



WASTEWATER COLLECTION SYSTEM

MASTER PLAN

City Council Work Session - July 14, 2020

Current General Plan

► Goal

- Provide functionally effective community facilities and services to support a safe, healthy, and vibrant community life.

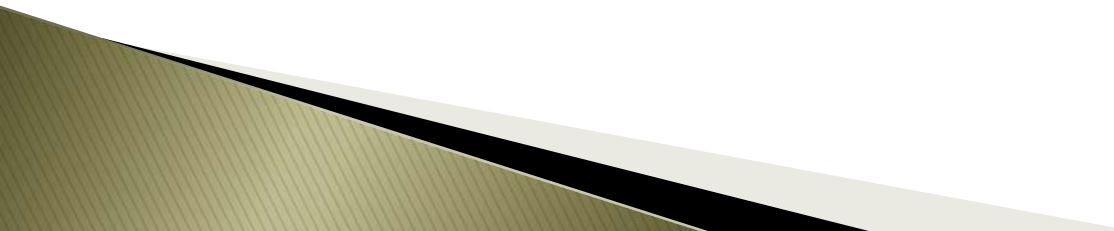
► Objective 7 – Wastewater Collection System

- Protect health and safety of the City
- Economical
- Meet current and future needs.

► Strategies

- Adopt, implement & update the Master Plan
 - Regular system maintenance program
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WHY A SEWER MASTER PLAN?

- ▶ Existing System Report Card
 - Quantifies major infrastructure
 - Identifies infrastructure deficiencies
 - ▶ Planning Document
 - Anticipates and plans for future growth
 - Forecasting tool for future development-driven capital projects
 - ▶ Basis Document for:
 - Impact Fee Facilities Plan
 - Impact Fee Assessment
- 

MASTER PLAN BASICS

- ▶ Map Existing Collection System
- ▶ Collect Wastewater Flow Data (metering)
 - Various sites throughout the community
 - Headworks – Water Reclamation Facility (WRF)
- ▶ Determine Total Flows . . . & separate out:
 - Wastewater Base Flows from . . .
 - Unwanted Surface, Subsurface & Illegal Flows

MASTER PLAN BASICS

- ▶ Identify Current System Deficiencies
 - Existing Deficiency Projects
- ▶ Project Future Flows
 - Current Land Use/Zoning
 - Pipe Capacity
- ▶ Define Future Projects
 - Growth Related Projects
- ▶ Develop Funding Plan

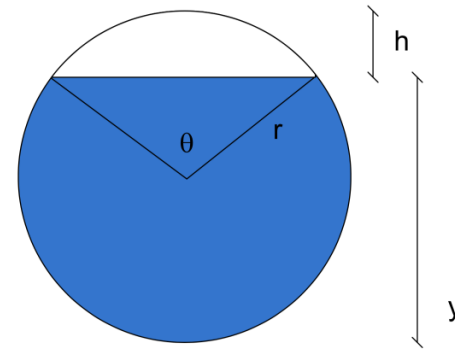


Figure 3: water in circular pipe of depth y exceeding radius

Show that $\theta = 2 \cos^{-1} \left(\frac{r-h}{r} \right)$ where $h = 2r - y$. Hence show that the wetted perimeter

$P = r(2\pi - \theta)$. Show that $A = r^2 \left(\frac{2\pi - \theta + \sin(\theta)}{2} \right)$. Hence determine the value of the hydraulic diameter and the average velocity of the flow. You may now employ the Darcy-Weisbach equation to determine the head loss.

EXISTING IMPROVEMENT PROJECTS

TABLE 8-1 EXISTING IMPROVEMENT PROJECT COST ESTIMATES

PROJECT ID	DESCRIPTION	COST¹
E-1	Remove and upgrade existing 8" diameter gravity line to a 1,900 ft 12" gravity line.	\$ 870,000
E-2	Replace 1,900 ft of existing 8" diameter gravity line. Make connection with 4 way connection to be able to divert flow as needed for maintenance.	\$ 795,000
E-3	Replace 500 ft of existing 8" diameter gravity line.	\$ 210,000
E-4	Install 470 ft of new 8" diameter gravity line.	\$ 200,000
TOTAL		\$2,075,000

¹ All costs include 35% for engineering, administrative costs, and contingencies. Costs are shown in 2019 dollars.

