groundwater Management Act (SGMA).

Work on the IWRMP was divided into two phases. The first phase focused on preliminary analyses to serve as the basis for the master plans and was completed in April 2017. The second phase focused on updating the water, wastewater, and recycled water master plans. The Phase 1 efforts and analyses included the following:

(1) Selection of hydraulic modeling software;

(2) Update of the City's infrastructure geodatabase;

(3) Update of the City's land use-specific water use and wastewater flow factors, establishment of development projections based on the City's General Plan and input from the development community, and projections of future water demand and wastewater flow by development area; and

(4) Evaluation of key water supply and reliability issues.

(5) Development of a water, wastewater, and recycled water policy and decision framework

These Phase 1 efforts were documented in draft technical memorandums and meeting presentations, which have been incorporated herein.

The IWRMP has been developed in close coordination with multiple City departments, including the Public Works, Finance, and Community Development Departments, as well as the City Manager's Office. To facilitate participation of City staff, monthly progress meetings were held throughout development of the IWRMP to review project status and major findings, as well as discuss key project decisions.

In addition, the City engaged stakeholders during the IWRMP process to share findings and solicit input on the IWRMP development and decision-making process. The City held a meeting with all stakeholders in October 2016 to introduce the IWRMP and initial findings and held a series of meetings with individual stakeholders in April 2017 to discuss the Phase 1 findings.

1.2 Scope of Work

The scope of work for the WWSMP included the following primary tasks:

- Review of the City's basic assumptions, criteria and conclusions in wastewater planning, e.g., wastewater system design criteria, pump station operations, infiltration and inflow rates, pump station operations, surcharging, and other identified system deficiencies;
- Development of updated wastewater flow unit factors and projections;
- Development of an updated peaking curve to evaluate peak wet-weather flows;
- Assessment of existing collection system under existing and future flow conditions using steady-state model simulations;
- Evaluation of pump stations, force mains, and conveyance alternatives;
- Documentation of wastewater treatment and planned improvements;
- Development of a recommended wastewater system CIP; and
- Preparation of the WWSMP document.

1.3 Report Organization

The WWSMP is organized into the following sections:

- Section 1 - Introduction
- Section 2 - Study and Service Area
- Section 3 - City's Existing Wastewater Infrastructure

- Section 4 - Existing and Future Wastewater Generation
- Section 5 - Collection System Performance and Design Criteria
- Section 6 - Hydraulic Assessment of the Collection System
- Section 7 - Recommended Capital Improvement Projects
- Section 8 - References

2. STUDY AND SERVICE AREAS

The City of Lathrop is located in San Joaquin County, approximately 10 miles south of the City of Stockton and directly west of the City of Manteca. The City lies east of the Coastal Range that separates California's Central Valley from the San Francisco Bay Area. Interstate 5 (I-5), a major north-south interstate corridor, bisects the City. The City is also connected by Highway 120 which runs east-west through the southeastern-most part of the City, and by Interstate 205, which connects Interstate 580 to I-5. The City is also served by the Altamont Commuter Express train, which travels along the southern and eastern border of the City. The community was primarily developed primarily east of I-5. However, most major new developments have recently been constructed west of I-5 and others are currently planned or under construction in this area.

This section provides an overview of the City's service area, including discussions of the City's service area boundaries, planned developments, and population.

2.1 City Limits, Sphere of Influence, and Service Boundaries

The City currently encompasses an area of approximately 13,400 acres, or about 20.9 square miles, however its Sphere of Influence (SOI) is slightly larger with an area of about 13,600 acres, or 21.2 square miles. The City's SOI includes two unincorporated areas:

1. Approximately 134 acres northeast of the City boundary and along Roth Road that is designated Freeway Commercial and Light Industrial, and

2. Approximately 62 acres southeast of the City boundary that is pre-zoned for industrial uses and part of the Lathrop Gateway Business Park Specific Plan area.

The City reduced their SOI in 2016 to exclude an additional unincorporated area (approximately 2,100 acres) located north of the Central Lathrop Specific Plan (CLSP or Central Lathrop) area and west of I-5. Most of this area does not have a General Plan land use designation. The City has designated this area as an Area of Interest (AOI) (Lathrop, 2016).

The City's wastewater collection system service area is generally contiguous with the City limits. The City currently provides wastewater service to approximately 6,100 residential, commercial, industrial and institutional/governmental properties.

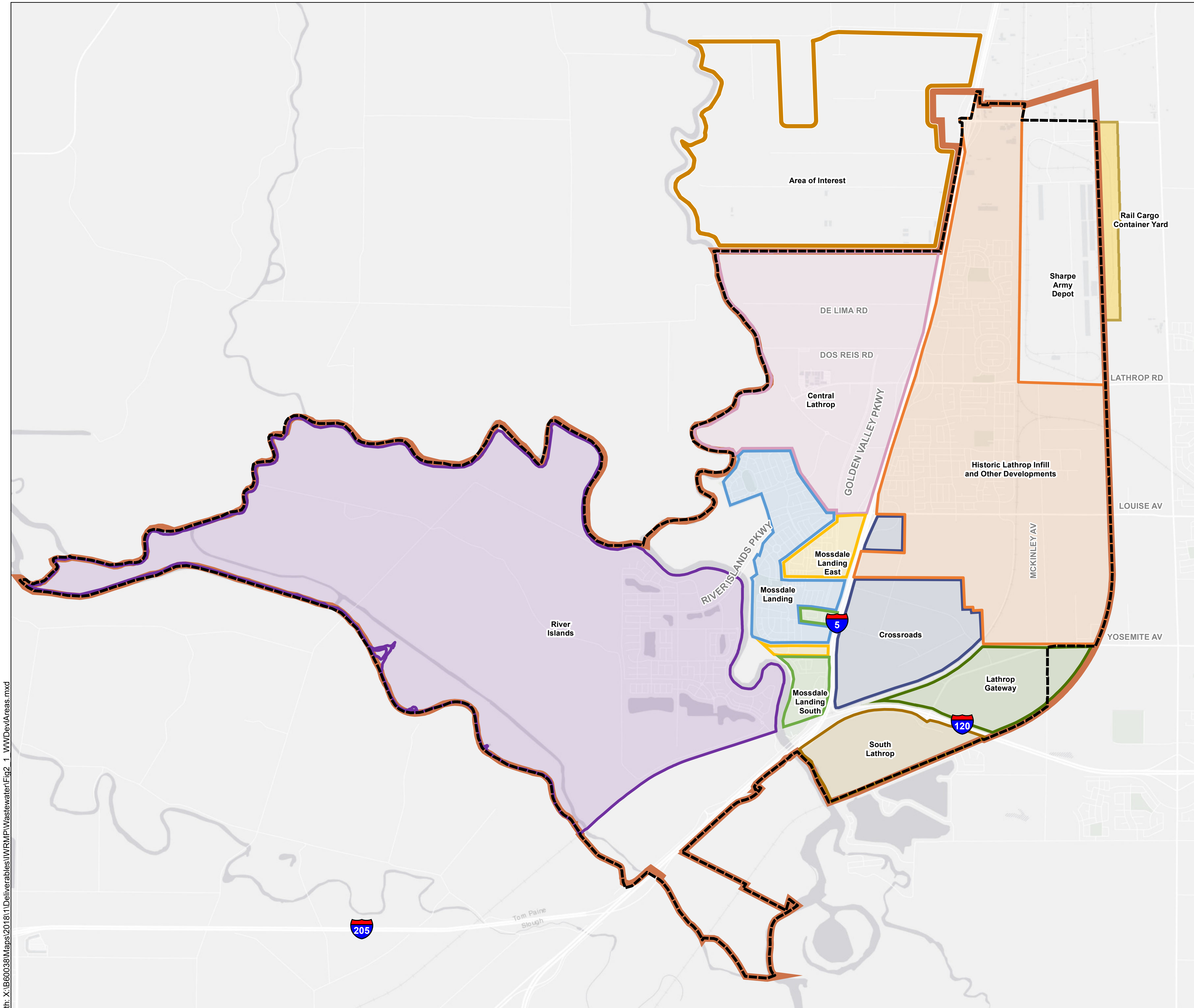
The 724 acre Sharpe Army Depot, located in the northeast part of the City, is not currently served by the City's wastewater system. As discussed below, the existing Army & Air Force Exchange Services (AAFES) and the California Military Department (CMD) portions of the property are anticipated to connect to the City's collection system in the near future.

Several other large industrial facilities (e.g., Simplot, a future Kraft-Heinz facility, and former Carpenter Company facility) as well as the Next Generation STEAM Academy in River Islands manage their wastewater onsite. California Natural Products independently treats and land applies most of their wastewater onsite and sends the remaining flows to the City's collection system. In addition, residential homes in the Central Lathrop area, as well as parcels in the recently-annexed Lathrop Gateway and South Lathrop areas are currently not served by the City's wastewater system.

2.2 Specific Plans and Large Planned Unit Development

The City of Lathrop has several approved or pending large development projects. Infrastructure needs for these projects are evaluated in this document. The projects are described below per the City's Municipal Service Review (Lathrop, 2016) and shown on Figure 2-1:

- River Islands. The 4,995-acre River Islands development is located west of the San Joaquin River and east of Paradise Cut on land known as the Stewart Tract. The development proposes a mixture of low, medium and high density residential units. In total, River Islands will consist of 11,000 homes, a 260-acre employment center, a 47-acre town center, 265 acres of parks and nine schools. Construction has begun in the River Islands project with the completion of an elementary school for the Banta Elementary School District (Next Generation STEAM Academy) as well as the construction of a Charter School. About 450 low density residential units were constructed and occupied by the end of 2016. The estimated project completion date is 2040.
- Mossdale Landing. Mossdale Landing is a mixed-use master planned community that is anticipated to be completed by 2030. Construction at Mossdale Landing began in 2003 and approximately 1,570 residential units have been constructed thus far. An additional 66 low density and 62 high density units are anticipated by project completion. In addition, the development is allocating approximately 35 acres of land for two schools, 40 acres for parks, and 25 acres for commercial development.
- Mossdale Landing East. Mossdale Landing East (formerly referred to as Lathrop Station) is anticipated to be completed by 2030. Approximately 151 low density and 293 medium density residential units have been constructed so far. An additional 38 low density and 144 high density units are anticipated by project completion. The development plan also includes 6.5 acres of village commercial, 13.2 acres of service commercial, and 27.5 acres of highway commercial land uses.
- Mossdale Landing South. Mossdale Landing South is a proposed 104-acre development that is anticipated to be completed by 2030. The development will consist of about 280 medium density and 150 high density residential units, of which 140 medium density units have been constructed so far. In addition, the project includes 28 acres of commercial, 25 acres of open space, and 9.5 acres of parks.
- Mossdale Landing – Other. The City has identified additional areas for development within Mossdale Landing including the Sylveria property, on which the City anticipates 658 low density dwelling units will be built by City buildout.



Legend

- City Limit
- Sphere of Influence
- Area of Interest
- Rail Cargo Container Yard

Development Areas

- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing East
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 8 January 2018.

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(Scale in Feet)

City of Lathrop Boundaries and Development Areas

Wastewater System Master Plan
City of Lathrop
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Figure 2-1

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- Historic Lathrop Infill and Other Developments East of I-5. The portion of the City east of I-5 is anticipated to expand and add density in the future. Currently, this area consists of approximately 3,076 low density and 78 medium density units, commercial and industrial areas, and a few public parks. Future residential growth of this area is expected on undeveloped/underutilized and redeveloped parcels consolidated from large lots where low density residential units would be demolished. New residential projects are estimated to consist of 34 low density, 158 medium density, and 25 high density residential units, increasing the total existing residential unit count by 217 total units.

- Central Lathrop Specific Plan. The Central Lathrop Specific Plan proposes development of 1,520 acres located west of I-5. The Specific Plan proposes approximately 6,790 low, medium and high density residential units and additional commercial land uses (offices). The project also includes two schools and 216 acres of recreational land use and open space. Phases 1 and 2 of the project are anticipated to be completed by 2040, adding 274 high density units, 2,236 variable density residential units, and 173 acres of commercial land uses.

- Lathrop Gateway Business Park Specific Plan. The Lathrop Gateway Business Park Specific Plan proposes commercial and industrial development of approximately 384 acres to be completed by 2040. The City annexed 213 acres of this area in June 2012 and 99 acres of the remaining 117 acres in May 2016. This would result in approximately 4.7 million square feet of service commercial, limited industrial, distribution, and research and development related uses, and approximately 920,000 square feet of commercial office and retail uses. The first phase of the project, the Phelan Gateway Project, includes approximately 167 acres of limited industrial, 83 acres of service commercial, and 57 acres of office and commercial retail uses and is anticipated to be completed by 2025.

- South Lathrop Specific Plan. The South Lathrop Specific Plan (SLSP or South Lathrop) was recently approved by the City Council on 20 July 2015 and includes a 315-acre plan area. The Specific Plan proposes approximately 10 acres of commercial office uses, 246 acres of limited industrial, 31 acres of open space, and 27 acres of roads and public facilities. The City South Lathrop Specific Plan area was annexed into the City in May 2016. The South Lathrop Commerce Center, approximately 272 acres within the South Lathrop Specific Plan, is anticipated to be completed by 2025. The South Lathrop Commerce Center will encompass all of the South Lathrop Specific Plan area with the exception of approximately 24 acres of light industrial, 1.2 acres of office commercial, and 19 acres of open space and public roads.

- Sharpe Army Depot. During World War II, the US Army created the Sharpe Army Depot (Depot) in the rural Lathrop Community to allow shipment of major army supplies to the western United States. The Depot is comprised of a 724-acre facility south of Roth Road and has served both the Army and Airforce with a variety of supplies depending on the demand of goods and supplies created by war time efforts. The Depot is occupied by the West Coast Distribution Center that employs 348 workers. Prior to 30 September 2014 the Defense Logistics Agency was also housed at the Depot; its workforce of 700 workers has since been transferred to the larger Tracy Army Depot. Sharpe Army Depot was included in the City limits as part of the 1989 incorporation and is entirely self-contained:

meaning all public services normally necessary to serve urban development such as water, sewer, storm drainage, police and fire services are provided by the US Army. The City of Lathrop does have an emergency water intertie with the Depot.

The City and AAFES are currently in discussions to connect the AAFES property, including the West Coast Distribution Center and Building 240, to the City's water and sewer systems. The City is currently also in discussions with CMD to connect service to the remainder of the Depot and accommodate their future expansion plans. Flows from both of these facilities are currently planned to connect to the City's collection system on West Lathrop Road through a common force main. This connection is anticipated to occur before 2020 and is evaluated as part of the IWRMP.

Projected future development within each of the above development areas is presented in Table 2-1, based on City and developer projections. Specifically, Table 2-1 lists the number of new residential dwelling units and commercial, industrial, and institutional (CII) acreage that is anticipated to be developed in five-year increments between 2020 and 2040 and at buildout.

2.3 Current and Projected Population

Values for the historical and current population within the City's wastewater service area were obtained from data reported by the California Department of Finance (DOF) within the City Limits. Although Lathrop's wastewater service area currently excludes the Sharpe Army Depot and other industrial facilities, the service area population is estimated to be equivalent to the City population. As of January 2016, the population estimate for Lathrop was 22,112 (California DOF, 2016). The historical and current population data within the City's water service area are presented in Table 2-2.

Population in the City has grown by approximately 223% over the 26-year period between 1990 through 2016, from approximately 6,800 to 22,100 (California DOF, 2007, 2012, and 2016). Between 2005 and 2016, population increased by 73%, from approximately 12,800 to 22,100.

The City anticipates that population will continue to grow in the future given the existing entitlements for several large residential developments, discussed above in Section 2.2. The population projections for 2020 through 2040, summarized in Table 2-3, are estimated using the existing population (as determined by California DOF) and adding the amount of new housing anticipated to be permitted in each five-year increment based on Table 2-1. The population added each year is projected by multiplying the number of new housing units by the person per dwelling unit values reported by DOF based on the 2010 census data (3.77 persons per dwelling unit). Current and projected population trends are shown on Figure 2-2. The projected residential buildout is summarized by each development area in Table 2-4. Residential buildout is projected to occur beyond 2045.

Table 2-1
City of Lathrop Development Projections by Development Area

Land Use Designation	Units	Incremental New Development (a)(b)						Total New Development	
		2020	2025	2030	2035	2040	Buildout	2040	Buildout
Central Lathrop									
Low Density Residential	du	600	771	626	--	--	4,101	1,997	6,098
Medium Density Residential	du	--	239	--	--	--	--	239	239
High Density Residential	du	--	274	--	--	--	179	274	453
Commercial	ac	19.0	114.7	39.0	--	--	105.8	172.7	278.5
Parks	ac	8.6	48.2	10.0	--	--	48.2	66.8	115.0
Schools	ac	--	--	--	--	--	54.6	--	54.6
Public Landscaping	ac	21.6	2.2	12.5	--	--	10.1	36.3	46.4
Mossdale - All Developments (c)									
Low Density Residential	du	37	--	66	--	--	658	103	761
Medium Density Residential	du	--	64	--	74	--	--	138	138
High Density Residential	du	266	--	--	78	78	--	422	422
Commercial	ac	--	13.9	--	21.5	13.0	--	48.4	48.4
Parks	ac	--	4.0	--	--	--	--	4.0	4.0
Schools	ac	--	16.2	--	--	--	--	16.2	16.2
River Islands									
Low Density Residential	du	1,517	1,609	1,413	1,868	1,389	--	7,797	7,797
Medium Density Residential	du	253	330	290	383	285	--	1,539	1,539
High Density Residential	du	--	400	810	--	--	--	1,210	1,210
Commercial	ac	10.0	50.0	90.0	100.0	70.0	--	320	320
Schools (d)	ac	41.0	23.0	57.0	11.0	11.0	--	143	143
Animal Campus	ac	--	10.0	--	--	--	--	10	10
Parks and Landscape Parcels (e)	ac	24.0	37.0	40.0	36.0	27.0	--	164	164
South Lathrop									
Light Industrial / R&D Flex	ac	164.5	56.7	--	--	--	21.6	221.2	242.8
Office Commercial	ac	--	8.8	--	--	--	--	8.8	8.8
Open Space	ac	6.8	--	--	--	--	--	6.8	6.8
Public Landscaping	ac	0.8	--	--	--	--	--	0.8	0.8
Lathrop Gateway									
Light Industrial / R&D Flex	ac	--	151.0	--	--	16.6	--	167.6	167.6
Office Commercial	ac	--	--	--	--	139.7	--	139.7	139.7
Open Space (f)	ac	--	--	--	--	1.6	--	1.6	1.6
Crossroads (g)									
Industrial	ac	258.5	2.0	--	--	23.0	--	283.5	283.5
Commercial	ac	2.2	19.8	--	--	--	--	22.0	22.0
Historic Lathrop and Other Development Areas (g)									
Low Density Residential (h)	du	6	6	6	6	5	5	29	34
Medium Density Residential (f)	du	27	27	26	26	26	26	132	158
High Density Residential	du	5	4	4	4	4	4	21	25
Commercial	ac	14.0	26.6	8.0	8.0	8.0	25.5	64.6	90.1
Industrial	ac	3.4	40.9	--	--	--	143.0	44.3	187.3
Sharpe Army Depot									
Industrial	ac	(i)	--	--	--	--	--	(i)	(i)

Table 2-1
City of Lathrop Development Projections by Development Area

Land Use Designation	Units	Incremental New Development (a)(b)						Total New Development	
		2020	2025	2030	2035	2040	Buildout	2040	Buildout
Existing Development to be Connected to City Sewer System									
Commercial	ac	28.3	--	--	--	--	--	28	28
Industrial	ac	64.8	--	--	--	--	--	65	65

Notes:

(a) Dwelling unit counts and acreages based on information provided by developers and the City in November 2016, December 2016, May 2017, July 2017, and September 2018.
(b) Includes dwelling units and acreages that are assumed to be developed during the preceding five-year period.
(c) Includes low density residential units for the Sylveria Property.
(d) Includes connection of NEXT Generation STEAM Academy (30 acres) to the City's sewer system by 2020.
(e) Area of landscape parcels and parks to be irrigated with potable water, per O'Dell Engineering, 'Phase 1A &1B Irrigation Coverage Exhibit', 30 August 2016, and 'Stage 2A Irrigation Coverage Exhibit', 25 August 2016.
(f) Open space area does not include stormwater retention ponds and right-of-way areas of Phelan Gateway.
(g) Future development located in the Historic Lathrop Development Area that are anticipated to be discharging to the CTF are listed under the Crossroads Development Area for the purposes of this document.

(h) Number of infill residential units from Appendix A, 2016 Housing Element Update (De Novo, 2016) distributed evenly over the planning period, except for parcels 196-050-20, 196-070-04 & -05 identified by the City as where development is highly unlikely.
(i) Both the AAFES facility and the CMD facility at the Sharpe Army Depot will be connected to City's sewer system by 2020. Wastewater flow for the AAFES and CMD facilities are provided by the City in April 2018.

