Wastewater Master Plan Update

Prepared For:

Mission Springs Water District

2025

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Acknowledgements

We appreciate the combined efforts of the entire project team in the development and preparation of the Master Plan. Our project team includes District staff and consulting staff.

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Special Acknowledgements

This Master Plan Update uses information developed by Michael Baker International along with Mission Consulting Services and Dopudja & Wells Consulting. While the Draft Master Plan was submitted by Michael Baker International in 2022, significant changes were made by Mission Consulting Services and Dopudja & Wells Consulting to produce the final documents herein.

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LIST OF ACRONYMS AND ABBREVIATIONS

To conserve space and to improve readability, the following abbreviations are used in this report.

ADWF	Average Dry Weather Flow
BWF	Base Wastewater Flow
CIP	Capital Improvement Program
CSWRCB	California State Water Resources Control Board
CVWD	Coachella Valley Water District
Desert Crest WWTP	Desert Crest Wastewater Treatment Facility
District	Mission Springs Water District
Dos Palmas LS	Dos Palmas Lift Station
DWA	Desert Water Authority
EPA	U.S. Environmental Protection Agency
fps	Feet per Second
GPD	Gallons per Day
GPM	Gallons per Minute
GQPP	Groundwater Quality Protection Program
GWI	Groundwater Infiltration
Horton WWTP	Alan L. Horton Wastewater Treatment Facility
MG	Million Gallons
mg/L	Milligrams per Liter
MGD	Million Gallons per Day

MSWD	Mission Springs Water District
N	Nitrogen
Nancy Wright RWRF	Nancy Wright Regional Wastewater Reclamation Facility
NPDES	National Pollutant Discharge Elimination System
POTWs	Publicly Owned Treatment Works
PDWF	Peak Dry Weather Flow
PWWF	Peak Wet Weather Flow
RTS	Return-to-Sewer
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
WDRs	Waste Discharge Requirements

Executive Summary

ES.1 Purpose

The primary objective of this 2024 Sewer System Master Plan is to update the Mission Springs Water District's (District) sewer system use characteristics and collection system hydraulic model, evaluate the sewer system under various flow conditions, identify system improvements needed to accommodate existing and future sewer flow, and recommend a Capital Improvement Program (CIP). The 2024 Sewer Master Plan is a tool for the District to help make decisions on implementing collection system improvements to provide reliable and efficient sewer service to its existing and future customers. The 2024 Sewer Master Plan has a 20-year planning horizon through year 2045.

ES.2 Existing Collection System

The District currently has two wastewater treatment facilities (with a third facility substantially complete and scheduled to be made operational soon) and a lift station. The wastewater facilities included the Horton Wastewater Treatment Facility (Horton WWTP) and the Desert Crest Wastewater Treatment Facility (Desert Crest WWTP). Each treatment facility treats flows from a separate portion of the collection system. The Horton WWTP is the primary treatment facility that handles most of the wastewater in the service area. The Dos Palmas Lift Station (Dos Palmas LS) was constructed to convey wastewater to the Horton WWTP from a growing residential area south and down gradient of the Horton WWTP. However, the Dos Palmas LS is planned to be redirected from the Horton WWTP and deliver flows to the Nancy Wright Regional Wastewater Reclamation Facility (Nancy Wright RWRF).

The District currently has approximately 120 miles of sewer gravity mains, most of which have been constructed in the past two decades. Most existing sewer gravity mains are located within the City of Desert Hot Springs. There are currently a significant number of septic systems within the sewer service area. As these septic systems are converted to sewer system service, the amount of gravity mains required in the collection system will increase. Development within the service area will also increase the size of the collection system. The existing collection system is detailed in **Chapter 2**.

The third wastewater treatment facility that will soon be operational is the Nancy Wright RWRF. This treatment facility will expand the District's treatment capacity and provide treatment capacity for homes and businesses currently using a septic system that are to be connected to the MSWD collection system. The Nancy Wright RWRF will also be able to take some flow currently being treated at the Horton WWTP, thereby extending the life of that facility. Information on the Nancy Wright RWRF can be found in **Chapter 3**.

ES.3 Existing and Future Collection System Flows

Empirical data was used to develop existing wastewater flows for the 2024 Sewer Master Plan. The majority of this data was captured at the influent to the Horton WWTP. Additional data was gathered during a temporary flow monitoring study. MSWD contracted directly with a flow monitoring firm, ADS Environmental, to complete a temporary flow monitoring study at three locations in the collection system. The results from this temporary study were used to evaluate the flows in isolated portions of the collection system that allowed for the development of unit generation and per capita wastewater generation rates. The resulting existing flows are shown in Table ES.1 for Average Dry Weather Flows (ADWF), Peak Dry Weather Flows (PDWF), and Peak Wet Weather Flows (PWWF).

Table ES.1 – MSWD Existing Wastewater Flows

	Horton WWTP (MGD)	Desert Crest (MGD)	Total (MGD)
ADWF	2.06	0.06	2.12
PDWF	3.58	0.10	3.68
PWWF	5.58	0.16	5.74

Future flows in the District's collection system were developed for both future development areas and for septic conversion areas. Nearly 4.0 MGD of new ADWF is projected to be added through development, and another 0.9 MGD of ADWF is projected to be added through septic conversion. More discussion of existing and future flows within the District's sewer service area can be found in **Chapter 4**.

ES.4 Collection System Evaluation

The collection system was evaluated under various existing and future (2045) conditions using the calibrated collection system hydraulic model. The planning criteria used for evaluating the collection system is discussed in **Chapter 5**. The results of the existing collection system evaluation are presented fully in **Chapter 6**. The results of the future collection system evaluation are presented fully in **Chapter 7**.

The results of the hydraulic evaluation of the collection system indicate the following in summary:

- A small number of existing gravity mains require upsizing for higher capacity, both for existing flows and for future projected flows.
- New gravity mains are required to convey future development flows and future flows from septic conversion.
- The Desert Crest WWTP will be abandoned, and the flows tributary to it will be conveyed to treatment via a new lift station.
- The Dos Palmas LS will require improvement in capacity and reconfiguration to convey flows to the Nancy Wright RWRF.

ES.5 Capital Improvement Program (CIP)

The 2024 Sewer Master Plan developed a collection system CIP with infrastructure projects divided into five-year increments (phases), starting with 2025 and ending in 2045. Each project is classified as:

- Gravity Main Improvements
- Lift Station/Force Main Improvements

These improvement projects are summarized in Table ES.2.

Table ES.2 – Summary of Master Plan CIP Projects

Type	Projected 2025 Project Costs	Projected 2030 Project Costs	Projected 2035 Project Costs	Projected 2040 Project Costs	Projected 2045 Project Costs	*Total by Type*
Gravity Main	$9,971,100	$6,106,100	$15,228,300	$1,985,400	$1,211,100	$34,502,000
Lift Station/ Force Main	$7,971,200	$-	$20,306,500	$-	$-	$28,277,700
Total by Phase	$17,942,300	$6,106,100	$35,534,800	$1,985,400	$1,211,100	$62,779,700

Additionally, projects were developed for ongoing rehabilitation and repair of the collection system. The budget for a gravity main inspection program is presented in Table ES.3.

Table ES.3 – Gravity Main Inspection Project Budget CIP

Description	2025	2030	2035	2040	2045
Annual Inspection	$158,400	$166,400	$177,700	$179,300	$180,500
Total Inspection by Phase	$792,000	$832,000	$888,500	$896,500	$902,500

The results of the inspection program will direct the District in prioritization of gravity mains for rehabilitation and repair. The projected rehabilitation and repair budgets for a gravity main rehabilitation and repair plan are presented in Table ES.4.

Table ES.4 – Gravity Main Rehabilitation and Repair Budget CIP

Description	2025	2030	2035	2040	2045
Annual Rehabilitation and Repair	$443,800	$372,960	$298,200	$201,040	$202,160
Total Rehabilitation and Repair by Phase	$2,219,000	$1,864,800	$1,491,000	$1,005,200	$1,010,800

The details of the CIP developed for the sewer system as part of the 2024 Sewer Master Plan can be found in **Chapter 8**.

Chapter 1 Introduction

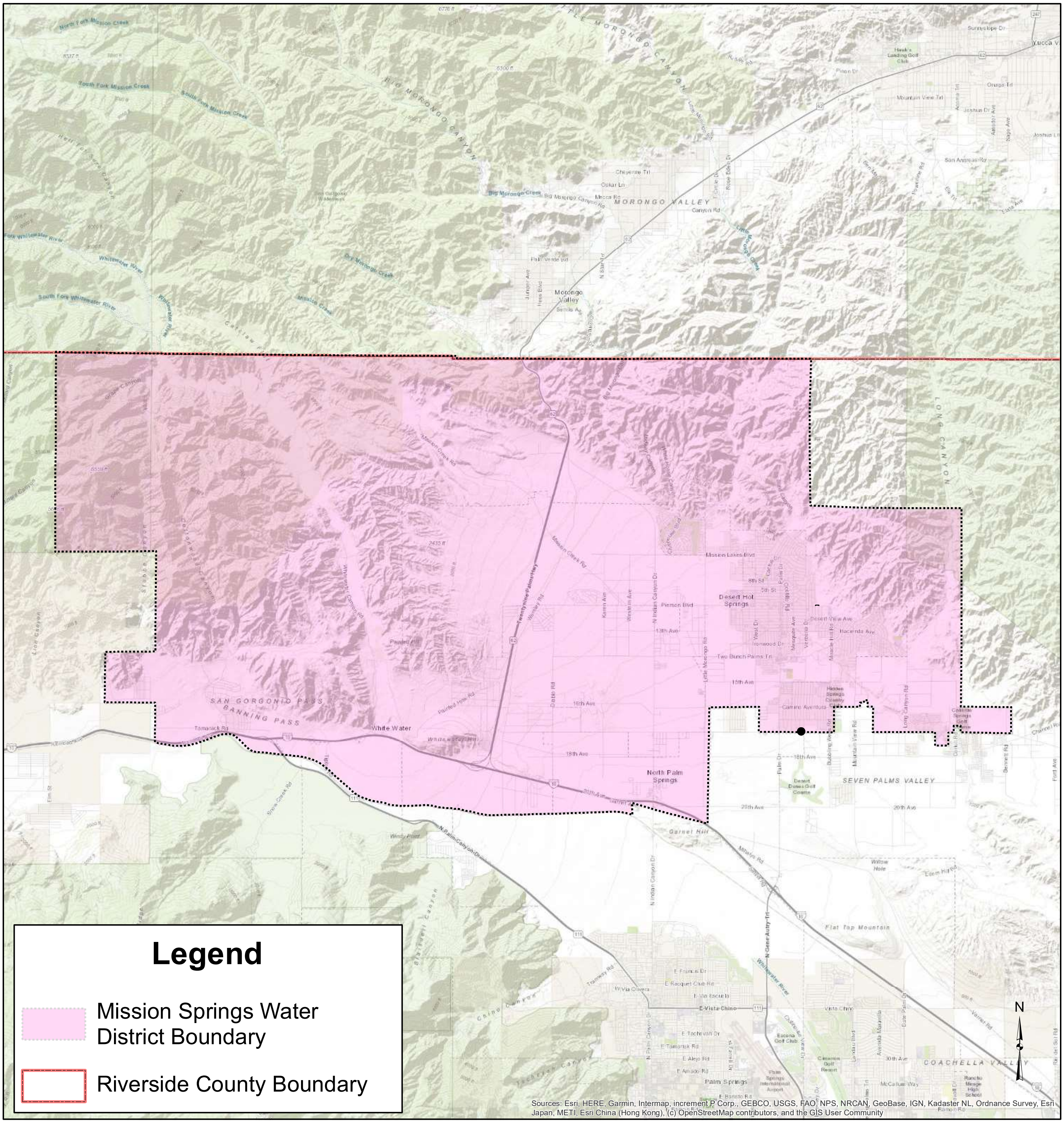
1.1 General Description

The growth and development of Desert Hot Springs, California, led to the establishment of Old Mutual Water Company. Old Mutual Water Company provided groundwater to the community and, in 1948, was incorporated into Desert Hot Springs Water Company. Desert Hot Springs Water Company was purchased by the Desert Hot Springs County Water District. The name Mission Springs Water District (MSWD, District) was established in 1987. The District is located within the northeast portion of Riverside County and the Coachella Valley geographic region (Figure 1.1).

As described above, MSWD was formed in response to a significant burst of development in the Coachella Valley circa 1940, resulting in an overall need for unified wastewater systems. Since its formation, the District has grown to a service area of approximately 135 square miles. It serves approximately 6,000 customers with its sewer collection system across the City of Desert Hot Springs and in unincorporated areas of Riverside County.

The District's early wastewater treatment process relied entirely on septic tanks until the Alan L. Horton Wastewater Treatment Facility (Horton WWTP) was constructed in 1973. This WWTP was accompanied by a typical gravity line collection system and has been expanded four times over its lifespan to meet the growing demands of the service area. The Horton WWTP treats the average daily flow of 2.09 MGD of wastewater. This accounts for an overwhelming majority of the service area's wastewater generation. Additionally, the overall sewer collection system has expanded to include the Desert Crest Wastewater Treatment Facility (Desert Crest WWTP), constructed in 1974 to service a small neighborhood in the southeastern portion of the District. The Dos Palmas Lift Station (Dos Palmas LS) was built in 2005 to deliver wastewater from a developing area south and down gradient of the Horton WWTP. However, the Dos Palmas LS is planned to be redirected from the Horton WWTP and deliver flows to the Nancy Wright Regional Wastewater Reclamation Facility.

The District has continued to improve treatment capacity in the service area, and the Nancy Wright Regional Wastewater Reclamation Facility (Nancy Wright RWRF) is substantially complete and will be brought online shortly. The Nancy Wright RWRF is described further in Chapter 3 of this document. Currently, the District is converting all legacy septic systems into connections to the sewer collection system as part of its Groundwater Quality Protection Program (GQPP). The GQPP has an anticipated completion year of 2029.



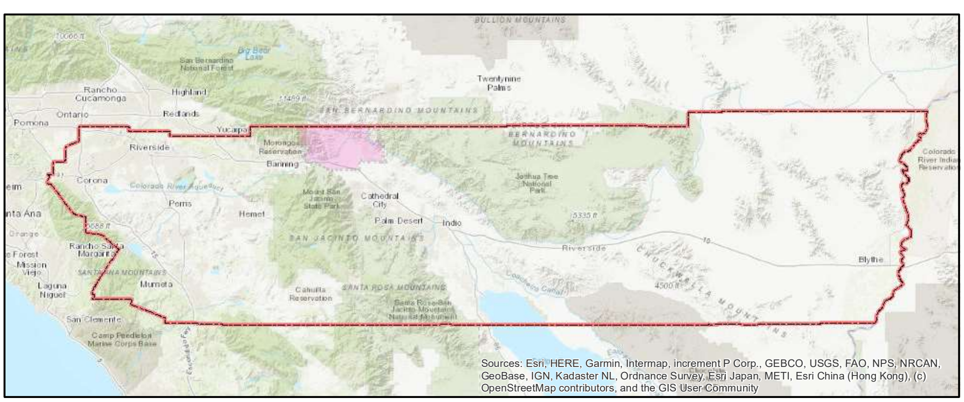


Figure 1.1 - Mission Springs Water District Region

MSWD's service area has experienced a substantial population increase over the past few decades, growing by 32% since the completion of the 2007 Wastewater Master Plan. This growth, along with ongoing development within the District, necessitates an updated sewer master plan. The 2024 Sewer Master Plan incorporates revised population projections and future wastewater flows, recognizing the importance of the rapid conversion of legacy septic systems to protect the underlying groundwater, which is the sole source of potable water for MSWD.

1.2 Purpose, Goals, & Expectations

The 2024 Sewer Master Plan Report will be a high-level planning document to guide the District's future capital improvement endeavors. The existing sewer collection systems have been documented and researched to create a baseline inventory of all sewer-related assets. These facilities and assets were analyzed with hydraulic modeling software; the remaining life-risk-based condition assessments provided the District with capital improvement program recommendations grouped in five-year increments based on priority for future improvements or expansions. These recommendations have been compiled in Chapter 8 Capital Improvement Program of this document.

1.3 Regional Context

MSWD's sewer collection and treatment systems have impacts on neighboring water and sewer providers, including the Coachella Valley Water District (CVWD), and Desert Water Agency (DWA). As a result, significant improvement decisions impacting regional groundwater, wastewater effluent quality, wastewater treatment facility odor, etc., have been incorporated within this document's analysis.

Consideration was given to all wastewater collection and treatment system analyses related to the Nancy Wright RWRF. At the time of this publication, the Nancy Wright RWRF is substantially complete and will be operational shortly.