2038 IMPROVEMENT PROJECTS

TABLE 8-2 FUTURE IMPROVEMENT PROJECT COST ESTIMATES

PROJECT ID	DESCRIPTION	COST¹
F-1 (From SSMH01731 to SSMH00308)	Install 3,300 ft of parallel 15" diameter gravity line next to existing 15" diameter gravity line from SSMH01731 to SSMH00308. Bore 150 ft under canal. Bore 230 ft under Interstate 15.	\$2,365,000
F-2 (SSP01262)	Remove and upgrade existing 10" diameter gravity line to a 400 ft 15" diameter gravity line.	\$ 210,000
F-3 (SSP01356)	Remove and upgrade existing 8" gravity line to a 400 ft 12" diameter gravity line.	\$ 190,000
F-4 (N/A)	Install 4,500 ft of 10" diameter gravity line to connect new developments to sewer collection system. Bore 60 ft under canal.	\$2,085,000
F-5 (N/A)	Install 2,700 ft of 10" diameter gravity line to connect new developments to sewer collection system.	\$1,205,000
F-6 (1500 W)	Install additional 1,500 gpm pump to increase pump capacity to 3,000 gpm and maintain one redundant pump. Install 6,800 ft of 16" diameter force main pipe from lift station to WWTP.	\$1,015,000
TOTAL		\$7,070,000

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MASTER PLAN RECOMMENDATIONS

- ▶ Continue Cleaning & Inspection Program
- ▶ Continue in the State's "Utah Sewer Management Program"
- ▶ Eliminate Inflow & Infiltration
- ▶ Establish Sinking Funds for Future Projects



QUESTIONS?

EXISTING COLLECTION SYSTEM

- ▶ Gravity Pipelines - 135 miles
 - Minor Mains 6" - 8"
 - Collectors 10" - 15"
 - Interceptors 18" - 30"
 - Outfalls 36"
- ▶ Manholes - 2,700+
- ▶ Lift Stations - 12
 - Pumping Capacity - 50 to 1,800 gpm
- ▶ Force Mains (sewage pumped uphill to a gravity pipeline)
 - 4" - 12" diameter

WASTEWATER FLOW DATA

- ▶ Equivalent Residential Units – ERU's
 - Wastewater Loading of a Residential Unit



- Average Indoor Water Use – winter month records
 - ▶ Measured = 172 gpd/ERU

WASTEWATER FLOW DATA

- ▶ Equivalent Residential Units – ERU's
 - Wastewater Loading of a Commercial Business converted to a single Residential Unit (ERU)