Table 2-2
Historical City of Lathrop Population

Year	City of Lathrop Population (a)	Annual Growth Rate
1990	6,841	
1991	7,018	2.6%
1992	7,063	0.6%
1993	7,434	5.3%
1994	8,410	13.1%
1995	8,713	3.6%
1996	9,031	3.6%
1997	9,172	1.6%
1998	9,508	3.7%
1999	9,786	2.9%
2000	10,445	6.7%
2001	10,802	3.4%
2002	11,616	7.5%
2003	12,089	4.1%
2004	12,482	3.3%
2005	12,768	2.3%
2006	14,489	13.5%
2007	16,271	12.3%
2008	17,282	6.2%
2009	17,589	1.8%
2010	18,023	2.5%
2011	18,688	3.7%
2012	19,090	2.2%
2013	19,642	2.9%
2014	20,158	2.6%
2015	20,796	3.2%
2016	22,174	6.6%

Notes:

(a) Historical and current population is based on population estimates by the California DOF for the City of Lathrop included in DOF, 2007; DOF, 2012; and DOF, 2016.

Table 2-3
Current and Projected City of Lathrop Population

Current and Projected City of Lathrop Population (a)(b)							
Year	2016	2020	2025	2030	2035	2040	Buildout
Population Served	22,174	32,395	46,434	58,653	67,844	74,581	93,485

Notes:
(a) Current population is based on population estimates by the California DOF for the City of Lathrop included in DOF, 2016.
(b) Projected populations for 2020 through 2040 and buildout are based on residential unit counts from Table 2-1, multiplied by the City's person per dwelling units figure reported by DOF in 2010 based on census data (3.77 persons per dwelling unit).

Figure 2-2
Historical and Projected City of Lathrop Population

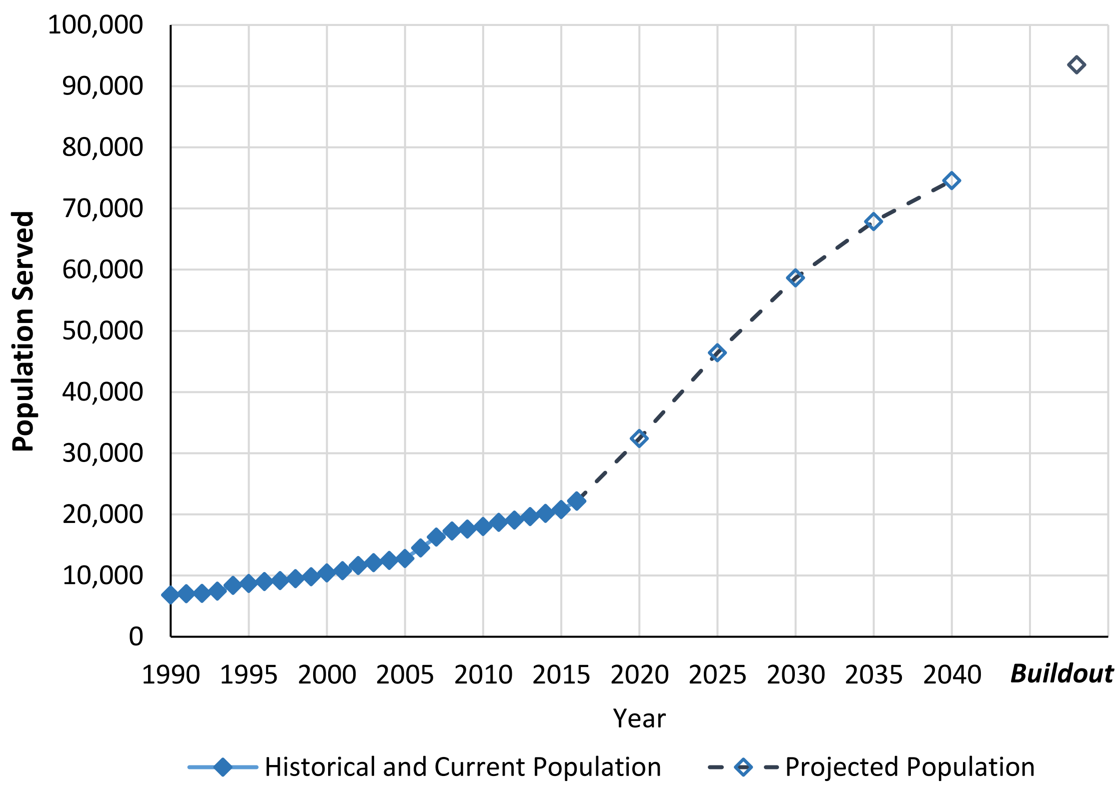


Table 2-4
Residential Buildout by Development Area

Development Area	Dwelling Units (a)	Estimated Population (b)
Historic Lathrop - Existing	3,293	12,415
Historic Lathrop - Underutilized	240	905
Mossdale Landing	1,697	6,398
Mossdale Landing East	691	2,605
Mossdale Landing South	428	1,614
Mossdale Landing - Other	658	2,481
Central Lathrop	6,790	25,598
River Island	11,000	41,470
Total	**24,797**	**93,485**

Notes:
(a) Dwelling Unit Counts at buildout provided by City Staff.
(b) Population estimates are based on the 2010 census figure for persons per household (3.77)

3. CITY'S EXISTING WASTEWATER INFRASTRUCTURE

Wastewater from the City is treated at two facilities: the regional Manteca Wastewater Quality Control Facility (MWQCF) and the City-owned Lathrop Consolidated Treatment Facility (Lathrop CTF). The City's wastewater collection system, including the City's lift station and pump station drainage areas[1], is shown on Figure 3-1. The City's wastewater utilities are discussed in more detail in the sections below.

3.1 Wastewater Collection

The City's wastewater collection system consists of approximately 72 miles of gravity mains, 21 miles of force mains, as well as 12 lift and pump stations. The City has a supervisory control and data acquisition (SCADA) system for control and monitoring of facilities.

As shown on Figure 2-2, most of the City's wastewater generated in the areas east of I-5 is conveyed to the MWQCF; wastewater generated in the Crossroads industrial area and the areas west of I-5, including the Mossdale, River Island, and Central Lathrop areas, is conveyed to the Lathrop CTF.

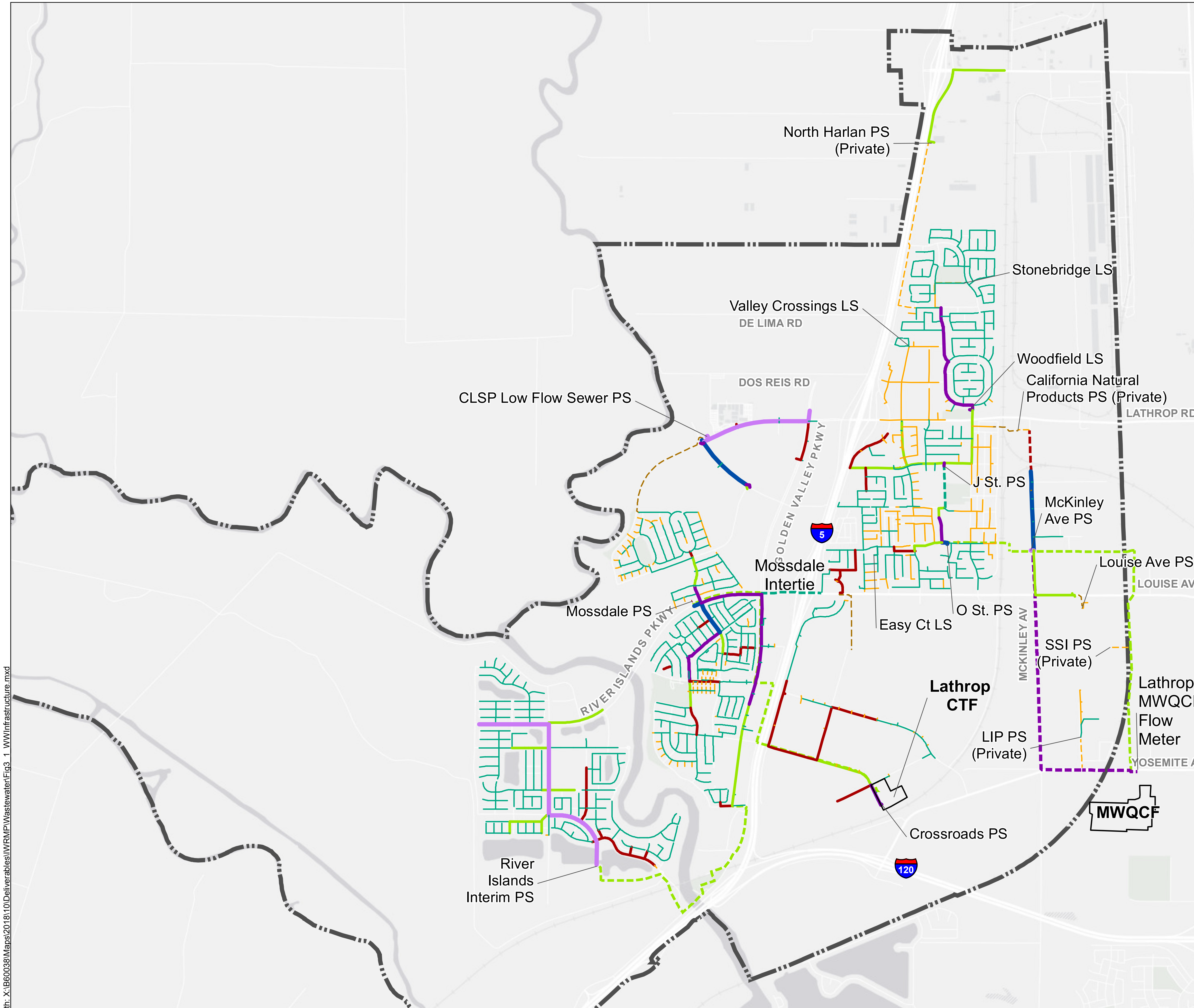
Several large industrial facilities (e.g., Simplot, a future Kraft-Heinz facility, Sharpe Army Depot, and former Carpenter Company facility) as well as the Next Generation STEAM Academy in River Islands manage their wastewater onsite. California Natural Products manages the majority of their wastewater and sends the remaining flows to either the J Street Lift Station (LS) or the McKinley Avenue Pump Station (PS).

3.1.1 *Gravity System*

Table 3-1 summarizes the City's gravity main inventory by diameter. Gravity main sizes are also shown on Figure 3-1.

Approximately 63% of gravity mains are polyvinyl chloride (PVC) pipes, and the remaining 37% are vitrified clay (VC) pipes. All the VC pipes are located in the older Historic Lathrop and Crossroads areas. Newer areas of the City west of I-5 are exclusively served by PVC pipe, which is the City's current standard pipe material.

[1] Generally, lift stations add hydraulic head to the wastewater flow within the gravity collection system; pump stations pressurize wastewater flow for conveyance via force mains.



Legend

Sphere of Influence

Approximate Area of WWTF

Pump Station or Lift Station

Gravity Main Diameter

3" - 4"
6
8
10
12
14" - 16"
18" - 20"
24" - 36"

Force Main Diameter

3" - 4"
6
8
10
12
14" - 16"
18" - 20"
24" - 36"

Abbreviations

CLSP = Central Lathrop Specific Plan
CTF = Consolidated Treatment Facility
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility

Notes

1. All locations are approximate.
2. Gravity mains north of North Hanlan PS and gravity mains built as part of the LogiCenter project south of McKinley Ave PS were constructed post 2016 and are not evaluated in the hydraulic model.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

N

0 2,500 5,000
(Scale in Feet)

Existing Wastewater Infrastructure

DRAFT

eki environment & water

Wastewater System Master Plan
City of Lathrop
Lathrop, CA
December 2018
B60038.00

Figure 3-1

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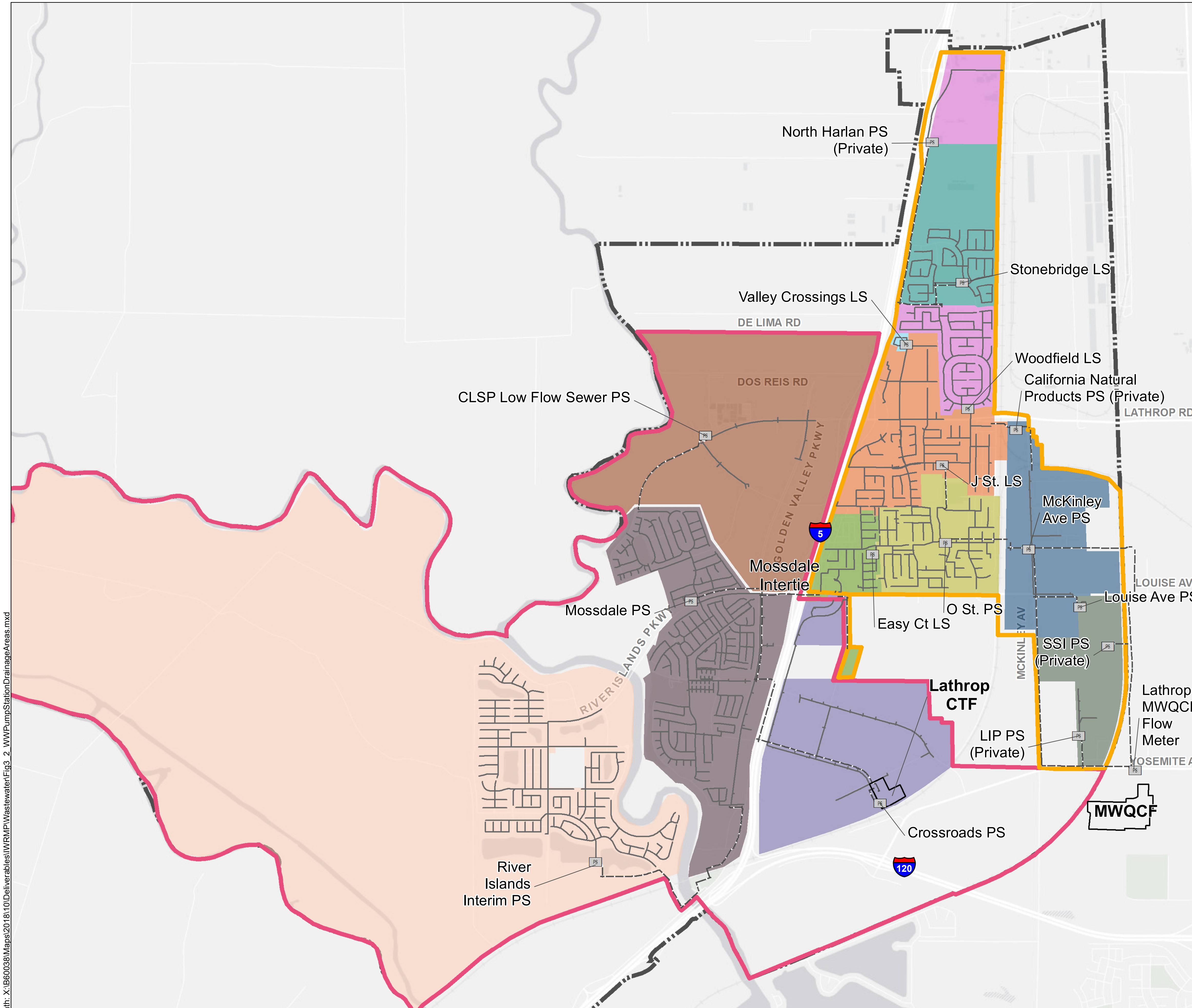


Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Gravity Main
- Force Main

Pump Station Drainage Area

- CLSP
- Crossroads
- Easy Ct
- J St
- Manteca
- McKinley
- Mossdale
- O St
- River Islands
- Stonebridge
- Valley Crossing
- Woodfield

WWTF Drainage Area Boundaries

- MWQCF Collection System
- Lathrop CTF Collection System

Abbreviations

CLSP = Central Lathrop Specific Plan
CTF = Consolidated Treatment Facility
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility

Notes

1. All locations are approximate.
2. Gravity mains north of North Hanlan PS and gravity mains built as part of the LogiCenter project south of McKinley Ave PS were constructed post 2016 and are not evaluated in the hydraulic model.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

N

0 2,500 5,000
(Scale in Feet)

Wastewater Pump Station Drainage Areas

Wastewater System Master Plan
City of Lathrop
Lathrop, CA
December 2018
B60038.00

DRAFT

eki environment & water

Figure 3-2

Path: X:\B60038\Maps\2018\10\Deliverables\WRMP\Wastewater\Fig3_2_WWPumpStationDrainageAreas.mxd

Table 3-1
Collection System Inventory (a)

Pipe Diameter (inches)	Total Pipe Length (miles)	Percent of System
Gravity Mains		
6	10.2	14%
8	46.0	64%
10	4.5	6.3%
12	4.3	6.0%
14	0.4	0.6%
15	2.4	3.3%
16	0.1	0.1%
18	1.1	1.5%
20	0.4	0.6%
21	0.02	0.03%
24	0.9	1.3%
30	1.0	1.4%
36	0.5	0.7%
Total	**71.8**	**100%**
Force Mains		
4	1.0	5%
6	1.9	10%
8	2.5	13%
10	0.7	4%
12	6.3	32%
14	2.2	11%
16	1.8	9%
18	3.6	18%
Total	**20**	**100%**

Notes:
(a) Does not include laterals.

3.1.2 *Pump Stations and Force Mains*

Table 3-2 summarizes the characteristics of each of the City's lift and pump stations and their associated force mains. The direct tributary areas of each lift station or pump station, or "drainage areas", are shown on Figure 3-2. A schematic of the City's lift stations and pump stations that shows how wastewater flows through the collection system is illustrated on Figure 3-3. An inventory of the City's force main sizes is summarized in Table 3-1.

The City's wastewater generated east of I-5 and north of Louise Avenue in the Historic Lathrop area is conveyed via gravity sewers and lift stations to a regional pump station, the O Street PS. Wastewater generated in industrial parcels located near McKinley Ave is conveyed to the McKinley Avenue PS. Wastewater from the McKinley Avenue PS and O Street PS converge at the McKinley intertie, which is capable of sending converged flow via a 12-inch and/or a 16-inch diameter force main to the MWQCF. These force mains also convey wastewater from the Louise Avenue and other private pump stations that serve the industrial areas east of I-5 to the MWQCF.

Currently, wastewater from the CLSP and River Islands development areas is conveyed to the collection system in Mossdale via the CLSP Low Flow Storm and Sewer PS and the River Islands Interim PS, respectively. The City plans to expand the CLSP PS and construct a new permanent River Islands Sewer PS to convey wastewater from these development areas directly to the Lathrop CTF as development proceeds. As of 2017, the future CLSP force mains are built to Brookhurst Boulevard, while one of the two force mains ties into the 12-inch Mossdale force main near River Islands Parkway.

3.1.3 *Collection System Intertie*

The City's two collection systems are connected by the 8-inch Mossdale Intertie, which crosses beneath I-5 on River Islands Parkway and Louise Avenue. The intertie is not routinely operated but could potentially be utilized in the future to reroute a portion of flows from the Mossdale PS to the MWQCF tributary area.

3.1.4 *Major Collection System Improvements Completed Since 2006*

The following sewer system improvements were completed since the prior master plan updates:

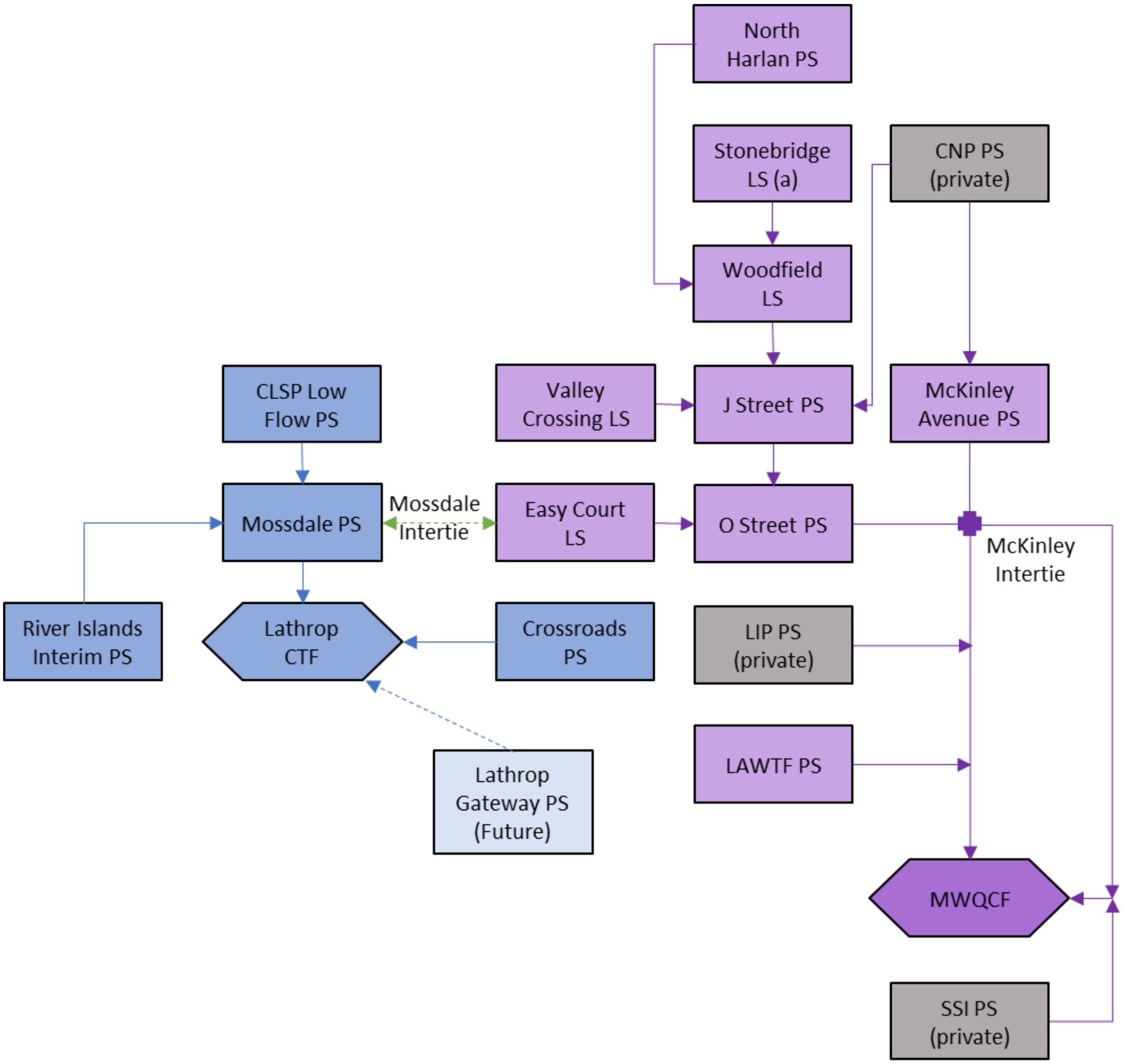
- <u>O Street PS upgrade</u>: two new 70-Horse Power (HP) pumps and one 5-HP pump were installed at the O Street PS.
- <u>McKinley Avenue PS and 16-inch force main:</u> a new pump station on McKinley Avenue was constructed in 2014 to collect wastewater from industrial facilities in its vicinity. The pump station conveys flows to the MWQCF via a 16-inch force main on McKinley Avenue and Yosemite Avenue. The 16-inch force main is tied to the existing 12-inch force main to MWQCF at the pump station.
- <u>North Harlan private gravity sewers:</u> industrial facilities north of Brookfield Street in the Stonebridge PS drainage area installed private sewers and pump stations to connect to the Stonebridge gravity mains on Brookfield Street.