1.3.1 Population

Table 1.1 shows the historical population growth within the MSWD service area over the past 25 years and the expected population growth in the next 20 years. MSWD's service area encloses the City of Desert Hot Springs and some areas of the County of Riverside. The 2007 Wastewater MP was used to determine the historical population. The 2020 Coachella Valley Regional UWMP shows that the MSWD service area serves a population of about 39,000 people. According to the 2020 Coachella Valley Regioanl UWMP, the MSWD Service Area is expected to rapidly increase over the next 20 years to a population of approximately 72,000 residents. These estimates are used to determine future wastewater flows.

Table 1.1 – Historic and Projected Population

Year	Population
1990	19,500
2000	26,100
2005	32,900
2010	35,738
2015	38,987
2020	38,962
2025	49,081
2030	54,414
2035	59.747
2040	66,064
2045	72,380

Note

1) Historical Data from 2007 Wastewater MP
2) Future Projections based on the Coachella Valley Regional 2020 UWMP

1.3.2 Land Use

The service area of MSWD is a developing area consisting of a mix of residential, commercial, and open space lands. As a developing area, the MSWD service area currently contains a large portion of undeveloped vacant land.

1.4 Regulatory and Environmental Consideration

All analysis and design criteria have been considered and abided by all regulations set forth by the U.S. Environmental Protection Agency (EPA), California State Water Resources Control Board (CSWRCB), and other relevant regulating bodies.

1.5 Study Area & Period

The scope of the 2024 Sewer Master Plan and the related CIP recommendations are limited to the District's established service area as of 2022. However, much supporting information has been sourced from publications in the greater Coachella Valley geographic region and Southern California. The 2022 MSWD sewer service area includes all portions of the City of Desert Hot Springs, parts of Palm Springs Crest, West Palm Springs Village, West Garnet, and several unincorporated areas of Riverside County.

The scope of this report and the related CIP recommendations are limited to the District's established service area as of 2022. However, much supporting information, has been sourced from publications in the greater Coachella Valley geographic region and Southern California. The 2022 MSWD wastewater service area includes all portions of the City of Desert Hot Springs, parts of Palm Springs Crest, West Palm Springs Village, West Garnet, and several unincorporated areas of Riverside County. (Figure 1.2)

Periods considered in this report vary significantly by context and purpose. While wastewater generation projections have been considered up to the 2040 planning year, other elements of time-sensitive information, such as rainfall data, have been sourced to align with the data generated by the District's supervisory control and data acquisition (SCADA) systems. All decisions involving the selection of periods for analysis were made collaboratively with District staff.

Chapter 2 Existing Infrastructure

2.1 General Description

This chapter describes the existing collection, conveyance, pumping, and treatment facilities within MSWD's sewer collection system. These facilities include the Horton Wastewater Treatment Facility, Desert Crest Wastewater Treatment Facility, the Dos Palmas Lift Station, and 120 miles of gravity mains. As noted above and detailed in Chapter 3, the Nancy Wright RWRF is substantially complete and will soon be added to the sewer system.

2.2 Inventory

Collection system facilities are inventoried in the sections below.

2.2.1 Facilities

The District currently has two wastewater treatment facilities (with a third facility substantially complete and scheduled to be made operational soon) and a lift station. The wastewater facilities included the Horton Wastewater Treatment Facility (Horton WWTP) and the Desert Crest Wastewater Treatment Facility (Desert Crest WWTP). Each treatment facility treats flows from a separate portion of the collection system. The Horton WWTP is the primary treatment facility that handles most of the wastewater in the service area. The Dos Palmas Lift Station (Dos Palmas LS) was constructed to convey wastewater to the Horton WWTP from a growing residential area south and down gradient of the Horton WWTP. However, the Dos Palmas LS is planned to be redirected from the Horton WWTP and deliver flows to the Nancy Wright RWRF. Figure 2.1 shows the location of these facilities in the MSWD service area.

Federal regulations on water discharges protect water quality standards and control pollutant discharges. The California Regional Water Quality Control Board (CRWQCB) sets the requirements for each wastewater treatment plant discharge. These requirements are further explained in the description of each treatment facility and detailed in the National Pollutant Discharge Elimination System (NPDES) permit for each facility.

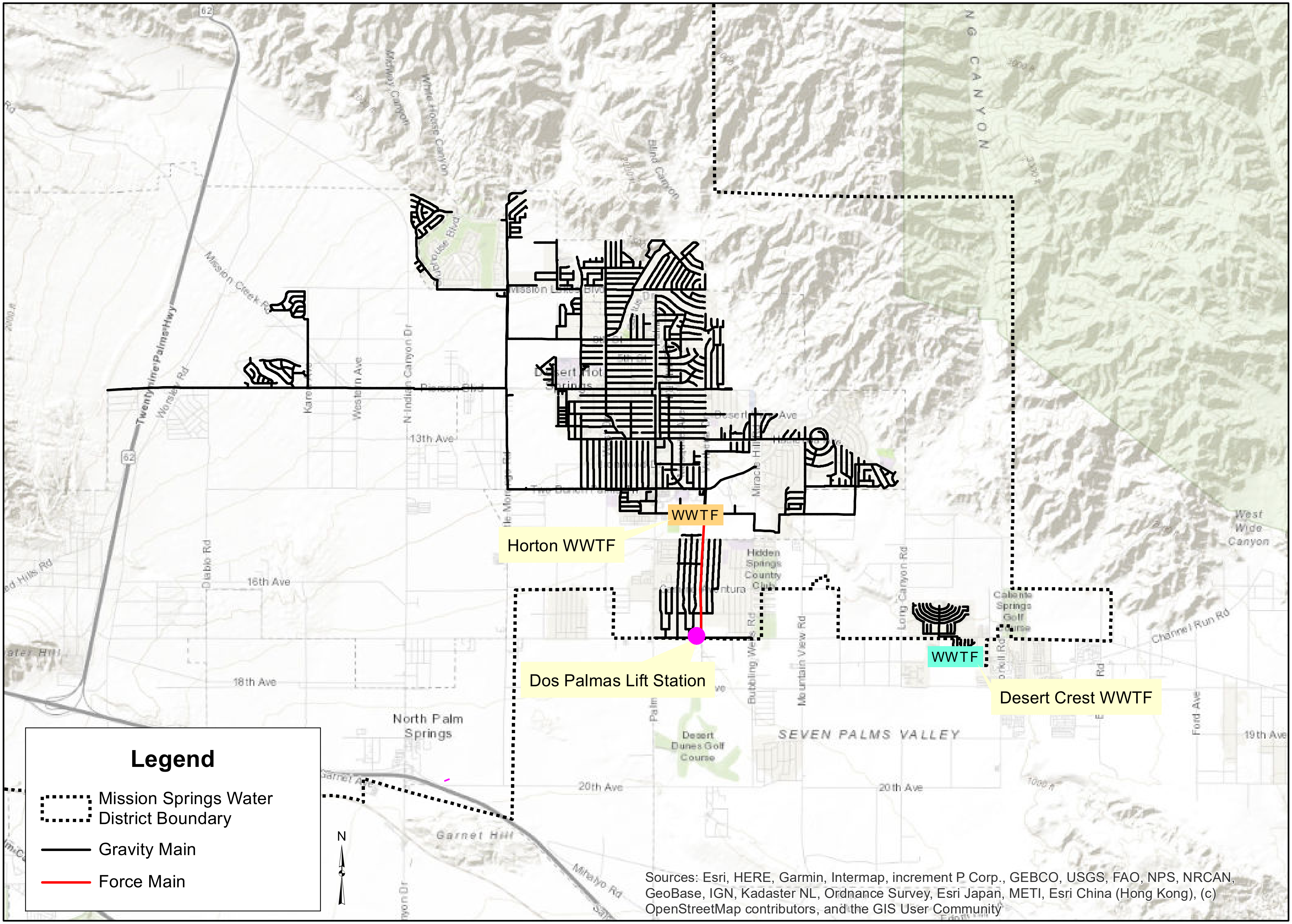


Figure 2.1 - Existing Sewer Facilities

2.2.2 Horton WWTP

The Horton WWTP is a conventional wastewater treatment facility located in the southern portion of the City of Desert Hot Springs near the intersection of Park Lane and Verbena Drive. The facility was constructed in 1973 and could treat 0.20 MGD at the time of initial construction. The latest expansion of this facility was completed in the early 2000s with the addition of Carousel Oxidation Ditches. The total capacity of the existing Horton WWTP was increased to 2.44 MGD with this expansion. Based on the facility's monthly treatment records from 2017 to 2021, the facility treated an average of 2.09 MGD. The facility includes a grit chamber, aeration basins, clarifiers, belt filter press, and eight percolation ponds. The Horton WWTP consists of the following primary treatment processes and major-related equipment:

- Rated treatment capacity – 2.44 MGD
- Preliminary Treatment – Influent pumps, grinder, magnetic flow meter, grit chamber, and flow splitter.
- Walker Process concentric aeration basin, reaeration basin, and final clarifier contact stabilization unit – 0.20 MGD capacity (currently off-line).
- Two extended aeration oxidation ditch basins with brush aerators and circular clarifiers – 0.26 MGD capacity each.
- One extended aeration oxidation ditch basin with brush aerators and circular clarifier – 0.42 MGD capacity.
- Two extended aeration Carousel® oxidation ditch basins each with an estimated capacity of 0.75 MGD and two final clarifiers with 0.26 MGD capacity.

Effluent from the biological treatment process is conveyed to eight infiltration ponds where treated effluent percolates into the ground. Grit is removed and hauled to the landfill for disposal. Biosolids are delivered to one (1) 2-meter Belt Filter Press, with dried biosolids being hauled off-site by a private contractor (Synagro Ecology Auto Parts) to either land application or a composting facility for subsequent reuse. Biosolids are currently being transported to a disposal area. The biosolids leaving the plant comply with EPA Part 503 Sub Class B requirements. The filtrate from the Belt Filter Press is returned to the headworks for treatment.

Both the Horton WWTP and the Desert Crest WWTP treated wastewater effluent streams are discharged to recharge the groundwater aquifer via percolation ponds. These same aquifer(s) are a source of MSWD drinking water supplies. Therefore, nitrate discharge to the aquifer is not allowed to exceed the Safe Drinking Water Act maximum contaminant level of 10 mg/L as nitrogen (N). The 2007 MSWD WWMP identified the report entitled "Evaluation of the Source and Transport of High Nitrate Concentrations in Ground Water, Warren Subbasin, California" (USGS Water

Investigation Report 03-4009, 2003) as being referenced by the CRWQCB with regard to nitrogen discharge requirements in several geographic areas of California. In summary, the 2007 MSWD WWMP indicated that Report 03-4009 identifies septic tanks and irrigation returns as increasing the nitrate levels in the Warren Subbasin's groundwater. Point source discharges, including publicly owned treatment works (POTWs), were not explicitly identified as sources of nitrates. Nevertheless, the latest California Waste Discharge Requirements (WDRs) require nitrogen discharge requirements. A Nitrate Compliance Study was completed by MSWD.

Based upon historical results provided by the District, the Horton WWTP's influent contained a monthly average of 281 mg/L BOD and an average of 197 mg/L TSS between April 2020 to June 2021. The treated effluent water quality parameters and standards are shown in Table .

Table 2.1 – Horton WWTP Average Effluent Concentrations

Contaminant	Average Effluent Concentration (mg/L)	Monthly Average Limit (mg/L)	Weekly Average limit (mg/L)
BOD	19.21	30	45
TSS	8.55	30	45
DO	4.28	N/A	N/A
TDS	639.36	The increase in TDS shall not exceed 400 mg/L of the influent.	
Nitrate as N	1.29	10	10
T Nitrogen	20.91	45	45

Information is taken from the following:

- Effluent concentration from MSWD 2020 Horton WWTP's Log
- California Regional Water Quality Board, Waste Discharge Requirements for MSWD Alan L. Horton Wastewater Treatment Plant, WQCB

2.2.3 Desert Crest WWTP

The Desert Crest WWTP is a conventional wastewater treatment facility located at the end of Sunset Road, behind the Dillion Mobile Home Park. This facility was constructed in 1974 to service the wastewater generated from the Desert Crest Country Club and the Dillion Mobile Home Park. The original treatment facility could treat up to 90,000 GPD and was expanded in the mid-1980s to treat 180,000 GPD. This treatment facility is located near the southeastern border of the MSWD service area. Based on the monthly records for the treatment facility, the average influent flow for this treatment plant is 0.044 MGD. The facility includes a bar screen, two treatment tanks, three percolation ponds, and six drying beds. The average flow has not changed significantly over the past few decades. The Desert Crest WWTP influent records between April 2020 to June 2021 indicated an average influent BOD of 251 mg/L and a TSS of 231 mg/L. The treated effluent water quality parameters and standards are shown in Table 2.2.

Table 2.2 – Desert Crest Effluent Average Concentrations

Contaminant	Average Effluent Concentration (mg/L)	Monthly Average Limit (mg/L)	Weekly Average Limit (mg/L)
BOD	8.37	30	45
TSS	9.27	30	45
DO	5.13	N/A	N/A
TDS	709.18	The increase in TDS shall not exceed 400 mg/L of the influent.	
Nitrate as N	35.60	10	10
T Nitrogen	34.64	45	45

Information is taken from the following:

- Effluent concentration from MSWD 2020 Horton WWTP's Log
- California Regional Water Quality Control Board, Waste Discharge Requirements for MSWD Desert Crest Wastewater Treatment Plant, WQCB (Appendix J)

2.2.4 Dos Palmas LS

The original Dos Palmas LS was initially constructed in 1987 to convey flows from the areas south and down gradient of the Horton WWTP to this treatment facility. The current Dos Palmas LS replaced the original facility in the mid-2000s. The lift station is located near the intersection of Dillion Road and Avenida Manzana. The lift station includes a 30-foot deep below-grade wet well equipped with two 60 HP submersible pumps, each with a 700 GPM capacity. A 7,000 linear foot force main connects the Dos Palmas LS to the Horton WWTP.

The future configuration of the collection system requires the ability to convey flow from Dos Palmas LS to the Nancy Wright RWRF once that facility is operational. Toward that end, the Dos Palmas LS has recently been connected hydraulically to the Nancy Wright RWRF via 5,000 feet of force main and 10,000 feet of gravity main. There is operational flexibility such that flow can either be pumped to the Horton WWTP or to the Nancy Wright RWRF. Further detail concerning the configuration of the collection system in the future can be found in Chapter 7 of the 2024 Sewer Master Plan.

2.2.5 Collection System

The historical method for dealing with sewer flows generated in the MSWD service areas was on-site septic systems. Some septic systems, clustered into specific areas, are still active in the service area. There were over 5,000 septic systems on record with MSWD as of 2012. Most are active year-round, with the remaining operated seasonally when part-time residents occupy dwellings during the mild winters. Because the underlying thermal and cold groundwater sub-basins are an essential asset to the area for recreational spas and for the only water supply source for MSWD, the District is currently executing a program to convert all residences that use legacy septic systems. This Groundwater Quality Protection Program is focused on connecting these residences to the centralized sewer collection system. The program has been ongoing for over a decade and is planned to be continued until all legacy septic systems are abandoned and the sewer collection system services are connected to all residences. The remaining septic areas are identified on Figure 2.2. The proposed infrastructure to connect these areas to the collection system is identified later in the 2024 Sewer Master Plan.

The District currently has approximately 120 miles of sewer gravity mains, most of which have been constructed in the past two decades. Most existing sewer gravity mains are located within the City of Desert Hot Springs. The District plans to expand the collection system and build new sewer infrastructure in areas identified for development and septic conversion.

The District is expected to nearly double its population by 2045. As a result, significant infrastructure will be required to serve development. The District plans to construct another treatment facility, described further in Chapter 3 of this document. The new treatment facility is projected to treat the additional wastewater flow generation that is expected from the expansion of the sewer collection system due to the completion of the Groundwater Quality Protection Program, as well as future development and population growth.