- 3 ERU's



WASTEWATER FLOW DATA DIURNAL CURVES

► Peaking Factors

- $I = 1.8$
- $M = 2.2$
- $R = 2.0$

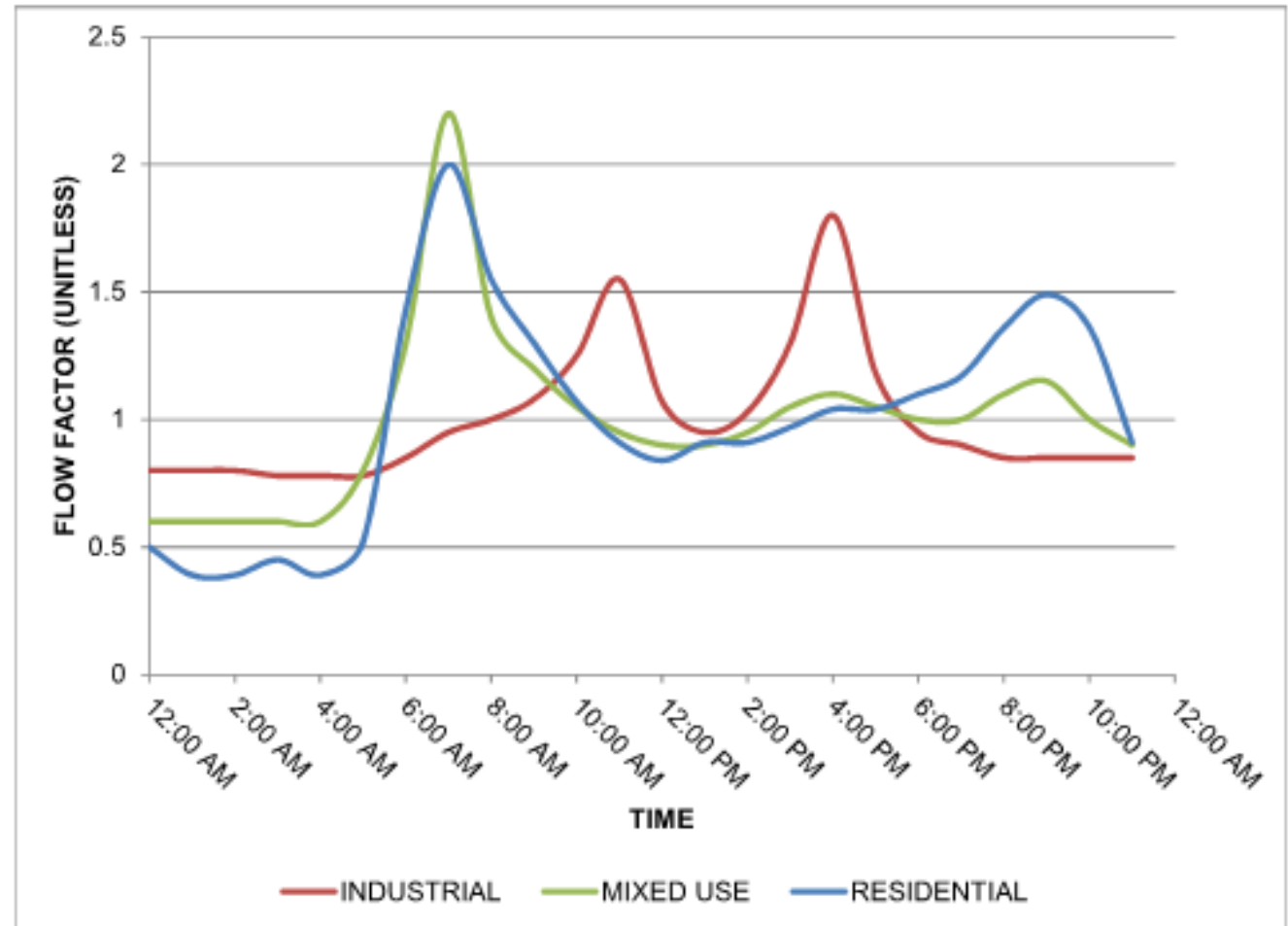


FIGURE 4-2 DIURNAL CURVES

WASTEWATER FLOW DATA

I & I

Infiltration: ground water that seeps into the sanitary sewer through cracks or joints.



Continuous Seepage
0.4 MGD

Inflow: rain water that enters the sanitary sewer through holes in manhole covers, catch basins, or improper plumbing connections.



Rain Event Driven
2.0 MGD

ESTABLISHING PEAK DAY DEMAND

- ▶ Equivalent Residential Units – ERU's
 - Wastewater Loading of a Residential Unit



- Average Indoor Water Use – winter month records
 - ▶ Measured = 172 gpd/ERU

Metered Data

- ▶ Calculated **Peak** Day Demand
- ▶ Industry Standard
- ▶ **This Master Plan**

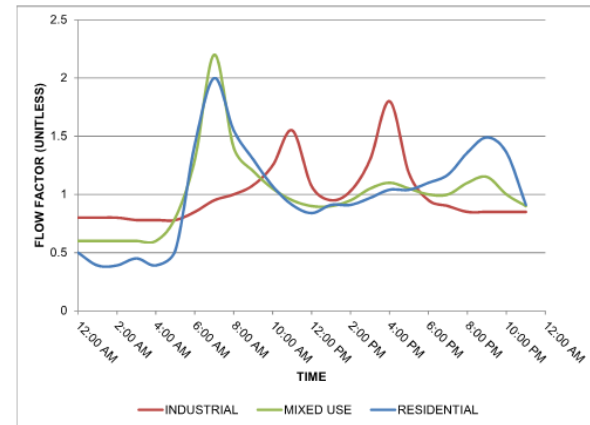


FIGURE 4-2 DIURNAL CURVES

Metered Flows

$$\begin{aligned} &= 226 \text{ gpd/ERU} \\ &= 250 \text{ gpd/ERU} \\ &= \mathbf{250 \text{ gpd/ERU}} \end{aligned}$$