Table 3-2
Summary of Wastewater Pump Station Characteristics

Pump Station	Number of Pumps	Rated Power	Force Main Diameter (in)	Firm Capacity (gpm)
MWQCF Collection System				
North Harlan PS	2	10 HP	6"	245
Stonebridge LS	2	10 HP	6"	380
Woodfield LS	2	5 HP	8" (a)	750
Valley Crossing LS	2	3 HP	4"	83 (b)
J Street LS	2	10 HP	8"	625
Easy Court LS	2	3 HP	-	500
O Street PS	3	Two at 70 HP; one at 5 HP	12"	1,575
McKinley Avenue PS	3	Two at 25 HP; one at 5 HP	16"	1,670
Louise Avenue PS	2	5 HP	4"	(c)
Lathrop CTF Collection System				
Central Lathrop Low Flow PS	1	4 HP	4"	87 (e)
Mossdale PS	4	30 HP	8" & 12"	1,800
River Islands Interim PS	1	20 HP	12"	1150 (e)
River Islands Sewer PS (Future)	6 (d)	--	12" & 18"	4,250
Crossroads PS	2	10 HP	8"	570

Notes:
(a) This table shows Woodfield LS's capacity for its current connection to a 8" force main to the J Street LS area. The City has plans to reconnect it to a 10-inch diameter force main to McKinley Ave PS drainage area.
(b) Capacity of the 8"outlet is listed as the lift station capacity, as it is the capacity limiting component of this pump station.
(c) Pump station capacity depends on flows through the 16-inch force main to MWQCF and is not analyzed.
(d) River Islands Sewer PS will be constructed in phases with addition of two pumps during each phase. This analysis assumes two pumps are installed at the pump station.
(e) Interim pump station with only one pump.

Figure 3-3
City's Existing Wastewater Collection System Schematic



Notes:

(a) The Stonebridge PS receives wastewater from four private pump stations: Panattoni, Gordon Trucking, Boise Cascade, and Utility Trailer. These pump stations convey wastewater collected by the private North Harlan Gravity System, which serves industrial parcels north of Brookfield Street.

- Valley Crossing sewer infrastructure: infrastructure improvements were constructed for the Valley Crossing neighborhood near Warren Avenue, including gravity mains and the Valley Crossing LS.
- Lathrop Road/UPRR Overhead: In 2016, A new 10-inch force main was constructed from the Woodfield LS to connect with the 10-inch force main upstream of the McKinley Avenue PS. The force main will be able to convey wastewater flows from Woodfield LS to the McKinley Avenue PS.
- Private Sewer by North Harlan to Brookfield: A 8-inch private sewer conveys wastewater from industrial parcels north of Brookfield Street to the City's gravity main on Brookfield Street. Specifically, the private sewer collects wastewater from four private pump stations: Panattoni, Gordon Trucking, Boise Cascade, and Utility Trailer.
- North Harlan PS: A private pump station was constructed at 11800 Harlan Road in 2016 to convey wastewater flow from the facility at this address to a manhole on Stonebridge Lane via a 6-inch force main. The private pump station will later be upgraded to a public pump station to collect wastewater from the Roth Road areas.
- CLSP sewer infrastructure and offsite improvements: infrastructure improvements in the Central Lathrop area were constructed including gravity mains, a low flow pump station, and an interim 4-inch diameter force main conveying flows to Mossdale PS drainage area on Dry Creek Place. In addition, a 14-inch force main and an 18-inch force main were constructed from the vicinity of the CLSP PS to Brookhurst Boulevard via Golden Valley Parkway. These force mains will be extended to CTF and convey wastewater flow from buildout of CLSP.
- River Islands sewer infrastructure and offsite improvements: sewer infrastructure was constructed for Phase 1 of the River Islands development, including a gravity collection system, an interim pump station, and a 12-inch diameter force main conveying flows to the Mossdale PS via gravity mains on Golden Valley Parkway. The 12-inch diameter force main along with an 18-inch diameter force main will connect to the future River Islands Sewer PS and will be extended to the Lathrop CTF.

These completed projects are incorporated in the WWSMP evaluation of the existing wastewater collection system.

3.2 Wastewater Treatment

Wastewater treatment at the MWQCF and the Lathrop CTF are discussed in the following sections.

3.2.1 *Manteca Water Quality Control Facility*

The City owns 14.7% of the existing MWQCF capacity by contract with the City of Manteca. However, the City does not participate in the operation of the plant, nor does it receive recycled water from the MWQCF. As listed in Table 3-3, the total current MWQCF design capacity is 9.87 million gallons per day (MGD) and the City's allocated capacity is approximately 1.45 MGD (Lathrop, 2016). The MWQCF is permitted for future expansions of up to 26.97 MGD, of which the City would be allocated up to 3.97 MGD, should the City elect to fund its share of the expansions to maintain its proportional allotment.

Treatment at the MWQCF consists of primary sedimentation followed by roughing biotowers, conventional activated sludge, secondary clarification, tertiary filtration, and ultraviolet disinfection. Disinfected tertiary effluent is discharged to the San Joaquin River. A portion of the secondary effluent is not disinfected and is used to irrigate crops on 190 acres of land owned by the City of Manteca (WDR Order No. R5-2015-0026).

Table 3-3.
Wastewater Capacity Allocation at MWQCF

Phase	Allocated Capacity at MWQCF (MGD)		
	City of Manteca	City of Lathrop	Total
Existing	8.42	1.45	**9.87**
Build-Out (2050)	23.00	3.97	**26.97**

3.2.2 *Lathrop Consolidated Treatment Facility*

Daily operations of the Lathrop CTF are contracted to a private contractor, Veolia Water NA. In August 2015, the City began diverting wastewater from the Crossroads area to the Lathrop CTF and decommissioned the adjacent Crossroads wastewater treatment facility (WWTF). The Lathrop CTF was previously known as Water Recycling Plant No. 1 (WRP-1) and was expanded from a total capacity of 0.75 MGD to 1.0 MGD average dry weather flow (ADWF) in 2015. In summer 2018, the City completed a Phase 2 Expansion of the facility to a total capacity of 2.5 MGD ADWF to accommodate future growth in the Mossdale, Central Lathrop, and River Islands development areas.[2] The Lathrop CTF is permitted for a maximum capacity of up to 6.0 MGD with additional expansions.

Wastewater treatment and disposal at the City's Lathrop CTF is regulated under Waste Discharge Requirements (WDR) Order No. R5-2016-0028. Because the Lathrop CTF discharges to land, it is not subject to the National Pollution Discharge Elimination System (NPDES) requirements for discharges to surface water

Wastewater treatment processes at the Lathrop CTF include secondary treatment, tertiary membrane filtration, and disinfection prior to storage and disposal. The upgraded Lathrop CTF is capable of treating Peak Day Flows of 4.0 MGD at a loading of 14,000 pounds of biochemical oxygen demand (BOD) per day and will have capacity for Peak Hour Flows of 7.5 MGD. All wastewater flows to CTF are treated by new and existing headworks, new dual-train bio-reaction tanks, and new membrane filtration system (PACE, 2016). The Lathrop CTF produces disinfected tertiary recycled water suitable for irrigation at parks, landscape strips, median islands, pond berms, and agricultural fields. Currently, the treated effluent is used for agricultural irrigation.

[2] While the CTF currently has a treatment capacity of 2.5 MGD, it is still only permitted for 1.6 MGD because the recycled water disposal facilities required to support the full expansion have not been completed.

4. EXISTING AND FUTURE WASTEWATER GENERATION

As part of the IWRMP, the City evaluated its existing wastewater flows and updated its flow projections. The following sections summarize the City's historical and current wastewater generation, wastewater flow projections, and wastewater peaking factors.

Wastewater flows in a sanitary sewer system typically consist of the following components:

- **Base sanitary flow (BSF)**: BSF is the sanitary wastewater flow from domestic, commercial, industrial, and institutional uses.
- **Infiltration:** Infiltration refers to groundwater that enters a sewer system through defective pipes, pipe joints, connections, or manholes.
- **Inflow:** Inflow refers to stormwater that enters a sewer system through direct connections, such as manhole covers and defective sewer service cleanouts or (illegal) roof drains, foundation drains, catch basins, or area drain connections.

Infiltration and Inflow are collectively referred to as "I&I". The amount of I&I tends to be smaller in new collection systems, but is generally observed to increase over time due to wear and tear on the collection system.

The following terminology is used throughout this document to describe variations in wastewater flow:

- **Average annual flow (AAF):** AAF refers to the average daily flow over the entire year and is inclusive of BSF and I&I.
- **Average dry-weather flow (ADWF):** ADWF refers to the average daily flow for the months of June, July, and August (i.e., during the dry season). ADWF includes BSF and infiltration, but not inflow.
- **Peak wet weather flow (PWWF):** PWWF refers to the peak hourly flow, which includes peak diurnal BSF, infiltration, and inflow from storm events.

EKI reviewed the following available information for evaluation of wastewater flows:

- Daily flow data collected between 2009 and December 2016 from the headworks of the Lathrop CTF (and at the Mossdale Pump Station and Crossroad Influent Pump Station, which together convey flow to the Lathrop CTF);
- Daily flow data collected between 2009 and December 2016 from the flow meter on Yosemite Avenue that measures the City's flow to the MWQCF;
- Available discharge flow and level data recorded in 30-minute intervals from the City's lift stations and pump station by a SCADA system between June 2013 and August 2016, as well as between January and June 2018; and
- Flow monitoring data recorded in 5-minute intervals from six locations in Historic Lathrop during January through March 2018 and from three locations in West Lathrop during June 2018.

4.1 Current and Historical Wastewater Flow

Table 4-1 and Table 4-2 provide historical context by summarizing the City's wastewater generation, service area population, and per-capita wastewater generation for the years 2009 through 2016. Table 4-1 lists the total AAF, citywide and by treatment facility, and per-capita AAF. Table 4-2 lists the same information on an ADWF-basis, and compares AAF to ADWF along with Figure 4-1 and Figure 4-2.

This AAF and ADWF comparison is an indication of the amount of rainfall-induced I&I collected during a given year (typically between 1% to 4% of ADWF).

The City's total AAF and ADWF generally remained steady between 2009 and 2012 and between 2013 and 2016, with increases between 2012 and 2013 as well as between 2015 and 2016. In 2016, the City generated a total AAF of 1.46 MGD, including 0.92 MGD treated at the MWQCF (63%) and 0.54 MGD treated at the CTF (37%). Of the wastewater that was treated at the Lathrop CTF, 0.14 MGD (i.e. 9.6% of the total City flow) was collected from the Crossroads industrial area and 0.41 MGD (i.e. 28% of the total City flow) was collected at the Mossdale PS from the Mossdale, Central Lathrop, and River Islands development areas (see Figure 4-1).

The total per capita ADWF varied between 60 and 69 gallons of wastewater per day per capita between 2009 and 2016. The City's service population has increased steadily over these seven years, resulting in per-capita ADWFs that generally declined between 2009 and 2012, peaked in 2013, and declined again between 2013 and 2015. These per-capita wastewater flow patterns are similar to that of per-capita water use, as presented in the IWRMP Water System Master Plan.

4.2 Wastewater Generation Projections

This section summarizes the methodology utilized to develop wastewater generation projections for the City.

Wastewater ADWF projections were calculated as the sum of the two major components of future wastewater flow: (1) the volume of wastewater that best represents existing wastewater generation within the City, and (2) the anticipated wastewater generation associated with the future development projects and planning areas.

In order to estimate both components, EKI (1) selected a "representative year" to serve as the basis for existing and projected wastewater flow, (2) developed land-use specific wastewater flow factors, and (3) applied these factors to the City's anticipated future development. This methodology is described further below.

Table 4-1
Current and Historical Wastewater AAF and Per Capita AAF

Year	Average Annual Flow (AAF) (a)				City Population (d)	Per Capita Wastewater Flow (e) (gallons per capita per day)
	MWQCF (MGD)	CTF (b)		Total (MGD)		
		Mossdale (MGD) (c)	Crossroads (MGD)			
2009	0.706	0.287	0.161	1.154	17,589	66
2010	0.705	0.286	0.154	1.145	18,023	64
2011	0.724	0.294	0.139	1.157	18,688	62
2012	0.781	0.280	0.110	1.171	19,090	61
2013	0.919	0.301	0.114	1.333	19,642	68
2014	0.897	0.315	0.148	1.359	20,158	67
2015	0.873	0.348	0.139	1.360	20,796	65
2016	0.918	0.405	0.139	1.463	22,112	66

Notes:
(a) Wastewater flow data from 2009 to 2016 are obtained from the treatment plant's semi-annual monitoring reports. Totals may not sum due to rounding.
(b) Since August 2015, the CTF has treated flows from both the Mossdale Pump Station and Crossroads Pump Station. Prior to August 2015, flows to the Crossroads Pump Station were treated separately at the recently decommissioned Crossroads WWTF, and the CTF only treated flows from the Mossdale Pump Station.
(c) Wastewater flow data for the Mossdale Pump Station were obtained from the influent meter at CTF prior to January 2016, and from the Mossdale Pump Station SCADA system after January 2016, due to the issues with meter calibration at CTF.
(d) City sewered population is assumed to be approximate to City population, which is based on population estimates by the California DOF for the City of Lathrop included in DOF, 2007; DOF, 2012; and DOF, 2016.
(e) Per capita wastewater flow is calculated by dividing the total annual wastewater flow by City population and the number of days in a year.

Table 4-2
Current and Historical ADWF and Per Capita ADWF

Year	Average Dry Weather Flow (ADWF) (a)				AAF vs. ADWF (d)	Annual Rainfall (e)	Per Capita ADWF (f) (gallon per capita per day)
	MWQCF	CTF (b)		Total			
	(MGD)	Mossdale (MGD) (c)	Crossroads (MGD)	(MGD)		(in)	
2009	0.701	0.257	0.175	1.134	102%	10.48	64
2010	0.697	0.266	0.153	1.116	103%	18.70	62
2011	0.710	0.276	0.133	1.120	103%	10.09	60
2012	0.779	0.274	0.100	1.152	102%	13.54	60
2013	0.950	0.299	0.108	1.358	98%	14.59	69
2014	0.896	0.304	0.142	1.342	101%	14.23	67
2015	0.857	0.335	0.136	1.328	102%	7.43	64
2016	0.874	0.383	0.147	1.405	104%	18.28	64

Notes:

(a) ADWF is calculated as the average daily flow between June and August of the year. Totals may not sum due to rounding.

(b) Since August 2015, the CTF has treated flows from both the Mossdale Pump Station and Crossroads Pump Station. Prior to August 2015, flows to the Crossroads Pump Station were treated separately at the recently decommissioned Crossroads WWTF, and the CTF only treated flows from the Mossdale Pump Station.

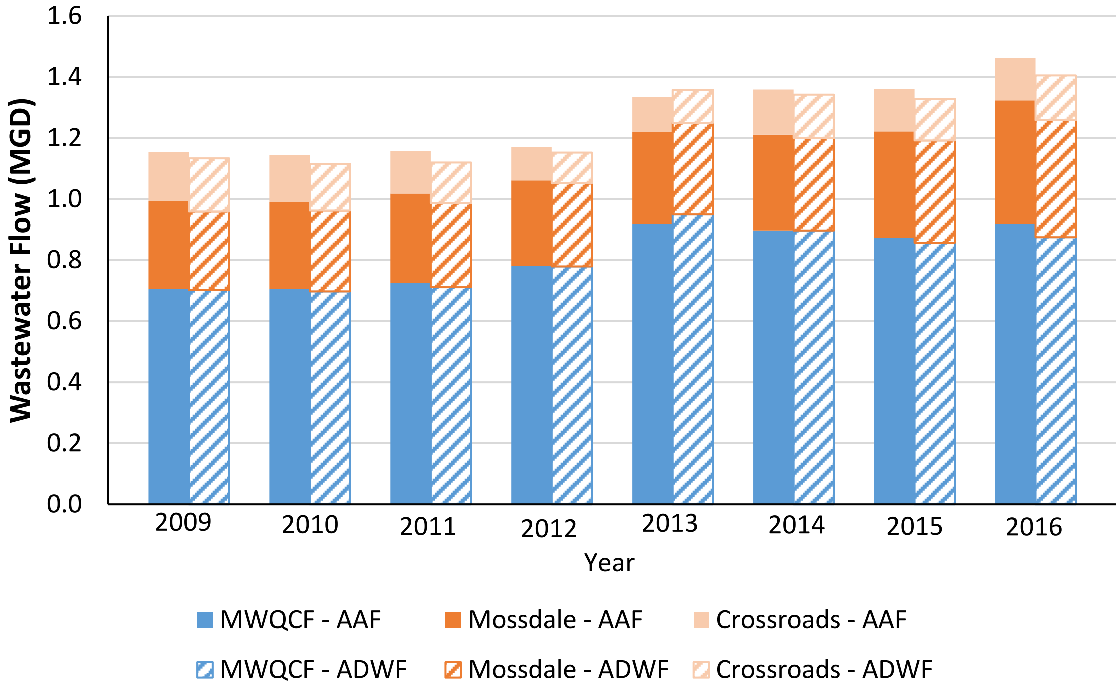
(c) Wastewater flow data for the Mossdale Pump Station were obtained from the influent meter at CTF prior to January 2016, and from the Mossdale Pump Station SCADA system after January 2016, due to the issues with meter calibration at CTF.

(d) The ratio of AAF to ADWF is calculated using AAF values from Table 4-1.

(e) Precipitation data obtained from Western Regional Climate Center Stockton Metro AP Station (048558).

(f) Per capita ADWF is calculated using City population data in Table 4-1.