2.2.6 SCADA System

The District operates on a SCADA system for data collection, monitoring, and controlling the Dos Palmas LS and the Horton WWTP. The planned Nancy Wright RWRF will also be connected to the SCADA system. The information collected by SCADA includes the flow metering pump status and water surface levels at 30-second intervals. The Desert Crest WWTP is not connected to the SCADA system but has local data loggers on-site that record daily flow and concentration measurements, including BOD, TSS, SVI, F/M ratio, and other essential variables to operate the treatment facility. The data collected by SCADA and data loggers at the plants

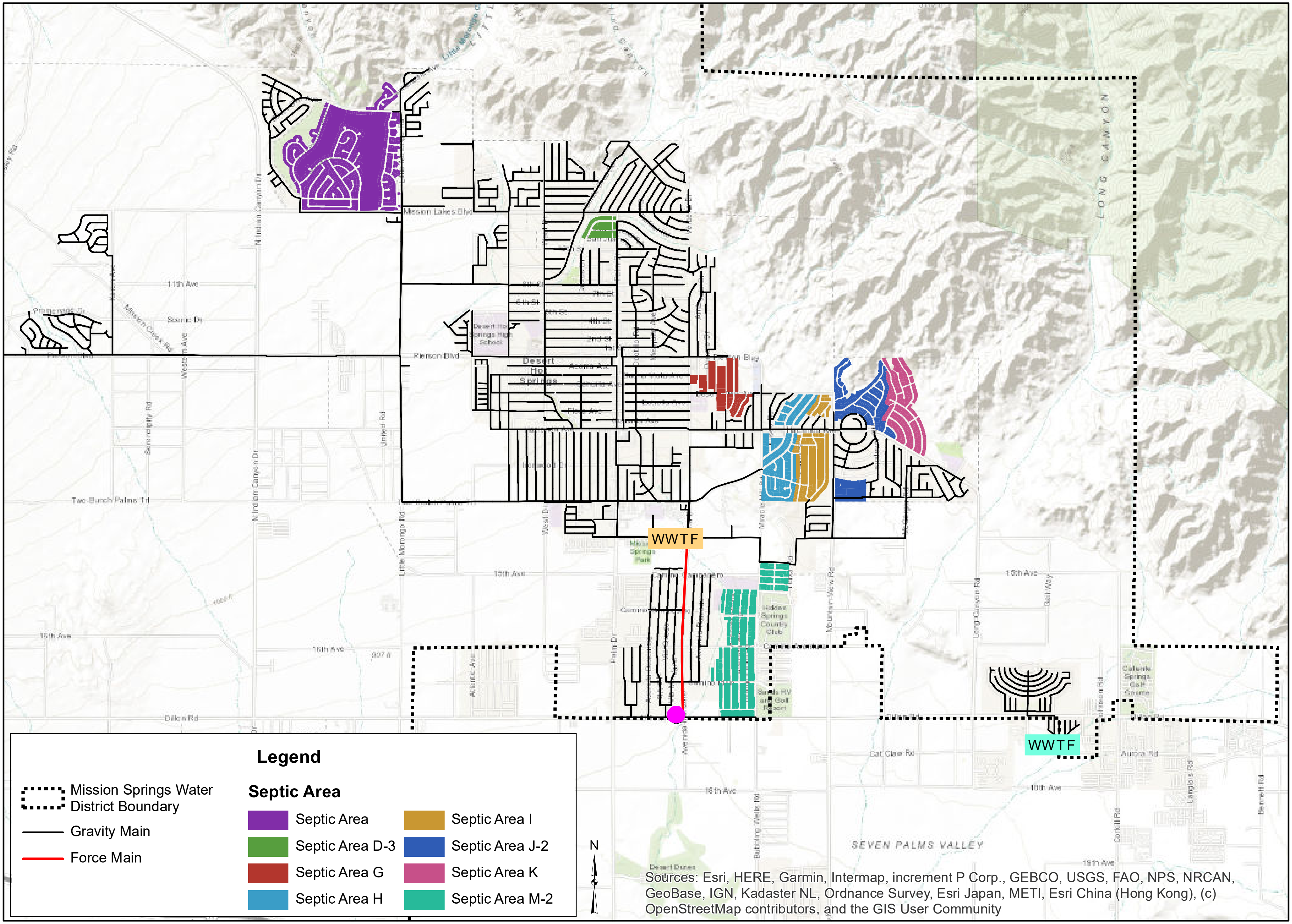


Figure 2.2 - Septic Conversion Areas

supported the development and calibration of the model of the District's sewer collection facilities presented in this Sewer Master Plan.

2.3 Summary List Of Sewer Assets

A list of the District's sewer assets was created by MBI to identify the most current data and information for sewer infrastructure. This asset list was then further associated with the essential characteristics of each asset. The site visit, hydraulic model analysis, pump system efficiency analysis, and age analysis were also used to develop and discover information in the asset list. This list was used to help establish the CIP projects and allowed determination the CIP project criticality. The development of the CIP is described in more detail in subsequent chapters of the 2024 Sewer Master Plan.

The MBI team conducted a site visit to survey the typical sewer system facilities in the District. Site visits were organized and facilitated by the MSWD Operations and Maintenance staff. This site visit supported the determination of the improvements needed for each facility as part of a risk assessment.

As described above, the District has the following facilities: the Horton WWTP, the Desert Crest WWTP, the Dos Palmas LS, and 120 miles of horizontal infrastructure that include the existing gravity mains and manholes. The following tasks were performed to determine the asset list attributes for the above assets:

- A site visit assessed the condition of the wastewater treatment facilities and lift station.
- Hydraulic modeling of the District's current and proposed future collection system was performed. The hydraulic evaluation is detailed in Chapter 6 and Chapter 7.
- A remaining life assessment of the District's gravity mains was performed.
- Efficiency test data was reviewed.
- Operations report data was reviewed.

A summary of the asset list with assessment can be found in Table 2.4 below.

2.3.1 Site Assessment

A site visit of the District's wastewater treatment facilities and lift station was conducted on July 1, 2021. The District outlined its planned system improvements and limitations during the site visit.

2.3.2 Hydraulic Modeling

Hydraulic modeling of the District's existing and future systems was performed as part of this study. Historical and projected wastewater flows were analyzed and evaluated to determine collection system performance based on system design parameters. For detailed information on the modeling efforts and outcomes, refer to Chapter 6 for the existing system hydraulic analysis and Chapter 7 for the future system hydraulic analysis.

2.3.3 Remaining Life Assessment

A remaining life assessment of the District's sewer collection gravity mains was conducted to determine which pipelines were reaching the end of their useful service life and may need to be replaced. The service life will vary depending on the pipeline's material. The typical service life for pipelines can vary between 40-100 years, depending on the material of the pipeline. Table 2.3 shows the pipeline service life for each pipeline material used in the District's sewer collection system and the linear length of the pipeline for each pipeline material. The service life shown in Table 2.3 is the typical service life for a pipeline. It is recommended that a CCTV inspection be conducted to determine the pipeline's condition when it nears the end of its service life or when problems are observed, such as an increase in maintenance and operational costs. If significant issues are found, pipeline replacement would be necessary before further degrading

Table 2.3 – Gravity Main Service Life and Length by Material

Material	Estimated Service Life	Length in District (miles)
Cast Iron	70	0.01
Ductile Iron	70	0.38
Polyvinyl Chloride	70	1.08
Vitrified Clay Pipe	100*	117.85

Note: Information based on

- Vitrified Clay Pipe Engineering Manuel, NCPI
- Life Cycle analysis for water and Wastewater Pipe Materials, ASCE

Figure 2.3 shows the remaining pipeline service life in the District graphically. The District has many pipelines with 50 to 55 and 80 to 100 years of service life remaining. The District also has approximately 6.5 miles of pipeline with unknown service life. A CCTV inspection should be done on the unknown pipelines to ensure these pipelines do not have any significant deficiencies. The inspections should be a part of the annual operation and maintenance budget. The District does not currently have a pipeline beyond its service life and will not have a pipeline over its typical service life for the next 30 years. It should also be noted that the VCP pipeline could last much longer than the 100-year lifespan used in this analysis. As a result, it is unlikely that the District will need to replace the pipeline due to its age for several more decades. However, the VCP pipeline is more susceptible to damage from roots, earthquakes, and other external factors. As a result, a budget for VCP pipeline repairs is recommended if the VCP pipelines need to be replaced due to these external factors. Regular CCTV inspections would be required to ensure the integrity of the VCP pipelines.

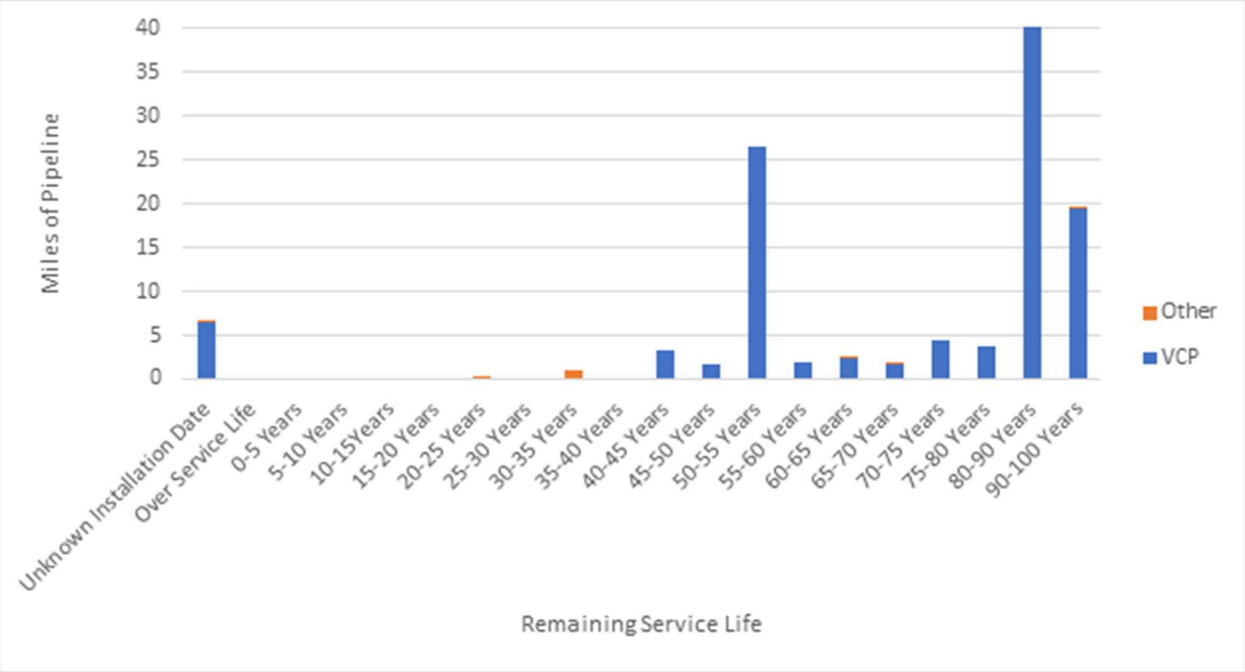


Figure 2.3 – Remaining Pipeline Service Life

2.3.4 Sewer Asset Summary

The asset list developed by MBI with critical data or asset registers is presented in Table 2-4. The asset register includes the list of basic information, comments, and summarized improvements associated with each item. The improvements identified in this summary table are developed and more fully in subsequent chapters of this document.

Table 2.4 – Sewer Asset List Summary

Item	Facilities	Location	Construction Date	Comments/Summarized Improvements
1	Horton WWTP	The Intersection of Park Ln. and Verbena Dr.	1973	• Upgrade of tertiary effluent filters is currently planned. • The Odor control system at the plant headworks was recently completed • VFD Drives need to be installed in Aeration Basin. • Influent chopper pumps recently completed. • Effluent reuse in the future may become objective. Disinfection of tertiary treated effluent may be necessary.
2	Desert Crest WWTP	Behind Dillion Mobile Home Park	1974	• Demolition of Desert Crest WWTP because of the underperformance is pending.
3	Nancy Wright RWRF	The Intersection of Little Morongo and 20th Ave.	Expected online in 2025	• Regional Conveyance Line is needed to connect the Nancy Wright RWRF to the existing collection system is needed and is being implemented. • Phase 1 Plant Capacity is 1.5 MGD • The proposed plant process is a sequence batch reactor • Future expansion Phase 2 will increase plant capacity to 3.0 MGD using MBR filters.
4	Dos Palmas Lift Station	Intersection of Dillion Rd. and Avenida Manzana	1987	Currently, LS capacity is 2x700 (GPM)
5	120 miles of collection system gravity mains	Located throughout District	Varies	• Relocation of manholes on private property. • Some pipelines need to be replaced due to hydraulically deficient pipelines and underperforming VCP sections. • The District is fully converting individual septic systems to a centralized sewer collection system.

Information is based on MBI's site visit conducted on 7/1/21.

Chapter 3 Planned Regional Wastewater Reclamation Facility

3.1 General Description

MSWD is in the process of constructing the Nancy Wright RWRF, capable of treating 1.5 MGD of wastewater. This treatment facility will expand the District's treatment capacity and provide treatment capacity for homes and businesses currently using a septic system that are to be connected to the MSWD collection system. The Nancy Wright RWRF will also be able to take some flow currently being treated at the Horton WWTP, thereby extending the life of that facility.

The Nancy Wright RWRF will be in the south of the MSWD's service area, near the intersection of 20th Ave and Little Morongo Rd. The facility will be a conventional sequencing batch reactor (SBR) wastewater treatment facility with the ability to be expanded if needed. Treated wastewater from the facility will primarily be used to recharge groundwater by infiltration. The facility is expected to be operational by the beginning of 2025.

3.2 Treatment Process and Facilities

The treatment process of the planned facility is described in this section.

3.2.1 Process Layout

Influent to the facility will enter a wet well before being pumped to the headworks. The headworks will comprise two mechanical bar screens and a grit chamber. The odor from the headworks and wet well will be collected using a foul air fan and odor mitigation measures to reduce odors before release. Removed waste from the grit chamber will be sent to a grit washer and grit classifier. Solid waste will be dewatered and screened before being removed and disposed. The remaining wastewater will recirculate through the grit removal chamber. Caustic soda will be added to the grit chamber's effluent and mixed with returning activated sludge before entering the sequencing batch reactor tanks. Four tanks are planned for construction in Phase 1 (three duty and one standby). These tanks will have the ability to be converted to a membrane bioreactor treatment process when the facility is eventually expanded in Phase 2.

Treated water exiting the tanks will enter a decant channel, from which the treated water will either flow to infiltration basins or a hydropneumatic tank. The hydropneumatic tank will store reclaimed water to be used around the Nancy Wright RWRF site (colloquially known as 3-water).

Waste from the SBR tanks will enter an aerated sludge storage tank. Decant will return to the inlet of the facility, while waste will be sent to a belt filter press. The dewatered solids will be removed from the facility, while the remaining waste will be sent to the inlet of the facility. The Nancy Wright RWRF can treat an average of 1.5 MGD, with a peak hour flow of 3.75 MGD. This facility can expand to double its capacity in the same footprint during the Phase 2 expansion, when needed.

3.2.2 Infiltration Basins

The treatment facility is planned to have three infiltration basins with a combined volume capacity of 2.1 million gallons (MG), with the ability to expand to six infiltration basins. These basins will have a maximum length and width of 250 ft, with a slope of 4:1. They will have a bottom elevation of 713.0 ft with an expected high-water level of 715.5 ft. Each basin is expected to have a maximum capacity of 0.7 MG.

3.3 Expected Effluent Quality

Table 3.1 shows the expected influent and effluent concentrations from the Nancy Wright RWRF.

Table 3.1 – WWRF Expected Influent and Effluent Concentrations

Contaminant	Expected Maximum Influent (mg/L)	Expected Effluent (mg/L)
BOD	330	30
TSS	370	30
Total Nitrogen	60	10

Chapter 4 Sewer Collection System Flows

4.1 General Description

This chapter provides an overview of the historical and projected future wastewater flows within the MSWD collection system. Existing flows are calibrated within the hydraulic model of the collection system, and existing and future flows in the hydraulic model are used to identify hydraulic deficiencies within the collection system in future chapters.

Currently, wastewater flows are primarily generated within the City of Desert Hot Springs; such wastewater flows are categorized into single-family residential, multi-family residential, commercial, public, and industrial areas.

4.2 Wastewater Flow Component Description

Collection systems typically convey both sanitary flow, which is the intended use of the collection system, and external flows that enter the collection system infrastructure through defects and imperfections. A realistic evaluation of wastewater flow requires that these components be deconstructed and quantified separately. The detailed flow components that require quantification include:

- Average Dry Weather Flow (ADWF)
- Peak Dry Weather Flow (PDWF)
- Peak Wet Weather Flow (PWWF)

The wastewater flow components described in this section are depicted conceptually on Figure 4-1.