EXISTING **PEAK** FLOW SUMMARY

► Existing Peak Flow Summary

◦ Existing Development	4.4 MGD
◦ Infiltration	0.4 MGD
◦ Inflow	<u>2.0 MGD</u>
Total	6.8 MGD
Nestle	<u>0.7 MGD</u>
	7.5 MGD



9.2 MGD –
Current WRF
Peak Capacity

FUTURE MODELING CRITERIA

- ▶ System Culinary Water Use – Winter Months
- ▶ Diurnal Curves
- ▶ Peaking Factors
- ▶ Inflow & Infiltration
- ▶ Current Land Use/Zoning
- ▶ Pipe Capacity

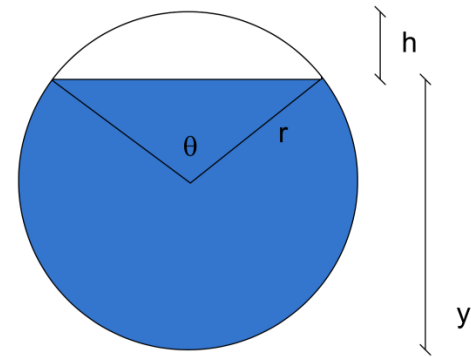


Figure 3: water in circular pipe of depth y exceeding radius

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- ▶ Lift Station Pumping Rates

GROWTH PROJECTIONS

► ERU Densities

Land Use Type	Land Use Density ERUs/Acre
Agriculture	10
Commercial	5
Commercial/Residential Option	5
Industrial / Manufacturing	3
Low Density Residential	3
Medium Density Residential	10
Medium High Density Residential	15
Medium Low Density Residential	5
Medium Low Density Residential / Commercial	5
Mixed Use	5
Parks	2



GROWTH PROJECTIONS

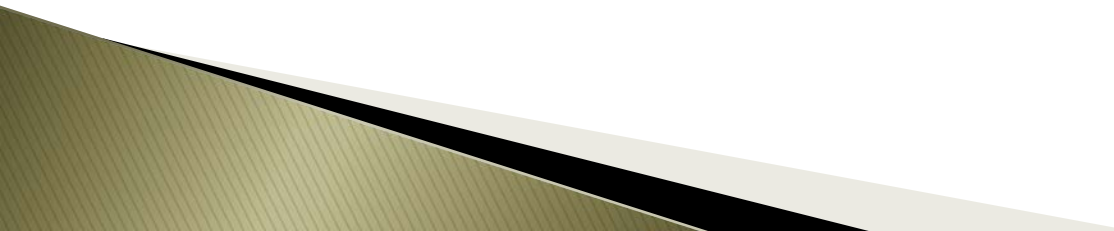
► Projected **Peak** Hydraulic Loadings (MGD)

Planning Period	Peak Hydraulic Loading*
Existing Conditions	6.8
2038	9.3
2060	11.0

*Including infiltration (0.4 MGD) and inflow (2.0 MGD).

Above numbers do **NOT** include Nestle flows at 0.7 MGD

Current WRF **Peak** Capacity 9.2 MGD



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FUTURE FLOW PROJECTIONS

MAJOR LIFT STATIONS

TABLE 5-4 PUMP STATION FLOW RATE PROJECTIONS

Item	Pump Station	Capacity	Existing Modeled Peak Flow	2038 Modeled Peak Flow	2060 Modeled Peak Flow
1	Valtek	500 gpm	370 gpm	370 gpm	380 gpm
2	Westfields	1,800 gpm	740 gpm	1,650 gpm	2,080 gpm
3	1500 West	1,400 gpm	900 gpm	1,670 gpm	2,270 gpm
4	Oakbrook	700 gpm	630 gpm	640 gpm	720 gpm