Figure 4-1
Current and Historical Wastewater Flow by Collection System



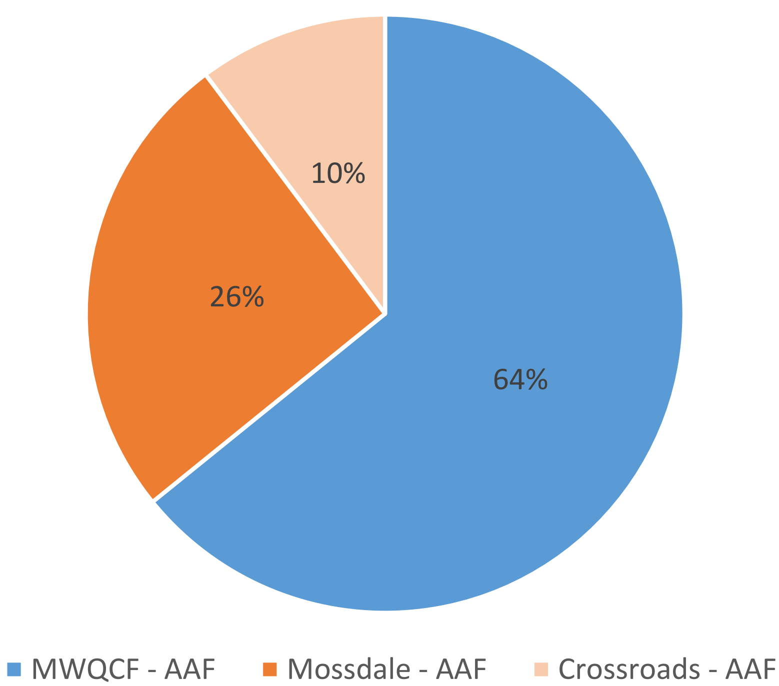
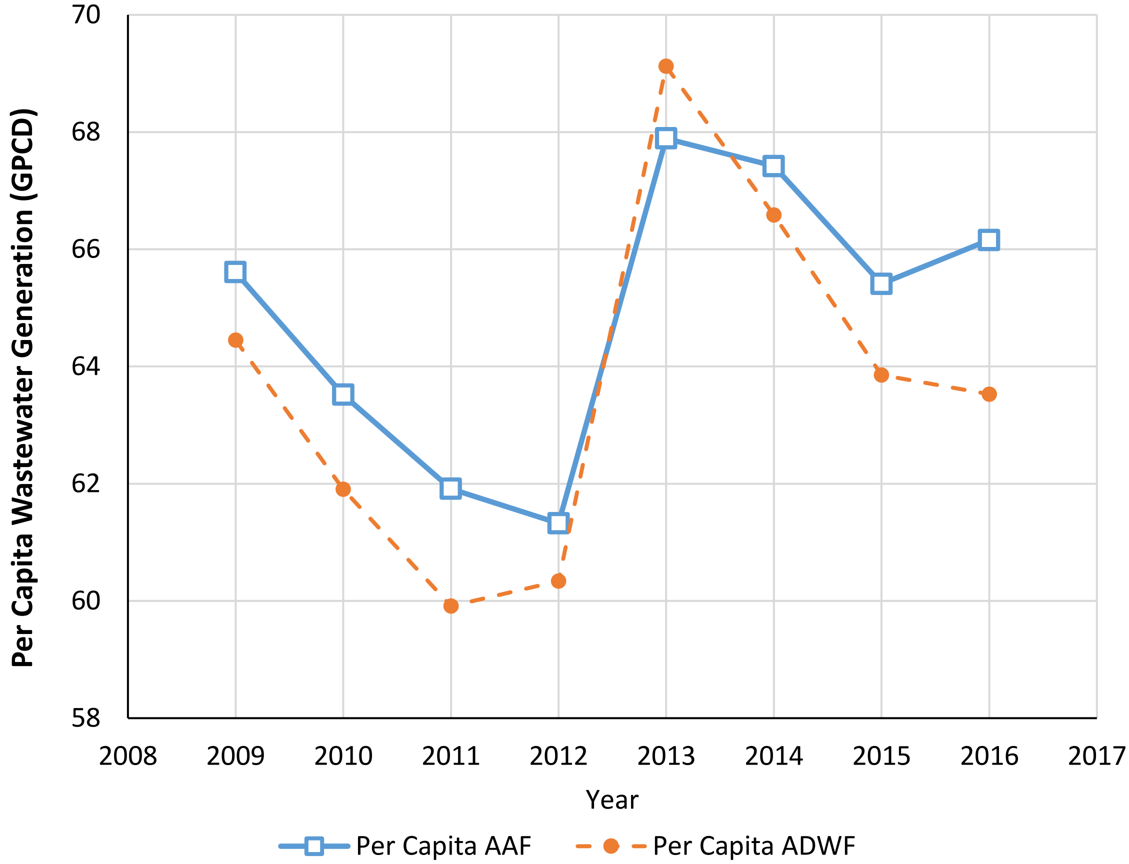


Figure 4-2
Current and Historical Per Capita Wastewater Flow



4.2.3 *Selection of a Representative Year*

The City's historical wastewater flow data were reviewed to evaluate wastewater generation trends (Section 4.1) and determine a "representative year" that will serve as the basis for existing and future projections. Because wastewater flows peaked in 2013 and the trends are generally consistent with those of water use, 2013 was selected as the "representative year" (i.e., the same year used as the basis for development of water demand projections in the Water System Master Plan (EKI, 2017)).

The City decided to apply a 10% to 15% safety factor to the 2013 flows to account for anticipated future increases in I&I, as detailed in Appendix A. Groundwater levels decreased during the recent historic drought, thus likely reducing the amount of groundwater infiltration in recent years. In addition, the newer collection systems in the areas west of I-5 will likely produce more I&I in the future as the infrastructure ages.

4.2.4 *Wastewater Generation Factors*

EKI developed land use-specific wastewater generation factors using historic wastewater flow and parcel-level water use data to serve as the basis to estimate ADWF for future developments. The factors are based on 2013 wastewater flows—the representative year's flows—with a safety factor, as described above. The methodology used to develop the factors is described in detail in Appendix A. The IWRMP updated wastewater generation factors (in units of gallons per day per dwelling unit or gallons per day per acre; gpd/du or gpd/ac) are presented in Table 4-3, below.

Table 4-3.
Wastewater Flow Factors

Land Use	Wastewater Flow Factor	
	Historic Lathrop	West Lathrop
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	180 gpd/du	
High Density Residential	170 gpd/du	
Commercial	590 gpd/ac	
Industrial	355 gpd/ac	
Parks	55 gpd/ac	
Schools / Institutional	245 gpd/ac	

4.2.5 *Existing and Future Dry Weather Flow*

The City's existing wastewater generation is representative of development within the City as of the end of 2016 and was calculated as the sum of (1) the City's 2013 daily wastewater flow, selected as the representative baseline year, with a ten percent safety factor, and (2) estimated wastewater generation for existing development built between 2013 and the end of 2016. As shown on Table 4-4, the total existing ADWF is estimated to be 1.7 MGD.

Table 4-4
Existing Wastewater Flow by Development Area

Land Use Designation	Existing Development Built After 2013	Units	Wastewater Flow Factor	Existing Wastewater Generation (gpd)
Central Lathrop				
			2013 Central Lathrop ADWF (a)	6,197
			10% Safety Factor	620
School/Institutional	*12*	*ac*	*245 gpd/ac*	*2,889*
Total Estimated Wastewater Flow for Existing Development Built After 2013				2,889
			Total Existing Central Lathrop ADWF	**9,705**
Mossdale				
			2013 Mossdale ADWF (b)	293,256
			10% Safety Factor	29,326
Low Density Residential	*136*	*du*	*200 gpd/du*	*27,200*
Medium Density Residential	*21*	*du*	*180 gpd/du*	*3,780*
Parks	*4.8*	*ac*	*55 gpd/ac*	*264*
Total Estimated Wastewater Flow for Existing Development Built After 2013				31,244
			Total Existing Mossdale ADWF	**353,826**
River Islands				
			2013 River Islands ADWF	0
			10% Safety Factor	0
Low Density Residential	*449*	*du*	*200 gpd/du*	*89,800*
Commercial	*4.7*	*ac*	*590 gpd/ac*	*2,773*
Parks and Landscaping Parcels	*12*	*ac*	*55 gpd/ac*	*660*
Total Estimated Wastewater Flow for Existing Development Built After 2013				93,233
			Total Existing River Islands ADWF	**93,233**
South Lathrop				
			2013 South Lathrop ADWF	0
Total Estimated Wastewater Flow for Existing Development Built After 2013				0
			Total Existing South Lathrop ADWF	**0**
Lathrop Gateway				
			2013 Lathrop Gateway ADWF	0
Total Estimated Wastewater Flow for Existing Development Built After 2013				0
			Total Existing Lathrop Gateway ADWF	**0**
Crossroads				
			2013 Crossroads ADWF	108,372
			10% Safety Factor	10,837
Industrial	*11*	*ac*	*355 gpd/ac*	*3,912*
Total Estimated Wastewater Flow for Existing Development Built After 2013				3,912
			Total Existing Crossroads ADWF	**123,121**
Historic Lathrop and Other Development Areas				
			2013 Historic Lathrop ADWF	949,856
			10% Safety Factor	94,986
Low Density Residential	*27*	*du*	*240 gpd/du*	*6,480*
Commercial	*43.8*	*ac*	*590 gpd/ac*	*25,842*
Parks	*4.8*	*ac*	*55 gpd/ac*	*264*
Total Estimated Wastewater Flow for Existing Development Built After 2013				32,586
			Total Existing Historic Lathrop ADWF	**1,077,428**
			TOTAL EXISTING ADWF	**1,657,313**
			EXISTING ADWF AT CTF	***579,885***
			EXISTING ADWF AT MWQCF	***1,077,428***

Notes:
(a) Because historical wastewater flow data from the Central Lathrop area are not available, 2013 Central Lathrop ADWF is estimated using the wastewater flow factor for the Lathrop High School, which was the only facility that was sewered in Central Lathrop during 2013.
(b) The 2013 Mossdale ADWF is historical flow measured at the Mossdale Pump Station subtracted by estimated flow for the Central Lathrop area.

Wastewater generation associated with anticipated future development are estimated using the updated wastewater flow factors and the anticipated acreages and number of dwelling units associated with each proposed development (Table 2-1). Table 4-5 summarizes the City's projected wastewater generation by sector and by development area in five-year increments between 2020 and 2040 and at buildout, based on development projections listed in Table 2-1. Based on these projections, it is anticipated that total ADWF in 2040 will be 5.34 MGD, whereas the ADWF at Buildout is estimated to be 6.48 MGD. Of these totals, ADWFs of 1.40 MGD and 1.47 MGD are anticipated to flow to MWQCF from Historic Lathrop in 2040 and at buildout, respectively. ADWFs of 3.94 MGD in 2040 and 5.01 MGD at buildout are projected to flow to the Lathrop CTF. The majority of the anticipated increase in wastewater generation at the CTF is associated with the River Islands and Central Lathrop development areas.

4.2.6 *Existing Land Uses to be Connected to City's Sewer System*

Future wastewater flow also includes flow from existing land uses that the City anticipates will connect to the City after the end of 2016, including:

- NextGeneration STEAM Academy in River Islands by 2025;
- AAFES and CMD facilities at Sharpe Army Depot by 2020;
- Future Kraft Heinze facility at the former Pilkington site by 2020;Industrial facilities by North Harlan Road were connected late 2017; and
- Industrial facilities by McKinley Avenue were connected late 2017.

4.3 Wastewater Peaking Factors

EKI reviewed the City's historical wastewater flow data to identify the peaking factor curve that best estimates PWWF. PWWF is the highest hourly flow experienced during the year due to rainfall-induced I&I and peak diurnal sanitary flows and is used to evaluate the hydraulic capacity of a wastewater collection system. The PWWF peaking factors are typically higher in smaller drainage areas, in which there is little flow attenuation. Larger drainage areas provide a greater capacity to attenuate flows, as peak flows generated in the upstream reaches of the system take a longer amount of time to travel downstream. EKI developed a new peaking factor curve shown on Figure 4-3. The methodologies used to develop this curve are described in Appendix B.

4.4 Wastewater Treatment Capacity Assessment

This section compares the City's projected wastewater generation through 2040 to its treatment capacity at the two treatment plants. The City's collection system and treatment plant capacity are described in Section 3.2.

Table 4-5
Projected Wastewater Flow by Development Area

Land Use Designation	Wastewater Flow Factor	Projected New Wastewater Flow (gpd) (a)					
		2020	2025	2030	2035	2040	Buildout
Central Lathrop							
Low Density Residential	200 gpd/du	120,000	274,200	399,400	399,400	399,400	1,219,600
Medium Density Residential	180 gpd/du	0	43,020	43,020	43,020	43,020	43,020
High Density Residential	170 gpd/du	0	46,580	46,580	46,580	46,580	77,010
Commercial	590 gpd/ac	11,210	78,883	101,893	101,893	101,893	164,315
Parks	55 gpd/ac	473	3,124	3,674	3,674	3,674	6,325
Schools	245 gpd/ac	0	0	0	0	0	13,377
New Central Lathrop ADWF		131,683	445,807	594,567	594,567	594,567	1,523,647
Existing Central Lathrop ADWF		9,705	9,705	9,705	9,705	9,705	9,705
Projected Central Lathrop ADWF		*141,388*	*455,512*	*604,272*	*604,272*	*604,272*	*1,533,352*
Mossdale - All Developments							
Low Density Residential	200 gpd/du	7,400	7,400	20,600	20,600	20,600	152,200
Medium Density Residential	180 gpd/du	0	11,520	11,520	24,840	24,840	24,840
High Density Residential	170 gpd/du	45,220	45,220	45,220	58,480	71,740	71,740
Commercial	590 gpd/ac	0	8,201	8,201	20,886	28,556	28,556
Parks	55 gpd/ac	0	220	220	220	220	220
Schools	245 gpd/ac	0	3,979	3,979	3,979	3,979	3,979
New Mossdale ADWF		52,620	76,540	89,740	129,005	149,935	281,535
Existing Mossdale ADWF		353,826	353,826	353,826	353,826	353,826	353,826
Projected Mossdale ADWF		*406,446*	*430,366*	*443,566*	*482,831*	*503,761*	*635,361*
River Islands							
Low Density Residential	200 gpd/du	303,400	625,274	907,972	1,281,472	1,559,356	1,559,356
Medium Density Residential	180 gpd/du	45,563	104,897	157,009	225,859	277,083	277,083
High Density Residential	170 gpd/du	0	68,000	205,700	205,700	205,700	205,700
Commercial	590 gpd/ac	5,900	35,400	88,500	147,500	188,800	188,800
Golf Clubhouse	55 gpd/ac	0	0	0	0	0	0
Schools	245 gpd/ac	10,045	15,680	29,645	32,340	35,035	35,035
Animal Campus	245 gpd/ac	0	2,450	2,450	2,450	2,450	2,450
Parks and Landscaping Parcels	55 gpd/ac	1,320	3,355	5,555	7,535	9,020	9,020
New River Islands ADWF		366,228	855,056	1,396,831	1,902,856	2,277,444	2,277,444
Existing River Islands ADWF		93,233	93,233	93,233	93,233	93,233	93,233
Projected River Islands ADWF		*459,461*	*948,289*	*1,490,064*	*1,996,089*	*2,370,677*	*2,370,677*
South Lathrop							
Light Industrial / R&D Flex	355 gpd/ac	58,398	78,526	78,526	78,526	78,526	86,194
Office Commercial	590 gpd/ac	0	5,168	5,168	5,168	5,168	5,168
Open Space	55 gpd/ac	373	373	373	373	373	373
New South Lathrop ADWF		58,770	84,067	84,067	84,067	84,067	91,735
Existing South Lathrop ADWF		0	0	0	0	0	0
Projected South Lathrop ADWF		*58,770*	*84,067*	*84,067*	*84,067*	*84,067*	*91,735*
Lathrop Gateway							
Light Industrial / R&D Flex	355 gpd/ac	0	53,605	53,605	53,605	59,498	59,498
Office Commercial	590 gpd/ac	0	0	0	0	82,423	82,423
Open Space	55 gpd/ac	0	0	0	0	88	88
New Lathrop Gateway ADWF		0	53,605	53,605	53,605	142,009	142,009
Existing Lathrop Gateway ADWF		0	0	0	0	0	0
Projected Lathrop Gateway ADWF		*0*	*53,605*	*53,605*	*53,605*	*142,009*	*142,009*
Crossroads							
Industrial	355 gpd/ac	91,771	92,481	92,481	92,481	100,646	100,646
Commercial	590 gpd/ac	1,298	12,980	12,980	12,980	12,980	12,980
New Crossroads ADWF		93,069	105,461	105,461	105,461	113,626	113,626
Existing Crossroads ADWF		123,121	123,121	123,121	123,121	123,121	123,121
Projected Crossroads ADWF		*216,190*	*228,582*	*228,582*	*228,582*	*236,747*	*236,747*

Table 4-5 (Continued)
Projected Wastewater Flow by Development Area

Land Use Designation	IWRMP Flow Factor	Projected New Wastewater Flow (gpd) (a) 2020	2025	2030	2035	2040	Buildout
Historic Lathrop and Other Development Areas							
Low Density Residential	240 gpd/du	1,440	2,880	4,320	5,760	6,960	8,160
Medium Density Residential	180 gpd/du	4,860	9,720	14,400	19,080	23,760	28,440
High Density Residential	170 gpd/du	850	1,530	2,210	2,890	3,570	4,250
Commercial	590 gpd/ac	8,260	23,942	28,662	33,382	38,102	53,153
Industrial	355 gpd/ac	1,207	15,727	15,727	15,727	15,727	66,492
Parks	55 gpd/ac	0	0	0	0	0	0
Schools	245 gpd/ac	0	0	0	0	0	0
California Natural Products (b)	--	71,689	161,300	161,300	161,300	161,300	161,300
New Historic Lathrop / Other ADWF		88,306	215,099	226,619	238,139	249,419	321,795
Existing Historic Lathrop / Other ADWF		1,077,428	1,077,428	1,077,428	1,077,428	1,077,428	1,077,428
Projected Historic Lathrop / Other ADWF		*1,165,734*	*1,292,527*	*1,304,047*	*1,315,567*	*1,326,847*	*1,399,222*
Sharpe Army Depot							
Industrial	--	32,000	32,000	32,000	32,000	32,000	32,000
New Sharpe Army Depot ADWF		32,000	32,000	32,000	32,000	32,000	32,000
Existing Sharpe Army Depot ADWF		0	0	0	0	0	0
Projected Sharpe Army Depot ADWF		*32,000*	*32,000*	*32,000*	*32,000*	*32,000*	*32,000*
Existing Development to be Connected to City Sewer System							
Commercial	590 gpd/ac	16,673	16,673	16,673	16,673	16,673	16,673
Industrial	355 gpd/ac	23,008	23,008	23,008	23,008	23,008	23,008
New ADWF		39,681	39,681	39,681	39,681	39,681	39,681
Total Projected New ADWF		**862,358**	**1,907,316**	**2,622,570**	**3,179,380**	**3,682,748**	**4,823,472**
Existing ADWF		**1,657,313**	**1,657,313**	**1,657,313**	**1,657,313**	**1,657,313**	**1,657,313**
TOTAL PROJECTED ADWF		**2,519,671**	**3,564,628**	**4,279,883**	**4,836,693**	**5,340,061**	**6,480,785**
PROJECTED ADWF AT CTF		***1,282,256***	***2,200,421***	***2,904,156***	***3,449,446***	***3,941,533***	***5,009,881***
PROJECTED ADWF AT MWQCF		***1,237,415***	***1,364,208***	***1,375,728***	***1,387,248***	***1,398,528***	***1,470,903***

Notes:
(a) Projected residential wastewater generation calculated as the total number of projected residential dwelling units multiplied by the applicable wastewater flow factor (Table 4-3). Projected non-residential wastewater flow are calculated as the total projected acreage multiplied by the applicable wastewater flow factor (Table 4-3). Projected residential dwelling units and non-residential acreage are listed in Table 2-1.
(b) Existing ADWF from California Natural Products (CNP) in the Historic Lathrop area is estimated to be 38,700 gpd, based on the difference between 2013 ADWF at the McKinley PS and calculated ADWF for remaining parcels in the McKinley PS drainage area excluding CNP. Flows from CNP are projected to reach their allocated 200,000 gpd by 2025.

As shown in Table 4-6 and on Figure 4-4, the Lathrop CTF Phase 2 Expansion, completed in Summer 2018, is projected to have sufficient treatment capacity to meet projected flows from new development areas and Crossroads through 2027. The City's current capacity allocation at MWQCF (Table 4-7 and Figure 4-5) is projected to be sufficient to meet projected flows from Historic Lathrop infill beyond 2040, although additional capacity is needed by buildout. The City is evaluating alternatives that would reroute portions of the areas currently tributary to MWQCF to the Lathrop CTF (see Section 7.5), which would change each treatment facility's projected flows.

The City's existing Mossdale Intertie can reroute approximately 100,000 gallons per day wastewater flow from the Lathrop CTF collection system to MWQCF to provide operational flexibility and utilize excess capacity at the MWQCF[3]. Additionally, the City has contemplated constructing a new intertie between the CTF and the MWQCF force mains, allowing the City to send flow as needed to either facility as needed. Wastewater treatment capacity at the CTF (including the Phase 2 Expansion) and MWQCF combined is projected to be sufficient to meet Citywide projected wastewater flows through 2028 (Table 4-8 and Figure 4-6).

As discussed further in Section 7.2, EKI recommends that the City initiate expansion of the Lathrop CTF beyond 2.5 MGD ADWF in the near-future, considering that an expansion will likely require significant lead time for financing, planning, design, construction, and permitting.

[3] Utilization of the intertie is currently limited by surcharges in gravity mains along O Street due to a deficiency at the O Street PS as discussed in Section 7.3.6.