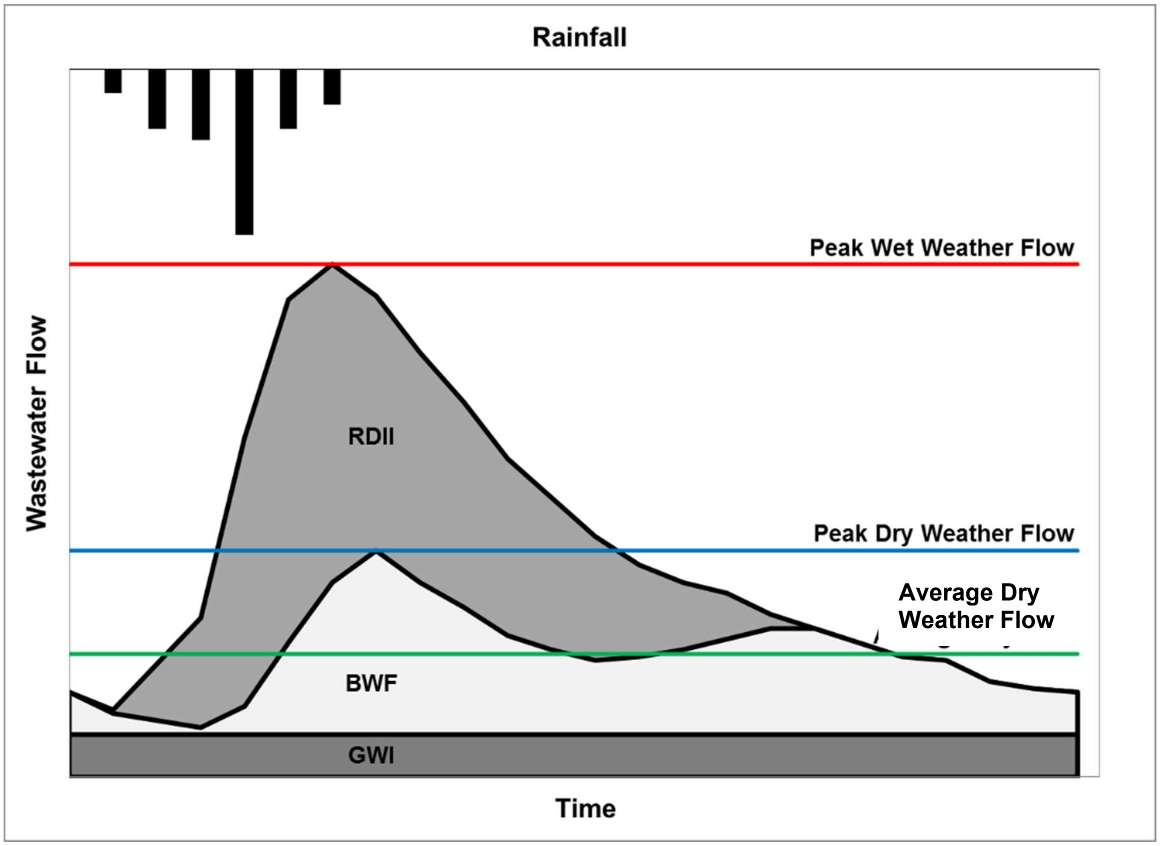


Figure 4-1 Wastewater Components for Typical PWWF Conditions

4.2.1 Average Dry Weather Flow

ADWF is generally accepted to include two components: base wastewater flow (BWF) and groundwater infiltration (GWI). BWF represents the sanitary flow contributions from residential, commercial, institutional, and industrial dischargers to the collection system. GWI refers to groundwater that infiltrates into the collection system via defects in wastewater pipes and manholes. Although GWI rates can be influenced by wet weather events (because wet weather events can impact groundwater levels) GWI is present in dry weather conditions and is therefore a component of dry weather flow. However, GWI can have significant variation seasonally because of the wet weather influence. Despite the seasonal variation, GWI is assumed to be constant for any given day.

In some collection systems, GWI is low enough compared to BWF that it can assumed to be negligible. As will be discussed in more detail below, analysis of flow data in the District's collection system indicates that GWI values are minimal in the District's collection system. Therefore, ADWF in the District's collection system is composed entirely of wastewater generated by the District's customers.

4.2.2 Peak Dry Weather Flow

While GWI tends to remain relatively constant over any given day, BWF varies throughout the day, but typically follows predictable diurnal patterns depending on the type of land use. For example, residential dischargers tend to produce higher flows in the morning and evening hours, while commercial dischargers tend to have steady discharge during business hours, but very low discharge outside of business hours. Industrial dischargers have flow patterns that depend upon their individual processes.

PDWF is defined as the diurnal flow peak within the collection system during dry weather conditions. PDWF is typically 1.2 to 3.0 times the ADWF, depending on the mixture of discharger types and the size and layout of the collection system. Under static evaluation of a collection system, PDWF values are established from ratios to ADWF values calculated via peaking factor or peaking curve. Under dynamic evaluation of a collection system, PDWF values are established by taking the peak value from a flow hydrograph that is created using diurnal patterns within the collection system. Wastewater flows within the District's collection system have been monitored and evaluated dynamically using diurnal patterns as will be described in more detail below.

4.2.3 Peak Wet Weather Flow

PWWF is composed of PDWF and rainfall-dependent inflow and infiltration (RDII). RDII consists of stormwater inflow and infiltration that enters the system in direct response to rainfall events, either through direct connections such as holes in manhole covers or illicitly-connected roof leaders or area drains, or through defects in wastewater pipes, manholes, and service laterals. RDII is typically characterized by short-term peak flows that recede relatively quickly after rainfall ends. The magnitudes of RDII flows are related to the intensity and duration of the rainfall but are also related to the degree of soil saturation from earlier (antecedent) rainfall conditions.

The District's collection system must be designed to convey both dry weather and wet weather flows as described above. Therefore, PWWF is considered the design condition for the hydraulic evaluations contained in the 2024 Sewer Master Plan. The development of the design condition PWWF values specific to the District's collection system is described below in this chapter.

4.3 Data Used for Development of Representative Wastewater Flows

Empirical data was used to develop representative wastewater flows for the 2024 Sewer Master Plan. The majority of this data was captured at the influent to the Horton WWTP via Supervisory Control and Data Acquisition (SCADA) records. SCADA data captured during ordinary daily operation of the collection system was used to establish ADWF and PDWF values. Additionally, in 2019 a 5-year return frequency storm event (an event whose intensity would be expected to occur once every five years, or which would have a 20% chance of occurring in any given year as established by the historical record) was captured in the SCADA record. Storms with a return frequency between 5-years and 10-years are typically used to establish design conditions for collection systems, and the flow data from this storm event was evaluated and determined to be reasonable for such. Therefore, the 2019 storm was used to develop PWWF values for the hydraulic evaluation of the collection system in the 2024 Sewer Master Plan.

Furthermore, MSWD contracted directly with a flow monitoring firm, ADS Environmental, to complete a temporary flow monitoring study at three locations in the collection system. The results from this temporary study were used to evaluate the flows in isolated portions of the collection system that allowed for the development of unit generation and per capita wastewater generation rates. The temporary flow monitoring study took place in March of 2022.

4.4 Representative Wastewater Flow Factors

Flow factors were developed for the 2024 Sewer Master Plan as described below.

4.4.1 Groundwater Infiltration

Although there are portions of the District's collection system that overlay relatively shallow groundwater, evaluation of the District's SCADA data in conjunction with the ADS flow monitoring data indicates that GWI values are minimal in the collection system. Therefore, GWI values were established as negligible for design in the District's collection system, and ADWF was set equal to BWF for this master plan.

4.4.2 ADWF Unit Generation Values

ADWF unit generation values were calibrated within two sets of constraints:

- Existing wastewater values calculated from these generation factors must match measured values from SCADA and temporary flow monitoring.

- ADWF unit generation values must result in an appropriate Return-to-Sewer (RTS) ratio when compared to potable water unit demand factors.

ADWF unit generation factors were calculated to be the values presented in Table 4.1.

Table 4.1 – Calculated ADWF Unit Generation Factors with Corresponding Water Demand Factors

Land Use	ADWF Unit Generation Value	Units	Potable Water Unit Demand Factor	Return – to – Sewer Ratio
Residential	100 311	gpd/resident gpd/household	175 550	57% 57%
Commercial/Industrial	1,500	gpd/acre	1,500/2,000	100%/75%
Public/Institutional	1,000	gpd/acre	1,500	67%
Schools	500	gpd/acre	-	-

The values presented in Table 4.1 were calculated using the following steps:

1. Two of the three temporary flow monitors isolated residential parcels. Monitor No. 15 isolated 275 households and recorded a flow of 86,000 gpd, resulting in a generation factor of 313 gpd/household. Monitor No. 37 isolated 757 households and recorded a flow of 229,000 gpd, resulting in a generation factor of 303 gpd/household. These factors were rounded to 311 gpd/household, which corresponds to a per capita generation rate of 100 gpd given the average of 3.11 persons per household in the study area. The RTS ratio for these values is 57%, which is a reasonable value for arid areas with significant outdoor watering.

2. With the residential generation factors established, non-residential factors were calculated such that the existing flow into the Horton WWTP equals the measured 2.09 mgd. The values in Table 4.1 achieved this balance. The resulting RTS ratios are between 67% and 100%, which are typical for non-residential land uses.

4.4.3 PDWF Factor

PDWF can be generated from ADWF values using multiple methods. For the 2024 Sewer Master Plan, PDWF was generated from ADWF using diurnal patterns applied to the ADWF values. Figure 4.2 shows the diurnal pattern for the District's sewer collection system entering the Horton WWTP during weekends and weekdays, based on the SCADA logs from August 2019. The month was chosen because it did not experience wet weather flows for the region that would impact the collection system. There are slight differences in the diurnal curve between weekends and weekdays. The weekday pattern has a more pronounced curve peaking at 8 A.M., while the weekend pattern has a more gradual morning curve peaking at 11 A.M. Analysis of the treatment plant influent data and the flow monitoring data indicates that the highest daily peak typically occurs around 11 A.M. There is another secondary peak that occurs around 10 P.M. This late peak is generally seen in predominantly residential communities with long work commutes, such as the City of Desert Hot Springs. Therefore, the weekday diurnal curves represent peak conditions in the hydraulic model and were used to develop PDWF values for the 2024 Sewer Master Plan.

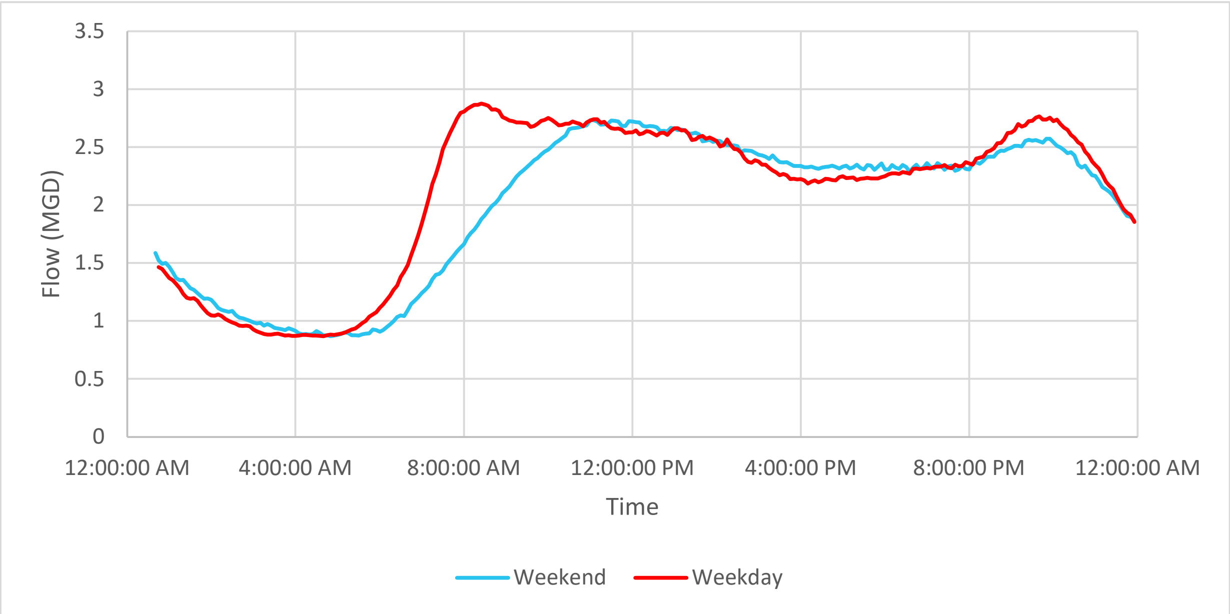


Figure 4.2 – Horton WWTP Average Day Dry Weather Diurnal Pattern

Rather than utilize an average day to establish true PDWF conditions, the highest flow day from August 2019 was used to establish the PDWF diurnal design pattern. Figure 4.3 shows the Horton WWTP's diurnal pattern during its peak dry weather day. This diurnal pattern is similar to the average daily dry weather diurnal pattern, shown in Figure 4.2, except that a more prominent peak occurs around 9 P.M. There is also no peak around 9 A.M, as the flow in the morning rises from 1 MGD to 2.7 MGD from 5 A.M. to 9 A.M. and then remains relatively steady between 9 A.M. and 3 P.M. Therefore, the peak flow for this day occurs at 9 P.M. with a flow of 3.48 MGD. The system's maximum peaking factor for dry weather flow is established to be 1.7, with a peak of 3.48 MGD versus an average flow of 2.09 MGD. This design PDWF diurnal pattern was deemed to be representative for the entire collection system and is used throughout the hydraulic model to generate PDWF values.

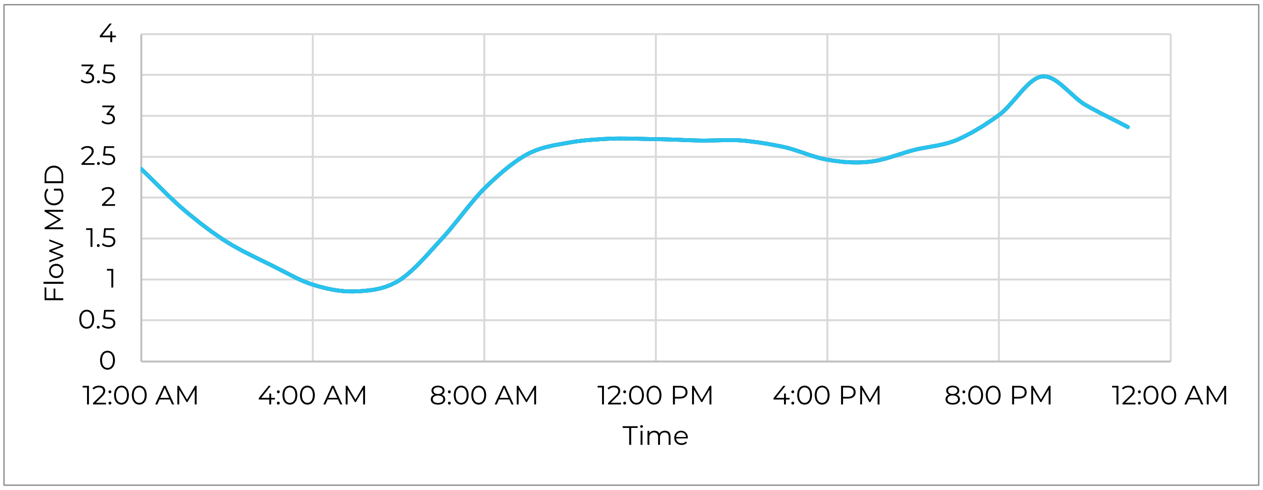


Figure 4.3 – Horton WWTP Peak Dry Weather Diurnal Curve

4.4.4 PWWF Factor

As described above, the design condition for collection systems corresponds to PWWF, when RDII has entered the collection system and is occupying a portion of the capacity intended for the wastewater flows in the system. There are multiple methods that can be used to determine PWWF factors that generate PWWF values from ADWF/PDWF values. Based upon the data available for the 2024 Sewer Master Plan, wet weather flow captured in SCADA data for the Horton WWTP was evaluated and then distributed evenly across the collection system for hydraulic modeling purposes.

Rain gauge data between 2017 and 2021 in the study area was gathered and evaluated to determine what year would best represent the District's worst-case wet weather flow scenario. Upon reviewing this data, it was established that the District encountered a significant storm event on February 14, 2019. Return frequency analysis indicated that this storm has a 5-year return frequency for both 12-hour and 24-hour durations, making it a suitable design storm for collection system planning purposes. Using the SCADA information from February 2019, it was determined that during the peak of this storm, an additional 2.1 MGD was added to the Horton WWTP flow.

Figure 4.4 shows the resulting hydrograph for the Horton WWTP with these wet weather flows being captured. This diurnal pattern uses the modeling data for the peak dry weather flow, with the additional flow the District experienced during the 5-year storm event on February 14, 2019. Since this hydrograph adds the storm event flows to the peak day flows, the diurnal pattern follows the same trend as the peak day dry weather diurnal pattern. This hydrograph shows that the peak wet weather flow value is 5.58 MGD. With an average flow of 2.09 MGD, the wet weather flow factor would be approximately 2.7 times the ADWF. This patten was deemed to be applicable across the collection system and was used to generate PWWF throughout the collection system in the hydraulic model.