Figure 4-3
Average Dry Weather Flow and Peaking Factors

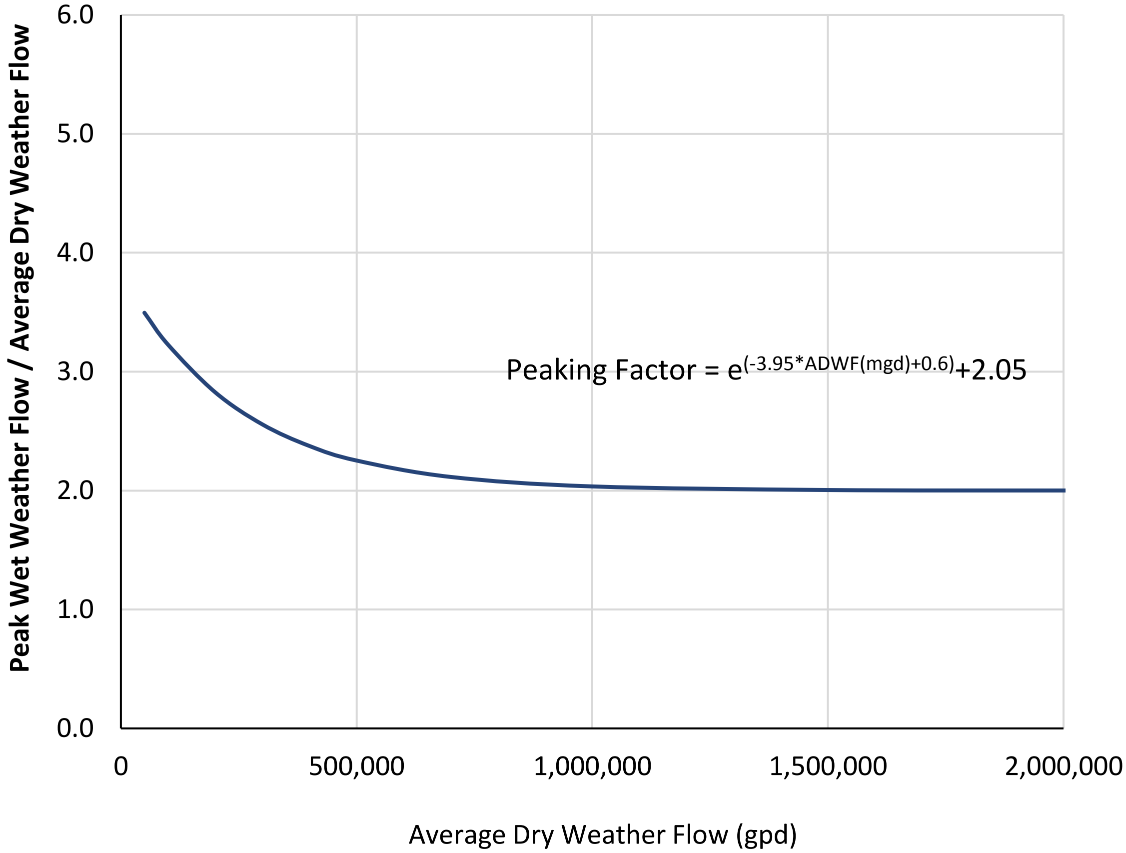


Table 4-6
Projected Wastewater Flow and Treatment Capacity at Lathrop CTF

	Estimated ADWF Influent and Treatment Capacity (MGD)						
	Existing (2016)	2020	2025	2030	2035	2040	Buildout
Projected Influent ADWF (a)							
ADWF Projection	0.58	1.28	2.20	2.90	3.45	3.94	5.01
Existing Capacity and Future Expansions							
Lathrop CTF Phase 0	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Lathrop CTF Phase 1	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lathrop CTF Phase 2	-	1.50	1.50	1.50	1.50	1.50	1.50
Total Capacity	*1.00*	*2.50*	*2.50*	*2.50*	*2.50*	*2.50*	*2.50*

Notes:
(a) Wastewater influent to Lathrop CTF is the combination of wastewater flow from all city areas except for the Historic Lathrop area and Sharpe Army Depot.

Figure 4-4
Projected Wastewater Flow and Treatment Capacity at Lathrop CTF

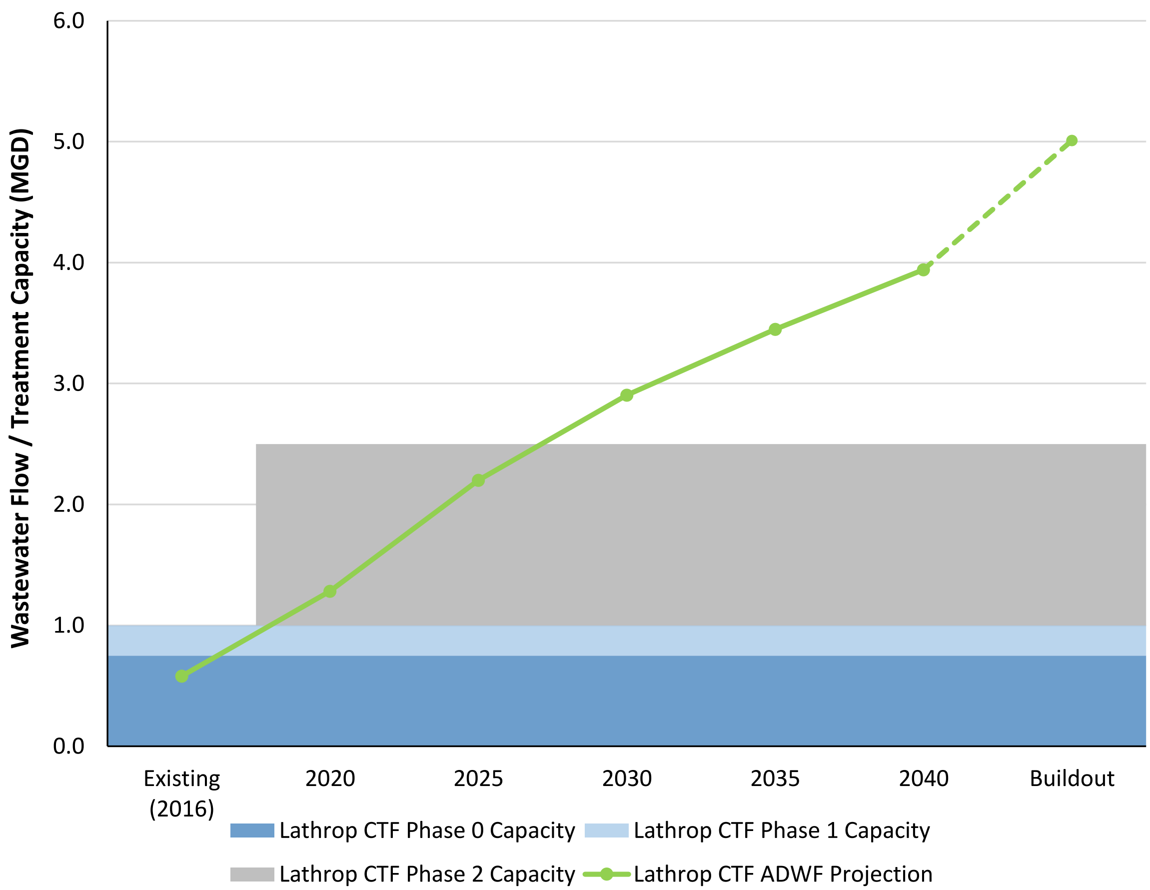


Table 4-7
Projected Wastewater Flow and Treatment Capacity at MWQCF

	Estimated ADWF Influent and Treatment Capacity (MGD)						
	Existing (2016)	2020	2025	2030	2035	2040	Buildout
Projected Influent ADWF (a)							
ADWF Projection	1.08	1.24	1.36	1.38	1.39	1.40	1.47
Existing Capacity							
MWQCF	1.45	1.45	1.45	1.45	1.45	1.45	1.45

Notes:
(a) Wastewater influent to MWQCF is the wastewater flow from the Historic Lathrop area and Sharpe Army Depot.

Figure 4-5
Projected Wastewater Flow and Treatment Capacity at MWQCF

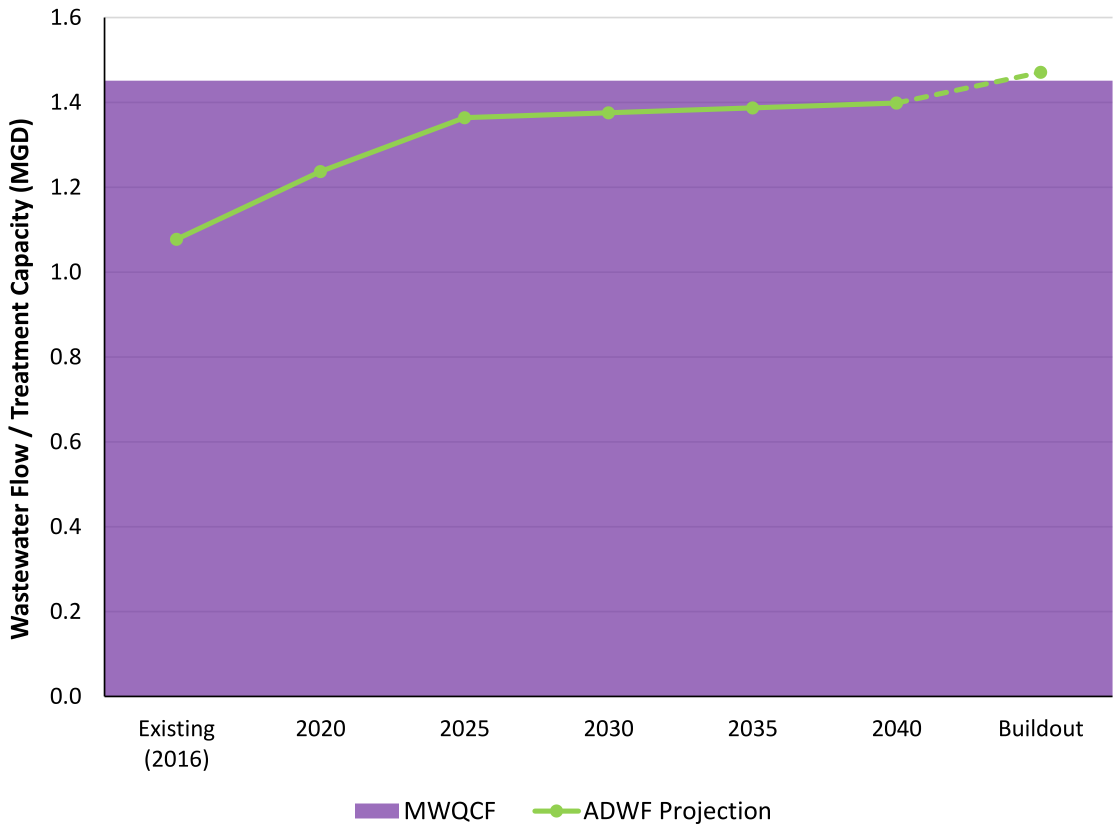
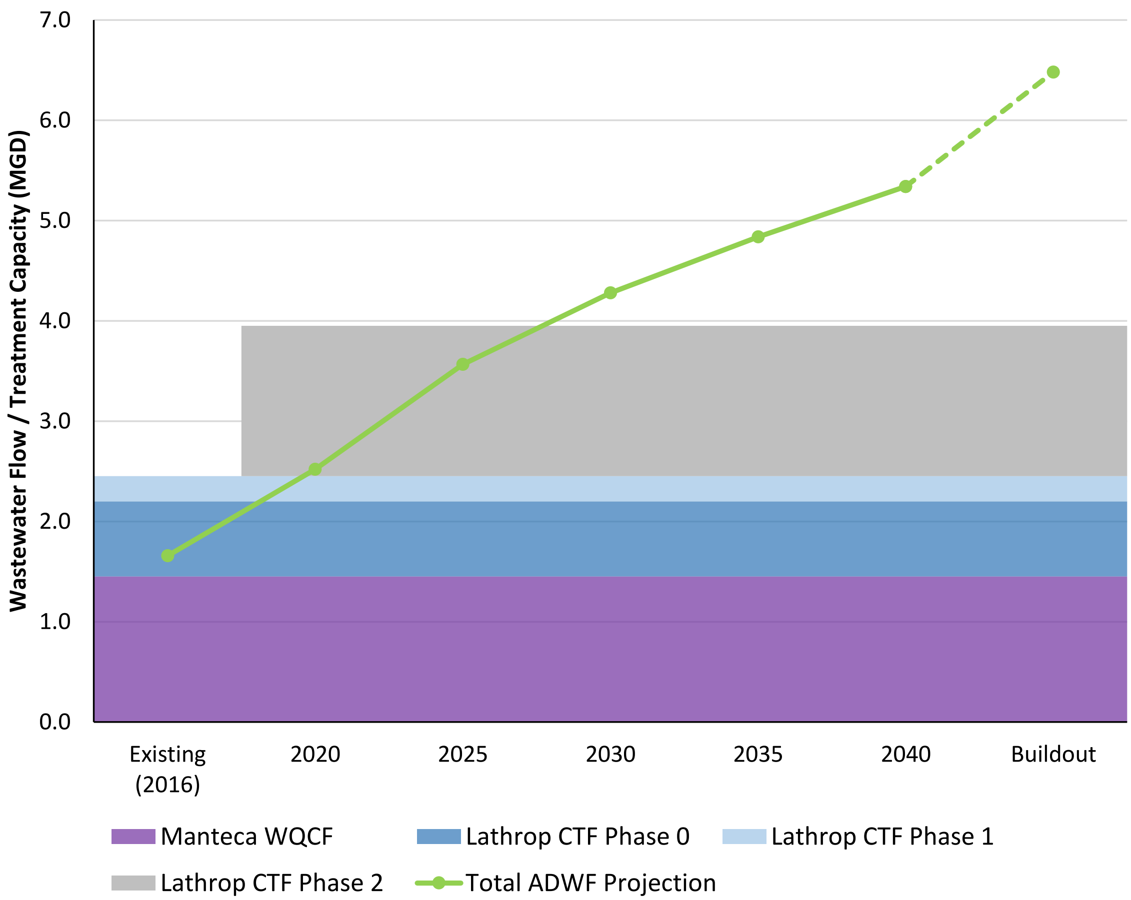


Table 4-8
Projected Wastewater Flow and Treatment Capacity, Citywide

	Estimated ADWF Influent and Treatment Capacity (MGD)						
	Existing (2016)	2020	2025	2030	2035	2040	Buildout
Projected Influent ADWF (a)							
Total ADWF Projection	1.66	2.52	3.56	4.28	4.84	5.34	6.48
Existing Capacity and Future Expansions							
Manteca WQCF	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Lathrop CTF Phase 0	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Lathrop CTF Phase 1	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lathrop CTF Phase 2	-	1.50	1.50	1.50	1.50	1.50	1.50
Total Capacity	*2.45*	*3.95*	*3.95*	*3.95*	*3.95*	*3.95*	*3.95*

Notes:
(a) Flow projections include total Citywide ADWF projections

Figure 4-6
Projected Wastewater Flow and Treatment Capacity, Citywide



5. COLLECTION SYSTEM PERFORMANCE AND DESIGN CRITERIA

The criteria used to evaluate the City's existing collection system is based on *2014 Lathrop Design and Construction Standards* ("Standards"; Lathrop, 2014) and the City's previous master plan analyses. A summary of the wastewater system design criteria is provided below:

- For hydraulic analyses, a Manning's "n" of 0.013 is assumed for all sewers.
- Pipes 15 inches in diameter and smaller are designed for peak flows with a maximum depth to diameter (d/D) ratio of 0.50. Pipes 18 inches in diameter and larger are designed for peak flows at a maximum d/D ratio of 0.75.
- Design velocity and head loss for force mains calculated using Hazen-Williams formula with a roughness constant of 110.
- Minimum velocity greater than 2 feet per second (fps) for pipes flowing half full.
- Minimum gravity main slopes are summarized in Table 5-1.
- Maximum velocity less than 10 fps.
- Pump stations should be designed to convey PWWF within its firm capacity[4].

Table 5-1. Minimum Gravity Main Slopes

Pipe Size (inch)	Minimum Slope (ft/ft)
6	0.0050
8	0.0035
10	0.0025
12	0.0020
15	0.0015
18	0.0012

The City intends to update the City Standards to be consistent with the criteria described above.

5.1 Capacity Criteria

The collection system is primarily evaluated against its ability to carry projected PWWF. Specifically, the d/D ratio for gravity mains under PWWF are compared to the design criteria. Force mains are considered to be capacity deficient if maximum velocity exceeds 10 fps. For pump stations, the required total head and flow under PWWF are compared to their firm capacity.

5.2 Minimum Velocity and Slope Criteria

Minimum velocity and slope criteria for gravity mains are of the same nature and independent of flow, i.e. velocity in a pipe flowing at half full is determined by its slope. These criteria ensure an appropriate flushing velocity and prevents sediment buildout in the pipes. However, it is

[4] Defined as pumping capacity with the largest pumping unit out of service.

unnecessary to correct an existing pipe with a mild slope if the pipe is sufficient to carry PWWF. Therefore, minimum velocity and slope criteria are evaluated as secondary requirements.

6. HYDRAULIC ASSESSMENT OF THE COLLECTION SYSTEM

EKI constructed a wastewater system hydraulic model to assess the capacity of City's existing collection system and key planned infrastructure under various wastewater flow scenarios. A hydraulic model transforms information about the physical facilities and system into a mathematical model that is used to analyze the sewer system under various demand conditions. The hydraulic model then generates information on flow, velocity, flow depth, and head that can be used to assess system performance and identify system capabilities and deficiencies. The hydraulic model can also be used to verify the adequacy of recommended or proposed system improvements.

6.1 Hydraulic Modeling Approach

To evaluate collection system performance against hydraulic design criteria, EKI (1) conducted steady-state model simulations of PWWF conditions, and (2) evaluated capacity and head requirements at PWWF for each lift station or pump station for existing, near-term future, and long-term future development scenarios.

The PWWF were modeled for all pipes as the total ADWF upstream of the pipe multiplied by the corresponding peaking factor from Figure 4-3. Pump stations were first modeled as ideal pumps that can pump at a rate equal to the inflow to determine the estimated PWWF influent to each pump station. The modeling results were then evaluated against actual pump hydraulics to determine if each pump station has sufficient capacity to pump the modeled PWWF.

6.2 Hydraulic Model Construction

This section documents the development of the hydraulic model that was used to assess the capacity of the City's wastewater system. The section provides an overview of the modeling platform selection and the model construction process, including descriptions of the modeled network and modeled flows. The hydraulic model was used to evaluate capacity needs within the collection system under existing and future flow conditions and to complete the hydraulic assessment portion of the WWSMP.

6.2.1 *Model Platform*

The City selected to use Innovyze InfoSWMM as the model platform for this WWSMP update. This selection was partially based on the platform's geographical information system (GIS) integration capabilities. To optimize the modeling building and maintenance process, a key objective of the IWRMP modeling effort was to construct hydraulic models that are integrated with the City's infrastructure GIS and allow for automatic synchronization between the model and infrastructure GIS to limit future maintenance efforts.

6.2.2 *Model Construction*

The City maintains a GIS geodatabase of its infrastructure assets, which was used as the basis of information to construct the sewer system hydraulic model. Prior to constructing the model, EKI updated the City's GIS database to address City identified inconsistencies, added most recent infrastructure improvements, and identified and filled data gaps in order to make sure the GIS database accurately represented the City's existing utility infrastructure. This effort is documented in Appendix C.

Data gaps remained after the City's geodatabase updates were completed. After importing the City's GIS data into the hydraulic model, the following steps are performed to address data gaps, validate network data, and create a fully connected network:

- The model network was reviewed and refined for connectivity. Using the software's tools, each pipe was connected to a model node[5] and identified for upstream and downstream directions. Orphan and duplicate elements were corrected.
- Node and pipe invert data were reviewed and corrected of data errors. Missing invert data were inferred based on the City's minimum slope requirement, known invert of connecting pipes, and ground slope.
- Global parameters including Manning's constant and the Hazen-Williams C-Factors were applied to pipes based on City's design criteria.
- All scenarios were created with associated active facilities and conveyance configurations
- Parcel-level wastewater flow projections were allocated to the nearest upstream manhole.

EKI also obtained data for pump stations including wet well dimensions and elevations, pump types, operating levels, and head-discharge curves. These data are summarized in Table 3-2 and are the basis for the pump station evaluation in Section 6.5. Modeled PWWF at each pump station are summarized in Table 6-1.

EKI did not calibrate the hydraulic model due to lack of sewer flow monitoring data. However, flow monitoring recommended as a CIP (see Section 7.4) could be used to calibrate the model in the future.

6.3 Sewer System Hydraulic Modeling Scenarios

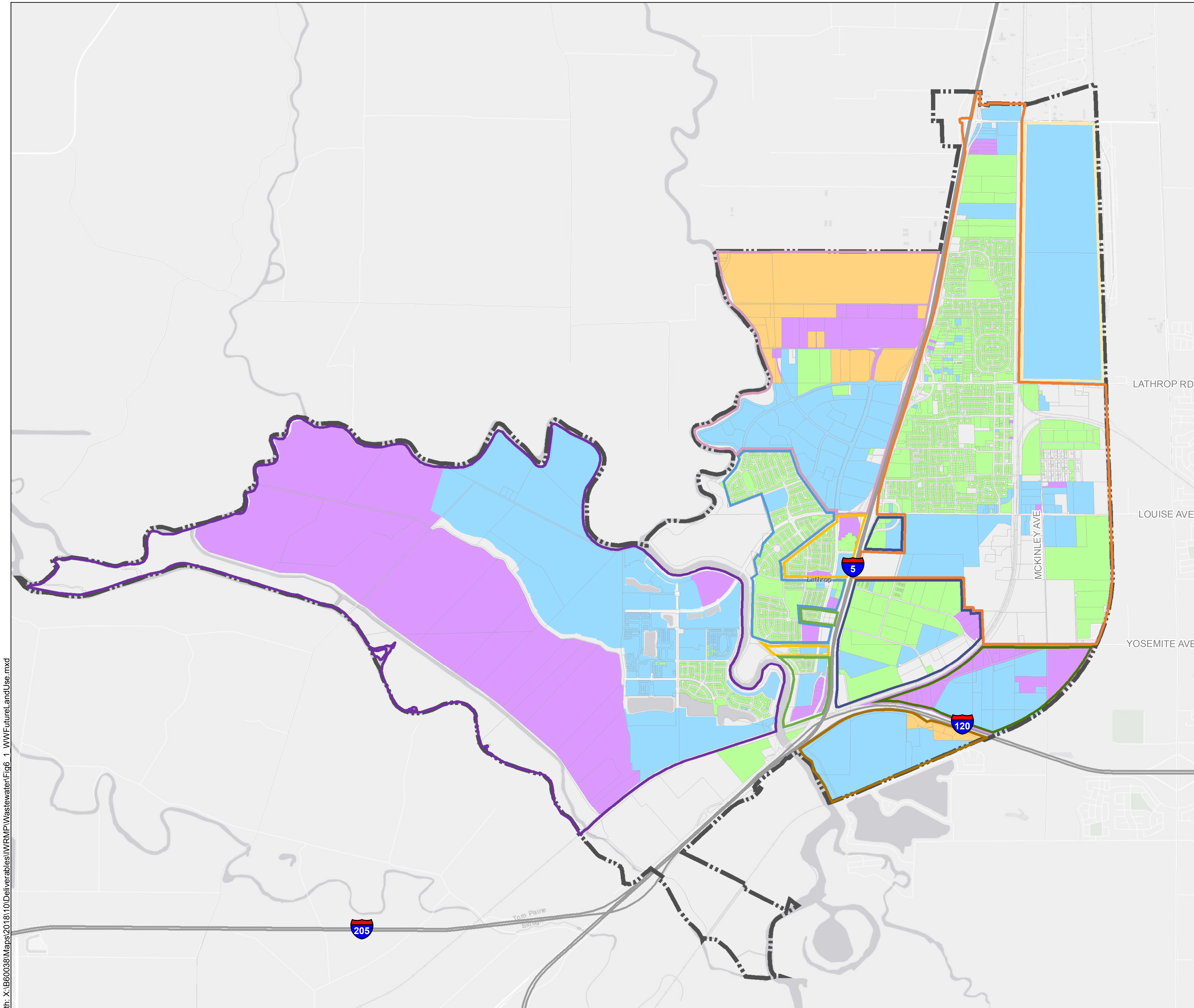
Existing infrastructure and key planned infrastructure were assessed under four scenarios: Existing (2016), Near-Term Future (2025), Long-Term Future (2040), and Selected Buildout (beyond 2040). The Selected Buildout scenario includes buildout of CLSP and SLSP that are anticipated to occur after 2040 to evaluate regional infrastructure needs for full buildout of CLSP and SLSP, respectively. Figure 6-1 shows parcels and future development included in each scenario.

[5] either a manhole, a force main fitting, or a network structure

Table 6-1
Peak Wet Weather Flow at Pump Stations

Lift Station or Pump Station	Existing (2016)			Near-Term Future (2025)			Long-Term Future (2040)			Selected Buildout		
	ADWF (mgd)	Peaking Factor	PWWF (mgd)	ADWF (mgd)	Peaking Factor	PWWF (mgd)	ADWF (mgd)	Peaking Factor	PWWF (mgd)	ADWF (mgd)	Peaking Factor	PWWF (mgd)
MWQCF Collection System												
North Harlan PS (a)	0.024	3.7	0.090	0.048	3.6	0.170	0.057	3.5	0.199	0.057	3.5	0.199
Stonebridge LS	0.203	2.9	0.583	0.207	2.9	0.590	0.207	2.9	0.590	0.207	2.9	0.590
Woodfield LS	0.384	2.5	0.940	0.435	2.4	1.033	0.444	2.4	1.050	0.444	2.4	1.050
Valley Crossing LS	0.007	3.8	0.028	0.007	3.8	0.028	0.007	3.8	0.028	0.007	3.8	0.028
J Street LS	0.629	2.2	1.385	0.254	2.7	0.691	0.266	2.7	0.715	0.266	2.7	0.715
Easy Court LS	0.085	3.4	0.285	0.086	3.3	0.288	0.086	3.3	0.288	0.086	3.3	0.288
O Street PS	0.891	2.1	1.875	0.524	2.3	1.196	0.546	2.3	1.235	0.546	2.3	1.235
McKinley Avenue PS	0.065	3.5	0.225	0.740	2.1	1.590	0.753	2.1	1.615	0.753	2.1	1.615
Louise Avenue PS	0.003	3.9	0.019	--	--	--	--	--	--	--	--	--
Lathrop CTF Collection System												
Central Lathrop Low Flow PS	0.015	3.8	0.057	--	--	--	--	--	--	--	--	--
Central Lathrop PS (Future)	--	--	--	0.461	2.3	1.081	0.610	2.2	1.350	1.541	2.1	3.165
Mossdale PS	0.431	2.4	1.027	0.499	2.3	1.150	0.572	2.2	1.282	0.572	2.2	1.282
River Islands Interim PS	0.093	3.3	0.307	--	--	--	--	--	--	--	--	--
River Islands Sewer PS (b)	--	--	--	0.948	2.1	1.984	2.370	2.1	4.859	2.370	2.1	4.86
Crossroads PS	0.142	3.1	0.439	0.248	2.7	0.677	0.256	2.7	0.694	0.256	2.7	0.694
South Lathrop PS	--	--	--	0.084	3.4	0.282	0.084	3.4	0.282	0.092	3.3	0.304
Lathrop Gateway PS	--	--	--	--	--	--	0.14	3.1	0.44	0.14	3.1	0.439

Notes:
(a) North Harlan Pump Station is an existing private pump station and that will be upgraded and converted to a public pump station by 2018.
(b) Wastewater from River Islands is conveyed through an interim pump station and will be redirected to a permanent pump station in its vicinity.



Legend

Sphere of Influence

Development Areas

- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing East
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Incremental Development by Model Scenario

- Existing (2016) (See Note 2)
- Near-Term Future (2025)
- Long-Term Future (2040)
- Selected Buildout (Beyond 2040)

Notes
1. All locations are approximate.
2. Includes all residential accounts with at least one full year of billing data and connected to the City's sewer system.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

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(Scale in Feet)

Modeling Scenarios

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Wastewater System Master Plan
City of Lathrop
Lathrop, CA
December 2018
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Figure 6-1

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Parcel-level wastewater ADWFs for the existing scenario were developed based on parcel land use and wastewater generation factors summarized in Section 4.2. Incremental ADWF in each future scenario is consistent with flow projections described in Section 4.2.5. Key planned infrastructure was added to the Near-Term and Long-Term Future scenarios based on available drawings and design reports.

The following key planned infrastructure is added to the Near-Term Future scenario:

- River Islands Sewer PS and conveyance to CTF;
- Central Lathrop force main tie-in to Mossdale force main;
- South Lathrop PS and conveyance to CTF;
- Harlan Road Public PS expansion;
- Woodfield LS connection to McKinley Avenue PS; and
- LogiCenter project gravity mains (indirectly reflected by allocating associated flows to the McKinley Avenue PS).
- Lathrop Gateway PS and conveyance to CTF.

The following key planned infrastructure is added to the Long-Term Future scenario:

- Central Lathrop conveyance to CTF.

6.4 Collection System Hydraulic Evaluation

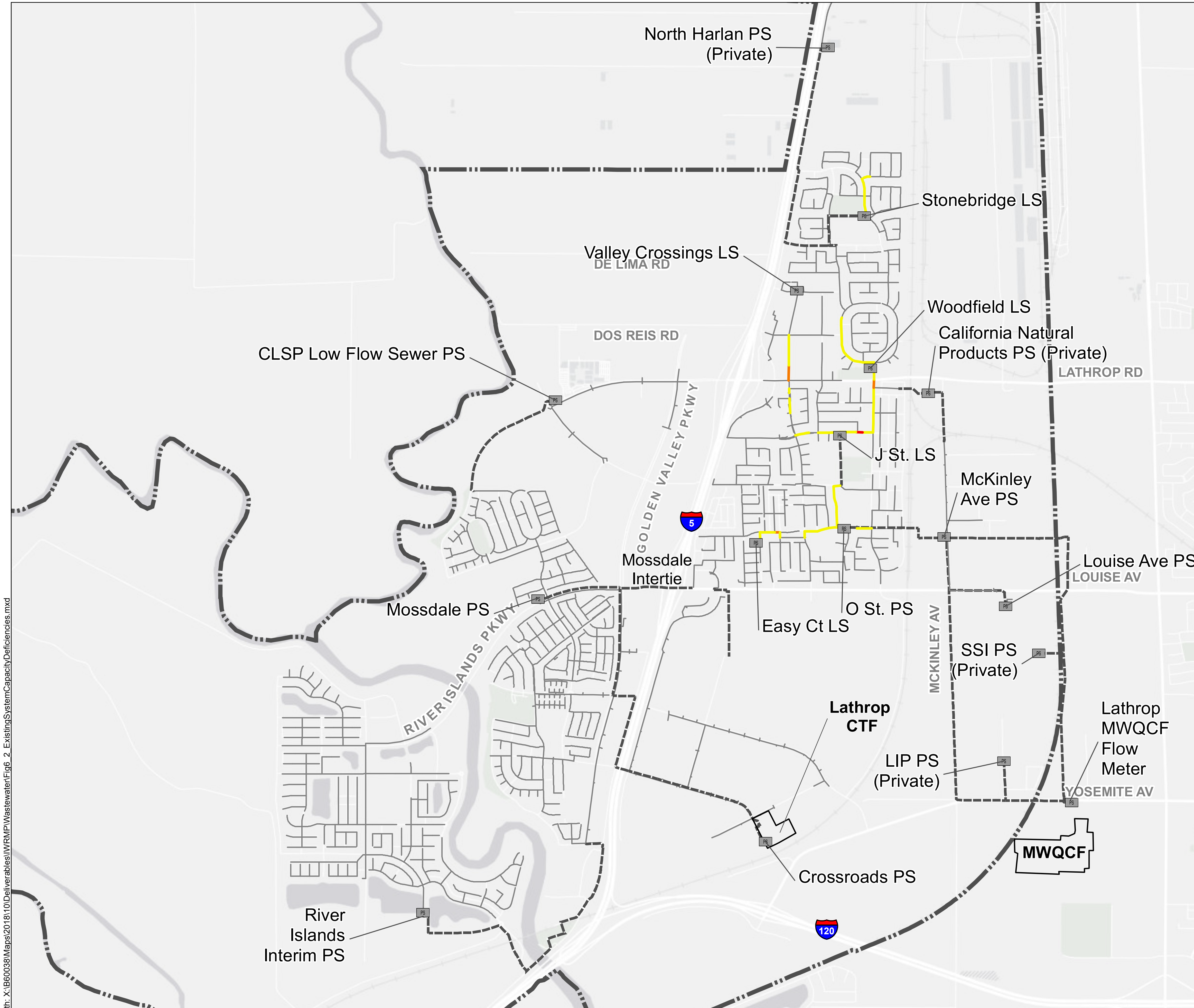
As discussed in Section 5.1, the City's collection system is primarily assessed against the capacity criteria, including d/D ratio in gravity mains and maximum velocity in force mains. Figure 6-2 through Figure 6-4 shows the modeled d/D ratio under PWWF for each scenario. Gravity mains are highlighted where the modeled d/D ratio exceeds the design criteria.

Modeled results have shown that approximately 4% of City's existing gravity mains will not meet the capacity criteria by 2040 (see Table 6-2). As shown on Figure 6-2 to Figure 6-4, areas with capacity deficiencies are mostly consistent in all scenarios, indicating that most capacity deficiencies identified in the future scenarios already exist in the existing system, although the degree of deficiency may increase with projected development. Existing sewer mains for CLSP will be able to accommodate Long-Term Future and Buildout of the CLSP.

Existing deficiencies at gravity mains between the Woodfield LS and the O Street PS are shown to be alleviated as flows from the Woodfield LS route to McKinley Avenue PS in the Near-term and Future scenarios.

Table 6-2 summarizes modeled d/D ratio results for each scenario. Detailed modeling results are included in Appendix D.

As shown on Figure 6-5, approximately 43% of the City's existing gravity mains do not meet the minimum velocity and slope criteria. However, as discussed in Section 5.2, minimum velocity and slope are secondary criteria and does not necessarily trigger an improvement if the pipe is able to meet the capacity criteria beyond 2040.



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains

- Meeting Capacity Criteria

Modeled Deficiencies

- d/D ratio 0.51 - 0.75
- d/D ratio 0.76 - 0.99
- d/D ratio >= 1.0 (Surcharged)

Abbreviations

CLSP = Central Lathrop Specific Plan
CTF = Consolidated Treatment Facility
d/D = flow depth vs. pipe diameter
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

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(Scale in Feet)

Existing Collection System Capacity Deficiencies

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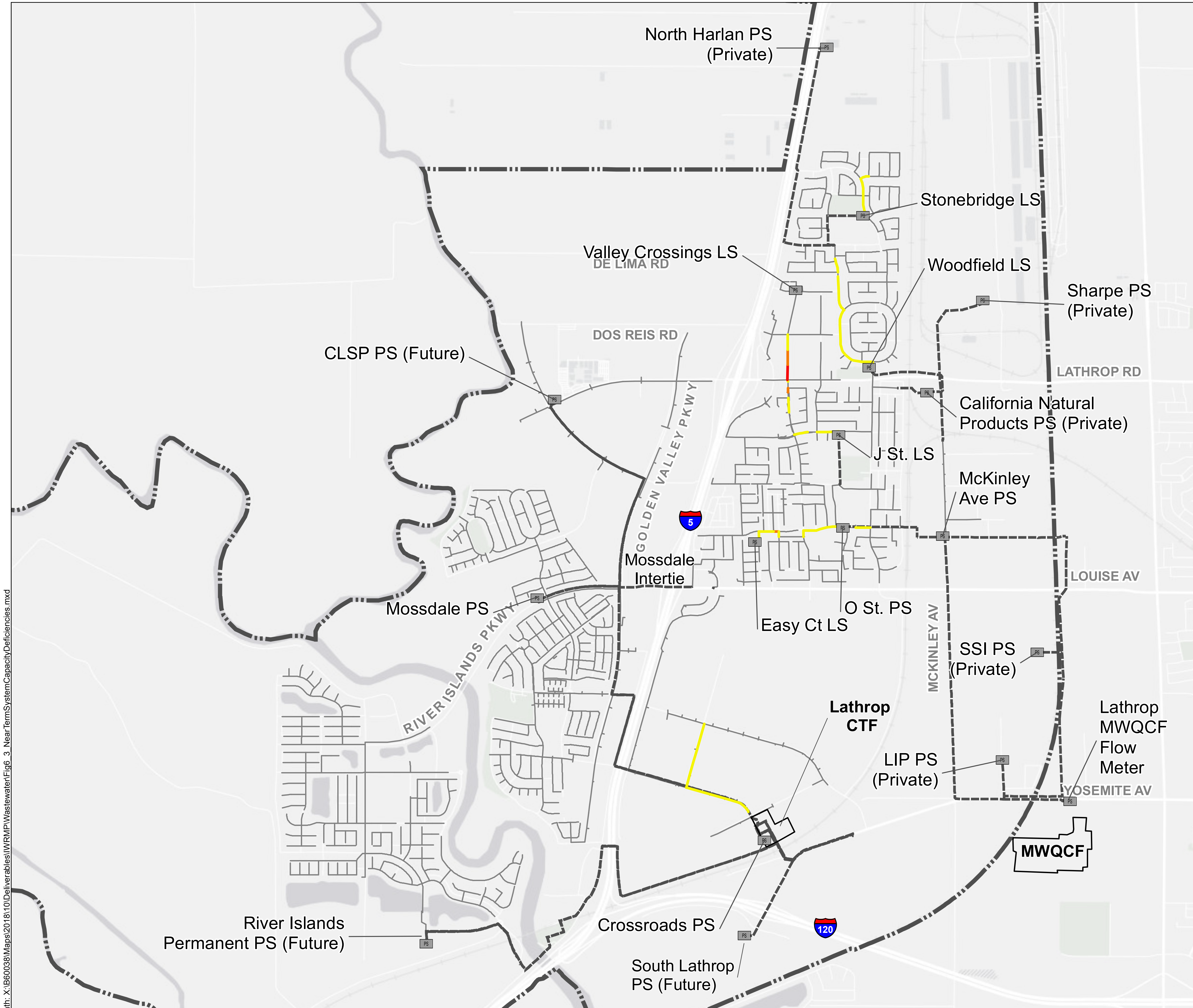
Figure 6-2



Legend
- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains
- Meeting Capacity Criteria

Modeled Deficiencies
- d/D ratio 0.51 - 0.75
- d/D ratio 0.76 - 0.99
- d/D ratio >= 1.0 (Surcharged)

Abbreviations

CLSP	=	Central Lathrop Specific Plan
CTF	=	Consolidated Treatment Facility
d/D	=	flow depth vs. pipe diameter
LIP	=	Lathrop Industrial Park
LS	=	lift station
MWQCF	=	Manteca Water Quality Control Facility
PS	=	pump station
SSI	=	Super Store Industries
WWTF	=	wastewater treatment facility

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

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(Scale in Feet)

Near-Term Future Collection System Capacity Deficiencies

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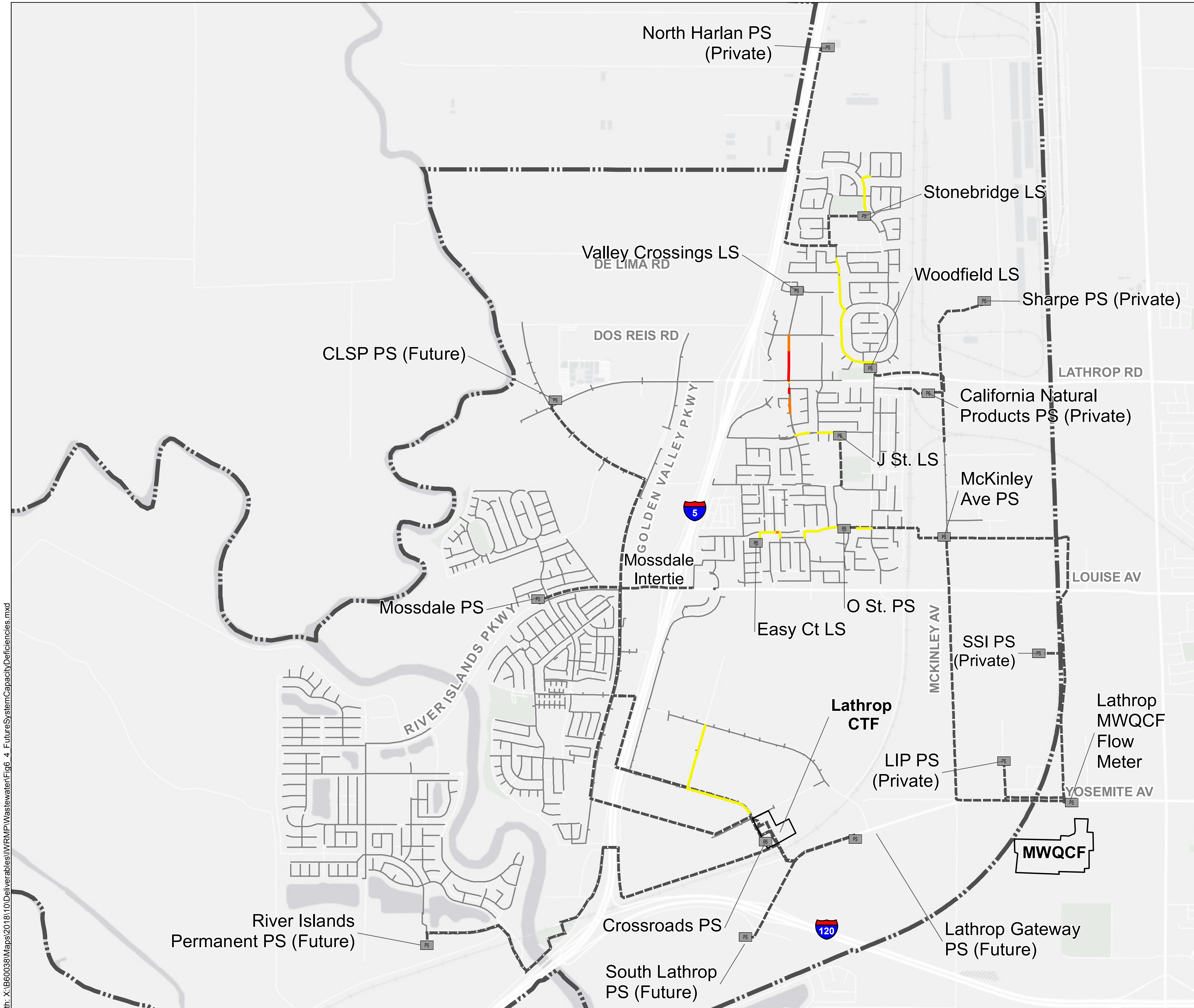
Figure 6-3



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains

- Meeting Capacity Criteria

Modeled Deficiencies

- d/D ratio 0.51 - 0.75
- d/D ratio 0.76 - 0.99
- d/D ratio >= 1.0 (Surcharged)

Abbreviations

CLSP	=	Central Lathrop Specific Plan
CTF	=	Consolidated Treatment Facility
d/D	=	flow depth vs. pipe diameter
LIP	=	Lathrop Industrial Park
LS	=	lift station
MWQCF	=	Manteca Water Quality Control Facility
PS	=	pump station
SSI	=	Super Store Industries
WWTF	=	wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 December 2018.