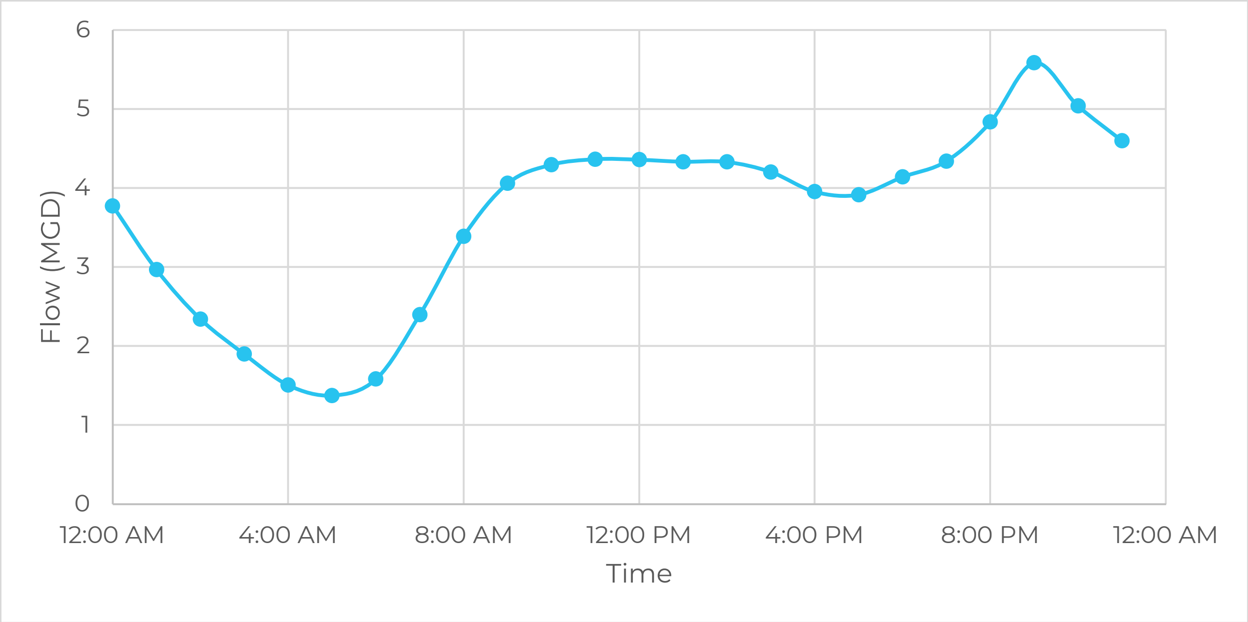


Figure 4.4 – Horton WWTP Wet Weather Hydrograph

4.5 Existing and Future Wastewater Flows

Existing flows and projected future flows in the MSWD sewer study area are described below.

4.5.1 Existing Flows

Existing flows in the collection system are summarized in Table 4.2.

Table 4.2 – MSWD Existing Wastewater Flows

	Horton WWTP (MGD)	Desert Crest (MGD)	Total (MGD)
ADWF	2.06	0.06	2.12
PDWF	3.58	0.10	3.68
PWWF	5.58	0.16	5.74

4.5.2 Future Flow Projections

The ADWF, PDWF, and PWWF factors described above in this chapter were applied to parcels that are not being served by the collection system in the District's study area to project future wastewater flows. These parcels include parcels currently being served by septic systems (septic areas), and parcels that are beyond the infrastructure that currently provides service and that will need infrastructure development to be served in the future (development areas).

Septic areas were identified by MSWD and provided in GIS format. Septic areas consist of single family residential land use, and every parcel in the septic areas was assigned one household for purposes of generating ADWF. Development areas were identified through extensive collaboration between Mission Consulting and the District for the 2024 Water Master Plan. The development areas were provided to Dopudja & Wells after this process. ADWF projections from these areas were compared to water demand projections for the same areas to maintain appropriate RTS ratios for future development. Some developments for the 2024 Water Master are outside of the sewer service area and thus are not included in future ADWF projections for the 2024 Sewer Master Plan (Development Area 16 and Development Area 20). In addition, a Preliminary Design Report was previously completed for the I-10/Indian Avenue area, with detailed ADWF projections performed for this area. The ADWF projections for Development Area 15 and Development Area 22, which fall within the I-10/Indian Avenue Area, were subtracted from the Preliminary Design Report values to maintain overall consistency throughout the planning documents.

The septic areas and the development areas can be seen on Figure 4.5 The ADWF projections for the development areas are presented in Table 4.3. The ADWF projections for the septic areas are presented in Table 4.4.

Table 4.3 – MSWD Development Area Future Flow Projections

Development Area	Project Name	Area (acre)	Households	Simplified Land Use	ADWF Projection (gpd)
1	New	11.4	43	Residential	13,435
2	New	174.1	659	Residential	204,824
3	1530	10.1	38	Residential	11,882
4	Annondale 1400	20.0	76	Residential	23,529
5	Annondale 1400	10.7	40	Residential	12,559
6	Terrace 1240	1.7	6	Residential	1,964
7	1070 Two Bunch	3.9	15	Residential	4,622
8	HDV 1400	4.1	15	Residential	4,797
9	Highland 1661	10.1	38	Residential	11,869
10	1240 Quail	12.3	47	Residential	14,465
11	Mission Lakes 1530	13.4	51	Residential	15,765
14	Desert Hot Springs 109 Industrial Park	110	-	Commercial/ Industrial	165,000
15	Desert Harvest SPA	64.9	-	Commercial/ Industrial	97,350
16	Desert Land Ventures	123.4	-	Commercial/ Industrial	185,100
17	Vista Rosa	222.1	1,251	Residential	389,061
18	Tuscan Hills Community	554	1,572	Residential	488,943
19	Skyborn TOTAL	87	1,796		620,445
20	Green Day Village		612	Residential	190,332
21	Two Bunch Palms Project	285	-	Commercial/ Industrial	Already Constructed
22	Coachillin' Industrial	161	-	Commercial /Industrial	241,500

Table 4.3 – MSWD Development Area Future Flow Projections

Development Area	Project Name	Area (acre)	Households	Simplified Land Use	ADWF Projection (gpd)
	Park				
23	Rancho Descanso		76	Residential	23,636
24	I-10 & Indian Ave			Mixed (Provided in Preliminary Design Report)	1,244,830
Total					**3,965,908**

Table 4.4 – MSWD Septic Area Future Flow Projections

Septic Area	Parcels/Households	ADWF Projection (gpd)
Septic Area A	879	273,369
Septic Area D-3	81	25,191
Septic Area G	197	61,267
Septic Area H	342	106,362
Septic Area I	335	104,185
Septic Area J-2	240	74,640
Septic Area K	272	84,592
Septic Area M-2	706	219,566
Total	**3,052**	**949,172**

As shown in Table 4.3 and Table 4.4, significant ADWF increase is projected by MSWD in the sewer service area. The infrastructure required to collect and convey this flow to existing and future treatment facilities is described in the chapters that follow.

Chapter 5 Service Criteria

5.1 General Description & Background

Sewer system design criteria outlined in this section of the 2024 Sewer Master Plan are founded on published regional design standards, current MSWD design standards, wastewater flow and water billing data utilized during hydraulic model calibration, and other data previously established in the 2007 Wastewater Master Plan.

5.2 Design Flows and Peak Factors

As described in Chapter 4, sewer flows for the 2024 Sewer Master Plan were developed for ADWF, PDWF, and PWWF conditions. ADWF values were developed using water billing data from the 2022 Water Master Plan, collection system flow monitoring performed specifically for the 2024 Sewer Master Plan, and land use evaluation. ADWF unit values developed for the 2024 Sewer Master Plan are presented in Table 5.1. As detailed in Chapter 4, these values result in good calibration to the flow monitoring data while providing reasonable return-to-sewer ratios with respect to the water demand unit values developed for the 2022 Water Master Plan. These unit values are also within industry norms for similar utility agencies.

Table 5.1 – Recommended ADWF Unit Values

Land Use	Unit Flow	Units
Residential	100	gpd/resident
	311	gpd/household
Commercial/Industrial	1,500	gpd/acre
Public/Institutional	1,000	gpd/acre
Schools	500	gpd/acre

As described in Chapter 4, collection system infrastructure is not sized for ADWF conditions, but is rather sized for peak flows. These peak flows may represent PDWF conditions or PWWF conditions depending on the characteristics of the collection system. For the 2024 Sewer Master Plan, PDWF and PWWF values were calculated using diurnal peaking patterns applied to the ADWF values calculated using the unit values in Table 5.1. These diurnal peaking patterns were developed from the flow monitoring data captured for the 2024 Sewer Master Plan. The diurnal peaking patterns result in a peak factor of approximately 1.5 between PDWF and ADWF, and a peak factor of approximately 3.0 between PWWF and ADWF. Table 5.2 compares these peaking factors to those utilized by two neighboring agencies: Eastern Municipal Water District (EMWD) and Coachella Valley Water District (CVWD). As can be seen in the table, the wastewater flow peaking factors developed for the District are similar to those utilized by neighboring agencies.

Table 5.2– Regional Peak Factors

Agency	Peak Factor
MSWD	1.5 – 3.0
EMWD	1.5 – 2.5
CVWD	1.25 - 3.0

5.3 Sewer Collection System Design Criteria

The collection network usually represents the most significant portion of the total assets of most wastewater systems. Therefore, proper design criteria for collection pipelines are vital in evaluating existing pipelines and planning future pipelines for appropriate size, efficiency, and longevity.

5.3.1 Sewer Collection Gravity Main Sizes, Materials, and Hydraulics

MSWD's current guidelines state that all sizes for gravity pipelines are determined based on specific design flows with a minimum diameter of 8 inches and an assumed material of extra-strength vitrified clay pipe (VCP).

Collection system gravity mains are typically sized based upon depth of flow (d) to gravity main diameter (D) design criteria (d/D design criteria). For example, a d/D design criteria of 0.50 for an 8-inch gravity main indicates that the design flow in this gravity main should not exceed a depth of 4 inches. The gravity main design criteria for the 2024 Sewer Master Plan were taken from the MSWD Developer/Contractor Handbook. These criteria are presented in Table 5.3.

Table 5.3– MSWD Gravity Main Design Criteria

Gravity Main Diameter	Manning's Roughness Coefficient (n)	Maximum d/D Value
8-in to 12-in	0.013	0.50
15-in and greater	0.013	0.75

The values presented in Table 5.3 are similar to those utilized by EMWD and CVWD. Although d/D criteria are the primary criteria for gravity main design, velocity criteria are also used for gravity mains, and velocity criteria are the primary criteria for force main and inverted siphon infrastructure design. MSWD's velocity design criteria are shown in Table 5.4. All values are in feet per second (fps).

Table 5.4 – MSWD Velocity Design Criteria

Velocity at Design Flow (Q) by Infrastructure Type			
Infrastructure Type	**Minimum**	**Desired**	**Maximum**
Gravity Mains	2 fps	3 fps	10 fps
Force Mains	3 fps	-	5 fps
Inverted Siphons	3 fps	-	5 fps

The velocity design criteria presented in Table 5.4 are once again similar to those of neighboring agencies. CVWD uses identical criteria for gravity mains. CVWD force mains have a preferred design velocity between 4 fps and 7 fps, with a minimum of 3 fps and a maximum velocity between 7 to 10 fps. For inverted siphons, the desired design velocity is 4 fps, with a minimum of 3 fps and a maximum of 5 fps in CVWD. For EMWD, force main velocities must be between 2 fps and 6 fps.

In addition to the pipeline criteria presented above, the MSWD Developer/Contractor Handbook contains additional guidelines on sewer laterals, exact locations, and installations. These design elements should be viewed in-depth on a project-by-project basis and are not included in this planning document.

5.3.2 Lift Stations and Force Mains Design Criteria

MSWD has deemed the use of lift stations only permitted when gravity mains are demonstrated unfeasible. Therefore, within the scope of master planning, the only critical design criteria are the following:

- Existing and future lift stations shall be designed for peak flows for the development to be serviced with consideration of the entire drainage area. Lift stations shall handle the peak flow with the largest pump out of service.

- Lift station facilities shall be constructed on MSWD property.

5.4 Wastewater Treatment Plant Design Criteria

Future and existing wastewater treatment plants (WWTP) within MSWD's service area should be evaluated using two critical design criteria: design flow capacity and wastewater effluent quality. Each of these criteria must be met for existing and future conditions.

5.4.1 Design Flow Capacity

All existing and future WWTPs within MSWD's service area must be able to, at a minimum, treat the design flow. This design flow is determined with the PDWF, which is ultimately derived from the ADWF and an appropriate peaking factor. Additionally, to comply with the redundancy regulation provisions, all WWTPs processes must be able to treat the design flow with the most significant operating processing unit out of service.

5.4.2 Wastewater Treatment Plant Quality

Regulatory agencies such as the State Water Resources Control Board and EPA established the wastewater quality criteria. Therefore, all future and existing WWTPs in the MSWD service area must adhere to these agencies' requirements.

5.5 MSWD Sewer System Design Criteria Table

Sewer system design criteria recommended in the 2024 Sewer Master Plan are summarized and tabulated in Table 5.5.

Table 5.5 – MSWD Sewer System Design Criteria Summary

<table>
<tr><th>Design Parameter</th><th colspan="2">Criteria</th></tr>
<tr><td rowspan="4">ADWF</td><td>Residential</td><td>100 gpd/resident
311 gpd/household</td></tr>
<tr><td>Commercial/Industrial</td><td>1,500 gpd/acre</td></tr>
<tr><td>Public Uses (excluding schools)</td><td>1,000 gpd/acre</td></tr>
<tr><td>Schools</td><td>500 gpd/acre</td></tr>
<tr><td>Peak Factor</td><td colspan="2">1.5 – 3.0</td></tr>
<tr><td>Design Flow</td><td colspan="2">ADWF x peak factor</td></tr>
<tr><td>Gravity Mains</td><td colspan="2">Must convey design flow while maintaining the following:

8-in to 12-in gravity mains
Manning's coefficient shall be 0.013
Maximum d/D shall be 0.50
Velocity shall be no less than 2 fps and no more than 10 fps
The preferred minimum velocity is 3 fps

15-in and larger gravity mains
Manning's coefficient shall be 0.013
Maximum d/D shall be 0.75
Velocity shall be no less than 2 fps and no more than 10 fps
The preferred minimum velocity is 3 fps.

All gravity mains shall be extra strength VCP unless approved otherwise by MSWD.</td></tr>
<tr><td>Lift Stations</td><td colspan="2">Only to be considered when the gravity system is not feasible.
Sized for PDWF with the largest pump out of service</td></tr>
<tr><td>Force Mains</td><td colspan="2">The minimum diameter shall be 4-in.
Peak flow design point shall be between 4 fps and 5 fps.
Velocity shall be no less than 3 fps and no greater than 6 fps under all operating conditions.
The material shall be ductile iron with minimum pressure Class 150 and Class 53 thickness.</td></tr>
<tr><td>Wastewater Treatment Plants</td><td colspan="2">WWTP shall be designed for PDWF with largest processing unit out of service.
All WWTP shall follow regulatory guidelines related to the level of treatment. Guidelines are determined by the specific regulatory agency.</td></tr>
</table>

Chapter 6 Existing Collection System Evaluation

6.1 Generation Description

This chapter describes the hydraulic evaluation of the of the existing collection system under existing flow conditions. Capacity deficiencies in the existing collection system have been identified so that improvements to these deficiencies can be included in the Capital Improvement Program developed as part of the 2024 Sewer Master Plan. Development of the hydraulic model used for the capacity evaluation is described in the chapter prior to discussion of the evaluation results.

6.2 Hydraulic Model Description

The development and calibration of the collection system hydraulic model is described in the sections below.

6.2.1 Hydraulic Model Infrastructure

The hydraulic model represents gravity mains, force mains, pumps, and manholes for hydraulic simulation. Treatment facilities are represented as outfalls from which flow exits the collection system and at which the hydraulic simulation ends. The collection system infrastructure represented in the hydraulic model was imported from infrastructure data stored in Geographic Information System (GIS) format. Recent upgrades and improvements to the collection system were provided by MSWD as record drawings for input into the model. Questions and discrepancies in hydraulic modeling data were presented to District staff for review and reconciliation.

6.2.2 Existing Wastewater Flows

Existing wastewater flows were developed for the MSWD collection system using the data and generation factors detailed in Chapter 4. The existing flows were spatially distributed across the collection system using water demand distribution developed for the 2024 Water Master Plan in conjunction with flow monitoring data captured during the ADS Environmental temporary flow monitoring study. This flow monitoring study and the calibration of the hydraulic model to this study are described below.

6.2.3 Collection System Hydraulic Model Calibration

Hydraulic model calibration under existing conditions using Horton WWTP historical data and ADS Environmental temporary flow monitoring data is detailed in this section.

a. ADS Environmental Temporary Flow Monitoring Study

ADS conducted a temporary flow monitoring study at three gravity main locations in the MSWD collection system, with the locations identified as Project 15, Project 30, and Project 37. Figure 6.1 presents these locations in the collection system, along with their associated basins. Flow monitoring took place continuously from Friday, March 11, 2022, to Thursday, March 24, 2022, spanning a total of 14 days. As is typical for temporary flow monitoring studies conducted under gravity flow conditions, data was collected for depth of flow, velocity of flow, and resulting flow rate. The ADS Environmental FlowShark Triton flow meter was used to capture this data at 5-minute intervals. Table 6.1 summarizes the ADWF measured at these three locations. The ADS Environmental temporary flow monitoring report is attached to the 2024 Sewer Master Plan as Appendix D.