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(Scale in Feet)

Long-Term Future and Selected Buildout Collection System Capacity Deficiencies

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Figure 6-4

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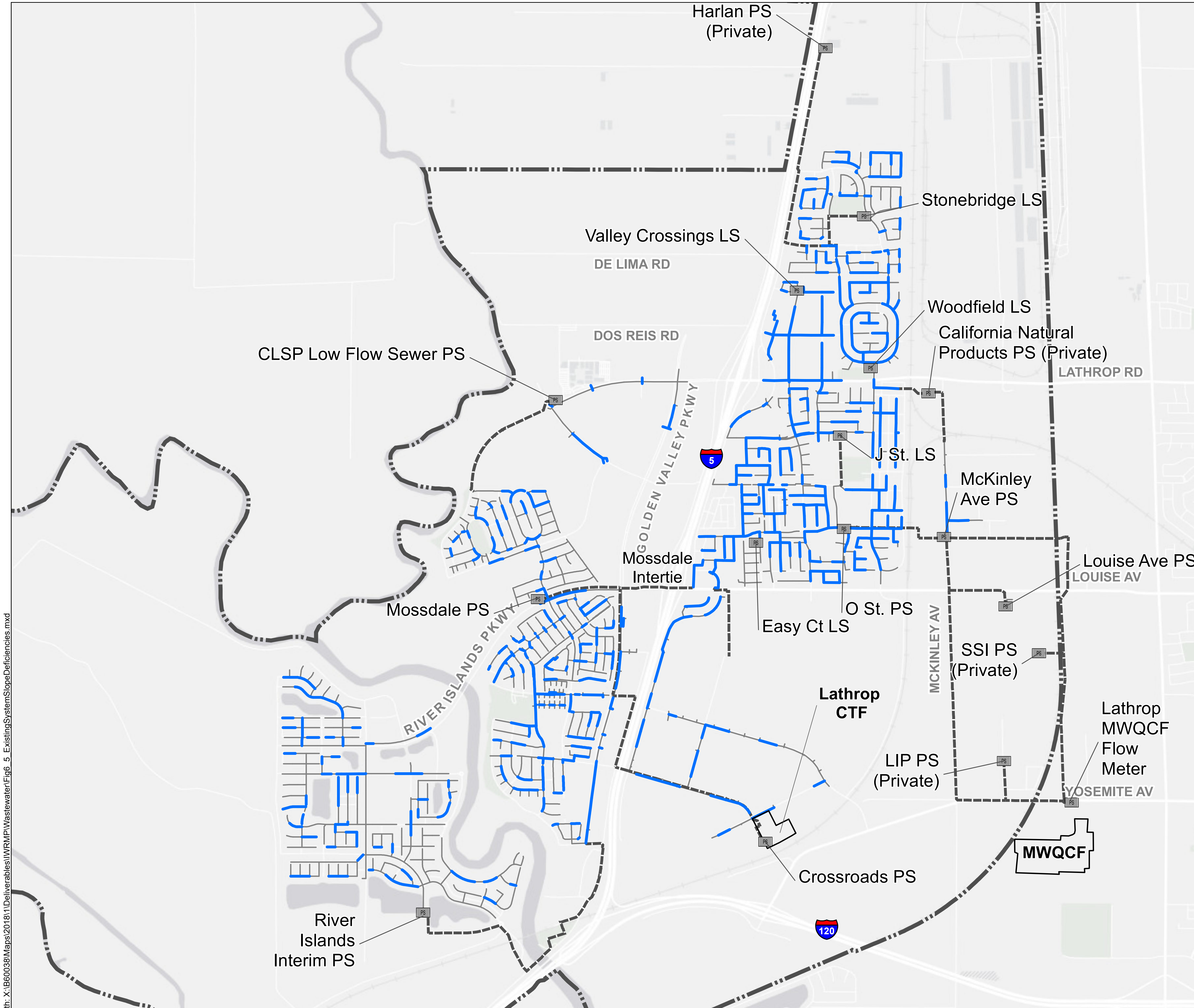
Table 6-2
Summary of Collection System Capacity Deficiencies

Scenario	Percent Length of Gravity Mains			
	Meeting Capacity Criteria	d/D Ratio Greater Than 0.5 (a)	d/D Ratio Greater Than 0.75	d/D Ratio Greater Than 1 (Surcharged)
Existing (2016)	97%	3.1%	0.2%	0%
Near-Term Future (2025)	97%	3.1%	0.2%	0.1%
Long-Term Future (2040)	96%	3.1%	0.2%	0.2%
Selected Buildout	96%	3.1%	0.2%	0.2%

Notes:
(a) Gravity mains less than 18-inch diameter and exceeding the capacity criteria.



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains

- Meeting Minimum Velocity and Slope Criteria
- Not Meeting Minimum Velocity and Slope Criteria

Abbreviations

CLSP	=	Central Lathrop Specific Plan
CTF	=	Consolidated Treatment Facility
d/D	=	flow depth vs. pipe diameter
LIP	=	Lathrop Industrial Park
LS	=	lift station
MWQCF	=	Manteca Water Quality Control Facility
PS	=	pump station
SSI	=	Super Store Industries
WWTF	=	wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 9 January 2018.

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(Scale in Feet)

Existing Collection System Minimum Velocity and Slope Deficiencies

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Figure 6-5

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6.5 Force Main and Pump Station Capacity Evaluation

The hydraulic requirements at each lift station or pump station depends on configuration of its downstream force main, specifically, size and head loss. Therefore, EKI ran the model to optimize force main configuration in the future scenarios before conducting the hydraulic assessment. Force main and pump station schematics for the Near-Term Future, Long-Term Future, and Selected Buildout scenarios are shown on Figure 6-6.

Table 6-3 summarized the force main configurations under PWWF in each scenario, as well as the head loss and velocity of each force main. As shown on the table, the City's existing and planned force mains are able to convey projected wastewater flow beyond 2040.

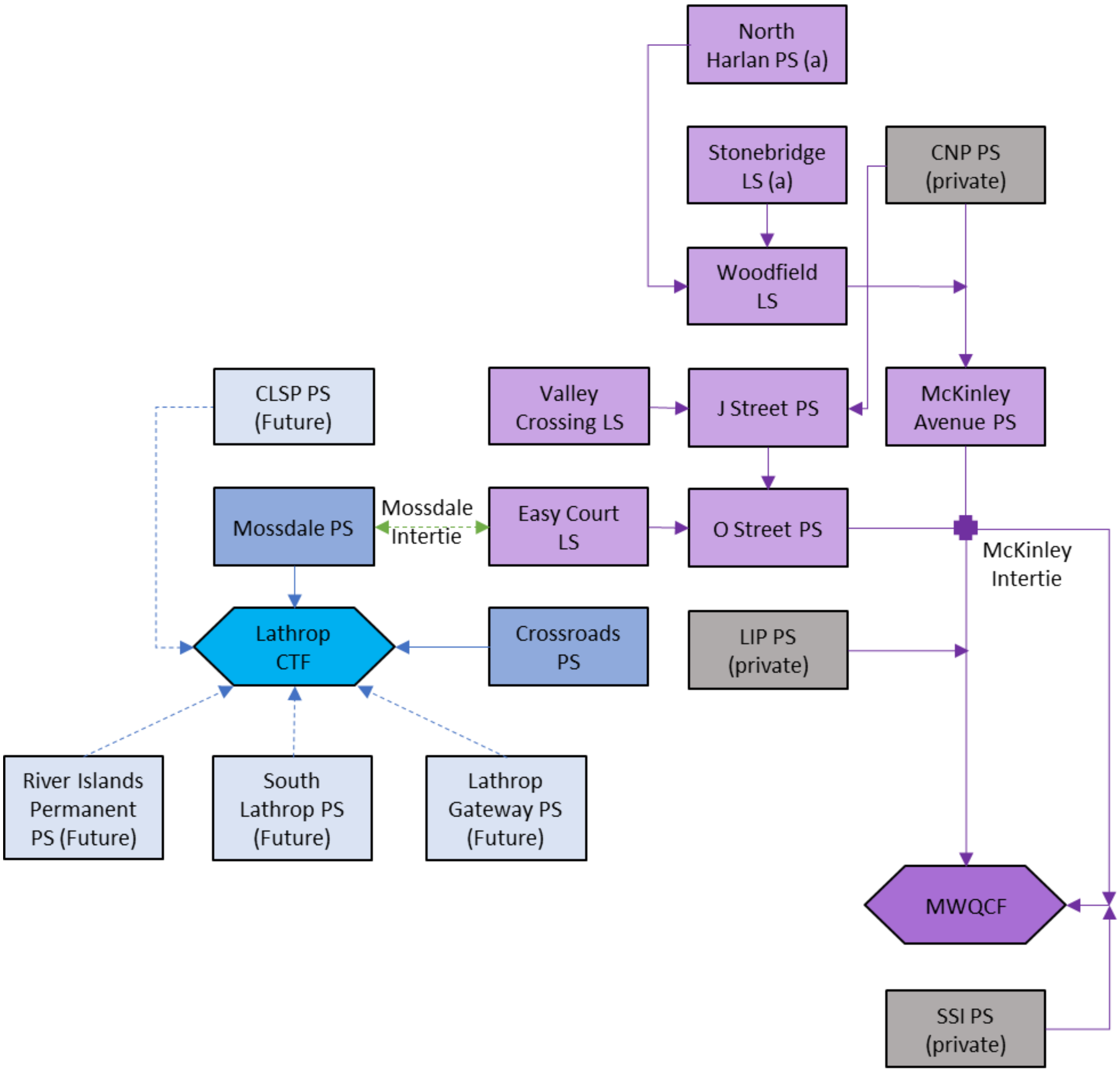
In the Near-Term Future, Long-Term Future, and Selected Buildout scenarios, wastewater flow from the River Islands and CLSP areas is configured to flow directly to Lathrop CTF, as the gravity system in the Mossdale area will not be able to accommodate PWWF from River Islands and CLSP areas past 2025. Correspondingly, an upgrade to the Central Lathrop PS as well as the River Islands Sewer PS will be required before 2025.

In the 12-inch and 16-inch force mains connecting to MWQCF, if both pipes are utilized, flow velocity is less than the minimum criteria even under PWWF under Existing and Near-Term scenarios. The City can adjust operation of the McKinley intertie to alternate use of these force mains and ensure enough flow velocity to prevent sedimentation.

Table 6-4 summarizes the flow and total head requirements under PWWF for each pump station. When compared to the pump stations' capacities listed in Table 3-2, deficiencies are identified in the Stonebridge LS and Woodfield LS in all scenarios. Existing deficiencies at the J Street LS are shown to be alleviated as flows from the Woodfield LS route to McKinley Avenue in the Near-Term and Long-Term Future scenarios.

Because designs are not available for the future Central Lathrop, South Lathrop, and Lathrop Gateway pump stations, the listed flow and total head requirements for these pump stations are only listed in Table 6-4 and are not evaluated.

Figure 6-6.
Future Wastewater Collection System Schematics



Notes:

(a) The Stonebridge PS receives wastewater from four private pump stations: Panattoni, Gordon Trucking, Boise Cascade, and Utility Trailer. These pump stations convey wastewater collected by the private North Harlan Gravity System, which serves industrial parcels north of Brookfield Street.

Table 6-3
Force Main Hydraulic Analysis Results

Upstream Pump Station	Description / Downstream Connection	Force Main Diameter (in)	Head Loss (ft/1,000 ft)	Velocity (fps)
Existing (2016) Scenario				
Central Lathrop Low Flow PS	Gravity mains on Dry Creek Street to Mossdale PS	4"	2.8	1.3
River Islands Interim PS	Gravity mains on Golden Valley Parkway to Mossdale PS	12"	0.2	0.6
Mossdale PS	Lathrop CTF	12"	1.8	2.0
O Street PS	McKinley Avenue PS and McKinley Intertie	12"	5.7	3.7
McKinley Intertie	MWQCF	12"	0.8	1.2
		16"	0.9	1.6
Near-Term Future (2025) Scenario				
Central Lathrop PS (Future)	Tie-in with 12-inch force main from Mossdale PS	14"	1.0	1.6
River Islands Permanent PS	Lathrop CTF	18"	0.9	1.7
Mossdale PS	Lathrop CTF	8"	1.2	1.2
		12"	2.5	2.4
O Street PS	McKinley Avenue PS and McKinley Intertie	12"	2.5	2.4
McKinley Intertie	MWQCF	12"	1.5	1.8
		16"	1.7	2.3
South Lathrop PS	Lathrop CTF	8"	1.9	1.6
Long-Term Future (2040) Scenario				
Central Lathrop PS (Future)	Lathrop CTF	14"	1.5	2.0
River Islands Permanent PS	Lathrop CTF	12"	2.7	2.5
		18"	2.7	3.2
Mossdale PS	Lathrop CTF	8"	1.7	1.5
		12"	1.6	1.9
O Street PS	McKinley Ave Pump Station and McKinley Intertie	12"	2.7	2.4
McKinley Intertie	MWQCF	12"	1.5	1.8
		16"	1.8	2.4
South Lathrop PS	Lathrop CTF	8" (a)	1.9	1.6
Lathrop Gateway PS	Lathrop CTF	4"	7.9	2.2
		6"	7.7	2.8

Table 6-3 (Continued)
Force Main Hydraulic Analysis Results

Upstream Pump Station	Description / Downstream Connection	Force Main Diameter (in)	Head Loss (ft/1,000 ft)	Velocity (ft)
Selected Buildout Scenario				
Central Lathrop PS (Future)	Lathrop CTF	18"	2.1	2.8
River Islands Permanent PS	Lathrop CTF	12"	2.7	2.5
		18"	2.7	3.2
Mossdale PS	Lathrop CTF	8"	1.7	**1.5**
		12"	1.6	**1.9**
O Street PS	McKinley Ave Pump Station and McKinley Intertie	12"	2.7	2.4
McKinley Intertie	MWQCF	12"	1.5	**1.8**
		16"	1.8	2.4
South Lathrop PS	Lathrop CTF	8" (a)	2.2	**1.7**
Lathrop Gateway PS	Lathrop CTF	4"	7.9	2.2
		6"	7.7	2.8

Notes:
1.7 = Velocity does not meet minimum criteria of 2 fps.
(a) No conveyance plans are currently available for the South Lathrop and Lathrop Gateway developments. Therefore, planned force main sizes are assumed.
(b) Velocity in the force mains under steady-state hydraulic modeling is evluated as a secondary criterion. In reality, force main and pump station operations can be adjusted from time-to-time to ensure there is enough velocity to prevent sedimentation.

Table 6-4
Summary of Hydraulic Capacity Analysis for Pump Stations

Pump Station	Existing Firm Capacity (gpm)	Existing (2016) PWWF (gpm)	Near-Term Future (2025) PWWF (gpm)	Long-Term Future (2040) PWWF (gpm)	Selected Buildout PWWF (gpm)
MWQCF Collection System					
North Harlan PS	245	--	118	138	138
Stonebridge LS	380	**405**	**410**	**410**	**410 (c)**
Woodfield LS	750	653	**717**	**729**	**729 (d)**
Valley Crossing LS	83	19	19	19	19
J Street LS	625	**962**	480	497	497
Easy Court LS	500	198	200	200	200
O Street PS	1575	1,302	830	857	857
McKinley Avenue PS	1670	156	1,242	1,259	1,259
Louise Avenue PS	(b)	8	--	--	--
Lathrop CTF Collection System					
Central Lathrop Low Flow PS	87	**40**	--	--	--
Central Lathrop PS (Future) (b)	--	--	751	937	2,198
Mossdale PS	1800	713	798	890	890
River Islands Interim PS	1150	**213**	--	--	--
River Islands Sewer PS (Future)	4250	--	1,378	3,374	3,374
Crossroads PS	570	305	470	482	482
South Lathrop PS (b)	--	--	196	196	211
Lathrop Gateway PS (b)	--	--	--	305	305

Notes:
410 = PWWF exceeded pump station's firm capacity.
67 = Interim pump station with only one pump.
(a) Pump station capacity depends on flows through the 16-inch force main to MWQCF and is not analyzed.
(b) No pump station plans are available for these pump stations, therefore their PWWF requirements are not compared with capacity.
(c) At Selected Buildout, Stonebridge LS requires 46.9 ft of total dynamic head at 410 gpm of PWWF.
(d) At Selected Buildout, Woodfield LS requires 39 ft of total dynamic head at 729 gpm of PWWF.

7. RECOMMENDED CAPITAL IMPROVEMENT PROJECTS

This section describes the wastewater collection system CIPs recommended to address the potential deficiencies identified in the wastewater treatment capacity assessment (Section 4.4) and in the hydraulic assessment (Section 6), and reduce the risk of overflows due to insufficient capacity during PWWF. The assumptions that were used to define the projects are also discussed. The CIPs are summarized in Table 7-1 including cost, timeframe, and priority.

For each identified gravity sewer capacity deficiency, a collection system improvement project was developed to remove and replace the existing pipe with a larger diameter pipe. Improvements were also identified to address the potential deficiency at the City's lift stations, including construction of parallel force mains and/or pump upgrades. Figure 7-1 shows an overview of the collection system improvement project locations, and Table 7-2 summarizes all the identified collection system projects, including location, proposed improvements, estimated planning level costs, and alternatives. Each project is shown in detail in Appendix E.

7.1 CIP Cost Evaluation

Cost for capacity improvement projects were estimated based on recent bids provided by the City and EKI experience with similar projects. These costs are conceptual level estimates, considered to have an estimated accuracy range of -30% to +50%, suitable for use for budget forecasting, CIP development, and project evaluations, with the understanding that refinements to the project details and costs would be necessary as projects proceed to design and construction. An Opinion of Probable Cost (OPC) for each project is developed using unit cost factors discussed below and are presented in November 2018 dollars based on an Engineering News Record (ENR) Construction Cost Index (CCI) of 11,184 (20-city average).

The total CIP cost also includes allowances equal to 60% of the OPC for project construction contingency, design, construction management, permitting, regulatory compliance, CEQA, and program implementation:

- Project Construction Contingency: 25%
- Design: 10%[6]
- Construction Management: 10%
- Permitting, Regulatory Compliance, CEQA: 10%
- Project Implementation: 5%

[6] Design cost is assumed to be approximately 10% of the construction cost for this analysis. Practically, design cost varies from 8% to 15% depending on the project.

Table 7-1
Summary of Capital Improvement Projects

Project Number	Project	Timeframe	Addresses Modeled Surcharging in Existing Scenario	Total Project OPC (a)
Treatment Facility Improvement Projects				
WWT-1	Lathrop CTP Expansion to 5.0 MGD	Long-Term Future	--	$ 36,000,000 (c)
Collection System Improvement Projects				
WW-1	Stonebridge Gravity Main Replacement and Pump Station Upgrade	Existing	No	$ 700,000
WW-2A	Woodfield West Deficiency Project - Alternative A	Existing (b)	No	$ 2,240,000
WW-2B	Woodfield West Deficiency Project - Alternative B	Existing (b)	No	$ 1,970,000
WW-3	Woodfield Pump Station Upgrade	Existing (b)	No	$ 720,000
WW-4	J Street Gravity Main Replacement Project	Existing (b)	Yes	$ 1,390,000
WW-5	Easy Court / O Street Gravity Main Replacement Project	Existing	No	$ 1,130,000
WW-6	O Street Pump Station Upgrade	Existing	No	$ 1,280,000
WW-7	Crossroads Gravity Main Replacement Project	Near-Term Future	No	$ 1,690,000
		Collection System CIP Cost Subtotal	*$ 8,880,000 - $ 9,150,000*	
Miscellaneous Collection System Projects				
WW-8	Temporary Flow Monitoring	--	--	$ 100,000
		TOTAL CIP COST	**$ 44,980,000 - $ 45,250,000**	

Notes:
(a) Costs shown are presented in November 2018 dollars based on an ENR CCI of 11,184 (20-city average).
(b) Project addresses existing deficiencies, however future development influences recommended pipe or pump sizes to be installed.
(c) Total project OPC consists of construction OPC developed based on a unit cost of $9 per gallon additional ADWF capacity, 25% construction contingency, and 35% engineering and administration costs.

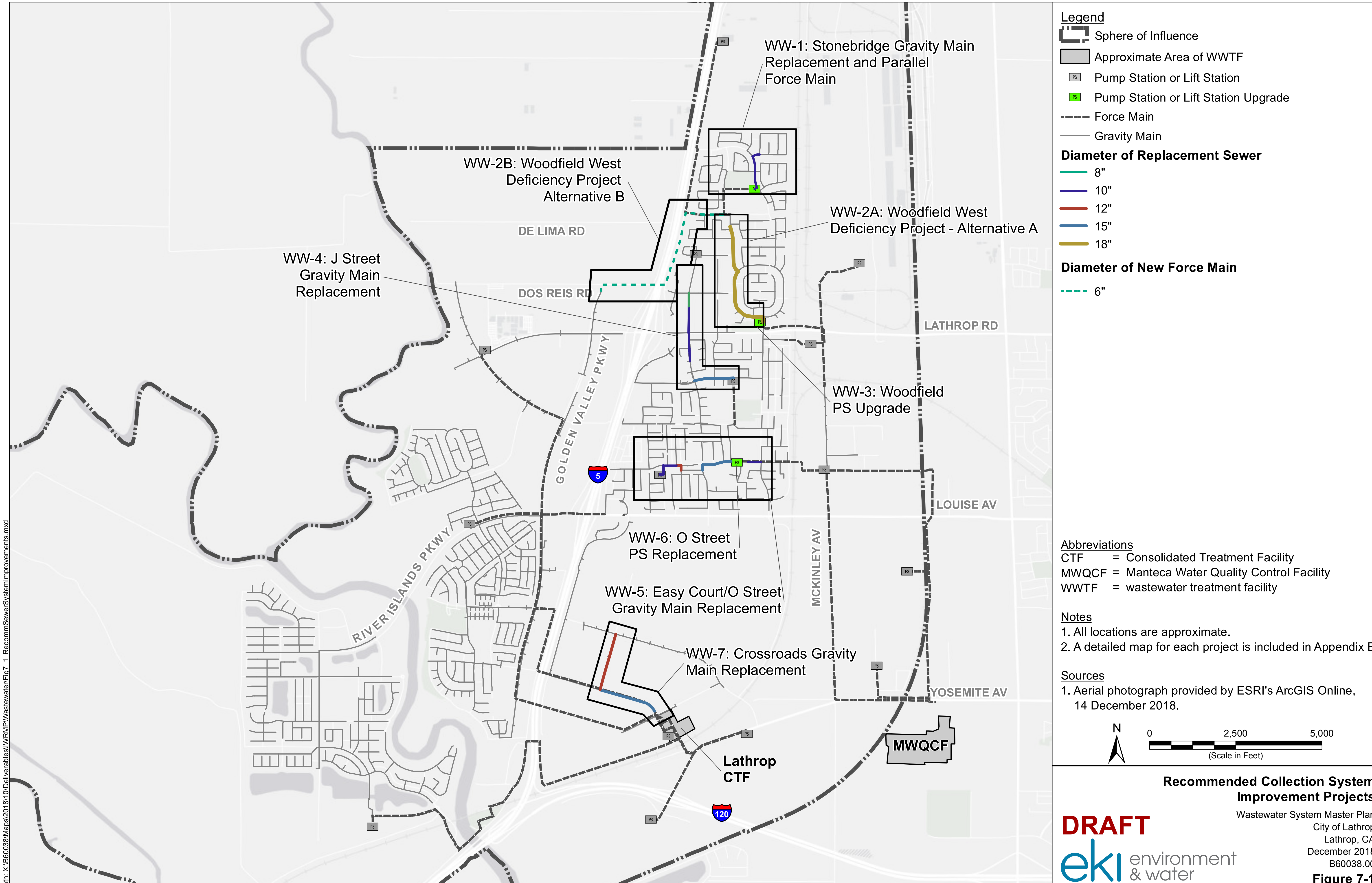


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Table 7-2
Recommended Collection System Improvement Projects

Improvement Type	Description	Quantity		Unit Cost	Construction OPC (a)
Project WW-1: Stonebridge Gravity Main Replacement and Pump Station Upgrade					
Gravity Main	Install new 10" gravity main	1,230	LF	$ 186	$ 228,780
Pump Station	Stonebridge PS upgrade	1	ls	$ 158,000	$ 158,000
Laterals	Replace sewer laterals	9	ls	$ 2,100	$ 18,900
Manhole	Rehabilitate manholes	10	ls	$ 3,100	$ 31,000
				Construction Contingency (25%)	*$ 109,170*
				Construction OPC	***$ 545,850***
				Engineering and Administration Costs (35%)	*$ 152,838*
				Total Project OPC	***$ 700,000***
Project WW-2A: Woodfield West Deficiency Project - Alternative A					
Gravity Main	Install new 18" gravity main from Jasper St to Long Barn Dr	3,430	LF	$ 335	$ 1,148,364
Laterals	Replace sewer laterals	95	ls	$ 2,100	$ 199,500
Manhole	Rehabilitate manholes	16	ls	$ 3,100	$ 49,600
				Construction Contingency (25%)	*$ 349,366*
				Construction OPC	***$ 1,746,830***
				Engineering and Administration Costs (35%)	*$ 489,112*
				Total Project OPC	***$ 2,240,000***
Project WW-2B: Woodfield West Deficiency Project - Alternative B					
Force Main	Jack & Bore new 6" force main through I-5	500	LF	$ 1,000	$ 500,000
Force Main	Install new 6" force main to Dos Reis Road	5,550	LF	$ 93	$ 516,150
Pump Station	Stonebridge PS upgrade (b)	1	ls	$ 216,000	$ 216,000
				Construction Contingency (25%)	*$ 308,038*
				Construction OPC	***$ 1,540,188***
				Engineering and Administration Costs (35%)	*$ 431,253*
				Total Project OPC	***$ 1,970,000***
Project WW-3: Woodfield Pump Station Upgrade					
Pump Station	Woodfield PS upgrade (c)	1	ls	$ 450,000	$ 450,000
				Construction Contingency (25%)	*$ 112,500*
				Construction OPC	***$ 562,500***
				Engineering and Administration Costs (35%)	*$ 157,500*
				Total Project OPC	***$ 720,000***
Project WW-4: J Street Gravity Main Replacement Project					
Gravity Main	Install new 8" gravity main on Cotton Drive	390	LF	$ 149	$ 58,032
Gravity Main	Install new 10" gravity main on Cambridge Drive	810	LF	$ 186	$ 150,660
Gravity Main	Install new 12" gravity main on Cambridge Drive	790	LF	$ 223	$ 176,328
Gravity Main	Install new 15" gravity main on J Street	1,140	LF	$ 279	$ 318,060
Laterals	Replace sewer laterals	59	ls	$ 2,100	$ 123,900
Manholes	Rehabilitate manholes	13	ls	$ 3,100	$ 40,300
				Construction Contingency (25%)	*$ 216,820*
				Construction OPC	***$ 1,084,100***
				Engineering and Administration Costs (35%)	*$ 303,548*
				Total Project OPC	***$ 1,390,000***

Table 7-2 (Continued)
Recommended Collection System Improvement Projects

Improvement Type	Description	Quantity	Unit Cost	Construction OPC (a)
Project WW-5: Easy Court / O Street Gravity Main Replacement Project				
Gravity Main	Install new 10" gravity main on O Street	1,480 LF	$ 186	$ 275,280
Gravity Main	Install new 12" gravity main on O Street	130 LF	$ 223	$ 29,016
Gravity Main	Install new 15" gravity main on O Street	850 LF	$ 279	$ 237,150
Laterals	Replace sewer laterals	52 ls	$ 2,100	$ 109,200
Laterals	Reconnect back alley laterals to replacement sewer	3 ls	$ 4,100	$ 12,300
Manholes	Rehabilitate manholes	13 ls	$ 3,100	$ 40,300
			Construction Contingency (25%)	*$ 175,812*
			Construction OPC	***$ 879,058***
			Engineering and Administration Costs (35%)	*$ 246,136*
			Total Project OPC	***$ 1,130,000***
Project WW-6: O Street Pump Station Upgrade				
Pump Station	O Street PS upgrade (d)	1 ls	$ 797,000	$ 797,000
			Construction Contingency (25%)	*$ 199,250*
			Construction OPC	***$ 996,250***
			Engineering and Administration Costs (35%)	*$ 278,950*
			Total Project OPC	***$ 1,280,000***
Project WW-7: Crossroads Gravity Main Replacement Project				
Gravity Main	Install new 12" gravity main on Murphy Parkway	1,690 LF	$ 248	$ 419,796
Gravity Main	Install new 15" gravity main on Nestle Way	1,730 LF	$ 341	$ 589,065
Laterals	Replace sewer laterals	7 ls	$ 2,100	$ 14,700
Manholes	Rehabilitate manholes	11 ls	$ 3,100	$ 34,100
			Construction Contingency (25%)	*$ 264,415*
			Construction OPC	***$ 1,322,076***
			Engineering and Administration Costs (35%)	*$ 370,181*
			Total Project OPC	***$ 1,690,000***
TOTAL COLLECTION SYSTEM CIP COST (ALTERNATIVE A)				**$ 9,150,000**
TOTAL COLLECTION SYSTEM CIP COST (ALTERNATIVE B)				**$ 8,880,000**

Notes:
(a) Costs shown are presented in November 2018 dollars based on an ENR CCI of 11,184 (20-city average).
(b) Incremental cost to install higher capacity pumps at the Stonebridge pump station for Project WW-2B compared to Project WW-1.
(c) Estimated construction cost for the Woodfield Pump Station Upgrade Project is provided by the City on 6 December 2018.
(d) Cost estimate based on detailed bid information provided for by the City for the Mckinley Pump Station project, which is a similar size pump station as the O Street Pump Station.

7.1.1 *Treatment Facility Projects*

Based on the engineer's estimate for City's current Lathrop CTF expansion, EKI estimated a unit construction cost for a treatment facility expansion at $9.00 per gallon ADWF capacity. The cost does not include constructing storage ponds and spray fields for disposal, as those will be discussed in the Recycled Water Master Plan.

7.1.2 *Pipeline Projects*

Unit construction costs for wastewater pipeline projects are provided in Table 7-3.

Gravity main and force main unit costs are developed on a diameter-inch basis varying by trench depth. These cost factors assume open-trench construction for pipeline projects. The unit construction costs presented below generally include pipeline materials, trenching, placing and joining pipe, fittings, placing imported pipe bedding, native backfill material, and partial asphalt pavement replacement, if required. They also include Division 1 costs such as mobilization and traffic control. However, the costs presented in Table 7-3 do not include cost of boring and jacking pipe. Pipeline bore and jack costs are added where required in Table 7-2.

Unit costs are also developed for lateral connections and manhole rehabilitation as part of replacement sewer projects.

Table 7-3
Unit Construction Cost for Pipeline Projects

Improvement Type	Cost Unit	Trench Depth		
		Less Than 18 ft bgs	18 to 22 ft bgs	Greater Than 22 ft bgs
Gravity Main	Per Inch-Diameter and Foot-Length	$18.60	$20.70	$22.70
Lateral	Each (a)	$2,100	$2,350	$2,600
Manhole Rehabilitation	Each	$3,100		
Force Main	Per Inch-Diameter and Foot-Length	$15.5		

<u>Note:</u>
(a) Assume a lateral at 30-feet long.
(b) Unit costs are presented in November 2018 dollars.

7.2 <u>Treatment Facility Improvement Projects</u>

As discussed in Section 4.4, wastewater ADWF to the Lathrop CTF is projected to reach 3.89 MGD in 2040 and 4.96 MGD at buildout of CLSP and SLSP, in accordance with the Selected Buildout scenario. The City has recently completed an expansion of the facility to a total ADWF capacity of 2.5 MGD with a Peak Hour Flow capacity of 7.5 MGD, however, this is only projected to meet flows from the new development areas and Crossroads through 2027.

Therefore, the suggested treatment facility CIP consists of expanding Lathrop CTF to a total capacity of 5.0 MGD ADWF, sufficient to meet wastewater flows through the Selected Buildout scenario beyond 2040. As shown on Table 7-1, the total project OPC for expansion to 5.0 MGD ADWF is approximately $36 million.

As a full expansion is not needed until after 2040, the City may elect to develop this project in multiple phases. It is recommended that the City initiate the first phase of this expansion in the near future, because the project will likely require significant lead time for financing, planning, design, construction, and permitting.

7.3 Collection System Improvement Projects

To address the capacity deficiencies identified in Section 6, replacement or new pipes were sized to meet the hydraulic design criteria under Selected Buildout PWWFs. The gravity main projects are designed for removal and replacement of the existing capacity-deficient mains. The City prefers this method for gravity sewers as opposed to construction of relief sewers.

Existing pipe slopes and depths were preserved when upsizing sewers in-place. Diameters were increased as minimally as possible to prevent oversizing and resulting low velocities during dry weather conditions. As shown in Table 7-2, EKI has developed alternative designs for certain suggested projects and evaluated for the cost-effectiveness of these alternatives. Total OPC for collection system improvement projects ranges from $8.88 million to $9.15 million, depending on selection of alternatives.

It should be noted that the recommended CIP only identifies improvements at a master plan level and does not constitute a design of such improvements. Subsequent detailed design is required to determine the exact sizes and locations of these proposed improvements.

7.3.1 *Stonebridge Gravity Main Replacement and Pump Station Upgrade Project (WW-1)*

The Stonebridge Sewer Replacement and Parallel Force Main Project addresses an existing deficiency under PWWF and consists of following:

- Replacement of approximately 1,230 linear feet (LF) of existing 8-inch gravity mains with new 10-inch diameter gravity mains from Christie Falls Way and Waterman Ave to the Stonebridge LS; and
- Upgrade of the Stonebridge pump station to support PWWF flow rate and TDH.

The Stonebridge LS upgrade assumes the lift station is in good condition and consists of replacing the existing pumps with two new 10 HP pumps with variable frequency drive motors and associated upgrades to the electrical systems.

The project also includes the replacement of service laterals and modification/rehabilitation of existing manholes along the extent of the project. The total project OPC is approximately $700,000.

An alternative has been discussed for this project which consists of connecting the industrial parcels north of Brookfield Street to the future North Harlan Public PS. However, this will not eliminate the need for gravity main improvements in the Stonebridge area or the need for the 6-inch parallel Stonebridge LS force main. In addition, this alternative will increase the burden on the North Harlan Public PS and requires another 6,500 LF parallel force main from the Harlan Public PS to Jasper Street. The alternative involves a significantly larger effort and is not retained for further evaluation.

7.3.2 *Woodfield West Deficiency Project Alternatives (WW-2)*

EKI developed two alternative projects to address an existing gravity main deficiency along Jasper Street and Long Barn Drive. One alternative (Alternative A) is to replace the deficient gravity mains. A second alternative (Alternative B) is to upgrade and reroute the Stonebridge LS to CLSP PS drainage area instead of the Woodfield LS drainage area. The two alternative projects are described below. Detailed cost comparison is shown in Table 7-2.

7.3.2.1 Woodfield West Gravity Main Replacement (Alternative A)

This alternative replaces approximately 3,760 LF of existing 15-inch-diameter gravity mains with new 18-inch-diameter gravity mains from the north end of Jasper Street to the Woodfield LS through Long Barn Drive. It also includes the replacement of service laterals and modification/rehabilitation of existing manholes along the extent of the main replacement.

The total project OPC for Alternative A is approximately $2.24 million.

7.3.2.2 Stonebridge LS Upgrades and Connection to CLSP Project (Alternative B)

Alternative B consists of further upgrading the Stonebridge LS and diverting wastewater flow from the Stonebridge LS to the CLSP sewer system. This will require jack & bore of a 6-inch diameter force main under I-5 to convey flows to the gravity mains on Golden Valley Parkway near Dos Reis Road, as well as upgrading the Stonebridge LS to provide sufficient head for the force main extension. Under this alternative, Alternative A improvements are no longer needed.

The Stonebridge LS upgrade assumes the lift station is in good condition and consists of replacing the existing pumps with two 35 HP pumps with new variable frequency drive motors and associated electrical system upgrades. The new pumps will need to be connected to the existing 6-inch diameter force main, where wastewater flow will continue to be conveyed to CLSP via the new 8-inch diameter force main. Because this alternative will eliminate the need for upgrading the Stonebridge PS under Project WW-1, the pump station cost for this alternative includes only incremental cost associated with upgrading Stonebridge PS pumps to a higher capacity compared to Project WW-1.

This option diverts approximately 0.21 MGD of ADWF from MWQCF to Lathrop CTF by 2040. The resulting ADWF at Lathrop CTF by 2040 will be increased from 3.94 MGD to 4.15 MGD (see Tables E-1 and E-2 of Appendix E). Potential connection cost to Lathrop CTF and disposal facility cost may need to be evaluated prior to pursuing this project.

The total project OPC for Alternative B is approximately $1.97 million.

7.3.3 *Woodfield Pump Station Upgrade Project (WW-3)*

The City is currently in the process of designing an upgrade to the Woodfield Pump Station. The Woodfield Pump Station Upgrade Project addresses an existing deficiency under PWWF conditions at the Woodfield LS and is sized to accommodate the City's plans to connect the Woodfield LS to the McKinley Avenue PS drainage area via the 10-inch force main constructed as part of the Lathrop Road / UPRR Overhead Project (Section 3.1.4). This connection is necessary before receiving wastewater from AAFES and CMD facilities at the Sharpe Army Depot (anticipated by 2020) and will accommodate increased industrial flow from the Harlan area and alleviate stress on downstream Historic Lathrop pump stations.

The project consist of replacing the pump station wet well, installing new variable frequency driver pumps, and connecting the pump station to the 10-inch diameter force main constructed to the vicinity of the lift station. The total project OPC is approximately $720,000.

7.3.4 *J Street Gravity Main Replacement Project (WW-4)*

The J Street Gravity Main Replacement Project addresses an existing deficiency with modeled surcharging under PWWF conditions. The project is sized to also accommodate future infill development along Cotton Drive and Cambridge Drive. The project consists of replacing a total of approximately 3,130 LF of existing gravity mains varying from 6 to 12 inches with new gravity mains varying in diameter from 8 to 15 inches. The project starts from Shilling Ave and Cotton Drive and ends at the J Street LS. The project also includes the replacement of service laterals and modification/rehabilitation of existing manholes along the extent of the project. Existing manholes will be rehabilitated during construction. The total project OPC is approximately $1.39 million.

In the City's GIS database, invert data for several pipes on Cambridge Drive and J Street are likely to be erroneous, appearing to be either too mild or too steep. It is recommended that the City field confirm pipe inverts on these streets before pursuing this project.

7.3.5 *Easy Court / O Street Gravity Main Replacement Project (WW-5)*

The Easy Court / O Street Gravity Main Replacement Project addresses an existing deficiency with modeled surcharging under PWWF. The project is sized to also accommodate future infill development in the Easy Court / O Street area. The project consists of replacing a total of approximately 2,460 LF of existing mains with new gravity mains varying in diameters from 10 inches to 15 inches. The project is located on O Street between Tumbleweed Lane and 5th Street, passing both the Easy Court LS and the O Street PS. A portion of the existing sewers are constructed in residential backyards; the new sewer will be realigned on O Street. The project also includes the replacement of service laterals and modification/rehabilitation of existing manholes along the extent of the main replacement. Higher costs are assumed for the lateral replacements along the main realigned from the back alley to the public street. The total project OPC is approximately $1.12 million.

7.3.6 *O Street Pump Station Upgrade Project (WW-6)*

During flow monitoring, it was observed that at least 2,060 ft of gravity mains upstream of the O Street PS is surcharged on a regular basis because of the shallow wet well at O Street PS. In order to operate the pumps at O Street PS at a reasonable turn-on level, the City had to allow the shallow wet well to fill above the influent pipe invert and use part of the upstream pipes as storage. Because these gravity mains are downstream of the Mossdale Intertie, this surcharging condition limits the City's ability to use the intertie to balance wastewater flow between the MWQCF and Lathrop CTF.

The O Street PS Upgrade Project replaces the existing O Street PS with a new O Street PS. This project assumes the new pump station to be installed at a corner of the Lathrop Elementary School lot across the street from the current O Street PS. The new O Street PS will connect to existing gravity mains and force mains on O Street. Two 15 HP pumps with variable speed drives will be installed at the pump station to accommodate PWWF and TDH at Selected Buildout. As with the existing O Street PS, one 5 HP pump will also be installed to meet low-flow operational requirements at MWQCF. The total project OPC is approximately $1.28 million. This OPC does not include property acquisition costs.

7.3.7 *Crossroads Gravity Main Replacement Project (WW-7)*

The Crossroads Gravity Main Replacement Plant addresses an existing deficiency and is sized to accommodate future industrial development in the Crossroads drainage area, including the Murphy Parkway project and future Kraft Heinz facility. The project consists of the following:

- Replacing approximately 1,690 LF of existing 10-inch gravity mains with new 12-inch gravity mains along Murphy Parkway between D'Arcy Parkway and Nestle Way;
- Replacing approximately 1,730 LF of existing 12-inch gravity mains with new 15-inch gravity mains along Nestle Way between Murphy Way and Christopher Way.

The project also includes the replacement of service laterals and modification/rehabilitation of existing manholes along the extent of the project. The total project OPC is approximately $1.69 million.

7.4 Flow Monitoring Projects

The wastewater flow assessment summarized in Appendix A identified varying degrees of I&I across the City. Specifically, in the Mossdale PS drainage area, wastewater flows are approximately 70% of winter water use, however, in the Crossroads PS drainage area, wet season wastewater flows are as much as 150% of winter water use. Moreover, the 5-year average ADWF in the Crossroads PS drainage area is 131% of minimum month water use, indicating significant I&I, while the rest of the City's ADWF averages around 93% of minimum month water use. As discussed in Section 3.1.1, the Crossroads area also has an older sewer system with primarily vitrified clay gravity mains.

EKI has conducted temporary flow monitoring during winter and summer 2018 to inform the wastewater flow analysis of this WWSMP and assess I&I across the City. Flow monitoring results are included as Appendix, while the analysis is detailed in Appendices A & B.

As discussed in Appendix B, the flow monitoring study did not find any significant peak flow response to wet weather events in the City's collection system. However, wet weather events captured during the flow monitoring event were small compared to typical wastewater system design storms. Therefore, it is recommended that the City continue to implement flow monitoring projects to assess I&I, evaluate actual wastewater flow compared to developed flow factors, and inform future capacity improvement projects discussed in Section 7.2. EKI recommends that annual monitoring be conducted at approximately 10 different sites each year.

7.5 Discussion of Conveyance Options

As discussed in Section 3.1.3, the City's two collection systems are connected by the 8-inch Mossdale Intertie, which conveys wastewater from the Mossdale PS to gravity mains in the Easy Court LS drainage area. The City intends to utilize the intertie on emergency situations to reroute a portion of flow from the Mossdale PS to the MWQCF tributary area.

The capacity of the intertie is limited by capacity in the downstream gravity mains from the Easy Court LS drainage area to the O Street PS. As discussed in Section 4.4, the Mossdale Intertie can currently reroute approximately 100,000 gallons per day of wastewater flow. The model results showed that if sewers are allowed to flow full during emergency operation of the intertie, approximately 100,000 gallons per day of capacity remains in these pipes to receive wastewater from the Mossdale Intertie. However, current operations of the intertie are limited by capacity deficiencies along Easy Court and O Street, as well as surcharge conditions along O Street caused by the shallow wet well of O Street PS, as discussed in Section 7.3.6.

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