Table 6.1– ADWF Temporary Flow Monitoring Results

Project Number	Average Depth (in)	Average Velocity (ft/s)	ADWF (MGD)
Project 15	1.28	2.64	0.086
Project 30	4.30	6.01	1.730
Project 37	5.63	0.82	0.229

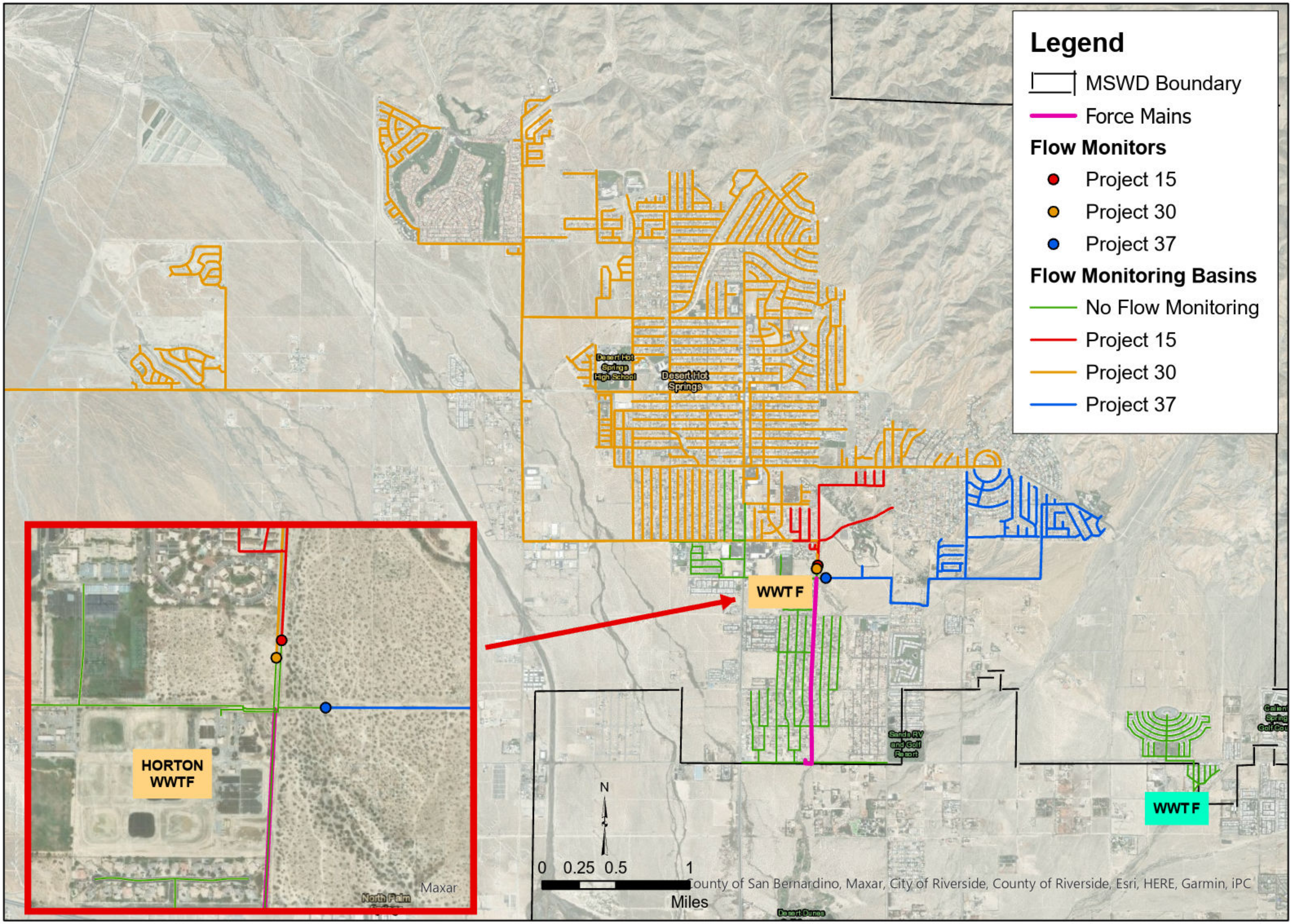


Figure 6.1 - Flow Monitoring Locations

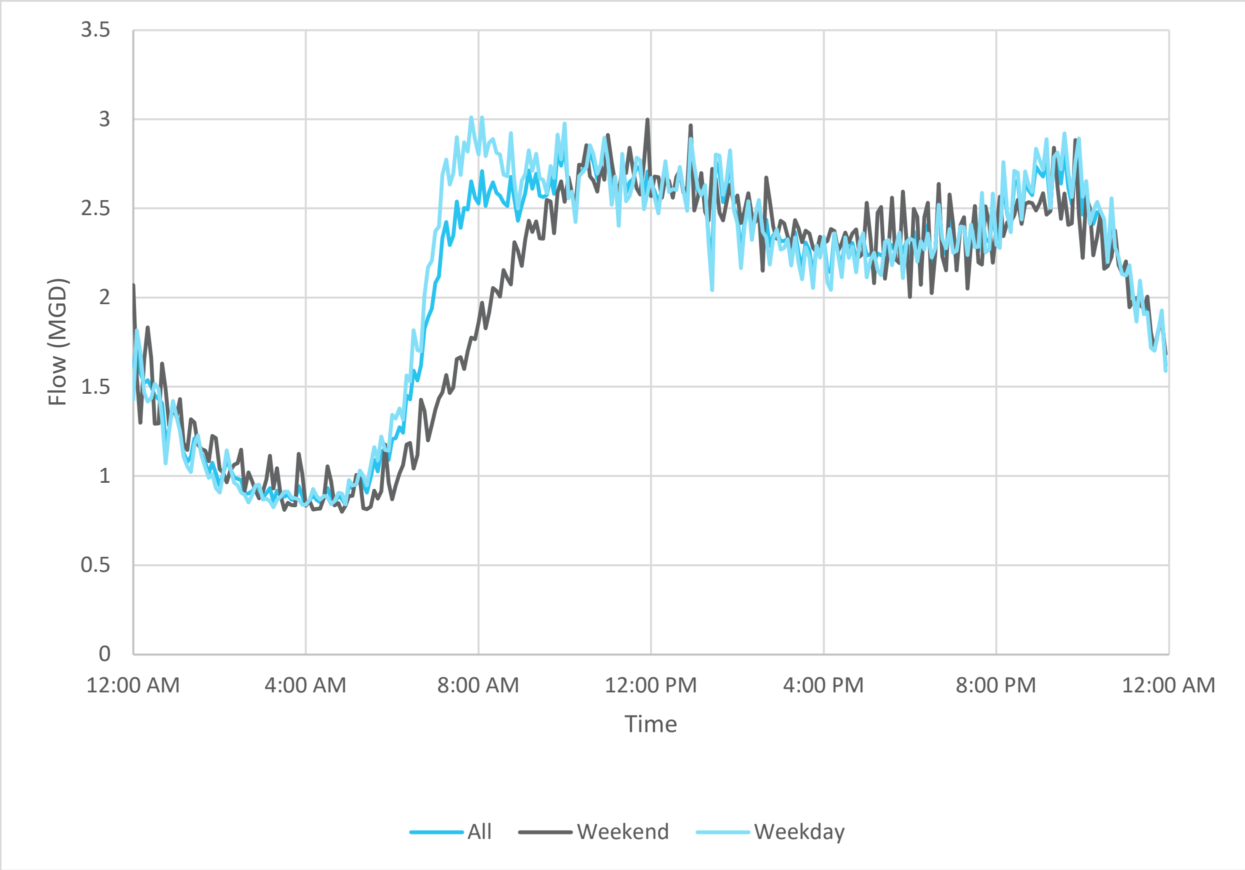
a. Dry Weather Calibration

Calibration is the process by which hydraulic model simulation results are compared to measured data to confirm that the model accurately represents field conditions. Dry weather calibration was performed for the MSWD collection system hydraulic model using the two flow sources identified in Chapter 4: influent flow data for Horton WWTP and flow monitoring data captured during a temporary flow monitoring study conducted by ADS Environmental.

Dry weather calibration was first verified using the Horton WWTP influent data to establish an overall system flow value. The month of August 2019 was selected to represent dry weather flow for 2019; August is often chosen for such representation because it typically has no precipitation and does not contain holidays that can significantly impact wastewater flows.

Summarized diurnal patterns for the Horton WWTP can be seen in Figure 6.2, broken down by weekend and weekday patterns. Weekday flows were typically slightly more varied with an earlier morning peak than weekend flows, and with a higher nighttime peak as well. ADWF for August 2019 was calculated to be 2.09 MGD at the Horton WWTP. As described above, this flow value was distributed across the collection system based on water demand distribution taken from billing data.

Figure 6.2 – Horton WWTP Dry Weather Diurnal Patter



With the overall system flow value established as described above, the temporary flow monitoring data was used to adjust values within the collection system. The calibration was adjusted to match the flow monitoring data as it is the most recent and, with three separate locations, the flow monitoring data provides greater granularity. Only minor adjustments to ADWF were required to calibrate to the temporary flow monitoring data, and in general, the flow monitoring data provided good confirmation for the Horton WWTP influent data. After the flow monitoring data calibration adjustments, the ADWF into the Horton WWTP in the hydraulic model simulation is 2.27 MGD. This value is within 10% of the measured value of 2.09 MGD from the SCADA data. The value of 10% is within the typical margin of accuracy for flow monitoring technology.

Diurnal patterns from the temporary flow monitoring study were used to refine the diurnal patterns in the hydraulic model. First, typical diurnal curves for weekday and weekend flows were developed for each flow monitoring location, as presented in

Figure 6.3, Figure 6.4, and Figure 6.5, respectively. “Typical” diurnals tend to underestimate true peak flows because they average the peaks. Therefore, the peak dry weather flows captured at each location were maintained in the daily patterns to generate a representative design value for peak dry weather flow. For Figure 6.3, Figure 6.4, and Figure 6.5, it should be noted that “All” in the legend indicates an average value for an entire 7-day week. The “XX-60” values in the legend indicate flow values that have been smoothed using a running 60-minute average to dampen the rapid data fluctuations that are found in flow monitoring data, especially data from monitors capturing relatively small basins.

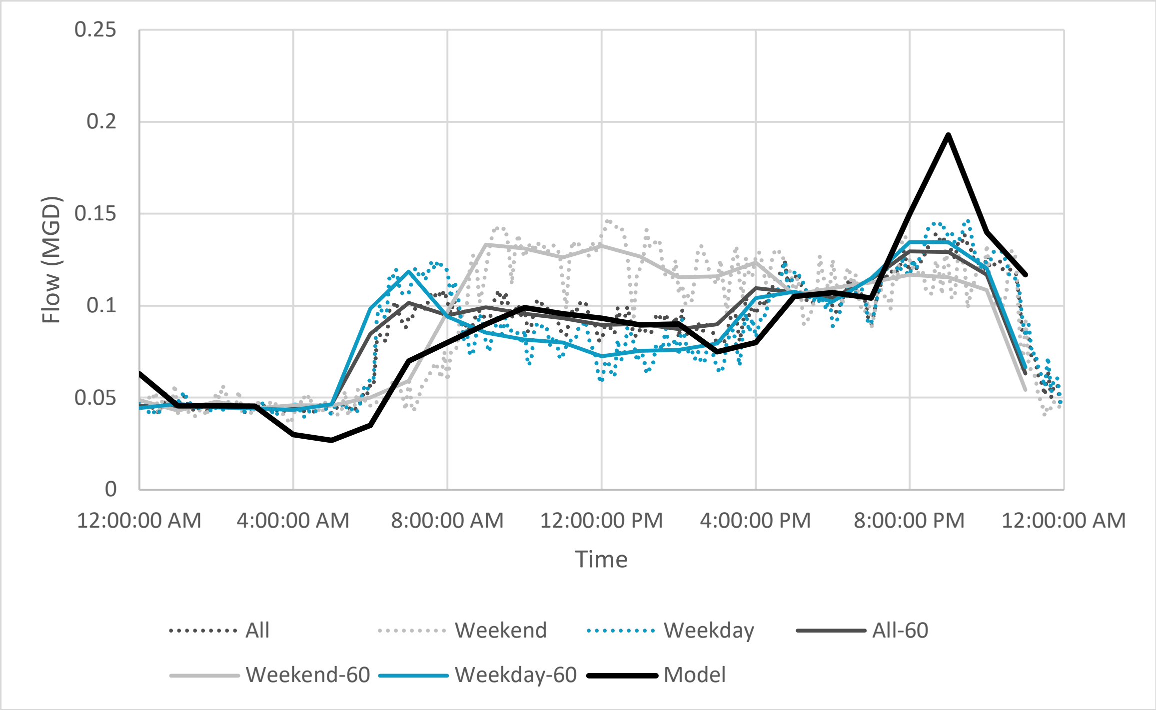


Figure 6.3 – Project 15 Dry Weather Calibration Plot

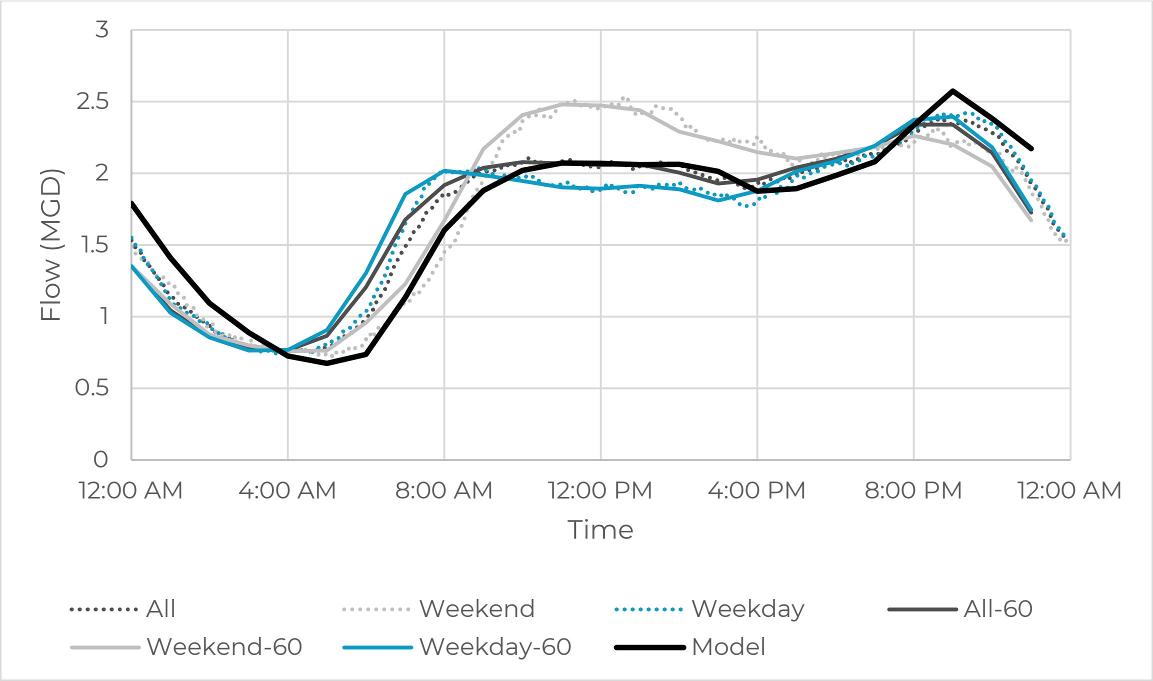


Figure 6.4 – Project 30 Dry Weather Calibration Plot

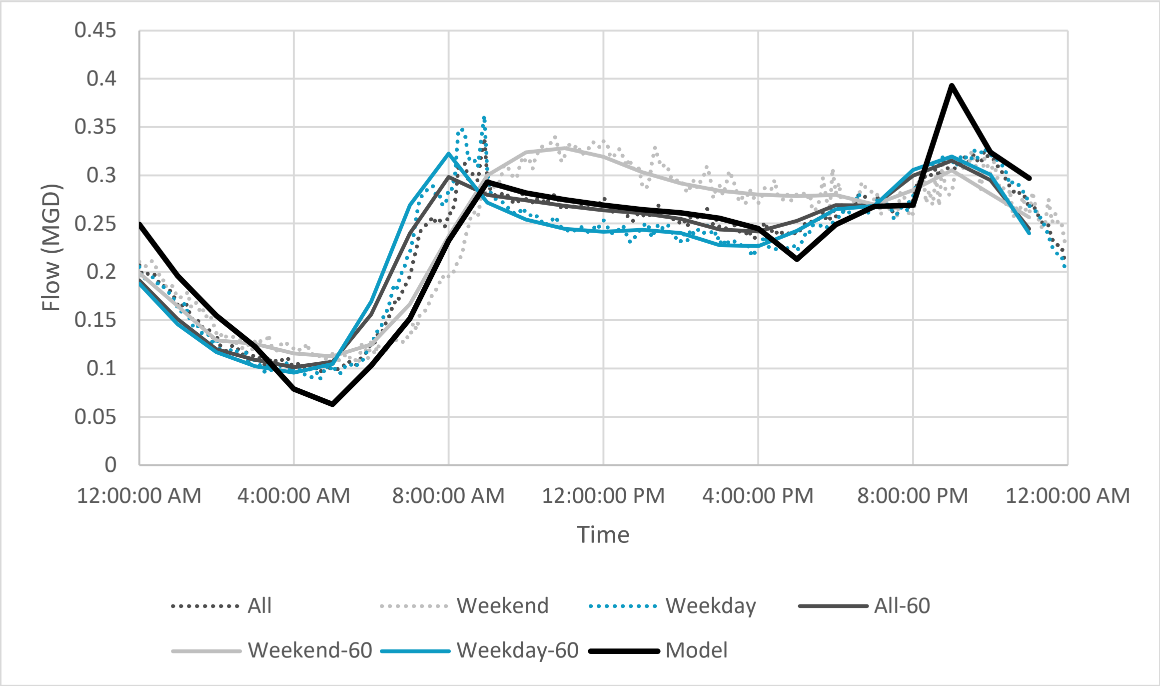


Figure 6.5 – Project 37 Dry Weather Calibration Plot

b. Wet Weather Calibration

The ADS Environmental temporary flow monitoring study did not include wet weather data. Wet weather calibration of the collection system hydraulic model was performed using influent data from Horton WWTP in conjunction with precipitation data publicly available for the Desert Hot Springs Rain Gauge.

Discussions with District staff indicated that the Desert Hot Springs Rain Gauge provides the most representative data for precipitation across the existing collection system. Data for this rain gauge between 2016 and 2021 were reviewed to find the highest intensity precipitation events with antecedent precipitation, which is required for effective wet weather calibration. The event's highest intensity occurred on February 14, 2019. Rainfall returns frequency data from NOAA indicated that this storm had slightly less than a five-year return frequency for both the 6-hour and 24-hour durations. Also, there were several storms earlier in February, so the antecedent conditions were wet and appropriate for calibration.

Horton WWTP influent data was evaluated using the February 14, 2019, storm event data. For each 5-minute interval, the typical diurnal amount of flow was subtracted from the measured amount of flow, with the difference representing Rainfall Dependent Infiltration and Inflow (RDII). The peak RDII rate was calculated to be 2.0 MGD, occurring just after midnight. When this peak RDII is added to the peak dry weather flow (representing the potential worst-case scenario), the peak wet weather flow for design is calculated to be 5.58 MGD into Horton WWTP. This value is used to evaluate the collection system under wet weather conditions.

6.3 Existing Collection System Analysis

The hydraulic evaluation of the existing collection system using the hydraulic model, calibrated as described above, is described in the following section.

6.3.1 Performance Criteria

The collection system performance criteria detailed in Chapter 3 were used in the existing system hydraulic evaluation. The primary criterion used for gravity mains in the evaluation is the d/D criterion, which is a direct measure of capacity utilized in a given gravity main. Gravity main velocities were evaluated with secondary priority. It is typical that gravity mains at minimum diameter in the most upstream portions of a collection system do not meet minimum velocity criteria. Enhanced focus on cleaning of these lines can eliminate the negative impacts of the low velocities. Velocity values outside of typical criteria are more critical in trunk gravity mains which carry more flow, in which low velocities can result in sedimentation and/or odor issues, and high velocities can materially impact gravity main service life.

6.3.2 Gravity Main Evaluation

Gravity main evaluation results are shown on Figure 6.6 and presented in Table 6.2. As can be seen, 14 gravity mains totaling 3,340 feet of pipeline fail to meet the capacity criteria under wet weather design conditions. No trunk gravity mains were found to be outside of velocity criteria.

6.3.3 Lift Station Evaluation

The MSWD's existing lift station, Dos Palmas LS, was evaluated in the hydraulic model. The 700 gpm capacity of the lift station with one pump out of service is sufficient for the 227 gpm design flow into the lift station identified in the hydraulic model.

6.3.4 Existing System Hydraulic Evaluation Summary

Hydraulic deficiencies in the existing collection system under existing flow conditions are identified above. As shown, the hydraulic deficiencies under these conditions are confined to gravity mains. Not every hydraulic deficiency needs to be immediately upgraded. The actions recommended to the District for these deficiencies, including priorities for these actions, are provided in the Capital Improvement Program described in Chapter 8 of the 2024 Sewer Master Plan.

Table 6.2– Existing Gravity Main d/D Capacity Evaluation Results

Gravity Main ID	From Manhole	To Manhole	Max d/D Value	Deficient d/D Value	Diameter (in)	Length (ft)
N251009	N25107	N25114	0.62	>0.50	8	40
R291016	R29116	R29117	0.54	>0.50	8	315
R291018	R29117	R28114	0.53	>0.50	8	350
S281008	S28107	S28106	0.52	>0.50	8	112
S281002	S28102	S28100	0.80	>0.50	8	298
S281001	S28100	R28119	0.80	>0.50	8	30
R281020	R28119	R28113	0.80	>0.50	8	299
R281019	R28113	R28112	0.66	>0.50	8	348
R281017	R28111	R27144	1.00	>0.50	8	354
P261072	P26160	P26156	1.00	>0.50	8	32
P261078	P26161	Q26101	1.00	>0.50	8	398
R271020	R27111	R27112	1.00	>0.50	8	116
R271017	R27110	R27152	0.60	>0.50	8	295
R261020	R26115	R26116	0.55	>0.50	8	350

Table 6.3– Existing Lift Station Capacity Results

Lift Station	Design Capacity (gpm)	Existing Design Flow (gpm)	Capacity Deficiency	Surplus/(Deficit) Capacity (gpm)
Dos Palmas LS	700	228	No	472

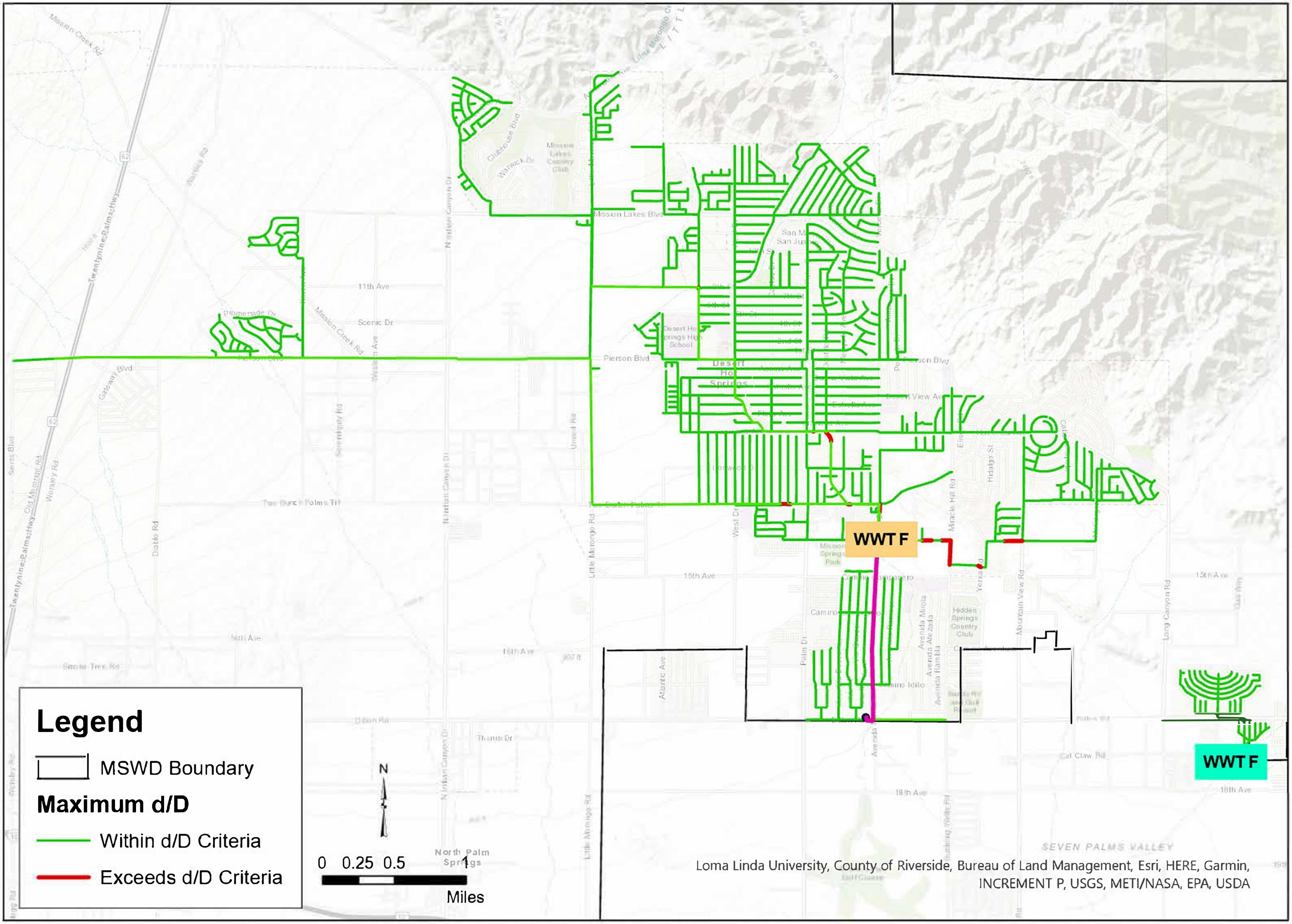


Figure 6.6 - Existing Gravity Main Hydraulic Capacity Evaluation Results

Chapter 7 Future Collection System Evaluation

7.1 General Description

This chapter describes the hydraulic evaluation of the of the future collection system under future flow conditions. Capacity deficiencies in the existing collection system with future flows have been identified so that improvements to these deficiencies can be included in the Capital Improvement Program developed as part of the 2024 Sewer Master Plan. In addition, new infrastructure that extends the collection system to serve future development is identified and sized.

7.2 Future Development Summary

Wastewater flow was projected in the future for parcels that are not being served by the collection system in the District's study under existing conditions. These parcels include parcels currently being served by septic systems (septic areas), and parcels beyond the infrastructure that currently provides service and will need infrastructure development to be served in the future (development areas). The septic areas and development areas are described in detail in Chapter 4 above in the 2024 Sewer Master Plan.

In addition to the increased flows generated in the sewer service area due to the development and the conversion of septic areas, operation of the collection system will be modified in the future because of changes to treatment facilities in the District. In the future, the Nancy Wright RWRF will come online, and the Desert Crest WWTP will be retired. A new lift station and force main are required in the collection system to convey flows from the Desert Crest WWTP tributary area to treatment at the Nancy Wright RWRF. These operational changes are captured in the evaluation presented in this chapter.

7.3 Future Collection System Analysis

The hydraulic evaluation of the future collection system using the calibrated hydraulic model is described in the following section.

7.3.1 Future Gravity Main Evaluation

The proposed future collection system for the 2024 Sewer Master Plan is presented on Figure 7.1. The future collection system includes improved and proposed gravity mains, force mains, and lift stations.

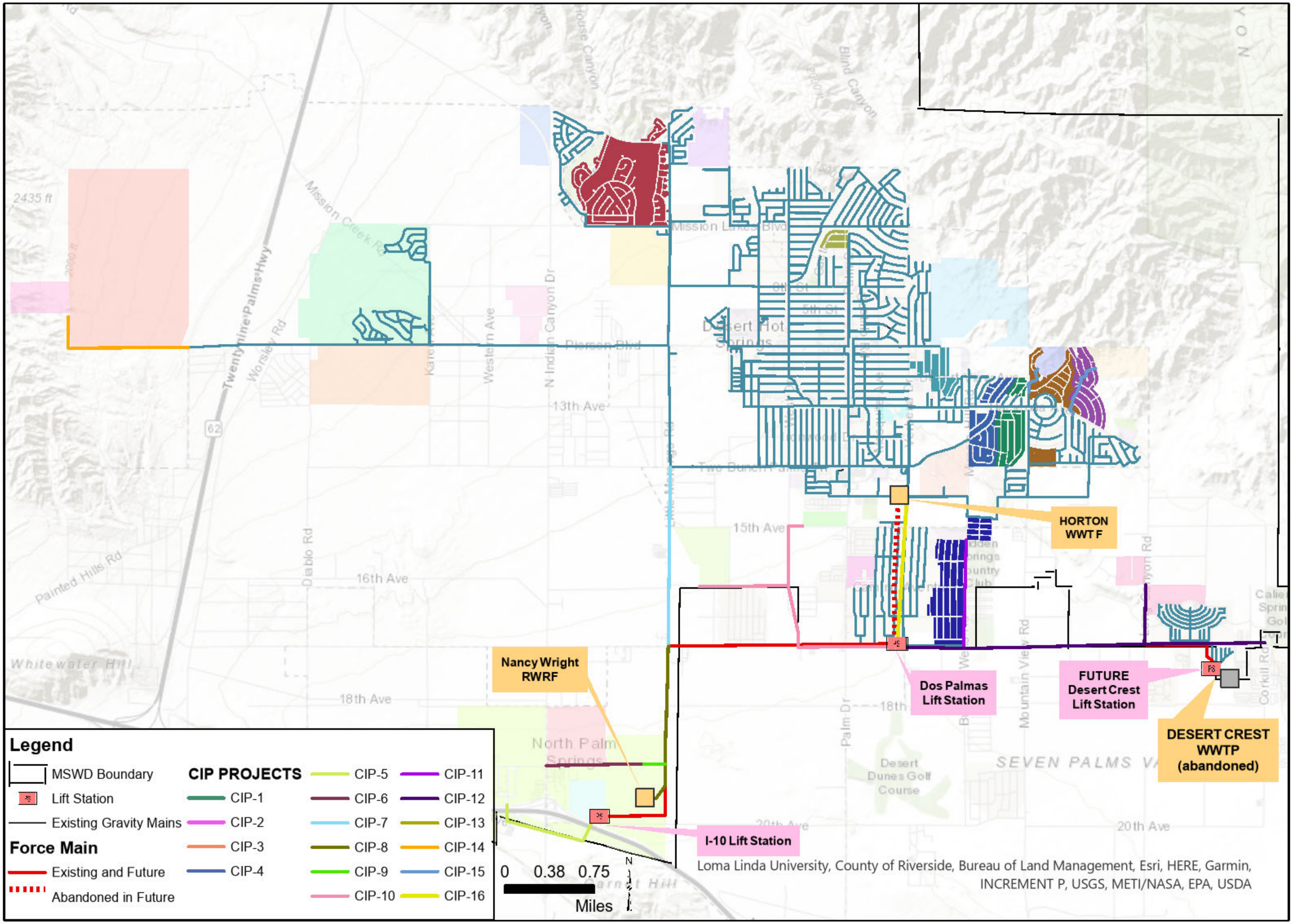


Figure 7.1 - Future CIP Projects

The proposed gravity mains and gravity main improvements have been developed to accomplish the following:

1. Provide upgraded capacity in existing gravity mains to handle increased future flows. Existing gravity mains were upsized to satisfy the District's d/D capacity criteria (detailed in Chapter 5 of the 2024 Sewer Master Plan).
2. Extend the collection system to serve septic areas and development areas outside of the current collection system.
3. Route collection system flows to account for future treatment configuration.
    a. Desert Crest WWTP is nearing the end of its useful life and is to be abandoned.
    b. Nancy Wright RWRF is coming online.
    c. Existing ADWF into the Horton WWTP is 2.09 MGD, and the capacity of this facility is 2.44 MGD.

The gravity main improvements that accomplish these goals are grouped into CIP projects. These CIP projects are summarized in Table 7-2. Hydraulic details for the projects are provided in Appendix D. The following points should be noted for these projects:

- Project CIP-7 is designed to divert future flow from the northwestern portion of the collection system away from Horton WWTP and into the Nancy Wright RWRF.
- Project CIP-12 is sized to accommodate flow from the to-be-abandoned Desert Crest WWTP, which will require a new lift station and force main to pump the flow into the project.
- Project CIP-16 is a gravity main designed to divert flow away from the Horton WWTP and into the Dos Palmas Lift Station, from which the flow can be pumped towards the Nancy Wright RWRF. This gravity main is envisioned to follow the existing force main alignment between the two facilities. Without this project and the potential diversion of flow, future flow into the Horton WWTP will exceed the ADWF capacity of 2.44 MGD. The City is currently using the previous force main in this capacity, but this project identifies the gravity main necessary should the City need dedicated infrastructure.
- The improvements for Project CIP-5 and the I-10 Lift Station were evaluated and designed by others as part of the I-10 Preliminary Design Report, and the results were integrated into this evaluation.
- The improvements for Project CIP-8 were designed by others as part of the Nancy Wright RWRF design, and the results were integrated herein.

Table 7.1– Future Gravity Main Improvements

Project	Location	Summary Description	Overall Length (feet)
CIP-1	Park Ln to San Gorgonio St to Yerxa Rd, to Mountain View Rd	Existing 8-inch gravity mains improved to 15-inch	5,563
CIP-2	230 ft west of Palm Dr. along Hacienda Ave.	Existing 15-inch gravity mains improved to 18-inch	454
CIP-3	Along Pierson Blvd, from Foxdale Dr to 200 ft west of Palm Dr, then to Hacienda Ave.	Existing 8-inch and 10-inch gravity mains improved to 12-inch	5,975
CIP-4	Along Octillo Rd, from Hacienda Ave to Two Bunch Palm Trails	Existing 15-inch gravity mains improved to 21-inch	3,083
CIP-5	I-10 Development Area	New 12-inch, 15-inch, and 21-inch gravity mains	5,107
CIP-6	Along 18th Ave, from Indian Canyon Dr to 950 ft east of Little Morongo Rd.	New 15-inch and 18-inch gravity mains	3,809
CIP-7	Along Little Morongo Rd from Two Bunch Palms Trl to Dillon Rd	New 18-inch gravity mains	7,964
CIP-8	Along Little Morongo Rd from Dillon Rd to NRWWRF (new WWTP)	New 15-inch, 18-inch, 21-inch, 24-inch and 27-inch gravity mains	6,798
CIP-9	Along 18th Ave, from 950 ft east of Little Morongo Rd. to Little Morongo Rd.	New 18-inch gravity mains	939

Project	Location	Summary Description	Overall Length (feet)
CIP-10	Along West Dr, from 15th Ave to 16th Ave and then along Dillon Rd	New 12-inch gravity mains	21,497
CIP-11	Along Avenida Manzana, from 315 ft south of Cam Idilio to 265 ft north of Dillon Rd	New 8-inch and 10-inch gravity mains	4,678
CIP-12	Along Long Canyon Rd from 16th Ave to Dillon Rd, and then along Dillon Rd	New 8-inch and 10-inch gravity mains	19,037
CIP-13	Proposed inlet gravity main into new Desert Crest Lift Station	New 24-inch gravity main	100
CIP-14	East of the 62 Hwy, along Pierson Blvd	New 8-inch gravity mains	6,713
CIP-15	Fernwood Dr down Red Bud Ave, and down Skyline Dr.	New 8-inch gravity mains	4,095
CIP-16	Runs North to South parallel to old force main alignment into Dos Palmas LS. Diverts flow out of Horton WWTP. District is currently using the old force main for this purpose, but this project provides dedicated infrastructure when it becomes necessary.	New 18-inch gravity mains	6,857

7.3.2 Future Lift Station Evaluation

The capacity of existing lift stations, as well as the need for future lift stations in the collection system, were evaluated using the hydraulic model. The results of the evaluation are presented in Table 7.2.

Table 7.2– Future Lift Station Capacity Results

Lift Station	Design Capacity (gpm)	Future Design Flow (gpm)	Capacity Deficiency
Dos Palmas LS	700	4,500	Yes
Future Desert Crest LS	-	105	To Be Built to Design Flow
Future I-10 LS		1,100	To Be Built to Design Flow

Additionally, the Desert Crest lift station will require 3,900 feet of 6-inch force main to connect the facility to the collection system. The I-10 LS will require 4,500 feet of 10-inch force main to connect that facility to the new Nancy Wright RWRF. Finally, the Dos Palmas LS will require 10,200 feet of re-routed force main at 18-inch diameter. The re-routed force main and change in discharge point results in different head as well as capacity requirements for this lift station in the future. The entire lift station should be comprehensively re-designed when necessary.

Chapter 8 Capital Improvement Program

8.1 General Description

This Chapter presents the recommended Capital Improvement Program (CIP) Projects for the sanitary sewer system, along with estimated capital costs. These Projects are based on the sewer system evaluations described in Chapters 6 and 7.

This Chapter will highlight the proposed capital improvement programs for the 2025 through 2045 planning years and provide recurring annual capital expenditure estimates to repair or replace aging and outdated infrastructure.

8.2 Basis for Capital Improvement Costs

The cost estimates presented in this chapter are developed using Engineering News Record (ENR) Construction Cost Index 12,704 (ENG Los Angeles, October 2021) and recent bid information for similar projects. Construction costs are to be used for conceptual-level cost estimating only. The cost estimates prepared for the 2024 Sewer Master Plan are in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International for a Class 5 Estimate, suitable for long-range capital planning, with an accuracy range of -50 percent to +100 percent. In other words, estimates may be 50% less to 100% more than actual costs.

The contingencies presented, which include variants to the construction cost, engineering and design, and project management, are typical and align with those seen by MSWD on recent projects. Final constructed costs for a project will depend on actual labor and material cost, competitive market conditions, final scope, implementation schedule, and other variables.

Costs are presented in presented as present-day values.

8.2.1 Gravity Main Construction Costs

Gravity main cost estimates are based upon the unit costs provided in Table 8-1. These unit costs are based upon estimates used for similar agencies in the District's geographic area. All construction of gravity mains is assumed to be open-cut construction of new gravity mains for cost estimating purposes. For those projects that include improvement of existing gravity mains, the District can determine if other methods such as parallel construction or trenchless improvement are appropriate and present cost savings.

Table 8.1– Gravity Main Unit Construction Costs

Diameter	New Construction Unit Cost ($/foot)	Typical Rehabilitation Unit Cost ($/foot)
4-in	$170	$140
6-in	$170	$140
8-in	$175	$145
10-in	$180	$150
12-in	$190	$155
15-in	$205	$170
18-in	$220	$180
21-in	$285	$235
24-in	$310	$255
27-in	$350	$285
30-in	$390	$320
33-in	$440	$360
36-in	$490	$400
42-in	$575	$470
48-in	$625	$510
54-in	$670	$545

8.2.2 Lift Station Construction Costs

The hydraulic analysis in Chapter 6 and Chapter 7 identified new lift stations required to provide service as the collection system is expanded for development. It is assumed that future lift stations will be built in similar fashion to recently completed lift stations within the District. Historic costs combined with parametric cost curves to account for capacity requirements were used to develop lift station cost estimates. Force main costs were included with the lift station costs.

8.2.3 Contingency and Implementation Costs

Contingency cost and implementation mark-ups must be reviewed on a case-by-case basis because they will vary considerably with each construction project. However, to assist District staff with budgeting for these recommended collection system improvements, the following percentages were developed:

- **Construction Contingency:** **30 percent**
- **Implementation Costs:** **30 percent**
  - Design: 10 percent
  - Construction Management and Inspection: 10 percent
  - Permitting, Regulatory and CEQA Compliance: 5 percent
  - District Administration, Outreach, and Legal: 5 percent

The total contingency and implementation costs are compounded, so the total markup of the base construction cost is 30 percent x 30 percent = 69 percent. For the 2024 Sewer Master Plan, it is assumed that new facilities will be developed in public rights-of-way or on public property. Therefore, land acquisition costs have not been included. Proposed costs do not include costs for annual operation and maintenance.

8.3 Master Plan CIP Projects

The 2024 Sewer Master Plan developed a collection system CIP with projects divided into five-year increments (phases), starting with 2025 and ending in 2045. Each project is classified as:

- Gravity Main Improvements
- Lift Station/Force Main Improvements

These projects are described below.

8.3.1 Master Plan Gravity Main Projects

Required gravity main CIP projects identified in the 2024 Sewer Master Plan are identified in Table 8.2. Currently identified phasing and projected project costs are included in the table.

Table 8.2 – Gravity Main CIP Projects

Project	Location	Summary Description	Overall Length (feet)	Phase	Funding	Projected Project Cost
CIP-1	Park Ln to San Gorgino St to Yerxa Rd, to Mountain View Rd	Existing 8-inch gravity mains improved to 15-inch	5,563	2025	District	$1,927,100
CIP-2	230 ft west of Palm Dr. along Hacienda Ave.	Existing 15-inch gravity mains improved to 18-inch	454	2025	District	$168,800
CIP-3	Along Pierson Blvd, from Foxdale Dr to 200 ft west of Palm Dr, then to Hacienda Ave.	Existing 8-inch and 10-inchgravity mains improved to 12-inch	5,975	2025	District	$1,918,500
CIP-4	Along Octillo Rd, from Hacienda Ave to Two Bunch Palm Trails	Existing 15-inch gravity mains improved to 21-inch	3,083	2025	District	$1,484,800
CIP-5	I-10 Development Area	New 12-inch, 15-inch, and 21-inch gravity mains	5,107	2025	Developer	$1,745,400
CIP-6	Along 18th Ave, from Indian Canyon Dr to 950 ft east of Little Morongo Rd.	New 15-inch and 18-inch gravity mains	3,809	2025	District	$1,332,200
CIP-7	Along Little Morongo Rd from Two Bunch Palms Trl to Dillon Rd	New 18-inch gravity mains	7,964	2030	District	$2,961,000

Project	Location	Summary Description	Overall Length (feet)	Phase	Funding	Projected Project Cost
CIP-8	Along Little Morongo Rd from Dillon Rd to NRWWRF (new WWTP)	New 15-inch, 18-inch, 21-inch, 24-inch and 27-inch gravity mains	6,798	2030	District	$2,796,100
CIP-9	Along 18th Ave, from 950 ft east of Little Morongo Rd. to Little Morongo Rd.	New 18-inch gravity mains	939	2030	District	$349,000
CIP-10	Along West Dr, from 15th Ave to 16th Ave and then along Dillon Rd	New 12-inch gravity mains	21,497	2035	District	$6,902,800
CIP-11	Along Avenida Manzana, from 315 ft south of Cam Idilio to 265 ft north of Dillon Rd	New 8-inch and 10-inch gravity mains	4,678	2025	Developer	$1,394,300
CIP-12	Along Long Canyon Rd from 16th Ave to Dillon Rd, and then along Dillon Rd	New 8-inch and 10-inch gravity mains	19,037	2035	District	$5,723,700
CIP-13	Proposed inlet gravity main into new Desert Crest Lift Station	New 24-inch gravity main	100	2035	District	$52,400
CIP-14	East of the 62 Hwy, along Pierson Blvd	New 8-inch gravity mains	6,713	2040	Developer	$1,985,400

Project	Location	Summary Description	Overall Length (feet)	Phase	Funding	Projected Project Cost
CIP-15	Fernwood Dr down Red Bud Ave, and down Skyline Dr.	New 8-inch gravity mains	4,095	2045	District	$1,211,100
CIP-16	Runs North to South parallel to old force main alignment into Dos Palmas LS. Diverts flow out of Horton WWTP. District is currently using the old force main for this purpose, but this project provides dedicated infrastructure when it becomes necessary.	New Diversion Structure	6,857	2035	District	$2,549,400

8.3.2 Master Plan Lift Station/Force Main Projects

Chapter 7 of the 2024 Sewer Master Plan identified three lift station/force main projects that are required in the collection system:

- Dos Palmas LS Reconfiguration – The Dos Palmas LS currently conveys flows north to the Horton WWTP. The LS is currently planned to be reconfigured to convey flows west to the Nancy Wright RWRF. Because of the required increase in capacity and the complete reconfiguration of the discharge, this project will be more similar in cost to a new lift station, rather than an upgrade to an existing lift station. The reconfigured lift station will require 4,500 gpm of lift station capacity combined with 10,200 feet of 18-inch diameter force main.

- Future Desert Crest Lift Station Project – As described in Chapter 7, the Desert Crest WWTP will be decommissioned rather than rehabilitated as it reaches the end of its useful life. Flow from this facility will be directed to a new lift station that will convey the flow west. This flow will be conveyed to the reconfigured Dos Palmas LS through which it will be conveyed to the Nancy Wright RWRF. The new Desert Crest LS will require 105 gpm of capacity and 3,900 feet of 6-inch diameter force main.
- Future I-10 Lift Station Project – The I-10 area is a development area at the southern edge of the District's service area. The area is below the grade of the Nancy Wright RWRF and requires a lift station to convey flows to this facility. The new lift station requires 1,100 gpm of capacity and 4,500 feet of 10-inch diameter force main.

The projected costs and CIP phase for these lift station/force main projects are provided in Table 8-3.

Table 8.3 – Lift Station/Force Main CIP Projects

Project	Lift Station	Design Capacity (gpm)	Force Main Requirements	Phase	Funding	Projected Project Cost
CIP-17	Dos Palmas LS	4,500	10,200 feet 18-inch	2035	District	$17,146,297
CIP-18	Future Desert Crest LS	105	3,900 feet 6-inch	2035	District	$3,160,318
CIP-19	Future I-10 LS	1,100	4,500 feet 10-inch	2025	Developer	$7,971,263

8.3.3 Summary of Master Plan CIP Projects

The CIP projects identified above are summarized by phase and project type in Table 8.4. As can be seen in this table, a total of nearly $63M worth of collection system improvements have been identified in the 2024 Sewer Master Plan. Approximately 55% of these projects are gravity main projects. Over 85% of these projects are required in the 2030 and 2035 phases.

Table 8.4 – Summary of Master Plan CIP Projects

Type	**Projected 2025 Project Costs**	**Projected 2030 Project Costs**	**Projected 2035 Project Costs**	**Projected 2040 Project Costs**	**Projected 2045 Project Costs**	***Total by Type***
Gravity Main	$9,971,100	$6,106,100	$15,228,300	$1,985,400	$1,211,100	$34,502,000
Lift Station/ Force Main	$7,971,200	$-	$20,306,500	$-	$-	$28,277,700
Total by Phase	$17,942,300	$6,106,100	$35,534,800	$1,985,400	$1,211,100	$62,779,700

The CIP projects above, based upon the hydraulic evaluation of the District's existing and projected future collection system, are shown on Figure 8-1, classified by phase.

Figure 8.1 – CIP Projects by Phase

8.4 Other Identified CIP Projects

In addition to the CIP projects identified through hydraulic analysis for the 2024 Sewer Master Plan, CIP projects for rehabilitation and repair were developed. Further projects have been identified by District staff and prior studies as well. These projects are discussed in the sections below.

8.4.1 Rehabilitation and Repair Projects

Planning for regular rehabilitation and repair in the collection system consists of two distinct stages. The first stage is inspection of the collection system to determine rehabilitation and repair priorities. To budget for gravity main inspections, it is assumed that the inspection cycle will be complete inspection of the collection system in 20 years. This cycle is a reasonable starting point that can be adjusted up or down as initial inspection results are obtained. It is further assumed that the inspection costs for gravity mains will be $5.00 per linear foot inspected. This value includes CCTV inspection and return of the inspection database coded in NASSCO PACP format. Based upon these assumptions, the annual inspection and total phase inspection budgets for gravity mains are provided in Table 8.5.

Table 8.5 – Gravity Main Inspection Project Budget CIP

Description	2025	2030	2035	2040	2045
Annual Inspection	$158,400	$166,400	$177,700	$179,300	$180,500
Total Inspection by Phase	$792,000	$832,000	$888,500	$896,500	$902,500

It is assumed that manholes will be visually inspected during CCTV of the gravity mains, and that pump station inspection will take place during regular pump station preventative and regular maintenance.

The results of the inspections will direct the District in prioritization of gravity mains for rehabilitation and repair. Based upon recent experience and industry standards, it is estimated that 10% of the gravity mains will require rehabilitation or repair at the beginning of a robust inspection program, presuming that known problem areas are targeted first for inspection. That percentage will decrease over time as problem areas are rehabilitated/repaired and eliminated from the system. The projected rehabilitation and repair budgets for gravity mains are presented in Table 8.6.

Table 8.6 – Gravity Main Rehabilitation and Repair Budget CIP

Description	2025	2030	2035	2040	2045
Annual Rehabilitation and Repair	$443,800	$372,960	$298,200	$201,040	$202,160
Total Rehabilitation and Repair by Phase	$2,219,000	$1,864,800	$1,491,000	$1,005,200	$1,010,800

8.4.2 Previously Identified Sewer CIP Projects

In addition to the CIP projects identified above through hydraulic evaluation and rehabilitation planning, the District has identified further projects that are necessary to maintain the successful operation of the sanitary sewer system. Some of these projects were identified through previous studies, and some were identified by District staff through the course of normal sanitary sewer system planning. The projects include repair and replacement of specific equipment in treatment facilities as well as specific collection system repairs that have been identified. These projects are presented in Table 8.7.

Table 8.7 –Previously Identified Sewer CIP Projects From Other Studies

Project	Description	Phase	Funding	Comments
CIP-20	Wastewater Septic Tank Conversion	2035	District	Local septic conversion implementation.
CIP-21	Horton's Tertiary Treatment Filter Upgrade	2045	District	3 MGD Filter part of future recycled water development.
CIP-22	Demolition of the Desert Crest WWTP	2035	District	Capacity 0.16 MGD. Desert Crest collection system needs to be connected to the new Regional collection and conveyance system.
CIP-23	CCTV truck and equipment	2030	District	New purchases are replacement for existing equipment.
CIP-24	Horton's Anoxic Mixers replacement at Horton WWTP	2030	District	Advances nitrogen compliance.
CIP-25	Horton WWTP VFD installation to control DO concentration	2025	District	VFD is to control the aeration system.